TECHNICAL MANUAL

AVIATION UNIT AND INTERMEDIATE MAINTENANCE MANUAL

ARMY MODEL AH-1P (PROD) AH-1E (ECAS) AH-1F (MODERNIZED COBRA) HELICOPTERS

DISTRIBUTION STATEMENT A: Approved for public release; distribution is unlimited.

* This manual supersedes TM 55-1520-236-23-1, dated 8 May 1980, including all changes.

HEADQUARTERS, DEPARTMENT OF THE ARMY
12 APRIL 1996

TECHNICAL MANUAL

NO. 55-1520-236-23-1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 12 April 1996

Aviation Unit and Intermediate Maintenance Manual

For

ARMY MODEL
AH-1P (PROD)
AH-1E (ECAS)
AH-1F (MODERNIZED COBRA)
HELICOPTERS

NOTE

This manual is printed in five volumes, as follows:

TM 55-1520-236-23-1, dated 12 April 1996, consisting of Table of Contents, Preface, Chapters 1 through 6.

TM 55-1520-236-23-2, dated 8 May 1980, consisting of Table of Contents, Chapters 7 through 17, Appendix A through C.

TM 55-1520-236-23-3, dated 8 May 1980, consisting of Table of Contents, Appendix D through G, and Index.

TM 55-1520-236-23-4, dated 8 May 1980, consisting of Table of Contents, FO-1 thru FO-142.

TM 55-1520-236-23-5, dated 31 July 1990, consisting of Table of Contents. FO-143 thru FO-144.

The Preface, Appendices and Index are applicable to all volumes.

WARNING

Personnel performing operations, procedures, and practices which are included or implied in this technical manual shall observe the following warnings. Disregard of these warnings and precautionary information can cause serious injury, or death.

Warnings, cautions, and notes are used to emphasize important and critical instructions and shall be used for the following conditions:

STARTING ENGINE

Starting and Operation
of the helicopter will be performed only by
authorized personnel in accordance with AR 95-11

HIGH VOLTAGE

The helicopter should be electrically grounded when parked.
Turn off all power switches before making electrical connections or disconnections.
Serious bums and electrical shock can result from contact
with exposed electrical wires or connectors.

RADIATION HAZARD

Self-luminous dials contain radioactive materials.
If such an instrument is broken or becomes unsealed, avoid personal contact.
Use forceps or gloves made of rubber or polyethylene to pick up contaminated material.
Place material and gloves in a plastic bag.
Seal bag and dispose of it as radioactive waste
in accordance with AR 385-11 and TM 3-261 (TB 43-0108).
Repair procedures shall conform to requirements in AR 700-52.

RADIATION HAZARD

Thorium Fluoride

Some of the FLIR optics inside the C-NITE telescopic sight unit (TSU)
have a coating that is slightly radioactive.
Accidental inhaling or swallowing of this material is hazardous to health.
If the C-NITE TSU has been ruptured (by crash damage, etc.), dispose of broken optics in
accordance with AR 385-11 and TB 750-237.

DANGEROUS CHEMICALS

Exposure to high concentrations of fire extinguishing agents can cause severe irritation of eyes and nose.

Corrosive Battery Electrolyte (Potassium Hydroxide). Wear rubber gloves, apron, and face shield when handling baking batteries. If potassium hydroxide is spilled on clothing, or other material, wash immediately with clean water. If spilled on personnel, immediately start flushing the affected area with dean water. Continue washing until medical assistance arrives.

Use advents or chemicals in a well ventilated area. Do not inhale vapors or allow to come in contact with skin or eyes. Observe proper fire prevention rules.

LASER LIGHT

The laser beam is dangerous and can cause blindness if it enters the eye either directly or reflected from a shiny surface. Crewmen shall wear approved laser protective visors whenever in controlled area when laser rangefinder or laser target designators are being used. Laser shall be used only in controlled areas by qualified personnel.

NOISE LEVEL

Sound pressure levels in the helicopter during some operating conditions exceed the Surgeon Generals hearing conservation criteria as defined in TB MED 251. Hearing, protection devices, such as the aviator helmet or ear plugs, are required to be worm by all personnel in and around the helicopter during its operation.

ASBESTOS FIBERS

Avoid creating dust. Breathing asbestos dust may cause serious bodily harm.

ARMAMENT

When working on, or near an armed helicopter, take all possible precautions to avoid accidental firing of armament.
Personnel shall not occupy possible firing pattern in front of or up to 20 meters behind rocket pods.
Munitions shall be handled by authorized personnel only.
All weapons shall be dry-fired. Only dummy ammunition with smooth oases like live ammunition shall be used.

JETTISON

All ground safety pins must be removed before flight. Failure to do so will prevent emergency jettison of stores.

Jettison circuit may be activated with BAT switch OFF and pilot WING STORES JTSN circuit breaker OPEN. For positive deactivation of jettison circuit, open both the PLT JTSN circuit breaker and the GNR JTSN circuit breaker located in the pilot's side console. Serious injury can result from accidental ground jettison.

SANDING DUST

Sanding on reinforced laminated glass produces fine dust that may cause skin irritations. Observed necessary protective measures.

TRANSMISSION LEVELING

Do not attempt to level transmission with "Jacks Only". Hoist must be used in conjunction with jacks while lifting transmission.

EXTERNAL STORES

Prior to any helicopter maintenance functions that require external stores be removed, JETTISON cartridge shall be removed.
Remove jettison cartridges from pylon stores ejection device prior to placing helicopter in a hangar, to prevent injury to personnel and damage to equipment.
Exception: Removal is not necessary when helicopter is to be placed in hangar for short-term, providing both PLT JTSN and GNR JETSN circuit breakers in the pilot's side console ore OPEN, and warning signs indicate that helicopter has an armed jettison system.

CANOPY REMOVAL SYSTEM

Ground safety pins must be installed in pilot and gunner arming firing handles of canopy removal system whenever the helicopter is on the ground. Pins should be installed by crew.

CLEANING HYDRAULIC COMPONENTS

The use of any alcohol in cleaning components which contact hydraulic fluids is prohibited. Formation of a polymeric residue can result, which could impair mechanical operation of the component.

HANDLING HYDRAULIC FLUID (MIL-H-83282)

When handling hydraulic fluid (MIL-H-83282), Table 1-3, Item 61, observe the following:

– Prolonged contact with liquid or mist can irritate eyes and skin.

– After any prolonged contact with skin, immediately wash contacted area with soap and water. If liquid contacts eyes, flush them immediately with clear water.

– If liquid is swallowed, do not induce vomiting; get immediate medical attention.

– Wear rubber gloves when handling liquid. If prolonged contact with mist is likely, wear an appropriate respirator.

– When fluid is decomposed by heating, toxic gases are released.

EPOXY BASED ADHESIVE

Epoxy based adhesive, P/N EA934, contains an asbestos filler which could be inhaled or ingested during grinding, cutting, or sanding operations on cured epoxy material.

TOOLS

Use only chrome plated steel or unplated steel tools for disassembly or reassembly procedures described in this manual. Use of cadmium or zinc plated tools is not permitted.

GROUNDING

All aircraft parked outside will be grounded and bonded, in accordance with FM 1-500, to the aerospace ground equipment while servicing, i.e., fueling or defueling, arming (ammunition or explosives), oxygen, hydraulic fluids or any flammable liquids. Grounding is not necessary for aircraft parked outside unless one of the above is being accomplished.

INSPECTION OF REMOVED COMPONENTS

When components are being removed from an aircraft, all inspections required by the next phase maintenance inspection must be accomplished prior to either immediate re-use or storage. Upon installation, the component will be inspected in accordance with the current phase either that phase the receiving aircraft is in or if in between phase, the last phase performed). This will ensure that a are-used component will not overfly any PM inspections, and that it will be properly interfaced with the receiving aircraft phase sequence.

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AVIATION UNIT AND INTERMEDIATE MAINTENANCE MANUAL ARMY MODEL

AH-1P (PROD)
AH-1E (ECAS)
AH-1F (MODERNIZED COBRA)
HELICOPTERS

REPORTING OF ERRORS

You can help improve this manual, if you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual directly to: Commander, U.S. Army Aviation and Troop Command, ATTN: AMSAT-I-MP 4300 Goodfellow Blvd.. St Louis, MO 63120-1798. A reply will be furnished to you. You may also submit your recommended changes by E-mail directly to <mpmt%avma28@st-louis-emh7 army. mil>. A reply will be furnished to you

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PREFACE

P-1. GENERAL.

a. This manual is the official document for Aviation Unit and Intermediate Maintenance of Army Model AH-1P/E/F Helicopters. Refer to the following for serial number effectivity.

1. AH-1P (Production).
   (Coded P)
   76-22567 through 76-22610
   76-22692 through 76-22713
   77-22729 through 77-22762

2. AH-1E (Enhanced Cobra Armament System)
   (Code E)
   78-22763 through 78-22810
   78-23043 through 78-23092

3. AH-1F (Modernized Configuration)
   (Coded M)
   76-22567 and 76-22600 (Production Prototypes)
   78-23093 through 78-23125 Selected aircraft-
   66-15248 through 71-21052. All aircraft-78-
   All aircraft-78-23093 and subsequent.

b. The purpose of this manual is to familiarize you with the maintenance functions to be performed at the Aviation Unit and Intermediate Maintenance levels. The Table of Contents for this manual is provided to assist in determining the chapter in the manual in which individual functions are covered. This manual provides all essential information for personnel to accomplish Aviation Unit and Intermediate Maintenance on the complete airframe, its components, and systems, excluding armament and avionics subsystems, as indicated for Aviation Unit and Intermediate Maintenance activities in the Maintenance Allocation Chart (MAC). Refer to Appendix B.

c. Designator symbols are used in conjunction with text contents, text headings and illustration titles to show limited affectivity of material. Designator symbols may precede a text heading or illustration title to indicate proper affectivity, unless the material applies to all series and configurations within the manual. Designator symbols precede procedural steps and designated material in the text. If the material applies to all series and configurations. no designator symbols will be used. Where practical, descriptive information is condensed and combined for all models to avoid duplication. Data in this manual are coded as follows:

(1) P AH-1P (Production)

(2) E AH-1E (Enhanced Cobra Armament System)

(3) M AH-1F (Modernized Configuration)

(3.1) MCN AH-1F (Modernized Configuration with C-NITE)

(4) No Code - All models

(5) B540 Bell Helicopter Textron Main Rotor Blades

(6) K747 Kaman Aircraft Corporation Main Rotor Blades

d. Changes, except as noted below, to the text and tables, including new material on added pages, are indicated by a vertical line in the outer margin extending close to the entire area of the material affected. Symbols show current changes only. A miniature pointing hand symbol is used to denote a change to an illustration. However, a vertical line in the outer margin, rather than miniature pointing hands, is utilized when there have been extensive changes made to an illustration. Change symbols are not utilized to indicate changes in the following:

(1) Introductory material.

(2) Indexes and tabular data where the change cannot be identified.

(3) Blank space resulting from the deletion of text, an illustration, or a table.

(4) Correction of minor inaccuracies, such as spelling, punctuation, relocation of material, etc., unless such correction changes the meaning of instructive information end procedures.

P-2. QUALITY ASSURANCE/QUALITY CONTROL (QA/QC).

Personnel will assure proper maintenance has been performed by verifying dimensions and tolerances contained throughout this technical manual have been complied with.

P-3. DESCRIPTION.

A. Fuselage. The helicopter is a two-place assault type with a narrow fuselage, single main and tail rotors, short wings, and provisions for a variety of armament, The forward fuselage is built up on two main longitudinal beams with lateral bulkheads, floors, shear panels, and decks of honeycomb panel construction, forming a box beam. Crew compartments are arranged in tandem, with the pilot seated behind and above the gunner, and are covered by a transparent canopy with two doors. Both doors are sections of the canopy, hinged at top with the gunner door opening at left and the pilot door opening at right side. Both seats are protected by armor on backs, seats and sides of supports. The compartment area is ventilated by forced air from a transmission-drive blower. The short wings provide support for armament mounting pylons and also aid maneuverability by providing lift at higher airspeeds.

b. Tailboom Section. The tailboom section, attached to the forward fuselage by four bolts, is a tapered semimonocoque structure with a vertical fin slanting up and aft at the rear end to support the tail rotor. Ballast is added to the aft end of tailboom to control helicopter center of gravity limits. Lead shot is added inside the tailskid on P coded helicopters. Tail rotor driveshafts and gearboxes are mounted under rovers along the top of the tailboom and front of the vertical fin. A controllable elevator is also mounted on the tailboom.

c. Propulsion System. The propulsion system consists of a gas turbine engine, main driveshaft, transmission and mast, main rotor, and tail rotor with driveshafts and gearboxes. The transmission and engine are mounted on the fuselage aft of the crew compartment and covered by cowling and fairing. The engine drives the transmission through the main driveshaft, rototating the mast and main rotor. Power is also taken off the transmission to drive the tail rotor, which compensates for main rotor torque to control the helicopter heading. Fuel tanks consist of two interconnected cells, located in the fuselage.

d. Flight Controls. Flight controls are direct mechanical linkages from sticks and pedals at pilot and gunner stations, assisted by hydraulic cylinders powered by transmission-driven hydraulic pumps. A stabilization and control augmentation system is also incorporated in the control linkage to steady the helicopter during use of armament.

e. Armament Provisions. Armament provisions include mounting, wiring, and hydraulic lines for an armament turret under the forward end of the fuselage, an ammunition compartment immediately aft of the turret location, sights and control panels at crew stations, and mounting pylons for external armament pods on each wing. Helicopters coded P utilize hydraulically operated armament turrets. Helicopters code [illegible] and M utilize electrically operated armament turrets.

f. Landing Gear. Lending gear is skid type with arched cross tubes attached to the fuselage. Exposed portions of cross tubes are covered by streamlined fairings to reduce drag. A tail skid is provided to warn the pilot in the event of a tail-low landing.

P-4. Destruction of Army Material to Prevent Enemy Use.

For destruction of Army material to prevent enemy use, refer to TM 750-244-1-5.

P-5. Maintenance of Forms and Records.

Maintenance of forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by DA PAM 738-751.

P-6. Authority for Substitution.

Substitution or interchange of items of materiel for maintenance of Department of the Army helicopter shall not be authorized, nor shall orders be issued for shipment. Substitution or interchangeability shall only be authorized by US Army Aviation Systems Command (AVSCOM).

P-7. Special Tools and Equipment.

Aviation Unit and Intermediate Maintenance special tools and equipment will be found in TM 55-1520-236-23P (Repair Parts and Special Tools List). Use of special tools and equipment for complex tasks is described in this manual.

P-8. Calibration.

Equipment requiring calibration shall be indicated and reference made to publications containing the applicable procedures.

a. Helicopter components, accessories, and instruments requiring calibration shall be specified in Chapter 1.

b. Special tools and test equipment shall be calibrated as specified in TB 750-25, Army Metrology and Calibration System.

P-9. Storage.

Refer to TM 740-90-1 and Appendix E for Storage of helicopter.

P-10. Engineering Authorization.

All requests for engineering authorization, when required by this manual will be forwarded to USA AVSCOM, ATTN: AMSAV-ME, 4300 Goodfellow Blvd., St. Louis, MO., 63120. Urgent requests shall be clearly identified to insure priority handling and response. The requests shall include detailed information on the problem, e.g., sketches, photographs, dimensional data, etc., to assist in the evaluation and prompt reply.

CHAPTER 1

AIRCRAFT GENERAL

SECTION I. SERVICING

1-1. SERVICING.

1-2. DESCRIPTION – SERVICING.

Servicing information and procedures are presented by system or components in the following paragraphs. Points used infrequent servicing and replenishment of fuels, oil, hydraulic fluid, and other materials are shown in figure 1-1.

1-3. SERVICING – FUEL SYSTEM.

a. The fuel supply tank consists of two cells, located in the fuselage forward and aft of the wings, interconnected by a crossover and vented through a common outlet line. Each cell has a sump and a fuel pump with drains (figure 1-1) accessible through doors in the fuselage lower skin. The fuel tank filler cap and static ground receptacle serve both tanks. **P** **E** The cap and adapter assembly allows for gravity refueling. **M** A closed circuit fueling receiver allows for dosed port or open port gravity refueling.

b. Total tank capacity for the fuel system is 262 Us. gallons, and normal service capacity is 260 Us. gal fens.

WARNING

Servicing personnel shall comply with all safety precautions and procedures specified in FM 10-68, Aircraft Refueling field manual.

c. Closed Circuit Refueling (Power Off).

(1) Refer to Figure 1-1 for fuel filter location.

(2) Assure that fire guard is in position with fire extinguisher.

(3) Ground servicing unit to ground stake.

(4) Ground servicing unit to helicopter.

(5) Ground fuel nozzle to ground receptacle located adjacent to fuel receptacle on helicopter.

(6) Remove fuel filler cap, and assure that refueling module is in locked position (refer to figure 1-1.1).

(7) Remove nozzle cap and insert nozzle into fuel receptacle and lock into position.

(6) Activate flow control handle to ON or FLOW position. Fuel flow will automatically shut off when fuel cdl is full. Just prior to normal shut off, fuel flow may cycle several times, as maximum fuel level is reached.

(9) Assure that flow control handle is in OFF or NO FLOW position and remove nozzle.

(10) Replace fuel nozzle cap.

(11) Replace fuel filler cap.

(12) Disconnect fuel nozzle ground.

(13) Disconnect ground from helicopter to servicing unit.

(14) Disconnect servicing unit ground from ground stake.

(15) Return fire extinguisher to designated location.

c.1. Gravity or Open-Port Refueling (Power Off).

(1) Refer to Figure 1-1 for fuel filler location.

(2) Assure that fire guard is in position with fire extinguisher.

(3) Ground servicing unit to ground stake.

(4) Ground servicing unit to helicopter.

(5) Ground fuel nozzle to ground receptacle located adjacent to fuel receptacle on helicopter.

(6) Remove fuel filler cap.

(7) Using latch tool, attached to filler cap cable open refueling module if equipped with dosed circuit receptacle (refer to figure 1-1.1).

(8) Remove nozzle cap and insert nozzle into fuel receptacle.

(9) Initiate fuel flow by squeezing trigger grip on nozzle. When using a CCR open-port/gravity nozzle adapter; prior to squeezing trigger grip, actuate flow control handle on CCR nozzle to ON or FLOW position.

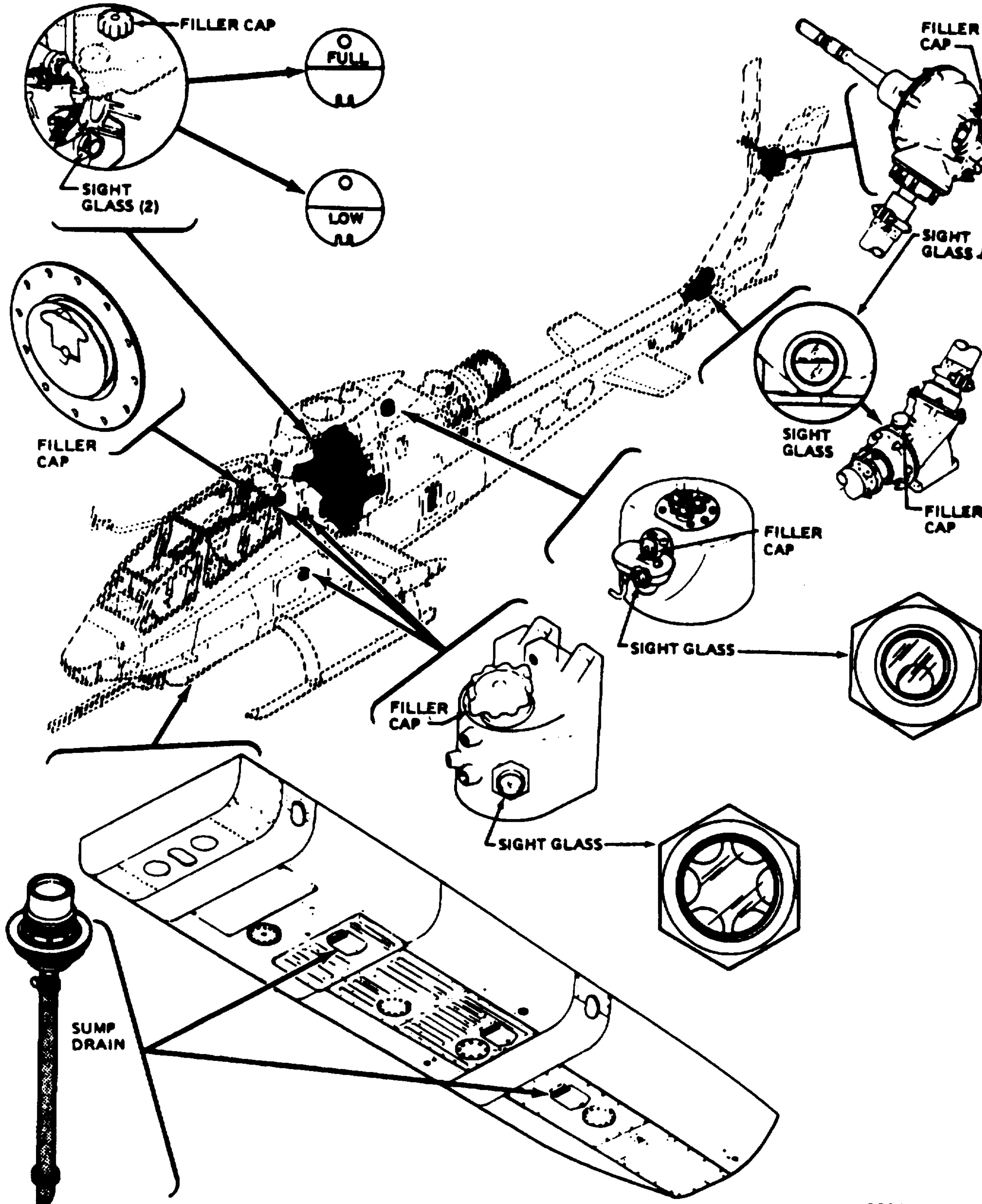


Figure 1-1. Servicing Points Diagram (Typical)

(10) Closely monitor fuel quantity; when fuel is at desired level, release trigger grip to shut-off/stop fuel flow. When using a CCR open-portUgravity nozzle adapter, actuate flow control handle to OFF or NO FLOW position. Remove nozzle.

(11) Replace fuel nozzle cap.

(12) Close refueling module by pulling cable until latch is in locked position, if equipped with dosed circuit receptacle (refer to figure 1-1.1).

(13) Replace fuel filler cap.

(14) Disconnect fuel nozzle ground.

(15) Disconnect ground from helicopter to servicing unit.

(16) Disconnect servicing unit ground from ground stake.

(17) Return fire extinguisher to designated location.

c.2. Rapid (Hot) Refueling (Closed Circuit).

(1) Before RAPID Refueling.

(a) Throttle – Idle.

(b) FORCE TRIM Switch – FORCE TRIM.

WARNING

In case of helicopter fire, observe fire emergency procedures In Chapter 9 of TM 55-1520-236-10.

(2) During RAPID Refueling. A crewmember, shall observe the refueling operation (performed by authorized refueling personnel) and stand fire guard as required. One crewmember shall remain in the helicopter to monitor controls. Only emergency radio transmission should be made during (rapid) refueling.

(3) Refer to figure 1-1 for fuel filler location.

(4) Assure that fire guard is in position with fire extinguisher.

(5) Ground servicing unit to ground stake.

(6) Ground servicing unit to helicopter.

(7) Ground fuel nozzle to ground receptacle located adjacent to fuel receptacle on helicopter.

(8) Remove fuel filler cap, end assure that refueling module is in dosed position (refer to figure 1-1.1.)

(9) Remove nozzle cap and insert nozzle into fuel receptacle and lock into position.

(10) Activate flow control handle to ON or FLOW position. Fuel flow will automatically shut off when fuel cell is full. Just prior to normal shutoff, fuel flow may cycle several times, as maximum fuel level is reached.

(11) Assure that flow control handle is in OFF or NO FLOW position and remove nozzle.

(12) Replace fuel nozzle cap.

(13) Replace fuel filler cap.

(14) Disconnect fuel nozzle ground.

(15) Disconnect ground from helicopter to servicing unit. AFTER RAPID REFUELING. The pilot shall be advised by the refueling crew that fuel cap is secure and grounding cables have been removed.

(16) Disconnect servicing unit ground from ground stake.

(17) Return fire extinguisher to designated location.

c.3. RAPID (HOT) GRAVITY Refueling.

(1) Before RAPID Refueling.

(a) Throttle – Idle.

(b) FORCE TRIM Switch – FORCE TRIM.

WARNING

In case of helicopter fire, observe fire emergency procedures in Chapter 9 of TM 55-1520-236-10.

(2) During RAPID Refueling. A crewmember, shall observe the refueling operation (performed by authorized refueling personnel) and stand fire guard as required. One crewmember shall remain in the helicopter to monitor controls. Only emergency radio transmission should be made during (rapid) refueling.

(3) Refer to figure 1-1 for fuel filler location.

(4) Assure that fire guard is in position with fire extinguisher.

(5) Ground servicing unit to ground stake.

(6) Ground servicing unit to helicopter.

(7) Ground fuel nozzle to ground receptacle located adjacent to fuel receptacle on helicopter.

(8) Remove fuel filler cap.

(9) Using latch tool, attached to filler cap cable open refueling module if equipped with dosed circuit rapid refueling receptacle (refer to figure 1-1.1).

WARNING

During RAPID GRAVITY Refueling, exercise extreme caution to prevent fuel splashing from fuel cell or fuel nozzle. Any fuel leakage could be extremely hazardous If Ingested Into engine air intake.

(10) Remove nozzle cap and insert nozzle into fuel receptacle.

(11) Initiate fuel flow by squeezing trigger grip on nozzle. When using a CCR open-port/gravity nozzle adapter; prior to squeezing trigger grip, actuate fuel control handle on CCR nozzle to ON or FLOW position.

(12) Closely monitor fuel quantity; when fuel is at desired level, release trigger grip to shut-off/stop fuel flow. When using CCR open-port/gravity nozzle adapter, actuate flow control handle to OFF or NO FLOW position. Remove nozzle. Close refueling module by pulling cable until latch is in locked position, if equipped with dosed circuit receptacle (refer to figure 1-1.1).

(13) Replace fuel nozzle cap.

(14) Replace fuel filler cap.

(15) Disconnect fuel nozzle ground.

(16) Disconnect ground from helicopter to servicing unit. AFTER RAPID REFUELING. The pilot shall be advised by the refueling crew that fuel cap is secure and grounding cables have been removed.

(17) Disconnect servicing unit ground from ground stake.

(18) Return fire extinguisher to designated location.

d. Defueling.

(1) Remove lower section of drain valve from aft fuel cell.

NOTE

Aft fuel drain valve assembly is a two place valve which will automatically dose valve opening when lower valve is removed

(2) Install AN815-12D fitting, with flexible hose installed, in valve assembly in bottom of cell. Valve will open as fitting is being installed.

(3) After defueling, remove AN815-12D fitting. Install lower section of valve and lockwire (C137).

e. Fuel Requirements. Fuel requirements for the engine are listed in table 1-1. A general listing of acceptable fuels is provided in table 1-2. The fuels listed in table 1-2 for each type have nearly identical characteristics. All of the fuels are compatible and may be mixed in aircraft fuel tanks. The use of fuels shall be in accordance with TB 55-9150-200-25.

WARNING

Turbine engine fuels, as well as gasoline, form explosive mixtures readily. To ensure safety of personnel, aircraft handling and filling operations shall conform to TM 10-1101 and FM 10-68.

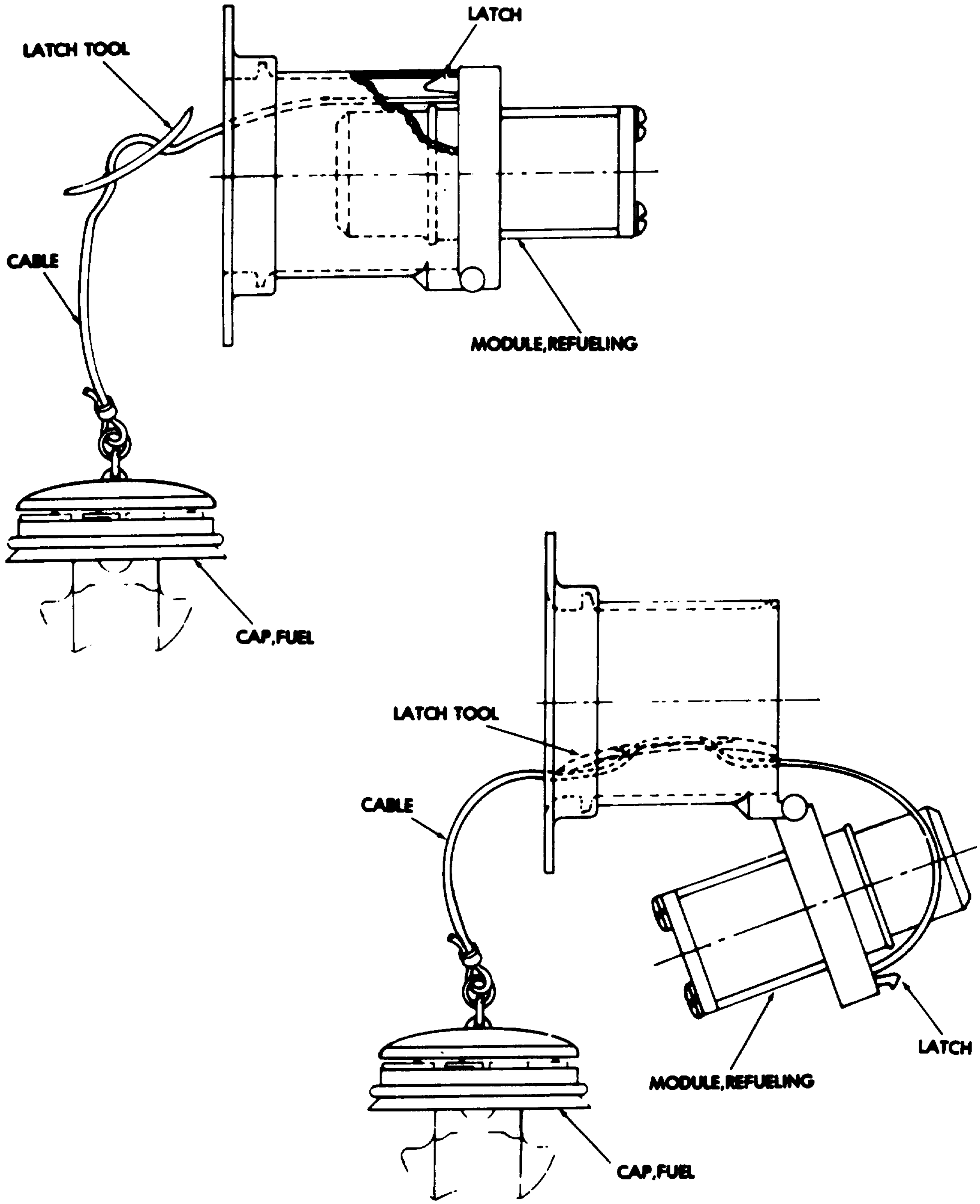


Figure 1-1.1. Receiver and Cap Assembly

Table 1-1 Engine Fuel Specifications

ARMY STANDARD FUEL

MIL-T-5624	Grade JP-4	NATO Code F-40

ALTERNATE FUEL

MIL-T-5624	GRADE JP-5	NATO Code F-44
MIL-T-83133	GRADE JP-8	NATO Code F-34

Note: JP-5 and JP-8 fuels may be added to JP-4 fuels in any quantity in helicopter fuel system

EMERGENCY FUEL

MIL-G-5572	AVIATION GASOLINE	NATO Codes F-12, F-18, and F-22
		Refer to TB 55-9150-200-25

Notes:

1. Make an entry on DA Form 2408-13 if emergency fuel is used.
2. Any mixture containing aviation gasoline is considered emergency fuel.
3. Maximum allowable engine operating time when using aviation gasoline without TCP is 50 hours.
4. Maximum allowable engine operating time when using aviation gasoline with TCP is 25 hours.

f. **Fuel Types.** Fuels are classified as Army Standard, Alternate, or Emergency.

(1) Army Standard Fuels: These are the Army designated primary fuels adopted for worldwide use, and will be the only fuels readily available in the Army support system.

(2) Alternate Fuels: These are fuels which can be used continuously when Army Standard fuel is not available, without reduction of power output. Power setting adjustments may be required when an alternate fuel is used.

(3) Emergency Fuels: These are fuels which can be used if Army Standard and approved Alternate fuels are not available. Their use is subject to a specific time limit. Refer to TM 55-1520-236-10.

g. Use of Fuels. There is no special limitation on the use of Army Standard fuel, but certain limitations are imposed when emergency fuels are used. For the purpose of record, fuel mixtures shall be identified as to the major component of the mixture (except when the mixture contains leaded gasoline) and recorded on DA Form 2408-13 (Aircraft Inspection and Maintenance Record). A fuel mixture which contains over 10 percent leaded gasoline shall be recorded as all leaded gasoline.

(1) The use of kerosene fuels (JP-5/JP-8) in turbine engines dictates the need for observance of special precautions. Both ground starts and air restarts at low temperature may be more difficult due to low vapor pressure, Kerosene fuels having a freezing point of -40 degrees F (-40 degrees C) limit the maximum altitude of a mission to 28,000 feet under standard day conditions. Those having a freezing point of -55 degrees F (-48 degrees C) limit the maximum altitude of a mission to 33,000 feet under standard day condition.

Table 1-2. Approved Fuels

SOURCE	PRIMARY OR STANDARD FUEL	ALTERNATE FUEL	
US MILITARY FUEL	JP-4 (MIL-T-5624)	JP-5 (MIL-T-5624) or JP-8 (MIL-T-83133)	
NATO CODE NO.	F-40 (WIDE CUT TYPE)	F-44 or F-34 (High Flash Type)	
COMMERCIAL FUEL (ASTM-D-1655)	JET B	JET A	JET A-1 NATO F-34
American Oil Co.	American JP-4	American Type A	
Atlantic Richfield	Aerojet B	Aerojet A	Aerojet A-1
Richfield Div		Richfield A	Richfield A-1
B.P. Trading	B.P.A.T.G.		B.P.A.T.K.
Caltex Petroleum Corp.	Caltex Jet B		Caltex Jet A-1
Cities Service Co.		CITGO A	
Continental Oil Co.	Conoco JP-4	Conoco Jet-50	Conoco Jet-60
Gulf Oil	Gulf Jet B	Gulf Jet A	Gulf Jet A-1
EXXON Co., USA	EXXON Turbo Fuel B	EXXON A	EXXON A-1
Mobil Oil	Mobil Jet B	Mobil Jet A	Mobil Jet A-1
Phillips Petroleum	Philjet JP-4	Philjet A-50	
Shell Oil	Aeroshell JP-4	Aeroshell 640	Aeroshell 650
Sinclair		Superjet A	Superjet A-1
Standard Oil Co.		Jet A Kerosene	Jet A-1 Kerosene
Chevron	Chevron B	Chevron A-50	Chevron A-1
Texaco	Texaco Avjet B	Avjet A	Avjet A-1
Union Oil	Union JP-4	76 Turbine Fuel	
FOREIGN FUEL	NATO F-40	JP-5 (NATO F-44 (High flash type)) JP-8 (NATO F-34 (High flash type)	
Belgium	BA-PF-2B		
Canada	3GP-22F	3-6P-24e	
Denmark	JP-4 MIL-T-5624		
France	Air 3407A		
Germany (West	VTL-9130-006	UTL-9130-007/-TL 9130-010	
Greece	JP-4 MIL-T-5624		
Italy	AA-M-C-1421	AMC-143	
Netherlands	JP-4 MIL-T-5624	D. Eng RD 2493	
Norway	JP-4 MIL-T-5624		
Portugal	JP-4 MIL-T-5624		
Turkey	JP-4 MIL-T-5624		
United Kingdom (Britain)	D. Eng RD 2454	D. Eng RD 2498	

NOTE

Anti-icing and Biocidal Additive for Commercial Turbine Engine Fuel — The fuel system icing inhibitor shall conform to MIL-I-27686. The additive provides anti-icing protection and also functions as a biocide to kill microbial growths in helicopter fuel systems. Icing inhibitor conforming to MIL-I-27686 shall be added to commercial fuel not containing an icing inhibitor during refueling operations regardless of ambient temperatures. Refueling operations shall be accompanied in accordance with accepted commercial procedures. This additive (prist or eq.) is not available in the Army Supply System, but will be locally procured when needed.

(2) The use of straight unleaded gasoline may shorten the operating life of combustor parts; therefore, its use between scheduled internal (hot end) inspections is limited. When the time limit has been reached, the use of unleaded gasoline must be discontinued pending result of internal inspection.

NOTE

Two parts of unleaded gasoline mixed with one part d kerosene fuel (JP-5/JP-8) produce a fuel which is preferred above straight unleaded gasoline. In the fueling record this mixture should be identified as unleaded gasoline.

Unleaded gasoline leaves combustor parts dean: therefore, no special cleaning is required between scheduled internal (hot end) inspections

(3) Leaded gasoline, either straight or mixed with other fuels in any proportion, will deposit a layer of lead oxide on combustor parts. The lead oxide attacks the underlying metal and also acts as an insulator which reduces combustion efficiency and causes the formation and deposition of carbon. Therefore, the operating time between scheduled internal (hot end) inspections is limited. If the, permissible accumulated operating time is exceeded, a special cleaning and inspection is mandatory (TM 55-2840-229-24).

NOTE

Special cleaning and Inspection maybe delayed for 10 operating hours provialed that only Army Standard fuel is used during the delay.

1-4. SERVICING – ENGINE OIL SYSTEM.

The engine oil tank is located above the engine in the aft fairing. Oil level sight gage and filler cap (figure 1-1) are on front of tank, accessible through doors on pylon center fairing. Tank drain valve is accessible through the engine compartment, and has an overboard drain line.

a. fill engine oil tank to spill-over for normal servicing. Sight gage is positioned to show low oil level. When oil level is below spill-over level the tank should be filled. Useful capacity of tank is 2.25 U.S. gallons, with expansion space of 1.15 gallons.

b. Before adding oil, determine whether system contains oil (C79) or oil (C80). Type of oil used should be shown on DA Form 2408-13. If type oil is not known, comply with paragraph c Maximum oil consumption for T53-L703 engine is 0.3 gal./hr. (2.4 US pints). The oil level sight gage is provided for the purpose of determining a low oil condition. When oil level is at sight gage level, oil supply is 2.75 +0.25 quarts low. When servicing oil tank, fill completely to a spill-over condition. The system warning light will come ON and the bypass valve will open when the oil is down 3.8 quarts low from spill-over.

c. Usage of Oils. It is not advisable to mix oil (MIL-L-23699) (C80) and oil (MIL-L-7808) (C79) except when an emergency exists and conditions warrant. If mixing becomes necessary, the engine oil system shall be drained within 6 hours of operations and refilled with the appropriate oil. (See subparagraphs (1) and (2) below for oil usage.) If engine oil system is to be replenished proceed in accordance with paragraph 14, step b. When changing from oil (C79) to oil (C80), proceed in accordance with paragraph 1-4, step d (1), steps (a) thru (i). When changing from oil (C80) to oil (C79) proceed in accordance with paragraph 1-4, step d (2), steps (a) thru (i). Transmission oil system shall be serviced in accordance with paragraph 1-5. Gearboxes shall be serviced in accordance with paragraph 1-7.

(1) Oil (C80) used in engine, main transmission, and gearboxes oil systems is authorized and directed for ambient temperatures -25 degrees F and above.

(2) Oil (C79) used in engine, main transmission, and gearboxes oil systems is specified for prolonged operation in ambient temperatures below -25 degrees F. This oil may also be used when oil (C80) is not available.

CAUTION

Under no circumstances shall MIL-L-23699 oil be used at temperatures below -25 degrees F.

d. Procedure for Changing Engine Oils.

(1) When changing from oil (C79) to oil (C60) in engine oil system, accomplish steps below.

(a) Take oil sample.

(b) Drain oil from system.

(c) Remove, inspect, dean, and reinstall all engine oil filters and strainers.

(d) Fill engine oil tank to lip of filler neck with oil (C80). Motor engine to pump oil into cooler and lines. Check tank level and refill. Repeat until level does not change, indicating the cooler lines are filled.

(e) Operate engine for 30 minutes to 1 hour. Shut down engine.

(f) Remove, inspect, dean, and reinstall all engine oil filters and strainers.

1 If oil filter was contaminated, accomplish all steps below.

2 If oil fitter was not contaminated, omit steps (g) and (h) and accomplish steps (i) through (i) below.

(g) Drain all oil from engine oil system and discard oil.

(h) Fill engine oil system with new oil (C80) and release helicopter for use.

(i) After 5 hours operation, inspect and dean all engine oil filters and strainers.

(j) After 15 hours operation since oil change, remove, inspect, and clean all engine oil filters and strainers.

(k) Revert to normal schedule of inspections of engine oil fitter and strainers.

(2) When changing from oil (C80) to oil (C79) in engine oil system, accomplish the following:

(a) Take oil sample.

(b) Drain oil (C80) from system.

(c) Remove, inspect, clean, and reinstall all engine oil strainers and filters.

(d) Fill engine oil tank with oil (C79); motor engine to pump oil into cooler and lines. Check tank level and add oil. Repeat until tank level does not change, indicating that cooler and lines are filled.

(e) Operate engine until oil reaches operating temperature. Shut down engine

(f) Remove, inspect, dean, and reinstall all engine oil strainers and filter. Release helicopter for service use.

(g) After 5 hours of operation, inspect and dean all engine oil strainers and filter.

(h) After 15 hours of operation since lost oil change, inspect and dean engine oil strainers and fitter.

(i) Revert to normal interval of inspection for engine oil strainers and filter.

1-5. SERVICING — TRANSMISSION OIL SYSTEM.

a. The transmission oil supply is contained in the sump case. A double sight glass (figure 1-1) sump can be viewed through a small transparent plastic window in the right-hand pylon cowling door, using a light controlled by a push-button below the door. Before servicing transmission sump to upper sight glass level, determine whether system containing oil (C79) (C79A) or oil (C80). If unable to determine type of oil used, comply with paragraph 1-4, step c. System capacity is 2.25 US gallons when filled to center of upper sight glass. When filling is required, open the cowling door for access to the filler cap on the transmission support ease. The sump drain valve is accessible by removing an access panel on fuselage below either wing.

b. When changing from oil (C79)(C79C) to oil (C80) or from oil (C80) to oil (C79)(C79C) accomplish the following steps:

(1) Take oil sample

(2) Drain oil.

(3) Remove external fitter element and inspect for contamination. Install new filter element.

(4) Remove, inspect, dean, and reinstall primary oil filter.

(5) Refill with appropriate oil (paragraph 1-4).

1-6. SERVICING—MAIN AND TAIL ROTOR SYSTEMS.

Main and tail rotor systems require no normal servicing. Lubrication requirements are covered in paragraph 1-28.

1-7. INTERMEDIATE AND TAIL ROTOR DRIVE GEARBOXES.

The intermediate gearbox is under a removable cover, located between driveshaft covers of tailboom and vertical fin. An oil level sight glass figure 1-1, a chip detector, and drain plug, are on the right side of the gearbox; a vented filler cap is on the topside of the gearbox. The tail rotor drive gearbox is covered by two removable fairings near upper end of the vertical fin. An oil level sight glass (2) is provided on lower left side, a chip detector and drain plug at bottom, an a vented filler cap on the aft side of the gearbox.

a. Before servicing either gearbox to indicated sight glass level with lubricating oil, determine whether system contains oil (C79)(C79A) or oil (C80). If unable to determine type of oil used, refer to paragraph, 1-4.

b. When changing from oil (C79)(C79A) to oil (C80) or from oil (C80) to oil (C79)(C79A) accomplish the following steps:

(1) Take oil sample.

(2) Drain oil.

(3) Perform normal inspection.

(4) Refill with appropriate oil (paragraph 1-4).

1-8. SERVICING-HYDRAULIC RESERVOIRS.

Reservoirs (figure 1-1) for hydraulic systems No. 1 and No. 2 are located in a compartment just aft of the canopy. Access doors are provided at both sides of the fuselage. Fluid level sight glasses on both reservoirs are visible through left side door. Each reservoir has a tiller cap accessible from nearest door. The reservoir for the electrical emergency hydraulic system is located behind a panel on the fuselage below the right wing. For systems serviced with fire resistant hydraulic fluid, refer to TB 55-1500-334-25.

WARNING

When handling hydraulic fluid (MIL-H-83282), Table 1-3, Item 61, observe the following:

—Prolonged contact with liquid or mist can irritate eyes and skin.

—After any prolonged contact with skin, immediately wash contacted area with soap and water. If liquid con tacts eyes, flush them immediately with clear water.

—If liquid is swallowed, do not induce vomiting; get immediate medical attention.

—Wear rubber gloves when handling liquid. If pro longed contact with mist is likely, wear an appropriate respirator.

—When fluid is decomposed by heating toxic gases are released.

a. Open access doors and remove panel to gain access to hydraulic reservoirs.

WARNING

To avoid contamination, a sealed can of fluid must be opened and used. Do not use previously opened cans of hydraulic fluid.

b. Service reservoirs with hydraulic fluid (C61 or C62).

c. Close access door or reinstall panel.

1-9. SERVICING—GROUND HANDLING GEAR.

a. Lubricate assemblies with grease (C58) through fittings on wheels, actuating arms, and cradles as frequently as operating conditions warrant.

b. Repair tires and tubes in accordance with TM 55 2620-200-24. Inflate with compressed air to **75 psi.**

c. Check and fill hydraulic pump as required.

(1) Hold handling gear assembly so that pump is vertical with filler hole at upper end. Remove screw from filler hole.

(2) Fill pump to filler hole level with hydraulic fluid (C62). Reinstall screw in filler hole.

1-10. SERVICING-BATTERY.

WARNING

- Corrosive Battery Electrolyte (Potassium Hydroxide). Wear robber gloves, apron and face shield when handling leaking batteries. If potassium hydroxide is spilled on clothing, or other material, wash immediately with clean water. If spilled on personnel, immediately start flushing the affected area with clean water. Continue washing until medical assistance arrives.

- Battery failure and explosions may be caused by an excess of electrolyte in the cells. The specific gravity of a nickel-cadmium battery remains constant when the battery is in either a charged or discharged condition, consequently the state of charge cannot be determined by a test of the electrolyte. Neither can the state of charge be determined by a voltage test, due to the fact that the voltage remains constant over 90 percent of the discharge time. Since the state of charge cannot be determined by a check of either voltage or the electrolyte, the charging input to a completely discharged battery must be monitored in both current and time until the ampere hour capacity of the battery has been reached.

The nickel-cadmium battery is mounted in **BATTERY** compartment. The battery is a 24 volt 22 ampere-hour battery unit. It is connected to the helicopter electrical system through a relay which is controlled by the battery switch on the pilot console. Two overflow, or vent tubes extend from the battery to the outside of the fuselage. Access to the battery is gained through a door in the helicopter battery compartment. The battery shall be removed from the helicopter at 100 hour intervals or 120 calendar day inspection, whichever comes first, and sent to the Battery Shop for inspection, repair, charging capacity test, and adjustment of electrolyte level. For additional servicing instructions refer to TM 11-6140-203-15-2.

1-11. CLEANING OF HELICOPTER.

1-12. DESCRIPTION—CLEANING OF HELICOPTER

Cleaning procedures and information are presented in the following paragraphs. Helicopter must be grounded prior to any cleaning maintenance, disassembly, or preservation. See TM 55-1500-344-23 for additional cleaning information.

CAUTION

To preclude damage to bonded panels, solvents and water are to be applied at the minimum pressure required to maintain a constant flow suitable for washing and rinsing. Steam is not to be utilized.

NOTE

Additional cleaning procedures are covered in this manual under individual components.

1-13. CLEANING-INTERIOR.

Clean the interior of the helicopter to prevent debris from falling into operating mechanisms. If the seats and cushions need cleaning, use mild soap (C113) and water. To remove grease or oil spots use cleaning compound (C133). Wipe dry with a clean cloth. Finally, thoroughly clean the helicopter with a vacuum cleaner.

1-14. CLEANING-EXTERIOR

CAUTION

Exercise extreme caution when cleaning the SU-130 Laser Detection sensor units.

Clean the exterior structure by applying a mixture of one part cleaning compound (C33) and three to seven parts water. Use the stronger mixtures for exhaust outlet areas and other very dirty surfaces. Wash a small area at a time making sure to rinse thoroughly with water under pressure. If allowed to dry or if not completely rinsed off, streaking will occur.

1-15. CLEANING – ACRYLIC PLASTIC.

CAUTION

Do not use compounds other than those specified. Avoid excessive scrubbing of plastic panels during washing operation.

a. Clean all transparent acrylic plastic with cleaning compound (C33) mixed with three to seven parts of water.

b. Gently free all caked mud or dirt with fingers. Do not use sponges or coarse cloths. Rinse the area continuously while removing the mud.

WARNING

Solvent shall be used with adequate ventilation and prolonged breathing of the vapors shall be avoided. The solvent shall not be used near open flames or heat as the products of decomposition are toxic and very irritating. Avoid contact with skin. Wear rubber gloves.

CAUTION

To prevent plastic discoloration do not use aliphatic naphtha (Type 1).

c. Remove grease or oil with aliphatic naphtha, Type 2 (C75).

d. Allow surfaces to drip dry.

e. Minor scratches may be reduced or removed (TB 55-1560-276-24/1).

f. Apply repellant and conditioner (C94).

1-16. CLEANING – ROTOR BLADES.

CAUTION

Clean **K747** main rotor blades only in accordance with paragraph 5-28.

NOTE

Do not spray or rinse main rotor hub with water under pressure.

a. Wash rotor blades with one part cleaning compound (C33) and nine parts water.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

b. Remove stubborn deposits with a cloth dampened with solvent (C112).

1-17. TREATMENT OF ALUMINUM AND MAGNESIUM ALLOY CORROSION.

Aluminum and magnesium alloy corrosion will be treated in accordance with TM 43-0105. Apply the protective paint finish to the affected area immediately after drying of chemical treatment in accordance with TB 746-93-2.

1-18. REMOVAL OF SNOW AND ICE - AIRCRAFT, 540 AND 747 ROTOR BLADES AND TAIL ROTOR.

CAUTION

Do not, under any circumstances, try to remove ice directly from the SU-130 Laser Detection sensor unit windows.

Extreme care shall be exercised at all times to prevent any damage to the aircraft surfaces. Sharp instruments such as picks, knives, or screw drivers will not be used to loosen the ice formation.

a. Check entire helicopter for snow, frost, and ice accumulation. Snow can be removed from airframe and rotor blades by using a bristle brush or equivalent. Ensure that helicopter skids are not frozen to ground.

CAUTION

Extreme care must be exercised when melting ice and frost with applied heat. Water accumulation may flow into critical areas in proximity to heat application. If heat gun is used, exercise caution to prevent excessive heat from damaging rotor blades, bonded panels, metal surfaces, and paint.

b. Frost or Moderate Ice. Apply heat to ice accumulations and dry with rags as melting occurs.

c. Severe Ice Accumulation. Helicopter should be moved into a warm hangar, when possible, for natural de-icing.

WARNING

Extreme caution must be exercised in the use of ethylene glycol-water solutions, Ethylene Glycol, Technical, and MIL-A-8243 Anti- Icing/Deicing/Defrosting Fluid in and around air. craft having silver or silver. coated electrical/electronic circuitry. Rapid oxidation and fire can occur when glycol-water solutions come in contact with and short across bare or defectively insulated silver or silver-coated electrical circuits such as wiring, switches, circuit breakers, etc., which are carrying positive direct current.

De-icing fluids are toxic irritants; protective precautionary measures apply.

CAUTION

Because of adverse effects of heated de-icing fluid, precaution must be taken to protect bearings, plastic windows, covers, and boots.

Do not substitute de-icing fluid (C48, C48.1 or C48.2) as material failure may occur.

d. Apply de-icing/defrosting fluid (C48, C48.1, or C48.2) to remove ice or heavy occumulations and to retard recurrence. Fluid may be applied with a low pressure spray or a brush, and will provide retarding protection for approximately 10 hours.

e. Upon completion of de-icing procedures, check all controls for ice and freedom of movement.

1-18.1. DE-ICE K747 BLADE.

a. Use MIL-A-8243C or MIL-A-82438 ethylene propylene glycol.

b. Do not break ice with sharp, blunt or similar instrument.

c. Apply to ice by spray:

(1) Pressure low/medium.

(2) Hand pump spray (atomizer).

d. Wipe off de-ice fluid from all surfaces. Fluid should not be dripping off of blade.

e. Allow ice to melt off.

f. Very light scraping can be done using either a wood, plastic or teflon scraper.

g. Do not scrape leading edge boot.

1-19. CONSUMABLE MAINTENANCE SUPPLIES AND MATERIALS.

1-20. DESCRIPTION – CONSUMABLE MAINTENANCE SUPPLIES AND MATERIALS.

Consumable maintenance supplies and materials are listed in table 1-3 in alphabetical order. Each consumable also has an item number assigned for ease of location and reference. When an item number is unknown, you may locate any consumables used within this manual through its alphabetical arrangement. When an item number is referenced in the manual. you may locate the item through its C designator and item number. C designators are used only with consumable maintenance supplies and materials; tables are found only in this chapter; therefore, the table number will not be referenced in the text.

Table 1-3. Consumable Maintenance Supplies and Materials

The supplies and material listed in this table are required for maintenance support of this equipment and are authorized to be requisitioned by Common Table of Allowances (CTA) 50-970.

ITEM No.	DESCRIPTION/ NOMENCLATURE	REFERENCE NUMBER AND FSCM	NSN
01	Abrasive Pads, Nylon Web, Scotch-Brite, Type A, Very Fine, L-P-50, Type 1, Class 1, Size 1	81348	7920-00-659-9175
1	Acid, Chromic, Type II	O-C-303	6810-00-264-6517
2	Acid, Hydrochloric (Muriatic)	O-H-765	6810-00-222-9641
3	Acid Nitric	O-N-350	6810-00-237-2918
4	Adhesive, EA9330	(33564)	8040-01-089-9073
4.1	Adhesive, EA956	(33564)	8040-01-104-5388
4.2	Adhesive Promoter, A934BX	(03461)	8040-00-152-0075
5	Adhesive, A-6 with Activator A	A6 (98911)	8040-00-691-1322
6	Adhesive, EC-776	MMM-A-122	8040-00-664-0439
7	Adhesive, EC2216-BA Scotchweld	(94960)	8040-00-145-0019
8	Adhesive, Metalset A-4	MMM-A-1754	8040-00-944-7292

Table 1-3. Consumable Maintenance Supplies and Materials (Cont)

ITEM NO.	DESCRIPTION/ NOMENCLATURE	REFERENCE NUMBER AND FSCM	NSN
8.1	Deleted		
9	Adhesive	FA956A/B, Type II, Class 3, (33564)	8040-01-126-6271
9.1	Accelerator	Accelerator No. 5	8040-01-174-4684
10	Adhesive, PS-30	(77902)	8040-01-152-2312
11	Adhesive, RTU 106, Type I	(01139)	8040-00-843-0802
12	Adhesive, Rubber Base, EC2126	MMM-A-1617	8040-00-281-1977
12.1	Adhesive, Ethyl-2- Versamid 125	MIL-A-46050 Type 2, Class 3	8040-01-140-0954
13	Adhesive, Silicone Rubber	MIL-A-46146	8040-00-224-4655
13.1	Adhesive Mixture,		
	Epon 826	(86961)	8030-00-144-9658
	Versamid 125	(11884)	8030-00-893-4224
	Diethylenetriamine (DTA)	(79741)	8040-01-194-3933
14	Adhesive, Two Part EA934NA	MMM-A-132, Type I, Class 3 (33564)	8040-00-016-8662
15	Adhesive, EA9309. 3NA	299-947-125 Type I (33564)	8040-01-163-3481
15.1	Adhesive, EA9320	299-947-125, Type II, Class 2 (33564)	8040-01-043-5423
16	Adhesive, Two-Part Liquid Silicone	SR529 and SRC18 (01139)	8040-00-097-6524
17	Adhesive, Uralane (Part A and B) EC3549, Type I	(04963)	8040-01-016-4726
17.1	Adhesive	Versilok 204	8040-01-184-1704
18	Alcohol, Methyl	O-M-232F	6810-00-275-6010
18.1	Anodic, Black	MIL-A-8625, Type H	
19	Deleted		
20	Use C74.1		
21	Antiseize Compound	MIL-A-907	8030-00-597-5367
22	Barrier Material, Grease-Proofed	MIL-B-121, Grade A	8135-00-224-8885
23	Barrier Material, Waterproof, Vaporproof	MIL-B-131 , Class 1	8135-00-282-0565

Table 1-3. Consumable Maintenance Supplies and Materials (Cont)

ITEM NO.	DESCRIPTION/ NOMENCLATURE	REFERENCE NUMBER AND FSCM	NSN
23.1	Bottle, Screw Cap, 16 oz.		6640-00-404-0660
23.2	Bottle, Screw Cap, 32 oz.		6640-00-404-0661
24	Bungee Cord, Type I	MIL-C-5651	8305-00-267-3119
25	Deleted		
26	Cap, Protective	NAS816-158	5340-00-815-0890
27	Cellophane	L-C-110	8135-00-392-8971
28	Cement (EC1357)	MMM-A-121 (76381)	8040-00-165-8614
28.1	Cement Proseal 584	(83527)	8040-00-964-6757
29	Cement, 3230	MIL-A-9117 (89373)	8040-00-262-9060
30	Cheesecloth	CCC-C-440 (81348)	8305-00-267-3015
30.1	Chemical Film Alodine No. 1201	MIL-C-81706 Class 1-A, Form III	8030-00-613-3131
31	Chemical Film, Alodine No. 1200S	MIL-C-81706 (84563)	8030-00-057-2354
31.1	Cleaner, Engine, B and B 3100	MIL-C-85704 (21361)	6850-00-181-7594
32	Cleaning and Polishing Compound, Biodegradable	P-P-560	7930-00-634-5340
33	Cleaning Compound, Air-craft Surface, Alkaline, Waterbase	MIL-C-25769	6850-00-935-0995
34	Cleaning Compound, Alumi-num Nonflame Sustaining	MIL-C-5410	6850-00-282-6770
35	Cleaning Compound, Oil Cooler Solvent	MIL-C-6864	6850-00-551-3694
35.1	Cleaning Cloth, Type III	MIL-C-85043	7920-00-044-9281
36	Cloth, Abrasive	P-C-451	5350-00-192-5050
36.1	Cloth, Screen, Abrasive	3-738-7011-0 (27712)	
37	Cloth, Crocus	P-C-458	5350-00-221-0872

Table 1-3. Consumable Maintenance Supplies and Materials (Cont)

ITEM No.	DESCRIPTION NOMENCLATURE	REFERENCE NUMBER, AND FSCM	NSN
38	Cloth, Fiberglass, Type VIII A, Class 2 (0.010 in thick)		8505-00-530-0109
39	Cloth, Tack	(57687)	4940-01-198-9333
39.1	Coating, Urethane	MIL-C-46168 No. 37038	8010-01-144-9879
40	Corrosion Preventive, Aircraft Engine, Type III	MIL-C-6529	6850-00-281-2031
41	Corrosion Preventive compound, Cold Application Solvent Cutback Grade 1	MIL-C-6173	8030-00-231-2345
42	Deleted		
43	Corrosion Preventive Compound, Cold Application Solvent Cutback Grade 11	MIL-C-16173	8030-00-244-1297
43.1	Corrosion Preventive Compound, Cold Application Solvent Cutback, Grade IV	MIL-C-16173	8030-00-062-5866
44	Corrosion Preventive Compound, Hot Application, Class 3, 424450 PC7	MIL-C-11796	8030-00-231-2353
44.1	Deleted		
44.2	Corrosion Preventive Fingerprint Remover	MIL-C-15074	8030-00-664-4017
44.3	Corrosion Preventive Compound, H20 Displacing Clear (Amguard)	MIL-C-85054	8030-01-041-1596
45	Corrosion Removing and Metal Conditioning Compound (phosphoric Acid Base)	MIL-C-10578	6850-00-854-7952
46	Cushioning Material, Bound Fiber, Type VI, Class A	PPP-C-1120	8135-00-292-9800
47	Deleted		
48	Deicing/Defrosting Fluid	MIL-A-8243	6850-00-558-1248
48.1	Deicing/Defrosting Fluid Type II, 5 gallon	MIL-A-8243C	6850-01-039-3842
48.2	Deicing/Defrosting Fluid Type II, 55 gallon	MIL-A-8243C	6850-01-039-3841
46	Desiccant, Packaging	MIL-D-3464	6850-00-264-6573
50	Detergent, General Purpose	MIL-D-16791	7930-00-985-6911
51	Etchant Tetraetch	Tetraetch (17217)	6850-00-431-8662

Table 1-3. Consumable Maintenance Supplies and Materials (Cont)

ITEM NO.	DESCRIPTION/ NOMENCLATURE	REFERENCE NUMBER, AND FSCM	NSN
52	Deleted		
53	Fabric, Synthetic, 5066	(89616)	9320-00-949-8363
53.1	Filler, Urethane Compound	RP3265 (DC182-72)	
53.2	Film, Teflon, Unperforated 0.002 inch	E3760-P2 Richmond Corp., Highland, CA	
53.3	Felt, Sheet 0.062 inch Thick, Hard Rabbit Fur	CF206 (81348)	8305-00-262-1672
54	Gloves, White Cotton	MIL-G-3866	8415-00-268-8353
55	Grease, Aircraft Oscillating Bearing	MIL-G-25537	9150-00-478-0055
56	Grease, Extreme Pressure (Tube Pack)	204-040-755-5 (97499) or (ASN TECH 3913-GI)	9150-00-506-8497
57	Grease (Lubriplate)	Aerolubriplate (73219)	9150-00-068-6268
58	Grease, Acft Multipurpose	MIL-G-81322	9150-00-944-8953
58.1	Grease, Aircraft. Multi-Purpose	MIL-G-81322 14 oz. Cartridge	9150-01-262-3358
59	Grease Silicons, Dow Corning II, or Equiv	8490010	9150-00-616-9212
60	Grease, Ball and Roller	DC33 Fluid (71984) ASUM 100 (78510)	9150-00-823-8048
61	Hydraulic Fluid Firs Resistant	MIL-H-83282	9150-00-149-7431
62	Hydraulic Fluid Petro-leum Base	MIL-H-5606	9150-00-180-6181
63	Hydraulic Fluid, Preser-vative, Petroleum Base	MIL-H-6083 Type 1	9150-00-935-9807
63.1	Insulating Compound	MIL-I-46058, Type UR	
64	Isopropyl Alcohol	TT-I-735	6810-00-855-6160
65	Deleted		
66	Lacquer, Camouflage Gray, 36231	TT-L-20	8010-00-515-1568
67	Lacquer, Acrylic, Low Reflective, Aircraft Green	MIL-L-46159, Type I	8010-01-042-9438

Table 1-3. Consumable Maintenance Supplies and Materials (Cont)

ITEM NO.	DESCRIPTION/ NOMENCLATURE	REFERENCE NUMBER, AND FSCM		NSN
67.1	Lacquer, Acrylic Resin	MIL-L-46159, Olive Drab		8010-01-211-1107
68	Lacquer, Acrylic, Olive Drab, Camouflage, X34087	MIL-L-81352		8010-01-033-8917
69	Paint, Slippage	F900/Orange		8030-01-125-0055
70	Lacquer, Acrylic Resin	MIL-L-46159, Black		8010-01-211-1106
70.1	Lacquer, Acrylic Black, 37038	MIL-L-81352		8010-00-935-7077
71	Lacquer, Acrylic, 31136	MIL-L-81352, Red		8010-00-935-7064
72	Lacquer, Acrylic, 37875	MIL-L-81352, White		8010-00-935-6609
72.1	Lexcote	G3397 (FSCM 51747)		8030-00-118-1022
73	Lubricant	ASU-M100 (78511)		9150-00-823-8048
74	Methyl-Ethyl-Ketone(MEK)	TT-M-261		6810-00-281-2785
74.1	Metallic Wool	MIL-A-4864		5350-00-286-4851
75	Naphtha, Aliphatic, Type 2	TT-N-95		6810-00-238-8119
76	Oil, Corrosion Preventive, Grade B	MIL-C-8188		6850-00-273-2395
77	Oil, Lubricating, Jet Engine (Grade 1010)	MIL-L-6081		9150-00-273-2388
78	Oil, Lubricating, Low Temperature, General Purpose	MIL-L-78709		9150-00-263-3490
79	Oil, Lubricating, Synthetic Base	MIL-L-7808		9150-00-782-2627
79A	Oil, Lubricating, Synthetic Base	DOD-L-85734		9150-00-120-2684
80	Oil, Lubricating, Synthetic Base	MIL-L-23699	(8 oz) (1 qt)	9150-00-180-6266 9150-00-985-7099
81	Oil, Penetrating	VV-P-216		9150-00-261-7899
82	Pads, Abrasive, Nylon Web	L-P-0050 (27713) (76381)		7920-00-659-9175
82.1	Paint, Enamel, Red	TT-E-001384		8010-00-159-4519
82.2	Paint, Aircraft Green, Polyurethane	MIL-C-46168		8010-01-141-2420
83	Deleted			
83.1	Petrolatum, Lubrication, Vacuum Bagging	VV-P-236		9150-00-250-0926

Table 1-3. Consumable Maintenance Supplies and Materials (Cont)

ITEM NO.	DESCRIPTION/ NOMENCLATURE	REFERENCE NUMBER, AND FSCM	NSN
84	Pigment, Aluminized	TT-P-320	8010-00-687-4019
85	Plastilube, Moly No. 3	Plastilube Moly 3 (02307)	9150-00-141-4481
86	Deleted		
86.1	Polyurethane, Color Black, 37038	MIL-C-83286	8010-00-482-5671
86.2	Potting Resin Uralite #3148A/B	(01490)	
86.3	Polyurethane Coating Black 37038	MIL-C-46168	8010-01-146-2646
87	Primer, A934B	A934B (03481)	8040-00-943-2502
88	Primer, Epoxy Polyamide	MIL-P-23377	8010-00-082-2450
89	Primer, Silicone Adhesive, 1200RTV	SS4004 (01139)	8010-00-701-9616
90	Primer, Silicone Adhesive, S-2260	(02988)	8040-00-712-9058
91	Primer, Zinc Chromate	TT-P-1757, MIL-P-8585	8010-00-297-0593
91.1	Zinc, Chromate	TT-P-1757, MIL-P-23377	8010-00-145-0312
92	Prussian Blue Paste, Bearing Surface (thinned with oil)	MIL-P-30501	8010-00-281-4105
93	Putty, Zinc Chromate	MIL-P-8116	8030-00-664-4968
94	Rain Repellent Windshield	MIL-W-006882	6850-00-139-5297
95	Remover, Paint	TT-R-248B	8010-00-515-2258
96	Remover, Paint, Epoxy System	MIL-R-81294	8010-00-926-1488
97	Repair Kit, Infrared Suppression System	205-706-083-1 (97499)	1560-00-103-3459
97.1	Repair Kit, Erosion	K747-207-1 (84955)	1560-01-161-2805
98	Resin Epoxy, Liquid EA828 and Catalyst Diethylenetramine (DTA)	MIL-R-9000 O-D-1271	8040-00-822-6430 6810-00-995-4804
99	Deleted		
100	Rubber, Silicone, RTV	(71984)	8030-00-903-6566

Table 1-3. Consumable Maintenance Supplies and Materials (Cont)

ITEM NO.	DESCRIUPTION/ NOMENCLATURE	REFERENCE NUMBER. AND FSCM	NSN
101	Rubber Strip, Type II, Grade A, Soft	MIL-R-6130	9320-00-814-4583
102	Sandpaper	P-101	5350-00-224-7215
103	Scotchbrite, Type I, Class 1, Size I	L-P-0050 (81348)	7920-00-659-9175
104	Deleted - Replaced by C107		
105	Sealant, Proseal 890	MIL-S-8802	8030-00-723-2746
105.1	Sealant, No. EC801	MIL-S-7124	8030-00-275-8117
105.2	Sealing compound PR-1422 B2	83574	8030-01-154-9254
105.3	Sealant, Vacuum Bag	GS213	8030-01-183-1721
105.4	Sealing Compound	MIL-S-46163 Type II	8030-00-111-2763
105.5	Sealing Compound	MIL-S-11030 Type III	8030-00-965-2437
106	Sealing Compound, Grade 4 Locking and Retaining, Single Component	MIL-S-22473	8030-00-081-2326
106.1	Sealing Compound, Grade CV	MIL-S-22473	8030-00-081-2330
107	Sealing Compound, Low Adhesion (Proseal 706)	MIL-S-8784 Proseal 706B2 (83527)	8030-00-616-9191
107.1	Sealing Compound Brushable CLA-1/2	MIL-S-8784	8030-00-291-8380
107.2	Sealing Compound Brushable CLA-2	MIL-S-8784	8030-00-152-0062
107.3	Sealing Compound Extrudable CLB-1/2	MIL-S-8784	8030-00-152-0022
107.4	Sealing Compound Extrudable CLB-2	MIL-S-8784	8030-00-680-2041
107.5	Sealing Compound	MIL-S-8802D	8030-00-753-4599
108	Shellac, Type 2, Grade A, Body 1	TT-S-300	8010-00-577-4816
109	Shot, Lead No. 8	10511620(19200)	8650-00-312-6640
110	Silicone Compound	MIL-S-8660	6850-00-880-7616

Table 1-3. Consumable Maintenance Supplies and Materials (Cont)

ITEM No.	DESCRIPTION/ NOMENCLATURE	REFERENCE NUMBER, AND FSCM	NSN
111	Smoother, Aerodynamic, Type I, RP-1257-3	EA960A-B	8010-00-006-7089
112	Solvent, Dry Cleaning	P-D-680, Type II (81348)	6850-00-274-5421
113	Soap, Liquid (Detergent)	P-S-624	8520-00-228-0598

Table 1-3. Consumable Maintenance Supplies and Materials (Cont)

ITEM NO.	DESCRIPTION/ NOMENCLATURE	REFERENCE NUMBER, AND FSCM	NSN
114	Soap, Toilet, Cake	P-S-620	8520-00-531-6484
115	Steel Wool	FF-W-1825	5350-00-250-2920
116	Stone, India, Pine	SSS736	5345-00-144-6894
117	Talc, Technical	MIL-T-50036	6810-01-080-9589
118	Tap, Antichafe Teflon	5490 (76381)	7510-00-923-0591
118.1	Tape, Nylon, Wright Lon No. 7400PS	International Plastics Products, Carson, CA	
118.2	Sealing Compound Locking and Retaining Single Component	MIL-S-22473	8030-00-081-2326
119	Deleted		
120	Tape, Dissimilar Metal Separation	MIL-T-23142	7510-00-472-4021
121	Tape, Electrical, Black	MIL-I-24391	5970-00-419-4290
122	Tape, Insulation Spiral Wrap (0.006 x 1.0 inch)	MIL-I-18746	5970-00-935-0098
123	Tape, Masking	PPP-T-42	7510-00-290-2026
124	Tape, Mystic, 7455	(83301)	7510-00-180-6288
125	Tape, Pressure Sensitive	Y9265A (76381)	7510-00-145-0171
126	Tape, Fastener Hook, Velcro	MIL-L-21840 (83149)	8315-00-926-4931
127	Tape, Pressure Sensitive, Waterproof, Type II	PPP-T-60	7510-00-663-0199
128	Tape, Teflon, Self-Adhesive	MIL-I-23594	5970-00-812-7387
128.1	Tape, Multi-Purpose Double-faced Cloth P50	(99742)	7510-00-584-2848
129	Thinner, Acrylic Lacquer	MIL-T-19544	8010-00-527-2897
129.1	Thinner, Polyurethane	MIL-T-81772/AS	

Table 1-3. Consumable Maintenance. Supplies and Materials (Cont)

ITEM NO.	DESCRIPTION/ NOMENCLATURE	REFERENCE NUMBER, AND FSCM	NSN
130	Toluene	TT-T-548	6810-00-281-2002
131	Toluene-Methyl Isobutyl Ketone Mixture	MIL-T-19588	6810-00-286-0458
132	Trichloroethylene Technical	O-T-634	6810-00-184-4800
133	Trichlorotrifluoroethane Cleaning Compound	MIL-C-81302	6850-00-033-8851
134	Varnish, Alkali-Resistant	MS35637-1	8010-00-597-7856
135	Deleted		
136	Wire, Steel (Lockwire)	MS20995C20	9505-00-221-2650
137	Wire, Steel (Lockwire)	MS20995C32	9505-00-293-4208
138	Wire, Steel (Lockwire)	MS20995C41	9505-00-603-4120
139	Trichloroethane, Technical Inhibited	O-T-620C	6810-00-664-0387
140	Use C12		
141	Deleted.		
142	Deleted.		
143	Repair Kit, Tube	AC-8101-1008KT	2945-01-324-8328

1-21. SPECIAL TOOLS AND TEST EQUIPMENT.

1-22. DESCRIPTION – SPECIAL TOOLS AND TEST EQUIPMENT.

Special tools and test equipment are listed in table 1-4 in alpha-numeric order. Each tool or piece of test equipment has an item number assigned for ease of location and reference. When an item number is unknown, you may locate special tools and test equipment through alphanumeric arrangement within the table When an item is referenced in the manual, you may locate the item through its T designator and item number. T designators are used only with special tools and test equipment. The special tools and test equipment table is found only within this chapter; therefore, the table number will not be referenced within the text. A complete listing of all special tools and test equipment authorized for use to perform maintenance on helicopter/accesories are contained in the helicopter parts manuals.

1-23. USABILITY CODES/CALIBRATION.

The usability code identifies the purpose(s) for which the tool is designed. Codes are:

A - Assembly

AD - Adjustment

D - Disassembly

I - Inspection

IN - Installation

R - Removal

RP - Repair/Replace

S/P - Storage/Preservation

T - Testing

Table 1-4. Special Tools and Test Equipment

ITEM NO.	PART NO.	NOMENCLATURE	USABILITY CODE CALIBRATION	FIGURE REFERENCE
1	AN/USM-23	Milliammeter	T	
2	AN/USM-223	Multimeter	T	
3	AN/USDM-303A	Multimeter	T	
4	AN8514-2	Spanner Wrench	R/IN	
5	D9T626	Round Fire Simulator (G.E)	T	
6	204-011-178-1	Crash Rescue Clevis	R/IN	1-6
7	F-50	Air Pressure Gage	T	
7.1	JTB Model 33FS (or equivalent)	Frequency Meter	T	
8	K747-401-1	Blade Repair Tool Set	RP	
9	LTCT 773	Engine Sling	R/IN	
10	MB 1	Airspeed Simulator	T	

Table 1-4. Special Tools and Test Equipment (Cont)

ITEM NO.	PART NO.	NOMENCLATURE	USABILITY CODE CALIBRATION	FIGURE REFERENCE
11	MJ2A	Portable Hydraulic Test Stand	T	
12	MP1	Pressure Tester (0-150 PSI)	T	
13	M1A1	Gunner Control Quadrant	T	
14	NC2A	Auxiliary Power Unit	T	
15	PD1201	Torque Multiplier	R/IN/D/A	
15.1	PD1468	Adapter	D/A	
15.2	PD1469	Socket	D/A	
15.3	PD1470	Socket Collective	D/A	
15.4	PD1471	Extension, Socket WRN	D/A	
16	PD2659	Mast Nut Socket	R/IN/D/A	
17	PD2660	Reaction Adapter	R/IN	
18	R02-4CO-RMM-4U	Regulator	T	
19	AA1730-1310	Engine Adapter	D/A/RP	
20	TK-100/G	Tool Kit	T	
21	BH-907	RPM Adapter Cable	T	
21.1	22196	RPM Adapter Cable	T	
22	141000310-1	Torque Fixture	R/IN	7-13
23	T100619-2	Torque Fixture	R/IN	7-13
24	T100220	Sling, Rotor	R/IN	
25	T101306	External Spline Wrench, Main Driveshaft	R/IN	
26	T101307	Wrench Assembly	D/A	
27	T101308	Jackscrew Set	R	
28	T101338	Jackscrew Set	R	
29	T101356	Build-up Bench, Main Rotor	R/IN/D/A/AD	

Table 1-4. Special Tools and Test Equipment (Cont)

ITEM NO.	PART NO.	NOMENCLATURE	USABILITY CODE CALIBRATION	FIGURE REFERENCE
29.1	T101369	Support Plate	D/A	
29.2	T101382	Ram Adapter	D/A	
29.3	T101392	Wrench	D/A	
30	T101401	Scope Assembly	AD	
31	T101414	Blase Bolt Wrench	R/IN	
32	T101419	Alignnent Tool Set	T	
33	T101420	Holding Fixture	T	

Table 1-4. Special Tools and Test Equipment (Cont)

ITEM NO.	PART NO.	NOMENCLATURE	USABILITY CODE CALIBRATION	FIGURE REFERENCE
34	T101421	Adapter Plate	R/IN/D/A/AD	5-6
34.1	T101424	Holding Bar	R/IN	
35	T101440	Jack Set	AD	
35.1	T101447	Holding Fixture	D/A	
36	T101449	Wrench, Transmission Fan Drive Quill	D/A	
37	T101455	Holding Plate Assembly	D/A	6-44, 6-45
38	T101467	Support, Main Rater Blade	AD	
39	T101468	Flap Stop	AD	
40	T101475	Bearing Tool	RP	
41	T101485	Bending Gage	AD	
42	T101487	Bearing and Seal Tool	RP	
43	T101488	Input Quill Wrench	D/A	
44	T101491	Hub Bearing Puller	RP	
44.1	T101493	Wrench	D/A	
45	T101520	Hoist Assembly	R/IN	
46	T101524	Rigging Fixture, Flight Controls	AD	
47	T101525	Tab Bender, Main Rotor Blade	AD	
48	T101530	Staking Tool	RP	
49	T101549	Holding Fixture, Transmission	D/A	
50	T101550	Disassembly Tool, Transmission	D	
51	T101551	Puller	D	
52	T101553	Tool Set	A	
53	T101559	Grip Spacing Gage	AD	
53.1	T101560	Fixture, Holding	R/IN/D	

Table 1-4 Special Tools and Test Equipment (Cont)

ITEM NO.	PART NO.	NOMENCLATURE	USABILITY CODE CALIBRATION	FIGURE REFERENCE
54	T101577	Staking Tool	RP	
55	T101600	Duplex Bearing Nut Wrench	R/IN/D	
56	T101726	Backlash Tool	I	
57	T101727	Holding Fixture	D/A	
58	T101736	Duplex Bearing Nut Wrench	D/A	
59	T101864	Grip Lock, Main Rotor	R/IN/D/ A/AD	
60	T100929	Jackscrew Set	R	
61	T102095	Bearing Staking Tool Set	RP	
61.1	T101873	Bearing Staking Tool Set	RP	
62	ZM4AU	Resistance Bridge	T	
63	ZU4BU	Resistance Bridge	T	
64	5120-EG-007-1	Installation Tool, Damper Seal	I	2-82
65	5120-AH1-001	Swashplate Alignment Tool	I	D-348
66	209-071-239-1	Wrench, Rack Release	R/IN	
66.1	209-071-244	Pin, Ground Safety	T	
67	209-071-244-1	Wrench, Rack Release	R/IN	16-2
67.1	TTU-27E	Tachometer Test Set		
68	BH112JB53	Tester Exhaust Gas Temperature	T	
68.1	BH16492	Temperature Indicator Adapter	T	RS69
68.2	BH16491	Temperature Trim Adapter	T	D-5
69	2480	Field Indicator, (Magnetometer), or equivalent	I	
70	3234107-100	TOW Simulator Evaulation Missile (HAC)	T	
71	3B5000B	MJ-3(SP) Lift Truck	R/IN	
72	42M76	Transmission Stand	R/IN	

Table 14. Special T's and Test Equipment (Cont)

ITEM NO.	PART NO.	NOMENCLATURE	USABILITY CODE CALIBRATION	FIGURE REFERENCE
73	7A050	Rotor Balance Kit	AD	
74	7HEL066	Adapter Kit, Main Rotor Balancing	AD	
75	7HEL074	Plate, Tail Rotor Balancing	AD	
76	94251	Seal Installation Tool	IN	
77	Deleted			
78	N-3A	Electric Thermometer Tester, Field Type	T	
79	387891-003	Field Calibration Unit	T	
T79.1	PSD60-1AF	Tester Bridge Capacitance	T	8-5.1
T79.2	PSDAF-537	Cable Assembly ("T" Cable)	T	8-5.2. and 8-5.3
80	S22	Packing Seating Tool, Ground Handling Gear Cylinder	I	
81	S135	Packing Seating Tool, Ground Handling Gear Cylinder	I	
82	208-071-275	Ejector Rack Alignment Fixture		
83	114-98194	TSU Boresight Device		
84		Packing Nut Tool (Workaid)	AD	
85	RS69	Windshield Maintenance Kit	RP	
86	EAB20	Acrylic Plastic Polishing Kit	RP	
87	1045864	Corrector Lens Assembly (HAC)	T	
88	1045882 or 1045879	IR Target Assemble (HAC)	T	
89	50-T	Sealing Iron FCM 18836		

Table 1-4. Special Tools and Test Equipment (Cont0

ITEM NO.	PART NO.	NOMENCLATURE	USABILITY CODE CALIBRATION	FIGURE REFERENCE
90	K747-404-1	Blade Repair Fixture	RP	5-27
91	K747-406-1	Cable Assembly	RP	5-27
92	K747-409-1	Router Assembly	I	5-27
93	1733	Puller, Circuit Board	R	
94	LT-40	Bushing and Bearing Tool Kit	ADR	
195	LT-40-1	Nest		2-79.1
196	LT-40-2	Ram Adaptor		2-79.1
197	LT-40-3	Bushing Tool		2-79.1
198	LT-40-4	Bushing Tool		2-79.1
199	LT-40-5	Bearing Tool		2-79.1
*100	LT-40-6	Stating Tool		2-79.1
*101	LT-40-7	Staking Tool		2-79.1
102	LT-40-8	Piercing Tool		2-79.1
103	LT-40-9	Piercing Tool		2-79.1
104	1031-102A-351X	Vacuum Pump	RP	
105	F508	End Mill	RP	5-27
106	K747-407-11	End Mill	RP	5-27
107	TY9CL257A	Gap Setting Gage		6-45.2

* Part of Bushing and Bearing Tool Kit LT-40. (Item 94)

1-24. SUPPORT EQUIPMENT.

1-25. DESCRIPTION - SUPPORT EQUIPMENT.

All support equipment is listed on table 1-5 in alphanumerical order. S designators and item numbers are used m text to identify support equipment.

Table 1-5. Support Equipment

ITEM NO.	PART NO.	NOMENCLATURE
1	AF5	Dispenser, Hydraulic Fluid
2	D-5	Test stand, Hydraulic
3	1214-30B	Jack Hydraulic, Hand 10 Ton
4	204-011-178-1	Clevis Assembly Rescue
5	204-050-200-5	Ground Handling Gear Assembly
6	209-030-195-1	Jack Fitting, Aft
7	209-030-245-1	Jack Fitting, Fwd
8	209-030-405-1	Jack Fitting, Wing
9	50K25177 (B5)	Jack Hydraulic Tripod
10	51E24854	Maintenance Platform
11	601364-1	Tow Bar
12		Electrical Auxiliary Power Unit
13		Gage, Hydraulic Pressure 0-3000 PSI
14	30FC10	Manometer, Water
15		Regulator, Air Row

1-26. SURFACE FINISHES.

1-26A. DESCRIPTION - SURFACE FINISHES.

Surface finish can be identified by one of the following methods: Root Mean Square (RMS), Roughness Height Rating (RHR), or Micro-inches. These methods refer to the average linear deviation of the actual surface. This manual will list the surface finish by the RMS method and this finish can be obtained using the appropriate abrasive grit as fried in table 1-6.

Table 1-6. Roof Mean Square/Abrasive Grit Equivalency

NOTE

This table was developed by USAATCOM Engineering as a ready reference means of achieving the various Root Mean Square (RMS) finishes specified in this manual.

4-16 Micro-inches (RMS)	500 Abrasive Grit
10-30 Micro-inches (RMS)	320 Abrasive Grit
15-63 Micro-inches (RMS)	240 Abrasive Grit
85 Maximum Micro-inches (RMS)	180 Abrasive Grit
125 Maximum Micro-inches (RMS)	120 Abrasive Grit
250 Maximum Micro-inches (RMS)	60 Abrasive Grit

1-27. ADHESIVE MIX RATIO, POT LIFE AND CURE CYCLES.

When bonding procedures are required, refer to table 1-11 for instructions for proper use of adhesives.

Table 1-11. Adhesive Mix Ratio, Pot Life, and Cure Cycles.

Consumable Maintenance Supplies and Materials Number	Adhesive	Activator Hardener, or Catalyst	Mix Ratio by Weight	Pot Life (Minutes)	Cure Cycle			Alternate Cure Cycle		
					Time Minimum	Pressure psi	Temperature	Time Minimum (Minutes)	Pressure psi	Temperature
C4.1	EA956	Part "B"	100 Parts "A" 58 Parts "B"	30	24 hrs.	Firm Contact	75 ± 10 Degrees F (23.8 ± 5.5 Degrees C)	120 "FOLLOWED BY" 4 hrs	Firm Contact	75 ± 10 Degrees F (23.8 ± 5.5 Degrees C) 150 ± 10 Degrees F (65 ± 5.5 Degrees C)
C7	EC 2216 Two part See Note 1	Part "A" See Note 2	100 Parts "B" 140 Parts "A"	110 to 130	24 hrs. See Note 3	Firm Contact	70 to 95 Degrees F (21 to 35 Degrees C)	120	Firm Contact to 10	145 to 155 Degrees F (63 to 68 Degrees C)
C8	Metalset A-4 Two Part See Note 1	Part "B"	Equal Parts "A" and "B"	30 to 40	24 hrs.	Firm Contact	70 to 95 Degrees F (21 to 35 Degrees C)	30	Firm Contact	145 to 180 Degrees F (63 to 82 Degrees C)
C13.1	EPON 826 Three part Adhesive System	--	100 Parts EPON 826 10 parts Vesamid 125 6 parts DTA	--	24 hrs.	Firm Contact	75 Degrees F (23.8 Degrees C)	16 hrs. "FOLLOWED BY" 2 hrs.	Firm Contact	75 Degrees F (23.8 Degrees C) 120 -140 Degrees F (52.4-60 Degrees C)
								4 hrs.	Firm Contact	120 -140 Degrees F (52.4-60 Degrees C)
C14	EA 934NA Two part Type II Class 2 See Note 1 See Note 4	Part "B"	100 parts "A" 33 parts "B"	30 to 50	24 hrs. See Note 3	Firm Contact to 10	70 to 95 Degrees F (21 to 35 Degrees C)	60	Firm Contact to 10	175 to 190 Degrees F (79 to 88 Degrees C)
C53.2	Filler RP3265 2 part See Note 1	Part "B"	100 parts "A" and 100 parts "B"	3	15 - 20 Minutes	Firm Contact	70 to 75 Degrees F 21 to 23.8 Degrees C)	--	--	--
C86.1	URALITE #3148	--	100 parts "A" and 40 parts "B"	60 to 120	12 hrs.	Firm Contact	75 Degrees F 23.8 Degrees C)	--	--	--
C98	Adhesive EPON 828 2 part	Part "B"	100 parts "A" and 10 parts "B"	15	4 hrs.	Firm Contact	75 Degrees F (23.8 Degree C)	--	--	--
C105.1	EC 801	Part "B"	10 parts "A" and 100 parts "B"	30	24 hrs.	--	70 Degrees F (21 Degrees C)	60	--	140 - 180 Degrees F (60 to 82 Degrees C)

Notes:

1. Comply with manufacturer's expiration date stamped on container.
2.. For EC 2216, part "A" (grey) is the catalyst or hardener, part "B" (white is the base resin).
3. Maximum strength is obtained in 6 to 7 days.
4. Part "A" of EA934NA has a three months shelf life when stored at 80 degrees F. The shelf life decreases to two months when adhesive is stored at 100 degrees F.

All data on pages 1-25 through 1-40, including figures 1-2 through 1-4 and tables 1-7 through 1-10, deleted.

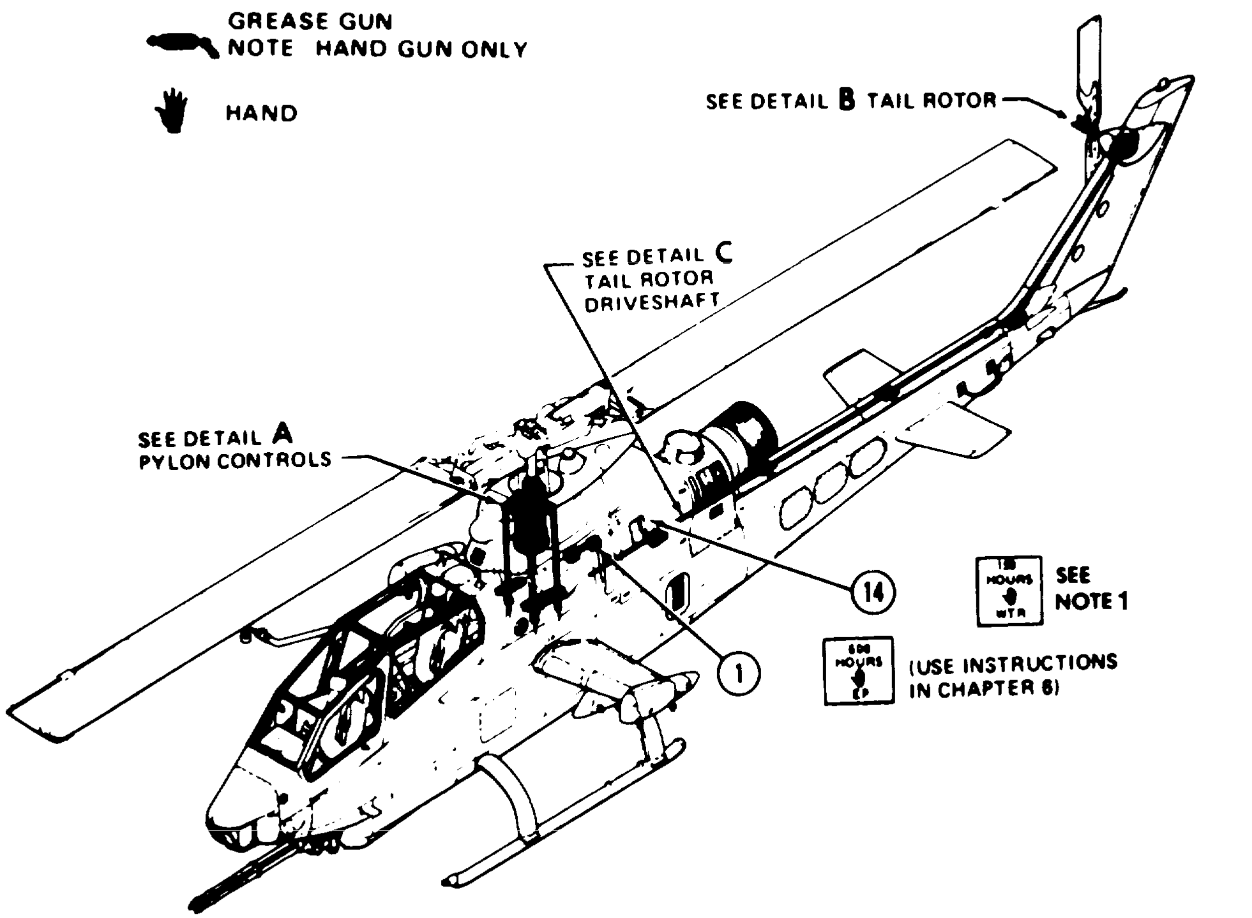
SECTION II. LUBRICATION

1-28. LUBRICATION INSTRUCTIONS.

1-29. DESCRIPTION – LUBRICATION.

The lubrication chart consists of a main drawing which is a perspective diagram of the helicopter, with enlarged or detail views where required to show items clearly (figure 1-5). The chart shows all parts requiring periodic lubrications, except the engine and transmission and tail rotor gearboxes, which are lubricated by oil in accordance with servicing instructions. The lubrication chart uses symbols and abbreviations to indicate the required lubricant, method of application, and time interval for lubrication of each part listed. A key on the chart defines the meanings of symbols and abbreviation.

TABLE OF LUBRICANTS		
IDENTIFICATION LETTER	SPECIFICATION	TYPE OF LUBRICANT
WTR	MIL-G-81322	GREASE AIRCRAFT WIDE TEMP RANGE
EP	204-040-755-5 ASN TECH-3913-G1	GREASE, EXTREME PRESSURE



PARTS NOMENCLATURE KEY

Main driveshaft couplings
Collective lever link
Scissors
Collective sleeve hub
Collective sleeve and mast splines
Pitch link assembly bearing
Swashplate bearings

8. Collective lever trunnions
9. Tail rotor control crosshead
10. Transmission quill coupling (See Note 4)
11. Hanger flexible couplings (See Note 4)
12. Intermediate gearbox quill couplings (See Note 4)
13. Tail rotor drive gearbox quill couplings (See Note 4)
14. Droop Cam Slider

Figure 1-5. Lubrication Chart (Typical) (Sheet 1 of 4)

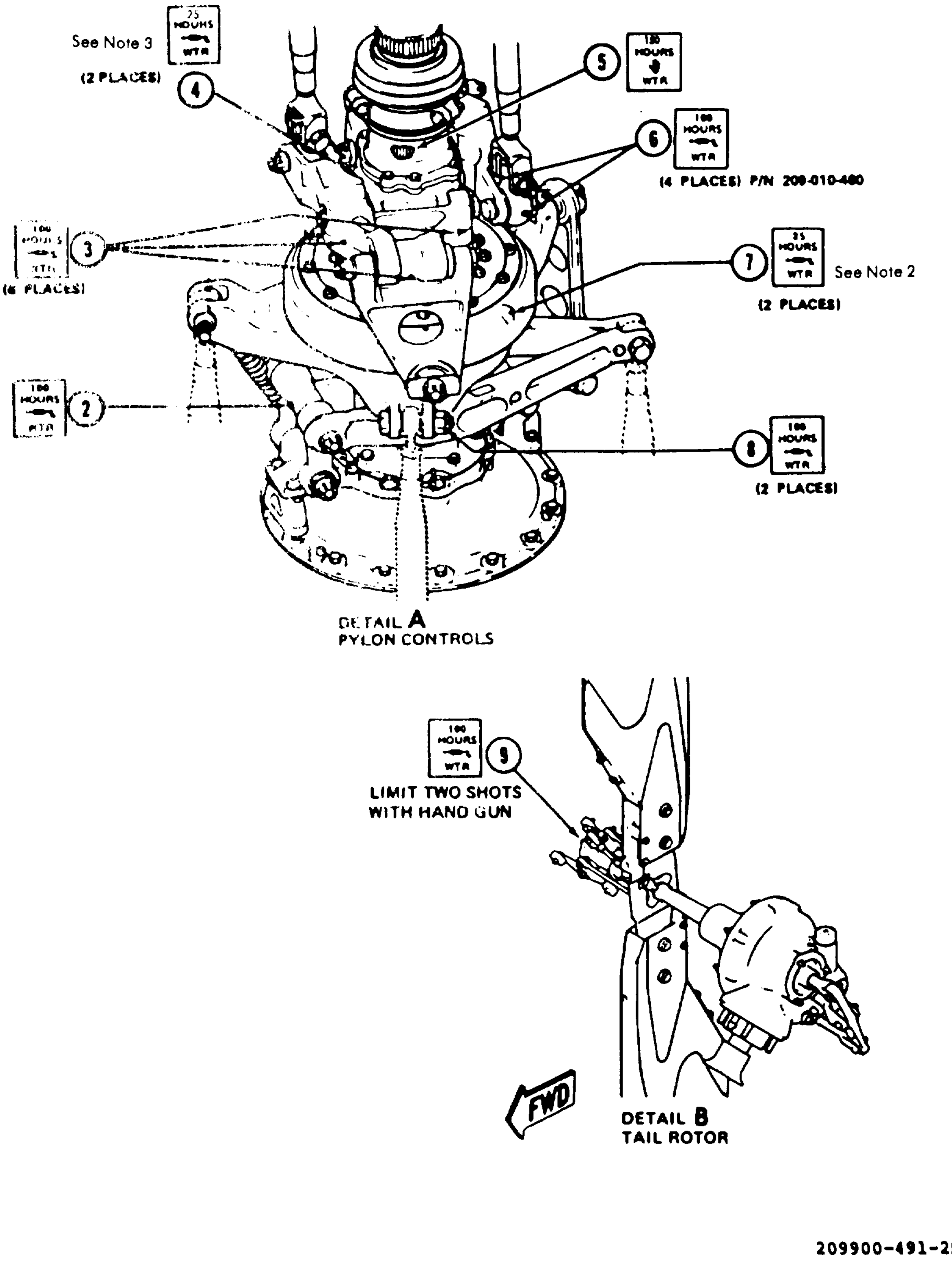


Figure 1-5. Lubrication Chart (Typical) (Sheet 2 of 4)

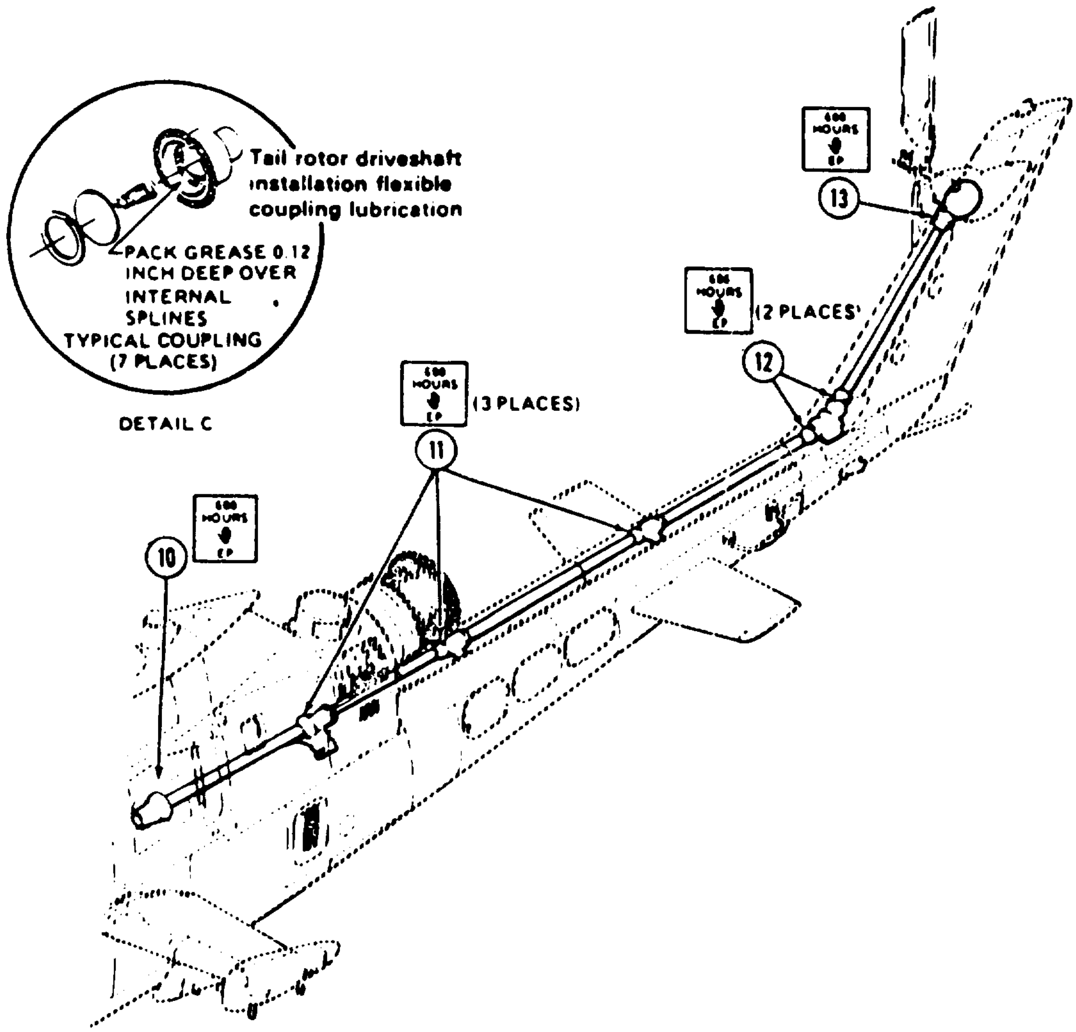


Figure 1-5. Lubrication Chart (Typical) (Sheet 3 of 4)

NOTES:

WARNING

Failure of swashplate to accept grease requires investigation and correction prior to releasing aircraft for fright. Perform swashplate alignment check in accordance with the procedures contained in the Special inspection section.

CAUTION

Ensure cotter pins, nuts, and special washers are removed from drive link before rotating main rotor blade. This will avoid damage to anti-drive link horn on non-rotating part of swashplate.

(1) Lubricate droop cam slider (14) lightly. Wipe excess off and out of slots. Slide contacts should have minumum lubrication required to prevent dry contact without contributing to grit build-up. More frequent lubrication may be-necessary depending on environment and usage factors.

(2) Disconnect drives links. Rotate swashplate, grease at 30° intervals through full 360°. Continue to grease until old grease is purged. See Special inspection section.

(3) Rotate main rotor by hand and grease at approximately 30° intervals until assembly has been rotated one full turn to ensure thorough purging of bearings. After lubrication, clean debris from boot, cut safety wire, raise boot and inspect to ensure no grease has fallen on uniball. Clean grease from uniball, if necessary. Reinstall boot and safety.

(4) The lubrication interval for flexible couplings on seven tail rotor driveshaft couplings is as follows:

a. Inspect and lubricate flexible couplings at time of installation of couplings on helicopter.

NOTE

This inspection and lubrication requirement will b. accomplished on all couplings.

b. Maximum interval from last lubrication is 600 hours (aircraft flying hours) or 12 months (from last lubrication date).

c. Make entry on DA Form 2408-18 to indicate date and aircraft flying hour of next inspection and lubrication and lubrication due.

Figure 1-5. lubrication Chart (Typical) (Sheet 4 of 4)

SECTION III, HANDLING, JACKING, MOORING, HOISTING AND SLING LOADING

1-30 GROUND HANDLING

1-31. DESCRIPTION – GROUND HANDLING.

WARNING

Before any work in cockpit area of a helicopter with explosive canopy removal system, ensure that ground safety pins are installed in pilot and gunner arming firing mechanisms.

CAUTION

The structural panels shown in figure 2-2 must be installed prior to helicopter ground run, fright or ground handling.

Ground handling includes hoisting, jacking, mooring, parking, towing, and application of external electrical power.

Premaintenance Requirements for Ground Handling

Condition	Requirements
Model	AH-1P E F
Part No or Serial No	All
Special Tools	(T45)
Test Equipment	None
Support Equipment	(S4) (S5) (S6) (S7) (S8) (S9) (S11)
Minimum Personnel Required	Four
Consumable Materials	None
Special Environmental Conditions	None

1-32. TOWING.
1-33. TOWING PROCEDURES.

The helicopter can be equipped for towing with an approved tow vehicle by attachment of two ground handling gear assemblies (8, figure 1-6) on landing gear skids. Attach a standard aircraft tow bar (S11) to the tow rings (9) on the forward end of each skid tube A work aid for moving ground handling gear assemblies to and from parked helicopters can be locally fabricated (figure 1-7) The device is a small tow bar, with lugs to fit on mounting pins of ground handling gear which can then be pulled or pushed on its own wheels.

WARNING

Prior to use of ground handling gear assure serviceabllity. Us. only AH-1 ground handling wheels, P/N 214-706-104-101. Keep clear of area above handling gear as much as possible when weight of helicopters is on wheels.

CAUTION

Aircraft must sit for 25 minutes to prevent possible damage to ASN 43 gyro, or turn power on to gyro and allow 5 minutes to build gyro back up before moving aircraft.

a. **Install ground handling gear (S5) as follows:**

(1) Position handling gear assembly (8, figure 1-6) with a spring loaded pin forward over landing gear skid between eyebolts.

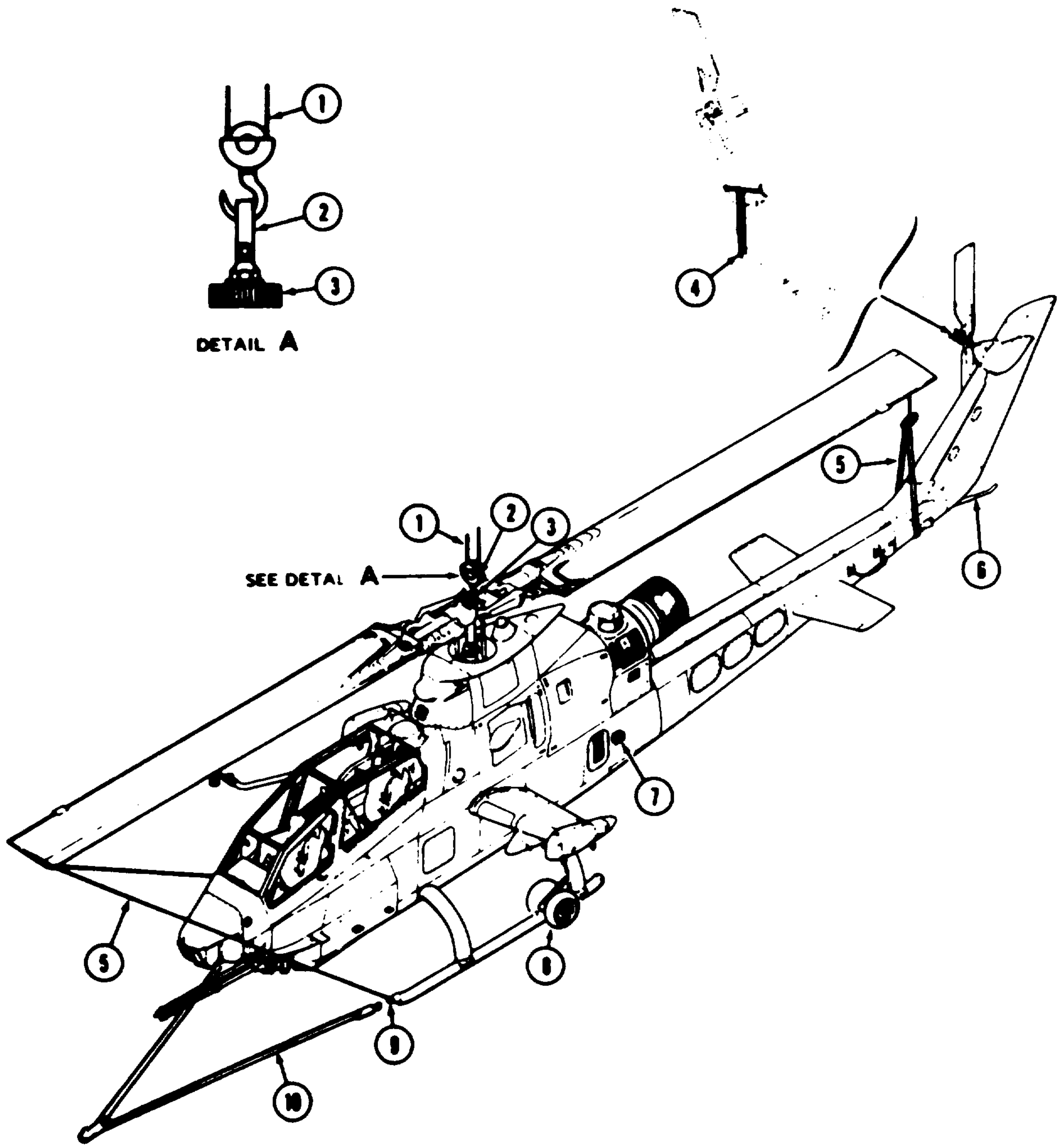
(2) Release enough hydraulic pressure, by turning T-handle of pump valve to allow alignment of cradle mounting pins with eyebolts. Insert fixed pin in aft eyebolt, then engage spring-loaded pin securely in forward eyebolt. Install safety pin in spring-loaded pin. Spring-loaded pin can be moved by means of flat-headed release pin.

(3) Install handling gear on opposite skid.

(4) Station personnel at tail skid to steady helicopter and to force tailboom down as handling wheel pumps are actuated.

(5) On both sets of handling gear, close pump valve and operate handle to extend wheels until skids are raised.

b. Attach tow bar (10) to rings (9) on forward ends of landing skids. Attach tow bar to approved tow vehicle.



1. Hoisting cable and clevis
2. Clevis assembly (S4)
3. Main rotor retaining nut
4. Tail rotor tiedown
5. Main rotor tiedown
6. Tail skid
7. External power receptacle
8. Ground handling gear
9. Tow ring
10. Tow bar
11. Lateral leveling pads
12. Fore and aft leveling pads

Figure 1-6. Ground Handling Diagram (Sheet 1 of 2)

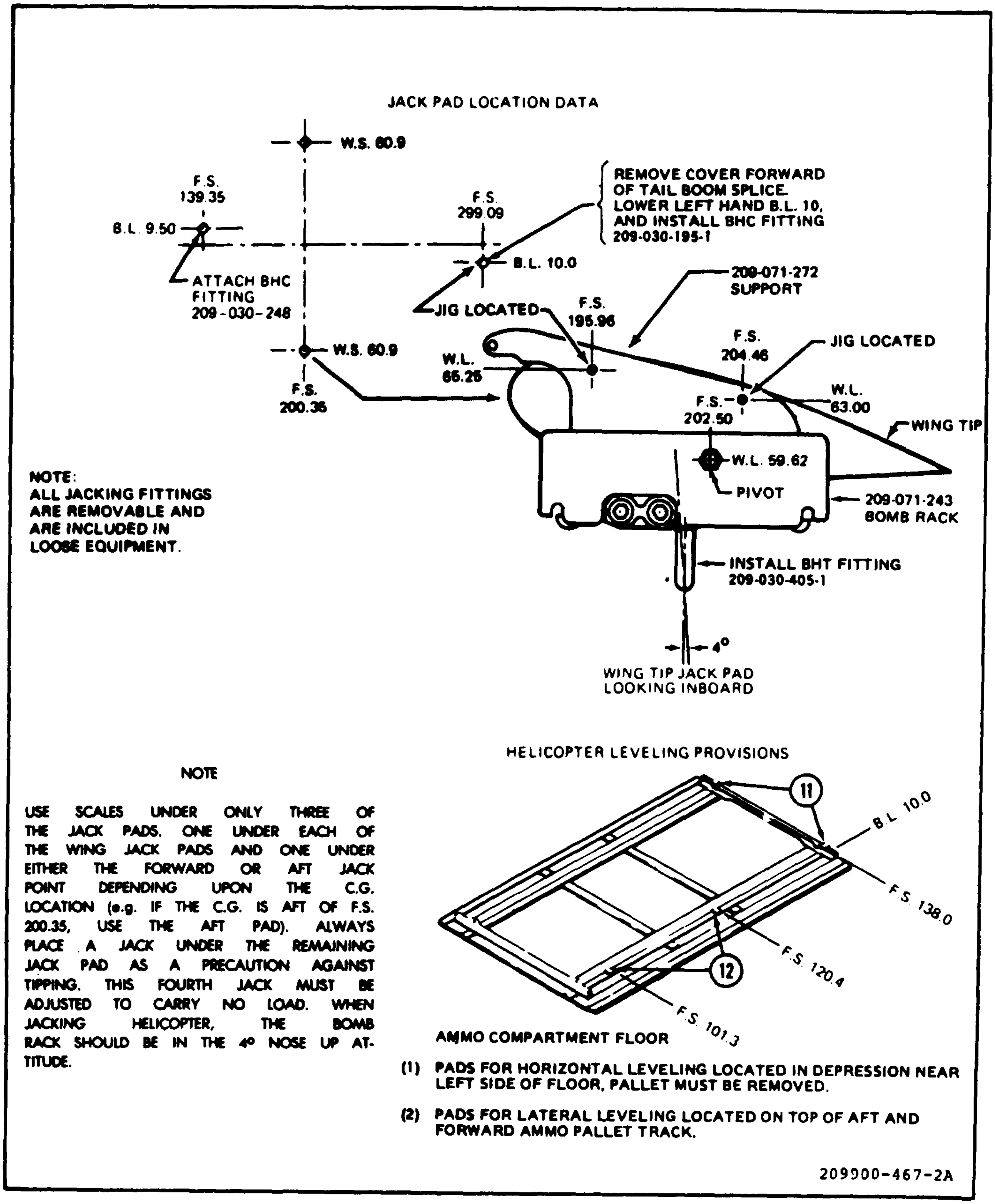


Figure 1-6. Ground Handling Diagram (Sheet 2 of 2)

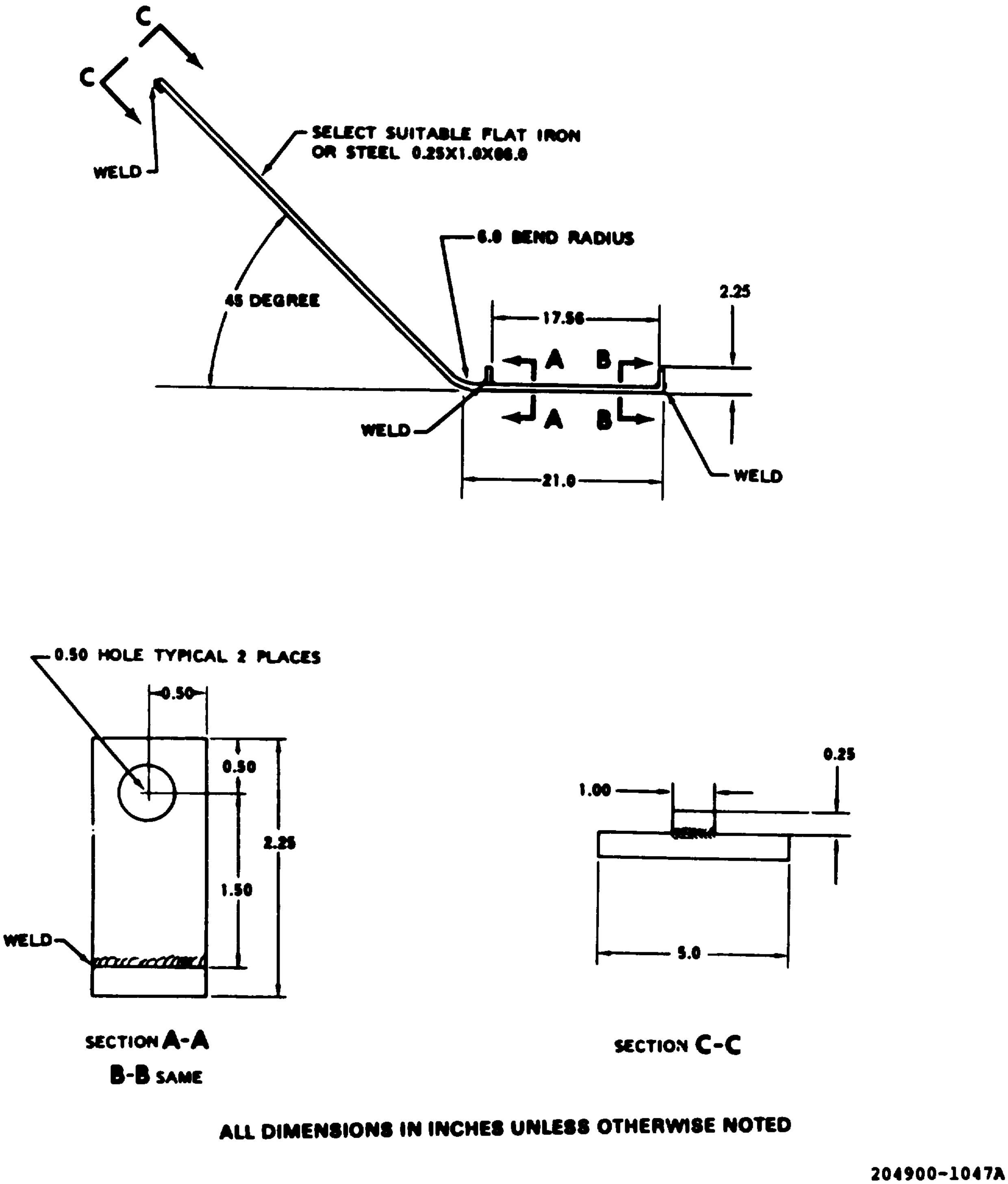


Figure 1-7. Work Aid for Towing Ground Handling Gear

CAUTION

Ground handling forces should not exceed 460 pounds (vertical direction) and 150 pounds (horizontal direction) pressure exerted on tailboom.

c. Station a person at aft end of tailboom to balance helicopter on handling gear and to assist in control while towing.

CAUTION

Towing the helicopter on ground handling gear over prepared surfaces at a gross weight in excess of 9660 pounds may cause permanent set in the aft cross tube. Do not tow helicopter on unprepared surfaces at gross weights in excess of 7500 pounds. Caution should be exercised when towing on unprepared surfaces at any gross weight. Do not tow at speeds in excess of 5 miles per hour. Avoid sudden starts and stops.

d. Tow helicopter to desired area.

e. Remove ground handling gear as follows:

(1) Station a person at tailboom to assist by steadying helicopter.

(2) Release hydraulic pressure by turning T-handle of pump valve on each set of handling gear, allowing wheels to retract and landing skids to rest on ground. Close valve.

(9) Push release pin on rear of cradle to disengage spring-loaded mounting pin from eyebolt. Pull front pin free of eyebolt and remove handling gear assembly. Remove opposite ground handling gear in the same manner.

(4) Remove tow-bar.

1-34. JACKING.

1-35. JACKING PROCEDURES.

Four jack fittings with mooring shackles attached are provided as loose equipment for use at two jack points on the fuselage and inboard of wing pylona (figure 1-8). The forward jack fitting is attached by bolts under the struture of the right main beam and the ammunition compartment rear bulkhead. The aft jack fitting is screwed into a socket on the left main beam ahead of the tailboom attach splice. Wing pylon jack fittings are substituted for ejector tube assemblies in outboard armament racks.

WARNING

Do not jack helicopter in open area during windy or gusty conditions.

CAUTION

Outboard articulated pylons must be in the stowed position (four degrees up) when the helicopter is to be jacked for any purpose. Jacking fitting (S8) must be installed.

CAUTION

All structural panels must be installed prior to jacking and leveling. Helicopter must be leveled prior to removing structural panels, except tailboom structural panels. Do not lower jacks until structural panels have been reinstalled to prevent possible permanent set to helicopter structure.

a. Remove aft section of bottom forward electrical access panel (station 138.7). Remove heat sink appproximately 10 inches right of center. Carefully secure heat sink to one side using masking tape to prevent damage to the wire connectors for transistors (8Q5 and 8Q6). Remove three screws to gain access to the jack fitting mounting nutplates. Install jack fitting (S7), using three bolts and washers provided with fitting.

b. Remove aft jack fitting cover plate. Select jack fitting (S6) with threaded end approximately 1.0 inch long, from shoulder to end. Install fitting in aft jack point socket, on bottom of left main beam just forward of tailboom.

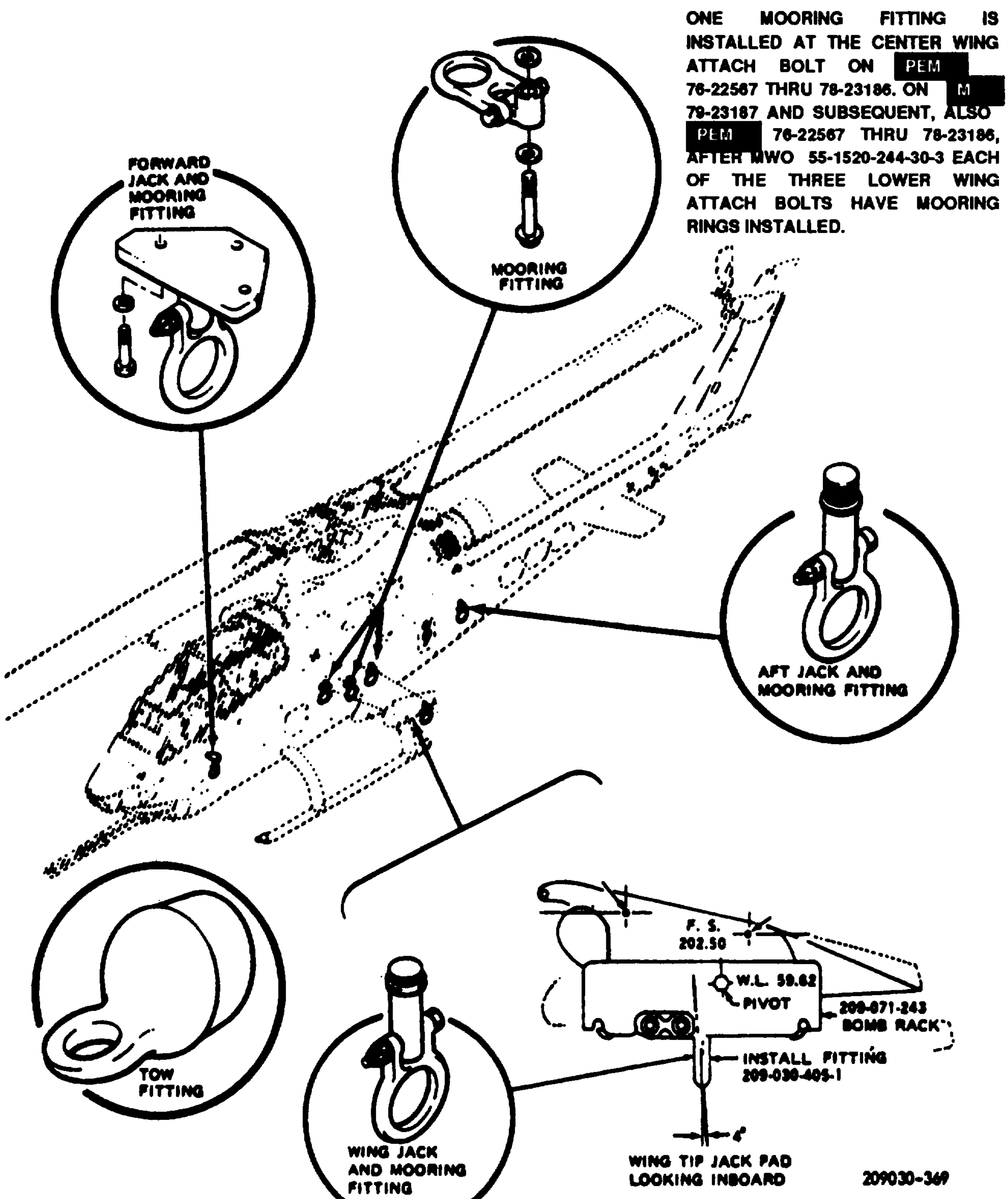


Figure 1-8. Jacking and Mooring Fittings

c. Remove outboard armament pods (paragraph 16-22), Check that two remaining jack fittings (S8), for wing jack points are similar to fitting used in step b. except for shorter threaded ends approximately 0.49 inch long.

WARNING

Ejector cartridges must be removed before installing jack fittings in outboard wing pylons.

d. At each outboard rack, remove lockwire and remove complete ejector tube assembly (paragraph 16-41). Install jack fitting.

e. Place jacks under four jack point fittings. If removing landing gear, align all jacks with inboard legs parallel at approximately 27 degrees to axis of fuselage.

CAUTION

High center of gravity makes it imperative that all jacks be raised evenly with wings level.

f. Raise helicopter slowly and evenly.

g. Observe the following precautions while helicopter is on jacks.

(1) Rope off area around helicopter and prominently display warning signs stating CAUTION: HELICOPTER ON JACKS.

(2) All personnel in immediate area shall exercise extreme caution not to bump or otherwise disturb helicopter while raised or supported on jacks.

(3) Personnel shall not climb into or onto helicopter while raised or supported on jacks.

h. After necessary work, lower helicopter slowly and evenly. Remove jacks.

i. Remove jack fittings from outboard pylon ejector racks. Reinstall and lockwire ejector tube assemblies. Reinstall cartridges (paragraph 16-36).

j. Remove forward jack fitting with bolts and washers. Reinstall screws in jack point bolt holes.

k. Install heat sink and aft section of forward electrical access panel.

l. Remove aft jack fitting Install aft jack fitting cover plate. Return all fittings to loose equipment.

m. Install outboard armament pods.

1-36. LEVELING.

Leveling pads located in the ammunition compartment floor are used with a bubble protractor when it IS necessary to level the helicopter. Pallet must be removed for access. For fore-and-aft leveling, use two pads (12, figure 1-6), located in depression near left side of floor. For lateral leveling, use two pads (11), located left and right on top of aft ammunition pallet track. Apply jacking procedures to correct helicopter position (paragraph 1-35).

NOTE

If leveling pads are damaged or missing, refer to paragraph 2-280 for pad replacement.

1-37. PARKING.

1-38. DESCRIPTION – PARKING.

Parking, as used in this manual, IS defined as the condition in which helicopter will be secured while on the ground. Direction of heading and location of helicopter is normally determined by ease of maintenance and servicing, to allow removal of any one helicopter from parking area and to permit ready access of mobile fire fighting equipment within area. Although parking arrangements may vary according to local facilities, the general procedures in the following paragraph should be observed.

1-39. PARKING PROCEDURES.

a. Double-row lateral parking, with front and rear helicopter of each double row placed tail to tail, should be used where possible.

b. Helicopter should be parked not less than 750 feet from ends of center line of nearest runway, and not less than 250 feet from edge of connecting taxi strips.

c. Width of fire lanes between each double row should be slightly greater than rotor span of parked helicopters. This spacing will facilitate removal of any helicopter from parking area, as well as permitting greater ease of movement of mobile fire fighting equipment within area.

d. Fire lanes having a minimum width of 50 feet should be provided to cross main fire lanes and isolate blocks of 10 helicopters or less.

e . Helicopters parked on concrete ramps or aprons should be placed to utilize mooring rings when available.

f. Parked helicopter will be provided with a static ground.

g. Under normal conditions park the helicopter as follows:

(1) Park helicopter on a level surface, whenever possible, so that load will be evenly distributed on landing gear.

(2) Retract or remove ground handling wheels to allow helicopter to rest an landing skids.

NOTE

If helicopter is to remain parked more than 14 days, use suitable blocks or shoring to raise skids slightly off sup porting surface.

CAUTION

Do not use a rope to pull rotor blades into alignment for tiedown. Damage to loading edge may result. Manually position rotor blades.

(3) Align main rotor blades fore and horizontal, and tail rotor blades parallel to vertical fin.

NOTE

If the collective stick is positioned in other than full down, place EMER HYD switch to EMER HYD PUMP and BAT switch to ON and fully lower collective stick. Place both switches to OFF after collective is lowered.

NOTE

Use 1/2 inch polyester rope, NSN 4020-00-630-4873, for blade tie-down. Reference TM 1-1520-250-23-1 for additional information.

(4) Engage hook of main rotor tiedown (6, figure 1-6) in hole of fitting on each end of rotor blade and position blade above tailboom. Pull on tiedown to remove the spanwise slack from the rotor system and secure rotor by wrapping tiedown rope firmly around tailboom on aft end. Tie forward tiedown rope to tow rings (10) on landing gear skid. Additional security of the main rotor tiedown can be accomplished by inserting an AN416-2 safety pin through a 0.060 inch hole drilled through the hook of the main rotor tiedown. The hole is drilled perpendicular to the plane of the handle 0.25 inch from the insertion end of the hook. Secure the safety pin to the hook handle with a six inch piece of NAS1455B30-6 chain and safety wire. Insert the pin through the hook after inserting the hook through the rotor blade fitting.

(5) Attach tail rotor tiedown rope (5) to tail rotor and secure to loop provided on side of vertical fin.

(6) Install TSU cover (9).

WARNING

Before entry into cockpit area, ensure that canopy removal system ground safety pins are installed in pilot and gunner arming/firing mechanisms.

(7) Check that all switches are OFF and external power disconnected; close all doors and access plates. Lock ignition and canopy doors. Remove keys.

(8) Install pitot tube cover (2, figure 1-9), engine air inlet shields (4), and [redacted] [redacted] exhaust cover (3) or [redacted] exhaust cover/IR duct cover (7).

NOTE

If required and available, install canopy cover (1).

h. Under turbulent weather conditions, park the helicopter os follows:

CAUTION

Structural damage can occur from turbulent weather conditions. Anchoring and mooring should be accomplished when wind is expected to exceed 45 knots. When possible, helicopter should be evacuated to a safe weather area if a tornado, hurricane or wind condition above 75 knots is expected.

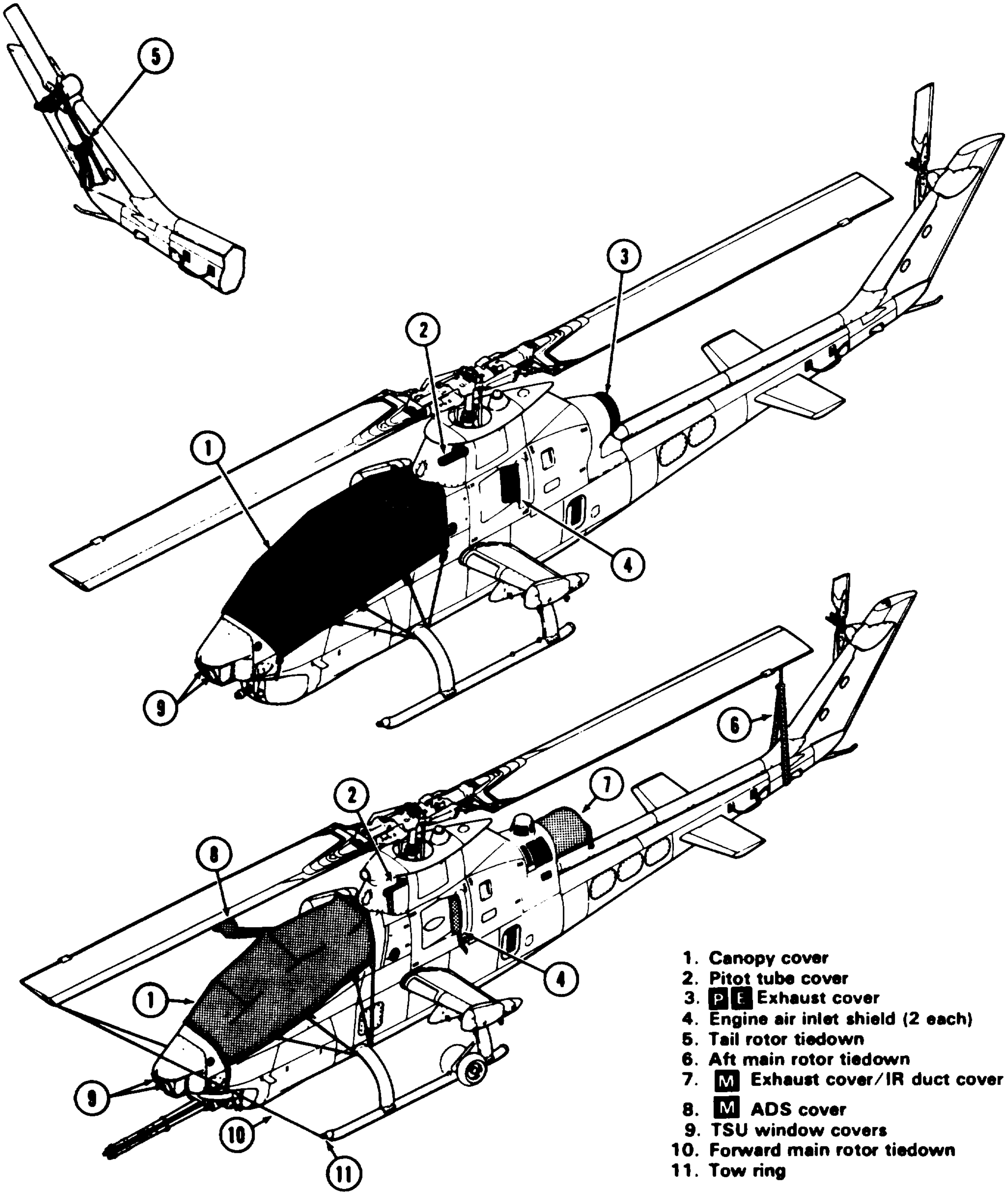


Figure 1-9. Covers Diagram

(1) Park helicopter.

(2) Moor helicopter in accordance with paragraph 1-39

(3) Fill fuel cell to capacity if time permits.

(4) Disconnect battery. Secure ail loose equipment. Moor all ground support equipment at safe distance from helicopter.

(5) After high winds have passed, inspect helicopter for damage.

1-40. MOORING.

1-41. DESCRIPTION – MOORING.

Mooring is a process of securing perked helicopter to avoid damage by high winds or turbulent weather. Mooring fittings are provided at locations shown on figure 1-10. Where properly spaced rings are not available, marring can be accomplished with a standard mooring kit. Refer to paragraph 2-267 for description of mooring fittings.

1-42. MOORING PROCEDURE.

1-42.1. Mooring Hardware (See Table 1-7).

1-42.2. Mooring Procedure On Unpaved Surface.

a. Park helicopter on unpaved parking area, headed in direction of highest winds forecast.

b. Install Mooring Fittings.

(1) Assemble mooring fittings (figure 1-8) for installation at wing attach points by assembling two parts of fitting and installing bolt, nut and washer.

(2) Position mooring fitting on helicopter at wing attach point (figure 1 -8) and install bolt and washer. Torque bolt to 400 inch-pounds. Back off to zero torque or until threads disengage. Tighten bolt until contact occurs between bolt head and washer or until torque begins to increase. Record torque value. Apply 100 inch-pounds torque above torque value recorded before, but do not apply more than 460 inch-pounds torque. Install opposite fitting in the same manner.

(3) Install aft jack and mooring fitting at aft jack point (paragraph 1-35).

(4) Position forward jack and mooring fitting (figure 1-8) on helicopter fuselage. (paragraph 1-35).

(5) Install wing jack and mooring fittings (figure 1-8) (paragraph 1-35).

c. Assemble and install anchor rods.

(1) Screw anchor rod (1, figure 1-10) into arrow (3).

(2) Slip driving rod (2) over anchor rod and into socket of arrow.

(3) Turn cam of driving rod so that prongs of arrow are not spread by driving.

(4) If necessary, loosen surface of ground.

(5) Position driving rods as shown in figure 1-10.

(6) Drive each arrow into ground until driving rod handle is approximately three inches above surface.

(7) Rotate driving rod handle approximately 90 degrees and give it a sharp blow to spread arrow prongs.

(8) Return driving rod to driving position and remove it from anchor rod.

(9) Align squared socket of eye (4) with squared end of anchor rod. Fit in place and tighten knurled nut.

(10) Set arrow prongs by pulling up on eye assembly.

CAUTION

Do not overtighten cables or rope. Overtightening may cause the mooring fitting bolt to bond.

d. Secure helicopter to anchor rods with quarter-inch cables or one-inch manila rope, as shown on figure 1-10.

e. Remove mooring cables or ropes installed in step d.

f. Remove anchor rods installed in step c.

g. Remove mooring fittings from helicopter as follows:

(1) Remove combination mooring and jack fittings (figure 1-8) from aft jack mounting points and wing Jack mounting points by rotating the mooring and jack fitting in a counterclockwise direction,

(2) Remove combination jacking and mooring fittings (figure 1-8) from forward jack mounting point by removing three bolts and washers.

(3) Remove mooring fitting at wing attach points (figure 1-8) by removing bolt and washer.

1-42.3. Mooring Procedure On Paved Surface.

a. Position the aircraft on the mooring pad with the longitudinal centerline of the aircraft directly above and parallel to the longitudinal axis of the pad as shown in figure 1-9.1. The aft mooring ring is to be located directly opposite the center pair of mooring points on the pad as illustrated.

NOTE

It will be necessary to remove the fairing which covers the forward jack-point, by removing the flush head bolts which secure the fairing to the aircraft. With the fairing removed, install the stainless steel jack-point in the uncovered recess, as described in this TM. With the jack-point installed, install the mooring clevis to the jack-point as described in this TM. A mechanics tool kit will be required.

b. Place the hook-ends of the two forward chains into the mooring clevis. Adjust the chains with the chain adjusters provided on each chain. Chains should be adjusted to the point where the slack has been removed.

c. Remove the fairing covering the aft jack-point. Four flush head bolts must be removed. With the fairing removed install the jack-point in the uncovered recess and install the aft mooring clevis on the jack-point as described in this TM. A Frearson head screw driver will be required.

d. Place the hook-ends of the two aft mooring chains into the aft mooring ring. Place the hook-end of the two center mooring chains into the most aft of the three D-rings provided under the aircraft wings. Adjust the chains with the chain adjusters provided with each chain. Chains should be adjusted to the point where the slack has been removed.

NOTE

It is highly recommended that AH-1 helicopters be flown with the mooring hardware installed at all times to permit a rapid response to weather emergencies, unless it is the commanders decision that to fly without the fairings would significantly impact the mission.

NOTE

The mooring hardware is not considered flyaway equipment. All active mooring points shall be equipped with this hardware.

Table 1-11.1. Mooring Hardware Chart

MOORING HARDWARE

ITEM	DESCRIPTION	P/N	NSN	QTY
1	CHAIN ADJUSTER	MB-1	1670-00-212-1149	6
2	CHAIN WITH HOOK	FOR MB-1	4010-00-516-8405	12

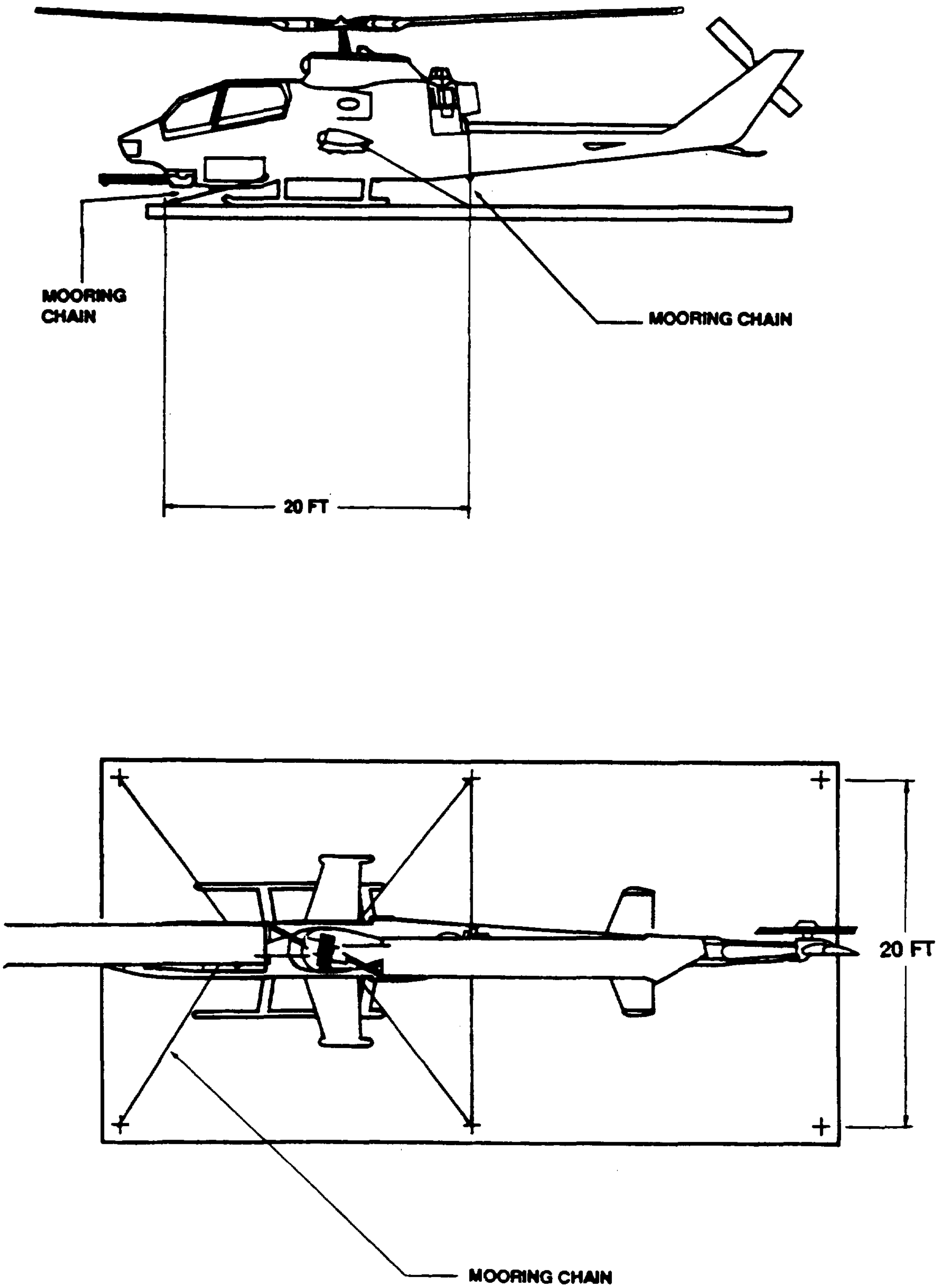
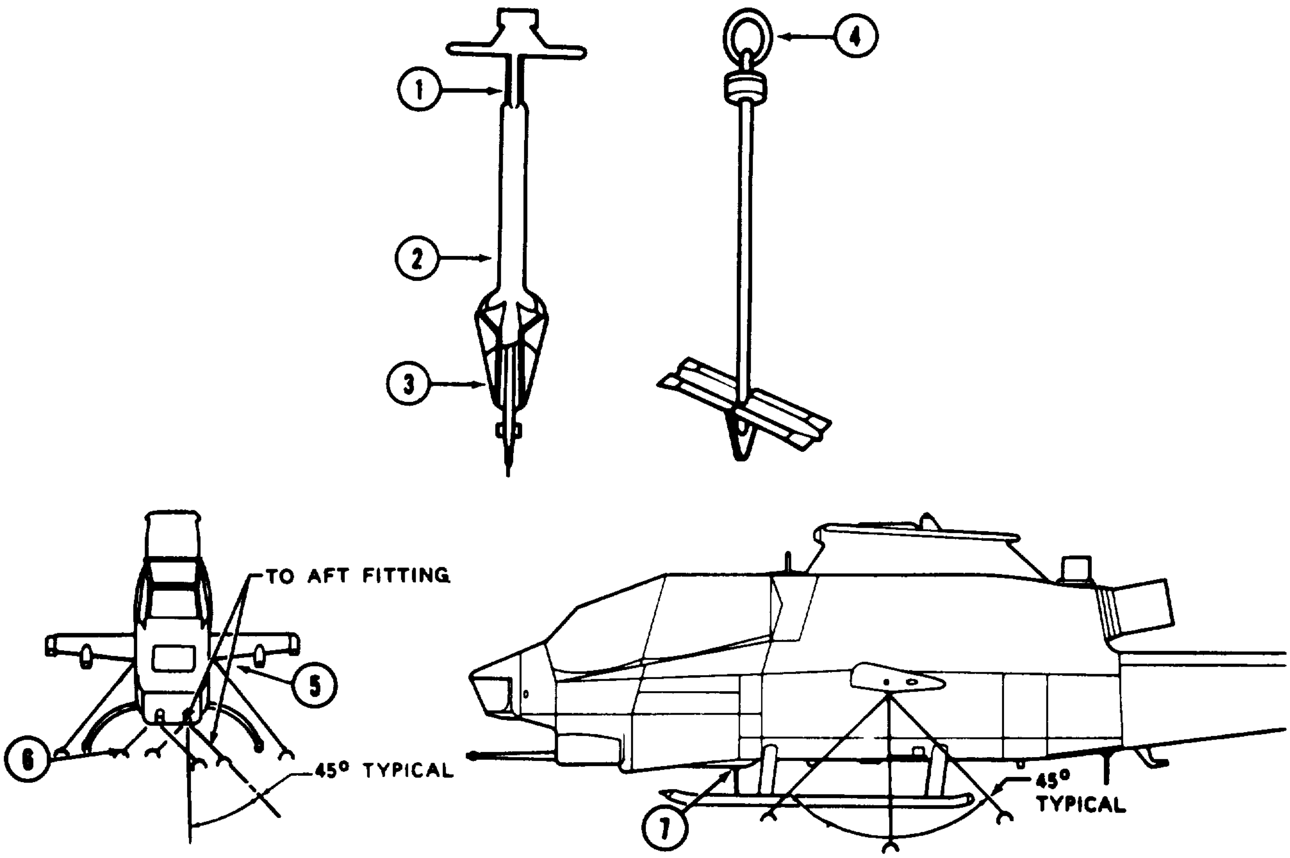


Figure 1-9.1 AH-1 Paved Surface Mooring Configuration



1. Anchor rod
2. Driving rod
3. Arrow
4. Eye
5. Mooring fitting
6. One inch rope or one-fourth inch cable
7. Forward jack and mooring fitting

209070-224

Figure 1-10. Mooring Diagram

1-43. HELICOPTER COVERS.

1-44. DESCRIPTION — HELICOPTER COVERS.

The helicopter covers consist of the canopy cover, pitot cover, exhaust cover, and the engine air inlet shields (figure 1-9). The pitot cover, exhaust cover, and engine air inlet shields should be installed whenever helicopter is parked outside. The canopy cover is made of vinyl coated cloth with elastic cord straps attached. The canopy cover should be installed during extended outside parking or when stormy weather is expected.

1-45. HOISTING.

1-46. DESCRIPTION — HOISTING.

The entire helicopter can be lifted by a suitable hoist attached to an eye provided on the main rotor retaining nut at top of the mast. This hoisting point can also be used to lift out the mast assembly (with or without the main rotor and rotating controls assemblies), or the complete mast and transmission assembly.

1-47. HOISTING — HELICOPTER.

a. Attach a hoisting cable and clevis or clevis assembly (S4) to lifting eye of main rotor retaining nut (figure 1-6). Connect a suitable hoist and take up slack.

b. Station a person at tail skid to steady helicopter against swinging or turning when hoisted. If lifting beyond reach, attach a suitable rope for this purpose.

c. Hoist slowly, maintaining a steady lifting force.

1-48. HOISTING – COMPONENTS.

a. For hoisting or handling tailboom as a separate component use straps or slings at both ends of boom, Use tail skid for steadying boom.

b. To hoist engine, main rotor, or mast and transmission from helicopter use maintenance hoist (T45) or other suitable hoist.

1-49. MAINTENANCE HOIST.

1-50. DESCRIPTION — MAINTENANCE HOIST.

A maintenance hoist (T45), designed to mount on left side of the fuselage, is provided for use in removing and installing main rotor, mast, transmission, or engine assemblies. The hoist consists of a tube assembly, a hub assembly, and attaching parts. The tube assembly has a hand-operated winch, with cable, pulleys and weighted hook. The hub is a socket made from larger diameter tubing, with attachment fittings, sleeve bearings, and a platform to aid the operator. The tube assembly rests on a steel ball in the hub, and can be rotated by means of the crossbar handle to move the hook into position.

WARNING

Do not exceed maximum hoist hook load of 935 pounds and maximum cable angular displacement of 10 degrees from the vertical.

1-51. INSTALLATION – MAINTENANCE HOIST.

a. At left side of fuselage, remove two screws and washers from bolt holes of upper hoist supports, located just ahead of engine forward firewall. Remove six screws and washers from lower support bolt holes, located in vertical rows of three ahead of and behind landing gear aft crosstube.

CAUTION

Prior to installation of maintenance hoist inspect hoist and support visually for cracks and other damage which may affect function. Replace parts If damaged.

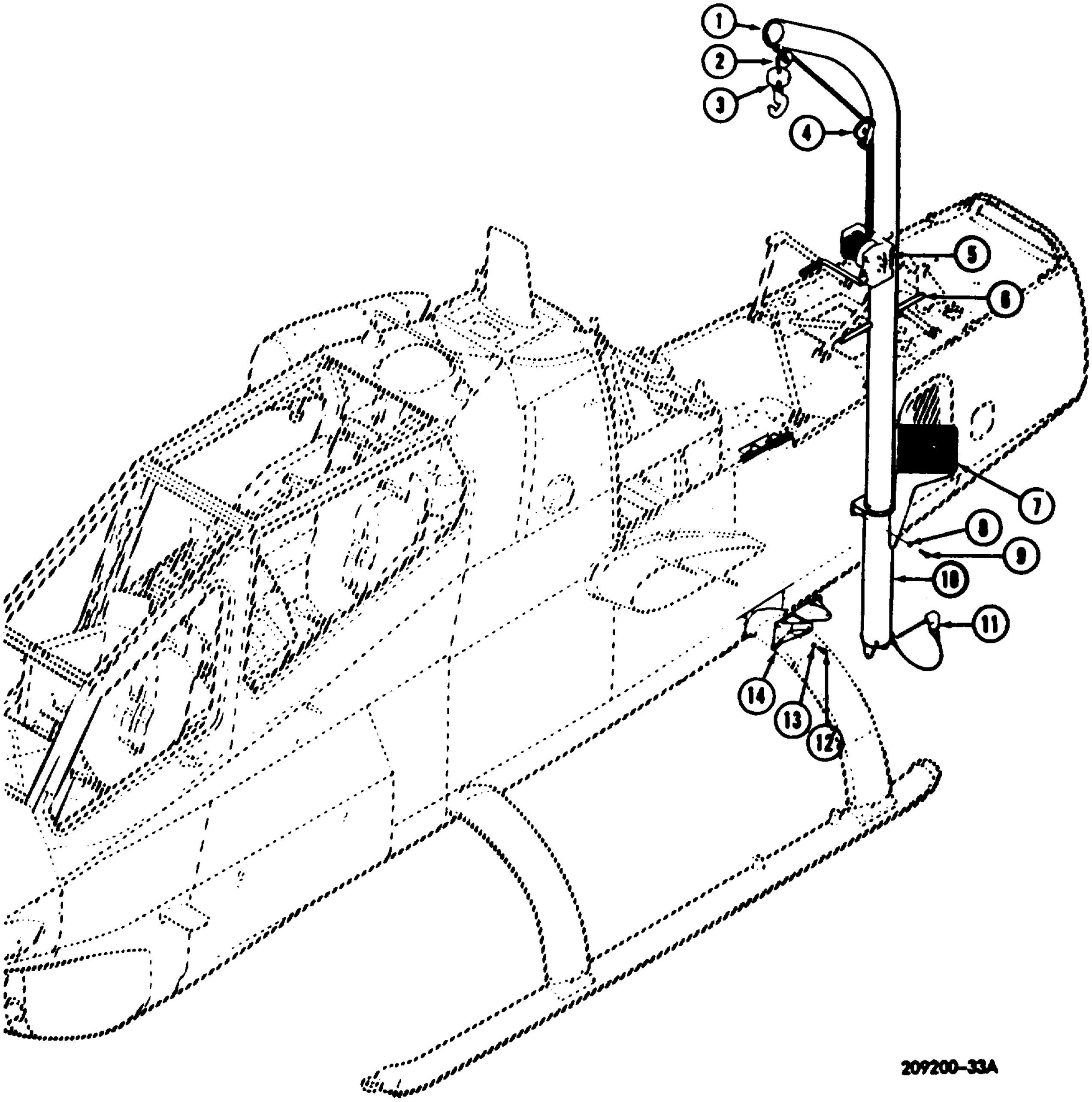
b. Install bracket (14, figure 1-11) above londing gear crosstube, using six bolts and washers instead of screws removed in preceding step.

c. Insert lower end of tube assembly (1) into hub assembly (10). Align lower fitting of hub in support bracket and install pin (11).

d. Raise hoist assembly. Attach upper fitting of hub to upper supports, using two bolts and washers instead of screws previously removed.

WARNING

Handle hoist with care to avoid personal injury or damage to aircraft.



1. Tube assembly
2. Universal joint and puller
3. Hook weight
4. Cable guide and puller
5. Winch assembly
6. Handle
7. Platform
8. Washer
9. Bolt
10. Hub assembly
11. Pin
12. Bolt
13. Washer
14. Bracket

Figure 1-11. Maintenance Hoist, T101520

1-52. REMOVAL - MAINTENANCE HOIST.

a. Detach hub fitting from upper supports by removing two bolts and washers.

b. Carefully awing top of hoist assembly outward and down until resting on ground. Remove tube assembly (1, figure 1-11) form hub assembly (10).

c. Detach lower fitting of hub from bracket (14) by pulling out pin (11). Remove hub assembly.

d. Remove bracket with attaching bolts and washers from fuselage. Bracket can be l teched with pin to hub for conveince.

e. Reinstall screws and washers in bolt holes of upper and lower support points.

1-53. SLING LOADING.

Refer to FM 55-413.

1-54. APPLICATION OF EXTERNAL POWER.

Art external power receptacle (7. figure 1-6) for application of external 28 Vdc power is located in left side of the fuselage at station 274, covered by a spring-loaded access door. When the door is open, a switch causes the EXTERNAL POWER caution panel segment to be lighted. Battery switch should be at OFF position. Use a 28 Vdc power source capable of delivering 650 amperes. When cable connector from power source is connected to the receptacle, the external power relay in the helicopter DC circuit wiIl be energized l nd power will be supplied to the main bus for distribution.

NOTE

If battery charge is less than 24 volts, external power may be required to avert hot starts.

a. On E M when an external power source is provialing electrical power, the helicopter battery should be connected to the essential hue. During extended armament checks, the condition of the battery should be checked every 30 minutes. If an overheated battery is suspected or detected, external power should be disconnected and BATTERY switch turned to OFF position. No attempt should be made to disconnect or remove an overheated battery.

b. E M The BATTERY switch should be in the RUN position, only during armament checks when external power is being applied to the helicopter. At completion of armament testing the external power should be disconnected. The BATTERY switch should be returned to OFF position, and battery should be disconnected. Hours accumulated on the battery during armament testing with battery on the line should be added to DA Form 2408-18.

SECTION IV. INSPECTION REQUIREMENTS

1-55. GENERAL INFORMATION.

a. This section contains complete requirements for special inspections, overhaul and retirement schedule, and standards of serviceability applicable to the aircraft. The inspections prescribed in this chapter shall be accomplished at specific periods by aviation unit maintenance activities with the assistance of intermediate maintenance activities when required. Daily inspection are contained in TM 55-1500-220-PMD, Preventive Maintenance Daily Check List. Phased maintenance inspections are contained in TM 55-1500-220-PM, Phased Maintenance checklists.

b. Special inspection frequencies that are based on flight hours may be accomplished within a plus or minus ton percent tolerance from the nominal time when such inspections would ordinarily be duo.

c. Special inspections based on calendar times will have a tolerance of plus or minus ten percent not to exceed thirty days.

1-56. STANDARDS OF SERVICEABILITY.

Standards of serviceability to be utilized in the day-to-day inspection and maintenance of the helicopter can be found as fits, tolerances, wear limits, and specifications in the applicable chapter. Standards of serviceability for tranfer of helicopters are contained in TM 55-1500-326-25.

1-57. SPECIAL INSPECTION.

This section supplements the scheduled inspect ions contained in TM 55-1500-220-PM, Phased Maintenance requirements. This section also inclueds inspections of items which are required to be inspected at intervals not compatible with airframe operating time or airframe inspection intervals. Refer to DA PAM 738-751 for applicable forms, records, and worksheets required for these inspection intervals. Typical of this type inspection items are:

a. An inspection which is contingent upon specific conditions or incidents that arise, and only because of these conditions or incidents, whose immediate inspection is required to ensure safe flight. Typical of these conditions are hard landings, overspeed, and sudden stoppage.

b. Inspection of components of airframe on a calendar basis: first aid kits, weight and balance check, aircraft inventory, etc.

CAUTION

When components are being removed from on aircraft, all inspections required by the next phase maintenance inspection must be accomplished prior to either immediate re-use or storage. Upon installation, the component will be inspected in accordance with the current phase (either that phase the receiving aircraft is in or if in between phase, the last phase performed). This will ensure that a re-used component will not overfly any PM inspections, and that it will be properly interfaced with the receiving airdraft phase sequence.

Special inspections are listed in the following Aircraft inspection Checksheet. Use figure 1-12 with the Aircraft Inspection Checklsheet to locate component to be inspected.

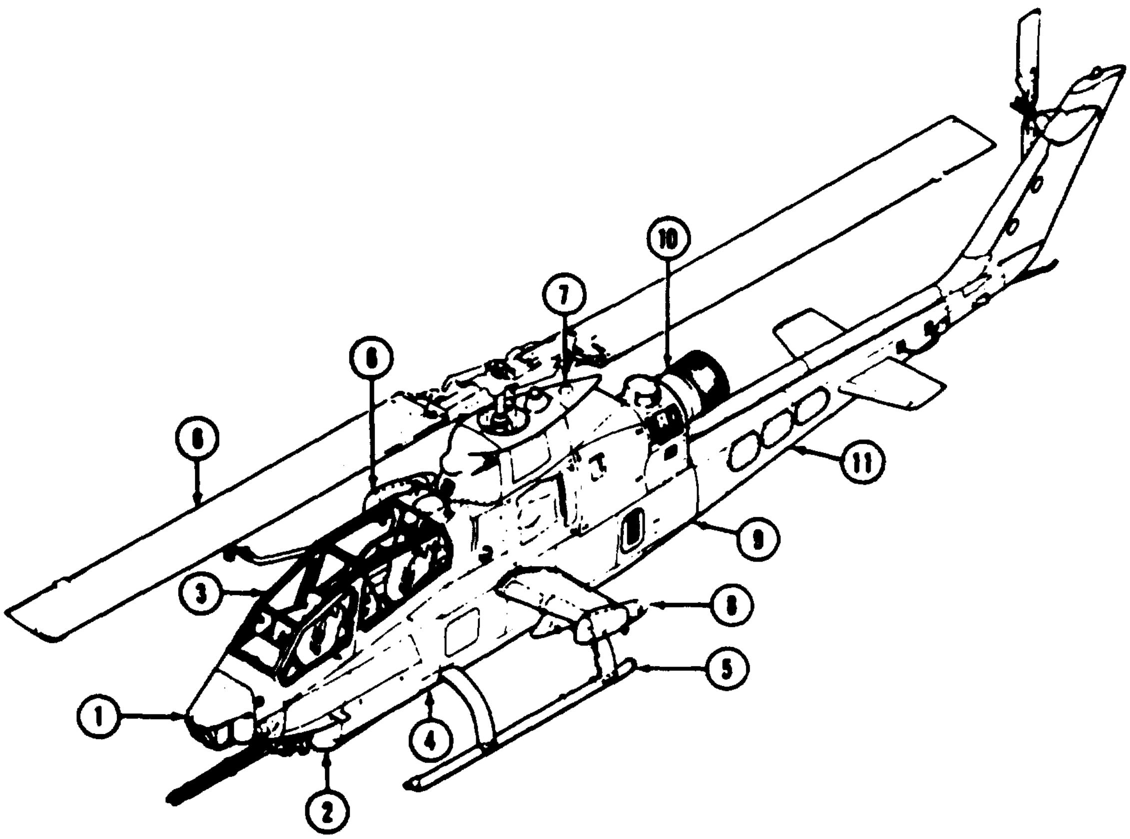


Figure 1-12. Inspection Area Diagram (Typical) (Sheet 1 of 2)

AREA NO. 1:	Nose Area	All surfaces, components, and equipment in nose compartment and on exterior ahead of forward edge of gunner door.
AREA NO. 2:	Turret Area	All surfaces, components, and equipment inside and outside of armament turret and ammunition compartment.
AREA NO. 3	Gunner and Pilot Area	All surfaces, components, and equipment inside and outside the gunner-pilot compartment. Includes items stowed in cabin aft of pilot soot.
AREA NO. 4:	Lower Forward Fuselage Area	All surfaces, components, and equipment contained in. and on exterior of, lower forward portion of fuselage between ammunition compartment and aft cabin bulkhead (Sta 186.25) except forward fuel cell.
AREA NO. 5:	Landing Gear Area	All surfaces, components, and equipment which constitute the landing gear and attachments.
AREA NO. 6:	Main Rotor Area	All components of the main rotor hub and blade. Does not include the mast.
AREA NO. 7:	Pylon Area	All surfaces, components, and equipment contained in, and on the exterior of, the hydraulic and transmission compartments to the bottom of the transmission. Includes transmission cowling. most, mounts, rotating controls, and main (input) driveshaft.
AREA NO. 8:	Wing Area	All surfaces, components, end equipment in and on the wings. Includes all external fittings end attachments.
AREA NO. 9:	Center Fuselage Area	All surfaces, components. and equipment in and on the fuselage below the engine deck (WL 65.00) and between the cabin area (Station 186.25) and tailboom attachment bulkhead (Station 299.57). Includes forward and aft fuel cells, compartment below transmission, oil cooler, and compartments accessible through side doors and panels on fuselage.
AREA NO. 10:	Engine Area	All surfaces, components, and equipment associated with engine installation located above engine deck (WL 65.00) and within engine cowling, tailpipe fairing, and aft fairing.
AREA NO. 11:	Tailboom Area	All surfaces, components, and equipment located in and on the tailboom and vertical fin. Includes tail rotor, synchronized elevator, control linkages. driveshafts, gearboxes, electronic gear, and cooling fan.

209900-777-2A

Figure 1-12. Inspection Area Diagram (Typical) (Sheet 2 of 2)

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 1	NO. OF PAGES 26
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIRE-MENT EVERY	ITEM	STA-TUS	RECORDED ON WORKSHEET
All Areas		**AFTER A HARD LANDING**		

AFTER A HARD LANDING

Definition: Hard landing is defined as any accident or incident in which ground impact of the helicopter causes severe pitching of main rotor, allowing hard contact of hub with mast, or results in cracking or yielding of the mounting lugs of the transmission support case or noticeable yielding or cracking of fuselage pylon support structure or landing gear. This definition is confined only to those accidents not involving sudden stoppage of main rotor or tail rotor.

Inspections: When a probable hard landing incident has occurred, proceed as follows:

a. Inspect main and tail rotor blades for evidence of strike damage. If such evidence is found on either rotor, perform AFTER SUDDEN STOPPAGE Special Inspection.

b. Visually inspect underside of fuselage and tailboom for evidence of ground contact.

c. Inspect landing gear for yielding of cross tubes to cause skid tube deflection to exceed allowable dimensions. If not obvious, determine condition by measurements according to instructions in chapter 3.

(1) If crosstubes have yielded, remove landing gear and inspect supports and structure to which they are attached for signs of yielding or other damage. Inspect crosstubes and retaining plates for cracks using fluorescent penetrant or ultrasonic shear wave inspection methods.

(2) If supports and attaching structure are undamaged, replace landing gear.

(3) Penetrant inspect tubes for cracks in area from saddle fittings to fuselage mount.

d. Inspect mast for evidence of hard rotor hub contact sufficient to cause yielding or deformation. None is acceptable.

e. Inspect supports of dampers under pylon aft mounts for loose rivets or other damage.

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 2	NO. OF PAGES 26
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AREA NO.	REQUIRE-MENT EVERY	ITEM	STA-TUS	RECORDED ON WORKSHEET
		AFTER A HARD LANDING (CONT)		
		f. If no damage other than yielded landing gear crosstubes has been found at this point, it can reasonably be decided that a true hard landing did not occur. Complete a careful Daily Inspection and return helicopter to operation if no further evidence of damage is found.		
		g. If damage other than yielded landing gear crosstubes was found in preceding steps, a hard landing has occurred, and the following steps must be performed.		
		h. Remove main (input) driveshaft. Tag shaft with reason for removal and send to next higher maintenance level.		
		i. Remove transmission. Tag assembly with reason for removal, and send to next higher maintenance level.		
		j. Remove and inspect mast.		
		(1) If there is yielding or deformation in area which might be contacted by main rotor hub, or if there is other obvious damage, the mast should be considered unserviceable and non-reparable and disposed of locally.		
		(2) If such damage is not found, tag mast assembly with reason for removal and send to depot maintenance level.		
		k. Perform thorough visual inspection of the following components, which may be kept in service if no discrepancy or damage is found.		
		(1) Main Rotor Blades		
		(2) Main Rotor Hub, Buffer Pads, and Hub Moment Spring Assembly (MWO 55-1520-244-50-3 Incorporated)		
		(3) Tail Rotor Blades		
		(4) Tail Rotor Hub		
		(5) Intermediate Gearbox		
		(6) Tail Rotor Drive Gearbox		
		(7) Tail Rotor Driveshafts		

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 3	NO. OF PAGES 26
AIRCRAFT ANO SERIAL NO.			INSPECTION NO,	DATE OF INSPECTION	

AREA NO.	REQUIRE-MENT EVERY	ITEM	STA-TUS	RECORDED ON WORKSHEET
		AFTER A HARD LANDING (CONT)		
		(8) Tail Rotor Driveshaft Hanger Assemblies		
		(9) Swashplate and Support Assembly		
		(10) Scissors and Sleeve Assembly		
		l. Remove cowling. Inspect all cowl attachment fittings.		
		m. Make complete inspection of pylon support structure (including damper supports) for loose rivets, cracked forgings, and buckled or cracked support angles and webs.		
		n. Check each pylon mount damper for yielding, by measuring clearances according to instructions in paragraph 2-236. Replace dampers if yielded.		
		o. Make complete inspection of lift link, attachment fitting, end lift beam for cracks, buckling, or other evidence of damage.		
		p. Make complete inspection of area where tailboom is attached to forward fuselage section. This includes both sets of attachment fittings, and the longerons, beam caps, skins, webs, bulkhead flanges, and other structural members. Check torque on attachment bolts to determine if yielding has occurred, Refer to paragraph 2-286.		
		q. Conduct a complete inspection of engine mount for yielding or other damage of tubes, rod ends, and attaching parts. Inspect trunnions and airframe attachment fittings by magnetic-particle method. If damage exceeding that defined in step g is incurred, remove engine and send to next higher maintenance level for inspection.		
		r. If no significant damage has been found, no further inspection is necessary.		
		s. If significant damage has been found in any area of the l irframe, inspection should be expanded in those areas until it extends beyond the zone of damage.		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP (Daly, Intermediate, etc.) SPECIAL	PAGE NO. 4	NO. OF PAGES 26
AIRCRAFT AND SERIAL NO.	INSPECTION No.	DATE OF INSPECTION	

AREA NO.	REQUIRE-MENT EVERY	ITEM	STA-TUS	RECORDED ON WORKSHEET
		t. Inspect pitch link assembly upper bearing for marks on lower surfaoe face and outer race, indicating metal to metal oontact		
		(1) If such contact is evident, remove the tube assembly and inspect bearing and tube. Test tube for straightness by procedures in figure 5-54 and for cracks by procedures in TM 43-0103, Chapter 6, or TM 55-1500-204-25/1, Chapter 7.		
		(2) Inspect bearing for damage, axial and radial play, per limits shown in figures 5-54 and 5-54.1. The deformed areas should be marked with Prussian blue (C92) to preclude further inspection of already inspected damage.		
		(3) If pitch link assembly passes inspection, the assembly may be retained in service.		
2		**u.** Inspect lower wire strike cutter for bends, cracks, and alignment. Replace cutter if damage is found.		
6		**K747 MAIN ROTOR BLADE SUBJECTED TO HIGH WINDS**		
		Blades unrestrained and/or have tom loose from their mooring when subjected to winds of 60 MPH and higher are to be tap tested in main spar areas between stations 70 to 90.		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 4	NO. OF PAGES 26
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
6 & 7	.	**AFTER SUDDEN STOPPAGE (Power On or Power Off)**		

Sudden Stoppage is defined as an instantaneous shock load applied to the drive train and rotor systems either POWER ON or POWER OFF.

Shock loads result from:

- Blade(s) striking an object.
- Seizures which occur as a result of an internal failure of a drive train/rotor system.
- Engine compressor stall.

After a sudden stoppage, one of the following special inspections shall be conducted, depending on origin of shock load.

a. **Main Rotor Blade Strike.**

(1) No visible damage to either blade.

(a) Wipe upper and lower surfaces of main rotor blades with a clean, soft cloth and inspect both surfaces for cracks, distortion, or bond separation.

(b) Visually inspect hub assembly and mast for damage.

(c) If no damage is found, inspection is complete. If damage is found in either of the above inspections, proceed to paragraph (2) below:

(2) Mirror damage to either blade.

NOTE

This category includes both field repairable damage and skin tears whether repairable or not.

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 5	NO. OF PAGES 26
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AREA NO.	REQUIRE-MENT EVERY	ITEM	STA-TUS	RECORDED ON WORKSHEET
		AFTER SUDDEN STOPPAGE (Power On or Power Off) (CONT) (a) Inspect and replace the following items if damage is found: 1 Main rotor hub trunnion cap attach bolts and drag brace jamnuts and attach bolts for security. 2 Flight control system, from rotor to servo cylinder, for bent or damaged tubes. 3 Scissors levers drive links for damage. 4 Swashplate gimbal mounting for damage. 5 Collective friction collet assembly for free travel. 6 Structure at transmission mounting points. (Use ten-power magnifying glass for cracks.) 7 Lift link and structure for damage, security, and distortion 8 Main driveshaft. Visually inspect SKCP series (K-Flex) driveshaft for the following conditions. If any one condition is found, replace shaft. a Bolt contact with adjacent plate. b Plate contact with end fitting. c Interconnect contact with end fitting. d Contact of fail-safe surface. 9 Mast. 10 Transmission sump oil filter, external oil filter, and chip detector for metal particles. a Positive indications are cause for replacing transmission. b If no metal particles are found, continue operation for 5 hours, then repeat inspection. If no positive indications are found, resume normal operation.		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate. etc.) SPECIAL.	PAGE NO. 6	NO. OF PAGES 26
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIRE - MENT EVERY	ITEM	STA-TUS	RECORDED ON WORKSHEET
		11 Intermediate and tail rotor drive gearboxes for metal particles. 12 Tail rotor driveshafts and hanger assemblies for obvious damage. 13 Tail rotor hub and blade assemblies. a Repair/replace blades as required. b Inspection complete. (3) Major damage to either blade. **NOTE** **This category is restricted to non-repairable damage other than skin tears. For skin damage, see Minor Damage Inspection (figures 2-44 and 2-49).** Replace the following: (Disposition as noted.) 1 Main rotor hub assembly (overhaul). 2 Main rotor blades (scrap). 3 Mast (overhaul). 4 Swashplate (overhaul). 5 Scissors and sleeve assembly (scrap). 6 Deleted 7 Control rods (rotor to scissors levers) (scrap). 8 Transmission (overhaul). 9 Engine: Refer to TM 55-2840-229-23 for required inspection.		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 7	NO. OF PAGES 26
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AREA NO.	REWIRE - MENT EVERY	ITEM	STA- TUS	RECORDED ON WORKSHEET

b. Tail Rotor Blade Strike.

(1) No visible damage to either blade.

(a) Inspect doublers for bonding separation, attachment area for distortion.

(b) Tail rotor hub assembly for damage.

(c) Inspect tail rotor rotating controls for damage.

(d) Inspect intermediate and tail rotor drive gearboxes for metal particles.

(e) Tail rotor driveshafts and hangers for obvious damage.

(f) If no damage is found, inspection complete. If damage is found, proceed to paragraph (2) below:

(2) Visible damage to either blade.

NOTE

Damage to tail rotor system that requires blade replacement will cause mandatory tail rotor yoke replacement.

(a) Scrap both blades.

(b) Replace intermediate and tail rotor drive gearboxes and return for overhaul.

(c) Inspect and replace the following items if damage is found.

<u>1</u> Tail rotor hub assembly.

<u>2</u> Tail rotor rotating controls.

<u>3</u> Tail rotor driveshafts.

<u>4</u> Tail rotor hanger assemblies (inspect for internal spline and curvic coupling damage).

<u>5</u> Transmission sump oil filter, external oil filter and chip detector for metal particles.

<u>a</u> Positive indications are cause for replacing transmission

<u>b</u> If no metal particles are found, continue operation for 5 hours, then repeat inspection. If no positive indications are found, resume normal operation.

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 8	NO. OF PAGES 26
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIRE-MENT EVERY	ITEM	STA-TUS	RECORDED ON WORKSHEET
		6 Main driveshaft.		
		7 Tailboom attachment points.		
		8 Mast assembly.		
		9 Main rotor rotating controls.		
		10 Main rotor blades.		
		11 Main rotor hub trunnion cap attach bolts-and drag brace jamnuts for security.		
		12 Transmission tail rotor output quill.		
		13 Inspection complete.		
		AFTER SUDDEN STOPPAGE (Power On or Power Off) (CONT)		
		(c) Inspect and replace the following items if damage is found.		
		1 Tail rotor hub assembly.		
		2 Tail rotor rotating controls.		
		3 Tail rotor driveshafts.		
		4 Tail rotor hanger assemblies (inspect for internal spline and curvic coupling damage).		
		5 Tailboom attachment points.		
		(3) Inspection Complete.		

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 9	NO. OF PAGES 26
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AREA NO.	REQUIRE - MENT EVERY	ITEM		STA- TUS	RECORDED ON WORKSHEET

AFTER SUDDEN STOPPAGE (Power On or Power Off) (CONT)

c. Internal Failure of Drive Train/Rotor System Component.

(1) Replace the following: (Disposition as noted).

(a) Transmission (overhaul).

(b) Mast assembly (overhaul).

(c) Intermediate gearbox (overhaul).

(d) Tail rotor drive gearbox (overhaul).

(e) Engine: Refer to TM 55-2840-229-23 for required inspection.

(f) Main rotor hub assembly (overhaul).

(2) Inspect and repair/replace the following as required:

(a) Main rotor blades.

(b) Main rotor rotating controls.

(c) Tail rotor blades.

(d) Tail rotor hub assembly.

(e) Main driveshaft (inspect for internal and curvic coupling damage). Visually inspect SKCP series (K-Flex) driveshaft for the following conditions. If any one condition is found, replace shaft.

1 Bolt contact with adjacent plate.
2 Plate contact with end fitting.
3 Interconnect contact with end fitting.
4 Contact of foil-safe surface.

(f) Tail rotor driveshafts.

(g) Tail rotor hangar assemblies (inspect for internal and curvic coupling damage).

(h) Helicopter structure.

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP (Daily, Intermediate, etc.) SPECIAL	PAGE NO 10	NO OF PAGES 26
AIRCRAFT AND SERIAL NO	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIRE - MENT EVERY	ITEM	STA- TUS	RECORDED ON WORKSHEET

ENGINE COMPRESSOR STALL

Engine compressor stall (surge) is characterized by a sharp rumble or a series of loud, sharp reports, severe engine vibration, and a rapid rise in exhaust gas temperature (EGT) depending on the severity of the surge.

a. Perform Engine Compressor Stall Inspection in accordance with TM 55-2840-229-23.

b. Inspect tail rotor drive gearbox for damage to gears, unusual wear pattern on either coast or driveside of gears and damage to input/output coupling internal and curvic coupling splines.

(1) No damage to tail rotor drive gearbox. Visually inspect remaining tail rotor driveshaft components. If no damage is found, inspection complete.

(2) Damage to tail rotor drive gearbox or other drivetrain component. Perform inspection requirements of paragraph c below.

c. Inspect and replace the following items if damage is found:

(1) Intermediate gearbox (inspect for damage to gears, unusual wear pattern on either coast of drive side or gears and damage to input/output coupling internal and curvic coupling splines).

(2) Tail rotor hanger assemblies (Inspect for Internal spline and curvic coupling damage).

(3) Tail rotor driveshafts.

(4) Main rotor driveshaft. visually inspect SKCP series (K-Flex) driveshaft for the following conditions. If any one condition is found, replaceshaft.

(a) Bolt contact with adjacent plate.
(b) Plate contact with end fitting.
(c) Interconnect contact with end fitting.
(d) Contact of fail-safe surface.

(5) Transmission sump oil filter, external oil filter, and chip detector for metal particles.

(a) Positive indications are cause for replacing transmission.

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 10A	NO. OF PAGES 26
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIRE-MENT EVERY	ITEM	STA-TUS	RECORDED ON WORKSHEET
		(b) If no metal particles are found, continue operation for five hours and then repeat instructions. If no positive indications are found, resume normal operation.		
		(6) Mast assembly.		

AIRCRAFT INSPECTION CHECKSHEET		TYPE OF INSP (Daily. Intermediate, etc.) SPECIAL	PAGE NO 11	NO OF PAGES 26
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AREA No.	REQUIRE-MENT EVERY	ITEM	STA - TUS	RECORDED ON WORKSHEET
		ENGINE COMPRESSOR STALL (CONT)		
		(7) Helicopter structure including tailboom attachment area and vertical fin.		
		(8) Replace main rotor hub trunnion attach bolts.		
		(9) Tail rotor blades.		
		(10) Tail rotor hub assembly.		
		d. Inspection complete.		
		HELICOPTER STRUCK BY LIGHTING OR HIGH TENSION WIRE STRIKE		
		a. General Inspection Requirements.		
		(1) Inspect fuselage interior and exterior, the landing gear, rotor systems and static ground wire for burn marks, cracks, pitting, or other signs of high temperature stress to determine lightning entry and exit points.		
		(2) Trace path of lightning strike to extent possible, using a field indicator (magnetometer) (T64.1).		
		(3) Check magnetic compass for accuracy (the degree of inaccuracy may serve as an indicator of severity of strike).		
		(4) Inspect wiring in tunnel areas and exposed areas for burns.		
		(5) Inspect antennas for burns and pitting.		
		(6) Inspect all electrically operated components and lighting system for damage.		
		(7) Inspect communications and navigation equipment for damage.		
		(8) If the preceding steps (1) through (7) reveal major damage has occurred, proceed as follows:		
		(a) Bench test all avionics and electrical systems and components.		

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AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIRE-MENT EVERY	ITEM	STA-TUS	RECORDED ON WORKSHEET
		HELICOPTER STRUCK BY LIGHTNING (CONT) **(b)** Perform a Megger check and continuity check on all wiring and cables. **(c)** Perform a Voltage Standing Wave Ratio (VSWR) check on all antennas, antenna cables, and connectors. **(9)** Perform specific inspections/replacements as required, **(10)** Perform a ground run operational check on aircraft. Functionally check flight control system and all avionics, electrical, lighting, communication, and navigation systems. **(11)** Repair any damage and replace damaged components as required, using standard maintenance practices. **(12)** Inspection complete. **b. Specific Requirements.** **(1)** Whenever lightning strike is evident on main rotor system: **(a)** Inspect blades for damage such as burns, pitting, skin separation, etc. If damage is evident, replace damaged blade(s). **(b)** Remove hub assembly and return for overhaul. **(c)** Replace all bearings {or next higher assembly if required) in the fixed and rotating control system located above the servo cylinders. **(d)** Remove swashplate assembly, mast assembly, and transmission assembly, and return for overhaul. **(e)** Check main driveshaft for residual magnetism. If magnetized, remove, and visually inspect short shaft for damage and remove engine and return for overhaul, Repair or replace main driveshaft as required.		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 13	NO. OF PAGES 26
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AREA NO.	REQUIRE-MENT EVERY	ITEM	STA-TUS	RECORDED ON WORKSHEET
		HELICOPTER STRUCK BY LIGHTNING (CONT)		
		(2) Whenever lightning strike is evident on tail rotor system:		
		(a) Inspect blades for damage such as burns, pitting, skin separation, etc. If damage is evident, replace damaged blade(s).		
		(b) Inspect tail rotor hub for arcing damage. If damaged, replace.		
		(c) Remove and condemn pitch change links, counterweight links, crosshead bearing.		
		(d) Inspect crosshead, idler, lever, bellcranks, counterweight assemblies, and control rod for any indications of arcing. Replace as necessary.		
		{e) Remove both the intermediate and tail rotor drive gearboxes and return for overhaul.		
		(f) Check hangers for residual magnetism. Replace any magnetized hanger bearings.		
		<u>1</u> If all hangers are magnetized, remove transmission and return for overhaul.		
		<u>2</u> Check main driveshaft for residual magnetism. If magnetized, return engine for overhaul and tear down main driveshaft for inspection. Repair or replace main driveshaft as required.		
		AFTER MAIN ROTOR OVERSPEED		
		Inspection and/or replacements are required after any report that main rotor has exceeded **105** percent limit, When **110** percent has been exceeded, additional requirements apply.		
		MAIN ROTOR OVERSPEED OF 110 PERCENT OR LESS.		
		Inspect the following:		
		a. Main rotor blades for damage, bond separation, and distortion.		

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AREA NO.	REQUIRE-MENT EVERY	ITEM	STA-TUS	RECORDED ON WORKSHEET
6 & 11		AFTER MAIN ROTOR OVERSPEED (CONT)		
		b. Tail rotor blades for damage, bond separation, and distortion.		
		MAIN ROTOR OVERSPEED EXCEEDING 110 PERCENT:		
		a. Inspect main rotor blades follows:		
		(1) Inspect blade bolt holes for elongation. Inspect inboard hole of root fitting for maximum elongation of 0.002 inch. Maximum hot. diameter shall not exceed 2.5025 inch.		
		(2) Visually inspect blade skins. Any wrinkle or deformation found should be reported to AVSCOM Engineering.		
		(3) Remove tip cap and inspect balance weights. Deformation of weights and/or studs is cause for blade replacement. Loose weights is not a cause for blade replacement. Inspect stud retention nuts for looseness by applying 30 inch pound torque. Torque loose stud retention nuts to 130 to 145 inch pounds.		
		K747(4) **Remove tip cap. Inspect balance weights. If weights are deformed, reshape and secure.**		
		K747(5) **Visually inspect for any crescent shaped raised areas on the upper and lower inertia weight repair patches roughly corresponding to a segment of a two-huh diameter circle (not to exceed 0.060 inch in height).**		
		(6) **Blades which pass these inspection are acceptable for futher service. Return faulty blades to next higher maintenance level with details of overspeed incident.**		
		b. Replace main rotor hub assembly. Send removed hub to depot maintenance with information on overspeed incident. Bolts should remain with hub.		
		c. Deleted.		
		d. Inspect tail totor blades:		
		(1) Sand separation anywhere on the blade& cause for replacing blades. Send removed blades to next higher maintenance level.		
		(2) If any movement of the tip or root and balance weights has occurred, dispose of the blade locally.		
		(3) Check the retention bushings for evidence of looseness. If any bushing is loose, dispose of the blade locally.		

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AREA No.	REQUIRE-MENT EVERY	ITEM	STA-TUS	RECORDED ON WORKSHEET
6&11		**AFTER MAIN ROTOR OVERSPEED (CONT)** **(4)** If blade passes the above inspection requirements and no other discrepancies exist, then the blade is serviceable. **e.** Perform a thorough visual inspection of tail rotor hub. If no discrepancies are found, the hub may be retained in service. **f.** Visually inspect the following components, which may be considered satisfactory for continued use if no visible damage is found (1) Transmission assembly (2) Intermediate gearbox (3) Tail rotor drive gearbox (4) Tail rotor driveshafts and hangers (5) Main driveshaft (6) Mast (7) Swashplate assembly (8) Sscissors and sleeve assembly (9) Tail rotor hub **MAIN ROTOR HUB INSPECTION** The following inspection shall be performed whenever external indications of hub problems exist, i.e., unusual noises, excessive heat, vibrations, etc.		

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AREA NO.	REQUIRE. MENT EVERY	ITEM	STA-TUS	RECORDED ON WORKSHEET
		a. Removal hub assembly from helicopter and disassemble to the extent required to determine the serviceability of the following components: (1) Feathering axis Teflon bearings. (2) Extension sleeves. (3) Radius rings. (4) Inboard bearing housing seals. (5) Outboard dust seals. b. Replace items as required, reassemble hub assembly, and reinstall on helicopter.		
10&11	EVERY 20-25 HOURS	a. Deleted. b. Deleted.		
		AFTER ENGINE OVER. TEMPERATURE NOTE If engine cannot be operated without exceeding turbine gas temperature (TGT) limits as specified in TM 55-2840-229-23 "Engine Operating Limits Table", this is indication of engine malfunction or instrument error. Refer to TM 55-2840-229-23 troubleshooting chart to determine cause and corrective action required. An over-temperature inspection may not be required. WHEN ENGINE OIL TEMPERATURE LIMITS ARE EXCEEDED a. At ambient temperatures above 86 degrees F (30 degree C), a steady state engine "OIL IN" temperature of 212 degree F (100 degree C) is acceptable, provided the following requirements and limitations are observed.		

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AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
		WHEN ENGINE OIL TEMPERATURE LIMITS ARE EXCEEDED (CONT)		
		(1) Inspect number 2, 3 and 4 bearing oil strainers and main oil filter every 15 hours of engine operation for excessive carbon accumulation of metal particles.		
		(2) Change engine oil after 50 hours of engine operation.		
		NOTE Requirements b. thru e. are used either when ambient temperature is below 86 degrees F (30 degrees C) or when ambient temperature is above 86 degrees F (30 degrees C) and engine oil temperature exceeds 212 degrees F (100 degrees C).		
		b. Temperature 94 TO 130 degree C for ten minutes or less. Inspect number 2, 3, and 4 bearing oil strainers and main oil filter.		
		c. Temperature 94 TO 130 degree C for more than ten minutes but less than 30 minutes. Change engine oil, clean numbers 2, 3, and 4 bearing oil strainers and main oil filter and ground run engine for 30 minutes. Recheck main oil filter and screens. If contamination is found, change engine oil, clean oil strainers and filter, and ground run engine.		
10		d. Temperature 101 TO 130 degree C for more than 30 minutes. Ship engine to next higher maintenance level.		
		e. Temperature in excess of 130 degree C. Ship engine to next higher maintenance level.		
10		**AFTER ENGINE OVERSPEED** Perform an engine overspeed inspection. Refer to TM 55-2840-229-23 for overspeed limits and inspection procedure.		
		AFTER HELICOPTER IS FLOWN IN A LOOSE GRASS ENVIRONMENT.		
		Aircraft modified per MWO 55-1520-236-50-12, Modification for Improved Filtration System, are not required to perform this inspection. Anytime the helicopter is flown in a loose grass environment, inspect the engine for grass blockage in accordance with TM 55-2840-229-23.		
		ENGINE POST INSTALLATION INSPECTION		
		a. Check installation of power control linkage in accordance with chapter 4, section 7.		
		b. Perform turbine gas temperature (TGT) system test. Refer to TM 55-2840-229-23 and TM 55-4920-244-14.		

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AREA NO.	REQUIRE-MENT EVERY	ITEM	STA-TUS	RECORDED ON WORKSHEET

c. Perform a daily inspection.

NOTE

The following stop d. need not be performed if engine has been removed and reinstalled for reasons other than engine maintenance. However, engine should be inspected for leaks and security of mounting provisions, hoses, and accessories prior to flight.

d. Perform inspection before and after initial check-run. Refer to TM 55-2840-229-23.

e. Perform a limited test fight (TM 55-1520-236-MTF).

f. Perform an engine vibration test. Refer to TM 55-2840-229-23.

10 **ENGINES DROPPED DURING HANDLING**

If an engine is dropped during handling, perform inspection, Refer to TM 55-2840-229-23.

AFTER OVERTORQUE

Overtorque is defined as any inicident in which torsional loads are introduced into the helicopter dynamic system in excess of 100 percent as determined on the engine torquemeter (calibrated).

NOTE

Use calibrated torque for overtorque limits. The following table shall be used to convert indicated torque to calibrated torque.

Calibration Factor	Multiply Indicated Torque By
64	0.96
63	0.97
62	0.99
61	1.00
60	1.02
59	1.04
58	1.06

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AREA No.	REQUIRE-MENT EVERY	ITEM	STA-TUS	RECORDED ON WORKSHEET
		Example: For an indicated torque of 98 percent with a calibration of 58 the calibrated torque is 103.9 percent (98 X 1.06= 103.9). **AFTER OVERTORQUE IN EXCESS OF 100 PERCENT BUT NOT EXCEEDING 112 PERCENT** Inpsect and/or replace components as follows. Records of replaced components shall show overtorque condition as reason for removal. **a.** Replace main rotor trunnion bearing bolts.		

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AREA NO.	REQUIRE-MENT EVERY	ITEM	STA-TUS	RECORDED ON WORKSHEET
		AFTER OVERTORQUE IN EXCESS OF 100 PERCENT BUT NOT EXCEEDING 112 PERCENT (CONT)		
		b. Inspect main transmission sump oil filter, external oil filter, and chip detector for metal particles. Aircraft with ODDS classify debris I.A.W. oil debris classification chart (figure 4-19.2). Document findings on DA Form 2403-20, block 7.		
		(1) If metal particles are found indicating internal failure, replace transmission and send it to next higher maintenance level stating reason for removal.		
		(2) If there are no positive indications of failure, continue operation for 5 hours, then repeat inspection. If no indications of failure are then found, resume normal operation.		
		c. Perform thorough visual inspection of the following components; each may be kept in service if no discrepancy or obvious damage is found. Replace any damaged component.		
		(1) Main rotor blades		
		(2) Main rotor hub		
		(3) Tail rotor blades		
		(4) Tail rotor hub		
		(5) Intermediate gearbox		
		(6) Tail rotor drive gearbox		
		(7) Tail rotor driveshafts		
		(8) Tail rotor driveshafts hangers		
		(9) Swashplate assembly		
		(10) Scissors and sleeve assembly		
		(11) Main driveshaft		
		(12) Mast		
		(13) Drive links		

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AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
		AFTER OVERTORQUE IN EXCESS OF 112 PERCENT		
		a. Replace the following components and send to next higher maintenance level with records showing overtorque as reason for removal.		
		(1) Transmission		
		(2) Main driveshaft		
		(3) Mast		
		(4) Main rotor blades		
		(5) Main rotor hub		
		b. Perform thorough inspection of the following components; each may be kept in service if no discrepancy or obvious damage is found.		
		(1) Tail rotor blades		
		(2) Tail rotor hub		
		(3) Intermediate gearbox		
		(4) Tail rotor drive gearbox		
		(5) Tail rotor driveshafts		
		(6) Driveshaft hangers		
		(7) Swashplate assembly		
		(8) Scissors and sleeve assembly		
		(9) Drive links		
7		**AFTER ENGINE OVERTORQUE**		
		When the engine has exceeded overtorque limits, perform engine overtorque inspection in accordance with TM 55-2840-229-23.		

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AREA NO.	REQUIRE-MENT EVERY	ITEM	STA-TUS	RECORDED ON WORKSHEET

AFTER ENGINE OVERTORQUE (CONT)

CAUTION

The following limits are engine torque limits only. Pilot monitoring is necessary to prevent the engine from exceeding dynamic components (airframe) limits.

a. Output shaft torque limits:

(1)	Intermediate (30 minutes)	64 PSI	114 Percent
(2)	Normal (continuous)	60 PSI	107 Percent
(3)	Transient operation (2 seconds of less)	86 PSI	153 Percent

AFTER TAIL ROTOR DRIVE SYSTEM OVERTORQUE

NOTE

If tail rotor rigging is known to be correct, flight maneuvers with maximum allowable engine power which result in insufficient tail rotor control can cause a possible overtorque.

a. Remove output quill assembly from intermediate gearbox, and inspect output gear teeth for damage as described in chapter 6. If no scoring or scuffing is found, and if there are no other indications of damage, reassemble gearbox and retain in service. If gear teeth are scored or scuffed, or if there are other indications of damage, replace gearbox and perform inspection in step b.

b. Remove output quill assembly from tail rotor gearbox, and inspect condition of gears as in step a. If no scoring or scuffing is found and if there are no other indications of damage, reassemble gearbox and retain in service. If gear teeth are scored or scuffed, or if there are other indications of damage, replace gearbox and perform inspection in step c.

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AREA NO.	REQUIRE-MENT EVERY	ITEM	STA-TUS	RECORDED ON WORKSHEET
	AFTER TAIL ROTOR DRIVE SYSTEM OVERTORQUE (CONT)			
		c. Remove transmission tail rotor drive quill and inspect condition of gear teeth. Evidence of scoring or scuffing is cause for replacement of main transmission assembly. If it is necessary to replace the transmission assembly, then the tail rotor hanger bearing assemblies and tail rotor driveshafts must also be replaced.		
		d. Tag any removed components with reason for removal before turning in through normal supply channels to next higher maintenance level.		
7	**AFTER TRANSMISSION OIL OVER TEMP**			
		a. Troubleshoot transmission oil system to determine cause (paragraph 6-21).		
		b. Replace transmission, mast, oil cooler, and external oil filter if cause is due to transmission internal failure. If cause is due to oil system external to transmission and oil temperature did not exceed **130** degrees C **(266** degrees F) for **15** minutes, correct cause of overheating and drain and refill transmission oil system.		
		c. If temperature exceeded above limits, replace transmission and mast. If abnormal contamination is present, also replace oil cooler and external oil filter and flush system lines with solvent (C 112).		
7	**AFTER COMPLETE LOSS OF TRANSMISSION OIL**			
		a. Troubleshoot transmission oil system to determine cause.		
		b. Replace transmission and mast, if engine power was applied after complete loss of oil. Also replace oil cooler and external oil filter if abnormal contamination is present and flush system lines with solvent (C 112).		
8	**AFTER FIRING EJECTOR CARTRIDGES. Refer to paragraphs 16-46 and 16-53.**			
	AFTER KNOWN OR PROBABLE WIRE STRIKE			
1		**a.** Inspect wire strike deflector on TSU windows for bends, cracks, and alignment. Replace if damage is found.		
2		**b.** Inspect nose wire strike cutter for bends, cracks, and alignment. Replace if damage is found.		

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AREA NO.	REQUIRE-MENT EVERY	ITEM	STA-TUS	RECORDED ON WORKSHEET
3		**c.** Inspect channel and insert on right forward windshield post for teeth missing in insert. Replace damaged insert or channel.		
3		**d.** Inspect upper wire strike cutter on pilot top window for bends, cracks, and alignment. Inspect mounting panel for cracks and pulled inserts. Replace damaged parts.		
2		**e.** Inspect lower wire strike cutter for bends, cracks, and alignment. Replace if damage is found.		
7	**MAST BUMPING**			
		a. Visually inspect the mast area where the hub step would contact the mast. If no surface deformation of the mast has occurred, the inspection is complete.		
		b. If there is visual evidence of surface deformation of the most due to hub stop contact:		
		(1) Evaluate the condition of the mast per the damage limits in Chapter 6.		
		(2) Inspect and replace the following items if damage is found:		
		(a) Main rotor hub trunnion cap attach bolts and drag brace jamnuts and attach bolts for security.		
		(b) Flight control system, from rotor to servo cylinder, for bent or damaged tubes and rod end bearings.		
		(c) Structure at transmission mounting points.		
		(d) lift link and structure for damage, security and distortion.		
		(e) Transmission sump oil filter, extend oil filter, and chip detector for metal particles.		
		(f) Main Drive shaft.		
		(g) Tail rotor driveshafts and hanger assemblies for obvious damage.		
		(h) Tail rotor drive quill.		
		(i) Canopy of aircraft.		
		(j) Tail rotor driveshaft cover.		
		(k) Main rotor hub moment spring assembly per damage limits in Chapter 5. (MWO 55-1520-244-50-3 Incorporated).		

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AREA NO.	REQUIRE-MENT EVERY	ITEM	STA-TUS	RECORDED ON WORKSHEET
All Areas		**AFTER PROBABLE EXPOSURE TO RADIOACTIVITY**		
		Accomplish the following:		
		a. Survey helicopter for level of radioactivity.		
		b. Decontaminate helicopter as required. Refer to TM 3-220.		
9		**AFTER INDICATION OF UNUSUALLY HIGH OR LOW FUEL CAPACITY OR UNUSUALLY HIGH OR LOW FUEL CONSUMPTION**		
		Perform inspection of fuel cells with special attention to possible self sealing material and/or inner liner separation.		
All		**AFTER INSTALLATION, REMOVAL OR RELOCATION OF EQUIPMENT OR MAJOR MODIFICATION WHICH RESULT IN UNKNOWN CHANGE IN BASIC WEIGHT AND BALANCE OR AFTER REPORT OF UNSATISFACTORY FLIGHT CHARACTERISTICS.**		
		Weigh helicopter and accomplish necessary entries in Weight and Balance Data, DD Form 365. Refer to AR 95-3 and TM 55-1500-342-23.		
9		**AFTER OVERFLOW OF BATTERY**		
		a. Refer toTM43-0105 for treatment of affected areas.		
		b. Sheet metal surfaces and overlaps, both internal and external for damage.		
		c. Rivets, bolts, screws, and other hardware for damage.		
		d Troubleshoot battery system to determine cause.		
11		**AFTER TOW MISSILE HAS BEEN FIRED (ONE OR MORE)**		
		Inspect tailboom skins for nicks, dents, scratches, creases, and cracks.		
11		**AFTER FIRING 2.75 INCH ROCKETS**		
		Visually inspect tailboom skins, synchronized elevators, and tail rotor blades for damage.		

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AREA No.	REQUIRE-MENT EVERY	ITEM	STA-TUS	RECORDED ON WORKSHEET
All Areas		**AFTER THE HELICOPTER HAS BEEN SUBJECTED TO SALT WATER, SALT SPRAY OR VOLCANIC ACTIVITY** Wash entire helicopter with fresh water, particularity inside of engine compartment doors, wash all compartments which were exposed to salt water; make a detail check of all surfaces for corrosion. Apply corrosion preventive compound (C41) to exposed nonpainted, anodized, or cadmium plated assemblies. Water-wash engine internally, per TM 55-2840-229-23.		
3		**AFTER WASHING HELICOPTER** Check pitot-static system for moisture.		
All		**WHEN OVERHAULS, MAJOR MODIFICATIONS OR MAJOR AIRFRAME REPAIRS ARE ACCOMPLISHED, ANY SPECIAL EQUIPMENT HAS BEEN ADDED TO OR REMOVED FROM THE BASIC AIRFRAME OR WHEN WEIGHT AND BALANCE DATA ARE SUSPECTED TO BE IN ERROR** For general weight and balance information, refer to TM 55-1500-342-23, Army Aviation Maintenance Engineering Manual and AR 95-3, Weight and Balance, Appendix B, Maintenance Allocation Chad should be consulted for responsibility of weighing and balancing of the aircraft.		
All		**WHEN HELICOPTER IS TRANSFERRED, RECEIVED, PLACED IN STORAGE, OR REMOVED FROM STORAGE.** Inventory helicopter for availability of inventoriable property (DA PAM 738-751).		
All		**UPON TRANSFER AND UPON RECEIPT OF A HELICOPTER; UPON eXPIRATION OF 12 MONTHS ELAPSED TIME SINCE LAST INVENTORY; PLACING A HELICOPTER IN STORAGE AND UPON REMOVAL FROM STORAGE (HELICOPTER NEED NOT BE INVENTORIED WHILE IN STORAGE)** Perform an inventory check. Refer to DA Form 2408-17 and Appendix C.		
3		**FIRST AID KIT INSPECTION** Inspect in accordance with TM 1-1500-204-23-1.		
6 and 11		**DAiLY WHEN OPERATING IN HIGH HUMIDITY OR SALT-LADEN AIR** Wash main and tail rotor with mild detergent (Ch 3), rinse with dear water and dry.		

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9		**EVERY 30 DAYS OR 25 FLIGHT HOURS, WHICHEVER OCCURS FIRST**		
		Perform preventive maintenance checks and services on nickel-cadmium battery (TM 11-6140-203-14-2, Table 4-1). Check voltage regulator settings; adjust for temperature as required (carbon pile regulators) (TM 1-1500-204-23 Series).		
10		**EVERY 12 1/2 HOURS OF OPERATION**		
		Engine spectrometric oil analysis (Refer to TB 43-0106). For helicopters with odds installed, engine is exempt from oil sampling.		
		EVERY 25 HOURS OF OPERATION		
7		**a.** Retorque alternator V-band attached bolts 50 to 70 inch-pounds.		
7		**b.** Aircraft without ODDS. Remove engine, transmission 42 and 90 degree gearbox, chip detectors and check for contamination (determine the source, if metal particles are present), then dean and reinstall. (I.A.W. figure 6-2, 6-2.1 and table 6-1.1.)		
		c. Aircraft with ODDS. Remove engine and 42 and 90 degree gear-box chip detectors. Check for contamination I.A.W. Oil Debris Classification Chart (figure 4-19.2). Document finding on DA Form 2408-20, block 7. Clean and reinstall.		
7		**d.** Hydraulic fluid is to receive spectometric analysis per TB 43-0106 every 25 hours.		
		e. Deleted.		
		f. Deleted.		
7 and 10		Transmission spectrometric oil analysis for helicopters with ODDS installed, transmission is exempt from oil sampling. Hydraulic System Spectrometic Oil Analysis 42 Degree Gearbox Spectrometic Oil Analysis 90 Degree Gearbox Spectrometic Oil Analysis (TB 43-0106)		

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AREA No.	REQUIRE-MENT EVERY	ITEM	STA-TUS	RECORDED ON WORKSHEET
7		**IMMEDIATELY PRECEDING 25 HOUR LUBRICATION AND AT INSTALLATION** a. Swashplate and Support. **(1)** Visually inspect for evidence of contact between outer ring or drive Iink and stationary swashplate. Measure vertical clearance from the bottom of both drive links. P/N 209-010-408-7 to all three horns of stationary swashplate. The minimum clearance must be not less than .035 (thirty five thousandths) inch. Replace swashplate if any contact is evident or if clearance is below minimum. **(2)** Disconnect main rotor drive finks from swashplate and secure to prevent damage. Rotate swashplate ring, checking for roughness, binding, or unusual noise from swashplate bearing. **(3)** Using a soft, dean, lint free cloth dampened with cleaning solvent (Ch 2), dean the inner ring assembly and outer ring assembly at the dust cover. Insure all surface grit, sand and other surface materials are removed. **(4)** Using a grease gun with a flexible hose, purge lubricate the swashplate per figure 1-5. If the swashplate fails to accept grease, perform a swashplate bearing sleeve alignment check **(5)** Remove old grease purged from swashplate using a wooden tongue depressor NSN 6515-00-324-5500. Place sample of old grease in plastic bottle NSN 8125-01-082-9697 ensuring that the bottle is more than half filled. On the bottle Iabel, print aircraft serial number, swashplate serial number and date of sample.		

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(6) Prepare DD Form 2026, Transit Aircraft Oil Analysis Record, and submit along with grease sample to the AOAP Laboratory designated in TB 43-0106. Make appropriate entries on DA Form 2408-20 in accordance with DA PAM 738-751.

(7) Reconnect drive links and perform maintenance operational check of at least 15 minutes duration.

b. Scissors and Sleeve Assembly.

(1) Visually inspect visible part of scissors hub assembly and boot for signs of heat. Any heat discoloration or distortion of components is cause for replacement.

(2) Using a soft, dean, lint-free cloth dampened with cleaning solvent (C112), remove all surface grit sand, and other surface materials.

(3) Using a grease gun with a flexible hose, purge/lubricate the scissors bearing in accordance with figure 1-5, at approximately 30-degree intervals until the assembly has been lubricated through one full turn (360 degrees). Check for up and down play in bearing between inner and outer swashplate. Replace svvashplate if any roughness, binding, noise or play is evident. Where rotation of main rotor blades is not possible, this procedure can be accomplished as follows; disconnect the pitch change links at the upper universal and remove the 6 (ea) bolts securing tie collet extention and the collet spline plate. This will allow you to rotate the swashplate as required.

(4) Remove old grease purged using a wooden tongue depressor (NSN 6515-00-324-5500). Place sample of old grease in plastic bottle (NSN 8125-01-082-9697), ensuring that the bottle is more than half filled. The bottle label should be filled out as completely as possible to avoid confusion with other grease samples. Label to show operating activity, scissors and sleeve assembly serial number, aircraft serial number, and date of sample.

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AREA No.	ITEM
	(5) Prepare DD Form 2026, Transit Aircraft Oil Analysis Record, and submit along with grease sample to the AOAP Laboratory designated in TB 43-0106. Make appropriate entries on DA Form 2408-20 in accordance with DA Pam 738-751.
10	**EVERY 50 HOURS**
	a. Deleted.
	b. Deleted.
5	**c.** Inspect nonstandard locally manufactured heavy duty skid shoes exceeding 20 pounds each.
	(1) Perform inspection using liquid fluorescent dye penetrant method. This inspection to be conducted by AVUM with assistance from AVIM as required to gain access to inspection area.
	(a) Jack airframe and remove landing gear assembly IAW specified procedures.
	(b) Conduct visual inspection for nicks, scratches, or gouges over entire cross tube surface. Refer to Chapter 3 for allowable damage criteria.
	(c) Remove blind rivets securing cross tube fuselage attachment fittings to cross tubes and remove fittings. Save fittings for reuse.
	(d) Fluorescent dye penetrant inspection is required on cross tube surface of an area completely around cross tube at support fitting locations and adjacent area one inch out from each of support fittings. A one inch band around cross tubes at them-milled step area adjacent to skid tube saddle fitting will also be dye penetrant inspected.
	(e) Prepare the surface and conduct a liquid fluorescent dye penetrant inspection IAW TM 55-1500-335-23, utilizing penetrant kit NSN 8850-00-782-2740.

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		(f) Wash and remove all excess penetrant and developer from cross tube surfaces.		
		(g) Recoat surface of cross tube to be covered by the attachment fittings with sealant (C105).		
		(h) Reinstall attachment fittings to cross tubes. Diameter and length of rivets to be determined at time of installation.		
		(2) Cross tubes with crack indications will be scrapped. All cross tubes with no crack indications are to be returned to service.		
7		**EVERY 75 HOURS OF OPERATION**		
		Remove transmission sump oil filters (wafer disk screen), check for contamination, then dean and install.		
3		**EVERY 100 HOURS**		
9		**EVERY 100 HOURS OR 120 CALENDAR DAYS WHICHEVER FIRST**		
		a. Perform preventive maintenance checks and services on the nickel cadmium battery (TM 11-6140-203-23-2)		
		b. Check voltage regulator settings as required (Solid State Regulators) (TM 1-1500-204-23 Series).		
5		**EVERY 150 HOURS**		
		Inspect nonstandard locally manufactured heavy duty skid shoes weighing 20 pounds or less each using same procedures as 50 hours inspection on same item of more weight.		
7		**EVERY 300 HOURS**		
		Remove, disassemble, dean and inspect main rotor hub assembly (See Chapter 5).		

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		NOTE **When main rotor hub assembly is removed from one aircraft and installed on another, assure that the component's next inspection due time is transferred to the receiving aircraft's DA Form 2408-18.**		
7 & 11		**EVERY 600 HOURS OF OPERATION OR 1 YEAR, WHICHEVER OCCURS FIRST.**		
		a. Remove, disassembLe, dean, inspect for damage and corrosion, lubricate, assemble and reinstall main drive shaft assembly (PN 205-040-004-19).		
		b. Lubricate tail rotor drive flexible couplings.		
		c. Visually check tail rotor drive train flexible coupling splines for wear and nicks.		
		d. Visually check tail rotor drive train flexible coupling seal for proper installation, cuts, and tears.		
		e. Deleted.		
6		**EVERY 30 DAYS OR 50 HOURS OF OPERATI0N (WHICHEVER IS FIRST)**		
		Clean main and tail rotor blades. Refer to Chapter 5 for cleaning solution.		
All		**EVERY 90 DAYS**		
		Review and update DD Form 365-4 (AR 95-3).		
All		**EVERY 12 MONTHS**		
		Review weight and balance records and perform weight and balance inventory on aircraft (AR 95-3).		

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (Daily, Intermediate, etc.) SPECIAL	PAGE NO.	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIRE-MENT EVERY	ITEM	STA-TUS	RECORDED ON WORKSHEET
3		**EVERY 6 M0NTHS**		
		a. Weight check CF3BR fire extinguisher. Refer to TM 1-1500-204-23 (Series).		
		b. Inspect and test connector receptacle (ground). Refer to TM 55-1500-323-23 or TM 1-1500-204-23 (Series).		
3		**EVERY 12 MONTHS OR NEAREST SCHEDULED PHASED INSPECTION**		
3		**EVERY 12 MONTHS**		
		a. Deleted.		
		b. Deleted.		
		c. Magnetic compass for discoloration of liquid and proper calibration; recompensate if necessary.		
		d Gyromagnetic compass system for proper calibration; recompen-sate if necessary TM 1-1500-204-23 (Series).		
3		**EVERY 15 MONTHS**		
		Replace ejector rack cartridges. P/N ARD863-1 and P/N P7911-2. Refer to paragraph 16-40.		
7		**EVERY 18 MONTHS**		
2		**EVERY 24 MONTHS**		
		Pitot-Static System-Perform a functional check of system. Refer to paragraph 8-117.1.		
3		**EVERY 36 M0NTHS**		
		Replace ejector rack cartridges P/N CCU-44B. Refer to paragraph 16-40.		
All		**AFTER 7 DAYS**		
		After the aircraft has remained inactive for 7 consecutive days, process the aircraft into the appropriate storage category. (See Appendix E.)		
All		**EVERY 30 DAYS**		
		Clean aircraft (TM 1-1500-344-23).		

AIRCRAFT INSPECTION CHECKHEET			TYPE OF INSP (Daily, Intermediate, etc.) SPECIAL	PAGE NO.	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIRE-MENT EVERY	ITEM	STA-TUS	RECORDED ON WORKSHEET
10	**EVERY 900 HOURS OR EACH TIME THE ENGINE IS REMOVED AND REPLACED. AIRCRAFT WITHOUT ODDS.**			
		a. Engine oil system, including oil cooler, drained and refilled. If engine is replaced due to internal failure, flush all airframe mounted engine oil lines and engine oil tank and replace engine oil Waler.		
		NOTE		
		Only to airdraft engine serviced with MIL-L-23699. If MIL-L-7808 is used, oil change Is required every 300 hours.		
		b. If engine is changed, check gyromagnetic compass for proper calibration: Recompensate if necessary (TM 55-15800-204-25/1).		
10	**EVERY 1200 HOURS**			
		Hot end inspection on T53-L-703 engine, P/N 1-000-060-23, TM 55-2840-229-23.		
7	**EVERY 900 HOURS OR EACH TIME THE TRANSMISSION IS REMOVED AND REPLACED. AIRCRAFT WITHOUT ODDS.**			
		Transmission and transmission oil cooler drained and oil pump screen inspected for metallic particles and other contaminants. Clean screen, replace and refill transmission oil system to proper level. If transmission is replaced due to internal failure, flush all airframe-mounted transmission oil lines and replace transmission oil cooler.		
		NOTE		
		Only to aircraft transmission serviced with MIL-L-23699. If ML-L-7808 is used, oil change is required every 300 hours.		
9	**EVERY 1100 HOURS OR AT OVERHAUL. (WHICHEVER COMES FIRST)**			
		Inspect diagonal brace fitting, P/N 209-030-183-1 fior cracks using fluorescent penetrant method.		

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSP (Daily, Intermediate, etc.) SPECIAL	PAGE NO.	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	

AREA No.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
7		**SWASHPLATE BEARING SLEEVE ALIGNMENT CHECK** Perform the following whenever the shashplate fails to accept grease or upon andy indication of linear misalignment (overheating; difficulty in lubing). a. Using pliers, remove lubrication fitting (NAS516) from one side of swashplate. b. Insert alignment tool (T65) into lubrication port. Any stoppage before tool is fully seated is cause for rejecting the swashplate. c. Lightly tap a new fitting (NAS516) into place. d. Lubricate swashplate and support in accordance with figure 1-5.		

SECTION V. OVERHAUL AND RETIREMENT SCHEDULE

1-58. OVERHAUL AND RETIREMENT SCHEDULE.

This section lists units of operating equipment that are to be overhauled or returned at the period specified. Removal of equipment for overhaul may be accomplished at the inspection nearest the time when overhaul is due unless otherwise specified in TM 55-1500-328-23.

WARNING

Refer to TM 55-1500-328-23 concerning mutilation/destruction of items when they have reached the established life expectancy (finite life) before the items are forwarded for property disposal.

AREA FIGURE 1-12	PART NUMBER & ITEM		OVERHAUL INTERVAL	RETIREMENT SCHEDULE
	T53-L-703	Engine	2400	
3	6106319 (821798-1)	Arming/Firing Mechanism		72 months ****
3	115141-5	Arming /Firing Mechanism		7 years ***
3	116416	Arming/Firing Mechanism		7 years ***
3	814033-101	Arming/Firing Mechanism		7 years ***
7	212-040-001-51	Transmission Assembly	1200	
7	212-040-001-39	Transmission Assembly	1200*	
7	205-040-263-3	Main Input Quill	1500	
7	205-040-263-111	Main Input Quill	1500	
7	212-040-365-33	Hydraulic Pump Quill	1200	
7	212-040-365-25	T/R Output Quill	1200	
7	209-040-069-1	Alternator Drive Quill	1200*	
11	212-040-003-23	Intermediate Gearbox	1800	
11	212-040-004-9	Tail Rotor Drive Gearbox	1800	
11	212-010-704-5	Yoke Assembly		2400
11	212-010-704-107	Yoke Assembly		2400
11	212-010-744-5	Yoke Assembly		2400
11	212-010-750-11	Blade Assembly		2400
11	204-040-623-5	Tail Rotor Driveshaft Hanger Bearing		600******
7	SKCP 2381-1	KAFLEX SHAFT		1600
7	204-040-433-101	KAFLEX SHAFT		1500
6	K747-003-205	Main Rotor Blade		10,000
6	K747-003-205	Deviation Main Rotor Blade		10,000
6	K747-003-209	Main Rotor Blade		10,000
6	K747-003-303	Main Rotor Blade		10,000
6	K747-003-303	Field Modified Main Rotor Blade		10,000
6	K747-003-309	Main Rotor Blade		10,000
6	K747-003-401	Main Rotor Blade		10,000
6	K747-003-403	Main Rotor Blade		10,000
6	540-015-001-1	Main Rotor Blade		1100
6	540-011-101-25	Main Rotor Hub	1200	
6	540-011-101-129	Main Rotor Hub	1200	
6	540-011-101-131	Main Rotor Hub	1200	
6	540-011-153-13	Extension, Main Rotor Hub		2200
6	540-011-153-15	Extension, Main Rotor Hub		2200
6	540-011-153-17	Extension, Main Rotor Hub		2200
6	204-012-122-3	Retension Straps		1200
6	204-012-122-7	Retension Straps		1200
6	2601400	Retension Straps		1200
6	540-011-102-5	Yoke, Main Rotor Hub		4800

AREA FIGURE 1-12	PART NUMBER & ITEM		OVERHAUL INTERVAL	RETIREMENT SCHEDULE
6	540-011-102-115	Yoke, Main Rotor Hub		4800
6	204-012-112-3	Hub Retention Strap		1200
6	204-012-112-7	Hub Retention Strap		1200
6	204-310-101-103	Retention Strap		1200
6	540-011-113-1	Fitting Strap		2400
6	540-011-177-1	Nut, Strap Fitting		2400
6	540-011-154-5	Main Rotor Grip Assy		5500
6	209-010-109-5,-109	Main Rotor Pitch Horn		6600
6	540-011-112-5	Pin, Inboard		2400
6	540-011-112-7	Pin, Outboard		2400
6	K747-082-1	Drag strut		4000
6	K747-072-1	Fitting Assembly, Drag Strut		1400
6	K747-083-1	Root Fitting		4000
6	K747-061-5	Fitting Assembly Root		1000
6	NAS464P8-36	Fitting Bolt, Drag Strut		450
6	NAS6209-103D	Bolt		4000
6	NAS6206-76D	Bolt		4000
6	NAS6618D112	Bolt		4000
6	NAS6210-38D	Bolt		4000
8	ARD863-1 P7911-2	Cartridges		15 months**
8	CCU-44 B 5184850	Cartridges		36 months*****
7	212-040-136-1	Mast Bearing		1500
7	209-010-401-11	Scissors & Sleeve Assembly	1200	
7	209-010-405-7	Scissors Lever		3600
7	209-010-400-1	Swashplate & Support Assembly	1200	
7	209-010-402-1	Inner Ring		3300
7	209-010-403-1	Outer Ring		3300
7	209-010-460-3	Pitch Link Assy		600
7	209-040-366-3	Mast Assembly	1200	
7	204-040-136-7	Mast Bearing		1500
7	204-040-136-9	Mast Bearing		1500
7	204-076-428-1,3,5	Rod End Bearing		600
7	204-076-317-1,5,7	Bearing Housing		3300
7	100328	Cylinder Barrel		3300
7	205-040-263-105	Quill Assembly	1500	
7	41000434	Housing Assembly Servo		3300
9	J33C32	Oil Cooler Turbine Fan Bearing		450
9	H33C32	Oil Cooler Turbine Fan Bearing		450
9	P9103NPPFS50160	Oil Cooler Bearing		450
9	P9101NPPFS50160	Oil Cooler Bearing		450
7	209-010-408-7	Drive Link, Swashplate		11000
7	212-030-104-5	Lift Link		5700
7	209-010-450-5	Shaft, Mast Assy		3300
7	209-010-450-101	Shaft, Mast Assy		3300
7	209-010-450-105	Shaft, Mast Assy		3300
7	209-010-407-1	Hub Assy		11000
7	540-011-456-1	Sleeve, Collective		11000
7	209-076-124-1,-3,-5	Extension Tube		3300
7	209-001-358-13,-17,-21	Extension Tube		3300
7	209-010-520-101	Pitch Link Assy		5500
7	209-010-518-101	Pitch Link Assy		5700

AREA FIGURE 1-12	PART NUMBER & ITEM		OVERHAUL INTERVAL	RETIREMENT SCHEDULE
7	209-011-208-101	Plate		5700
7	209-011-212-101	Support set		5700
7	209-011-219-101	Strap Assembly		5700
7	209-310-100-105	Spring		5700
7	204-076-511-9	Servo Cylinder	3300	

* The 212-040-001-39 transmission is the same as the 212-040-001-51 transmission without the 209-040-069-1 alternator drive quill. The alternator drive quill must be ordered separately and installed in the 212-040-001-39 transmission to make the 212-040-001-51 configuration.

** Not to exceed 10 years from the date of manufacture (shelf life), or 15 months from the date of opening the sealed cartridge container (installed life) or 10 installations and/or removal from the cartridge housing. Explosive life is not additive; and therefore, cartridge removal is required whenever any of these conditions are reached.

*** Denotes life is not to exceed 9 years from the date of manufacture (shelf life) or 7 years from the date of installation, whichever is sooner.

**** Denotes life is not to exceed 8 yearn from the date of manufacture (shelf life) or 72 months from the date of installation, whichever is sooner.

***** Not to exceed 8.5 years from date of manufacture (shelf life), or 36 months from the date of opening the sealed cartridges container (installed life) or 10 installations and/or removals from the cartridge housing. Explosive life is not additive; and therefore, cartridge removal is required whenever any of these conditions are reached.

****** This bearing has a shelf life of 5 years, effective 31 December 1990.

NOTE

All unserviceable explosive items (NSN 1377 Class) shall be tagged with NSN, Installation date, reason for removal, lot number, helicopter type/model and serial number, aviation unit destination and returned to supporting ammunition supply activity in the container used to trans port the replacement cartridge.

All retirement life items will have a demil code of "L" and will be mutilated in accordance with DOD 4160.21-M-1, Defense Demilitarization Manual.

SECTION VI. FLIGHT SAFETY CRITICAL AIRCRAFT PARTS (FSCAP) PROGRAM

1-59. FLIGHT SAFETY CRITICAL AIRCRAFT PARTS (FSCAP) PROGRAM.

a. The AH-1 flight safety critical aircraft parts inclusion in this manual will be restricted to the Fight Safety Critical Aircraft Parts Section VI, including Table 1-12. Warnings will not be included throughout the manual. FSCAPs require special handling during maintenance and compliance with all maintenance procedures are mandatory.

b. Flight Safety Critical Aircraft Parts.

(1) A flight safety critical aircraft part is defined as a part, assembly or installation procedure with one or more critical characteristics than, if not conforming to the design data or quality requirements, could result in the destruction of or serious damage to the helicopter and/or serious injury or death of crew members.

(2) A critical characteristic is any dimension, tolerance, finish, material, manufacturing, assembly or other feature which if nonconforming or missing, could cause failure or malfunction of the critical item

(3) Table 1-12 identifies parts, assemblies, or installations under the flight safety critical aircraft parts program which require special handling during maintenance. This table lists all current fight safety critical aircraft parts of which some may not be repairable at field level.

Table 1-12. flight Safety Critical Aircraft Parts.

PART NUMBER	NOUN
204-010-420-1	NUT, PLAIN, ROUND
204-010-437-7	NUT, PLAIN, ROUND
204-010-481-1	NUT, PLAIN, SPLINE
204-010-742-9	T/R CONTROL TUBE
204-011-166-1	BOLT, CLOSE TOLER
204-011-406-15	SCISSORS ASSEMBLY
204-011-430-1	BEARING, BALL, ANNULA
204-011-702-17	BLADE ASSY, TAIL ROTOR
204-011-711-1	CROSSHEAD ASSEMBLY
204-011-722-5	YOKE ASSEMBLY, ROTOR
204-012-122-3	STRAP ASSEMBLY, MAIN
204-012-122-7	STRAP ASSEMBLY
204-040-115-1	NUT, SELF-LOCKING, SPECIAL
204-040-115-3	NUT, SELF-LOCKING, SPECIAL
204-040-117-3	ADAPTER, MAST DRIVIN
204-040-121-5	GEARSHAFT, SPUR
204-040-190-101	RING, BEARING, INNER
204-040-190-7	RACE> INNER, MAIN XMISSN
204-040-231-5	RING GEAR, MAIN XMISSION
204-040-324-5	SHAFT, MAIN GEAR, TRA

Table 1-12. Flight Safety Critical Aircraft Parts (Cont).

PART NUMBER	NOUN
204-040-330-3	GEARSHAFT, SPUR
204-040-349-11	PLATE ASSY.
204-040-353-23	CASE ASSEMBLY, TRANS
204-040-353-25	MAIN CASE, XMSN
204-040-359-1	CASE ASSEMBLY, TRANS
204-040-360-103	PLANETARY ASSY., UPPER
204-040-360-5	PLANETARY ASSY., UPPER
204-040-362-15	QUILL ASSY., BEVEL GEAR
204-040-362-9	QUILL ASSY., BEVEL GEAR
204-040-397-1	SPIDER ASSEMBLY
204-040-397-103	SPIDER ASSY., MAIN XMSN
204-040-397-17	SPIDER ASSY., MAIN XMSN
204-040-400-9	GEARSHAFT, BEVEL
204-040-433-101	SHORT SHAFT ASSY
204-040-500-10	GEARSHAFT, BEVEL
204-040-500-9	GEARSHAFT, BEVEL
204-040-600-7	HANGER ASSEMBLY, DRI
204-040-603-11	GEAR, SPUR
204-040-603-9	SPHERICAL DRIVE SHA
204-040-604-5	COUPLING DRIVESHAFT
204-040-619-3	ADAPTER, T/R DRIVE
204-040-620-3	SHAFT ASSEMBLY, TAIL
204-040-620-7	SHAFT ASSEMBLY, TAIL
204-040-623-5	BEARING, BALL, ANNULA
204-040-624-1	BOLT, INTERNAL WR
204-040-687-5	COUPLING, MAIN DRIVE
204-040-700-101	PINION, MAIN INPUT, T
204-040-701-101	GEAR, MAIN XMISSION
204-040-701-103	GEAR, BEVEL
204-040-701-3	GEAR, MAIN XMISSION
204-040-716-5	COUPLING SET
204-040-784-105	PLANETARY ASSY., LOWER

Table 1-12. Flight Safety Critical Aircraft Parts (Cont).

PART NUMBER	NOUN
204-040-784-5	PLANETARY ASSY., LOWER
204-040-785-3	SPIDER, LOWER, MAIN T
204-040-786-1	PLATE, RETAINING, BEA
204-040-786-3	PLATE SET, MAIN XMSN
204-040-809-1	CLAMP, T/R DRIVE
204-040-809-3	CLAMP, T/R DRIVE
204-040-811-1	CLAMP, COUPLING
204-040-812-3	ADAPTER, KAFLEX INSTA.
204-040-813-1	BOLT, EXTERNALLY REL
204-040-813-101	BOLT, INTERNALLY REL
204-060-102	SUPPORT, STRUCTURAL
204-060-102-11	SUPPORT, STRUCTURAL
204-060-152-1	FITTING ASSEMBLY
204-060-161-1	TRUNNION, LEFT HAND
204-060-161-3	TRUNNION, ENGINE MOU
204-076-003-5	SERVOCYLINDER
204-076-053-11	SERVOCYLINDER
204-076-053-15	SERVOCYLINDER ASSY
204-076-317-7	HOUSING, BEARING UNI
204-076-428-5	BEARING, PLAIN, RODE
204-076-511-9	SERVOCYLINDER
205-012-716-1	TRUNNION SET ASSEMB
205-012-716-3	T/R TRUNNION
205-012-716-5	T/R TRUNNION
205-040-004-19	DRIVESHAFT INSTALLAT'N
205-040-004-21	DRIVE ASSEMBLY, INPU
205-040-178-1	COUPLING, MAIN DRIVE
205-040-229-1	GEAR, SPUR
205-040-230-1	GEAR, HELICAL
205-040-231-5	RING GEAR ASSY
205-040-231-7	RING GEAR
205-040-232-1	LINER, BEARING HOUSI
205-040-232-101	LINER, BEARING HOUSI
205-040-233-1	GEAR, SPUR
205-040-233-101	GEAR, SPUR
205-040-250-101	CLUTCH, FREEWHEELING

Table 1-12. Flight Safety Critical Aircraft Parts (Cont).

PART NUMBER	NOUN
205-040-250-103	CLUTCH ASSEMBLY, FRI
205-040-263-105	QUILL ASSY, MAIN
205-040-263-111	QUILL ASSEMBLY, TRAN
205-040-263-3	QUILL ASSY TRANSMIS
206-001-060-1	CLEVIS, ROD END
209-001-052-1	BEARING, PLAIN, ROD E
209-001-063-25	CONNECTING LINK, RIG
209-001-063-29	CONNECTING LINK, RIG
209-001-063-31	TUBE, M/R
209-001-063-37	CONNECTING LINK, RIG
209-001-063-39	TUBE, M/R
209-001-063-7	TUBE, M/R
209-001-065-11	TUBE, M/R
209-001-065-13	CONNECTING LINK, RIG
209-001-065-17	TUBE, M/R
209-001-065-19	CONNECTING LINK
209-001-065-7	CONNECTING LINK, RIG
209-001-067-1	CONNECTING LINK, RIG
209-001-067-5	TUBE, M/R
209-001-107-101	BELL CRANK
209-001-358-13	BODY LINK, ACTUATOR
209-001-358-15	TUBE, M/R FLT. CNTRL'S
209-001-358-17	TUBE ASSEMBLY ACTUA
209-001-358-19	TUBE, M/R FLT. CNTRL'S
209-001-358-21	TUBE ASSY, ACTUATOR
209-001-358-23	TUBE, M/R FLT. CNTRL'S
209-001-361-1	BEARING, PLAIN, ROD E
209-001-362-1	ACTUATOR ASSY
209-001-362-3	ACTUATOR ASSY
209-001-362-5	ACTUATOR ASSY
209-001-720-1	WALKING BEAM ASSY
209-001-741-1	PLATE ASSEMBLY CYLI
209-001-741-2	PLATE ASSEMBLY CYLI
209-001-754-1	BEU CRANK
209-001-761-5	BEAM ASSEMBLY, ANTl-
209-001-761-7	WALKING BEAM, M/R
209-001-762-5	BELL CRANK

Table 1-12. Flight Safety Critical Aircraft Parts (Cont).

PART NUMBER	NOUN
209-001-762-7	BELLCRANK
209-001-763-1	SUPPORT, ANTI-TORQUE
209-001-763-5	SUPPORT, ANTI-TORQUE
209-001-764-1	BELL CRANK
209-001-764-3	BELLCRANK, M/R
209-001-795-1	CONNECTING LINK, RIG
209-001-795-3	TUBE ASSY., FLT. CNTRL'S
209-001-795-5	TUBE, FLT. CONTROLS
209-001-796-1	CONNECTING LINK RIG
209-001-796-3	TUBE, FLT. CONTROLS
209-001-797-1	CONNECTING LINK RIG
209-001-797-101	CONNECTING LINK RIG
209-001-797-3	TUBE, FLT. CONTROLS
209-001-799-1	CONNECTING LINK RIG
209-001-799-5	PITCH HORN, M/R ACTUAT'R
209-001-908-1	HORN ASSEMBLY ELEVA
209-001-908-3	TUBE, M/R
209-010-109-109	PITCH HORN ASSEMBLY
209-010-109-5	PITCH HORN ASSEMBLY
209-010-109-7	PITCH HORN ASSEMBLY
209-010-111-1	BUSHING, SLEEVE
209-010- 111-3	BUSHING, SLEEVE
209-010-112-1	BOLT, PITCH HORN, MAI
209-010-112-3	BOLT, PITCH HORN, MAI
209-010-400-1	SWASHPLATE AND SUPP
209-010-400-103	SWASHPLATE & SUPPORT
209-010-401-11	SCISSORS AND SLEEVE
209-010-402-1	RING ASSEMBLY, SWASH
209-010-402-3	FIXED RING M/R S/P
209-010-403-1	RING ASSEMBLY, SWASH
209-010-404-1	SUPPORT ASSEMBLY SW
209-010-404-3	SUPPORT, SWASHPLATE
209-010-405-7	SCISSORS ASSY, SWASH
209-010-405-9	SCISSORS, ROTARY CNTRL'S
209-010-406-5	LEVER ASSEMBLY, MAIN
209-010-406-7	LEVER, COLLECTIVE
209-010-407-1	HUB ASSEMBLY, COLLEC

Table 1-12. Flight Safety Critical Aircraft Parts (Cont).

PART NUMBER	NOUN
209-010-407-3	HUB, COLLECTIVE
209-010-408-3	LINK, SWASHPLATE
209-010-408-7	LINK ASSY, SWASH PLA
209-010-409-1	CONNECTING LINK, RIG
209-010-409-3	LINK, IDLER
209-010-410-5	LINK ASSEMBLY, SWASH
209-010-410-7	LINK, SWASHPLATE
209-010-413-1	ADAPTER, PITCH LINK
209-010-414-1	BARREL, PITCH LINK
209-010-420-1	PLATE, RETAINER, SPLI
209-010-427-1	PIN, OUTER RING
209-010-443-1	BEARING, PLAIN, RODE
208-010-460-1	PITCH LINK ASSY
208-010-460-3	TUBE ASSEMBLY, CONNE
209-010-460-5	TUBE, PITCH LINK
209-010-462-1	CLEVIS, ROD END
209-010-462-103	CLEVIS, ROD END
209-010-518-101	TUBE ASSEMBLY, METAL
209-010-520-101	PITCH LINK ASSY
209-010-520-103	PITCH LINK
209-011-400-101	SWASHPLATE CONTROL
209-011-710-5	TUBE ASSY, CONTROL T
209-011-711-1	IDLER, TAIL ROTOR
209-011-711-3	IDLER, T/R CONTROL
209-011-712-1	LEVER ASSY ROTOR
209-011-712-3	LEVER, T/R CONTROL
209-011-713-1	LINK ASSY, ROTOR
209-011-714-1	c LEVIS, ROD END
209-012-700-1	T/R INSTALLATION
209-012-700-103	T/R INSTALLATION
209-040-069-1	QUILL ASSEMBLY GEN
209-040-073-1	GEARSHAFT
209-040-073-3	GEAR ASSY., MAIN XMSN
209-040-149-1	GEAR, BEVEL
209-040-149-3	GEAR ASSY., T/R QUILL
209-040-151-1	GEARSHAFT, BEVEL
209-040-153-1	QUILL ASSEMBLY, GEAR

Table 1-12. Flight Safety Critical Aircraft Parts (Cont).

PART NUMBER	NOUN
209-040-349-1	PLATE, RETAINING, XMSN
209-040-349-3	PLATE, RETAINING, XMSN
209-040-366-101	MAST ASSY.
209-040-366-3	MAST ASSY, TRANSMISS
209-050-002-41	CROSS TUBE ASSY,LAN
209-050-002-43	CROSSTUBE, AFT.
209-050-002-45	CROSS TUBE ASSY, LAN
206-050-002-47	CROSSTUBE, FWD.
209-060-112-1	ENGINE MOUNT, AFT
209-060-112-3	ENGINE MOUNT, AFT
209-060-121-101	ENGINE MOUNT FITTING
209-060-121-11	ENGINE MOUNT FITTING
209-060-123-101	ENGINE MOUNT TUBE
209-060-123-103	ENGINE MOUNT TUBE
209-060-123-11	ENGINE MOUNT TUBE
209-060-123-17	ENGINE MOUNT TUBE
209-062-120-101	MOUNT ASSEMBLY ENGI
209-062-120-5	MOUNT ASSEMBLY, ENGI
209-062-120-7	MOUNT ASSEMBLY, ENGI
209-062-122-1	LEG ASSEMBLY, ENGINE
209-062-123-21	ENGINE MOUNT TUBE
209-062-124-101	LEG ASSEMBLY, ENGINE
209-062-126-1	ENGINE MOUNT LEG ASSY
209-062-126-101	ENGINE MOUNT LEG ASSY
209-062-126-103	ENGINE MOUNT LEG ASSY
209-062-126-5	ENGINE MOUNT LEG ASSY
209-200-003-131	M/R PYLON INSTALLATION
209-200-003-133	M/R PYLON INSTALLATION
209-200-003-147	M/R PYLON INSTALLATION
209-200-003-149	M/R PYLON INSTALLATION
209-200-003-21	M/R PYLON INSTALLATION
209-200-003-23	M/R PYLON INSTALLATION
209-200-003-25	M/R PYLON INSTALLATION
209-200-003-27	M/R PYLON INSTALLATION
209-310-401-101	BEARING, PLAIN, ROD E
209-510-101-101	PITCH HORN ASSEMBLY
209-704-240-101	RETROFIT DRIVESHAFT

Table 1-12. Flight Safety Critical Aircraft Parts (Cont).

PART NUMBER	NOUN
209-961-406-1	HANGER ASSEMBLY, DRI
209-961-412-1	DRIVE SHAFT ASSEMBL
209-961-412-3	DRIVESHAFT ASSY.
212-010-701-11	HUB & BLADE ASSY., T/R
212-010-701-9	HUB ASSEMBLY, TAIL R
212-010-704-3	YOKE, T/R
212-010-704-5	YOKE ASSEMBLY, TAIL
212-010-706-1	RETAINER, TAIL ROTOR
212-010-709-1	BELL CRANK
212-010-709-3	BELLCRANK, T/R
212-010-711-3	CONNECTING LINK, RIG
212-010-712-1	LINK ASSY - T/R
212-010-712-3	LINK ASSY., T/R
212-010-716-13	PITCH HORN, T/R
212-010-716-9	PITCH HORN ASSY
212-010-739-7	SUPPORT, COUNTER WE
212-010-744-3	T/R YOKE
212-010-750-11	BLADE, T/R
212-010-750-3	BLADE, T/R
212-010-762-1	BEARING, BALL, ANNULA
212-010-775-1	CROSSHEAD ASSEMBLY,
212-040-001-39	TRANSMISSION
212-040-001-51	MAIN XMSN
212-040-003-15	QUILL ASSEMBLY
212-040-003-17	QUILL ASSEMBLY
212-040-003-23	GEARBOX ASSEMBLY
212-040-004-11	QUILL ASSEMBLY
212-040-004-9	GEARBOX ASSEMBLY
212-040-054-3	SUPPORT CASE, XMSN
212-040-054-7	CASE ASSEMBLY, TRANS
212-040-150-5	PINION, GEAR, ROTOR
212-040-151-11	GEAR ASSY., T/R QUILL
212-040-151-9	PINION, GEAR, ROTOR
212-040-201-1	GEAR, SPUR
212-040-202-3	GEAR, PINION
212-040-206-3	ADAPTER, QUILL
212-040-208-3	QUILL ASSY., BEVEL GEAR

Table 1-12. Flight Safety Critical Aircraft Parts (Cont).

Part Number	Noun
212-040-365-23	QUILL ASSY., T/R DRIVE
212-040-365-25	QUILL ASSEMBLY, TRAN
212-040-365-31	DRIVE & SUMP ASSY., XMSN
212-040-365-33	QUILL ASSEMBLY
212-040-450-5	PINION, SPIRAL BEVEL
212-040-450-7	PINION ASSY., T/R DRIVE
212-040-451-1	GEAR ASSY, T/R DRIVE
212-040-451-3	GEAR, BEVEL
212-040-452-1	SLEEVE, OUTPUT, GEARB
212-040-452-3	SLEEVE, OUTPUT
212-040-462-1	SHAFT, T/R DRIVE
212-040-468-1	CASE, T/R DRIVE
212-040-468-3	CASE, T/R DRIVE
212-040-500-6	GEARSHAFT, SPUR
212-040-500-7	GEAR, BEVEL
212-040-506-15	CASE ASSY., T/R DRIVE
212-040-506-5	CASE ASSY., T/R DRIVE
212-040-506-7	CASE ASSY., T/R DRIVE
212-040-600-7	HANGER ASSEMBLY
214-010-434-1	BEARING, UNIVERSAL, P
41001221	PISTON ROD, M/R ACTUATOR
540-001-102-7	YOKE, M/R
540-001-904-5	BELLCRANK, ANTI-DRIVE
540-001-904-7	BELLCRANK, ANTI-DRIVE
540-001-905-1	SUPPORT, STRUCTURAL
540-001-905-3	SUPPORT, S/P ANTI-DRIVE
540-011-101-25	HUB ASSEMBLY, MAIN
540-011-012-5	YOKE ASSEMBLY, MAIN
540-011-102-7	YOKE ASSEMBLY, MAIN
540-011-109-5	HOUSING ASSEMBLY, MA
540-011-112-5	PIN, GROOVED, HEADLES
540-011-112-7	PIN, GROOVED, HEADLES
540-011-113-1	FITTING, RETENTION S
540-011-116-1	DRAGE BRACE ASSY
540-011-117-1	CLEVIS, ROD END
540-011-117-3	CLEVIS, ROD END
540-011-118-1	BARREL ASSEMBLY, DRA
540-011-118-3	BARREL ASSEMBLY, DRA
540-011-119-17	BOLT ASSY., M/R RETENT'N
540-011-119-19	BOLT ASSY., M/R RETENT'N
540-011-153-11	YOKE EXTENSION, M/R

Table 1-12. Flight Safety Critical Aircraft Parts (Cont).

PART NUMBER	NOUN
540-011-153-17	YOKE EXTENSION, M/R
540-011-154-5	GRIP ASSEMBLY MAIN
540-011-154-7	GRIP ASSEMBLY, MAIN
540-011-162-1	BOLT, SHEAR
540-011-177-1	NUT, RETENTION STRAP
540-011-192-1	TRUNNION, MAIN ROTOR
540-011-192-3	TRUNNION, MAIN ROTOR
540-011-193-1	BEARING UNIT, PLAIN
540-011-404-5	RING ASSEMBLY OUTER
540-011-404-7	RING, SWASHPLATE
540-011-449-3	BEARING, BALL, STACK
540-011-456-1	SLEEVE, COLLECTIVE, A
540-011-459-1	PIN, SHOULDER
540-012-125-3	SLEEVE
540-015-001-1	BLADE, ROTARY WING
K747-003-205	BLADE, ROTARY WING
K747-003-209	BLADE, ROTARY WING
K747-003-303	BLADE, ROTARY WING
K747-003-309	BLADE, ROTARY WING
K747-003-401	BLADE, ROTARY WING
K747-003-403	BLADE, ROTARY WING
K747-061-5	ROOT FITTING ASSEMB
K747-072-1	FITTING ASSEMBLY, DR
K747-082-1	STRUT, FITTING
K747-083-1	ROOT FITTMG ASSEMB
NAS1310-29D	BOLT, SHEAR
NAS1310-40D	BOLT, SHEAR
NAS1310-46H	BOLT, SHEAR
NAS464P8-36	BOLT, SHEAR
NAS6206-76D	BOLT, SHEAR
NAS6208-103D	BOLT, SHEAR
NAS6210-38D	BOLT, SHEAR
NAS6618D112	BOLT, SHEAR
PAM9107NPPA2702	BEARING, BALL, ANNULA

CHAPTER 2

AIRFRAME

SECTION I. STRUCTURAL REPAIR

2-1. GENERAL INFORMATION AIRFRAME.

a. This chapter contains airframe instructions for AVUM (Aviation Unit Maintenance) and AVIM (Aviation Intermediate Maintenance) on the army model AH-1P/E/F single rotor, single engine, **attack** helicopter. The airframe consists of the fuselage, tailboom, and wings (figure 2-1).

b. Qualified Engineering Authority, as used in this manual, is AVSCOM Engineering. Engineering Authority may be contacted by writing to:

HEADQUARTERS
U.S. Army Aviation Systems Command
ATTN: AMSAV-ME
4300 Goodfellow Blvd.
St. Louis, MO 63120

CAUTION

The structural panels shown on figure 2-2 must be installed prior to helicoptor ground run, flight, jacking, towing, or hoisting. Non-structural panels must be installed prior to flight operations.

NOTE

Install all fasteners in structural panel. Non-structural panels (figure 2-3) may have every third fastener missing; however, no panel shall have more than thirty-three percent of the total number of fasteners missing.

c. **This chapter contains the following sections:**

Section I — Structural Repair
Section II — Fuselage
Section III — Tailboom
Section IV — Wings
Section V — Deleted

d. Structural repair of the airframe is covered in Section I. Maintenance functions other than structural repair are covered in the applicable sections II thru IV.

e. Structural repairs described in this section are intended for use in conjunction with TM 55-1500 204-25/1, General Aircraft Maintenance Manual.

f. The limitations in the following note should be observed when performing structural repair on the airframe.

NOTE

Repair at (AVUM) is limited to minor repair of sheetmetal cracks, scratches, corrosion, and loose or missing hardware. These repairs can be accomplished using the airframe repairman's tool kit and portable hand tools. If any extensive damage occurs or major repair is required, repairs shall be accomplished by (AVIM). Repair at (AVIM) is limited to repair of sheet metal cracks, scratches, corrosion, halos, and loose or missing hardware. If major damage occurs requiring jigs and fixtures, repairs shall be accomplished by next higher maintenance level.

g. The damage limits provided in chapter 2 on bonded panels are not intended to red X the aircraft. The limits are to provide guidance for scheduling repair or replacement at a schedule maintenance interval. When damage limits, particularly bond voids in bonded panels, are exceeded, the responsible unit maintenance authority will establish a reoccurring special inspection on the damaged area until the damage to the structure is corrected. If the damage is in the area that requires engineering authority for repair, engineering should be contacted in writing with a description of damage. If depot assistance will be required, unit should contact AVSCOM, AMSAV-MPD, with your requirement.

2-2. TYPE OF CONSTRUCTION – AIRFRAME.

The AH-1S model attack helicopter basic structural configuration is composed of four main groups.

a. Main and Tail Rotor Group. The bonded, all-metal main rotor blade assembly consists of a main spar, a honeycomb core, aluminum skins, and laminated root plates to provide rigid support for mounting to the hub. Tail rotor blades are of similar construction. Maintenance and repair procedures for the main and tail rotor group are covered in chapter 6.

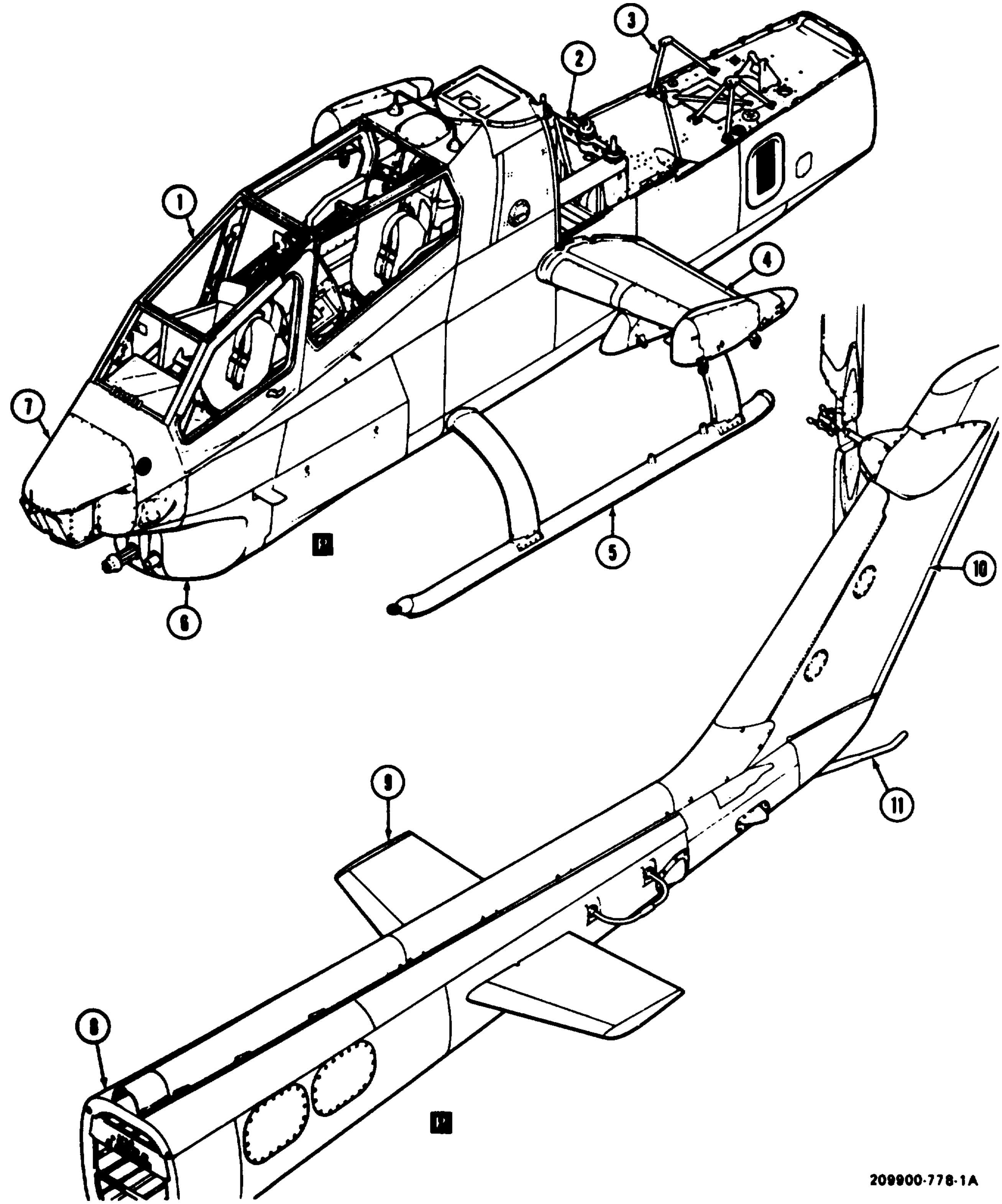


Figure 2-1. Fuselage Components and Tailboom (Sheet 1 of 2)

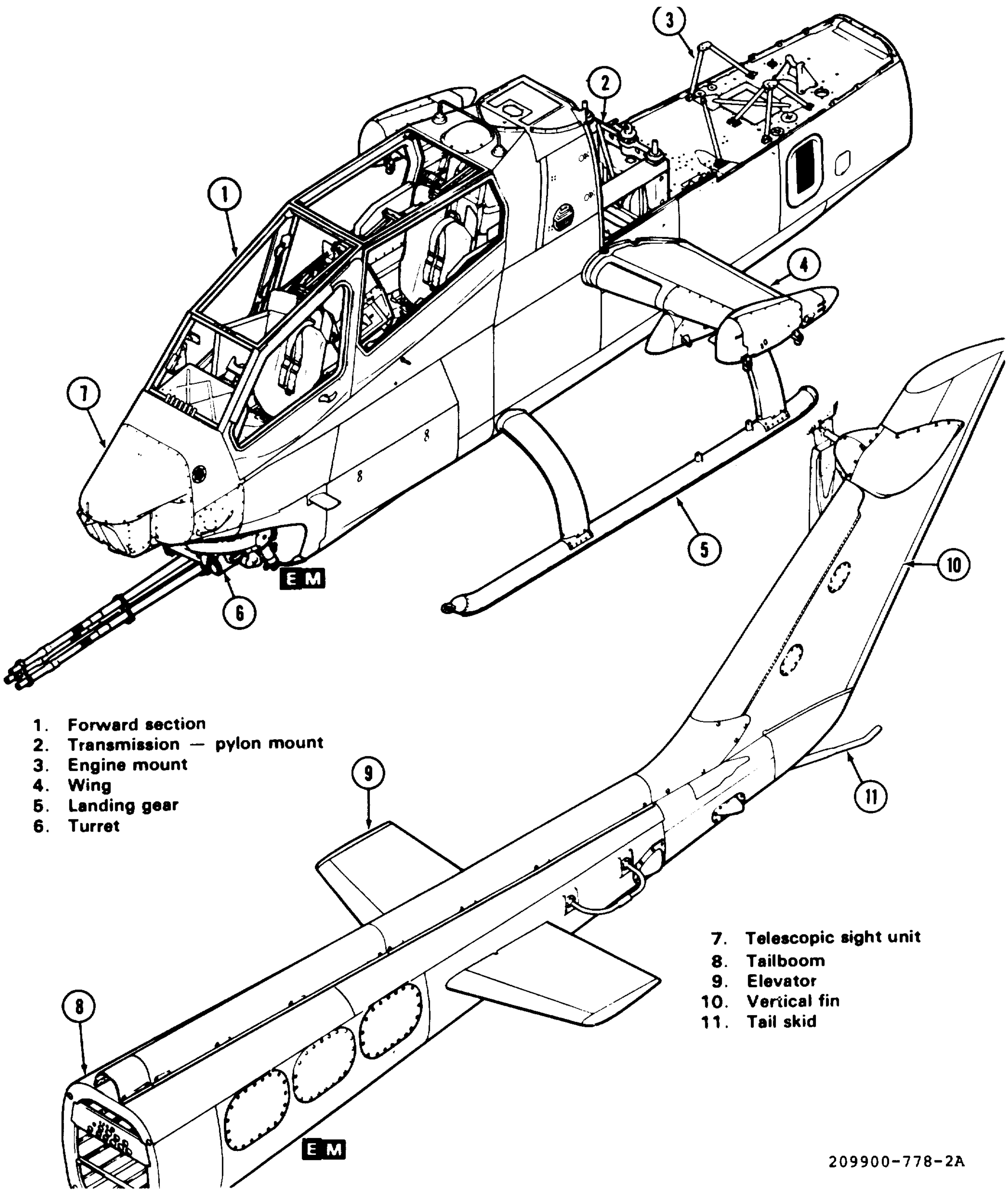


Figure 2-1. Fuselage Components and Tailboom (Sheet 2 of 2)

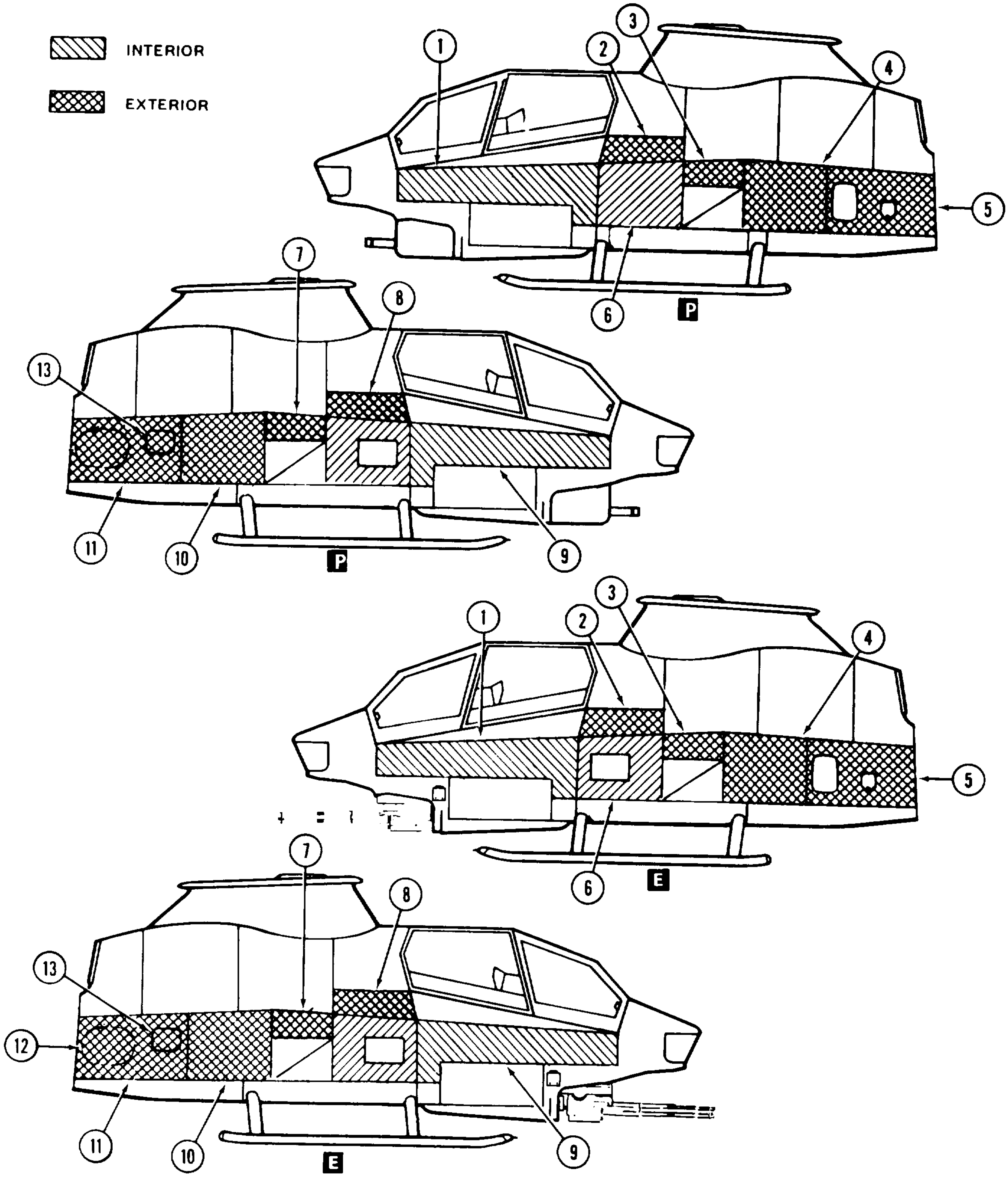


Figure 2-2. Structural Panels (Sheet 1 of 4)

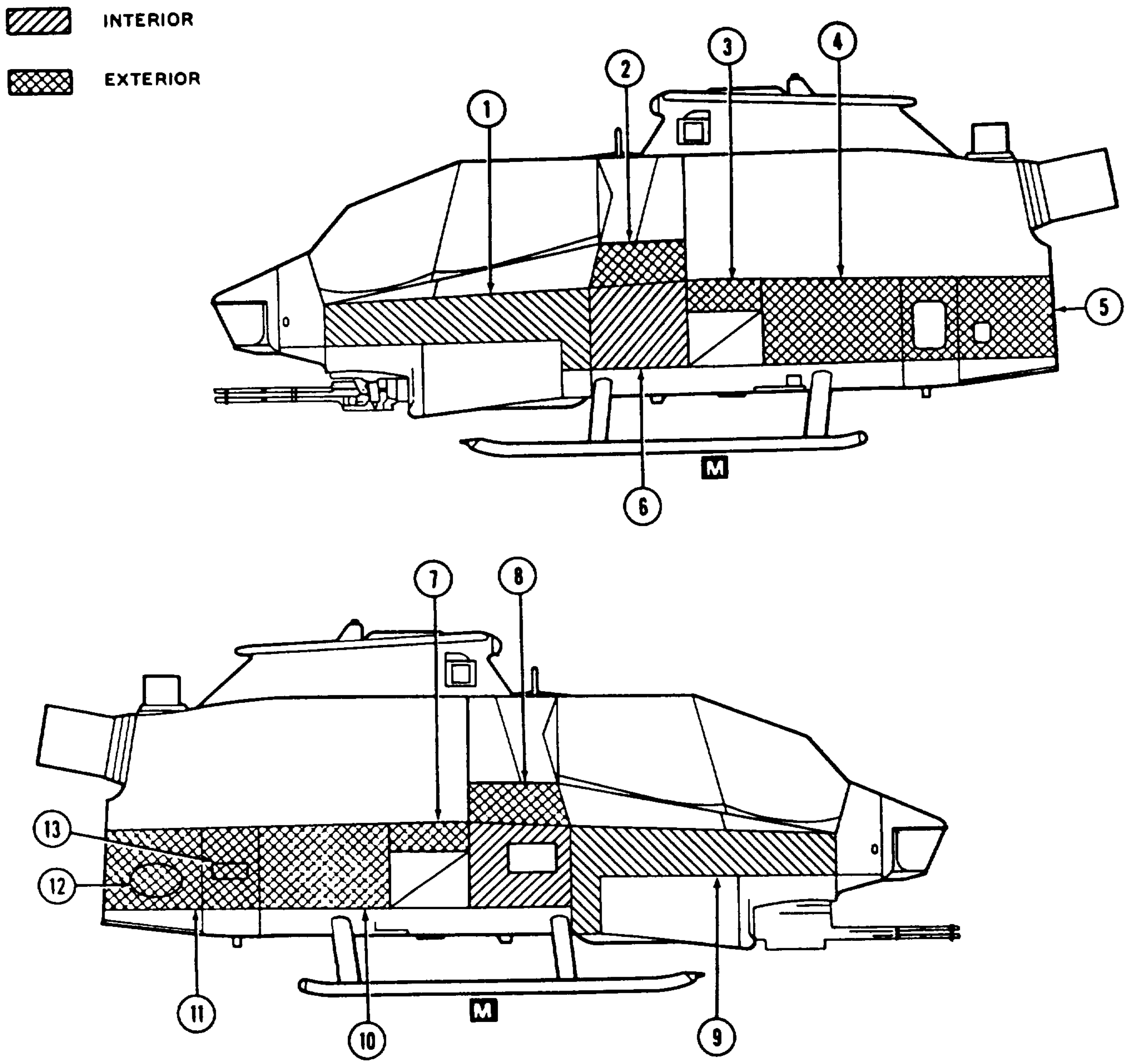


Figure 2-2. Structural Panels (Sheet 2 of 4)

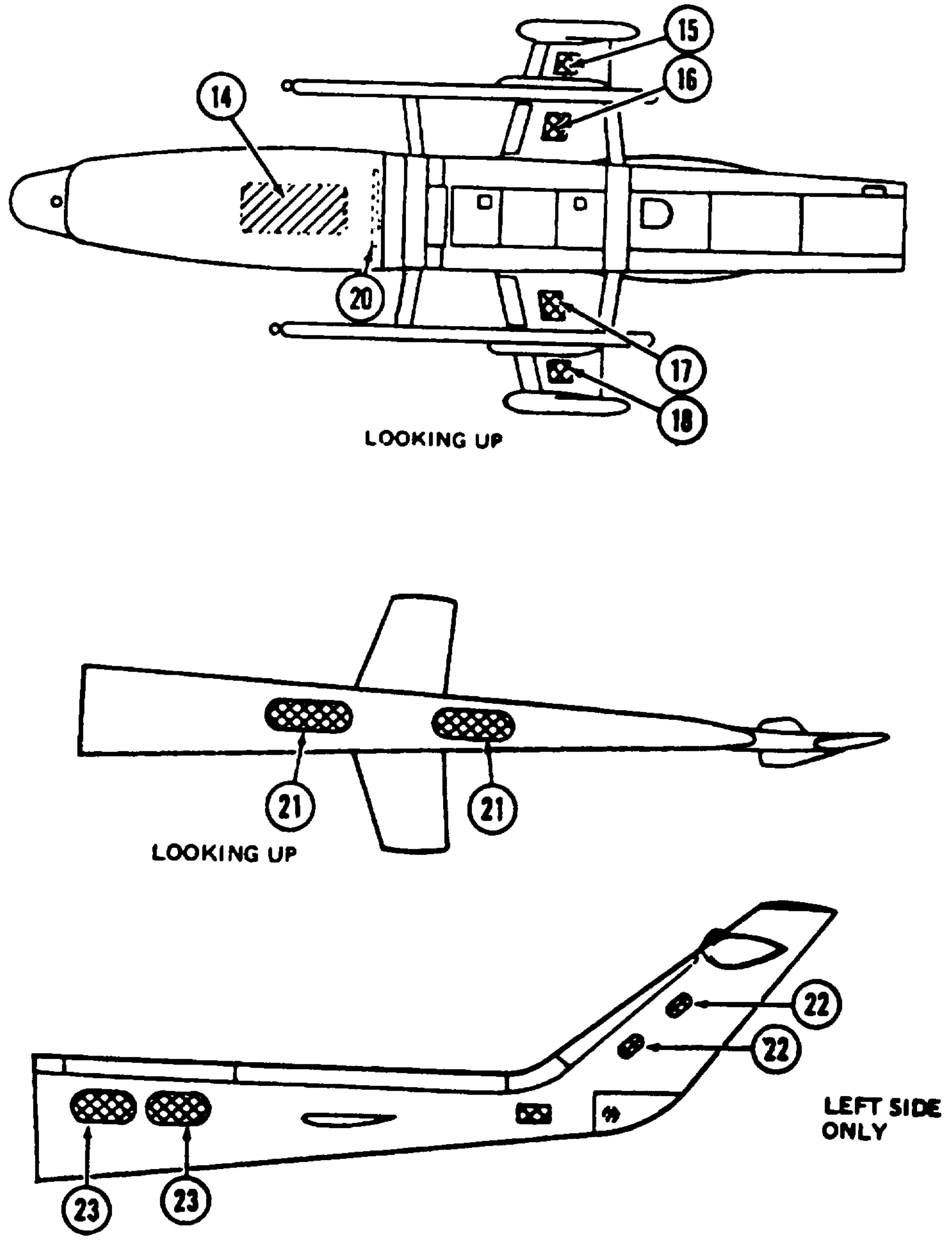
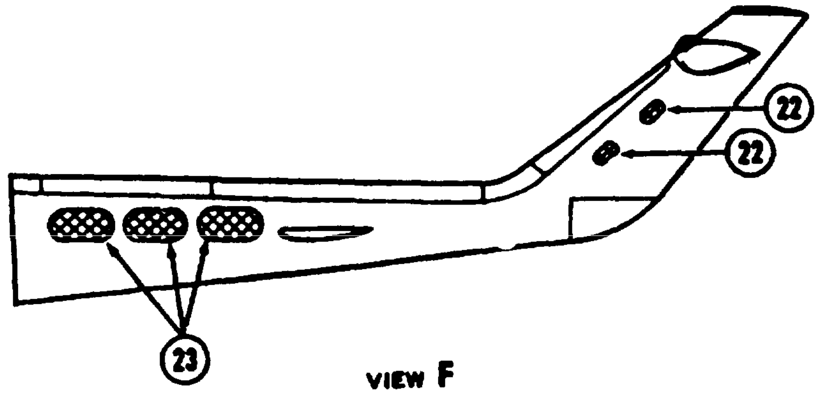


Figure 2-2. Structural Panels (Sheet 3 of 4)



VIEW F

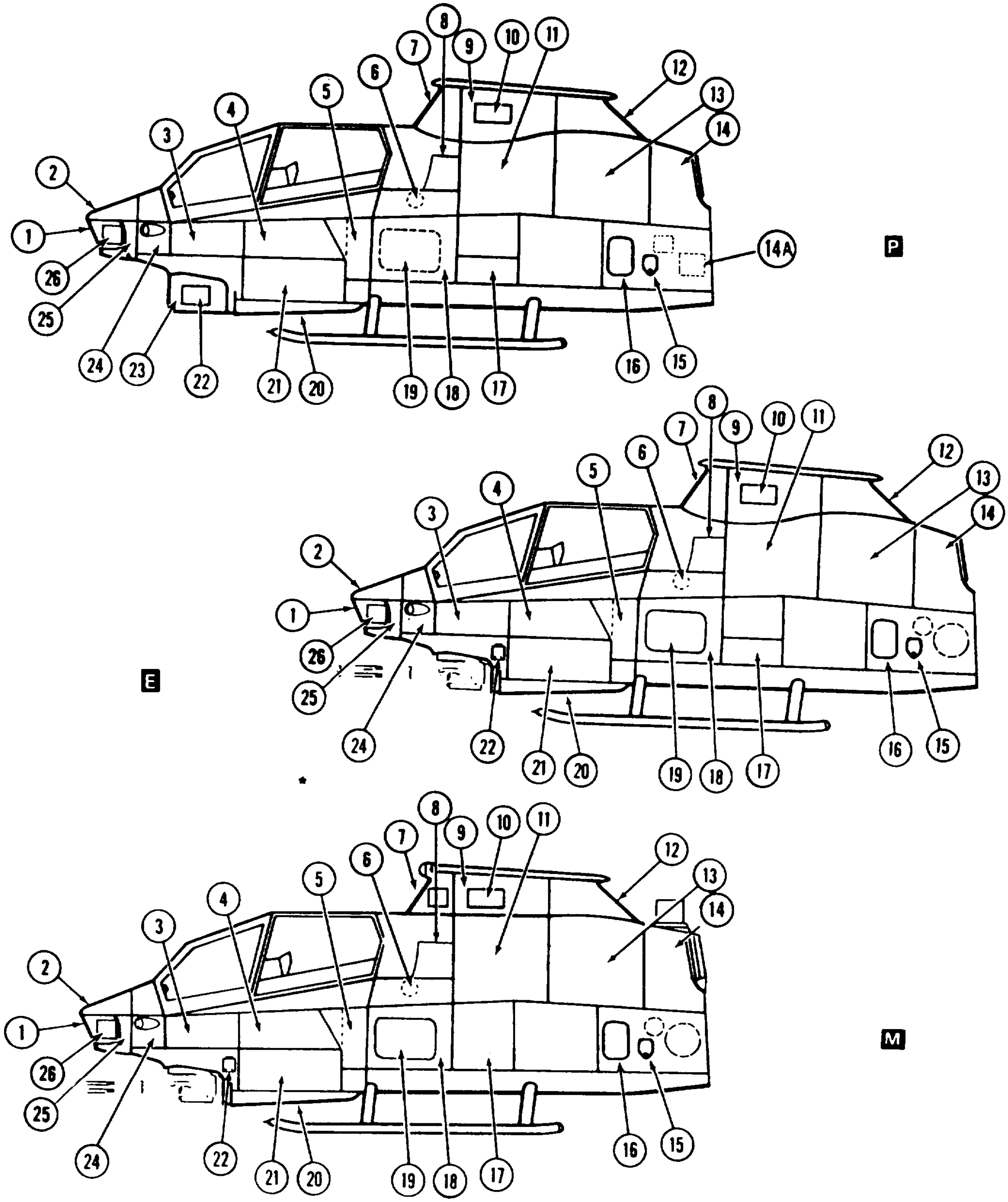
AH-1S [I] [M]

ITEM		TYPE FASTENER	ACCESS TO:
1.	Beam panel	Rivets	–
2.	Upper fuel cell panel	Screws	Forward fuel cell
3.	Pylon support panel	Rivets	–
4.	Beam panel	Rivets	Aft fuel cell
5.	Beam panel	Rivets	–
6.	Fuel cell access panel	Screws	Forward fuel cell
7.	Pylon support panel	Rivets	–
8.	Upper fuel cell panel	Rivets	–
9.	Beam panel	Rivets	–
10.	Fuel cell access panel	Screws	Aft fuel cell
11.	Beam panel	Rivets	–
12.	Deleted		
13.	Access panel	Screws	Oil cooler, AN/ARN-89 ADF receiver
14.	Ammunition compartment upper panel	Screws	Heating and ventilating ducts and valves
15.	Wing outboard access covers (left)	Screws	TOW hydraulic and electrical installation
16.	Wing inboard covers (left)	Screws	TOW hydraulic and electrical installation
17.	Wing inboard access covers (right)	Screws	TOW hydraulic and electrical installation
18.	Wing outboard covers (right)	Screws	TOW hydraulic and electrical installation
19.	Deleted		
20.	Ammunition compartment aft panel	Screws	Servo electronic control unit
21.	Tailboom access door	*Screws	Control linkage, synchronized elevator supports, TOW cooling fan, avionics, electronic equipment
22.	Access cover	Screws	Tail rotor control linkage
23.	Avionics compartment door (left side only)	Screws	Avionics, electronic equipment and cooling fan

NOTE: Legend applies to all views.

* And AT-844/APX-44 antenna connector

Figure 2-2. Structural Panels (Sheet 4 of 4)



*After MWO 55-1520-236-50-23

Figure 2-3. Nonstructural Access Panels, Doors, and Fairings (Sheet 1 of 4)

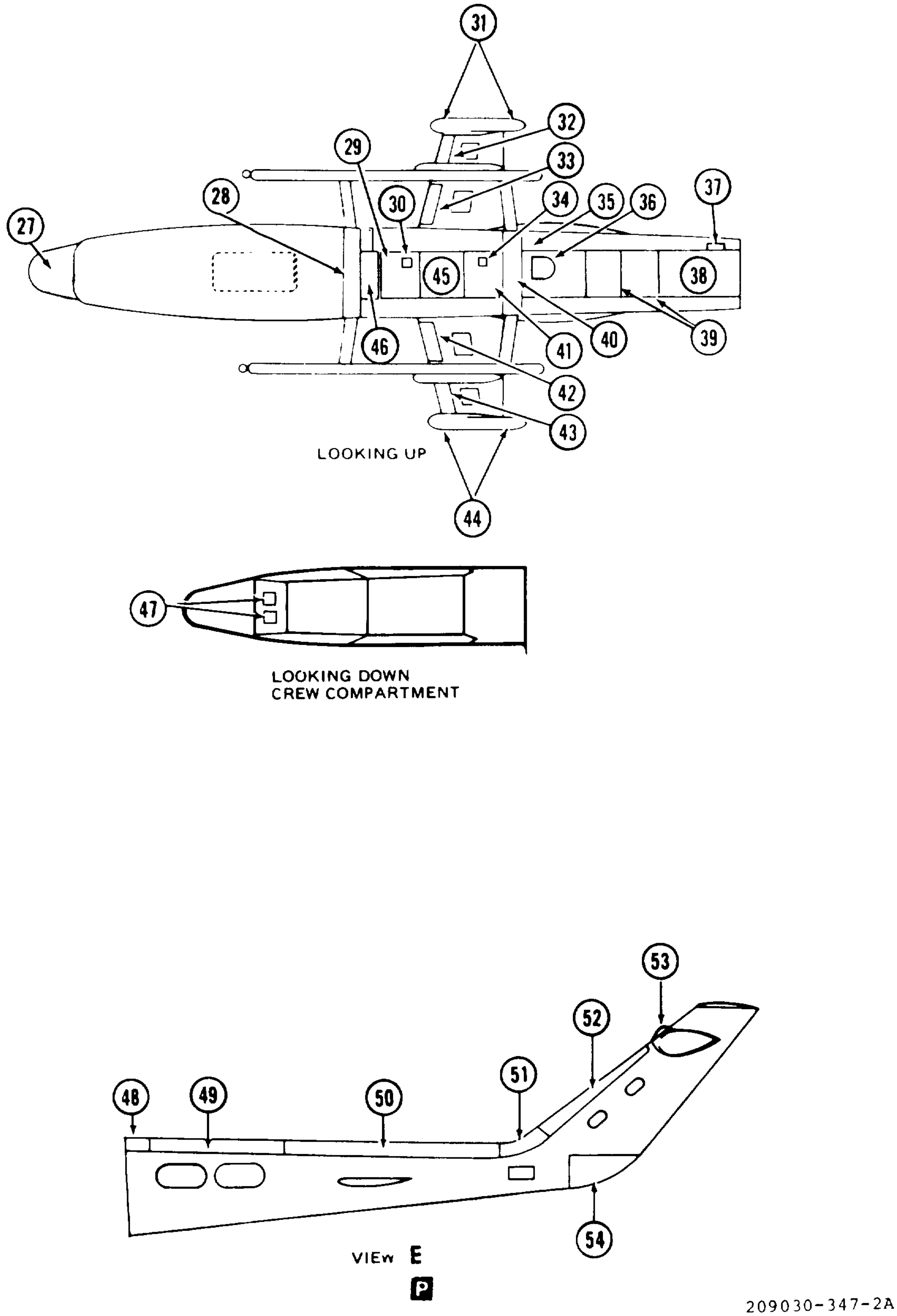
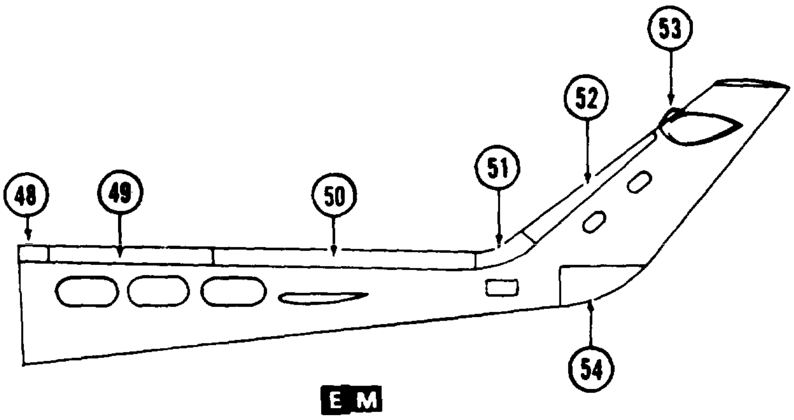


Figure 2-3. Nonstructural Access Panels, Doors, and Fairings (Sheet 2 of 4)



ITEM	ACCESS TO:
1. Forward fairing	Telescopic sight unit
2. Upper fairing	Telescopic sight unit
3. Outer panel (left and right)	Flight controls
4. Outer panel (left and right)	Flight controls
5. Outer panel (left and right)	Flight controls
6. Fuel filler cap (right side only)	
7. Forward pylon fairing	Airborne laser tracker, cabin air intake
8. Access door (left and right)	Hydraulic reservoirs and modules, air distribution duct, and ECU
9. Center pylon fairing (left and right)	Rotating controls, anti-collision light
10. Access door (left and right)	Rotating controls
11. Transmission cowl assembly (left and right)	Transmission, driveshaft, engine air induction
12. Aft pylon fairing	Engine oil tank
13. Engine cowl assembly (left and right)	Engine compartment
14. P E Tailpipe fairing	Exhaust tailpipe, tail rotor driveshaft
14. M IR suppressor cowling	AN/ALQ 144 Connections
14A. Access panel (may be removed for ground run only)	Aft electrical compartment, tail rotor actuator
15. External power door (left side only)	External power receptacle
16. Oil cooler duct panel (left side only)	Oil coolers, turbine fan, and fresh air vent
17. Access panel assembly (left and right)	Lower transmission, lift beam, hydraulic units, control linkage
18. Outer panel (left and right)	Fuel cell panel
19. Access panel (left side)	M197 turret logic control unit
19. E M Access panel (right side)	Interface control unit
20. Access panel (bottom)	Telescopic sight unit wiring
21. Ammunition compartment door (left and right)	Ammunition stowage, leveling points
22. Turret access door (left and right)	Armament
23. P Turret fairing (left and right)	Turret exterior
24. Access panel	Controls — gunner and antennas
25. Outer fairing (left and right)	Telescopic sight unit
26. Coverplate (left and right)	Nose antenna location

Figure 2-3. Nonstructural Access Panels, Doors, and Fairings (Sheet 3 of 4)

ITEM	ACCESS TO
27. Access panel	APR 39 Receiver
28. Crosstube fairing	Forward crosstube and supports
29. Lower skin panel	Forward fuel cell sump
30. Drain cover	Forward fuel drain
31. Pylon access panels	Pylon hydraulic and electrical units, ground intercom panel
32. Left cover (LE, outboard)	Electrical wiring
33. Left cover (LE, inboard)	Electrical wiring
34. Drain cover	Aft fuel cell
35. Lower skin panel	Control linkages
36. Drain cover	Fuel sump drain door
37. Jack point opening (left side only)	Jack and mooring point
38. ADF sense antenna	Antenna and SCAS control tube
39. Lower skin panel	Electrical cables
40. Aft crosstube fairing	Aft crosstube and supports
41. Lower skin panel	Aft fuel cell sump
42. Right cover (LE, inboard)	Electrical wiring
43. Right cover (LE, outboard)	Electrical wiring
44. Pylon access panel	Pylon hydraulic and electrical units, ground intercom panel
45. Lower skin panel	Control linkages
46. Access panel	Avionics wiring
47. Gunner floor access panel	Armament turret
48. Driveshaft forward cover	Tail rotor driveshaft
49. Driveshaft center cover	Tail rotor driveshaft
50. Driveshaft aft cover	Tail rotor driveshaft
51. Gearbox cover	Intermediate gearbox
52. Driveshaft cover	Tail rotor driveshaft
53. Gearbox fairing and cover	Tail rotor drive gearbox
54. Aft tail fairing	Tail structure

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Figure 2-3. Nonstructural Access Panels, Doors, and Fairings (Sheet 4 of 4)

b. Body and Wing Group. The body is divided into a forward fuselage section and a tailboom. In the forward fuselage, titanium, aluminum, and fiberglass honeycomb deck panels and main beams form a primary box beam structure which is covered with aluminum alloy skin and honeycomb sandwich panels. The forward fuselage structure supports the engine, pylon assembly, tailboom, landing gear, wings, fuel tanks, weapons turret, and the tandem cockpit. The cockpit enclosure is an acrylic plastic canopy incorporating crew access doors. The wings, which provide additional lift and support for external stores, are constructed of two main spars, ribs, and aluminum skin. The tailboom is semi-monocoque construction with bulkheads, longerons, stringers, and aluminum skin. The tail fin, built up of spars, ribs, and skin, is an integral part of the tailboom. The tailboom is attached to the forward fuselage section with four bolts and supports the aft section of the tail rotor drive system, the tail rotor, and elevator.

c. Landing Gear Group. The aluminum alloy skid-type landing gear consists of two skid tubes and two arched cross tubes and is bolted to the primary structure of the forward fuselage section at four points. Maintenance and repair procedures for the landing gear are covered in chapter 3.

d. Power Plant Group. The power plant is supported by a horizontal titanium deck on the upper aft part of the forward fuselage section. This group, which includes the engine, transmission, and related accessories, is enclosed by hinged fiberglass and aluminum cowling. Maintenance and repair procedures for the power plant are covered in chapter 4.

2-3. INVESTIGATION OF DAMAGE – AIRFRAME.

a. Remove grease, dirt, and paint in area of damage so that the extent of damage can be determined.

b. Inspect structure for dents, scratches, abrasions, punctures, cracks, distortion, and corrosion. Deep scratches, nicks, and abrasions shall be treated as a crack.

c. Inspect all riveted and bolted joints in vicinity of damage area for sheared, loose, or missing rivets and bolts. Inspect for elongated rivet and bolt holes. If there is any doubt whether a rivet or bolt has failed, remove the fastener for inspection.

d. Inspect ail adjacent structure for secondary damage that may have resulted from a shock load transmitted from the primary damage.

2-4. CLASSIFICATION OF DAMAGE AND TYPE REPAIR – AIRFRAME.

a. Negligible Damage. Damage that can be permitted to remain as is or damage repairable by simple procedure, such as removing dents, stop drilling short cracks in non-critical structure, temporary patches, etc., without placing restrictions on flight.

b. Damage Repairable by Patching. Damage exceeding the specified negligible limits may be repairable by application of a patch.

c. Damage Repairable by Insertion. Damage to a member which is repairable by removing the material at the point of damage and applying a newly fabricated insert having identical characteristics to that removed, plus the necessary reinforcement.

d. Damage Necessitating Replacement of Parts. Damage which cannot be repaired or damage so severe that the repair thereof would not warrant the time expended,

e. Riveted Repairs. The finished aluminum alloy parts and magnesium alloy sheets used in the helicopter are heat treated, Only rivets and/or bolted repairs shall be permitted. For instruction on the use and installation of rivets, refer to General Aircraft Maintenance Manual, TM 55-1500-204-25/1.

f. Welded Repairs. For welded repair information to components such as tailpipe and spot welds, refer to TM 55-1500-204-25/1.

2-5. SUPPORT OF STRUCTURE DURING REPAIR – AIRFRAME.

CAUTION

When replacing any riveted structural honeycomb panels or the right aft fuel cell panel which is installed with screws, structural loads must be relieved to maintain alignment of airframe.

a. Use the following procedures to ensure that airframe alignment is maintained.

CAUTION

Do not use aircraft structure as work platform when structural panels or engine decks are removed because airframe warpage may result.

(1) Attach hoist to mast retaining nut and support the main rotor by hoisting vertically until the lift link retaining bolt can be freely rotated. A free lift link retaining bolt indicates that the load has been removed.

Alternate method: Remove main rotor, mast, controls, and transmission.

(2) Attach engine sling (T9) and hoist (T45) to engine. Loosen pillow blocks on engine mounts. Support the engine by hoisting vertically until engine is loose in the pillow blocks.

Alternate method: Remove engine. Refer to paragraph 4-12.

(3) Support tailboom at two locations, forward and aft, to remove load from forward fuselage,

Alternate procedure: Remove tailboom.

CAUTION

All structural panels must be installed prior to jacking or lowering on jacks, to prevent possible warpage. Refer to paragraphs 1-34 and 1-45 for hoisting and jacking instructions.

(4) Place jacks (S3 and S9) under jack points and raise until hand-tight against jack fittings (S6, S7, and S8).

CAUTION

Remove and install the panels listed in the following step one at a time unless a work aid fixture is used to restrain the structure and maintain alignment, or damage to the fuselage may result.

b. Replacement of structural panels is restricted to only one at a time unless a work aid fixture is used to restrain the structure and prevent misalignment. Panels that can be replaced one at a time without the use of a fixture are listed below.

Table 2-1. Main Beam Panels (Structural)

FIGURE 2-2 INDEX NO.	SIDE	FUSELAGE STATION REF.
1	Left	61.25 to 148.50
2	Left	148.50 to 186.25
3	Left	186.25 to 213.94
4	Left	213.94 to 250.00
5	Left	250.00 to 300.68
6	Left	148.50 to 186.25
7	Right	186.25 to 213.94
8	Right	148.50 to 186.25
9	Right	61.25 to 148.50
10	Right	213.94 to 250.00
11	Right	250.00 to 300.68

c. Deleted.

2-6. LOCATION OF LEVELING POINTS – AIRFRAME.

Refer to paragraph 1-34 for leveling procedure.

2-7. PRINCIPAL DIMENSIONS - AIRFRAME

Refer to figure 2-4 for principal dimensions of the helicopter.

2-8. REFERENCE LINES — AIRFRAME.

Refer to figure 2-5 for major reference lines of the helicopter. Definitions of reference lines are as follows:

a. Fuselage Station Lines. Station lines (FS) are vertical reference lines against the helicopter which are used to locate major assemblies and parts of the structure. FS numbers indicate the distance in inches from the reference datum line, which is located 24.4 inches forward of the most forward nose contour and designated as Station 0.

b. Boom Station Lines. Boom station lines (BS) are reference tines perpendicular to the center line of the tailboom. Boom stations indicate the distance in inches from the reference datum line, which is located 41.37 inches forward of the most forward surface of the boom structure.

c. Water Lines. Water lines (WL) are horizontal reference lines (viewed from the side or front of helicopter) used to locate major assemblies and parts of the structure by a number indicating the distance in inches from a line of origin, located 21.62 inches below the tower contour of the turret fairing and designated as water line 0.

d Butt Lines. Butt tines (BL) are vertical reference lines as viewed from front of helicopter used to locate major assemblies and parts of the structure by a number indicating the distance in inches on each side of the helicopter centerline, which is designated as butt line 0.

Wing Station Lines. Wing station lines (WS) are vertical reference lines as viewed from front of helicopter and are used to locate parts of the wing structure by a number indicating the distance in inches from the helicopter centerline (BLO).

2-9. STRUCTURAL REPAIR MATERIALS.

Structural repair materials are listed in table 2-2 in alphabetical order.

2-10. CORROSION CONTROL — AIRFRAME.

This paragraph contains information required for identification and control of corrosion. Refer to TM 1-1500-343-23 or TM 1-1500-344-23 for additional information. Preventive maintenance for corrosion control should include the following procedures:

(1) Periodic inspection to detect corrosion in the early stages.

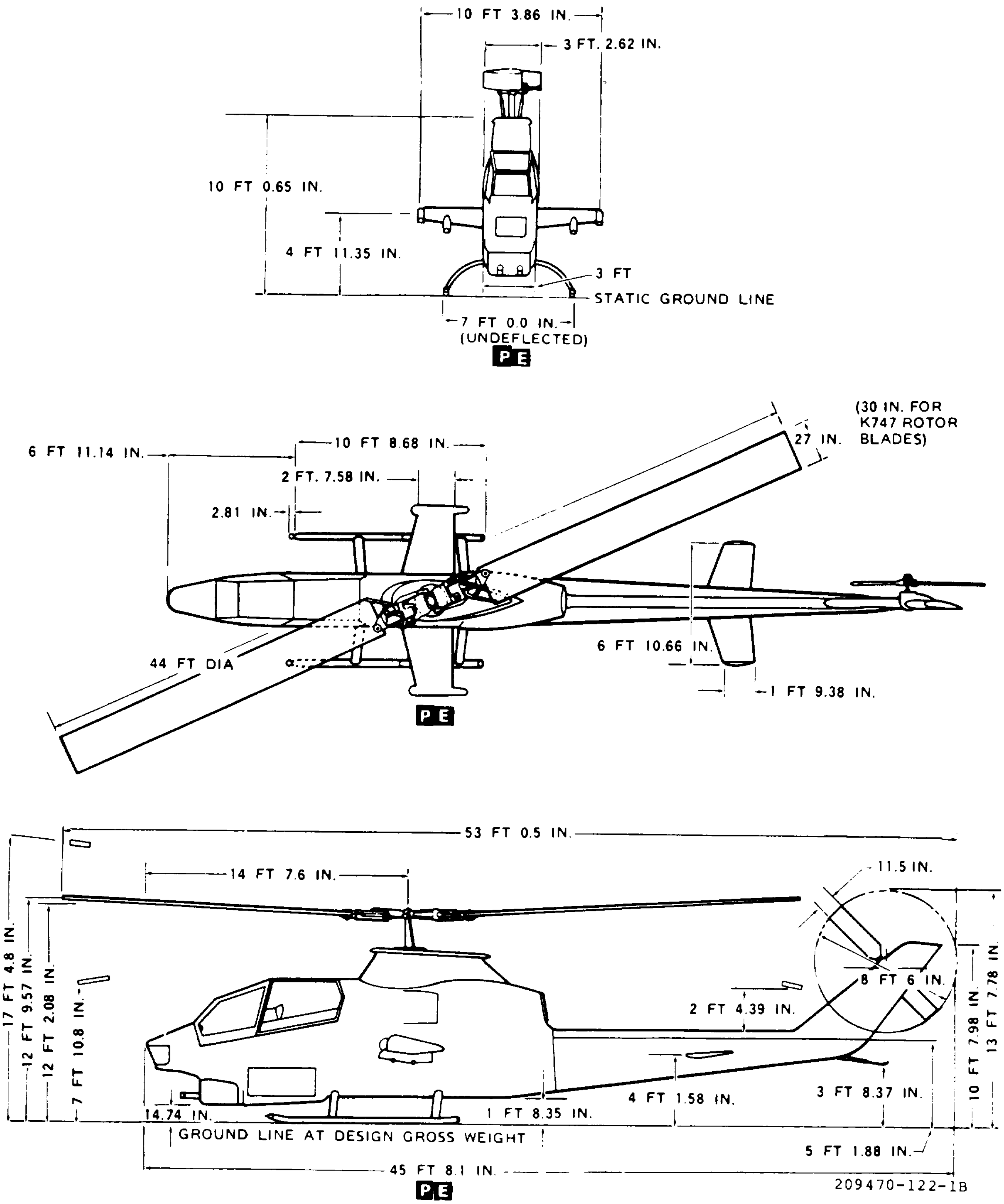


Figure 2-4. Principal Dimensions — Airframe (Sheet 1 of 2)

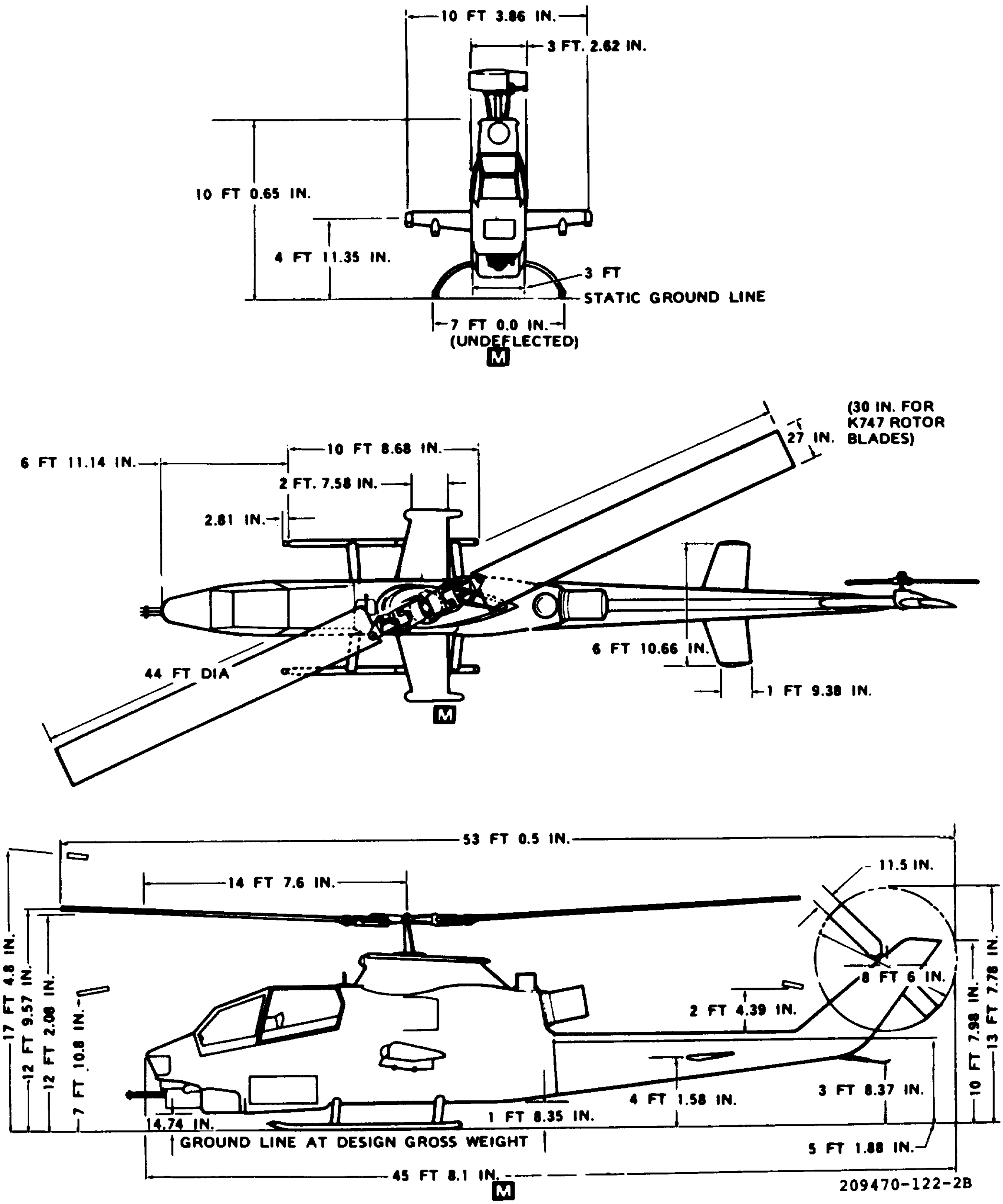
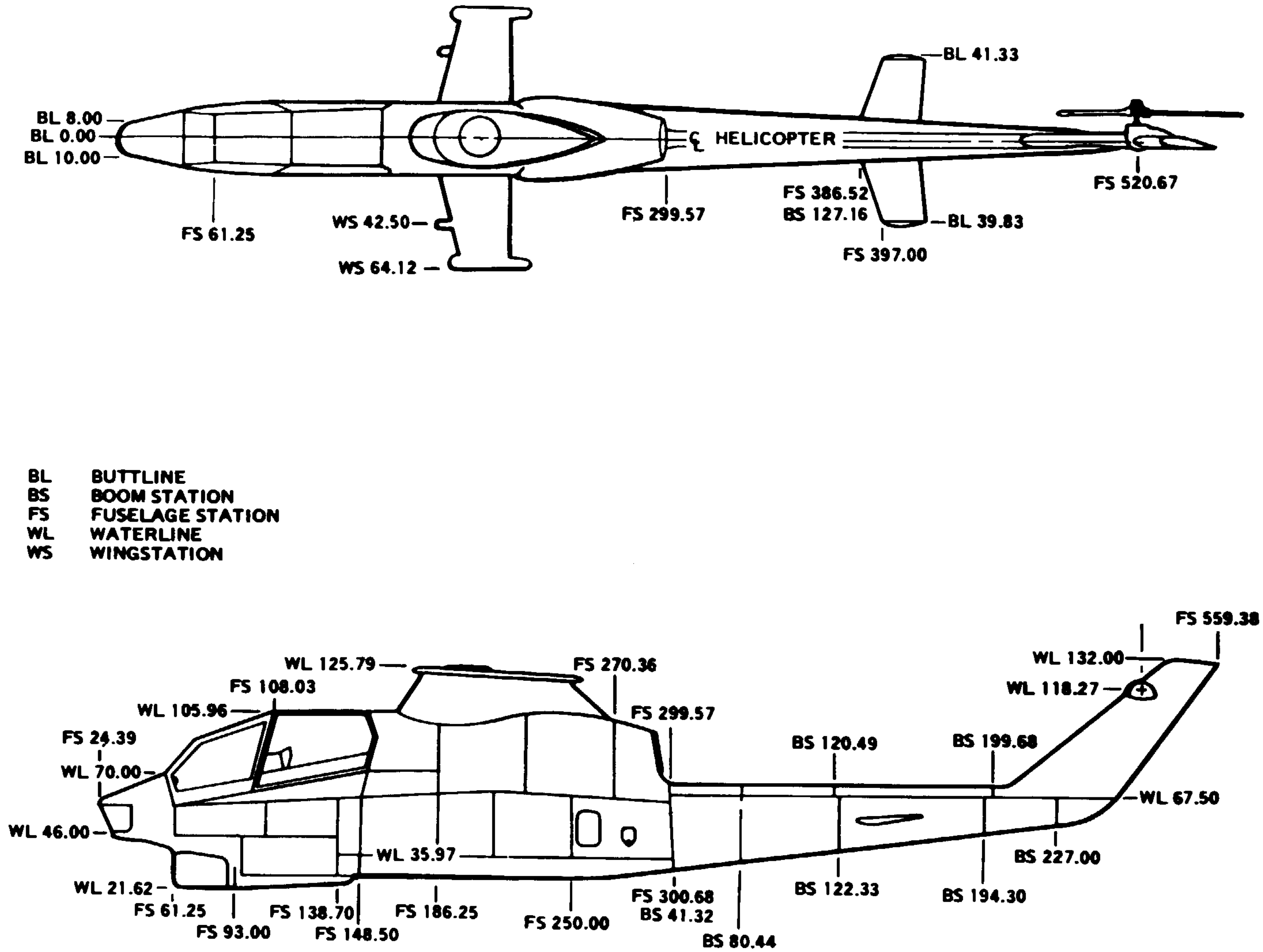


Figure 2-4. Principal Dimensions – Airframe (Sheet 2 of 2)



209900-501A

Figure 2-5. Reference Lines. – Airframe

(2) Adequate cleaning of helicopter to minimize the effects of corrosion.

(3) Removal and treatment of corrosion.

(4) Draining of moisture entrapment areas.

(5) Sealing of watertight areas.

(6) Preservation, including paint touch-up and replacement of finishes.

(7) All exposed common hardware requires overcoating with MIL-C-16173, Grade IV (C43.1) and all exposed weapon system connectors required overspraying with MIL-C-85054 (C443) IAW TM 1-1500-344-23.

b. Types of Corrosion.

(1) Uniform etch corrosion. The surface effect produced by most direct chemical attacks (as by an add) is a uniform etching of the metal. On a polished surface, this type of corrosion is first seen as a general dulling of the surface. if such corrosion is allowed to continue, the surface becomes rough and possibly frosted in appearance.

Table 2-2. Structural Repair Materials

ITEM No.	DESCRIPTION	REF. NO. AND FSCM	NSN
1	Aluminum Alloy Sheet, 0.010 inch the 2024-T3	QQ-A-250/5 (81348)	9535-01-024-1983
2	Aluminum Alloy Sheet, 0.012 inch thick, 2024-T3	QQ-A-250/5 (81348)	9535-00-167-2274
3	Aluminum Alloy Sheet, 0.016 inch thick, 2024-T3	QQ-A-250/5 (81348)	9535-00-232-0543
4	Aluminum Alloy Sheet, 0.020 inch thick, 2024-T3	QQ-A-250/5 (81348)	9535-00-167-2277
5	Aluminum Alloy Sheet, 0.025 inch thick, 2024-T3	QQ-A-250/5 (81348)	8535-00-167-2278
6	Aluminum Alloy Sheet, 0.032 inch thick, 2024-T3	QQ-A-250/5 (81348)	9535-00-086-9729
7	Aluminum Alloy Sheet, 0.040 inch thick, 2024-T3	QQ-A-250/5 (81348)	9535-00-167-2280
8	Aluminum Alloy Sheet, 0.050 inch thick, 2024-T3	QQ-A-250/5 (81348)	9535-00-232-0569
9	Aluminum Alloy Sheet, 0.063 inch thick, 2024-T3	QQ-A-250/5 (81348)	9535-01-049-0763
10	Aluminum Alloy Sheet, 0.071 inch thick, 2024-T3	QQ-A-250/5 (81348)	9535-00-106-0609
11	Aluminum Alloy Sheet, 0.080 inch thick, 2024-T3	QQ-A-250/5 (81348)	9535-00-232-0398
12	Aluminum Alloy Sheet, 0.100 inch thick, 2024-T3	QQ-A-250/5 (81348)	9535-00-288-4675

Table 2-2. Structural Repair Materials (cont)

ITEM NO.	DESCRIPTION	REF. NO. AND FSCM	NSN
12.1	Aluminum Alloy Sheet, 0.040 inch thick, 2024-TO	QQ-A-250/5 (81348)	9535-00-167-2267
13	Aluminum Alloy Sheet, 0.020 inch thick, 5052-H32	QQ-A-250/8 (81348)	9535-00-242-8598
14	Aluminum Alloy Sheet, 0.025 inch thick, 5052-H34	QQ-A-250/8 (81348)	9535-00-832-1868
15	Aluminum Alloy Sheet, 0.040 inch thick, 5052-H32	QQ-A-250/8 (81348)	9535-00-232-6864
16	Aluminum Alloy Sheet, 0.025 inch thick, 6061-T6	QQ-A-250/11 (81348)	9535-00-250-6502
17	Aluminum Alloy Sheet, 0.032 inch thick, 6061-T6	QQ-A-250/11 (81348)	9535-00-085-4133
18	Aluminum Alloy Sheet, 0.010 inch thick, 7075-T6	QQ-A-250/13 (81348)	
19	Aluminum Alloy Sheet, 0.012 inch thick, 7075-T6	QQ-A-250/13 (81348)	9535-00-236-7091
20	Aluminum Alloy Sheet, 0.016 inch thick, 7075-T6	QQ-A-250/13 (81348)	9535-00-084-4438
21	Aluminum Alloy Sheet, 0.020 inch thick, 7075-T6	QQ-A-250/13 (81348)	9535-00-086-9808
22	Aluminum Alloy Sheet, 0.025 inch thick, 7075-T6	QQ-A-250/13 (81348)	9535-00-086-9864
23	Aluminum Alloy Sheet, 0.032 inch thick, 7075-T6	QQ-A-250/13 (81348)	9535-00-249-5811
24	Aluminum Alloy Sheet, 0.040 inch thick, 7075-T6	QQ-A-250/13 (81348)	9535-00-084-4581
25	Aluminum Alloy Sheet, 0.050 inch thick, 7075-T6	QQ-A-250/13 (81348)	9535-00-086-9465
26	Aluminum Alloy Sheet, 0.063 inch thick, 7075-T6	QQ-A-250/13 (81348)	9535-00-088-6599
27	Aluminum Alloy Tubing (4" Dia.) 0.083 thickness, 2024-T3	QQ-A-300-3B	

Table 2-2. Structural Repair Materials (cont)

ITEM NO.	DESCRIPTION	REF. NO. AND FSCM	NSN
28	Magnesium Alloy	AMS4350	
29	Rivet, Blind, Flush Head	CR2263-4-1 (11815)	
30	Rivet, Blind, Flush Head	CR2248-4 (11815)	
31	Rivet, Blind, Flush Head	CR2248-6-3	5320-00-916-9534
32	Rivet, Universal	CR2249-6-3 (11815)	5320-00-779-0300
33	Rivet, Blind, Flush Head, Monel Sleeve and Inconel Nickle Spindle	NAS1739MW5 (80205)	
34	Rivet, Blind, Protruding Head	NAS1738B-4 (80205)	
35	Rivet, Blind, Protruding Head	NAS173SB-5 (80205)	
36	Rivet, Blind, Protruding Head	NAS1738B-6 (80205)	
37	Rivet, Blind, Protruding Head, Locked Spindle	NAS1398-6 (80205)	
38	Rivet, Blind, Structural Pull. Stem, Protruding Head	MS20600BK-1 (80205)	
39	Rivet, Blind, Structural Pull, Stem, Protruding Head	MS20600-B4-W1 (80205)	5320-00-582-3273
40	Rivet, Blind, Structural Pull, Stem, Protruding Head	MS20600M6 (80205)	
41	Rivet, Blind, Universal Head	CR2249-3 (11815)	
42	Rivet, Blind, Universal Head	CR2249-4-1 (11815)	5320-00-866-6114
43	Rivet, Blind, Universal Head	CR2249-4-5 (11815)	5320-00-349-5132

Table 2-2. Structural Repair Materials (cont)

ITEM NO.	DESCRIPTION	REF. NO. AND FSCM	NSN
44	Rivet, Blind, Universal Heed	CR2249-6-3 (11815)	5320-00-779-0300
45	Rivet, Hi-Lok	HL2086W-5 (73197)	
46	Rivet, Hi-Lok	HL2086W-6 (73197)	
47	Rivet, Solid, Aluminum Alloy, Flat Head	MS20426AD3 (80205)	
48	Rivet, Solid, Aluminum Alloy Flat Head	MS20426AD4 (80205)	5320-00-117-6948
49	Rivet, Solid, Aluminum Alloy, Flat Head	MS20426AD5 (80205)	
50	Rivet, Solid, Aluminum Alloy, Flat Head	MS20426DD4 (80205)	
51	Rivet, Solid, Aluminum Alloy, Universal Head	MS20470AD3 (80205)	
52	Rivet, Solid, Aluminum Alloy, Universal Head	MS20470-AD4 (80205)	
53	Rivet, Solid, Aluminum Alloy, Universal Head	MS20470-AD5 (80205)	
54	Rivet, Solid, Aluminum Alloy, Universal Head	MS20470-DD6 (80205)	
55	Rivet, Solid, Universal Head	MS20615-3M3 (80205)	
56	Rivet, Solid, Universal Head	MS20615-3M4 (80205)	
57	Rubber, Type II, Grade A soft, 0.125 x 0.190	MIL-R-6130	
58	Rivnut P/N 2R1393		
59	Steel Sheet, Stainless, 0.016 inch thick	MIL-S-5059A	

Table 2-2. Structural Repair Materials (Cont)

ITEM NO.	DESCRIPTION	REF. NO. AND FSCM	NSN
60	Steel Sheet, 0.032 inch thick, N-155	AMS5532	
61	Steel Sheet, 0.063 inch thick, 4130 COND-N	MIL-S-18729	
61.1	Titanium Alloy, 80.000 PSI, 0.020 inch thick	MIL-T-9046 Type I, Comp B	
61.2	Titanium Alloy, 0.020 inch thick	MIL-T-9046 Type I, Comp B	
61.3	Titanium Alloy, 0.050 inch thick	MIL-T-9046 Type I, Comp B	
61.4	Titanium Alloy, 0.070 inch thick	MIL-T-9046 Type I, Comp B	
62	Titanium	MIL-T-9046 Type I, Comp. C	

(2) Pitting Corrosion. The most common effect of corrosion on aluminum and magnesium alloys is called pitting. It is first noticeable as a white or gray powdery deposit, similar to dust, which blotches the surface. When the deposit is cleaned away, thin pits or holes can be seen in the surface, Pitting corrosion may also occur in other types of metal alloys.

(3) Intergranular Corrosion. This type of corrosion is selective and attacks along the grain boundries of metal alloys. Aluminum alloys which contain appreciable amounts of copper and zinc and some stainless steels are vulnerable to intergranular corrosion. Piano hinges are an example of aluminum extrusions which are vulnerable. Lack of uniformity in the a the alloy structure caused by heat treating procedures or localized overheating, such as from fire damage, may result in intergranular corrosion. This corrosion may exist without visible evidence on exterior surfaces and serious structural weakening may occur without detection. In cases of intergranular corrosion, it is almost impossible to be sure all corrosion has been removed except through metallurgical examination.

(4) Exfoliation Corrosion. Exfoliation is a form of intergranular corrosion. It shows itself by lifting up the surface grains of a metal by the force of expanding corrosion products occuring at the grain boundaries just below the surface. It is visible evidence of intergranular corrosion. It is most often seen on extruded sections where grain thicknesses are usually less than in rolled forms.

(5) Galvanic Corrosion. Galvanic corrosion occurs when dissimilar metals are in contact and an external circuit is provided by the presence of a buildup of corrosion at the joint between the metals. For example, aluminum and magnesium skins riveted together form a galvanic couple if moisture and contaminations are present. When aluminum pieces are attached with steel bolts or screws, galvanic corrosion can occur between the aluminum and the steel.

(6) Stress Corrosion Cracking. Stress corrosion cracking is caused by the simultaneous effects of tensile stress and corrosion. Stress may be internal or applied. Internal stresses are produced by nonuniform deformation during cold working, by unequal cooling from high temperatures, and by internal structural rearrangement involving volume changes. Stresses induced when apiece is deformed, those induced by press and shrink fits, and those in rivets and bolts are internal stresses.

(7) Fatigue Corrosion. Fatigue corrosion is a special case of stress corrosion caused by the combined effects of cyclic stress and corrosion. No metal is immune to some reduction of its resistance to cyclic stressing if the metal is in a corrosive environment. Damage from fatigue corrosion is greater than the sum of the damage from both cyclic stresses and corrosion.

(a) Fatigue corrosion failure occurs in two stages. During the first stage, the combined action of corrosion and cyclic stresses damages the metal by pitting and cracking to such a degree that fracture by cyclic stressing will ultimately occur, even if the corrosive environment is completely removed. The second stage is essentially a fatigue stage in which failure proceeds by propagation of the crack and is controlled primarily by stress concentration effects and the physical properties of the metal.

(b) Fracture of a metal part due to fatigue corrosion generally occurs at a stress far below the fatigue limit in laboratory test, though the amount of corrosion is very small. For this reason, protection of all parts subject to alternating stress is particularly important when practical, even in environments that are only mildly corrosive.

(8) Fretting Corrosion. This type of corrosive attack develops when two heavily loaded surfaces in contact with each other are subject to slight vibratory motion. The rubbing contact removes small particles of virgin metal from surface. These particles will usually oxidize to form abrasive materials. The continuing motion prevents formation of any protective oxide film, and in conjunction with the abrasive formed, creates a prime area of further corrosion to occur. Fretting is evident at an early stage by surface discoloration and the presence of corrosion products in any lubricant present. Continued fretting will ruin bearing surfaces, destroy critical dimensions, and may be serious enough to eventually cause cracking and fatigue failure. Fretting may be controlled by preventing slippage of two surfaces or by lubricating the surfaces.

c. Surface Maintenance.

(1) Helicopter External Surfaces. The helicopter should be cleaned as often as necessary to keep surface free of salt, soil, and other corrosive deposits. The term “clean” means to do the best job possible using the materials and facilities available. A wipe down with water or oil soaked cloth is better than no cleaning at all. The importance of frequent cleaning when operating in coastal areas cannot be overemphasized. The cleaning procedure used should be the mildest method which will produce the desired results. For example, steam cleaning is a very effective soil and grease remover, but it also may erode paint and damage electrical insulation. In the following instructions a specific cleaning method is outlined. Refer to cleaning chart, figure 2-6 and TM 55-1500-204-25/1.

(2) Fuselage and Tailboom. Clean the painted areas of the helicopter fuselage and tailboom as indicated in the cleaning chart, figure 2-6.

(3) Helicopter Interior Surfaces. Clean the cabin compartment, engine compartment, fuselage compartment, beneath the engine, and the tailboom with materials indicated on the cleaning chart, figure 2-6.

(4) Clear Plastic Surfaces. Clean clear plastic surfaces, where polishing for scratch removal is not required, as follows:

CAUTION

Remove rings or any object from the hands which might scratch the plastic surface.

(a) Flush plastic with fresh water, using the bare hand to dislodge dirt and solid particles.

(b) Wash with mild soap (C113) and water solution. Be sure that the solution is free of abrasive material. Go over the surface with the bare hand to detect any abrasive material.

(c) Dry with a clean damp chamois or soft clean cloth. Do not continue rubbing after plastic is dry.

CAUTION

Do not rub plastic with a dry cloth. This builds up an electrostatic charge which attracts dust particles to the surface.

CLASSIFICATION OF SURFACES

CLASSIFICATION OF SOILS	Fuselage and Tail Boom	Rotor Blades Main and Tail	Aluminum	Magnesium	Steel	Plastics Clear	Rubber	Fabric	Helicopter Interior Surfaces
Grease	1, 3, 4, 5, 10, 7	1, 3, 4, 5,7,8,10	1, 2, 4, 5, 10, 7	1, 2, 4, 5, 10, 7	1, 2, 4, 5, 10, 7	5, 6 + 11	5, 6	4, 5, 8	3, 4, 5 6, 7
Oil	1, 3, 4 5, 10, 7	1, 3, 4 5,7,8,10	1, 2, 4 5, 10, 7	1, 2, 4 5, 10, 7	1, 2, 4 5, 7, 10	5, 6 + 11	5, 6	4, 5, 8	3, 4, 5, 6, 7
Preservation Compounds	1, 3	1, 3, 8	1, 2, 4	1, 2, 4	1, 2, 4				
Waxes	1, 3, 10	1, 3, 8 10	1, 2, 10	1, 2, 10	1, 2, 10	5, 6 + 11			
Carbon	1, 18	1, 8	1, 18	1, 18	1				
Combustion Products	1, 18	1, 8	1, 18	1, 18	1				
Gun Combustion	1, 18	1, 8	1, 18	1,18	1				
Mud	1, 3, 4 5, 6, 7	1, 3, 4 5, 6, 7	1, 3, 4 5, 6, 7	1, 4, 5 7	1, 2, 4, 5	5, 6 + 11	5, 6	4,5,8	3, 4, 5 6, 9, 7
Sand	1, 3, 4 5, 6, 7	1, 3, 4 5, 6, 7	1, 2, 3, 4 5, 6, 7	1, 2, 4, 5, 7	1, 2, 4 5, 7	5, 6 + 11	5, 6	4, 5,8	9
Operational Film	1, 3, 4 5, 7, 10	1, 3, 4 5,7,8,10	1, 2 13,7	1, 2, 4, 5, 7	1, 2, 4 5, 7	5, 6 + 11	5, 6		
Industrial Film	1, 3, 4 5, 11	1, 3, 4 5, 8, 10	1, 2, 11 + 13	1, 2, 4, 5, 10	1, 2, 4, 5, 10	5, 6 + 13	5, 6		
Internal Soils	1, 3, 4, 5 6, 9, 16		3, 4, 5 6, 7	3, 4, 5 6, 7	4, 5	6		3, 4, 5, 8	3, 4, 5 6, 9, 16
Battery Acids	14, 15, 6	6, 14, 15	15,14,6	14, 6	14, 15 + 6				
Paint Removal	3, + 6 18,22,24	3, 6 22,24	2, 3, + 6 18,22,24	2,3, + 6 18,22,24	2,3, + 6 18,22,24		2,3, + 6 19		
Corrosion-Aluminum	12,25 6	25 6	12, 25 6						
Corrosion-Magnesium	12, 25 6			12, 25 6					
Corrosion-Steel	23, 4 20 + 6				23, 4, 20, + 6				
Salt Deposits	1, 3, 4 5, 6, 7,10	1, 3, 4 5,6,7,10	1, 2, 3, 4, 12	1, 2, 3, 4, 15	13, 12 + 6		5, 6	4, 5, 8	

ACCEPTABLE CLEANERS

Item No. Materials

1. Solvent Emulsion Clng. (P-C444A)
2. Steam Cleaning (P-C-437A)
3. Detergent (MIL-C-25768)
4. Solvent Wipe Down (P-D-680)
5. Soap Hand Wash (P-S-577A)
6. Fresh Water Scrub
7. Water Emulsion Clng. (MIL-C-43616)
8. Naphtha-Aliphatic (TT-N-95-2)
9. Vacuum Cleaning
10. Waterless Cleaner (Mil-C-22550)
11. Plastic Cleaner
12. Skin Brightener (Mil-C-5410)
13. Skin Aluminum polish (Mil-P-6888)
14. Ammonium Hydroxide (O-A-451)
15. Chromic Acid (O-C-303)
16. Disinfectant Cleaners
17. Polish & Wax (Mil-W-18723)
18. Paint Stripper (Mil-R-25134)
19. Paint Stripper (Mil-R-18553)
20. Abras., Buffing Cmpd. Alum. Oxide (325 Grit)
21. Corrosion Remover (Mil-C-5410)
22. Lacquer Thinner Wipedown (TT-T 266)
23. Pumice, Ground (SS-P-821) Grade FF
24. Epoxy Paint Remover (Alkline Type) (MIL-R-81294)
25. Abrasive Sandpaper (Silicon Carbide)

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NOTES :

1. Numbers shown in blocks indicate acceptable cleaners as itemized.
2. Non-specular painted surfaces shall not be polished or waxed.

CLEANING CHART

CAUTION

Main rotor blade data on this figure applies to BHT 540 main rotor blades only.
Clean K747 main rotor blades only in accordance with paragraph 5-28.

Figure 2-6. Cleaning Chart

(d) Clean plastic with an approved cleaner (C32).

NOTE

If cleaner is not available, rinse with clear water, in a shaded area if possible, to prevent water spotting.

d. Corrosion Removal and Treatment.

WARNING

Paint strippers are highly toxic. Use in well ventilated area and avoid skin contact by use of protective clothing and appropriate eye protection. If stripper comes in contact with skin or eyes, promptly flush with water and seek medical attention.

CAUTION

Corrosion removal must be complete. Failure to remove all corrosion allows corrosion to continue even after cleaning and refinishing. All surfaces to be treated must be clean, unpainted, and free from oil and grease. Care must be taken not to exceed the limits of corrosion removal established for a particular part.

(1) Clean aluminum parts which are corroded in accordance with figure 2-6. Treat and refinish anodized and painted aluminum parts as indicated in the following steps. Anodized aluminum parts have been treated to form a supplemental film of aluminum oxide on the surface of the part. When processing anodized surfaces, avoid unnecessary destruction of the oxide film.

CAUTION

Use of steel wool, steel wire brushes, or severe abrasive materials is prohibited on any aluminum surface.

(a) Brush paint remover (C96) on area to be stripped. Allow remover to remain on surface for a sufficient length of time for paint to loosen (do not allow remover to dry on surface). Scrub the area with a bristle brush, wet with paint remover, to loosen any paint still adhering to the metal. Repeat as required until all paint is removed.

(b) Flush paint remover from area with fresh water and a long handle brush. Remove any residual paint with a non-metallic scraper. Remove masking materials and thoroughly rinse area.

(c) Clean stains and lightly corroded areas with cleaning compound (C34). Use aluminum wool, aluminum wire brushes, or stiff fiber brushes to clean more severely corroded areas.

WARNING

Acid is extremely dangerous. Avoid contact with skin or clothing. Avoid breathing fumes. Rubber gloves should be used when handling and applying any acid solution.

(d) Treat corroded areas with a solution of 10 percent chromic acid (C1), to which 20 drops of lead acid battery electrolyte per gallon has been added. Apply the solution with a bristle brush and scrub to ensure penetration to the bottom of any pits. Allow solution to remain in place 5 to 20 minutes then rinse or wipe off with a damp cloth. Alcoholic phosphoric acid (C19) may be used as an alternate for the chromic acid solution.

(e) Wipe the area dry with a clean cloth and inspect with a magnifying glass to ensure that all corrosion has been removed and that the corrosion damage limits have not been exceeded.

(f) Smooth all rough edges with a burnishing tool or an aluminum oxide impregnated rubber wheel.

(g) When skin seams and other places subject to water leakage are involved seal with sealant (C105). Use zinc chromate putty (C93) as an alternate material in small areas if necessary.

(h) Repaint the area.

NOTE

Protect surrounding areas from overspray with paper and masking tape. In addition, ensure that an in-line water separator is in the compressed air line to the spray equipment.

(2) Steel parts which are corroded should be cleaned and treated as follows:

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

CAUTION

Methods used for corrosion removal on highly stressed parts shall not be used, if the method results in scratches or overheating of the part.

(a) Clean affected area with solvent (C112).

(b) Remove rust corrosion with abrasive cloth (C36). Refer to cleaning chart, figure 2-6. Remove abrasive residue.

(c) Apply alcoholic phosphoric acid solution (C19) to affected area.

(d) Rinse and dry.

(e) After drying, restore protective coating of primer and paint or corrosion preventive compound. Refer to TM 55-1500-345-23.

(f) If the part was originally protected only by cadmium plate (example main rotor mast or controls above transmission) apply primer (C88 or C91) and two coats of aluminized lacquer. Aluminized lacquer is one gallon of clear lacquer (C71) mixed with 12 ounces of aluminum pigment (C84).

(3) Magnesium Touch-Up.

(a) Clean affected area. Refer to cleaning chart, figure 2-6.

(b) Remove light corrosion products with abrasive pads (C82). Heavy corrosion may be removed by hand scraping with a suitable carbide tipped scraper.

CAUTION

Do not use carbon steel brush or carbon steel wool on magnesium surfaces. Tiny dissimilar metal particles will become embedded in the metal, causing further corrosion and subsequent damage to equipment.

(c) After all visible corrosion has been removed, additional material must be removed to ensure that no corrosion products remain. The procedure is to remove twice the depth of the corrosion. The surface of the repaired area should blend smoothly and evenly with the surrounding original surface so that a saucer shaped depression is formed to eliminate sharp transition and possible stress concentration. It must also be at least as smooth as the original surface.

WARNING

Cleaning solvent is flammable end toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with akin or eyes.

(d) Following corrosion removal, the area should be wiped with a clean damp cloth followed by wiping dry with a clean, dry, lint-free cloth. The area may also be cleaned with MEK (C74) and/or blown dry with oil -free air. The area under treatment should also be kept as clean as possible during repair so as not to allow a build-up of metallic or corrosion particles in the working area.

CAUTION

Never use alcohol or materials containing alcohol on magnesium alloys due to severe corrosion effect.

(e) Treat magnesium alloy by applying corrosion protection in accordance with MIL-M-3171, Type I.

1 Apply solution to affected area with a brush and allow to remain for 1 minute. Add more solution when necessary to keep surface wet. The temperature of the solution must be from **65** degrees to 90 degrees E **(18** degrees to **32** degrees C).

2 Proper application time will be the least time required to produce desired finish color (iridescent or dark brown). Treat surface for at least **30** seconds and not longer than three minutes Excessive time will cause deposits affecting paint adhesion.

3 Wipe off solution with a damp, lint-free cloth, frequently rinsing with clean water. Air dry surface. Drying may be accelerated by use of low pressure clean air or gaseous nitrogen.

NOTE

Parts containing bronze, steel, or cadmium plated inserts may be treated by process in preceding steps 1 through 3.

2-11. FORWARD FUSELAGE ASSEMBLY.

2-12. CLASSIFICATION OF DAMAGE – FORWARD FUSELAGE ASSEMBLY.

Classification of damage and repair limits for the forward fuselage are given on table 2-3.

Table 2-3. Forward Fuselage Classification of Damage

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
1. RIVETS, NUTPLATES, FASTENERS, AND THREADED INSERTS.	Damaged, loose, missing, sheared, or improperly installed.		Replace as required	
2. FORWARD FUSELAGE EXTERIOR SKINS (EXCLUD-ING HONEY-COMB PANELS)	a. Dents	a. Smooth contoured dents, free of cracks or gouges. Depth and diameter not to exceed; Depth Diameter 0.016 IN 1.0 IN 0.047 IN 2.0 IN 0.063 IN 3.0 IN Nicks and scratches in a dent not to exceed 10 percent of material thick-ness after polishing. Dents shall come no closer than 1.0 inch to internal structure and have a minimum of 3.0 inches of undamaged material between dents. NOTE: Dents closer than 1.0 inch are classed as one dent.	a. Damage exceeds negligible limits but does not exceed 25 percent of total area for a single skin panel (including prior repairs). Damage is 6.0 inches minimum from a similar repair and comes no closer than 2.0 inches to support structure.	a. Damage exceeds repairable limits between any two bulkheads. Damage and subsequent repair interferes with supporting structure.

Table 2-3. Forward Fuselage Classification of Damage (cont)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
2. FORWARD FUSELAGE EXTERIOR SKINS (EXCLUD- ING HONEY- COMB PANELS) (Cent)	b. Corrosion	b. Not to exceed 10 percent of material thickness and less than 4.0 square inches after clean up. Damage 1.0 inch minimum from internal structure.	b. Damage exceeds negligible limits. Cleanup shall not exceed 5 percent of skin panel area. and come no closer than 2.0 inch to supporting structure.	b. Damage exceeds repairable damage limits.
	c. Holes, cracks or tears.	c. None	c. Cracks or tears no longer than 25 percent of shortest skin dimension. Holes 3.0 inch max. dia. Cleanup no closer than 2.0 inch to supporting structure and affect no more than 5 percent of skin area.	c. Damage exceeds repairable limits.
	d. Nicks and scratches.	d. No deeper than 10 percent of material thickness and less than 4.0 square inches after cleanup.	d. Same as preceding step c.	d. Damage exceeds repairable limits.
	e. Trapped or stretched skin.	e. Inward or out- ward bulges located in a sectional area, that can be corrected by removing attach- hardware, allow- ing skin to shift. Mismatch of rivet holes shall not exceed that which can be cleaned up by drill- ing and installing one size larger rivet and maintain proper rivet edge distance. However, if condition does not disappear after unloading	e. Creased dents not classified as oil can or stretched skin, not exceeding 26% of a sectional area and no closer than 1.0 inch to a supporting structure. Oil can condition, free of sharp dents or creases and not extending over or into supporting structure, may be repaired by inserting a backup stiffener over the damaged area.	e. Stretched skin, oil cans, or creased dents that cannot be repaired by unloading, insertion repair or back up stiffeners.

Table 2-3. Forward Fuselage Classification of Damage (Cont)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
2. FORWARD FUSELAGE EXTERIOR SKINS (EXCLUDING HONEYCOMB PANELS) (Cont)	e. Trapped or stretched akin (Continued)	panel, area is stretched or oil canned and must be replaced or repaired. Oil canning or stretched condition can be determined by pressing in on a sectional area and that section remains depressed and a bulge appears in that section or adjacent structure.		
3. FORWARD FUSELAGE HONEYCOMB PANELS, INCLUDING BULKHEADS, BEAM PANELS, AND ENGINE DECK	a. Dents	a. Dents smooth contoured dents up to 5 percent of panel thickness provided: 1. Total damage does not exceed 6 percent of panel area. 2. No voids exist under dents.	a. Damage exceeds negligible damage limits. If no cracks, holes, or voids exist, see figure 2-7 for limits. Void limits are shown on figure 2-8. Limits for sharp dent or dents which penetrate panel surfaces are shown on figures 2-9 and 2-10.	a. Damage exceeds repairable limits. Corrosion in honeycomb core.
	b. Voids.	b. Voids up to 0.26 square inch (0.50 x 0.50) provided: 1. No more than two such areas can be encompassed by a 4.0 inch circle. 2. The edge of any void is a minimum of 3.0 inches from supporting structure, panel edge bevel or insert or fitting. NOTE: Voids closer than 1.0 inch are	b. Damage exceeds negligible limits. See figure 2-8.	b. Damage exceeds repairable limits.

Table 2-3. Forward Fuselage Classification of Damage (cont)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
3. FORWARD FUSELAGE HONEY-COMB PANELS IN-CLUDING BULKHEADS BEAM PANELS, AND ENGINE DECK (Cont)	b. Voids. (cont)	classed as one void. Edge separation is never classed as negligible damage.		
	c. Nicks and scratches	c. Nicks and scratches not exceed-ing **10** percent of metal facing thick-ness and **4.0** inches square after cleanup. Damage **1.0** inch minimum form supporting structure after cleanup.	c. Damage exceeds negligible limits. See figure 2-7 for damage not penetrating surface. See figure 2-9 for damage penetrating surface.	c. Damage exceeds repairable limits. Replace any panel having evidence of water or corrosion in the core.
	d. Corrosion.	d. Corrosion no to exceed **10** percent of metal facing thickness and **4.0** square inches after cleanup. Damage minimum **1.0** inch from supporting structure.	d. Damage not to exceed **20** percent of panel area. Maximum diameter of any area after cleanup is **1.0** inch. One repair per bay allowed. Min. distance between repairs is **3.0** inches. No repair within **1.0** inch of supporting structure, inserts, or beveled edge.	d. Same as preceding step c.
	e. Cracks, holes, punctures.	e. None.	e. Cracks, holes or punctures. 1. Damages affect only one skin and core. (See figure 2-9 for limits.) 2. Damages affect both skins and core. (See figure 2-10 for limits.)	e. Same as preceding step c.
	f. Loose or damaged inserts.	f. None.	f. Replace as required.	

Table 2-3. Forward Fuselage Classification of Damage (cont)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
4. **COWLING AND FAIRING ENGINE & TRANS-MISSION.**	a. Dents.	a. Same as Item 2, for exterior skins.	a. Same as Item 2, exterior skins, cracks, or holes in dent.	a. Damage exceeds 25 percent of panel area or repair affects the function and serviceability of cowling.
	b. Cracks, holes, or tears.	b. None.	b. Cracks or tears longer than **25** percent of the shortest dimension of the panel. Holes not to exceed **3.0** inch dia. after cleanup. Total repairs (including prior repairs) not to exceed **25** percent of panel area.	b. Same as dents.
	c. Corrosion.	c. Damage less than 10 percent of material thickness and less than 5 percent of panel area and clear of supporting structure after cleaning and treatment.	c. Damage exceeds negligible less than **20** percent of panel thickness but does not exceed **5** percent of panel area after repair. Cleanup comes no closer than **2.0** inches to supporting structure.	c. Damage exceeds repairable limits or repair affects function and serviceability of cowling.
	d. Damaged screens.	d. None.	d. None.	d. Replace when damaged.
	e. Damaged seals and gaskets,	e. None.	e. Bonding of loose seals or gaskets.	e. Replace when damaged.
5. **AIR INDUCTION BAFFLE ASSEMBLY.**	a. Dents, nicks, and scratches.	a. Dents, nicks, and scratches that do not puncture metal.		
	b. Cracks, tears, and holes.		b. Cracks, tears, and holes can be repaired by patching or insertion using standard aluminum repair procedures in TM 55-1500-204-25/1.	b. Repairs that do not warrant the time expended or repairs that would interfere with attaching parts require replacement of parts.

Table 2-3. Forward Fuselage Classification of Damage (cont)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
5. AIR INDUCTION BAFFLE ASSEMBLY (CONT)	c. Torn or damaged seals or gaskets.			c. Seals and gaskets torn or damaged to the extent that their function is affected must be replaced.
6. FORWARD FIREWALL, AFT FIREWALL AND TAIL ROTOR DRIVESHAFT FIRESHIELD	a. Dents, nicks, and scratches.	a. Dents, nicks, and scratches that do not puncture metal.		
	b. Cracks, tears, and holes.		b. Cracks, tears, and holes can be repaired by patching or insertion using standard titanium repair procedures in TM 55-1500-204-25/1.	Repairs that do not warrant the time expanded or repairs that would interfere with mating parts require replacement of parts.
	c. Torn or damaged seals or gaskets			c. Seals and gaskets torn or damaged to the extent that their function is affected must be replaced.
7. FUSELAGE TAILBOOM ATTACH FITTINGS	a. Nicks, scratches, and gouges.	a. Nicks, scratches, and gouges in fuselage tailboom fitting may be polished out if they do not exceed these limits: (1) Axial damage (parallel to bolt holes) must not exceed 0.020 inch in depth and 0.300 inch in length. (2) Radial damage (normal to bolt axis) must not exceed 0.010 inch in depth or 0.300 inch in length. (3) Nicks, scratches or gouges are not permitted within one diameter of bolt hole.		a. Damage exceeding negligible limits.
	b. Corrosion.			b. No corrosion allowed.

Table 2-3. Forward Fuselage Classification of Damage (cont)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
7. FUSELAGE TAILBOOM ATTACH FITTINGS (Cont)	c. Bolt hole elongation.			c. Inspect tailboom attachment bolt holes in forward fuselage tailboom attach fittings for wear. Maximum diameter permitted for holes IS 0.516 inch.
	d. Cracks.			d. Any cracks in the fuselage fittings (tail-boom attach) or damage exceeding limitations, requires the part to be replaced by next higher maintenance level.
8. FUSELAGE WING FITTINGS	a. Nicks, scratches, and gouges.	a. Nicks, scratches, and gouges on the wing fittings, inboard of BL 14.00, each side, may be polished out provided, they do not exceed 0.025 inch in depth and 0.50 inch in length after cleanup.		a. Damage exceeding negligible limits. Any damage to wing attach lugs outboard of BL 14.00 is cause for replacement.
	b. Worn bushings in wing attachment lugs.			b. Wear exceeding limits in section IV is cause for replacement.
9. BEAM CAPS (PRIMARY STRUC-TURAL CAPS) FORWARD FUSELAGE ASSEMBLY. See fig-ures 2-11 and 2-12	a. Cracks, corrosion dents, holes, tears, nicks and scratches.	None.	Any damage found must be examined and repair recommendations made by qualified engineering authority.	No repairs permitted except with specific approval by engineering authority. Replace damaged beam caps per their instructions.

Table 2-3. Forward Fuselage Classification of Damage (cont)

ITEM	DERECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
10. ENGINE DECK (FORWARD FUSELAGE ASSEMBLY See figure 2-26	a. Cracks b. Corrosion c. Dents d. Holes end tears e. Nicks and scratches f. Buckled or wrinkled.	See figure 2-26.	See figure 2-26.	Authorized repair to the engine deck installation only by qualified engineering authority.
11. M SUP-PRESSOR COWLING MOUNT BRACKETS, ROD END BEARINGS, AND CLEVIS PINS. See figures 2-51 and 2-52.	a. Cracks	a. None	a. None	e. Replace if cracked.
	b. Bracket lug hole elonga-tion.	b. Total out-of round condi-tion does not exceed 0.015 inch. Diame-ter must not exceed 0.323 inch.	b. None	b. Damage exceeds negligible limits.
	c. Loose fasteners.	c. None	c. Replace as required.	
	d. Corrosion.	d. Damage leas than 5 per-cent of mate-rial thick-ness and leas than 5 percent of area.	d. Damage less than 10 percent of thick-ness of area after cleaning with crocus cloth and treatment.	d. Pitting corrosion.
	e. Nicks and scratches.	e. Nicks and scratches less than 0.060 deep 1.0 inch long.	e. Nicks and scratches 0.060 deep and greater than 1.0 inch long. Dress out, polish-zinc	e. Damage exceeds repairable limits.

Table 2-3. Forward Fuselage Classification of Damage (Cont)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
11. M SUP-PRESSOR COWLING MOUNT BRACKETS, ROD END BEARINGS, AND CLEVIS PINS, See figures 2-51 and 2-52 (Cent}	e. Nicks and scratches less then 0.060 deep and less than 1 inch long.		chromate and paint to suit surroundings.	
	f. Bearing for elongation.	f. Less than 0.006 inch TIR.	f. None	f. Damage exceeds negligible limits.
	g. Radial play in bearing.	g. Lass than 0.010 inch.	g. None	g. Damage exceeds negligible limits.
	h. Axial play in bearing.	h. Less than 0.012 inch.	h. None	h. Damage exceeds negligible limits.
	i. Clevis pin worn.	i. Diameter not less than 0.303 inch.	i. None	i. Damage exceeds negligible limits.
12. M SUP-PRESSOR ASSEMBLY– UNFINNED AREAS.	a. Cracks.	a. Cracks in sheet metal surfaces not exceeding one inch and non-triangu-lating.	a. Cracks one to three inches in length-stop drill and weld. Crocks greater than three inches in length - patch and weld.	a. N/A
	b. Holes.	b. No more then 3 holes each less than 5/16 inch diameter.	b. Patch and weld hales greater than 5/16 inch but less than 2 inches diameter.	b. Holes greater than two inch diameter.
	c. Skin dents.	c. Dents with no cracks or gougles: Depth 0.250 inch maximum. Diameter 3.0 inches.	c. Dents in ex-cess of service able limits that can be straight-ened, or cut out and patched.	c. Dents that cannot be restored to serviceable limits

Table 2-3. Forward Fuselage Classification of Damage (Cont)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
13. M SUP-PRESSOR ASSEMBLY—EXTERNAL-LY FINNED ALUMINUM SECTION.	a. Loose rivets.	a. Three loose/missing rivets. No more than two adjacent.	a. If more than three, remove and replace loose rivets and replace missing rivets.	a. N/A.
	b. Skin dents.	b. Dents with no cracks or gouges: Depth 0.250 inch. Diameter 3.0 inches.	b. Dents in excess of serviceable limits that can be straightened.	b. Dents that cannot be restored to serviceable limits.
	c. Skin cracks.	c. Cracks not exceeding one inch in length and non-triangulating.	c. Triangulating cracks and cracks less than four inches in length that can be contained by stop drilling at each end.	c. Damage exceeds repairable limits.
	d. Bent fins.	d. Bent fins covering a total area of less than 12 square inches on the total duct assembly.	d. Bent fins that exceed serviceable limits and can be straightened.	d. N/A.
	e. Loose or missing fin sections.	e. Missing fin sections covering a total area of less than 12 square inches on the duct assembly.	e. Fins separated from duct skin for more than one inch may be cut out to the maximum serviceable limits.	e. Missing fin sections in excess of serviceable limits.
14. M SUP-PRESSOR ASSEMBLY—INTERNALLY FINNED PANEL SECTIONS.	a. Cracks.	a. Cracks not exceeding one inch and non-triangulating.	a. Cracks one to three inches length-stop drill (unlimited). Cracks greater than 3 inches in length - repair by welding 0.50 inch oversize patch over affected area.	a. Limit of three weld repairs per panel.

Table 2-3. Forward Fuselage Classification of Damage (Cont)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
14. M SUPPRESSOR ASSEMBLY— INTERNALLY FINNED PANEL SECTIONS. (CONT)	b. Crushed finned panel inlet or outlet.	b. Crushed length less than two inches.	b. Crushed length greater than two inches - straighten with common hand tools.	b. Areas which cannot be straightened to serviceable limits.
	c. Holes.	c. No more than 3 holes, each less than 5/16 inch diameter.	c. No more than five holes total, each less than one inch diameter. Repair by welding 0.50 inch oversize patch over affected area.	c. Holes greater than one inch diameter or in excess of five holes.
15. M SUPPRESSOR ASSEMBLY— PLUG-STRUT CLIP (OUTER)	a. Cracks in plug strut clip from braze relief hole to outboard edge of clip.	a. One clip per strut may be cracked (maximum four clips cracked). One strut may have both clips cracked while any other strut may have one clip cracked (maximum three clips cracked).	a. Cracks in excess of negligible damage limit must be weld repaired prior to next flight.	a. N/A.
	b. Cracks in plug-strut clip from inboard edge, thru the braze relief hole and continuing to the outboard edge of clip.	b. A maximum of two nonadjacent clips may be cracked.	b. Cracks in excess of negligible damage limit must be weld repaired prior to next flight.	b. N/A.
	c. Cracks in plug-strut clip to plug compound contour panel joint.	c. A maximum of two nonadjacent joints may be effectively cut.	c. Not repairable.	c. Damage in excess of the negligible damage limit.

Table 2-3. Forward Fuselage Classification of Damage (Cont)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
16. SUPPRESSOR ASSEMBLY—CHANNEL AND CLIPS	a. Cracks in channel from braze relief hole to outboard cap.	a. One channel per strut may be cracked (maximum of four channels cracked). One strut may have both channels cracked while any two of the remaining (non-adjacent) channels may be cracked (maximum of four channels cracked).	a. Damage in excess of the negligible damage limit must be weld repaired prior to the next flight.	a. N/A.
	b. Cracks in channel from inboard edge through braze relief hole and continuing to the outboard cap.	b. A maximum of two non-adjacent channels may be cracked.	b. Damage in excess of the negligible damage limit must be weld repaired prior to the next flight.	b. N/A.
	c. Cracks along the junction of the channels and the main mount ring.	c. A maximum of two non-adjacent channel junctures may be cracked.	c. Damage in excess of the negligible damage limit must be weld repaired prior to the next flight.	c. N/A.
17. SUPPRESSOR ASSEMBLY-STRUTS (AFT PORTION)	Cracks in the inner or outer skins of the strut internally finned aft portion.	Cracks not exceeding one inch and non-triangulating in any one or all skin surfaces.	Cracks one to three inches in length in not more than one skin per strut, not more than two struts, must be stop drilled prior to next flight.	Damage in excess of repairable damage limit.

Table 2-3. Forward Fuselage Clasification of Damage

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
18. M SUPPRESSOR ASSEMBLY-MAIN MOUNT RING AND BRACKET	Cracks.	Cracks which effectively eliminate any one fastener.	Cracks which effectively eliminate more than one fastener must be patch and weld repaired prior to next flight.	N/A.
19. M SUPPRESSOR ASSEMBLY—PLUG-STRUT CLIP (INNER)	Cracks.	A maximum of two non-adjacent clips may be cracked through. A maximum of four clips may be partially cracked.	Damage in excess of negligible limits shall be weld repaired.	N/A.

2-13. REPAIR – FORWARD FUSELAGE.

Repair of specific areas of the forward fuselage is covered in the following paragraphs. Refer to table 2-3 for classification of damage and limitations.

2-14. REPAIR – SHEET METAL PANELS AND SKINS, FORWARD FUSELAGE.

NOTE

Repair is limited to repair of cracka, holes, scratches, corrosion, and replacement of loose or missing hardware. If damage requires use of jigs and fixtures, repairs must be made by depot maintenance.

a . Replace loose, missing, or cocked rivets if no other structral damage is present.

b. Rapair cracks, holes, and tears less than three inches in length.

(1) Stop drill cracks.

(2) Smooth out edges of holes and tears.

(3) Apply a lay-on patch of like materlal. Install a minimum of four rivets on each side of patch. Refer to TM 55-1500-204-25/1 for standard repair instructions.

c. Repair cracks, holes, and tear a more than three inches in length as follows:

(1) Remove all the damaged skin and fabricate a filler plate of the same material as the skin to match the hole in the skin. Fabricate a backing patch of the same material.

(2) Rivet filler plate and backing patch in place. Refer to TM 55-1500-204-25/1 for standard repair instructions.

d. Repair corrosion damage.

(1) Polish out minor corrosion damage.

(2) Apply chemical film (C31) to bare aluminum surfaces.

(3) Prime repaired area with silicone primer (C89).

(4) Touch up paint to match surrounding area. Refer to TB746-93-2 for paint instructions,

2-15. REPAIR – HONEYCOMB PANELS, FORWARD FUSELAGE.

Repair mechanical damage to fuselage and tailboom fin honeycomb panels as outlined in this paragraph. Damage to honeycomb panels varying from minor dents to penetration completely through the panel is classified as type A, type B, type C, or type D damage. The damage descriptions, damage limits, and repair procedures are shown in figures 2-7 through 2-10. When type A through type D damage is present on a panel and is in the "repair permissible" area as shown on figures 2-13 through 2-26, repair the damage as shown on figures 2-7 through 2-10 as applicable.

a. Accomplish standard patch repair on honeycomb panels.

(1) Use the same materials to fabricate paches that were used in the original construction with the two following exceptions:

(a) Stainless steel sheet (59, table 2-2) 1/4 hard or harder may be used to repair honeycomb panels which have titanium skin.

(b) Other material substitutions can be made when qualified engineering authority approves the substitute material.

(2) Repair damage that is within limits shown on figures 2-13 through 2-26 and figures 2-7 through 2-10. Materials required and repair procedures are shown on the illustrations. The chemicals, adhesives, and compounds required are listed in the consumable materials table (table 1-3). Instructions for using these materials are on the containers.

b. Accomplish repair of edge damage that is within limits as shown on figure 2-13 through 2-26. Comply with the following additional instructions for fiberglass and metal faced panels shown on figures 2-27 through 2-30.

(1) Fiberglass.

(a) Use only fiberglass cloth (C38) 0.010 inch thick when making edge repairs. The repair must equal or exceed the number of plies lost.

(b) Remove all old finish from repair area with varying grades of sandpaper (C102).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(c) Clean sanded area with clean cloth moistened with MEK (C74).

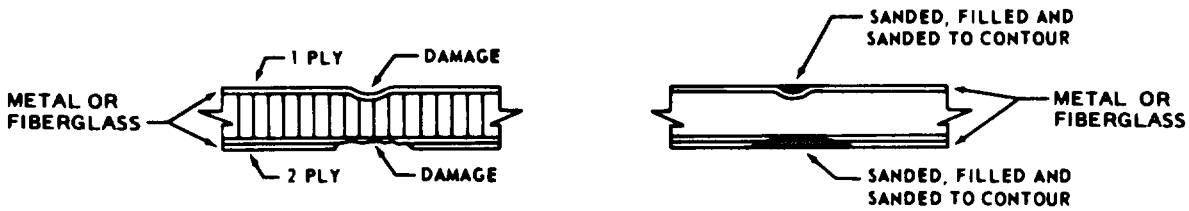
(d) Cut fiberglass cloth (C38) to correct size and saturate with epoxy resin (C98) and apply as a patch.

(e) If multiple layers of fiberglass are required, overlap each successive patch for a minimum distance of one inch.

(2) Metal (aluminum alloy, titanium or stainless steel).

(a) Stainless steel sheet (59, table 2-2) 1/4 hard or harder may be substituted for titanium. Use stainless steel of same thickness as that specified for titanium patch.

(b) The minimum thickness of patches is specified on figures 2-27 through 2-29.



FIBERGLASS OR METAL FACINGS

FIBERGLASS FACED PANELS | **METAL FACED PANELS**

DESCRIPTION

Fiberglass faced panels: Dents, scratches, scars, or erosion in facings with no holes, cracks, or voids.

Metal faced panels: Smooth dents or depressions in the skins with no holes or cracks. (See Type C damage for repairs to penetrating damage.)

LIMITS — REPAIRABLE DAMAGE

Fiberglass faced panels:

1. Maximum depth: 25 percent of panel thickness.
2. Minimum distance from an edge bevel: 0.5 inch.

Metal faced panels:

1. Maximum diameter of damage: 0.50 inch.
2. Maximum depth: 20 percent of panel thickness.
3. Maximum area of all dents combined: 5 percent of panel surface area.
4. Maximum of five dents in a 3.0 square inch area.
5. No voids may be present under the damage.

REPAIR PROCEDURES

Fiberglass faced panels:

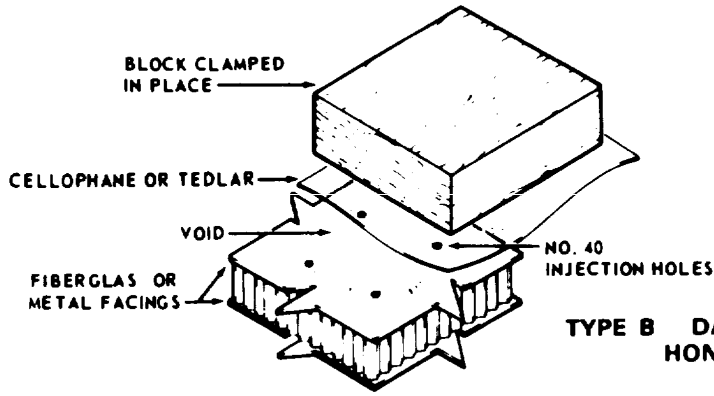
1. Smooth out damaged area by lightly sanding using sandpaper (C102).
2. Clean with MEK (C74) and allow to dry.
3. Brush on smoother (C111) level to contour and allow to cure.
4. When cured, sand smooth and refinish if required with sandpaper (C102).

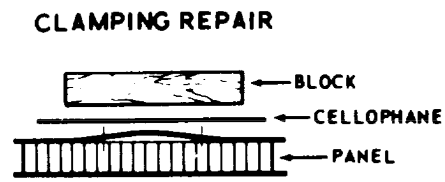
Metal faced panels:

SAME AS FIBERGLASS REPAIR

209030-332A

Figure 2-7. Type A – Damage, Body Panel Repairs





TYPE B DAMAGE LIMITS AND REPAIRS — HONEYCOMB BODY PANELS

DESCRIPTION

Voids between the facings and core and separations between laminations of facings on metal or fiberglass panels.

LIMITS — REPAIRABLE DAMAGE

FIBERGLASS FACED PANELS

1. Maximum area of all damage: 4.0 square inches or 5 percent of panel surface area whether as a single void or combination of separate voids.
2. Maximum length of a void: 4.0 inches in any direction.
3. Damage is not repairable within 0.50 inch of any beveled edge.

METAL FACED PANELS

1. Maximum area of all damage: 5 percent of total area of panel with aluminum or stainless steel skin and 3 percent with titanium skin.
2. Maximum area of single void: 1.5 square inches for aluminum and stainless steel, 1.0 square inch for titanium.
3. Voids within 3.0 inches of any structural member and within 0.50 inch of a beveled edge are not repairable.
4. Maximum length of a void 3.0 inches in any direction for aluminum and stainless steel and 2.5 inches for titanium.

REPAIR PROCEDURES

FIBERGLASS FACED PANELS

1. Drill No. 40 (or smaller) holes around edge of damage a minimum of 1.0 inch apart. Use as many holes as required to ensure complete filling of cavity.
2. Inject epoxy resin (C98) with hypodermic syringe until resin is forced out opposite hole.
3. Cover repair with cellophane and level out by clamping with blocks. Allow to cure.
4. Seal holes with smother (C111).
5. Clean up and smooth with fine sandpaper (C102). Refinish if required.

METAL FACED PANELS

SAME AS FIBERGLASS REPAIR

Except use adhesive (C14) in lieu of (C98) for metal to metal bonding.

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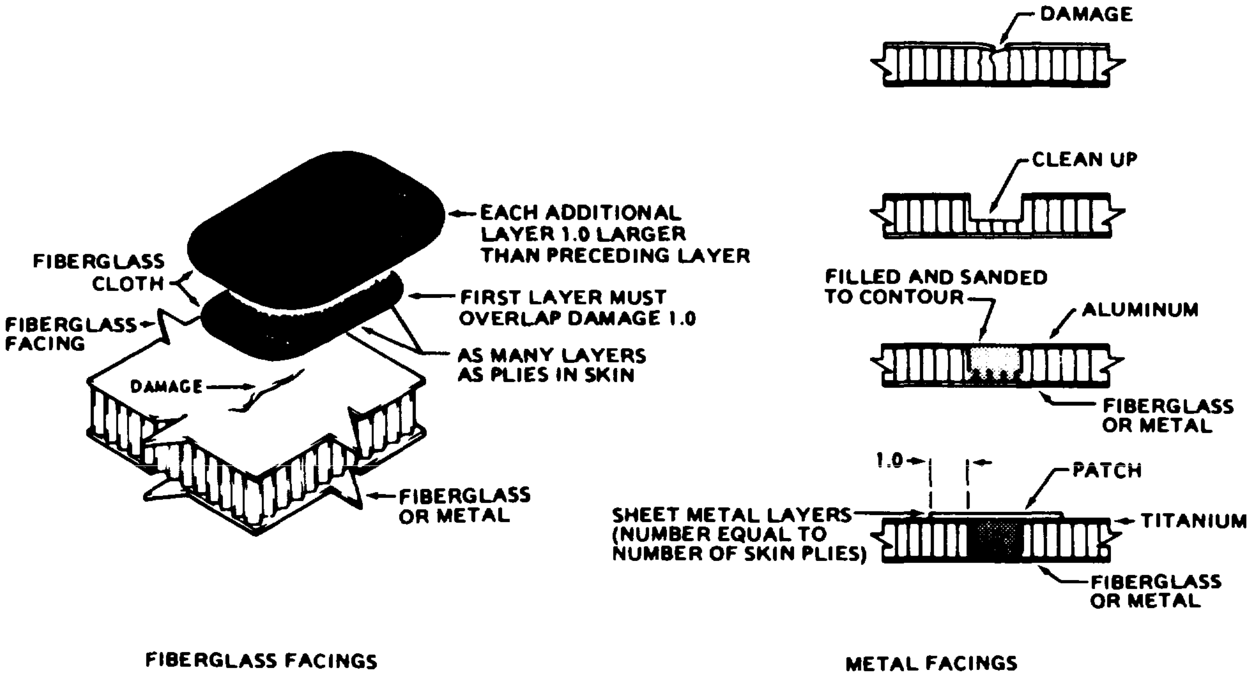
Figure 2-8. Type B – Damage. Body Panel Repairs



ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

DESCRIPTION

FIBERGLASS FACED PANELS

Tears, fractures, and holes through fabric skins with no damage to core. (See Type D damage limits for core damage.)

METAL FACED PANELS

Sharp dents and dents containing holes and cracks but not extending completely through panel. (See Type D for through limits and damage greater than 0.50 inch diameter.)

LIMITS — REPAIRABLE DAMAGE

FIBERGLASS FACED PANELS

1. Maximum area of damage: 9.0 square inches or 5 percent of total panel area whether a single area or combination of separate areas.

METAL FACED PANELS

1. Maximum diameter of hole after clean up: 0.50 inch. (See Type D for damage over 0.50 inch.)
2. Maximum number of repairs per panel: One.
3. Minimum distance from structural member fitting, or insert: 1.0 inch.
4. Minimum distance from beveled edges: 0.50 inch.

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Figure 2-9. Type C – Damage, Body Panel Repairs (Sheet 1 of 2)

REPAIR PROCEDURES

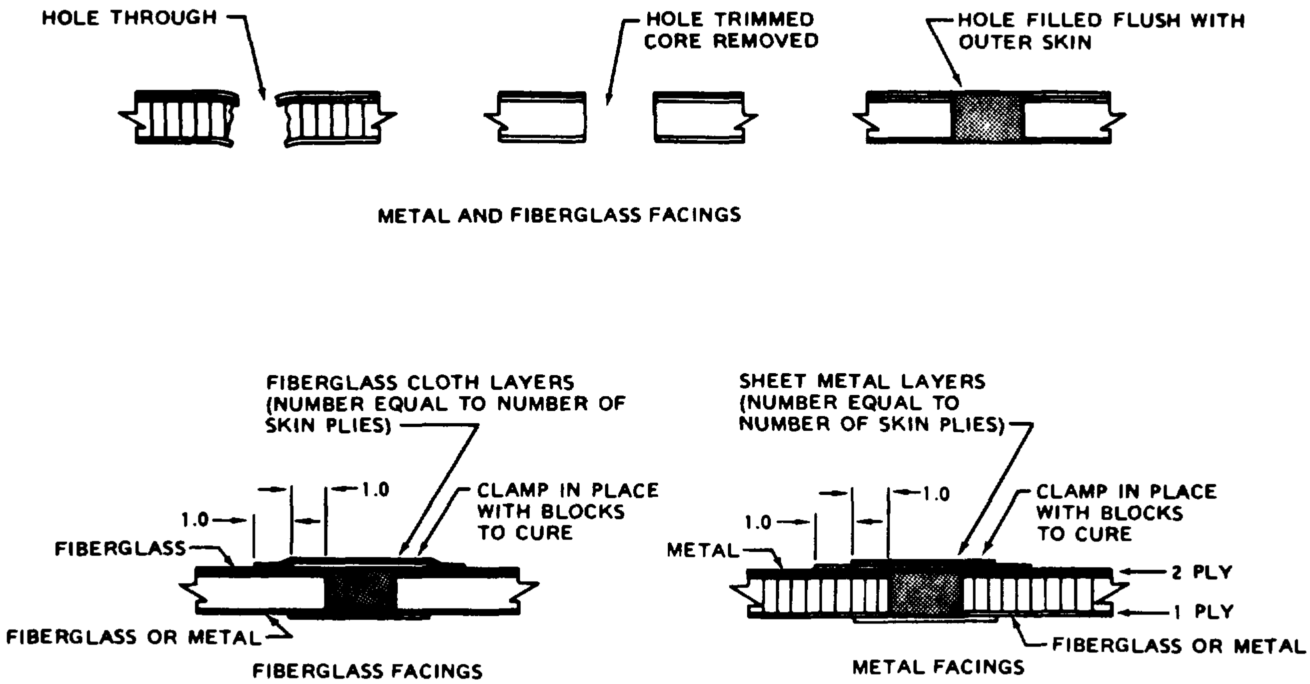
FIBERGLASS FACED PANELS

1. Smooth damaged surface by light sanding with sandpaper (C102).
2. Cut the required number of plies from fiberglass cloth (C38).
3. Saturate each ply with epoxy resin (C98) and place over damage.
4. Cover patch with cellophane (C27). Press down to smooth and allow to cure.
5. If necessary sand repair to smooth out and refinish if required.

METAL FACED PANELS

1. Counterbore area to the diameter and depth required to clean out damage. (Maximum diameter 0.50 inch.)
2. Pack cavity with adhesive (C14) or (C15).
3. Level out flush with skin and cure.
4. Titanium skin only — cut required number of doublers from the same material as the skin.
5. Bevel the edges of doublers on top side.
6. Clean all surfaces with methyl-ethyl-keytone (C83).
7. Apply adhesive (C14) or (C15) and center doublers over damage. Clamp smoothly with blocks and allow to cure. Refinish if required.

Figure 2-9. Type C – Damage, Body Panel Repairs (Sheet 2 of 2)



ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

DESCRIPTION

FIBERGLASS FACED PANELS

Damage penetrating the facings and extending into core. Same limits apply to damage through one skin only and damage completely through panel.

METAL FACED PANELS

Damage penetrating metal skins greater than 0.50 inch diameter, and damage extending completely through panel.

LIMITS — REPAIRABLE DAMAGE

FIBERGLASS FACED PANELS

1. Maximum damaged area after clean up: Total of 9.0 square inches or 5 percent of panel surface area per panel. Applies whether a single area or combination of separate areas.
2. Maximum length of damage: 4.0 inches in any direction.
3. Minimum distance from an edge bevel: 0.50 inch.

METAL FACED PANELS

1. Maximum area of damage after clean up: 4.0 square inches, whether a single area or combination of separate areas.
2. Maximum length: 3.0 inches in any direction.
3. Minimum distance from structural members or other repair: 3.0 inches.
4. Minimum distance from an edge bevel: 0.50 inches.

Figure 2-10. Type D – Damage, Body Panel Repairs (Sheet 1 of 2)

REPAIR PROCEDURES

FIBERGLASS FACED PANELS

1. Clean up damage with counterbore or hole cutter. If damage is limited to one side of panel, counterbore only deep enough for proper cleanup.

2. Pack hole with smoother (C111). Level out flush with surface of panel. Allow to cure.

3. Cut required number of patch layers from fiberglass cloth (C38).

4. Saturate each cloth layer with epoxy resin (C98) and place over damage.

5. Cover patch with cellophane (C27). Press down smoothly and allow to cure.

6. If necessary, sand smooth and refinish using sandpaper (C102).

METAL FACED PANELS

1. Clean up damage with counterbore or hole cutter. If damage is limited to one side of panel, counterbore only deep enough for proper cleanup.

2. Pack cavity with adhesive (C14) or (C15). Smooth flush with surface of panel and allow to cure.

3. Cut required number of doublers from the same material as the skin. Use stainless steel for repairing titanium skin.

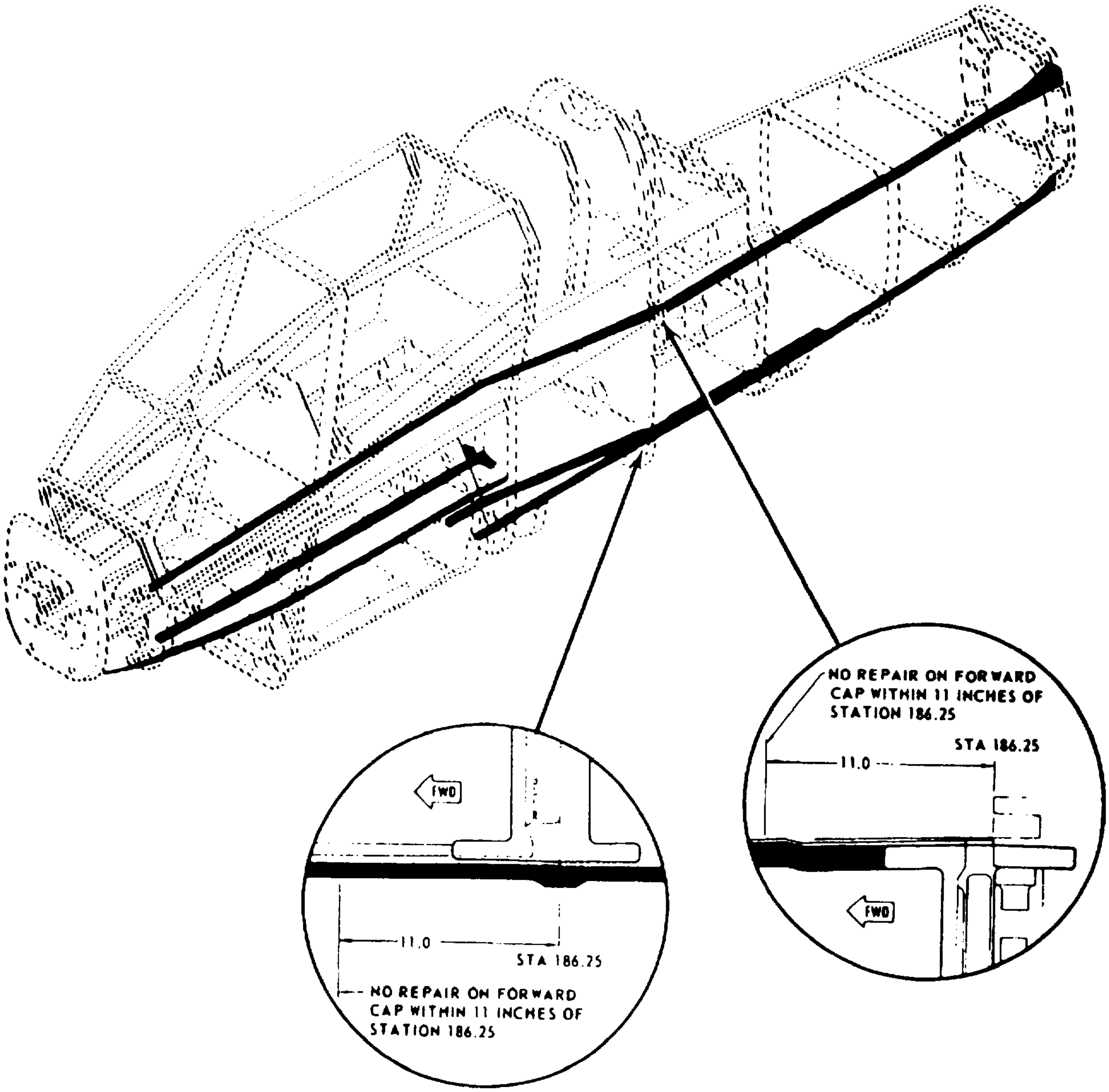
4. Clean all surfaces with MEK (C74).

5. Apply adhesive (C14) or (C15) and center doublers over damage. Clamp smoothly with blocks and allow to cure. Refinish if required.

Figure 2-10. Type D — Damage, Body Panel Repairs (Sheet 2 of 2)

■ Primary structural caps. No repairs permitted except with specific approval by engineering authority.

Refer to TM 55-1500-345-23 for paint instructions.

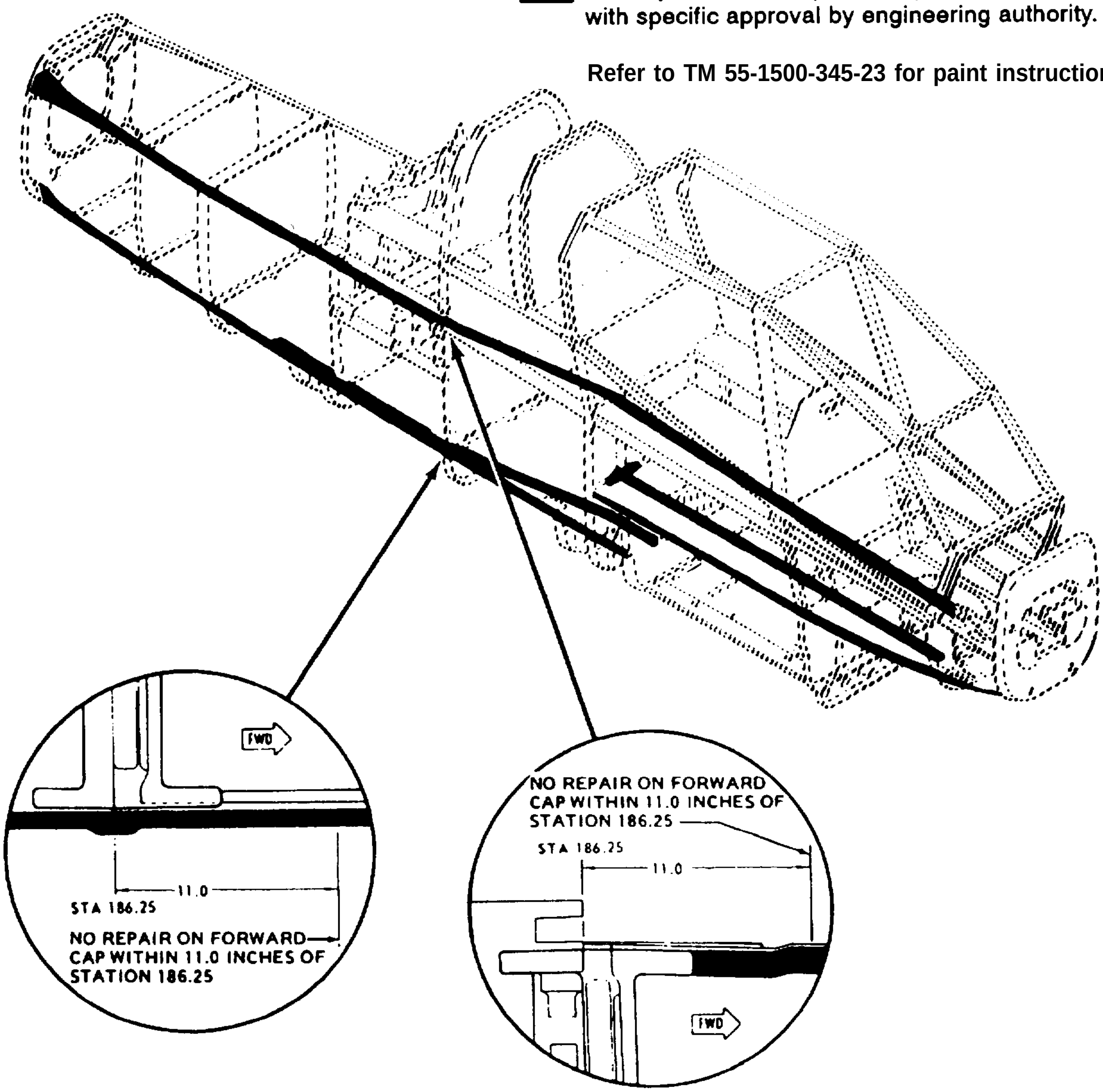


ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

Figure 2-11. Primary Structural Cap — Left Side

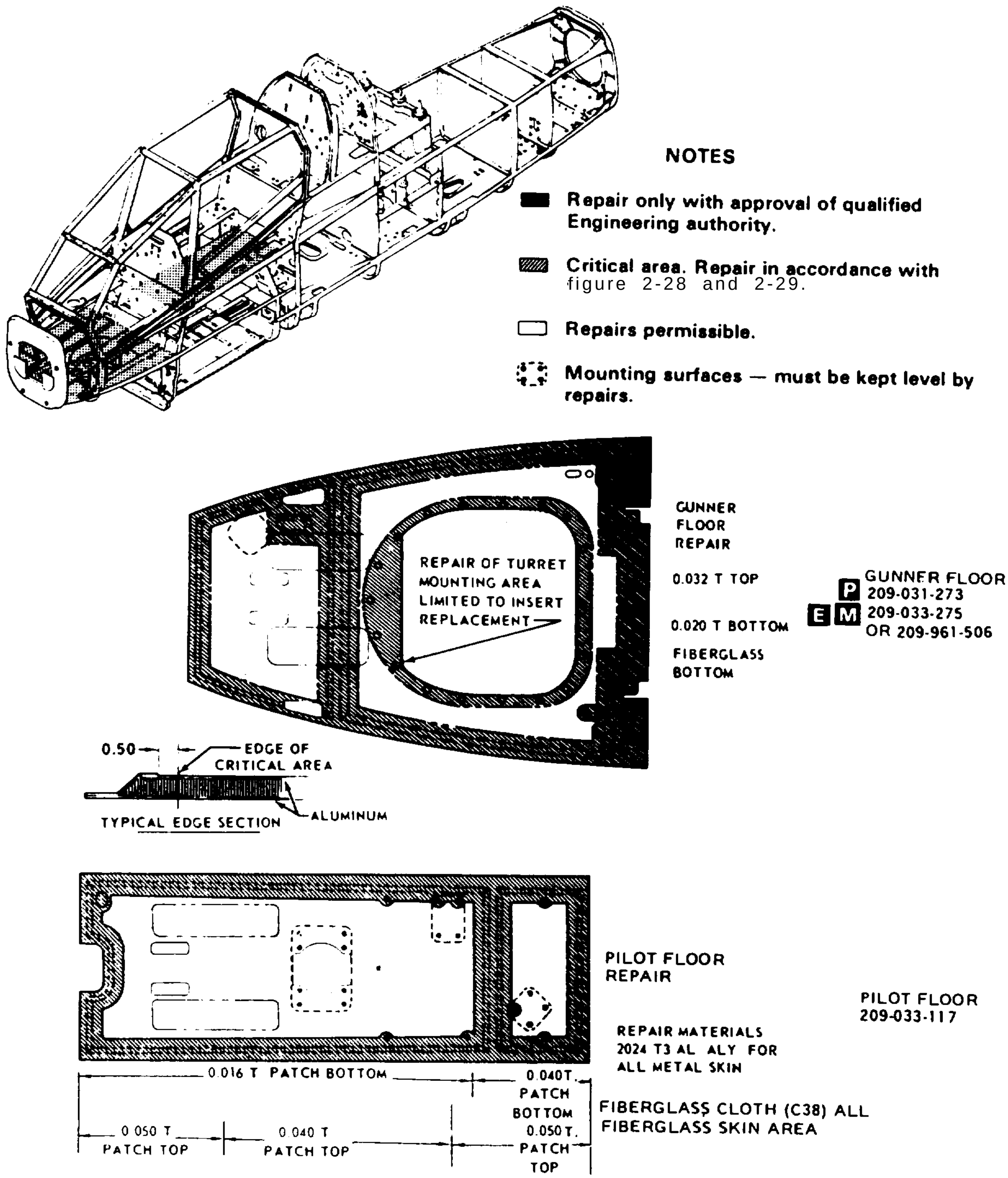
Primary structural caps. No repairs permitted except with specific approval by engineering authority.

Refer to TM 55-1500-345-23 for paint instructions.



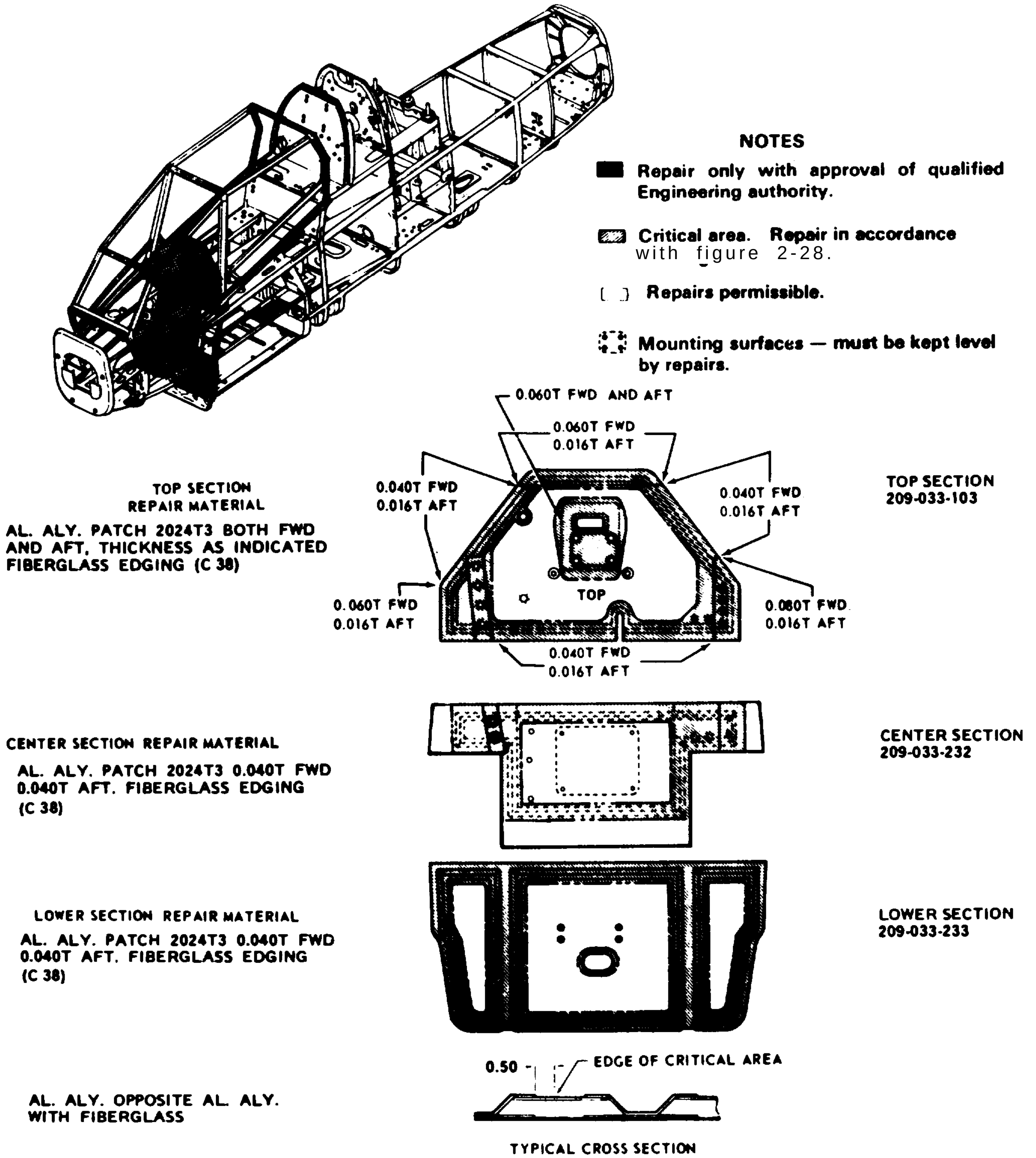
ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

Figure 2-12. Primary Structural Cape — Right Side



ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

Figure 2-13. Pilot and Gunner Floor Panels



NOTE: ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

Figure 2-14. Bulkhead at Station 93.0

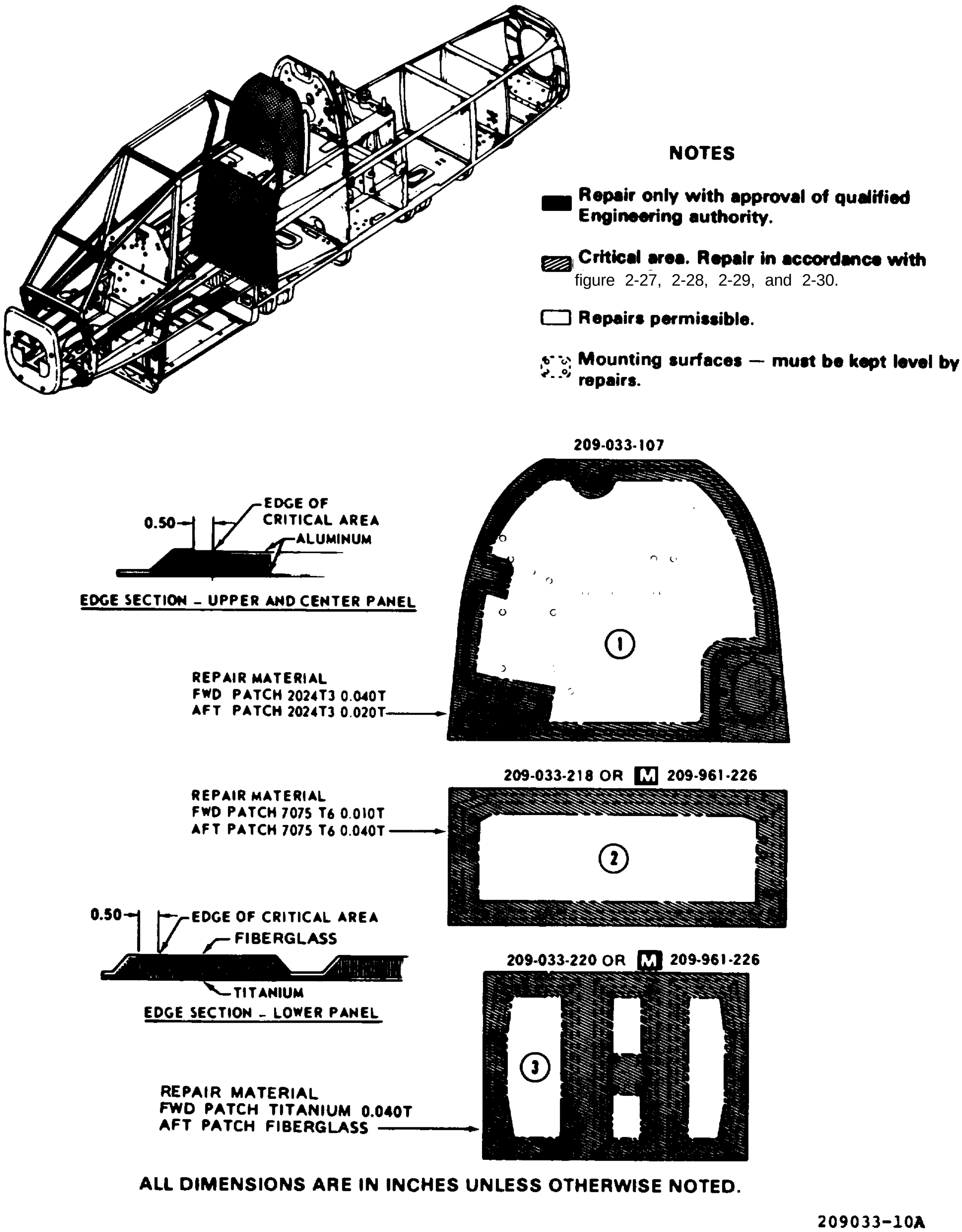


Figure 2-15. Bulkhead at Station 148.5 and 171.61

NOTE

One inch openings will be provided in scuff doubler above leveling points located on ammo floor.

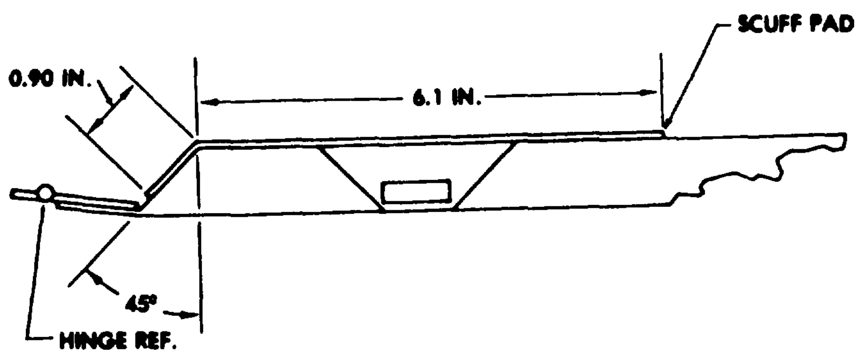


Figure 2-15.1 Ammo Floor Scuff Doubler Installation

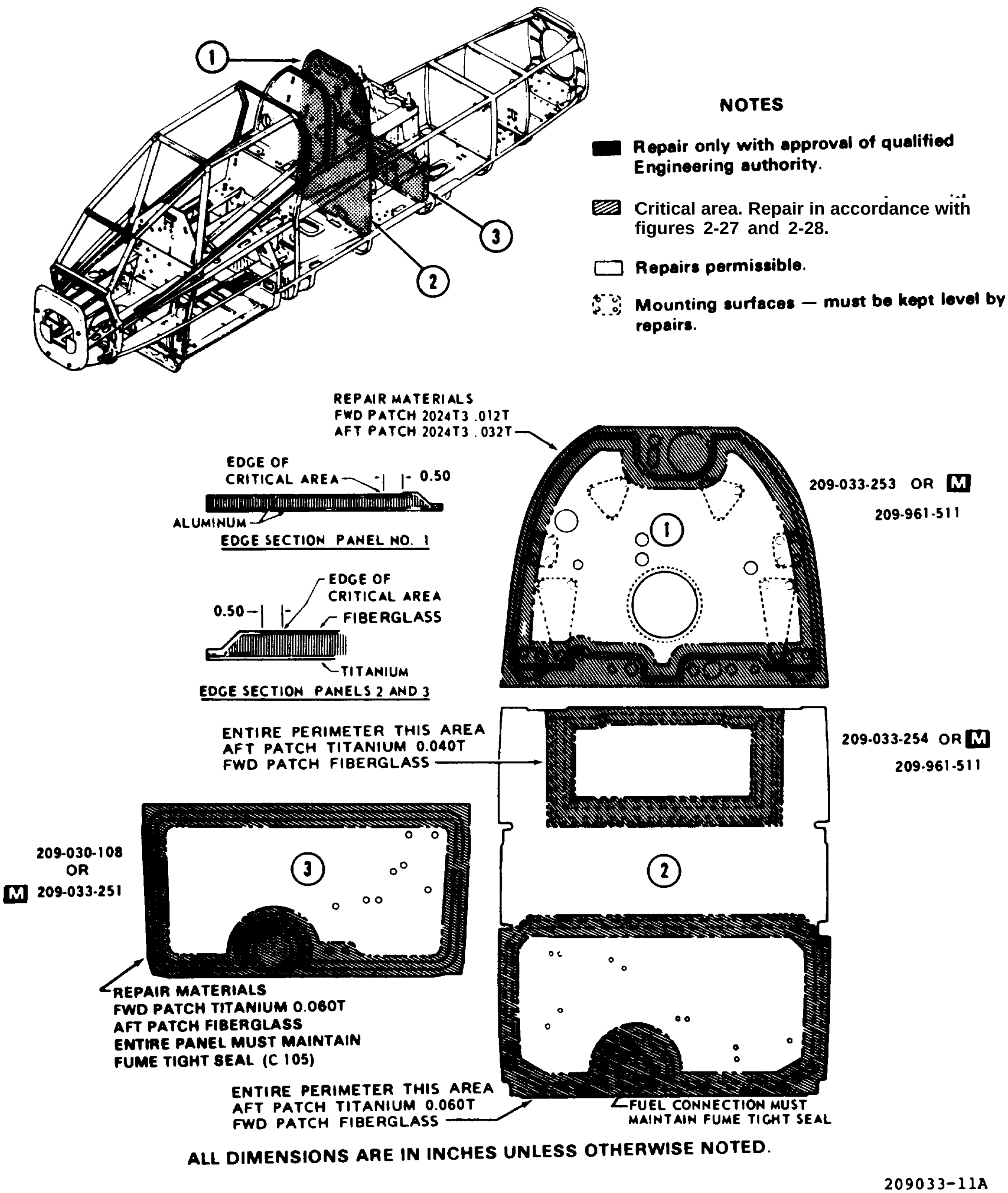
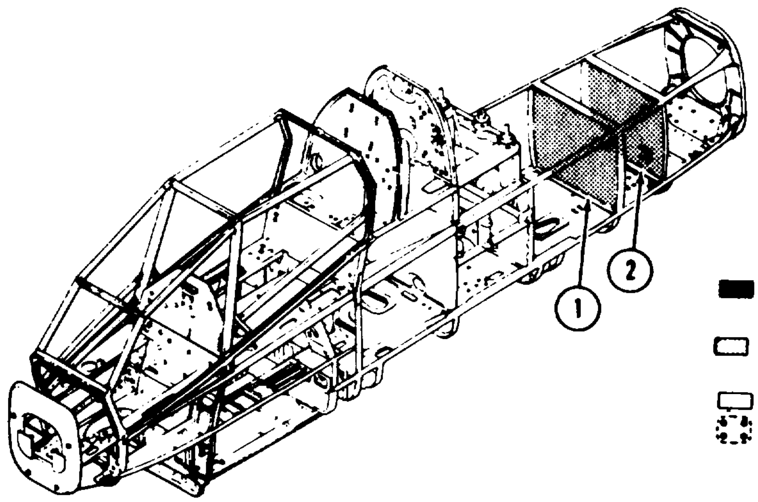
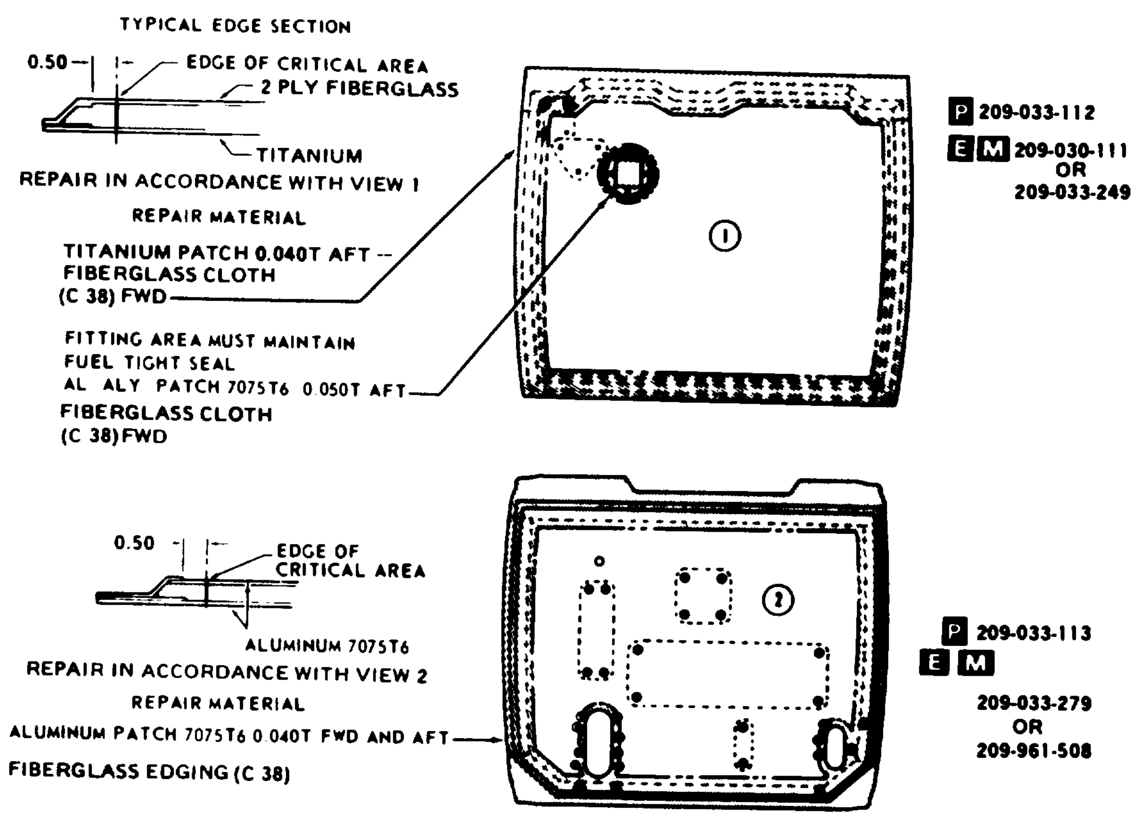


Figure 2-16. Bulkhead at Stations 186.25 and 213.94



NOTES

- Repair only with approval of qualified Engineering authority.
- Critical area. Repair in accordance with figure 2-28 and 2-29.
- Repairs permissible.
- Mounting surfaces — must be kept level by repairs.



ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

209033-12B

Figure 2-17. Bulkhead at Stations 250.0 and 268.5

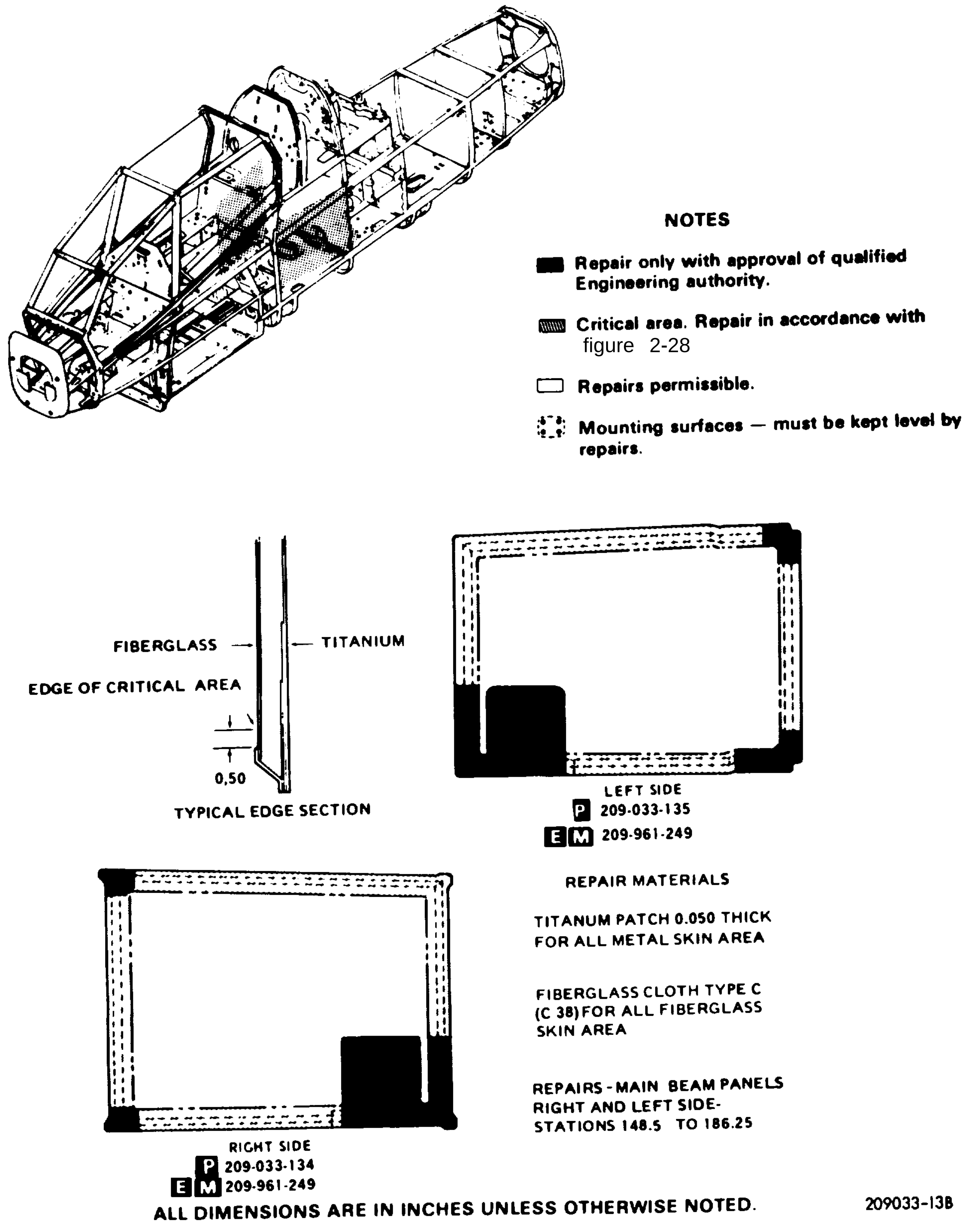
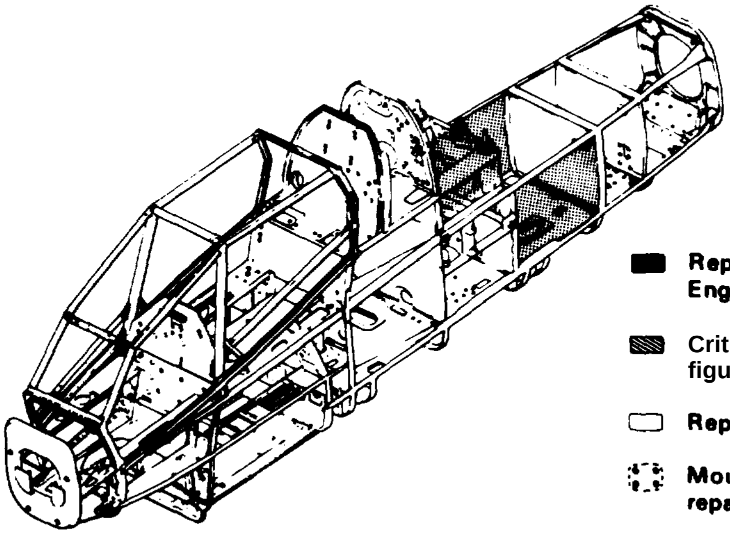
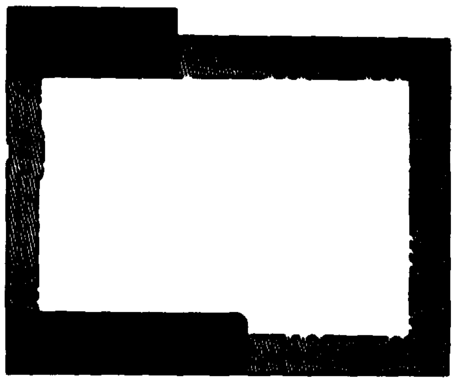


Figure 2-18. R & L Main Beam Panels at Station 148.5 to 186.26

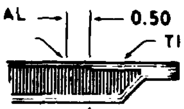


NOTES

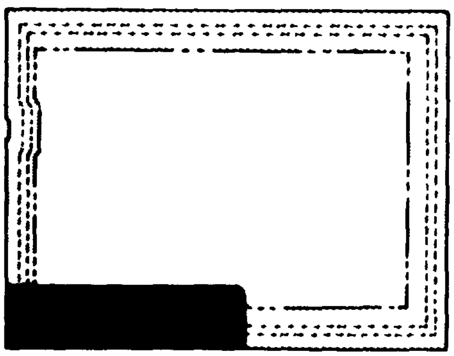
- **Repair only with approval of qualified Engineering authority.**
- Critical area. Repair in accordance with figure 2-27.
- **Repairs permissible.**
- **Mounting surfaces — must be kept level by repairs.**



LEFT SIDE
209-033-129 OR E M 209-030-119



TYPICAL EDGE SECTION



RIGHT SIDE
209-033-128 OR E M 209-030-120

REPAIR MATERIAL

TITANIUM PATCH 0.032 THICK FOR ALL METAL SKIN AREA

FIBERGLASS CLOTH (C 38)FOR ALL FIBERGLASS SKIN AREA

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

209033-14B

Figure 2-19. R & L Main Beam Panels at Station 213.94 to 250.0

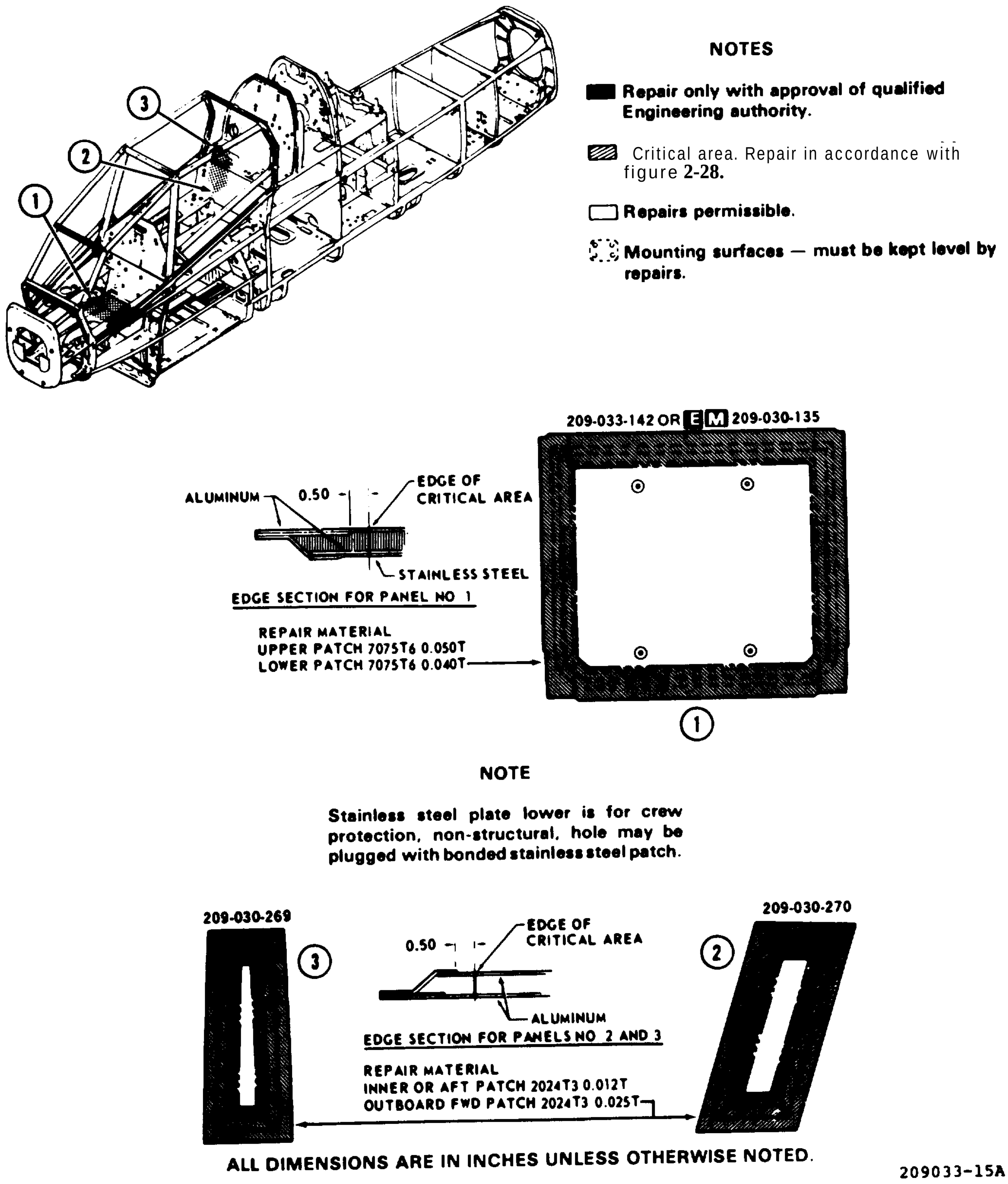


Figure 2-20. Panel at Forward Fuel Cell at R.S. and Gunner Floor

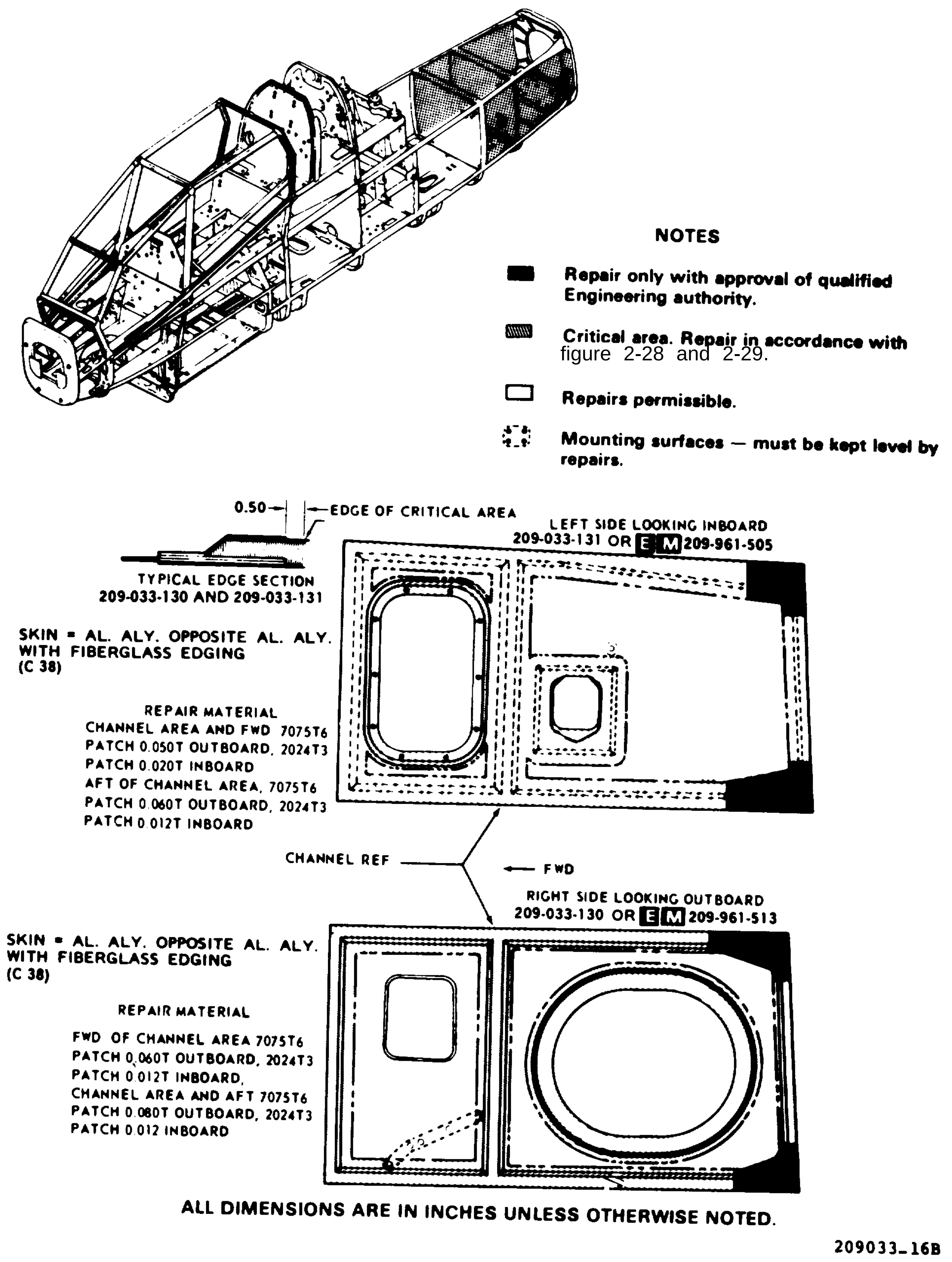


Figure 2-21. R & L Beam Panels at Station 250 to B.S. 41.32

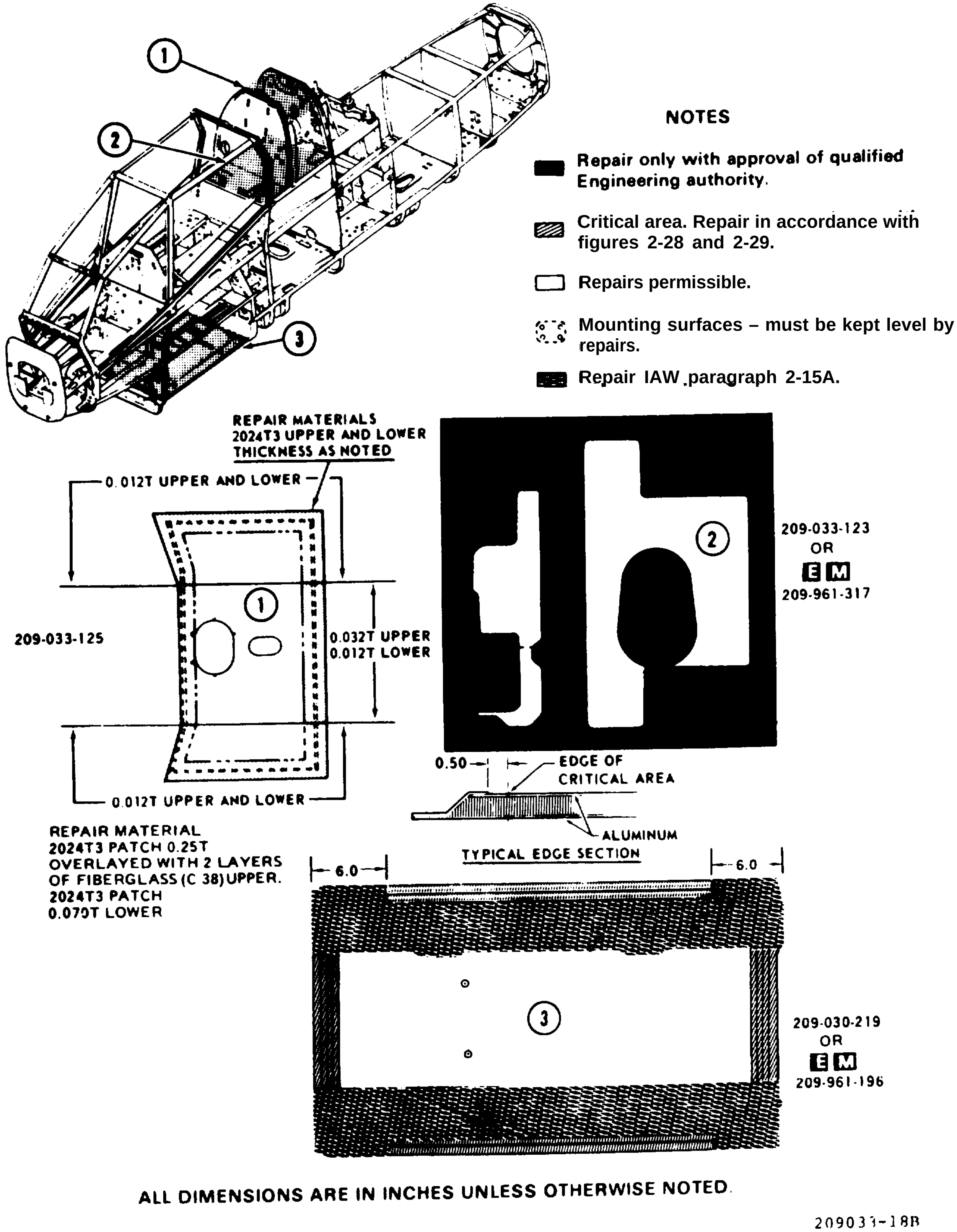


Figure 2-22. **Ammo Floor, Support Panel and Forward Fuel Cell Panel at Station 213.9**

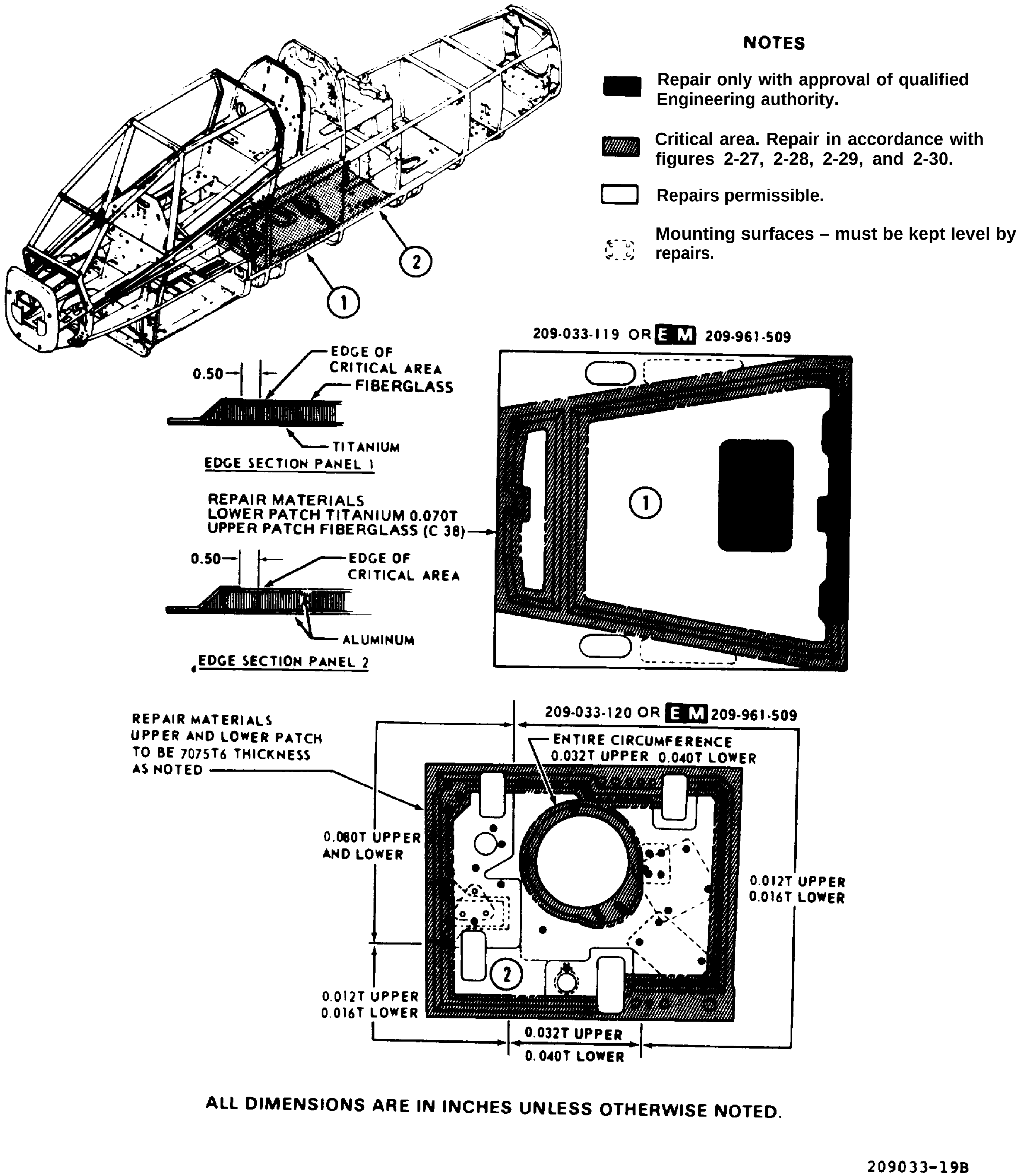


Figure 2-23. Forward Fuel Cell Floor — Lower Panel Station 86 to 213

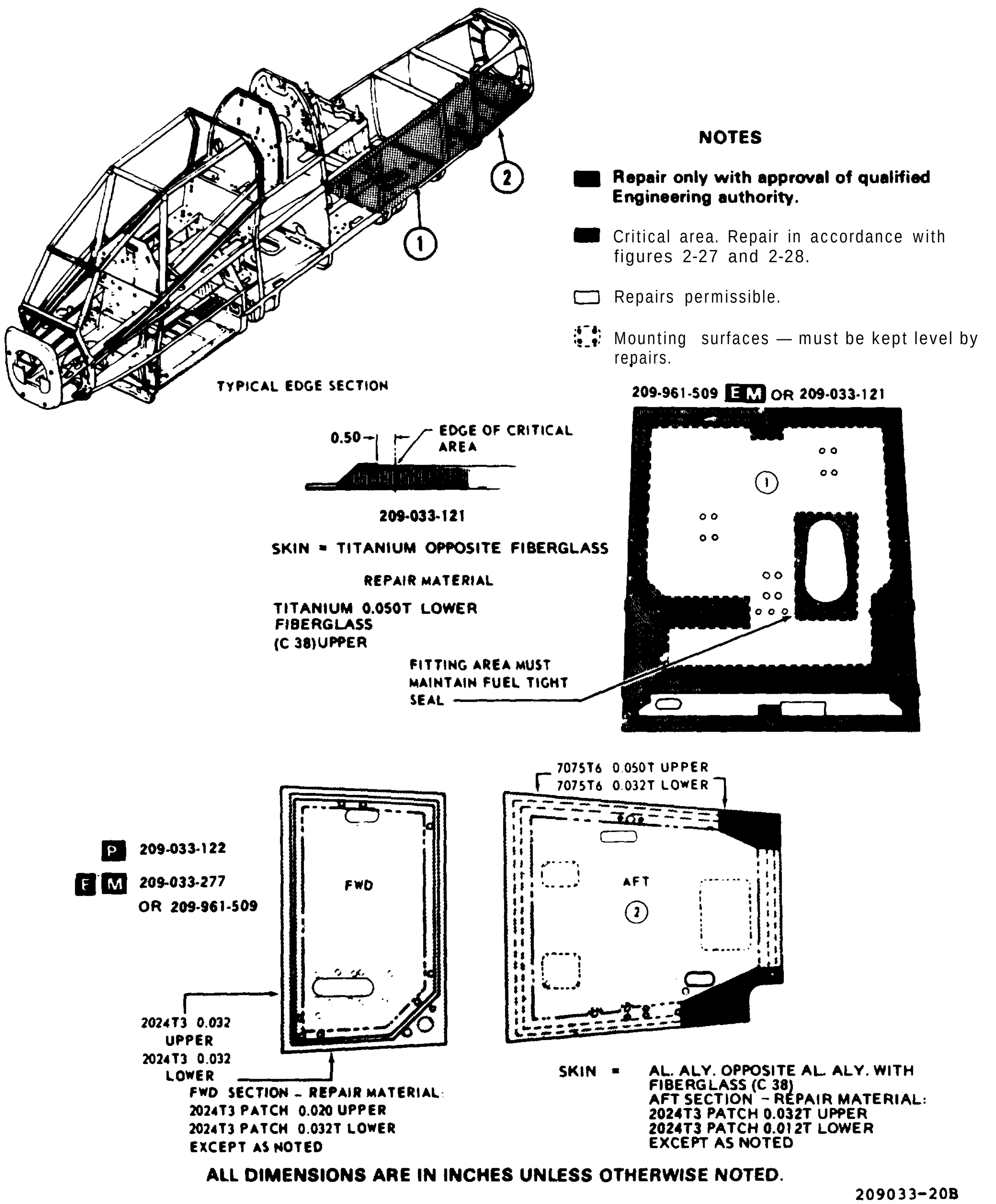


Figure 2-24. **Lower Aft Fuel Cell Panel at Station 250 to B.S. 41.32**

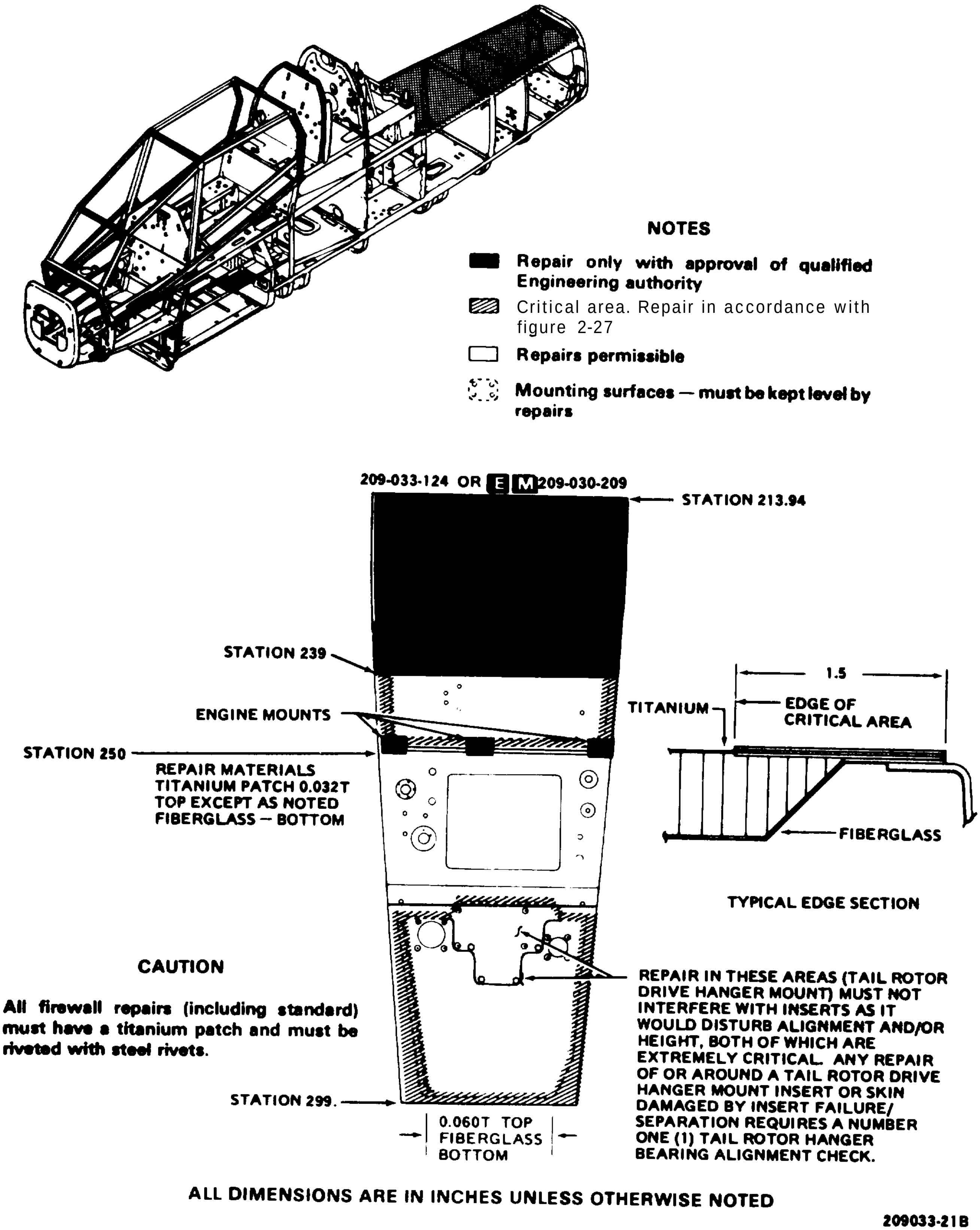


Figure 2-25. Engine Deck Installation at Station 213.94 to 298.75

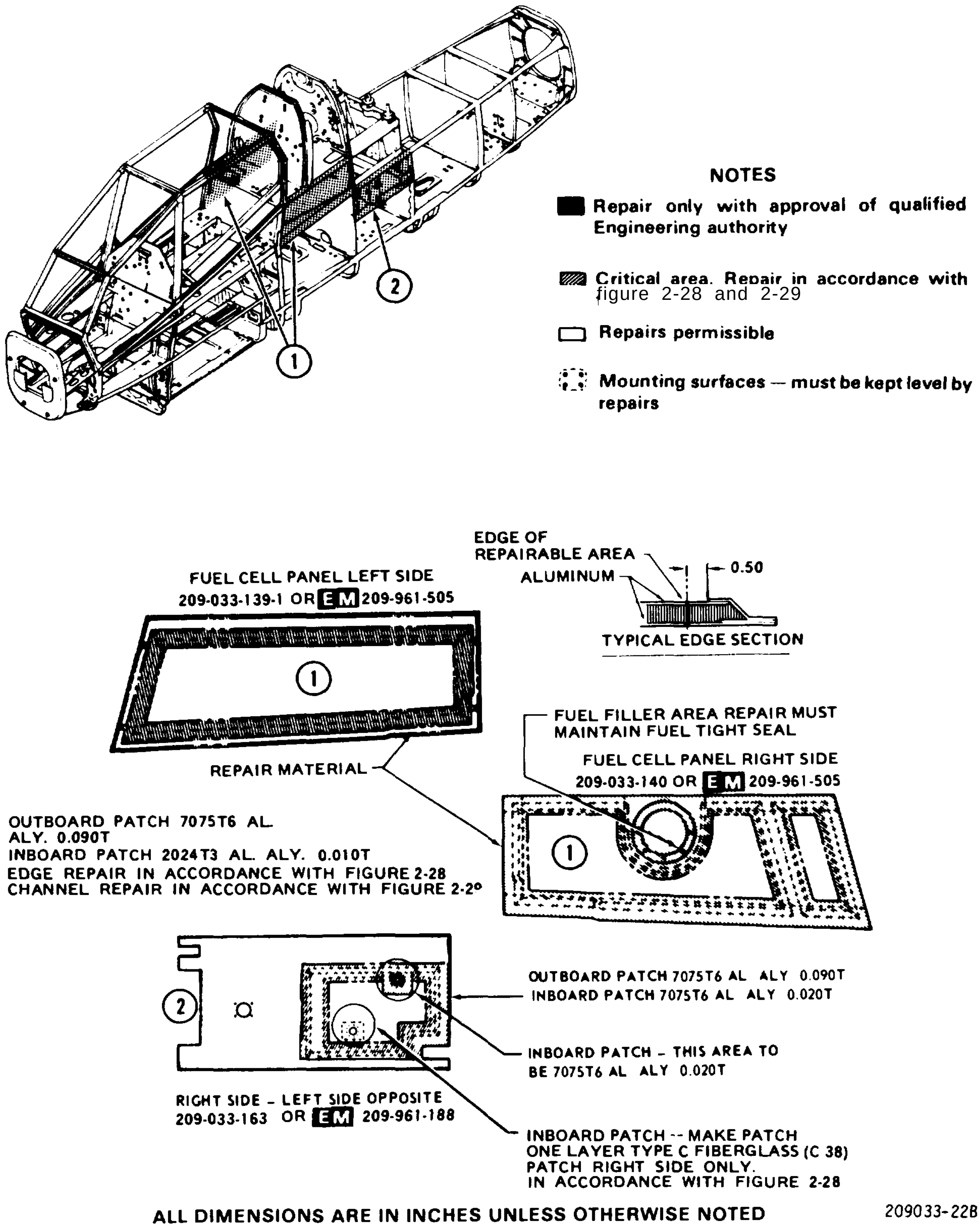


Figure 2-26. Forward Fuel Cell Panels - Main Beam at Station 186 to 214

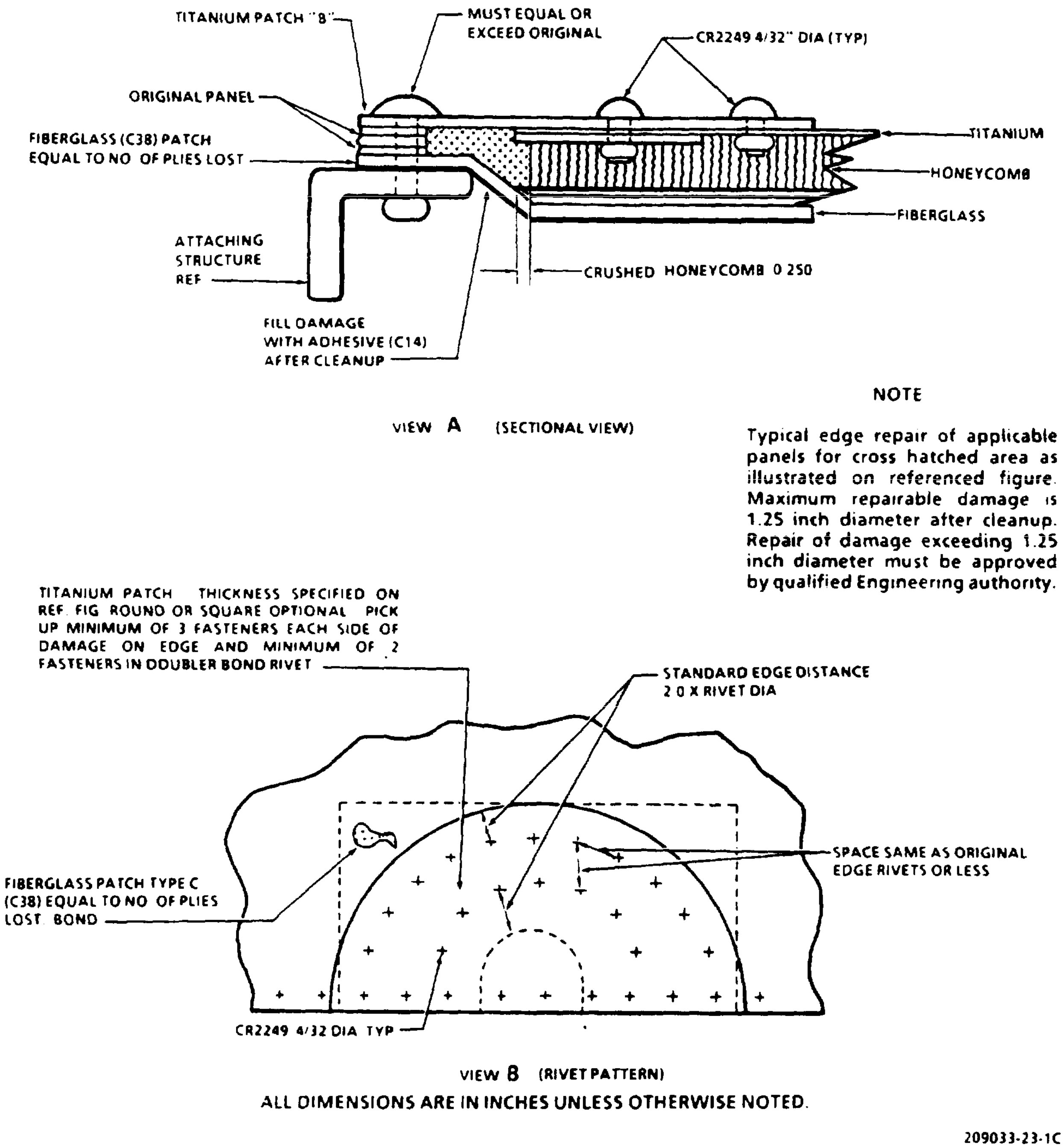


Figure 2-27. Edge Repair for Honeycomb Panels with Glass Skin Opposite Titanium (Sheet 1 of 2)

EDGE REPAIR OF HONEYCOMB PANELS

PART NO.	APPLICABLE PANELS	REF. FIG.
M 209-961-226 209-033-218	UPPER BULKHEAD STATION 148.56	2-15 2-15
M 209-961-226 209-033-220	LOWER BULKHEAD STATION 148.50	2-15 2-15
M 209-961-111 209-033-254	LOWER BULKHEAD STATION 186.25	2-16 2-16
209-030-108 M 209-033-251	BULKHEAD STATION 213.94	2-16 2-16
E M 209-030-111 E M 209-033-249 P 209-033-112	BULKHEAD	2-17 2-17 2-17
209-033-129 E M 209-030-119	LEFT FUEL CELL	2-19 2-19
209-033-128 E M 209-030-120	RIGHT FUEL CELL	2-19 2-19
E M 209-961-509 209-033-119	FORWARD FUEL CELL FLOOR	2-23 2-23
E M 209-961-509 209-033-121	BOTTOM OF FUEL TANK	2-24 2-24
E M 209-030-209 209-033-124	ENGINE DECK	2-25
209-031-821 E M 209-031-890	TAIL FIN FIN STA. — 15.00 TO 46.95	2-40

209033-23-2C

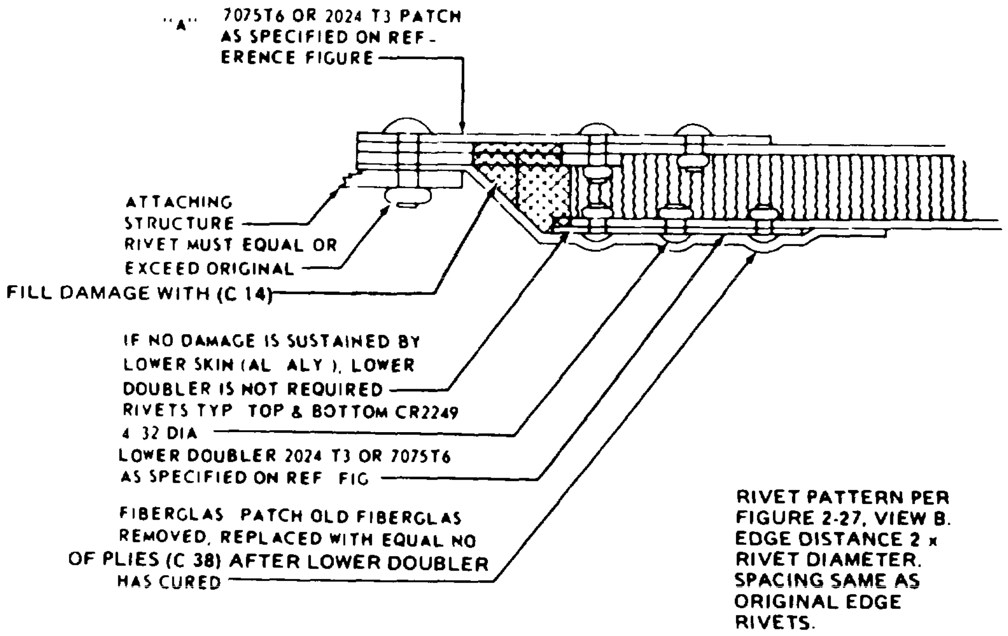
Figure 2-27. Edge Repair for Honeycomb Panels with Glass Skin Opposite Titanium (Sheet 2 of 2)

EDGE REPAIR OF HONEYCOMB PANELS

Typical edge repair of applicable panels for cross hatched area as illustrated on referenced figure. Maximum repairable damage is 1.25 inch diameter. Repair of damage greater than 1.25 inch diameter must be approved by qualified Engineering authority.

PART NUMBER	APPLICABLE PANELS	REF. FIG.
P 209-031-273	Gunner floor	2-13
E M 209-033-275		2-13
E M 209-961-506		2-13
209-033-117	Pilot floor	2-13
209-033-103	Bulkhead station 93.0	2-14
209-033-107	Center Bulkhead Station 164.0 and Station 171.61	2-15
209-033-253	Upper Bulkhead Station 186.25	2-16
M 209-961-511		2-16
P 209-033-113	Bulkhead Station 268.65	2-17
E M 209-033-279		2-17
E M 209-961-508		2-17
P 209-033-135	Right Main Beam	2-18
E M 209-961-249		2-18
P 209-033-134	Left Main Beam	2-18
E M 209-961-249		2-18
209-033-142	Gunner Seat	2-20
E M 209-030-135		2-20
209-030-269	Panel Station 155.97	2-20
209-030-270	Forward Fuel Tank Support	2-20
209-033-131	Left Beam	2-21
E M 209-961-505		2-21
209-033-130	Right Beam	2-21
E M 209-961-513		2-21
209-033-125	Pylon Support	2-22
209-030-219	Ammo Floor	2-22
E M 209-961-196		2-22

(SKIN = AL. ALY. OPPOSITE AL. ALY. WITH FIBERGLASS EDGING)



209033-24C

Figure 2-28. Edge Repair for Honeycomb Panels with Aluminum Alloy with Glass Edging

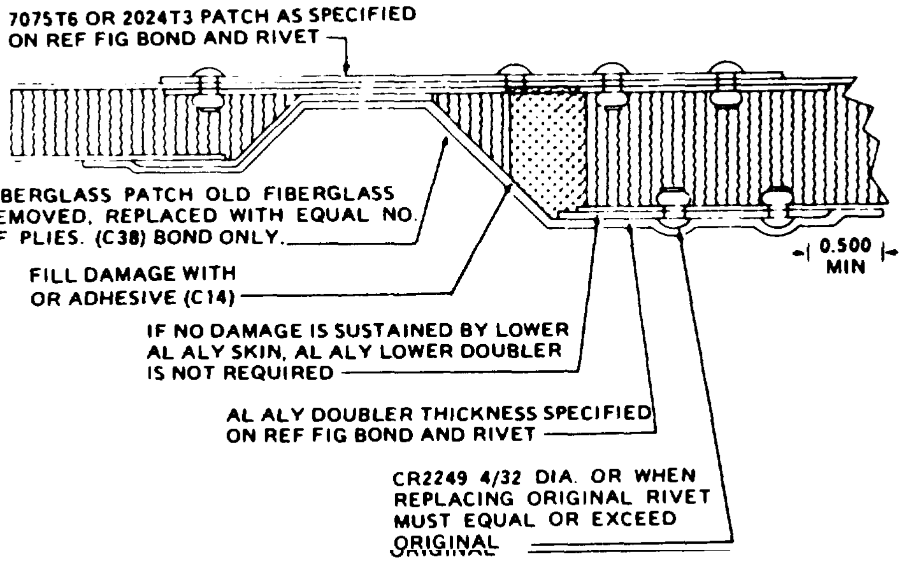
NOTE

Typical repair at channel section of applicable panels, cross hatched on reference figure. Maximum repairable damage 1.25 inch diameter after cleanup. Repair damage greater than 1.25 inch diameter must be approved by qualified Engineering authority.

REPAIR OF CHANNEL SECTION OF HONEYCOMB PANELS

PART NO.	APPLICABLE PANELS	REF. FIG.
P 209-031-273 E M 209-033-275 E M 209-961-506	Gunner Floor	2-13 2-13 2-13
209-033-117	Pilot Floor	2-13
209-033-220 M 209-961-226	Lower Bulkhead Station 148.50	2-15 2-15
P 209-033-113 E M 209-033-279 E M 209-961-508	Bulkhead Station 268.65	2-17 2-17 2-17
209-033-131 E M 209-961-505	Left Beam	2-21 2-21
209-033-130 E M 209-961-513	Right Beam	2-21 2-21
209-033-125	Pylon Support	2-22
209-030-219 E M 209-961-196	Ammo Floor	2-22 2-22
209-033-119 E M 209-961-509	Forward Fuel Cell Floor	2-23 2-23
209-033-139 E M 209-961-505	Fuel Cell Panel Left Side	2-26 2-26
209-033-140 E M 209-961-505	Fuel Cell Panel Right Side	2-26 2-26
209-033-163 E M 209-961-188	Main Beam	2-26 2-26

(SKIN = AL. ALY. OPPOSITE AL. ALY. WITH FIBERGLASS FINISH AT CHANNEL)



SEE REPAIR figure 2-27 VIEW B FOR TOP AND BOTTOM VIEW (RIVET PATTERN)

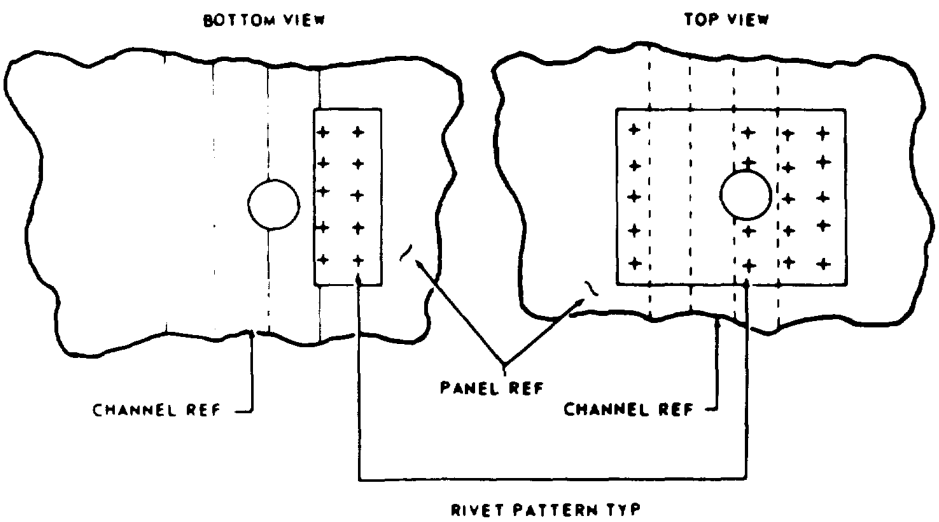
ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

209033-25B

Figure 2-29. Edge Repair for Honeycomb Panels with Glass Finish at Channel

REPAIR OF CHANNEL SECTION OF HONEYCOMB PANELS

PART NO.	APPLICABLE PANELS	REF. FIG.
P 209-031-273 E M 209-033-275 E M 209-961-506	Gunner Floor	2-13 2-13 2-13
209-033-117	Pilot Floor	2-13
209-033-220 M 209-961-226	Lower Bulkhead Station 148.50	2-15 2-15
P 209-033-113 E M 209-033-279 E M 209-961-508	Bulkhead Station 268.65	2-17 2-17 2-17
209-033-131 E M 209-961-505	Left Beam	2-21 2-21
209-033-130 E M 209-961-513	Right Beam	2-21 2-21
209-033-125	Pylon Support	2-22
209-030-219 E M 209-961-196	Ammo Floor	2-22 2-22
209-033-119 E M 209-961-509	Forward Fuel Cell Floor	2-23 2-23
209-033-139 E M 209-961-505	Fuel Cell Panel Left Side	2-26 2-26
209-033-140 E M 209-961-505	Fuel Cell Panel Right Side	2-26 2-26
209-033-163 E M 209-961-188	Main Beam	2-26 2-26



EDGE DISTANCE 2.0 x DIA. OF RIVET.
RIVET SPACING SAME AS EDGE RIVETS
OR SAME AS OPPOSITE LIKE PANEL.
MINIMUM OF TWO FASTENERS EACH
SIDE OF DAMAGE.

209033-268

Figure 2-30. Typical Rivet Pattern for Channel Section Repair

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(c) Clean the area where patch is to be applied with scotchbrite (C103) in lieu of sandpaper to avoid leaving residue. It is permissible to use 320 grit sandpaper (C102) in critical areas. If sandpaper is used, clean the sanded area with MEK (C74).

(d) Bond metal patches with adhesive (C14).

(e) After adhesive (C14) has cured, apply sealant (C105) to entire surface of titanium patch.

(f) Rivet patch with rivets of equal or larger size than original rivets in areas that were riveted prior to application of patch. Use the standard edge distance of two rivet diameters or space the rivets the same as the original panel. if the panel being worked is not riveted, use rivet spacing in opposite panel.

c. Replace damaged fasteners (inserts) in fuselage honeycomb panels.

(1) Determine whether the fastener (insert) is a potted-type, injection-type or grommet-type. See figure 2-31 for view of the fasteners (inserts).

(2) Remove damaged fastener (insert) by machining with a counterbore of the same diameter as the fastener. Note that the grommet-type fastener (insert) flanges overlap the skin of the honeycomb panel.

(3) Install new fastener (insert) as outlined in steps (4) through (6).

(4) Install potted-type fastener (insert).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(a) Immediately prior to installation, clean new fastener (insert) by soaking in MEK (C74). Air dry until moisture free. Handle fastener (insert) with clean white gloves after cleanup,

(b) Place masking tape (C123) over threads of fastener (insert) to prevent entry of adhesive.

CAUTION

An insufficient amount of adhesive will allow moisture or other fluids to enter the honeycomb panel core. This will result in ultimate failure of the panel.

(c) Fill cavity approximately two-thirds full of adhesive as shown on figure 2-31. Use adhesive (C8) in areas where the temperature will not exceed 180 degrees F (83 degrees C). Use adhesive (C14) in areas where panel will be subjected to higher temperatures but not exceeding 300 degrees F (149 degrees C). Install fastener (insert) while adhesive is in tacky state. Ensure that there are no pin holes In the adhesive, and that the fastener (insert) is properly aligned and is a snug fit where the fastener (insert) flange mates with the honeycomb panel face.

WARNING

Cleaning solvent is fiammabie and toxic. Provide adequate ventilation. Avoid proionged breathing of solvent vapors and contact with skin or eyes.

(d) Remove excess adhesive from honeycomb panel before adhesive sets up. Use cheese cloth (C30) dampened with MEK (C74). Exercise caution to prevent the MEK from diluting the adhesive in the potted areas.

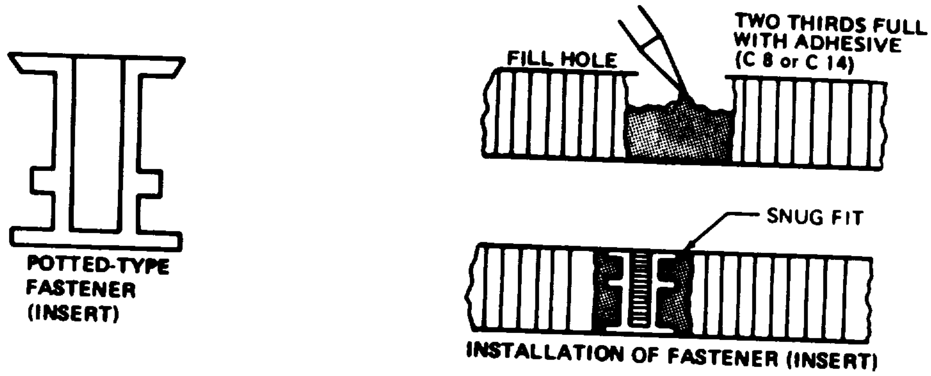
(5) Install injection-type fastener (insert).

WARNING

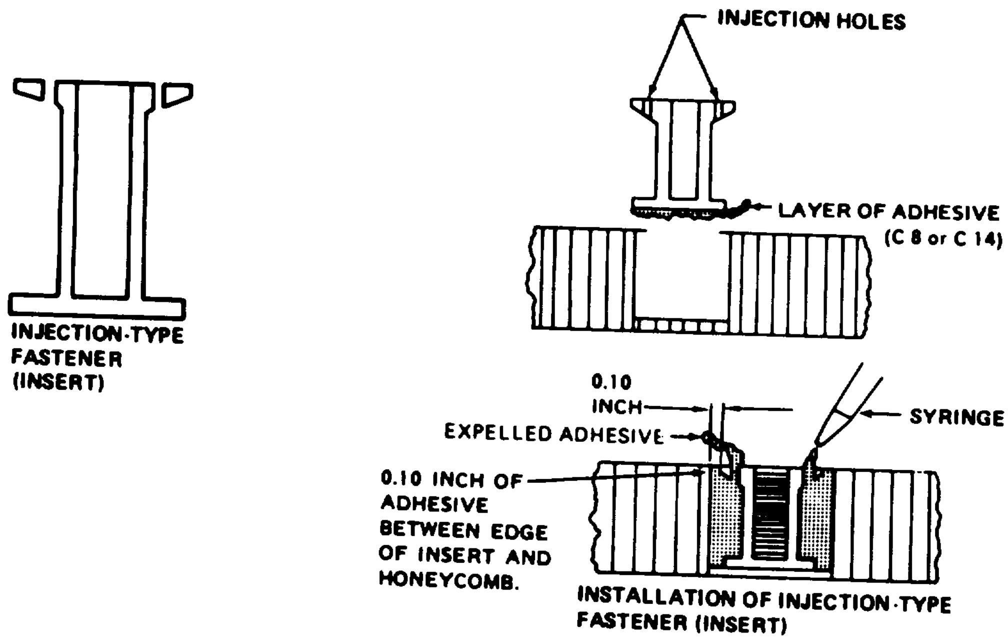
Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(a) Immediately prior to installation, clean new fastener (insert) by soaking in MEK (C74). Air dry until moisture free. Handle fastener (insert) with clean white gloves after cleaning.

(b) Place mystic tape (C124) over threads and injections holes of fastener (insert) to prevent entry of adhesive. Open holes in the tape at the injection holes with a pointed instrument to permit injection of adhesive compound.



POTTED-TYPE FASTENER (INSERT)



INJECTION-TYPE FASTENER (INSERT)

209030-298-1A

Figure 2-31 Potted – Injection — Grommet Type Fasteners (Sheet 1 of 2)

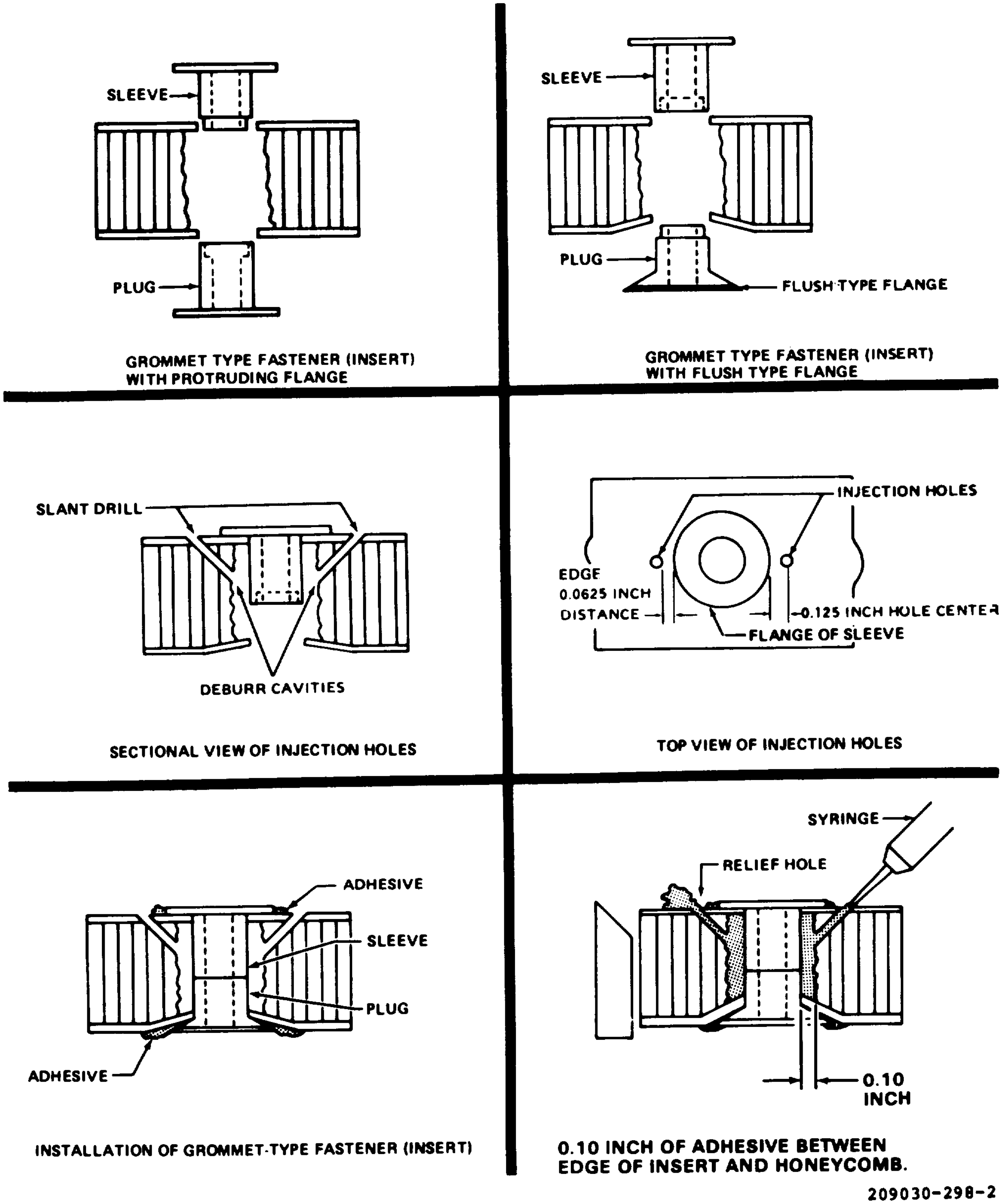


Figure 2-31. Potted — Injection – **Grommet Type Fasteners (Sheet 2 of 2)**

(c) Apply a layer of adhesive to bottom of fastener as shown in figure 2-31. Use adhesive (C8) in areas where temperature will not exceed 180 degrees F (82 degrees C). Use adhesive (Cl 4) in areas where panel will be subjected to higher temperatures but not exceeding 300 degrees F (149 degrees C). Position the fastener (insert in the hole).

CAUTION

An insufficient amount of adhesive will allow moisture or other fluids to enter the honeycomb panel core. This will result in ultimate failure of the panel.

(d) Inject adhesive used in the preceding step into one injection hole until a steady stream of adhesive, without air bubbles, flows out of the opposite injection hole. Use a syringe to inject adhesive (C8 or C14) as shown on figure 2-31.

(e) Ensure that fastener (insert) is properly aligned.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(f) Remove excess adhesive from honeycomb panel before adhesive sets up. Use cheese cloth (C30) dampened with MEK (C74), Exercise caution to prevent the MEK from diluting the adhesive in the potted areas.

(g) Touch up paint to match the surrounding area. Refer to TB 746-93-2 for paint instructions. Use primer (C88 or C91) and lacquer (C89) color to match surrounding area.

(6) Install grommet-type fastener (insert).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(a) Immediately prior to installation, clean new fastener (insert) by soaking in MEK (C74). Air dry until moisture free. Handle fastener (insert) with clean white gloves after cleaning,

(b) Place masking tape (C123) over threads of fastener (insert) to prevent entry of adhesive.

(c) Position the sleeve half of fastener (insert) in honeycomb panel and mark location of two injection holes (figure 2-31). Make hole centers 0.126 inch from edge of flange as illustrated. Remove sleeve and drill two holes with size 42 twist drill. Make hole through honeycomb panel face at ninety degrees, then slant drill as illustrated. Deburr holes and clean all debris from cavity.

(d) Apply a small bead of adhesive under flanges of sleeve and plug (figure 2-31). Use adhesive (C8) in areas where temperature will not exceed 180 degrees F (82 degrees C). Use adhesive (C14) in areas where panel will be subjected to higher temperatures but not exceeding 300 degrees F (149 degrees C). Install the sleeve and the plug in their correct relative position in the panel. Lightly tap the two parts together. Ensure that the flanges are seated and properly aligned with the panel.

CAUTION

An insufficient amount of adhesive will allow moisture or other fluids to enter the honeycomb panel core. This will result in ultimate failure of the panel.

NOTE

A screw and washer maybe installed in the fastener (insert) to hold it in position and prevent adhesive from getting on threads. Use a parting material, such as celophane, under the washer to prevent it from adhering to the fastener (insert).

(e) Inject the same adhesive used in the preceding step into one injection hole until a steady flow of adhesive, without air bubbles, comes out of the opposite hole.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

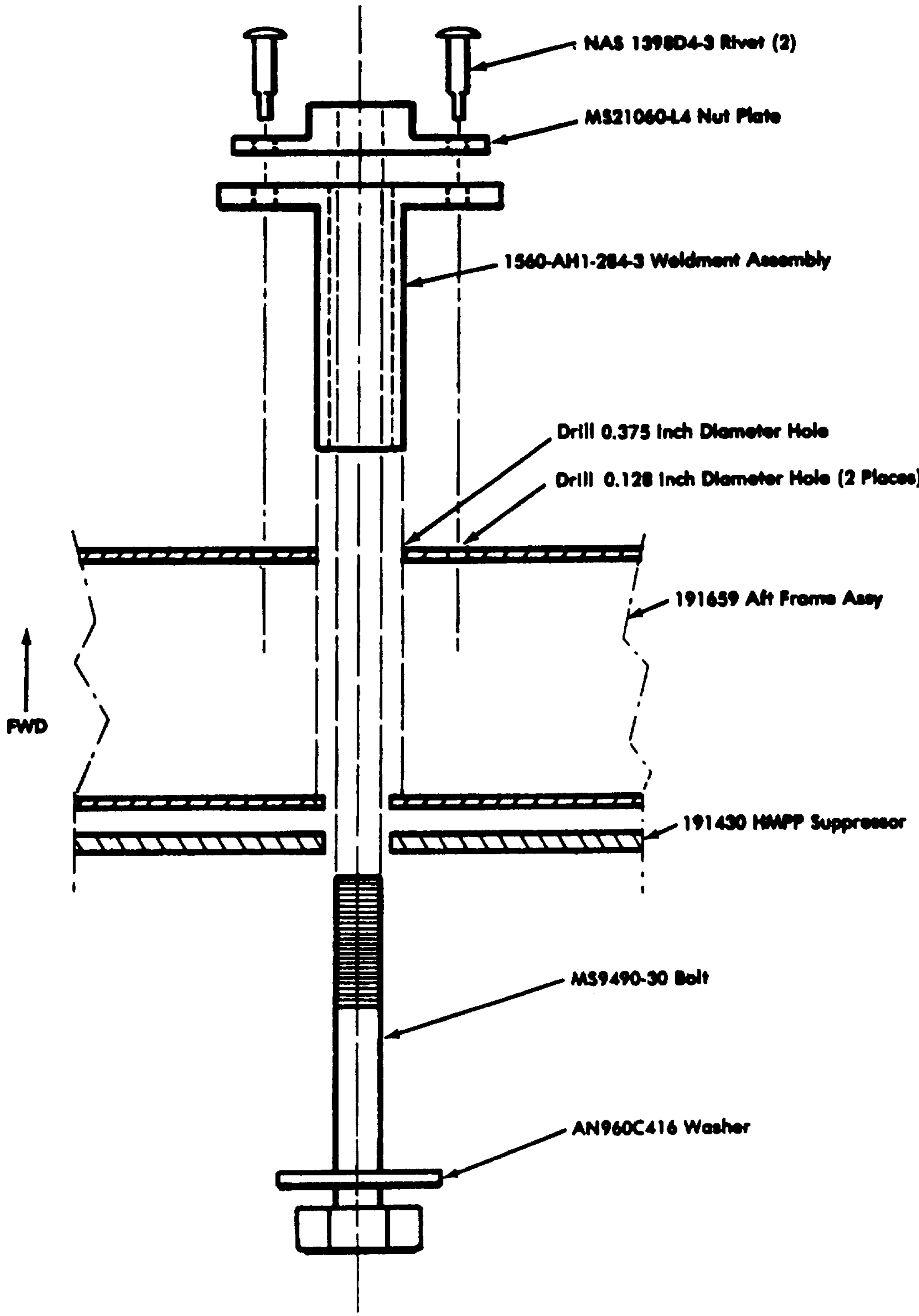
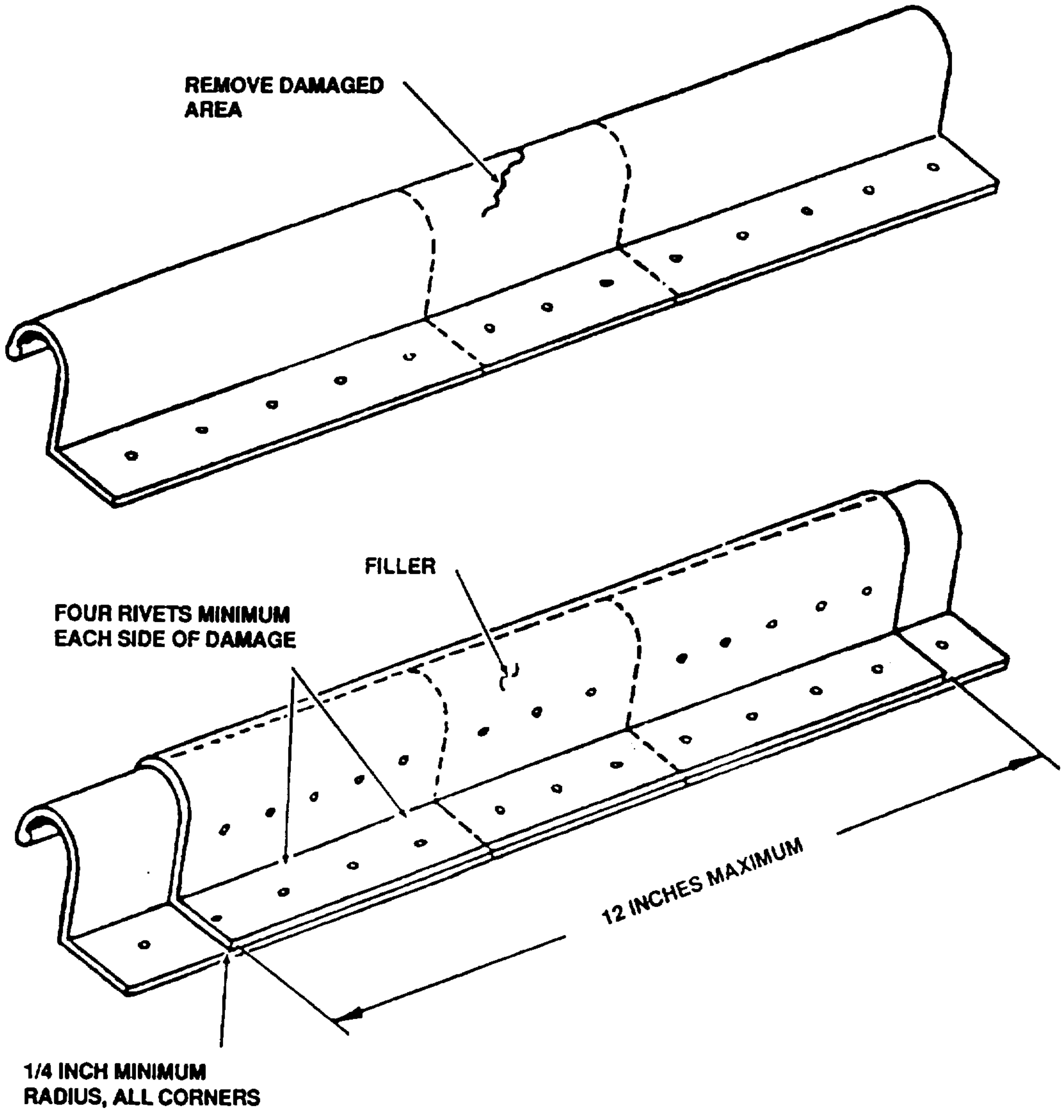


Figure 2-31.1. AH-1S HMPP Cowling Nut Plate Replacement



CONDITION

This repair shall be used for cracks, tears, punctures, breaks in J-Stringer,

RESTRICTIONS

1. Maximum length of doubler is 12 inches.

2. Repair must not extend into bulkhead.

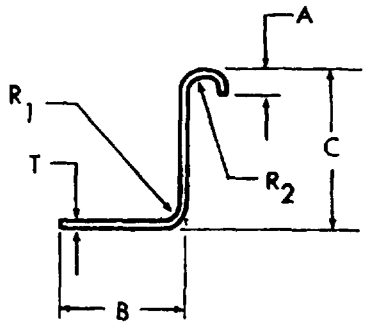
3. One repair per length between bulkheads.

Figure 2-31.2. Stringer Repair (Sheet 1 of 2)

MATERIAL

1. Patches shall be of same material or one gauge heavier than damaged stringer.

2. For insertion repairs requiring like material, Bell Standard 110-001 must be used. Dash number is determined by existing stringer size and thickness.



PART NUMBER (BELL STANDARD)	± 0.015	B	C ± 0.015	R_1	R_2	T	DEVEL. WIDTH
110-001-1	0.175	0.75	0.815	0.09	0.12	0.032	1.775
110-001-3	0.175	0.75	0.815	0.09	0.12	0.040	1.775
110-001-5	0.220	0.93	1.000	0.16	0.16	0.063	2.163
110-001-7	0.215	0.71	0.815	0.09	0.16	0.040	1.818
110-001-9	0.283	0.87	1.000	0.12	0.22	0.063	2.246

MATERIAL: Aluminum Alloy Clad, 7075-0, QQ-A-250/13

TENSILE: Heat Treat to T-6 in Accordance with MIL-H-6088

LIMITS UNLESS OTHERWISE NOTED: .XX ± 0.03
.XXX ± 0.010

Figure 2-31.2. Stringer Repair (Sheet 2 of 2)

(f) Remove excess adhesive from honeycomb panel before adhesive sets up, Use cheese cloth (C30) dampened with MEK (C74). Exercise caution to prevent the MEK from diluting the adhesive in the potted areas.

(g) Touch up paint to match the surrounding area. Refer to TB746-93-2 for paint instructions.

2-15.1. REPAIR — AMMO FLOOR HONEYCOMB PANEL.

a. Repair damage within allowable limits as outlined in table 2-3.

b. Fabricate scuff doublers from stainless steel, MIL-S-5059A, 301 (item 59, table 2-2), NSN 9515-00-203-5899, as illustrated in figure 2-15.1. Required stock is 0.016 x 44.20 inches.

c. Bend doubler 45 degrees as illustrated in figure 2-31.1. Make bend with 0.06 inch radius.

d. Remove Teflon rub strip 209-030-203-4 and retain for reinstallation.

e. Using a hole finder tool, locate four holes in doubler to align with screws retaining Teflon strips.

f. To prevent crushing honeycomb core at edge of panel, apply Proseal 890 (C105) along entire length of doubler under short leg.

g. Install doublers on both sides of panel. Install Teflon rub strip to original configuration and secure with original screws.

h. Remove and replace rub strip (209-030-224-13) on track assembly (209-030-224-19) if worn or damaged. Use adhesive (C14).

2-16. REPAIR — FLOOR PANELS, FORWARD FUSELAGE.

Repair pilot and gunner floor panels shown on figure 2-13 as outlined in paragraph 2-15.

2-17. REPAIR — ENGINE DECK PANELS, FORWARD FUSELAGE.

Repair engine deck panels shown on figure 2-25 as outlined in paragraph 2-15.

2-18. REPAIR — ACCESS COVERS AND DOORS, FORWARD FUSELAGE.

a. Repair access covers and doors, using sheet metal repairs outlined in paragraph 2-14. Refer to TM 55-1500-204-25/1 for standard repair instructions.

b. Replace seals on covers and doors as outlined in paragraph 2-20.

2-19. REPAIR — COWLING AND FAIRING, FORWARD FUSELAGE.

a. Repair metal cowling and fairing, using sheet metal repairs outlined in paragraph 2-14. Refer to TM 55-1500-204-25/1 for standard sheet metal repair instructions.

b. Repair fiberglass cowling and fairing, using fiberglass repair instructions outlined in paragraph 2-15. Refer to TM 55-1500-204-25/1 for standard fiberglass repair instructions.

c. Replace seals on cowling and fairing as outlined in paragraph 2-20.

d. Repair hot metal plus plume suppressor cowling using following procedures. Refer to figure 2-31.1.

(1) Clear off ring hole of defective nut plate.

(2) Remove rivet on forward face of cowling aft ring directly in line with nut plate hole to be repaired.

(3) Drill 0.375 inch diameter hole in aft ring forward face, coaxial with aft hole, using removed rivet hole as pilot hole.

(4) Insert weldment assembly 1560-AH1-284-3 into forward face until contact is made with aft face. Trim weldment length as required.

(5) With weldment assembly in place, insert MS9490-30 bolt with AN960C416 washer through aft face of weldment. Screw nut plate firmly into weldment assembly. Align weldment and nut plate holes. Drill 0.128 inch holes through nut plate, weldment assembly, and fonward side of 191659 aft frame (2 places). Remove assembly and deburr holes. Reinstall weldment and nut plate, and fasten to cowling forward face using NAS 1398 D4-3 rivets.

(6) Remove MS9490-30 bolt and AN960C416 washer.

2-20. SEAL REPLACEMENT — FORWARD FUSELAGE.

Many of the doors, cowlings, and fairings have replaceable seals. The seals may be either of rubber or silicone composition. Seals that are subjected to fuel and/or oil contamination are of the polysulfide or neoprene rubber type.

a. Inspection. Inspect seals for failed bonding, tears, breaks, and deterioration that would affect function.

b. Removal. Remove damaged or worn seal. Use paint remover (C95) to remove old adhesive, paint, and primer from area where new seal will be installed.

c. Test to Determine Seal Material. If the type material from which the seal is made must be determined, cut a small sample of material from the seal and burn the sample. Silicone seals burn readily and leave a gray ash residue. Rubber-type seals are more fire resistant and leave a black ash residue.

d. Installation.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

CAUTION

Do not permit MEK (C74) to contact acrylic windows of canopy or canopy doors.

NOTE

It is necessary to thoroughly clean surfaces prior to sanding to avoid working foreign matter into pores of material.

(1) Clean new seal with the metal where it is to be applied with MEK (C74) and dry with a clean cloth. Sand the mating surfaces of both seal and metal with 180 grit sandpaper (C102). Clean the sanded surface with MEK (C74).

(2) Bond rubber-type seals.

(a) Clean surfaces as outlined in step (1).

(b) Refer to previous step c for instructions to identify rubber-type seals.

(c) Apply an even coat of rubber adhesive (C12) to the mating surfaces of the seal and the metal.

(d) Allow adhesive to air dry 10 to 15 minutes at 75 degrees F (24 degrees C) or above, Check adhesive by touching with finger. When adhesive will adhere to finger but not transfer, apply a second coat of adhesive and air dry to the same degree.

(e) When second coat of adhesive has air dried until tacky, install seal on metal. Start at one end and roll seal onto metal. Press down on seal to ensure that all air is expelled and that the seal is in full contact with the metal.

(f) Allow bond to air dry for a minimum of fours hours at 75 degrees F (24 degrees C) or above. Adhesive should be cured at a temperature of 75 degrees F (24 degrees C) or higher. If temperature is below 75 degrees F (24 degrees C) double the amount of cure time for each 12 degrees F (7 degrees C) below 75 degrees F (24 degrees C). Do not attempt to cure adhesive at temperatures below 50 degrees F (10 degrees C).

Typical temperatures and cure times:

Temperature		Cure Time
Degrees F	Degrees C	Hours
75	24	5
63	17	8
51	11	16

(3) Bond silicone composition seals.

(a) Clean surface, as outlined in step (1) above.

(b) Refer to step c for instructions to identify silicone composition seals.

WARNING

Do not place a cap on the adhesive used in the following step after it is mixed. This two-part adhesive releases hydrogen gas after mixing which could result in high pressures. The pot life on the mixed adhesive is six hours.

(c) Mix adhesive (C16) in accordance with instructions on the container. Apply an even coat of adhesive to the mating surfaces of the seal and the metal.

(d) Allow the adhesive to air dry at 75 degrees F (24 degrees C) or above for 15 to 30 minutes. Install seal on metal. Start at one end and roll seal onto metal. Press down on seal to ensure that all air is expelled and that the seal is in full contact with the metal.

(e) Allow bond to cure for a minimum of twelve hours at 75 degrees F (24 degrees C) or above. Adhesive should be cured at a temperature of 75 degrees F (24 degrees C) or higher. If temperature is below 75 degrees F (24 degrees C) double the amount of cure time for each 12 degrees F (7 degrees C) below 75 degrees F (24 degrees C). Do not atempt to cure adhesive at temperatures below 50 degrees F (10 degrees C).

Typical temperature and cure times:

Temperature		Cure
Degrees F	Degrees C	Hours
75	24	12
63	17	24
51	11	48

e. Functional Check. Install door, cowling, or fairing and check to ensure that the new seal fits properly.

2-21. REPAIR – FIREWALLS, FORWARD FUSELAGE.

Repair firewall using titanium repair instructions in TM 55-1500-204-25/1. Stainless steel can be substituted for titanium of the same thickness. Use monel rivets for all repairs.

2-22. REPAIR – BULKHEADS, FORWARD FUSELAGE.

Repair bulkheads shown on figures 2-14 through 2-17 as outlined in paragraph 2-15.

2-23. REPAIR – FUSELAGE FITTINGS, FORWARD FUSELAGE.

a. Negligible damage to forward fuselage tailboom attachment fittings should be polished out using fine India stone (C116). See table 2-3 for limits. Fittings with damage or wear exceeding limits must be replaced by next higher maintenance level.

b. Wing attachment fittings can have bushing wear to limits shown in section IV. Bushings worn beyond limits must be replaced by next higher maintenance level. No damage limits or repairs allowed for wing attachment lugs.

c. Negligible damage to wing attachment fittings should be polished out, using fine India stone (C116). See table 2-3 for limits. Fittings with damage exceeding limits must be replaced by next higher maintenance level.

2-24. REPAIR – BEAM ASSEMBLIES, FORWARD FUSELAGE.

a. Repair main beam structural caps shown on figures 2-11 and 2-12 only with approval of qualified engineering authority.

b. Repair damage to main beam honeycomb panels as outlined in paragraph 2-15. Authorized repairs are shown on figures 2-27 through 2-29. Panels to which repairs are applicable are identified on figures.

2-25. CLASSIFICATION OF DAMAGE – TAILBOOM ASSEMBLY.

Classification of damage and repair limits for the tailboom are given in table 2-4.

2-26. REPAIR – TAILBOOM.

Repair of specific areas of tailboom are covered in the following paragraphs. Refer to table 2-4 for classification of damages and limitations,

2-27. REPAIR – TAILBOOM SKINS.

Refer to paragraph 2-14, same as forward fuselage skin repair.

2-28. REPAIR – TAILBOOM ACCESS COVERS AND DOORS.

Refer to paragraph 2-18, same as forward fuselage cover repair.

2-29. REPAIR – TAILBOOM STRINGERS.

a. Repair damaged stringers by patching. Cracks, tears, and punctures in the stringer may be repaired by patching, provided they do not extend more than one-half the width of the stringer. Repair damaged stringer.

(1) Check to see that no rivets are bent or damaged and that rivet holes are not enlarged or torn.

(2) Remove damaged and insecure rivets.

(3) Stop drill end of crack and, if necessary, cut away damaged part, taking care not to cut away more than necessary.

(4) Re-form damaged stringer and other displaced areas into correct position.

Table 2-4. Tailboom Classification of Damage

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
1. TAIL BOOM SKINS See figure 2-90.	a. Dents	a. Smoth contour free of cracks, nicks, or wrinkles. Depth and diameter not to exceed: Depth / Diameter 0.016 / 1.0 inch 0.047 / 2.0 inch 0.063 / 3.0 inch	a. Cracks or sharp nick in dent. Damage areas after cleanup (including prior repairs) shall not exceed 20 percent of total area for a single skin panel. Damage 6.0 inch minimum from similar repair.	a. Total damage (including prior repairs) exceeds 20 percent of total area of a single skin panel, or damage spans entire distance between two bulkheads, or two stringers.

Table 2-4. Tailboom Classification of Damage (cont)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
1. TAIL BOOM SKINS see figure 2-90 (cont)	a. Dents (cont)	3.0 inch minimum undamaged material between dents and 1.0 inch minimum from internal structure. Nicks and scratches which can be blended out not to exceed 10 percent of material depth.		
	b. Cracks, holes tears, nicks, scratches, corrosion and wrinkles.	b. Nicks and scratches no deeper than 10 percent of material thickness and not exceeding 1.0 inch length by 0.25 inch width after cleanup. Corrosion damage less than 10 percent of material thickness and not exceeding 4.0 square inch after cleanup. Damage no closer than 1.0 inch to a supporting structure.	b. Damage exceeds negligible limits but does not exceed 20 percent (including prior repairs) of total area for a single skin panel.	b. Same as dents.
	c. Trapped or stretched skin.	c. Inward or outward bulges located in a sectional area, that can be corrected by removing attaching hardware, allowing skin to shift. Mismatch of rivet holes shall not exceed that which can be cleaned up by drilling and installing one size larger rivet and maintain proper rivet edge distance. However, if condition does not disappear after unloading panel,	c. Creased dents not classified as oil can or stretched skin, not exceeding 20 percent of a sectional area and no closer than 1.0 inch to a supporting structure. Oil can condition, free of sharp dents or creases and not extending over or into supporting structure may be repaired by inserting a backup stiffener over the damaged area.	c. Stretched skin, oil cans, or creased dents that cannot be repaired by unloading, insertion repair, or back up stiffeners.

Table 2-4. Tail boom Classification of Damage (cont)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
1. TAIL-BOOM SKINS See figure 2-90 (cont)	c. Trapped or stretched skin. (cont)	area is stretched or oil canned and must be replaced or repaired Oil canning can be determined by pressing in on a sectional area and that section remains depressed and a bulge appears in that section or adjacent structure.		
2. ACCESS COVERS AND DOORS — TAILBOOM ASSEMBLY (Same defects as fuselage skin and panels table 2-3)				
3. TAILBOOM STRINGERS AND STIFFENERS	Dents, cracks, holes, tears, corrosion and distortion. NOTE Dye penetrant inspect bent stringers not requiring section removal (after rework)	Scratches or smooth shallow dents not extending into formed readius and less than 10 percent of material thickness and 0.50 inch length after cleanup. Damage in radius treat as a crack. One treated area per length between bulkheads. Edge damage not to exceed 0.025 inch depth and 0.75 inch length after cleanup. One repair per length between bulkheads.	a. Damage Repairable by Patching: Lateral cracks and smooth contour dents less than 1.0 inch depth that are less than 0.50 stringer width and do not extend into radius, stringer splice or bulkhead. Longitudinal cracks maximum 0.10 inch width and 1.0 inch length. b. Damage Repairable by Insertion: Damage exceeds limits for patching, but does not exceed 3.0 inch length after cleanup. One repair per length between bulkheads.	Damage requires more than one insertion type repair between bulkheads. Damage exceeds repairable limits or repair does not warrant time expended.

Table 2-4. Tailboom Classification of Damage (cont)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
3. TAIL-BOOM STRINGERS AND STIFFENERS (cont)			Damage not to extend into splice or bulk-heads. If combined stringer and skin damage is present, above limits and limits for skin damage shall not be exceeded.	
4. TAILBOOM DOUBLERS.	a. Cracks		Cracks that are no deeper than 20 percent of doubler thickness, and not exceeding 1.0 inch in length can be stop drilled at each end provided the crack is not closer than 1.0 inch to any adjacent structure.	
	b. Nicks, scratches, and dents.		Nicks, scratches and dents that are no deeper than 20 per-cent of the doubler thickness and not exceeding 1.0 inch in length, or 0.025 inch in width may be polished out and require no patching.	
	c. Holes, tears, and other damage exceeding the limits in a. and b. above		Holes, tears, and other damage exceeding the limits in steps a. and b. above and no longer than 4.0 inches or greater than 6.0 square inches may be repaired by patching.	

Table 2-4. Tailboom Classification of Damage (cont)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
5. LONGER-ONS (EXCLUD-ING TAIL-BOOM ATTACH FITTINGS) See fig-ure 2-32 SEE NOTE IN DAMAGE REQUIR-ING RE-PLACE-MENT COLUMN	a. Cracks, corrosion, dents, holes, tears, nicks, scratches, buckle, or wrinkled.	a. Nicks and Scratches: Not to exceed 10 percent of material thickness, 0.010 inch width and 0.75 inch length after cleanup. Scratches in web area that extend into radius or at angle greater than 45 degrees into critical area, treat as a crack, (figure 2-32, detail B). Nicks or notches in flange area not to exceed 0.80 inch length, 0.04 inch width and no deeper than 10 percent of material thickness after cleanup (figure 2-32 details B and C). No repair closer than 1.0 inch to a bulkhead, splice or doubler. Refer to attach fitting illustration for damage limits to fittings.	a. Damage Repair-able by Patching: 1. Smooth contoured dents, length not exceeding 1.0 inch longitudinal 0.5 inch lateral and 0.050 inch depth. If dent limits are exceeded, treat as a crack. (See figure 2-32, detail A.) 2. Nick and scratch damage exceeds negli-gible limits but does not exceed 1.0 inch width by 0.38 inch height and does not extend into critical after after cleanup (figure 2-32, detail F, section F-F). Damage in critical area does not exceed 2.0 inch length and 0.40 inch depth after cleanup. See detail F, section G-G.) 3. Crack, hole or tear damage not ex-ceeding limits of figure 2-32, details D and E, and extend-ing no closer than 1.0 inch to a splice, doubler or bulkhead after repair.	a. Damage exceeds repairable limits or two or more re-pairs required in a single bay. b. Damage other than negligible occurs in a bay containing either a splice joint or a previous repair. c. Damage other than negligible in forward bay. d. Splice required in second bay. e. Damage other than negligible comes closer than 1.0 inch to a doubler, splice or bulkhead. f. Any longer on damaged a suffi-cient amount to cause permanent buckles in tail boom, sharp wrinkles in skin or excessive misalignment. **NOTE** Damage to any longer on in forward bay area (other than negli-gible) requires replacement.
		b. Corrosion: Less than 10 percent of material thickness and not exceeding an area 0.10 inch	b. Damage Repair-able by Insertion: 1. Repairable by patching limits ex-ceeded but less than	requires replace-ment of both the longer on and fitting. Longer ons are replaced at next

Table 2-4. Tailboom Classification of Damage (cont)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
5. LONGERONS (EXCLUDING TAILBOOM ATTACH FITTINGS) See figure 2-32 (cont]		width by 0.75 inch length after cleanup. Damage confined to web area only and no closer than 1.0 inch to a splice, doubler or bulkhead, One repair for each longeron in a bay area. No damage in forward bay (figure 2-32, detail B).	2.60 inch length after cleanup, (figure 2-32, details F and G). 2. Cracks or sharp nicks in dent or damage exceeds repair by patching, but less than 2.60 inch after cleanup.	higher maintenance level
6. TAILBOOM BULKHEADS (Does not include canted bulkhead) See figure 2-33	Corrosion, dents, cracks, holes nicks, and wrinkles.	Corrosion less than 10 percent of web material thickness and not exceeding 4.0 square inch after cleanup. Damage no closer than 0.250 inch to a former, stiffener or radius. Dents, nicks, scratches in bulkhead web, refer to skin damage limits, item 1. Damage in a radius Damage in a radius treat as a crack.	a. Damage Repairable by Patching. 1. Corrosion damage greater than negligible but does not exceed 0.70 inch width or 33 percent of a cross section after cleanup. (See figure 2-33, detail B.) Damage no closer than 0.50 inch to a stiffener or attaching parts after cleanup. 2. Dent, cracks, holes and scratches greater than negligible but does not exceed limits of figure 2-33, details A and B. Maximum three damages not to exceed limits of detail A allowed for each bulkhead quadrant. Cracks or damage in radius of former on forward bulkhead except in area of attach fittings. b. Damage Repairable by Insertion:	Replace stiffeners or any attaching parts for damage other than negligible. Replace bulkhead if repairable limits are exceeded or if more than one repair to the limits of figure 2-33, detail D, is required **NOTE** Bulkheads are replaced by higher maintenance level.

Table 2-4. Tailboom Classification of Damage (cont)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
6. TAIL-BOOM BULK-HEADS (Does not include canted bulkhead) See figure 2-33 (cont)			1. Corrosion damage exceeds repairable by patching but does not exceed limits of figure 2-33, detail C. 2. Dent, cracks or hole damage exceeds limits of figure 2-33, details A and B, but less than limits.	
7. TAILBOOM CANTED BULKHEAD	Cracks, holes, nicks, corrosion, and wrinkles.	Corrosion not to exceed 1.0 square inch for single area, 4.0 square inch total area and 10 percent material thickness after cleanup. Nicks and scratches not to exceed 1.0 inch length, 0.025 inch width and 10 percent material thickness after cleanup. Treat damage in radius as a crack.	Three holes maximum not exceeding 1.0 inch diameter in web area and 3.0 inch minimum distance between damage. Cracks in nutplate hole but not extending into radius. Cracks in web area not exceeding 1.0 inch length after cleanup. No damage to come closer than 0.50 inch to stringer, longeron or structure attaching point and no closer than 1.0 inch to a fin spar cap attachment.	Cracks or holes in area of longeron, stringer, or fin spar cap attachment points. Damage exceeds repairable damage limits.
8. COVERS, TAIL ROTOR DRIVE-SHAFT INTER-MEDIATE GEARBOX See figure 2-34	Dents, nicks scratches, cracks, holes, corrosion, and worn rub strips.	Same as tailboom skins.	Same as tailboom skins except repair shall not interfere with fit or function of the cover. Replace worn rub strips.	Replace covers if damage is impractical to repair.

Table 2-4. Tailboom Classification of Damage (Cont)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
9. HINGES AND SUPPORT ANGLES, DRIVE-SHAFT COVER	Inspect hinges for cracked, worn, or missing loops. Check angles for cracks, holes, distortion and damaged or missing fasteners. Check covers for loose anti-chafing tape.	See figure 2-35	See figure 2-35	Damage exceeding limits of figure 2-35. Refer to TM 55-1500-204-25/1.
10. TAIL-BOOM ATTACH FITTINGS See figure 2-36	a. Nicks, scratches, and gouges.	a. Nicks, scratches, and gouges in tail-boom attach fitting may be polished out if they do not exceed these limits: (1) Axial damage (parallel to bolt holes) must not exceed 0.020 inch in depth and 0.300 inch in length. (2) Radial damage (normal to bolt axis) must not exceed 0.010 inch in depth or 0.300 inch in length. (3) Nicks, scratches, or gouges are not permitted within one diameter of bolt hole, longeron splice rivets or within 0.250 inch of end of sheet metal longeron located at splice.		Any cracks to the longeron attach fittings forward of boom station 70.00, or damage exceeding the above limitation require the part to be replaced by next higher maintenance level.
	b. Corrosion			No corrosion allowed in first 5.50 inches of attach fitting.

Table 2-4. Tailboom Classification of Damage (cont)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
10. TAILBOOM ATTACH FITTINGS See figure 2-36 (cont)	c. Bolt hole elongation.			Inspect attachment bolt holes in tailboom fuselage fittings for wear. Maximum diameter permitted for holes is 0.516 inch.
11. BEARING HANGER SUPPORT FITTING. See figure 2-37	a. Cracks b. Corrosion c. Hole elongation. Bearing support attach holes.		See figure 2-37.	Cracks in fitting or damage exceeding limits shown in figure 2-37. No corrosion damage allowed inside diameter of attachment hole surfaces. Refer to paragraph 2-35b.
12. INTERMEDIATE GEARBOX SUPPORT INSTALLATION. See figure 2-38.	a. Cracks.			Any cracks are cause for replacement.
	b. Distortion of support installation components.			Replace distorted components. Replacement of support fittings must be done by next higher maintenance level.
	c. Gearbox attachment hole damage.		See figure 2-38.	
	d. Scratches, nicks, dents.		See figure 2-38.	Treat deep scratches, nicks, and dents as cracks for inspection.

Table 2-4. Tailboom Classification of Damage (cont)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
12. INTERMEDIATE GEARBOX SUPPORT INSTALLATION. see figure 2-38 (cont)	e. Corrosion.		See figure 2-38.	Treat deep corrosion same as cracking for inspection.
	f. Stud pin damaged.		Replace damaged stud pin.	
	g. Nutplates damaged.		Replace damaged nutplates.	
13. TAIL-ROTOR GEARBOX SUPPORT FITTING see figure 2-39	a. Cracks			a. Any cracks are cause for replacement.
	b. Scratches, nicks, dents and corrosion.		b. Repairable scratches, nicks, dents, and corrosion on top surface and on stud holes may be polished out with Scotchbrite (C103) or No. 400 grit sandpaper (C102). When removing corrosion be sure to check pockets and hidden areas for indications. Determine the proper cleaning procedures and treatment of corroded parts.	
	c. Chafing		c. Total depth of chafing allowed in area A is 0.075 inch. For total depth of chafing allowed in area B refer to figure 2-39.	
	d. Gearbox mounting hole elongation. Stud holes diameter cannot exceed 0.400 inch			d. If limits are exceeded the tail rotor gearbox fitting must be repaired or replaced by next higher maintenance level.

Table 2-4. Tailboom Classification of Damage (cont)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
13. TAIL-ROTOR GEARBOX SUPPORT FITTING See figure 2-39 (cont)	e. Bellcrank support bushings may be elongated to a maximum diameter of 0.445 inch for bushing in forward lug and to 0.317 inch for bushing in aft lug.			e. Bellcrank support bushings elongated in excess of limits must be replaced.
14. VERTICAL FIN HONEY-COMB PANELS. See figure 2-40.	a. Dents	Smooth scratch free dents which do not crush the core may be classed as negligible.	See figure 2-40.	See figure 2-40.
	b. Holes	See figure 2-40	See figure 2-40	See figure 2-40
	c. Voids	See figure 2-40	See figure 2-40	See figure 2-40
	d. Nicks and scratches.	Minor surface scratches which do not penetrate the core may be classed as negligible. Surface scratches no deeper than 10 percent of material are acceptable after blending.	See figure 2-40	See figure 2-40
	e. Corrosion	See figure 2-40	See figure 2-40	Remove panel if water or corrosion is found in core, or repair limits exceeded, or if four or more patch type repairs are required to a panel.
	f. Loose or damaged inserts.	None	Replace as required. See figure 2-40	

Table 2-4. Tailboom Classification of Damage (cont)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
15. VERTICAL FIN TRAILING EDGE See figure 2-41	a. Nicks and scratches	Scratches and nicks which do not deform the airfoil shape of fin.		Any damage which cauases deformation of airfoil or repairable limits exceeded.
	b. Dents, cracks, and holes.	Smooth dents which do not deform airfoil shape of fin.	Dents, cracks, holes which are less than 1.0 inch length and 0.50 inch width through one or both sides. 8.0 inch minimum distance between damaged areas after cleanup. See figure 2-41.	Any damage which causes deformation of airfoil or if repairable limits are exceeded.
16. VERTICAL FIN FORWARD SPAR See figure 2-34	a. Dents.	Smooth dents in spar web free of cracks and gouges not exceeding 0.016 inch depth and 10 inch diameter. No dents in spar caps		Dents in area of fittings, or damage exceeding negligible limits, or damage to spar caps not authorized for repair at AVIM level
	b. Cracks		Cracks in lateral stiffeners that do not extend inside rivet line. Web damage not to exceed 3.0 square inches after cleanup, may be repaired in areas of fitting attach points. Any repair to spar cap angles requires qualified engineering approval.	Cracks in area of fittings, or damage exceeding repairable limits, or damage to spar caps not authorized for repair at AVIM level
	c. Scratches	Surface scratches no deepter than 10 percent of material thickness after blending.		Scratches in area fittings, or damage exceeding negligible limits, or damage to caps not authorized for repair at AVIM level.

Table 2-4. Tailboom Classification of Damage (cont)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
16. VERTICAL FIN FORWARD SPAR see figure 2-41 (cont)	d. Holes		Holes in lateral stiffiners that do not extend inside rivet line. Web damage not to exceed 3.0 square inches after cleanup may be repaired in areas clear off fitting attach point. Any repair to spar cap angle requires qualified engineering approval.	Holes in area of fittings or damage exceeding negligible limits, or damage to spar caps not authorized for repair at AVIM.
17. ELECTRONIC EQUIPMENT SHELF	a. Dents.	a. Smooth contoured dents up to 5 percent of panel thickness provided: 1. Total damage does not exceed 5 percent of panel area. 2. No voids exist under dents.	a. Damage exceeds negligible damage limits. If no cracks, holes, or voids exist, see figure 2-7 for limits. Void limits are shown on figure 2-8. Limits for sharp dent or dents which penetrate panel surfaces are shown on figures 2-9 and 2-10.	a. Damage exceeds repairable limits. Corrosion in honeycomb core.
	b. Voids.	b. Voids up to 0.25 square inch (0.50 x 0.50) provided: 1. No more than two such areas can be encompassed by a 4.0 inch circle. 2. The edge of any void is a minimum of 3.0 inches from supporting structure, panel edge bevel or insert or fitting. NOTE: Voids closer than 1.0 inch are	b. Damage exceeds negligible limits. See figure 2-8.	b. Damage exceeds repairable limits.

Table 2-4. Tailboom Classification of Damage (cont)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
17. ELECTRONIC EQUIPMENT SHELF (CONT)	b. Void. (cont).	classed as one void. Edge separation is never classed as negligible damage.		
	c. Nicks and scratches.	c. Nicks and scratches not exceeding 10 percent of metal facing thickness and 4.0 inches square after cleanup. Damage 1.0 inch minimum from supporting structure after cleanup.	c. Damage exceeds negligible limits. See figure 2-7 for damage not penetrating surface. See figure 2-9 for damage penetrating surface.	c. Damage exceeds repairable limits. Replace any panel having evidence of water or corrosion in the core.
	d. Corrosion.	d. Corrosion not to exceed 10 percent of metal facing thickness and 4.0 square inches after cleanup. Damage minimum 1.0 inch from supporting structure.	d. Damage not to exceed 20 percent of panel area. Maximum diameter of any area after cleanup is 1.0 inch. One repair per bay allowed. Minimum distance between repairs is 3.0 inches. No repair within 1.0 inch of supporting structure, inserts, or beveled edge.	d. Same as preceding atop c.
	e. Cracks, holes, punctures.	e. None.	e. Cracks, holes or punctures. 1. Damages affect only one skin and core. (See figure 2-9 for limits.) 2. Damages affect both skins and core. (See figure 2-10 for limits.]	e. Same as preceding atop c.

Table 2-4. Tailboom Classification of Damage (cont)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
17. ELECTRONIC EQUIPMENT SHELF (CONT)	f. Loose or damaged inserts.	f. None.	f. Replace as required.	

(5) Form a reinforcing patch of same material and one gage heavier than damaged stringer. The patch should extend at least four inches beyond each end of cutout section. Maximum length of patch is 12 inches. Refer to figure 2-31.2.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(6) Clean dirt from around damaged area and from both sides of reinforcing patch using a clean cloth saturated with naphtha (C75).

(7) Secure reinforcing patch firmly in place and drill rivet holes through patch and damaged stringer the same size and pitch as existing rivet holes. Deburr all holes.

(8) Apply a coat of primer (C88 or C91) to both sides of patch and damaged stringer.

(9) Secure reinforcing patch in position and rivet into place.

(10) Apply a coat of primer (C88 or C91) over repaired area.

b. Repair damaged stringer by insertion. Complete stringer breaks and cracks extending more than one-half the width of the stringer, which make patching inadequate, necessitates repair by insertion (splicing).

(1) Check to see that no rivets are bent or damaged and that the rivet holes are not elongated or torn.

(2) Remove damaged or loose rivets.

(3) Trim damaged edge of break in stringer. Do not trim more than necessary. Re-form and return damaged stringer to correct position.

(4) Cut and form an insert of same material and gage as damaged stringer. Cut and forma reinforcing patch of same material and one gage heavier than damaged stringer. The patch should extend at least 4 inches beyond each end of the cutout section.

CAUTION

A filler splice should never exceed 12.0 inches in length.

(6) Clean dirt from around damaged area and from both sides of insert and reinforcing patch.

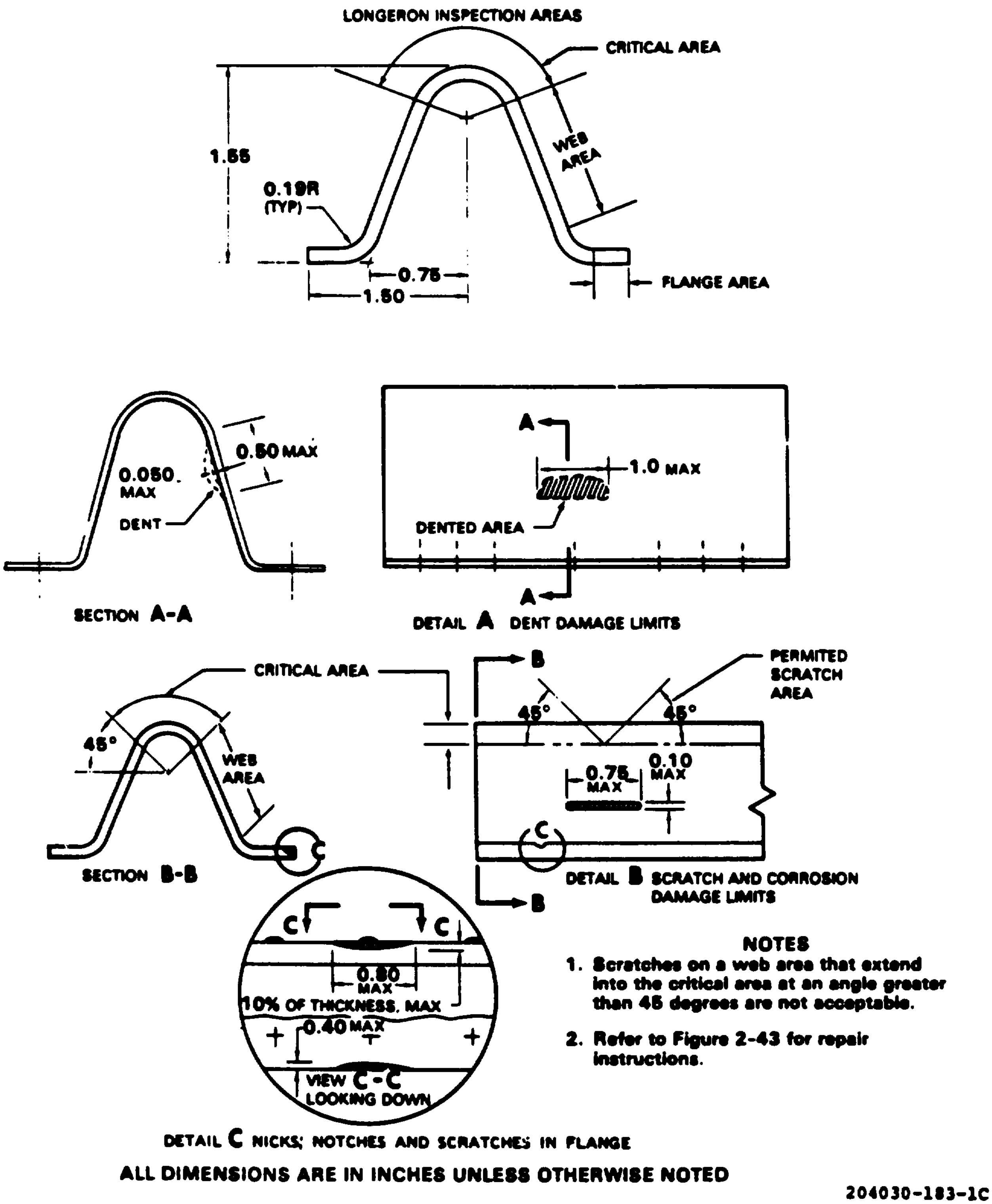
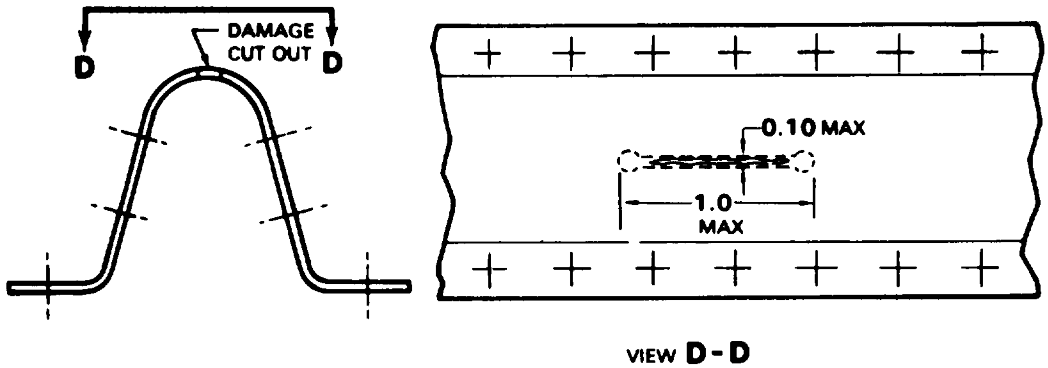
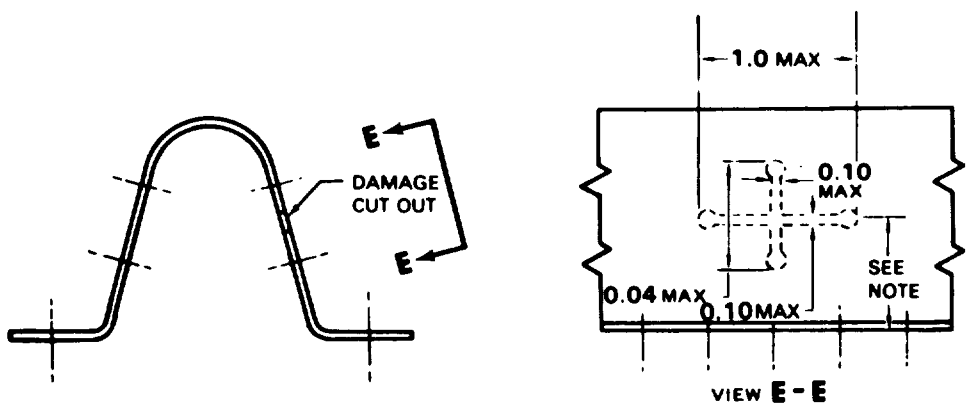


Figure 2-32. Longeron Damage Limits (Sheet 1 of 3)



DETAIL D LONGITUDINAL CRACKS IN CRITICAL AREA



DETAIL E LONGITUDINAL OR LATERAL CRACKS IN WEB AREA

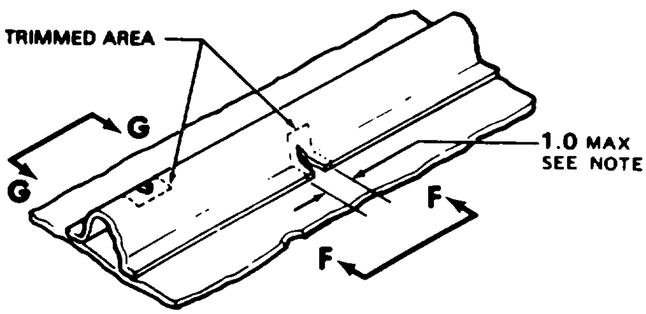
ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

NOTES

1. All longitudinal cracks are repairable if they are 0.45 inch minimum height from longeron flange, 1.04 inches maximum height from longeron flange.
2. Refer to figure 2-43 for repair instructions.

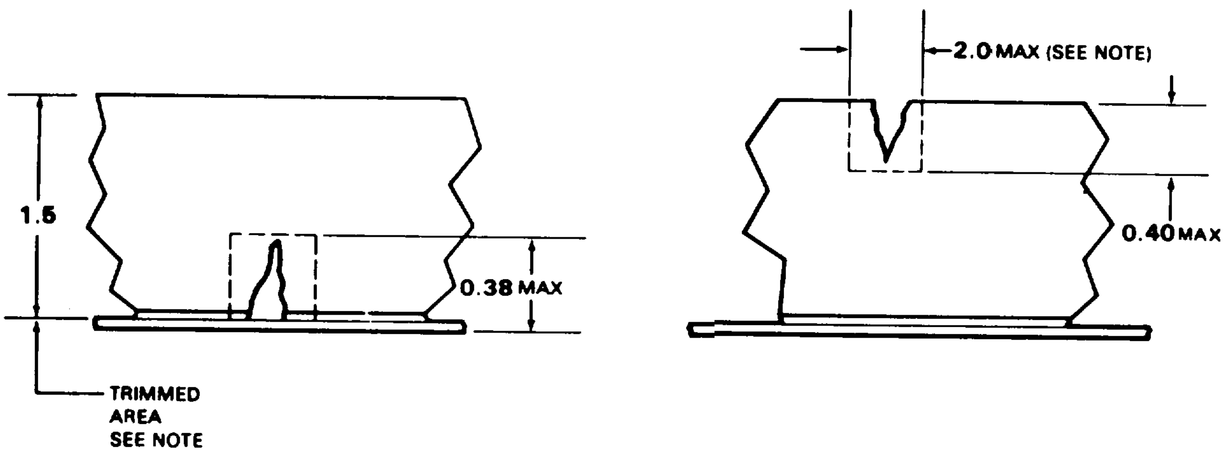
204030-183-2B

Figure 2-32. Longeron Damage Limits (Sheet 2 of 3)



NOTES.

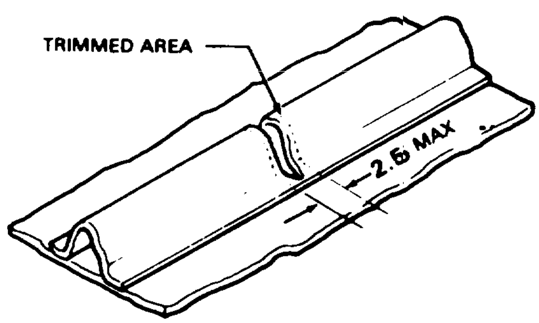
1. When trimmed area exceeds limits shown for either critical area or flange and web, or if combined damage extends from the flange and web into critical area, inspect to limits of detail G.
2. Refer to figure 2-43 for repair instructions.



SECTION F - F
FLANGE AND WEB

SECTION G - G
CRITICAL AREA

DETAIL F DAMAGE LIMIT TO CRITICAL AREA, FLANGE OR WEB

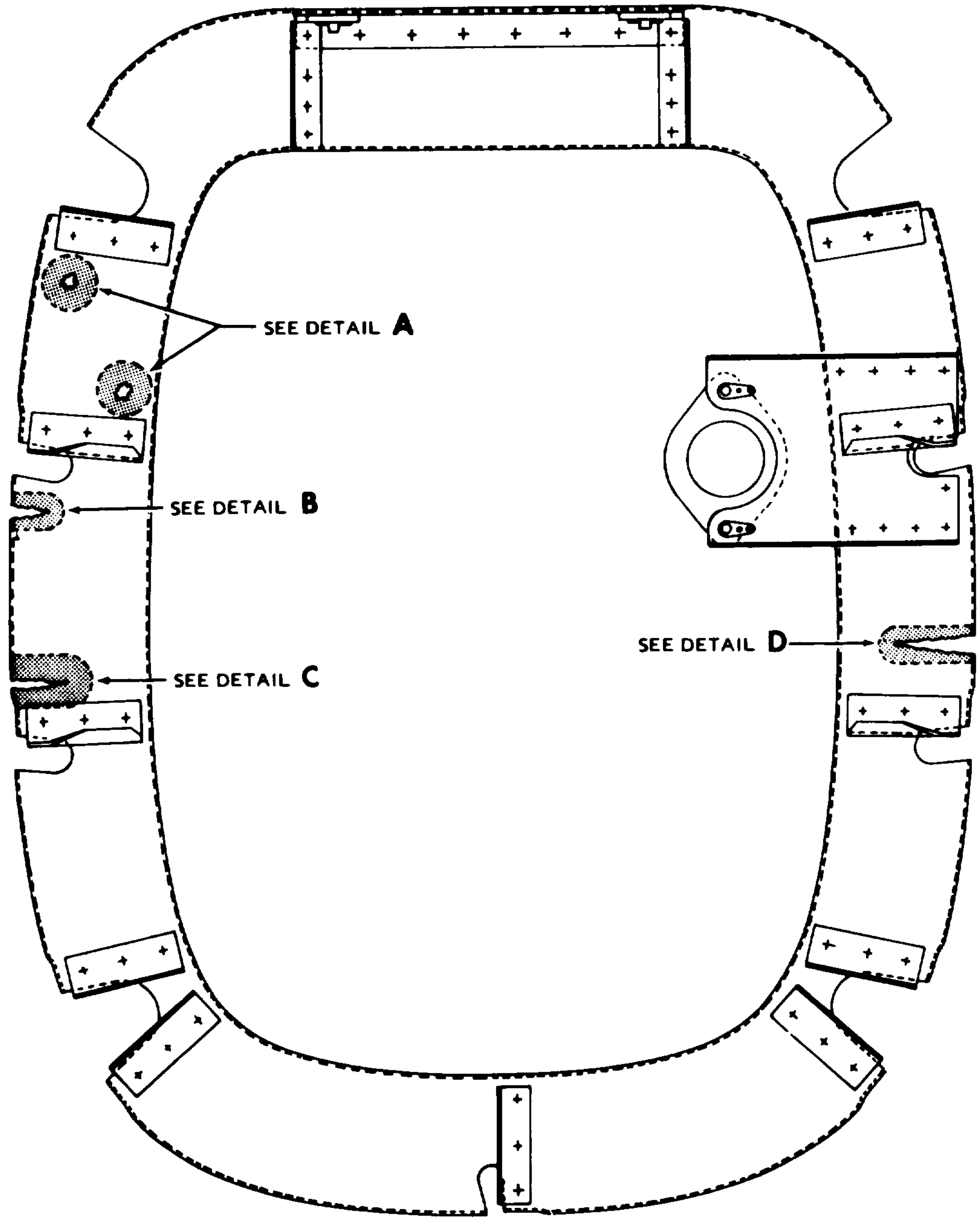


DETAIL G DAMAGE LIMIT TO CRITICAL AREA, FLANGE AND WEB

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

204030-183-3B

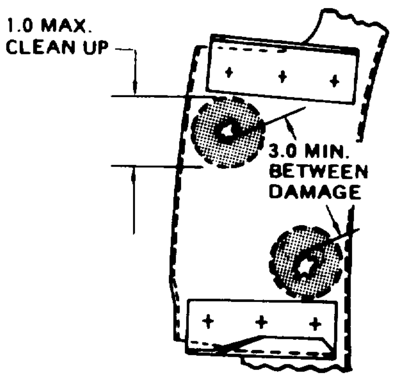
Figure 2-32. Longeron Damage Limits (Sheet 3 of 3)



NOTE

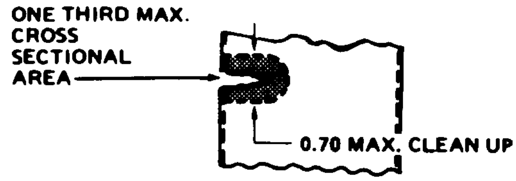
Three repairs not exceeding the limits of detail "A" or "B" and minimum 3.0 inches between damage areas are allowed for each quadrant of a bulkhead. One repair not exceeding the limits of detail "C" is allowed in each quadrant of a bulkhead. One repair not exceeding the limits of detail "D" is allowed for each bulkhead. Damage affecting more than one-half of a cross sectional area requires a full splice.

Figure 2-33. Typical Tailboom Bulkhead Damage Limits (Sheet 1 of 2)



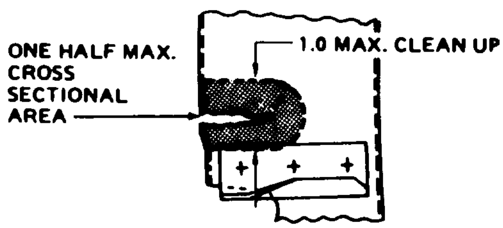
DETAIL A (SEE NOTE ON SHEET 1)

HOLE DAMAGE LIMITS



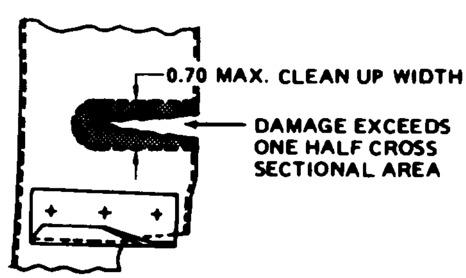
DETAIL B (SEE NOTE ON SHEET 1)

DAMAGE LIMITS AFFECTING ONE THIRD
OR LESS OF CROSS SECTION



DETAIL C (SEE NOTE ON SHEET 1)

DAMAGE LIMITS AFFECTING ONE HALF
OR LESS OF CROSS SECTION



DETAIL D (SEE NOTE ON SHEET 1)

DAMAGE AFFECTS MORE THAN
ONE HALF CROSS SECTIONAL AREA

NOTE: ALL DIMENSIONS IN INCHES UNLESS OTHERWISE NOTED.

209033-79-2

Figure 2-33. Typical Tailboom Bulkhead Damage Limits (Sheet 2 of 2)

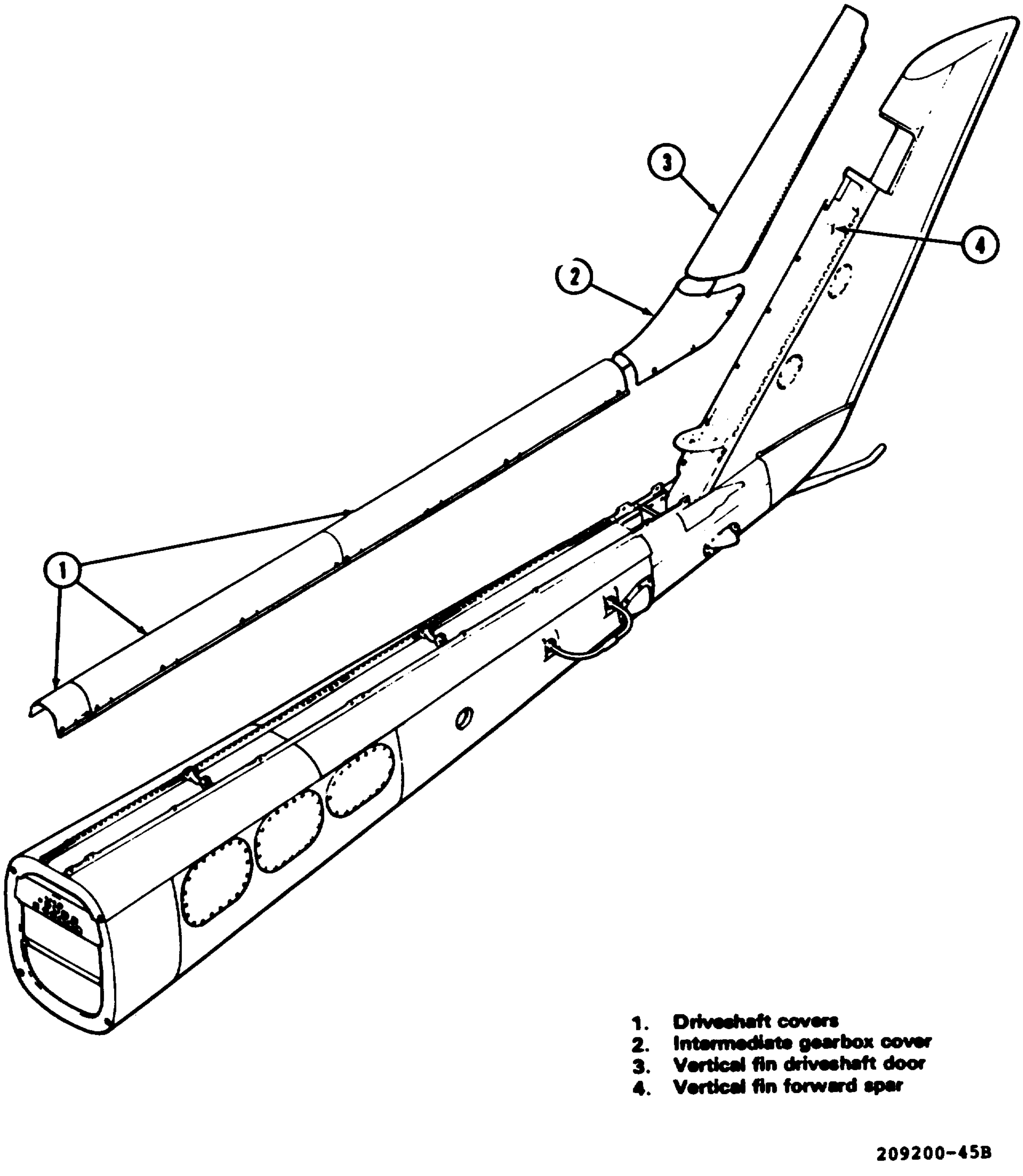


Figure 2-34. Tail Rotor Driveshaft Covers

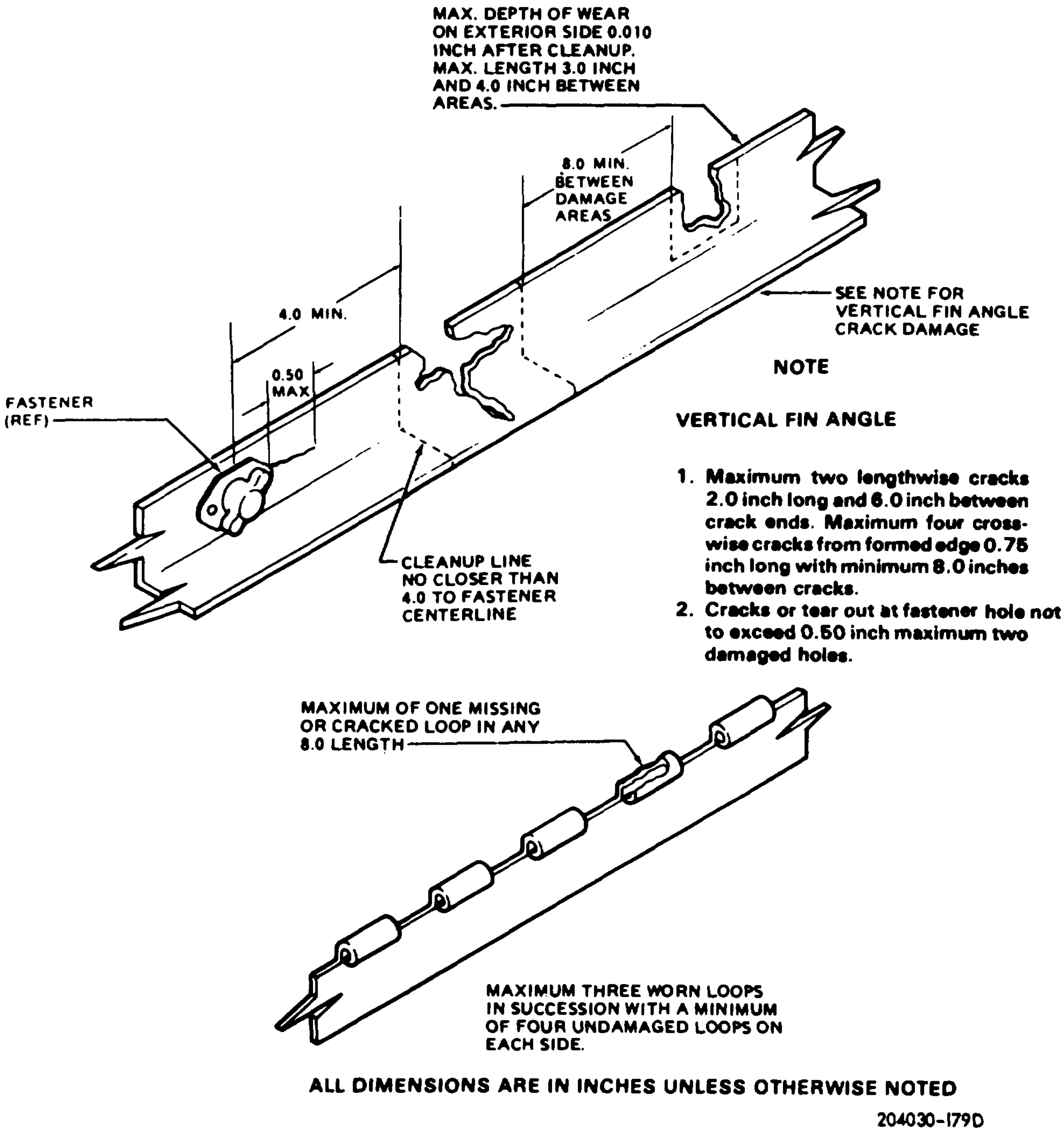
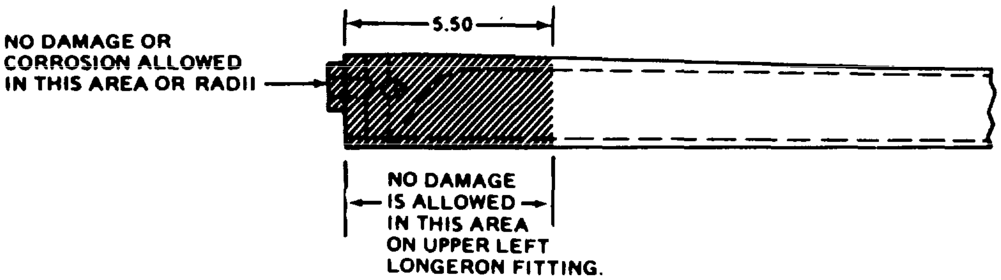


Figure 2-35. Driveshaft Cover Hinges and Angles Damage



LOWER LEFT FITTING	209-033-813-1
LOWER RIGHT FITTING	209-033-814-1
UPPER LEFT FITTING	209-033-815-1
UPPER RIGHT FITTING	209-033-816-1

DAMAGE LOCATION SYMBOLS

		
TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED	
CRACKS ALLOWED	NONE	NONE
MECHANICAL DAMAGE	0.020	0.040
CORROSION DAMAGE		
BEFORE REPAIR	0.010	0.010
AFTER REPAIR	0.020	0.020
MAXIMUM AREA PER FULL DEPTH REPAIR	20 Percent of surface area after cleanup.	20 Percent of surface area after cleanup.
MAXIMUM WIDTH	0.100	0.200
EDGE CHAMFER	0.020	0.040

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

NOTES:

1. Negligible damage consists of small, smooth contoured dents with a maximum depth of 0.010. No material may be removed. No rivet damage.

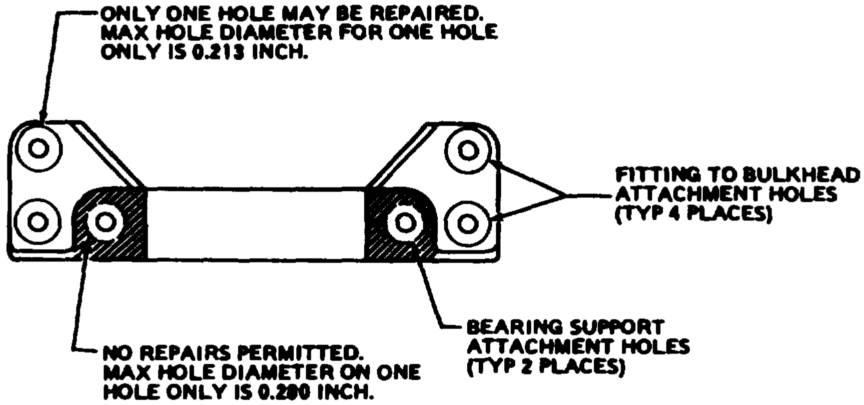
2. Blend nicks, dents, or scratches to 0.200 maximum width.

209033-45A

Figure 2-36. Damage Limits — Tailboom Attach Fitting

WARNING

NO REPAIRS PERMITTED ON BEARING MOUNTING SURFACE.



209-033-818-1 FITTING

DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED	
CRACKS ALLOWED	None	None
MECHANICAL DAMAGE	None	0.005
CORROSION DAMAGE AFTER REPAIR	None	10 percent of thickness or 0.020 whichever is greater.
MAXIMUM AREA PER FULL DEPTH REPAIR	None	Mechanical: 40 percent of surface area after cleanup including prior repairs. Corrosion: 20 percent of surface area after cleanup including prior repairs.

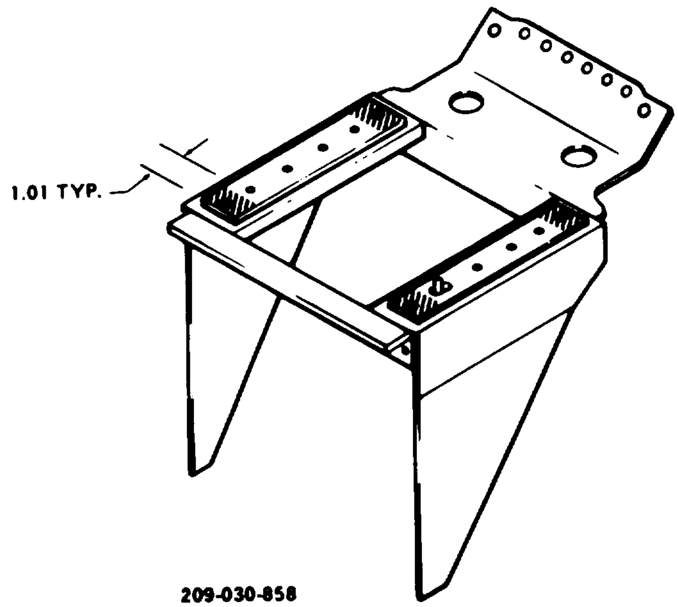
ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

NOTES:

1. No corrosion allowed in hole area.
2. Corrosion damage must be clear of counterbores, fillets, and fastener holes by 0.05 minimum.

209030-344A

Figure 2-37. Damage Limits – Searing Hanger Support Fitting



WARNING

NO REPAIRS PERMITTED ON
GEARBOX MOUNTING SURFACE.

TYPE OF DAMAGE	DAMAGE LOCATION SYMBOLS / MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED (hatched)	(open)
CRACKS ALLOWED	None	None
MECHANICAL DAMAGE	None	0.020
CORROSION DAMAGE AFTER REPAIR	None	10 percent of thickness or 0.020, whichever is less.
MAXIMUM AREA PER FULL DEPTH REPAIR	None	20 percent of surface area after cleanup including prior repairs.

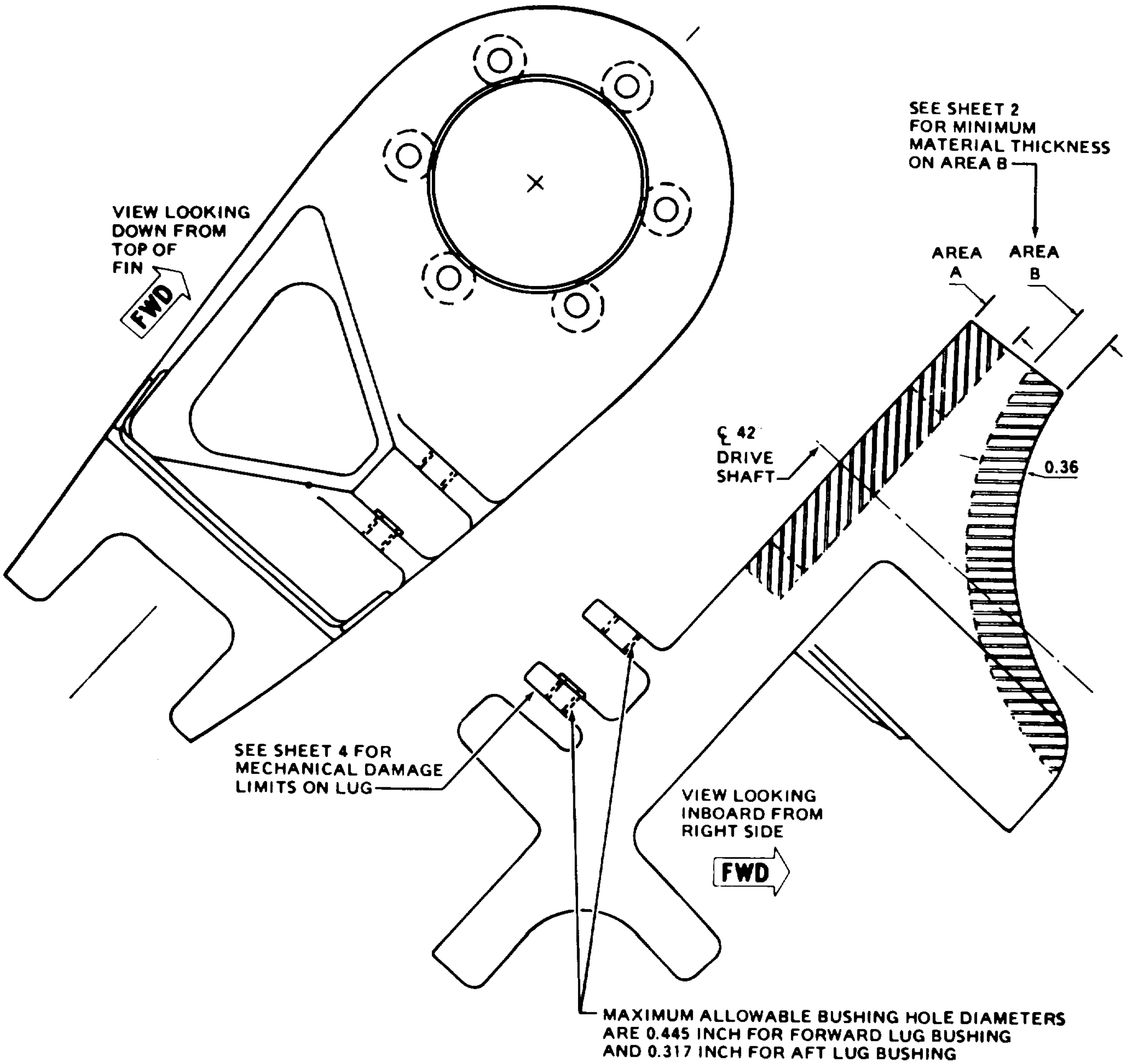
ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

NOTES:

1. Only one gearbox attachment hole can be repaired, maximum diameter 0.275.
2. No corrosion in attachment holes or within 0.05 of fastener holes or fillets.

209030-343B

Figure 2-38. Damage Limits — Intermediate Gearbox Support Installation



ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

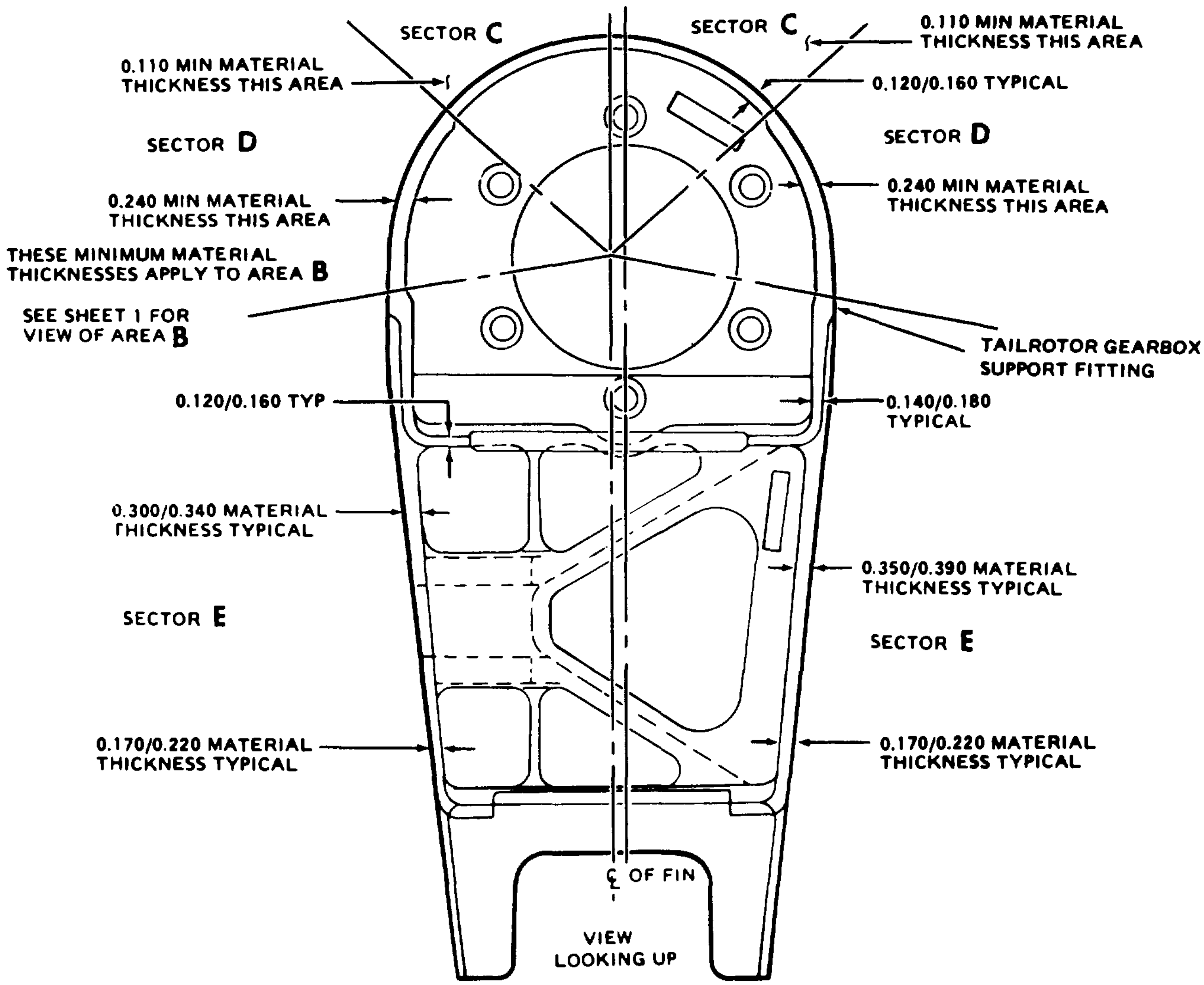
NOTES:

1. Total depth of nicks, scratches, and dents permitted to the top surface of the fitting is 0 080 inch with an allowable width of 0.200 inch. The total reworked area must not exceed 30 percent of the total surface area.

2. The total depth of chafing allowed in area A is 0.075 inch. The total depth of chafing allowed in area B is 0.010 inch. Minimum material thicknesses for area B are shown on sheet 2.

209031-85-1B

Figure 2-39. Damage Limits – Tail Rotor Drive Support Fitting (Sheet 1 of 4)



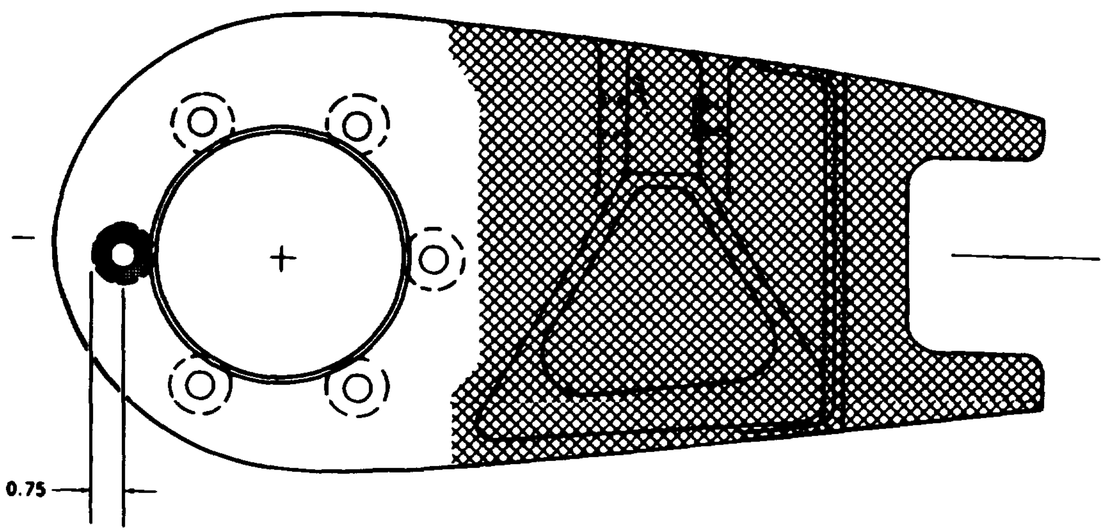
ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

DAMAGE LIMITS FOR AREAS BEYOND AREA B.
SEE SHEET 1 FOR VIEW OF AREA B

DAMAGE SECTOR	DAMAGE QUANTITY	MAX. LENGTH	MAX. DEPTH	MAX. BLEND DEPTH	MIN DAMAGE SPACING
C-LEFT C-RIGHT	3 2	0.75 0.75	0.005 0.005	0.006 0.006	2X LENGTH OF LONGEST DAMAGE
D-LEFT D-RIGHT	2 3	1.00 1.00	0.01 0.01	0.012 0.012	2X LENGTH OF LONGEST DAMAGE
E	3	0.75	0.01	0.012	2X LENGTH OF LONGEST DAMAGE

209031-85-2B

Figure 2-39. Damage Limits — Tail Rotor Drive Support Fitting (Sheet 2 of 4)



VIEW LOOKING DOWN ON TOP OF SUPPORT FITTING

DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED ON EXPOSED UPPER SURFACE			
CRACKS	None	None	None	None
NICKS, SCRATCHES, SHARP DENTS AND CORROSION	0.010 maximum depth after blending	0.025 maximum depth after blending	0.060 maximum depth after blending	0.080 maximum depth after blending 0.200 maximum width

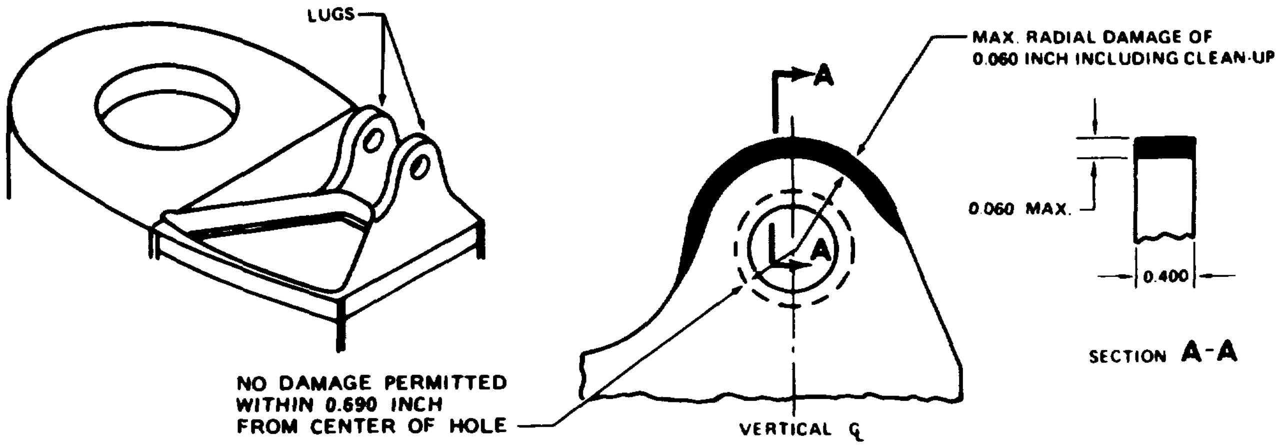
ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

NOTES

1. Damage limits adjacent to holes are applicable to each of six gearbox stud holes; however, if area around two or more holes is damaged to limits shown, part must be replaced.
2. Total reworked area on top surface of fitting must not exceed 30 percent of total area.
3. Wear Limit: Maximum diameter of holes for gearbox studs is 0.400.
4. See sheet 4 for additional limits in area of lugs.

209031-85-3B

Figure 2-39. Damage Limits – Tail Rotor Drive Support Fitting (Sheet 3 of 4)



ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

NOTES:

1. **Nicks and scratches on fitting lug faces to a maximum depth of 0.010 inch and a maximum length of 0.50 inch are reparable.**
2. **Only two repairs allowed on each lug face.**
3. **Both damages should not occur on same side of vertical lug face.**
4. ***No cracks in lug area acceptable.***

209031-85-4C

Figure 2-39. Damage Limits – Tail Rotor Drive Support Fitting (Sheet 4 of 4)

(6) Secure the insert and reinforcing patch firmly in place and drill rivet holes through reinforcing patch, insert, and damaged stringer, the same size, and pitch, as existing rivet holes. Remove burrs from all holes.

(7) Apply primer (C88 or C91) to damaged area on both sides of insert and patch.

(8) Secure insert and patch and rivet in place.

2-30. REPAIR – TAILBOOM DOUBLERS.

Repair using standard aluminum repair procedures in TM 55-1500-204-25/1.

2-31. REPAIR – TAILBOOM LONGERONS.

See figure 2-42. Repair damaged longeron aft of Boom Station 70.00.

WARNING

No repairs allowed forward of boom station 70.00 other than limits specified in Table 2-4, Tailboom Classification of Damage, item 10.

a. Check to sea if there is any damage to skin such as bent or damaged rivets or torn rivet holes.

b. Cut out damaged area, centering the cut edges between holes to permit retention of existing rivet pattern (figure 2-42). Do not cut more than necessary. Use generous radii at corners (0.250 inch minimum).

c. Cut and form a reinforcing patch of the same material and one gage heavier than the longeron and long enough to extend at least 4.50 inches on each side of the damage (after cleanup).

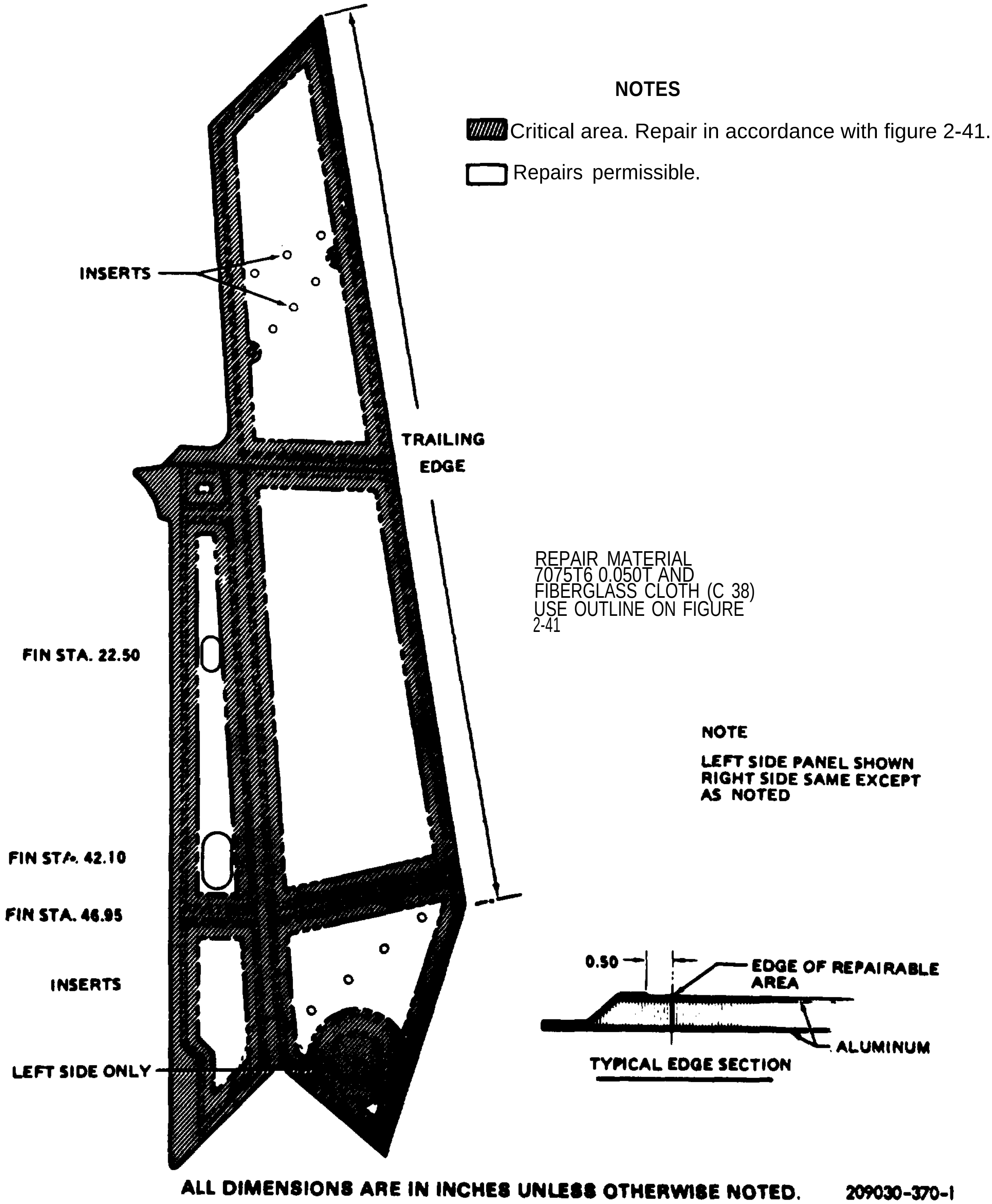
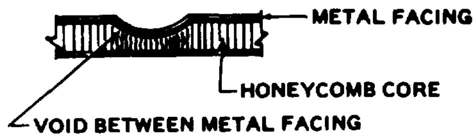


Figure 2-40, Vertical Fin Honeycomb Panels Damage (Sheet 1 of 4)

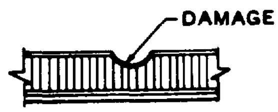


DETAIL A

SURFACE DENT WITH CRUSHED
CORE AND VOID BETWEEN
SKIN AND CORE

LIMITS

1. No sharp dents, holes, or damages that penetrate metal facing.
2. Maximum diameter of damage 2.0 inches, or maximum length of damage 1.50 inches.
3. Maximum depth of damage 20 percent of panel thickness.
4. Total damage not to exceed 10 percent of a bay area.
5. Minimum distance of 0.5 inch from adjacent structure, inserts or beveled edge.



DETAIL B

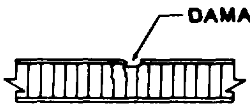
SURFACE DENT WITH
CRUSHED CORE. NO
VOIDS UNDER DENT

LIMITS

1. Smooth, crack free dent.
2. Maximum diameter of single dent 1.0 inch. Two or more dents in any 6.0 inch diameter area, consider as one dent.
3. Maximum depth: 20 percent of panel thickness.
4. Maximum area of all dents combined: 10 percent of a bay area.
5. Maximum of five dents in a 9.0 square inch area.
6. No voids may be present under the damage.
7. Minimum distance of 0.5 inch from inserts or beveled edge.

209030-370-2

Figure 2-40. Vertical Fin Honeycomb Panels Damage (Sheet 2 of 4)

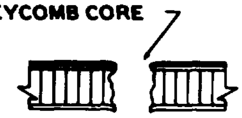


DETAIL C

OUTER SKIN AND CORE DAMAGED. DAMAGE PENETRATES OUTER SKIN AND CORE ONLY.

LIMITS

1. Maximum diameter of 3.0 inches after clean-up.
2. Maximum of three patch repairs in a panel. Damage after clean-up comes no closer than 1.5 inch to a similar repair or insert and no closer than 1.5 inch to a beveled edge.
3. Replace panel if water or corrosion found in core.
4. Total damage not to exceed 10 percent of total panel area or 25 percent of a single bay area after clean-up.



DETAIL D

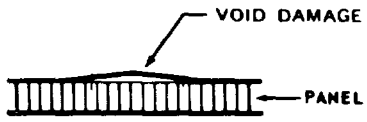
DAMAGE PENETRATES THROUGH BOTH SKIN AND CORE.

LIMITS

1. Maximum diameter of hole 3.0 inches, after clean-up.
2. Minimum distance from structural members or other repair: 2.0 inches.
3. Minimum distance of completed repair from an edge bevel: 0.50 inches.
4. Total damage not to exceed 10 percent of a bay area.
5. Maximum of three patch repairs in a panel.
6. Replace panel if water or corrosion found in core.

209030-370-3

Figure 2-40. Vertical Fin Honeycomb Panels Damage (Sheet 3 of 4)

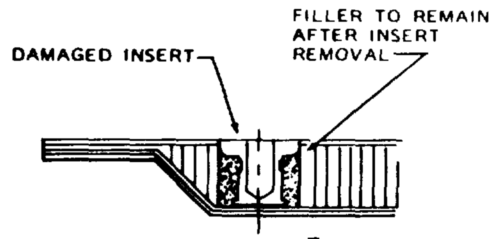


DETAIL E

VOID AREA BETWEEN METAL FACING AND CORE

LIMITS

1. **Maximum total void area not to exceed 5 percent of panel surface area.**
2. **Maximum area of a single void: 1.5 square inch and a minimum of 2.0 inches between voids. Maximum length of a void: 3.0 inches in any direction.**
3. **Damage not closer than 1.0 inch of a beveled edge, hole or adjacent structure, or within 3.0 inches of an insert. Void in area of insert limited to 0.62 square inch with no damage to insert.**



DETAIL F

DAMAGED OR LOOSE INSERTS

LIMITS

1. **Remove insert by counterboring without enlarging hole size in panel facing.**
2. **Original hole diameter in panel facing must be maintained in the replacement process.**
3. **No damage in area adjacent to insert.**

209030-370-4

Figure 2-40. Vertical Fin Honeycomb Panels Damage (Sheet 4 of 4)

d. Secure the reinforcing patch in position and drill out rivet holes of the same size and pitch as shown in figure 2-42.

e. Mark a line around outer edge of patch using a soft pencil. Remove patch and deburr holes.

WARNING

Cleaning advent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with akin or eyes.

f. Remove paint from between previously marked lines of damaged area using a clean cloth saturated with MEK (C74).

g. Buff both sides of patch with Scotchbrite (C103) and wipe with a clean cloth.

CAUTION

Do not touch patch with bare hands after cleaning.

h. Apply adhesive (C8) to mating surface of patch.

i. Secure reinforcing patch in position and rivet in piece while adhesive is still wet.

j. Apply a coat of primer (C88 or C91) over the repaired area.

2-32. REPAIR – TAILBOOM BULKHEADS.

Repair damaged bulkheads by patching and insertion.

a. Cracks, tears, and punctures in the bulkhead, web, and flanges may be repaired by patching, provided the damage does not extend more than one-half the width of the bulkhead. Refer to figures 2-44 through 2-47. Repair damage.

REPAIR — TRAILING EDGE

DESCRIPTION

Tears, cracks, gouges, dents, and holes, penetrating through one or both sides of the trailing edge.

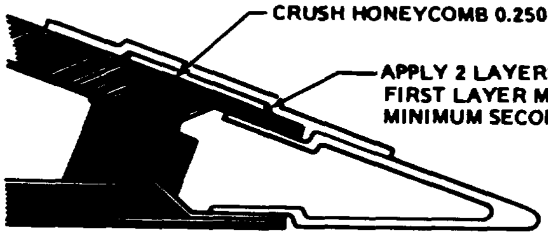
LIMITS — REPAIRABLE DAMAGE

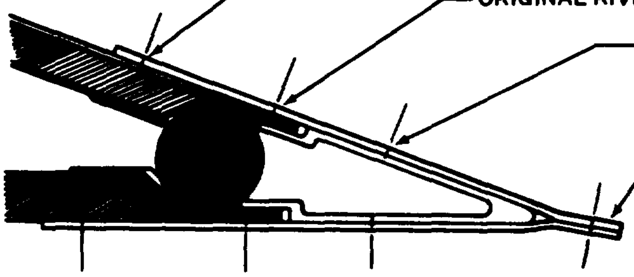
Tears, cracks, gouges, dents, and holes that are less than 1.25 inch in length and 0.50 inch in width through one or both sides of fin, can be repaired by patching.

Maximum distance between damaged areas, 8.0 inches.

TRAILING EDGE — SPAR NOT DAMAGED

MAXIMUM DAMAGE AFTER CLEANUP 1.25 INCHES





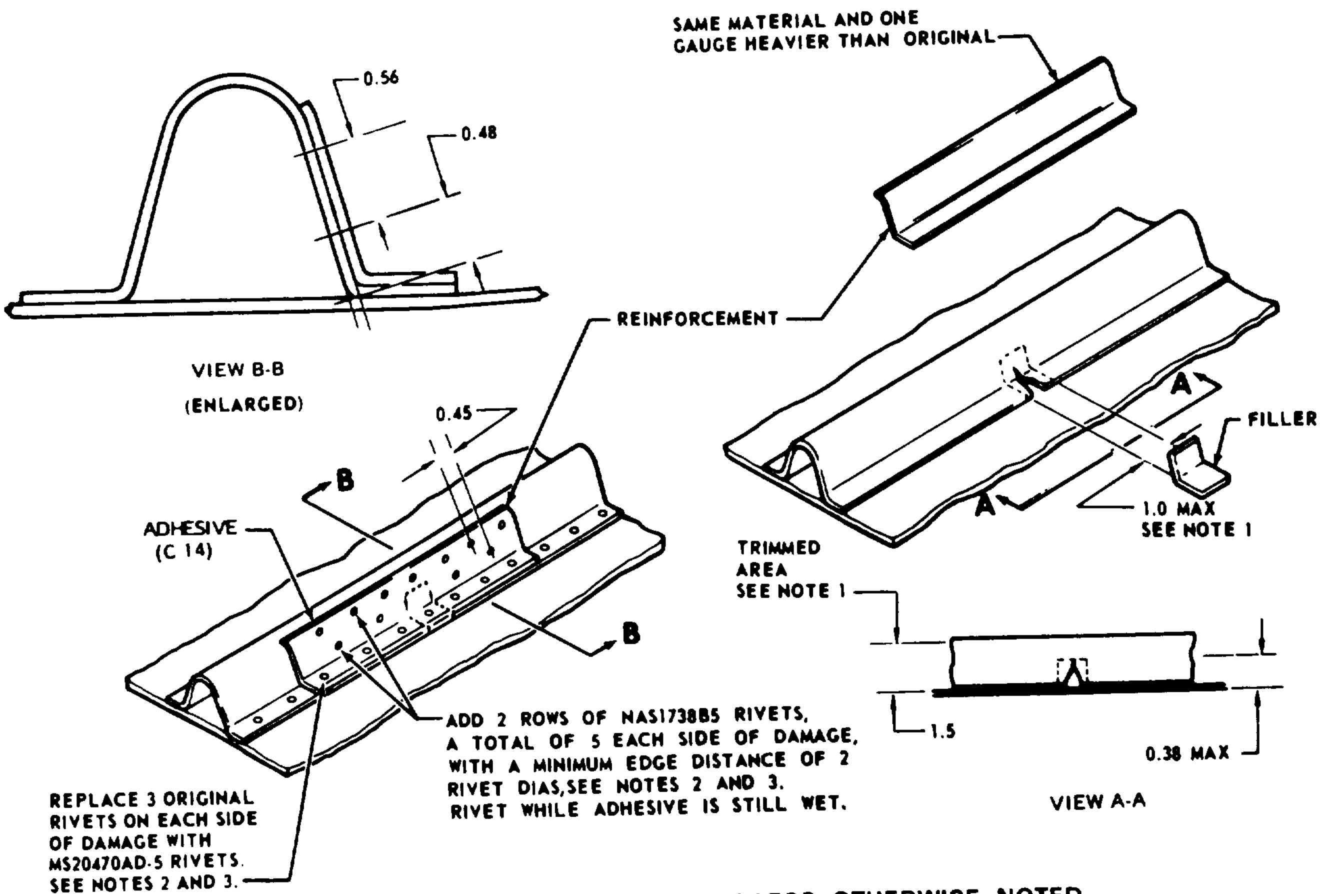
Bond doublers with adhesive (C14). Fill and file all edges of doubles after riveting. Touch up refinish.

Polish and inspect dents for cracks. If crack does exist stop drill cracks at both ends and patch as shown above. Dents with or without cracks fill and fair with adhesive (C14).

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

209030-331B

Figure 2-41. Edge Repair on Vertical Fin



Note 1

When trimmed area exceeds 1.0 inch, or more than two rivets (in flanges) are lost or damaged, repair as directed on figure 2-43.

Note 2

Under no circumstances may an MS20600 or similar nonlocking stem blind rivet be used in a structural application.

CAUTION

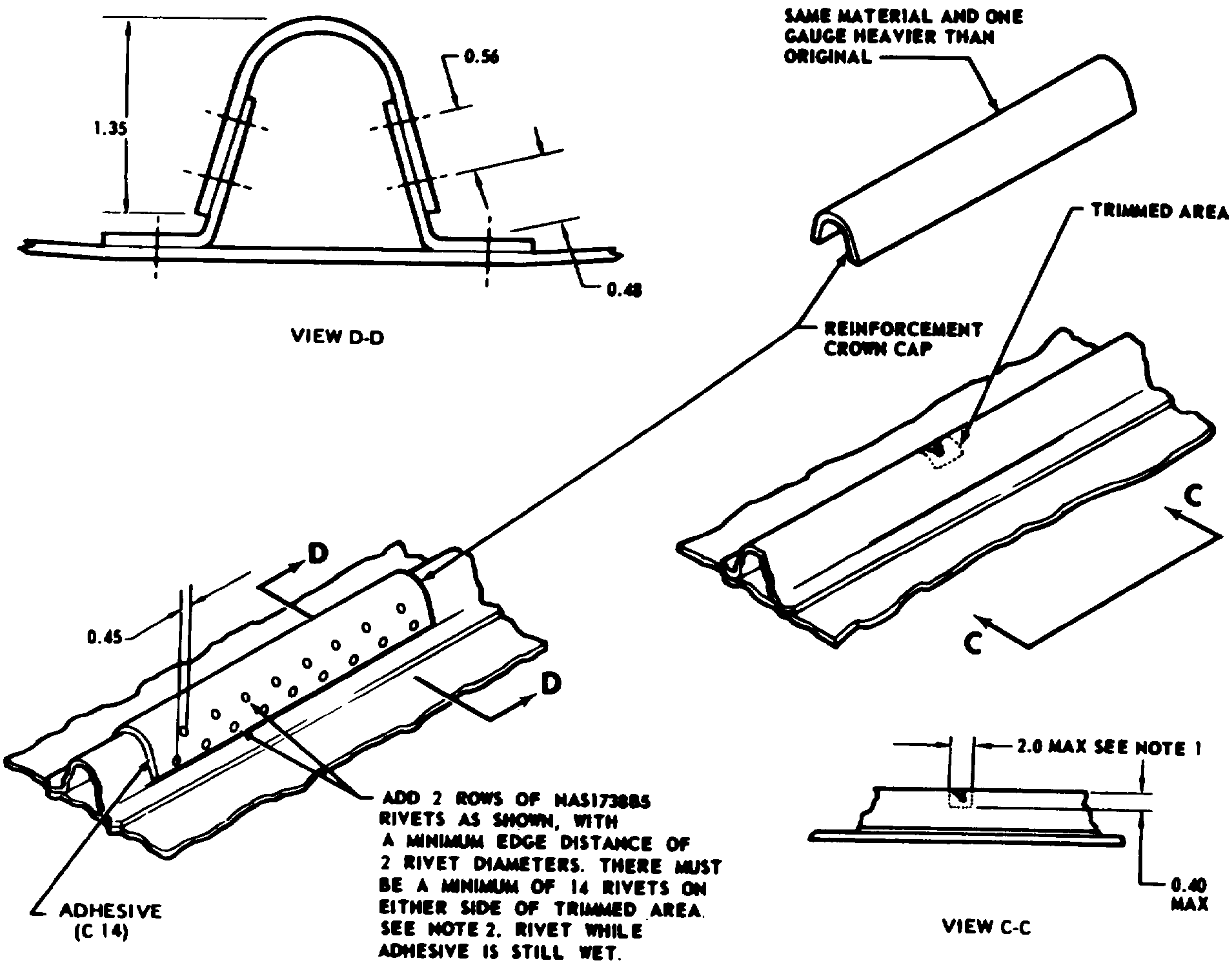
Before making repairs refer to "Limitation of Repairs at Specific Locations" in accompanying text.

Note 3

NAS1738B5 blind rivets or MS20470AD-5 rivets, where installation is not blind.

204030-1036

Figure 2-42. Tailboom Longerons



ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

CAUTION

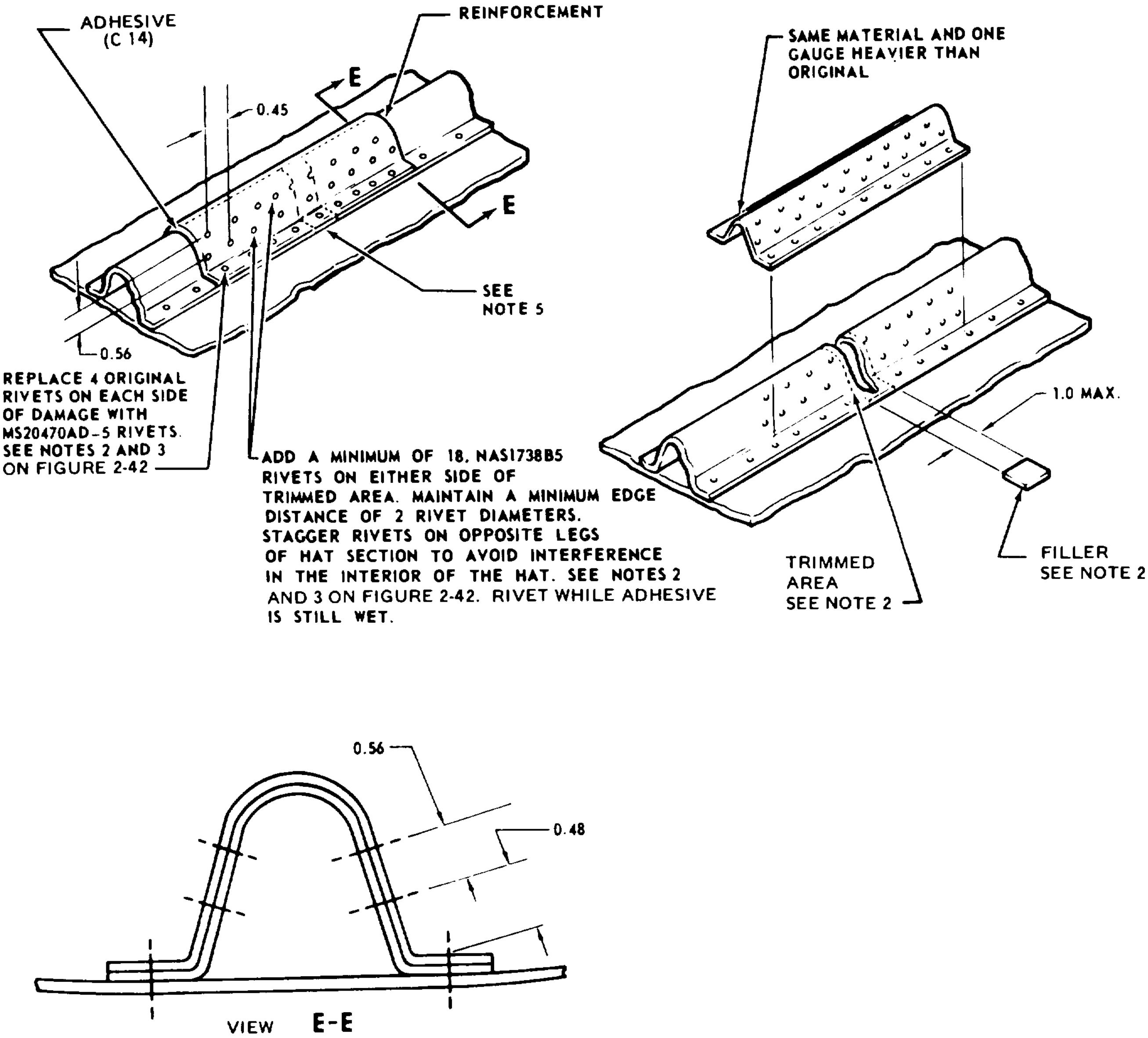
Before reeking repairs refer to "Limitations of Repairs at Specific Locations" in accompanying text.

Note 1

When trimmed area exceeds 0.40 inch depth, repair as directed on sheet 2.

204030-1035-1

Figure 2-43. Longeron Repair (Sheet 1 of 2)



NOTE 2

When trimmed area exceeds 1.0 inch, use an insert that is an identical section to the longeron, in addition to the reinforcement section.

CAUTION

Before making repairs refer to “Limitations of Repairs at Specific Locations” in accompanying text.

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

204030-1035-2

Figure 2-43. Longeron Repair (Sheet 2 of 2)

RESTRICTIONS

1. Only one repair maybe made on each longeron in any one bay area.

2. No repairs allowed in forward bay.

3. Holes in longerons must not exceed 1.0 inches in diameter after cleanup.

MATERIAL CHART									
NOTE: On all repairs requiring like material, 7075-T6 Al Aly is to be used with the following thickness.									
TAILBOOM MODEL	QUADRANT LOCATION	BOOM STATION LOCATION	NOMEN-CLATURE	MATERIAL THICKNESS					
				0.025	0.032	0.040	0.050	0.063	0.071
209	Upper L.H.	B.S. 41-94	Longeron			X			
209	Upper L.H.	B.S. 94 Aft	Longeron	X					
209	Lower L.H.	All	Longeron					X	
209	Upper R.H.	B.S. 41-133	Longeron					X	
209	Upper R.H.	B.S. 133 Aft	Longeron				X		
209	Lower R.H.	B.S. 41-94	Longeron						X
209	Lower R.H.	B.S. 94 Aft	Longeron					X	

Figure 2-43.1 Longeron Material Chart

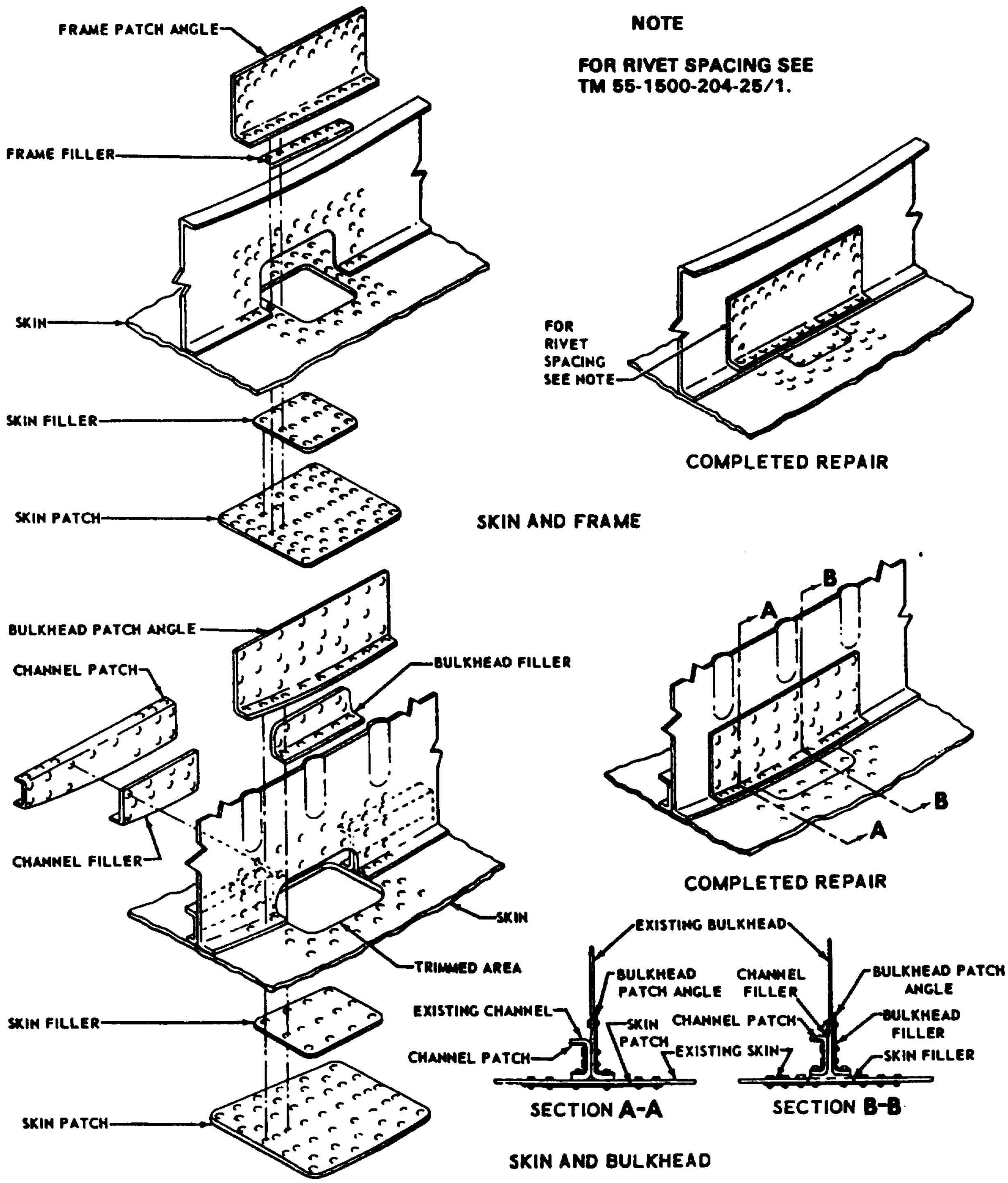
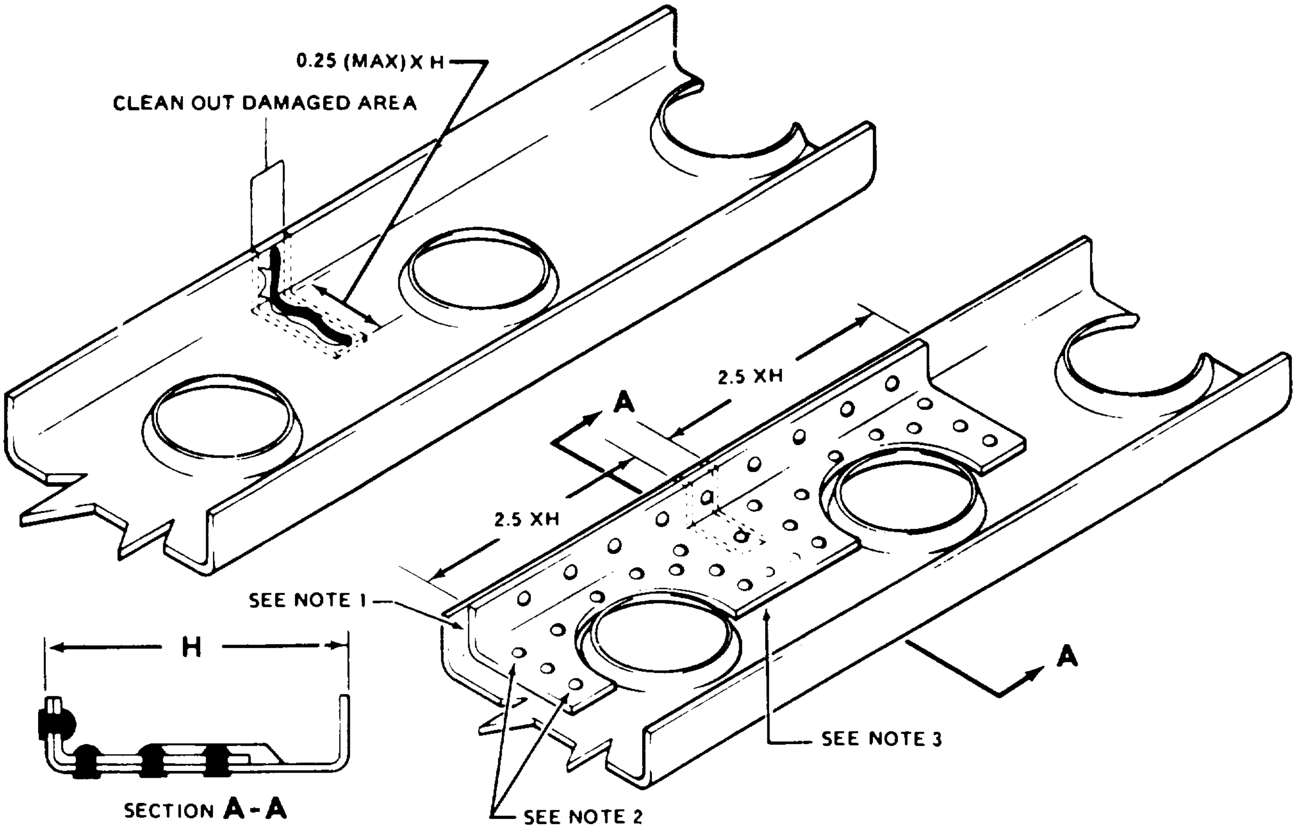


Figure 2-44. Damaged Skin, Frame, and Bulkhead Repair



ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

NOTE 1

REINFORCING ANGLE TO BE ONE GAGE HEAVIER THAN ORIGINAL METAL.

NOTE 2

USE MS20470AD4 FOR THICKNESS 0.040 INCH AND UNDER.
USE MS20470AD5 FOR THICKNESS OVER 0.040 INCH.
SPACE RIVETS SIMILAR TO THAT FOR ADJACENT AREAS. USE AS A GUIDE 4D (FOUR RIVET DIAMETERS) SPACING AND 2D (TWO RIVET DIAMETERS) EDGE DISTANCE.

NOTE 3

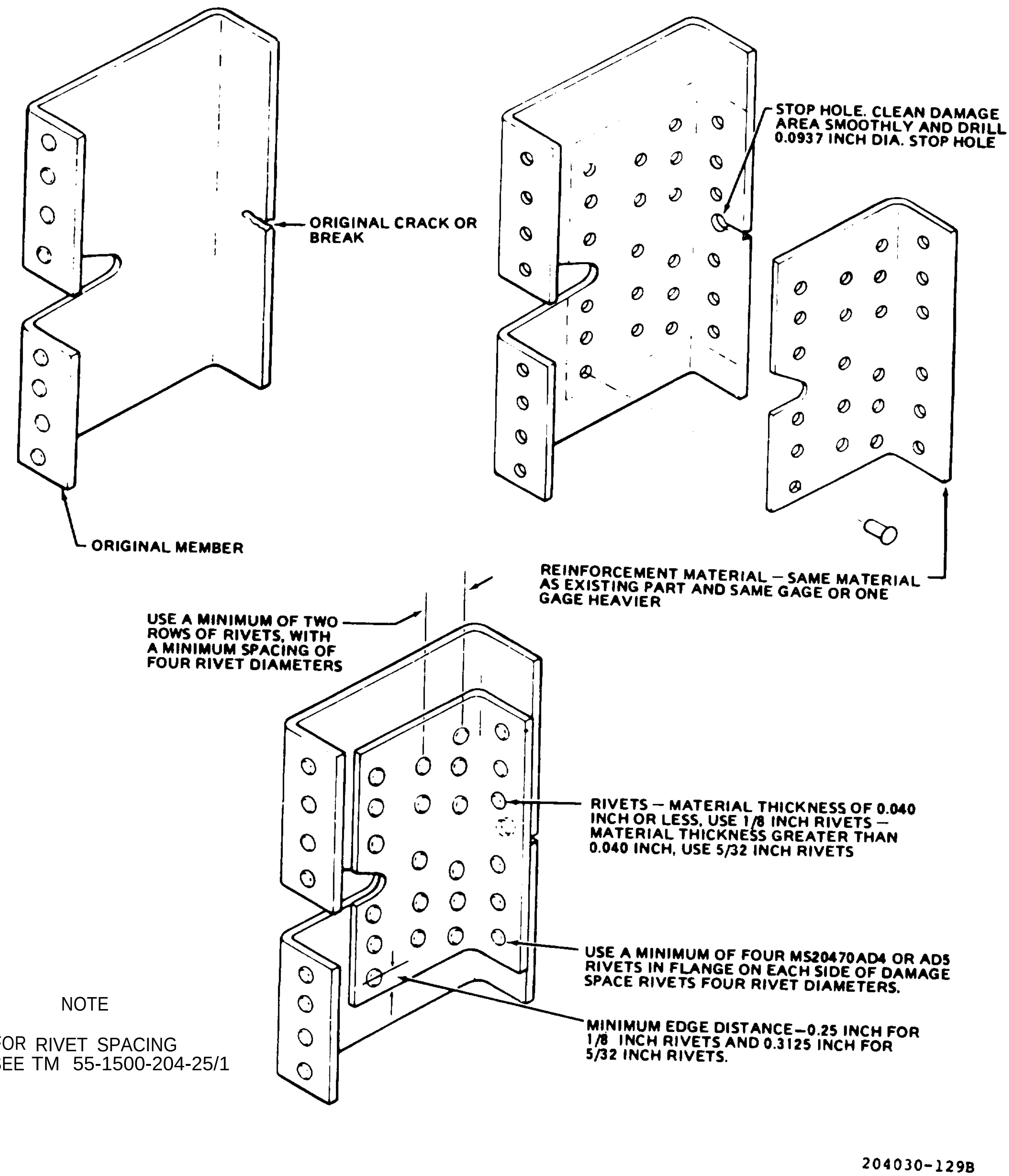
A MINIMUM OF FOUR RIVETS ON EACH SIDE OF DAMAGE IN FLANGE.

NOTE 4

REMOVE PAINT IN AREA TO BE COVERED BY REINFORCING ANGLE, AND CLEAN BOTH SIDES OF ANGLE. COAT CLEANED SURFACES WITH PRIMER (C88 OR C91). INSTALL RIVETS. APPLY A COAT OF PRIMER OVER REPAIRED AREA.

204030-126C

Figure 2-45. Repair – Damaged Ribs — Bulkhead



NOTE

FOR RIVET SPACING SEE TM 55-1500-204-25/1

Figure 2-46. Repair — Bulkhead Flanged Member

NAME	MATERIAL/ SPECIFICATION	HEAT TREAT CONDITION	THICKNESS
1. Bulkhead	Al Alloy 7075, QQ-A-250/13	T6	0.040
2. Bulkhead	Al Alloy 7075, QQ-A-250/13	T6	0.040
3. Bulkhead	Al Alloy 7075, QQ-A-250/13	T6	0.040
4. Bulkhead	Al Alloy 7075, QQ-A-250/13	T6	0.040
5. Bulkhead	Al Alloy 7075, QQ-A-250/13	T6	0.032
6. Bulkhead	Al Alloy 7075, QQ-A-250/13	T6	0.040
7. Bulkhead	Al Alloy 2024, QQ-A-250/5	T42	0.032
8. Bulkhead	Al Alloy 2024, QQ-A-250/5	T42	0.032

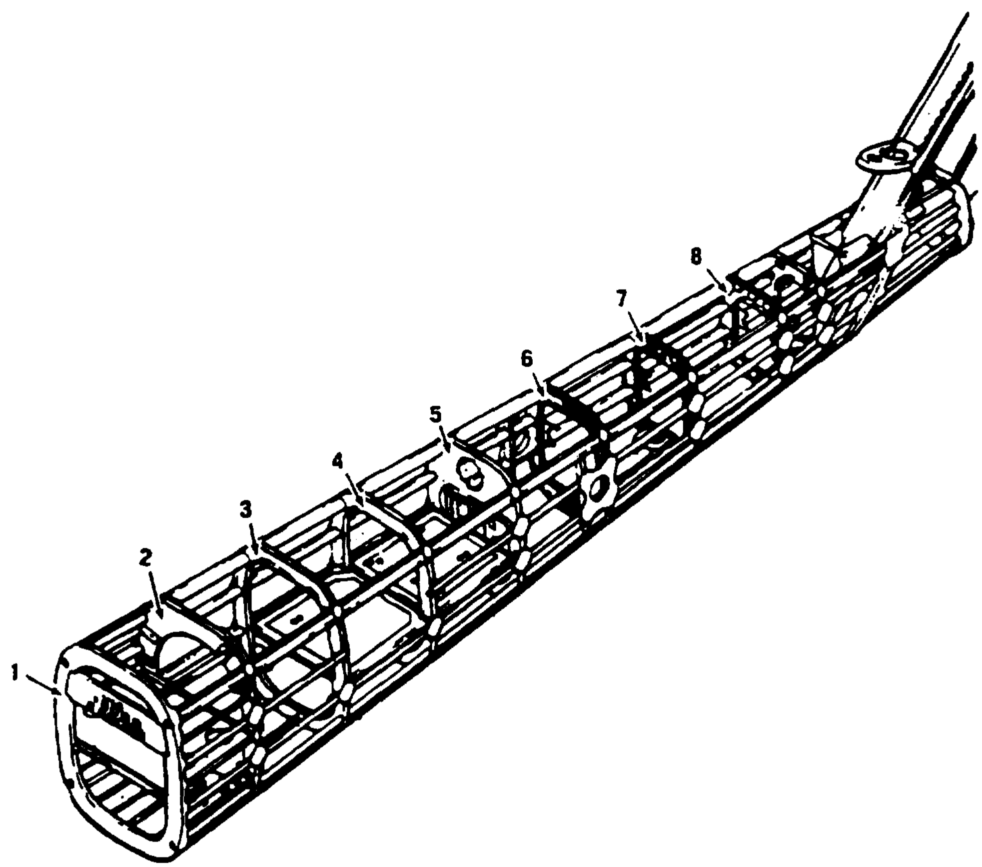
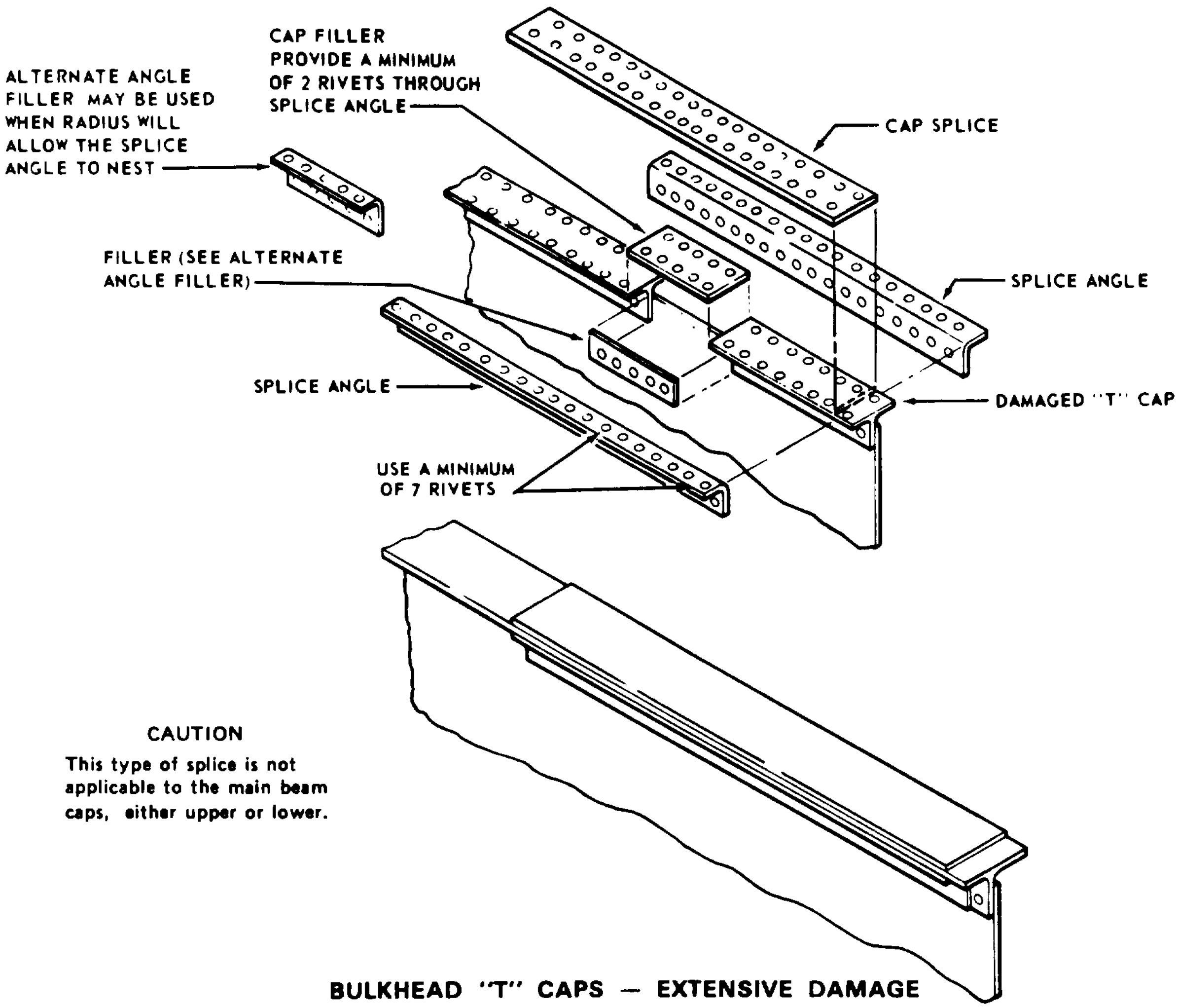


Figure 2-46.1. Tailboom Structural Material



REPAIR PROCEDURE

1. Clean up damage.

2. Use generous routing radius when damage is to one flange only (0.160 inch minimum).

3. Add fillers, same thickness as "T" cap.

d. Provide splica angles — same material and thickness as original cap extrusion. Splice angles may be made from equivalent extrusions. Chamfer corner to nest into original part.

e. Add a minimum of fourteen MS20470AD5 rivets, each side of damage, seven through each end of splice angle, as shown.

f. Cap splice, make from 0.25 inch 7075-T6 material in areas where floor must cover splice cap, and bond to upper surface of cap and filler with adhesive (C14) prior to riveting.

204030-139B

Figure 2-47. Repair — Bulkhead "T" Cap — Extensive Damage

(1) Check to see that no rivets are bent or damaged and that rivet holes are not elongated or torn.

(2) Remove damaged and loose rivets.

(3) Stop drill end of crack, or if a tear or puncture exists, cut away damaged part, taking care not to cut away more than necessary.

(4) Reform damaged member and other displaced areas into correct position.

(5) Form a reinforcing patch of same material and one gage heavier than damaged member, and sufficiently long to give sturdy support. (Figure 2-46.1)

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(6) Clean dirt from around damaged area and from both sides of reinforcing patch using, a clean cloth saturated with naphtha (C75).

(7) Secure reinforcing patch firmly in place and drill rivet holes through patch and damaged member, and same size, and pitch as existing rivet holes. Deburr all holes.

(8) Apply primer (C88 or C91) to both sides of patch, and damaged member.

(9) Secure reinforcing patch in position and rivet into place.

(10) Apply (C88 or C91) primer over repaired area.

b. Complete bulkhead breaks, and cracks, extending more than one-half the width of the member, make patching inadequate, repair by insertion (splicing).

(1) Check to see that no rivets are bent or damaged and that rivet holes are not enlarged or torn.

(2) Remove damaged or loose rivets

(3) Trim damaged edge of the break in bulkhead. Do not trim more than necessary.

(4) Re-form and return damaged bulkhead to correct position and contour.

(5) Cut and form an insert of same material and gage as damaged bulkhead. (Figure 2-46.1)

(6) Cut and form a reinforcing patch of same material and one gage heavier than damaged bulkhead, and sufficiently long to give sturdy support.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(7) Clean dirt from around damaged area and from both sides of insert and reinforcing patch, using a clean cloth saturated with naphtha (C75).

(8) Secure insert and reinforcing patch firmly in place. Drill rivet holes through reinforcing patch, insert, and damaged bulkhead, the same size and pitch as existing rivet holes. Remove burrs from all holes.

(9) Apply primer (C88 or C91) to both sides of insert, reinforcing patch, and damaged bulkhead,

(10) Secure insert and reinforcing patch in position and rivet into place.

(11) Apply primer (C88 or C91) over repaired area.

c. Repair damaged bulkhead, web, cracks, tears and punctures.

(1) Stop drill extreme ends of crack or cut a round or elongated hole according to the length or shape of crack, puncture, or tear in order to clean up ragged edges and stretched metal. Allow generous radii at all corners.

(2) Cut and form a patch of same material and thickness as damaged web.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(3) Remove dirt from around damaged area using clean cloth saturated with naphtha (C75).

(4) Secure patch in position and drill out a double row of holes of same size and pitch as surrounding areas. Remove patch and deburr holes.

(5) Apply primer (C88 or C91) to damaged area and both sides of patch.

(6) Secure patch and rivet in place.

(7) Apply primer (C88 or C91) over repaired area.

2-33. REPAIR TAILBOOM DRIVESHAFT COVERS AND SUPPORT HINGES.

Repair using standard aluminum repair procedures in TM 55-1500-204-25/1.

2-34. REPAIR – TAILBOOM ATTACH FITTINGS.

WARNING

Any cracks in tailboom attach fitting forward of boom station 70.00, or attachment bolt hole elongation wear exceeding the maximum diameter of 0.516 inch, is cause for replacement by next higher maintenance level.

Repair of tailboom attach fittings consisting of minor nicks, scratches,. and gouges may be polished out using fine india stone (C116), provided they do not exceed damage limits in table 2-4, Tailboom Classification of Damage.

2-35. REPAIR – BEARING HANGER SUPPORT FITTING.

a. Repair corrosion and damage areas on the bearing hanger support fitting per figure 2-37.

b. Damage to bearing hanger support fitting severe enough to require replacement:

(1) Two or more bulkhead attach holes exceeding the new part dimension of 0.203 to 0.208 inch diameter.

(2) Two bearing hanger attach holes exceeding 0.270 inch diameter,

2-36. REPAIR – INTERMEDIATE GEARBOX SUPPORT FITTING.

WARNING

No repairs are permitted on mounting surface of intermediate gearbox support fitting.

NOTE

Refer to table 2-4 for repairable damage limits of the intermediate gearbox support fitting.

a. Because of critical alignment requirements, replacement of distorted, damaged or cracked intermediate gearbox support fitting parts must be done by depot maintenance. An intermediate gearbox alignment check must be made by depot maintenance after repair or replacement of supporting structure.

b. Repair gearbox attachment holes within limits shown in figure 2-38.

c. Check laminated shims at gearbox attachment holes for security.

d. Inspect all scratches, dents and corroded areas for cracks. Inspect affected area using fluorescent penetrant method. Refer to TM 43-0103.

2-37. REPAIR – TAIL ROTOR DRIVE SUPPORT FITTING.

a. Repairable chafing damage to the tail rotor drive support fitting may be repaired as follows:

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(1) Clean the chafed area with MEK (C74).

(2) Polish chafed area to not less than minimum allowable thickness as shown on figures 2-39 with Scotchbrite (C103) or No. 400 grit abrasive paper (C36).

(3) If minimum thickness have not been exceeded, area B, figure 2-39, sheet 1 maybe built up with adhesive (C8 or C14) to provide a new seat for the driveshaft cover. Buildup portions of sector C, figure 2-39, sheet 2, to a thickness of 0.12 to 0.15 and buildup portions of section D to a thickness of 0.25 to 0.29. Area A, figure 2-39, sheet 1 may be built up with adhesive (C8 or C14) to provide a new seat for the gearbox cover. Buildup area to a thickness of 0.800 to 0.820.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation, Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(4) After adhesive is thoroughly dry, clean the repaired area with MEK (C74) and wipe dry with a clean cloth.

(5) Apply two coats of primer (C88 or C91) to the repaired area. When dry, apply two coats of lacquer of color to match finish.

(6) Install teflon tape, (C118) on forward upper edge of fitting where tail rotor driveshaft door contacts fitting.

b. Repair support fittings with gearbox hold down stud holes which exceed 0.40 inch.

(1) Ream out existing hole to maximum diameter of 0.4304 + 0.0003 - 0.0000 inch. Maintain hole relationship. If corrosion is still present, replace fitting.

(2) Treat machines surface per MIL-M-3171, type VI.

(3) Fabricate a bushing from 310 Stainless Steel (QQ-S-763, class 310). Grind O.D. to provide an interface fit of 0.0001 to 0.0003 with reamed hole in step (1) above. Make I.D. 0.383 +0.007 -0.000 inch and length 0.008 to 0.850 inch. Heat support fitting in bushing replacement area with a heat gun for approximately ½ hour (maximum temperature 275 degrees F). Chill bushing in dry ice (BB-C-104) and alcohol (O-E-760) for a minumum of ½ hour. Remove bushing from dry ice and install in aluminum casting using wet primer (MIL-P-23377).

(4) Ream bushing to final tolerances indicated in step (3) above.

c. Blend out repairable damage to fitting lug faces to a maximum blend depth of 0.010 inch, using (C102) or No. 400 grit abrasive paper (C36). Radial damage to top of lugs may be blended out to a maximum depth of 0.060 inch. Refer to figure 2-39 sheet 4, section A-A.

d. Bellcrank support bushing I.D.s may be elongated to a maximum diameter of 0.445 inch for bushing in forward lug and to 0.317 inch for bushing in aft lug. Bushings elongated in excess of these dimensions must be replaced.

(1) Forward lug bushing:

(a) Press out bushing.

(b) Press in new bushing.

(c) Ream bushing hole to 0.4425 TO 0.4430 inch diameter.

(2) Aft lug bushing:

(a) Press out bushing.

(b) Press in new bushing.

(c) Ream bushing hole to 0.3130 to 0.3145 inch diameter.

2-38. REPAIR – VERTICAL FIN HONEYCOMB PANELS.

a. Repair honeycomb panels on the vertical fin. Refer to paragraph 2-15. (Repair same as forward fuselage.)

b. Replace damaged fastener (insert) in vertical fin honeycomb panels. Refer to figure 2-48.

(1) Remove damaged fastener (insert) by drilling with counter bore of the same diameter, If the fastener (insert) is loose and turns, drill out two holes shown for injecting adhesive on figure 2-48. Use a spacer on twist drill while drilling out holes to avoid drilling too deep and damaging panel. Attach a puller to fastener (insert) with self-tapping screws and remove the fastener (insert) from the panel.

(2) Remove honeycomb core a minimum of 0.0625 inch and maximum of 0.250 inch on figure 2-48. Clean all metal particles out of hole.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(3) Immediately prior to installation, clean new fastener (insert) with MEK (C74) and air dry until moisture free. Handle fastener (insert) with white cotton gloves (C54) after cleaning.

(4) Cover threaded hole and injection holes with masking tape then open the injection holes with a pointed instrument. Apply adhesive (C8) to bottom of fastener (insert) as shown on figure 2-48 and position in hole in panel. Inject adhesive (C8) in one injection hole with a syringe until it comes out of the opposite injection hole as shown of figure 2-48.

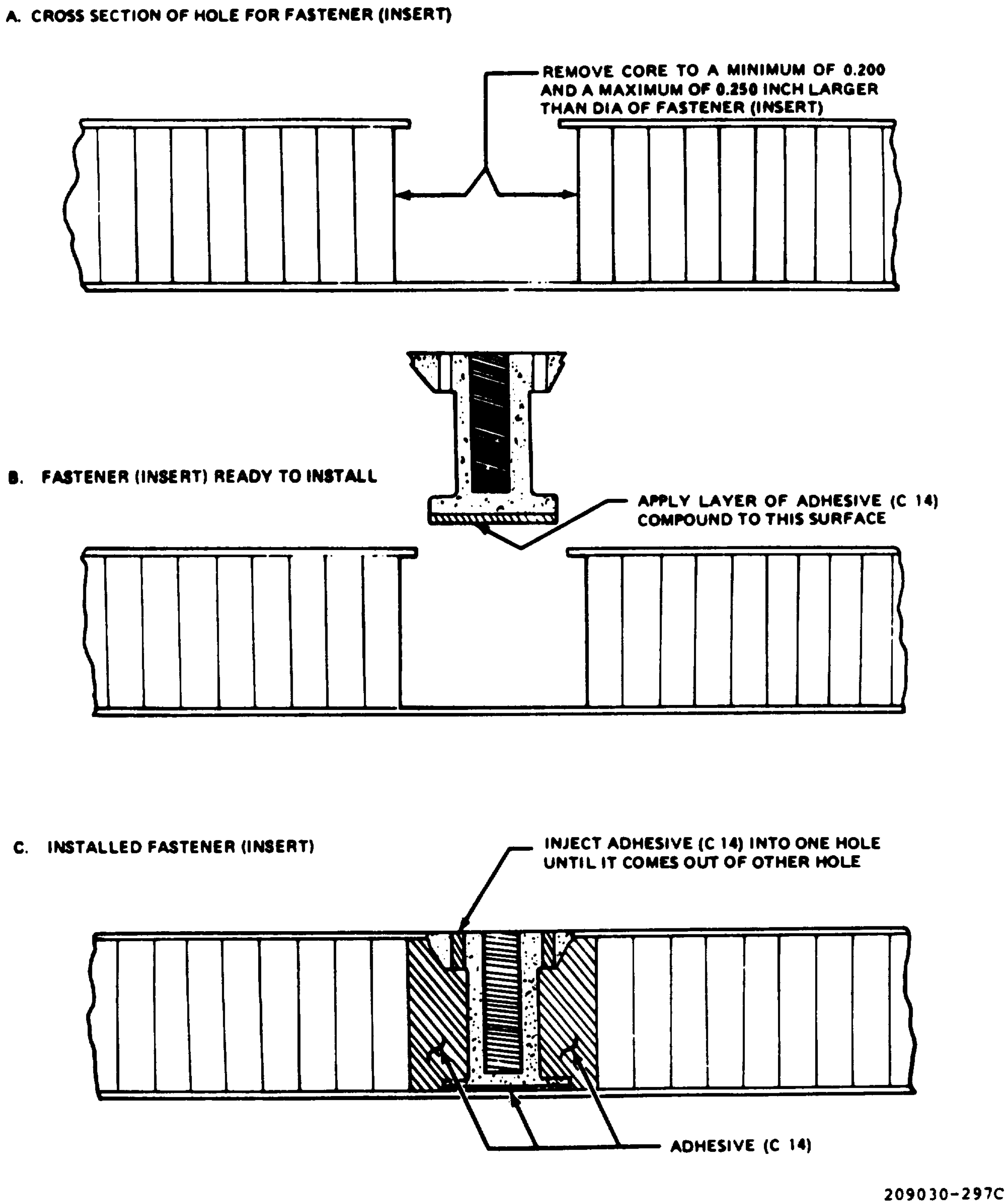


Figure 2-48. location Tape Fastener (Insert) in Vertical Fin Panel

WARNING

Cleaning solvent is flammable and toxic. Provide adaquate ventilation, Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(5) Remove excess adhesive with cloth dampened with MEK (C74) or naphtha (C75).

(6) Touch up paint to match surrounding area. Refer to TM 55-1500-345-23.

2-39. REPAIR – VERTICAL FIN TRAILING EDGES.

Comply with the following instructions for fiberglass or metal for repairing trailing edge. Refer to figure 2-41.

a. Fiberglass.

(1) Use only fiberglass cloth 0.010 inch thick (C38) when making edge repairs. The repair must equal or exceed the numer of plies lost.

(2) Remove all old finish from repair area with verying grades of sandpaper (C102).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with akin or eyes.

(3) Clean sanded area with clean cloth moistened with MEK (C74).

(4) Cut fiberglass cloth (C38) to correct size and saturate with epoxy resin (C98) and apply as a patch.

(5) If multiple layers of fiberglass are requred, overlap each successive patch for a minimum distance of one inch.

b. Aluminum alloy patching material.

(1) Use aluminum patching material as specified on figure 2-41.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(2) Clean the area where the patch is to be applied with MEK (C74).

(3) Bond the metal doubler patch to vertical fin trailing edge, using adhesive (C8 or C14).

(4). Rivet patch with rivets of equal or larger size than original rivets in areas that were riveted prior to application of patch. Use the standard edge distance of two rivet diameters or space the rivets the same as the original panel. If the panel being worked is not riveted, use rivet spacing in opposite panel.

(6) Fill and fair all edges of doubler patches after riveting. Touch up the area. Refer to TB746-93-2 for paint instructions.

2-40. REPAIR – VERTICAL FIN FORWARD SPAR.

a. Repair smooth dents, lateral stiffeners, surface scratches, and holes according to TM 55-1500-204-25/1.

b. All other repairs must be approved by qualified engineering authority.

2-40.1. REPAIR – ELECTRONIC EQUIPMENT SHELF.

a. The electronic equipment shelf is constructed of aluminum alloy honeycomb core and 2024T3 aluminum alloy skins. Edging material is two ply glass fabric. The lower skins are 0.008 inch thick.

The upper skins are 0.012 inch thick except for the right side between BS 80.44 and BS 122.33, these skins are 0.016 inch.

b. Repair acceptable damage in accordance with paragraph 2-15. Repairs shall not interfere with mounting surfaces or affect the serviceability of the panel.

c. Replace damaged or loose inserts in accordance with paragraph 2-38, step b., with the following exceptions:

(1) Adhesive (C15.1) shall be used for bonding inserts. Cure adhesive for 16 hours at 75 °F.

(2) Perform proof load test of 100 pounds on threaded inserts after adhesive cure, using pound reading spring scale.

2-40.2. REPAIR — VERTICAL FIN BALLAST WEIGHT PANELS.

a. Repair of outer skin surface cracks around Ballast Weight inserts.

b. Remove existing inserts and potting compound (7 places).

c. Remove cracks in panel by routing out a 1/4 inch of material around and below the damaged area. Fill void with adhesive (C-14) and prepare surface for doubler. Other damage, such as tears, gouges, etc., should have 1/4 inch of material routed around and below damage, filled with adhesive (C-14) and smoothed to surrounding surface level (see figure 248.1).

d. Install doubler on outboard surface of panel, covering all seven insert panel holes. Edges of doubler. must extend a minimum of 0.75 inches beyond the cracked and insert hole area. Bond doubler to panel with adhesive (C-15) and install rivets NAS1738B4-2. When rivets are to be installed, remove 1/4 inch of internal material around and below rivet hole. Fill rivet hole with adhesive (C-14) and install rivets immediately (see figure 2-48.1). Rivets should be spaced 1 1/2 inches apart around doubler; rivets should be at least two rivet diameters from edge of doubler (see figure 2-48.1). If o rivet is to be installed within 0.372 inches from an area of damage, do not install that rivet. Doubler material is made from 0.032 inches thick 2024 aluminum alloy QQ-A-250/0 temp T3.

e. Insert areas should have 1 1/2 inches of internal material removed through the inboard surface panel. Void area is then filled with adhesive (C-14) and prepared for doubler (see figure 248.1).

f. Install individual doublers on each insert hole on the inboard side of panel. Doublers should be minimum of 2 inches in diameter and corners rounded to a minimum of 0.25 inches in radius (see figure 2-48.1).

g. Drill a 0.427 inch hole for each insert. Install sleeve 80-013-S4D3-9 through outboard surface and plug 80-013P4F06-9 through inboard surface. Use adhesive (C15) on both sleeve and plug when installing (see figure 2-48.1).

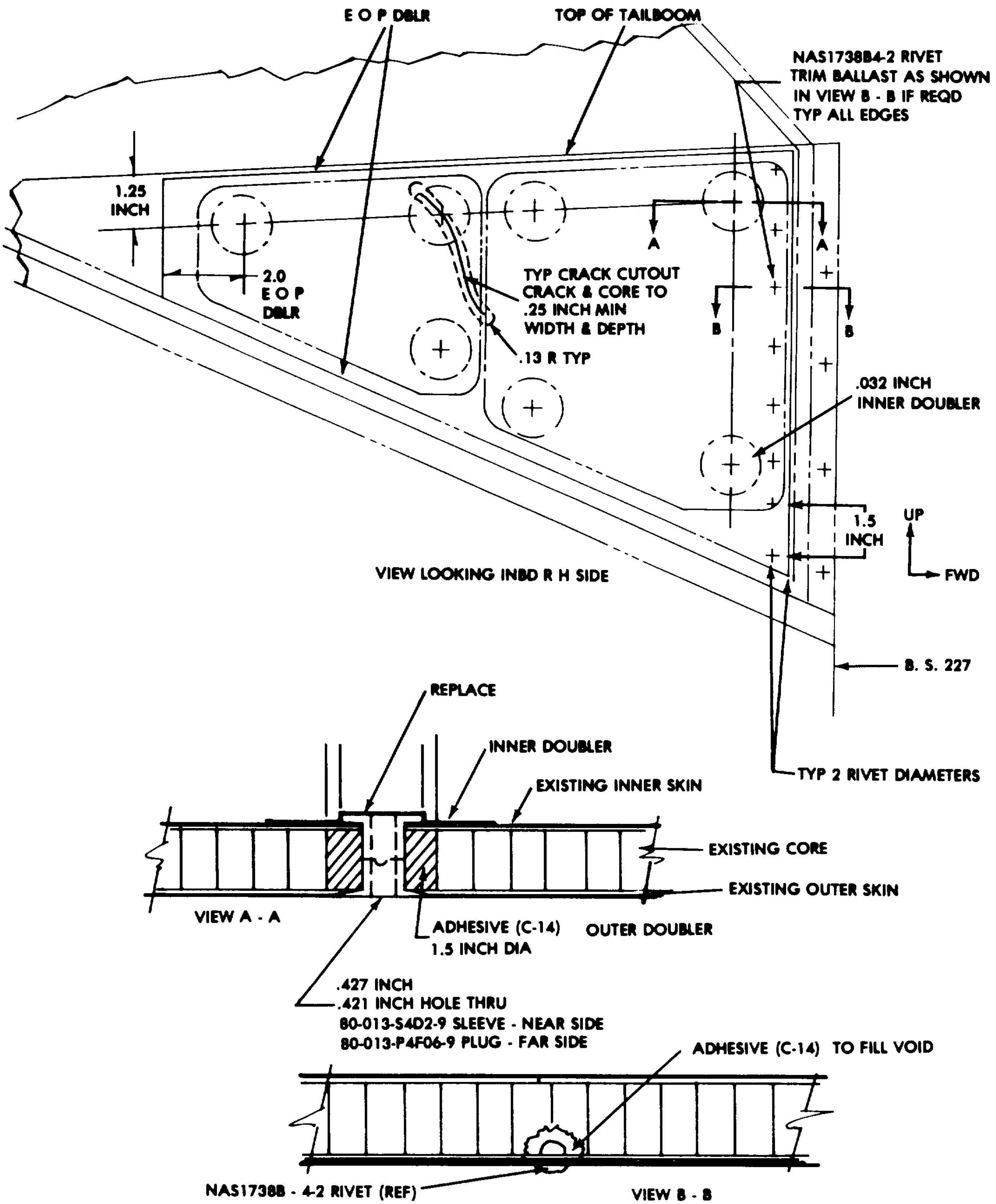


Figure 2-48.1 Vertical Fin Ballast Weight Panel

SECTION II. FUSELAGE

2-41. FUSELAGE ASSEMBLY.

2-42. DESCRIPTION – FUSELAGE ASSEMBLY.

The fuselage constitutes the primary structural assembly of the helicopter. It encloses and/or supports such major provisions and systems as the tandem crew compartment, engine, fuel and oil systems, armament system, transmission and main rotor pylon, alighting gear, wings and tailboom. See figure 2-1.

2-43. HONEYCOMB PANELS.

2-44. DESCRIPTION – HONEYCOMB PANELS.

The principal part of the fuselage structure is honeycomb panels. The panels have an, aluminum core that resembles honeycomb. Facings are bonded to the honeycomb to form the panel. The facings may be fiberglass or metal. The panels are joined together and supported by the primary structural caps which are shown on figure 2-11 and 2-12 by solid black shading. Panels on the unshaded portion of figure 2-2 are either of honeycomb panel construction or of conventional sheet metal construction. Refer to TM 55-1500-204-25/1 for repair instructions for the sheet metal construction panels.

2-45. REMOVAL – HONEYCOMB PANELS.

a. Replace honeycomb panels that have damage in excess of limits specified in table 2-3. Refer to paragraph 2-5 for support of structure during airframe repair. Refer to figure 2-2 for exterior panels secured with screws.

b. Remove screws or twist-type fasteners and remove panel. Do not remove riveted panels unless the entire panel is to be replaced.

2-46. INSPECTION – HONEYCOMB PANELS .

Refer to paragraph 2-12 and table 2-3 for inspection and classification of damage.

2-47. CLEANING – HONEYCOMB PANELS.

Refer to paragraph 2-10, figure 2-7, and TM 55-1500-204-25/1 for cleaning instructions.

2-48. REPAIR – HONEYCOMB PANELS.

Refer to paragraph 2-15 for repair instructions.

2-49. INSTALLATION – HONEYCOMB PANELS.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of advent vapors and contact with akin or eyes.

a. Clean mating surfaces of the forward fuselage panels with MEK (C74) and wipe dry with clean dry cloth.

b. Install panels on forward fuselage with screws.

2-50. PAINTING – HONEYCOMB PANELS – TOUCH-UP.

a. Clean area where paint requires touch-up with cleaning compound (C32) and rinse with water. Allow to dry thoroughly.

b. Apply primer (C88 or C91) to area that requires touch-up.

c. Apply lacquer (C71) finish coat color to match existing finish in accordance with TB746-93-2.

2-51. SHEET METAL PANELS AND SKIN.

2-52. DESCRIPTION – SHEET METAL PANELS AND SKIN.

A limited amount of sheet metal skin and panels are used on the fuselage. The major portions of the fuselage are covered with structural honeycomb panels. See figure 2-49 for description of sheet metal panels (doors) and skins used on the fuselage.

2-53. REMOVAL – SHEET METAL PANELS AND SKIN.

a. Removal of riveted skins illustrated on figure 2-49 must be accomplished at next higher maintenance level.

b. Remove panels (doors) illustrated on figure 2-49 by removing attaching screws.

2-54. INSPECTION – SHEET METAL PANELS AND SKIN.

Refer to table 2-3 for instructions to inspect sheet metal panels and skin.

2-55. CLEANING – SHEET METAL PANELS AND SKIN.

a. Clean sheet metal panels and skin with cleaning compound (C33) and water.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

b. Remove stubborn deposits with solvent (C112) and clean cloths.

2-56. REPAIR – SHEET METAL PANELS AND SKIN.

a. Refer to paragraph 2-14 for instructions to repair damage to skin and sheet metal panels and doors that is within repairable limits. See figure 2-49 for description of skin and panel (door) fabrication material.

b. Do not remove riveted skin panels from fuselage to accomplish repair (paragraph 2-53).

2-57. INSTALLATION – SHEET METAL PANELS AND SKIN.

a. Installation of riveted sheet metal skins illustrated on figure 2-49 must be accomplished at next higher maintenance level.

b. Install panels (doors) illustrated on figure 2-49. Position panel on fuselage and install attaching screws.

2-58. PAINTING – SHEET METAL PANELS AND SKIN – TOUCH-UP.

a. Clean area where paint requires touch-up with cleaning compound (C32) and rinse with water. Allow to dry thoroughly.

b. Apply primer (C88 or C91) to area that requires touch-up.

c. Apply finish coat to match existing finish.

2-59. ACCESS COVERS AND DOORS.

2-60. DESCRIPTION – ACCESS COVERS AND DOORS.

The access covers and doors are shown on figure 2-3. The components which are accessible through each cover and door are listed on the illustration legend.

The small covers and doors are constructed from aluminum sheet metal. The hydraulic compartment doors (8) are constructed from laminated fiberglass, honeycomb core and aluminum skin. The ammunition compartment doors (21) are constructed from aluminum frame and skin.

2-61. REMOVAL — ACCESS COVERS AND DOORS.

a. Remove hydraulic compartment doors (8, figure 2-3).

(1) Release latches and open doors.

(2) Remove air duct hose from inside of left door if installed.

(3) Remove bolt to separate door holding spring (restrainer) at the lower hinge. Remove bolts to disconnect hinges from hinge supports and remove door.

b. Remove ammunition compartment doors (21).

(1) Release latches and open door.

(2) Support door in horizontal position and disconnect the support cables.

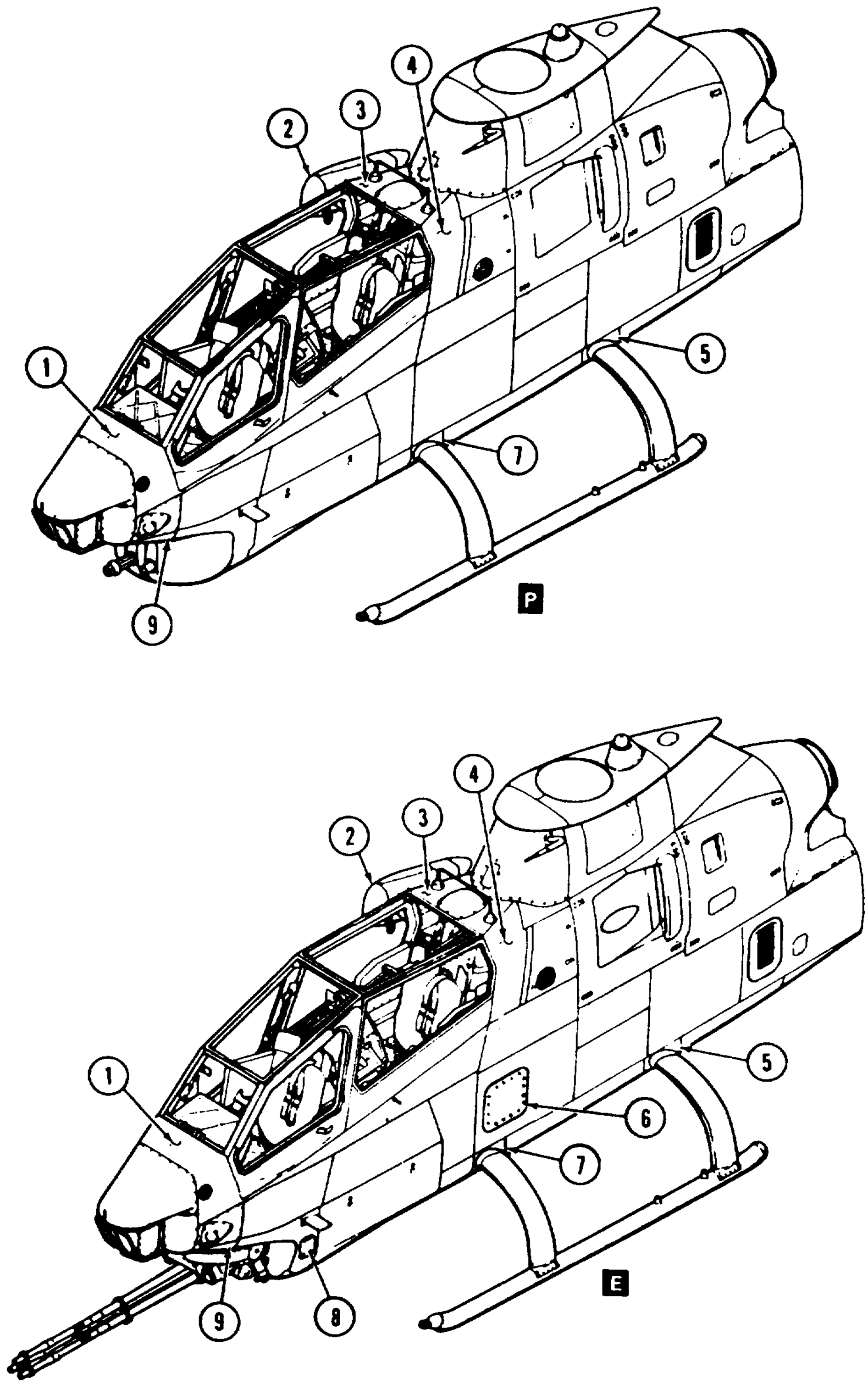
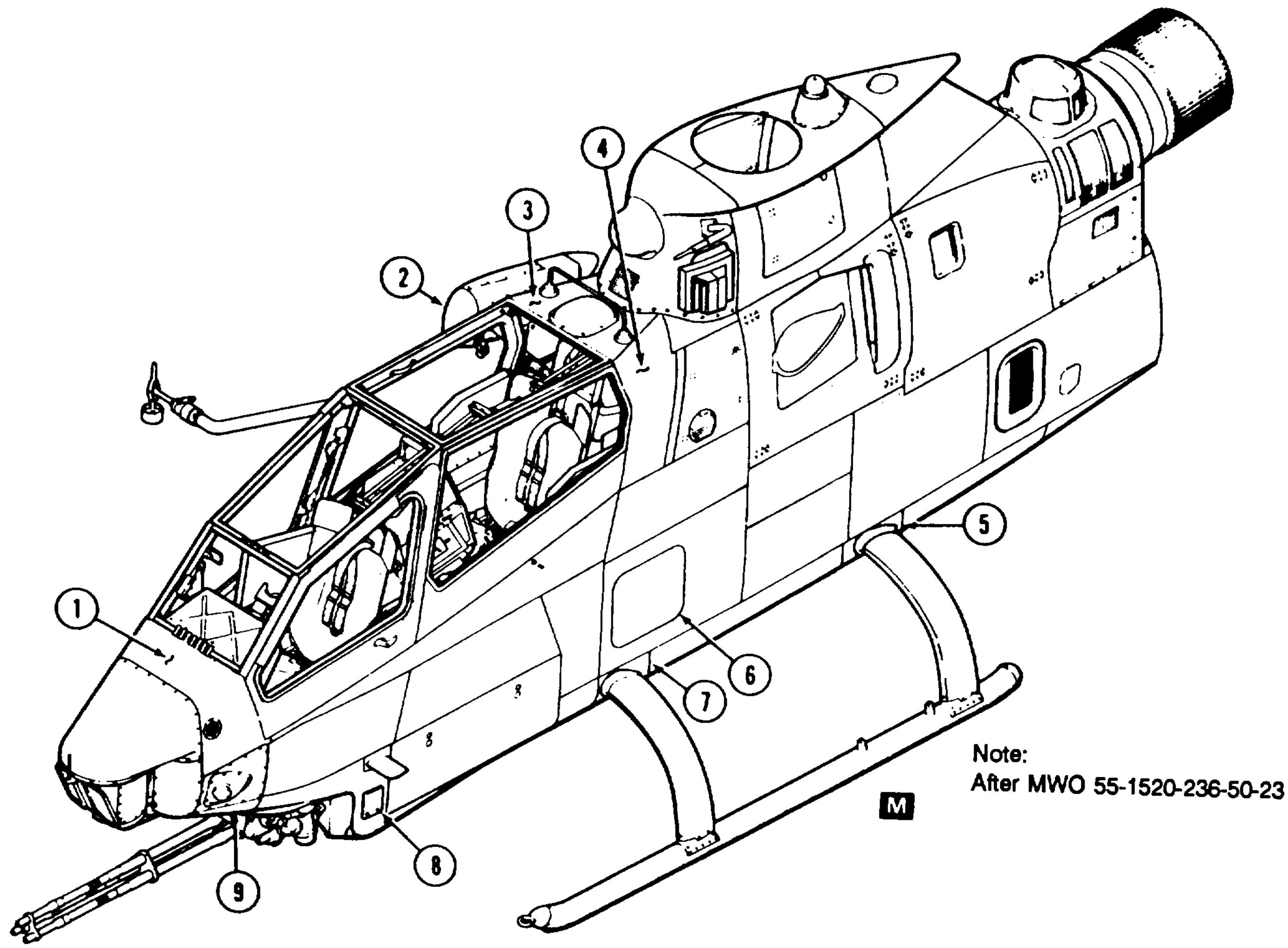


Figure 2-49. Sheet Metal Panels and Skin (Sheet 1 of 4)



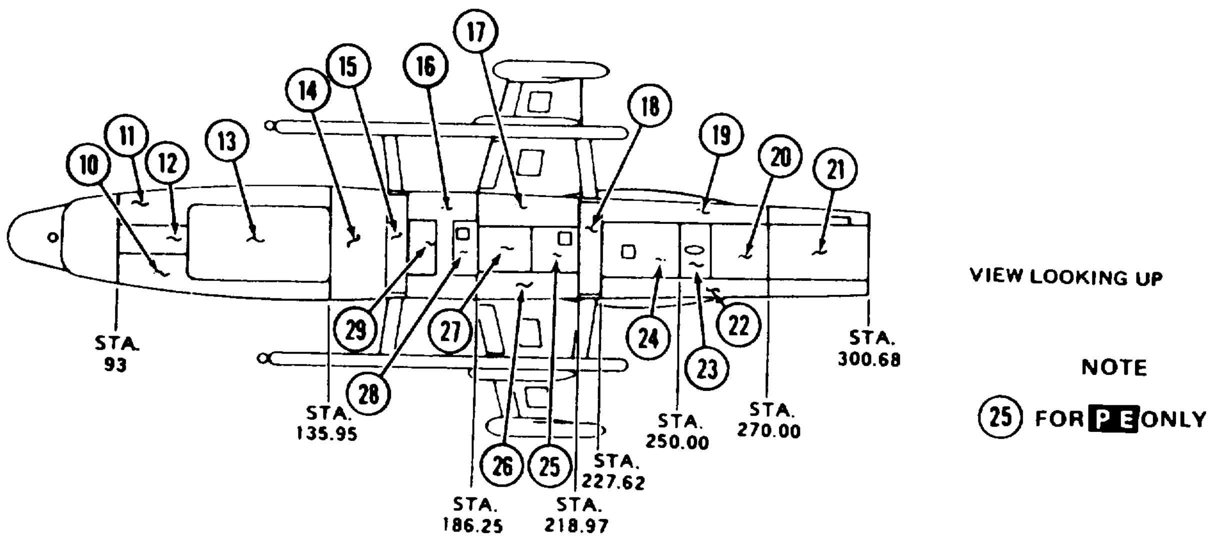


Figure 2-49. Sheet Metal Panels and Skin (Sheet 2 of 4)

ITEM	DESCRIPTION	PART NUMBER	MATERIAL	SPECIFICATION	CONDITION	THICKNESS	SIZE
1	Nose Upper Skin	209-033-005-15	2024 Al Aly	QQ-A-250/5 Temp 0	T42	0.063	17.0 x 6.5
2	Right Wing, Left Wing Removed for Clarity	NA	NA	NA	NA	NA	NA
3	Upper Skin	209-033-525-15	7075 Al Aly	QQ-A-250/13 Temp T6	T6	0.032	29.3 x 19.3
4	Side Skin	209-033-525-17	7075 Al Aly	QQ-A-250/13 Temp T6	T6	0.032	31.7 x 20.8
	Side Skin	209-033-525-18	7075 Al Aly	QQ-A-250/13 Temp T6	T6	0.032	31.7 x 20.8
5	Lower Skin, Right	209-033-150-49	2024 Al Aly	QQ-A-250/5 Temp T3	T3	0.025	5.7 x 9.0
	Lower Skin, Left	209-033-150-50		QQ-A-250/5 Temp T3	T3	0.025	5.7 x 9.0
6	Door	209-033-127-9	2024 Al Aly	QQ-A-250/5 Temp T3	T3	0.063	17.5 x 18.9
7	Lower Skin, Right	209-033-150-65	2024 Al Aly	QQ-A-250/5 Temp T3	T3	0.025	6.0 x 8.5
	Lower Skin, Left	209-033-150-66	2024 Al Aly	QQ-A-250/5 Temp T3	T3	0.025	6.0 x 8.5
8	Turret Door, Left	209-033-276-11	2024 Al Aly	QQ-A-250/5 Temp T3	T3	0.020	4.8 x 5.0
	Turret Door, Right	209-033-276-11	2024 Al Aly	QQ-A-250/5 Temp T3	T3	0.020	4.8 x 5.0
9	Nose Lower Skin	209-033-005-17	2024 Al Aly	QQ-A-250/5 Temp 0	T42	0.063	18.0 x 40.0
10	Ammo Floor Fairing Installation Right Skin	209-031-203-19	2024 Al Aly	QQ-A-250/5 Temp T3	T3	0.025	13.6 x 43.5
11	Ammo Floor Fairing Installation Left Skin	209-031-203-103	2024 Al Aly	QQ-A-250/5 Temp T3	T3	0.025	13.6 x 43.5
12	Plate	209-031-203-73	2024 Al Aly	QQ-A-250/5 Temp T3	T3	0.050	8.7 x 15.5
13	Door	209-031-203-75	N A	NA	NA	NA	NA
14	Fairing	209-031-203-57	6061 Al Aly	QQ-A-250/11 Temp 0	T6	0.040	14.0 x 30.7
15	Forward Cross Tube Cover	209-033-190-15	2024 Al Aly	QQ-A-250/5 Temp 3	T3	0.025	9.0 x 35.3

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Figure 2-49. Sheet Metal Panels and Skin (Sheet 3 of 4)

ITEM	DESCRIPTION	PART NUMBER	MATERIAL	SPECIFICATION	CONDITION	THICKNESS	SIZE
16	Lower Skin Sta 156.41 To Sta. 186.25	209-033-150-87	2024 Al Aly	QQ-A-250/5 Temp 3	T3	0.025	32.0 x 52 0
17	Lower Left Skin Sta 186.25 To Sta 218.97	209-033-150-89	2024 Al Aly	QQ-A-250/5 Temp 0	T42	0.025	24.0 x 34.0
18	Aft Cross Tube Cover	209-033-190-17	2024 Al Aly	QQ-A-250/5 Temp 3	T3	0.025	9.0 x 35.3
19	Lower Left Skin Sta 227.62 To Sta 270.00	209-033-150-63	2024 Al Aly	QQ-A-250)5 Temp 0	T42	0.025	20.0 x 44.0
20	Door	209-033-150-83	2024 Al Aly	QQ-A-250/5 Temp T3	T3	0.032	16.0 x 17.0
21	Sense Antenna Panel	209-030-133-7	NA	NA	NA	NA	NA
22	Lower Right Skin Sta 227.62 To Sta 270.00	209-033-150-67	2024 Al Aly	QQ-A-250/5 Temp 0	T42	0.025	20.0 x 44.0
23	Skin	209-033-150-79	2024 Al Aly	QQ-A-250/5 Temp T3	T3	0.025	6.0 x 17.0
24	Door	209-033-194-1	NA	NA	NA	NA	NA
25	P E Door	209-033-193-1	NA	NA	NA	NA	NA
26	Lower Right Skin Sta 186.25 To Sta 218.97	209-033-150-90	2024 Al Aly	QQ-A-250/5 Temp 0	T42	0.025	24.0 x 34.0
27	Door	209-033-192-1	NA	NA	NA	NA	NA
28	Door	209-033-191-1	NA	NA	NA	NA	NA
29	Door	209-033-150-121 or 209-033-150-123	)24 Al Aly	QQ-A-250/5 Temp T3	T3	0.032	10.5 x 21

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Figure 2-49. Sheet Metal Panels and Skin (Sheet 4 of 4)

(3) Remove hinge pin from hinge and remove door.

a. Remove other access covers and doors shown on figure 2-3 by removing screws or releasing turnlock fasteners as applicable.

2-62. INSPECTION – ACCESS COVERS AND DOORS.

a . Inspect hydraulic compartment doors (8, figure 2-3).

(1) Latches for correct operation.

(2) Seals for cuts, chafing, and secure adhesion surface.

(3) Hinges for cracks. If cracks are suspected, remove hinges and inspect by fluorescent penetrant method in accordance with TM 43-0103.

(4) Doors for cracks, dents, holes, deformation, and corrosion.

b. Inspect ammunition compartment doors (21).

(1) Catch assemblies for correct operation and damage. Catch assembly covers and strips for damage.

(2) Door support cables and cable fasteners for proper safetying and condition.

(3) Doors for cracks, dents, holes, deformation and corrosion.

(4) Door hinges for damage.

(6) Door rubber strips (seals) for cuts, chafing, and secure adhesion to door surface.

c. Refer to table 2-3 for instructions to inspect other access covers and doors shown on figure 2-3.

2-63. CLEANING – ACCESS COVERS AND DOORS.

a . Clean access covers and doors with cleaner (C33) and water.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

b. Remove stubborn deposits with solvent (C112) and clean cloths.

2-64. REPAIR – ACCESS COVERS AND DOORS.

a. Repair hydraulic compartment doors (8, figure 2-3).

(1) Replace faulty latches.

(2) Replace damaged seals or rebond seals with adhesive. Refer to paragraph 2-20 for procedure.

(3) Replace faulty hinges.

(4) Repair cracks, dents, and holes that are within limits shown on figures 2-7 through 2-10. Use repair procedures shown on the illustrations.

(6) Repair corrosion damage. Refer to paragraph 2-10.

(6) Replace door if it is distorted to the degree that it will not close properly and fit smoothly with the fuselage.

b. Repair ammunition compartment doors (21, figure 2-3).

(1) Replace faulty catch assemblies, damaged catch assembly covers, and strips.

(2) Replace damaged door support cables and cable fasteners (attachment brackets).

(3) Repair cracks, dents, holes, deformation, and corrosion. Refer to TM 55-1500-204-25/1 for general repair instructions. Refer to paragraph 2-10 for corrosion damage repair instructions. Repair fatigue-type vertical cracks along aft spotweld seam on outer skin of ammunition compartment doors.

(a) Stop drill ends of cracks.

(b) Remove rubber strip (seal) from inside aft edge of door.

(c) Fabricate doubler of 2024T3 aluminum alloy 0.040 inch thick. Make doubler to fit the width and length of the inside edge of door.

(d) Fabricate overlay patch for outside skin of door 2024T3 aluminum alloy 0.025 inch thick. Make overlay patch to overlap cracks in skin by 1.50 inches.

(e) Clamp inside doubler and overlaypatch to door. Drill holes for rivets (51, table 2-2) through overlay patch, aft edge of door and doubler. Use one inch spacing between rivets and 0.25 inch edge distance. Countersink the doubler for installation of these rivets. Drill holes for bulb-type cherryrivets(32, table 2-2) on remaining three edges of patch. Use the same spacing.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(f) Remove overlay patch and doubler from door. Clean and deburr parts and coat outside surface with primer (C88 or C91). Clean inside surface of doubler, patch, and mating surfaces on door with MEK (C74).

(g) Apply a thin smooth layer of adhesive (C14) on mating surfaces of door, patch, and doubler. Position the patch and doubler in the door. Install rivets (51, table 2-2) in holes prepared in step (e). Install cherry rivets (32, table 2-2) in remaining three sides of patch.

(h) Install rubber strip (seal) that was removed in step (b). Refer to paragraph 2-20 for procedure.

(i) Touch-up paint to match surrounding area.

(4) Replace damaged rubber strips (seals) or rebond with adhesive. Refer to paragraph 2-20 for procedure.

(6) Replace faulty hinges.

c. Refer to paragraph 2-18 for instructions to repair other access covers and doors shown on figure 2-3.

2-65. INSTALLATION – ACCESS COVERS AND DOORS,

a. Install hydraulic compartment doors (8, figure 2-3).

(1) Position door on fuselege and install bolts to attach hinges to supports. Attach door-holding spring to the lower hinge.

(2) Open and close door several times to ensure that latches operate properly.

(3) Attach air duct hose to vent on left door.

b. Install ammunition compartment doors (21).

(1) Align door hinge half with the meting hinge half on the fuselage and install pin.

(2) Install two door support cables.

(3) Check operation of door catches to ensure that they function properly. Check that door fits smoothly with fuselage and that rubber strips (seals) are in position on the door.

c. Install other access covers and doors shown on figure 2-3 by securing with turnlock fasteners or screws as applicable.

2-66. PAINTING–ACCESS COVERS AND DOORS – TOUCH-UP.

Touch-up damaged paint by same procedure outlined for cowling and fairing. Refer to paragraph 2-93 and TB746-93-2 for paint instructions.

2-67. FLOORS AND DECKS.

2-68. DESCRIPTION – FLOORS AND DECKS.

The floors and decks described in this paragraph are the ammunition compartment floor, gunner compartment floor, pilot compartment floor, engine deck, rear panel, and the floor (bottom panels) of the compartments below the engine compartment. These floors and decks are constructed of bonded honeycomb.

2-69. REMOVAL – FLOORS AND DECKS. (AVIM)

a. Except for engine deck, removal of floors and decks listed in paragraph 2-68 must be accomplished by depot maintenance.

b. Removal of Engine Deck.

CAUTION

Aircraft must be leveled prior to starting engine deck removal. Do not remove front engine deck panel (209-033-152) and center deck skin (209-033-154) at the same time. Structural misalignment can result when both sections of the deck are removed together.

All structural stress must be relieved prior to removing engine deck front panel or center skin. The primary method for relieving the stress is to remove all wing stores, engine assembly, all rotating controls, transmission assembly, and tailboom assembly.

Fuel system must be defueled and the rear fuel ceil removed to prevent inadvertant puncture and FOD during the drilling process in removing the front dock panel.

Do not use helicopter structure as work platform when engine deck is removed. All maintenance personnel must work from maintenance stands rather than the helicopter structure, to preclude structural misalignment.

(1) Remove engine assembly, including all mounts and linkage (paragraph 4-12).

(2) Remove transmission assembly, including all rotating controls (paragraphs 5-12 and 6-24).

(3) Remove tail boom assembly, including tail rotor driveshaft and number one hanger support (paragraphs 2-283 and 6-84).

(4) Install rear jack fitting and support helicopter with a suitable jack.

(5) Remove rear fuel cell side panel and cell (paragraphs 2-61 and 10-77).

NOTE

Cap all lines and cover ail component opening to prevent entry of foreign matter.

(6) Remove lines and wiring in work area.

(7) Identify all removed components and store in a secure location to prevent loss or damage.

(8) Preserve fuel cell to preclude deterioration.

(9) Cover oil cooler air inlet to prevent entry of foreign matter.

(10) Drill out rivets holding deck section in place, being careful not to drill into existing helicopter structure.

(11) Remove old sealant from edges of deck mating surface.

(12) Remove all foreign matter from work area including drill shavings and rivet fragments in fuel cell cavity.

2-70. INSPECTION – FLOORS AND DECKS.

Refer to table 2-2 for inspection requirements for the floors and decks listed in paragraph 2-68.

2-71. CLEANING – FLOORS AND DECKS.

a. Clean the floors and decks listed in paragraph 2-68 with cleaner (C32) and water.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

b. Remove stubborn deposits with solvent (C112) and clean cloths.

2-72. REPAIR – FLOORS AND DECKS.

Refer to paragraphs 2-16 and 2-17 for procedure to repair floors and decks listed in paragraph 2-68.

2-73. INSTALLATION – FLOORS AND DECKS (AVIM)

a. Except for engine deck, installation of floors and decks listed in paragraph 2-68 must be accomplished by higher maintenance level.

b. Installation of Engine Decks:

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(1) Clean deck mating surfaces with MEK (C74).

(2) Apply a bead of sealant (C105) to mating surface and install deck section, being careful not to bend corners or damage bonding.

(3) Rivet in place and seal edges to ascertain water-tight condition, using sealant (C105).

(4) Reinstall all removed components, lines, wiring, mounts, and fittings in reverse order. Insure that rear fuel cell cavity is completely free of foreign matter prior to installing fuel cell.

(5) Perform engine to transmission alignment check (paragraph 6-7).

(6) Rig all affected systems, perform maintenance operational checks, and maintenance test flight to ascertain airworthiness.

2-74. PAINTING – FLOORS AND DECKS – TOUCH-UP.

a. Clean area where paint requires touch-up with cleaning compound (C32) and rinse with water. Allow to dry thoroughly.

b. Apply primer (C88 or C91) to area that requires touch-up.

c. Apply finish coat to match existing finish.

2-75. COWLING AND FAIRING.

2-76. DESCRIPTION – COWLING AND FAIRING.

a. P E The pylon fairings (1, 3, and 4, figure 2-50) are primarily honeycomb construction with the exception of the horizontal firewalls (5 and 8) which are titanium.

b. M The pylon fairings (1, 3, and 4, figure 2-51) are primarily honeycomb construction with the exception of the horizontal firewalls (5 and 17) which are titanium.

c. The honeycomb construction parts have fiberglass facings with aluminum or fiberglass cores. The fairings are not structural members and do not carry primary loads; therefore, larger size damage may be repaired on these fairings than can be repaired on the fuselage honeycomb panels. It is necessary to maintain contours and restore the fairings to original strength when repair is accomplished.

d. P E The transmission cowling (14, figure 2-50) consists of the right and left doors.

e. M The transmission cowling (8, figure 2-51) consists of the right and left doors.

f. Openings in the doors form the engine air inlet ducts. A small window in the right door permits viewing the transmission oil level. A latch safety indicator, which is a red-painted knob, protrudes slightly past the surface of the door when the door is properly latched in the closed position. The doors are equipped with articulated hinges.

g. P E The engine cowling (11, figure 2-50) consists of the right and left doors. Ram air inlets (12) form inlets for outside air into the engine compartment.

h. M The engine cowling (6, figure 2-51) consists of the right and left doors. Ram air inlets (7) form inlets for outside air into the engine compartment.

i. The engine cowl doors are equipped with hinges and latch safety indicators similar to those described in the preceding paragraph for the transmission doors.

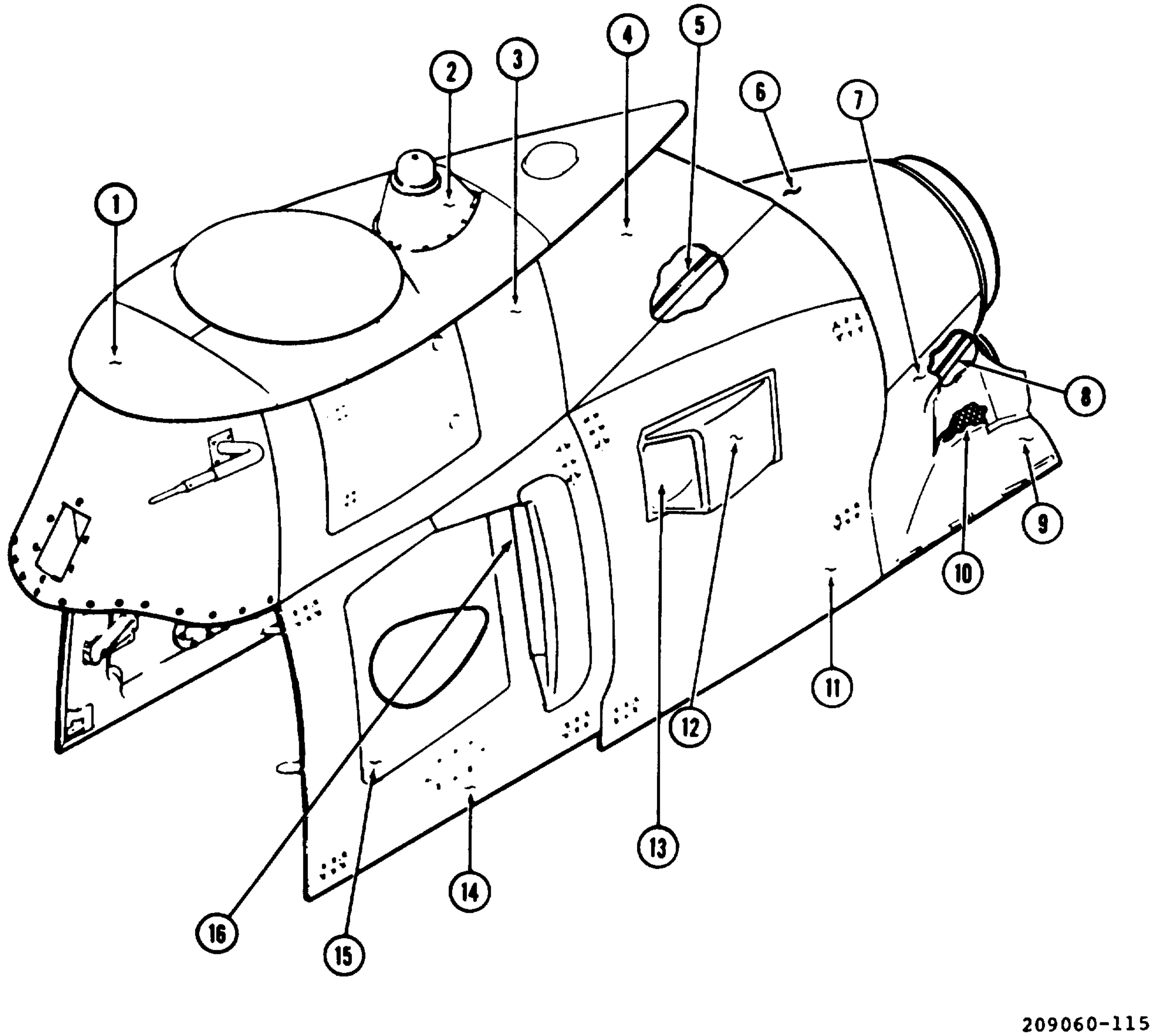

Figure 2-50. P E Fairing – Cowling for Pylon, Transmission, Engine and Tailpipe (Sheet 1 of 3)

ITEM	DESCRIPTION	PART NUMBER	MATERIAL	SPECIFICATION	CONDITION	THICKNESS	SIZE
1	Forward Pylon Fairing Assembly	209-061-801-1					
	Outer Skin, Two Ply Glass Fabric	N/A	Fiberglass Fabric	Bell Helicopter Specification 299-947-076 One Ply Type A on Outside One Ply Type C Next to Core	N/A	N/A	N/A
	Inner Skin, One Ply Glass Fabric	N/A	Fiberglass Fabric	Same As Above Except Use One Ply Type A Only	N/A	N/A	N/A
	Core Between Outer and Inner Skins	N/A	Nonmetallic Honeycomb	Bell Helicopter Specification 299-947-103 Grade II, Type I, Class I Density 4.0 1/8 Hexagonal Cell	N/A	N/A	N/A
	Core At Pitot Tube Mounting Boss	N/A	Al Aly Honeycomb	Bell Helicopter Specification 299-947-069 Type IV	N/A	N/A	N/A
2	Support Assembly	209-060-812-17					
	Outer Skin, 2 Ply Inner Skin, 1 Ply	N/A N/A N/A	Fiberglass Cloth Fiberglass Cloth Fiberglass Cloth	MIL-C-9084, Type III (120) MIL-C-9084, Type III (120) MIL-C-9084, Type III (120)	N/A N/A N/A	Variable Variable Variable	23.0 x 4.7 23.0 x 4.70 23.0 x 23.6
3	Fairing Assembly, Left	209-060-811-96					
	Outer Skin, 2 Ply Inner Skin, 2 Ply Core, Nonmetallic	N/A N/A N/A N/A N/A	Fiberglass Cloth Fiberglass Cloth Fiberglass Cloth Fiberglass Cloth Honeycomb, Nonmetallic	MIL-C-9084, Type III (120) MIL-C-9084, Type VIII MIL-C-9084, Type III (120) MIL-C-9084, Type VIII Same as Specification for core, nonmetallic in item 1.	N/A N/A N/A	Variable Variable Variable	42.0 x 46.0 42.0 x 46.0 42.0 x 46.0
	Fairing Assembly, Right, (Same as listed above for 209-969-811-95)	209-060-811-96					
4	Aft Pylon Fairing Assembly	209-060-807-13					
	Outer Skin, 2 Ply Inner Skin, 1 Ply Core, Nonmetallic	N/A N/A N/A N/A	Fiberglass Cloth Fiberglass Cloth Fiberglass Cloth Honeycomb, Nonmetallic	MIL-C-9084, Type III (120) MIL-C-9084, Type VIII MIL-C-9084, Type III (120) Same as Specification for core, nonmetallic in item 1.	N/A N/A N/A	Variable Variable Variable	54.0 x 154.0 54.0 x 154.0 54.0 x 154.0
5	Upper Horizontal Firewall	209-060-902-3	Titanium	MIL-T-9046 Type I, Comp B	80 Min.	0.020	25.0 x 41.0
6	Tail Pipe Fairing, Assembly of	209-040-810-7					
	Outer Skin	N/A	Al Aly 2024	QQA250/5, Temp 0	T42	0.025	22.0 x 45.0
7	Tail Pipe Fairing, Assembly of	209-060-810-7					
	Outer Skin	N/A	Al Aly 2024	QQA250/5, Temp 0	T42	0.025	26.0 x 35.0
8	Firewall	209-060-810-17	Titanium	MIL-T-9046, Type I, Comp C	65 Min.	0.020	24.0 x 28.0

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Figure 2-50. P E Fairing — Cowling for Pylon, Transmission, Engine, and Tailpipe (Sheet 2 of 3)

ITEM	DESCRIPTION	PART NUMBER	MATERIAL	SPECIFICATION	CONDITION	THICKNESS	SIZE
9	Tail Pipe Fairing, Assembly of	209-060-810-7					
	Outer Skin	N/A	Al Aly 2024	QQA250/5, Temp 0	T42	0.025	14.0 x 32.0
10	Screen (Nonreparable — replace screen)	209-060-810-75	N/A	N/A	N/A	N/A	N/A
11	Engine Cowl Assembly, Left	209-060-809-11					
	Outer Skin	N/A	Al Aly 2024	QQA250/5, Temp 0	T42	0.025	43.0 x 45.0
	Inner Skin	N/A	Al Aly 2024	QQA250/5, Temp 0	T42	0.025	43.0 x 45.0
	Engine Cowl Assembly, Right (Same as listed above for 209-060-809-11)	209-060-809-12					
12	Ram Air Inlet Assembly, Left	209-060-815-1					
	Reinforcement	N/A	Al Aly 2024	QQA250/5, Temp T3	T3	0.025	1.0 x 19.0
	Reinforcement	N/A	Al Aly 2024	QQA250/5, Temp T3	T3	0.025	1.0 x 20.0
	Reinforcement	N/A	Al Aly 2024	QQA250/5, Temp T3	T3	0.025	1.2 x 10.0
	Reinforcement	N/A	Al Aly 2024	QQA250/5, Temp T3	T3	0.025	2.6 x 10.0
	Skin Outer	N/A	Fiberglass Cloth	MIL-C-9084, Type III (120)	N/A	Variable	36.0 x 36.0
	Skin Inner	N/A	Fiberglass Cloth	MIL-C-9084, Type VIII	N/A	Variable	72.0 x 72.0
	Honeycomb Core, Aluminum			Bell Helicopter Specification 299-947-059, Type II		0.250	10.0 x 14.0 and 7.0 x 8.0
	Ram Air Inlet Assembly, Right (Same as listed above for 209-060-015-1)	209-060-815-2					
13	Air Scoop, Right Outer Skin	209-050-809-10	Al Aly 6061	QQA250/11, Temp 0	T6	0.032	14.0 x 6.0
	Air Scoop, Left Outer Skin	209-060-809-9	Al Aly 6061	QQA250/11, Temp 0	T6	0.032	14.0 x 6.0
14	Transmission Cowl Assembly, Left	209-060-808-215					
	Outer Skin	N/A	Al Aly 2024	QQA250/5, Temp 0	T42	0.025	40.0 x 43.0
	Inner Skin	N/A	Al Aly 2024	QQA250/5, Temp 0	T42	0.025	40.0 x 43.0
	Transmission Cowl Assembly Right (Same as listed above for 209-060-808-215)	209-080-808-216					
15	Intake Ramp, Left Outer Skin	N/A	Al Aly 2024	QQA250/5, Temp 0	T42	0.025	22.8 x 23.5
	Intake Ramp, Right Outer Skin	N/A	Al Aly 2024	QQA250/5, Temp 0	T42	0.025	22.8 x 23.5
16	Intake Lip, Left Outer Skin	N/A	Al Aly 6061	QQA250/11, Temp 0	T6	0.032	25.0 x 25.0
	Intake Lip, Right Outer Skin	N/A	Al Aly 6061	QQA250/11, Temp 0	T6	0.032	25.0 x 25.0

Figure 2-50. P E Fairing — Cowling for Pylon, Transmission, Engine, and Tailpipe (Sheet 3 of 3)

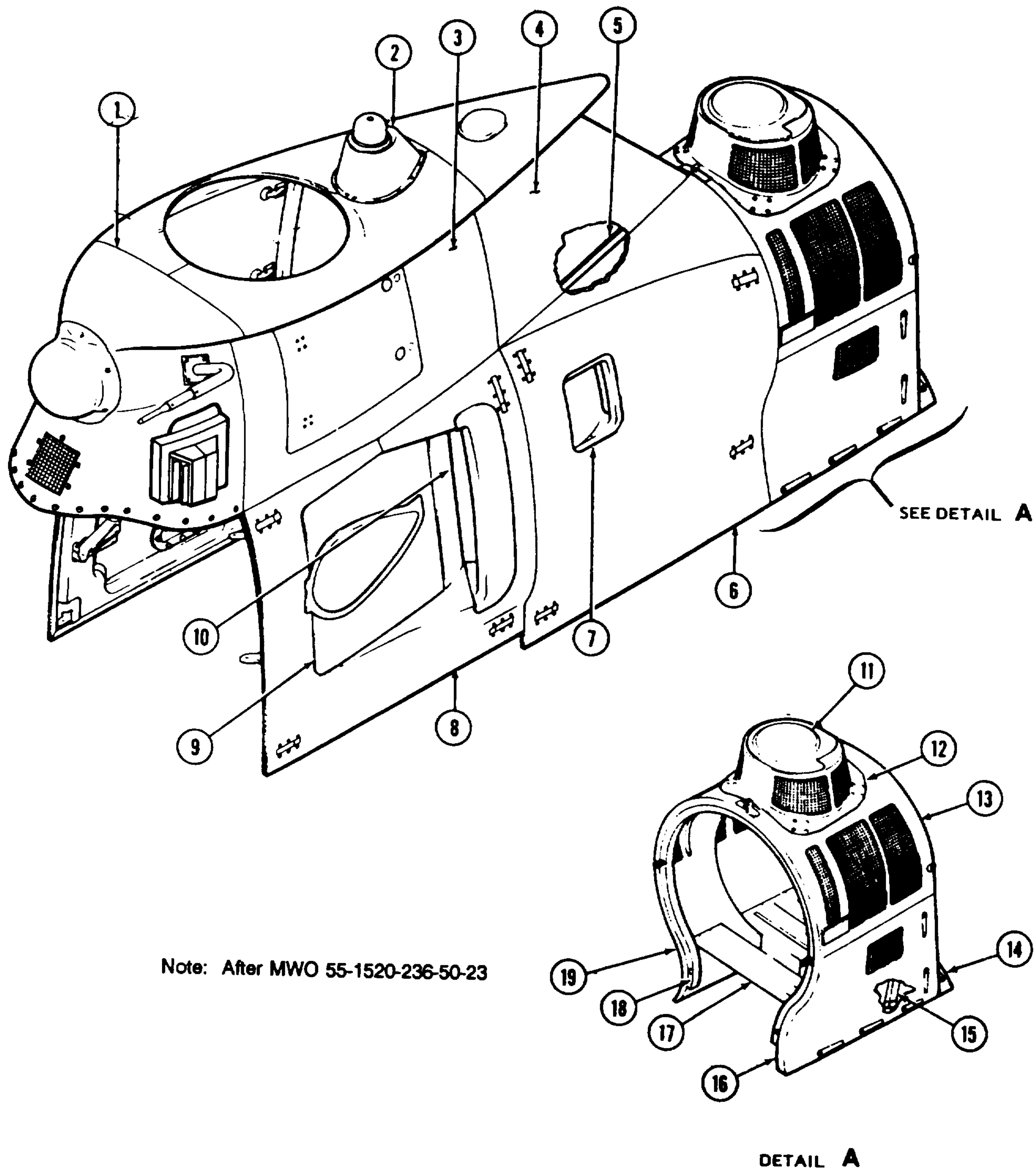


Figure 2-51. M Fairing and Cowling — Pylon, Transmission, Engine and IR Suppressor (Sheet 1 of 6)

ITEM	DESCRIPTION	PART NUMBER	MATERIAL	SPECIFICATION	CONDITION	THICKNESS	SIZE
1	Forward Pylon Fairing Assembly	209-050-803-101					
	Outer Skin, Two Ply Glass Fabric	N/A	Fiberglass Fabric	Bell Helicopter Specification 299-947-076 One Ply Type A on Outside One Ply Type C Next to Core	N/A	N/A	N/A
	Inner Skin, One Ply Glass Fabric	N/A	Fiberglass Fabric	Same As Above Except Use One Ply Type A Only	N/A	N/A	N/A
	Core Between Outer and Inner Skins	N/A	Nonmetallic Honeycomb	Bell Helicopter Specification 299-947-103 Grade II, Type I, Class I Density 4.0 1/8 Hexagonal Cell	N/A	N/A	N/A
	Core At Pitot Tube Mounting Boss	N/A	Al Aly Honeycomb	Bell Helicopter Specification 299-947-059 Type IV	N/A	N/A	N/A
	Forward Pylon Fairing Assembly with MWO 55-1520-236-50-23 accomplished	07-12100-1	Fiberglass Fabric	Bell Helicopter Specification 299-947-076 One Ply Type A on Outside One Ply Type C Next To Core	N/A	N/A	N/A
	Fairing Assembly	07-12210	Fiberglass/ Polyester Resin	ANSI Y14.5M-1982	N/A	N/A	N/A
	Housing Assembly	07-12230-1	Al Aly 2024	QQA250/4	N/A	N/A	N/A
2	Support Assembly	209-060-812-17					
	Outer Skin, 2 Ply Inner Skin, 1 Ply	N/A N/A N/A	Fiberglass Cloth Fiberglass Cloth Fiberglass Cloth	MIL-C-9084, Type III (120) MIL-C-9084, Type III (120) MIL-C-9084, Type III (120)	N/A N/A N/A	Variable Variable Variable	23.0 x 4.7 23.0 x 4.70 23.0 x 23.5
3	Fairing Assembly, Left	209-050-811-95					
	Outer Skin, 2 Ply Inner Skin, 2 Ply Core, Nonmetallic	N/A N/A N/A N/A N/A	Fiberglass Cloth Fiberglass Cloth Fiberglass Cloth Fiberglass Cloth Honeycomb, Nonmetallic	MIL-C-9084, Type III (120) MIL-C-9084, Type VIII MIL-C-9084, Type III (120) MIL-C-9084, Type VIII Same as Specification for core, nonmetallic in item 1.	N/A N/A N/A	Variable Variable Variable	42.0 x 46.0 42.0 x 46.0 42.0 x 46.0
	Fairing Assembly, Right, (Same as listed above for 209-969-811-95)	209-060-811-95					

Figure 2-51. M Fairing and Cowling — Pylon, Transmission, Engine and IR Suppressor (Sheet 2 of 5)

ITEM	DESCRIPTION	PART NUMBER	MATERIAL	SPECIFICATION	CONDITION	THICKNESS	SIZE
4	Aft Pylon Fairing Assembly	209-060-807-13					
	Outer Skin, 2 Ply	N/A	Fiberglass Cloth	MIL-C-9084, Type III (120)	N/A	Variable	54 0 x 154 0
		N/A	Fiberglass Cloth	MIL-C-9084, Type VIII	N/A	Variable	54 0 x 154 0
	Inner Skin, 1 Ply	N/A	Fiberglass Cloth	MIL-C-9084, Type III (120)	N/A	Variable	54 0 x 154 0
	Core, Nonmetallic	N/A	Honeycomb, Nonmetallic	Same as Specification for core, nonmetallic in item 1.			
5	Upper Horizontal Firewall	209-060-902-3	Titanium	MIL-T-9046 Type I, Comp B	80 Min.	0.020	25.0 x 41 0
6	Engine Cowl Assembly, Left	209-060-809-11					
	Outer Skin	N/A	Al Aly 2024	QQA250/5, Temp 0	T42	0.025	43.0 x 45.0
	Inner Skin	N/A	Al Aly 2024	QQA250/5, Temp 0	T42	0.025	43.0 x 45 0
	Engine Cowl Assembly, Right (Same as listed above for 209-060-809-11)	209-060-807-12					
7	Air Scoop, Right	209-060-809-10					
	Outer Skin		Al Aly 6061	QQA250/11, Temp 0	T6	0.032	14 0 x 6.0
	Air Scoop, Left	209-060-809-9					
	Outer Skin		Al Aly 6061	QQA250/11, Temp 0	T6	0.032	14 0 x 6 0
8	Transmission Cowl Assembly, Left	209-060-808-216					
	Outer Skin	N/A	Al Aly 2024	QQA250/5, Temp 0	T42	0.025	40 0 x 43 0
	Inner Skin	N/A	Al Aly 2024	QQA250/5, Temp 0	T42	0.025	40 0 x 43.0
	Transmission Cowl Assembly Right (Same as listed above for 209-060-808-215)	209-060-808-216					
9	Intake Ramp, Left	N/A					
	Outer Skin		Al Aly 2024	QQA250/5, Temp 0	T42	0.025	22.8 x 23.5
	Intake Ramp, Right	N/A					
	Outer Skin		Al Aly 2024	QQA250/5, Temp 0	T42	0.025	22 8 x 23 5
10	Intake Lip, Left	N/A					
	Outer Skin		Al Aly 6061	QQA250/11, Temp 0	T6	0.032	25.0 x 25.0
	Intake Lip, Right	N/A					
	Outer Skin		Al Aly 6061	QQA250/11, Temp 0	T6	0.032	25.0 x 25.0
11	Cover Assembly, Auxiliary Jammer	191722-2					
	Cover	191722-3	Al Aly 2024	QQA250/5	T3	0.040	
	Bracket	191722-7	Al Aly 2024	QQA250/5	T3	0.063	

M Fairing and Cowling — Pylon, Transmission, Engine and IR Suppressor (Sheet 3 of 5)

ITEM	DESCRIPTION	PART NUMBER	MATERIAL	SPECIFICATION	CONDITION	THICKNESS	SIZE
12	Fairing Assembly, Jammer	191657-1					
	Fairing	191657-3	Polyester Glass Cloth	MIL-R-7575, Form B	N/A		
	Screen	191657-5	N/A	N/A	N/A	N/A	N/A
	Screen (Nonreparable — replace screens)	191657-7	N/A	N/A	N/A	N/A	N/A
13	Panel Assembly, . Cowling Top	191653-2					
	Outer Skin	191653-15	Al Aly 2024	QQA250/3	T4	0.016	
	Screen (Nonreparable — replace screen)	191653-13	N/A	N/A	N/A	N/A	N/A
14	Panel Assembly, Aft	191652-1					
	Upper Panel	191652-9	Al Aly 2024	QQA250/5	T3	0.032	
	Lower Panel	191652-11	Polyester Glass Cloth	MIL-R07575, Form B	N/A		
	Screen (Nonreparable — replace screen)	191652-17	N/A	N/A	N/A	N/A	N/A
15	Frame Assembly, Aft	1911650-2					
	Channel, LH Strut Assembly		Al Aly 6061	QQA250/11	T6	0.040	
	Channel, RH Strut Assembly		Al Aly 6061	QQA250/11	T6	0.040	
	Channel, Fwd LH Leg Assembly		Al Aly 6061	QQA250/[illegible]1	T6	0.040	
	Foot, Fwd LH Leg Assembly		Al Aly 6061	QQA250/11	T6	0.75	
	Channel, Fwd RH Leg Assembly		Al Aly 6061	QQA250/11	T6	0.040	
	Foot, Fwd RH Leg Assembly		Al Aly 6061	QQA250/11	T6	0.75	
	Channel, Aft LH Leg Assembly		Al Aly 6061	QQA250/11	T6	0.040	
	Foot, Aft LH Leg Assembly		Al Aly 6061	QQA250/11	T6	0.75	
	Channel, Aft RH Leg Assembly		Al Aly 6061	QQA250/11	T6	0.040	
	Foot, Aft RH Leg Assembly		Al Aly 6061	QQA250/11	T6	0.75	
	Ring Assembly		Al Aly 6061	QQA250/11	T6	0.040	
	Doubler		Al Aly 6061	QQA250/11	T6	0.032	
	Flange		Al Aly 6061	QQA250/11	T6	0.032	

Figure 2-51. M Fairing and Cowling — Pylon, Transmission, Engine and IR Suppressor (Sheet 4 of 5)

ITEM	DESCRIPTION	PART NUMBER	MATERIAL	SPECIFICATION	CONDITION	THICKNESS	SIZE
16	Panel Assembly, Cowling Side LH	191654-3					
	Outer Skin		Al Aly 2024	QQA250/5	T3	0.025	
	Doubler		Al Aly 2024	QQA250/5	T3	0.032	
	Screen (Nonreparable — replace screen)	191654-35	N/A	N/A	N/A	N/A	N/A
17	Firewall Assembly	191651-1					
	Wall	191651-3	CRES	WWS766, Class 347	A	0.025	
	Flange, LH	191651-5	CRES	QQS766, Class 347	A	0.032	
	Flange, RH	191651-6	CRES	QQS766, Class 347	A	0.032	
	Flange	191651-7	CRES	QQS677, Class 347	A	0.032	
	Flange	191651-9	CRES	QQS766, Class 347	A	0.025	
18	Frame assembly, Fwd	191649-2					
	Frame		Al Aly 2024	QQA250/5	T3	0.032	
	Pad		CRES	QQS766, Class 321		0.063	
19	Panel Assembly, Cowling Side RH	191654-4					
	Outer Skin		Al Aly 2024	QQA250/5	T3	0.025	
	Doubler		Al Aly 2024	QQA250/5	T3	0.032	
	Screen (Nonreparable — replace screen)	191654-35	N/A	N/A	N/A	N/A	N/A
	Cover, Inspection Door		Al Aly 2024	QQA250/5	T3	0.025	

Figure 2-51. **M** Fairing and Cowling — Pylon, Transmission, Engine and IR Suppressor (Sheet 5 of 5)

j. P E The tailpipe assembly fairing (6, figure 2-50) encloses the engine tailpipe and supports the exhaust duct.

k. M The IR suppressor cowling (detail A, figure 2-51) encloses the engine exhaust duct and supports the IR suppressor.

2-77. REMOVAL – COWLING AND FAIRING.

Refer to paragraph 2-78 through 2-82.

2-78. REMOVAL – TRANSMISSION COWL ASSEMBLY.

a. Remove shields, if installed, from engine air inlet ducts.

b. P E Open transmission cowl assembly (door) (14, figure 2-50) that is to be removed.

c. M Open transmission cowl assembly (door) (8, figure 2-51) that is to be removed.

d. Remove bolts that attach hinges to fittings on cowl frame. Identify washers and shims for reinstallation in the same relative location to avoid requirement to align cowling assembly when it is reinstalled.

e. Remove cowling assembly from helicopter.

2-79. REMOVAL – ENGINE COWL ASSEMBLY.

a. P E Remove engine cowl assembly doors (11, figure 2-50) in same manner as transmission cowl doors (paragraph 2-78).

b. M Remove engine cowl assembly door (6, figure 2-51) in same manner as transmission cowl doors (paragraph 2-78).

2-80. P E REMOVAL – TAILPIPE FAIRING.

Disconnect fasteners and remove machine screws to release tailpipe assembly fairing (6, figure 2-50) from fuselage and from pylon fairings. Disconnectdrain lines from fittings on tailpipe and ejector. Remove tailpipe assembly fakings.

2-81. M REMOVAL– IR SUPPRESSOR COWLING.

a. Release fasteners (9, figure 2-52), and remove side panels (10) from cowling.

b. Remove IR suppressor (paragraph 4-54).

c. Disconnect auxiliary jammer connectors (3) at aft engine firewall.

d. Disconnect fuel drain lines.

(1) Overboard drain line (4) at aft engine firewall.

(2) Engine exhaust duct drain line (6) at tee fitting. Cap open drain lines.

Release fasteners (13) on aft panel assembly (11).

f. Remove screws (15) and washers (14).

g. Remove bolts and washers (5).

h. Remove safety clips (1) from dowel pins (2).

i. Open cowl support latch.

j. Remove cotter pins (18), washers (19) and pins (22).

k. Remove suppressor cowling.

(1) Pull upon aft end of cowling to disengage eyebolts (7) from lugs on mount brackets (26 and 29).

(2) Pull cowling aft to disengage dowel pins (2) from aft engine firewall.

(3) Remove cowling from helicopter.

2-82. REMOVAL – PYLON FAIRING.

a. P E Disconnect electrical wiring inside forward and aft pylon fairings (1, 3, and 4, figure 2-50).

b. M Disconnect electrical wiring inside forward and aft pylon fairings (1, 3, and 4, figure 2-51).

c. Disconnect tubing at pitot tube.

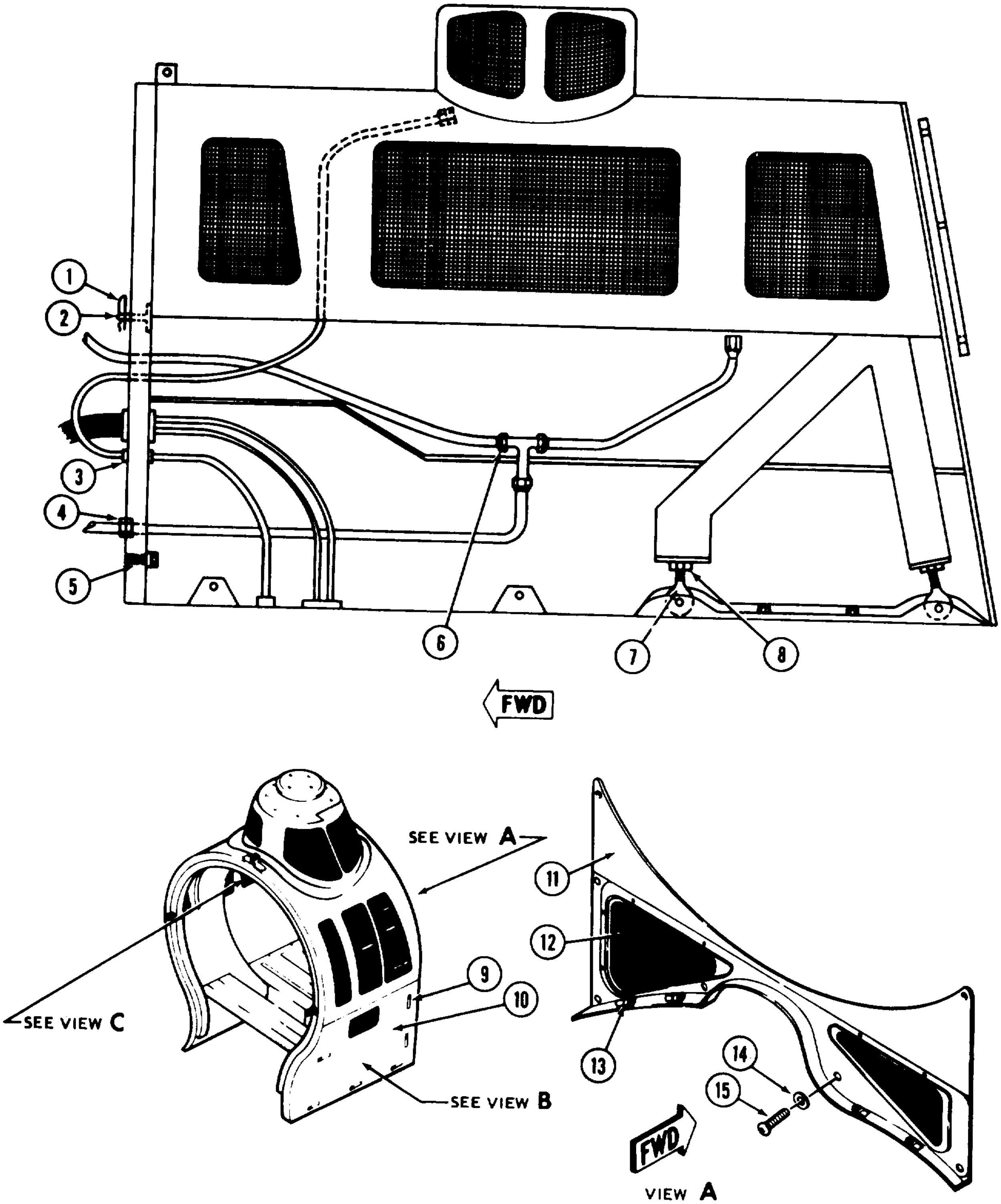
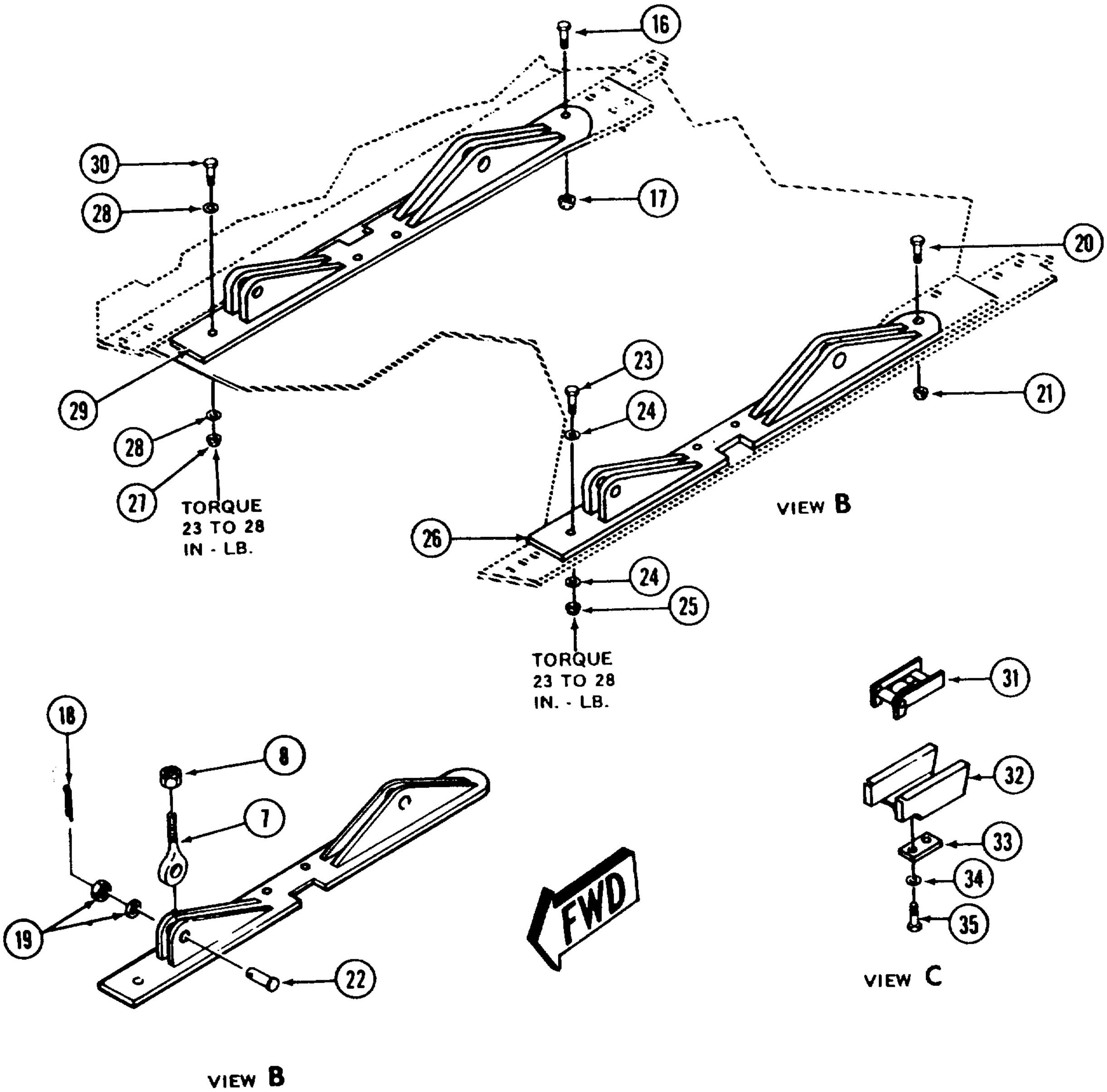


Figure 2-52. IR Suppressor Cowling Installation (Sheet 1 of 2)

c.1 (After incorporation of MWO 1-1520-236-50-30) Disconnect ODDS inlet end outlet hoses (23.1 and 49, figure 4-4).



1. Safety clip
2. Dowel pin
3. Auxiliary jammer connectors
4. Fuel drain connector
5. Bolt and washer
6. Fuel drain connector
7. Rod end bearing
8. Locknut
9. Fastener
10. Side panel
11. Aft panel assembly
12. Screen
13. Fastener
14. Washer
15. Screw
16. Bolt 145-173-9029
17. Nut 525-272-9502
18. Cotter pin
19. Washer
20. Bolt 145-173-9011
21. Nut 525-272-9501
22. Pin
23. Bolt AN3C6A
24. Washer
25. Nut MS21045C3
26. Bracket 191658-2
27. Nut MS21045C3
28. Washer
29. Bracket 191729-2
30. Bolt AN3C10A
31. Cowling latch
32. Bracket
33. Lower serrated plate
34. Washer
35. Screw

Figure 2-62. IR Suppressor Cowling Installation (Sheet 2 of 2)

d. Remove anti-collison light.

e. Disconnect oil tank from aft pylon.

f. Disconnect shut off valve and pressure regulator going to E.C.U.

g. Disconnect fasteners and remove pylon fairings.

2-83. INSPECTION – COWLING AND FAIRING.

a. Refer to table 2-3 to classify damage to structure and fasteners of cowling and fairing.

b. Inspect rubber seals and bumpers for deterioration, damage, and secure installation.

c. P E Inspect latch assemblies on transmission and engine cowling (14 and 11, figure 2-50) for wear and damage that could affect function.

d. M Inspect latch assemblies on transmission and engine cowling (8 and 6, figure 2-51) for wear and damage that could affect function,

e. P E Inspect hinge assemblies on transmission and engine cowling (14 and 11, figure 2-50) for wear and damage that could affect function.

f. M Inspect hinge assemblies on transmission and engine cowling (8 and 6, figure 2-51) that could affect function.

g. M Inspect SU-130 Laser Detection sensor tiring and housing assemblies (1, figure 2-51) far cracks, wear, and damage that could affect function. (After MWO 55-1520-236-50-23.)

2-84. CLEANING — COWLING AND FAIRING.

a. Clean cowling and fairing with cleaning compound (C32) and water.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

b. Remove stubborn deposits with solvent (C112) and clean cloths.

2-85. REPAIR – COWLING AND FAIRING.

a. Repair structural damage and replace damaged fasteners (paragraph 2-19).

b. P E Refer to figure 2-50 for cowling and fairing construction material.

c. M Refer to figure 2-51 for cowling and fairing construction material.

d. Replace damaged latches and hinges.

e. Replace damaged rubber seals and bumpers, Refer to paragraph 2-20.

f. P E Replace damaged screen (10, figure 2-50). Carefully drill out rivets and remove the aluminum alloy spoiler to gain access to the rivets that retain the screen. Carefully drill out the rivets that retain the screen. Remove the damaged screen and retainer strips. Deburr holes and touch-up bare metal with chemical film (C31) and primer (C88 or C91), Trim new screen to fit. Install new screen, retainer strips and spoiler with blind rivets (37, table 2-2).

2-86. M REPAIR – I R SUPPRESSOR COWLING.

a. Refer to paragraph 2-19 for procedure to repair structural damage and to replace damaged fasteners, See figure 2-51 for partial list of materials used in construction of cowling.

b. Replace damaged latches.

c. Replace damaged rubber seals (paragraph 2-20).

d. Replace damaged screen (12, figure 2-52).

{1) Carefully drill out rivets and remove doublers around screen.

(2) Deburr holes, touch up bare metal with chemical film (C31) and primer (C88 or C91).

(3) Trim new screen to fit.

(4) Install screen, doublers, and rivets.

e. Replace damaged cowling mount brackets (26 and 29) (Refer to table 2-3, item 11.)

(1) Remove IR suppressor cowling (paragraph 2-81).

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CAUTION

Use proper removal tool when removing Hi-Lok bolts to prevent damage to or enlargement of bolt holes. Use vise-grips or equivalent to remove locking collars from Hi-Lok bolts. Apply penetrating oil (C81) around heads of Hi-Lok bolts to facilitate removal.

(2) Use a 0.156 inch (maximum) diameter drive bar of aluminum or equally soft material to remove Hi-Lok bolts (16 and 20). Remove remaining nuts, bolts, and washers. Remove defective mount bracket. Clean engine deck, with sharp plastic scraper.

(3) Position replacement mount bracket (26 or 29) on engine deck at approximate installed position.

(4) Temporarily install cowling assembly on helicopter. Ensure that dowel pins (2) are engaged, and that rod end bearing (7) of cowling assembly are positioned within the lugs of mount brackets (26 and 29) on the engine deck.

(5) Temporarily install two bolts and washers (5) to secure lower section of cowling forward frame to aft engine firewall.

CAUTION

Adjustment of cowling latch may be necessary to ensure proper closing of latch. Do not force latch closed. Slight tension shall remain on latch in the closed position.

(6) Fasten cowl latch. If adjustment is required, perform steps (a) through (c).

(a) Loosen two attachment screws (35) securing serrated latch plate (33) to IR suppressor cowling bracket. Latch shall remain fastened during adjustment.

(b) Adjust as necessary to provide slight tension on latch when closed.

(c) Tighten two attachment screws (35).

(7) Adjust eyebolts (7) as necessary for alignment with mount bracket (26 and 29) lugs when brackets are resting on engine deck. Insert pins (22) through mount brackets (26 and 29) and rod end bearing (7).

(8) Transfer location of five holes from engine deck to underside of mount bracket.

(9) Remove pins (22) from mount brackets (26 and 29). Remove bolts (5) securing lower section of cowling forward support to aft engine firewall and cowl support. Unlatch upper cowl latch and remove cowling assembly from helicopter.

(10) Remove mount bracket from engine deck, and drill brackets.

(a) If left bracket (29) is being replaced. drill five 0.220 TO 0.227 inch diameter holes through mount bracket.

(b) If right bracket (26) is being replaced, drill three 0.220 TO 0.227 inch diameter holes at forward three locations. Drill two 0.193 TO 0.198 inch diameter holes (No. 9 drill) through aft end of mount bracket for Hi-Lok bolts.

CAUTION

After rework, mount bracket must beat least 0.290 inch thick and must not have any sharp edges or scratches.

(c) Remove sharp edges. Touch-up all drilled areas with primer (C88 or C91) and allow to dry.

(d) Position mount brackets on engine deck and ensure that no more than 0.010 inch gap exists in any mating area prior to securing attaching bolts.

(11) Place mystic tape (C124) over bottom surface of mount bracket (26 or 29). Tape will prevent adhesive (C14) from adhering to mount bracket during initial installation and curing.

(12) Apply adhesive (C14) to mount bracket contact area on engine deck. Apply enough adhesive to fill in any low areas on the engine deck and to make a smooth area for installation of mount bracket.

(13) Install mount bracket on prepared area of engine deck, using temporarly bolts and nuts. Install and torque nuts 10 inch-pounds.

(14) Allow filler material to cure for one hour at a temperature of 180 to 200 degrees F (82 to 93 degrees C) or 24 hours at room temperature. Use a heat lamp for the 180 to 200 degrees F curing temperature.

(16) Remove mount bracket. Remove tape and clean mount bracket of any adhesive.

(16) Install mount brackets (26 and 29) as follows:

(a) Position mount bracket (29) on engine deck. Install three bolts (30), six washers (28) and three nuts (27) at front of bracket. Do not torque nuts (27) at this time.

(b) Install two hi-lok bolts (16) and two nuts (17) at rear of bracket (29) in accordance with TM 55-1500-204-25/1.

(c) Torque nuts (27), that were installed in step a., 23 TO 28 inch-pounds.

(d) Position mount bracket (26) on engine deck. Install three bolts (23), six washers (24) and three nuts (25) at front of bracket. Do not torque nuts (25) at this time.

(e) Install two hi-lok bolts (20) and two nuts (21) at rear of bracket (26) in accordance with TM 55-1500-204-25/1.

(f) Torque nuts (25), that ware installed in step d., 23 TO 28 inoh-pounds.

Replace damaged or worn rod end bearings (7), locknuts (8), and pins (22). Refer to table 2-3, item 11.

2-87. INSTALLATION – COWLING AND FAIRING.

Refer to paragraph 2-88 through 2-92.

2-88. P E INSTALLATION – TAILPIPE FAIRING.

a. Position tailpipe faking (6, figure 2-50) on helicopter and secure.

b. Ensure that engine tailpipe overboard fuel drain is properly positioned to prevent chafing.

2-89. M INSTALLATION – IR SUPPRESSOR COWLING.

a. Position aft panel assembly (11, figure 2-52) on helicopter, but do not secure at this time.

b. Position IR suppressor cowling on helicopter (figure 2-52). Ensure that dowel pins (2) are engaged in holes in aft engine firewall and rod end bearings (7) are within lugs of mount brackets (26 and 29). Secure cowling.

(1) Maintain 0.040 TO 0.190 inch (minimum) clearance at IR suppressor cowling and aft pylon fairing interface.

(2) Check alignment of rod end bearings (7) to holes in lugs on mount brackets (26 and 29).

(3) If necessary, move cowling rearward and adjust rod end bearings (7) to obtain alignment.

(4) Tighten locknuts (8) on rod end bearings after adjustment. Secure locknuts to cowling support legs with lockwire (C137).

NOTE

Pins (22) shall be Installed wet coated with MIL-C-16173 Grade IV (C43.1), and then overspray. The entlre rod end assembly shall be covered with two coats of MIL-C-16173 Grade IV (C43.1). Reason: Pins are lightly susceptible to corrosion In a salt-air environment.

c. Install pins (22), washers (19), and cotter pins (18)

d. Install bolts and washers (5).

e. Install safety dips (1).

f. Remove caps and connect fuel drain fines:

(1) Engine exhaust drain line (6) at tee fitting.

(2) Overboard drain line (4) at aft engine fire-Wall.

g. Connect IR jammer cannon plugs (3).

h. Install IR suppressor (paragraph 4-57).

i. Install panels (10) with fasteners (9).

j. Secure aft panel assembly (11). Install screws (15) and washers (14). Secure fasteners (13).

2-90. INSTALLATION — PYLON FAIRING.

a. **P** **E** Position aft pylon fairing (4, figure 2-50) on helicopter and secure.

b. **M** Position aft pylon faking (4, figure 2-51) on helicopter and secure.

c. **P** **E** Position forward pylon fairing (1, figure 2-50) on helicopter and secure.

d. **M** Position forward pylon fairing (1, figure 2-51) on helicopter and secure.

e. Connect electrical wiring inside pylon fairing. Connect tubing at pitot tube.

f. (After incorporation of MWO 1-1520-236-50-30). Connect ODDS inlet and outlet hoses (23.1 and 49, figure 4-4).

2-91. INSTALLATION – TRANSMISSION COWL.

8. P E Position transmission cowl (14, figure 2-50) on helicopter.

b. M Position transmission cowl (8, figure 2-51) on helicopter.

c. Install bolts, washers, shims, and nuts to attach hinges to fittings on cowl frame. Install the shims in same location from which removed.

d. Close cowling and check alignment of cowling and operation of latches. Adjust shims on hinges and/or latch bolt assemblies if required.

(1) P E See figure 2-50 for view of latch and hinge.

(2) M See figure 2-51 for view of latch and hinge.

e. Open cowling and check standoff to ensure that it operates properly. Close cowling.

f. Install protective shields in air inlet ducts.

2-92. INSTALLATION – ENGINE COWL.

a. P E Install engine cowling (11, figure 2-50) in same manner outlined for transmission cowling (paragraph 2-91).

b. Install engine cowling (6, figure 2-51) in same manner outlined for transmission cowling (paragraph 2-91).

2-93. PAINTING – COWLING AND FAIRING – TOUCH-UP.

a. Clean area where paint requires touch-up with cleaning compound (C32) and rinse with water. Allow to dry,

b. Apply primer (C88 or C91) to area that requires touch-up.

c. Apply finish coat to match existing finish.

d. Refer to TM 55-1500-345-23 for paint instructions.

2-94. BEAM INSTALLATION – FUSELAGE RIGHT SIDE AND LEFT SIDE.

2-95. DESCRIPTION – BEAM INSTALLATION FUSELAGE RIGHT SIDE AND LEFT SIDE.

The right and left side beam installations in conjunction with floor installations, bulkhead installations, pylon installation, and the engine deck vent and drain installation form a primary box beam structure fuselage. The major components of the two beam installations are panel installations and the main beam caps.

2-96. REMOVAL – FUSELAGE RIGHT SIDE AND LEFT SIDE BEAM INSTALLATIONS.

Removal of beams must be accomplished at higher maintenance level.

2-97. INSPECTION – FUSELAGE RIGHT SIDE AND LEFT SIDE BEAM INSTALLATIONS.

Refer to table 2-3 to classify damage to beam panels. See figure 2-11 and 2-12 for damage repair limits on beam caps.

2-98. REPAIR – FUSELAGE RIGHT SIDE AND LEFT SIDE BEAM INSTALLATIONS.

Refer to paragraph 2-24 for procedure to repair right side and left side beam installations.

2-99. FITTINGS – FORWARD FUSELAGE TAILBOOM ATTACHMENT.

2-100. DESCRIPTION – FORWARD FUSELAGE TAILBOOM ATTACHMENT FITTINGS.

Four tailboom attachment fittings are installed at the aft bulkhead of the forward fuselage to provide strong points for the four tailboom attaching bolts.

2-101. CLEANING – FORWARD FUSELAGE TAILBOOM ATTACHMENT FITTINGS.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

Clean fittings with clean cloths dampened with solvent (C112). Dry with clean cloths.

2-102. INSPECTION – FORWARD FUSELAGE TAILBOOM ATTACHMENT FITTINGS.

Refer to table 2-3 to classify damage to fittings.

2-103. REMOVAL – FORWARD FUSELAGE TAILBOOM ATTACHMENT FITTINGS.

Removal of fittings must be accomplished at higher maintenance level.

2-104. REPAIR – FORWARD FUSELAGE TAILBOOM Attachment FITTINGS.

Repair of fittings must be accomplished at higher maintenance level.

2-105. INSTALLATION – FORWARD FUSELAGE TAILBOOM ATTACHMENT FITTINGS.

Installation of fittings must be accomplished at higher maintenance level facility.

2-106. PAINTING, TOUCH-UP – FORWARD FUSELAGE TAILBOOM ATTACHMENT FITTINGS.

a. Remove tail boom if necessary to gain adequate access to fittings. Refer to paragraph 2-283.

b. Clean area where paint is damaged with fine grit sandpaper (C102). If damage exceeds limits set forth in table 2-3, the damaged fitting must be replaced. If damage is within limits, touch-up with two coats of primer (C88 or C91).

2-107. FORWARD AND AFT ENGINE FIREWALLS.

2-108. DESCRIPTION – FORWARD AND AFT ENGINE FIREWALLS.

The forward and aft engine firewalls in conjunction with the engine, deck panel, the aft pylon fairing firewall, and the engine cowling doors forma closed compartment around the powerplant to protect the remaining structure in event of fire. The firewalls are constructed primarily of titanium with some aluminum clips, doublers and brackets.

2-109. REMOVAL – FORWARD ENGINE FIREWALL.

a. Remove the engine (paragraph 4-12).

b. Remove the tail rotor driveshaft fireshield. Refer to paragraph 2-119.

c. Disconnect engine power control lever (not illustrated) that passes through boot (32, figure 2-53). Disconnect lever at bellcranks and leave the lever in place in boot (32).

d. Disconnect the following lines et the forward firewall. Cap or plug open lines to prevent entry of foreign matter.

(1) Fuel lines at lower left side of firewall.

(2) Pneumatic line at upper left side of firewall.

(3) Pneumatic line at lower side of firewall.

(4) Lubrication lines at lower right side of firewall.

e. Remove nuts (27, figure 2-53), washers (26), and bolts (24).

f. Remove screw (15) at left side of firewall. Remove two screws (20) at right side.

g. Remove screws (17).

h. Remove screws (21) at right side of firewall. Remove similar screws (not illustrated) at left side of firewall. Carefully lift firewall off engine deck and remove shims (16) and six shims (19). Index shims for reinstallation in the same location.

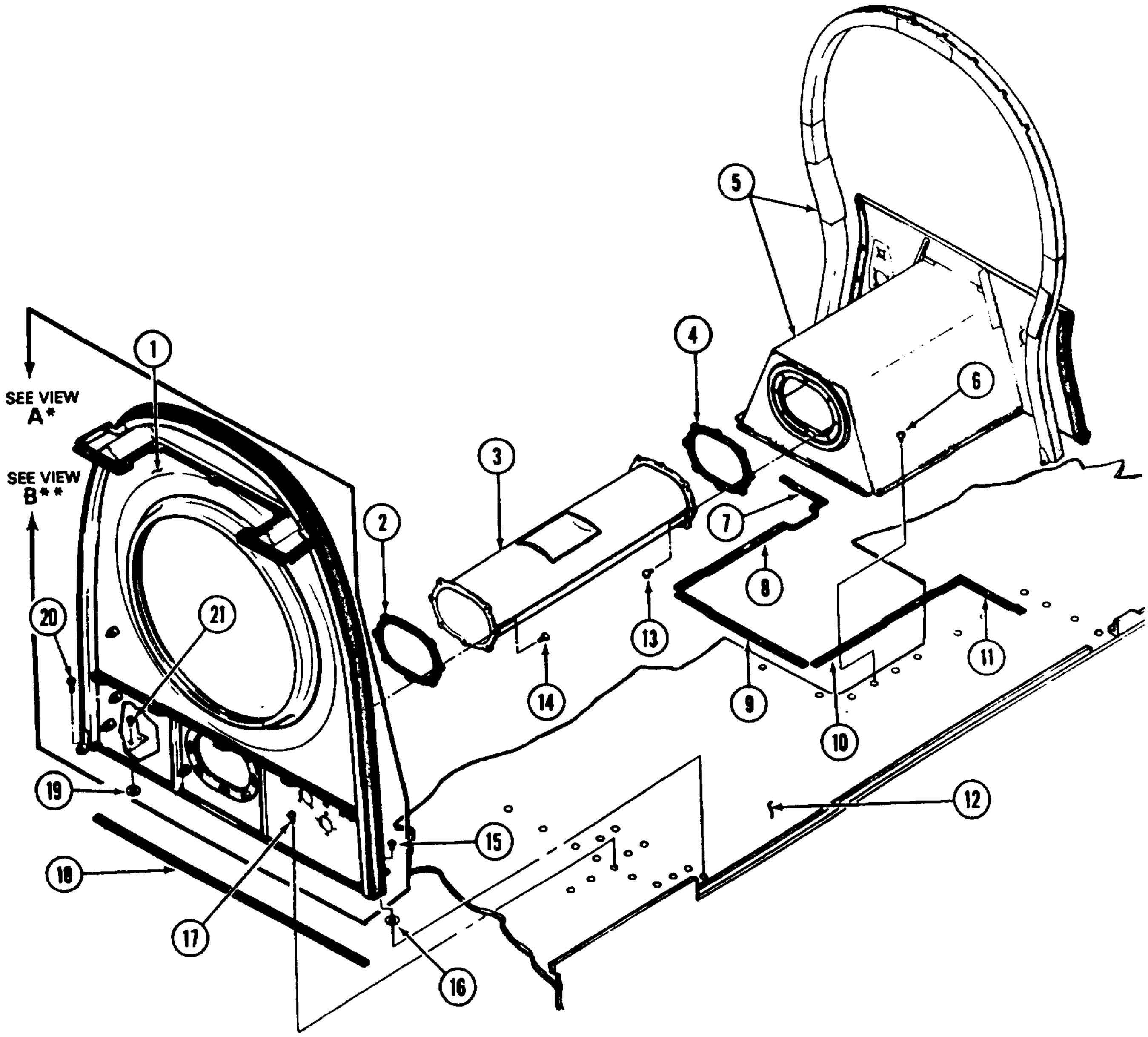
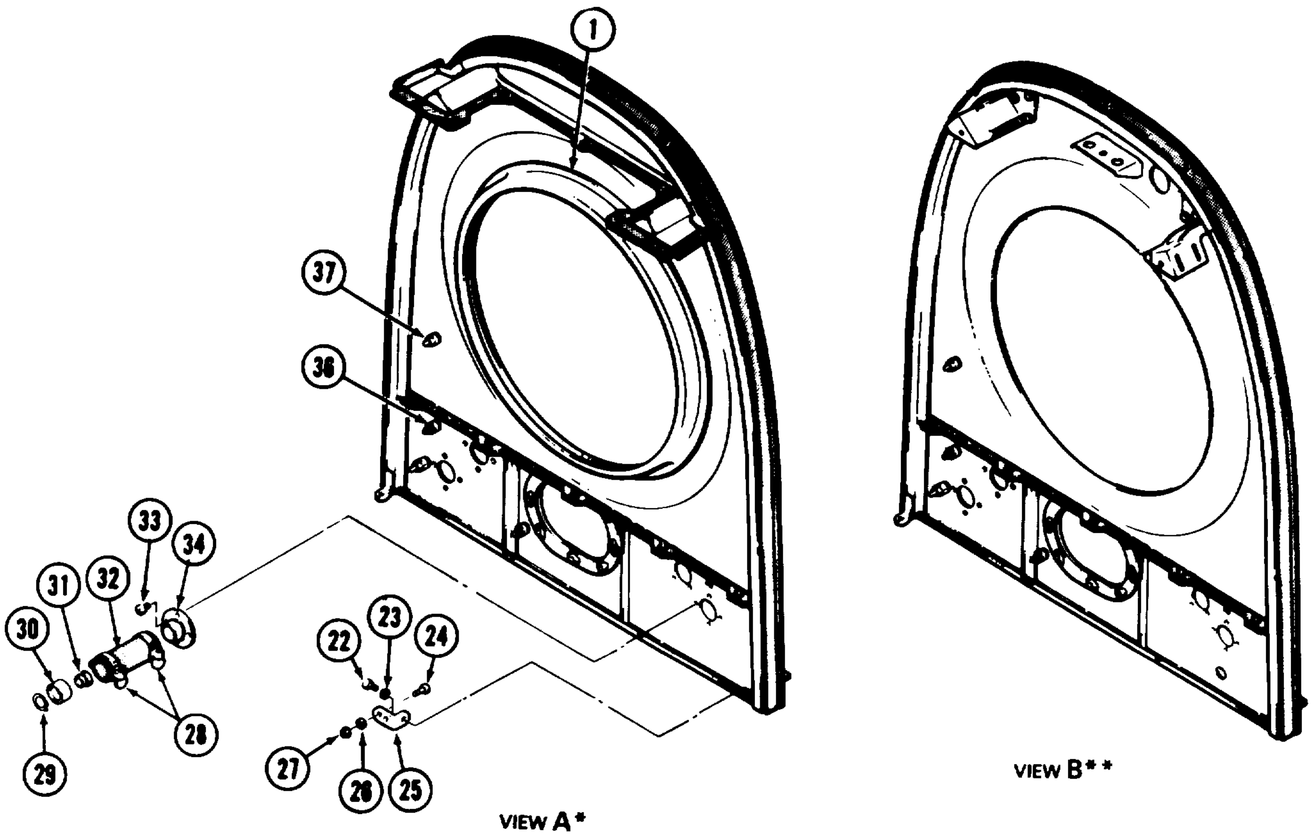


Figure 2-53. Firewalls and Driveshaft Fireshield Installation (Sheet 1 of 2)



1. Forward engine firewall
2. Gasket
3. Tail rotor driveshaft fireshaft
4. Gasket
5. Aft engine firewall and cowl support
6. Screw
7. Seal
8. Seal
9. Seal
10. Seal
11. Seal
12, Panel (engine deck)
13. Screw
14. Screw
15. Screw
16. Shim
17. Screw
18. Gasket
19. Shim
20. Screw
21. Screw
22. Bolt
23. Washer
24. Bolt
25. Clip
26. Washer
27. Nut
28. Clamps
29. Retainer ring
30. Boot retainer
31. Split bushing bearing
32. Power lever boot
33. screw
34. Retainer
36. Deleted
36. Clamp, screw, washer and nut
37. Clamp, screw, washer and nut
38. Deleted
39. Deleted

*E M P Prior to incorporation of MWO 55-1520-236-50-12.
**E M After incorporation of MWO 55-1520-236-50-12.

Figure 2-53. Firewalls and Driveshaft Fireshield Installation (Sheet 2 of 2)

2-110. REMOVAL – AFT ENGINE FIREWALL.

a. Remove the engine (paragraph 4-12).

b. Remove the tail rotor driveshaft fireshield. Refer to paragraph 2-119.

c. Disconnect electrical and forewarning cables at left and right sides of aft firewall.

d. Remove screws (6, figure 2-53) and remove aft engine firewall and cowl support from engine deck panel.

2-111. INSPECTION — FORWARD ENGINE FIREWALL.

a. Refer to table 2-3 to classify damage to firewall.

b. Inspect gasket (18, figure 2-53) for deterioration, damage, and secure installation.

c. Inspect seals and gaskets (2, 3, 4, 7, 9, 17 and 29, figure 2-54) or (1, 2, 4 and 5, figure 2-54.1) for deterioration, damage, and secure installation,

2-112. INSPECTION – AFT ENGINE FIREWALL.

a. Refer to table 2-3 to classify damage to fireball.

b. Inspect diaphragm (34, figure 2-55) for deterioration, damage, and secure installation.

c. Inspect seals (3, 6, 7, 8, 9, 10, 12, 15, and 21) for deterioration, damage, and secure installation.

2-113. REPAIR – FORWARD ENGINE FIREWALL.

a. Refer to paragraph 2-21 for procedure to repair structural damage. See figure 2-54 for partial listing of materials used in the firewall.

b. Replace damaged or missing gaskets (2, 4, 7, 9, and 18, figure 2-53).

(1) remove old gasket and clean firewall surface where new gasket will be installed. Refer to paragraph 2-121, steps a(l), a(2), and a(3).

WARNING

Adhesive is flammable and toxic. Provide adequate ventilation when mixing and using. Avoid prolonged breathing of adhesive vapors and contact with skin or eyes.

NOTE

Ensure that expiration date stamped on adhesive container has not been exceeded.

(2) Brush adhesive (C12) on mating surfaces of firewall and gasket. If surface of gasket is very porous, apply a second coat of adhesive. Allow adhesive to dry to a tacky stage. Position one end of gasket on firewall and press firmly into place. Continue until gasket is bonded to firewall.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(3) Clean excess adhesive from firewall while it is still wet. Use a clean cloth dampened with MEK (C74).

(4) Apply pressure to gasket to hold it in firm contact with firewall. Maintain pressure for a minimum of four hours to air dry adhesive. Adhesive should be cured at a temperature of 75 degrees F (24 degrees C) or higher. If temperature is below 75 degrees F (24 degrees C) double the amount of cure time for each 12 degrees F (7 degrees C) below 75 (24 degrees C). Do not attempt to cure adhesive at temperatures below 60 degrees F (10 degrees C).

TYPICAL TEMPERATURES AND CURE TIME

Temperature Degrees F	Degrees C	Cure Time Hours
75	24	4
63	17	8
51	11	16

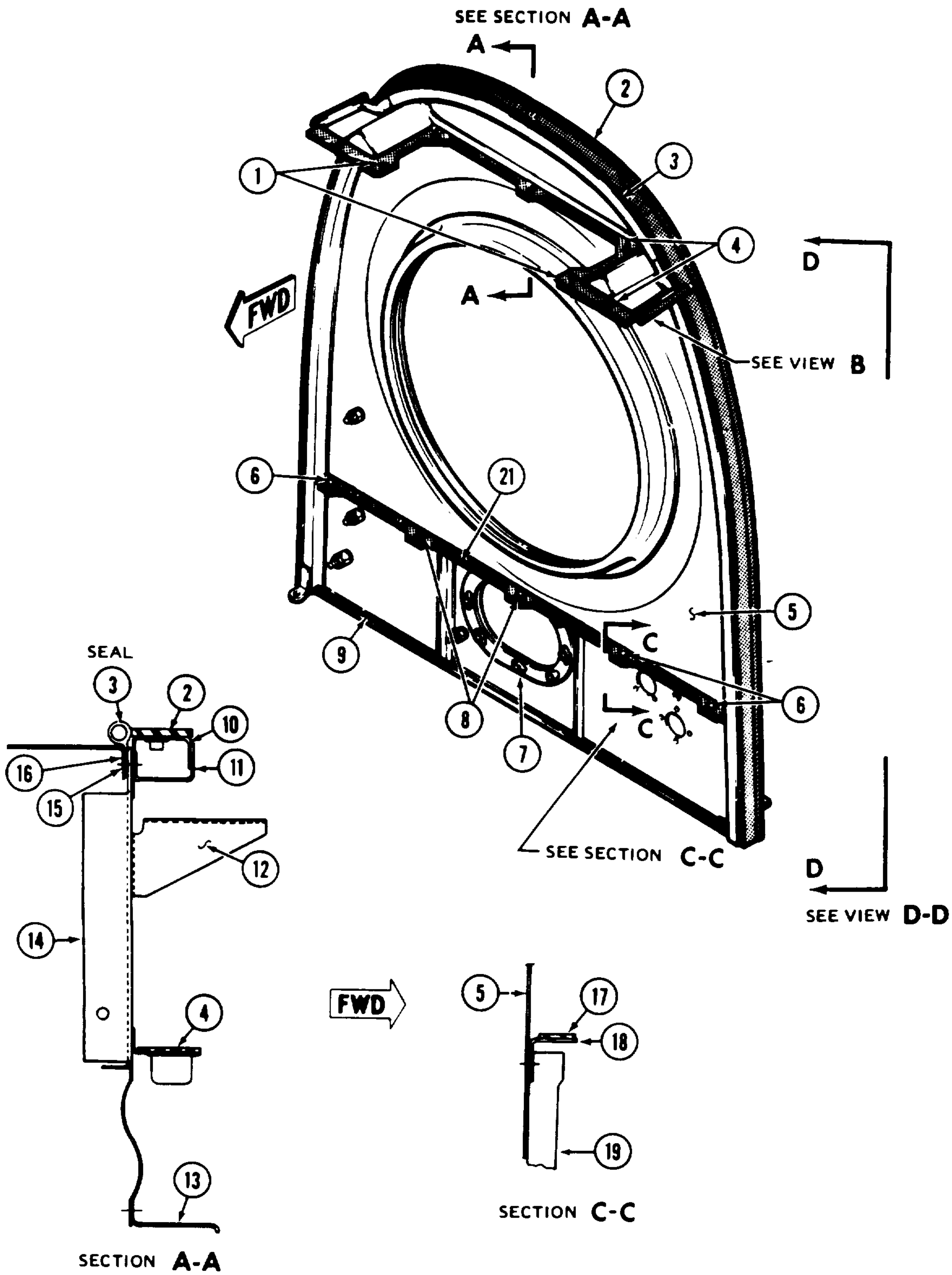


Figure 2-54. Forward Engine Firewall Assembly (Prior to Incorporation of MWO 55-1520-236-50-12) (Sheet 1 of 4)

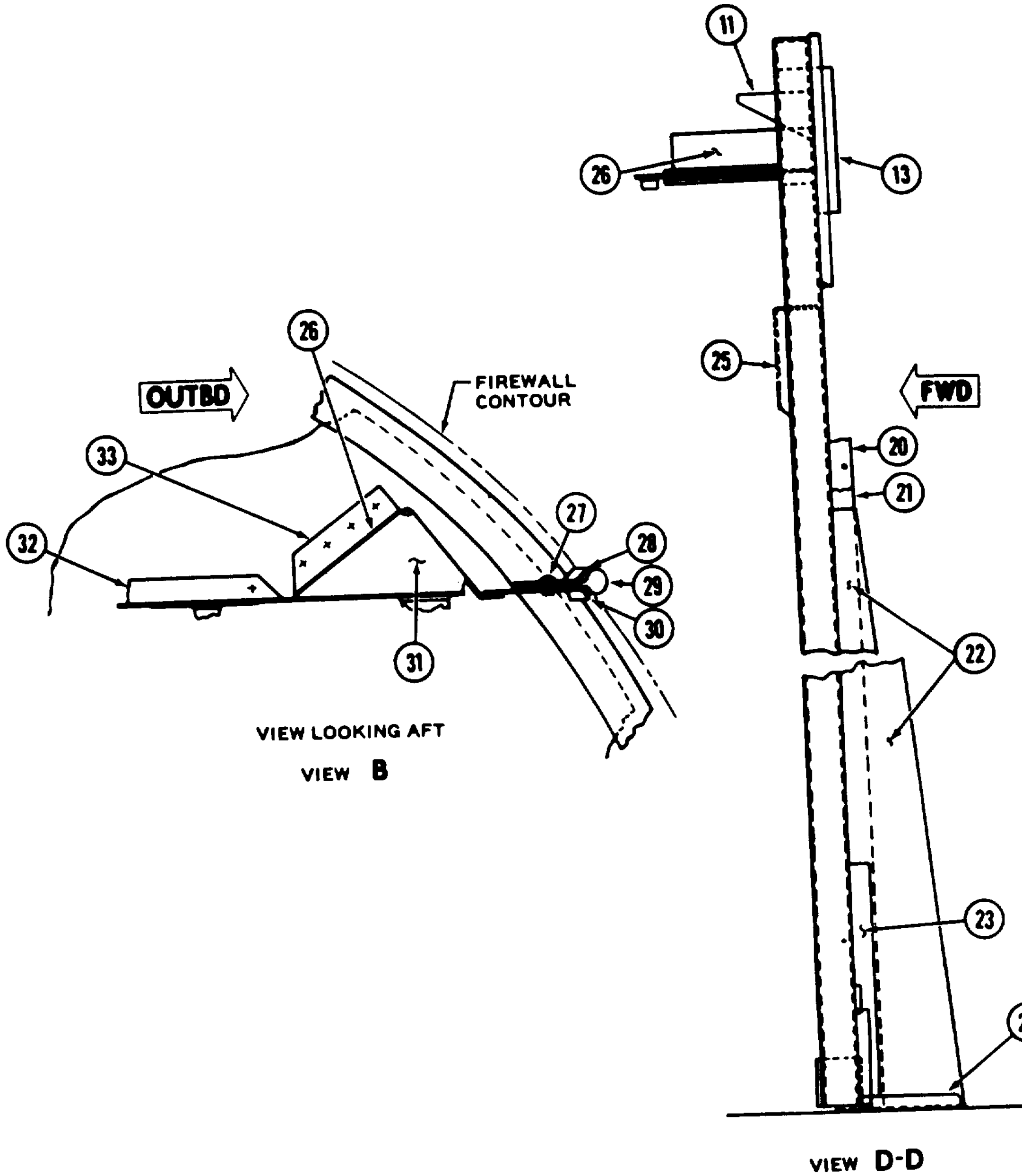


Figure 2-54. Forward Engine firewall Assembly (Prior to Incorporation of MWO 55-1520-236-50-121
(Sheet 2 of 4)

INDEX NO.	NOMENCLATURE	GAUGE	MATERIAL AND HEAT TREAT	SPECIFICATION
1	Receptacle Turnlock	NA NA	RF-5 RF-5-5	FSCM 72794 FSCM 72794
2	Rubber gasket	NA	209-060-900-67	
3	Rubber seal	NA	209-060-900-61	
4	Rubber gasket	0.060	209-060-900-121	
5	Web	0.020	Titanium Alloy 80 Min.	MIL-T-9046, Type I, Comp B
6	Studs Grommets	NA NA	A5T26 GH5	FSCM 72794 FSCM 72794
7	Rubber gasket	0.047	209-060-900-65	
8	Studs Grommets	NA NA	A5T18 GH5	FSCM 72794 FSCM 72794
9	Rubber gasket	0.047	209-060-900-63	
10	Former	0.040	2024 Al Aly T42	QQ-A-250/5
11	Former	0.040	2024 Al Aly T42	QQ-A-250/5
12	Bracket	0.032	2024 Al Aly T3	QQ-A-250/5
13	Adapter	0.020	Titanium Alloy 65 Min.	AMS 4900
	Alternate	0.020	Titanium Alloy 80,000 PSI	MIL-T-9046, Type I, Comp B
	Alternate	0.020	Titanium Alloy 65 Min.	MIL-T-9046, Type I, Comp B
14	Angle	0.032	2024 Al Aly T3	QQ-A-250-3
15	Rivet	NA	NA	MS20600M
16	Former	0.020	Titanium Alloy 80 Min.	MIL-T-9046, Type I, Comp B
17	Rubber gasket	0.06	209-060-900-127	
18	Stiffener	0.050	Titanium Alloy 80 Min.	MIL-T-9046, Type I, Comp B
19	Doubler	0.032	7075 Al Aly T6	QQ-A-250/13
20	Doubler	0.070	Titanium Alloy 80 Min.	MIL-T-9046, Type I, Comp B
21	Doubler	0.070	Titanium Alloy 80 Min.	MIL-T-9046, Type I, Comp B
22	Stiffener	0.020	Titanium Alloy 80 Min.	MIL-T-9046, Type I, Comp B

Figure 2-54. Forward Engine Firewall Assembly (Prior to Incorporation of MWO 55-1520-236-50-12) (Sheet 3 of 4)

INDEX NO.	NOMENCLATURE	GAUGE	MATERIAL AND HEAT TREAT	SPECIFICATION
23	Doubler	0.016	Titanium Alloy 80 Min.	MIL-T-9046, Type I, Comp B
24	Clip	0.040	Titanium Alloy 80 Min.	MIL-T-9046 Type I, Comp B
25	Adapter	0.020	Titanium Alloy 65 Min.	AMS 4900
26	Hat	0.025	2024 Al Aly	QQ-A-250/5
27	Rivet	NA	NA	MS20470AD
28	Seal retainer	0.032	2024 Al Aly T42	QQ-A-250/5
29	Rubber seal	3/8 Dia.	Extrusion No. 962	FSCM 70485
30	Seal retainer	0.032	2024 Al Aly T42	QQ-A-250/5
31	End plate	0.025	2024 Al Aly T42	QQ-A-250/5
32	Stiffener	0.040	2024 Al Aly T42	QQ-A-250/5
33	Clip	0.040	2024 Al Aly T42	QQ-A-250/5

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Figure 2-54. Forward Engine Firewall Assembly (Prior to Incorporation of MWO 55-1520-236-50-12) (Sheet 4 of 4)

c. Replace damaged or missing seals (3, figure 2-54).

(1) Remove rivets (15). Remove former (16) and seal (3).

(2) Place new seal (3) on former (16) and cut or punch holes in new seal to match holes in former.

(3) Position seal (3) and former (16) on firewall and install rivets (15).

d. Replace damaged or missing seals (2, figure 2-54.1).

(1) Remove rivets (11) from former (12) and seal (2).

(2) Place new seal (2) on former (12) and cut or punch holes in new seal to match holes in former.

(3) position seal (2) and former (12) on firewall and install rivets (11).

2-114. REPAIR – AFT ENGINE FIREWALL.

See figure 2-55.

NOTE

Remove screws (2) and pin (4) and remove cowl support (1) from firewall if necessary to accomplish repairs.

a. Repair firewall, using repair instructions in TM 55-1500-204-25/1. Stainless steel can be substituted for titanium of the same thickness. Use monel rivets for all repairs.

b. Replace damaged or missing seals (15 and 21).

(1) Remove rivets (28), angle (19), seal (21) and seal (3).

(2) Position new seal (21) and angle (19) on web (13) and secure with rivets (28). Make rivets flush on side where seal (3) will be installed.

(3) Install new seal (3). Refer to step c.

(4) Replace seal (15) in the same manner described in preceding steps.

c. Replace damaged seals (3, 6, 7, 8, 9, 10 and 12). Refer to paragraph 2-113 for procedure to bond new seals to firewall.

d. Replace damaged diaphragm (34).

(1) Remove rivets (32), plate (33), and diaphragm (34) from panel (11).

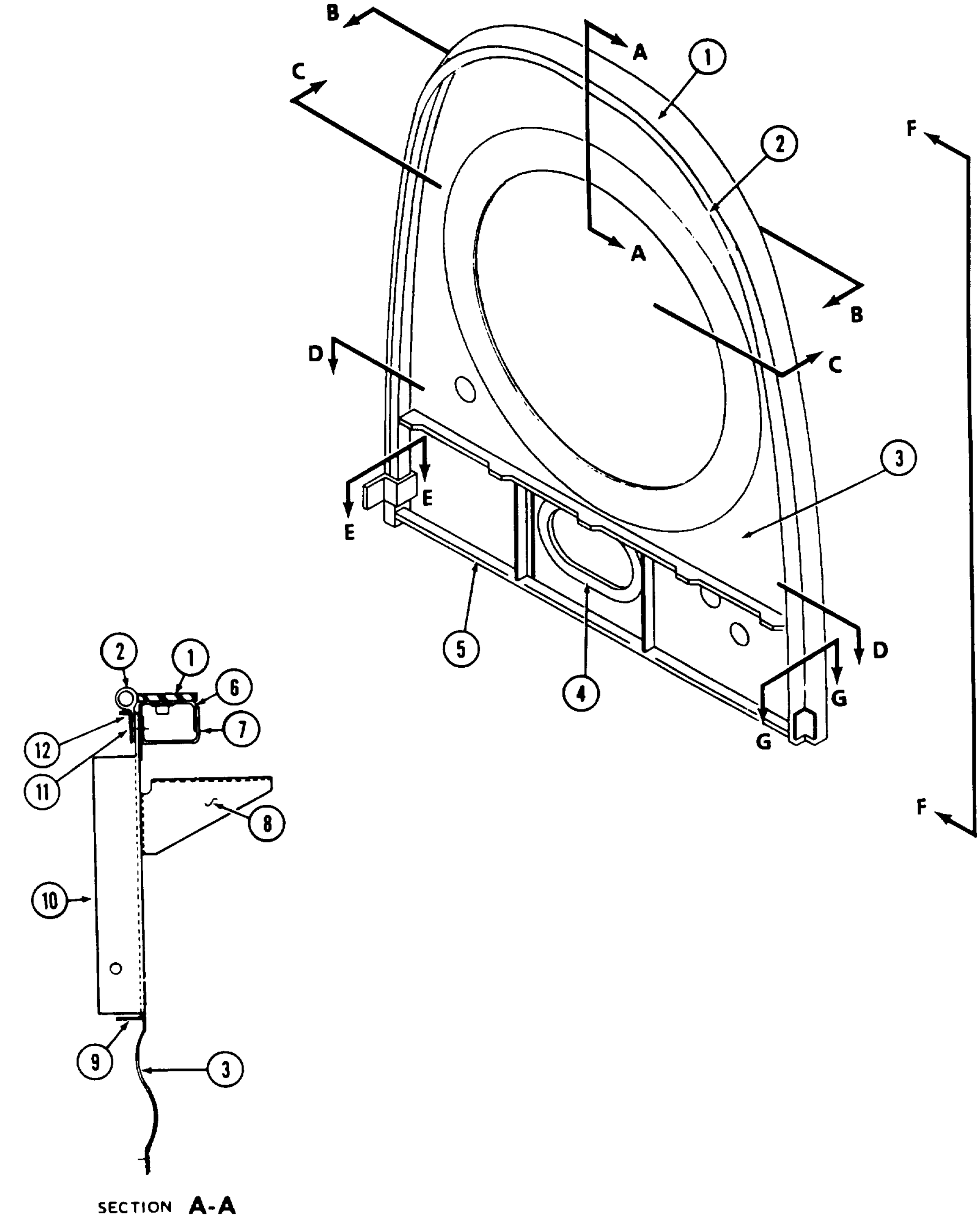
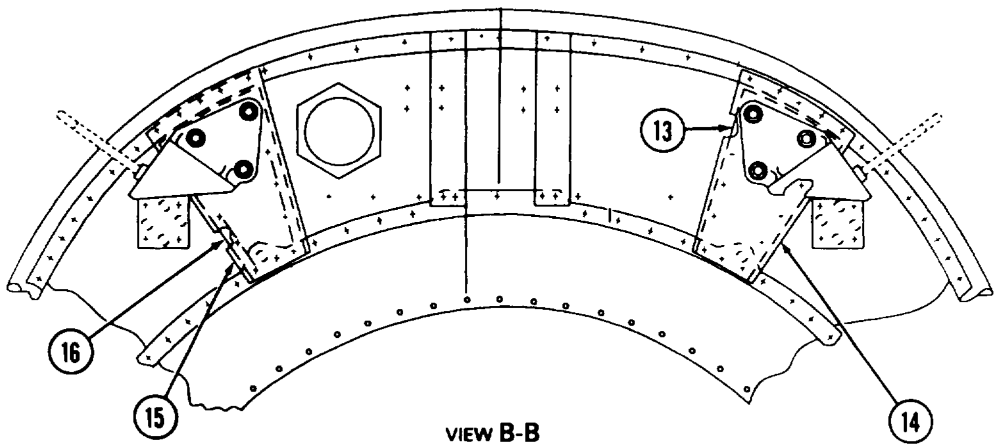
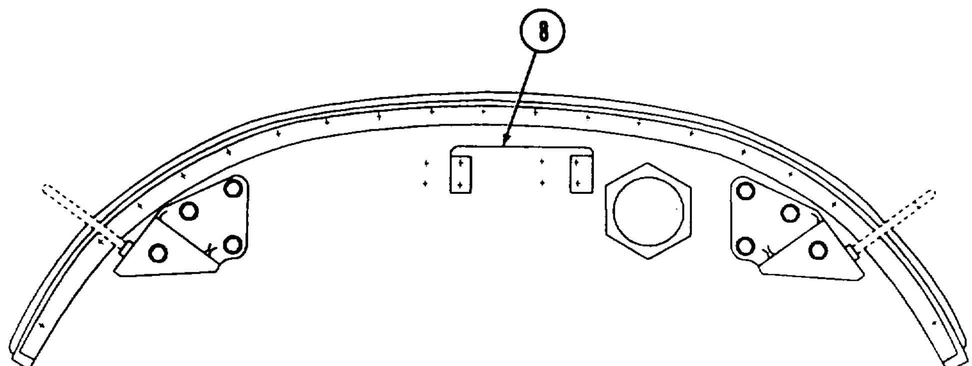


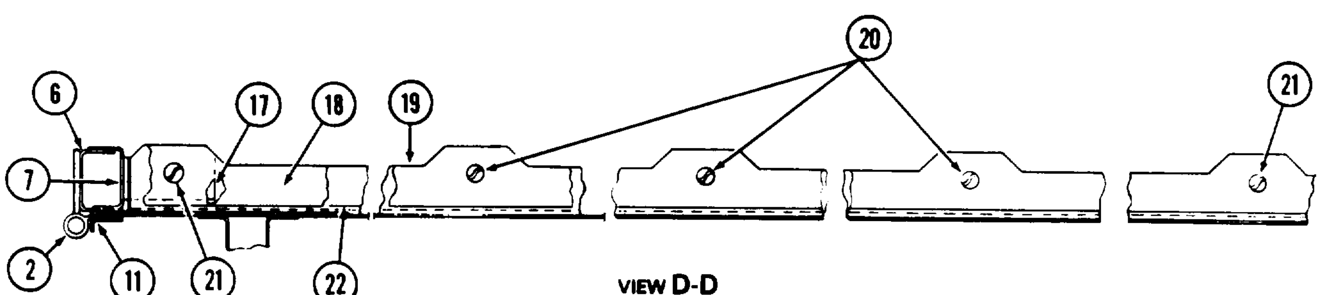
Figure 2-54.1 E M Forward Engine Firewall Assembly (After Incorporation of MWO 55-1520-236-50-12) (Sheet 1 of 5)



VIEW B-B
LOOKING FORWARD



VIEW C-C
LOOKING AFT



VIEW D-D
ROTATED 180°

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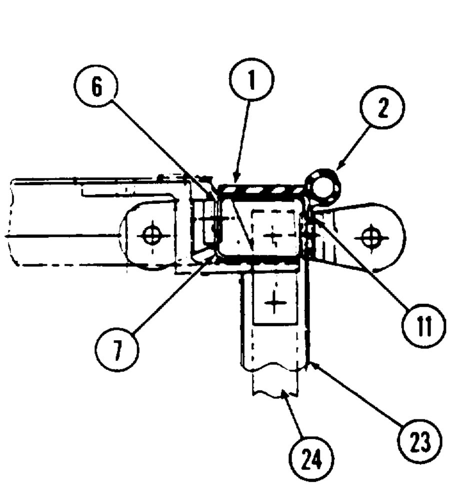
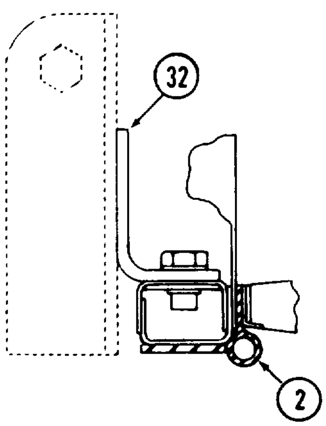
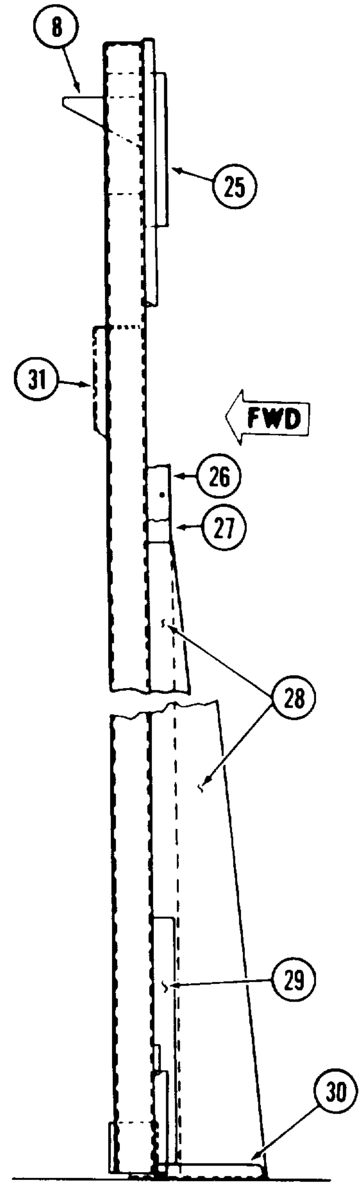
Figure 2-54.1 E M Forward Engine Firewall Assembly (After Incorporation of MWO 55-1520-236-50-12) (Sheet 2 of 5)



VIEW E-E



VIEW G-G



VIEW F-F

Figure 2-54.1 **E** **M** Forward Engine Firewall Assembly (After Incorporation of MWO 55-1520-236-50-12) (Sheet 3 of 5)

INDEX NO.	NOMENCLATURE	GAUGE	MATERIAL AND HEAT TREAT	SPECIFICATION
1	Rubber gasket	NA	209-060-900-67	–
2	Rubber seal	0.060	209-060-900-61	
3	Web	0.020	Titanium Alloy 65 Min.	MIL-T-9046, Type 1, Comp C
4	Rubber gasket	0.047	209-060-900-65	–
5	Rubber gasket	0.047	209-060-900-63	–
6	Former	0.040	2024 Al Aly T42	QQ-A-250/5
7	Former	0.040	2024 Al Aly T42	QQ-A-250/5
8	Bracket	0.032	2024 Al Aly T3	QQ-A-250/5
9	Stiffener	0.032	Titanium Alloy 65 Min.	MIL-T-9046 Type 1, Comp C
10	Angle	0.032	2024 Al Aly T3	QQ-A-250/5
11	Rivet	NA	NA	MS20600M
12	Former	0.020	Titanium Alloy 65 Min	MIL-T-9046 Type 1, Comp C
13	Filler	0.090	Plastic	L-P-513, Type PBE
14	Doubler	0.040	Titanium 80 Min	MIL-T-9046, Ty 1 Comp B
15	Doubler	0.040	Titanium 80 Min	MIL-T-9046, Ty 1 Comp B
16	Filler	0.090	Plastic	L-P-513, Type PBE
17	Clip	0.050	7075 Al Aly	QQ-A-250/13
18	Gasket	0.06	209-060-900-127	–
19	Stiffener	0.050	Titanium Alloy 80 Min	MIL-T-9046 Type 1, Comp B
20	Stud Grommet	NA NA	50-005-W18 50-009-5	CAGE 97499 CAGE 97499
21	Stud Grommet	NA NA	50-005-W26 50-009-5	CAGE 97499 CAGE 97499

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Figure 2-54.1 E M ard Engine Firewall assembly (After Incorporation of MWO 55-1520-236-50-12) (Sheet 4 of 5)

INDEX NO.	NOMENCLATURE	GAUGE	MATERIAL AND HEAT TREAT	SPECIFICATION
22	Doubler	0.025	7075 Al Aly	QQ-A-250/13
23	Doubler	0.025	7075 Al Aly	QQ-A-250/13
24	Gasket	NA	209-060-900-63	–
25	Angle	0.032	2024 Al Aly	QQ-A-250/5
26	Doubler	0.070	Titanium Alloy 80 Min	MIL-T-9046 Type 1, Comp B
27	Doubler	0.070	Titanium Alloy 80 Min	MIL-T-9046 Type 1, Comp B
28	Stiffener	0.020	Titanium Alloy 80 Min	MIL-T-9046 Type 1, Comp B
29	Doubler	0.016	Titanium Alloy 80 Min	MIL-T-9046 Type 1, Comp B
30	Clip	0.040	Titanium Alloy 80 Min	MIL-T-9046 Type 1, Comp B
31	Adapter	0.020	Titanium Alloy 80 Min	MIL-T-9046 Type 1, Comp B
32	Clip	0.125	7075 Al Aly	QQ-A-250/13

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Figure 2-54.1 E M Forward Engine Firewall Assembly (After Incorporation of MWO 55-1520-236-50-12) (Sheet 5 of 5)

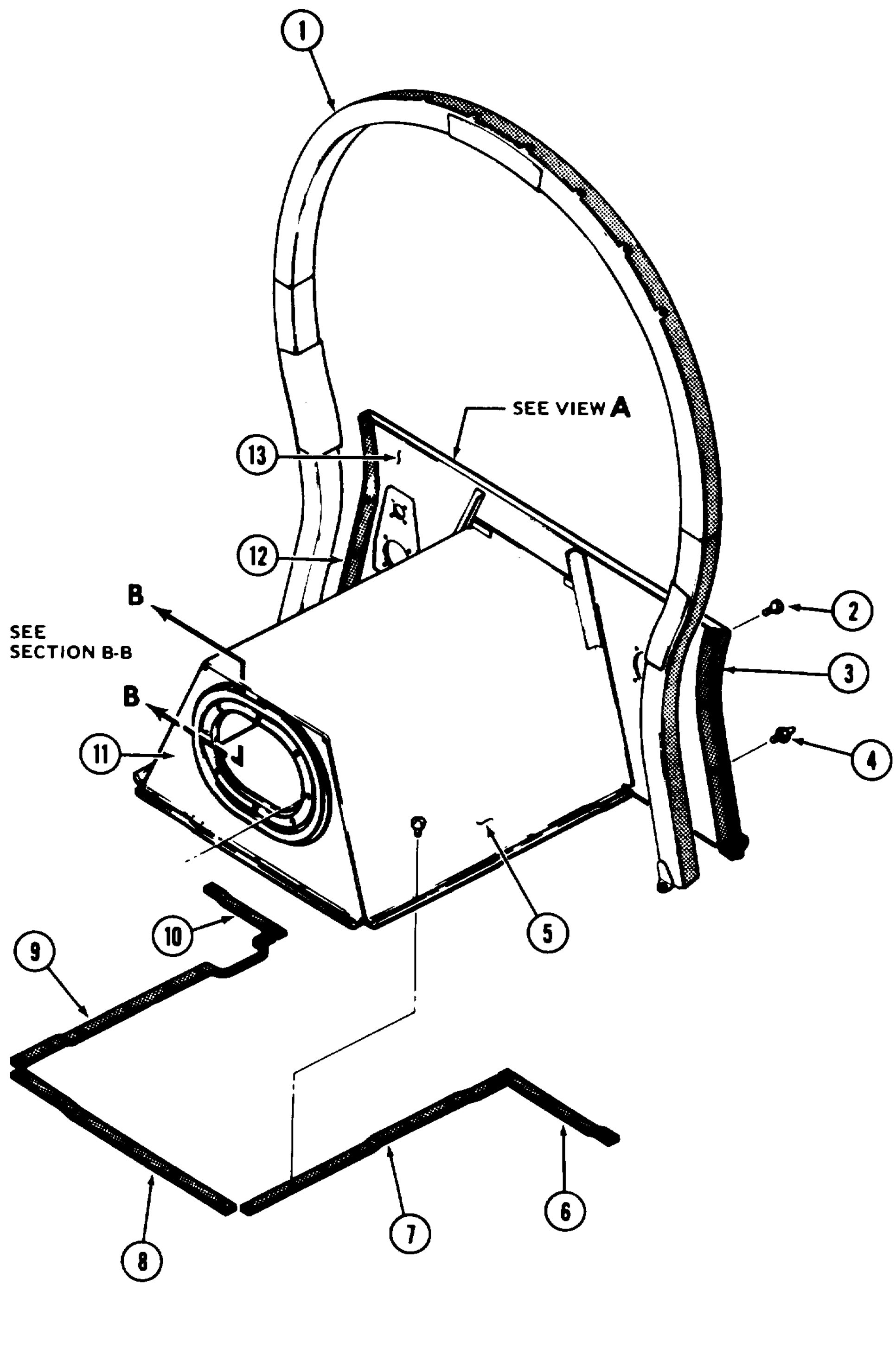
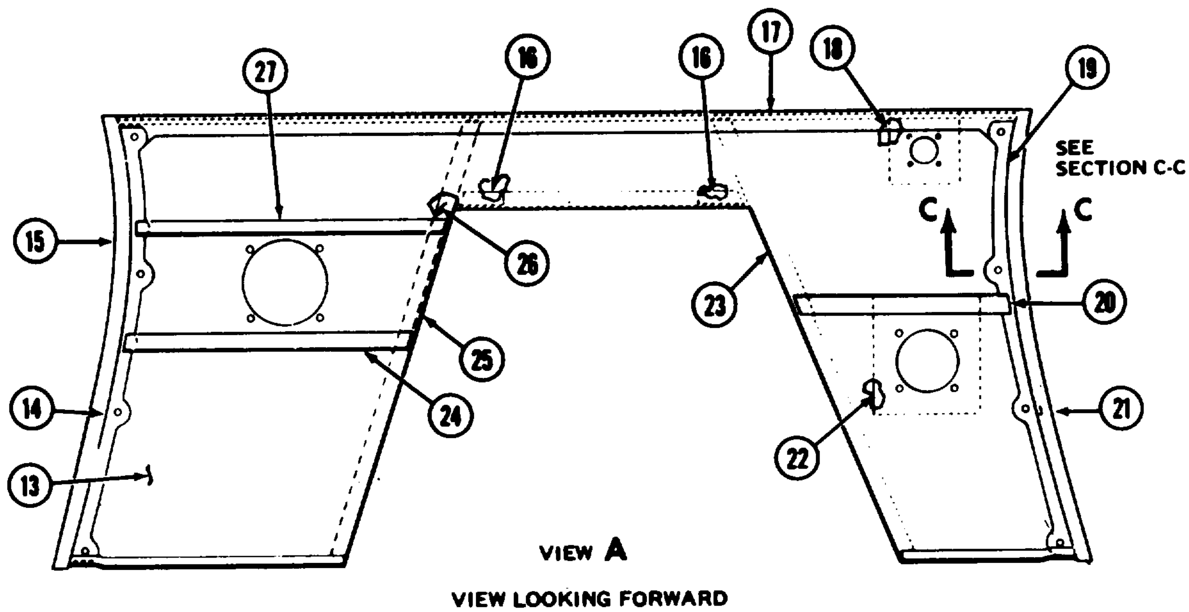
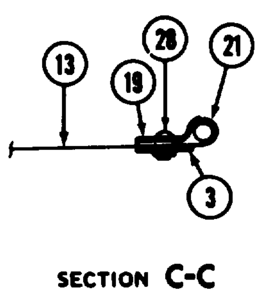


Figure 2-55. Aft Engine Firewall and Cowl Support (Sheet 1 of 4)





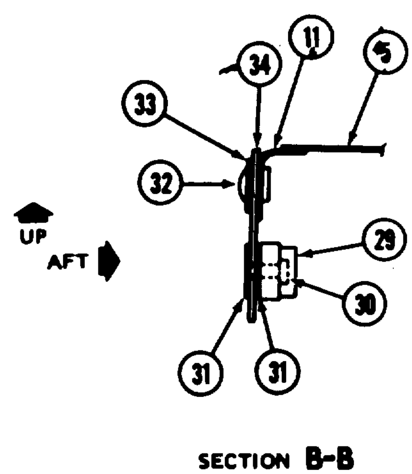


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Figure 2-55. Aft Engine Firewall and Cowl Support (Sheet 2 of 4)

INDEX NO.	NOMENCLATURE	GAUGE	MATERIAL AND HEAT TREAT	SPECIFICATION
1	Cowl Support Assembly	NA	NA	NA
2	Screw	NA	NA	NA
3	Seal	0.047	209-060-903-35	
4	Pin	NA	NA	NA
5	Plenum	0.020	Titanium	MIL-T-9046, Type I, Comp B
6	Seal	0.047	209-060-903-43	
7	Seal	0.047	209-060-903-39	
8	Seal	0.047	209-060-903-41	
9	Seal	0.047	209-060-903-49	
10	Seal	0.047	209-060-903-45	
11	Panel	0.020	Titanium	MIL-T-9046, Type I, Comp B
12	Seal	0.047	209-060-903-45	
13	Web	0.020	Titanium Min. 80	MIL-T-9046, Type I, Comp B
14	Angle	0.025		MIL-T-9046, Type I, Comp B
15	Seal	3/8	209-060-903-35	
16	Strap	0.020	Titanium 80 Min.	MIL-T-9046 Type I, Comp B
17	Bead	0.016	CRES 18-8 75 Min.	MIL-S-5059 Comp 302 annealed
18	Doubler	0.040	Titanium 80 Min.	MIL-T-9046 Type I, Comp B
19	Angle	0.025	Titanium 80 Min.	MIL-T-9046 Type I, Comp B
20	Angle	0.032	Titanium 80 Min.	MIL-T-9046 Type I, Comp B
21	Seal	3/8	209-060-903-47	
22	Doubler	0.040	Titanium 80 Min.	MIL-T-9046 Type I, Comp B
23	Angle	0.025	Titanium 80 Min.	MIL-T-9046 Type I, Comp B

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Figure 2-55. Aft Engine Firewall and Cowl Support (Sheet 3 of 4)

INDEX NO.	NOMENCLATURE	GAUGE	MATERIAL AND HEAT TREAT	SPECIFICATION
24	Angle	0.025	Titanium 80 Min.	MIL-T-9046 Type I, Comp B
25	Doubler	0.012	Titanium 80 Min.	MIL-T-9046 Type I, Comp B
26	Angle	0.025	Titanium 80 Min.	MIL-T-9046 Type I, Comp B
27	Angle	0.025	Titanium 80 Min.	MIL-T-9046 Type I, Comp B
28	Rivet	—	—	MS20427-3M
29	Nutplate	—	—	MS21060-L3
30	Rivet	—	—	MS20470-3M
31	Plate	0.020	Titanium 80 Min.	MIL-T-9046 Type I, Comp B
32	Rivet	—	—	MS20615-4M
33	Plate	0.020	Titanium 80 Min.	MIL-T-9046 Type I, Comp B
34	Diaphragm	0.047	Style 89	FSCM 92798

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Figure 2-55. Aft Engine Firewall and Cowl Support (Sheet 4 of 4)

(2) Remove rivets (30), nutplate (29), and plates (31).

(3) Install plates (31) and nutplates (29) on new diaphragm with rivets (30).

(4) Position diaphragm and parts assembled m preceding step on firewall panel (11) with plate (33). Secure with rivets (32).

(5) If cowl support (1) was removed, ensure that serviceable seals (3 and 12) are bonded to firewall. Position cowl support (1) on aft firewall web (13) and secure with screws (20 and pins (4).

2-115. INSTALLATION – FORWARD ENGINE FIREWALL.

a. Ensure that a serviceable gasket (18, figure 2-53) is bonded to lower surface of firewall and that all holes for firewall attachment screws (17) are open through gasket.

b. Position forward firewall (1) on engine deck panel with twelve shims (16 and 19) in position under stiffeners on aft side of firewall. Install screws(15, 17 and 20).

NOTE

It may be necessary to add or remove shims (16 and 19) to adjust position of firewall. The maximum allowable gap around the adjacent engine and transmission compartment cowling access doors after rigging and final adjustments is 0.190 inch. Minimum gap is 0.040 inch.

c. Install cowling and check to ensure that fit is within limits noted in preceding note. Adjust thickness of shims (16 and 19) if necessary. Remove cowling.

d. Install two bolts (24), washers (26) and nuts (27).

WARNING

Cleaning solvent is flammable and toxic, Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

e. Inspect for gaps and voids where firewall contacts engine service deck and also at edges where Individual parts of firewall are jointed If any gaps or voids are detected, clean the area with cloths dampened with MEK (C74) and dry with clean cloths. Fill gaps and voids with sealant (C104), Use a wooden spatula (tongue depressor) to apply the sealant.

f. Assemble engine power control lever (not Illustrated), boot (32) and associated parts If not previously accomplished, Connect ends of engine power control lever to bellcranks on each side of the firewall.

g. Install tail rotor driveshaft and tail rotor driveshaft fireshield, Refer to paragraph 2-122.

h. Install engine (paragraph 4-15).

i. Connect the following lines.

(1) Lubrication lines at lower right sides of firewall.

(2) Pneumatic line at lower side of firewall.

(3) Pneumatic line at upper left side of firewall.

(4) Fuel lines at lower left side of firewall.

Perform functional check of engine and environmental control system. Refer to TM 55-1520-236-10.

2-116. INSTALLATION – AFT ENGINE FIREWALL AND COWL SUPPORT.

a. Ensure that serviceable seals (7, 8, 9, 10, and 11, figure 2-53) are bonded to firewall.

b. Position assembled firewall and cowl support (5) on engine deck panel (12) and Install screws (6).

Install tail rotor driveshaft and tail rotor driveshaft fireshleld (paragraph 2-122).

d. Seal all gaps and voids where firewall contacts service deck and also at edges where individual parts of firewall join. Refer to paragraph 2-115 for procedure.

e. Install engine (paragraph 4-15)

f. Connect electrical and fire detection cables at left and right sides of aft firewall.

g. Perform functional check of engine.

2-117. TAIL ROTOR DRIVESHAFT FIRESHIELD.

2-118. DESCRIPTION – TAIL ROTOR DRIVESHAFT FIRESHIELD.

The tail rotor driveshaft fireshield is constructed of titanium. It protects the section of tail rotor driveshaft between the two engine firewalls. See figure 2-53.

2-119. REMOVAL – TAIL ROTOR DRIVESHAFT FIRESHIELD.

a. Remove section of tail rotor driveshaft located below engine. Refer to paragraph 6-77.

b. Remove screws (13 and 14, figure 2-53), at each end of fireshield (3).

c. Remove fireshield (3), gaskets (2 and 4) which should be bonded to the fireshield.

2-120. INSPECTION – TAIL ROTOR DRIVESHAFT FIRESHIELD.

a. Refer to table 2-3 to classify damage to driveshaft fireshield.

b. Inspect fireshield for dents, holes, and distortion.

(1) Surfaces of flanges (2 and 5, figure 2-56), at ends of tail rotor driveshaft fireshield must be flat within 0.020 inch.

(2) For damage limits for dents, holes etc. refer to table 2-3.

2-121. REPAIR – TAIL ROTOR DRIVESHAFT FIRESHIELD.

a. Replace damaged or missing gaskets (1 and 6, figure 2-56) as follows:

(1) Remove old gasket from flanges at fireshield.

WARNING

Cleaning solvent is flammable and toxic, Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(2) Clean flange in area where gasket will be installed by sanding with 400 grit sandpaper (C102). Remove sanding residue with naphtha (C75) or MEK (C74).

(3) Ensure that new gasket is clean and dry and that hole pattern in gasket and flange match.

WARNING

Sealant is flammable and toxic. Provide adequate ventilation when mixing and using prosed 880. Avoid prolonged breathing of vapors and contact with skin or eyes.

(4) Mix two-part sealant (C105) in accordance with directions on container. Apply a thin, even coat of sealant to mating surfaces of gasket and to flange. If gasket is very porous, apply a second coat of sealant. Allow sealant to dry to a tacky stage. Position one edge of gasket on flange and press firmly into place. Continue until gasket is bonded to flange. Ensure that all holes match.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(6) Clean excess sealant from flange while it is still wet. Use a clean cloth dampened with MEK (C74).

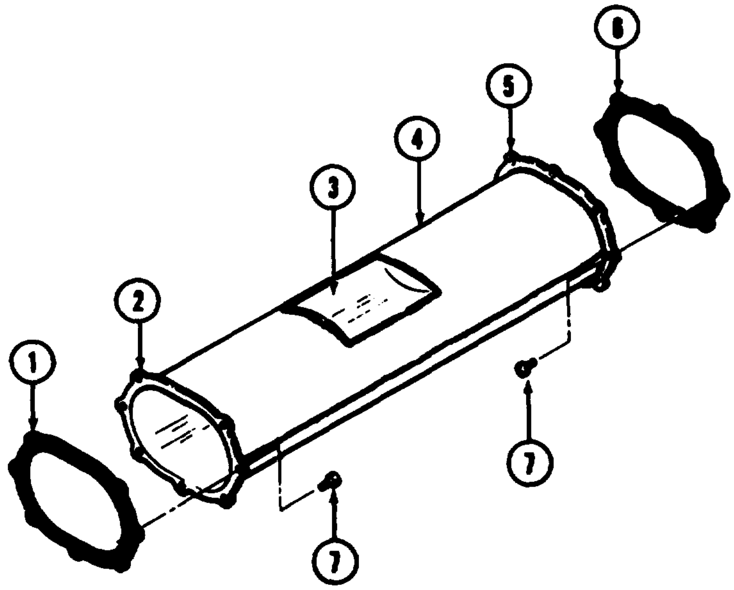
(6) Apply pressure to gasket to hold it in firm contact with flange. Maintain pressure for fifteen hours to air dry sealant.

b. Repair hole-type damage. Refer to TM 55-1500-204-25/1 .

2-122. INSTALLATION – TAIL ROTOR DRIVESHAFT FIRESHIELD.

a. Ensure that serviceable gaskets (2 and 4, figure 2-53) are bonded to fireshield (3).

b. Position fireshield in helicopter with cover (3, figure 2-56) up and with flange (2) forward as illustrated. Note that flange (2) has seven holes and



INDEX NO.	NOMENCLATURE	GAUGE	MATERIAL AND HEAT TREAT	SPECIFICATION
1	Gasket	0.047	209-060-904-11	
2	Flange	0.040	Titanium Heat Treat	MIL-T-9046 Type I, Comp B
3	Cover	0.020	Titanium Heat Treat	MIL-T-9046 Type I, Comp B
4	Tube	0.020	Titanium Heat Treat	MIL-T-9046 Type I, Comp B
5	Flange	0.040	Titanium Heat Treat	MIL-T-9046 Type I, Comp B
6	Gasket	0.047	209-060-904-9	
7	Screw	—		

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Figure 2-56. Tail Rotor Driveshaft Fireshield Assembly that flange (5) has eight holes. Install screws (7) to secure fireshield to gasket (1), forward firewall gasket (6) and aft firewall.

c. Install section of tail rotor driveshaft located below engine. Refer to paragraph 6-77.

2-123. ENGINE AIR INDUCTION BAFFLES.

2-124. DESCRIPTION — ENGINE AIR INDUG TION BAFFLES.

The engine air induction baffles are constructed primarily of aluminum with rubber seals attached at the edges. The induction baffles enclose the sand and dust separator on the forward side of the forward engine firewall. Air enters the area endosed by the air induction baffles through scoops located on the left and right transmission cowling doors. The air exits through the particle separator into the engine.

2-125. REMOVAL – AIR INDUCTION BAFFLES (PRIOR TO INCORPORATION OF MWO 55-1520-236-50-12).

a. Open transmission cowling.

b. Release fasteners and remove shaft access panel (4, figure 2-57) which forms the forward left side of the induction baffle assembly.

c. Detach electrical lead from three brackets (10) on top panel and three brackets (9) on forward panel.

d Release fasteners and remove top panel (2).

Disconnect tube assembly (7). Remove forward panel (8) and floor assembly (5).

2-125.1. E M REMOVAL — CENTRISEP PARTICLE SEPARATOR ENGINE AIR INDUCTION BAFFLES. (AFTER INCORPORATION OF MWO 55-1520-236-50-12).

a. Open transmission and engine cowling.

b. Remove center pylon left and right fairings (paragraph 2-82).

c. Deleted.

d. Deleted.

e. Deleted.

f. Remove bolts (12, figure 2-57.1) and washers (13) attaching baffle (1) to forward firewall.

g. Release turnlock fasteners (15) and remove baffle (1) and straps (14).

h. Remove four screws (17) and washers (16) from aft side of baffle (18).

i. Release turnlock fasteners (20) from bottom side of baffle (19).

j. Remove screws (21) and washers (22) from bottom side of baffle (19).

k. Remove centrisep particle separator (paragraph 4-28.1).

l. Remove three screws (24) and washers (25) from top right side of baffle (19).

m. Release turnlock fasteners (23) from bottom side of baffle (19) and remove.

2-126. INSPECTION – ENGINE AIR INDUCTION BAFFLES.

a. Refer to table 2-3 to classify damage to structure and fasteners in engine air induction panels.

b. Inspect gaskets (28, figure 2-58) or (23, figure 2-58.1) for deterioration, damage, and secure installation.

c. Inspect seals (1, 8, 20, 25, 33, and 35, figure 2-58) or (1, 8, 18, 32, and 34, figure 2-58.1) for deterioration, damage, and secure installation.

2-127. – ENGINE AIR INDUCTION BAFFLES.

a. Refer to table 2-3 for procedure to repair structural damage and to replace damaged fasteners.

b. Replace damaged or missing gaskets (28, figure 2-58) or (23, figure 2-58.1).

NOTE

The procedures in this paragraph are applicable to bonding gaskets (28) which are fabricated from silicone rubber.

(1) Remove all traces of old gasket with scrapers and 80 grit sandpaper (C102). Clean the area where the new gasket will be installed down to bare metal.

(2) Abrade the bonding surface of the new gasket with 80 grit sandpaper (C102).

WARNING

Toluene is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of toluene vapors and contact with skin or eyes.

(3) Clean mating surfaces of new gasket and the air induction baffle with clean cloths dampened with toluene (C130). Dry with clean dry cloths.

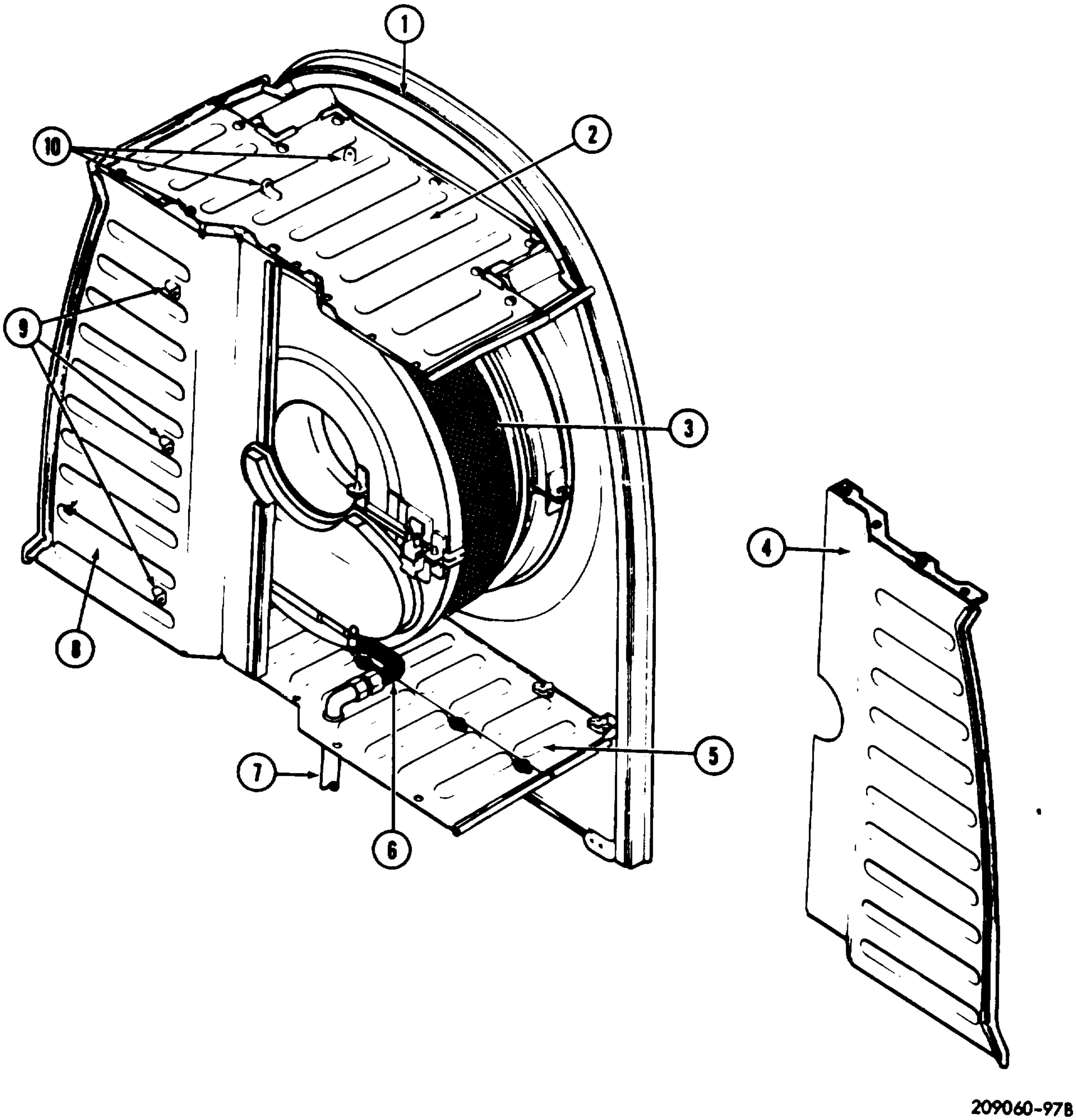
WARNING

Silicone adhesive primer is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of primer vapors and contact with skin or eyes.

(4) Use a pure bristle adhesive priming brush to apply a coat of silicone adhesive primer (C90) on the cleaned area of the air induction baffle. Do not apply primer to the rubber gasket. Allow the primer to air dry for thirty minutes.

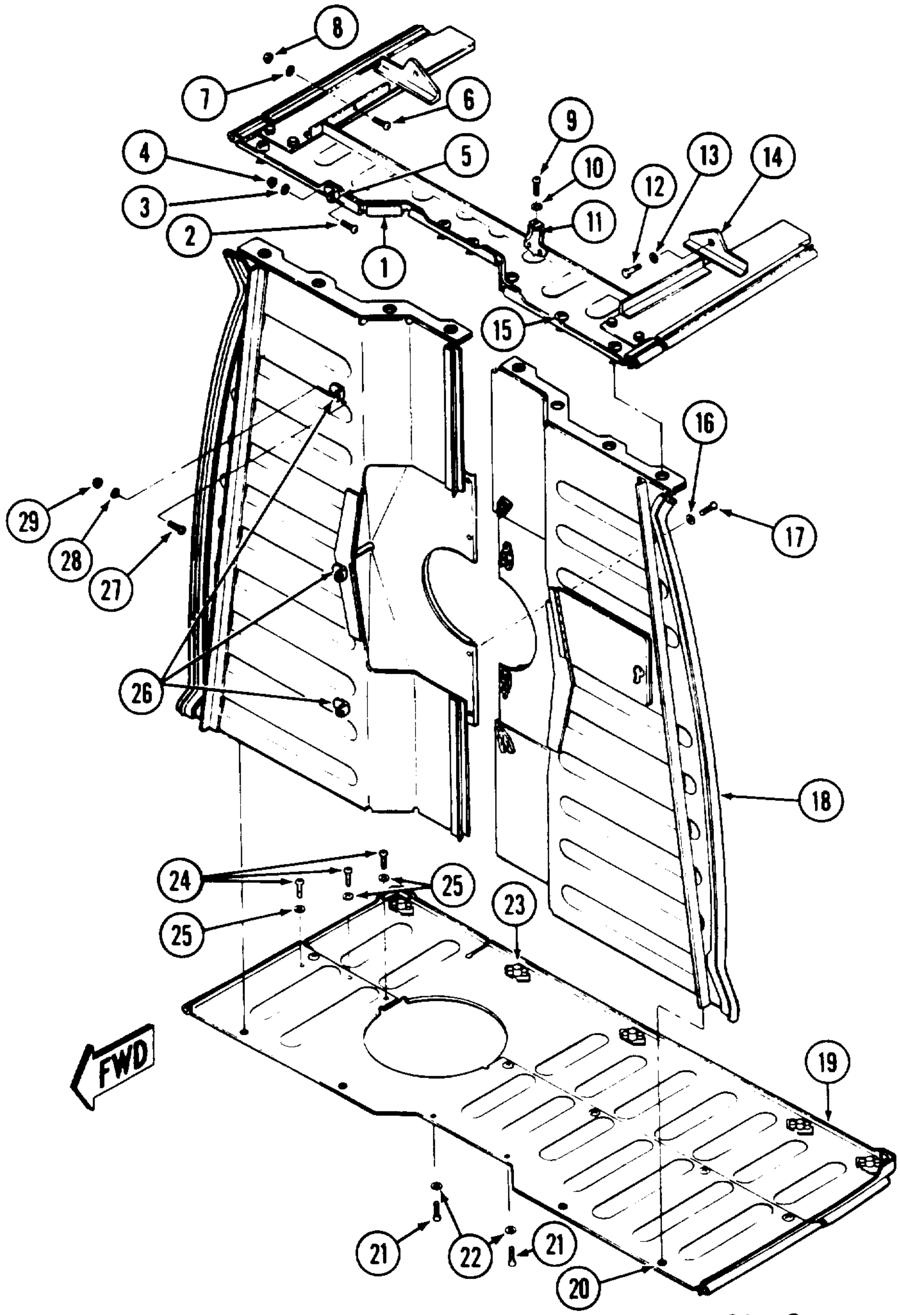
WARNING

Adhesive is flammable. Hydrogen gas is released after the two-compnent adhesive is mixed. Do not cap oontainer after combining components or pressure build-up may oocur.



1. Forward engine firewall
2. Top panel assembly
3. Particle separator
4. Driveshaft access panel assembly
5. Floor assembly
6. Overboard (ejector) hose
7. Tube assembly
8. Forward panel assembly
9. Brackets
10. Brackets

Fire 2-57. Engine Air Induction Baffle Installation (Prior to Incorporation of MWO 55-1520-236-50-12)



1. Baffle
2. Screw
3. Washer
4. Nut
5. Bracket
6. Screw
7. Washer
8. Nut
9. Screw
10. Washer
11. Nut
12. Bolt
13. Washer
14. Strap
15. Turnlock fasteners
16. Washer
17. Screw
18. Baffle
19. Baffle
20. Turnlock fasteners
21. Screw
22. Washer
23. Turnlock fasteners
24. Screw
25. Washer
26. Bracket
27. Screw
28. Washer
29. Nut

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Figure 2-57.1. E M Centrisep Particle Separator Engine Air Induction Baffle Installation (After Incorporation of MWO 55-1520-236-50-12)

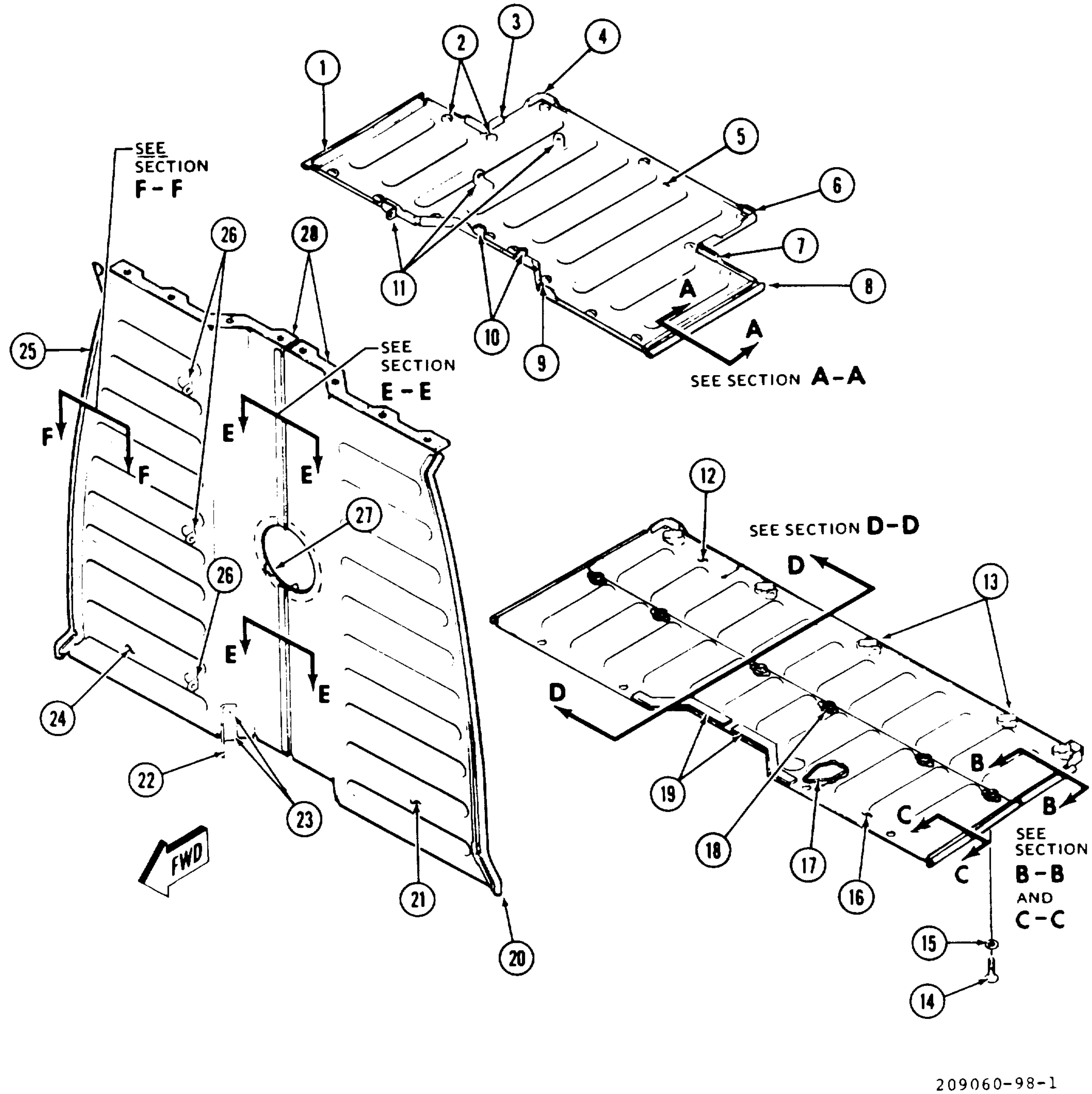

Figure 2-58. Engine Air Induction Baffle Assembly (Prior to Incorporation of MWO 55-1520-236-50-12) (Sheet 1 of 4)

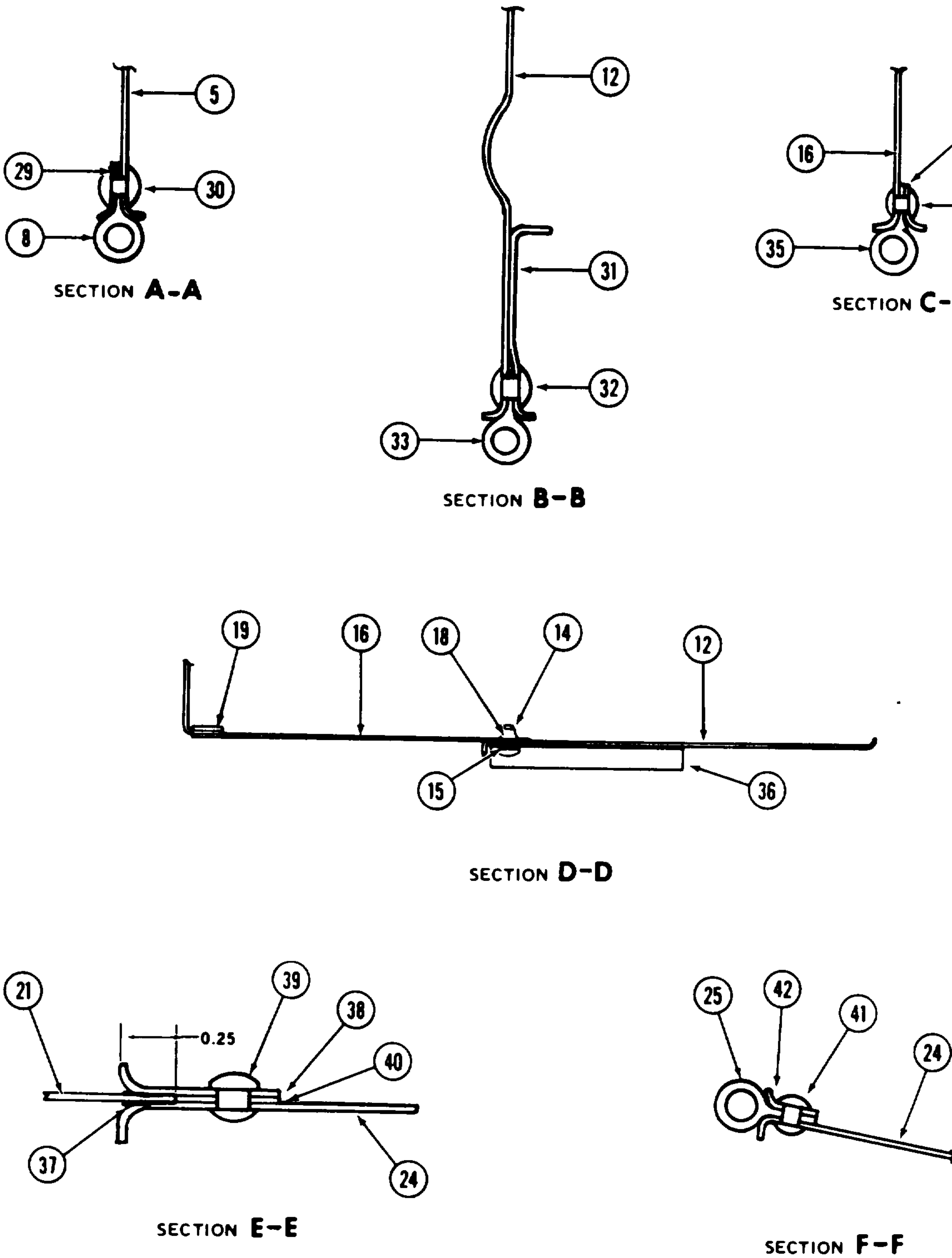

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Figure 2-58. Engine Air Induction Baffle Assembly Prior to Incorporation of MWO 55-1520-236-50-12)

(Sheet 2 of 4)

INDEX NO.	NOMENCLATURE	GAUGE	MATERIAL AND HEAT TREAT	SPECIFICATION
1	Seal	NA	209-060-200-17	
2	Turnlock fastener studs and grommets (eyelets)	NA NA NA NA		
3	Clip	0.032	2024 Al Aly T-42	QQ-A-250/5
4	Clip	0.032	2024 Al Aly T-42	QQ-A-250/5
5	Top panel	0.032	2024 Al Aly T-42	QQ-A-250/5
6	Clip	0.032	2024 Al Aly T-42	QQ-A-250/5
7	Clip	0.032	2024 Al Aly T-42	QQ-A-250/5
8	Seal	NA	209-060-200-17	
9	Clip	0.032	2024 Al Aly T-3	QQ-A-250/5
10	Doubler	0.032	2024 Al Aly T-3	QQ-A-250/5
11	Bracket	NA	NA	AN743-13
12	Floor panel	0.032	2024 Al Aly T-42	QQ-A-250/5
13	Receptacle	NA		
14	Screw	NA	NA	
15	Washer	NA	NA	
16	Floor panel	0.032	2024 Al Aly T-42	QQ-A-250/5
17	Doubler	0.032	2024 Al Aly T3	QQ-A-250/5
18	Nutplate	NA	NA	
19	Doubler	0.032	2024 Al Aly	QQ-A-250/5
20	Seal	NA	209-060-200-2[illegible]	
21	Access panel	0.032	2024 Al Aly T42	QQ-A-250/5

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Figure 2-58. Engine Air Induction Baffle Assembly (Prior to Incorporation of MWO 55-1520-236-50-12)
(Sheet 3 of 4)

INDEX NO.	NOMENCLATURE	GAUGE	MATERIAL AND HEAT TREAT	SPECIFICATION
22	Bracket	0.063	2024 Al Aly T3	QQ-A-250/5
23	Rivet	NA	NA	MS20470-AD3
24	Forward panel	0.032		QQ-A-250/5
25	Seal	NA	209-060-200-29	
26	Bracket	NA	NA	AN743-13
27	Doubler	0.032	2024 Al Aly T42	QQ-A-250/5
28	Rubber gasket	0.062	209-060-200-19 209-060-200-21	
29	Doubler	0.032	2024 Al Aly T42	QQ-A-250/5
30	Rivet	NA	NA	MS20470AD
31	Doubler	0.032	2024 Al Aly T42	QQ-A-250/5
32	Rivet	NA	NA	MS20470AD3
33	Seal		209-060-200-101	
34	Doubler	0.032	2024 Al Aly T42	QQ-A-250/5
35	Seal	NA	209-060-200-103	
36	Doubler	0.032	2024 Al Aly T42	QQ-A-250/5
37	Vinyl tape	0.003 x 0.500	No. 549	FSCM 76381
38	Clip	0.032	2024 Al Aly T3	QQ-A-250/5
39	Rivet	NA	NA	
40	Spacer	0.032	2024 Al Aly T3	QQ-A-250/5
41	Rivet	NA	NA	
42	Doubler	0.032	2024 Al Aly T42	QQ-A-250/5

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Figure 2-58. Engine Air Induction Baffle Assembly (Prior to Incorporation of MWO 55-1520-236-50-12) (Sheet 4 of 4)

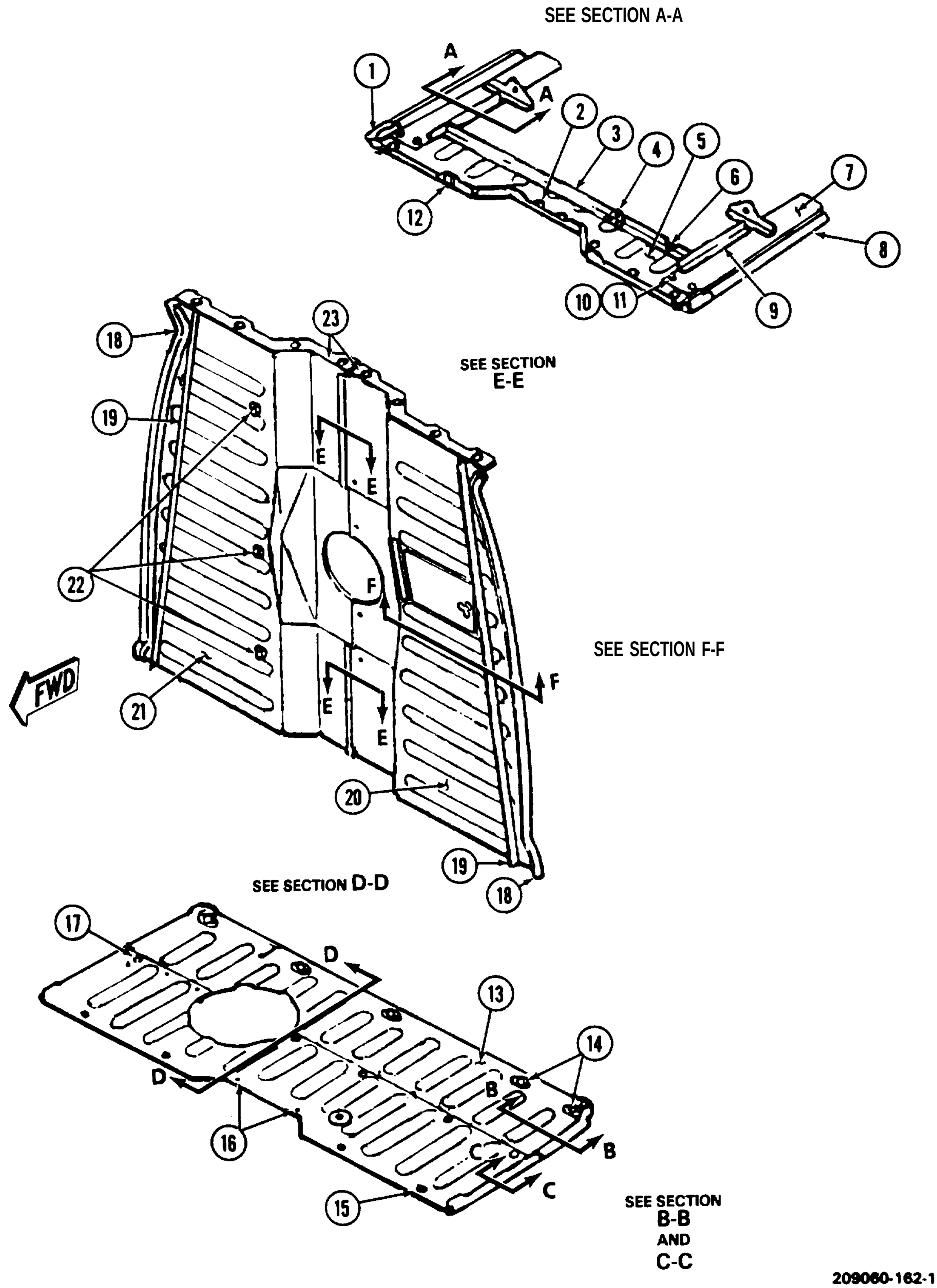

Figure 2-58.1. E M Centrisep Particle Separator Engine Air Induction Baffle Assembly (After Incorporation of MWO 55-1520-238-50-12) (Sheet 1 of 5)

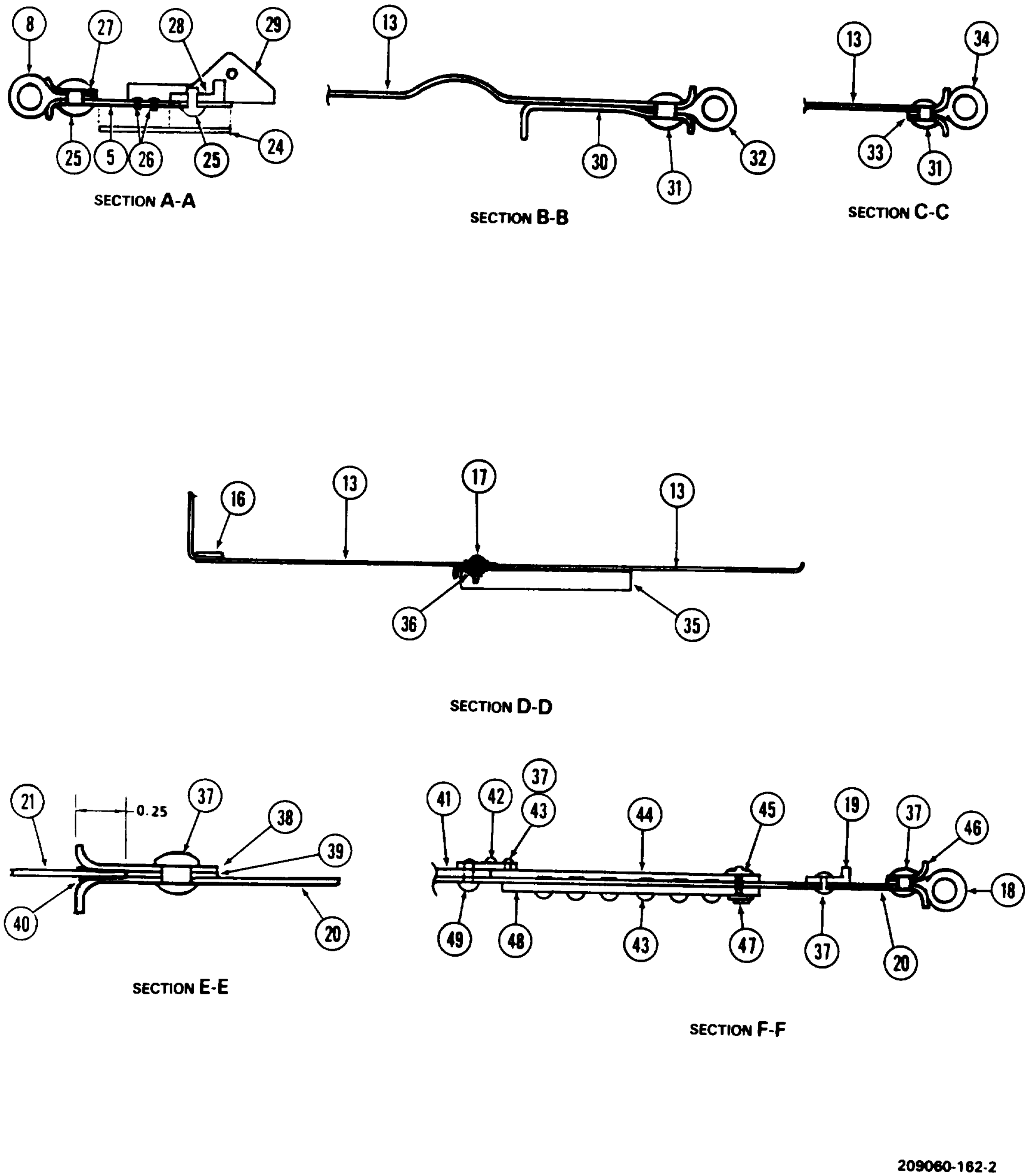

Figure 2-58.1. E M Centrisep Particle Separator Engine Air Induction Baffle Assembly (After Incorporation of MWO 55-1520-236-50-12) (Sheet 2 of 5)

INDEX NO.	NOMENCLATURE	GAUGE	MATERIAL AND HEAT TREAT	SPECIFICATION
1	Seal	NA	Rubber 110-059-1	MIL-R-6855 CL 1, GR 40
2	Turnlock fastener and grommet (eyelet)	NA NA	A5T14/T17 GH5	CAGE 72794 CAGE 72794
3	Stiffener	0.025	2024 Al Aly T-3	QQ-A-250/5
4	Nut	NA	NA	90-002-3
5	Top baffle	0.032	2024 Al Aly T42	QQ-A-250/5
6	Pad	NA	Rubber	MIL-R-6130 Ty II GR A
7	Strap and Pad	0.063 NA	2024 Al Aly T-42 Rubber	QQ-A-250/5 MIL-R-6130 Ty II GR A
8	Seal	NA	Rubber 110-059-1	MIL-R-6855 CL 1, GR 40
9	Angle	0.032	2024 Al Aly T-3	QQ-A-250/5
10	Bolt	NA	NA	NAS6203-2
11	Washer	NA	NA	AN960JD10L
12	Bracket	NA	NA	AN743-13
13	Bottom baffle (floor panel)	0.032	2024 Al Aly T-42	QQ-A-250/5
14	Turnlock fastener stud and grommet (eyelet)	NA NA	50-005W18/W26 50-009-5	CAGE 97499 CAGE 97499
15	Receptacle	NA	R5	CAGE 72794
16	Doubler	0.032	2024 Al Aly	QQ-A-250/5
17	Screw	NA	NA	AN525-10R6
18	Seal	NA	Rubber 110-059-1	MIL-R-6855 CL 1, GR 40
19	Stiffener	0.032	2024 Al Aly T-3	QQ-A-250/5
20	Forward baffle (left section)	0.032	2024 Al Aly T-42	QQ-A-250/5

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Figure 2-58.1. E M Centrisep Particle Separator Engine Air Induction Baffle Assembly (After Incorporation of MWO 55-1520-236-50-12) (Sheet 3 of 5)

INDEX NO.	NOMENCLATURE	GAUGE	MATERIAL AND HEAT TREAT	SPECIFICATION
21	Forward baffle (right section)	0.032	2024 Al Aly T-42	QQ-A-250/5
22	Bracket	NA	NA	AN743-13
23	Rubber gasket	0.062	Rubber	MIL-R-6130 Ty II Gr A
24	Rubber pad	0.250	Rubber	MIL-R-6130 Ty II Gr A
25	Rivet	NA	NA	MS20426AD3
26	Rivet	NA	NA	MS20426AD4
27	Stiffener	0.032	2024 Al Aly T-42	QQ-A-250/5
28	Angle	0.032	2024 Al Aly T-3	QQ-A-250/5
29	Angle	ND10133-140	7075 Al Aly T-6	QQ-A-200/11
30	Doubler	0.032	2024 Al Aly T-42	QQ-A-250/5
31	Rivet	NA	NA	MS20470AD3
32	Seal	NA	Rubber 110-059-1	MIL-R-6855 CL 1, GR 40
33	Doubler	0.032	2024 Al Aly T-42	QQ-A-250/5
34	Seal	NA	Rubber 110-059-1	MIL-R-6855 CL 1, GR 40
35	Doubler	0.032	2024 Al Aly T-42	QQ-A-250/5
36	Nutplate	NA	NA	MS21059L3K
37	Rivet	NA	NA	MS20470AD3
38	Clip	0.032	2024 Al Aly T-3	QQ-A-250/5
39	Spacer	0.032	2024 Al Aly T-3	QQ-A-250/5
40	Vinyl tape	0.003 X 0.005	No. 549	CAGE 76381

Figure 2-58.1. E M Centrisep Particle Separator Engine Air Induction Baffle Assembly (After Incorporation of MWO 55-1520-236-50-121 (Sheet 4 of 5)

INDEX NO.	NOMENCLATURE	GAUGE	MATERIAL AND HEAT TREAT	SPECIFICATION
41	Doubler	0.040	2024 Al Aly T-3	QQ-A-250/5
42	Hinge	NA	NA	MS20257P2-385
43	Rivet	NA	NA	MS20426AD3
44	Door	0.050	2024 Al Aly T-3	QQ-A-250/5
45	Turnlock fastener stud and grommet (eyelet)	NA NA	50-007W13 50-009-2	CAGE 97499 CAGE 97499
46	Doubler	0.032	2024 Al Aly T-42	QQ-A-250/5
47	Receptacle	NA	50-008RF2	CAGE 97499
48	Doubler	0.040	2024 Al Aly T-3	QQ-A-250/5
49	Rivet	NA	NA	MS20470AD4

Figure 2-58.1. E M Centrisep Particle Separator Engine Air Induction Baffle Assembly (After Incorporation of MWO 55-1520-235-50-12) Sheet 5 of 5)

NOTE

Inspect containers for expiration date prior to use.

(5) Mix two-component adhesive (C16) at a ratio, by weight, of 100 parts resin to 5 parts catalyst. The pot life of mixture-adhesive is four to eight hours, but best results are obtained when adhesives are used immediately after mixing.

(6) Use a pure bristle adhesive priming brush to apply a 10 to 15 mil coating of adhesive prepared in the preceding step to the rubber gasket and the metal air induction baffle. Allow the adhesive to air dry for 15 to 30 minutes. Start with one end of gasket and press onto baffle. Adhesive should be cured at a temperature of 75 degrees F (24 degrees C) or higher. If temperature is below 75 degrees F (24 degrees C) double the amount of cure time for each 12 degrees F (7 degrees C) below 75 degrees F (24 degrees C). Do not attempt to cure adhesive at temperatures below 50 degrees F (10.0 degrees C).

TYPICAL TEMPERATURES AND CURE TIME

Temperature Degrees F	Degrees C	Cure Time Hours
75	24	4 to 7
63	17	8 to 14
51	11	16 to 28

(7) Inspect bond after 24 hour cure time. There must be no evidence of dege lifting of the gasket.

c. Replace damaged or missing seals (1, 8, 20, 25, 33, and 35, figure 2-58) or (1, 8, 18, 32, and 34, figure 2-58.1).

(1) Remove rivets and doublers then retain seals to panels. See figure 2-58 or 2-58.1 for typical view of seal installation.

(2) Place new seal (1, 8, 20, 25, 33, or 35), as applicable, on panel and cut or punch holes in new seal to match holes in new seal to match holes in panel.

(3) Place seal and doubler on panel and secure with rivets. See figures 2-58 or 2-58.1 for typical views.

d. Replace damaged or missing vinyl tape (C128) on edge of access panel (21, figure 2-58) or (20, figure 2-58.1). See sectional view E-E. Wrap tape around edge of panel to form a strip approximately 0.25 inch wide on each side as illustrated.

2-128. INSTALLATION – ENGINE AIR INDUCTION BAFFLES. (PRIOR TO INCORPORATION OF MWO 55-1520-236-50-12)

a. Assemble two halves of flow assembly (5, figure 2-57) and forward panel assembly (8).

b. Position flow assembly (5) and forward panel (8) on forward engine firewall (1) and secure to firewall.

c. Install hose (6) and tube assembly (7).

d. Install forward access panel (4}.

e. Install top panel (2).

f. Install antenna lead on brackets (9) and (10).

2-128.1. E M INSTALLATION – ENGINE AIR INDUCTION BAFFLES. (AFTER INCORPORATION OF MWO 55-1520-236-50-12)

a. Position baffle (19. figure 2-57.1) on forward engine firewall and secure in place with turnlock fasteners (23).

b. Install screws (24) and washers (25), securing baffle (19) to structure.

c. Install centrisep particle separator (paragraph 4-32.1).

d. Position baffle (18) in place and assemble two halves using screws (17) and washers (16).

e. Fasten baffles (18 and 19) in place with turnlock fasteners (20).

f. Install screws (21) and washers (22).

g. Position baffle (1) on baffle (18), secure in place with turnlock fasteners (15).

h. Install bolts (12) and washers (13) through straps (14) securing baffle (1) to structure.

i. Deleted.

j. Deleted.

k. Deleted.

l. Install center pylon left and right fairings (paragraph 2-82).

m. Close transmission and engine cowling.

2-129. CREW DOORS.

2-130. DESCRIPTION – CREW DOORS.

The pilot door (1, figure 2-59) and the gunner door (1, figure 2-60) consist of metal frames with inset window panels of transparent acrylic plastic. The door handles are located on the lower side of the doors. Each door has a single piano-type hinge at the top and a gas spring (door support brace) to support the door when in the open position. The doors can be removed (jettisoned) in an emergency by the canopy removal system. Refer to chapter 17 for description of the canopy removal system. The door handles have lock cylinders installed so the door can be locked with a key. Both doors can be locked or unlocked with the same key.

2-131. REMOVAL — CREW DOORS.

WARNING

Ensure that both the pilot and gunner arming/firing mechanism handles are secured with safety pins prior to entry Into the cockpit area.

CAUTION

Removal of pilot or gunner door requires two persons to hold the door.

a. Remove pilot door.

(1) Open pilot door (1, figure 2-59).

(2) Support door in open poslfon manually and remove safety clip (23) from lower end of gas spring (3), then remove gas spring (3) from ball stud fitting (22). The socket fitting on end of gas spring should slide off ball stud fitting when moderate force IS applied.

(3) Support the door in the open postion manually and remove hinge pin (10). Remove door from helicopter.

b. Remove gunner door as follows:

(1) Open gunner door (1, figure 2-60).

(2) Support door in open position monually and remove safety clip (25) from lower end of gas spring (3), then remove gas spring (3) from ball stud fitting (24). The socket fitting on end of gas spring should slide off ball stud fitting when moderate force is applied.

(3) Support the door in the open postion manually and remove hinge pin (20). Remove door from helicopter.

2-132. DISASSEMBLY – CREW DOORS.

WARNING

Ensure that both the pilot and gunner arming/firing mechanism handies are secured with safety pins prior to entry into the cockpit area.

NOTE

It is recommended that door be removed from helicopter for disassembly if extensive disassembly of latch mechanism is to be accomplished. Refer to paragraph 2.131.

a. Disassemble pilot door.

(1) Remove pin (24, figure 2-61) and handle (25).

CAUTION

One screw (23) at the top of spacer assembly (47) and o simliar screw at the bottom of spacer assembly (47) must be left installed when door (11) is removed. The purpose of these two screws is to secure spacer assembly (47) to frame until spring (12) can be removed.

(2) Remove screws (22) and one screw (26). Leave two screws (23) installed as noted in “CAUTION” above. Remove door (11).

(3) Remove spring (12).

(4) Remove two screws (23) and spacer assembly (47).

(5) Remove screws (20) and plastic cover (7). Remove plastic covers (5), (14), and (16) in the same manner.

(6) Remove pin (31) to disconnect rod assembly (8) from bellcrank (46). Remove rod assembles (10) and (15) in the same manner.

(7) Remove bellcrank (46) and toggle (35).

(8) Remove screws (42) and handle (41).

(9) Remove bolt (28) and toggle (35) from bellcrank (46).

(10) Replace seal (48) if damaged.

b. Disassemble gunner door.

(1) Place gunner door assembly (1, figure 2-62) on a padded work surface.

(2) Remove pin (2, figure 2-63) and handle (1).

CAUTION

Screw (4, figure 2-63) at top of spacer assembly (32) and a similar screw at the bottom of spacer assembly (32) must be left installed when door (6) is removed. The purpose of these two screws is to secure spacer assembly (32) to door frame (8) until spring (9) is removed.

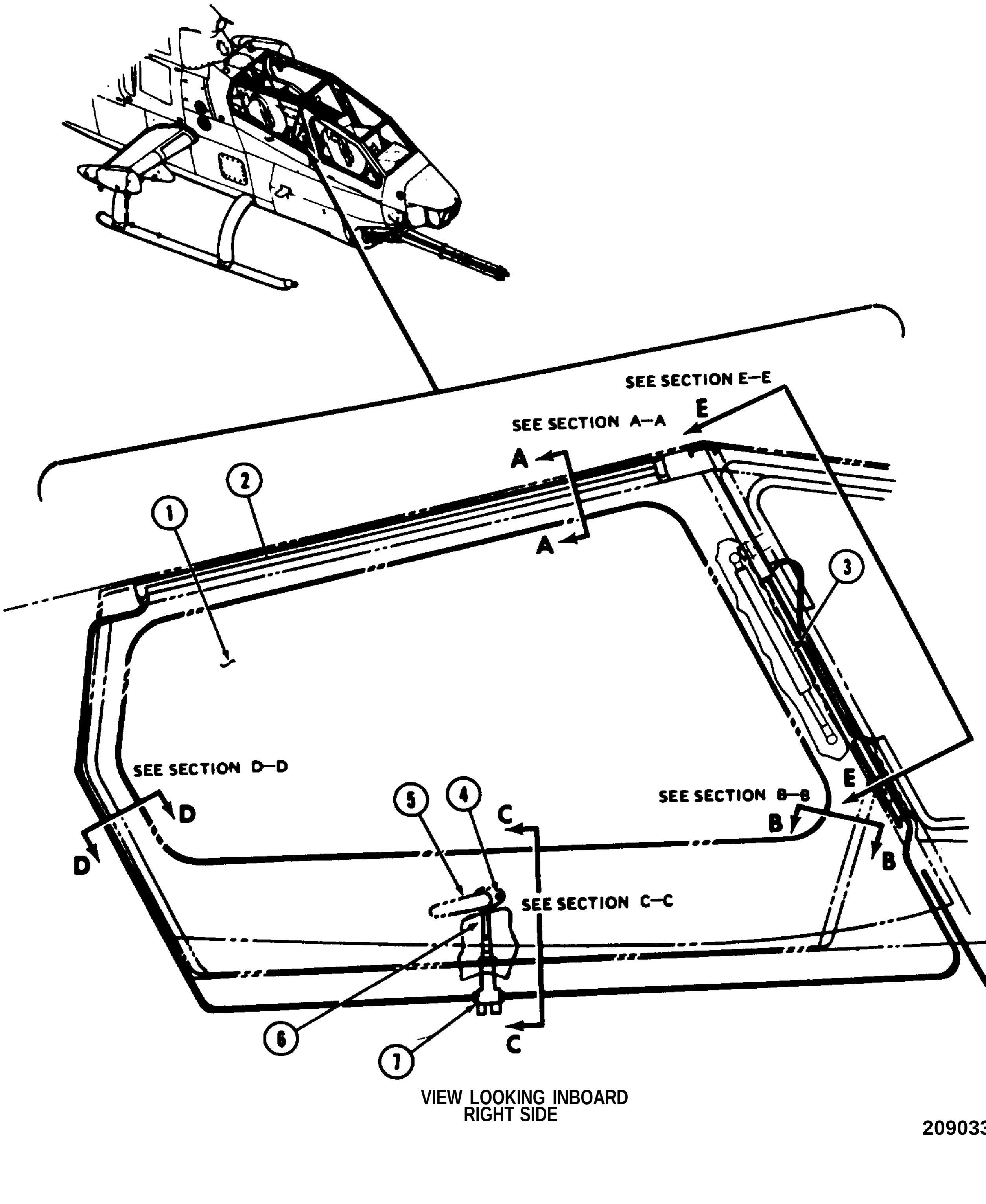
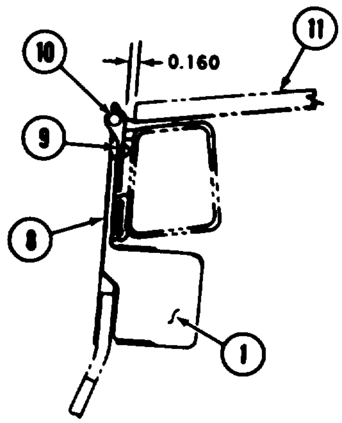
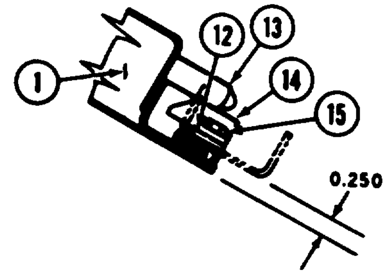


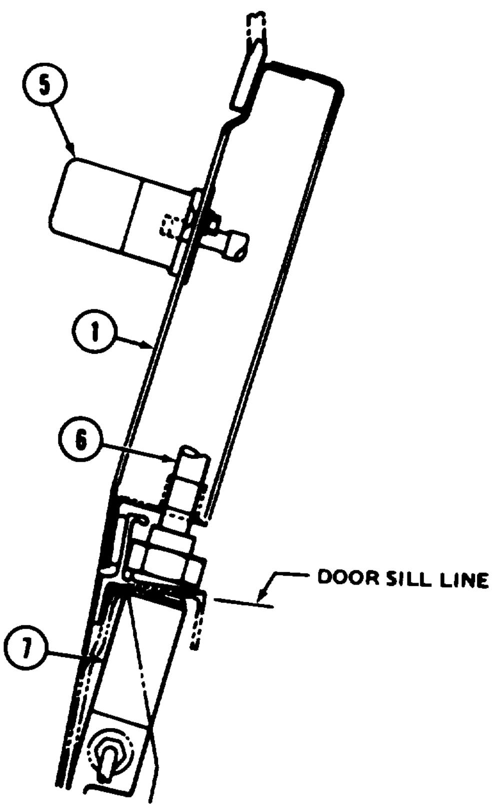
Figure 2-59. Pilot Door - Installation (Sheet 1 of 3)

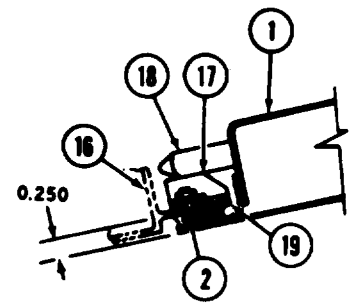


SECTION A-A



SECTION B-B





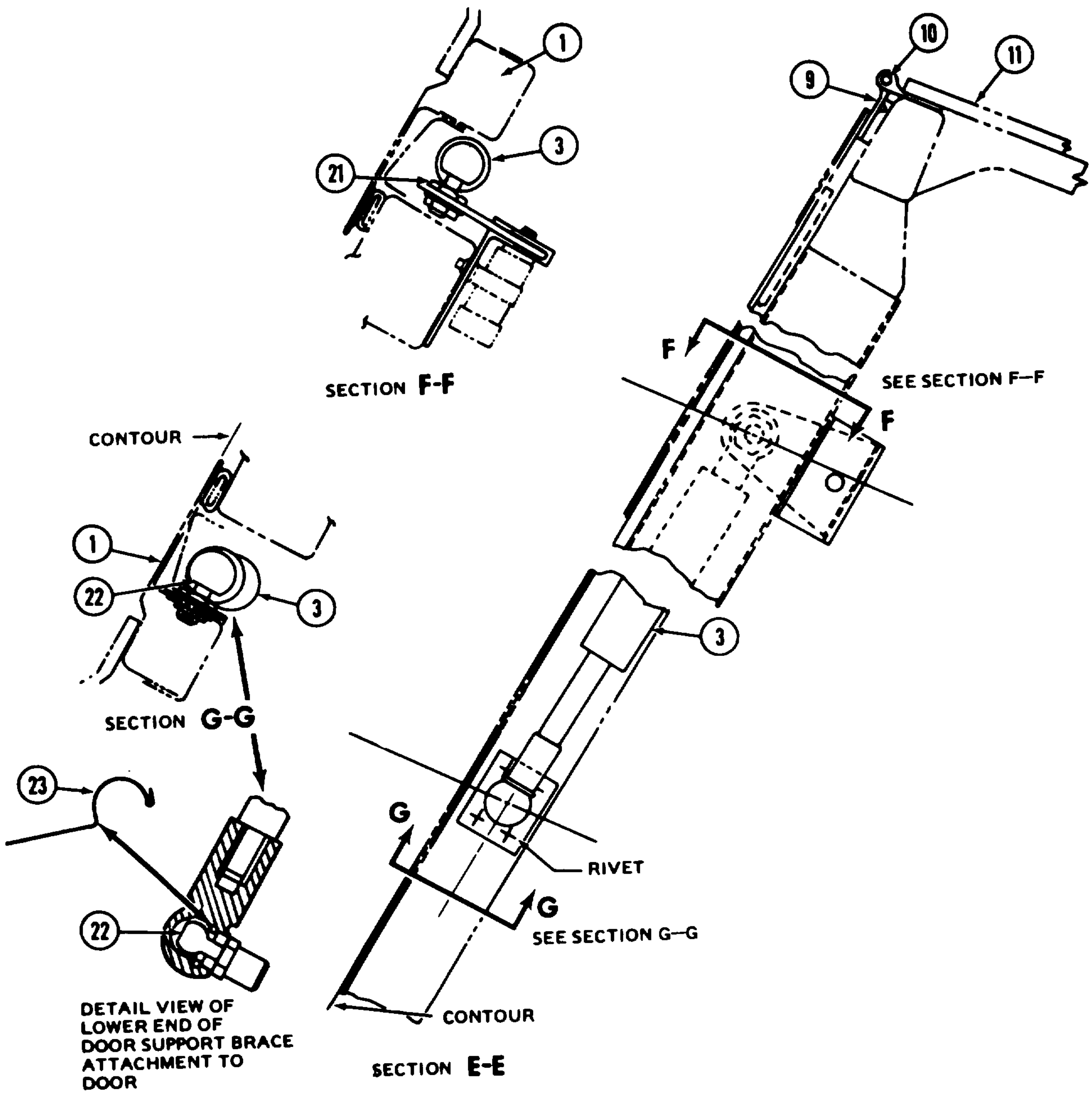
SECTION D-D

SECTION C-C

NOTE: ALL DIMENSIONS IN INCHES UNLESS OTHERWISE NOTED.

209033-58-2

Figure 2-59. Pilot Door – Installation (Sheet 2 of 3)



1. Pilot door
2. Hinge and hinge pin
3. Gas spring (door support brace)
4. Lock cylinder
5. Door handle
6. Door latch rod
7. Thruster (canopy removal system)
8. Shield
9. Hinge
10. Hinge pin
11. Upper canopy
12. Shim (two required)
13. Door latch rod
14. Striker
15. Screws and nuts (two required)
16. Canopy frame
17. Striker
18. Door latch rod
19. Shim (two required)
20. Screws and nuts (two required)
21. Fitting (ball stud)
22. Fitting (ball stud)
23. Safety clip

209033-58-3

Figure 2-59. Pilot Door - Installation (Sheet 3 of 3

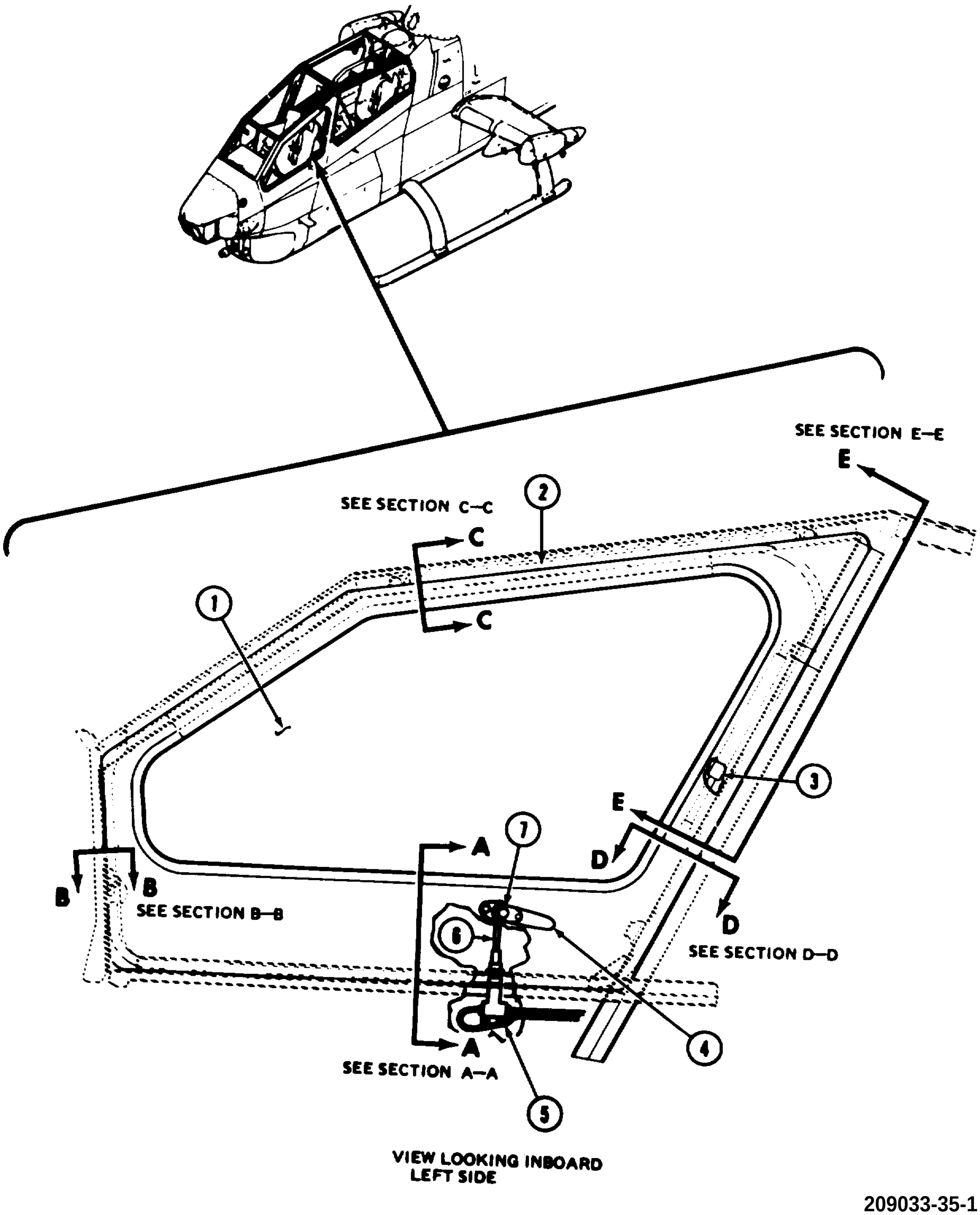


Figure 2-60. Gunner Door - Installation (Sheet 1 of 3)

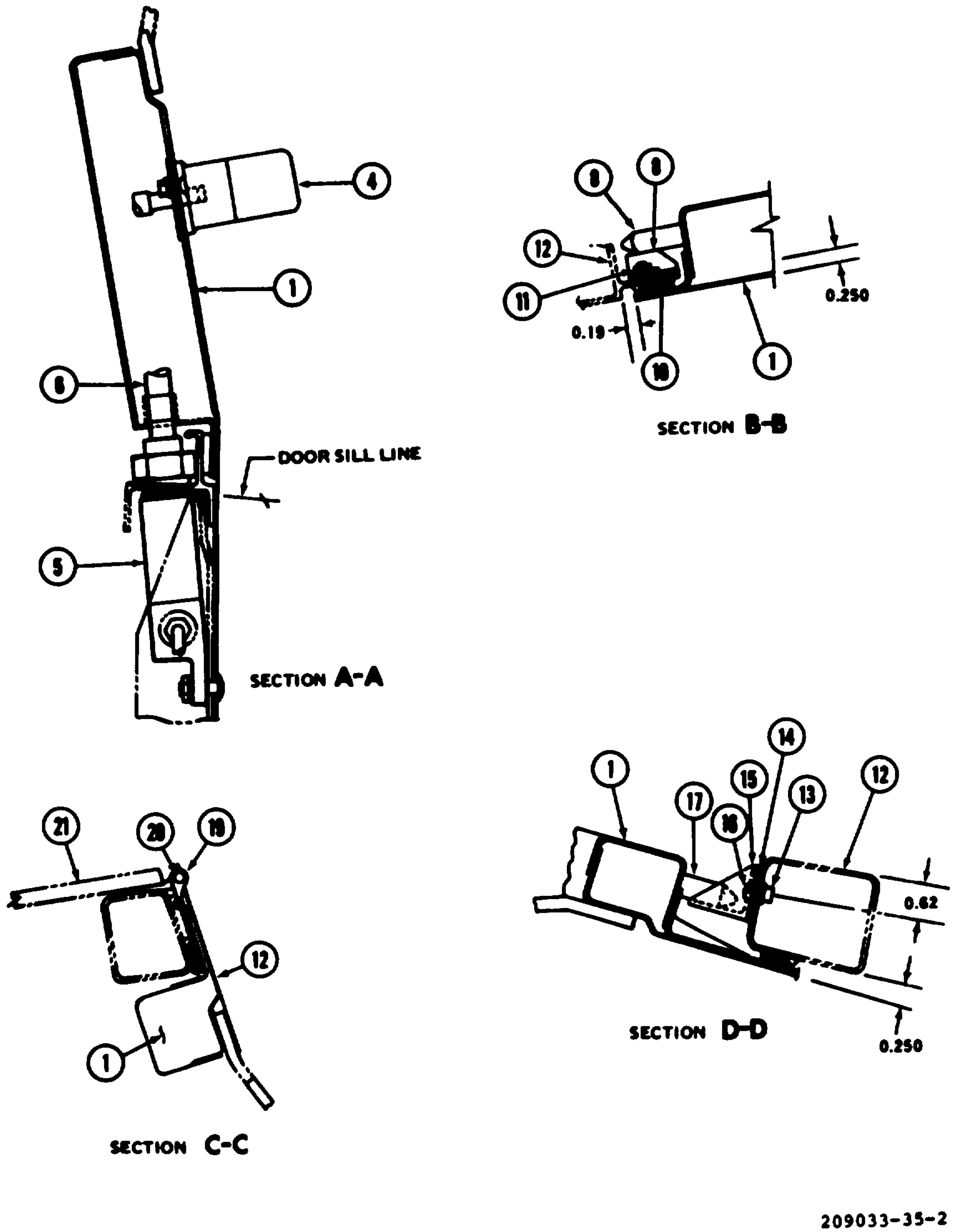
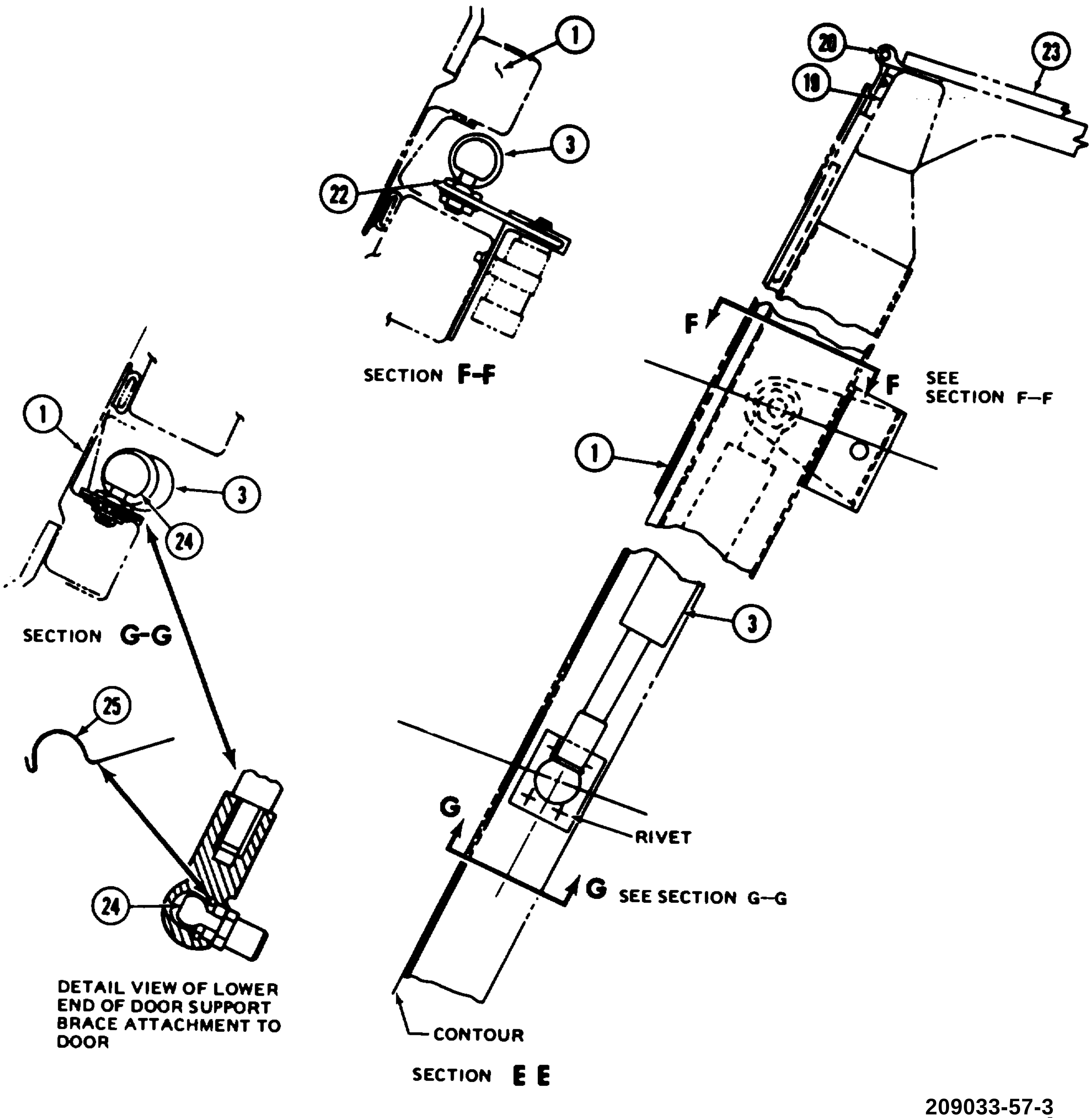
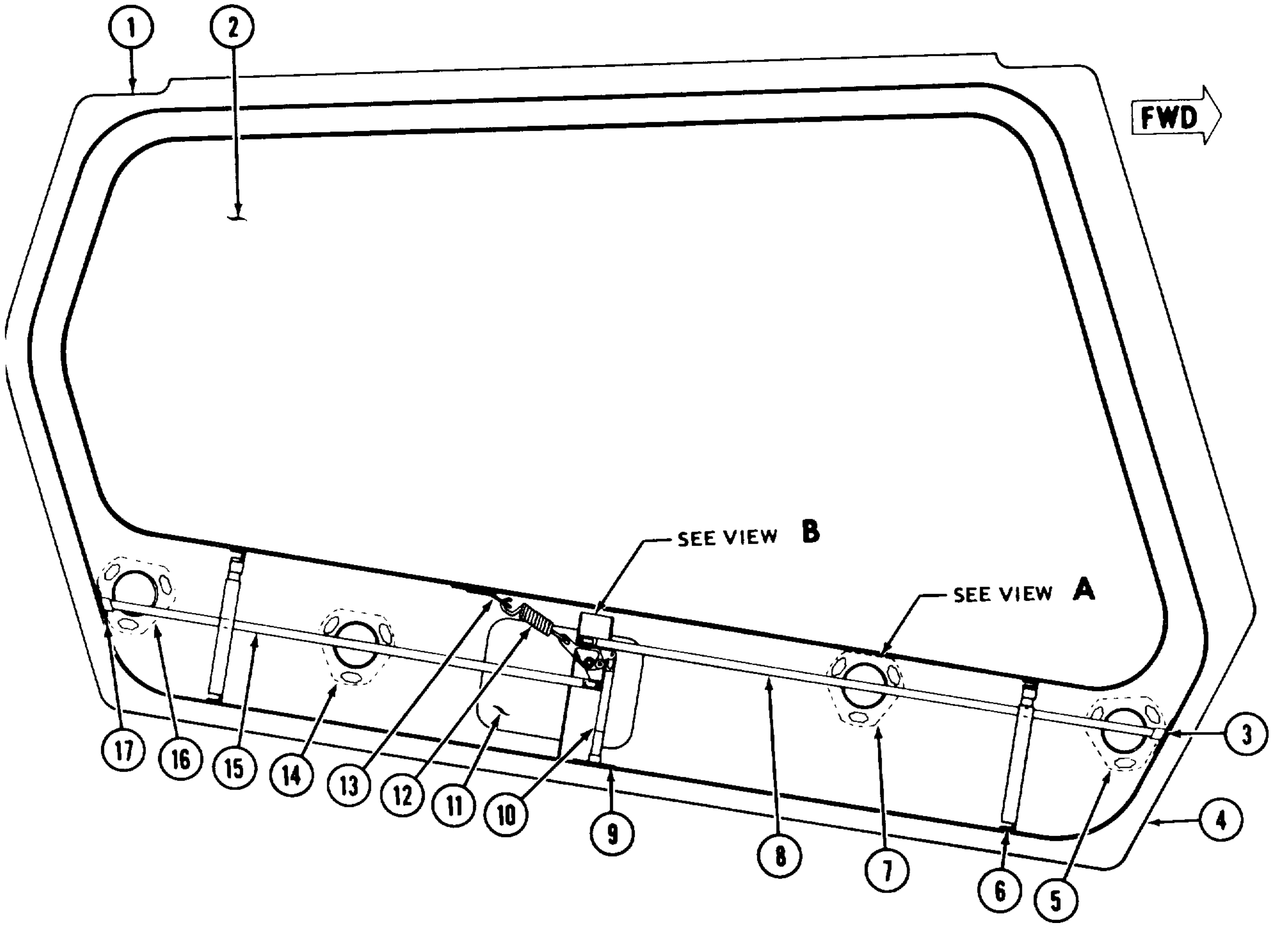


Figure 2-30. Gunner Door - Installation (Sheet 2 of 3)

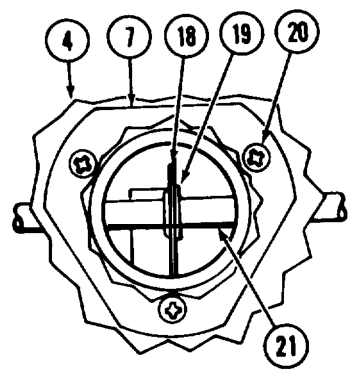


1. Gunner door
2. Hinge and hinge pin
3. Gas spring (door support brace)
4. Door handle
5. Thruster — canopy removal system
6. Door latch rod
7. Lock cylinder
8. Door latch rod
9. Striker
10. Shim (two required)
11. Screw (two required)
12. Canopy frame
13. Blind rivet nut
14. Aft strike plate
15. Aft striker
16. Screw (two required)
17. Door latch rod
18. Shield
19. Hinge
20. Hinge pin
21. Upper windshield
22. Fitting (ball stud)
23. Upper canopy
24. Fitting (ball stud)
25. Safety clip

Figure 2-60. Gunner Door - Installation (Sheet 3 of 3)



VIEW LOOKING INBOARD AT PILOT DOOR – OUTSIDE FRAME AND DOOR HANDLE REMOVED FOR CLARITY

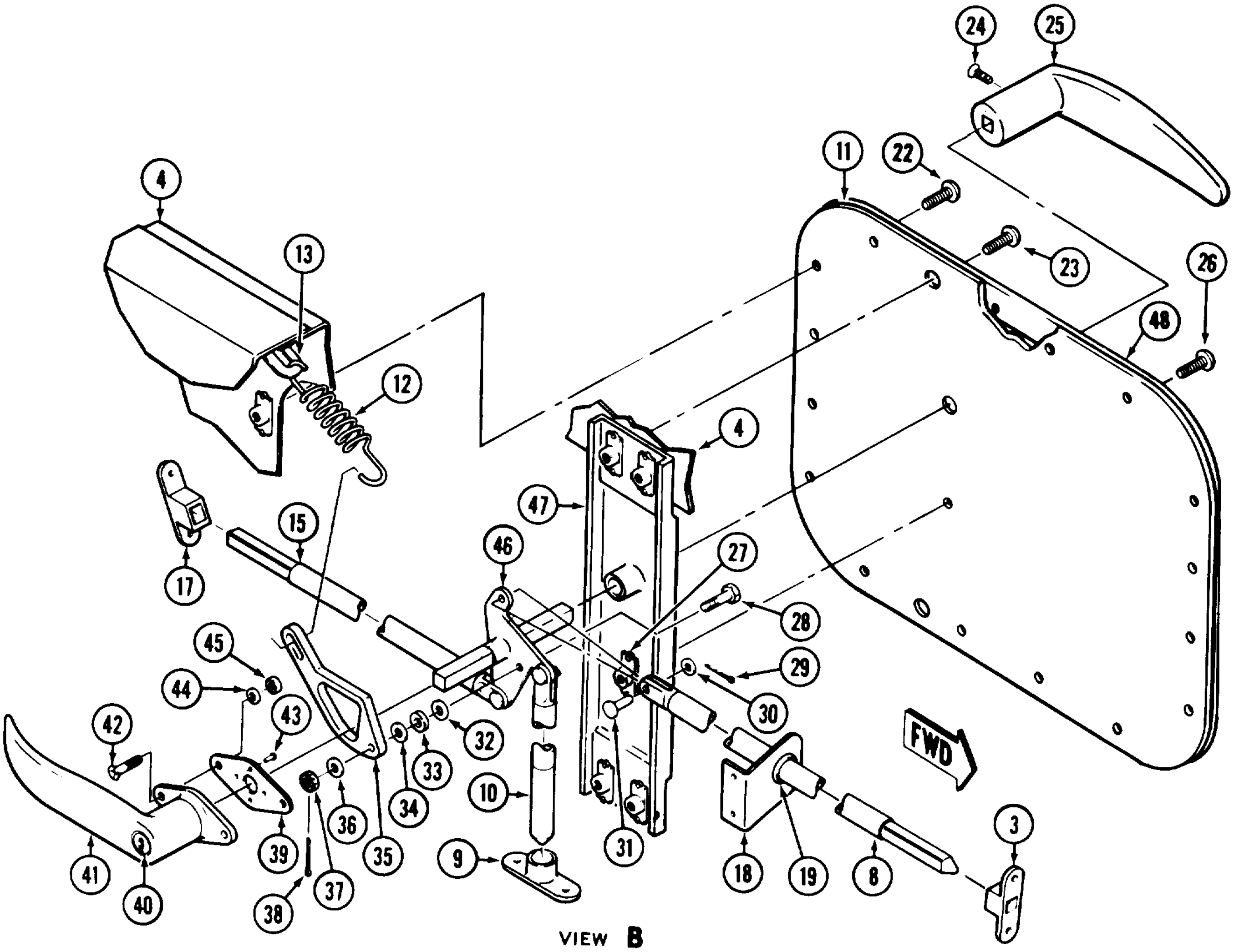


VIEW A

VIEW LOOKING OUTBOARD AT PILOT DOOR PLASTIC ACCESS COVER

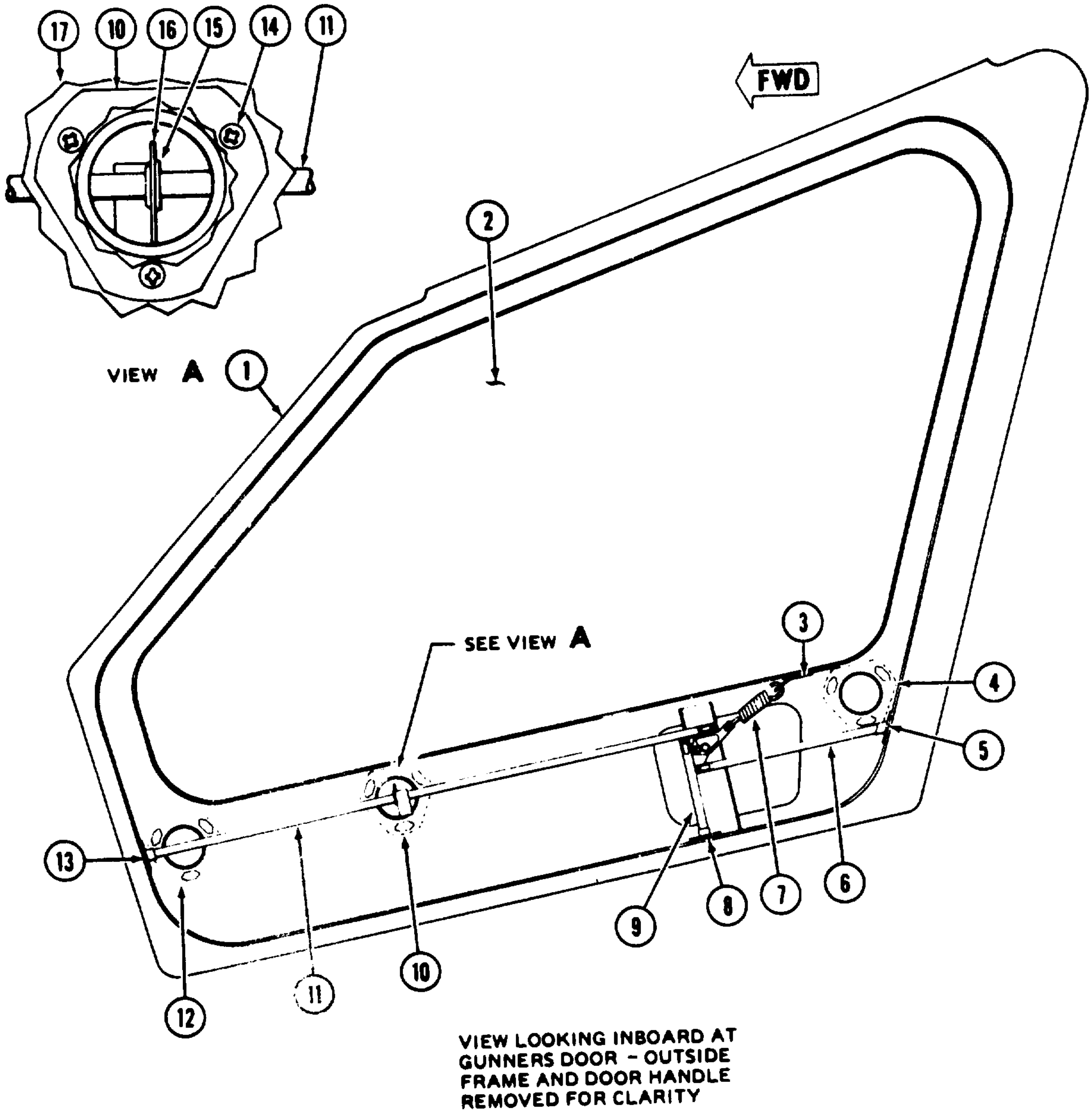
209033-34-1A

Figure 2-61. Pilot Door — Assembly (Sheet 1 of 2)



1. Pilot door
2. Acrylic plastic transparency
3. Guide
4. Door frame
5. Plastic cover
6. Stiffener
7. Plastic cover
8. Rod assembly
9. Guide
10. Rod assembly
11. Door
12. Spring
13. Clip
14. Plastic cover
15. Rod assembly
16. Plastic cover
17. Guide
18. Clip
19. Grommet
20. Screw
21. Rod assembly
22. Screw
23. Screw
24. Pin
25. Handle
26. Screw
27. Nutplate
28. Bolt
29. Cotter pin
30. Washer
31. Pin
32. Washer (standard aluminum)
33. Washer (corrosion resistant steel)
34. Washer (standard aluminum)
35. Toggle
36. Washer (thin aluminum)
37. Nut
38. Cotter pin
39. Doubler .
40. Lock cylinder
41. Handle
42. Screw
43. Rivet
44. Washer
45. Nut
46. Bellcrank
47. Spacer assembly
48. Seal

Figure 2-61. Pilot Door- Assembly (Sheet 2 of 2)



1. Gunners door
2. Acrylic plastic transparency
3. Clip
4. Plastic cover (door)
5. Guide
6. Rod assembly
7. Spring
8. Guide
9. Rod assembly
10. Plastic cover (door)
11. Rod assemblv
12. Plastic cover (door)
13. Guide
14. Screw
15. Grommet
16. Bracket
17. Door frame

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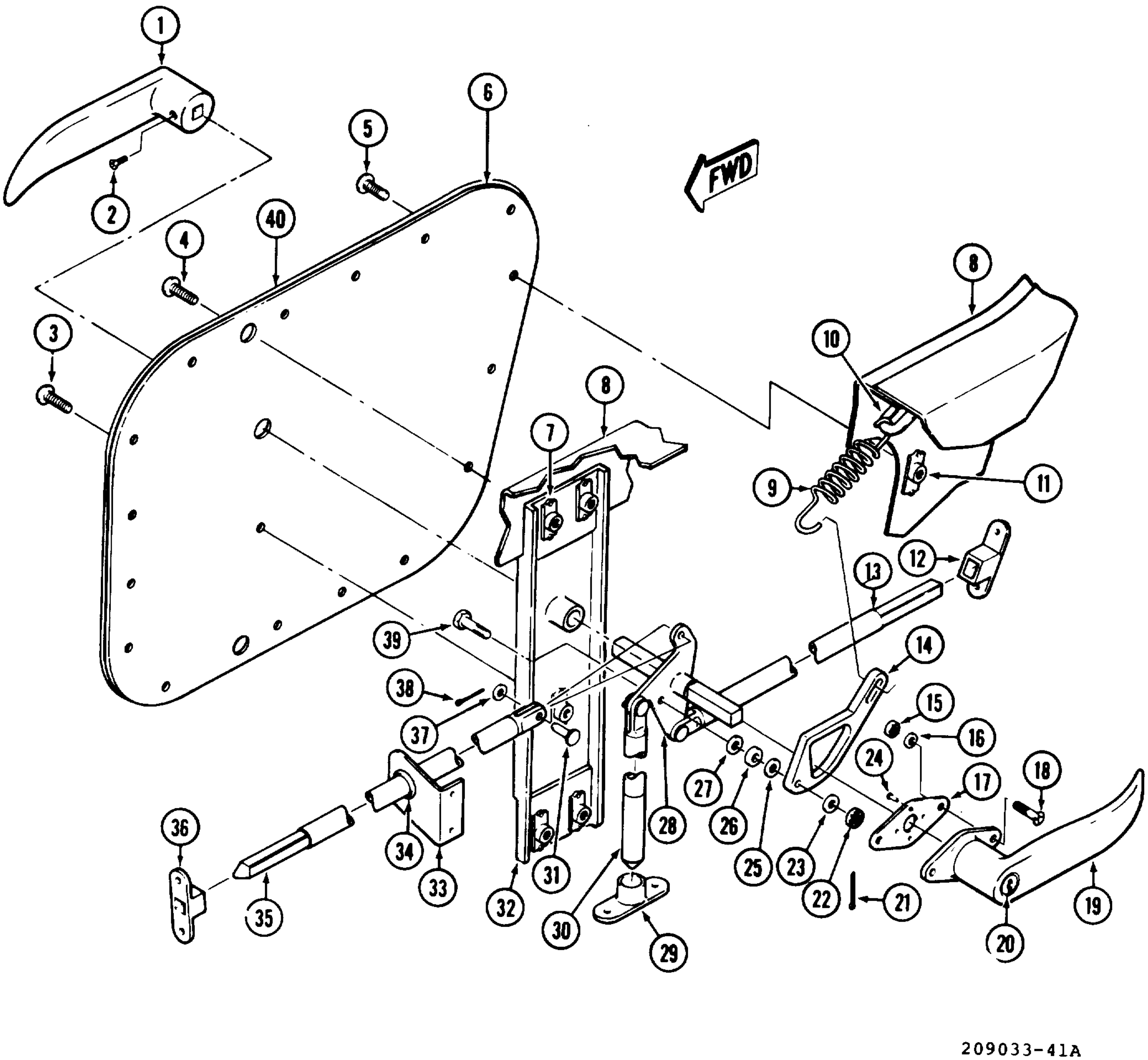
Figure 2-62. Gunner Door Assembly



1. Handle
2. Pin
3. Screw
4. Screw
5. Screw
6. Door
7. Nutplate
8. Doorframe
9. Spring
10. Clip
11. Nutplate
12. Guide
13. Rod assembly
14. Toggle
15. Nut
16. Washer
17. Doubler
18. Screw
19. Handle
20. Lock cylinder
21. Cotter pin
22. Nut
23. Washer (thin aluminum)
24. Rivet
25. Washer (standard aluminum)
26. Washer (corrosion resistant steel)
27. Washer (standard aluminum)
28. Bellcrank
29. Guide
30. Rod assembly
31. Pin
32. Spacer assembly
33. Bracket
34. Grommet
35. Rod assembly
36. Guide
37. Washer
38. Cotter pin
39. Bolt
40. Seal

Figure 2-63. Gunner Door Latch Assembly

(3) Remove sixteen screws (5) and one screw (3). Leave two screws (4) installed as noted in caution above.

(4) Remove spring (9).

(5) Remove door (6).

(6) Remove two screws (4) and spacer assembly (32).

(7) Remove three screws (14, figure 2-62) and plastic cover (4). Remove plastic covers (10 and 12) in the same manner.

(8) Remove pin (31, figure 2-62) to disconnect rod assembly (35) from bellcrank (28). Remove rod assemblies (13) and (30) in the same manner.

(9) Remove bellcrank (28) and toggle (14).

(10) Remove two screws (18) and handle(19).

(11) Remove bolt (39) and toggle (14) from bellcrank (28).

(12) Remove seal (40).

2-133. INSPECTION – CREW DOORS.

WARNING

Ensure that both the pilot and gunner arming/firing mechanism handles are secured with safety pins prior to entry into the cockpit area.

a. Inspect acrylic plastic transparent windows in doors for scratches, nicks, cracks, crazing, and secure installation to door frame.

b. Inspect door frames and hinges for cracks, scratches, nicks, corrosion, and deformation. If a hinge is cracked or broken, continue to use it if it remains within limits.

(1) Not more than three segments cracked or broken.

(2) No two cracked or broken segments are closer than four segments apart.

(3) No cracked or broken segments among first four segments from either end of hinge.

c. Inspect door handles for cracks, nicks, corrosion and deformation.

d. Inspect locks in door handles for satisfactory operation.

e. Inspect door latch mechanism for smooth operation and for correct adjustment at two latch rod strikers for each door.

f. If pilot or gunner door latch mechanisms are binding or out of adjustment, remove plastic covers (5, 7, 14, and 16, figure 2-61) or (4, 10, and 12, figure 2-62) as applicable. Inspect latch linkage for cause of discrepancy.

2-134. CLEANING – CREW DOORS.

a. Clean transparent acrylic plastic windows. Refer to paragraph 2-142.

b. Clean crew door frames in same manner as canopy frames. Refer to paragraph 2-142.

2-135. REPAIR – CREW DOORS.

a. Repair small cracks in metal frame by stop drilling. Also, repair with sheet metal and rivets or spotwelds.

b. Replace door if frame is distorted so that it affects opening and closing the door.

c. Replace worn or corroded hinges.

d. Replace stripped and missing nut plates.

e. Polish out corrosion not severe enough to affect function. Use 300 grit sandpaper (C102). Apply primer (C88 or C91) touch-up paint to match existing finish Refer to TB746-93-2 for paint instructions

f. Replace damaged or missing grommets (19, figure 2-61). There is one grommet (19) behind plastic cover (7) and one grommet behind plastic cover (14). There is one similar grommet on the gunner door.

g. Replace defective lock cylinders (40, figure 2-61) and similar lock cylinder on gunner door.

h. Replace broken plastic covers (5, 7, 14 and 16, figure 2-61) and (4, 10, and 12, figure 2-62).

i. Replace cracked or crazed acrylic plastic transparent windows in doors.

j. Polish out cracks or nicks in acrylic plastic transparent windows in doors provided that length of damaged area does not exceed 0.5 inch and depth of polished area does not exceed 0.025 inch. Use windshield maintenance kit (T85), acrylic plastic polishing kit (T86) and water.

k. Replace door if frame is cracked in area of hinge or latch.

l. Replace cracked or broken hinge that is not within limits. Refer to paragraph 2-133, step b.

m. Replace seal (48) if damaged.

2-136. ASSEMBLY – CREW DOORS.

a. Assemble pilot door. See figure 2-59 and 2-61.

WARNING

Ensure that both the pilot and gunner arming/firing mechanism handles are secured with safety pins prior to entry into the cockpit area.

NOTE

It is recommended that door be removed from helicopter for assembly if intensive disassembly has been accomplished. Refer to paragraph 2-131.

(1) Position toggle (35, figure 2-61) on bellcrank (46) in position shown. Install bolt (28) with standard aluminum washer (32), corrosion resistant steel washer (33) and standard aluminum washer (34) in position shown. Install nut (37) with thin aluminum washer (36). Install nut fingertight and check that toggle will move freely on bolt. Install cotter pin (38).

(2) Position handle (41) on door frame and install two screws (42).

(3) Position toggle (35) and bellcrank (46) in handle (41) with handle pointing aft as shown.

(4) Position spacer assembly (47) on bellcrank (46). Secure spacer assembly to door frame (4) with one screw (23) at the top and one similar screw at the bottom.

CAUTION

Spring (12) applies a strong force to spacer assembly (47) when the spring is installed. Ensure that screw (23) and a similar screw at the bottom of the spacer assembly are installed at all times when spring (12) is installed.

(5) Ensure that grommet (19) is in place and install rod assembly (8) through guide (3). Secure to bellcrank with pin (31), washer (30) and cotter pin (29). Install rod assemblies (10) and (15) in a similar manner.

(6) Install spring (12) on clip (13) and toggle (35). Operate handle (41) and check operation. There should be no binding of linkage. Spring (12) should return handle to horizontal position.

(7) Position door (11) on door frame (4) and install one screw (26) and sixteen screws (22).

(8) Install handle (25) on bellcrank (46), handle pointing forward as illustrated, with adhesive (C11) applied to that surface of the handle that engages with bellcrank shaft. Install pin (24). Cure adhesive per manufacturer's package instructions.

(9) Install plastic covers (5, 7, 14 and 16) with three screws each.

(10) Check operation of handle and latch linkage as outlined in step (6).

(11) Replace seal (48) if damaged.

b. Assemble gunner door as follows:

(12) Position gunner door (1, figure 2-62) on a padded work surface.

(2) Position toggle (14, figure 2-63) on bellcrank (28) in position shown. Install bolt (39) with standard aluminum washer (27), corrosion resistant steel washer (26) and standard aluminum washer (25) in position shown. Install nut (22) with thin aluminum washer (23). Install nut fingertight and check that toggle will move freely on bolt. Install cotter pin (21).

(3) Position handle (19, figure 2-63) on door frame (8) and install two screws (18).

(4) Position assembled toggle (14) and bellcrank (28) in handle (19) with handle pointing aft as shown.

(5) Position spacer assembly (32) on bellcrank (28). Secure spacer assembly (32) to door frame (8) with one screw (4) at the top and one similar screw at the bottom.

CAUTION

Spring (9) applies a strong force to spacer assembly (32) when the spring is installed. Ensure that screw (4) and a similar screw at the bottom of the spacer assembly are installed at all times when spring (9) is installed.

(6) Ensure that grommet (34) is in place. Install rod assembly (35) through guide (36). Secure rod to bellcrank with pin (31), washer (37), and cotter pin (38). Install rods (13) and (30) in the same manner.

(7) Install spring (9) on clip (10) and toggle (14). Operate handle (19) and check operation of latch mechanism. There should be no binding and spring (9) should return handle to horizontal position.

(8) Position door (6) on door frame (8) and install sixteen screws (5) and one screw (3).

(9) Install handle (1) on bellcrank (28), handle pointing forward as illustrated, with silicone adhesive (C11) applied to that surface of the handle that engages with bellcrank shaft. Install pin (2). Cure adhesive per manufacturer's package instructions.

(10) Install plastic covers (4, 10, and 12, figure 2-62) with three screws each.

(11) Replace seal (40, figure 2-63) if damaged.

2-137. INSTALLATION – CREW DOORS.

WARNING

Ensure that both the pilot and gunner arming/firing mechanism handles are secured with safety pins prior to entry into the cockpit area.

a. Install pilot door. See figure 2-59.

(1) Position door (1) on helicopter. Support the door in the open position, align hinge halves and install hinge pin (10).

(2) Align the socket on lower end of gas spring (3) with ball stud fitting (22). The socket on the end of the gas spring should slide on the ball stud fitting when moderate force is applied. Install safety clip (23).

(3) Close the door and check for 0.250 inch dimension at strikers (14) and (17). See sectional views B-B and D-D. Adjust thickness of shims (12) and/or (19) if required.

(4) Operate door handle (5) and check door latch rods (13) and (18) to ensure that they fully engage strikers and that the door latch mechanism operates smoothly.

(5) Lock and unlock cylinder (4) to ensure that operation is satisfactory.

b. Install gunner door. See figure 2-60.

(1) Position door (1) on helicopter. Support the door in the open position. align hinge halves and install hinge pin (20).

(2) Align the socket on lower end of gas spring (3) with ball stud fittings (24). The socket on the end of the gas spring should slide on the ball stud fitting when moderate force is applied. Install safety clip (25).

(3) Close the door and check for 0.250 inch dimension at strikers (9) and (15). See sectional views B-B and D-D. Adjust thickness of shim (10) and/or position of aft striker plate (14) if required.

(4) Operate door handle (4) and check door latch rods (8) and (17) to ensure that they fully engage strikers and that the door latch mechanism operates smoothly.

(5) Lock and unlock lock cylinder (7) to ensure that operation is satisfactory.

2-138. ADJUSTMENT – CREW DOORS.

Refer to paragraph 2-137.

2-139. PAINTING – CREW DOORS.

Touch up paint to match original finish. Refer to TM 55-1500-345-23 for general painting instructions.

2-140. CANOPY AND CREW DOOR WINDOWS AND WINDSHIELDS.

2-141. DESCRIPTION – CANOPY AND CREW DOOR WINDOWS AND WINDSHIELDS.

See figure 2-64. The canopy and crew door windows and windshields are fabricated from acrylic plastic. Acrylic impregnated nylon fabric edging is bonded to the edges of window and windshield sections. The windows and windshields are secured in the door frames or canopy frames as applicable with screws.

2-142. CLEANING – CANOPY AND CREW DOOR WINDOWS AND WINDSHIELDS.

WARNING

Ensure that both the pilot and gunner arming/firing mechanism handles are secured with safety pins prior to entry into the cockpit area.

CAUTION

Do not use compounds that contain any abrasive material or solutions that contain chlorinated carbons. Avoid excessive scrubbing of plastic panels during washing operation.

a. Clean the transparent plastic windows with clear water. Free all caked dirt with fingers. Do not use sponges or coarse cloths. Rinse frequently with water while removing dirt.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation.Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

CAUTION

Do not use aliphatic naphtha Type 1 in or around cockpit. Use of this solvent can result in damage to acrylic, plastic.

b. Remove any grease or oil that remains on windows after washing as describer in step a., with aliphatic naphtha, Type II (C75) and repeat cleaning with cleaning compound as described in step a.

c. Allow surfaces to drip dry.

d. Polish out minor scratches which may interfere with pilot or gunner vision, Use windshield maintenance kit (T85), acrylic plastic polishing kit (T86) and water.

e. Apply rain repellant in accordance with directions on container.

2-143. INSPECTION – CANOPY AND CREW DOOR WINDOWS AND WINDSHIELDS.

a. Nicks, chips, and gouges. Allowed if not deeper than 0.050 and not larger than can be, enclosed with a 0.50 diameter circle after cleanup. If more then two such damage areas fall within a 3.04nch circle, the panel should be replaced.

b. Penetrating damage. A hole that can be cleaned up not to exceed 0.75 may be patched with a tapered plug if no other damage occurs within 3.0 inches.

c. Scratches. Up to 0.016 deep and not exceeding 1.0 inch in length allowed if no other damage occurs within 1.0 inch.

d. Inspect for bond separation between acrylic plastic and nylon fabric edging.

e. No defects or repairs are acceptable which impair vision of crew members.

2-144. REMOVAL – CANOPY AND CREW DOOR WINDOWS AND WINDSHIELDS.

WARNING

Ensure that both the pilot and gunner arming/firing mechanism handles are secured with safety pins prior to entry into the cockpit area.

a. Pilot window (10, figure 2-64) and gunner window (7) are equipped with explosive window cutting assemblies. The window cutting assemblies are retained by the window installation screws. Refer to Paragraph 17-6 for instructions to remove these two windows.

b. Remove fire and high air data subsystem boom.

c. Remove windshields and windows (1, 5, 8, 9 and 11).

NOTE

Procedure for removal of upper windshield (6) is given. Remove other windows and windshield in the same manner.

(1) Remove screws (4) around edge of upper windshield (5).

CAUTION

Do not exceed 250 degrees F (121 degrees C) or acrylic plastic may be damaged.

(2) Push upper windshield (5) out of canopy frame (6). If windshield (5) is difficult to remove, apply heat with heat lamp to soften sealant.

(3) Clean old sealant from canopy frames (6). If the same upper windshield is to be reinstalled, also dean sealant from the windshield. Use a sharp plastic scraper to remove old sealant.

(4) Refer to paragraph 13-104 for removal of rain removal thermal switch from lower windshield (1).

2-145. REPAIR — CANOPY AND CREW DOOR — WINDOWS AND WINDSHIELDS.

WARNING

Ensure that both the pilot and gunner arming/firng mechanism handles are secured with safety pins prior to entry Into the cockpit area.

a. Polish out minor scratches and nicks in windshields and windows. Use windshield maintenance kit (T85) and acrytic plastic polishing kit (T86).

b. Repair leaks at edges of windshields and windows by removing windshield or window and reinstalling with new sealant. Refer to paragraphs 2-144 and 2-146.

2-146. INSTALLATION – CANOPY AND CREW DOOR WINDOWS AND WINDSHIELDS

WARNING

Ensure that both the pilot and gunner arming/fitlng handles are secured with safety pins prior to entry Into the cockpit area.

a. Pilot window (10, figure 2-64) and gunner window (7) are equipped with explosive window cutting assemblies. The cutting assemblies are retained by the window installation screws. Refer to paragraph 17-8 for instructions to install windows.

b. Install windshields and windows (1, 5, 8, 9, and 11).

NOTE

Procedure for Installation of upper windshield (5) is given. Install other windows and wlndshield In the same manner.

(1) Ensure that each rivet nut and nut plate for windshield attaching screws (4) is securely installed and the threads are not damaged. Replace any damaged rivet nuts or nut plates.

(2) Ensure that there are no obstructions on the canopy frame (6) or the windshield (5) that would prevent a dose fit when the windshield is installed.

(3) tf a new windshield (5) is being installed, drill holes in windsheild for screws (4) to match holes in frame (6). Use hole finder to locate holes. Drill holes 0.203 to 0206 inches in diameter.

WARNING

Adhesive and sealants are flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of adhesive vapor and contact with skin, or eyes.

(4) Ensure that edgings (2) and (3) are securely bonded to upper windshield (5). If any small areas are not bonded, repair loose area with adhesive (C10). Mix two-part adhesive in accordance with instructions on container. Mask off acrylic plastic to avoid damage by contact with adhesive. Apply mixed adhesive to unbended area with a small squeegee. Clean up excess adhesive and remove masking. Allow adhesive to cure for 24 hours at room temperature.

WARNING

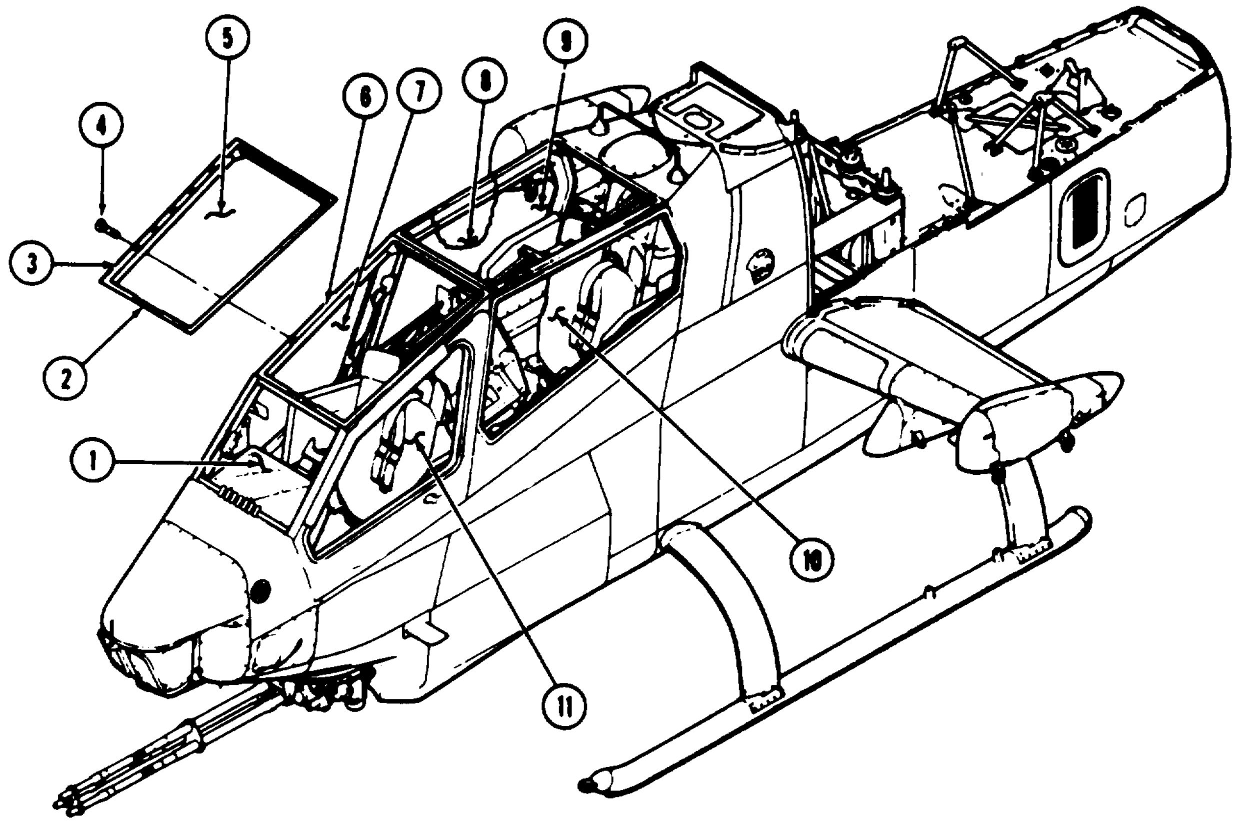
Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes

(5) Clean mating surfaces of frame (6) and upper windshield (5) with naphtha (C75) and clean cloths.

WARNING

Sealant is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

(6) Mix two-part sealant (C105), alternates are (C105.5), (C107), (C107.3), (C107.4). Use 10 parts of grey color base to one part white color accelerator by weight. Mix in a clean, non-absorbent container. Mix



1. Lower windshield
2. Nylon fabric edging (four circular sections 0.50 inch in diameter)
3. Nylon fabric strip edging
4. Screw
5. Upper windshield
6. Frame
7. Gunner window
8. Pilot door window
9. Canopy top
10. Pilot window
11. Gunner door window

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Figure. 2-64. Canopy Window and WIndshield – Installation the accelerator thoroughly in its container before mixing with the base material; then mix the two accelerators with the base material. Pot life of the mixed sealant is two hours.

(7) Apply a small bead of sealant prepared in preceding step to edge of frame (6) just outboard of holes for screws (4). The correct size bead of sealant will result in a slight amount of squeeze out when windshield is installed. Use a pressure gun to apply sealant if available.

(8) Position windshield (5) in frame (6) and install screws (4) finger tight. Use screws (4) of correct length for thread engagement with rivet nuts. Tighten screws (4) evenly. Clean excess sealant squeeze out with a sharp plastic scraper after sealant cures. It may take up to 14 days for sealant to cure.

(9) Refer to paragraph 13-105 for installation of rain removal thermal switch in lower windshield (1).

2-147. CANOPY FRAMES.

2-148. DESCRIPTION – CANOPY FRAMES.

The canopy frame assembly supports the pilot and gunner doors, windows, and windshields. The frames are constructed from aluminum alloy (figure 2-65).

2-149. REMOVAL – CANOPY FRAMES.

Canopy frames must be removed at the depot level maintenance activity.

2-150. INSPECTION – CANOPY FRAMES.

WARNING

Ensure that both the pilot end gunner arming/firing mechanism handles are secured with safety pins prior to entry into the cockpit area.

a . Inspect canopy frames for obvious damage such as distortion and cracks. Canopy frames with this type damage must be replaced.

b. Inspect canopy frames for nicks, dents, distortion and corrosion.

c. Inspect canopy frames for secure installation of windshields, windows, and doors.

d. If any windows or windshields have been removed from canopy frames, inspect exposed blind rivet nuts for secure installation and for damaged threads.

2-151. CLEANING – CANOPY FRAMES.

a. Clean canopy frames with biodegradable cleaner (C32), water, and clean cloths.

b. Remove all cleaner and water with clean dry cloths.

c. If any windows of windshields have been removed, clean old sealant from frames with sharp plastic scraper.

2-152. REPAIR – CANOPY FRAMES.

a. Replace damaged blind rivet nuts. Two types of blind rivet nuts are used. Refer to TM 55-1520-236-23P.

b. Touch-up damaged paint to match existing finish. Refer to TM 55-15ØØ-345-23.

2-153. INSTALLATION – CANOPY FRAMES.

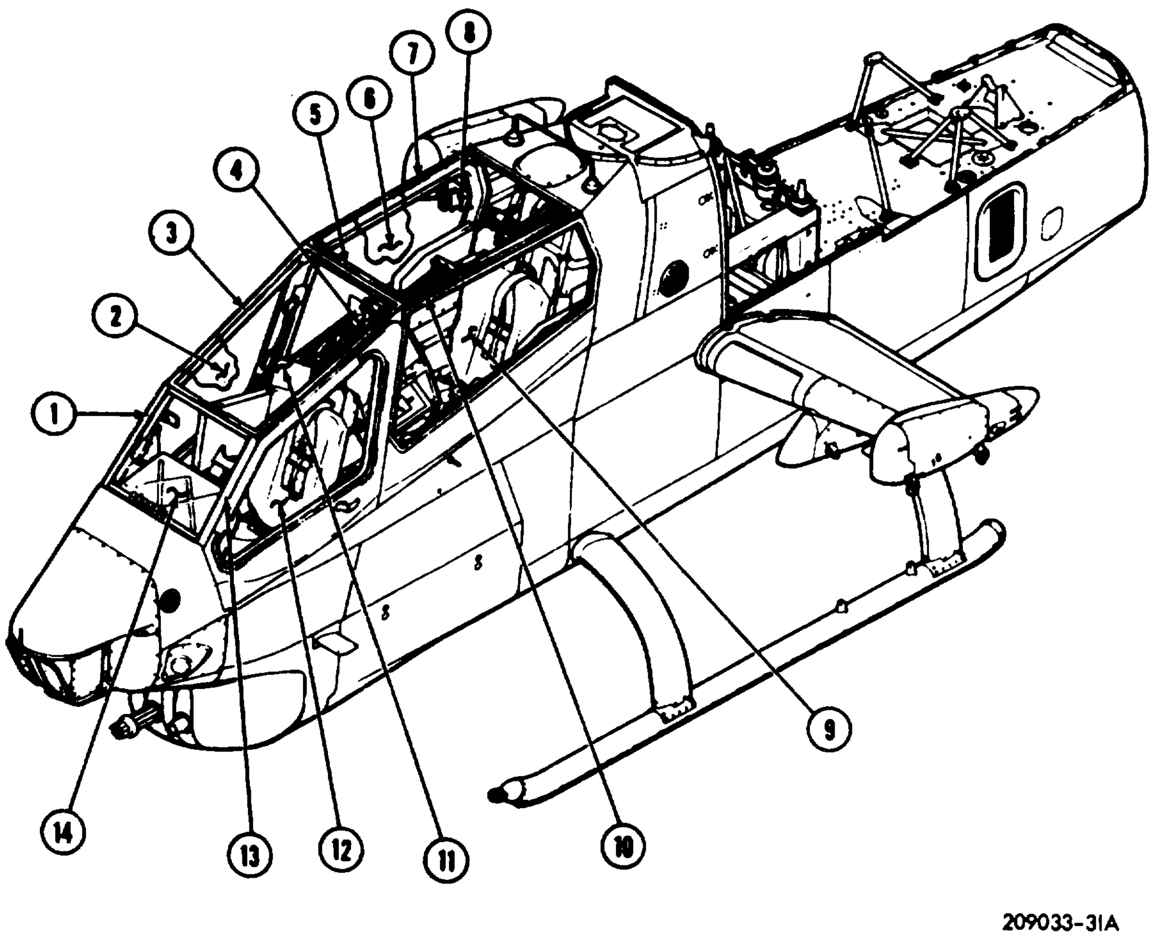
Canopy frames must be replaced at higher maintenance level.

2-154. PILOT AND GUNNER SEAT ASSEMBLIES.

2-155. DESCRIPTION – PILOT AND GUNNER SEAT ASSEMBLIES.

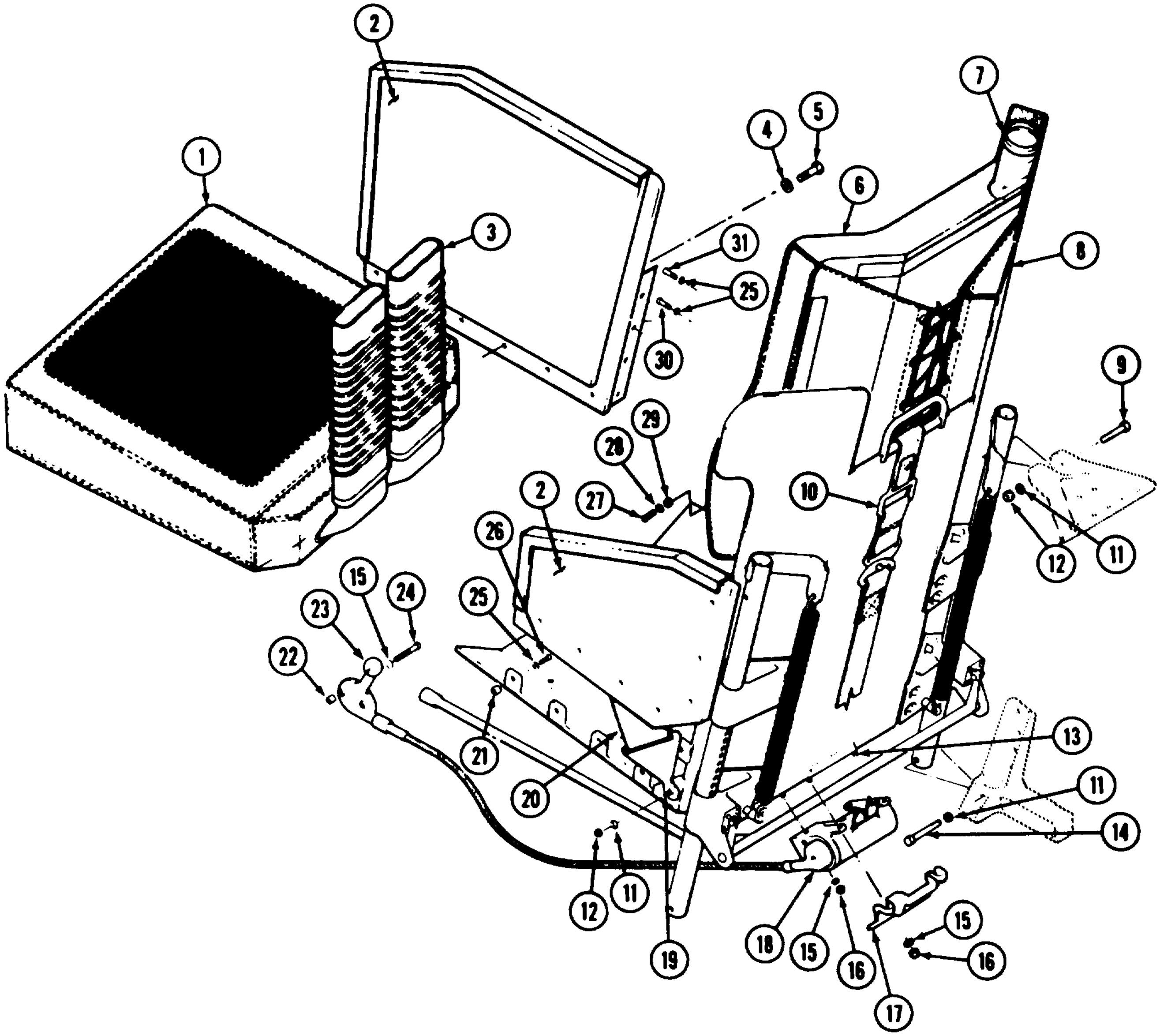
a. The pilot seat is one-piece, bucket-type seat mounted on two vertical tubes which hold it in place on the airframe structure and serve to make the seat adjustable vertically. See figure 2-66. The seat is constructed of armor steel with fittings for armor side panels.

b. The gunner seat is a two-piece, bucket type seat. The two major components are the back and the bottom. See figure 2-67. Construction is ceramic plate armor.



1. Forward frame
2. Gunners window
3. Forward upper frame
4. Forward upper frame
5. Top frame
6. Pilots door
7. Aft upper frame
8. Top canopy
9. Pilots window
10. Aft upper frame
11. Upper windshield
12. Gunners door
13. Forward frame
14. Lower windshield

Figure 2-65. Canopy Frame — Installation



1. Seat cushion
2. Side armor panel
3. Air ducts
4. Washer
5. Screw
6. Seat back cushion
7. Air inlet
8. Seat assembly
9. Bolt
10. Shoulder harness
11. Washer
12. Nut
13. Screw
14. Bolt
15. Washer
16. Nut
17. Cover, inertia reel
18. Inertia real
19. Bolt
20. Seat lap belt
21. Spacer
22. Spacer
23. Inertia real control
24. Screw
25. Washer
26. Screw
27. Bolt
28. Washer
29. Nut
30. Screw
31. Screw

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Figure 2-66. Pilot Seat – Installation

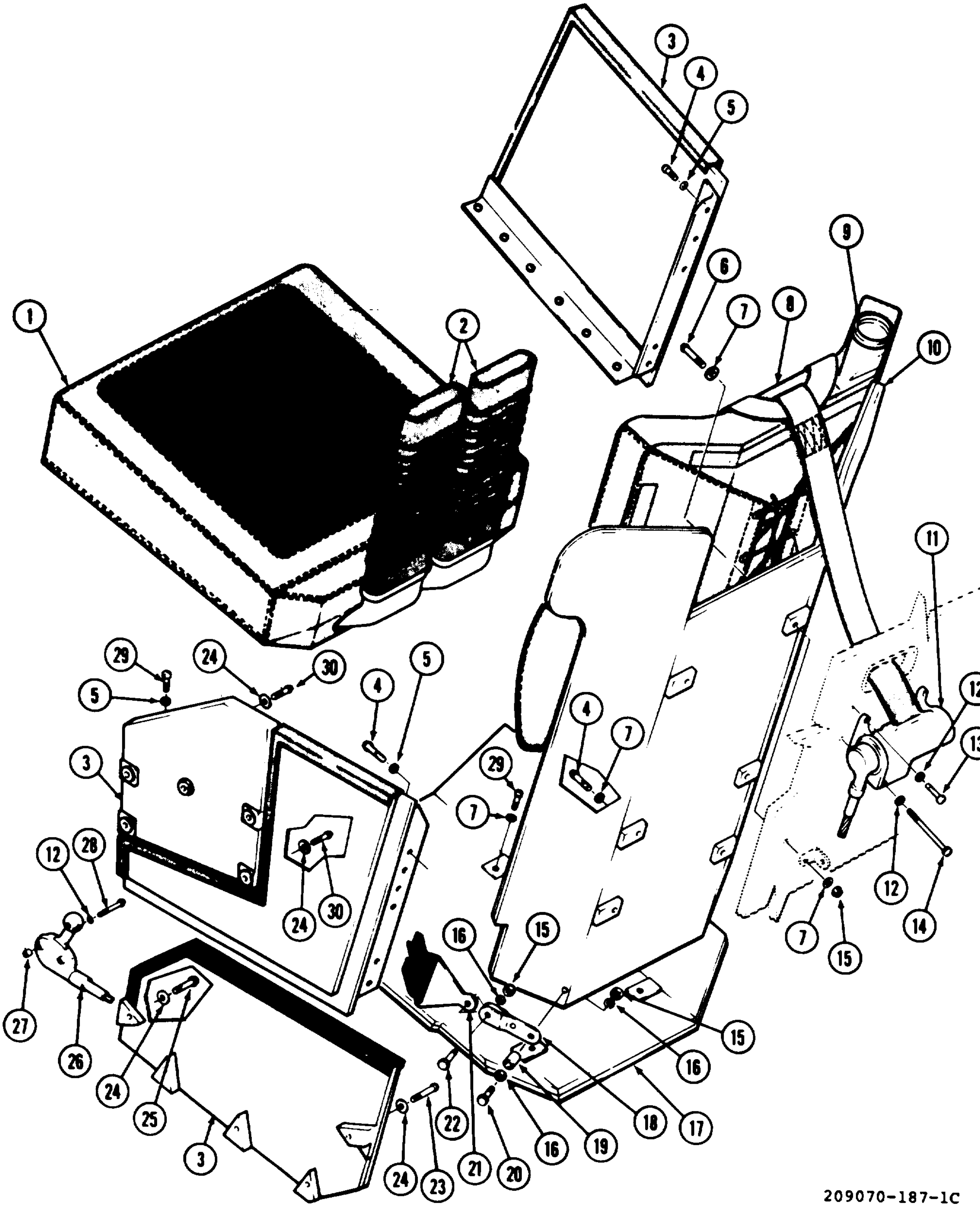


Figure 2-67. Gunner Seat – Installation (Sheet 1 of 2)

1. Seat cushion
2. Air ducts
3. Side armor panel
4. Screw
5. Washer
6. Screw
7. Washer
8. Seat back cushion
9. Air inlet
10. Seat back
11. Inertia real
12. Washer
13. Screw
14. Screw
15. Nut
16. Washer
17. Seat bottom panel
18. Attaching strap
19. Spacer
20. Bolt
21. Seat lap belt
22. Bolt
23. Screw
24. Washer
25. Screw
26. Inertia reel control
27. Spacer
28. Screw
29. Screw
30. Screw

209070-187-2C

Figure 2-67. Gunner Seat – Installation (Sheet 2 of 2)

2-156. REMOVAL – PILOT AND GUNNER SEAT ASSEMBLIES.

WARNING

Ensure that both pilot and gunner arming/firing mechanism handles are secured by safety pins prior to entry into the cockpit area.

a. Remove pilot seat from cockpit.

(1) Loosen clamp and disconnect air distribution duct from duct cushion air inlet (7, figure 2-66).

(2) Remove seat back cushion (6) and air ducts (3).

(3) Remove seat cushion (1).

CAUTION

Handle side armor panels and seat with care; ceramic tile is easily broken.

(4) Remove side armor panels (2) by removing screws (5, 26, 30, and 31), washers (4 and 25), and spacers (21).

(5) Detach inertia reel control (23) from side of cockpit by removing screws (24), washers (15), and spacer (22).

(6) Remove bolts (9 and 14), washers (11), and nuts (12). Remove seat assembly from helicoter.

(7) Remove nuts (12), washers (11), and bolts (19) and remove seat lap belt (20).

(8) Detach shoulder harness (10) from inertia reel strap by removing nut (29), washer (28), and bolt (27).

(9) Remove four nuts (16), washers (15), and screws (13) attaching inertia reel (18) and cover (17). Remove cover and inertia reel.

b. Remove gunner seat from cockpit.

(1) Loosen clamp and disconnect air distribution duct from air inlet (9, figure 2-67).

(2) Remove seat cushion (1) and air ducts (2).

(3) Remove seat back cushion (8).

CAUTION

Handle armor panels and seat with care; ceramic tile is easily cracked.

(4) Remove side armor panels (3) by removing screws (4, 23, 25, 29, and 30) and washers (5 and 24).

(5) Remove six screws (6) and washers (7) which attach seat back (10) to bulkhead and remove seat back.

(6) Remove screws (28), washers (12) and spacers (27) which attach inertia red control (26) to side of cockpit. Loosen knurled nut and disconnect control cable from handle.

(7) Remove four screws (13 and 14) and washers (12). Work shoulder harness back through bulkhead and remove inertia reel (11) from helicopter.

(8) Remove bolts (22), washers (16) and nuts (15) which attach seat lap belt (21) to attaching strap (18). Remove seat lap belt from helicopter.

CAUTION

Handle side armor panels and seat with care; ceramic tile is easily broken.

(9) Remove screws (29) and washers (7)which attach seat bottom panel (17) to structure. Remove seat bottom panel from helicopter.

2-157. INSPECTION – PILOT AND GUNNER SEAT ASSEMBLIES.

a. Inspection. Inspect installed pilots seat for the following defects:

(1) Refer to paragraph 2-178 for inspection procedure for side armor panels (2 figure 2-66) and armor seat (2, figure 2-68).

(2) Cracks. No cracks allowed.

(3) Secure mounting of the seat in the helicopter and secure installation of the inertia reel and armor panels.

(4) Seat cushion and back cushion for wear and damage. Sun fading is not cause for rejection. Wear and damage that affect comfort must be corrected by repair or replacement.

(5) Check seat vertical adjustment, ease of operation, and secure locking in various height positions.

b. Inspection. Inspect installed gunner seat for the following defects.

(1) Refer to paragraph 2-175 for inspection procedure for side armor panels (3, figure 2-67), seat back (10) and seat bottom panel (17).

(2) Seat cushion (1) and back cushion (8) for wear and damage. Use same procedure described for pilot seat cushions.

(3) Secure mounting of the seat in the helicopter and secure installation of the inertia real and armor panels.

c. Inspect disassembled pilot seat assembly as follows: See figure 2-68.

(1) Inspect upper guide fittings (4) and lower guide fittings (7) by fluorescent penatrant method. Refer to TM 43-0103.

(2) Inspect handle assembly (1), support tubes (3), latch springs (9), return spring (5), and latch pins (10) by magnetic particle method. Refer to TM 43-0103.

(3) Inspect seat netting for tears, cuts and holes. Damage greater than one inch in length or diameter is not repairable. Temporary repairs can be made to damage less than one inch in length or diameter.

(4) Inspect seat netting for deterioration and discoloration which indicate a decrease in strength. If integrity of netting is doubtful, the netting must be replaced.

2-158. DISASSEMBLY – PILOT AND GUNNER SEAT ASSEMBLIES.

a . Disassemble pilot seat.

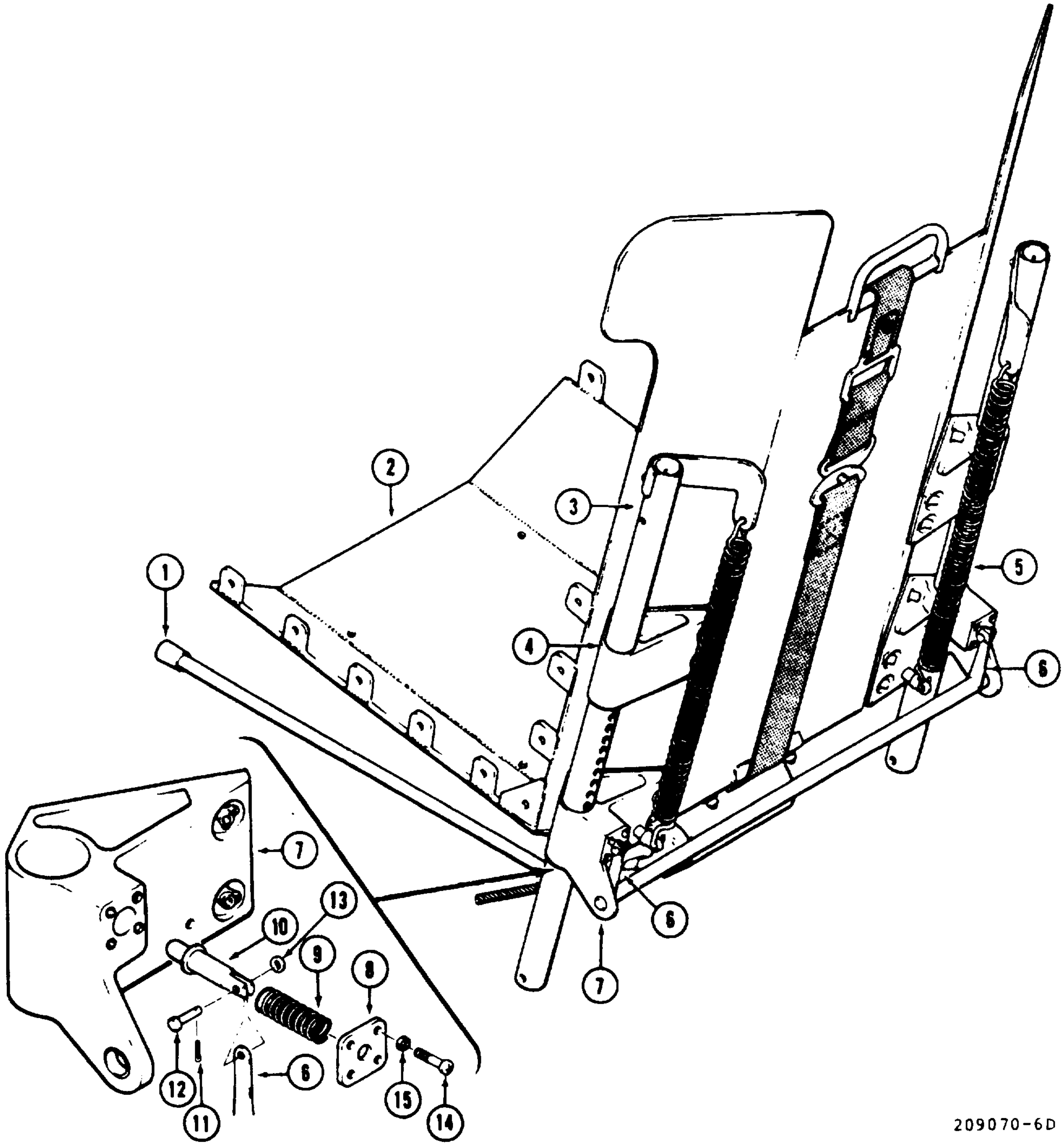
(1) Adjust the pilot seat to “UP” position on support tubes (3, figure 2-68). Remove two return springs (5).

(2) Pull upon handle (1) to withdraw latch pins (10) from support tubas (3). Pull upward on support tubas (3) and removal them from finings (4 and 7).

(3) Disconnect handle levers (6) from latch pins (10) by removing cotter pins (11), washers (13), and pins (12) at latch side of seat.

(4) Remove screwa (14), washers (16) and retainer plates (8) from lower fittings (7) and remove latch pins (10) and latch springs (9).

(5) Remove two upper faiings (4) and lower fittings (7) from seat (2).



1. Handle assembly
2. Seat assembly
3. Support tubes
4. Fittings (upper)
5. Return spring (2)
6. Levers (handles)
7. Fittings (lower)
8. Retainer plate
9. Latch spring
10. Latch pin
11. Cotter pin
12. Pin
13. Washer
14. Screw
15. Washer

Figure 28. Pilot Seat — Assembly

b. Disassemble gunner seat. The gunner seat is disassembled during removal (paragraph 2-156).

2-159. REPAIR — PILOT AND GUNNER SEAT ASSEMBLIES. Refer to TM 1-1500-204-23 (Series).

2-160. ASSEMBLY — PILOT AND GUNNER SEAT ASSEMBLIES.

a. Assemble pilot seat.

(1) Position handle assembly (1, figure 2-68) in place of each lower fitting (7).

(2) Install lower fittings (7) on seat assembly (2).

(3) Install upper fittings (4) on seat assembly.

(4) Install a latch pin (10) and latch spring (9) in each lower fitting (7). Install retainer plates (8) to secure latch pins and springs.

(5) Connect latch pins (10) to levers (6) of handle assembly (1) with clevis pins, washers, wand cotter keys.

(6) Install support tubes (3) down through upper fittings (4) and lower fittings (7). Hold handle (1) in UP position to permit passage of support tubes through lower fit tings (7).

(7) Install return springs (5).

b. Assemble gunner seat. The gunner seat is assembled during installation in the helicopter (paragraph 2-161).

2-161. INSTALLATION — PILOT AND GUNNER SEAT ASSEMBLIES.

WARNING

Before performing any maintenance in or near the cockpit area, ensure that both pilot and gunner arming/iring mechanism handles are secured by safety pins.

CAUTION

The pilot's and gunner's shoulder harness inertia reels are not interchangeable.

a. Install pilot seat assembly,

(1) Position inertia reel (18, figure 2-66) and cover (17) on back of seat assembly (8). Install screws (13), washers (15), and nuts (16) with heads of screws on inside of seat bucket.

(2) Thread shoulder harness (10) through guide at top of seat assembly (8). Attach inertia reel strap with bolt head facing seat back.

(3) Install seat lap belt (20) with bolts (19), washers (11), and nuts (12). Install belt half with lock on left side, install bolts (19) with bolt heads on inside of seat bucket

(4) Position seat assembly (2, figure 2.68) in helicopter. Fit support tubes (3) into fittings (4 and 7). Route inertia reel cable inboard of left support tuba as illustrated on figure 2-66. Install seat attaching bolts (9 and 14. figure 2-66), washers (11), and nuts (12).

(5) Tighten knurled nut on inertia reel control (23). Position inertia reel control (23) on side of cockpit and secure with spacers (22), washers (15), and screws (24). Lockwire knurled nut with lockwire (C137).

(6) Install seat (1), air ducts (3), and seat back cushion (6).

(7) Position air distribution duct on air inlet (7). Tighten clamp to secure duct.

(8) Install side armor panels (2) with screws (5, 26, 30, and 31), washers (4 and 25), and spacers (21).

b. Install gunner seat assembly.

(1) Position seat bottom panel (17, figure 2-67) in cockpit and secure with screws (29) and washers (1).

(2) Position seat back (10) in cockpit and secure with bolts (4) and washers (7).

(3) Work shoulder harness through bulkhead. Position inertia reel (11) on bulkhead. Secure with screws (13 and 14) and washers (12). Place one washer (12) under each screw head and one washer (12) under each inertia reel (11) attachment lug.

(4) Route inertia reel control cable along left side of seat and connect to inertia reel control (26). Tighten knurled nut and position inertia reel control (26) on beam. Install screws (28), washers (12) and spacers (27). Lockwire knurled nut with lockwire (C137).

(5) Attach seat lap belt (21) to attaching strap (18) with bolts) 22), washers (16), and nuts (15).

(6) Connect air ducts (2) on seat cushions (1) and install cushion.

(7) Connect air ducts (2) to seat back cushion (8) and install cushion.

(8) Position air distribution duct on air inlet (9) and tighten clamp to secure duct.

(9) Install side armor panels (3) with swcrew (4, 6, 23, 25, 30) and washers (5, 7, and 24).

2-162. ADJUSTMENT – PILOT AND GUNNER SEAT ASSEMBLIES.

a. Adjust pilot and gunner inertia reel and control to make sure the inertia reel will lock, unlock and rewind as applicable.

b. Perform funcitonal check of pilot seat vertical adjustment to make sure pilot seat will lock in all vertical positions, up and down.

c. The gunner seat is non-adjustable and has no functional check.

2-163. SHOULDER HARNESS AND INERTIA REEL.

2-164. DESCRIPTION – SHOULDER HARNESS AND INERTIA REEL.

The pilot and gunner shoulder harness serves to prevent injury and restrain their movement during helicopter operations. The inertia reel controls the shoulder harness through cable connections between the harness and the reel. The pilot and gunner can select "Lock" or "Auto" with their individual controls.

2-165. REMOVAL – SHOULDER HARNESS AND INERTIA REELS.

2-166. INSPECTION – SHOULDER HARNESS AND INERTIA REEL.

CAUTION

The pilots and gunners shoulder harness webbing adjusters are not the same. The pilots shoulder harness webbing adjuster includes a spring for proper operation. The gunners shoulder harness webbing adjuster does not require this spring. If the spring is installed, remove it prior to the next flight.

a. Inspect pilot and gunner shoulder harness and inertia reel strap for tears, fraying, wear, and general condition.

b. Refer to TM 55-1500-204-25/1. See figures 2-66 and 2-67.

c. Inspect pilot inertia reel (18, figure 2-66) and control (23). (Refer to TM 55-1500-204-25/1.)

(1) Place control (23) in "Lock" position and pull on shoulder harness; the inertia reel should hold the shoulder harness and not extend. Inertia reels that will not lock are not acceptable.

(2) Place control (23) in "Auto" position and pull on shoulder harness. The inertia reel should permit the shoulder harness to be pulled out

against spring tension and should rewind when pressure is decreased. Sharply pull shoulder harness exerting a two to three G force to check locking mechanism. When pulling pressure is decreased, harness should rewind in inertia reel. Locking mechanism will not release until auto locking mechanism is cycled through full travel. Cycle control handle to release auto locking mechanism. Inertia reels that will not operate as described in this paragraph are not acceptable.

(3) Inspect inertia reel strap for wear, fraying, and general condition.

(4) Inspect inertia reel (18) and control (23) for secure mounting and damage.

(5) Inspect cable between inertia reel (18) and control (23) visually for fraying and damage.

(6) Inspect gunner Inertia reel and control in similar manner See figure 2-67.

2-167. REPAIR – SHOULDER HARNESS AND INERTIA REEL.

a. Replace inertia reel that fails to pass functional check.

b. Replace worn inertia reel strap.

(1) Move inertia reel control handle to “Auto” position and pull out slowly on strap assembly until web retaining insert is visible through lower slot in reel housing.

CAUTION

If reel is inadvertently released while strap is removed, replace entire real assembly.

(2) Move control handle to LOCK position.

(3) Remove web retaining insert and withdraw strap from reel.

(4) Insert end of new strap through upper slot in reel housing and through slot in main shaft until end of strap protrudes through lower slot in real housing. Install web retaining insert. Pull upward on strap with at least six pounds force and hold. Move control handle to AUTO position and allow strap to rewind.

c. Replace inertia reel and/or control if cable is frayed or if the components have incurred damage that may affect function.

d. Refer to TM 55-1500-204-25/1 for repair procedures for pilot and gunner shoulder harness.

2-168. INSTALLATION – SHOULDER HARNESS AND INERTIA REEL.

Refer to paragraph 2-161 as applicable for installation and functional check instructions.

2-169. SEAT BELTS.

2-170. DESCRIPTION – SEAT BELTS.

The pilot and gunner seat lap belts are secure to the sides of the seats. The belts serve to restrain movement of the crew during helicopter operations.

2-171. REMOVAL – SEAT BELTS.

Refer to paragraph 2-156 as applicable.

2-172. INSPECTION – SEAT BELTS.

a. Inspect pilot and gunner seat lap belts for fraying, wear, tears, and general condition.

b. Refer to TM 55-1500-204-25-1/1.

2-173. REPAIR – SEAT BELTS.

Refer to TM 55-1500-204-25/1 for repair procedures for pilot and gunner seat belts.

2-174. INSTALLATION – SEAT BELTS.

Refer to paragraph 2-161 as applicable.

2-175. ARMOR PANELS.

2-176. DESCRIPTION – ARMOR PANELS.

The crew and engine are protected against hostile arms fire by ceramic-plastic armor panels. The pilot and gunner seats have armor installed on sides, back, and bottom. The engine compartment has armor installed at station 195 to protect the fuel control.

2-177. REMOVAL – ARMOR PANELS.

a. Refer to paragraph 2-156 for removal of armor panels at pilot and gunner seats. See figure 2-66 and 2-67.

b. Open engine cowling and remove engine armor assembly on left and right side. See figure 2-69.

2-178. INSPECTION – ARMOR PANELS.

a. Inspect armor installations on pilot and gunner seats and engine cowl for damaged brackets and cracks.

b. Inspect armor panels for the following defects:

(1) Damage caused by a ballistic projectile. Panels with this type damage are not reparable and must be replaced.

(2) Damage that results in loose nylon cloth shield and/or neoprene rubber edge moulding. Mark loose areas for rebonding.

(3) Damage that results in delamination is not reparable.

(4) Damage to threads in threaded inserts, loose bonding of threaded inserts to panel and missing threaded inserts.

(5) Damage to armor panel attaching brackets. Minor damage is reparable.

(6) Refer to TM 55-1500-204-25/1 for additional inspection criteria if required.

2-179. REPAIR – ARMOR PANELS.

WARNING

Adhesive is flammable and toxic. Provide adequate ventilation when mixing and using. Avoid prolonged breathing of vapors and contact with skin or ayes.

a. Rebond loose nylon cloth shield or neoprene rubber edge moulding with adhesive (C17).

b. Repair threaded fasteners with slightly damaged threads by cleaning up threads with a tap. Replace the threaded fastener with a new fastener if thread damage is severe. Refer to step d. for bonding procedure.

c. Repair a loose threaded insert by rebonding. Drill two small holes in the backing at an angle down to bottom of threaded insert and clean out holes. Place masking tape over the two small holes and the threaded hole in the insert to keep adhesive out of the threads. use a sharp pointed tool to open holes through the masking tape at the two drilled holes. Inject adhesive (C8) into one hole with a syringe. Continue injecting adhesive until it is forced from the second hole. Allow to cure for 24 hours.

WARNING

Adhesive is flammable and toxic. Provide adequate ventilation when mixing and using. Avoid prolonged breating of adhesive vapors and contact with skin or eyes.

d. Replace threaded fastener with faulty threads or one that is very loose in the panel. Drill out the old fastener carefully to avoid damage to the panel. Clean out the hole and bond a new fastener in the panel in the same manner outlined in the preceding step.

e. Repair cracked or distorted armor panel attaching brackets with standard metalworking procedures if practical. Replace brackets that are not reparable.

2-180. INSTALLATION – ARMOR PANELS.

a. Refer to paragraph 2-161 for installation of armor panels at pilot and gunner seats.

b. Open engine cowling. Install armor panels left and right as shown in figure 2-69.

NOTE

Temporary removal of armor panels: All crew and engine armor may be removed in non-combat areas at the discretion of the unit commander. If armor is removed, comply with the fallowing requirements.

Identify armor panels for installation and retain as flyaway equipment in a safe storage area where it is readily available.

Reinstall armor prior to transfer of helicopter.

NOTE

Make entries in helicopter weighing record and chart C, basic weight and balance record, when armor is removed and again when it is reinstalled.

2-181. SOUNDPROOFING BLANKET.

2-182. DESCRIPTION – SOUNDPROOFING BLANKET.

A soundproofing blanket assembly is installed behind the pilot station to reduce the noise level during flight operations. The blanket is made from flame resistant quilted material and bound with cloth tape.

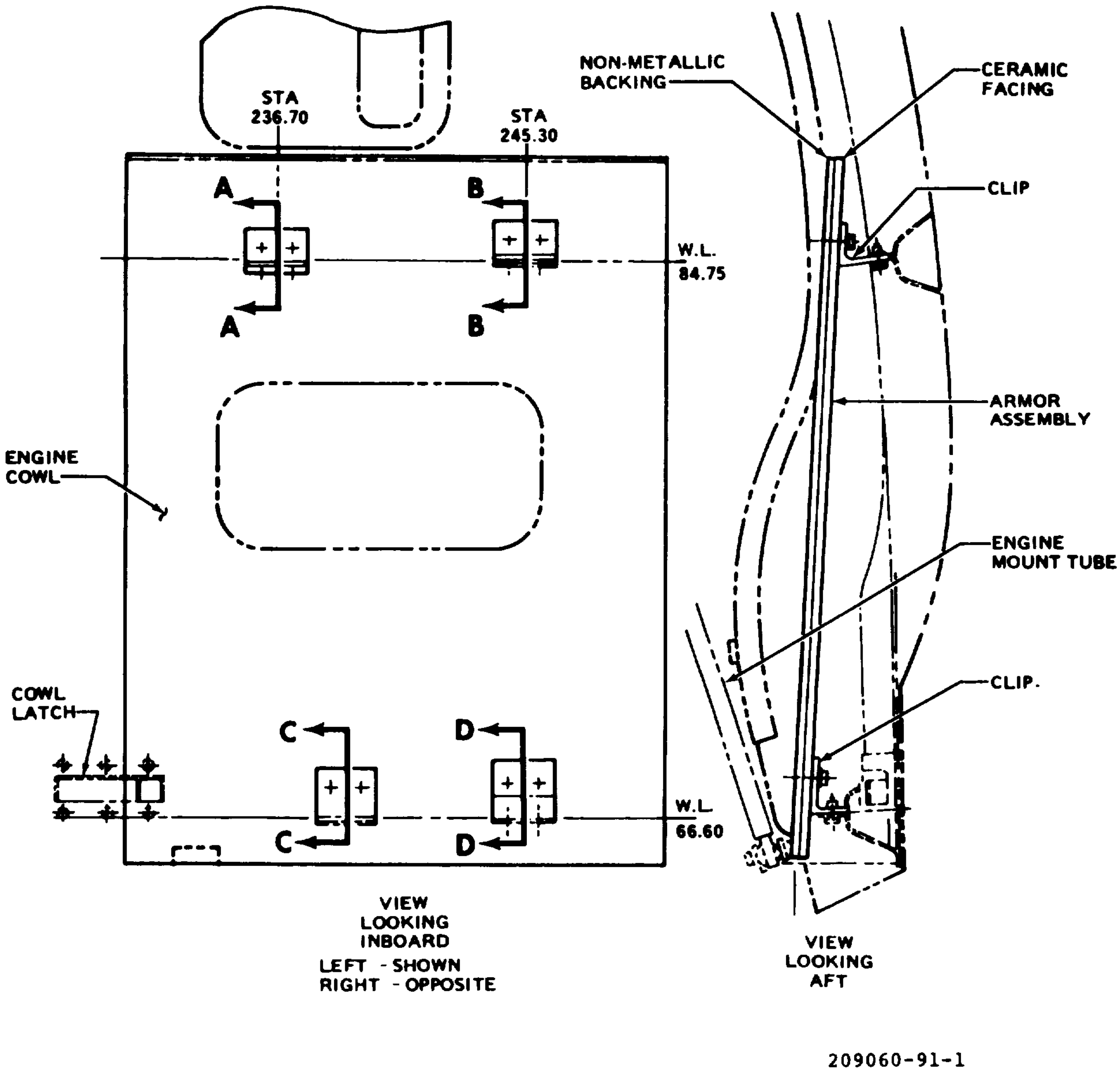
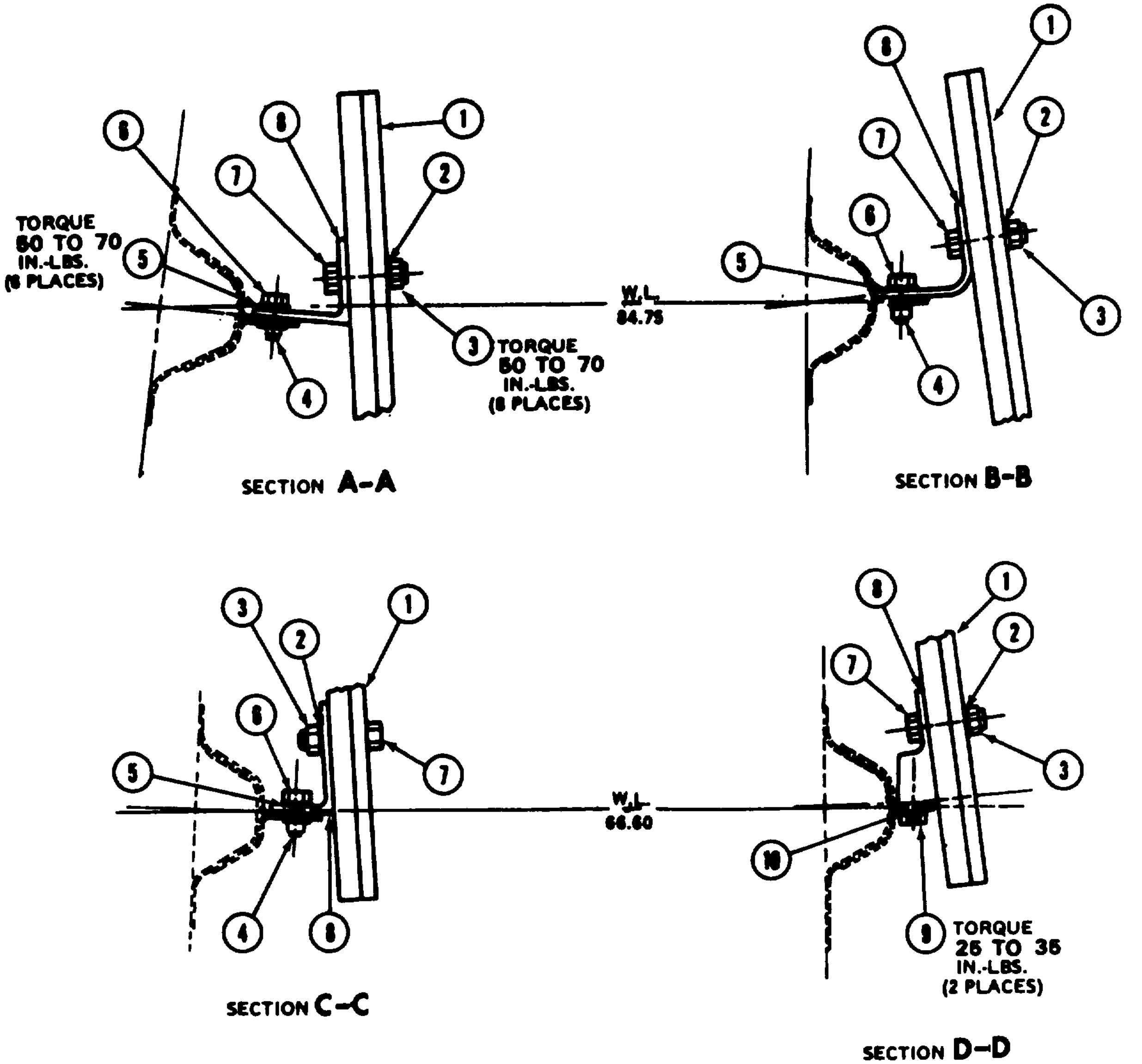


Figure 2-69. Engine Armor – Installation (Sheet 1 of 2)



1. Armor assembly
2. Washer (2 required)
3. Nut (2 required)
4. Nutplate
5. Washer (2 required)
6. Bolt (2 required)
7. Bolt (2 required)
8. Clip
9. Bolt (2 required)
10. Washer (2 required)

Install lockwire (C137) between heads of bolts (9). TORQUE BOLTS 25 TO 35 INCH-POUNDS.

Figure 2-69. Engine Armor - Installation (Sheet 2 of 2)

2-183. REMOVAL – SOUNDPROOFING BLANKET.

WARNING

Ensure that both the pilot and gunner arming/firng mechanism handles are secured with safety pins prior to entry into the cockpit area.

a. P Remove first aid kit, survival kit and storage net. Remove control box (SCAS pylon compensator unit). Refer to TM 11-1520-236-20.

b. E Remove first aid kit, survival kit and storage net.

c. M Remove survival kit, storage net and ADS unit (air data system). Refer to TM 11-1520-236-20.

d. Release hook and pile fasteners and remove soundproofing blanket.

2-184. INSPECTION – SOUNDPROOFING BLANKET.

Inspect blanket for minor tears, loose or missing tape or fasteners, and security of installation.

2-185. REPAIR – SOUNDPROOFING BLANKET.

Refer to TM 55-1500-204-25/1 for instructions for minor repairs to soundproofing blanket.

2-186. INSTALLATION – SOUNDPROOFING BLANKET.

WARNING

Ensure that both the pilot and gunner arming/firing mechanism handles are secured with safety pins prior to entry into the cockpit area.

a. Position the soundproofing blanket (figure 2-70) assembly behind the pilot station and fasten the hook and pile fasteners.

b. P Install storage net, survival kit and first aid kit. Install control box (SCAS pylon compensator unit). Refer to TM 11-1520-236-20, Chapter 2.

c. E Install first aid kit, survival kit, and storage net.

d. M Install storage net, survival kit and ADS unit (air data system). Refer to TM 11-1520-236-20, Chapter 2.

2-186.1. WIRE STRIKE PROTECTION SYSTEM.

2-186.2. DESCRIPTION – WIRE STRIKE PROTECTION SYSTEM.

The wire strike protection system consists of three cutters and two deflection devices. See figure 2-70.1 for view of system. A deflector is mounted on the nose of the helicopter. A channel with a sawtooth insert is mounted on the right forward windshield post. A wire cutter is mounted on a honeycomb panel and secured on the aft end of the pilot overhead window. A second wire cutter is mounted on the access door below the turret sight unit, and forward of the turret. The third wire cutter is mounted on the access door below the ammunition compartment.

2-186.3. REMOVAL – WIRE STRIKE CUTTER (UPPER).

a. Remove screws (4, 29, and 30, figure 2-70.1), and remove cutter (2) and panel (1) as a unit.

b. Remove attaching screws (3 and 35), and remove cutter from panel.

2-186.4. INSPECTION – WIRE STRIKE CUTTER (UPPER).

a. Inspect cutter for bends, cracks, nicks, alignment, and presence of protective sealant on blade.

b. Inspect panel for cracks, punctures, delamination, and pulled or loose inserts.

2-186.5. REPAIR – WIRE STRIKE CUTTER (UPPER).

a. Replace cutter blade using existing hardvvare, which shows evidence of wire strike. Recoat cutter blade with sealant (C105.2) that have protective sealant missing.

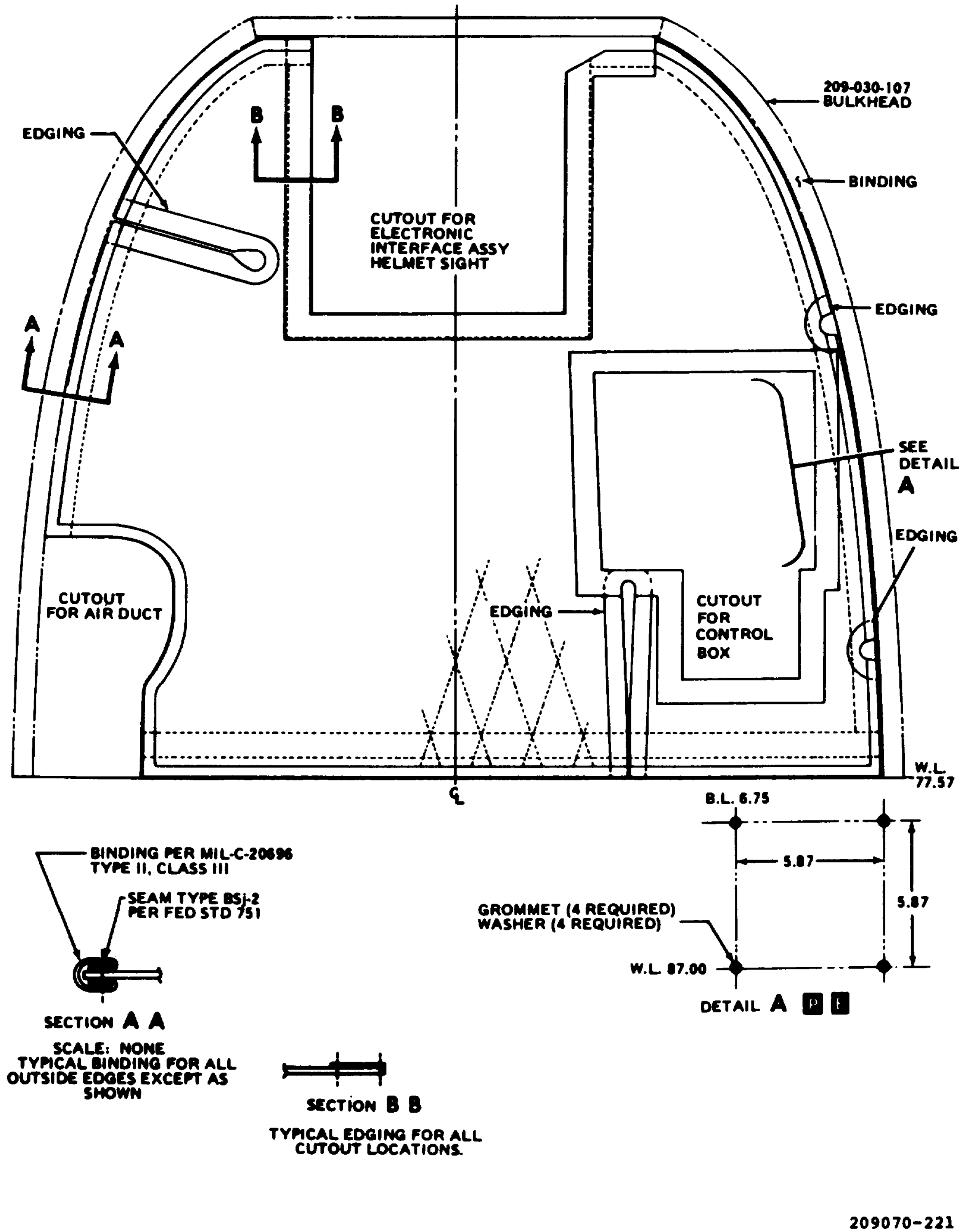
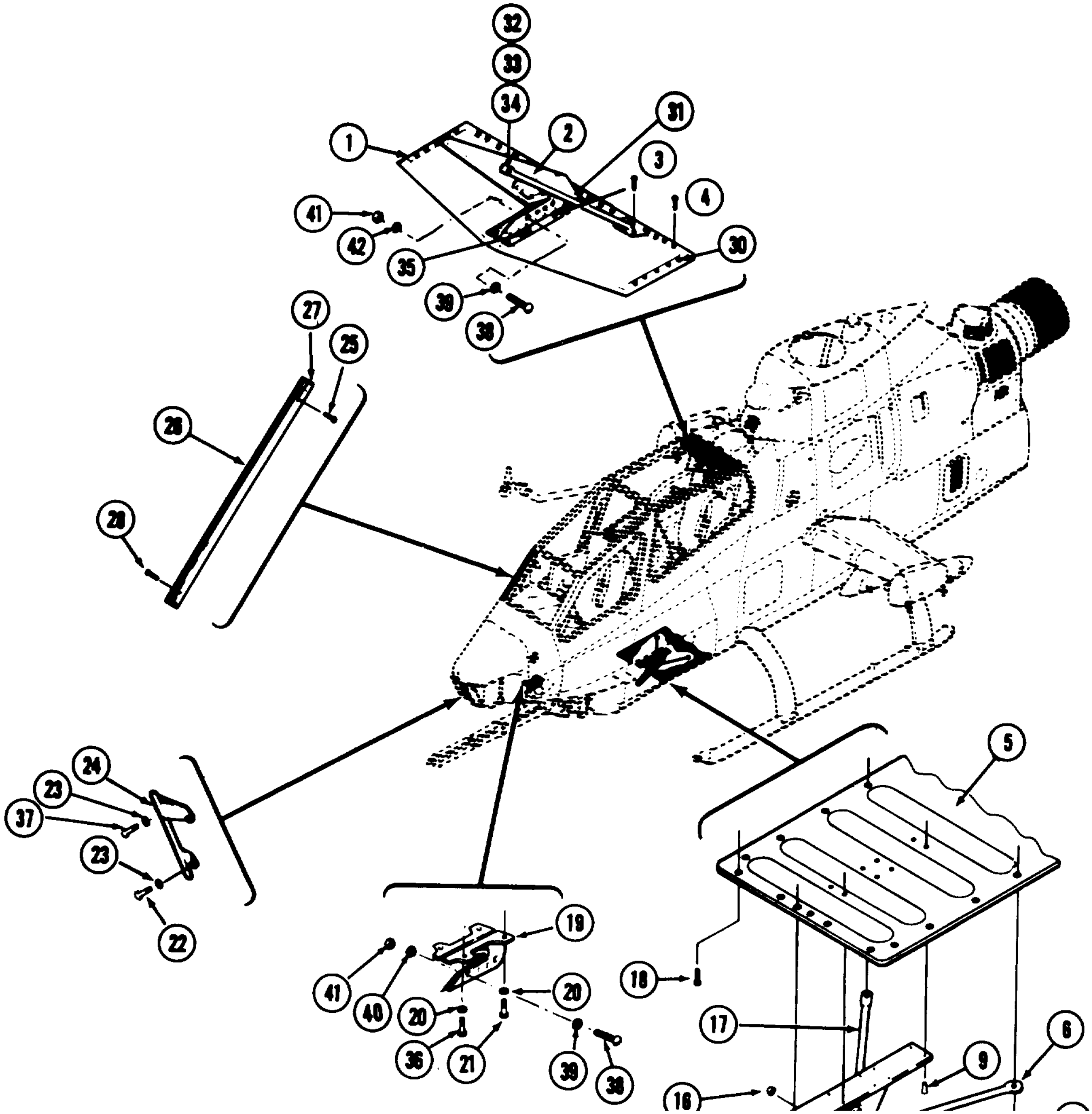


Figure 2-70. Soundproofing Blanket – Installation



1. Panel
2. Cutter
3. Screw
4. Screw
5. Door
6. Strut
7. Washer
8. Bait
9. RIvet
10. Bolt
11. Washer
12. Rivet
13. Cutter
14. Bolt
15. Washer
16. Nut
17. Strut
18. Screw
19. Cutter
20. Washer
21. Bolt
22. Bolt
23. Washer
24. Deflector
25. Screw
26. Insert
27. Channel
28. Screw
29. Screw
30. Screw
31. Strut
32. Bolt
33. Washer
34. Nut
35. Screw
36. Bolt
37. Bolt
38. Screw
39. Washer
40. Washer
41. Nut (Torque 30-35 in-lbs)

NOTE
Wir strike protection system installes by MWO 55-1520-236-50-3

Figure 2-70.1 Wire Strike Protection System.

b. Touch up damaged paint to match existing finish using green paint, MIL-L-46159.

c. Repair panel in accordance with paragraph 2-15.

2-186.6. INSTALLATION – WIRE STRIKE CUTTER (UPPER).

a. Position panel (1, figure 2. 70.1) and cutter (2) on aft end of pilot upper window.

b. Preassemble cutter assembly (2, 3, 4, 31 through 35) (through holes of strut (31) and panel (1)) prior to assembling panel (1) to the airframe.

c. Apply a 2-inch wide bead of sealing compound (C107.5) to fill the gap between the window and the bottom of the cutter panel.

d. Secure panel and cutter with screws (4, 29, and 30).

2-186.7. REMOVAL – CHANNEL AND INSERT (WIRE STRIKE).

a. Remove screws (25, figure 2-70.1) and remove insert (26).

b. Remove screws (28) and remove channel (27).

2-186.8. INSPECTION – CHANNEL AND INSERT (WIRE STRIKE).

a . Inspect insert for bends, cracks, loose or missing fasteners, missing teeth, and presence of protective sealant on saw teeth.

b. Inspect channel for distortion, loose or missing fasteners, and damage to paint.

2-186.9, REPAIR - CHANNEL AND INSERT (WIRE STRIKE).

a. Replace insert which has protective sealant missing or which shows evidence of wire strike.

b. Touch up damaged paint on channel using green paint, MIL-L-46159.

2-186.10. INSTALLATION - CHANNEL AN INSERT (WIRE STRIKE).

a . Position channel (27, figure 2-70.1) on right forward windshield post. Trim lower end of channel (27) for 0.03 inch clearance.

b. Position insert (26) into channel (27) with teeth of insert pointing forward. Trim lower end of insert (26) for 0.03 inch clearance.

c. Attach channel (27) to airframe with screws (28).

d. Attach insert (26) to channel (27) with screws (25).

2-186.11. REMOVAL — WIRE STRIKE CUTTER (NOSE).

a. Remove bolts (21 and 36, figure 2-70.1) and washers (20).

b. Remove cutter (19).

2-186.12. INSPECTION – WIRE STRIKE CUTTER (NOSE).

a . Inspect cutter for bends, cracks, nicks, and alignment.

b. Inspect condition of protective sealant on cutter blade.

2-186.13. REPAIR – WIRE STRIKE CUTTER (NOSE).

a. Replace cutter blade using existing hardware, which shows evidence of wire strike. Recoat cutter blade with sealant (C105.2) that have protective sealant missing.

b. Touch up damaged paint using red paint, TT-E-001384.

2-186.14 INSTALLATION - WIRE STRIKE CUTTER (NOSE).

a . Position cutter (19, figure 2-70.1) to helicopter.

b. Secure with bolts (21 and 36) and washers (20).

2-186.15. REMOVAL - WIRE STRIKE CUTTER (LOWER).

a . Remove screws (18, figure 2-70.1) securing door (5) to bottom of ammunition compartment. Remove door with cutter (13) attached.

b. Remove bolts (8 and 14), washers (7 and 15), and rivets (9 and 12). Remove cutter (13) from door (5).

c. Remove bolt (10), washer (11), and nut (16) and remove struts (6 and 17).

2-186.16. INSPECTION - WIRE STRIKE CUTTER (LOWER).

a Inspect cutter for bends, cracks and alignment.

b. Inspect condition of protective sealant on cutter blade.

c. Inspect door for delamination, impact damage, and loose inserts.

2-186.17. REPAIR - WIRE STRIKE CUTTER (LOWER).

a. Replace cutter blade using existing hardware, which shows evidence of wire strike. Recoat cutter blade with sealant (C105.2) that have protective sealant missing.

b. Touch up paint to match existing finish using green paint, MIL-L-46159.

c. Repair door in accordance with paragraph 2-15.

2-186.18. INSTALLATION – WIRE STRIKE CUTTER (LOWER).

a. Install struts (6 and 17, figure 2-70.1) on cutter (13) with bolt (10), washer (11), and nut (16).

b. Install cutter (13) on ammunition compartment bottom door (5) with bolts (8 and 14), washers (7 and 15), and new rivets (9 and 12).

c. Install door on helicopter, using previously removed screws (18).

2-186.19. REMOVAL – WIRE STRIKE DEFLECTOR.

a. Remove bolts (22 and 37, figure 2-70.1) and washers (23).

b. Remove deflector (24).

2-186.20. INSPECTION – WIRE STRIKE DEFLECTOR.

Inspect deflector for damage in accordance with figure 2-70.2.

2-186.21. REPAIR – WIRE STRIKE DEFLECTOR.

a. Replace deflector if damaged beyond limits shown in figure 2-70.2.

WARNING

Cleaning solvent is flammable and toxic Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

b. Polish out corrosion, nicks, scratches and dents not severe enough to reject deflector. Use 300 grit sandpaper (C102). Clean sanding residue with MEK (C74), and touch up bare metal with primer (C88) and paint to match existing finish. Refer to TM 55-1500-345-23.

2-186.22. INSTALLATION - WIRE STRIKE DEFLECTOR.

NOTE

When installing a new wire strike deflector, the unit must be demagnitized prior to installation.

a. Position deflector (24, figure 2-70.1) on helicopter.

b. Install bolts (22 and 37) and washers (23).

c. Position TSU and laser window covers and check clearance around deflector (24). Install covers.

2-187. ENGINE MOUNT INSTALLATION.

CAUTION

Perform an engine to transmission alignment check (paragraph 6-7) when an engine mount component is replaced or when any engine deck mount fitting is removed and installed.

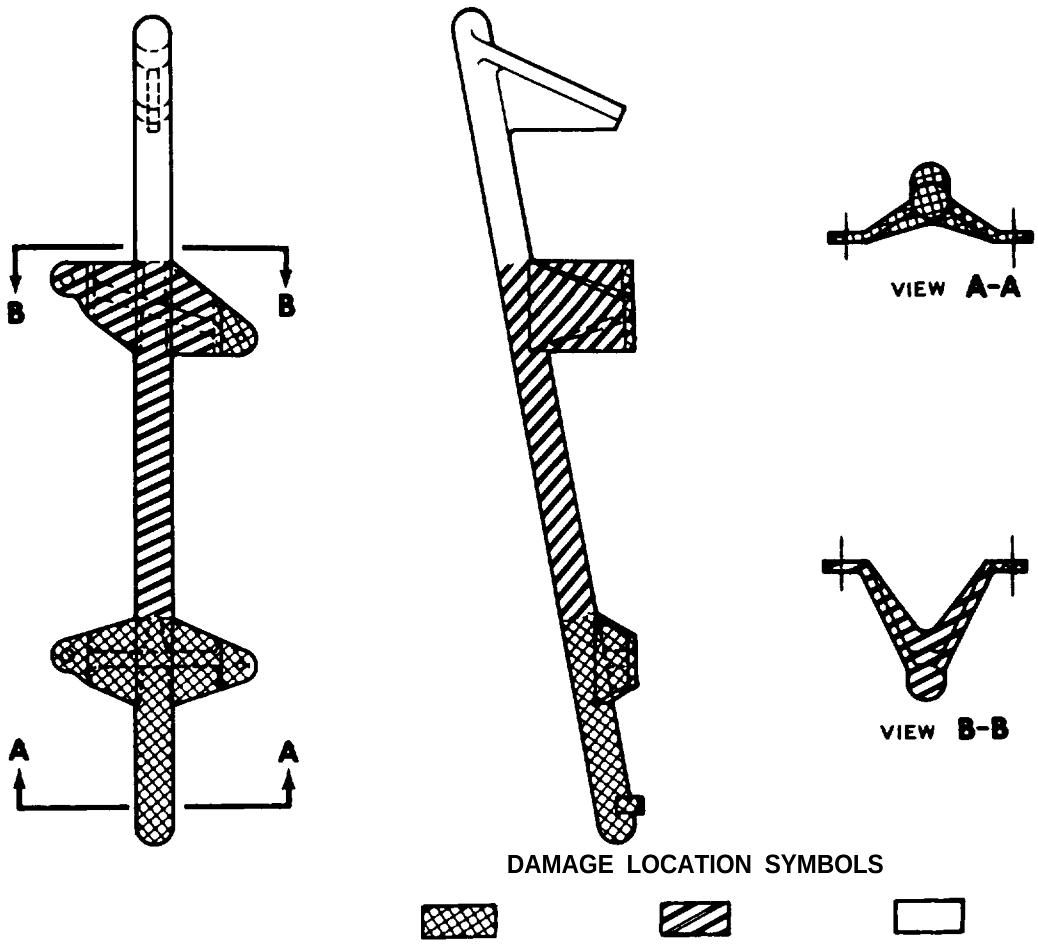
2-188. DESCRIPTION – ENGINE MOUNT INSTALLATION.

The engine is supported by two aft mounts (bipod and tripod) and the engine mount leg (forward). See figure 2-71 for view of engine mounts. All three mounts are made from steel tubing and rod end bearings. Investment casting-type fittings are used at the upper end of the two aft mounts (bipod and tripod). Hinged pillow blocks are attached to the two aft mounts (bipod and tripod). The pillow blocks support the engine through trunnions mounted on the engine diffuser housing. The engine mount leg (forward) supports the forward end of the engine through a trunnion mounted on engine inlet housing. The three engine mounts attach to fittings on the engine compartment deck. Shims are installed under the fittings to align the engine with the transmission. Ball bearings in the rod end bearings are softer than the outer part of the rod end bearing. If the ball bearings are worn, they may be replaced without replacing the entire rod end bearing.

2-189. AFT ENGINE MOUNT (BIPOD).

2-190. DESCRIPTION – AFT ENGINE MOUNT (BIPOD).

Refer to paragraph 2-188.



TYPE OF DAMAGE	MAXIMUM DAMAGE AND REPAIR DEPTH (cross-hatched)	(diagonal hatched)	(clear)
No cracks allowed			
Nicks, scratches, and dents	0.015	0.030	0.050
Corrosion: Before repair:	0.0075	0.015	0.025
After repair:	0.015	0.030	0.050
Maximum area per full depth repair	0.5 Sq. in.	1.0 Sq. in.	Not critical
Number of repair areas	2	5	Unlimited
Edge chamfer	0.04	0.06	0.08
Bore damage	0.002 For 1/4 circumference	N/A	N/A

NOTE: ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

209704-31
209-704-196
209-033-291

Figure 2-70.2. Damage limits – Wire strike deflector

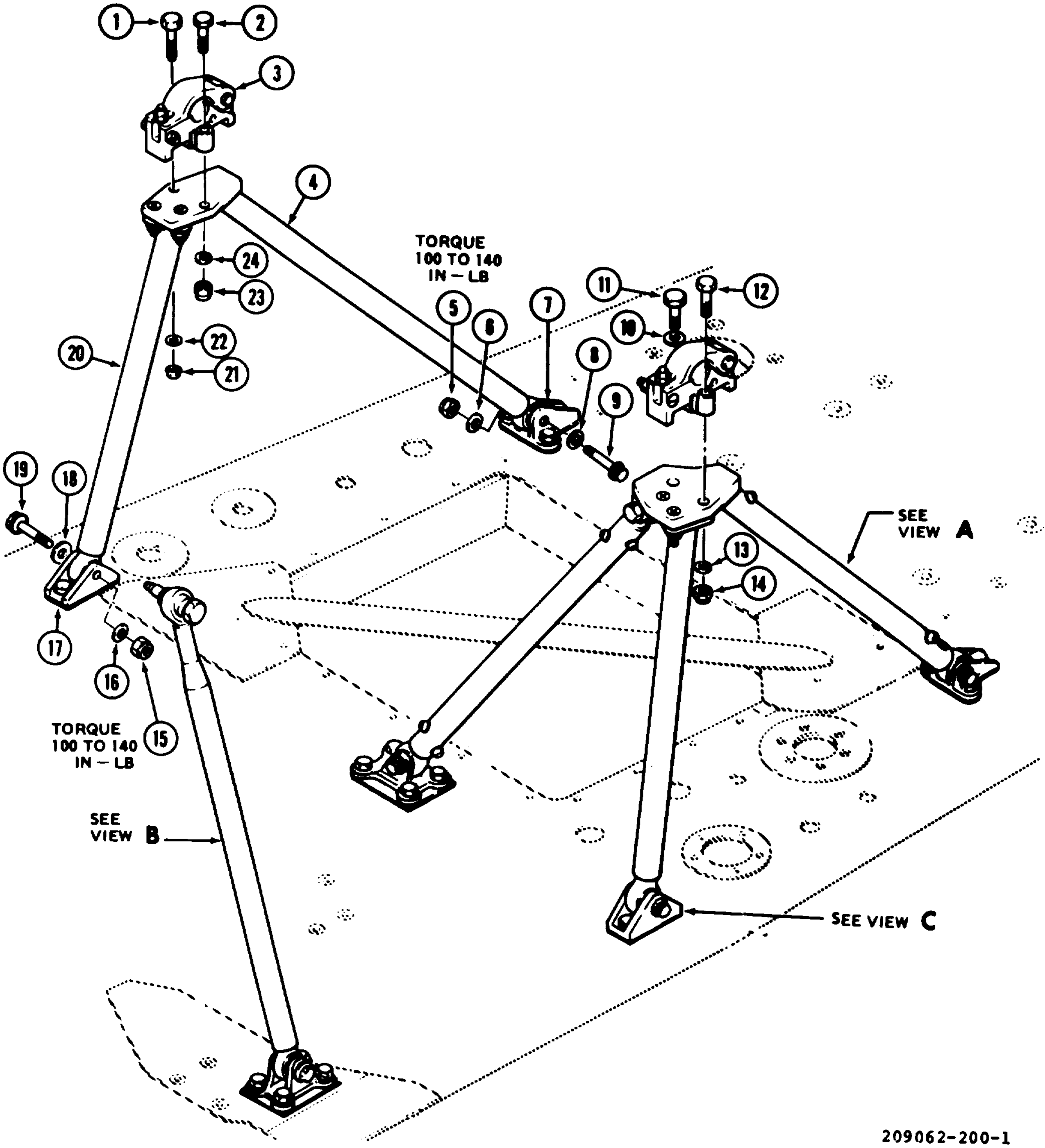


Figure 2-71. Engine Mount Installation (Sheet 1 of 3)

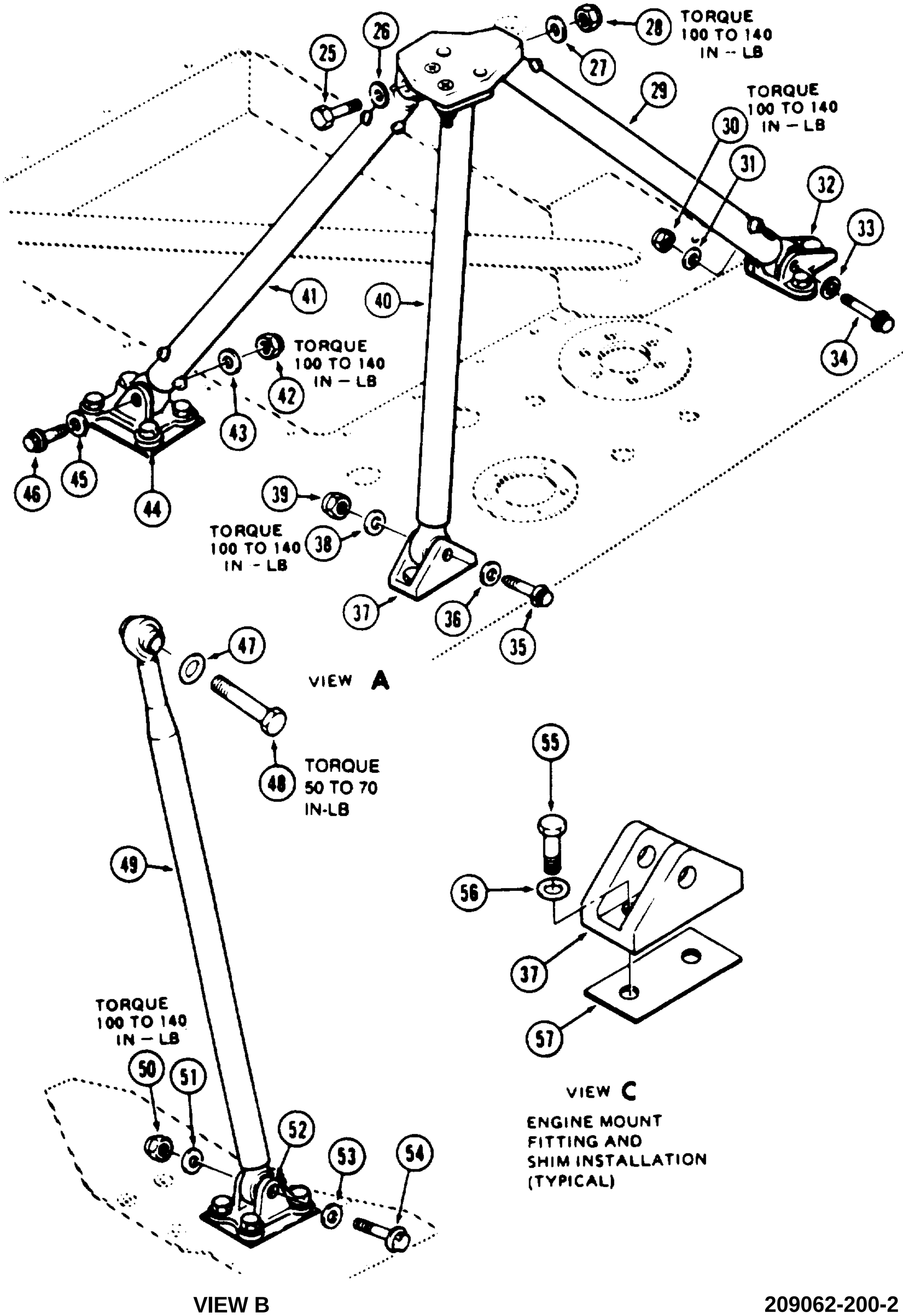


Figure 2-71. Engine Mount Installation (Sheet 2 of 3)

1. Bolt
2. Bolt
3. Pillow block
4. Engine mount leg
5. Nut
6. Flat washer
7. Engine mount fitting
8. Recessed washer
9. Flanged bolt
10. Washer
11. Bolt
12. Bolt
13. Washer
14. Nut
15. Nut
16. Flat washer
17. Engine mount fitting
18. Recessed washer
19. Flanged bolt
20. Engine mount leg
21. Nut
22. Washer
23. Nut
24. Washer
25. Tension bolt
26. Recessed washer
27. Flat washer
28. Extended washer nut
29. Engine mount leg
30. Nut
31. Flat washer
32. Engine mount fitting
33. Recessed washer
34. Flanged bolt
35. Flanged bolt
36. Recessed washer
37. Engine mount fitting
38. Flat washer
39. Nut
40. Engine mount leg
41. Engine mount leg
42. Nut
43. Flat washer
44. Engine mount fitting
45. Recessed washer
46. Flanged bolt
47. Flat washer
48. Engine mount bolt
49. Engine mount lag
50. Nut
51. Flat washer
52. Engine mount fitting
53. Recessed washer
54. Flanged bolt
55. Bolt
56. Recessed washer
57. Shim

209062-200-3

Figure 2-71. Engine Mount Installation (Sheet 3 of 3)

2-191. REMOVAL – AFT ENGINE MOUNT (BIPOD).

CAUTION

Do not remove fittings (7 and 17, figure 2-71) under biped mounts on engine compartment deck unless fittings must be replaced.

a. Support engine with engine sling (T9) end hoist (T45) to relieve weight from mounts. Refer to paragraph 1-31.

NOTE

Engine may be supported with suitable strap running underneath combustion section and a spreader bar to clear strap from aft pylon fairing.

b. Remove nut and washer from eyebolt and hinge open pillow block (3, figure 2-71).

c. Remove aft engine mount (bipod).

(1) Remove nut (5), bolt (9), and washers (6 and 8) from engine mount fitting (7).

(2) Remove nut (15), bolt (19), and washers(16 and 18) from engine mount fitting (17).

(3) Remove aft engine mount (bipod) from helicopter.

d. If engine mount fittings (7 and 17) must be removed, remove bolts (53), washers, and fittings (7 and 17) with shims (55).

2-192. INSPECTION – AFT ENGINE MOUNT (BIPOD).

a. Inspect aft engine mount (bipod) for following:

(1) Dents. Small, smooth dents which have not removed material from tubing and occur at least 1.5 inches from upper fittings are considered negligible and do not require repair. Dents greater than negligible are cause for replacement of the affected engine mount.

(2) Scratches. Transverse scratches longer than 0.313 inch are cause for replacement of the mount. Other scratches that are less than 0.010 inch deep may be polished out.

(3) Distortion. Inspect for bends, nicks, pin hole elongation, and similar damage. Any distortion-type damage that can be detected visually is cause for replacement of the affected mount.

(4) Wear. Inspect for worn rod end bearings (10, figure 2-72) in the engine mount tubes. If noticeable wear is present, remove the affected engine mount and check bearing wear with a dial indicator. Maximum allowable radial play is 0.008 inch. Maximum allowable axial play 0.016 inch.

(5) Corrosion. Inspect for corrosion damage that could affect function of engine mounts.

(6) Cracks. No cracks are acceptable. Inspect for cracks visually. If any area are suspect, inspect by fluorescent penetrant method. Refer to TM 43-0103.

(7) Inspect for security of bolts and rivets.

b. Inspect fittings (7 and 17, figure 2-71) for following:

(1) Cracks. No cracks are acceptable.

(2) Nicks and dents severe enough to affect function.

(3) Secure attachment to deck.

(4) Corrosion damage severe enough to affect function.

c. Inspect pillow block (3) eye bolt for damaged threads.

2-193. REPAIR – AFT ENGINE MOUNT (BIPOD).

CAUTION

Rod ends and ball bearings are not reparable by polishing.

a. Polish out minor corrosion damage using fine India stone (C116), and touch up with primer (C88 or C91).

b. (AVIM) Replace engine mount parts that are damaged or worn beyond allowable limits. Replace rod end bearings in the engine mounts that are worn beyond allowable limits, or are not suitable for further service for other reasons, as follows:

CAUTION

The 209-062-127-1 rod end allows removal and replacement of the ball bearing (11) only. The replaceable ball bearing is made of softer steel than the rod end.

(1) Rotate ball bearing (11) ninety degrees, axially align with slot in rod end and push out replaceable ball bearing with finger pressure.

(2) Position new ball bearing (11) perpendicular to slots in outer portion of rod end bearing (10). Push ball bearing into outer portion of rod end bearing and rotate ball bearing ninety degrees.

2-194. INSTALLATION – AFT ENGINE MOUNT (BIPOD).

a. Install fittings (7 and 17, figure 2-71) if not previously accomplished. It may be necessary to change shim thickness under fittings during engine to transmission alignment procedure (paragraph 6-7).

b. Install aft engine mount (bipod).

(1) Position engine mount legs (4 and 20) in engine mount fittings (7 and 17).

NOTE

Install recessed washers (8 and 18) with countersinks against heads of bolts (9 and 19).

(2) Install bolts (9 and 19), washers (6, 8, 16, and 18), and nuts (5 and 15).

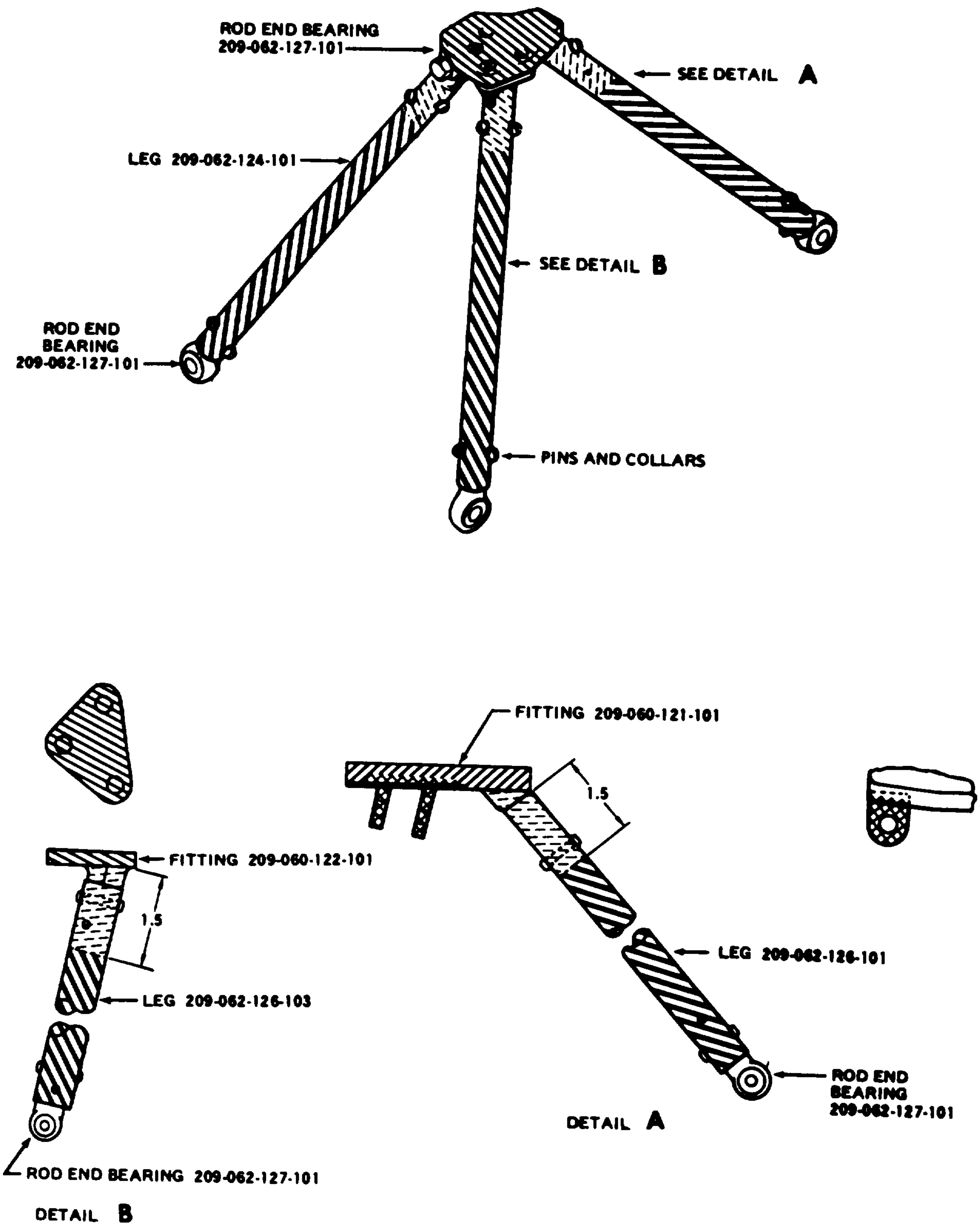
(3) Torque nuts (5 and 15) 100 TO 140 inch-pounds.

c. Install pillow block (3) if not previously accomplished. Refer to paragraph 2-206.

2-195. AFT ENGINE MOUNT (TRIPOD).

2-196. DESCRIPTION – AFT ENGINE MOUNT (TRIPOD).

Refer to paragraph 2-188 for description of aft engine mount (tripod).



Figur 2-72. Damage Limits – Aft Engine Mount Assembly (Tripod) (Sheet 1 of 2)

TYPE OF DAMAGE	DAMAGE LOCATION SYMBOLS			
	MAXIMUM DAMAGE AND REPAIR DEPTH			
CRACKS	None	None	None	None
NICKS, DENTS & CORROSION	0.002	0.005	0.010	0.010
SCRATCHES	Aany transverse scratch longer than 5/16 inch on a leg is cause to replace the affected part. Other scratches that are within limits below after polishing out are acceptable.			
	0.002	0.005	0.010	0.010
Maximum area per full depth repair	Not critical	Not critical	Not critical	Not critical
Number of repair areas	Not critical	Not critical	Not critical	Not applicable
Edge chamfer	0.002	0.005	0.010	Not applicable
Rod end bearing wear (looseness)	Radial axial	Looseness looseness	0.005 0.012	
Pins and collars (Hy-Loks)	No loose or missing pins and collars (Hy-Loks) are acceptable			

NOTE:
ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

209060-138-2

Figure 2-72. Damage Limits – Aft Engine Mount Assembly (Tripod) (Sheet 2 of 2)

2-197. REMOVAL – AFT ENGINE MOUNT (TRIPOD).

CAUTION

Do not remove fittings (32, 37, or 44, figure 2-71) under engine mount legs unless fitting must be replaced.

a. Support engine with engine sling (T9) and hoist (T45) to relieve weight from mounts. Refer to paragraph 1-31.

NOTE

Engine may be supported with suitable strap running underneath combustion section and a spreader bar to clear strap from aft pylon fairing.

b. Remove engine fuel control linkage and bell crank from tripod mount on left side. Remove base clamps from mount tubes.

c. Remove nut and washer from eyebolt and hinge open pillow block.

d. Remove aft engine mount (tripod).

(1) Remove nut (30), bolt (34), and washers (31 and 33) from engine mount fitting (32).

(2) Remove nut (39), bolt (35), and washers (36 and 38) from engine mount fitting (37).

(3) Remove nut (42), bolt (46), and washers (43 and 45) from engine mount fitting (44).

(4) Remove aft engine mount (tripod) from helicopter.

e. If engine mount fittings (32, 37, or 44) must be removed, remove bolts (53), washers (54), and fittings with shims (55).

f. Refer to paragraph 2-203 for pillow block (3) removal.

2-198. INSPECTION – AFT ENGINE MOUNT (TRIPOD).

a. Inspect aft engine mount (tripod) for damage in excess of limits shown on figure 2-72.

b. If aft engine mount (tripod) is installed on helicopter, inspect all attaching bolts for secure installation.

c. Inspect engine mount fittings (32, 37, and 44, figure 2-71) for damage in excess of limits shown on figure 2-73.

2-199. REPAIR – AFT ENGINE MOUNT (TRIPOD).

a. Replace engine mount legs (32, 37 and 44, figure 2-71) that have damage in excess of limits (paragraph 2-198).

b. Replace ball bearings (1 or 11, figure 2-74) in rod end bearings (10) that have wear (looseness) in excess of limits shown on figure 2-72 as follows:

(1) Rotate ball bearing ninety degrees axially to outer portion of rod end bearing. Align ball bearing with slots in outer portion. Push the ball bearing out through the slots.

(2) Position new ball bearing perpendicular to slots in outer portion of rod end bearing. Push ball bearing into outer portion of rod end bearing and rotate ball bearing ninety degrees.

c. Polish out mechanical and corrosion damage that is within limits shown on figure 2-72 with fine India stone (C116). Touch up repair area with primer (C88 or C91).

2-200. INSTALLATION – AFT ENGINE MOUNT (TRIPOD).

a. Install engine mount fittings (32, 37 and 44, figure 2-71) on engine service deck if not previously accomplished. It may be necessary to change shims under the engine mount fittings during engine to transmission alignment procedure (paragraph 6-7).

b. Assemble engine mount legs (5 and 9, figure 2-74) with two bolts (2), washers (1) and nuts (8)

c. Position engine mount leg (13) on two engine mount legs assembled in step b. Install tension bolt (14), recessed washer (15) with countersink against bolt head, washer (3) and nut (4).

d. Identify engine mount leg (13) as the forward inboard leg of the tripod. This is the only leg of the tripod that has a rod end bearing in each end of the leg.

e. Position assembled aft engine mount (tripod) on engine mount fittings (32, 37, and 44, figure 2-71) with engine mount leg (41) in engine mount fitting (44).

f. Secure aft engine mount (tripod) to engine mount fittings.

NOTE

Install recessed washers (33, 36, and 45) with countersinks against heads of bolts (34, 35, and 46).

(1) Install bolt (34), washers (33 and 31), and nut (30).

(2) Install bolt (35), washers (36 and 38), and nut (39).

(3) Install bolt (46), washers (45 and 43), and nut (42).

(4) Torque nuts (30, 39, and 42) 100 TO 140 inch-pounds.

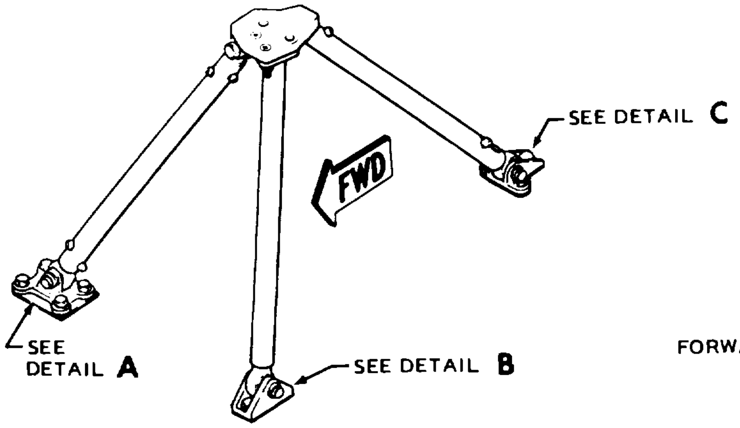
g. Install pillow block (paragraph 2-206).

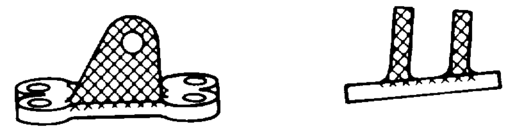
h. Install engine fuel control linkage, Move fuel control linkage through full throw and inspect for binding and interference with adjacent parts.

CAUTION

Perform an engine to transmission alignment check (paragraph 6-7) when any engine mount component is replaced or when any engine deck mount fitting is removed and installed.

i. Remove engine hoist (T45) and sling (T9).



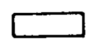


FORWARD INBOARD FITTING FOR ENGINE MOUNT (TRIPOD)
209-062-123-101 DETAIL A

FORWARD OUTBOARD FITTING FOR ENGINE MOUNT (TRIPOD)
209-062-123-130-101 DETAIL B

AFT FITTING FOR ENGINE MOUNT (TRIPOD)
209-062-129-101 DETAIL C

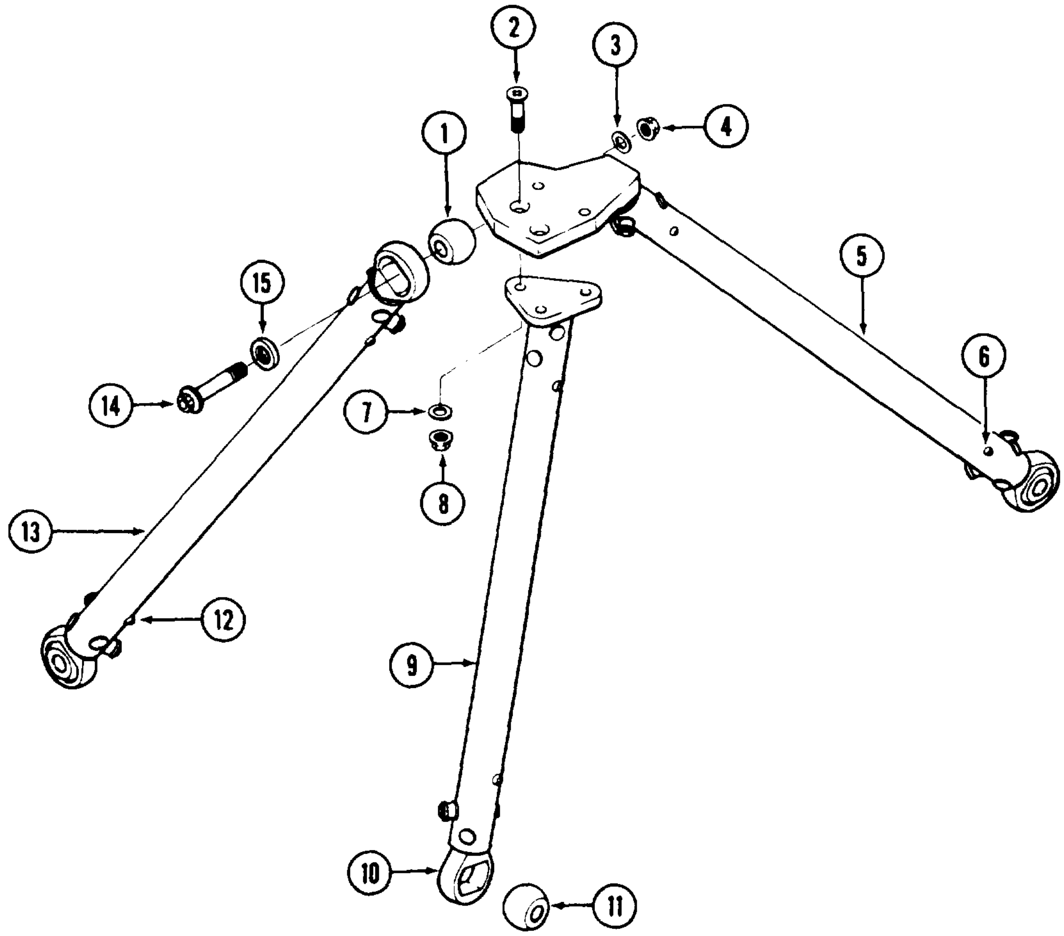
DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	 MAXIMUM DAMAGE AND REPAIR DEPTH	
No cracks allowed		
Nicks, scratches, and dents	0.002	0.010
Corrosion	0.001 Before repair 0.002 after repair	0.005 Before repair 0.010 after repair
Maximum area per full depth repair	Not critical	Not critical
Number of repair areas	One	Two
Edge chamfer	0.002	0.010
Bore damage	0.002 for 1/4 circumference	

NOTE: ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

209062-198

Figure 2-73. Damage Limits — Fittings for Aft Engine Mount (Tripod)



1. Ball bearing
2. Bolt
3. Flat washer
4. Extended washer nut
5. Engine mount leg
6. Hi- Lok rivet
7. Thin steel washer
8. Extended washer nut
9. Engine mount leg
10. Rod end bearing
11. Ball bearing
12. Rivet (plug)
13. Engine mount leg
14. Tension bolt
15. Recessed washer

Figure 2-74. Aft Engine Mount (Tripod) Assembly

2-201. PILLOW BLOCK.

2-202. DESCRIPTION – PILLOW BLOCK.

The pillow block installed on top of aft engine mounts (biped and tripod) is designed to transfer engine vibrations from aft end of engine to the engine mounts. Both pillow blocks are the same part number.

2-203. REMOVAL – PILLOW BLOCK.

a. Support engine with engine sling (T9) and hoist (T45) to relieve weight from engine mounts.

NOTE

Engine may be supported with suitable strap running underneath combustion section and a spreader bar to clear strap from aft pylon fairing.

b. Remove engine fuel control linkage from pillow block mounted on aft engine mount (tripod).

c. Remove nut and washer from eyebolt and hinge open pillow block (3, figure 2-71).

d. Remove nuts (21 and 23), washers (22 and 24), and bolts (1 and 2).

e. Remove pillow block (3) from biped mount.

NOTE

An additional washer (10) is used under the head of bolt (11) for pillow block installation on tripod mount.

f. Remove pillow block from tripod mount in similar manner.

2-204. INSPECTION – PILLOW BLOCK.

a. Inspect pillow block (3, figure 2-71) for damage in excess of limits shown on figure 2-75.

b. If pillow block is installed, inspect attaching bolts for secure installation.

2-205. REPAIR – PILLOW BLOCKS.

a. Replace eye bolt, and/or pillow block if damaged in excess of limits (paragraph 2-204).

b. Polish out mechanical and corrosion damage that is within limits shown on figure 2-75 with fine India stone (C116). Touch up repair area with primer (C88 or C91).

2-206. INSTALLATION – PILLOW BLOCKS.

a. Support engine with engine sling (T9) and hoist (T45).

b. Install aft engine mount fittings (trunnions) if not previously accomplished (paragraph 4-119).

c. Position pillow block (3, figure 2-71) on aft engine mount (bipod) with eye bolt forward. Install bolt (1), washer (22), and nut (21). Install bolt (2), washer (24), and nut (23).

NOTE

An additional washer (10) is used under the head of bolt (11) for pillow block installation on tripod mount.

d. Install pillow block on aft engine mount (tripod) with eyebolt forward. Install bolt (1 1) and washer (10), lockwire bolt (11) with lockwire (C137). Install bolt (12), washer (13), and nut (14).

e. Hinge upper half of pillow block (3, figure 2-71) on aft engine mount (bipod) closed over bearing on engine mount fitting (trunnion). Install washer and nut. Repeat this procedure for pillow block on aft engine mount (tripod).

f. Remove hoist (T45) and engine sling (T9).

g. Install engine fuel control linkage. Move fuel control linkage through full throw and Inspect for binding and interference with adjacent parts.

2-207. ENGINE MOUNT LEG (FORWARD)

2-208. DESCRIPTION – ENGINE MOUNT LEG (FORWARD).

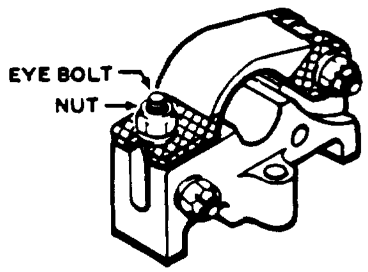
The engine mount leg is a steel tube with replaceable rod end bearings, which is installed between the left trunnion on the engine and a fitting on the engine compartment deck. The leg supports the forward end of the engine.

2-209. REMOVAL – ENGINE MOUNT LEG (FORWARD).

a. Support engine with suitable hoist to relieve weight from the mounts.

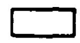
CAUTION

Do not remove fitting (52) and shim under engine mount leg (forward) on compartment deck unless fitting must be replaced.



PILLOW BLOCK 204-061-101-1

DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED 	
CRACKS ALLOWED	Norm	None
NICKS, SCRATCHES, DENTS. AND CORROSION	0.010	0.020
MAXIMUM AREA PER FULL DEPTH REPAIR	Not critical	Not critical
NUMBER OF REPAIR AREAS	Not critical	Not critical
EDGE CHAMFER	0.010	0.020
BORE DAMAGE	0.002 for 1/4 Circumference	
THREAD DAMAGE TO EYE BOLT AND NUT	None acceptable	

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

204061-1016

Figure 2-76. Damaged Limits – Engine Mount Pillow Blocks (Left and Right)

b. Remove bolt (48, figure 2-71) and washer (47) from top of leg. Remove bolt (54), washers (51) and (53) and nut (50) from bottom of leg. Remove engine mount leg (forward).

2-210. INSPECTION – ENGINE MOUNT LEG (FORWARD).

a. Inspect engine mount leg (49, figure 2-71) for following:

(1) Dents. Small, srnooth dents which have not removed material from tubing and occur at least 1.6 inches from points where tubes intersect rod end bearings are considered negligible and do not require repair. Dents greater than negligible are cause for replacement of the engine mount leg (forward).

(2) Scratches. Transverse scratches longer than 5/16 inch are cause for replacement of the engine mount leg (forward). Other scratches that are less than 0.010 inch deep may be polished out using fine India stone (C116).

(3) Distortion. Inspect for bends, nicks, pin hole elongation, and similar damage. Any distortion - type damage that can be detected visually is cause for replacement of the engine mount leg (forward).

(4) Wear. Inspect for worn rod end bearings in both ends of engine mount leg (forward). If noticeable wear is present, remove the affected engine mount and check bearing wear with a dial indicator. Maximum allowable radial play is 0.008 inch. Maximum allowable axial play is 0.016 inch.

(5) Corrosion. Inspect for corrosion damage that could affect function of engine mount leg (forward).

(6) Cracks. No cracks are acceptable. Inspect for cracks visually. If any areas are suspect, inspect by fluorescent penetrant method. Refer to TM 43-0103.

(7) Security. Check for secure installation of all bolts and rivets.

b. Inspect engine mount fitting (52, figure 2-71) for secure attachment to engine compartment deck and for damage in excess of limits shown on figure 2-73.

2-211. REPAIR – ENGINE MOUNT LEG (FORWARD).

CAUTION

The forward engine mount leg (49, figure 2-71) has a replaceable ball type bearing in the lower end. The bearing at the upper end is a high misalignment bearing and is not replaceable.

Repair engine mount leg (forward) by same procedures outlined for aft engine mount (tripod) (paragraph 2-119).

2-212. INSTALLATION – ENGINE MOUNT LEG (FORWARD).

a. Support engine with suitable hoist to relieve weight from the mounts.

b. Position engine mount leg (forward) (49, figure 2-71) on engine and install bolt (48) and washer (47). Torque bolt 50 TO 70 inch-pounds. Install flanged bolt (54), washers (51 and 53), and nut (50). Torque nut 100 TO 140 inch-pounds.

c. Remove hoist.

2-213. DIAGONAL BRACE TUBES.

2-214. DESCRIPTION – DIAGONAL BRACE TUBES.

The diagonal brace tube is a load carrying member of the fuselage structure. The right is larger in diameter than the left diagonal brace tube. The tubes are adjustable to specified lengths and are located in the fuselage adjacent to the wing attachment area.

2-215. REMOVAL – DIAGONAL BRACE TUBES.

a. Remove right and left access panels (17, figure 2-76).

b. Remove nuts (1 and 17, figure 2-76), special bolt (3), bolt (13), and washers (2, 11, and 13). Remove right diagonal brace tube (18) from helicopter.

c. Remove nuts (7 and 10), bolts (4 and 12), and washers (5, 6, 9, and 11). Remove left diagonal brace tube (8) from helicopter.

2-216. INSPECTION – DIAGONAL BRACE TUBES.

Inspect diagonal brace tubes for damage in excess of the following limits as follows

(1) Dents in excess of 0.010 inch. Smooth dents up to 0.010 inch deep are acceptable without polishing out.

(2) Nicks and scratches in excess of 0.010 inch depth. Nick and scratch damage less than 0.010 inch deep is acceptable if the damage is polished out using fine India stone (C116).

(3) Corrosion damage in excess of 0.010 inch deep after polishing out and/or which affects over twenty percent of the area of the tube is not acceptable. Replace tube.

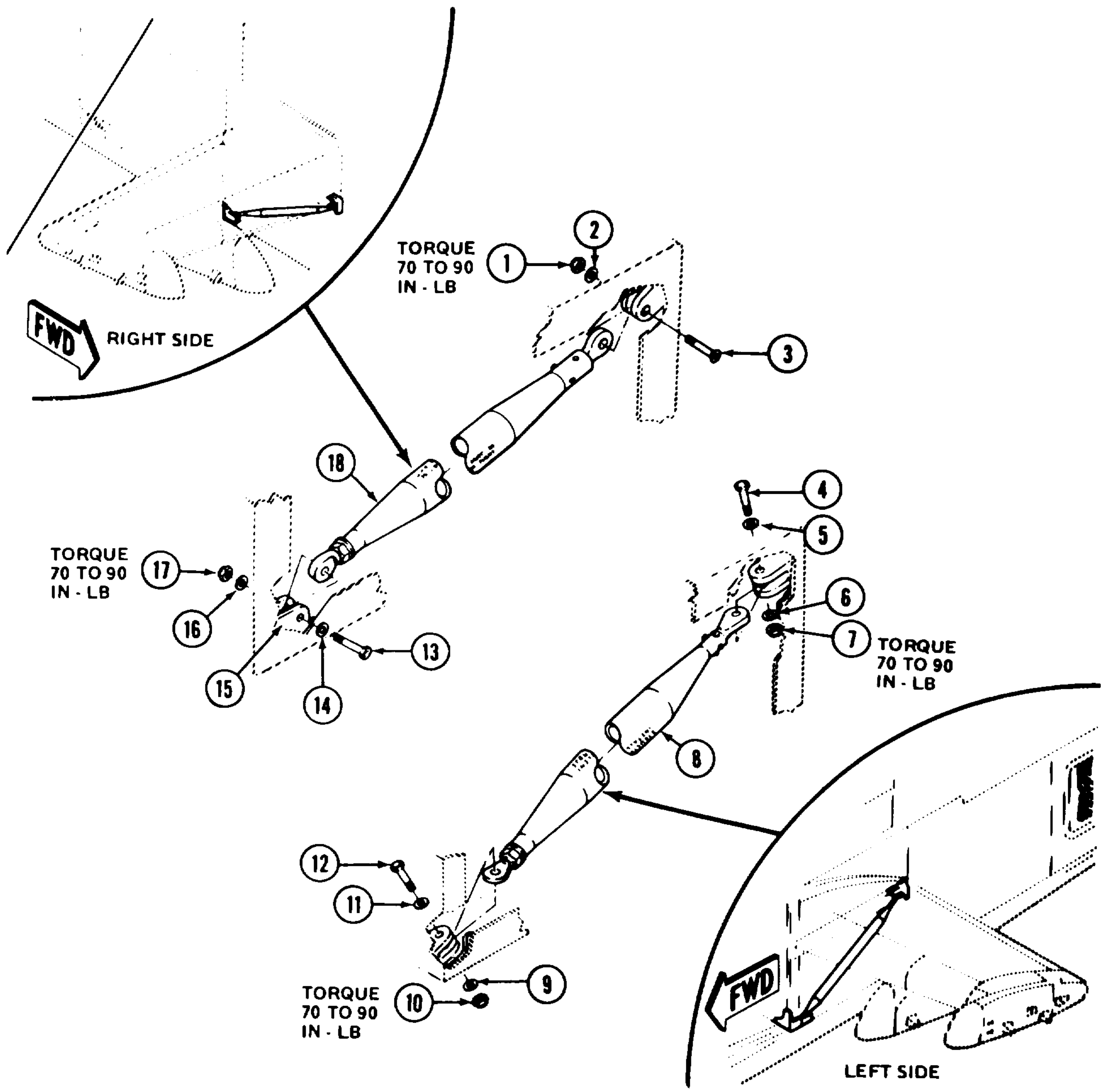
(4) Wear in bolt holes, dimension .3135, in fittings in ends of diagonal brace assemblies in excess of 0.005 inch is not acceptable. Make the inspection for bolt hole wear only if the diagonal brace tubes are removed for some other purpose.

(6) Distortion of the diagonal brace assemblies that can be detected visually is not acceptable. Replace tube.

(6) Cracks. No cracks are acceptable.

2-217. REPAIR – DIAGONAL BRACE TUBES.

a. Polish out nicks, scratches and corrosion damage that is within limits, using fine India stone (C116).



NOTE :

The right diagonal brace (18) is larger in diameter than the left diagonal brace (8). When diagonal brace tubes are being installed, refer to current Repair Parts and Special Tools List to ensure that correct P/N diagonal braces are installed.

1. Nut
2. Washer
3. Special bolt
4. Bolt
5. Washer
6. Washer
7. Nut
8. Left diagonal brace tube assembly
9. Washer
10. Nut
11. Washer
12. Bolt
13. Bolt
14. Washer
15. Fitting
16. Washer
17. Nut
18. Right diagonal brace tube assembly

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Figure 2-76. Diagonal Brace Tube – Installation

b. Touch up repair area with primer (C88 or C91).

c. Replace adjustable rod end connector if bolt hole is worn beyond 0.005 inch limit. Replace entire diagonal brace tube assembly if the bolt hole in the fixed fitting is worn beyond the 0.005 inch limit.

2-218. INSTALLATION — DIAGONAL BRACE TUBES.

CAUTION

Diagonal brace tubes must be installed prior to flight.

a. Position left diagonal brace tube assembly (8, figure 2-76) in helicopter. Install bolt (4), washers (5 and 6) and nut (7). Adjust rod end connector in opposite end of left diagonal brace tube assembly if necessary, Install bolt (12), washers (9 and 11) and nut (10). Torque nuts (7 and 10) 70 TO 90 inch-pounds.

b. Position right diagonal brace tube (18) in helicopter. Install special bolt (3), washer (2), and nut (1) in forward end. Adjust rod end connector in opposite end of brace tube assembly if necessary. Install bolt (13), washers (14 and 16), and nut (17). Torque nuts (1 and 17) 70 TO 90 inch-pounds.

c. Install right and left access panels (17, figure 2-3).

2-219. PYLON SUPPORT INSTALLATION.

2-220. DESCRIPTION — PYLON SUPPORT INSTALLATION.

The pylon support installation consists of provisions for mounting the transmission in the airframe. See figure 2-77. Major components of the pylon support installation are as follows:

a. Four transmission mount assemblies.

b. Two damper assemblies.

c. Two damper fittings.

d. One fifth mount support fitting assembly.

e. One lift beam assembly.

f. One lift link.

2-221. TRANSMISSION MOUNTS.

2-222. DESCRIPTION — TRANSMISSION MOUNTS.

Four transmission mount assemblies are located on the pylon support structure. The transmission support case rests on the mount assemblies. See figure 2-77. Each transmission mount assembly consists of a cylindrical molded rubber core bonded between steel outer and inner sleeves, with outer sleeve flange secured on the pylon support by four bolts. A large mount bolt extends up through the mount inner sleeve to seat in tapered bushing of transmission support case leg, and is secured by a retaining bolt installed from top through a broad special washer and threaded into tapped upper end of the mount bolt. Silicone rubber protective boots, with supporting bushings, cover both ends of mount.

2-223. REMOVAL — TRANSMISSION MOUNTS.

NOTE

New aircraft are delivered without lockwire on bolts (1 and 20, figure 2-77). This is an acceptable condition. However, all subsequent bolt installations must be accomplished with drilled heed bolts and must be lockwired.

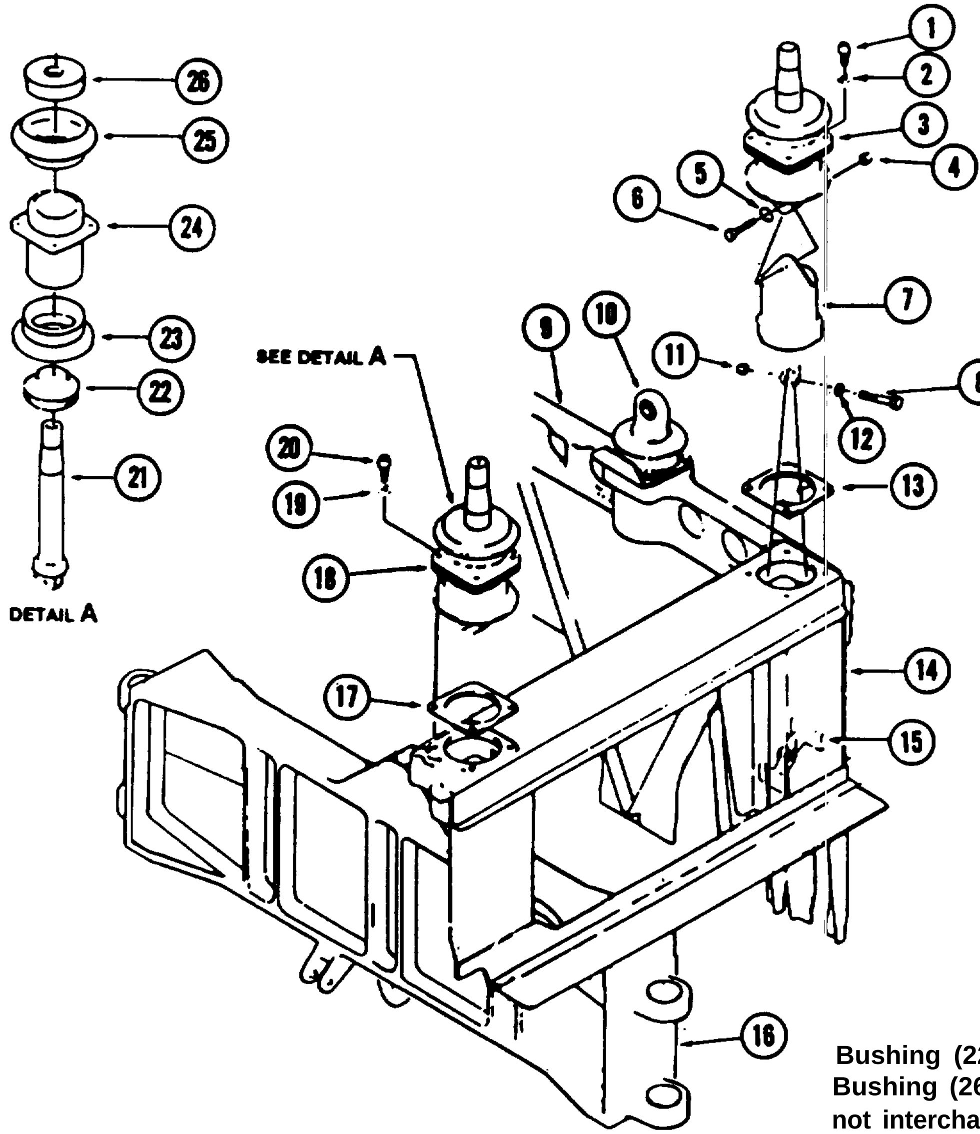
a. Remove transmission (Paragraph 6-24).

CAUTION

Anytime transmission mount bolts (21, figure 2-77) are loosened or removed, care must be taken to ensure they do not fall. Damage to airframe panels could occur.

NOTE

To aid in removing and installing bolts (6, figure 2-77) attaching dampers (7) to mount bolts (21), holes may be drilled in pylon supports (14) (figure 2-78). Use a hole cutter or other suitable tool. Care must be taken to prevent damage to adjacent parts. Clean and deburr edges of holes to preclude stress risers. Apply primer (C88 or C91) to edges of holes.



NOTE

Bushing (22) P/N 212-030-199-1 and Bushing (26) P/N 204-030-930-19 are not interchangeable.

1. Bolt
2. Recessed Washer
3. Pylon mount assembly
4. Nut
5. Flat washer
6. Bolt
7. Damper assembly
8. Bolt
9. Fifth mount support fitting
10. Fifth mount
11. Nut
12. Flat washer
13. Filler plate
14. Pylon support
15. Damper fitting
16. Lift beam
17. Filler plate
18. Pylon mount assembly
19. Recessed washer
20. Bolt
21. Mount bolt
22. Bushing
23. Boot
24. Pylon mount
25. Boot
26. Bushing

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Figure 2-77. Pylon Support — Installation

b. Remove left rear mount assembly (3, figure 2-77) and right rear mount assembly (not illustrated).

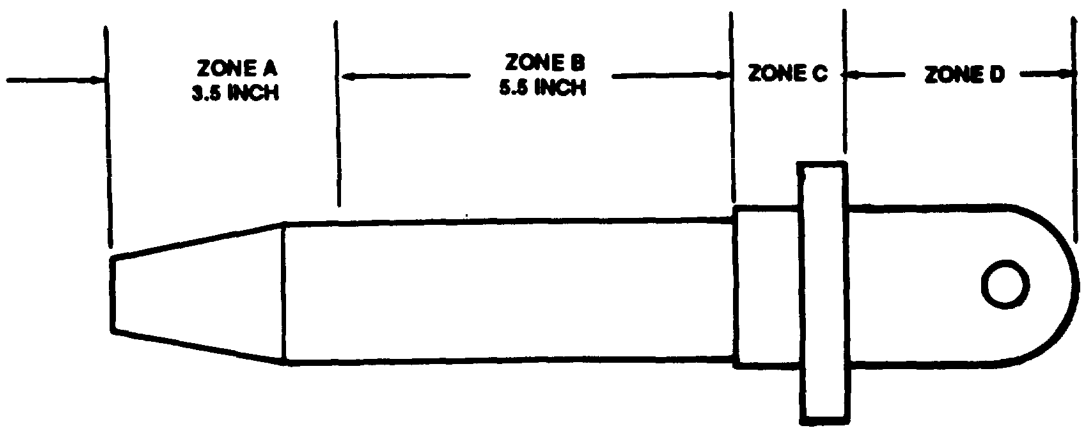
(1) Remove lockwire from bolts (1).

(2) Remove bolts (1) and washers (2).

(3) Dampers (7) can be left in place if desired. Remove nut (4), bolt (6), and washer (5).

CAUTION

Do not remove slotted head bolt through damper piston to remove damper.



NOTES:

1. IN ZONE A, WEAR OR NICKS TO A DEPTH OF 0.002 IS ACCEPTABLE. NO CRACKS ARE ALLOWED.
2. IN ZONE B, WEAR, NICKS, OR SCORING TO A DEPTH OF 0.005 IS ACCEPTABLE NO CRACKS ARE ALLOWED.
3. IN ZONE C, WEAR OR NICKS TO A DEPTH OF 0.002 IS ACCEPTABLE. NO CRACKS ARE ALLOWED.
4. IN ZONED, WEAR OR NICKS TO A DEPTH OF 0.002 IS ACCEPTABLE. NO CRACKS ARE ALLOWED. DAMAGE OF 0.020 IS ACCEPTABLE AFTER REMOVAL OF BURRS IF TREATED WITH ZINC CHROMATE SPRAY.

Figure 2-77.1. Pylon Mount Bolt Inspection Criteria.

NOTE

Remove hydraulic cylinders if damper (7) is to be removed with pylon mount assembly.

(3) Refer to paragraph 7-60.

(4) Remove nut (11), bolt (8) and washer (12). Lift damper out with mount assembly.

(5) Secure filler plate (13) in position with lockwire (C 137).

(6) Separate upper and lower bushings (26 and 22) and upper and lower boots (25 and 23), from mount bolt (21).

(7) Remove right rear mount assembly, using procedures outlined in steps (1) through (6) above.

c. Remove left forward mount assembly (18) and right forward mount assembly (not illustrated).

(1) Remove lockwire from bolts (20).

(2) Remove bolts (20) and washers (19).

(3) Keep filler plate (17) at location.

(4) Separate upper and lower bushings (26 and 22) and upper and lower boots (25 and 23) from mount bolt (21).

(5) Remove right forward mount assembly using procedures outlined in steps (1) through (4) above.

2-224. INSPECTION — TRANSMISSION MOUNTS.

a. Inspect mount bolts, bushings, and retaining washers for wear, nicks or cracks.

b. Inspect boots for tears or deterioration.

c. Inspect rubber and steel washers on inner face of bushing for securing of bonding.

CAUTION

Exercise care in inserting feeler gage to avoid damaging rubber core.

d. Inspect rubber core at both ends of mount for deterioration and separation. If vibration, roughness or mount bottoming was noted, inspect mount for bond separation between rubber core and inner and outer sleeves with a 0.010 inch feeler gage. If any separation exceeds 0.250 inch maximum depth for 33 percent of the circumference or if separation exceeds 0.750 inch at any one point, replace the mount.

2-225. REPAIR — TRANSMISSION MOUNTS.

a. Replace defective mounts or boots.

NOTE

It is important to note that a properly installed boot will extend the service life of the mount by keeping it free and clean of oil contamination. Any boot that is ripped or cut should be replaced.

b. Replace unserviceable protective boots. Replace bushings and retaining washers when worn, scored, nicked, or cracked. See figure 2-77.1 for inspection of pylon mount bolts.

WARNING

Adhesive is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

c. If rubber and steel washers on inner face of bushing become detached, rebond with adhesive (C12) or replace bushing assembly. Adhesive should be cured at a temperature of 75 degrees F (24 degrees C) or higher. If temperature is below 75 degrees F (24 degrees C) double the amount of cure time for each 12 degrees F (7 degrees C) below 75 degrees F (24 degrees C). Do not attempt to cure adhesive at temperatures below 50 degrees F (10 degrees C).

TYPICAL TEMPERATURES AND CURE TIME

Temperature Degrees F	Degrees C	Cure Time Hours
75	24	4
63	17	8
51	11	16

d. Replace mounts under following conditions:

(1) When excessive vibration in operation is believed to indicate that mounts no longer have proper spring rate to isolate normal pylon vibrations.

(2) When rubber-to-metal bond has separated deeper than raised rubber fillets at inner or outer sleeves.

2-226. INSTALLATION — TRANSMISSION MOUNTS.

a. Install left rear mount assembly (3, figure 2-77) and right rear mount assembly (not illustrated).

(1) Assemble boot (25) and bushing (26) on upper end of mount (24).

(2) Assemble boot (23) and bushing (22) on lower end of pylon mount (24).

(3) Insert mount bolt (21) through assembly from lower end of mount.

(4) If damper assembly (7) is not installed, position damper assembly on rear mount (3) and install bolt (6) with flat washer (5) under bolt head. Install nut (4). If damper assembly (7) is already installed, proceed to step (5).

NOTE

Ensure that replacement filler plate (13) is correct part number. Check TM 55-1520-236-23P.

(5) Position mount assembly (3) in pylon support (14) and on filler plate (13).

(6) Install four bolts (1) and washers (2). Torque bolts 100 TO 140 inch-pounds.

(7) Lockwire heads of bolts (1) in pairs with lockwire (C137).

(8) If damper (7) was installed with mount assembly (3), install bolt (8), with washer (12) under bolt head, and nut (11). If damper was already installed, proceed to step (9).

(9) If damper (7) was installed previously, install bolt (6), flat washer (5), and nut (4).

(10) Install hydraulic cylinders if they were removed during pylon mount removal procafure (paragraph 7-63).

b. Install left forward mount assembly (18) and right forward mount assembly (not illustrated).

(1) Assemble mount (18) using procedures in steps (1) through (3), above.

NOTE

Ensure that replacement ffl plate (17) is correct part number. Check TM 55-1520-236-23P.

(2) Position mount assembly (18) in pylon support (14) and on filler plate (17).

(3) Install bolts (20) and washers (19).

(4) Lockwire head of bolts (20) in pairs with lockwire (C137).

(5) Install right forward mount using procedures given for left forward mount.

2-227. FIFTH MOUNT AND FIFTH MOUNT SUPPORT FITTING.

2-228. DESCRIPTION — FIFTH MOUNT AND FIFTH MOUNT SUPPORT FITTING.

A fifth mount (10, figure 2-77), similar to the four transmission mounts (3 and 18), is located at the center of the fifth mount support fitting (9), across the rear of the pylon support (14). The purpose of the fifth mount is to assist the other four transmission mounts in the isolation of normal pylon vibrations and to restrict fore and aft movement of the transmission. The fifth mount is attached to the transmission support case by a bolt through a self-aligning bearing in the mount upper end.

2-229. REMOVAL— FIFTH MOUNT AND FIFTH MOUNT SUPPORT FITTING.

NOTE

Removal of the fifth mount while transmission is installed in helicopter requires removal of the fifth mount support fitting (15, figure 2-79).

a. Remove induction baffle mounted aft of fifth mount support fitting (15).

b. Remove fifth mount bolt.

(1) Remove cotter pin (1), nut (2), washer (3), and fifth mount bolt assembly (5).

(2) Remove cotter pin (11), nut (10), bolt (6), and washers (7 and 9).

(3) Remove fifth mount spacer (8) from transmission case fifth mount support (4).

c. Remove pylon transducer from pylon transducer bracket (20) in accordance with instructions contained in paragraph 11-.129.

d. Remove forward section of tail rotor driveshaft. Refer to paragraph 6-77.

e . Remove four bolts (17) and washers (16) securing each end of fifth mount support fitting (16) to pylon support (19) and remove fifth mount support fitting.

f. If shims (18) are loose, remove and identify for reinstallation at same location.

g. Remove lockwire, four bolts (22) and washers (21).

h. Remove pylon transducer bracket (20).

i. Lift fifth mount (13) and shim (14) from fifth mount support fitting (12). Save the shim for reinstallation.

i. Remove boot (12) from to of fifth mount (13).

2-230. INSPECTION – FIFTH MOUNT AND FIFITH MOUNT SUPPORT FITTING.

a . Inspect fifth mount (13, figure 2-78).

(1) Inspect boot (12) for cuts, tears or deterioration.

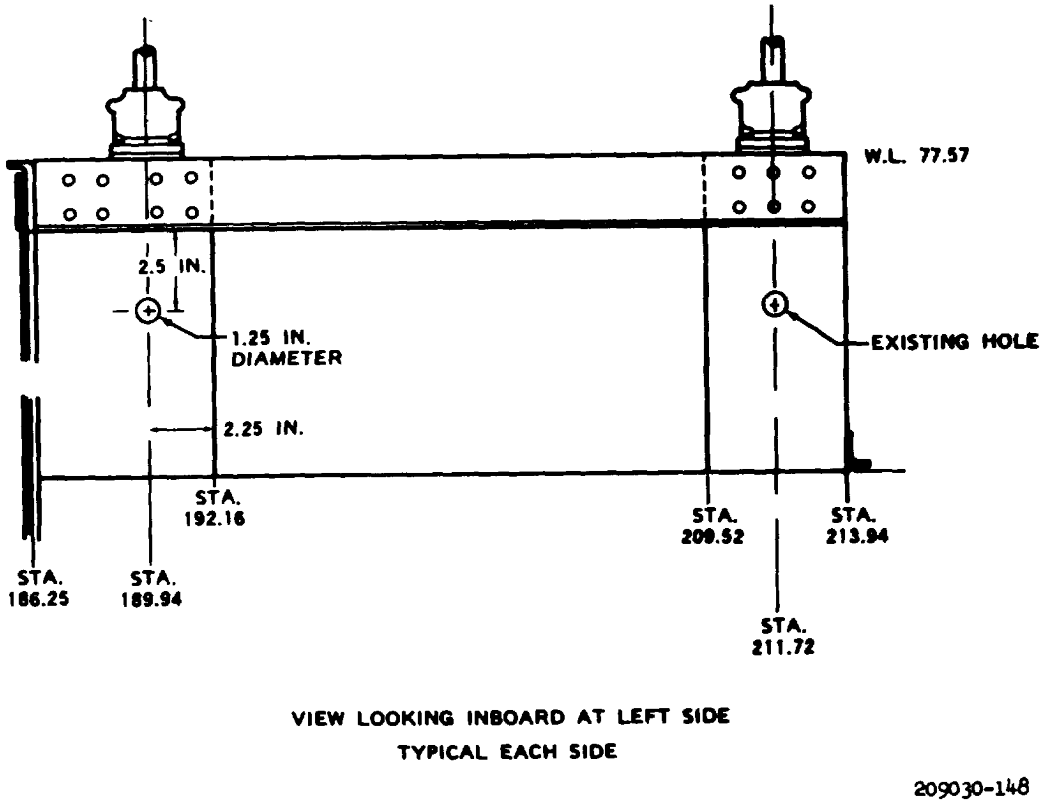


Figure 2-78. **Access Hole for Damper to Damper Support Fitting Mount Bolts**

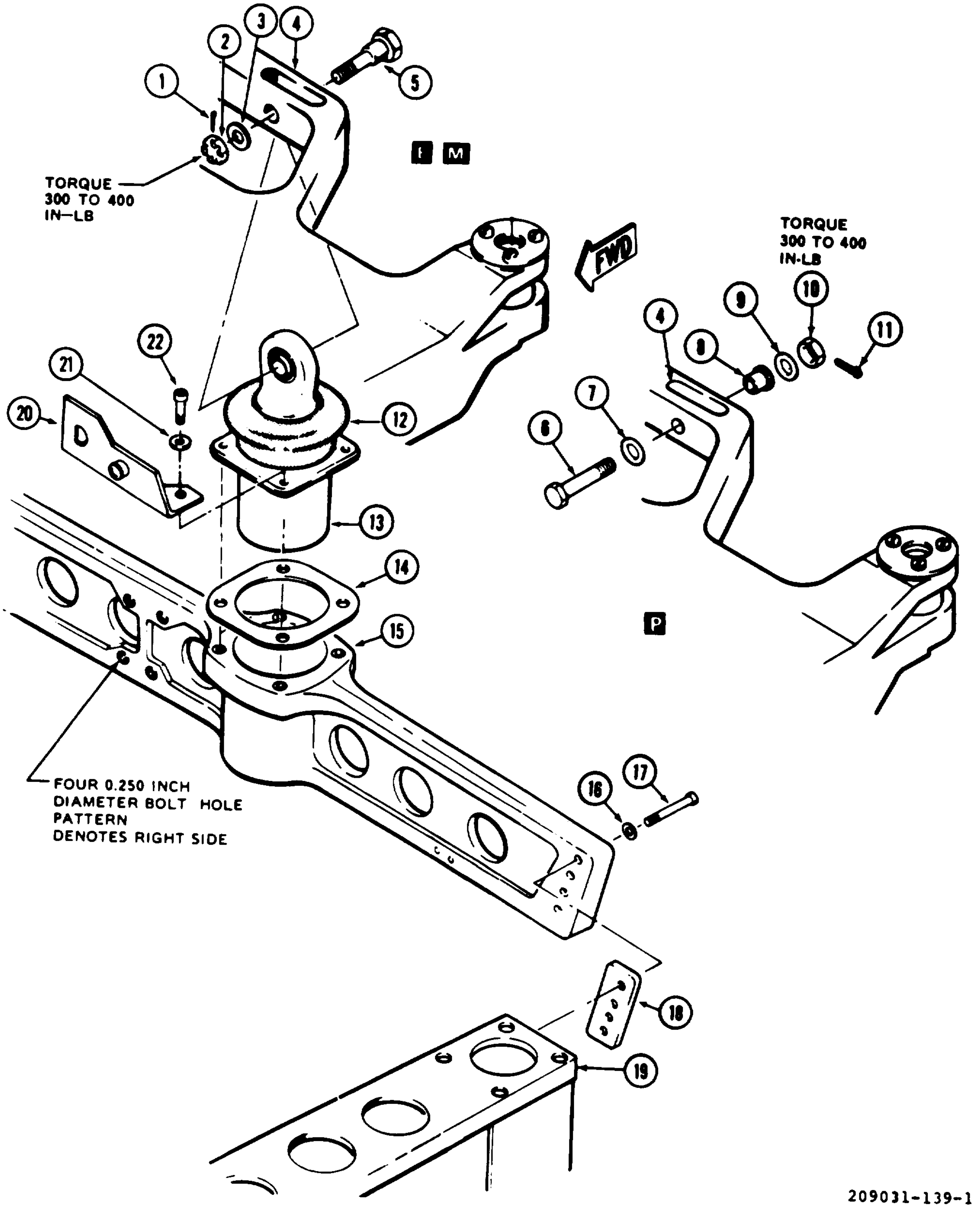


Figure 2-79. Fifth Mount and Fifth Mount Support Fitting - Installation (Sheet 1 of 2)

1. Cotter pin
2. Nut
3. Washer
4. Transmission case fifth mount support
5. E M Fifth mount bolt assembly
6. P Fifth mount bolt
7. P Special washer
8. P Fifth mount spacer
9. Washer
10. Nut
11. Cotter pin
12. Boot
13. Fifth mount
14. Shim
15. Fifth mount support fitting
16. Aluminum washer
17. Bolt
18. Shim
19. Pylon support
20. P Pylon transducer bracket
21. Thin steal washer
22. Bolt

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Figure 2-79. Fifth Mount and Fifth Mount Support Fitting – Installation (Sheet 2 of 2)

CAUTION

Exercise care in inserting feeler gage to avoid damaging rubber core.

(2) Inspect rubber core at both ends of fifth mount (13) for deterioration and separation. If vibration, roughness, or mount bottoming was noted, inspect mount for bond separation between rubber core and inner and outer sleeves with a 0.010 feeler gage. Maximum acceptable separation is 0.250 inch depth for one-third of the circumference or a separation of 0.750 inch depth at any one point.

(3) Inspect bearing in fifth mount (13) for wear (play). Maximum acceptable wear (play) is 0.008 inch radial and 0.016 inch axial.

(4) Inspect fifth mount (13) for cracks. No cracks are acceptable.

(5) Inspect shims (14) installation for working or missing shims.

b. Inspect fifth mount support fitting (15) for scratches, nicks, and cracks in accordance with figure 2-88.

c. Inspect mount bolts (22, figure 2-79) and washers (21) for damage or cracks.

d. Inspect fifth mount support fitting bolts (17) for wear, nicks, cracks, or damaged threads. Inspect washers (16) for cracks.

e. E M Inspect fifth mount bolt assembly (5) and nut (2) for cracks, nicks, wear, damage, and damaged threads. Inspect washer (3) for cracks.

f. P Inspect fifth mount bolt (6, figure 2-79) and nut (10) for cracks, nicks, wear, damage, and damaged threads. Inspect special washer (7) and washer (9) for cracks.

g. P Inspect fifth mount spacer (8) for cracks, wear and damage.

h. P Inspect pylon transducer bracket (20) for cracks and damage.

2-231. REPAIR OR REPLACEMENT – FIFTH MOUNT AND FIFTH MOUNT SUPPORT FITTING.

a. Replace boot (12, figure 2-79) if cut, torn or deteriorated.

(1) Remove all traces of old boot from mount by lightly sanding.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(2) Clean area using MEK (C74).

WARNING

Adhesive is flammable and toxic. Provide adequate ventilation when mixing and using proseal 890. Avoid prolonged breathing of vapors and contact with skin or eyes.

(3) Apply adhesive (C14) to area where boot makes contact with mount.

(4) Position new boot on mount and cure in accordance with table 1-11.

b. Replace fifth mount (13) if damage exceeds inspection limits.

c. Deleted.

d. Replace mount bolts (22) and washers (21) if damaged or cracked.

NOTE

Fifth mount support beam bolts may have non-drilled head bolts installed; however, when bolt removal and/or tare torque cannot be met, replace the fifth mount sup port beam bolts with drilled head bolts. Tare torque need not be checked until bolt removal becomes necessary.

e. Replace fifth mount support fitting bolts (17) if worn, nicked, cracked, or threads damaged; washers (16) if worn.

f. E M Replace fifth mount bolt assembly (5), or nut (2) if cracked, nicked, worn, damaged or if threads are damaged.

g. P Replace fifth mount bolt (6) or nut (10) if cracked, nicked, worn, damaged, or if threads are damaged.

h. P Replace fifth mount spacer (8) if cracked, worn or damaged.

i. P Replace pylon transducer bracket (20, figure 2-79) if cracked or damaged.

j. Replace missing shims (14). When working shims are evident, check shim adjustment and bolt (22) torque.

2-231.1. REMOVAL - FIFTH MOUNT BEARING AND BUSHING. (Refer to figure 2-79.1 for bushing and bearing tool kit.)

a. Remove mount assembly PN J-12292-1 from aircraft.

b. Visually inspect elastomer end (figure 2-79.2).

Note

No cracks, gouges, and/or separations are allowed on elastomer surface. If present, contact LAR or AVSCOM Engineering for guidance.

c. If elastomer is acceptable, remove bushing and bearings.

(1) Place mount on tool (T103) . Care should be taken not to puncture boot during entire replacement operations. (See figure 2-79.3.)

CAUTION

Care should be taken to properly align tools (T102 and T103) to avoid interference during normal operations.

(2) Press bushing and bearing out of housing by using a hydraulic press and tools (T102 and T103).

(3) After bushing and bearing removal, inspect hole diameter using an inside micrometer or equivalent. Hole diameter should be 1.2182/1.2162 inches.

2-231.2. CLEANING - FIFTH MOUNT BEARING AND BUSHING.

a. Deburr all edges using crocus cloth (C37).

CAUTION

Do not handle new or cleaned bearings and bushings with bare hands. Use white cotton gloves (C54) to avoid contamination to the bearing, bushing, and housing mating surfaces.

b. Thoroughly clean housing and bushing using toluene/xylene (C130) or similar, applied with cheesecloth (C30), then alcohol (C64) applied with clean cheesecloth (C30). Give special attention to corners arid any gouges causal by removal of bushing and bearing.

2-231.3. ASSEMBLY - FIFTH MOUNT BEARING AND BUSHING.

a. Apply a thin coat of zinc chromate primer (C91) to the 1.2182/1.2162 inch diameter hole in housing (figure 2-79.4).

b. Using a hydraulic press, align nest (T95) with ram adapter (T96) using tools (T97 and T98) for alignmnent. (See figure 2-79.1.)

c. Place mount PN J-12292-1, onto nest (T95).

CAUTION

If exterme interference fit occurs at the beginning of the press fit operation, stop, determine and eliminate cause before proceeding.

d. Press bushing into housing using tools (T97 and T98) and a load setting of one ton on press.

e. Check size of inside diameter (1.0935/1.0932) of bushing using a micrcometer (figure 2-79.4). Ensure roundness.

f. Apply thin coat of zinc chromate primer (C91) on 1.0935/1.0932 diameter of bushing surface.

CAUTION

If extremeterference fit occurs at the beginning of the press fit operation, stop and determine cause. Do not proceed unless cause of interference can be determined and eliminated.

9. With hydraulic press set to one ton, press bearing into bushing using tool (T98 and T99). (Refer to figure 2-79.1 and 2-79.4.)

2-231.4. STAKING - FIFTH MOUNT BEARING AND BUSHING.

a. Set load setting on hydraulic press to 8 tons, then ring stake bushing using tools (T100 ans T101). This tool ring stakes both sides of bushing at the same time. (See figure 2-79.1.)

b. Staked bushing should be as illustrated in figure 2-79.5.

c. Inspect bearing in accordance with paragraph 2-231.5.

2-231.5. INSPECTION - FIFTH MOUNT BEARING AND BUSHING.

a. Mechanically inspect, with the aid of a 4-inch long bolt placed through the bearing diameter. Rotate with hand pressure. Bearing must move freely and easily.

b. Inspect 100% 0.040/0.020 dimension (figure 2-79.5) on both sides of bushing. If the staked contour is on low side of dimensions, then restake bearing with an 8 ton load setting. If the staked contour is on high side of dimensions, dismantle and assemble using a new bushing.

c. If 0.040/0.020 dimension is met, visually inspect for general appearance. Check for loose plating in the staking area. Remove any loose plating.

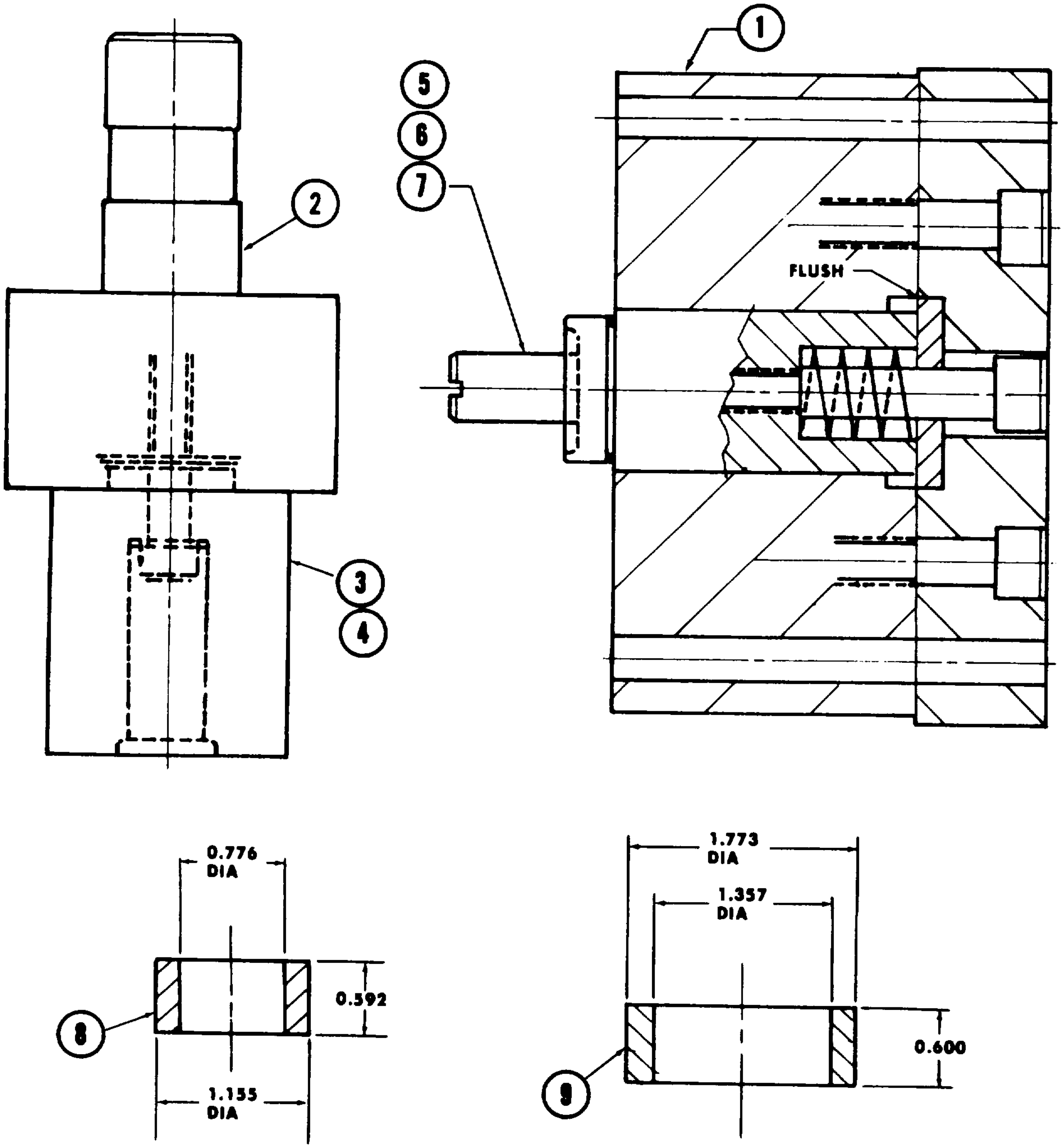
d. Brush stake area (both sides of bushing) with thin coat of zinc chromate primer (C91).

e. Apply slippage marks (one on each side of housing) as shown in figure 2-79.2.

NOTE

The slippage marks indicate that the bearing has been inspected 100%.

2-232. INSTALLATION - FIFTH MOUNT AND FIFTH MOUNT SUPPORT FITTING.



1. Nest LT-40-1 (T95)
2. Ram Adaptor LT-40-2 (T96)
3. Bushing Tool LT-40-3 (T97)
4. Staking Tool LT-40-7 (T101)
5. Bushing Tool LT-40-4 (T98)
6. Bearing Tool LT-40-5 (T99)
7. Staking Tool LT--40-6 (T100)

*8. Piercing Tool LT-40-6 (T102)

*9. Piercing Tool LT-40-9 (T103)

*Not part of tool kit

Figure 2-79.1. Bushing and Bearing Tool Kit LT--40

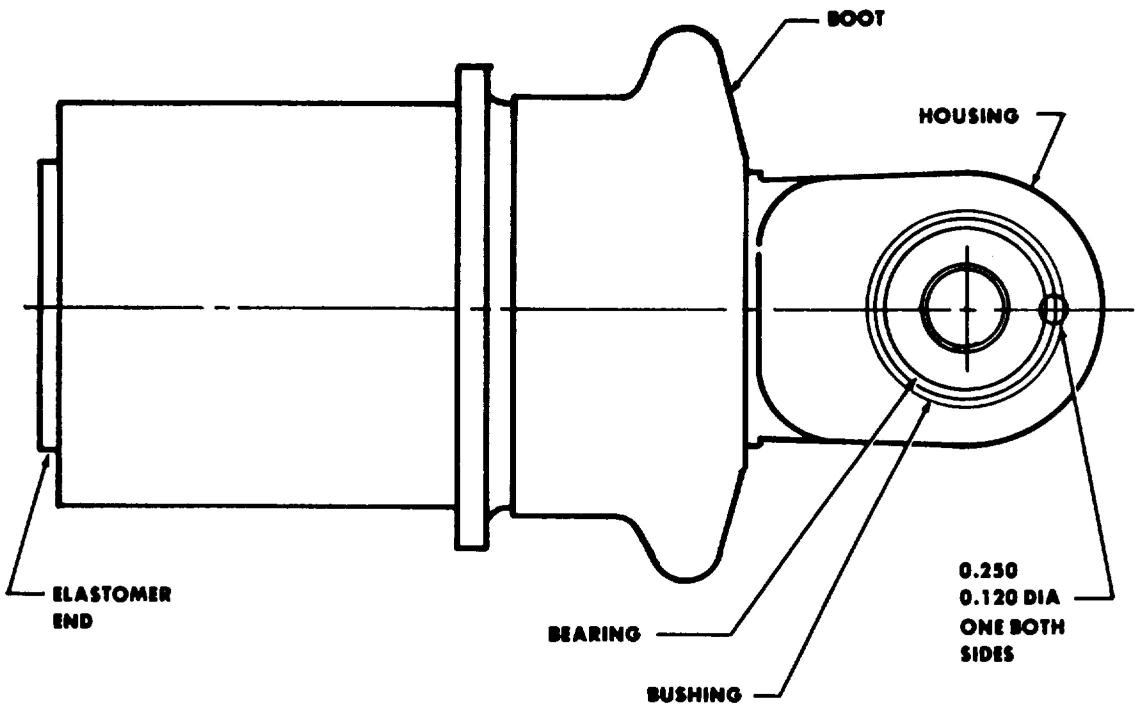


Figure 2-79.2. Fifth Mount Assembly

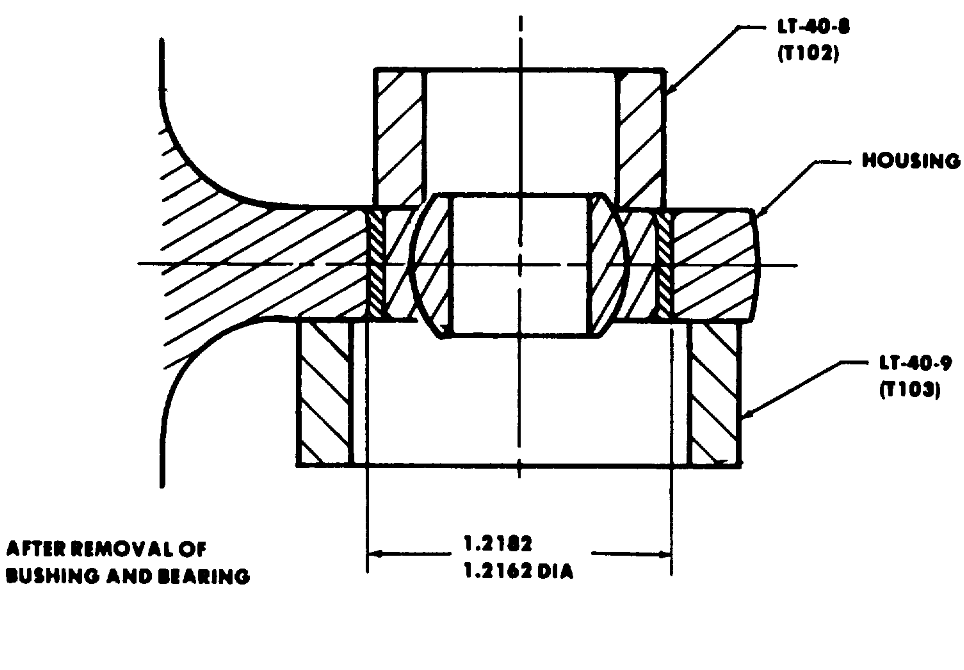


Figure 2-79.3. Fifth Mount Bushing and Bearing Removal

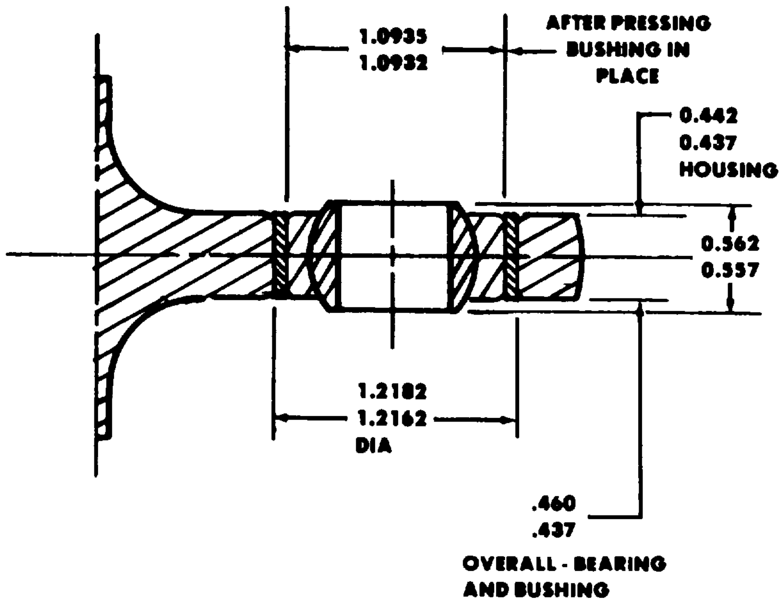


Figure 2-79.4. Fifth Mount Bushing and Bearing Installation

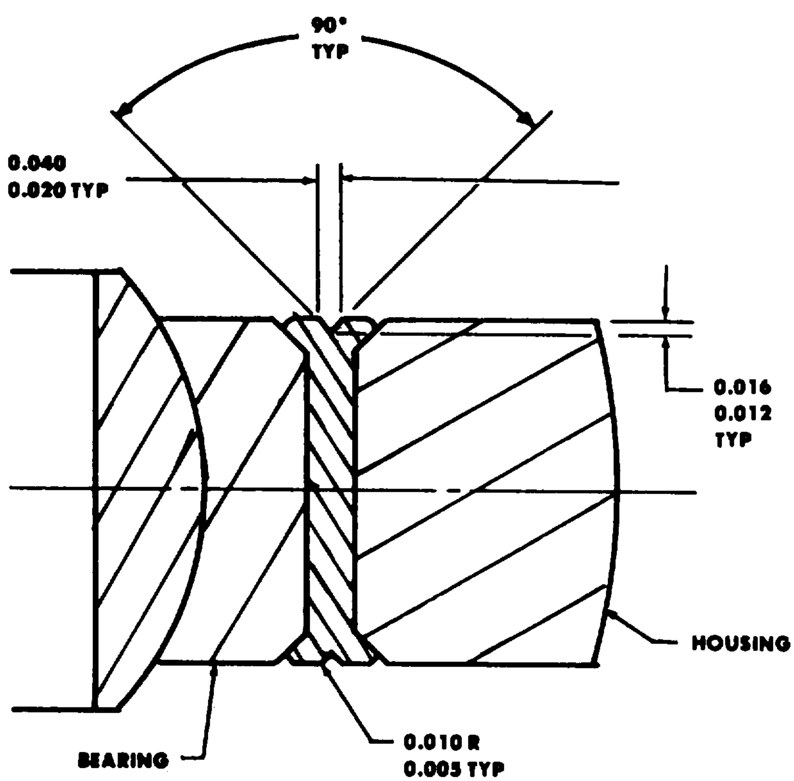


Figure 2-79.5 Fifth Mount Bushing Staking

CAUTION

It is possible to install the fifth mount support fitting backwards. Ensure that four 0.250 inch diameter bolt hole pattern is on right side when fitting is installed. See figure 2-79.

a. Position shim (14, figure 2-79) on fifth mount support fitting (15).

b. Insert fifth mount (13) into fifth mount support fitting (15) and align holes.

c. P Position pylon transducer bracket (20) on flange of fifth mount.

d. Install four bolts (22) with thin steel washers (21). Do not lockwire bolts at this time.

e. Ensure that shims (18) are in place on aft side of pylon support (19) for both ends of fifth mount support fitting (15). Bond loose shims (18) to pylon support (19) with adhesive (C12), if necessary.

f. Support transmission with a suitable hoist to relieve tension on eyebolt of fifth mount (13).

g. Position ends of fifth mount support fitting (15) on shims (18). Align holes and install bolts (17) with aluminum washers (16) under heads.

h. Align fifth mount (15) eyebolt with bushing of transmission case fifth mount support (4).

NOTE

When replacement of bolt (6) becomes necessary, replace with bolt assembly (5).

(1) E M Fifth mount bolt assembly (5) should be easily inserted without moving transmission.

(2) P Fifth mount bolt (6) should be easily inserted without moving transmission.

1. If unable to align, procure new shim (14) and/or shim (18). Peel shims as necessary to obtain proper alignment.

NOTE

Bolts (17) or (22) must not bottom out. For each 0.06 Inch shim removed, install steel washers on attaching bolts at that location.

j. Reinstall bolt (22) and thin steel washer (21) if removed. Lockwire bolts in pairs with lockwire (C137).

k. Reinstall bolts (17) and washers (16) if removed.

l. E M Install fifth mount bolt assembly (5), through eyebolt of fifth mount (13) and transmission case fifth mount support (4). Install washer (3) and nut (2). Torque bolt (5) 300 TO 400 inch-pounds. Install cotter pin (1).

m. **P** Install fifth mount spacer (8, figure 2-79, detail A) in transmission case fifth mount support (4).

n. **P** Install bolt (6) with special washer (7), (countersink against bolt head), through eyebolt of fifth mount (13, figure 2-79) and transmission case fifth mount support (4).

o. **P** Install washer (9) and nut (10). Torque nut (10) 300 TO 400 inch-pounds. Install cotter pin (11).

p. **P** Install pylon transducer on pylon transducer bracket (20) using instructions contained in paragraph 11-130.

q. Install tail rotor driveshaft using instructions contained in paragraph 6-81.

r. Install induction baffle.

2-233. TRANSMISSION DAMPERS.

2-234. DESCRIPTION – TRANSMISSION DAMPERS.

Two fluid-type dampers are used in the pylon mounting system to help control motion of the pylon and prevent vibration. One damper is connected between the pylon support structure and the lower end of each of the rear pylon mounts (figure 2-77).

2-235. REMOVAL – TRANSMISSION DAMPERS.

To remove dampers with transmission and mounts installed, remove bolts from upper and lower attachment fittings. Remove hydraulic cylinder for access; where necessary (figure 2-77).

2-236. INSPECTION – TRANSMISSION DAMPERS.

a. Mount boots for proper installation and deterioration.

b. Mounts for evidence of bottoming out and deterioration.

c. Underside of dampers for leaks.

d. Bearing in damper and damper fitting for maximum of 0.012 axial and 0.006 inch radial play.

e. After any hard landing, remove mount dampers to check for possible internal yielding as follows: (figure 2-80).

(1) Use calibrated dial indicator to measure the 0.030 inch max end play of barrel assembly. (15, figure 2-81)

(2) Measure gap between spring seat (12) and shims (9 and 11) under end of cylinder barrel.

(3) Damper is unserviceable if either measured gap exceeds 0.030 inch. See figure 2-80.

2-237. DISASSEMBLY – TRANSMISSION DAMPERS (AVIM).

a. Remove cotter pin (32, figure 2-81) nut (31), washer (30), and bolt (18) from piston (17) and clevis end (26).

b. Remove clevis end (26), dowel pin (27), and spool assembly (24) from piston (17).

c. Remove dowel pin (27) from spool assembly (24) and separate clevis end (26) from spool assembly. Remove and discard packings (25) from spool assembly.

d. Remove spirolox retainer (10), upper shim (7), barrel assembly (8), and lower shim (9) from body assembly (2).

NOTE

Shims must be placed in the same position on reassembly. Tag and identify the upper and lower shim.

e. Remove spirolox retainer (23), end cap (21), and piston (17) from barrel assembly (8).

f. Remove spirolox retainer (14), spring seats (12), spring (13), and shim (11) from barrel (15). Discard spirolox retainer (14).

g. Remove and discard packing (28), double delta seal (22), and packing (29) from end cap (21).

h. Remove and discard double delta seal (20) and packing (19) from piston (17).

i. Remove retaining ring (6) and retainer (3) from body assembly (2).

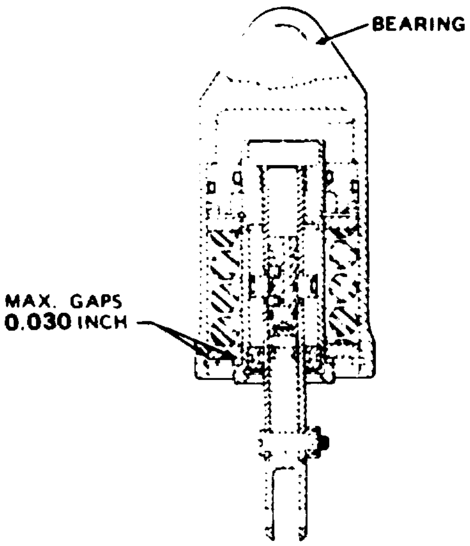


Figure 2-80. Damper – Internal Yielding Inspection

j. Remove and discard double delta seal (16), packing (4), and packing (51 from retainer (3).

2-238. CLEANING – TRANSMISSION DAMPERS (AVIM).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

Clean disassembled parts with solvent (C112) and dry with clean cloth or compressed air.

2-239. REPAIR – TRANSMISSION DAMPERS (AVIM).

a. Replace dampers if leaking or if found to be yielding after a hard landing. See figure 2-80.

b. Replace bearing (1, figure 2-81) if not within tolerance specified. Stake bearing using standard maintenance practices and staking tool.

c. Inspect detail parts far nicks, scratches, minor corrosion, wear, and broken shims.

NOTE

The mechanical and corrosion damage limits for the external part of the pylon damper housing assembly should not exceed 0.010 before cleanup (sanding, etc.) end 0.020 after cleanup. There are no damage limits required for the inner pylon housing adjacent to the shim retainer.

2-240. ASSEMBLY – TRANSMISSION DAMPERS (AVIM).

a. Lubricate all packings and seals with hydraulic fluid (C62) prior to assembly.

b. Install packing (19, figure 2-81) in groove of piston (17). Install double delta seal (20) over packing (19). Use care to prevent stretching and malforming of seal and packing.

c. Assemble pylon damper seal installation tool (T64) and pylon damper piston as follows:

(1) Place seal holder (2, figure 2-82) on shaft (1).

(2) Place bolt end of piston (17, figure 2-81) on shaft (1).

(3) Thread guide (3, figure 2-82) into shaft (1).

d. Work double delta seal (20, figure 2-81) under lip of seal holder (2, figure 2-82) and hold in position. Insert guide end of assembled parts into large hole of barrel (15, figure 2-81) until the seal holder bottoms inside barrel. Hold parts in position.

CAUTION

Double delta seal (20) is easily damaged. Maintain pressure to hold lip of double delta seal under lip of seal holder and to keep assembled parts bottomed inside barrel (15).

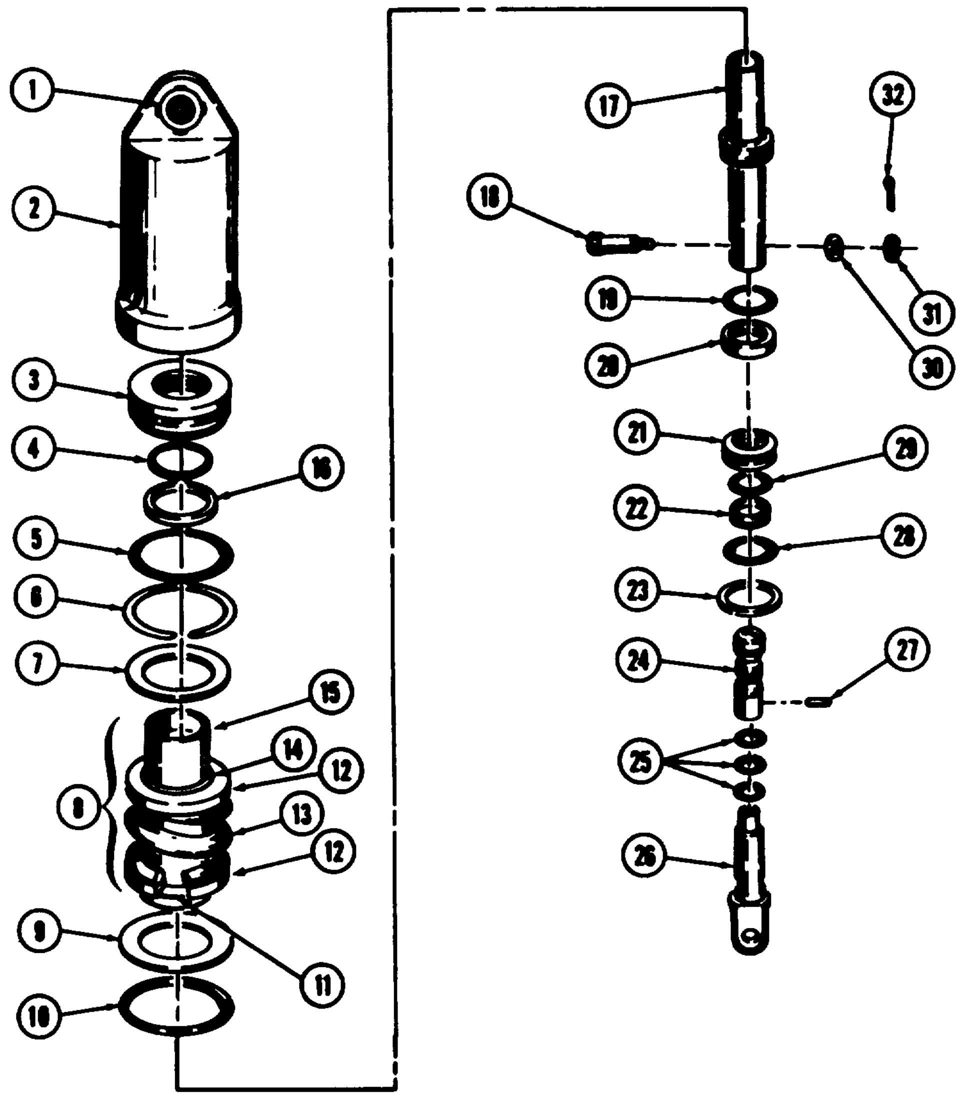
e. Hold barrel (15) firmly and rap shaft (1, figure 2-82) with heel of hand to force piston (17, figure 2-81) into position within barrel (15).

f. Remove guide (3, figure 2-82) from shaft (1) and remove shaft and seal holder from barrel and piston assembled in preceding step. Remove seal holder (2) from shaft (1).

g. Insert shaft (1) through piston (17, figure 2-81), thread guide (3, figure 2-82) into shaft (1), and align holes in piston and guide. Install pin (4) in aligned holes and install screw (5) in pin (4) to lock special tools to piston.

h. Install packing (29, figure 2-81) inside groove of end cap (21). Place double delta seal (22) over packing (29). Install packing (28) in groove on outside of end cap.

i. Place beveled end of end cap (21) down on guide that was pinned to piston (17) in step g. Force end cap into position within barrel (15).



1. Bearing
2. Body assembly
3. Retainer
4. Packing
5. Packing
6. Retaining ring
7. Upper shim
8. Barrel assembly
9. Lower shim
10. Spirolox retainer
11. Shim
12. Spring seat
13. Spring
14. Spirolox retainer
15. Barrel
16. Double-delta seal
17. Piston
18. Bolt
19. Packing
20. Double-delta seal
21. End cap
22. Double-delta seal
23. Spirolox retainer
24. Spool assembly
25. Packings
26. Clevis end
27. Dowel pin
28. Packing
29. Packing
30. Washer
31. Nut
32. Cotter pin

Figure 2-81. Transmission Damper - Assembly

j. Remove screw (5, figure 2-82), pin (4), and guide (3) from shaft (1). Remove shaft (1).

k. Install spirolox retainer (23, figure 2-81) into barrel (8).

l. Install packing (4) in retainer (3) and install double-delta seal (16) over packing. Install packing (5) on retainer. Install retainer (3) and packings on barrel (15). Turn retainer on barrel to seat and size double-delta seal (16). After a minimum of five minutes, remove retainer from barrel and inspect double delta seal for correct seating and for damage.

m. If double delta seal (16) is properly seated and is not damaged, install the retainer, seal, and packings into body assembly (2) and secure with retaining ring (6).

n. Select shim (11) of proper thickness as follows:

(1) Determine dimension A and dimension B as shown on figure 2-83.

(2) Subtract dimension B from dimension A to obtain measured gap. Determine proper shim from table on figure 2-83.

o. Install shim (11, figure 2-81) with inside chamfer of shim against radius of barrel (15). Install spring seat (12), spring (13), second spring seat (12), and spirolox retainer (14) on barrel (15).

p. Install clevis-end (26) in piston (17). Align round holes in piston and clevis-end and install bolt (18), washer (30) and nut (31). Do not install cotter pin (32) at this time.

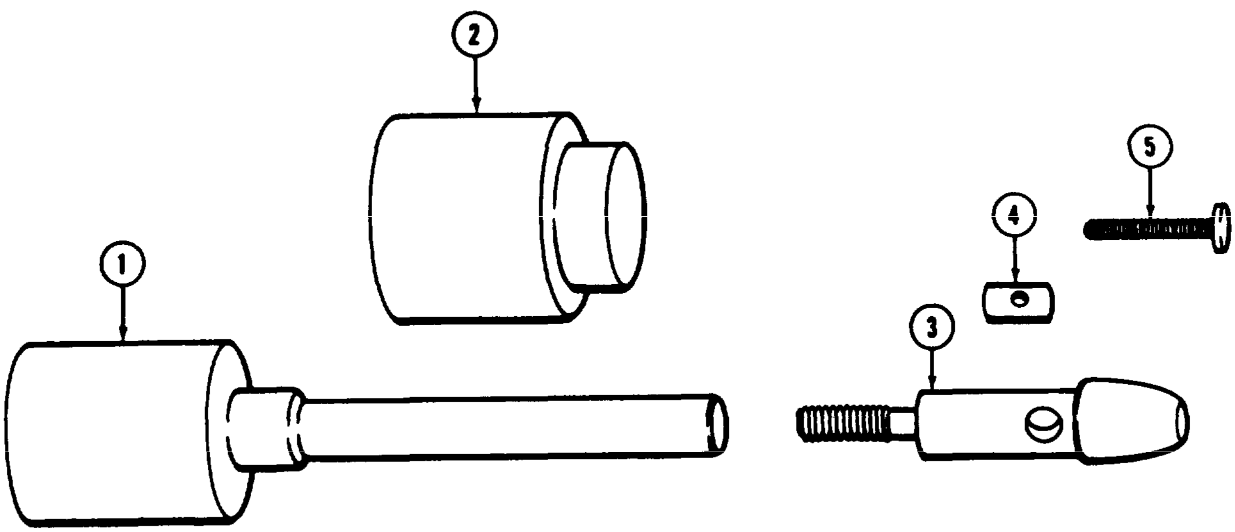
q. Select upper shim (7) of proper thickness as follows:

(1) Determine dimension C as shown on figure 2-84.

(2) Subtract dimension C from 5.82 inches to obtain measured gap. Determine proper shim by using table on figure 2-84.

r. Remove barrel assembly (8, figure 2-81) from body assembly (2). Install upper shim (7) in body assembly (2) and reinstall barrel assembly (8).

s. Temporarily install spirolox retainer (10). Using feeler gage measure gap between spring seat and spirolox retainer as shown on figure 2-85. Select proper lower shim based on measured gap from table on figure 2-85.



1. Shaft
2. Holder
3. Guide
4. Pin
5. Screw

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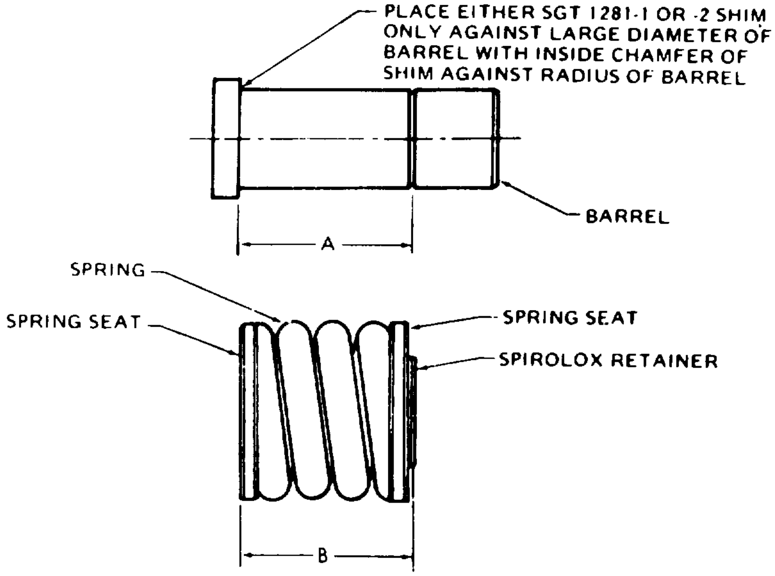
Figure 2-82. Damper Seal – Installation Tool



SGT 1281 SHIM REQUIRED

MEASURED GAP		-1 .070	-2 .050	-3 .040	-4 .035	-5 .030	-6 .025
	.070	1					
.071	.075		1				1
.076	.080		1			1	
.081	.085		1		1		
.086	.090		1	1			
.091	.095	1					1
.096	.100	1				1	
.101	.105	1			1		
.106	.110	1		1			
.111	.115		1		1	1	
.116	.120	1	1				
.121	.125		1	1	1		
.126	.130	1			1		1
.131	.135	1			1	1	

ALL DIMENSIONS ARE IN INCHES

Figure 2-83. Damper Barrel Shim — Replacement

t. Remove spirolox retainer (10, figure 2-81). Install lower shim (9) and reinstall spirolox retainer (10).

u. Remove bolt (18) and clevis-end (26) from piston (17).

v. Hold damper in vertical position. Add hydraulic fluid (C62) through piston rod (17). Slowly cycle piston rod (17) until air is removed. Leave piston rod (17) in retracted position.

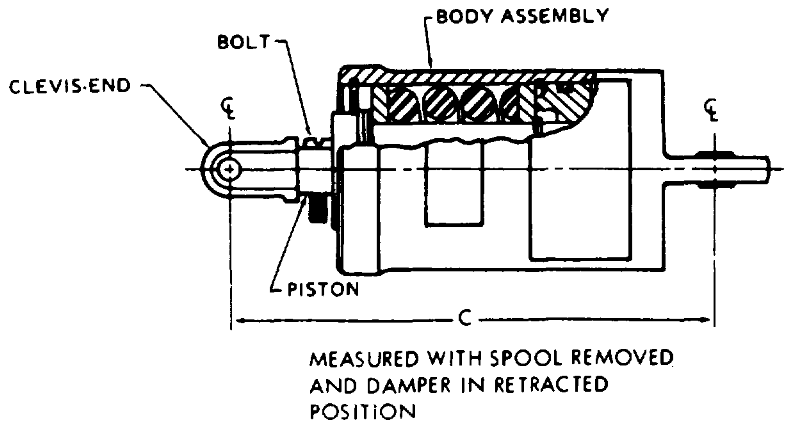
w. Install packings (25) on spool assembly (24). Align holes in spool assembly (24) and clevis-end (26). Insert dowel pin (27).

x. Install spool assembly (24) in piston (17). Align holes in piston (17) and clevis-end (26). Install bolt (18), washer (30), nut (31), and cotter pin (32).

y. Pack bearing (1) with grease (C55).

CAUTION

Any attempt to move the piston, spool, or clevis assembly with the damper in a position other than vertical may introduce air into the piston and spool assemblies.



SGT 1282 SHIM REQUIRED

	-1	-2	-3	-4	-5	-6	-7
MEASURED GAP	.060	.040	.035	.030	.025	.020	.015
.015							1
.016 .020						1	
.021 .025					1		
.026 .030				1			
.031 .035			1				
.036 .040		1					
.041 .045					1	1	
.045 .050				1		1	
.051 .055				1	1		
.056 .060	1						
.061 .065		1			1		
.066 .070		1		1			
.071 .075		1	1				
.076 .080	1					1	
.081 .085	1				1		
.086 .090	1			1			
.091 .095	1		1				
.096 .100	1	1					
.101 .105	1				1	1	
.106 .110	1			1		1	
.111 .115	1			1	1		
.116 .120	1		1		1		

Figure 2-84. Damper Upper Shim — Replacement

z. After damper is serviced and spool and clevis assembly is installed, hold damper assembly vertically, piston (clevis-end) down. Check for free movement or play of piston. If there is any free movement or play, the pylon damper is not properly serviced and/or not properly assembled.

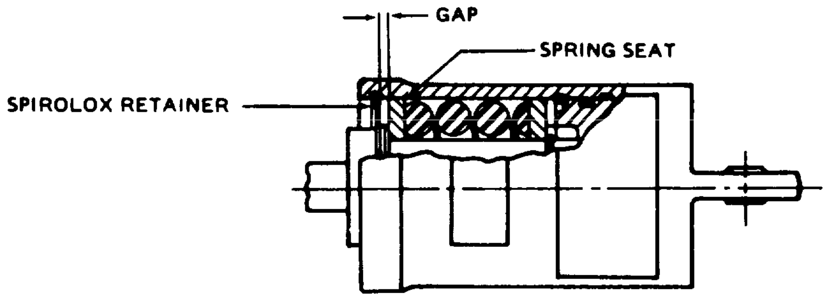
aa. Deleted

2-241. INSTALLATION – TRANSMISSION DAMPERS.

a. Place damper, with cylinder up, into pylon support from inboard side (figure 2-77 and paragraph 2-226).

b. Align cylinider bearings in eyebolt of aft mount, and clevis on support fitting in structure.

c. Install bolts, nuts, and washers in accordance with paragraph 2-226a(4).



	SGT 1282 SHIM REQUIRED (OUTBOARD)						
	-1	-2	-3	-4	-5	-6	-7
MEASURED GAP	.060	.040	.035	.030	.025	.020	.015
.015 .019							1
.020 .024						1	
.025 .029					1		
.030 .034				1			
.035 .039			1				
.040 .044		1					
.045 .049					1	1	
.050 .054				1		1	
.055 .059				1	1		
.060 .064	1						
.065 .069		1			1		
.070 .074		1		1			
.075 .079		1	1				
.080 .084	1					1	
.085 .089	1				1		
.090 .094	1			1			
.095 .099	1		1				
.100 .104	1	1					
.105 .109	1				1	1	
.110 .114	1			1		1	
.115 .119	1			1	1		
.120 .124	1		1		1		
.125 .129	1	1			1		
.130 .134	1	1		1			
.135 .139	1	1	1				
.140 .144	2					1	
.145 .149	2				1		
.150 .154	2			1			
.155 .159	2		1				
.160 .164	2						
.165 .169	2				1	1	
.170 .174	2			1		1	
.175 .179	2			1	1		
.180 .184	2		1		1		
.185 .189	2		1	1			
.190 .194	2	1		1			
.195 .199	2	1	1				

Figure 2-85. Damper Lower Shim – Replacement

d. Reinstall hydraulic cylinder removed for access.

2-242. TRANSMISSION BUSHINGS.

2-243. DESCRIPTION – TRANSMISSION BUSHINGS.

The transmission bushings are tapered metal wear surfaces which have steel and rubber washers bonded to the bushing inner face. The bushings cushion and support each of the five transmission mounts and are installed on the mount between the leg of the transmission and the pylon support.

2-244. REMOVAL – TRANSMISSION BUSHINGS.

Refer to paragraph 2-223 for removal of transmission mounts.

2-245. INSPECTION – TRANSMISSION BUSHINGS.

Refer to paragraph 2-224 for inspection of transmission mounts.

2-246. REPAIR – TRANSMISSION BUSHINGS.

Refer to paragraph 2-225 for repair of transmission mounts.

2-247. INSTALLATION –TRANSMISSION BUSHINGS.

Refer to paragraph 2-226 for installation of transmission mounts.

2-248. TRANSMISSION FITTINGS (AVIM).

2-249. DESCRIPTION – TRANSMISSION FITTINGS.

The transmission fittings form structural attachment points for the pylon support and the lower end of the dampers. See figures 2-86 and 2-77.

2-250. REMOVAL – TRANSMISSION FITTINGS.

a. Remove support (1, figure 2-86) as follows:

(1) Remove hydraulic lines and fittings from support (1). Cap or plug hydraulic lines to prevent entry of foreign material.

(2) Remove nut, screw and clamp from outboard side of support (1).

(3) Carefully remove six rivets which secure support to lift beam and remove support. Do not elongate holes in lift beam.

b. Remove the pylon damper fitting (15, figure 2-77).

(1) Remove transmission (paragraph 6-24).

(2) Remove the two aft transmission mount assemblies (3, figure 2-77) (paragraph 2-223).

(3) Carefully drill out rivets which secure damper fittings to structure and remove fitting. See figure 2-87 for detail view of rivet. Remove fitting.

c. Remove fifth mount support fitting (15, figure 2-79) (paragraph 2-229).

2-251. INSPECTION – TRANSMISSION FITTINGS.

a. Inspect support (1, figure 2-86) and support assembly (2) for cracks, corrosion damage, and secure attachment to lift beam (3).

b. Inspect damper fitting (15, figure 2-77) for defects:

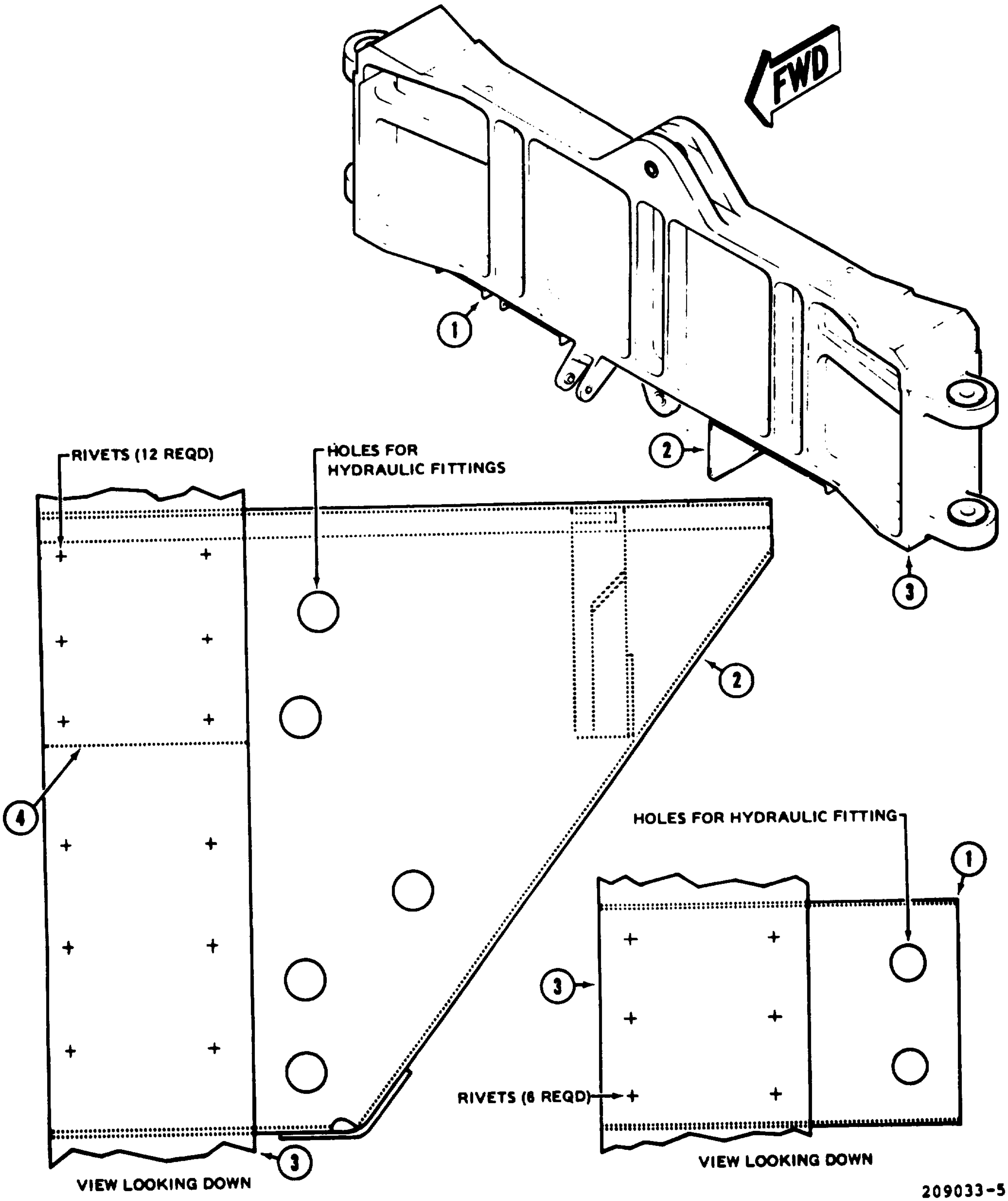
(1) Cracks. No cracks allowed.

(2) Corrosion. Severe corrosion damage is cause for replacement of damper fittings. Minor corrosion damage may be repaired, using fine India stone (C116).

(3) Secure installation of all rivets which attach the two fittings (15) to the structure.

(4) Secure installation of bearing in damper fitting and condition of bearing.

c. Inspect fifth mount support fitting (15, figure 2-79) for damage in excess of limits shown on figure 2-88.



1. Support
2. Support assembly
3. Lift beam
4. Radius block

Figure 2-86. Hydraulic Fitting Supports — Installation

2-252. REPAIR – TRANSMISSION FITTINGS.

NOTE

Do not repair a damaged support assembly (2, figure 2-86). Install a new support assembly.

a. Remove radius block (4) from old support assembly or fabricate a new support from 0.060 inch thick material.

a.1. INSPECTION — PYLON DAMPER FITTINGS. Inspect pylon damper fittings for loose or missing rivets.

b. Repair damper fitting (6, figure 2-87).

(1) Raplace damper fitting if cracked.

CAUTION

Do not replace loose or missing rivets with steel fasteners unless it is Hi-Lok rivet HL20PB5-6 (forward) or HL20PB-6-6 (aft). Rivets are designed to shear before doing excessive damage to pylon.

(2) Polish out superficial corrosion damage using fine India stone (C116). Apply primer (C88 or C91) to bare metal surfaces.

(3) If bearing in pylon damper fitting failed to meet inspection requirements, remove old bearing and install new bearing by roll staking method. Refer to chapter 5 for general instructions to remove and install roll staked bearings. If roll staking tools are not available install a new fitting.

(4) If rivet holes in pylon damper fitting are elongated, install a new fitting.

(6) If rivet holes in helicopter structure for rivets (1) are not elongated, proceed to step (b.7). If any holes in structure are elongated, install bushings as outlined in steps (6) through (9).

(6) Drill out elongated holes in web (3) and extrusion (4). Use a letter size N twist drill. Ream the hole for a class FN2 fit with a NAS 77-3-31 bushing. Make the hole 0.0004 TO 0.0014 inch smaller than the bushing.

(7) Coat bushing (2) and the hole with primer (C88 or C91) and press bushing into position while orimer is wet. Install the bushing with the flanged end on the opposite side of the structure from fitting (6) as illustrated. The bushing must extend through the wef (3) and extrusion (4). Face off bushing flush with extrusion (4) as shown on detail view A.

(8) If Hi-Lok rivets are to be installed, proceed us follows:

(a) Remove two forward 5/32 inch rivets and two aft 3/16 inch rivets. Exercise extreme caution to preclude further enlargement of original hole.

(b) Ream original 5/32 inch holes to 0.1615 to 0.1635 inch diameter and install HL20PB-5-6 Hi-Lok fasteners with HL86PB-5 collars.

(c) Ream original 3/16 inch holes to 0.1885 to 0.1895 inch diameter and install HL20PB-6-6 Hi-Lok fasteners with HL86PB-6 collars.

(d) One flat washer (AN960 series or equivalent) may be used under collar with nut if Hi-Lok rivet shows 1/8 inch or more of unthreaded shank.

(9) Touch up bare metal with primer (C88 or C91).

c. Repair fifth mount support fitting (15, figure 2 79) as follows:

(1) Polish out mechanical and corrosion damage using fine India stone (C116) that is within limits shown on figure 2-88.

(2) Replace support fitting if damage exceeds limits or if any cracks are detected.

(3) Touch-up repair areas with chemical film (C31) and primer (C88 or C91).

2-253. INSTALLATION – TRANSMISSION FITTINGS.

a. Install support (1, figure 2-86).

(1) Position support (1) on lift beam in original position so that hydraulic fittings can be reinstalled and clamp in place. Drill out holes for six rivets to match holes in lift beam. Remove support and deburr holes. Position support on lift beam and install six rivets (53, table 2-2).

(2) Install hydraulic fittings on support and install hydraulic lines on fittings.

(3) Install clamp removed from outboard side of support.

(4) Perform functional check of hydraulic system with hydraulic teat stand or by ground run of helicopter. Refer to paragraph 7-3. Check for correct operation of hydraulic system and for hydraulic fluid leaks.

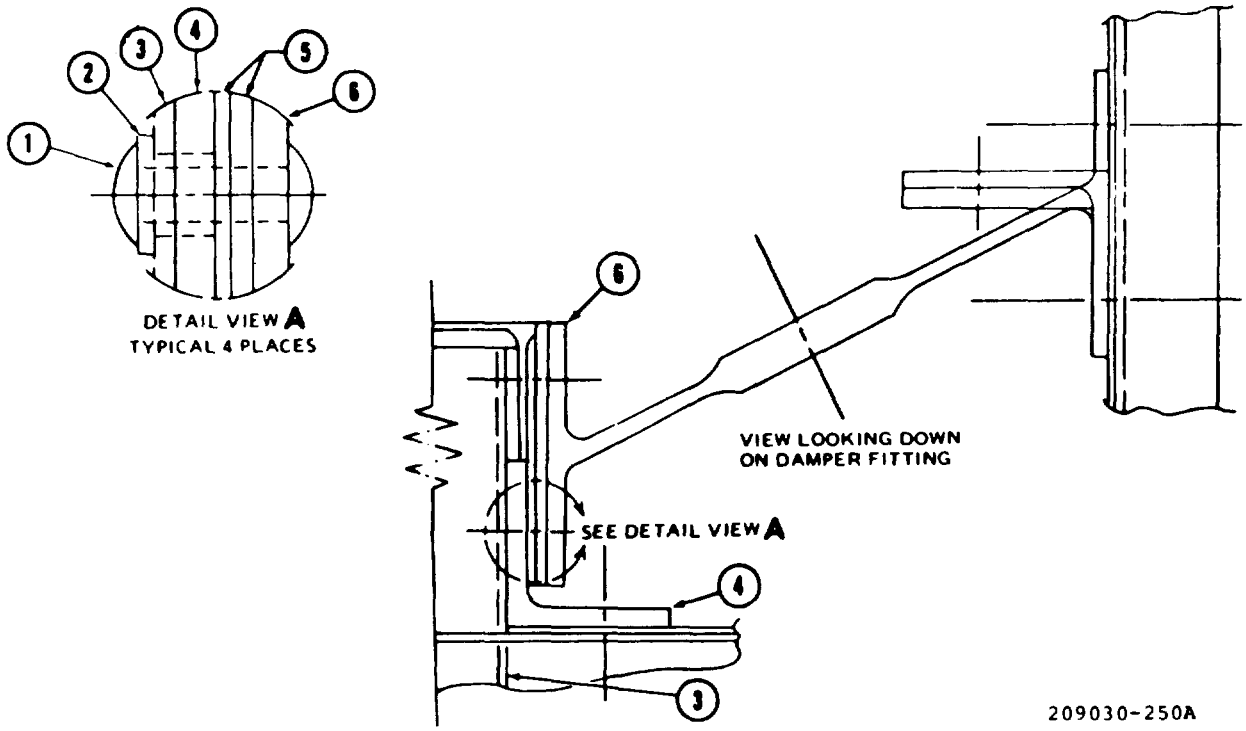
b. Install support assembly (2).

(1) Clamp support assembly (2) and radius block (4) on lift boom at position illustrated. En-aura that radius block (4) is nested against mating radius of the support assembly.

(2) Drill out rivet holes in new support assembly (2) and radius block to match holes in lift beam. Remove support and radius block (4). Deburr holes.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.



1. **Rivet**
2. **Bushing**
3. **Web**
4. **Extrusion**
5. **Shims (as required)**
6. **Fitting**

Figure 2-87. Damper Support Fitting – Elongated Holes

(3) Clean mating surfaces at support assembly (2) and radius block (4) with 400 grit sandpaper (C102). Remove all residue with MEK (C74).

(4) Mix a small quantity of adhesive (C14) according to instructions on container and apply a thin coat of adhesive to mating surfaces of support assembly and radius block (table 1-11).

(5) Place a 4 mil glass yarn string in bond line at one inch intervals. The glass yarn will serve as a spacer to ensure that adhesive thickness will be 3 TO 8 mils after curing.

(6) Clamp support assembly (2) and radius block (4) in position on lift beam with radius block radius nested in support assembly radius. Install twelve rivets.

(7) Clean all adhesive squeeze out from the parts before adhesive hardens.

(8) Paint support assembly (2) and radius block (4) with primer (C88 or C91).

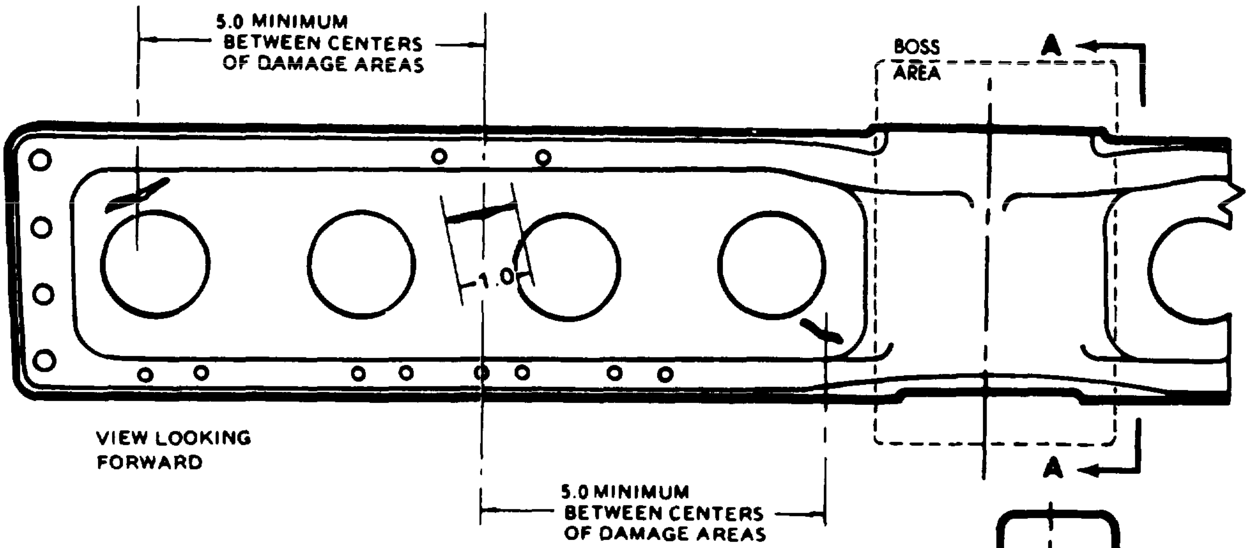
(9) Install hydraulic fittings on support assembly (2) and install hydraulic lines on fittings.

(10) Perform functional check for correct operation of hydraulic system with hydraulic test stand or by ground run of helicopter. Check for correct operation of hydraulic system and for hydraulic fluid leaks. Refer to chapter 7.

c. Install damper fitting (15, figure 2-77).

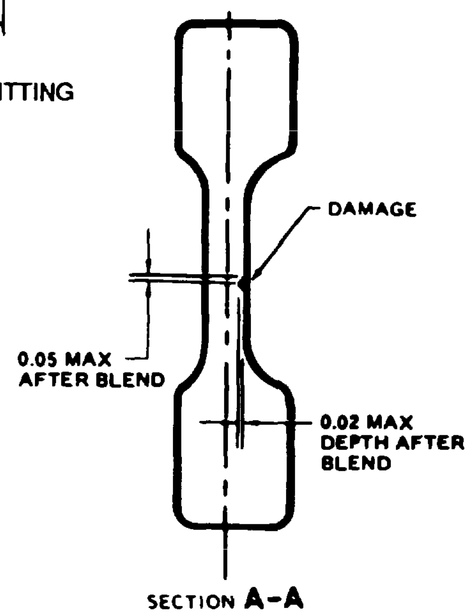
(1) Position fitting in helicopter and install rivets MS20470DD6 (1, figure 2-87).

(2) Install damper (7, figure 2-77), mount (3) and transmission. Refer to chapter 6.



SCRATCHES, NICKS, AND GOUGES IN WEB AND ON FLANGE OF FITTING

1. No cracks allowed.
2. Scratches, nicks, and gouges may be polished out provided they do not exceed limitations shown.
3. The maximum length of all damages shall not exceed 1.0 after blend.
4. Five repairable damages allowed on each face of web and flange, with a minimum spacing of 5.0 on center.
5. No damage allowed in boss area.
6. Replace fitting when damages exceed limitations listed above.



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ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

Figure 2-88. Damage Limits – Fifth Mount Support Fitting

(3) Perform ground run for functional check of flight controls and hydraulic system components affected by transmission removal/installation. Refer to chapter 7.

d. Install fifth mount support fitting (15, figure 2-79). Refer to paragraph 2-227.

2-254. MAP AND DATA CASE.

2-255. DESCRIPTION – MAP AND DATA CASE.

The data case for maps, flight reports etc., is located under the right arm rest in gunner compartment.

2-256. REMOVAL – MAP AND DATA CASE.

Release fasteners and remove data case on gunner right arm rest.

2-257. INSPECTION – MAP AND DATA CASE.

Inspect data case for damage which would affect its function.

2-258. REPAIR – MAP AND DATA CASE.

Replace data case if damage is beyond functional limits.

2-259. INSTALLATION – MAP AND DATA CASE.

Install data case and secure fasteners as applicable.

2-260. TOW AND JACK FITTINGS.

2-261. DESCRIPTION – TOW AND JACK FITTINGS.

a. Four jack fittings with mooring shackles attached are provided as loose equipment for use at two jack points on the fuselage and on two outboard wing locations. (Figure 2-89). The forward jack fitting is attached by bolts under the structure of the right main beam and the ammunition compartment rear bulkhead. The aft jack fitting is screwed into a socket on the left main beam ahead of the tailboom attach splice. Wing jack fittings are attached by bolts to sockets under the outboard ejector racks.

b. The tow fitting is a casting with an eyehole which is riveted to the front of the skid tubes (figure 2-89).

2-262. REMOVAL — TOW AND JACK FITTINGS.

a. If damaged, drill out rivets and remove the tow fitting from each skid tube as applicable.

b. Remove forward jack and mooring fitting (figure 2-89), aft jack and mooring fitting, and two wing jack and mooring fittings (paragraph 1-33).

2-263. INSPECTION – TOW AND JACK FITTINGS.

a. Inspect forward jack fitting for cracks and other defects which would affect its function.

b. Inspect aft jack fitting for cracks and other defects which would affect its function.

c. Inspect wing jack fittings for cracks and other defects which would affect their function.

d. Inspect tow ring on skid tube for cracks and other defects which would affect its function. Inspect for loose, cracked or missing rivets.

e. Perform fluorescent penetrant inspection of tow and lack fittings in accordance with MIL-STD 6866.

2-264. REPAIR – TOW AND JACK FITTINGS.

a. Replace cracked or damaged jack fittings.

b. Polish out minor scratches, nicks, or gouges, using fine India stone (C116).

c. Replace cracked or damaged tow fitting.

2-265. INSTALLATION – TOW AND JACK FITTINGS.

a. Install tow fitting (figure 1-8) with rivets (TM 55-1520-236-23P).

b. Refer to paragraph 1-35 for removal of jack fittings.

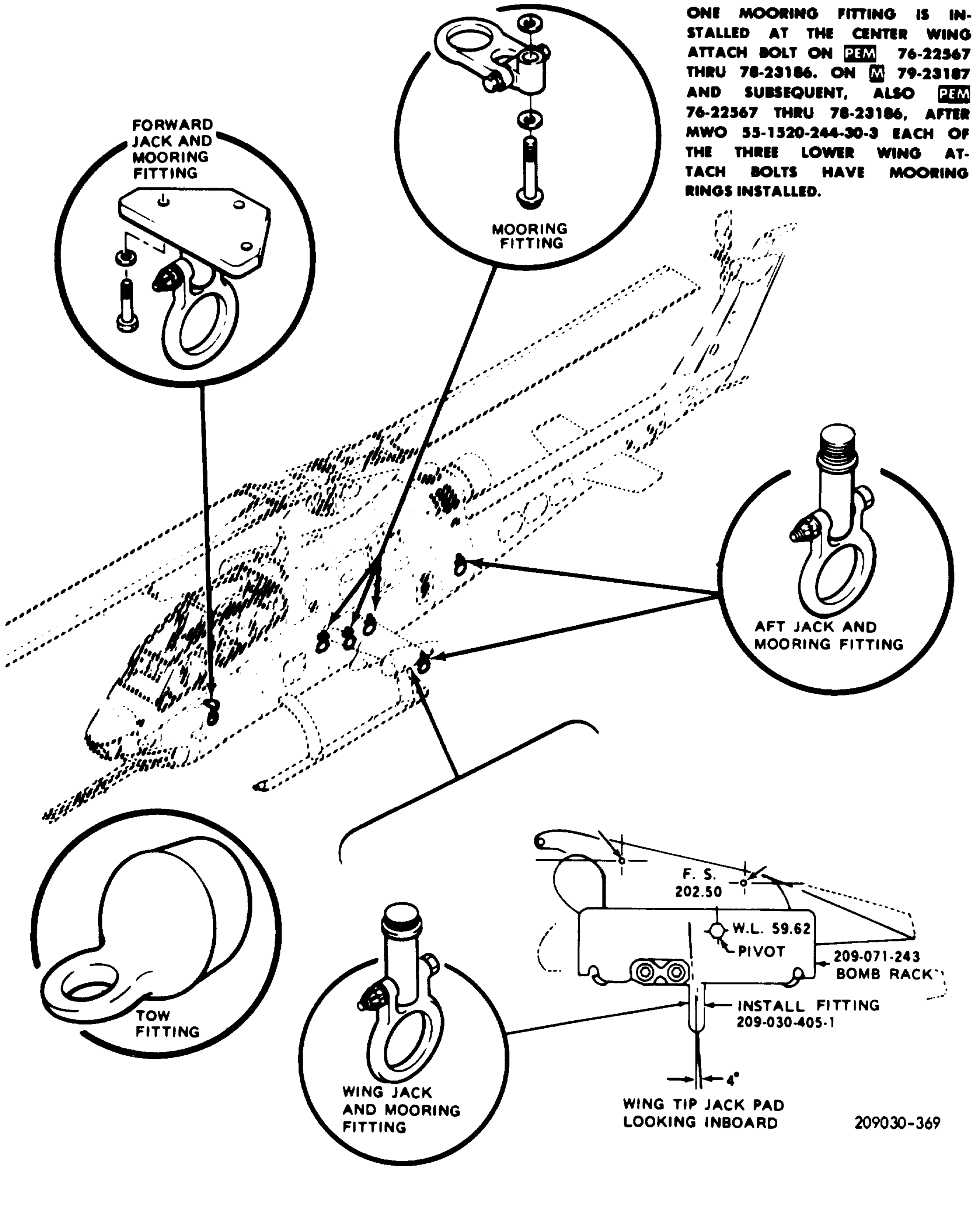


Figure 2-89. Tow, Jack, and Mooring Fittings

2-266. MOORING FITTINGS.

2-267. DESCRIPTION - MOORING FITTINGS.

a. Mooring fittings are steel rings that swivel and are baited to the forward, aft and wing jack fittings.

b. Two additional mooring fittings are installed under the wings at wing attach points (figure 2-89).

2-268. REMOVAL - MOORING FITTINGS.

(Refer to paragraph 1-40.)

2-269. INSPECTION - MOORING FITTINGS.

a. Refer to paragraph 2-263. Inspect all mooring fittings in same manner.

b. Inspect wing attach mooring fitting bolts (figure 2-89) for cracks, nicks, and damaged threads.

c. Inspect washers and bushings at wing attach mooring fittings (figure 2-89) for cracks and damage.

2-270. REPAIR - MOORING FITTINGS.

a. Replace cracked or damaged mooring fittings.

b. Polish out minor scratches, nicks, or gouges with fine India stone (C116).

c. Replace bolts at wing attach mooring fittings (figure 2-89) that do not pass inspection.

d. Replace washers and bushings at wing attach mooring fittings (figure 2-88) that do not pass inspection.

2-271. INSTALLATION – MOORING FITTINGS.

(Refer to paragraph 1-40).

2-272. TIEDOWN ASSEMBLY.

2-273. DESCRIPTION — TIEDOWN ASSEMBLY.

The helicopter is provided with 1/2" polyester ropes, NSN 4020-00-630-4873, for rotor blade tie-down.

2-274. REMOVAL — TIEDOWN ASSEMBLY.

Remove tiedown ropes as applicable. Refer to paragraph 1-39.

2-275. INSPECTION — TIEDOWN ASSEMBLY.

Inspect tiedown ropes for fraying, tom straps, or other defects which may affect function.

2-276. REPAIR — TIEDOWN ASSEMBLY.

Repair tom or frayed ropes and replace defective ropes as applicable.

2-277. INSTALLATION — TIEDOWN ASSEMBLY.

Install tiedown ropes as applicable. Refer to paragraph 1-39 and Figure 1-6. In the final tie-down position the blades must be in a level attitude. For additional information refer to TM 1-1520-250-23-1.

2-278. LEVELING PADS.

2-279. DESCRIPTION – LEVELING PADS.

Six leveling pads are located on floor of ammunition compartment. Two are used to level helicopter in fore-and-aft direction. Two (either two on forward track for ammunition pallet or two on aft track for ammunition pallet) are used to level helicopter in lateral direction. Each fore-and-aft leveling pad is a leveling shim assembly consisting of a spacer with a laminated shim bonded to it. Each leveling shim assembly is bonded to splice plate running lengthwise along left side of ammunition compartment floor. Each lateral leveling pad is a leveling pad attached near outboard ends of track for ammunition pallet by means of two rivets. Locations of leveling pads are shown in figure 1-6. Lateral leveling pads ore installed on forward track for ammunition pollet as well as on aft track. Height and condition of each leveling pad is of critical importance in leveling helicopter.

2-280. REPLACEMENT – LEVELING PADS.

CAUTION

Do not attempt to replace leveling pad(s) if structure In pylon area of helicopter is damaged. Sand helicopter having damaged pylon structure to depot.

NOTE

Any or all leveling pads may be replaced as necessary.

a. Open transmission cowl assembly (11, figure 2-3).

b. Check structure in pylon area including lift beam (16, figure 2-77) pylon support (14) and fifth mount support (9).

c. Place bubble protractor in fore-and-aft direction on lift beam (16).

NOTE

Fore-and-aft member of pylon support (14) may be used instead of lift beam (16).

d. Jack up helicopter. Refer to paragraph 1-32, steps a. through g.

e. Adjust jacks to level helicopter in fore-and-aft direction. Use bubble protractor to check level.

f. Place bubble protractor in lateral direction on lift beam (16) or fore-and-aft member of pylon support (14).

g. Adjust jacks to level helicopter in lateral direction. Use bubble protractor to check level.

h. Repeat steps c. and e. through g. to make sure helicopter is level.

i. Open ammunition compartment doors (21, figure 2-3).

j. If either or both fore-and-aft leveling pads are damaged or missing, replace as follows:

(1) Remove any remaining portion of leveling shim assembly.

(2) Use Scotch-brite (C103) to clean area.

(3) Use adhesive (C8) to bond new leveling shim assembly in place. Allow adhesive to dry.

(4) Place bubble protractor on leveling pads. Check fore-and-aft level of leveling pads.

(5) As necessary, peel laminations from shim until leveling in fore-and-aft direction is accomplished.

k. If any or all lateral leveling pads are damaged or missing, replace as follows:

(1) Remove five screws and remove ammunition floor track having damaged or missing leveling pads.

(2) Place new ammunition floor track in position and attach with five screws.

(3) Place bubble protractor on leveling pads of new ammunition floor track. Check lateral level of leveling pads.

(4) Place shim under ammunition floor track as necessary, and repeat steps (3) and (4) until leveling in lateral direction is accomplished.

l. Check leveling in both directions to ensure that it is satisfactory.

m. Remove bubble protractor and other tools. Lower helicopter slowly and evenly.

n. Remove jacks (paragraph 1-32, steps h. through k.).

o. Close access doors.

SECTION III. TAILBOOM

2-281. TAILBOOM ASSEMBLY.

2-282. DESCRIPTION – TAILBOOM ASSEMBLY.

The tailboom (10, figure 2-90) is an aluminum alloy semi-monocoque structure made up of bulkheads, longerons and stringers covered by aluminum skin. The tail fin is an integral part of the tailboom and is made up of aluminum ribs, a spar and honeycomb panels. The tailboom supports the synchronized elevator, tail rotor, tail rotor driveshaft, control systems, avionics equipment, armament system equipment, and cooling equipment for the avionics equipment.

2-283. REMOVAL – TAILBOOM ASSEMBLY.

WARNING

If the tailboom is removed with the tail rotor gearbox and tail rotor installed, the tailboom may rotate out of control due to the turning moment caused by the high center of gravity.

a. Remove tail pipe fairing and open tail rotor driveshaft covers.

b. Remove clamps on tail rotor driveshaft section at forward end of tailboom and remove section of driveshaft.

c. Open access panel on right side of fuselage and just forward of tail boom attachment point.

d. Disconnect electrical connectors.

e. Disconnect tail rotor control.

f. Disconnect synchronized elevator controls.

g. Fabricate a stand or padded support to hold the tailboom after removal (figure 2-91).

h. Place stands, prepared in preceding step, under tail boom.

i. Position three persons on each side of tailboom to support the tailboom and lower it into stands. Remove two lower bolts (15 and 16, figure 2-92). Direct persons to support tailboom. Remove two upper bolts (1 and 6). Lift up on vertical fin and slide tailboom back to clear helicopter. Lower tail boom into position on stands and install bolts to secure tail boom to forward stand as shown on figure 2-91.

2-284. INSPECTION — TAILBOOM ASSEMBLY.

a. Inspect for loose or missing hardware and loose or missing rivets.

b. Inspect for minor dents, cracks, holes, scratches and corrosion.

2-285. REPAIR – TAILBOOM ASSEMBLY.

NOTE

Repair is limited to repair of minor oil can dents, cracks, holes, scratches, corrosion and replacement of loose or missing hardware. If major damage occurs which requires use of jigs and fixtures to repair, forward tailboom to depot maintenance for repair.

2-286. INSTALLATION – TAILBOOM ASSEMBLY.

NOTE

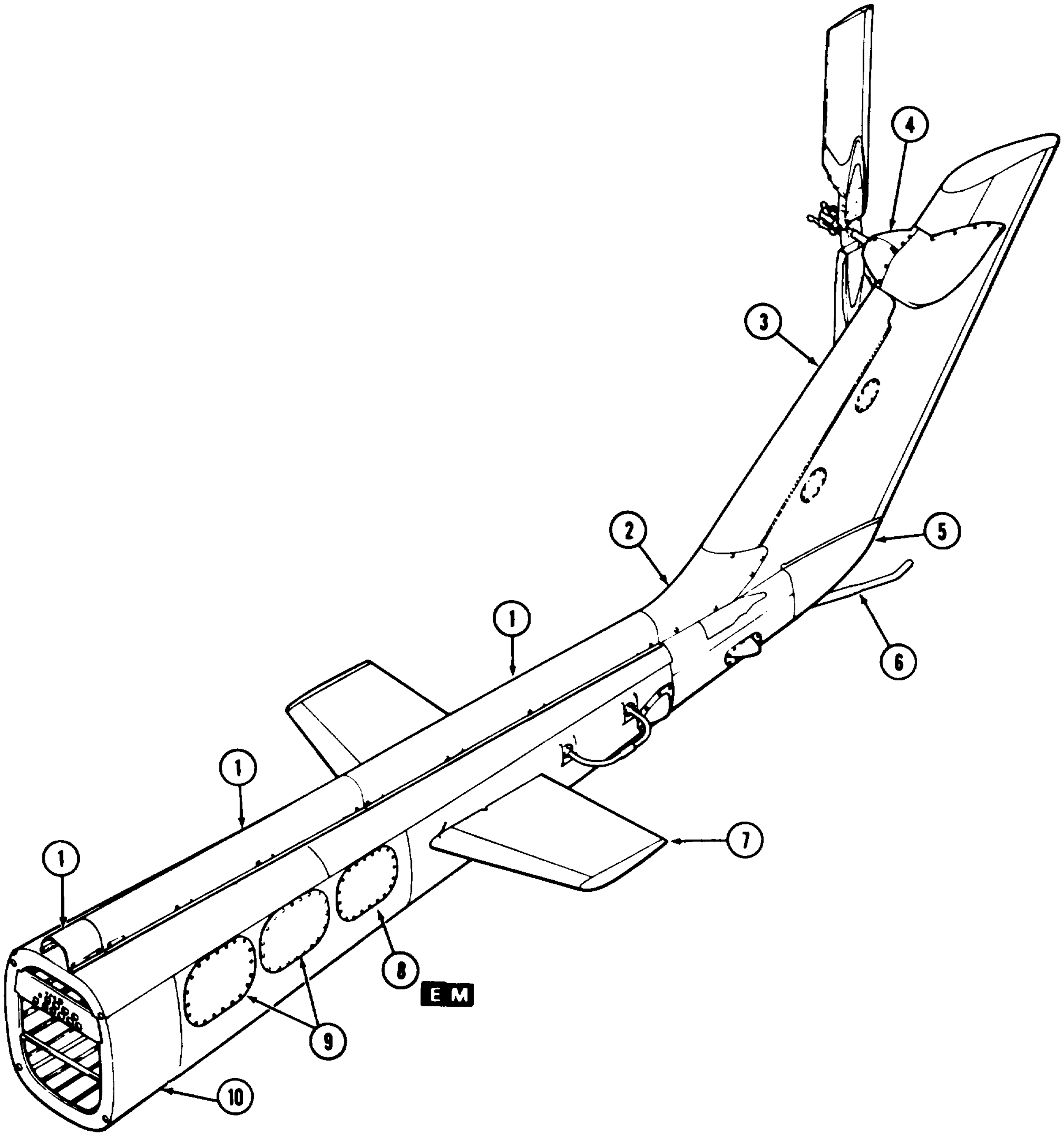
If a new tailboom is being installed, install electrical/avionics equipment, synchronized elevator and controls as outlined in steps a. through f. If the same tailboom is being installed, proceed to step g.

a. Install electrical and avionics equipment in tailboom.

b. Install synchronized elevator and control system. Refer to paragraphs 2-334 and 11-159.

c. Install tail rotor control linkage. Refer to paragraph 11-71.

d. Install intermediate and tail rotor gearboxes (paragraphs 6-105 and 6-121).



1. Driveshaft covers
2. Intermediate gearbox cover
3. Vertical fin driveshaft door
4. Tail rotor drive gearbox fairing
5. Lower tailboom to fin fairing
6. Tail skid
7. Synchronized elevator
8. E M Electrical access door
9. Electrical access doors
10. Tailboom assembly

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Figure 2-90. Aft Section Assembly

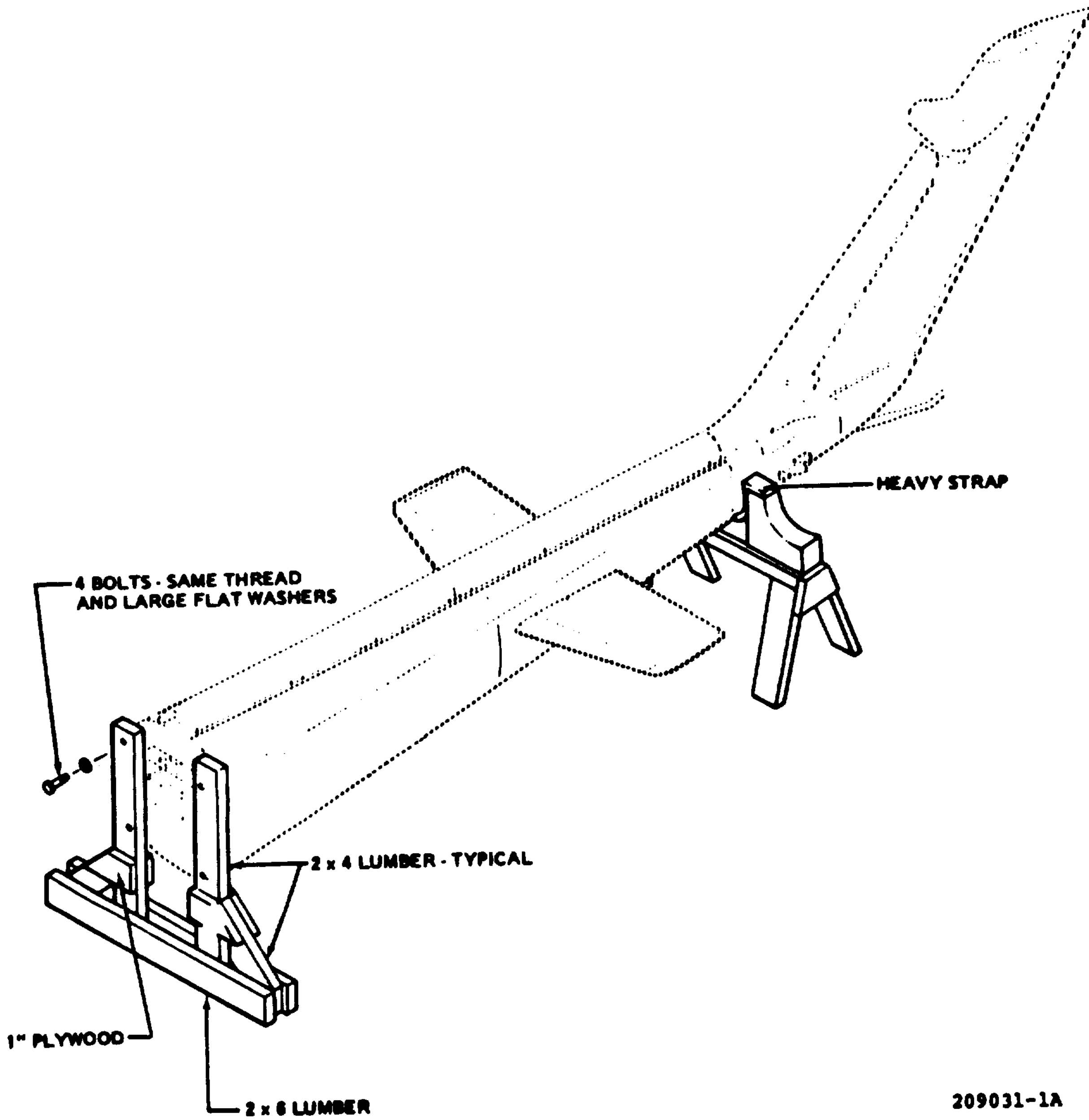
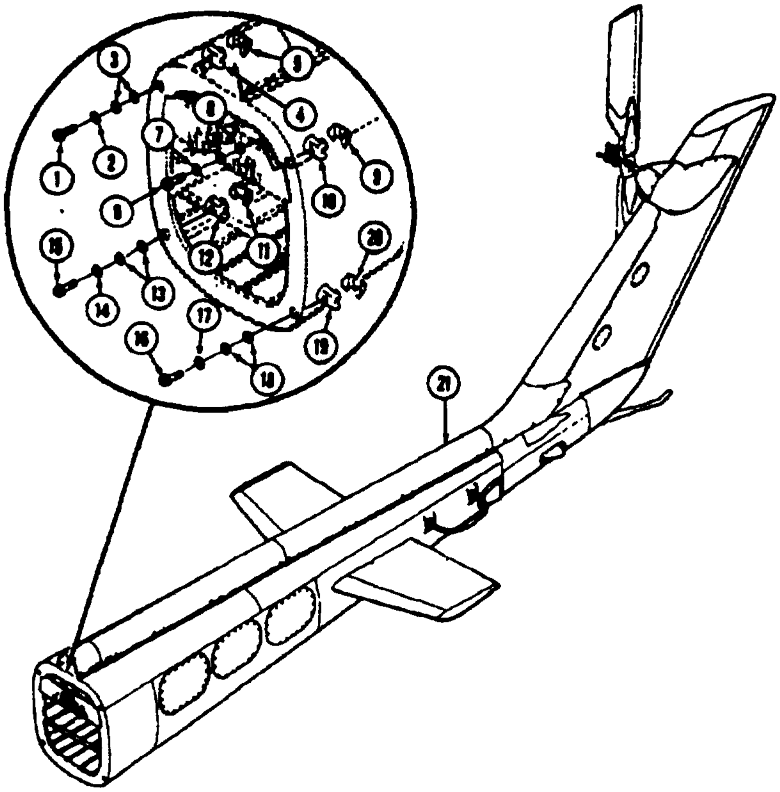


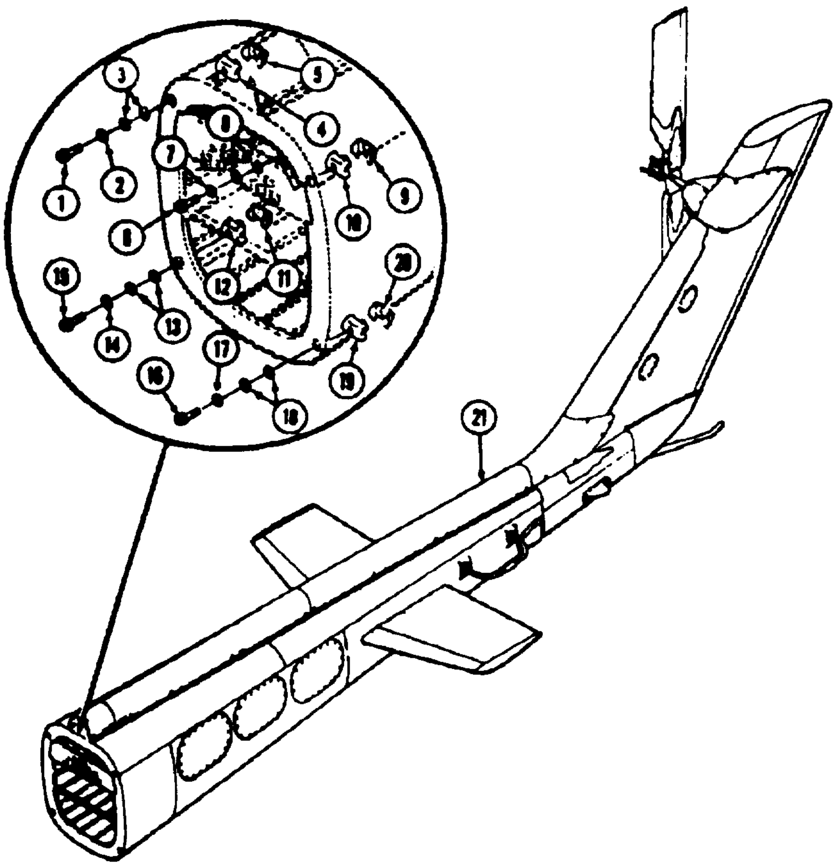
Figure 2-91. Tail Support - Workaid



⚠1 Two MS20002-8 washers are normally installed between the fuselage fitting and one 140-007-33-27E6 washer. Remove MS20002-8 washers as required, so that no less than one thread or more than three threads show after bolt is torqued. Torque bolts 1100 to 1300 inch-pounds.

1. ⚠1 Bolt P/N MS21250-08026
2. Washer P/N 140-007-33-27E6
3. Washer P/N MS20002-8
4. Barrel Nut
5. Retainer
6. ⚠1 Bolt P/N MS21250-08030
7. Washer P/N 140-007-33-27E6
8. Washer P/N MS20002-8
9. Retainer
10. Barrel Nut
11. Retainer
12. Barrel Nut
13. Washer P/N MS20002-8
14. Washer P/N 140-007-33-27E6
15. ⚠1 Bolt P/N MS21250H08024
16. ⚠1 Bolt P/N MS21250-08026
17. Washer P/N 140-007-33-27E6
18. Washer P/N MS20002-8
19. Barrel Nut
20. Retainer
21. Tailboom

Figure 2-92. Tailboom Installation



△1 Two AN960-816 washera are normally installed between the fuselage fitting and one MS20002C8 washer. Remove AN960-816 washers as required, so that no less than one thread or more than three threads show after bolt is torqued. Torque bolts 1100 to 1300 inch-pounds.

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△1 1. Bolt P/N NAS628-20
2. Washer P/N MS20002C8
3. Washer P/N AN960-816
4. Barrel Nut
5. Retainer
△1 6. Bolt P/N NAS628-26
7. Washer P/N MS20002C8
8. Washer P/N AN960-816
9. Retainer
10. Barrel Nut
11. Retainer
12. Barrel Nut
13. Washer P/N AN960-816
14. Washer P/N MS20002C8
△1 15. Bolt P/N NAS628-20
△1 16. Bolt P/N NAS628-30
17. Washer P/N MS20002C8
18. Washer P/N AN960-816
19. Barrel Nut
20. Retainer
21. Tailboom

Figure 2-92.1. Tailboom Installation

e. Install tail rotor driveshaft (paragraph 6-81).

f. Install tail rotor assembly (paragraph 5-87).

g. Open access panel on right side of fuselage just forward of tailboom attachment point.

h. Place recessed washers (2, 7, 14, and 17, figure 2-92) on tailboom attaching bolts with recessed side of washers toward bolt heads. Note that the bolts are of varying lengths. Identify bolts so they can be installed in the proper location.

i. Position three persons on each side of tailboom to lift the tailboom into position for installation. Direct persons to support tailboom. Remove bolts that secure front stand to tailboom (figure 2-91).

j. Ensure that four retainers (5, 9, 11 and 20, figure 2-92) are in place and that barrel nuts (4, 10, 12, and 19) are aligned for installation of bolts.

k. Lift tailboom into position and install bolts with washers that were prepared in step h. Ensure that the correct length bolt is installed for each location. Install two upper bolts (1 and 6) first, then install two lower bolts (15 and 16). Tighten bolts carefully to ensure that bolt threads do not bottom in barrel nuts. Two MS20002-8 washers (3, 8, 13, and 18) are nor-really installed between recessed washers (2, 7, 14, and 17) and fuselage fittings to obtain proper thread engagement. See NOTE on figure 2-92. Torque the four bolts (1, 6, 15, and 16) 1100 to 1300 inch-pounds. Retorque bolts after first flight and apply slippage index marks with lacquer (C69) or other suitable marking materiel. Apply thin bead of proseal (C105) around tailboom to fuselage attachment point to minimize water intrusion.

l. Install tail rotor driveshaft section.

m. Connect synchronized elevator controls and check rigging.

n. Connect tail rotor controls and check rigging.

NOTE

If tail rotor controls are found to be out of rig during preceding step, determine whether tail rotor has been removed and reinstalled. If tail rotor has been removed and reinstalled, check for proper installation of nylatron washer under bearing at outboard end of crosshead that supports tail rotor counterweights.

Refer to chapter 5 for illustration and installation instructions for nylatron washer.

o. Connect electrical connectors for electrical and avionics equipment.

p. Install access panels.

q. Perform functional check of electrical/avionics/armament equipment in the tailboom and perform maintenance test flight. Refer to TM 55-1520-236-MTF.

2-287. PAINTING-TAILBOOM ASSEMBLY.

Refer to TB746-93-2 for general painting instructions.

2-288. TAILBOOM SHEET METAL PANELS AND SKINS.

2-289. DESCRIPTION-TAILBOOM SHEET METAL PANELS AND SKINS.

Sheet metal panels, fairings, and skins cover the tail rotor gearboxes and internal components of the tailboom. The panels make the component accessible, the fairings lessen aerodynamic drag, and the skins consist of structural end non-structural sections.

2-290. REMOVAL-TAILBOOM SHEET METAL PANELS AND SKINS.

Remove fasteners and remove panels and/or skins as applicable (figure 2-93).

2-291. INSPECTION-TAILBOOM SHEET METAL PANELS AND SKINS.

a. Inspect panels and fairings for the following defects (paragraph 2-25).

(1) Cracks.

(2) Corrosion.

(3) Security of fasteners and/or hinges.

(4) Deformity that causes improper fit.

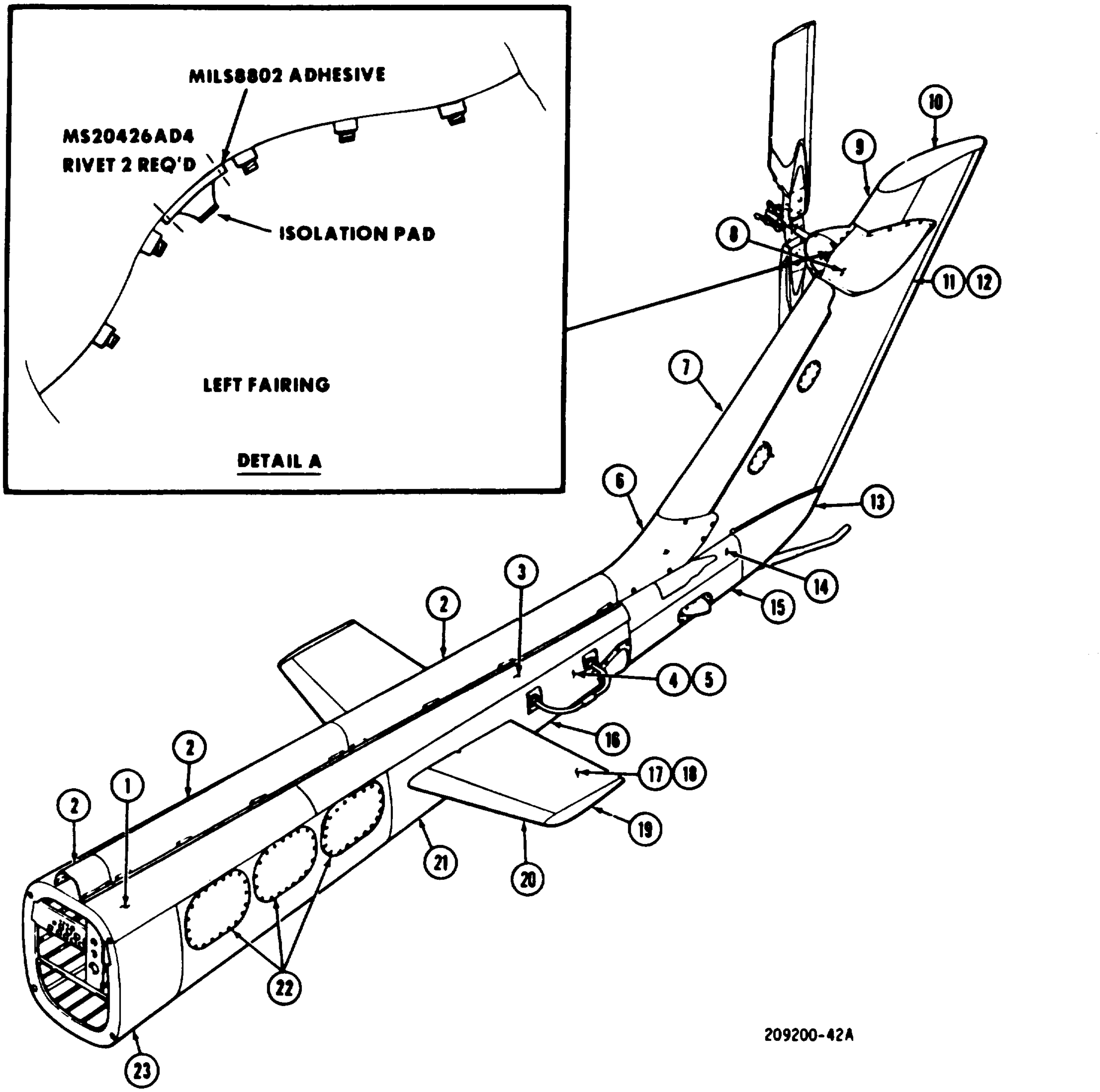


Figure 2-93. Tailboom and Elevator Skins (Sheet 1 of 2)

ITEM	MATERIAL	SPECIFICATION	CONDITION	THICKNESS
1	7075 Al. Alloy	QQA250/13	T6	0.032
2	5052 Al. Alloy	QQA250/8		0.040
3	7075 Al. Alloy	QQA250/13	T6	0.032
4	7075 Al. Alloy	QQA250/13	T6	0.032
5	7075 Al. Alloy	QQA250/13	T6	0.032
6	6061 Al. Alloy	QQA250/11	T6	0.040
7	Fiberglass (Inner Skin) and 7075 Al. Alloy (Outer Skin)	QQA250/13	T6	0.012
8	Fiberglass			
9	7075 Al. Alloy	QQA250/13	T6	0.025
10	Kydex 100			
11	Al. Faced Honeycomb Sandwich			
12	Al. Faced Honeycomb Sandwich			
13	Fiberglass			
14	7075 Al. Alloy	QQA250/13	T6	0.050
15	7075 Al. Alloy	QQA250/13	T6	0.050
16.	7075 Al. Alloy	QQA/13	T6	0.032
17	2024 Al. Alloy	QQA250/5	T3	0.040
18	2024 Al. Alloy	QQA250/5	T3	0.040
19	6061 Al. Alloy	QQA250/11	T6	0.040
20	2024 Al. Alloy	QQA250/5		0.050
21	7075 Al. Alloy	QQA250/13	T6	0.032
22	7075 Al. Alloy	QQA250/13	T6	0.032
23	7075 Al. Alloy	QQA250/13	T6	0.032

Figure 2-93. Tailboom and Elevator Skins (Sheet 2 of 2)

(5) Deteriorated or missing chafing strips,

(6) Security and condition of isolation pad on 90° gearbox fairing. (See figure 2-93.)

b. Inspect tailboom skin.

(1) Wrinkles and buckled areas. No damage of this type is allowable.

(2) Popped and cocked rivets. No damage of this type is allowable.

(3) Holes through skin. Limits for holes and tears in skin are the same as for cracks. Refer to following step.

(4) Cracks in skin. Identify cracks less than 3.0 inches in length for repair by stop drilling and application of a lay-on patch. Identify cracks over 3.0 inches in depth for repair by installation of a filler plate and backing patch of like material and gage.

(6) Surface scratches, dents and nicks. Disregard this type damage if dents are smooth contour, there is no evidence of cracks and no other damage to adjoining structure or rivets can be detected. If it appears that damage could progress into a crack, classify it as a crack. Refer to step (4).

(6) Corrosion damage severe enough to affect function of tailboom skin is cause to replace tailboom. Refer to paragraph 2-10 for corrosion treatment information.

2-292. REPAIR – TAILBOOM SHEET METAL PANELS AND SKINS.

a. Repair tailboom skins. Refer to paragraph 2-27.

(1) Replace loose, missing or cocked rivets if no other structural damage is present.

(2) Repair cracks, holes and tears less than three inches in length as follows:

(a) Stop drill cracks.

(b) Smooth out edges of holes and tears.

(c) Apply a lay-on patch of like material. See figure 2-93. Install a minimum of four rivets on each side of patch. Install rivets using same rivet spacing as skin being repaired. Refer to TM 55-1500-204-25/1 for standard repair instructions.

(3) Repair cracks, holes and tears more than 3.0 inches in length.

(a) Remove all the damaged skin and fabricate a filler plate of the same material as the skin to match the hole in the skin. Fabricate a backing patch of the same material. See figure 2-93.

(b) Rivet filler plate and backing patch in place. Refer to TM 55-1500-204-25/1 for standard repair instructions.

(4) Repair corrosion damage.

(a) Polish out minor corrosion damage.

(b) Apply chemical film (C31) to bare aluminum surfaces.

(c) Prime repaired area with primer (C89).

(d) Touch up paint to match surrounding area. Refer to TM 55-1500-345-23 for general painting instructions.

b. Repair tailboom panels and fairings.

(1) Repair minor cracks. Refer to TM 55-1500-204-25/1.

(2) Polish out minor corrosion on aluminum parts. Apply chemical film (C31) to bare metal surfaces. Touch up with primer (C89) and paint to match surrounding area.

(3) Replace missing and unserviceable turnlock fasteners, hinges and screws.

(4) Replace panels and fairings that are deformed to the degree that they do not fit when installed.

(5) Replace deteriorated or missing chafing strips.

2-293. INSTALLATION – TAILBOOM SHEET METAL PANELS AND SKINS.

a. Position panels on tailboom and engage fasteners.

b. Position skins on tailboom and install fasteners.

2-294. TAILBOOM STRUCTURAL MEMBERS.

2-295. DESCRIPTION – TAILBOOM STRUCTURAL MEMBERS.

The tailboom structure consists primarily of bulkheads, Iongerons, and stringers (figure 2-94).

2-296. REMOVAL – TAILBOOM STRUCTURAL MEMBERS.

Remove skins, panels, and/or fairings to gain access and remove structural members as applicable (figure 2-94).

2-297. INSPECTION – TAILBOOM STRUCTURAL MEMBERS.

a. Inspection. Inspect tailboom structure (such as; stringers, bulkheads, Iongerons, channels, and fittings) for defects (paragraph 2-25).

(1) Cracks. No cracks are allowed in tailboom structural members.

(2) Distortion. No distortion is allowed in tailboom structural members.

(3) Corrosion. Corrosion damage severe enough to affect function of a tailboom structural member is cause to replace the tail boom.

b. Inspect Iongeron attach fittings between Doom stations 41.37 and 70.00. Nicks, scratches, and gouges may be polished with fine India stone (C116) provided they do not exceed following limitations.

(1) Axial damage (parallel to bolt axis) must not exceed 0.020 inch in depth or 3.00 inches in length.

(2) Radial damage (perpendicular to bolt axis) must not exceed 0.010 inch in depth or 3.00 inches in length.

(3) Nicks, scratches or gouges are not allowed within one diameter of bolt hole, Iongeron splice rivets or within 0.250 inch of end of Iongeron at splice.

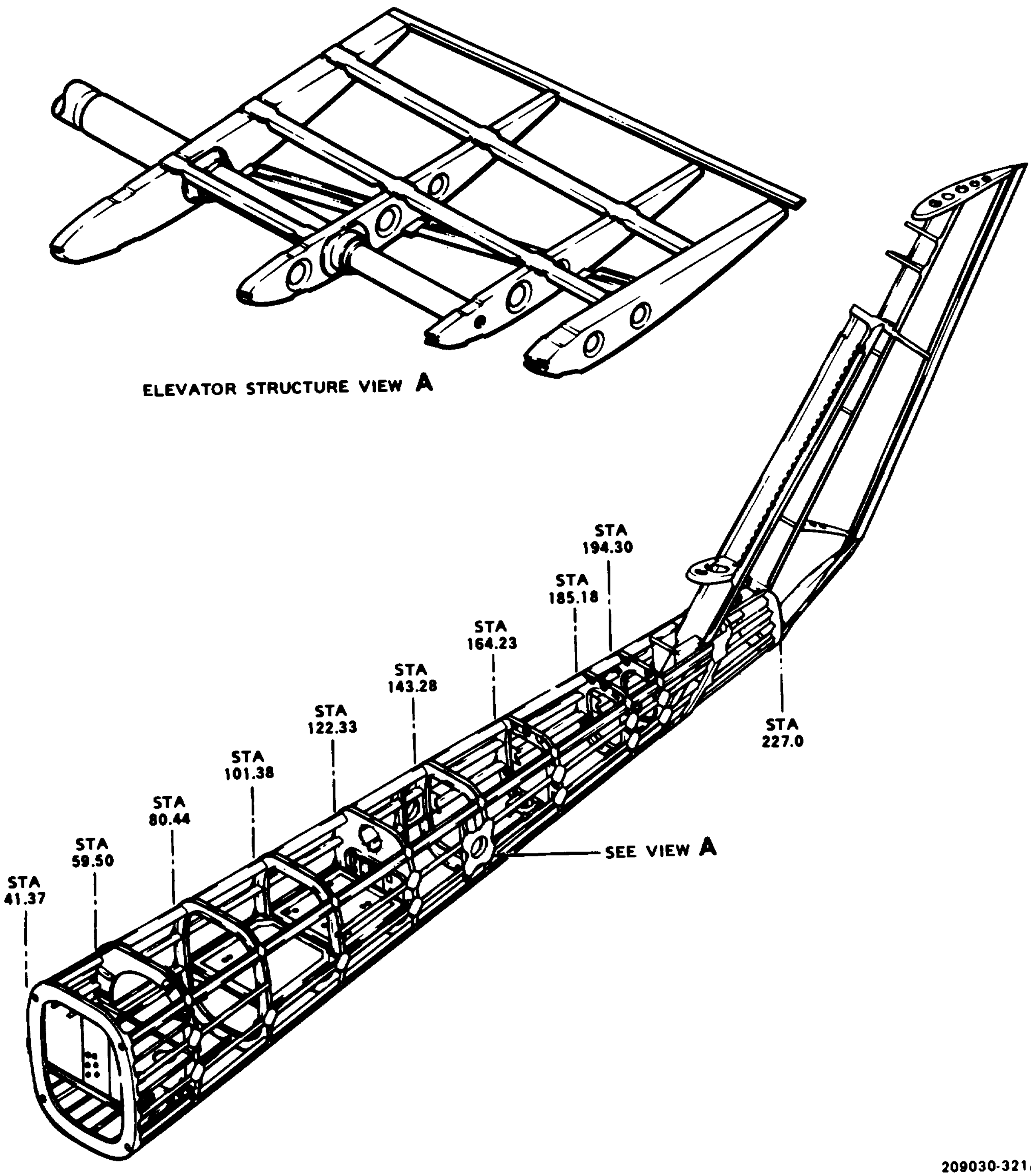


Figure 2-94. Tailboom and Synchronized Elevator — Structure

WARNING

Any cracks to the longeron attach fittings forward of boom station 70.00, or damage exceeding the above limitations, require the part to be replaced by depot maintenance.

(4) Turnlock Fastener Replacement – Vertical Fin. Replace turn lock receptacles, located on vertical fin, with less than 0.025 inch material remaining in stud pin slot.

2-298. REPAIR – TAILBOOM STRUCTURAL MEMBERS.

Refer to paragraphs 2-29, 2-30, 2-31, and 2-32.

NOTE

Repair is limited to repair of minor scratches, corrosion and replacement of loose or missing hardware. If damage such as cracking or other damage that requires use of jigs and fixtures to repair is incurred, forward tailboom to depot maintenance.

a. Cracks and damage resulting in distortion of structural members is not repairable. Replace tailboom.

b. Cracks or other damage that does not result in distortion of structural members may be repairable.

c. Corrosion. Use fine India stone (C116) to polish out minor corrosion damage to structural members. Apply chemical film (C31) to bare metal. Prime repair area with primer (C88 or C91).

2-299. INSTALLATION – TAILBOOM STRUCTURAL MEMBERS.

Install structural members and skins, panels, fairings as applicable (figure 2-94).

2-300. TAILBOOM ACCESS COVERS AND DOORS.

2-301. DESCRIPTION – TAILBOOM ACCESS COVERS AND DOORS.

The access covers and doors of the tailboom are shown in figure 2-90. They include tail rotor driveshaft covers, intermediate gearbox cover, and electrical access doors.

2-302. REMOVAL – TAILBOOM ACCESS COVERS AND DOORS.

a. Remove fasteners and/or hinges to remove tailboom doors as applicable (figure 2-90).

b. Remove fasteners and/or hinges to remove access covers on tailboom as applicable (figure 2-90).

2-303. INSPECTION – TAILBOOM ACCESS COVERS AND DOORS.

Refer to paragraph 2-25 for inspection.

2-304. CLEANING – TAILBOOM ACCESS COVERS AND DOORS.

Refer to TM 55-1500-204-25/1 for cleaning requirements.

2-305. REPAIR – TAILBOOM ACCESS COVERS AND DOORS.

Refer to paragraph 2-28 for repair.

2-306. INSTALLATION – TAILBOOM ACCESS COVERS AND DOORS.

a. Install tailboom doors with fasteners and/or hinges as applicable (figure 2-90).

b. Install tailboom covers with fasteners and/or hinges as applicable (figure 2-90).

2-307. PAINTING – TAILBOOM ACCESS COVERS AND DOORS.

Refer to 7B746-93-2 for general painting instructions.

2-308. TAIL ROTOR DRIVESHAFT ACCESS DOORS.

2-309. DESCRIPTION – TAIL ROTOR DRIVESHAFT ACCESS DOORS.

The tail rotor driveshaft access doors consist of three hinged door sections made from aluminum alloy. The first two sections are installed between the front of the tailboom and the intermediate gearbox. The third section is installed between the aft end of the intermediate gearbox and the tail rotor gearbox on the vertical fin (figure 2-90).

2-310. REMOVAL – TAIL ROTOR DRIVESHAFT ACCESS DOORS.

a. Open fasteners and door sections between front of tailboom and gearbox. Remove hinges and door sections.

b. Open fasteners and door section on vertical fin. Remove hinge and door section.

2-311. INSPECTION – TAIL ROTOR DRIVESHAFT ACCESS DOORS.

Refer to paragraph 2-25 for inspection.

2-312. CLEANING – TAIL ROTOR DRIVESHAFT ACCESS DOORS.

Refer to TM 55-1500-204-25/1 for cleaning requirements.

2-313. REPAIR – TAIL ROTOR DRIVESHAFT ACCESS DOORS.

Refer to paragraph 2-33 for repair.

2-314. INSPECTION – TAIL ROTOR DRIVESHAFT ACCESS DOORS.

a. Install hinges and door sections between the front of tailboom and gearbox. Close door and secure fasteners (figure 2-90).

b. Install hinge and door section on vertical fin. Close door and secure fasteners.

2-315. PAINTING – TAIL ROTOR DRIVESHAFT ACCESS DOORS.

Refer to TM 55-1500-345-23 for general painting instructions.

2-316. TAILBOOM SKID.

2-317. DESCRIPTION – TAILBOOM SKID.

The tailboom skid is located at the aft end of the tailboom. The purpose of the tail skid is to warn the pilot of a tail-low attitude when landing.

WARNING

It is possible to install the wrong tailboom skid. Helicopters coded P require lead shot ballast in the skid tube. If skid is to be replaced, ensure old and new parts have identical part numbers.

CAUTION

Ground handling forces should not exceed 450 pounds (vertical direction) and 150 pounds (horizontal direction).

2-318. REMOVAL – TAILBOOM SKID.

a. Remove taillight and access covers (1, figure 2-95) on aft end of tailboom.

b. Remove nut (8), washer (7), and bolt (6) that attach forward end of skid to tail boom. Remove screws (4), and support block (3).

c. Pull tail skid aft out through hole at boom station 227 with packing (5). Discard packing.

2-319. INSPECTION – TAILBOOM SKID.

a. Scratches and Nicks. Minor surface scratches and nicks are negligible and do not require repair. Slight scratches and nicks require polishing out. Replace tail skid if very deep scratches or nicks are present.

b. Dents. Smooth dents up to 0.0625 inch deep are negligible and do not require repair.Replace tail skid if dents deeper than 0.0625 inch are present.

c. Cracks. No cracks allowed. Replace tail skid if any cracks are present.

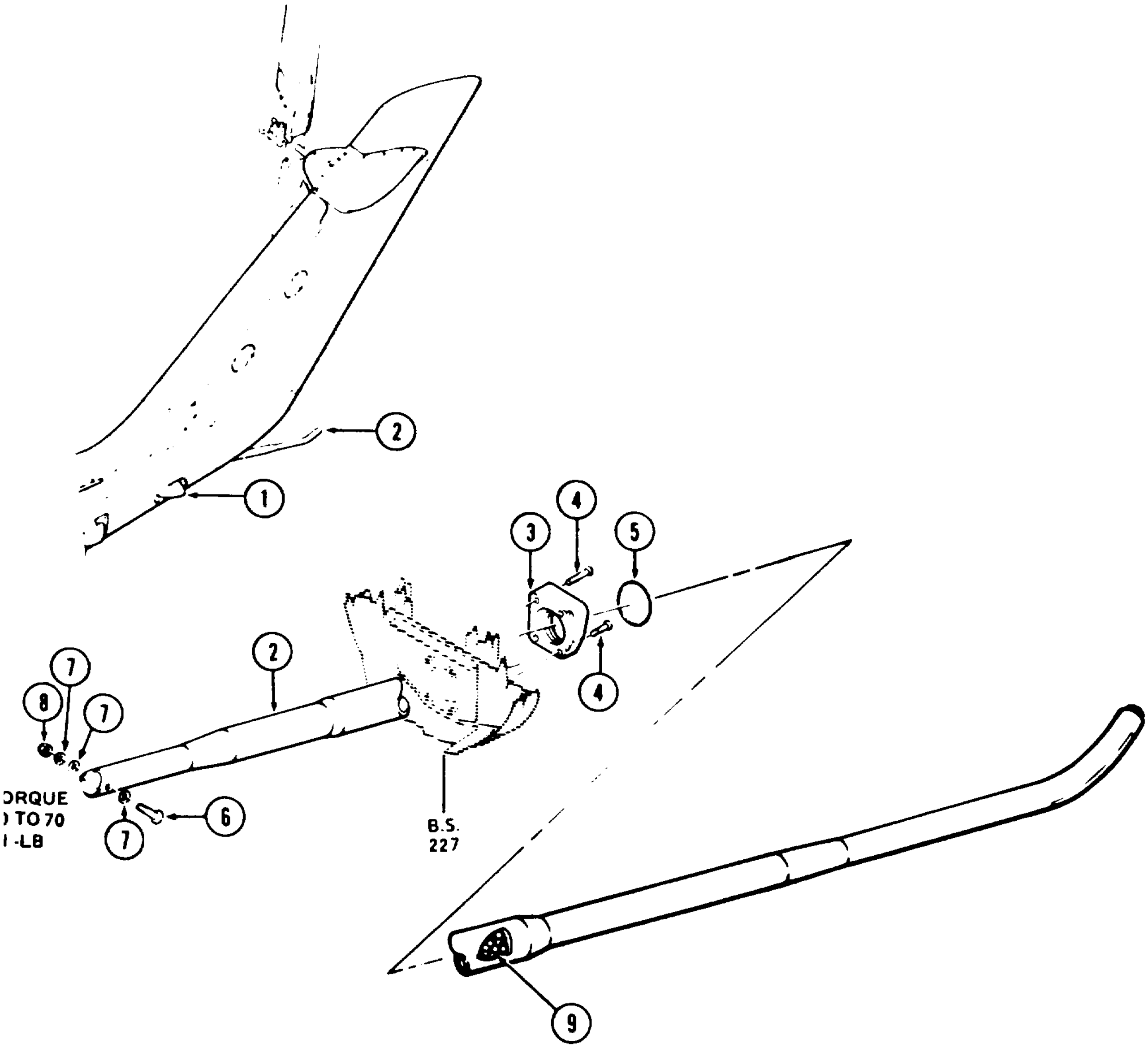
d. Deformity. Replace tail skid if deformed (bent) to the degree that it can be detected visually.

e. Loose Attachment to Tailboom. Determine cause for loose attachment.

f. Insufficient Lead Shot. P Ensure tailboom skid tube is completely filled with lead shot (C109).

2-320. REPAIR – TAILBOOM SKID.

a. Polish out slight scratches and nicks. If complete clean up of damage results in removal of enough material to weaken the tail skid, replace the



1. Taillight and access cover (2)
2. Tailskid
3. Support block
4. Screw (4)
5. Packing
6. Bolt
7. Washer
8. Nut
9. P Lead shot

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Figure 2-95. Tailskid — Installation

tail skid. Apply primer (C88 or C91) to bare metal surfaces and touch up paint to match surrounding surfaces. Refer to TM 55-1500-345-23 for general painting instructions.

b. Replace tail skids that are cracked, deformed, or have dents in excess of 0.0625 inch limit.

2-321. INSTALLATION – TAILBOOM SKID.

a. **P** Ensure that tail skid is completely filled with lead shot (C109) (approximately 15.6 pounds). Do not pack lead shot.

NOTE

Space washers (7, figure 2-95) so that tail skid (2) is centered, and to prevent buckling of the brace on which tail skid is installed.

b. Position tail skid through hole at boom station 227.0. Install bolt (6), washer (7) and nut (8) to secure forward end of tail skid to tail boom. Torque nut 50 TO 70 inch pounds.

c. Install support block (3), packing (5) and screws (4).

d. Install access covers and tail light (1) on left and right side of tailboom.

2-322. FIN BALLAST INSTALLATION.

2-323. DESCRIPTION – BALLAST.

Temporary lead ballast weights are available for Installation on the tailboom. Weights to be installed will be determined by weight and balance requirements.

2-324. REMOVAL - BALLAST INSTALLATION.

a. Remove tail light and access covers (6, figure 2-96) on tailboom.

b. Remove bolts (2), washers (1), and ballast weights (3 and 4) as applicable.

2-325. INSTALLATION – BALLAST INSTALLATION.

a. Determine ballast weights to be installed as required by weight and balance computations.

b. Install ballast weights (3, 4 and 8, figure 2-96), washers (1) and secure with bolts (6). **E** **M** Install ballast weight (8), using washers (9) and bolts (10).

c. Install taillights and access cover (6) on tailboom.

2-326. SYNCHRONIZED ELEVATORS.

2-327. DESCRIPTION – SYNCHRONIZED ELEVATORS.

The synchronized elevator consists of the right and left elevators, horn, supports and attaching parts. See figure 2-97. The horn is mounted inside the tailboom in supports which act as bearings and permit rotational movement of the horn. The synchronized elevator control linkage from the swashplate is attached to the horn and controls rotational movement. The two elevators are mounted on the horn. Their position is determined by rotational movement of the horn.

2-328. REMOVAL – SYNCHRONIZED ELEVATORS.

a. Remove bolt (2, figure 2-97) and washer (3). Slide elevator (1) outboard until elevator tubular spar is clear of horn (11).

b. Remove opposite elevator in same manner

2-329. INSPECTION – SYNCHRONIZED ELEVATORS.

a. Minor scratches on the elevator skins are negligible if no crack damage is involved.

b. Cracks, tears, holes, and nicks within the following limits are repairable. Replace part if damage exceeds limits.

(1) Cracks in elevator skin are repairable by patching if they do not exceed 6.0 inches.

(2) Holes and tears and cracks in elevator skins are repairable by cutting out damaged area and patching with insert plate and backup plate when the repaired area is not over 3.0 inches in diameter.

(3) No damage to tubular elevator spar (17, figure 2-97) allowed.

(4) Nicks in elevator trailing edge that are less than 0.025 inch deep are acceptable if polished out.

(5) Inspect for correct drag on elevators (paragraph 11-144).

(6) Prior to removal of elevator, inspect support brackets (4) on both sides of tailboom for loose attaching rivets. Inspect rivets visually and by hand contact for signs of movement. Replace loose, damaged, or missing rivets.

NOTE

Apply a moderate force when moving the elevator and use care not to bend the elevator thus causing false indications.

(7) Check axial play of elevator horn assembly (11) in support assemblies (8) as follows:

(a) Mount dial indicator inside of the tailboom placing the stylus against the elevator horn at the pivot point.

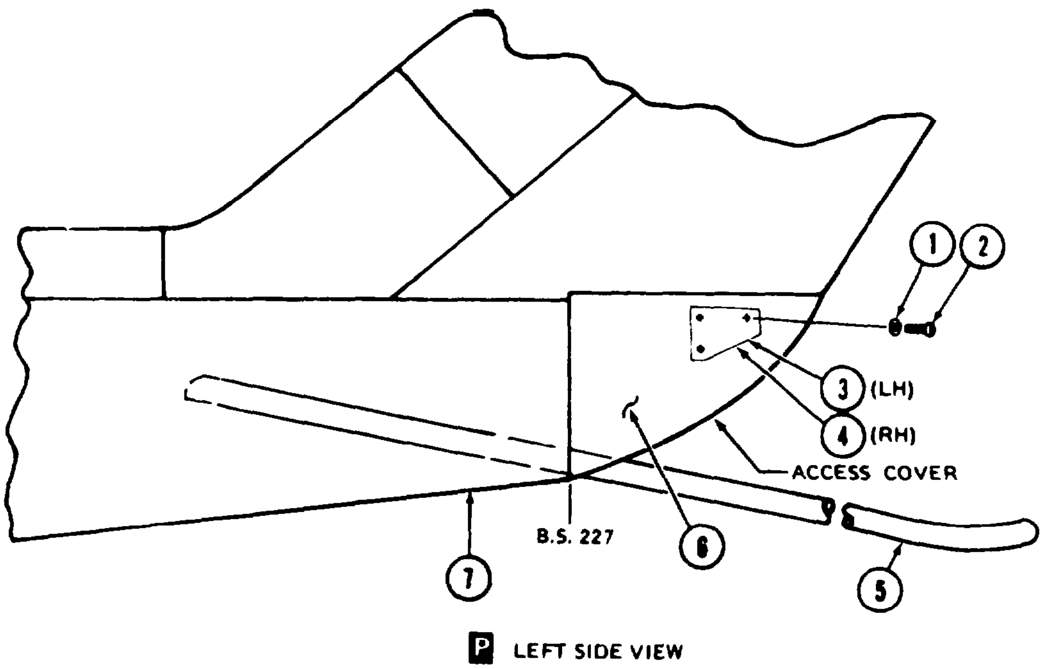
(b) Move elevator inboard and outboard (spanwise) and observe the total indicator reading, A minimum of 0.005 inch and maximum of 0.030 inch play should be indicated (figure 2-97).

(c) if the indicator readings are not within tolerance, adjust shims (7) as necessary.

(8) Check radial play as follows:

(a) Mount dial indicator inside tailboom with stylus in contact with the upper surface of elevator horn near the inboard edge of pivot point.

(b) Lightly move elevator up and down and observe total reading on dial indicator. A maximum reading of 0.010 inch is permissible (figure 2-97).



THE 209-033-839-1 AND 209-033-840-1 WEIGHTS TO BE TRIMMED TO OBTAIN A COMBINED WEIGHT OF 21.0 PLUS OR MINUS 0.2 POUNDS, EXCLUDING ATTACHING HARDWARE.

1. Washer (AN960PD416)
2. Bolt (AN4-13)
3. Ballast (209-033-839-1) (LH)
4. Ballast (209-033-840-1) (RH)
5. Tailskid (with lead shot)
6. Access cover
7. Tailboom

Figure 2-96. Aft Ballast — Installation (Sheet 1 of 2)

NOTE

Heavy force In moving the elevator will cause flexing of elevator spar tube thus producing false indications of excess radial play.

(c) If dial indicator readings are not within tolerance, adjust shims (16) as necessary.

(9) Negligible damage limit. Dents, smooth contour, free of nicks or wrinkles. Depth and diameter not to exceed:

Depth	Diameter
1/64	1.0 inch
3/64	2.0 inches
1/16	3.0 inches

Three inches minumum undamaged material between dents and one inch minimum from internal structure.

(10) Repairable damage limit. Sharp nick in dent. Damage areas after cleanup (including prior repairs) shall not exceed 25% of area for a single skin panel. Damage six inches minimum from similar repair.

(11) Damage requiring replacement. Total damage (including prior repairs) exceeds 25% of total area of a single skin panel.

c. Corrosion. Inspect elevators for corrosion damage. Minor corrosion damage that does not exceed 0.005 inch in depth is repairable. Maximum allowable corroded area is 4.0 square inches in a single area or 20 percent of the elevator skin area.

d. Refer to paragraph 11-161 for inspection of horn (11), support assembly (8), and bracket (4).

2-330. CLEANING – SYNCHRONIZED ELEVATORS.

Refer to TM 55-1500-204-25/1 for cleaning requirements.

2-331. REPAIR – SYNCHRONIZED ELEVATORS.

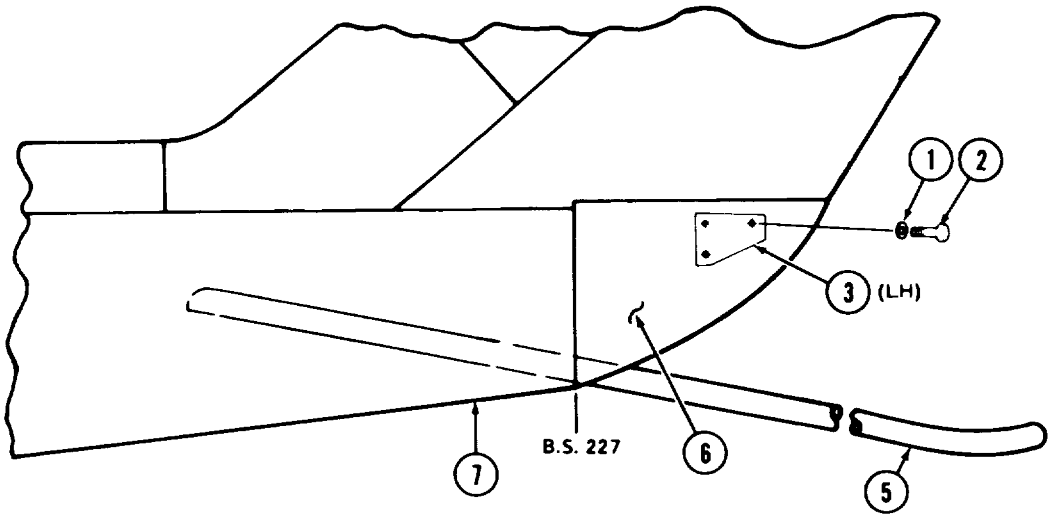
a. Polish out minor scratch damage on elevators. Apply primer (C88 or C91) and touch up paint to match adjacent area.

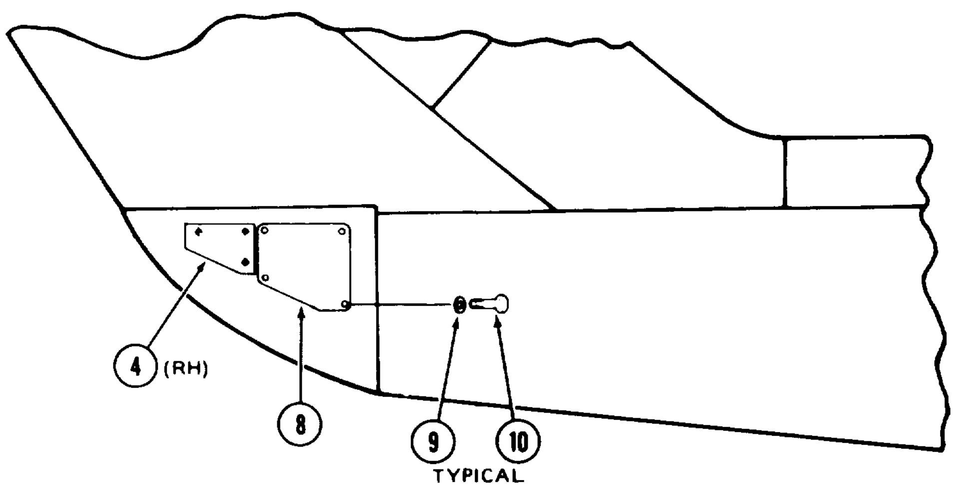
b. Repair elevators with crack damage that is within limits for patch repairs.

(1) Stop drill each end of crack.

(2) Ensure that tubular spar inside elevator has not been damaged.

(3) Fabricate a patch from the same material as the skin. See figure 2-93 for description of elevator skin. Install patch in accordance with standard instructions in TM 55-1500-204-25/1.





NOTES.

1. Weights P/N 209-033-839-101, 209-033-840-101, and 209-033-841-1 are trimmed to a combined weight of 62.0 ± 0.2 pounds at time of installation.

2. The exact required combined weight of the weights listed above is determined when weight and balance is computed.

1. Washer (AN960PD416)
2. Bolt (AN4-13)
3. Ballast (209-033-839-101 (LH)
4. Ballast (209-033-840-101 (RH)
5. Tailskid (no lead shot)
6. Access cover
7. Tailboom
8. Ballast (209-033-841-1) (RH)
9. Washer (AN960-416L)
10. Bolt (AN4-14)

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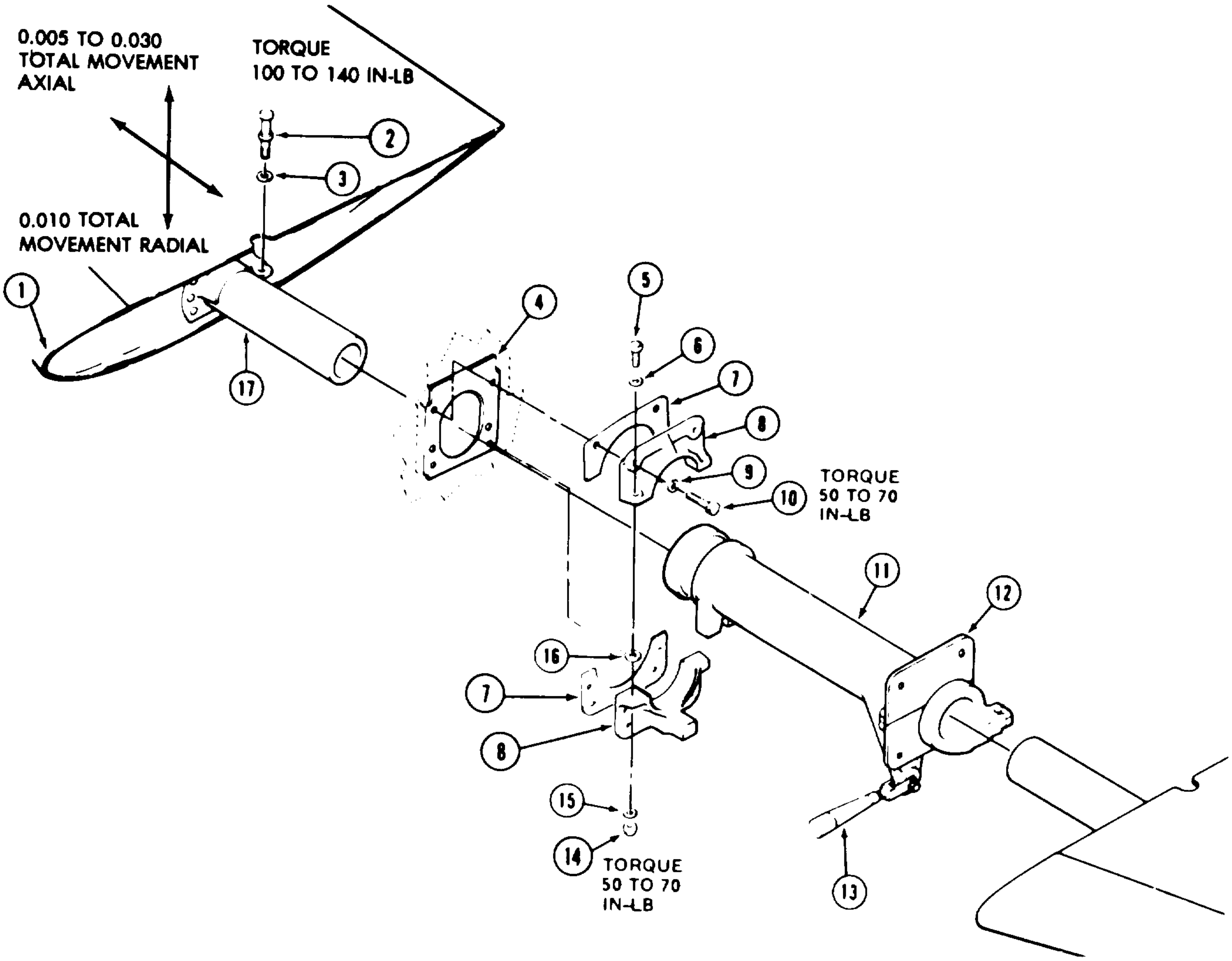
Figure 2-96. Aft Ballast — Installation (Sheet 2 of 2)



1. Elevator
2. Retaining bolt
3. Washer
4. Tailboom bracket (mounted on fuselage)
5. Screw
6. Aluminum washer
7. Shim set (upper and lower)
8. Support assembly (upper and lower)
9. Aluminum washer
10. Bolt
11. Horn
12. Support assembly (upper and lower)
13. Control tube
14. Nut
15. Aluminum washer
16. Shim (laminated)
17. Elevator spar

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Figure 2-97. Synchronized Elevators — Installation

c. Repair holes and tears that are within 3.0 inch diameter limit.

(1) Cut out the damaged area. Ensure that tubular spar inside elevator has not been damaged.

(2) Fabricate a filler plate to fit the cutout prepared in the preceding step from the same material as the skin. See figure 2-93 for description of elevator skin. Fabricate backup patch from the same material to use with filler plate. Install filler plate and backup patch in accordance with standard instructions in TM 55-1500-204-25/1.

d. Repair minor corrosion damage on elevators. Polish out corrosion and apply chemical film treatment (C31). Apply primer (C88 or C91). Touch up paint on elevators to match adjacent area. Refer to TM 55-1500-345-23 for general painting instructions.

e. Repair smooth dents by using a suction cup. Only one pull per dent is allowed. Inspect for crocks after repair. If only one crack is found, repair per paragraph 2-331.b. If two or more cracks are found, send elevator to depot for repair.

NOTE

Dents which cannot be pulled out with a suction cup shall be repaired in accordance with paragraph 2-33lb.

f. If dents are found in rivet pattern, send elevator to depot for repair.

2-332. INSTALLATION SYNCHRONIZED ELEVATORS.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

NOTE

If solid film lubricant is accidentally removed, It may be reapplied to the area from which it was removed.

a. Clean the inside part of the horn (11, figure 2-97) that mates with the tabular spars (17) of the elevators. Also clean tabular spars. If there is any zinc chromate or similar material in mating surfaces, clean down to bore metal with MEK (C74) and clean cheesecloth (C30). Do not use excess MEK or allow it to saturate the tabular spar as it may remove the solid film lubricant. Allow the MEK to dry.

b. Apply a thin coat of compound (C43) or (C44) to the surfaces of horn (11) contacted by the elevator spars.

c. Position elevator tubular spar (17) in horn (11).

d. Install bolt (2) and washer (3). Torque bolt 100 TO 140 inch-pounds.

e. Check rigging of elevator. Refer to paragraph 11-138.

2-333. ADJUSTMENT - SYNCHRONIZED ELEVATORS.

Refer to paragraph 11-138 for adjustment procedures.

2-334. PAINTING – SYNCHRONIZED ELEVATORS.

Refer to TM 55-1500-345-23 for general painting instructions.

SECTION IV. WING

2-335. WING ASSEMBLY.

2-336. DESCRIPTION – WING ASSEMBLY.

Stub wings, mounted on the fuselage, supply additional lift and provide mounting accommodations for weapons pylons. The structure is built up with aluminum alloy spars and ribs covered with sheet aluminum skin. Each wing is attached to fuselage fittings with attaching bolts. Four removable panels allow access to internal provisions.

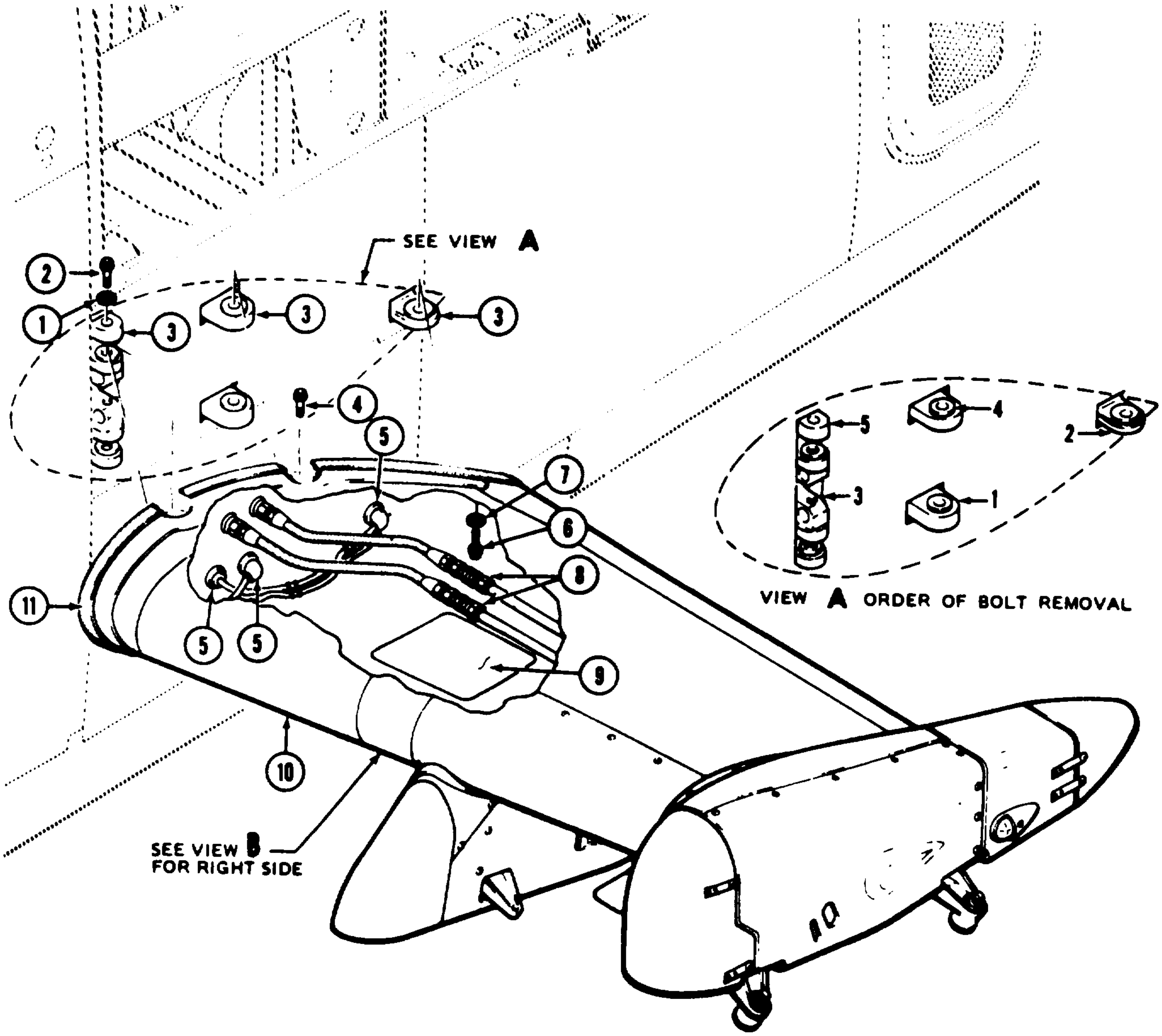
2-337. REMOVAL - WING ASSEMBLY.

NOTE

The removal procedure is the same for both wings.

a. Remove external stores from weapon pylon, if installed. Refer to chapter 16.

b. Remove lower access panel (9 figure 2-98) on each wing.



1. Washer
2. Bolt
3. Fitting
4. Bolt
5. Electrical connectors
6. Bolt
7. Washer
8. Hydraulic connections
9. Access panel
10. Wing
11. Bumper
12. Washer
13. Bolt
14. Wing mooring fitting
15. Barrel nuts
16. Washer

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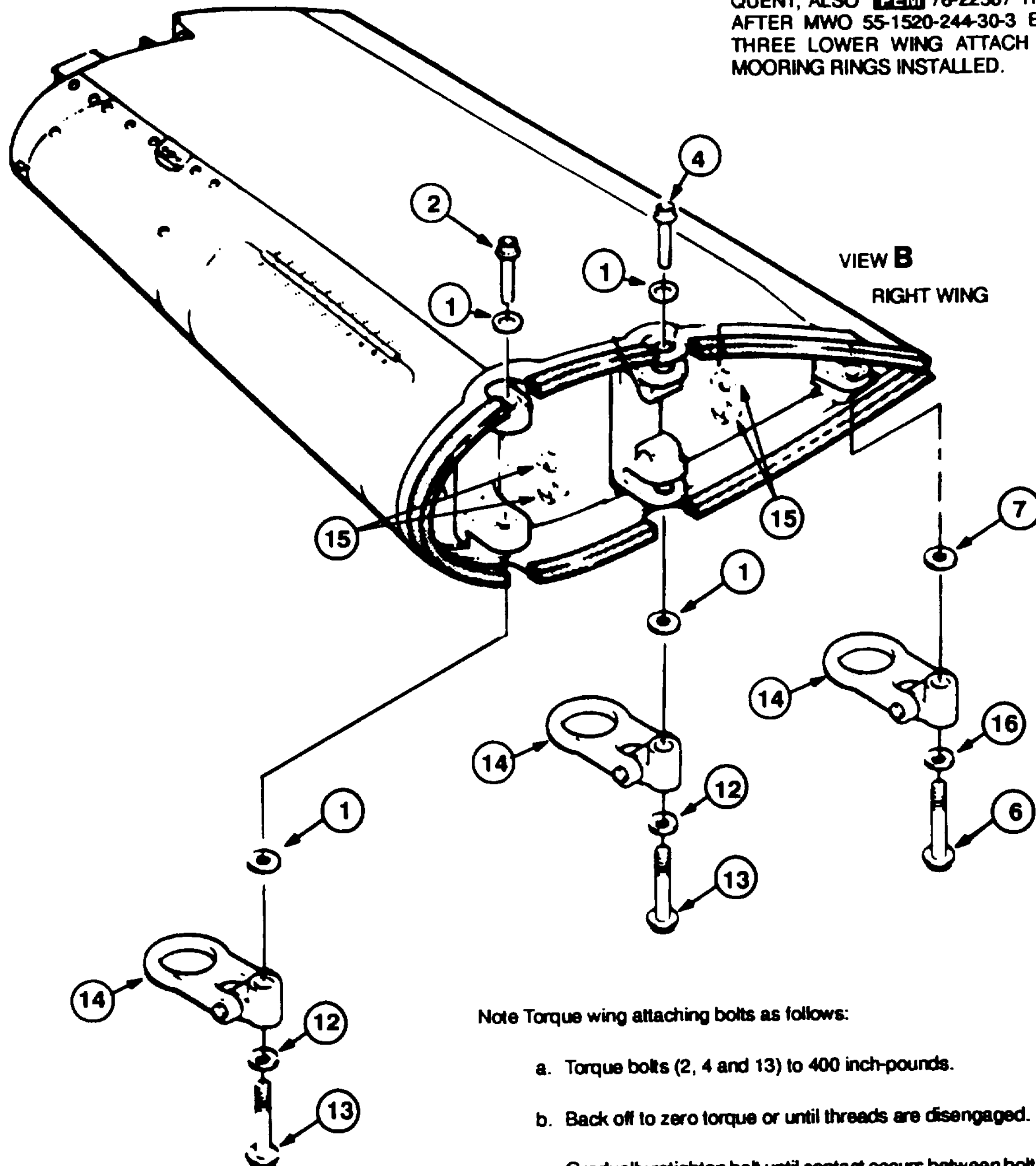
Figure 2-98. Wing Assembly - Installation (Sheet 1 of 2)

ONE MOORING FITTING IS INSTALLED AT THE CENTER WING ATTACH BOLT ON PEM 76-22567 THRU 78-23186. ON M 79-23187 AND SUBSEQUENT, ALSO PEM 76-22567 THRU 78-23186, AFTER MWO 55-1520-244-30-3 EACH OF THE THREE LOWER WING ATTACH BOLTS HAVE MOORING RINGS INSTALLED.



Note Torque wing attaching bolts as follows:

a. Torque bolts (2, 4 and 13) to 400 inch-pounds.

b. Back off to zero torque or until threads are disengaged.

c. Gradually retighten bolt until contact occurs between bolt head and washer or until torque begins to increase. Note contact torque level.

d. Apply an additional 100 inch-pounds of torque above the contact torque to insure a snug fit. Total torque not to exceed 450 inch-pounds.

e. Torque aft bolt (6) 80 TO 100 inch-pounds.

Figure 2-98. Wing Assembly — Installation (Sheet 2 of 2)

c. Disconnect two pylon hydraulic connections (8) in each wing. Cap all open lines.

CAUTION

Support wings to prevent bolts from binding. Remove bolts in sequence as shown in figure 2-98, view A.

d. Remove five attachment bolts and washers and separate wing from fuselage.

e. Disconnect electrical connectors (5) between wing root and fuselage.

2-338. INSPECTION – WING ASSEMBLY.

a. Inspect wing skins, access doors, and leading and trading edge of fairing. Refer to table 2-5.

Table 2-5. WING Classification of Damage

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
WING, SKIN, ACCESS DOORS, COVERS, AND LEADING AND TRAILING EDGE FAIRINGS	Dents, nicks, scratches, and gouges.	small smooth dents, nicks, scratches, and gouges that do not exceed 0.005 inch after polishing out.	Damage exceeding negligible limits can be patched if patching limits are not exceeded.	
	Corrosion		Minor surface corrosion can be polished out and area refinished.	Corrosion other than minor surface type requires replacement of wing.
	Sharp dents, holes, and cracks or nicks, scratches and gouges which exceed negligible limits.		Damage to skin not exceeding 1.25 inches long and not involving damage to wing structure can be repaired by patching (figure 2-101).	Damage exceeding repairable limits requires replacement of wing.
	Wrinkled skin			Replace wing if skin is wrinkled to the degree that internal structure is Involved.
WING; SPARS, RIBS, AND OTHER INTERNAL STRUCTURE	Dents, nicks, scratches and gouges.	Small smooth dents, and minor nicks, scratches, and gouges which will not affect strength.		Damage which exceeds negligible requires replacement of wing.
	Cracks, holes or other damage.			Any cracks, hole or other damage towing internal structure requires replacement of wing.

Table 2-5. WING Classification of Damage (Cont)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
WING BUMPERS	Cuts, debonding, or deterioration.			Bumpers damaged enough to affect function will be replaced.

b. Inspect wing bumper (11, figure 2-98) for cuts, tears, deterioration and debonding which would affect its function.

c. Inspect wing fitting bushing and corresponding bushings on pylon structure for damage and wear beyond limits shown on figure 2-99.

2-339. REPAIR – WING ASSEMBLY.

a. Repair damage to skin that is within repairable limits. See figures 2-100 through 2-102 for typical repairs. Wing materials are shown on figure 2-103.

b. Repair damage to leading and trailing edge fairings that is within repairable limits. See figure 2-104 for typical repair.

c. Replace damaged bumpers (11, figure 2-88).

(1) Remove wing if not previously accomplished.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(2) Remove defective bumper with plastic scraper. Clean remaining particles with MEK(C74)or naphtha (C75). Wipe area dry with clean cloth.

(3) Sand mating surfaces of bumper and metal with 180 grit sandpaper (C102).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(4) Clean sanded area with MEK (C74) or naphtha (C75). Dry with a clean cloth.

(6) Apply an even coat of adhesive (C12) to bond surfaces of bumper and metal.

(6) Allow adhesive to air dry 10 to 15 minutes at 70 TO 80 degrees F (21 TO 27 degrees C) or until tacky to touch. Apply second coat of adhesive in same manner.

(7) Install bumper on wing. Roll bumper to expel air from bond area. Air cure adhesive for a minimum of four hours.

2-340. PAINTING – WING ASSEMBLY.

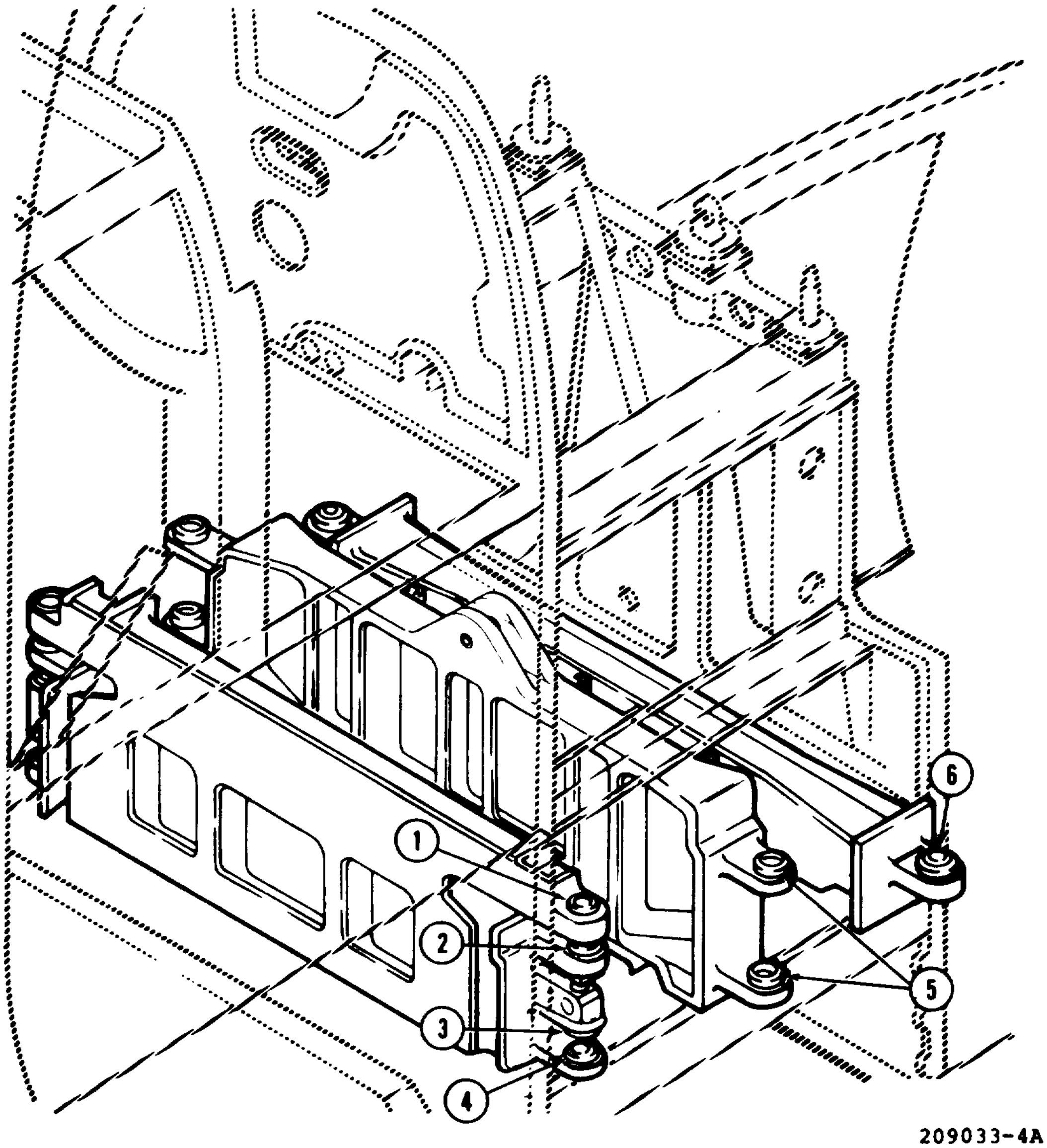
Paint repairs on wing to match surrounding area. Refer to TM 55-1500-345-23 for general painting instructions.

2-341. INSTALLATION – WING ASSEMBLY.

NOTE

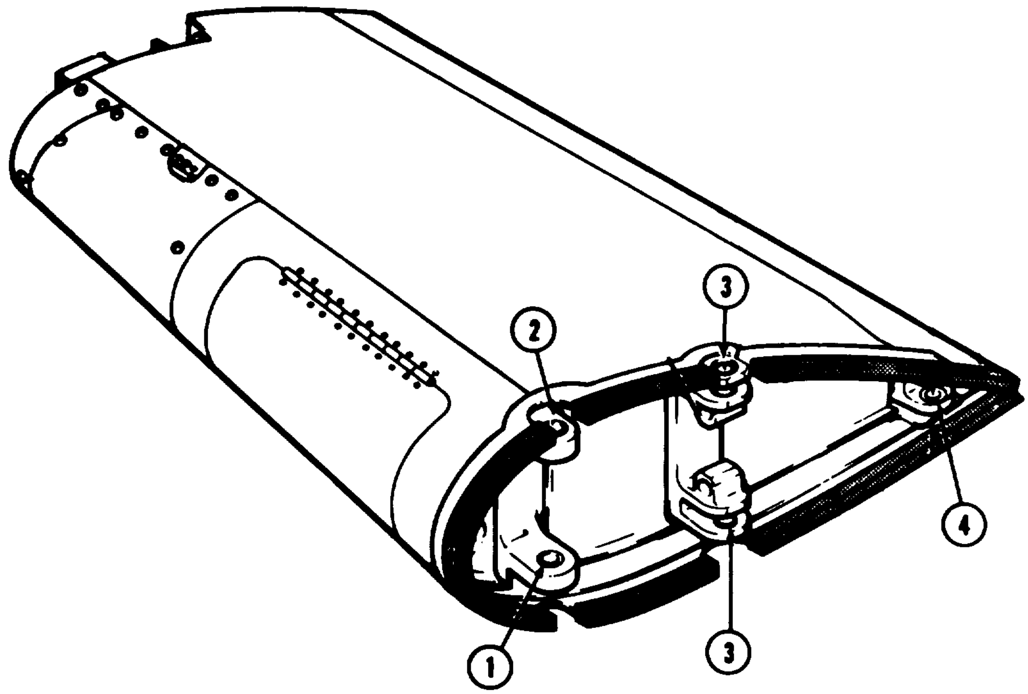
Installation procedure is the same for both wings.

a. Install and align barrel nuts in fittings.



ITEM	NOMENCLATURE	PART NUMBER	MAXIMUM INSIDE DIAMETER
1	BUSHINGS	209-032-167-7	0.6260
2	BUSHINGS	209-032-167-9	0.6260
3	BUSHING	209-032-167-3	0.6260
4	BUSHINGS	209-032-167-5	0.6260
5	BUSHINGS	209-032-167-1	0.6260
6	BUSHINGS	209-030-319-1	0.3775

Figure 2-99. Wing Bushings – Limits Chart (Sheet 1 of 2)



ITEM	NOMENCLATURE	PART NUMBER	MAXIMUM INSIDE DIAMETER
1	BUSHING	209-032-166-1	0.6260
2	BUSHING	209-032-166-3	0.6260
3	BUSHING	209-032-166-5	0.6260
4	BUSHING	21-009-11-12	0.3775

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Figure 2-99. Wing Bushings - Limits Chart (Sheet 2 of 2)

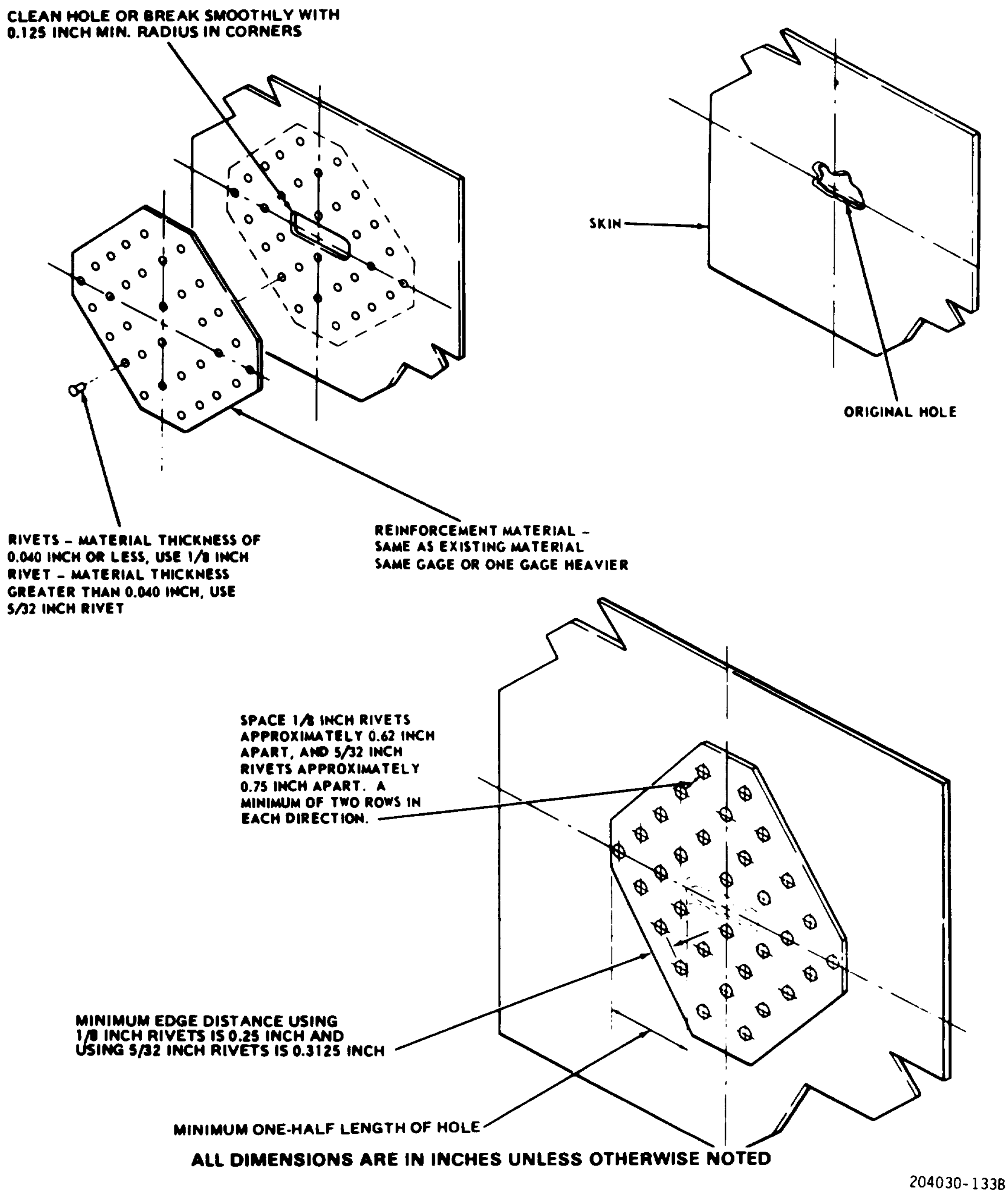
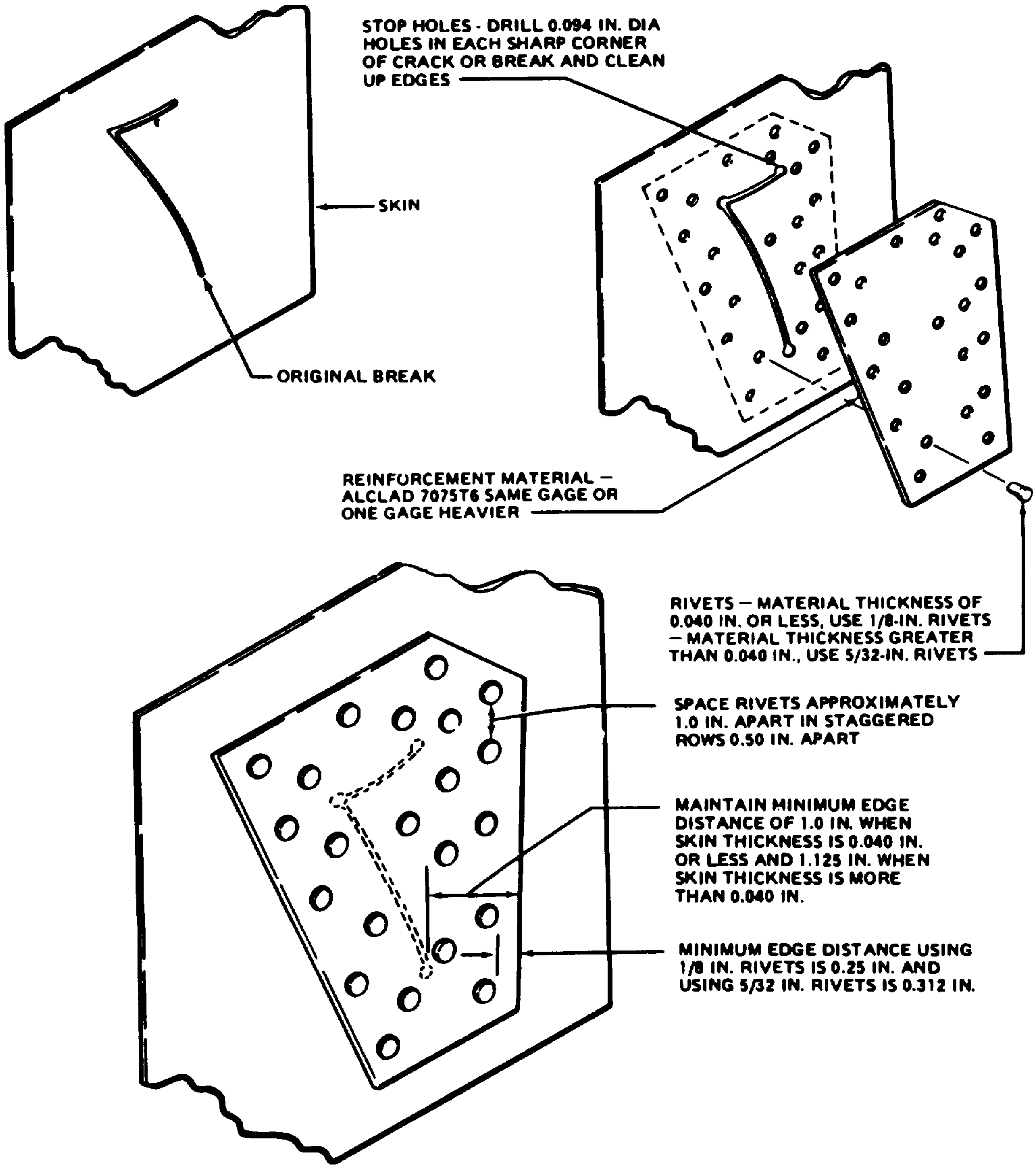


Figure 2-100. Wing Skin Repair (External Hole)



ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

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Figure 2-101. Wing Skin Repair (External Crack)

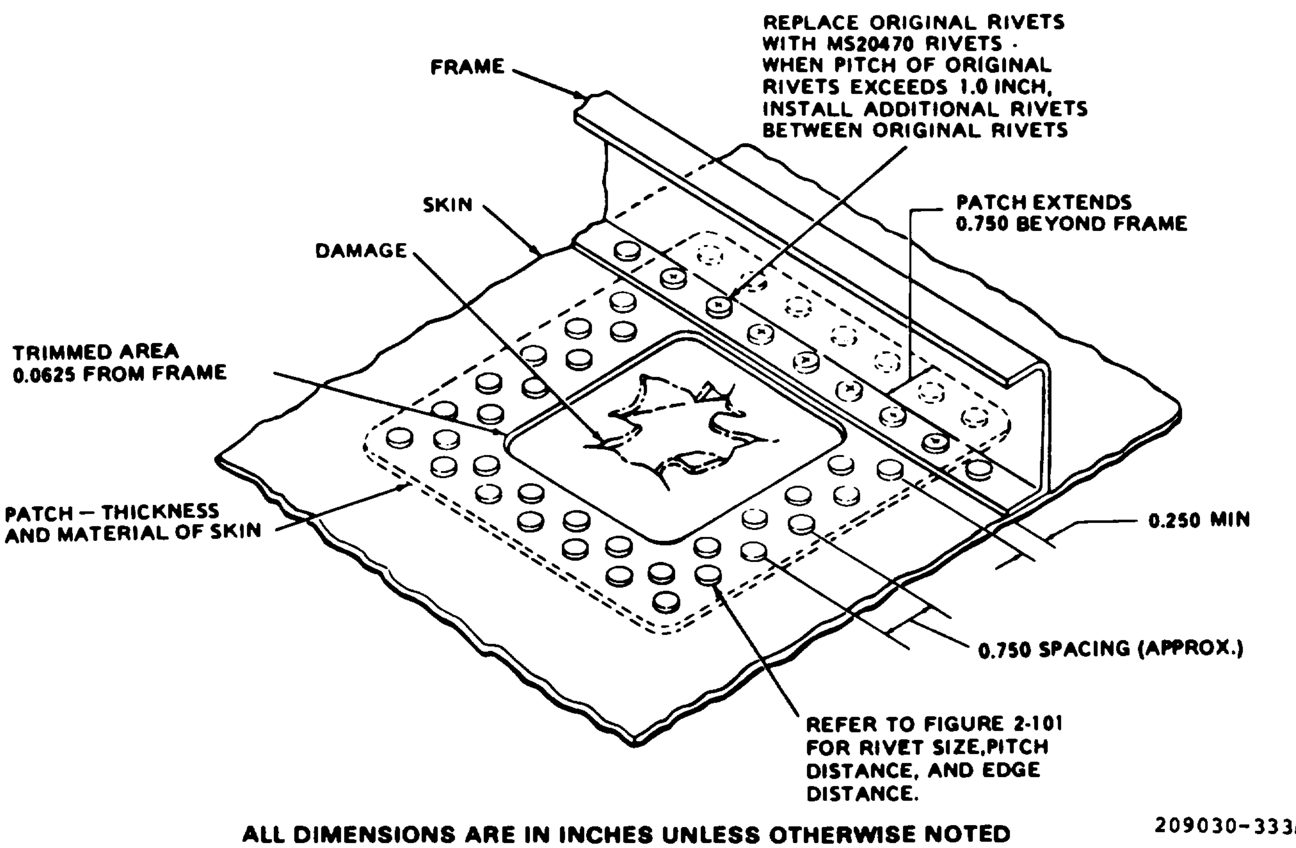
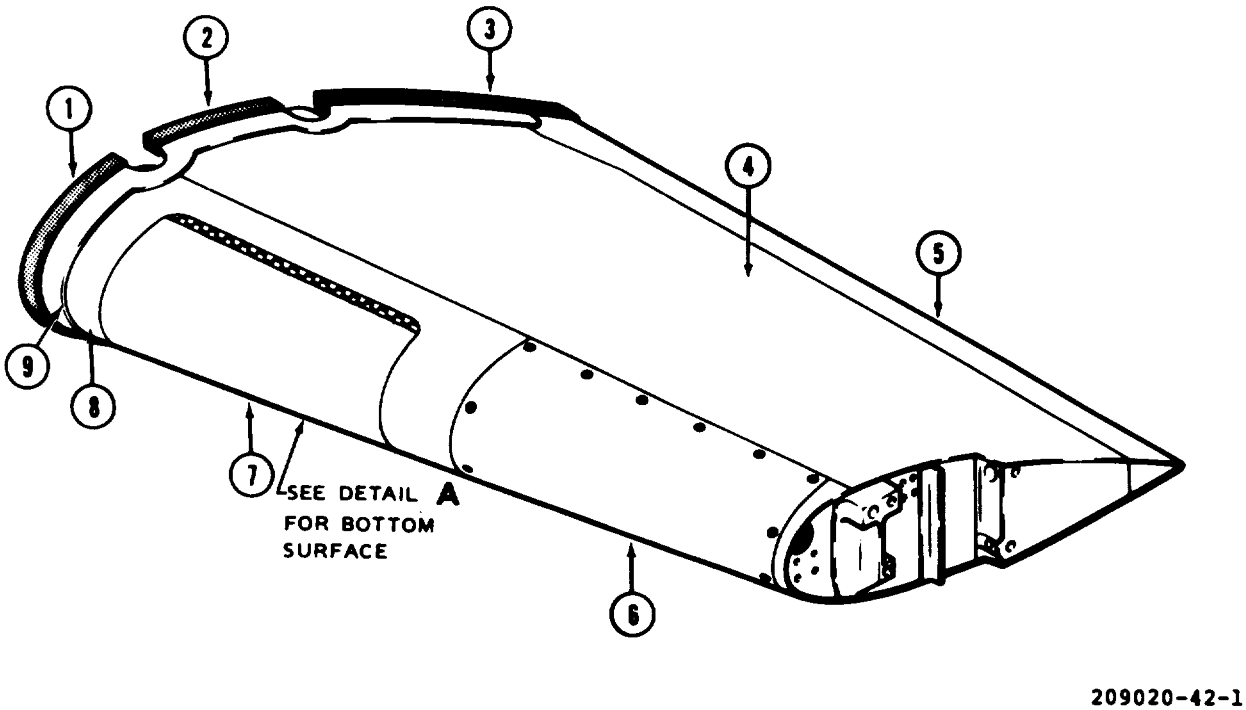
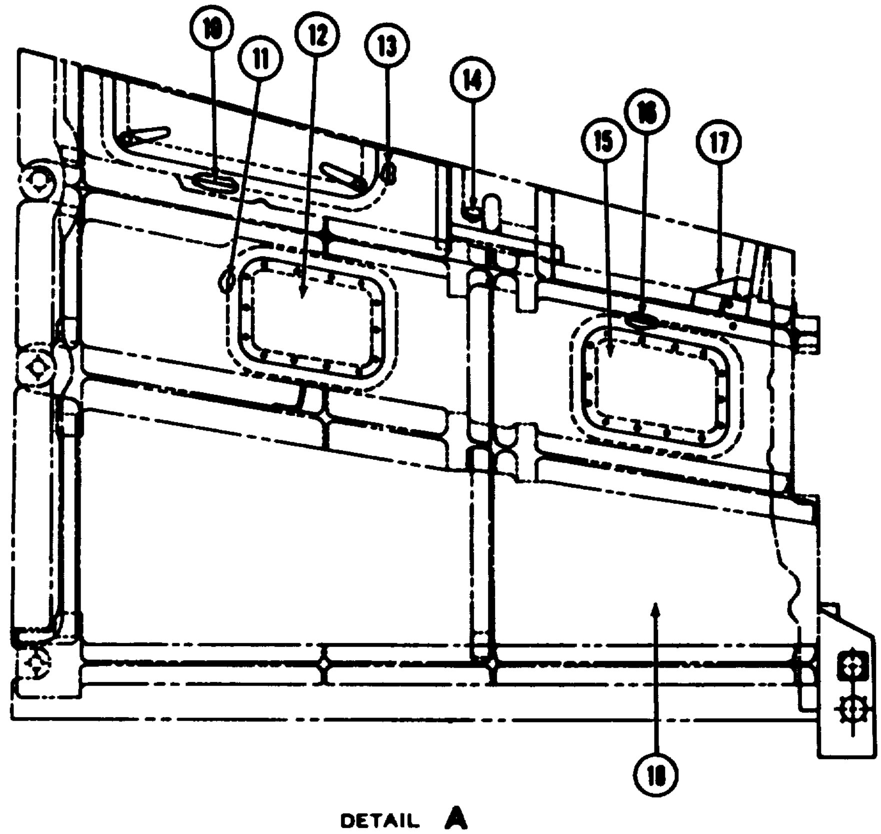


Figure 2-102. Wing Skin Repair (Close to Frame, Spar, or Ribs)



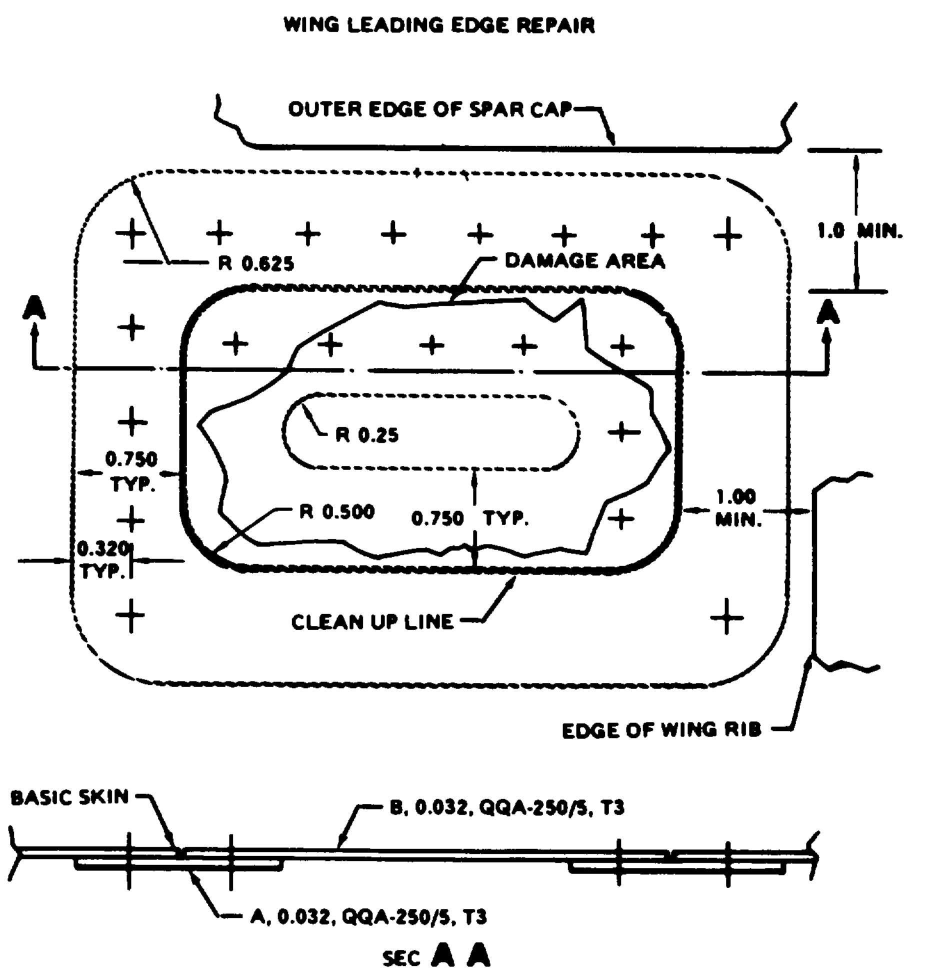
INDEX NO.	NOMENCLATURE	MATERIAL	SPECIFICATION	CONDITION	THICKNESS
1	Bumper	Rubber synthetic extruded	MIL-R-6855, Class 3, Grade 60		
2	Bumper	Same	Same		
3	Bumper	Same	Same		
4	Skin, upper	7075 Al. alloy	QQ-A-250/13	16	0.063
5	Fairing, aft	2024 Al. alloy	QQ-A-250/5	T3	0.032
6	Cover	2024 Al. alloy	QQ-A-250/5	13	0.032
7	Cover	2024 Al. alloy	QQ-A-250/5	13	0.032
8	Fairing	2024 Al. alloy	QQ-A-250/5	13	0.032
9	Closure	2024 Al. alloy	QQ-A-250/5	T3	0.040

Figure 2-103. Wing Skins, Fairings, Covers, Doors (Sheet 1 of 2)



INDEX NO.	NOMENCLATURE	MATERIAL	SPECIFICATION	CONDITION	THICKNESS
10	Double	2024 Al. alloy	QQ-A-250/5	T3	0.020
11	Doubler	7075 Al. alloy	QQ-A-250/13	T6	0.063
12	Door	7075 Al. alloy	QQ-A-250/13	T6	0.063
13	Doubler	2024 Al. alloy	QQ-A-250/5	T3	0.032
14	Doubler	2024 Al. alloy	QQ-A-250/5	T3	0.040
15	Door	7075 Al. alloy	QQ-A-250/13	T6	0.063
16	Doubler	7075 Al. alloy	QQ-A-250/13	T6	0.063
17	Doubler	2024 Al. alloy	QQ-A-250/5	T3	0.032
18	Skin, lower	7075 Al. alloy	QQ-A-250/13	T6	0.063

Figure 2-103. Wing Skins, Fairings, Covers, Doors (Sheet 2 of 2)



NOTE

1. Clean up damage area.
2. Install plates A and B with MS20470AD4 rivet at 6D spacing.
3. If patch is installed in blind area, NAS1738B4 cherry blind rivets may be used.

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

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Figure 2-104. Wing Fairing Repair (Leading - Trailing Edge)

b. Connect and lockwire electrical connectors (5, figure 2-98).

c. After MWO 55-1520-244-30-3, mount wing in fuselage fittings and install bolts and washers. Tighten wing attach bolts.

(1) Torque bolts (2, 4, and 13) **400** inch- pounds.

(2) Back off to zero torque or until threads are disengaged.

(3) Gradually retighten bolts until contact occurs between bolthead and washer or until torque begins to increase. Note contact torque level.

(4) Apply an additional 100 inch-pounds of torque above the contact torque to ensure a snug fit, but do not exceed 450 inch-pounds torque.

(5) Torque aft bolt (6) **80** to **100** inch-pounds.

c.1. Before MWO 55-1520-244-30-3, mount wing in fuselage fittings and install bolts. Tighten wing attach bolts. Torque bolts (2, 4, and 13) **100** 10 **150** inch-pounds, and aft bolt **80** TO **100** inch-pounds.

d. Remove caps from hydraulic connections (8) and connect.

e. Install lower access panel (9).

f. Attach weapons pylon to wing, if required. Refer to Installation — Outboard Ejection Rack and Installation — Inboard Ejector Rack, chapter 16.

g. Perform functional check of hydraulically actuated articulated pylon and all electrical circuits in the wing (chapters 7, 9, 16).

2-342. WING ACCESS COVERS AND DOORS.

2-343. DESCRIPTION – WING ACCESS COVERS AND DOORS.

To provide access to internal provisions in the wing two doors are on the wing lower skin and two covers are in the wing leading edge fairing. The inboard leading edge cover is hinged at the top and secured at the bottom with two turnlock fasteners. Doors and covers are made of aluminum alloy.

2-344. REMOVAL – WING ACCESS COVERS AND DOORS.

a. To remove doors (12 and 15, figure 2-103) and cover (6), remove attaching screws and remove door or cover.

b. To. remove cover (7), release fasteners at bottom of cover, remove hinge pin and remove cover.

2-345. INSPECTION – WING ACCESS COVERS AND DOORS.

Inspect covers and doors for damage. (Refer to table 2-5.)

2-346. CLEANING – WING ACCESS COVERS AND DOORS.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

a. Clean covers and doors with solvent (C112).

b. Dry with clean dry cloths.

2-347. REPAIR – ACCESS COVERS AND DOORS.

a. Repair doors on bottom skin using skin repair procedures in figures 2-98, 2-100, 2-102, 2-103 and 2-104.

b. Repair covers on leading edge using fairing repair procedures in figures 2-98, 2-100, 2-102, 2-103 and 2-104.

c. Replace hinge half on cover (7, figure 2-103) on mating hinge half on wing using rivets of same type. Use rivets of same diameter or one size larger.

2-348. INSTALLATION – ACCESS COVERS AND DOORS.

a. Position doors (12 and 15, figure 2-103) and cover (6) in place and install attaching screws.

b. Position cover (7) to align hinge half on cover with hinge half on wing. install hinge pin. Secure fasteners at bottom of cover.

2-349. PAINTING – ACCESS COVERS AND DOORS.

Paint covers and doors to match surrounding area. Refer to TM 55-1500-345-23 for general painting instructions.

2-350. WING PYLON INSTALLATIONS.

2-351. DESCRIPTION - WING PYLON INSTALLATIONS.

The wing pylon consists of an inboard and outboard ejector rack each enclosed in an aerodynamic shaped fiberglass fairing. Refer to paragraph 16-40 for maintenance Instruction on the ejector rack fairings.

SECTION V. DELETED

2-352. DELETED.

All data on pages 2-259 through 2-282 including figure 2-105, sheets 1 through 24, deleted.

CHAPTER 3

LANDING GEAR

SECTION I. LANDING GEAR

3-1. LANDING GEAR ASSEMBLY.

3-2. DESCRIPTION – LANDING GEAR ASSEMBLY.

The landing gear assembly (figure 3-1) consists of two skid tubes and two arched crosstubes of formed aluminum alloy, fastened together with skid saddles and attaching hardware. The assembly is attached to the lower fuselage structure with support assemblies at four points. The crosstubes extending from the fuselage are enclosed with thermoplastic fairings which are streamlined to reduce aerodynamic drag. The lower fuselage openings are covered with aluminum alloy covers. Eyebolts are mounted on the skid tubes to accommodate ground handling wheels, To prevent damage from contact with the ground, replaceable steel skid shoes attach to the bottom side of the skid tubes.

Premaintenance Requirements for Landing Gear

Condition	Requirements
Model	AH-1P/E/F
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
Support Equipment	(S3) (S6) (S7) (S8) (S9)
Minimum Personnel Required	Three
Consumable Materials	(C14) (C36) (C38) (C74) (C75) (C88) (C91) (C95) (C98) (C104) (C105) (C106) (C116) (C140)
Special Environmental Conditions	None

3-3. REMOVAL – LANDING GEAR ASSEMBLY.

NOTE

The landing gear can be removed as a complete assembly, or skid tubes (15, figure 3-1) and crosstubes (7 and 17) can be removed separately.

a. Remove the complete landing gear as follows:

(1) Jack or hoist helicopter off floor. If using jacks, align legs of jacks to allow clearance for removing landing gear (paragraph 1-34 or 1-45).

(2) Remove step (22), fairing (21), seal (23). Remove screws (18 and 20) and cover (19). Remove aft cover (not illustrated) in the same manner.

(3) Support landing gear. Remove bolts (29 and 30), washers (28 and 31) and two forward support assemblies (32). Remove bolts (43 and 44), washers (42 and 45), and two aft support assemblies (46). Lower landing gear assembly to floor. Turn landing gear to clear jacks and slide clear of helicopter.

b. Remove one or both skid tubes (15) from crosstubes (7 and 17) as follows:

(1) Remove screws (3) and washers (2).

(2) Remove screws (4) and washers (5).

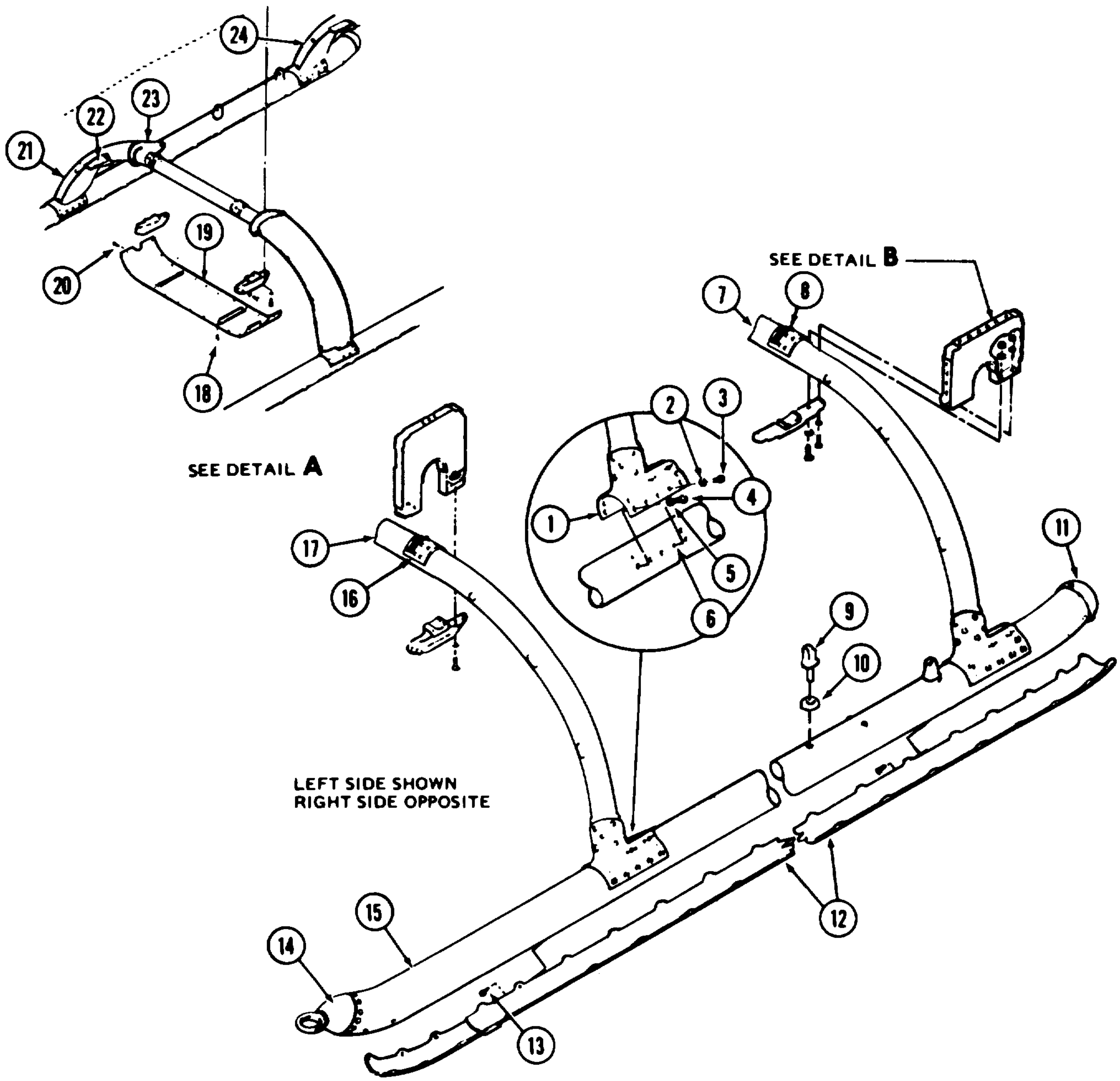
3-4. INSPECTION – LANDING GEAR ASSEMBLY.

a. Inspect skid tubes (15, figure 3-1) for damage. Refer to paragraph 3-16 for limits.

b. Inspect skid shoes (12) for damage. Refer to paragraph 3-22 for limits.

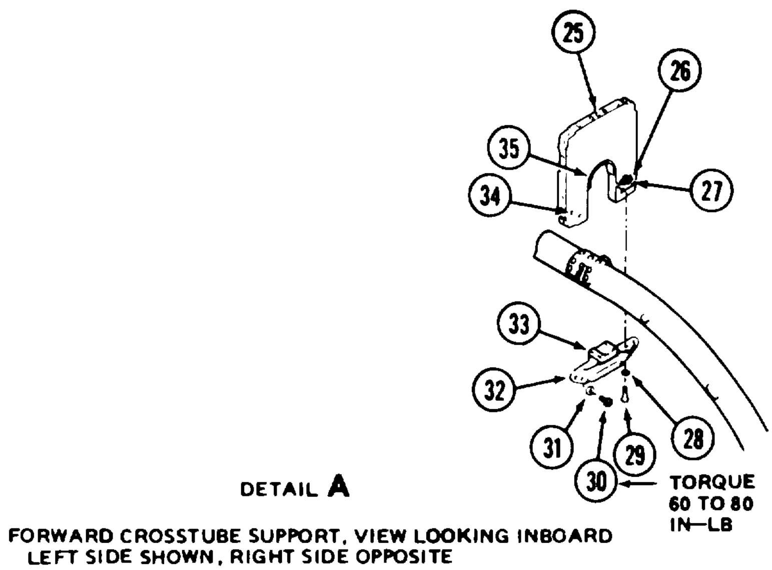
c. Inspect skid saddles (1) for damage. Refer to paragraph 3-28 for inspection procedure.

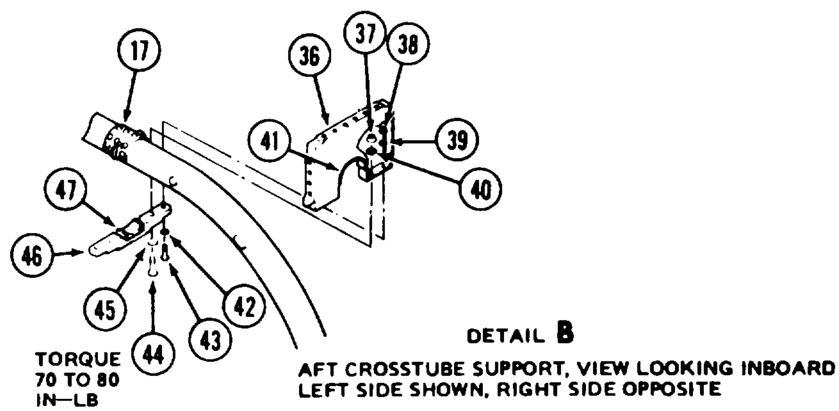
d. Inspect crosstubes (7 and 17) for damage and cracks. Refer to paragraphs 3-8 and 3-10 for limits and inspection procedure.



1. Skid saddle (2 places)
2. Washer
3. Screw
4. Screw
5. Washer
6. Nutplate
7. Aft crosstube
8. Retainer
9. Eyebolts
10. Washer
11. Skid cap
12. Skid shoes
13. Screw
14. Tow ring
15. Skid tube
16. Retainer
17. Forward crosstube
18. Screw
19. Forward cover (aft cover similar)
20. Screw
21. Crosstube fairing
22. Step
23. Fairing seal
24. Aft fairing

Figure 3-1. Landing Gear and Support Installation (Sheet 1 of 2)





25. Forward crosstube support
26. Nutplate
27. Nutplate
28. Washer
29. Bolt
30. Bolt
31. Washer
32. Forward support assembly
33. Rubber bumper
34. Nutplate
35. Spacer
36. Aft crosstube support
37. Nut
38. Nut
39. Washer
40. Washer
41. Spacer
42. Washer
43. Bolt
44. Bolt
45. Washer
46. Aft support assembly
47. Rubber bumper

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Figure 3-1. Landing Gear and Support Installation (Sheet 2 of 2)

e. Inspect crosstube fairings (21) for damage. Refer to paragraph 3-41 for inspection procedure.

f. Inspect tow rings (14) for damage. Refer to paragraph 3-35 for inspection procedure.

g. Inspect crosstube covers (19) and support assemblies (32 and 46) for damage. Refer to paragraph 3-48 for inspection procedure.

3-5. INSTALLATION-LANDING GEAR ASSEMBLY.

CAUTION

Do not interchange fore and aft crosstubes during installation. Refer to TM 55-1520-236-23P.

a. If not previously accomplished, assemble skid tubes (15, figure 3-1) and crosstubes (7 and 17) as follows:

(1) Apply a thin coat of sealing compound (C106) to mating surfaces of skid tube and crosstube saddle (1).

(2) Align saddle (1) on skid tube carefully to prevent damage to screw and rivnut threads. Maintain position of saddle on skid tube with "C" clamps if necessary.

(3) Using sealing compound (C106), install new screws (3 and 4) and washers (2 and 5).

b. Position lending gear in crosstube supports (25, figure 3-1). Ensure that both front retainers (16) properly engage both front supports (25). Maintain the landing gear in position. Position forward support assembly (32) on support (25). Install bolt (29) and washer (28); snug up to align holes for bolts (30). Install four bolts (30) and washers (31). Tighten bolts, but do not torque at this time.

c. Raise aft end of landing gear and ensure that both aft retainers (8) properly engage aft crosstube support (36). Maintain the landing gear in position. Position aft support assembly (46) on aft crosstube support (36). Install two bolts (44), washers (40 and 45), and nut (37). Install two bolts (43), washers (39 and 42), and nuts (38). Snug nuts, but do not torque at this time. Install opposite support assembly (46) in the same manner. Do not torque nuts at this time.

NOTE

Prior to torque application, the gap between the top of the support assembly and the bottom of the fuselage at the crosstube mounting area should be in accordance with figure 3-1.1. The gap shall be measured with appropriate feeler gage. If the gap is larger than recommended, fabricate shims per figure 3-1.1. If the gap is smaller than recommended, the rubber pad is worn and the cap should be replaced. Tighten bolts to a snug fit while aircraft is still supported by jacks or hoist. Depending on thickness of shim required, longer bolts of same part number may be needed to install caps.

d. Torque bolts (30) 60 TO 80 inch-pounds. No further tightening of bolt (29) is necessary.

NOTE

Check for minimum of 0.020 inch gap between support bracket assembly at bolt (29) location and support of aircraft. This is to insure there is no preloaded shear stress on bolts (30).

e. Lower helicopter to ground.

f. Torque bolts (43 and 44) 70 TO 80 inch-pounds.

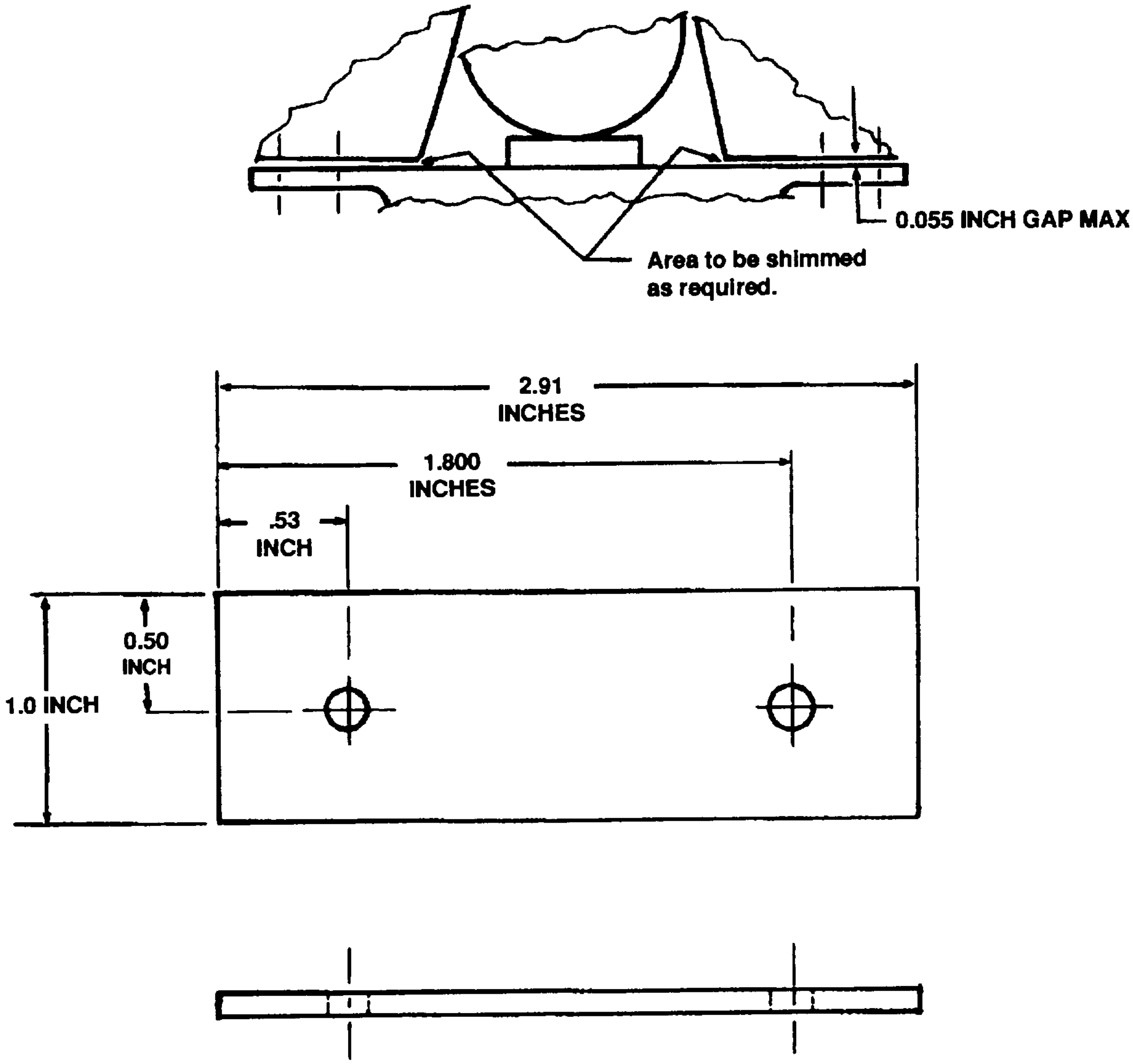
g. Install forward cover (19) with screws (18 and 20). Install aft cover in the same manner.

h. Align eyebolts (9) for Installation of ground handling gear.

3-6. CROSSTUBES.

3-7. DESCRIPTION-CROSSTUBES. The forward crosstube (17, figure 3-1) and aft crosstube (7) are made of formed aluminum alloy. The crosstubes are attached to the helicopter with two forward support assemblies (32) and two aft support assemblies (46).

3-8. INSPECTION-CROSSTUBES (CROSSTUBES INSTALLED ON HELICOPTER).



Fabricate Shim from Aluminum Alloy 2024T3 NSN 9535-00-084-4450

Figure 3-1.1. Crosstube Shim Fabrication

NOTE

Perform crosstube deflection inspection after a hard landing or overloading to determine whether crosstubes (7 and 17) have taken a permanent set with excessive spread.

a. Position helicopter on a smooth surface.

b. Raise helicopter off the surface with jacks, removing all weight from the landing gear (paragraph 1-34).

c. Level helicopter (paragraph 1-36).

d. Measure the distance between the crosstube retainers and divide that distance by 2 to determine helicopter centerline (figure 3-2).

e. Drop a plumb line from helicopter centerline to ground or floor surface. Measure from

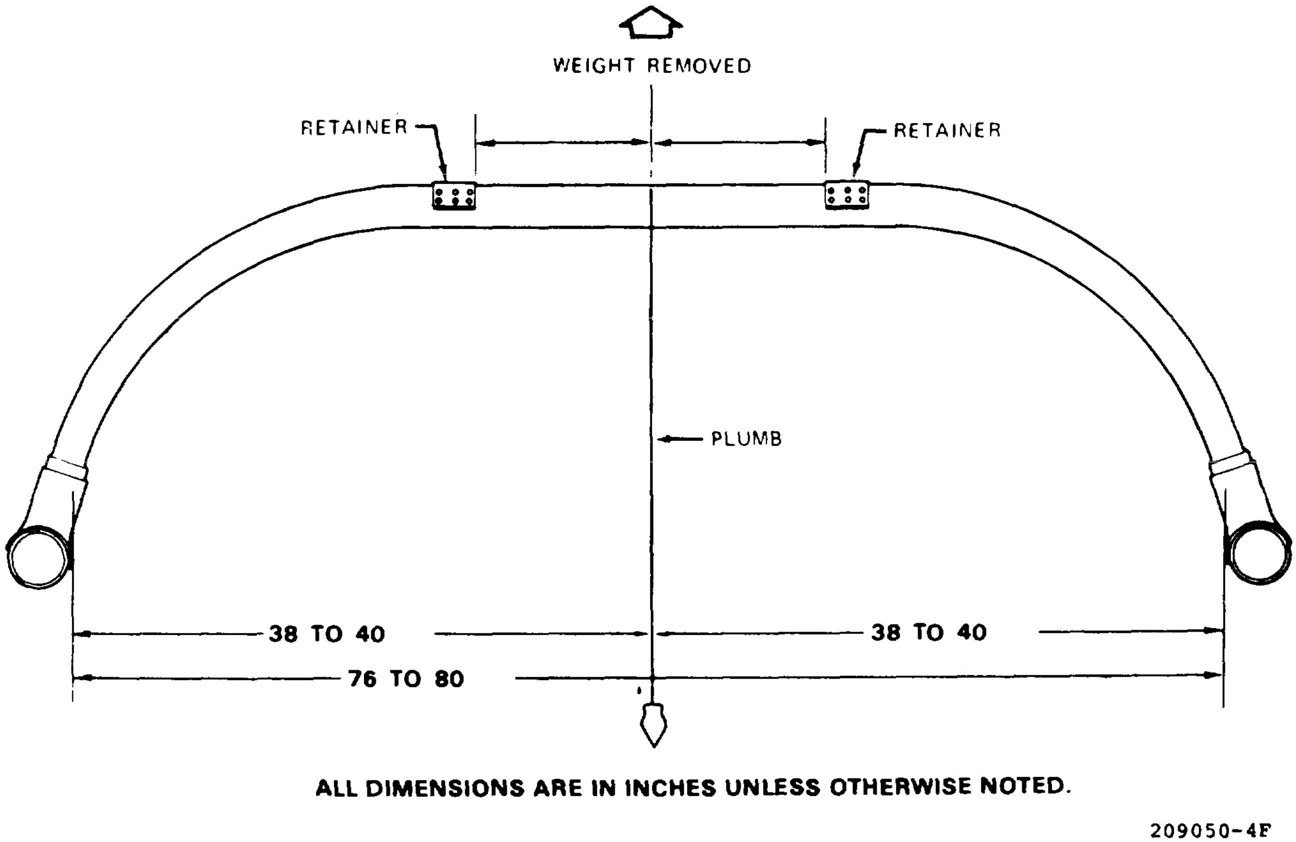


Figure 3-2. Crosstube — Deflection Inspection

plumb line to the inside of each skid tube at crosstube locations. Distance should be 38 TO 40 inches from inside edge of skid tube to plumb line. If distance exceeds 40 inches from the inside edge of either skid tube, replace crosstubes.

f. Lower helicopter to surface and remove jacks.

3-9. REMOVAL – CROSSTUBES.

Refer to paragraph 3-3.

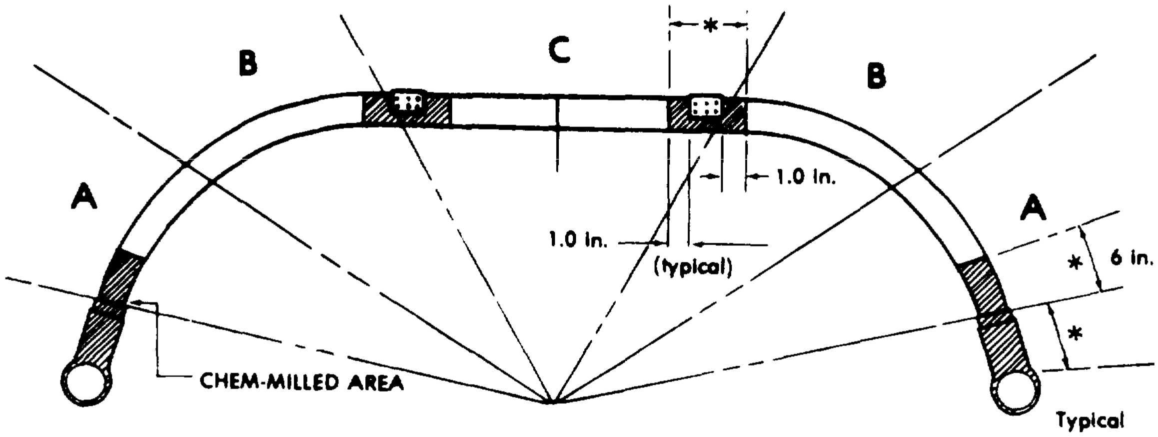
3-10. INSPECTION – CROSSTUBES (CROSS TUBES REMOVED FROM HELICOPTER).

a. Remove crosstube fairings if not previously accomplished (paragraph 3-40).

b. Inspect two aft crosstube retainers (8, figure 3-1) and two forward crosstube retainers (16) for secure installation on crosstubes. Inspect retainers for obvious wear and for cracks. Replace retainers if loose or damaged.

c. Inspect forward and aft crosstubes for scratches, nicks, and dents. Surface nicks and scratches and smooth contour dents within the limits shown on figure 3-3 and less than 0.50 inch in length radially or 2.00 inches in length longitudinally are acceptable if polished out in accordance with paragraph 3-11. The number of repairs is limited to one per cross section cut of the tube. Minimum longitudinal distance between repairs is 2.0 inches. Shot peen the areas around and within 2.0 inches of the fuselage support fittings after making repairs in these areas.

d. If it is suspected that crosstubes are cracked due to a hard landing or other cause, prepare



ALLOWABLE DEPTH OF REPAIR

	AREA A	AREA B	AREA C
Forward Tube	0.016	0.021	0.025
Aft Tube	0.016	0.027	0.037

* CRACK INSPECTION AREAS (INCLUDING ALL FOUR SADDLES.)

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

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Figure 3-3. Damage Limits — Crosstubes

the crosstubes for inspection and perform same as outlined below. (Figure 3-3 specifies the minimum areas that must be evaluated.)

NOTE

The cross tubes may be inspected by flourescent dye penetrant inspection (TM 55-1500-335-23, Chapter 6), ultrasonic Inspection (TB 55-1520-243-50-2), or radiographic inspection (TM 55-1500-335-23, Chapter 5). Replace cross tube or cross tube saddle if any cracks are detected.

e. **Remove retainers (8 and 16, figure 3-1). Refer to paragraph 3-11 for procedures. Prepare areas in figure 3-3 for dye penetrant inspection.**

NOTE

The success and reliability of penetrant Inspection depends upon the thoroughness with which the Inspector prepares the part from the precleaning process all the way through to the final Interpretation of the indications. All inspections shall be with the fluorescent penetrant (Type I, Method C) In strict accordance with TM 55-1500-335-**23.**

WARNING

Prolonged or repeated Inhalation of vapors or powders may result In irritation of the mucous membrane areas of the body. Provide adequate ventilation.

Continual exposure to penetrant inspection materials may cause skin irritation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

Injury to eyes and skin may occur when blacklight Is not used In accordance with manufacturer's inspections. Unfiltered light sources (if filter Is required) may possibly damage the eyes.

WARNING

Temperatures in excess of 120 degree F may cause burst ing of pressurized cans and injury to personnel.

Volatile fumes may occur, creating both a fire and health hazard.

NOTE

Paint will not be removed by any mechanical means under any circumstances because it may mask over any potential surface cracks.

f. With a soft hair brush, apply MEK (C74), or paint remover (C95) and remove the paint.

g. Clean the prepared surfaces with a soft cloth.

h. Apply a fluorescent dye penetrant to the prepared surfaces from either a spray can or with a soft hair brush and in strict conformance to the procedure specified to TM 55-1500-335-23, Chapter 6.

i. Allow penetrant to dwell for a minimum of 30 minutes.

j. Clean off all excess penetrant in accordance with TM 55-1500-335-23, standard procedures. (Check for complete excess penetrant removal from surface by using a backlight).

k. Apply applicable developer consistent with Type I, Method C penetrant method in TM 55-1500-335-23.

l. Inspect suspected area with backlight source in subdued white light.

NOTE

Normal manufacturing machining marks may be observed on the tube surfaces. These will not be cause of part rejection.

m. Clean tube with solvent and wipe dry.

n. Refer to paragraph 3-11 for instructions to repaint cross tubes.

3-11. REPAIR OR REPLACEMENT – CROSSTUBES.

a. Replace loose or damaged retainers (8 and 16, figure 3-1) as follows:

(1) Carefully drill out rivets that secure retainer to crosst ube and remove retainer.

(2) Remove old sealant from crosstube with 300 grit to 400 grit abrasive cloth (C36). No circumferential sanding or grooves permitted.

(3) Check crosstube surfaces previously covered by retainer (8 or 16) for cracks (paragraph 3-10).

(4) Coat mating surface of new retainer (8 or 16) and crosstube with sealant (C105).

(5) position retainer (8) on aft crosstube (7). Secure with blind rivets NAS 1399MW5-8. Install rivets while wet with primer (C88 or C91).

(6) Position retainer (16) on forward crosstube (17). Secure with blind rivets NAS 1399MW5-6. Install rivets while wet with primer (C88 or C91).

b. Polish out mechanical damage that is within limits noted in paragraph 3-10. Use 300 grit to 400 grit abrasive cloth (C36). Ensure that limits shown on figure 3-3 are not exceeded. No circumferential sanding or grooves permitted.

c. Touch up or completely repaint crosstube with primer (C88 or C91). Paint crosstube to match original finish (TM 55-1500-345-23).

d. Install crosstube fairings (paragraph 3-43).

3-12. INSTALLATION – CROSSTUBES.

Refer to paragraph 3-5.

3-13. SKID TUBES.

3-14. DESCRIPTION – SKID TUBES.

The aluminum skid tubes support the helicopter on the ground. Each skid tube has two steel skid shoes (12, figure 3-1) attached to the skid tube to extend the life of the skid tubes. The skid tubes have provisions for mounting ground handling wheels. When the ground handling wheels are attached and placed in the extended position, the helicopter may be towed with a tow bar attached to towing rings (14).

3-15. REMOVAL – SKID TUBES.

Refer to paragraph 3-3.

3-16. INSPECTION – SKID TUBES.

a. Inspect skid shoes (12, figure 3-1) for damage (paragraph 3-22). If damage is detected, remove skid shoes (paragraph 3-2 1).

b. Inspect skid tubes (15, figure 3-1) for scratches, nicks, dents, and holes.

(1) Smooth dents, not exceeding 0.25 inch in depth and 1.0 TO 1.2 inches in diameter between the crosstube saddles, are acceptable without repair.

(2) Scratches, dents, and holes in the skid tubes in front of forward crosstube saddle may be repaired at discretion of local maintenance officer.

(3) Scratches and gouges up to 0.03 inch deep and 1.0 TO 1.2 inches long running directly across top of skid tube between crosstube saddles are acceptable if polished out.

(4) Scratches and gouges running directly across top of skid tube that are more than 0.03 inch deep and more than 1.2 inches long but less than 4.0 inches long are reparable by patching if the damage is in area where repairs by patching are authorized. See figure 3-4 for illustration of area where repairs by patching are authorized.

(5) Dents more than 0.25 inch deep and 1.2 inches up to a maximum of 4.0 inches across are reparable by patching if the damage is in area where repairs by patching are authorized. See figure 3-4 for illustration of area where repairs by patching are authorized.

(6) Holes up to 4.0 inches in diameter through one surface of skid tube only are reparable by patching if the damage is in area where repairs by patching are authorized. See figure 3-4 for illustration of area where repairs by patching are authorized.

(7) Dents and holes on either top or bottom side of skid tube that are greater than 4.0 inches across in any direction are repairable by inserting a splice. This type repair is restricted to areas shown on figure 3-4.

(8) Damage in excess of the limits noted in the preceding steps is cause to replace the skid tube.

(9) Inspect skid tubes for damaged or missing threaded inserts.

3-17. REPAIR OR REPLACEMENT – SKID TUBES.

a. Polish out scratches and gouges that are within reparable limits noted in paragraph 3-16.b. (3).

b. Repair damage by patching that is within limits. Refer to paragraphs 3-16.b. (4) through 3-16.b. (6) for limits. Apply patch repairs as follows:

(1) Polish out scratches; trim and smooth rough edges of holes.

(2) Fabricate a patch from 0.100 inch thick aluminum alloy (12, table 2-1) of the required size as shown in figure 3-4 or make a patch from material salvaged from scrap skid tube.

(3) Lay out the rivet hole pattern and form patch to fit contour of skid tube as shown in figure 3-4.

(4) Locate and securely clamp patch to skid tube and drill rivet holes with a No. 10 twist drill.

(5) Rivet patch in place using blind rivets (32, table 2-1).

(6) Touch-up repair area or paint entire skid tube (paragraph 3-72).

c. Repair damage by insertion that is within limits. Refer to paragraph 3-16, b. (7) for limits. Install insert as follows:

(1) Cut out damaged portion of skid tube with hand or powered metal saw.

(2) Fabricate an insert of the required length from tubing 0.095 inch wall thickness (27, table 2-1) or from scrap skid tube, as shown in figure 3-4.

(3) Fabricate splice plates as follows:

(a) Cut four plates to the required dimensions as shown in figure 3-4 from sheet stock 0.100 inch-thick (12, table 2-1) or use material salvaged from scrap skid tube.

(b) Form two plates to fit the outside diameter of skid tube and the other two plates to fit the inside diameter as shown in figure 3-4.

(4) Apply a coat of primer (C88 or C91) to plates and tubes.

(6) Lay out rivet hole pattern on upper splice plates and lower side of tubes as shown in figure 3-4.

(6) Maintain proper alignment and securely clamp splice plates and tubes together.

(7) Drill rivet holes in plates end tubes with No. 10 twist drill. Countersink lower holes with 100 degree countersink. Install protruding head blind rivets (36, table 2-1) in upper half of splice. Install flush head blind rivets (31, table 2-1) in lower half of splice as shown in figure 3-4.

(8) If repair involves removal of skid shoe bolt sleeves, mark sleeve locations using skid shoe as a template and install new sleeves.

d. Replace damaged or worn threaded inserts. Refer to TM 55-1500-204-25/1.

e. Install skid shoes (paragraph 3-24).

3-18. INSTALLATION – SKID TUBES.

Refer to paragraph 3-5.

3-19. SKID SHOES.

3-20. DESCRIPTION – SKID SHOES.

The skid shoes are two steel plate assemblies attached with screws to the bottom of each skid tube to minimize abrasive damage to the skid tubes from ground contact.

3-21. REMOVAL – SKID SHOES.

Remove skid shoes (12, figure 3-1) from bottom of skid tubes (15) by removing screws (13).

3-22. INSPECTION – SKID SHOES.

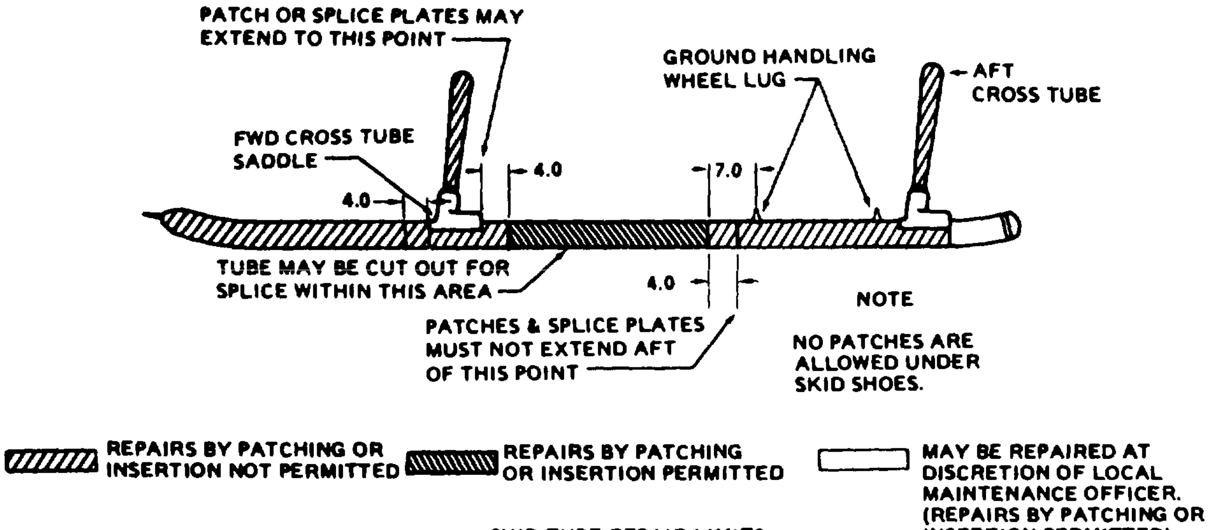
Inspect skid shoes (12, figure 3-1) for damage and wear which is severe enough to affect function. Check for loose or missing fasteners.

3-23. REPAIR OR REPLACEMENT – SKID SHOES.

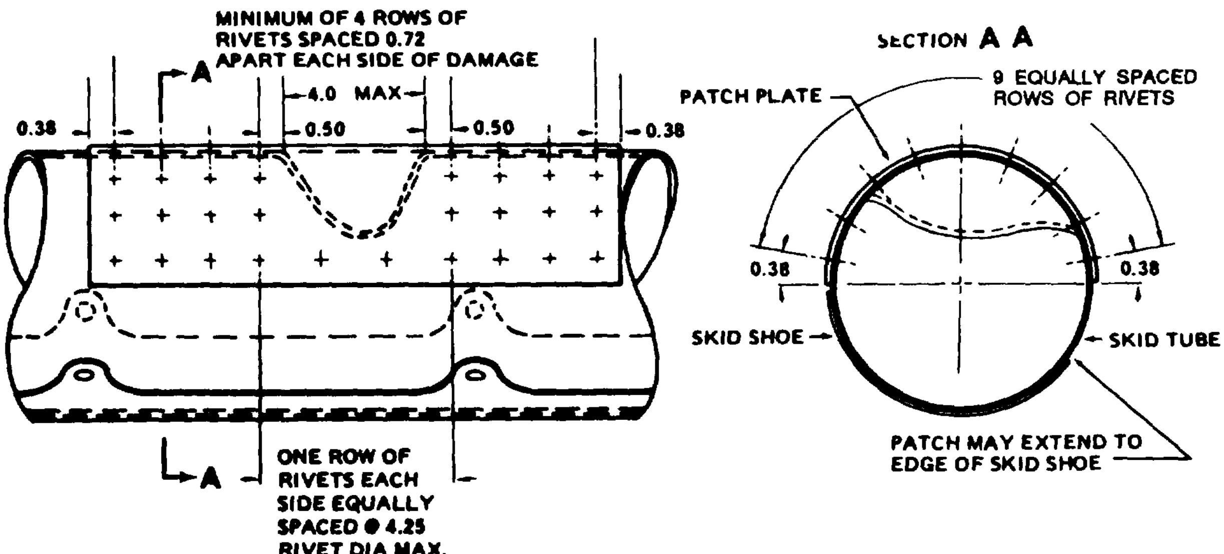
a. Replace skid shoes (12, figure 3-1) if worn too thin to give proper protection to skid tubes.

b. Replace skid shoes if mounting holes are elongated or cracked.

c. Replace missing fasteners.



SKID TUBE REPAIR LIMITS



TYPICAL PATCH REPAIR

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

Figure 3-4. Skid Tube – Repairs (Sheet 1 of 2)

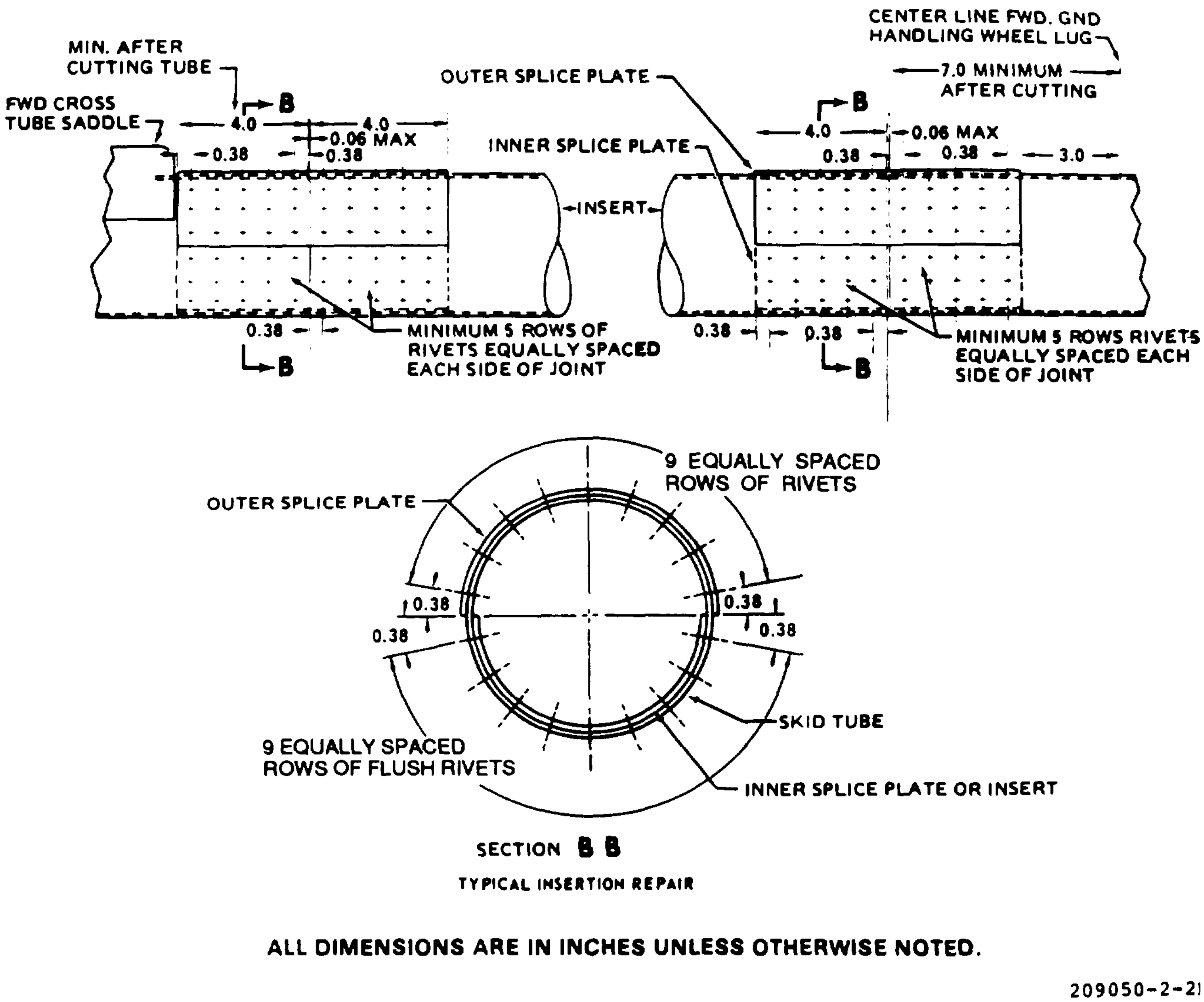


Figure 3-4. Skid Tube – Repairs (Sheet 2 of 2)

3-24. INSTALLATION – SKID SHOES.

Install skid shoes (12, figure 3-1) to bottom of skid tube (15) with screws (13). Make sure proper length screw is used to prevent bottoming out.

3-24.1. SKID SHOES – STANDARD HEAVY DUTY (SURFACITE) (NON-LOCALLY FABRICATED).

Description, standard heavy duty skid shoes manufactured with a special surfacite treated steel bottom plate, anti-slip brackets and stainless steel attaching damps. These skid shoes have extended wear life and weight 19.6 pounds per shoe, 39.2 pounds per set (Figure 3-4.1).

3-24.2. INSTALLATION – STANDARD HEAVY DUTY (SURFACITE) SKID SHOES.

a. Remove Bell factory skid shoes, refer to paragraph 3-21.

b. Ensure skid tube is free of dirt and debris.

(1) Screw holes used to attach Bell factory skid shoes will not be reused. Seal holes with sealing compound (C-105).

NOTE

On some aircraft crosstube to saddle retaining bolts are one long bolt rather than two separate opposing bolts

(2) Remove lower inboard and two outboard crosstube to saddle retaining bolts on all four saddles (figure 3-4.1).

(3) Install and loosely clamp skid shoe on skid tube. Install skid shoe with damp T-bolt nut inboard side of skid tube. Do not fully tighten damps at this time.

NOTE

A flat washer may be required under head of crosstube to saddle bolts to cover edges of oblong holes on anti-slip brackets.

(4) Position skid shoes on skid tubes so oblong holes in anti-slip brackets are aligned over crosstube to saddle retaining bolt holes. Re-install crosstube to saddle retaining bolts and tighten fully.

(5) Lower helicopter and torque all damps to 60 inch pounds using the following sequence: (Fonward damp is number 1 and aft damp is number 9) tighten damp 5 first, damp 4 second, damp 6 third, damp 3 fourth, damp 7 fifth, damp 2 sixth, damp 8 seventh, clamp 1 eighth, and damp 9 last

3-24.3. INSPECTION - STANDARD HEAVY DUTY SKID SHOES (SURFACITE).

a. Inspect attaching damps for looseness.

b. Inspect anti-slip bracket bolts for looseness.

c. Inspect skid shoe bottom plate for excessive wear. The last 18 inches of shoe receives the most wear.

3-24.4. REPLACEMENT OR REPAIR — STANDARD HEAVY DUTY SKID SHOES (SURFACITE).

a. Replacement Replace excessively worn skid shoes.

b. Repair.

(1) 45 degree ramps at front and rear of skid shoe can be repaired by re-welding and regrinding the 45 degree angle. (Figure 3-4.1).

(2) Anti-slip brackets that are bent or distorted can be reworked by carefully bendng to original shape. (Figure 3-4.1).

3-24.5. REMOVAL – STANDARD HEAVY DUTY SKID SHOE (SURFACITE).

a. Jack or hoist helicopter dear of ground (paragrapj 1-34, 1-35, 1-36, 1-38, and 1-49).

b. Loosen 9 mounting damps on skid shoe.

c. Remove lower inboard and two outboard crosstube to saddle retaining bolts. (Figure 3-4.1).

d Remove skid shoe.

3-25. SKID SADDLES.

3-26. DESCRIPTION – SKID SADDLES.

The skid saddle (1, figure 3-1) is a reinforced aluminum forging that connects the forward and aft crosstubes to the skid tubes.

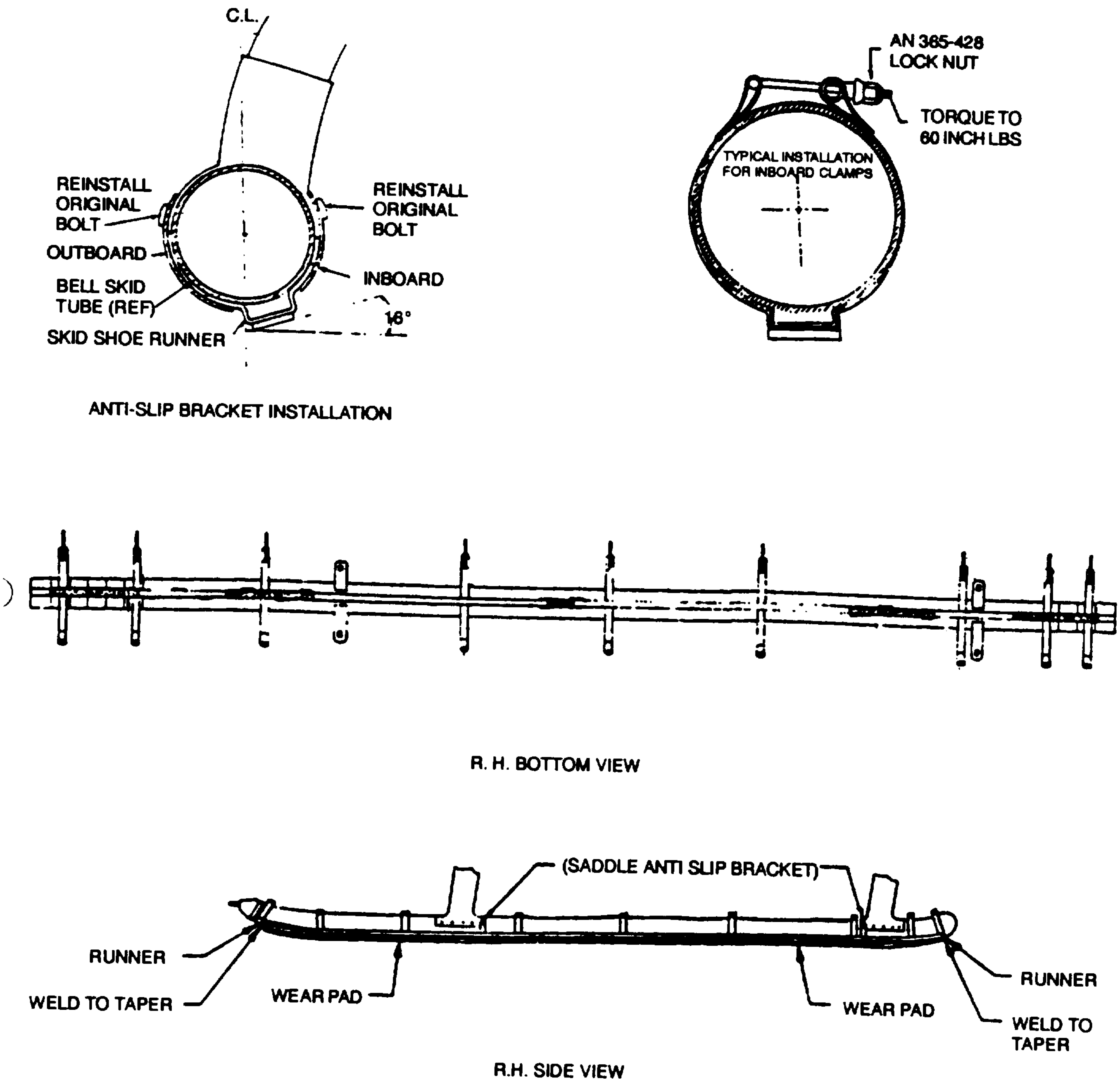


Figure 3-4.1. Skid Shoes - Standard, Heavy Duty

3-27. REMOVAL – SKID SADDLES

a. Remove skid tubes (paragraph 3-3).

b. Carefully drill out rivets that secure saddle (1, figure 3-1) to crosstube (7 or 17). Remove saddle from crosstube.

3-28. INSPECTION – SKID SADDLES.

a. Inspect skid saddle for cracks in area of screw and rivet holes, using fluorescent penetrant inspection method (TM 55-1500-335-23).

b. Inspect for secure installation of rivets and screws.

c. Inspector elongated screw and/or rivet holes. Elongation of screw holes at the 1/4 inch screw locations shall not exceed 0.281 inch. Elongation of screw holes at the 5/1 6 inch screw locations shall not exceed 0.344 inch.

d. Inspect nutplates on lower part of saddle for loose rivets and damaged threads.

3-29. REPAIR – SKID SADDLES

Repair is limited to replacement of attaching screws. Rivets (figure 3-1) attaching saddle to crosstube may be replaced or oversize rivets OSB100 T6-3/16 inch buck oversize may be used. (Next size fasteners not permitted.)

3-30. INSTALLATION - SKID SADDLES

a. Position skid saddle (1, figure 3-1) or crosstube and install rivets.

b. Install skid tube (paragraph 3-5).

3-31. PAINTING — SKID SADDLES

Refer to paragraph 3-72.

3-32. TOW RINGS.

3-33. DESCRIPTION - TOW RINGS.

The tow ring (14, figure 3-1) is a one-piece casting with eyehole which is riveted to the front end of each skid tube (15) to facilitate ground handling and towing of the helicopter.

3-34. REMOVAL – TOW RINGS.

Drill out rivets and remove how ring (14, figure 3-1) from front end of skid tube (15).

3-35. INSPECTION – TOW RINGS

a. Inspect tow ring (14, figure 3-1) and attaching rivets for damage or recks.

b. Perform magnetic particle inspection (TM 55-1500-335-23).

3-38. REPAIR OR REPLACEMENT – TOW RINGS.

a. Repair is limited to replacement of attaching rivets and polishing out minor surface damage with fine India stone (C116).

b. Replace tow rings that exceed repair limits.

3-37. INSTALLATION – TOW RINGS.

a. Insert tow ring (14, figure 3-1) into front end of skid tube (15) with eyehole horizontal and the part number facing up. Install with sealant (C104).

b. Install rivets (CR2538-6-4).

3-38. CROSSTUBE FAIRINGS.

3-39. DESCRIPTION – CROSSTUBE FAIRINGS.

The crosstube fairings (figure 3-5) are plastic coverings designed to lessen the dragon the landing gear. The fairings are attached to the crosstubes with screws. It is permissible to fly this aircraft with both crosstube fairings removed. No additional flight restrictions will be required when troth fairings are removed.

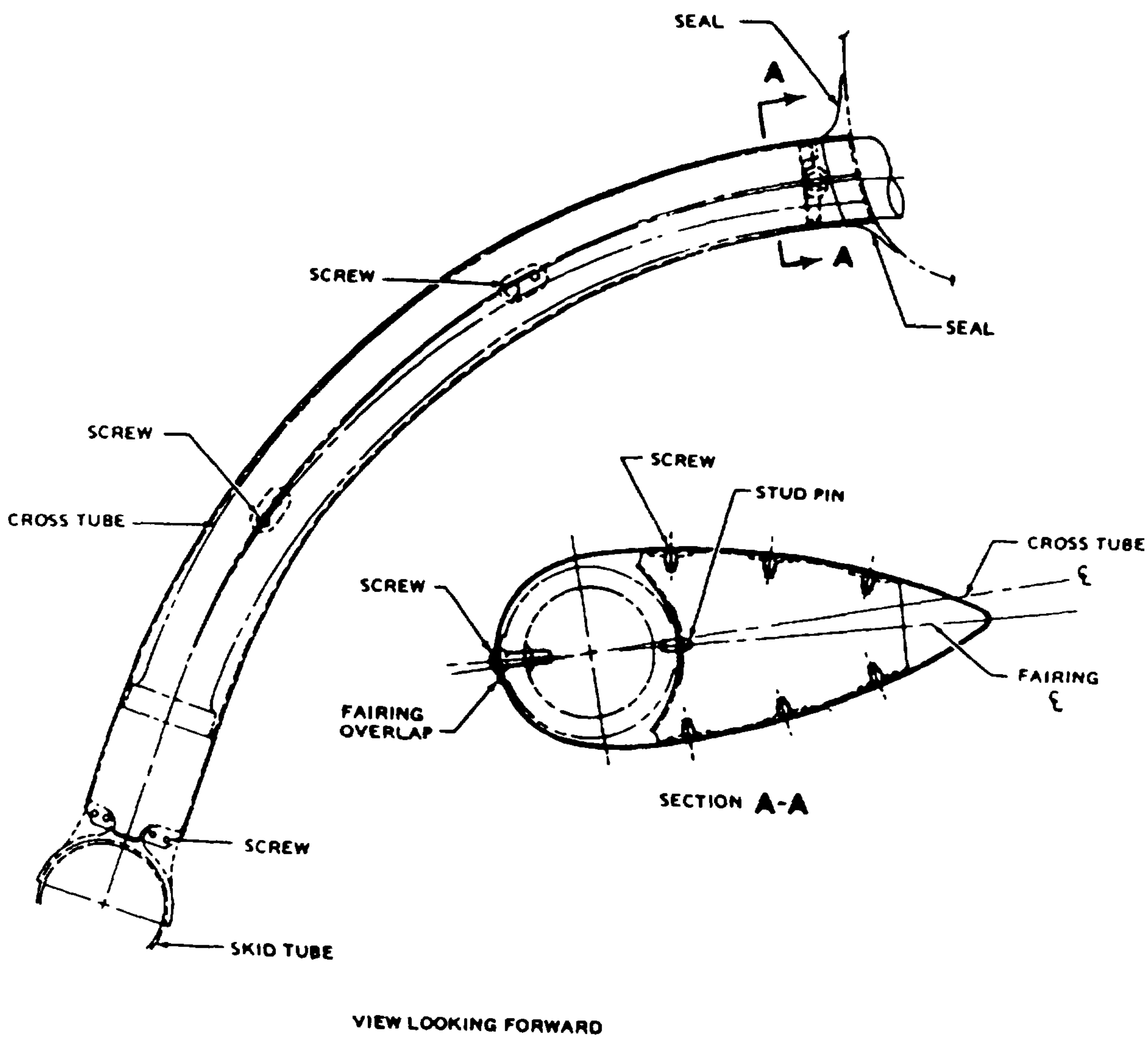


Figure 3-5. Crosstube Fairing Assembly

3-40. REMOVAL — CROSSTUBE FAIRINGS.

a. Remove screws (figure 3-5).

b. Remove fairings from crosstubes.

3-41. INSPECTION — CROSSTUBE FAIRINGS.

a. Inspect plastic fairings for cracks. There is no limit to the number of cracks that may be repaired,

b. Inspect nutplates on faking for loose rivets thread damage.

3-42. REPAIR OR REPLACEMENT — CROSSTUBE FAIRINGS.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

a. Repair cracks as follows:

(1) Clean area around the crack perimeter using a clean cloth dampened with aliphatic naphtha (C75). Lightly sand area using fine grade of sand paper. Clean the surface as described above with aliphatic naphtha after sanding.

(2) Two layers of fiberglass patches are required. Measure and cut one fiberglass patch from fiberglass cloth (C38) to cover cracks by a minimum of one inch around the perimeter. Cut a second patch to overlap the first patch by one inch on all sides.

(3) Using a brush, apply a coat of epoxy resin (C98) to the cleaned surface of fairing to match size of patch. Apply fiberglass patch (C38) and brush epoxy resin (C98) to cover patch completely, using brush to work out air bubbles.

(4) Apply another coat of epoxy resin (C98) to cover area for second patch. Apply fiberglass patch (C38) and brush epoxy resin (C98) to completely cover and saturate fiberglass patch. Work out air bubbles.

(5) Allow epoxy resin (C98) to cure for 4 hours at 70 degrees F (21 degrees C) prior to flying helicopter. The complete cure time for epoxy resin (C98) is 24 hours at 70 TO 80 degrees F (21 TO 27 degrees C). Refinish repaired area to match surrounding surface.

b. Replace nutplates as required.

3-43. INSTALLATION – CROSSTUBE FAIRINGS.

a. Align screw holes in fairing with fasteners and start all screws before tightening.

b. Tighten screws evenly to prevent stress on fairing.

3-44. PAINTING – CROSSTUBE FAIRINGS.

Refer to paragraph 3-72.

3-45. CROSSTUBE COVERS AND SUPPORT ASSEMBLIES.

3-46. DESCRIPTION — CROSSTUBE COVERS AND SUPPORT ASSEMBLIES.

The aluminum alloy crosstube covers (19, figure 3-1) are contoured plates designed to lessen drag. The crosstube covers are secured to the support assemblies (32 and 46) with screws. The support assemblies (32 and 46) secure the crosstubes (7 and 17) to helicopter structure.

3-47. REMOVAL – CROSSTUBE COVERS AND SUPPORT ASSEMBLIES.

NOTE

It is not necessary to remove complete landing gear assembly if only repairing or replacing support assembly. Remove and replace support assemblies one at a time.

a. Remove screws (18 and 20) and cover (19). Remove aft cover in same manner.

b. Remove bolts (29 and 30), washers (28 and 31) and two forward support assemblies (32). Remove baits (43 and 44), washers (42 and 45) and two aft support assemblies (46).

3-48. INSPECTION – CROSSTUBE COVERS AND SUPPORT ASSEMBLIES.

a. Inspect crosstube covers (19, figure 3-1) for cracks, holes, and corrosion. Damage that can be repaired by standard structural repair procedures is acceptable if repairs are made.

b. Inspect support assemblies (32 and 46) as

(1) Presence of deteriorated, or worn rubber bumpers is not cause to replace the support assembly. Missing rubber bumpers is cause to change the support assembly.

(2) Inspect metal portion of the support assemblies for cracks, distortion, and elongated holes. Obvious damage is cause to replace the support assembly.

3-49. REPAIR OR REPLACEMENT – CROSSTUBE COVERS AND SUPPORT ASSEMBLIES.

a. All traces of fuel, oil and grease will be removed. Clean support assembly with MEK (C74) and dry.

b. Apply adhesive, EC-2126 (C12 or equivalent) to support assembly and allow adhesive to dry tack free. Align rubber bumper on support assembly and hold firm contact pressure. Place support assembly in oven and heat to 250°-260°F, remove immediately and allow to cool before installing on crosstubes.

c. Deleted.

d. Repair crosstube covers in accordance with standard structural repair procedures for stopdrilling and patching.

3-50. INSTALLATION - CROSSTUBE COVERS AND SUPPORT ASSEMBLIES.

Refer to paragraph 3-5.

3-51. CROSSTUBE SUPPORT SPACERS.

3-52. DESCRIPTION-CROSSTUBE SUPPORT SPACERS.

The crosstube support spacers (35 and 41, figure 3-1) are fabricated by the investment casting process. They are bonded and riveted to the crosstube supports (25 and 36).

3-53. REMOVAL-CROSSTUBE SUPPORT SPACERS.

a. Remove landing gear (paragraph 3-3).

b. Carefully drill out two rivets which secure each spacer (35 and 41) to crosstube supports (25 and 36).

c. Heat spacer with heat lamp to soften adhesive if necessary and remove spacer from support.

3-54. INSPECTION-CROSSTUBE SUPPORT SPACERS.

NOTE

The spacers can be inspected only when the landing gear crosstubes are removed.

a. Inspect spacers (35 and 41, figure 3-1) for secure installation on supports (25 and 36). Loose spacer installation is cause for removal and inspection. Inspect spacers for cracks ardor wear damage. Any cracking is cause for replacement. Wear damage is acceptable up to 1/3 original spacer thickness.

b. Reinstall spacers per paragraph 3-55.

3-55. INSTALLATION-CROSSTUBE SUPPORT SPACERS.

a. Clean old adhesive from forward crosstube support (25, figure 3-1) or aft crosstube support (36) as applicable. Use 300 grit to 400 grit abrasive cloth (C36) and sharp plastic scrapers

b. Position new or acceptable old spacer on crosstube support and drill two holes for rivets (Figure 3-6). If old spacer is used, the existing holes must be countersunk so that a depth of bevel portion is 0.042 inch.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

c. Clean mating surfaces of crosstube supports (25) and spacers with MEK (C74).

d. Apply a thin coat of adhesive (C14) to mating surfaces of spacer and support (25). Position spacer on support and install two MS20427M4-4 rivets before adhesive cures.

e. Install landing gear (paragraph 3-5).

3-56. PAINTING-LANDING GEAR.

NOTE

Use the procedures in this paragraph to touch-up small areas or to repaint entire landing gear.

a. Apply coat of primer (C88 or C91) to area to be painted.

b. Paint primed area to match existing finish

3-57. GROUND HANDLING GEAR

3-58. DESCRIPTION-GROUND HANDLING GEAR

Two ground handling wheel assemblies are provided for quick mounting on landing skids to facilitate moving helicopter on ground. Each assembly consists of two wheels on an offset axle, a supporting cradle and hand-operated hydraulic jack with two rams which actuate axle to extend or retract wheels, See figure 3-7, The cradle is mounted on eyebolts on landing skid by means of a fixed rear pin end spring-loaded gear front pin.

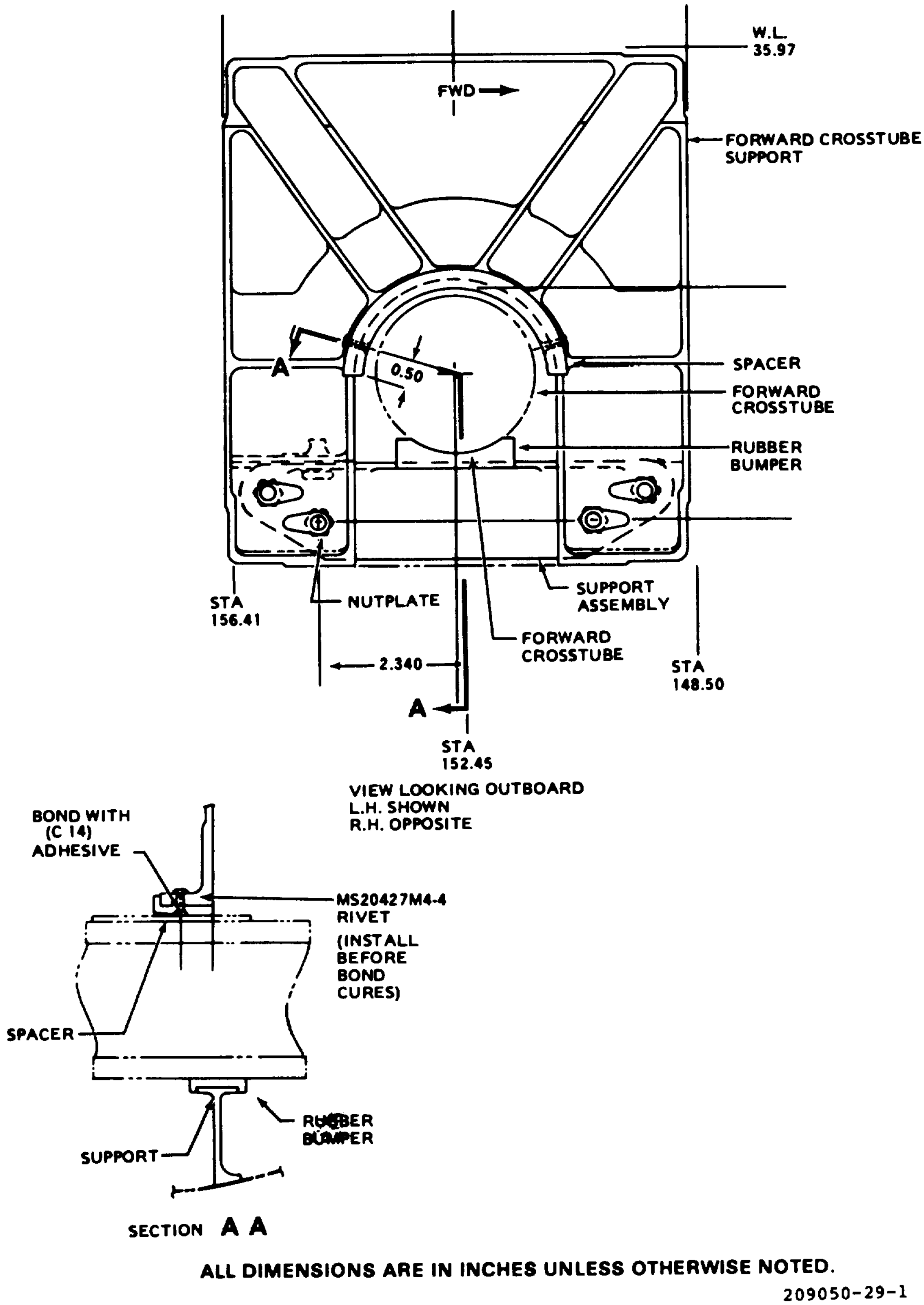


Figure 3-6. Landing Gear Support Spacer Installation (Sheet 1 of 2)

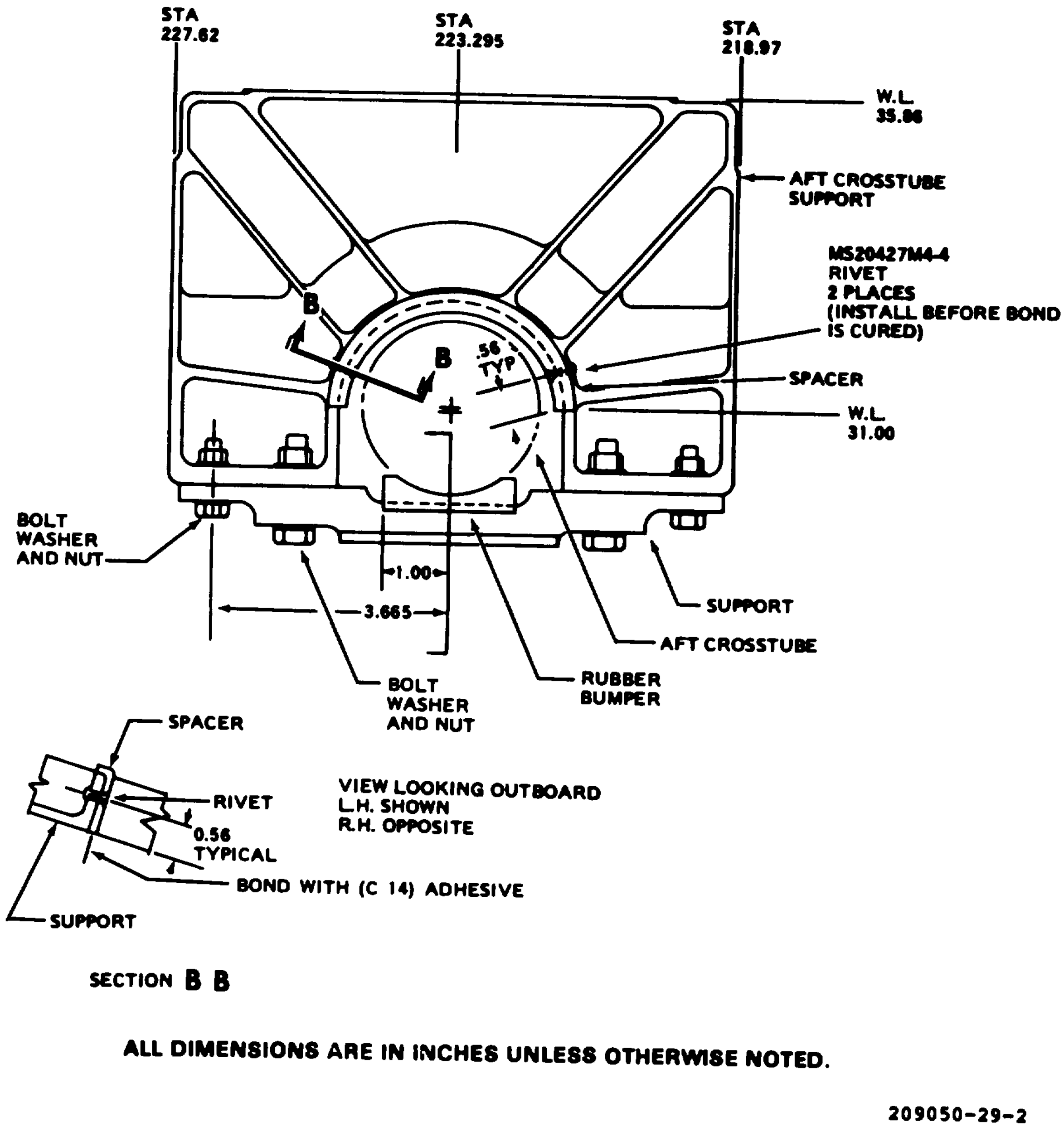
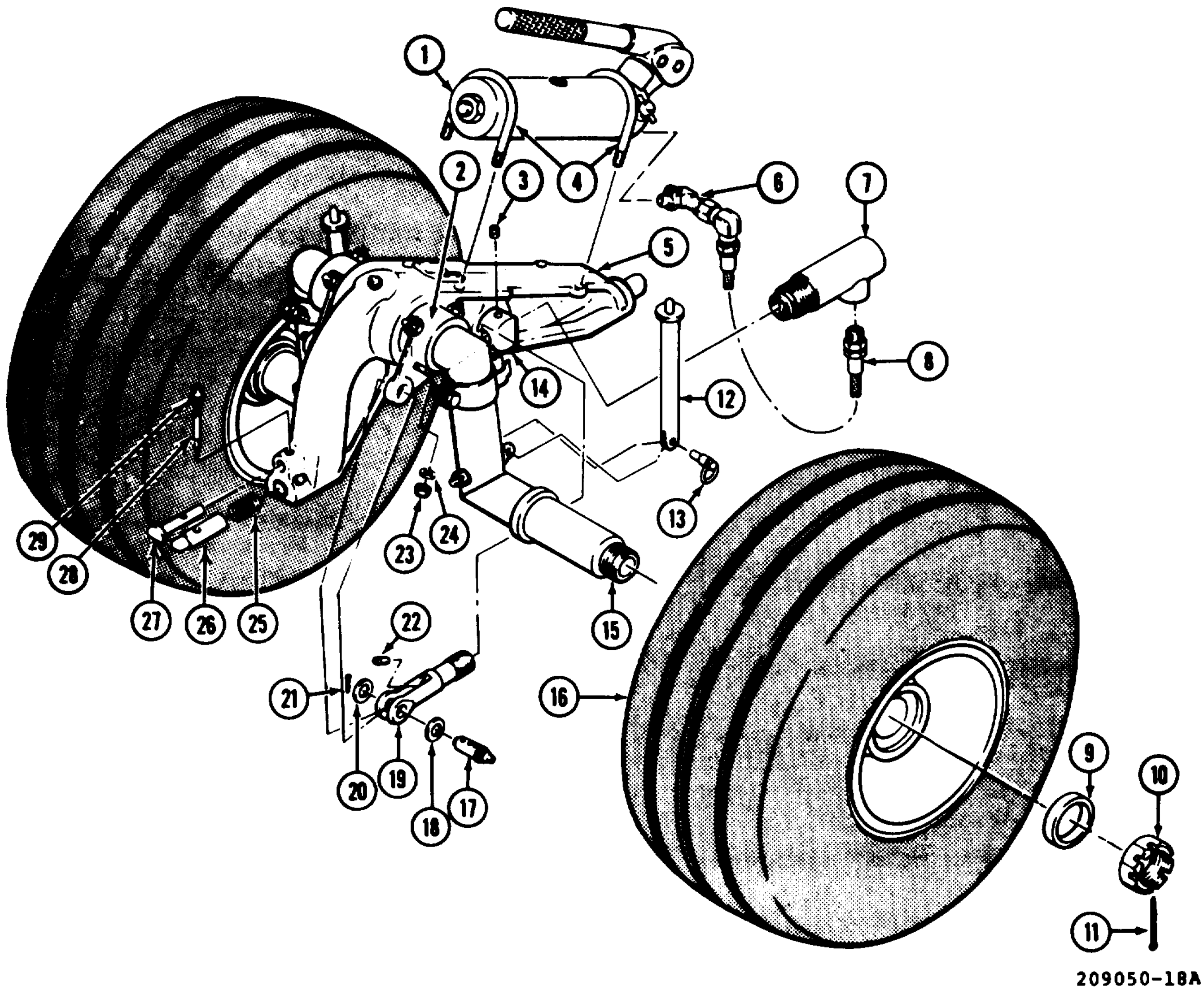


Figure 3-6. landing Gear Support Spacer Installation (Sheet 2 of 2)



1. Hydraulic pump
2. Ram arm
3. Set screw
4. U-bolts
5. Cradle ssembly
6. Hose fitting
7. Hydraulic ram
8. Hose
9. Retainer
10. Nut
11. Cotter pin
12. Support rod
13. Ball-lock pin
14. Trunnion
15. Axle
16. Wheel assembly
17. Lubrication pin
18. Washer
19. Clevis
20. Washer
21. Cotter pin
22. Set screw
23. Nut
24. Washer
25. Spring
26. Support pin
27. Release pin
28. Connecting pin
29. Lubrication fitting

Figure 3-7. Ground Handling Gear — Assembly

3-69. DISASSEMBLY – GROUND HANDLING GEAR. (AVIM)

Premaintenance Requirements for Ground Handling Gear

Condition	Requirements
Model	AH-IS
Part No. or Serial No.	All
Special Tools	(T80) (T81) (T84)
Test Equipment	None
Support Equipment	(S2)
Minimum Personnel Required	One
Consumable Materials	(C30) (C37) (C62) (C63) (C112) (C116)
Special Environmental Conditions	Dust Free

WARNING

Deflate tire prior to wheel assembly removal.

a. Remove ball-lock pin (13, figure 3-7) and remove support rod (12) from axle.

b. Remove wheel assembly (16) with tire and tube assembled, by removing cotter pin (11), nut (10), and retainer (9).

c. Disconnect and remove flexible hose (8) from fitting (6) on hydraulic pump (1) and hydraulic ram (7).

d. Remove nuts (23) and washers (24) and lift U-bolts (4) attaching hydraulic pump (1) to cradle assembly (5). Remove hydraulic pump (1).

e. Remove cotter pin (21), washers (18 and 20), and lubrication pin (17) attaching ram arm (2) to clevis (19) of hydraulic ram (7).

f. Back out set screw (3) and remove hydraulic ram (7) from trunnion (14). Using clevis (19) as handle, hold hydraulic ram (7) and separate ram piston (not illustrated) from cylinder of hydraulic ram (7).

NOTE

When connecting pin (28) is removed, support pin (26) can be released and spring (26) will slide from cradle.

g. Remove lubrication fitting (29), unscrew and remove connecting pin (28) and release pin (27).

3-60. DISASSEMBLY – HYDRAULIC PUMP P/N BU0953B. (AVIM)

a. Remove tank filler hole screw (24, figure 3-8) and packing (25) and drain oil from tank (26).

b. Remove retaining rings (1, 2, 6, and 36), fulcrum pins (5 and 37), and separate handle assembly (3) from pump body (15).

c. Pull out piston (7) and remove clip (48) by spreading clip slightly. Unscrew gland nut (8) using adjustable spanner wrench and remove packing support (9), leather packings (10 and 11). rubber packing (12), leather packing (13), and spreader (14).

d. Pry out filter screen (30) from hose hole. Remove retaining screw (31). discharge valve spring (32), 0.3125 inch diameter ball (33), suction valve spring (34), and 0.1875 inch diameter ball (35).

e. Remove screw (42). Lift up on knob (41) to disengage from stem (44), and turn knob clockwise to relieve tension on spring (39). Remove pin (40) from pump body (15). Position knob (41) on stem (44), and install screw (42). Remove knob (41), spring (39), stem (44), spring (45), washer (46), packing (38), and ball (47). Remove screw (43), and remove spring (39) from knob (41).

f. Remove nut (27) and packing (28). Twist tank (26) off pump body (15). Remove seal (16).

g. Remove screw (22) and screen (23). Dispose of screen.

h. Remove overload valve body (19) from tie rod (29). Remove spring (21) and plunger (20) from valve body (19).

3-61. DISASSEMBLY – HYDRAULIC PUMP P/N HP9902-41-10. (AVIM)

a. Remove filler plug (27, figure 3-9) and gasket (26). Drain hydraulic fluid from reservoir (25).

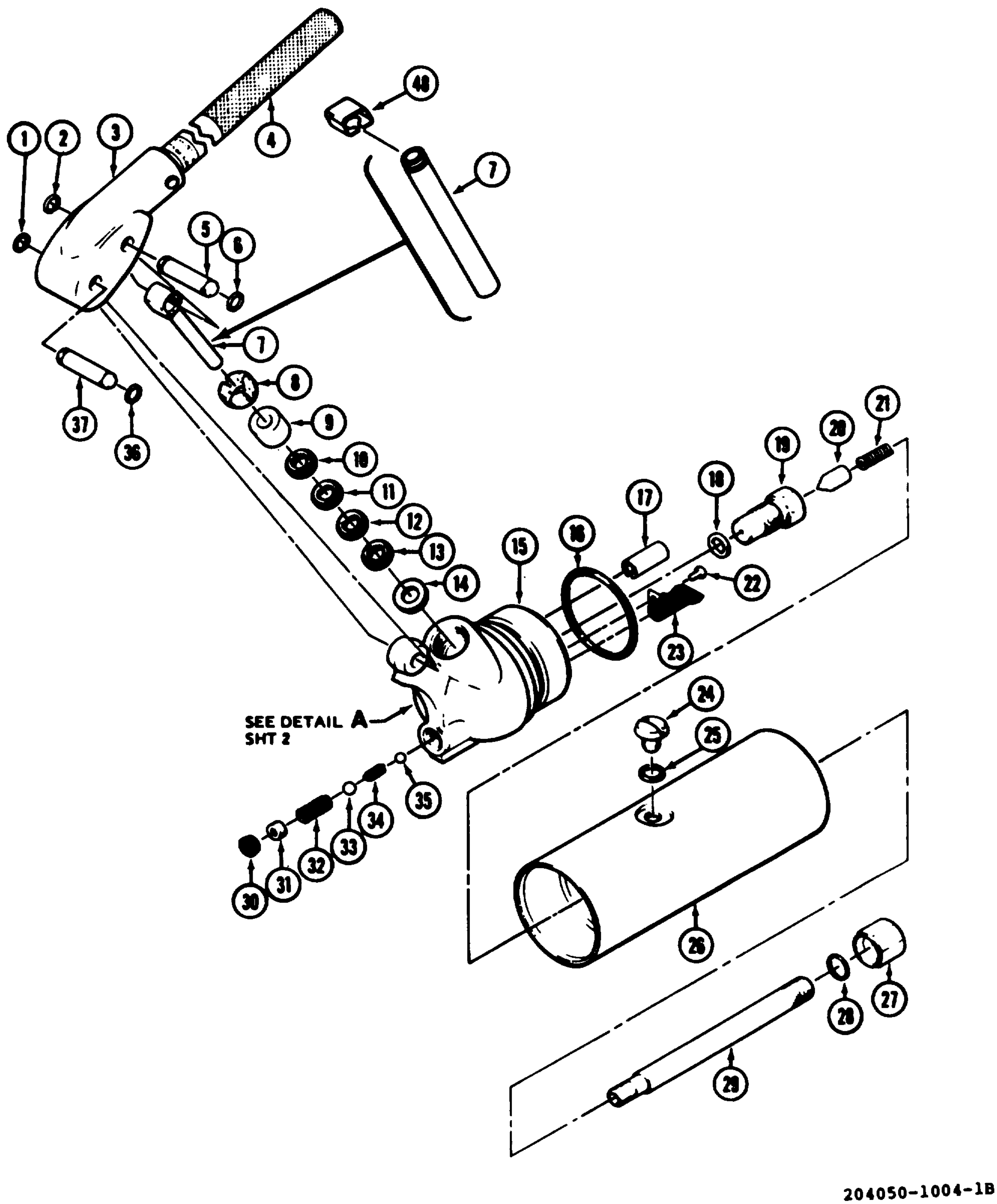


Figure 3-8. Ground Handling Gear Pump PN BU0953B – Assembly (Sheet 1 of 2)

1. Retaining ring
2. Retaining ring
3. Handle assembly
4. Handle
5. Pin
6. Retaining ring
7. Piston
8. Gland nut
9. Support
10. Leather packing
11. Leather packing
12. Rubber packing
13. Leather packing
14. Spreader
15. Pump body
16. Seal
17. Magnet
18. Gasket
19. Valve body
20. Plunger
21. Spring
22. Screw
23. Screen
24. Screw
25. Packing
26. Tank
27. Nut
28. Packing
29. Tie rod
30. Screen
31. Screw
32. Spring
33. Ball (0.3125 in. dia.)
34. Spring
35. Ball (0.1875 in. dia)
36. Retaining ring
37. Pin
38. Packing
39. Spring
40. Pin
41. Knob
42. Screw
43. Screw
44. Stem
45. Spring
46. Washer
47. Ball (0.3125 in. dia)
48. Clip

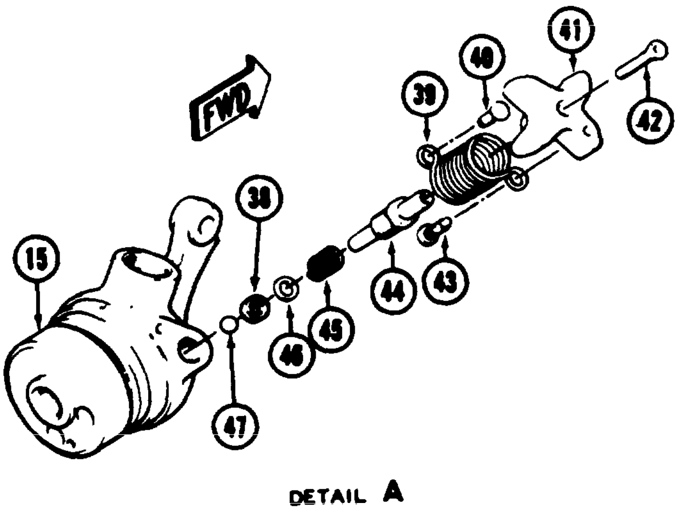


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Figure 3-8. Ground Handling Gear Pump PN BU0953B – Assembly (Sheet 2 of 2)

b. Remove handle (1).

c. Remove cotter pin (4 and 31), beam pin (30), and plunger cross pin (3). Separate beam (2) from plunger (5) and base (11).

d. Pull out plunger (5). Use packing nut tool (workaid) (T84) (figure 3-10) to unscrew packing nut (6, figure 3-9). Remove pump cup (9), cup retainer (8), packing (7), and spreader (10).

e. Remove reducer bushing (12).

f. Unhook return spring (15) from handle (17).

g. Remove capscrew (20) and washer (21).

h. Remove screw (19), lockwasher (18), handle (17), and return spring (15).

i. Remove release spindle (16) with release packing (13) and release packing nut (14).

j. Remove release packing (13) and release packing nut (14) from release spindle (16).

k. Remove reservoir (25), reservoir shim washers (28), and shim washer(s) (29).

NOTE

Use of shim washers and reservoir shim washers varies from O to a total of 4.

l. Remove screen (22).

m. Remove relief valve (23) and gasket (24).

n. Remove valve plug (35), outlet check spring (34), 0.3125 inch diameter ball (33), and 0.2188 inch diameter ball (32).

3-62. INSPECTION — GROUND HANDLING GEAR (AVIM).

a. Ball-lock pin (13, figure 3-7) for cracks, corrosion, wear, and distortion.

b. Lubrication pin (17) for damage, distortion, and wear.

c. Internal threads of trunnion (14) for damage and set screw (3) and its internal threads in trunnion for damage.

d. Lubrication fitting (29) for serviceability.

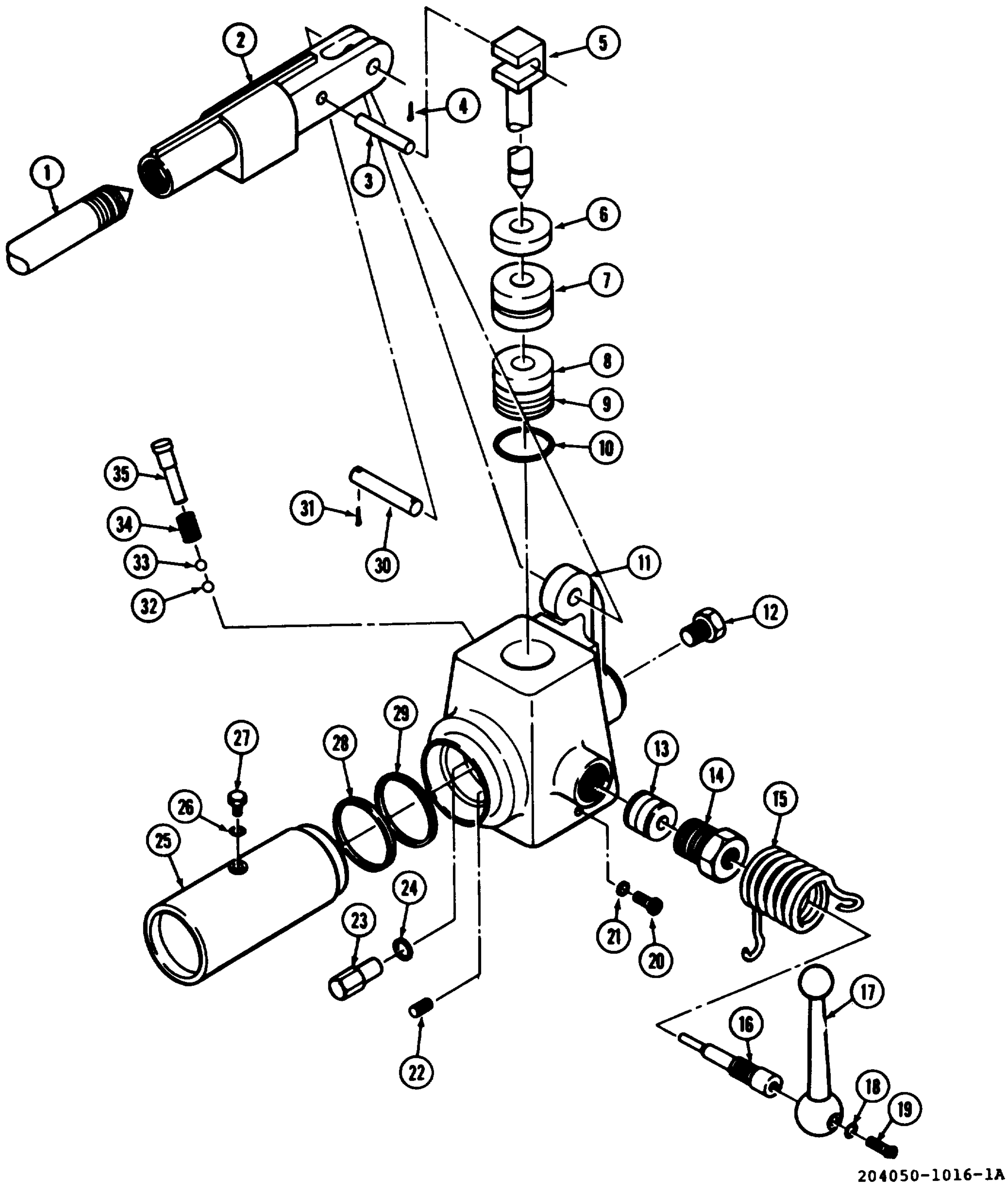

Figure 3-9. Ground Handling Gear Pump, PN HP9902-41-10 (Sheet 1 of 2)

1. Handle	19. Capscrew
2. Beam	20. Capscrew
3. Plunger cross pin	21. Washer
4. Cotter pin	22. Screen
5. Plunger	23. Relief valve
6. Packing nut	24. Gasket (copper)
7. Packing	25. Reservoir
8. Cup retainer	26. Gasket (copper)
9. Pump cup	27. Filler plug
10. Spreader	28. Reservoir shim washer
11. Base	29. Shim washer
12. Reducer bushing	30. Beam pin
13. Release packing	31. Cotter pin
14. Release packing nut	32. Ball (0.2187 inch diameter)
15. Return spring	33. Ball (0.3125 inch diameter)
16. Release spindle	34. Outlet check spring
17. Handle	35. Valve plug
18. Lockwasher	

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Figure 3-9. Ground Handling Gear Pump PN HP9902-41-10 (Sheet 2 of 2)

e. Connecting pin (28) and spring (25) for damage or distortion.

f. Flexible hose (8) for leaks, damage, and serviceability.

g. Axle (15), cradle assembly (5), and sleeve for wear, corrosion damage, and cracks.

h. Hydraulic ram (7) for leaks, security, corrosion, and damage.

3-63. INSPECTION – HYDRAULIC PUMP P/N BU0953B.

a. Prior to inspection of hydraulic pump, P/N BU0953B, clean magnet (17, figure 3-8) with clean cheesecloth (C30).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

Clean filter screen hole in pump body (15), inside of overload valve body (19), and passage in end of tie rod (29) with solvent (C1 12).

c. Inspect pump for leaks, security, corrosion, and damage.

d. Inspect washers, screws, retaining rings, clips, and springs for damage and serviceability.

e. Inspect screen (23) for damage and serviceability.

f. Inspect balls (33 and 35) for corrosion and mechanical damage.

g. Inspect hole in tie rod (29) for clear passage.

3-64. INSPECTION – HYDRAULIC PUMP P/N HP9902-41-10.

a. Inspect pump (25, figure 3-9) for leaks, security, corrosion, and damage.

b. Inspect washers, screws, retaining rings, clips, and springs for damage and serviceability.

c. Inspect screen (22) for damage and serviceability.

d. Inspect balls (32 and 33) for corrosion and mechanical damage.

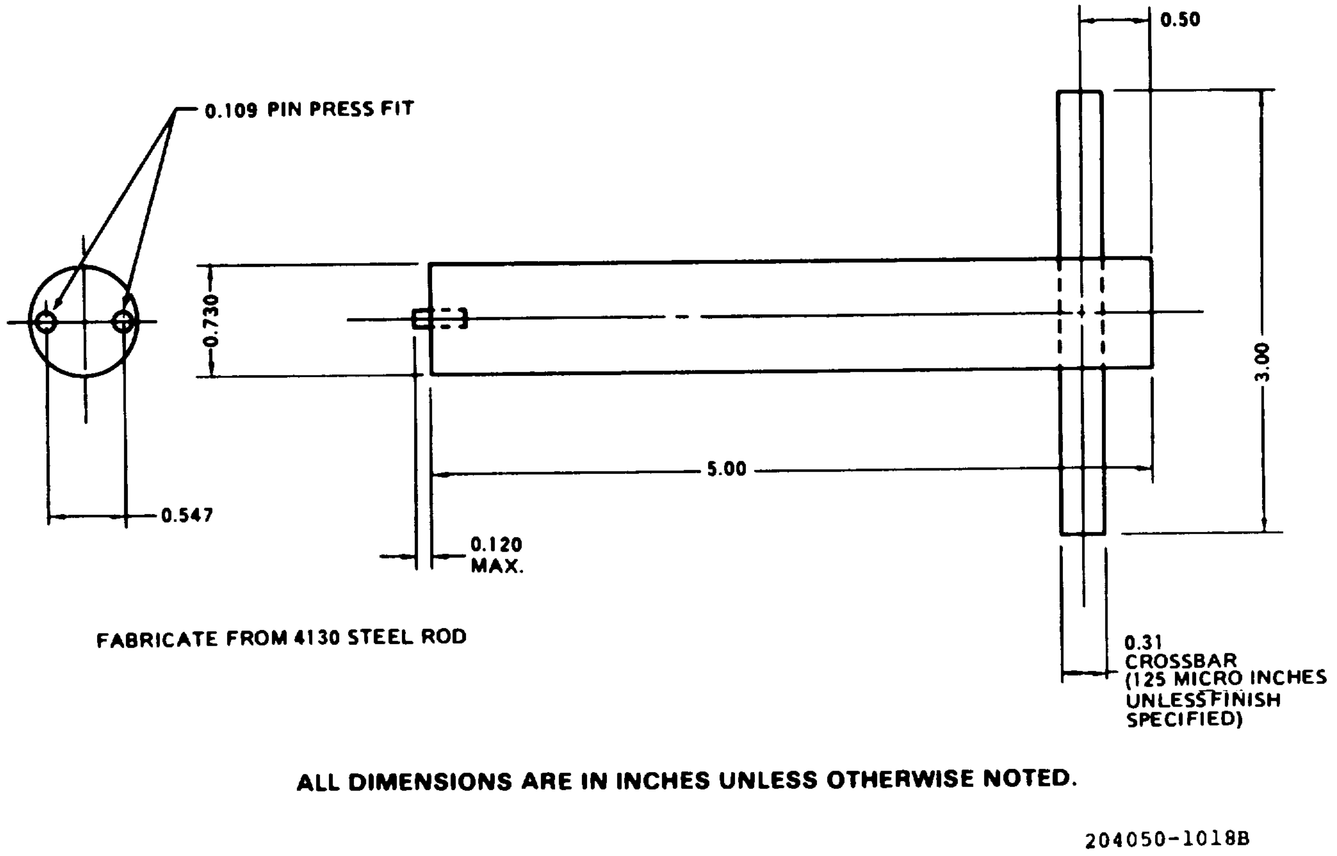


Figure 3-10. Workaid for Packing Nut Removal/Installation — Fabrication Instructions

3-65. REPAIR OR REPLACEMENT — GROUND HANDLING GEAR. (AVIM)

a. Replace ball-lock pin (13, figure 3-7) if unserviceable.

b. Replace lubrication pin (17) if worn or distorted.

c. Replace trunnion (14) if internal threads are damaged.

d. Replace lubrication fitting (29) if damaged.

e. Replace connecting pin (28), support pin (26), and spring (25) if distorted or damaged.

f. Replace flexible hose (8) if leaking or damaged.

g. Replace axle sleeve (15) or cradle assembly (5), if cracked or damaged.

3-66. REPAIR OR REPLACEMENT – HYDRAULIC PUMP P/N BU0953B. (AVIM)

Procure a hydraulic pump parts kit, P/N JS953 (TM 55-1520-236-23P).

b. Replace clip (48, figure 3-8), leather packings (10, 11, and 13), and rubber packing (12).

c. Replace filter screen (23), discharge valve spring (21), 0.3125 inch ball (33), suction valve spring (34), and 0.1875 inch bail (35).

d. Replace release valve spring (45), washer (46), packing (38), and 0.3125 inch diameter ball (47).

e. Replace packing (25) and seal (16).

f. Replace screw (22).

3-67. REPAIR OR REPLACEMENT – HYDRAULIC PUMP, P/N HP9902-41-10. (AVIM)

a. Procure a hydraulic pump service kit, P/N KH9000 (TM 55-1520-236-23P).

b. Replace packing (7, figure 3-9), cup retainer (8), pump cup (9), and spreader (10).

c. Replace release packing (13).

d. Replace outlet check spring (34), 0.312. inch diameter ball (33), and 0.2187 inch diameter ball .

e. Replace gaskets (24 and 26).

3-68. REPAIR OR REPLACEMENT – HYDRAULIC RAM. (AVIM)

NOTE

If hydraulic ram (7, figure3-7) does not have piston P/N 330617, which is machined for packing and beck-up ring, requisition new piston P/N 330617.

a. Carefully slip new beck-up ring over inboard end of piston P/N 330617 and into packing groove,

b. Carefully slip new packing over inboard end of piston and into packing groove.

NOTE

Ensure each packing is not twisted in groove.

c. Burnish scratches inside hydraulic ram cylinder that are less than 0.005 inch deep, using crocus cloth (C37).

d. Replace hydraulic ram if inside of cylinder has nicks, scratches, or pits deeper than 0.005 inch.

3-69. ASSEMBLY – GROUND HANDLING GEAR. (AVIM)

a. Insert trunnion (14, figure 3-7) in cradle assembly (5) with threaded openings aft.

NOTE

To prepare *a new* hydraulic pump (1, figure 3-7) and hydraulic mm (7) assembly for installation, remove pipe plug on each and drain hydraulic fluid.

b. Install hydraulic ram (7) on each end of trunnion (14) to bottom out in hole. Back off until hydraulic outlet is directed down. Secure with set screw (3).

c. Position hydraulic ram arm (2) on sleeve, insert axle (15), and secure with bolts, insert sleeve through cradle (5) and install hydraulic ram arm (2) and axle on opposite end. Hydraulic ram must be forward of wheel hub center line 1.98 inches. Refer to figure 3-11.

d. Position hydraulic pump (1, figure 3-7) on cradle (5) and secure with U-bolts (4), washer (24), and nut (23).

e. Install ram clevis (19). With hydraulic ram fully extended, adjust clevis to hold 1.48 inches diameter (figure 3-11).

f. Insert spring (25, figure 3-7) and support pin (26) into lower orifice of cradle (5). At same time insert release pin (27) into upper orifice of cradle (5). Align holes in both pins and install connecting pin (28).

g. Attach support rod (12) to clevis pin on axle and insert ball-lock pin (13).

h. Install tire and wheel assembly (16).

i. Bleed hydraulic pump as follows:

(1) Fill hydraulic pump cylinder (1) with hydraulic fluid (C62).

(2) Operate pump handle for several strokes to build up pressure.

(3) Crack (loosen) hose coupling (8) at tee of hydraulic pump (1).

(4) Operate pump handle until air bubbles no longer show at loose hose coupling (8) and fluid runs smoothly.

(6) Refill hydraulic pump and repeat previous steps to be sure all air is expelled from system.

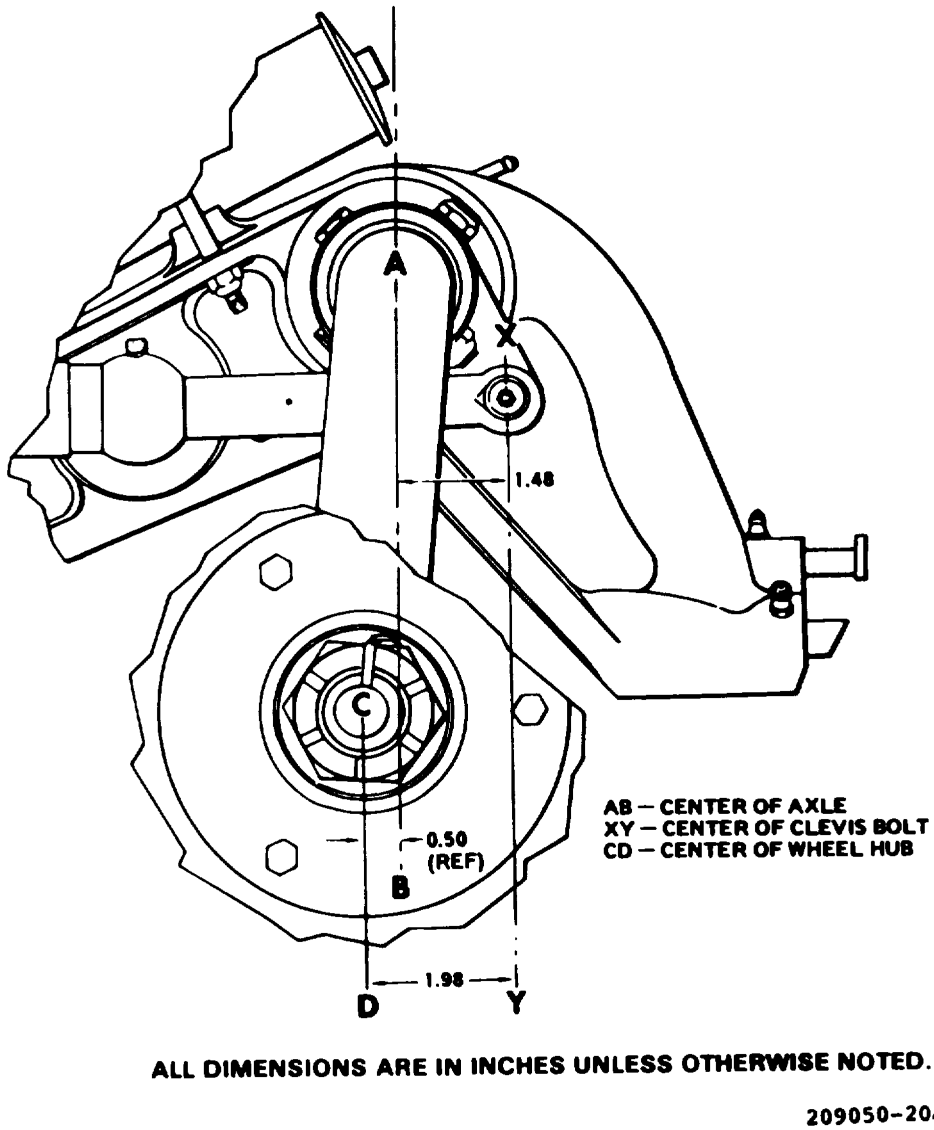


Figure 3-11. Ground Handling Wheels – Adjustment Dimensions

(6) Tighten hose coupling to hydraulic pump and refill cylinder.

j. Test hydraulic pump P/N BU0953B as follows:

(1) Fill the oil tank to proper level with hydraulic fluid (C62).

(2) Connect a 10,000 psi pressure gage to outlet hole.

(3) Operate pump until pressure builds up and overload valve unloads. Proper setting is 8300 TO 8800 PSI. If pressure goes too high, loosen nut (27, figure 3-8) and turn tie rod (29) counterclockwise, using a screwdriver. If pressure is too low, turn the tie rod clockwise. Test and readjust as necessary until proper setting is obtained

(4) When proper setting is obtained, tighten nut (27).

NOTE

Hold tie rod in position using screwdriver in slot to prevent rod turning with the nut.

k. Test hydraulic ram as follows:

(1) Screw ram (7, figure 3-7) into trunnion (14) and connect ram to hydraulic pump (1).

(2) Pump until overload in pump goes off with ram against trunnion stop.

(3) Check for leaks.

(4) Release pressure and pump ram out halfway. Allow to stand a few minutes.

(5) Check for leaks. Ram is ready for service when no leaks are found.

3-70. ASSEMBLY – HYDRAULIC PUMP P/N BU0953B. (AVIM)

a. Insert brass spreader (14, figure 3-8) into pump body (15) flat side down.

b. Slide packing support (9) onto piston (7).

NOTE

The "V" must face away from groove on piston.

C. Dip two leather packings (10 and 11), one rubber packing (12), and third leather packing (13) into hydraulic fluid (C63), and assemble in that order over bottom end of piston.

NOTE

The "'V" on packing must rest on brass spreader (14).

d. Place assembly bushing tool (180) into top of hole in pump body (15).

e. Insert piston (7) with packings installed into bellmouth of assembly bushing tool (T80).

f. Slip packing seating tool (T81) over piston (7).

g. Drive piston (7) and packing down solid, using medium weight hammer on seating tool (T81).

h. Remove packing seating tool (T81) and assembly bushing tool (T80).

i. Install and tighten gland nut (8) using an adjustable spanner wrench. Install clip (48).

j. Insert 0.1875 inch diameter ball (35), suction valve spring (34), 0.3125 inch diameter ball (33), and discharge valve spring (32). Install screw (31).

k. Install filter screen (30) in hose hole.

1. Insert 0.3125 inch diameter ball (47), rubber pecking (38), steel washer (46), and spring (45) into pump body (15).

CAUTION

To prevent damage to ball (47) and seat in Pump body (16), do not force knob (41) down tight.

m. Install valve stem (44) in base and turn down against ball by slipping knob (41) onto stem and tightening. Remove knob (41) from stem (44).

n. Position spring (39) on knob (41) and install screw (43). Position knob (41) and spring (39) over stem (44). Install pin (40) through eye of spring (39) and into hole in pump body (15).

NOTE

Do not place knob onto hex of valve stem. Knob and valve stem should work free and valve should close firmly when opened and released.

o. Hold pump body (15) and valve stem (44) firmly and twist knob (41) to the left two faces of the hex. Push knob onto the hex of the valve stem at this position Insert flat head socket screw (42) and tighten. Try knob action to see if closing is positive. If action is not positive, move knob to the left another face on hex, and recheck closing.

p. Install filter screen (23) in pump body (15) and secure with screw (22).

q. Install plunger (20) and spring (21) in overload valve body (19). Screw tie rod (29) into valve body (19) and position in tank (26).

r. Install gasket (18) and seal (16) and assemble tank (26) to pump body (15).

s. install packing (28) and nut (27). Tighten nut lightly. Rotate tank so that filler hole is on top and in line with pump handle. Tighten nut (27) and replace tank filler hole screw (24) and packing (25).

t. Position handle assembly (3) to pump body (15) and secure with fulcrum pins (5 and 37) and retaining rings (1, 2, 6, and 36).

3-71. ASSEMBLY – HYDRAULIC PUMP, P/N HP9902-41-10. (AVIM)

a. Insert spreader (10, figure 3-9) into pump base (11) flat side down.

b. Slide packing nut (6) onto plunger (5).

c. Dip packing (7), cup retainer (8), and pump cap (9) into hydraulic fluid (C63) and assemble in that order over bottom end of plunger (5).

NOTE

The "V" on pump cup must rest on spreader.

d. Place assembly bushing tool (T80) into top hole in pump base (11).

e. Insert plunger (5) with packing nut, packing, cup retainer, and pump cup installed into bellmouth of assembly bushing tool (C80).

f. Slip packing seating tool (T81) over plunger.

g. Drive plunger (5) and assembled parts down solid, using medium weight hammer on packing seating tool.

h. Remove packing seating tool (T81) and assembly bushing tool (T80).

i. Tighten packing nut (6) using packing nut tool workaid (T84) (figure 3-10).

j. Insert 0.3125 inch diameter ball (33, figure 3-9), 0.2187 inch diameter ball (32), and outlet check spring (34). Install valve plug (35).

k. Install screen (22) in pump base (11).

1. Install release packing nut (14) on release spindle (16). Check threads on release packing nut (14) and release spindle (16) for free turning. Remove release packing nut (14) from release spindle (1 6).

NOTE

Touch up threads if damaged or binding.

m. Dip release packing (13), release packing nut (14) and release spindle (16) into hydraulic fluid (C63) and assemble parts in that order. Install release spindle (16) with release packing (13) and release packing nut (14) in pump base (11). Tighten release packing nut (14) until release packing (13) bottoms out in pump base (11). Loosen release packing nut (14) and torque to 20 inch-pounds.

n. Position return spring (15) over release spindle (16). Use capscrew (20) and washer (21) to attach return spring (15) to pump base (11).

o. Hold pump base (11) and release spindle (16) firmly. Place handle (17) on release spindle. Handle shall be vertical with release valve in closed position. Install capscrew (19) and lock washer (18). Hook return spring (15) around handle (17). Try handle action to check for positive closing of release valve.

NOTE

If handle action is not positive, move handle to the left another face on hex shank of release spindle, and check again for positive closing.

p. Install relief valve (23) and gasket (24) in pump base (11).

q. Set relief valve as follows:

(1) Connect hydraulic pump to hydraulic test stand (S2).

(2) Set relief valve to open at 8500 (±300) psi.

(3) Release pressure. Then increase pressure to 8000 psi. Observe for 15 seconds. Loss of pressure in excess of 500 psi is cause for rejection.

(4) Open release valve to drop pressure. From a 10 degree open position on handle (17), release quickly, letting return spring (15) close release valve.

NOTE

Do not push on handle.

(5) Increase pressure to 8000 psi observe for 14 seconds. Loss of pressure in excess of 500 psi is cause for rejection.

r. Install shim washer (29) and/or reservoir shim washer (28) as required to line up filler plug (27) on reservoir (25) with top of pump within plus or minus 10 degrees, Use of shim washers (29) and reservoir shim washers (28) varies from 0 to a total of 4. Install reservoir (25) in pump base (11). Ensure that filler plug on reservoir (25) lines up with top of pump within plus or minus 10 degrees.

s. Position beam (2) to plunger (5) and pump base (11). Install plunger cross pin (3) and beam pin (30). Secure beam pin (30) with two cotter pins (4 and 31).

t. Connect air line to fill port in reservoir (25). Apply 100 psi air pressure, and check hydraulic pump under water for signs of leakage Reject hydraulic pump if there are signs of leakage. Remove hydraulic pump from water. Remove air line from reservoir (25). Install gasket (26) and filler plug (27).

3-72. PAINTING — GROUND HANDLING GEAR.

a. Clean components (TM 55-1500-204-25/1).

b. Repaint ground handling gear (TM 55-1500-345-23).

3-73. WHEELS, TIRES, AND TUBES — GROUND HANDLING GEAR.

3-74. DESCRIPTION – WHEELS, TIRES, AND TUBES.

The ground handling gear wheel assembly consists of two aluminum alloy wheels two rubber tubes, and two 7.00-6, 6-ply rating, type III aircraft tires.

3-75. REMOVAL – WHEELS, TIRES, AND TUBES.

WARNING

Deflate tire prior to wheel assembly removal.

a. Remove wheels from axle (15, figure 3-7) by removing cotter pin (11), with nut (10), and retainer (9).

b. Deflate tire and use suitable tools to remove tire and tube from wheel rim,

3-76, INSPECTION – WHEELS, TIRES, AND TUBES.

a. Inspect rim of wheel for deformation, wear, or damage. Deformation is cause for rejection.

b. Inspect tires and tubes for excessive wear or damage.

c. If tire is mounted on wheel, make sure air pressure is 75 PSI.

3-77. REPAIR OR REPLACEMENT – WHEELS, TIRES, AND TUBES.

a. Replace tire if tread is worn excessively or cut to where cord is visible

b. Repair or replace tires and tube (TM 55-2620-200-24).

c. Repair of wheels is limited to polishing out minor scratches, nicks, or dents with fine India stone (C116).

d. Repaint wheels (TM 55-1500-345-23).

3-78. INSTALLATION – WHEELS, TIRES, AND TUBES.

a. Install tube wheel with tire. Make sure tube is not pinched or rolled under.

b. inflate tire to 75 PSI with low pressure air source.

c. Place wheel assembly (16, figure 3-7) on axle (15) and secure with retainer (9), nut (10), and cotter pin (11).

3-79. PAINTING – WHEELS, TIRES, AND TUBES.

a. Touch up rim of wheel to match original finish.

b. Repaint rim of wheels (TM 55-1500-345-23).

SECTION II. SKIDS/STRUTS

(Not Applicable)

SECTION III. FLOATS

(Not Applicable)

SECTION IV. SKIS

(Not Applicable)

SECTION V. BRAKES

(Not Applicable)

CHAPTER 4

POWER PLANTS

SECTION I. POWER PLANT

4-1. POWER PLANT.

4-2. DESCRIPTION – POWER PLANT.

The power plant consists of a T53-L-703 series shaft turbine engine mounted horizontally on the fuselage behind the main rotor pylon, with adapting parts and connections to the airframe structure and to fuel, oil, electrical, instrument, and engine control systems (figures 4-1 and 4-2). The engine and transmission are enclosed by cowling and fairing. Hinged pylon fairing doors at each side give access to the air induction and driveshaft area ahead of the engine forward firewall. These doors also have engine air inlet scoops. The engine compartment between forward and rear firewalls has hinged side doors equipped with cooling air inlets. Doors also have armor panels to protect the fuel control and compressor section, The exhaust area, behind the rear firewall, is enclosed by removable fairing.

4-3. CLEANING – POWER PLANT

Refer to TM 55-2840-229-23.

4-4. OPERATIONAL CHECK – POWER PLANT.

Refer to TM 55-1520-236 MTF and TM 55-2840-229-23.

4-5. ENGINE ASSEMBLY.

4-6. DESCRIPTION – ENGINE ASSEMBLY.

The T53-L-703 engine is an improved version of the T53-L-13 series. The engine is a free-type power turbine, turboshaft. The engine incorporates a two stage power turbine and two stage gas producer turbine. Major sections of the engine are the air-inlet, compression, diffuser, combustion and exhaust. The engine is flat rated at 1485 shp, and derated to 1280 shp due to transmission limitations. The engine is cooled by ram and ambient air.

4-7. SERVICING – ENGINE ASSEMBLY.

Refer to chapter 1.

4-8. ADJUSTMENT – ENGINE ASSEMBLY.

Refer to TM 55-2840-229-23.

4-9. VIBRATION TESTING – ENGINE ASSEMBLY.

a. Refer to TM 55-2840-229-23 to detailed instructions to perform engine vibration check.

Premaintenance Requirements For Vibration Test of Engine Assembly

Condition	Requirements
Model	AH-IS
Part No. or Serial No.	All T53-L-703 engines
Special Tools	Refer to TM 55-2840-229-23
Test Equipment	Refer to TM 55-2840-229-23
Support Equipment	Refer to TM 55-2840-229-23
Minimum Personnel Required	Two
Consumable Materials	(C24)
Special Environmental Conditions	None

b. Prepare helicopter for vibration testing.

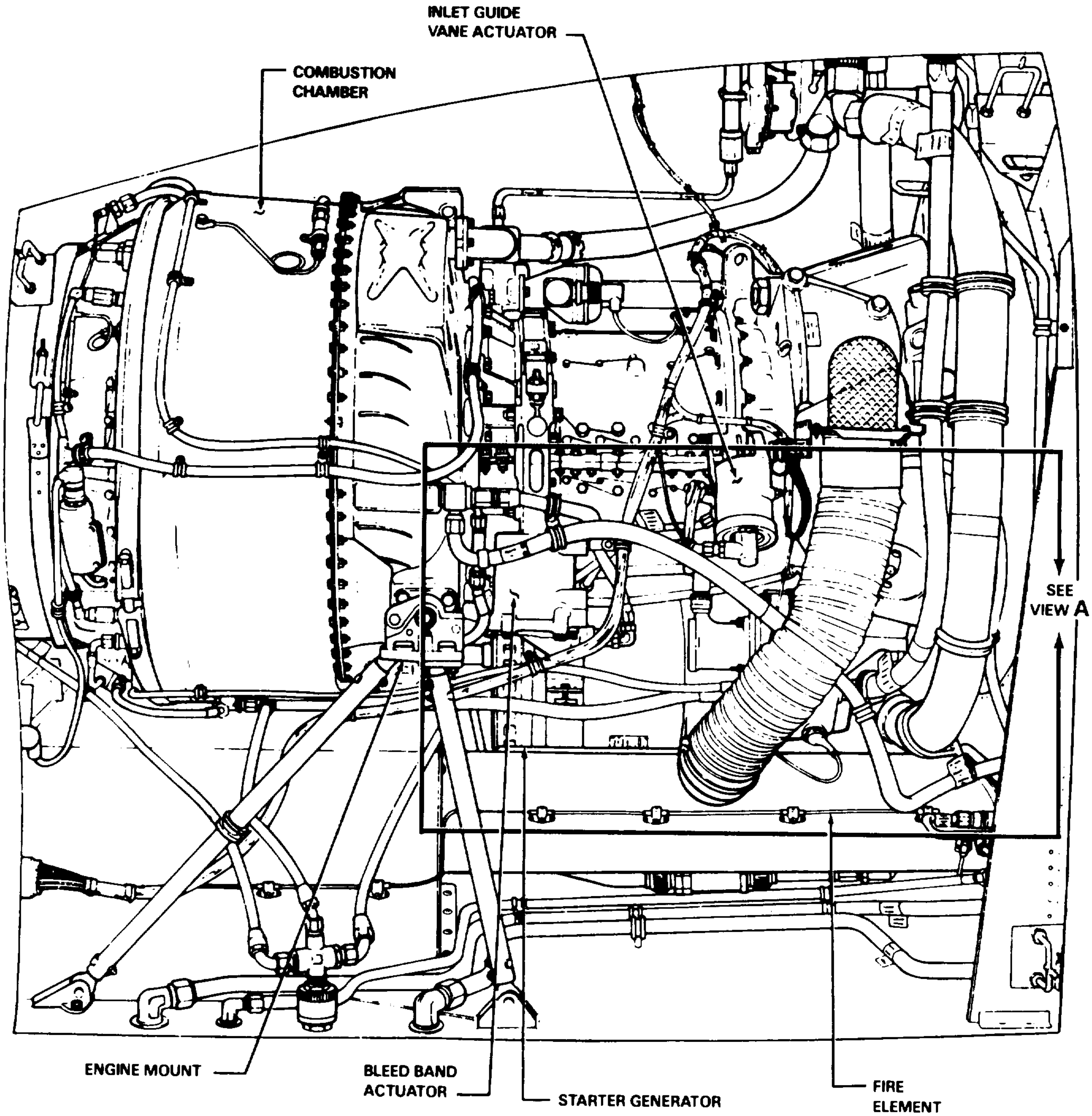
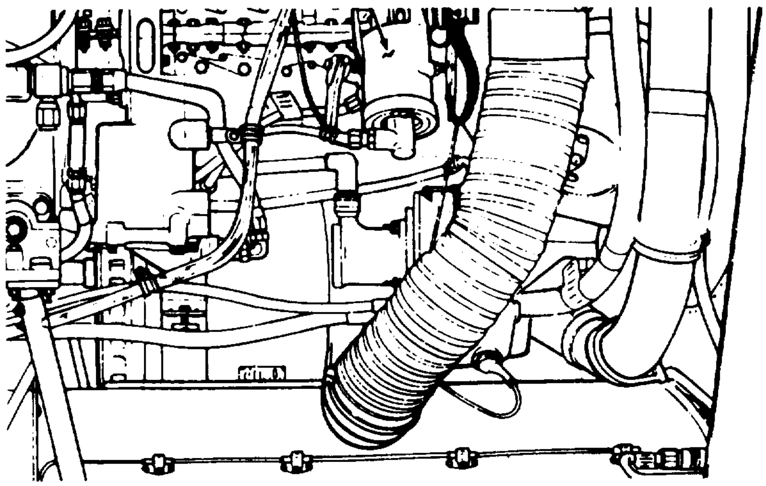


Figure 4-1. Power Plant Installation – Right Side (Sheet 1 of 2)



VIEW A *

*E M After incorporation of MWO 55-1520-236-50-12.

Figure 4-1. Power Plant Installation – Right Side (Sheet 2 of 2)

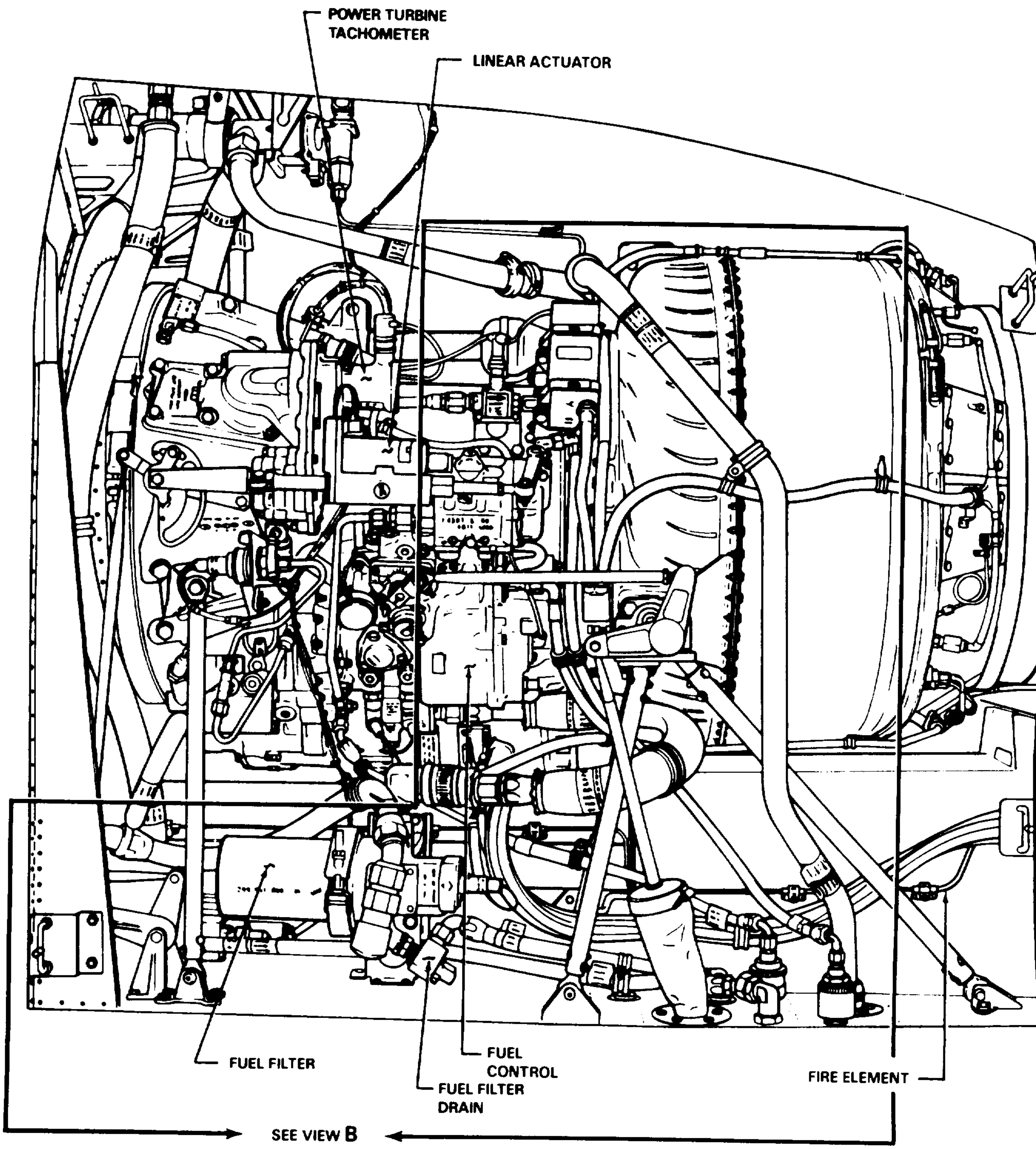
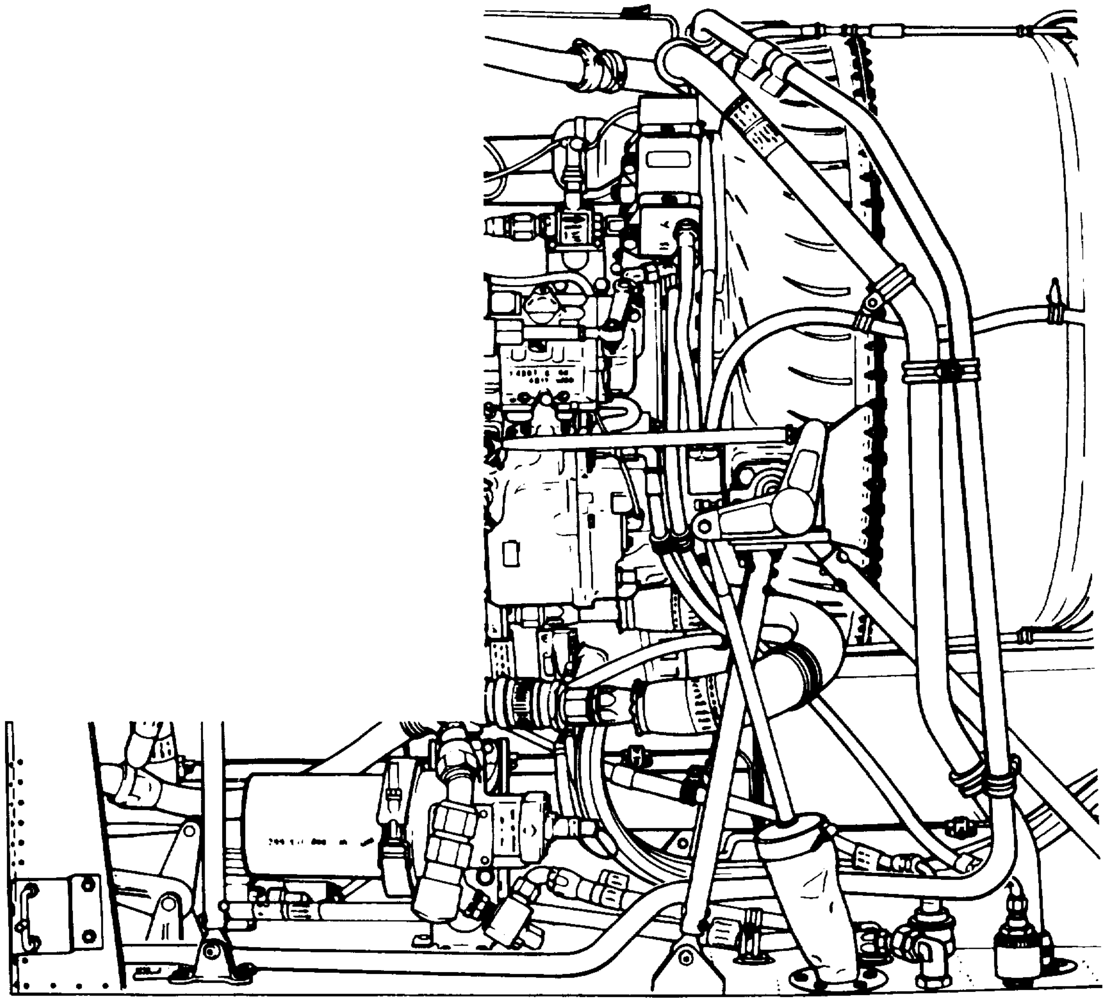


Figure 4-2. Power Plant Installation – Left Side (Sheet 1 of 2)



VIEW B *

*E M After incorporation of MWO 55-1520-236-50-12.

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Figure 4-2. Power Plant Installation – Left Side (Sheet 2 of 2)

WARNING

To prevent a possible electrical shock hazard to personnel and damage to equipment, set vibration tester meter power switch to OFF, while breaking or making connections to a source of electrical power.

CAUTION

Leave enough slack in cables to prevent unnecessary strain on pickups and connectors. Avoid conditions that would cause cables to deteriorate from heat or abrasion.

(1) Route vibration cable assemblies aft to one location. Secure to engine bleed air tube, adjacent to ignition exciter box, with cable clamps (figure 4-3).

(2) Route cables out left engine compartment door ventilation opening. Make sure cables are clear of engine throttle control linkages. Close and secure engine compartment door.

(3) Route cable forward over wing, along left side of aircraft to gunner station. Remove four screws at location shown on figure 4-3 where clamps will be installed. Retain screws for later installation.

(4) Secure cable to fuselage with clamps at four points as shown on figure 4-3. Use AN3 bolts to secure clamps to fuselage.

(5) Route cables inboard into gunner compartment.

NOTE

During test it will be necessary to compress seal on gunner access door under cables to allow closing of the door for flight.

(6) Secure vibration meter with bungee cord (shock cord) (C24) or other suitable means, to a cushioned, protected location in aircraft cabin.

(7) After test, remove all test equipment, cables and clamps. Install four screws that were removed in step (3).

4-10. MAINTENANCE PRECAUTIONS – ENGINE ASSEMBLY.

a. Use extreme caution to prevent dirt and foreign objects from entering the engine. Place temp0rary covers on all exposed openings. All open hoses and tubing shall be protected with plastic or metal caps, If suitable caps are not available use commercial grade aluminum foil crimped to fit the particular opening.

WARNING

Penetrating oil may cause a skin rash if prolonged contact is allowed. Do not inhale vapors, or allow to come in contact with skin, eyes or clothing.

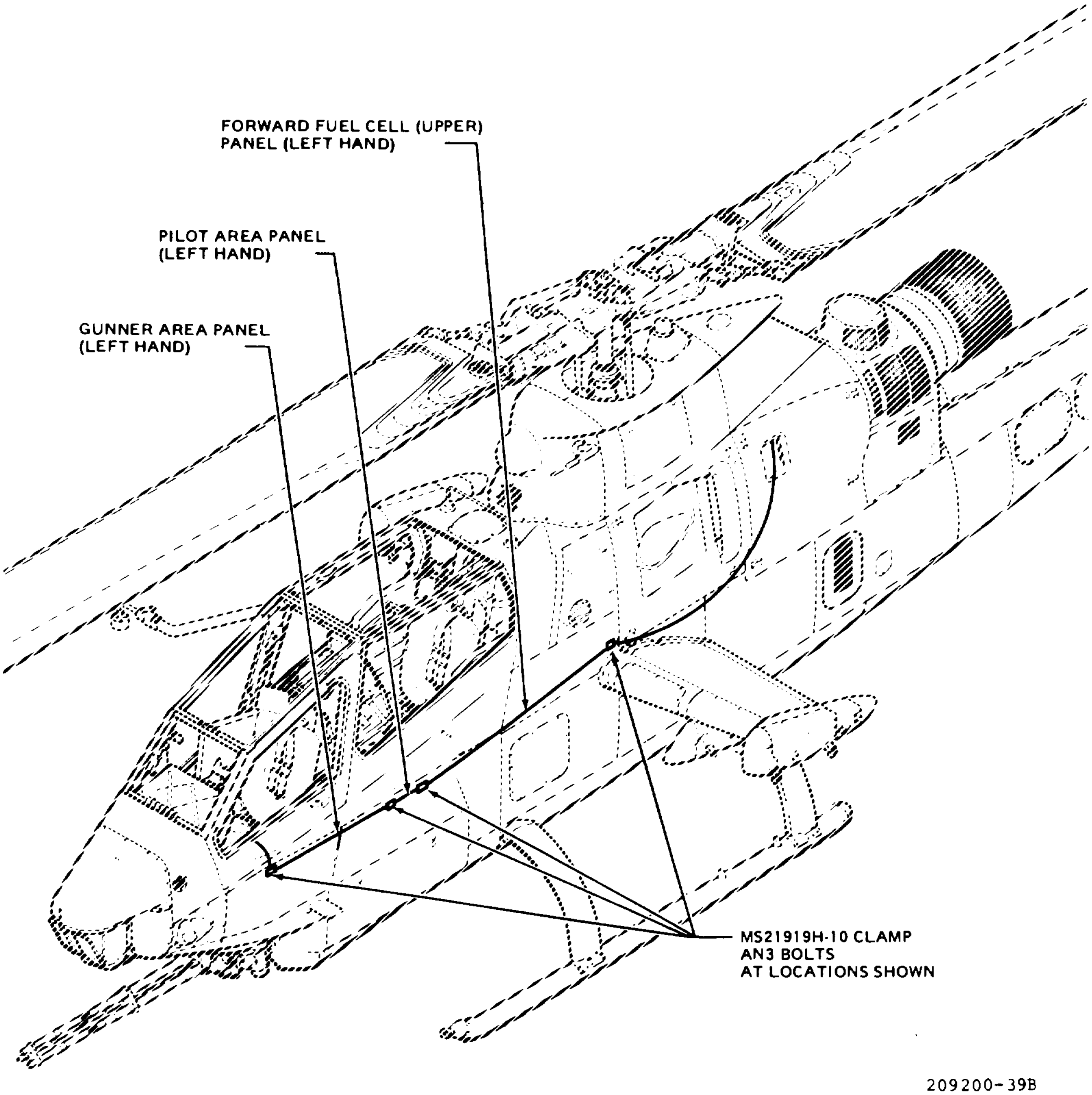


Figure 4-3. Engine Vibration Test Equipment Cabling Tiedown

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

CAUTION

Do not use tape to seal fuel or oil openings. Tape adhesive is soluble in fuel or oil and can cause contamination.

b. Apply penetrating oil (C8I)as required to assist in removal of parts during disassembly. On parts to be installed, remove all traces of penetrating oil with solvent (C112).

c. Protect engine from dust and inclement weather. If practical, perform engine maintenance in closed areas.

WARNING

HANDLING IGNITION UNIT

The ignition unit contains a very small amount of radioactive material. (Cesium-Barium 137) and normally requires no handling precautions. However, severely damaged units that have been broken open must be handled with forceps or gloves and disposed of in accordance with AR-755-15 and TB 43-0108.

d. Before removing engine components, disconnect the electric cable assembly at the ignition unit and ground the ignition leads.

e. Discard used lockwire, packings, cotter pins, gaskets, tabwashers, lockpins, keywashers, and lockwashers.

CAUTION

Use care to prevent damage to lockwire holes.

f. When removing hoses and electrical lines, remove clamps from brackets. Leave brackets on the engine unless otherwise stated.

g. When disconnecting electrical connectors, or hose and tubing fittings, remove clamps on brackets as required to gain slack and avoid damage to connectors and fittings.

h. Remove hose assemblies that maybe damaged during removal of engine components.

CAUTION

Do not use cadmium-plated tools for any of the disassembly or reassembly procedure given in this manual. Cadmium plating has a tendency to chip. If these chips enter the engine, they will contaminate the lubrication system. possibly clog the fitters, and cause magnesium parts to deteriorate.

i. Avoid hanging objects (tools, etc.) on hose assemblies.

j. Care shall be taken to route and clamp hose assemblies securely. Chafing shall be avoided at all times. Proper clamping and chafe pads shall be used at all times.

k. During removal, examine all parts for serviceability. Look for indications of work that was incorrectly performed during previous repairs or overhauls. Report such indications in accordance with current practice.

l. when removing or installing oil, fuel, and air hose assemblies, do not apply torque to the narrow hex nut of the sleeve and nipple. Torque must be applied only to the wide hex nut. Secure the nipple or sleeve to prevent twisting of the hose assembly.

WARNING

Prolonged contact with lubricating oil may cause a skin rash. Those areas of skin and clothing that come in contact with lubricating oil should be thoroughly washed immediately. Saturated clothing Should be remove Immediately. Areas in which lubricating oil is used should be adequately ventilated to keep mist and fumes to a minimum.

CAUTION

Lubricating oil may soften point upon contact. If lubricating oil is spilled on painted surfaces. these surfaces should be thoroughly washed.

CAUTION

To ensure total seating of packings, remove identifying point by carefully rubbing or scraping paint with finger or fingernail. Do not use a sharp instrument which could damage the pecking.

NOTE

Fittings being tightened to prescribed torque should have dry, clean threads.

m. Remove protective tape, caps, plugs, and covers as necessary for installation.

4-11. TROUBLESHOOTING – ENGINE ASSEMBLY.

Refer to TM 55-2840-229-23.

4-12. REMOVAL - ENGINE ASSEMBLY.

Premaintenance Requirements for Removal of Engine Assembly

Condition	Requirements
Model	AH-1 E/F/P
Part No. or Serial No.	All
Special Tools	(T9), (T17), (T18), (T1 9), (T45)
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	Three
Consumable Materials	(C85)
Special Environmental Conditions	None

a. Disconnect battery (paragraph 9-49).

b. Remove all engine cowling and pylon fairings (paragraphs 2-79 through 2-82).

c. Remove transmission cowling (paragraph 2-78).

d. Remove particle separator (paragraph 4-28).

e. E M Remove centrisep particle separator (paragraph 4-28.1).

f. Remove main driveshaft (paragraph 6-8).

g. Remove exhaust system.

(1) P F Exhaust system (paragraph 4-41).

(2) P F IR Suppression system (paragraph 4-47).

(3) M IR Suppression system (paragraph 4-54).

NOTE

When electrical cables and plugs are disconnected from airfreme plugs. secure cables and plugs to engine in a manner that will avoid interference when removing engine assembly.

h. Disconnect electrical cables ahd plug at airframe location.

(1) Remove two clamps (18 and 19, figure 4-4) securing harness assembly (14) to left side of driveshaft shroud.

(2) Disconnect plug of harness assembly (14) from aft firewall on left side of engine.

(3) Remove clamp securing cable assembly (21) to fuel filter.

(4) Disconnect plug of cable assembly (21) from fuel filter.

ALL DATA ON PAGES 4-6.1 AND 4-6.2 INCLUDING FIGURE 4-301 DELETED.

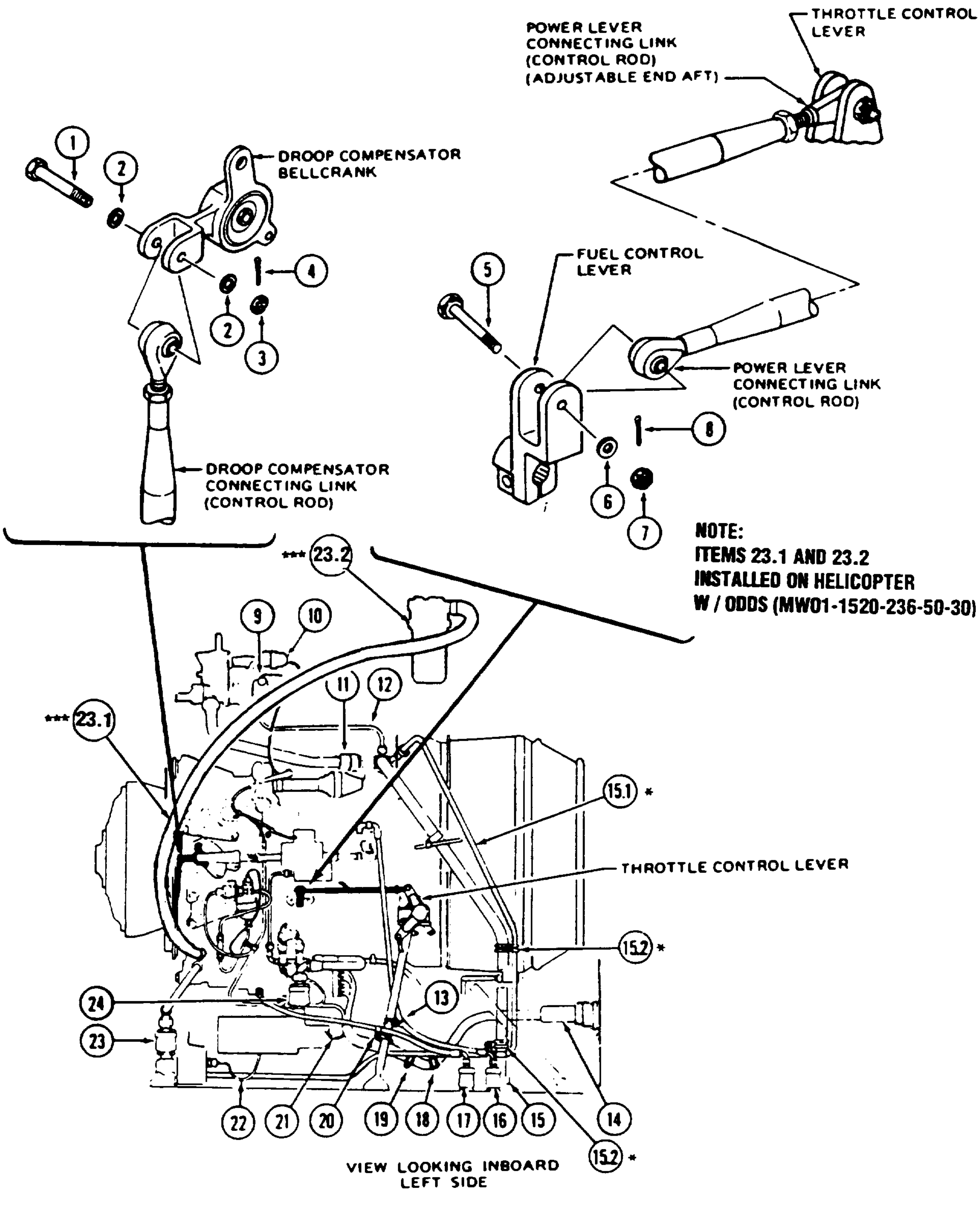
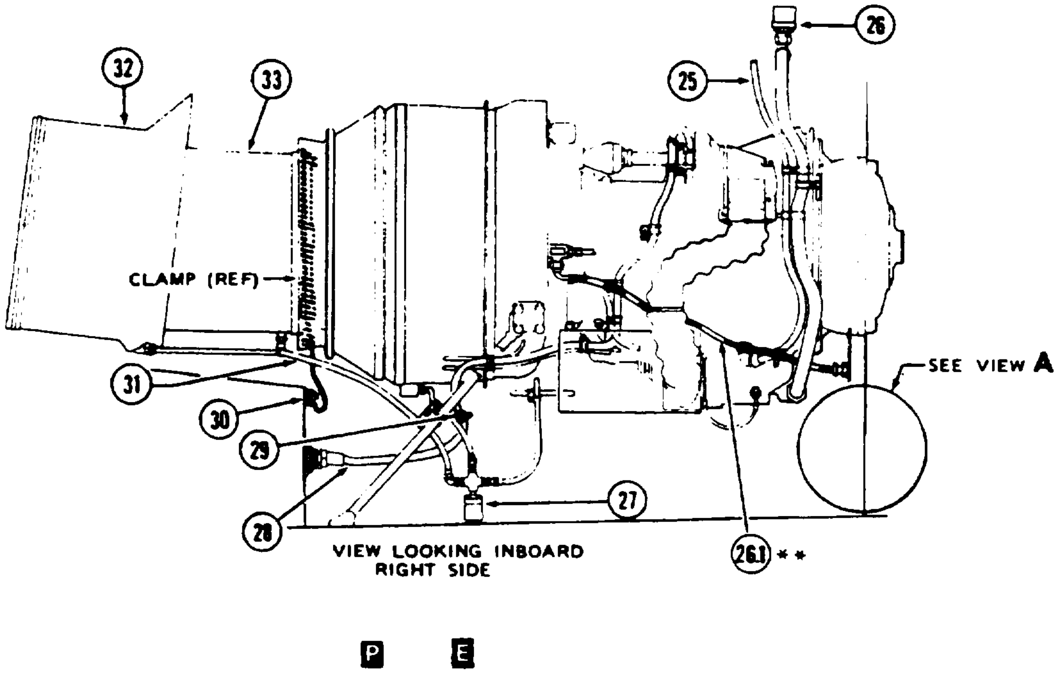


Figure 4-4. Engine Installation (Sheet 1 of 4)



1. Bolt
2. Washer (2 reqd)
3. Nut
4. Cotter pin
5. Bolt
6. Washer
7. Nut
8. Cotter pin
9. Electrical plug (bleed air valve)
10. Electrical plug (oil tank low level switch)
11. Coupling (bleed air)
12. Tube assembly
13. Clamp
14. Electrical harness assembly
15. Coupling (bleed air)
*15.1 Tube assembly (bleed air)
*15.2 Clamp
16. Fuel drain disconnect (governor bleed)
17. Oil drain disconnect (starter seal)
18. Clamp
19. Clamp
20. Clamp
21. Cable assembly (fuel filter)
22. Cable assembly (oil bypass valve)
23. Oil hose disconnect
***23.1 **Oil Inlet hose (ODDS)**
***23.2 **Oil separator (ODDS)**
24. Fuel disconnect (fuel filter to engine)
25. Hose assembly (oil breather)
26. Hose assembly (oil in)
**26.1 Hose assemblly (bleed air)
27. Fuel drain disconnect
28. Electrical harness assembly
29. Clamp
30. Exhaust thermocouple cable
31. Fuel drain hose
32. Ejector
33. Tail pipe
34. Hose assembly
35. Tee
36. Transducer (inboard)
**37. Bracket
**37.1 Bracket
38. Union
39. Hose assembly

Figure 4-4. Engine Installation (Sheet 2 of 4)

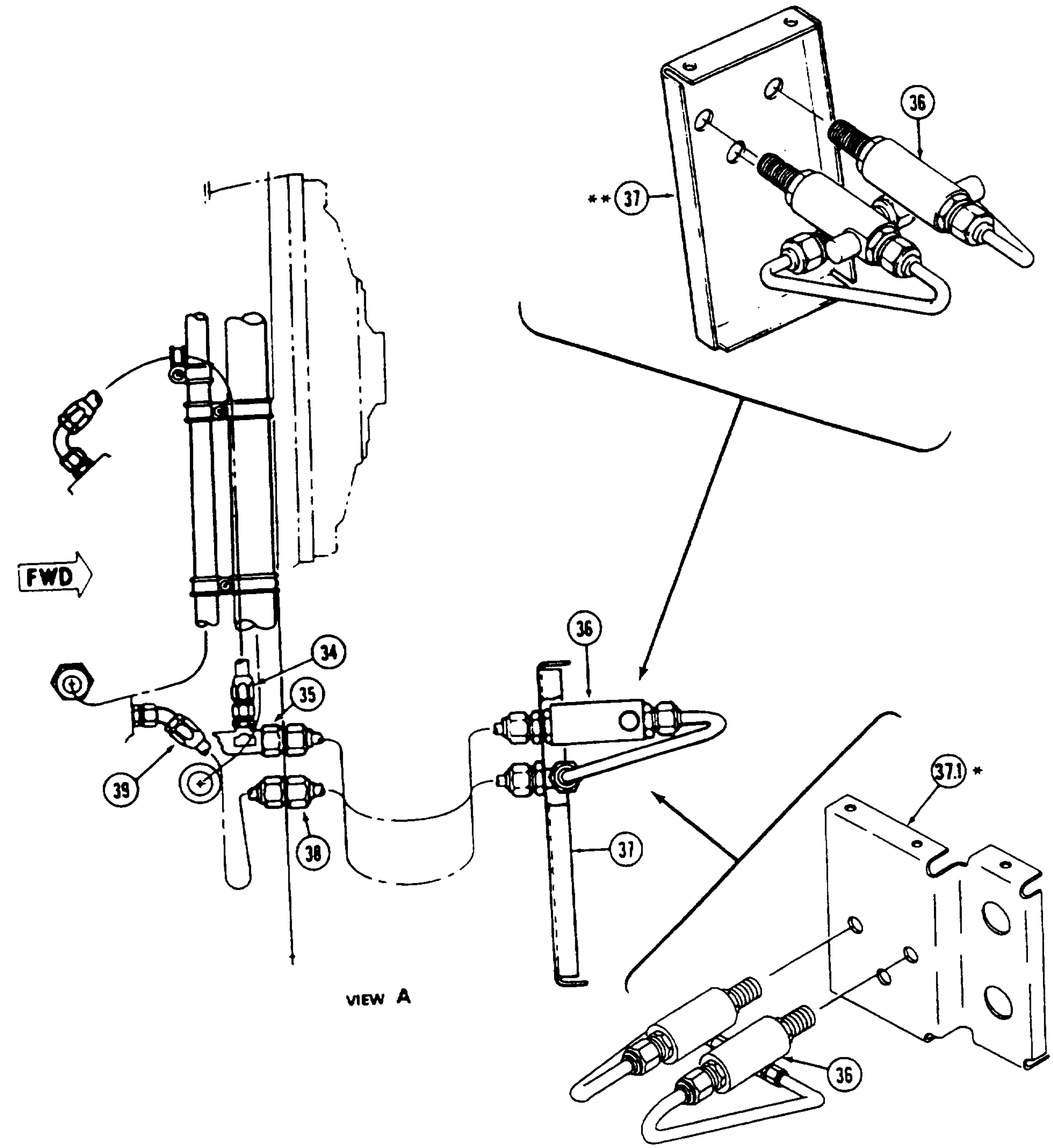
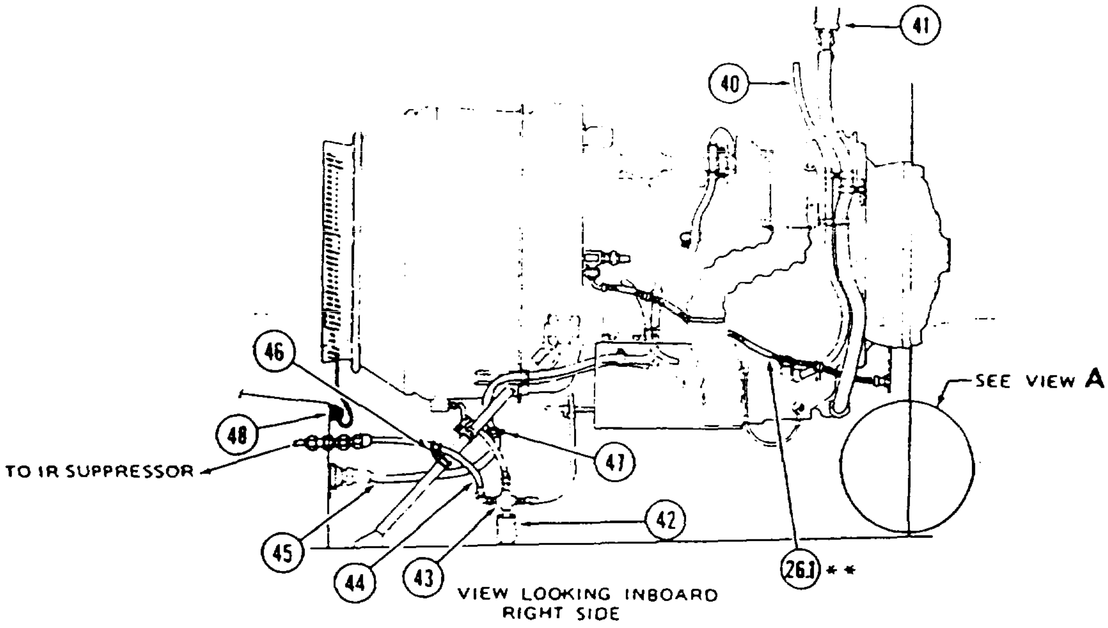


Figure 4-4. Engine Installation (Sheet 3 of 4)



M

40. Hose assembly (oil breather)
41. Hose assembly (oil in)
42. Fuel drain disconnect
43. Tube cross
44. Fuel drain hose
45. Electrical harness assembly
46. Clamp
47. Clamp
48. Exhaust thermocouple cable
*** 49. Hose, outlet (ODDS)
*** 50. Filter (ODDS)

* E M After incorporation of MW0 55-1520-236-50-12.
* * E M P Prior to incorporation of MW0 55-1520-236-50-12.
* * * M After incorporation of MWO 1-1520-236-50-30.

Figure 4-4. Engine Installation (Sheet 4 of 4)

(5) Disconnect plug of cable assembly (22) from engine oil bypass valve.

(5.1) M (After incorporation of MWO 1-1520-236-50-30) Disconnect connector (8, figure 4-18.1) from chip detector on oil separator (1).

(6) Remove harness clamp.

(a) P E Remove clamp (29, figure 4-4) securing harness assembly (28) to right side of driveshaft shroud.

(b) M Remove clamp (47) securing harness assembly (45) to right side of driveshaft shroud.

(7) Disconnect harness plug.

(a) P E Disconnect plug of harness assembly (28) from aft right side of firewall.

(b) M Disconnect plug of harness assembly (45) from aft right side of firewall.

(8) Disconnect exhaust thermocouple.

(a) P E Disconnect exhaust thermocouple (30) from aft right side firewall.

(b) M Disconnect exhaust thermocouple (48) from aft right side firewall.

(9) Disconnect electrical plug (9) at bleed air valve.

(10) Disconnect oil tank low level switch electrical plug (10) at airframe plug.

i. Disconnect fuel, oil, and bleed air hoses, lines, and tubes as follows:

NOTE

When removing fuel and oil hoses, lines, fittings, ensure residual fluids have been drained. Cap all open parts. Inspect all removed parts for serviceability.

(1) P E Disconnect hose assembly (26) at oil tank disconnect fitting.

(2) P E Disconnect hose assembly (25) at oil tank disconnect.

(3) P E Disconnect fuel drain. Disconnect (27) from right side engine deck fitting.

(4) M Disconnect hose assembly (41) at oil tank disconnect fitting.

(5) M Disconnect hose assembly (40) at oil tank disconnect fitting.

(5.1) (After incorporation of MWO 1-1520-236-50-30) Disconnect hose (49) from filter (50).

(6) M Disconnect fuel drain hose (44) at tube cross (43).

(7) M Disconnect fuel drain, Disconnect (42) from right side engine deck fitting.

(8) Disconnect oil bypass valve hose (23) at engine deck fitting on left forward side of engine.

(9) Disconnect fuel filter hose (24) at engine deck disconnect fitting.

(10) Disconnect starter seal drain hose. Disconnect (17) at engine deck.

(10.1) E M Disconnect hose assembly (26.1) at engine firewall, prior to incorporation of MWO 55-1520-236-50-12.

(11) Disconnect governor and filter bleed hose. Disconnect (16) at engine deck.

(12) Disconnect bleed air line coupling (15) at engine deck coupling.

(12.1) E M After incorporation of MWO 55-1520-236-50-12, disconnect bleed air tuba assembly (15.1) at top of engine. Remove clamps (15.2), disconnect opposite end and remove bleed air tube.

(13) Disconnect tube assembly (12) from top of engine. Disconnect opposite end at bleed air valve and remove tube assembly (12).

(14) Disconnect bleed air tube coupling (11) at top of engine. Disconnect opposite end and remove bleed air tube.

(15) Remove cotter pin (4), nut (3), washers (2) and bolt (l). Disconnect connecting link (control tube) from droop compensator bell crank

(16) Remove cotter pin (8), nut (7), washer (6) and bolt (5). Disconnect power lever connecting link (control rod) from fuel control lever.

(17) Disconnect hose assembly (34) from tee (35).

(18) Disconnect hose assembly (39) from union (38).

i.1. Deleted.

j. Attach engine lifting sling (T9) to engine assembly. Attach hoist (T45) to sling. Take slack out of hoist and sling.

k. Loosen nuts (19, figure 4-5) from left and right side pillow blocks. Open pillow blocks.

CAUTION

To prevent possible damage to engine mount, ensure weight is removed from mount bolt (8) before removal.

l. Remove bolt (8), from forward engine mount trunnion (paragraph 4-18).

m. Slowly hoist engine from helicopter structure ensuring all hoses, tubing and electrical cables are clear of airframe.

n. Install engine in engine adapter (T19) on transportation trailer.

4-13. INSPECTION-ENGINE ASSEMBLY.

a. Inspect external hoses, tubing, and electrical cables on engine assembly for damage and serviceability before engine assembly is reinstalled in helicopter airframe.

b. If engine assembly is to be reinstalled, inspect engine assembly in accordance with TM 55-2840-229-23,

4-14. REPAIR OR REPLACEMENT - ENGINE ASSEMBLY.

a. Refer to TM 55-2840-229-23 for repair of engine and engine furnished components.

b. Refer to paragraph 4-118 for buildup of adapting parts on replacement engine.

4-15. INSTALLATION - ENGINE ASSEMBLY.

a. Attach engine lifting sling (T9) to engine assembly.

b. Attach lifting sling (T9) to hoist (T45). Take up slack in hoist and remove hardware securing engine to engine and transmission stand (T19) or transportation trailer.

c. Hoist engine to dear airframe engine mounts. Ensure airframe pillow blocks are open and slowly lower engine assembly aligning engine trunnion bearing over engine mount pillow blocks.

d. Align forward trunnion (1, figure 4-5) with rod end bearing (12) of forward engine mount tube (10). Install bolt (8) through rod end bearing (12) and trunnion (1). Torque bolt (8) 50 to 70 inch-pounds. Lockwire (C137) bolt (8) to upper bolt (5), then to lower bolt (6).

e. Close pillow block (17, figure 4-5) over left aft trunnion bearing (14). Ensure that correct special washer (22) is installed, and torque ring base nut (19) 50 to 70 inch-pounds. Install pillow block on right aft trunnion bearing in same manner.

e.1. install starter generator (paragraph 4-121).

f. Connect electrical cable harness and cable assemblies as follows:

(1) Connect plug of harness assembly.

(a) P E Connect plug of harness assembly (28, figure 4-4) to a plug on right side of aft firewall. Attach harness assembly (28) to right side of driveshaft shroud with damp (29).

(b) M Connect plug of harness assembly (45, figure 4-4) to plug on right side of aft firewall. Attach harness assembly (45) to right side of driveshaft shroud with damp (47).

(2) Connect plug of harness assembly (14) to plug on left side of aft firewall.

(3) Connect plug of cable assembly (21) to fuel filter plug.

(4) Connect plug of cable assembly (22) to oil bypass valve.

(4.1) (After incorporation of MWO 1-1520-236-50-30) Connect plug of cable (8, figure 4-18.1) to chip detector on oil separator (1)

(5) Attach damps (18 and 19, figure 4-4) to left side of driveshaft shroud.

(6) Secure cable assembly (21) to fuel fitter using existing damp on fuel filter.

(7) Connect electrical plug (9) to bleed air valve plug.

(8) Connect electrical plug (10) to airframe mounted plug for oil tank lower lever switch.

g. Connect engine fuel, oil and bleed air hoses, and tubing as follows:

(1) Connect fuel drain hoses.

(a) P E Connect fuel drain disconnect (27) to engine deck fitting.

(b) M Connect fuel drain disconnect (42) to engine deck fitting.

(c) M Connect fuel drain hose (44) to tube cross (43).

(2) Connect fuel disconnect (24) to fuel filter.

(3) Connect oil hose disconnect (23) to oil bypass valve.

(4) Connect oil drain disconnect (17) to engine deck fittings.

(5) Connect fuel drain disconnect (16) to engine deck fitting.

(6) Connect engine bleed air tube coupling (15) to engine deck fitting

(7) P E Connect oil hoses.

(a) P E Connect coupling of oil breather hose assembly (25) to engine oil tank

(b) P E Connect coupling of hose assembly (26) to engine oil tank.

(8) M Connect oil hoses.

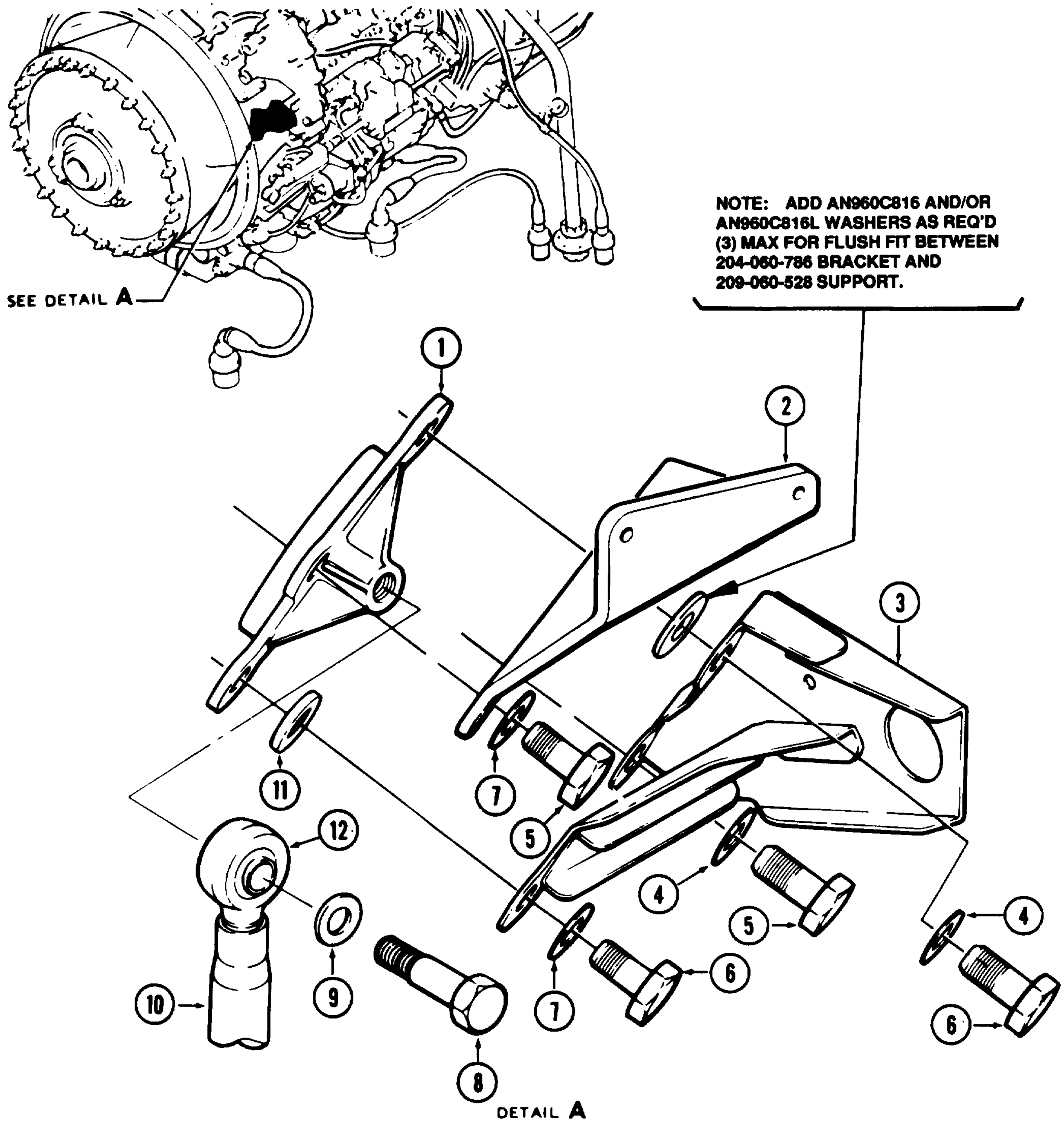
(a) M Connect coupling of oil breather nose assembly (40) to engine oil tank.

(b) M Connect coupling of hose assembly (41) to engine oil tank.

(c) (MWO 1-1520-236-50-30) Connect hose (23.1) between engine scavenge and oil separator (23.2). Secure with clamps (23, 24, and 26, figure 4-18.1) screws (16 and 29), washers (18), and nuts (15).

(d) (MWO 1-1520-236-50-30) Connect hose (49, figure 4-4) between oil filter (50) and oil hose disconnect (23). Secure with clamps (26 and 27, figure 4-18.1), screws (16 and 17), spacers (21), washers (18), and nuts (15).

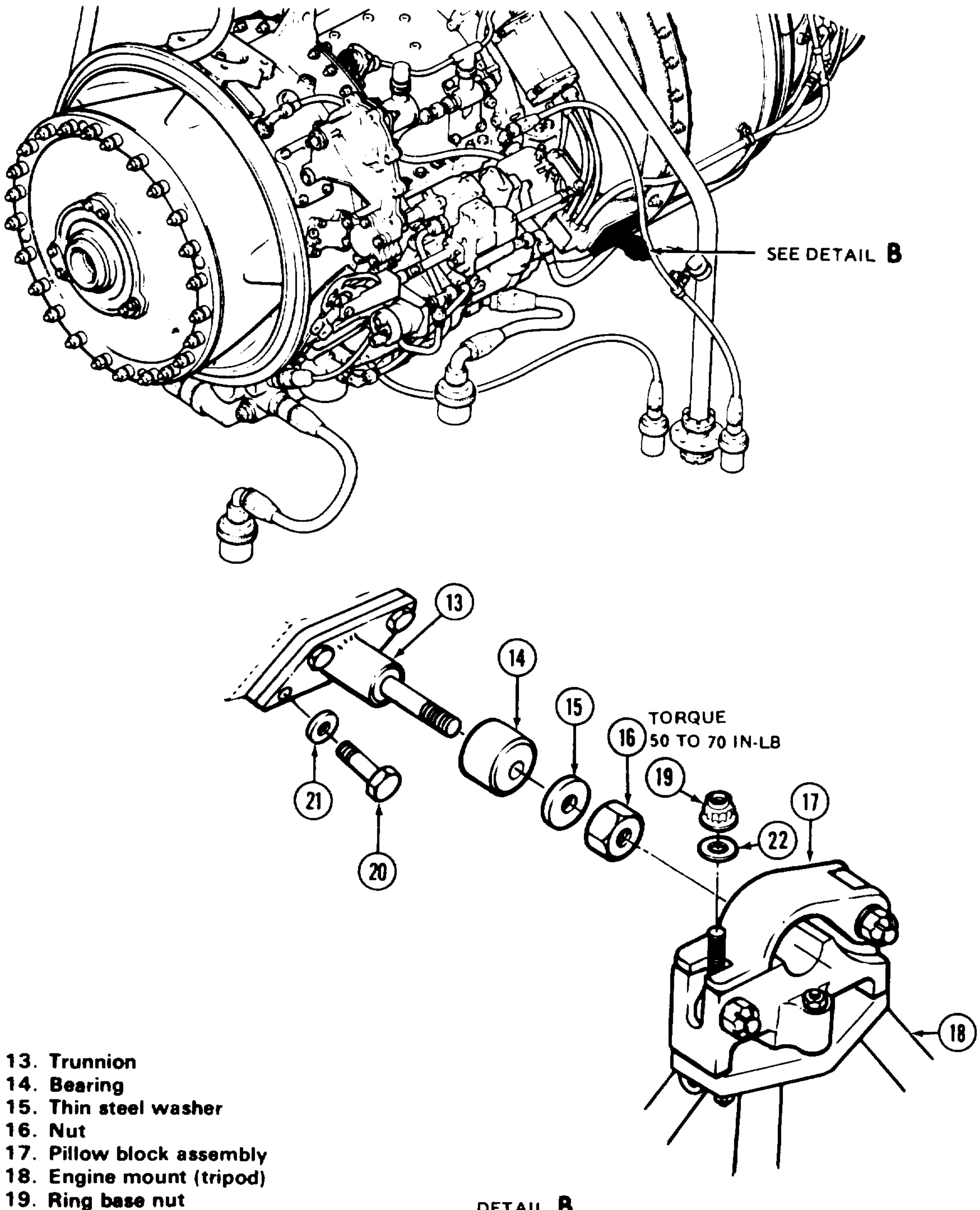
(9) Install tube assembly (12, figure 4-4) between bleed air valve and bleed air fitting on top of engine.



1. Trunnion
2. Cambox assembly bracket
3. Transducer bracket
4. Thin steel washer
5. Bolt
6. Bolt
7. Thin steel washer
8. Special bolt
9. Thin steel washer
10. Engine mount forward
11. Steel washer
12. Rod end bearing

209060-121-1

Figure 4-5. Engine Mount Fittings (Trunnions) Installation (sheet 1 of 2)



13. Trunnion
14. Bearing
15. Thin steel washer
16. Nut
17. Pillow block assembly
18. Engine mount (tripod)
19. Ring base nut
20. Bolt
21. Thin steel washer
22. Special Washer

209060-121-2A

Figure 4-5. Engine Mount Fittings (Trunnions) Installation (Sheet 2 of 2)

(10) Install bleed air tube and coupling (11) between bleed air line and fitting.

(11) Install hose assembly (34) on tee (35).

(12) Install hose assembly (39) on union (38).

h. Position droop compensator control rod on droop compensator bellcrank (3) and install bolt (1), two washers (2), nut (3), and cotter pin (4).

i. Position power lever connecting link on fuel control lever and install bolt (5), washer (6), nut (7), and cotter pin (8).

j. Check rigging on power lever and droop compensator (paragraphs 4-105 and 4-113).

k. Install exhaust system.

(1) P E Exhaust system (paragraph 4-44).

(2) P E IR Suppression system (paragraph 4-51).

(3) M IR Suppression system (paragraph 4-58).

l. Install main driveshaft (paragraph 6-13).

m. Install particle separator (paragraph 432).

n. Install transmission cowling (paragraph 2-91).

o. Install engine cowling and pylon fairings (paragraph 2-90 and 2-92).

4-16. ENGINE MOUNT FITTINGS (TRUNNIONS).

4-17. DESCRIPTION-ENGINE MOUNT FITTINGS (TRUNNIONS).

Engine mount fittings (trunnions) are the part of the engine mount that are installed on the engine. The forward fitting (trunnion) is bolted to the forward left side mount pad. The two aft fittings (trunnions) are bolted to the rear mounting pads, one left and one right.

4-18. REMOVAL-FORWARD ENGINE MOUNT FITTING (TRUNNION).

a. Attach engine lifting sling (T9) to engine assembly. Attach hoist (T45) to sling. Take up slack between hoist and sling.

NOTE

Engine may be supported with suitable strap running underneath combustion section and spreader bar to clear strap from aft pylon fairing.

b. Cut lockwire attached to bolt (8, figure 45). Remove lockwire.

c. Remove bolt (8) and washer (9) from trunnion (1).

d. Cut lockwire attached to bolts (5 and 6). Remove lockwire.

e. Remove bolts (5 and 6), washers (4, 7, and 11).

f. Remove cambox assembly bracket (2) and transducer bracket (3).

g. Remove trunnion (1).

4-19. REMOVAL-AFT ENGINE MOUNT FITTINGS (TRUNNIONS).

a. Attach engine sling (T9) to engine assembly. Attach hoist (T45) to sling. Take up slack in hoist cable to relieve weight from engine mount.

NOTE

Engine may be supported with suitable strap running underneath combustion section and a spreader bar to clear strap from aft pylon fairing.

b. Remove left aft fitting (trunnion) (13, figure 4-5) as follows:

CAUTION

Ensure that engine is supported by hoist and sling prior to removal of pillow block

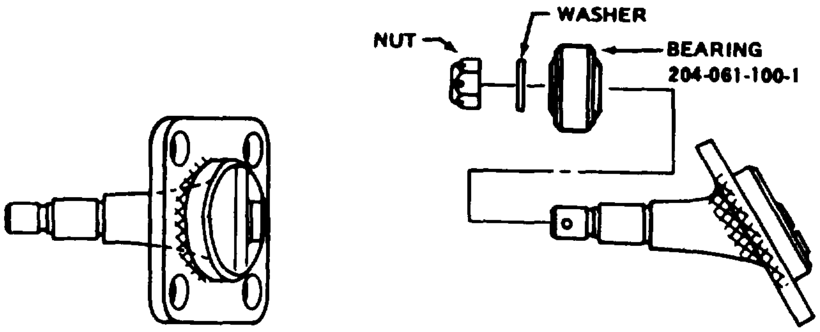
(1) Remove left pillow block assembly (17) by procedure outlined in paragraph 2-203.

(2) Remove self-locking nut (16), washer (15), and bearing (14) from trunnion on left side of engine.

(3) Remove lockwire from four bolts (20). Remove bolts (20) and washers (21).

(4) Remove trunnion (13).

c. Remove aft right engine mount fitting (trunnion) by same procedure outlined in step b.



ENGINE MOUNT FITTING (TRUNNION) 204-460-1 52-1

DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED 	
CRACKS	None	None
NICKS, SCRATCHES, DENTS AND CORROSION	0.010	0.020
MAXIMUM AREA PER FULL DEPTH REPAIR	Not critical	Not critical
NUMBER OF REPAIR AREAS	Not critical	Not critical
EDGE CHAMFER	0.010	0.020
BORE DAMAGE	0.002 for 1/4 Circumference	
THREAD DAMAGE ON FITTING AND NUT	None acceptable	
BEARING WEAR (LOOSENESS)		
Radial	0.006	
Axial	0.012	

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

Figure 4-6. Damage Limits — Aft Engine Mount Fittings (Trunnions) and Bearings

4-20. INSPECTION – ENGINE MOUNT FITTINGS (TRUNNIONS).

a. Inspect aft engine mount fittings (trunnions) for damage in excess of limits shown in figure 4-6.

b. Inspect bearings on aft engine mount fittings (trunnions) for damage and wear (looseness) in excess of limits shown in figure 4-6.

c. Inspect forward engine mount fitting (trunnion) (1, figure 4-5) for nicks, scratches, cracks and thread damage. No cracks, thread damage or severe mechanical damage is acceptable.

4-21. REPAIR OR REPLACEMENT – ENGINE MOUNT FITTING (TRUNNIONS).

Replace bearings if damaged or worn in excess of limits (paragraph 4-20).

(1) Remove nut (16, figure 4-5), washer (15) and bearing (14).

(2) Position serviceable bearing (14) on fitting (trunnion). Install thin steel washer (15) and self-locking nut (16). Torque 160 TO 190 inch-pounds.

b. Replace engine mount fittings (trunnions) if damaged in excess of limits (paragraph 4-20).

c. Polish out mechanical and corrosion damage that is within limits shown on figure 4-6 with fine India stone (C116). Touch up repair area with primer (C88 or C91).

4-22. INSTALLATION – FORWARD ENGINE MOUNT FITTING (TRUNNION).

NOTE

If trunnlon was removed from an Installed englne, the engine should be supported by a hoist (paragraph 4-18).

a. Position trunnion (1, figure 4-5) on engine forward left mount pad.

b. Position cambox assembly bracket (2) on top mounting holes of tin. Position transducer bracket (3) on tower portion oftrunnion (1) with washer (11) between bracket and trunnion.

c. Install two thin steel washers (4) and bolts (5). Do not tighten bolts. If required, add a maximum of three AN960C816 and/or AN960C816L washers (pargraph 4-120) to obtain a flush fit between transducer bracket (3) and trunnion (1).

d Install two bolts (6) and thin steel washers (7). Torque bolts (5) and bolts (6) 290 to 410 inch-pounds.

e. Position forward engine mount (10) on trunnion (1) and install special bolt (8) and thin steel washer (9). Torque bolt (8) 50 to 70 inch-pounds.

Lockwire (C137) bolt (8) to upper forward bolt (6), then to lower forward bolt (6). Lockwire (C137) lower aft bolts (5), to upper aft bolts (5).

4-23. INSTALLATION – AFT ENGINE MOUNT FITTINGS (TRUNNIONS).

NOTE

If trunnions wera removed from an installed engine, the angina should be supported by a hoist (paragraph 4-19).

a. Install left aft trunnion (13, figure 4-5) as follows:

(1) Position trunnion (13) on engine left aft mount pad

(2) Install four bolts (20) and thin steel washers (21). Torque bolts (20) 95 to 110 inch-pounds. Lockwire (C137) bolts in pairs.

b. Install right aft trunnion in same manner outlined in step a.

c. Remove hoist and engine sling if applicable.

d. Install main driveshaft (paragraph 6-13).

e. Install particle separator (paragraph 4-32).

f. Install engine cowling and transmission cowling (chapter 2).

g. Connect battery.

h. Perform runup and maintenance test fright.

SECTION II. COOLING SYSTEM

(Not Applicable)

SECTION III. AIR INDUCTION SYSTEM

4-24. AIR INDUCTION SYSTEM.

4-25. DESCRIPTION – AIR INDUCTION SYSTEM.

Engine Intake alr passes through large vertical scoops on both transmission cowling doors, into a chamber enclosed by induction baffles and the forward firewall. From this chamber, air IS drawn into the engine air Inlet through a particle separator which removes particles of foreign matter.

4-26. PARTICLE SEPARATOR.

4-27. DESCRIPTION – PARTICLE SEPARATOR. (PRIOR TO INCORPORATION OF MWO 55-1520-236-50-12)

The particle separator is a self-purging, inertial type separator. Engine inlet air entering the particle separator must first pass through the foreign object damage screens (13 and 33, figure 4-7). Refer to paragraph 4-34 for description of foreign object damage screen. Foreign particles which pass through the foreign object screen enter the air filter upper half (14) and air filter lower half (32) with engine inlet air. The particles are separated by inertial action as illustrated in figure 4-8.. The air filter halves consist of curved, annular, radial flow bellmouths. When engine inlet air flows through the bellmouths, foreign particles separate as the air passes around the curve. the particles are forced into the concave inner flow wall and caught by a protruding lip. Clean air continues into the engine inlet. The foreign particle contaminated air is drawn through a second turn which results in further separation of foreign particles. The clean air passing through the second turn is returned to the engine inlet area. Foreign particle laden air flows into the air cleaner mounted on the front of the air filter lower half. The engine compressor discharges (P3) bleed air from a fitting mounted on the engine diffuser. The bleed air is routed through hose (8, figure 4-7) to ejector unit (5), Venturi effect within the ejector carries the foreign particles overboard through hose (3).

4-27.1. E M DESCRIPTION – CENTRISEP PARTICLE SEPARATOR. (AFTER INCORPORATION OF MWO 55-1520-236-50-12)

The centrisep particle separator (3, figure 4-7.1) IS a self-purging, inertial type particle separator. Engine intake air enters into a chamber enclosed by baffles (1, 2, and 22) and the forward firewall (17) through scoops mounted on left and right transmission cowling doors (see figure 4-8.1 for air flow diagram). From this chamber, air is drawn through the centrisep particle separator. The spiral vanes within each of the vortex tubes (13, figure 4-7.1) causes passing air to swirl and centrifugal force throws dirt and other particles of foreign matter out of the intake air path. Clean air passes through vortex tubes (13) into engine bellmouth while dirt and foreign matter are drawn to bottom of centrisep particle separator into the scavenge box (23) and attached ejector duct. Engine bleed air enters ejector duct through side port. Air is discharged through bleed air ejector nozzles into ejector tubes. The air exits the ejector tubes into the atmosphere; at the same time, debris is exhausted overboard.

Premaintenance Requirements for Particle Separator

Condition	Requirements
Model	AH-1P/E/F
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
‘Support Equipment	Regulated Source of Air Pressure
Minimum Personnel Required	One
Consumable Materials	(C12), (C13), C14), (C28), (C31.1), C74), C100), (C102), (C112), (C118), (C132)
Special Environmental Conditions	None

*After MWO 55-1520-236-50-12 is incorporated.

4-28. REMOVAL – PARTICLE SEPARATOR. (PRIOR TO INCORPORATION OF MWO 55-1520-236-50-12)

a. Remove baffles (paragraph 2-123).

b. Remove top half of FOD screen (13, figure 4-7), (paragraph 4-35).

c. Release air filter latches (42 and 45) by simultaneously pressing the safety latch up and lifting up on the release catch.

d. Release air filter latches (40 and 47).

e. Release air filter latch (15).

f. Remove air filter upper half (14).

g. Remove gasket assemblies (37 and 38).

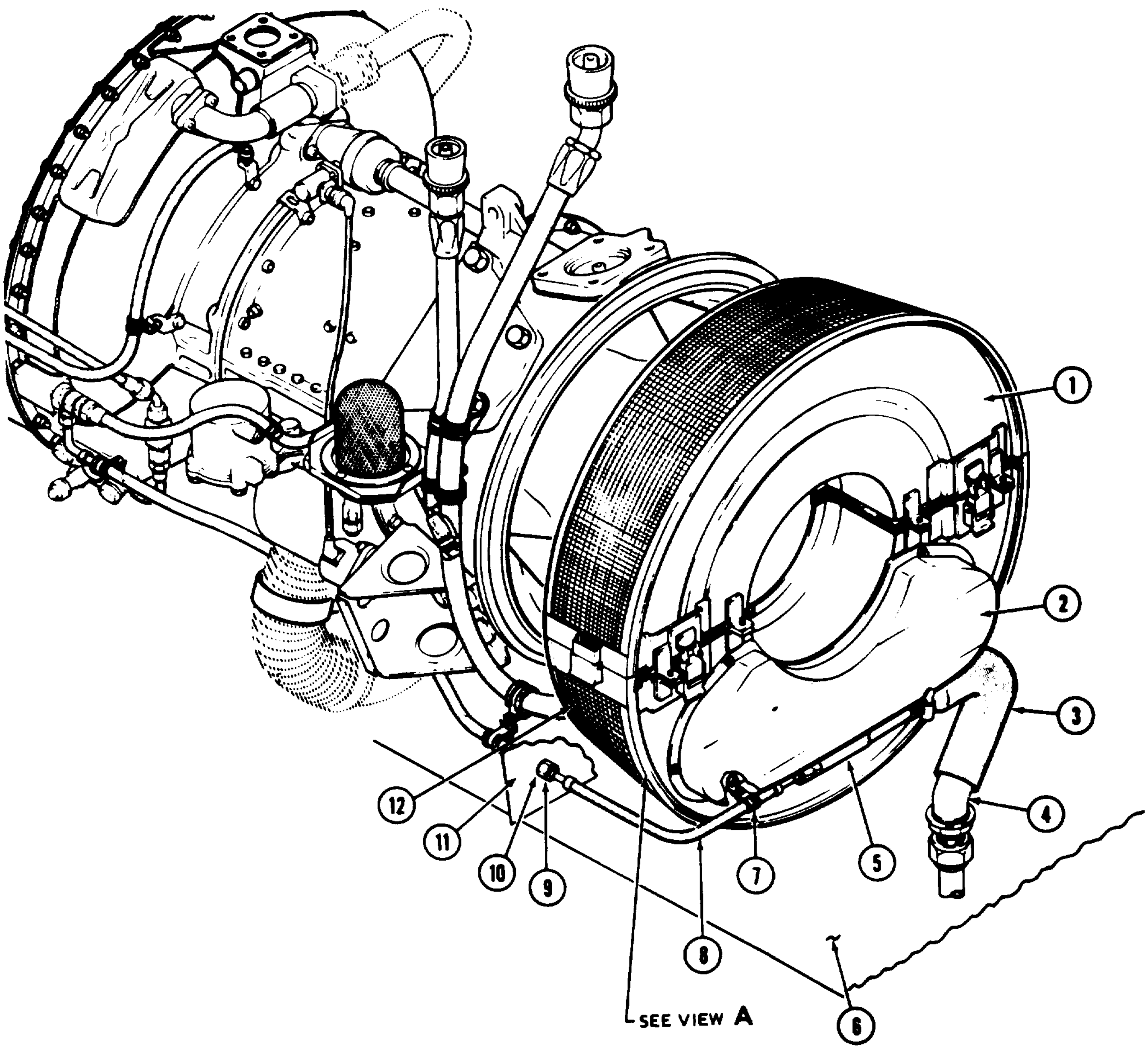
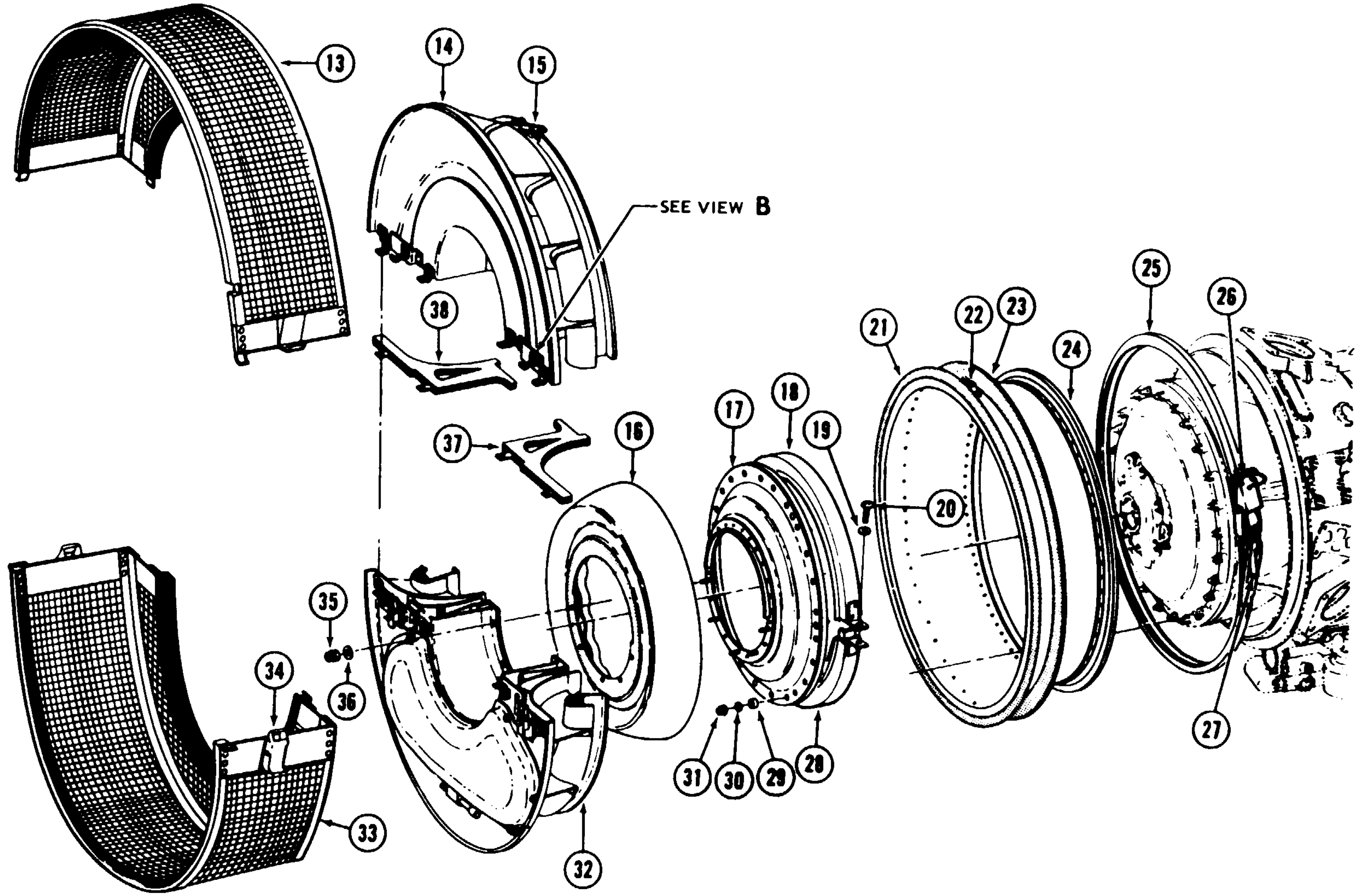


Figure 4-7. Particle Separator and FOD Screen Installation (Prior to Incorporation of MWO 55-1520-236-50-12) (Sheet 1 of 4)



NOTE

Do not install nut (35) and washer (36) at 6 o'clock position.

VIEW A

Figure 4-7. Particle Separator and FOD Screen Installation (Prior to Incorporation of MWO 55-1520-236-50-12) (Sheet 2 of 4)

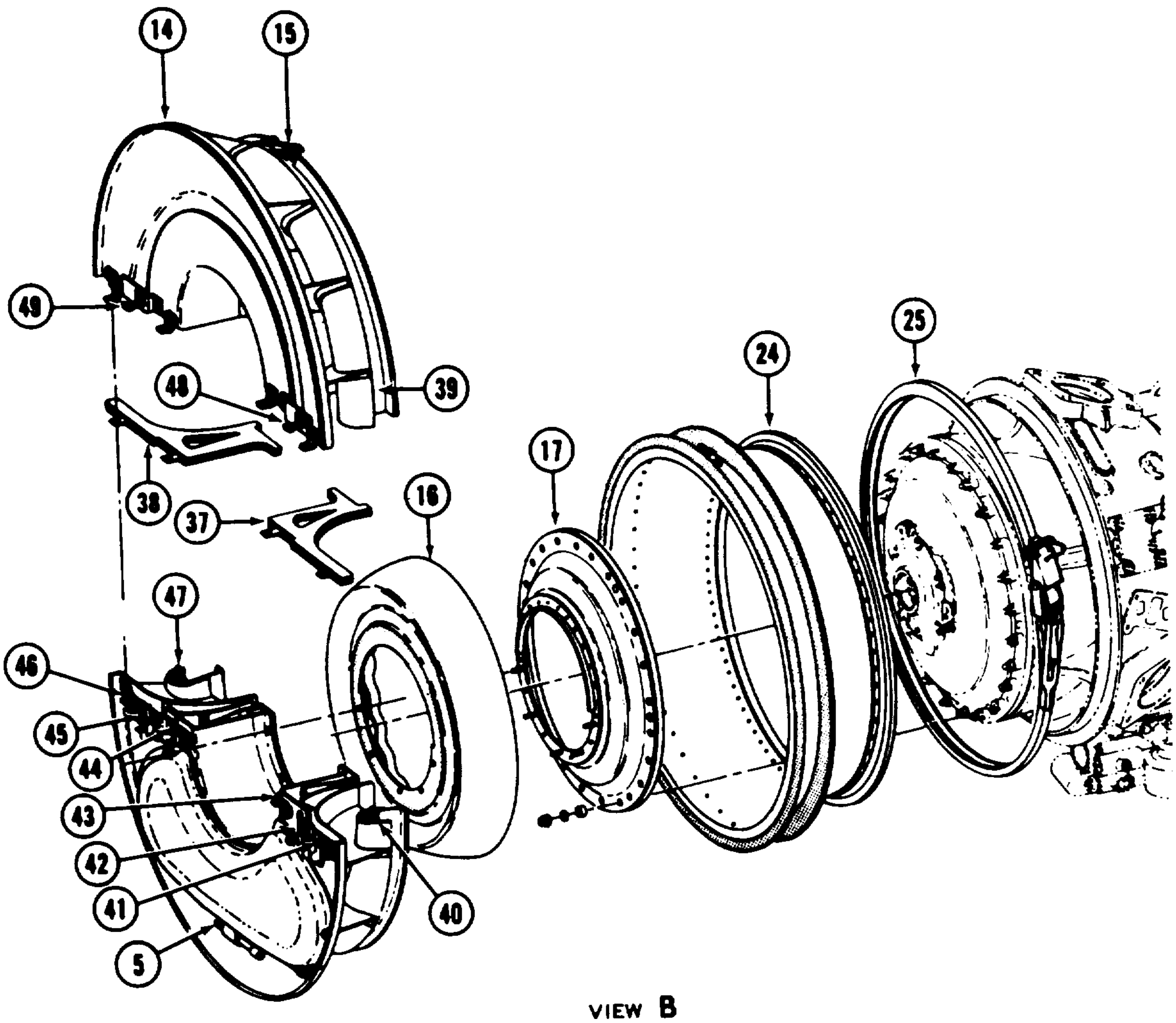


Figure 4-7. Particle Separator and FOD Screen Installation (Prior to Incorporation of MWO 55-1520-236-50-12) (Sheet 3 of 4)

1. Particle separator assembly
2. Air cleaner
3. Hose
4. Elbow
5. Ejector unit
6. Service deck
7. Clamp
8. Hose assembly
9. Nut
10. Fitting
11. Forward firewall
12. FOD screen assembly
13. FOD screen upper half
14. Air filter upper half
15. Air filter latch
16. Deflector assembly
17. Ring assembly
18. Former assembly upper half
19. Thin steel washer
20. Screw
21. Rubber seal
22. Mounting bracket (hook)
23. Gasket
24. Flange assembly
25. V band clamp assembly
26. Clamp latch
27. Nut
28. Former assembly lower half
29. Sleeve spacer
30. Thin steel washer
31. Extended base nut
32. Air filter lower half
33. FOD screen lower half
34. FOD screen latch
36. Extended base nut
36. Steelwasher
37. Gasket assembly
38. Gasket assembly
39. Hook (rear curl of air cleaner)
40. Air filter latch
41. Positioning pin
42. Air filter latch
43. Positioning pin
44. Positioning pin
45. Air filter latch
46. Positioning pin
47. Air filter latch
48. Strike catch (hook)
49. Strike catch (hook)

Figure 4-7. Particle Separator and FOD Screen Installation (Prior to Incorporation of MWO 55-1520-236-50-12) (Sheet 4 of 4)

NOTE

It is not necessary to further disassemble the separator unless the inspection procedures indicate that gaskets and seals may be damaged. if further inspection is required, proceed with the following steps.

h. Remove the lower half of the FOD screen, (paragraph 4-35).

i. Remove main driveshaft and curvic coupling adapter from engine output shaft (paragraph 6-16).

j. Remove hose (3).

k. Disconnect nut (9) from fitting (10).

l. Remove five nuts (35) and washers (36). Remove air filter lower half (32) and deflector assembly (16).

m. Remove two screws (20) and washers (19). Remove filter assembly upper half (18) and lower half (28).

n. Cut and remove lockwire from clamp latch (26). Loosen nut (27). Release clamp latch (26). Remove flange assembly (24) and V-band clamp assembly (25).

o. Remove twenty-four nuts (31), washers (30), and sleeve spacers (29). Remove ring assembly (17). Install sleeve spacers (29), washers (30), and nuts (31) on studs from which they were removed, do not torque nuts,

4-28.1. E M REMOVAL — CENTRISEP PARTICLE SEPARATOR. (AFTER INCORPORATION OF MWO 55-1520-236-50-12)

a. Open left and right transmission and engine cowlings.

b. Remove center pylon left and right fairings (paragraph 2-82).

c. Remove bolt (27, figure 4-7.1), washer (26), nut (25) and right side firewall fitting (14).

d. Remove top baffle (2) and forward baffle (1) (paragraph 2-125.1)

e. On aft side of engine bellmouth (12), remove four bolts (10) and washers (11) securing left section of centrisep particle separator (3).

f. Unfasten four fasteners (21) securing left section of centrisep particle separator (3) to right section.

g. Unfasten latch (16) securing both sections of centrisep particle separator (3), and remove left section.

h. Loosen clamps (18 and 20) securing flexible hose (19) to centrisep particle separator (3).

i. On aft side of engine bellmouth (12), remove remaining six bolts (10) and washers (11).

j. Remove right side of centrisep particle separator (3).

J.1 Cut and remove lockwire from clamp latch (49). Loosen nut (50). Release clamp latch (49). Remove engine bellmouth (12).

k. unscrew oil hose quick disconnect (29).

l. Remove floor baffle (22) (paragraph 2-125.1).

m. Remove flexible hose (19), and clamps (18 and 20).

NOTE

Shims shall remain in same position for installation purposes.

n. Remove bolt (43), shim (40), washer (41), nut (42) and firewall fitting (39).

NOTE

Residual oil spill may occur when oil tubes are removed.

o. Remove tube (47).

p. Remove tubes (32 and 33) between forward firewall (17) and bracket (37).

NOTE

Identify electrical plugs prior to removal to prevent wrong installation.

q. Disconnect electrical plugs (34 and 36).

r. Disconnect tubes (30, 31, and 35) from forward firewall (17).

s. Remove four screws (44), washers (45), and bracket assembly (46).

t. Remove bleed air tube (38) from scavenge ejector (23), and forward firewall.

u. Remove two screws (28) and scavenge ejector (23) from airframe.

4-29. CLEANING – PARTICLE SEPARATOR/ CENTRISEP PARTICLE SEPARATOR.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

a. Prior to incorporation of MWO 55-1520-236-50-12, clean parts only as required to facilitate inspection using solvent (C112).

b. I M After incorporation of MWO 55-1520-236-50-12, clean centrisep particle separator as follows:

(1) Clean exterior and interior surfaces and remove any foreign objects from vortex inlet and outlet tubes.

CAUTION

If airflow is restricted or not evident, the obstruction must be located and removed.

(2) Apply 60 psi air pressure to bleed air inlet fitting. Check for airflow from high pressure ejector nozzles.

(3) Clean foreign matter accumulation from vortex tubes and ejector slots using an air solvent vaporing gun and apply 60 psi air pressure together with one quart of cleaner (C31.1) mixed with four parts water.

(4) Repeat step (2) to eject residual cleaning solution.

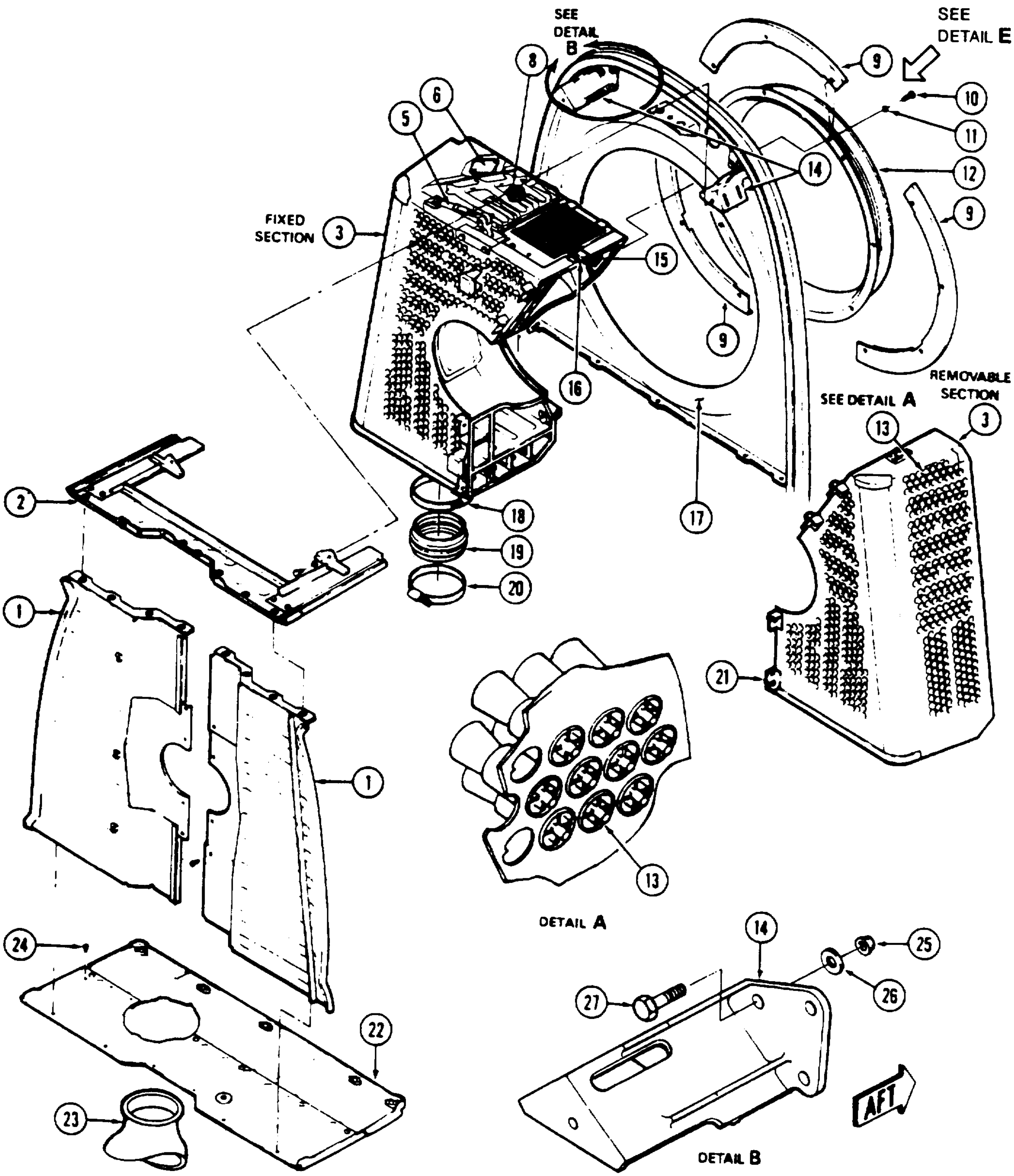


Figure 4-7.1 **E** **M** Centrisep Particle Seperator Installation (After Incorporation of MWO 55-1520-236-50-12) (Sheet 1 of 3)

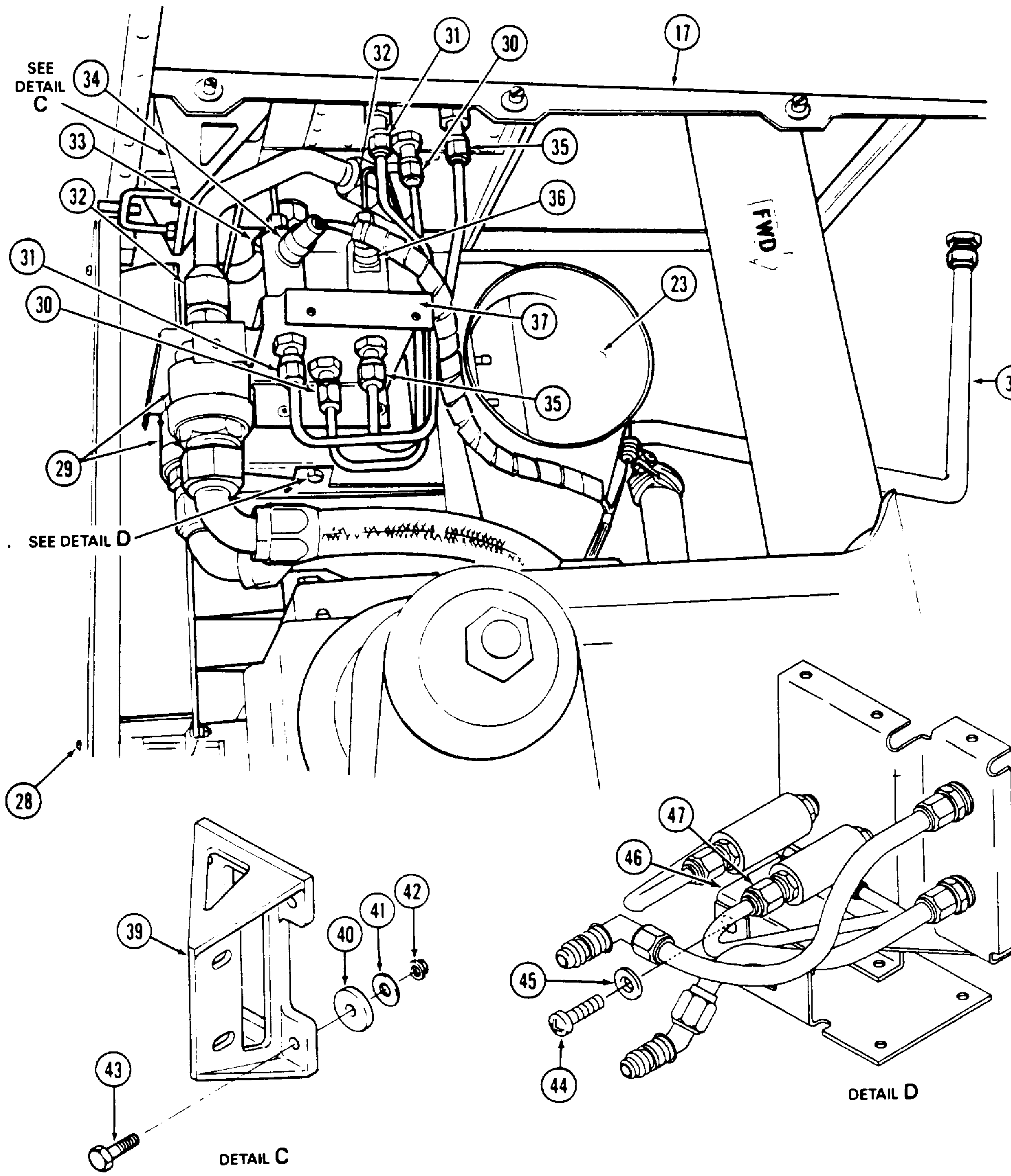
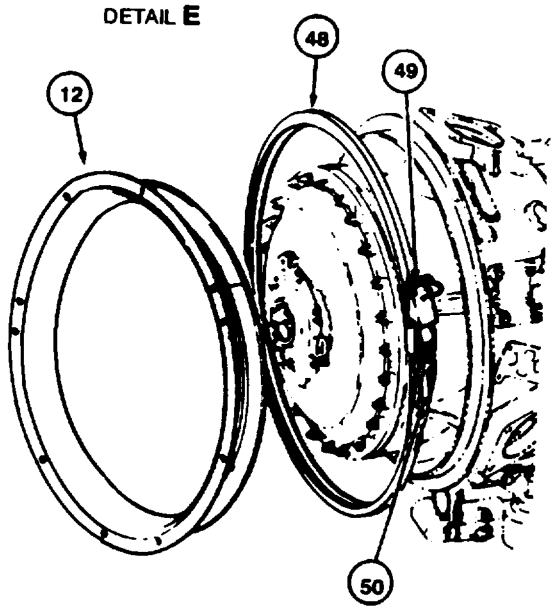


Figure 4-7.1. E M Centrisep Particle Separator Installation (After Incorporation of MWO 55-1520-236-50-12) (Sheet 2 of 3)



1. Forward baffle
2. Top baffle
3. Centrisep particle separator
4. Deleted
5. Turnbuckle
6. Plate
7. Deleted
8. Bypass door
9. Bellmouth seal flange (3 places)
10. Bolt (10 places)
11. Washer (10 places)
12. Engine bellmouth
13. Vortex tubes
14. Firewall fitting (2 places)
15. Nutplate (10 places)
16. Latch
17. Forward firewall
18. Clamp (top)
19. Flexible hose
20. Clamp (bottom)
21. Fastener (4 places)
22. Floor baffle
23. Scavenge ejector
24. Screw (3 places)
25. Nut
26. Washer
27. Bolt
28. Screw (2 places)
29. Oil hose quick disconnect
30. Tube
31. Tube
32. Tube
33. Tube
34. Plug
35. Tube
36. Plug
37. Bracket
38. Tube
39. Firewall fitting
40. Shim
41. Washer
42. Nut
43. Bolt
44. Screw
45. Washer
46. Bracket assembly
47. Tube
48. Clamp
49. Clamp latch
50. Nut

Figure 4-7.1. E M Centrisep Particle Separator Installation (After Incorporation of MWO 55-1520-236-50-12) (Sheet 3 of 3)

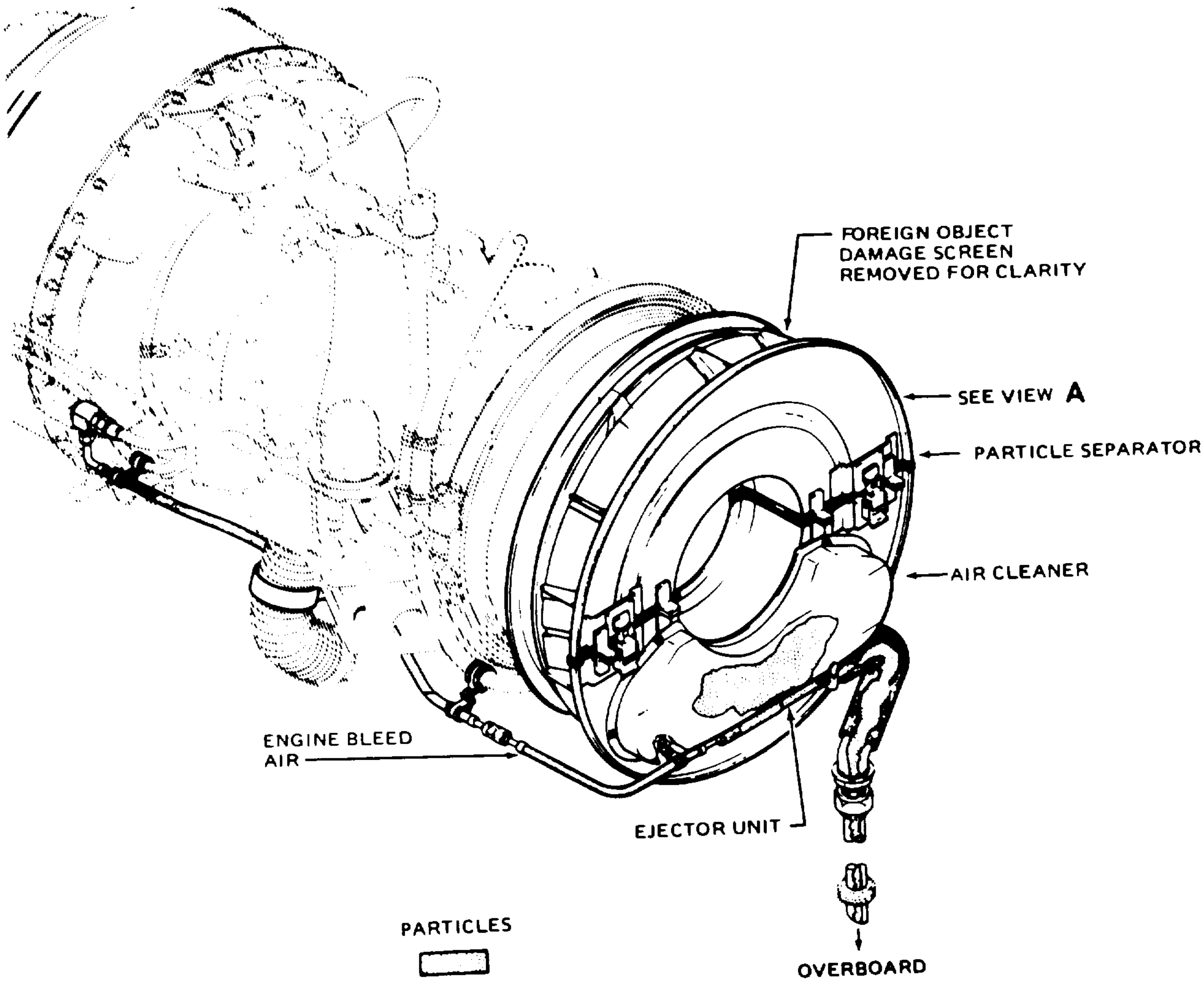


Figure 4-8. Particle Separator – Air Flow Diagram (Prior to Incorporation of MWO 55-1520-236-50-12)
(Sheet 1 of 2)

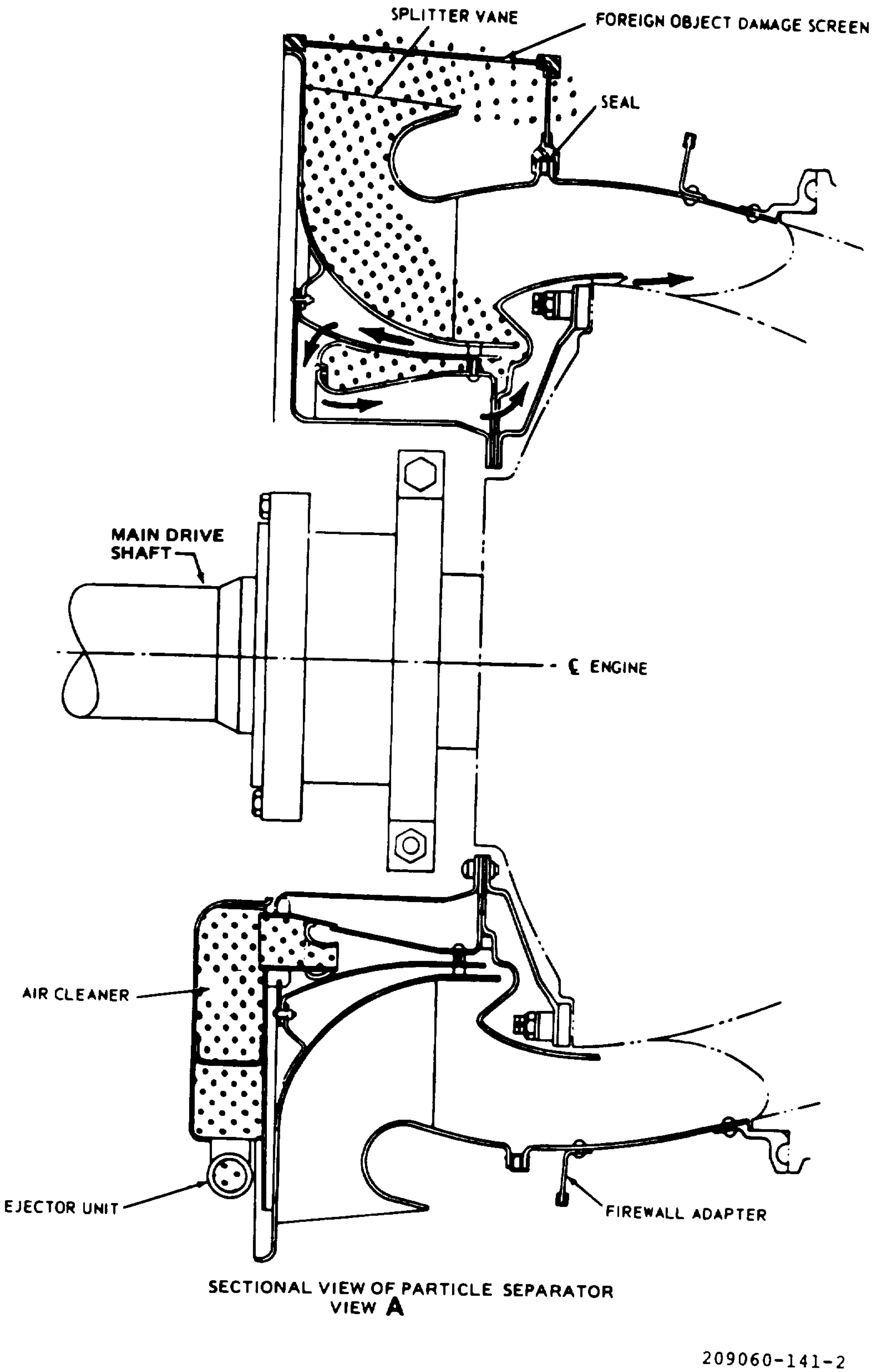


Figure 4-8. Particle Separator -Air Flow Diagram (Prior to Incorporation of MWO 55-1520-236-50-12) (Sheet 2 of 2)

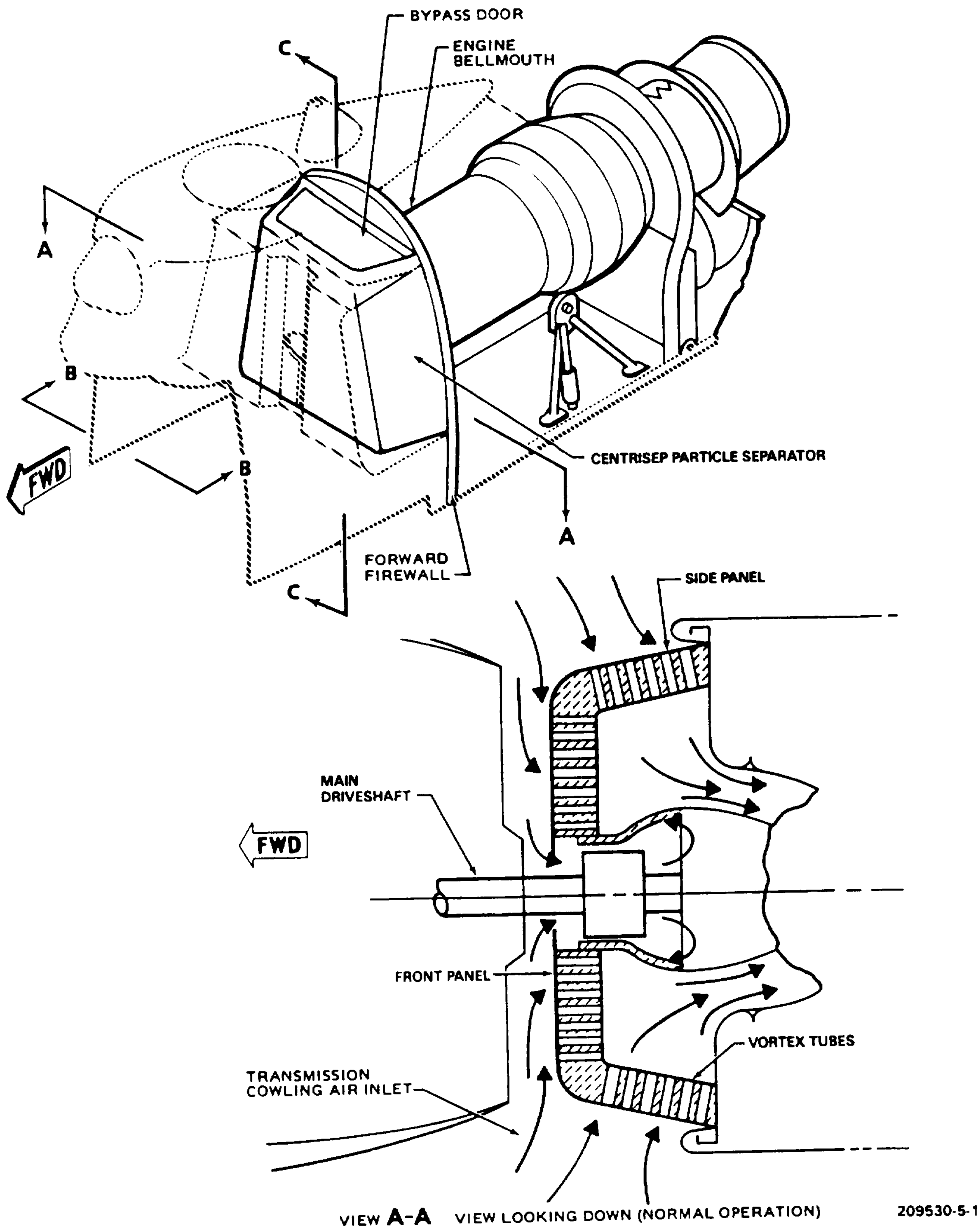


Figure 4-8.1. E M Centrisep Particle Separator – Air Flow Diagram (After Incorporation of MWO 55-1520-236-50-12) (Sheet 1 of 2)

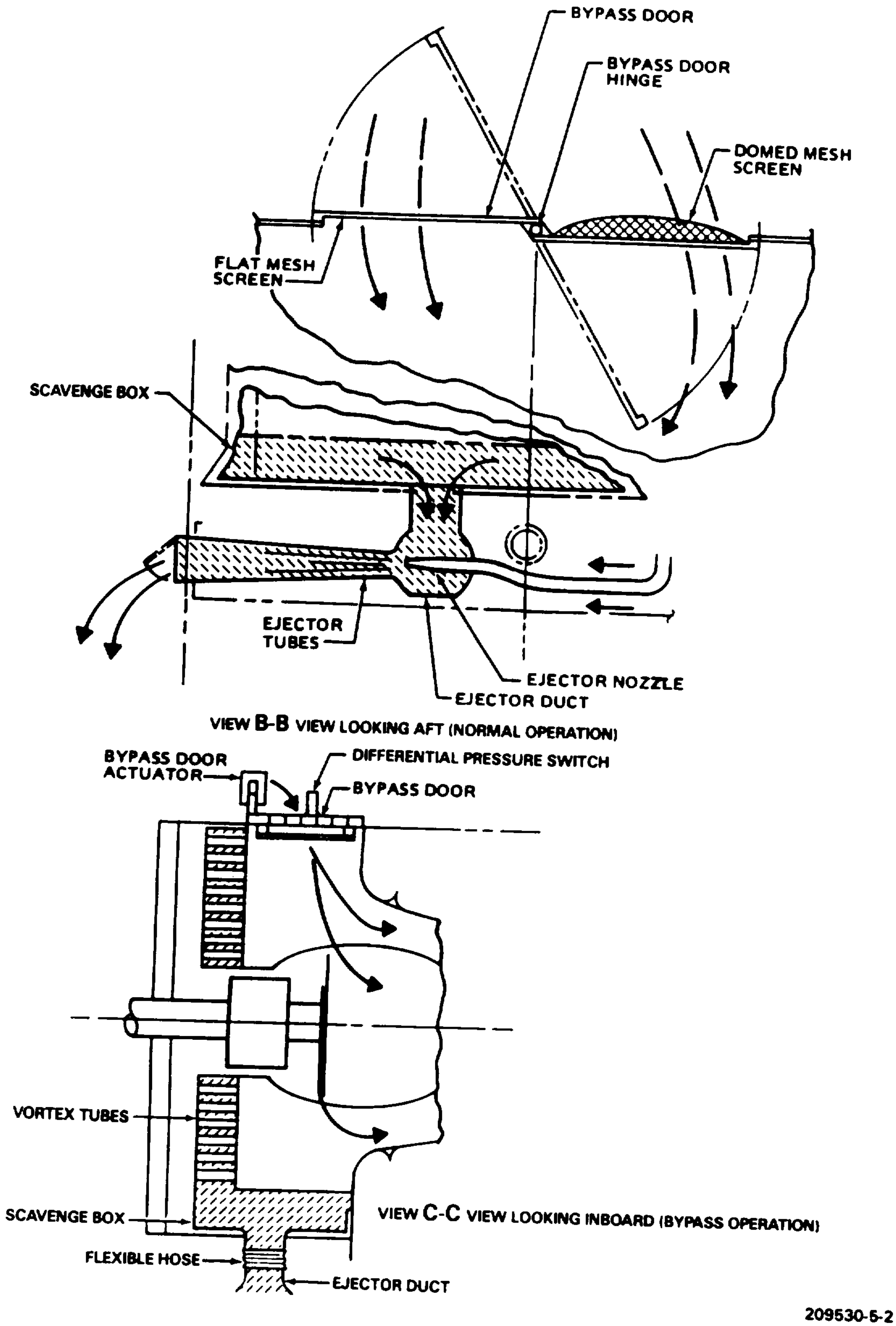


Figure 4-8.1. E M Centrisep Particle Separator – Air Flow Diagram (After Incorporation of MWO 55-1520-236-50-12) (Sheet 2 of 2)

4-30. INSPECTION – PARTICLE SEPARATOR. (PRIOR TO INCORPORATION OF MWO 55-1520-236-50-12)

a. Inspect seal (5, figure 4-9) on flange assembly (7) for tearing and/or ripping at the edges and for lack of adhesion.

b. Inspect gasket (8) on each side of flange assembly (7) for lack of adhesion.

c. Inspect gasket assembly (26) for a permanent set and lack of adhesion.

d. Inspect all metal surfaces for cracks or other damage.

e. Inspect for loose or missing rivets. If rivets are loose or missing in upper or lower air filter half (2 or 14) perform FOD inspection. Replace the alr filter half or repair in accordance with paragraph 4-31.

f. Inspect for weld cracks *or* weld separation, particularly in the area of the inlet vanes in both upper and lower air filter halves. If cracks or separation is evident, replace affected air filter half or repair in accordance with paragraph 4-31.

g. Inspect for damaged or inoperable air filter latches (1, 15, 16 and 22), damaged positionlng pins (23), and angle brackets (28). If damage is evident replace the affected air filter half or repair in accordance with paragraph 4-31.

h. Inspect air cleaner (19) for evidence of erosion

i. Inspect all other parts for evidence of erosion. Replace damaged parts.

4-30.1. E M SPECTION – CENTRISEP PARTICLE SEPARATOR. (AFTER INCORPORATION OF MWO 55-1520-236-50-12)

a. Inspect centrisep particle separator (3, figure 4-7.1) as follows:

(1) Inspect all visible vortex tubes (13) for looseness, broken or missing pieces, displacement, and rotation.

(2) Inspect centrisep particle separator (3) for structural damage or serious deformation of surfaces, particularly the rim of the hole in inlet panel. Ensure there are no cracks in structure or welds and no loose or missing rivets.

(3) Inspect for inoperable or missing latch (16)

(4) Inspect bypass door turnbuckle assembly (5) for security.

(5) Deleted.

(6) Inspect all fasteners (21) for damage or security.

(7) Inspect all nutplates (15) for damage and security.

(8) Inspect rubber gaskets for tears or delamination.

(9) Inspect bypass screen and seals for damage and security.

b. Inspect scavenge ejector (23), ejector tubes. and outboard connector for cracks and other damage.

4-31. REPAIR OR REPLACEMENT – PARTICLE SEPARATOR. (PRIOR TO INCORPORATION OF MWO 55-1520-236-50-12)

a. Repair loose seal and gaskets as follows:

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(1) Repair loose gasket (8, figure 4-9) by recementing gasket to mounting flange assembly with cement (C14). Clean mating surfaces with MEK (C74).

(2) Repair loose gaskets (13 and 26, figure 4-9) by recementing gaskets to mating surface with adhesive (C12). Clean mating surfaces with MEK (C74). Adhesive should be cured at a temperature of 75 degrees F (24 degrees C) or higher. If temperature is below 75 degrees F (24 degrees C), double the amount of cure time to each 12 degrees F (7 degrees C) below 75 degrees F (24 degrees C). Do not attempt to cure adhesive at temperatures below 50 degrees F (10 degrees C).

TYPICAL:

Temperature Degrees F	Degrees C	Cure Time Hours
75	24	4
63	17	8
51	11	16

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(3) Repair loose seal (5, figure 4-9) by recementing seal to mating surface, using adhesive (C13). Clean mating surfaces with trichloroethylene (C132) and then with MEK (C74).

b. Replace damaged gaskets (13) as follows:

(1) Remove defective gasket (13) and old adhesive from deflector assembly (12).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

NOTE

Do not install nut (20) and washer (21) at 6 o'clock position.

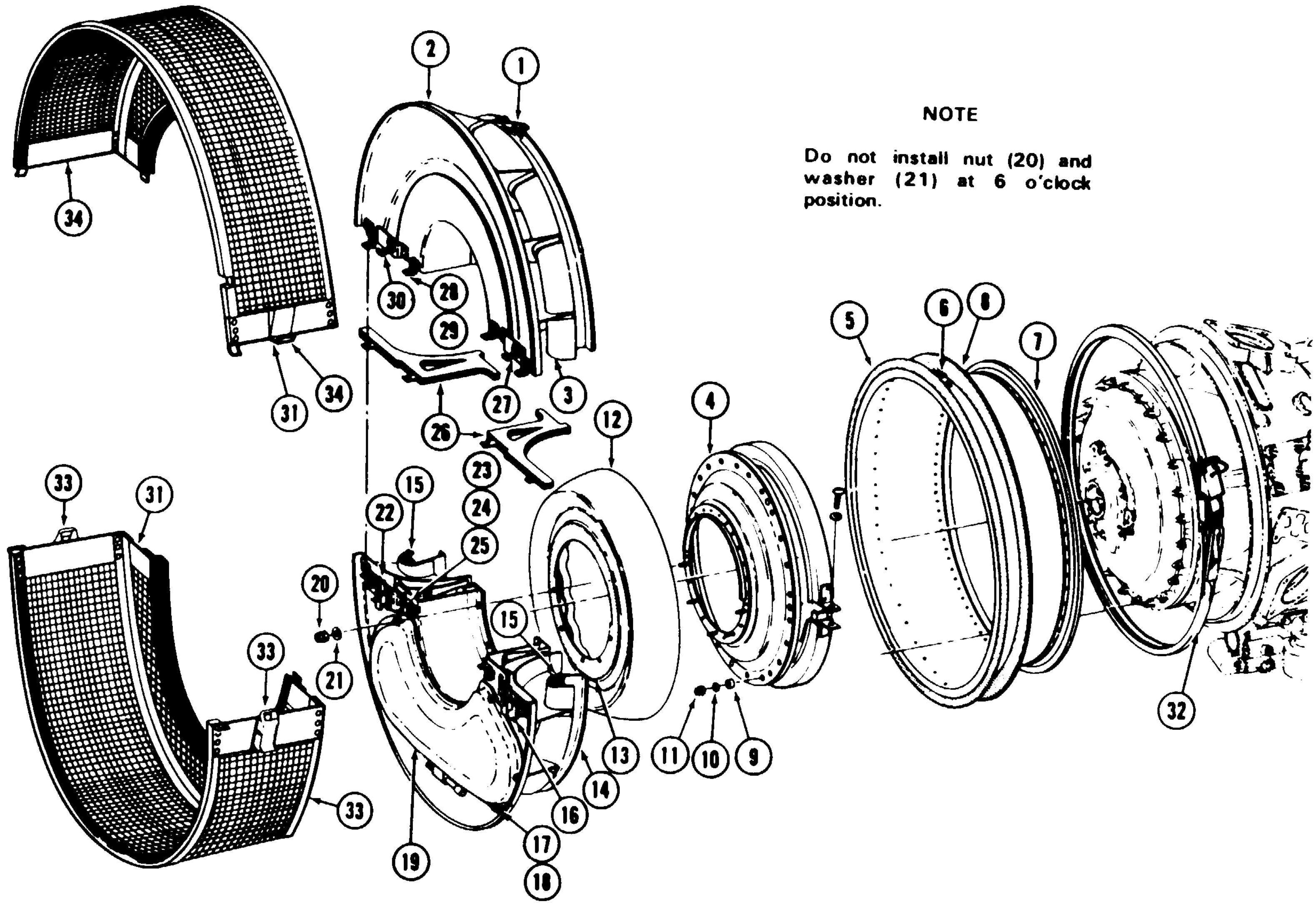


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Figure 4-9. Particle Separator — Exploded View (Prior to Incorporation of MWO 55-1520-236-50-12) (Sheet 1 of 2)

1. Latch
2. Upper assembly half
3. Hook
4. Mounting ring assembly
5. Seal
6. Hook assembly
7. Mounting flange assembly
8. Gasket
9. Sleeve spacer
10. Washer
11. Nut
12. Deflector assembly
13. Gasket
14. Lower assembly half
15. Latch
16. Latch assembly (RH)
17. Nut
18. Washer
19. Air cleaner
20. Nut
21. Washer
22. Latch assembly (LH)
23. Positioning pin
24. Angle bracket
25. Spacer
26. Gasket assembly
27. Hook assembly
28. Angle bracket
29. Spacer
30. Hook assembly
31. FOD screen
32. V band clamp
33. Latch
34. Hook

209900-857-2A

Figure 4-9. Particle Separator – Exploded View (Prior to Incorporation of MWO 55-1520-236-50-12) (Sheet 2 of 2)

(2) Wipe all metal surfaces to be bonded with cheesecloth (C30) moistened (not dripping) with MEK (C74). Continue wiping surface changing cheesecloth (C30) frequently, until cheesecloth (C30) remains clean,

NOTE

All grease, oil, or other surface contaminants must be removed from the bonding surface.

(3) Using clean, stiff brush, remove contaminants from surface of new gasket. Porous surfaces which have been contaminated with oil or grease cannot be satisfactorily cleaned to ensure proper bonding. Discard oil or grease contaminated gaskets.

(4) Using clean applicator, apply a continuous film of adhesive (C12) to surfaces to be bonded.

(5) Allow adhesive to air-dry for 10 TO 15 minutes at 75 degrees F (24 degrees C) or above. Check adhesive by touching with finger. When adhesive will adhere to finger but not transfer, apply a second uniform, continuous film of adhesive to air-dry to the same degree as the first coat.

(6) When second coat of adhesive has air-dried until tacky, install gasket on deflector assembly (12, figure 4-9). Align surfaces to be bonded to obtain contact over entire surface. Press down on gasket to ensure that all air is expelled and that the gasket is in full contact with the metal.

(7) Apply light pressure load to surfaces being bonded. Allow adhesive to cure under this pressure for a minimum of 4 hours at 75 degrees F (24 degrees C) or above. If temperature is below 75 degrees F (24 degrees C) double the amount of cure time for each 12 degrees F (7 degrees C) below 75 degrees F (24 degrees C). Do not attempt to cure adhesive at temperatures below 50 degrees F (10 degrees C).

TYPICAL:

Temperature		Cure Time
Degrees F	Degrees C	Hours
75	24	4
63	17	8
51	11	16

c. Replace damaged seal (5, figure 4-9) on flange assembly (7) as follows:

(1) Remove defective seal. Remove old adhesive film from metal surfaces with a knife blade, Then use a wire brush or sandpaper (C102).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(2) Wipe metal surfaces to be bonded with cheesecloth (C30), moistened (not dripping) with trichloroethylene (C132) followed by MEK (C74). Continue wiping, changing cheesecloth frequently, until cheesecloth remains clean.

CAUTION

To ensure proper bonding of seal, ensure that all grease, oil, or other surface contaminants are removed.

NOTE

Determine whether new seal (5) is proper size by fitting it to metal mating flange of flange assembly. Do not stretch seal when installing it for fit. If the seal is too large, it may have developed an oversize set during shipment. If so, cut the seal (5) to the required circumferential length and adhere as a strip with the "butt joint" located at either the 6-or 12-o'clock position.

(3) Using sandpaper (C102), roughen seal surfaces to be bonded.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(4) Using cheesecloth (C30), thoroughly clean all surfaces to be bonded with trochloroethylene (C132).

(5) Apply a uniform layer (0.01 TO 0.03 inch thick) of adhesive (C13) to surfaces to be bonded.

(6) Fit seal (5) to flange of the flange assembly and press surfaces together.

NOTE

Use only enough pressure to displace air but not so much that the adhesive is forced out of the joint.

(7) Allow adhesive to cure undisturbed.

NOTE

Under light pressure, the adhesive will take 24 hours to cure. Under warm, damp conditions the adhesive may cure sufficiently in 4 hours to permit reinstallation of flange assembly (7).

d. Replace damaged gasket (8, figure 4-9) on each side of support of flange assembly (7) as follows:

WARNING

Cleaning solvent is flammable and toxic, Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(1) Remove gasket material.

(2) Wipe metal surfaces to be bonded with cheesecloth (C30) moistened (not dripping) with MEK (C74). Continue wiping and changing cheesecloth frequently, until cheesecloth remains clean.

CAUTION

For proper bonding of gasket, ensure that all grease, oil, and other surface contaminants are removed.

(3) Fit new 0.047 inch thick gasket (8) to flange assembly (7).

(4) Using sandpaper (C102) roughen surface of gasket to be bonded.

(5) Wipe all gasket surfaces to be bonded with cheesecloth (C30) moistened (not dripping) with MEK (C74) to remove all powder and surface contaminants. Allow gasket (8) to dry for 15 minutes,

(6) Apply a continuous uniform film of cement (C28) to both metal and rubber surfaces to be bonded. Allow approximately 2 TO 3 hours drying time,

(7) Wipe the surface of one adhesive film with cheesecloth (C30) moistened with MEK (C74), one section at a time. The reactive surface should immediately become tacky,

(8) Align mating surfaces, one section at a time to obtain contact over entire surface, and press tacky

surface to dry surface. Allow adhesive to cure under light pressure for a minimum of 4 hours.

e. Replace air cleaner (19, figure 4-9) as follows:

(1) Remove six nuts (17) and six washers (18). Remove air cleaner (19) from lower air filter half (14).

(2) Position new air cleaner (19) on lower air filter half (14) and secure with six washers (18) and six nuts (17). Torque nuts 30 TO 35 inch-pounds.

f. Repair nonconverging cracks by stopdrilling crack ends. Where necessary to prevent air leakage, seal with tape or silicone rubber, RTV (C100).

g. Use rivets or tack welds to patch-repair converging cracks. Follow standard airframe sheet metal repair procedures.

NOTE

Any standard aluminum aircraft rivets, including Huck, Cherry, etc., of proper size may be used for all rivet repairs.

h. Patch-repair punctures too large to repair with silicone rubber. Follow standard airframe sheet metal repair procedures. Secure patches with rivets or tack welds.

i. Repair torn tack and spot welds with tack, interrupted, or plug weld repairs; use doublers as needed (figure 4-10). Rivet repairs, using doublers as needed, are acceptable.

j. Repair serious erosion damage by replacing damaged parts or using doublers.

k. Reshape deformed parts if feasible. If reasonable conformity cannot be achieved, particularly at mating edges, sealing surfaces, etc., replace part.

i. Replace damaged latches (15, 16, and 22, figure 4-9) on lower air filter half (14) as follows:

NOTE

The tape (C118) between hardware items and air filter half must be replaced if damaged during removal of hardware.

(1) Remove two rivets and remove latch.

2) Assemble upper and lower air filter halves (2 and 14) without gaskets (26) installed between halves.

(3) Position latch on lower assembly half in line with hook or upper assembly half. Mark lines to position latch.

(4) Separate assembly halves.

(5) Position latch on lower air filter half (14) within marked lines, and drill 0.128 TO 0.133 inch holes for rivets.

NOTE

If rivet holes are elongated during driliing or if new holes are drilled, back up sheet metal with douber before riveting.

(6) Secure latch with two rivets.

m. Replace damaged positioning pins (23) or angle brackets (28) on lower air filter half as follows:

(1) Remove rivets, bracket (28), and spacer (29).

(2) Assemble upper and lower air filter halves without gaskets.

(3) Position spacer and bracket on lower assembly half in line with bracket on upper air filter half. Top of bracket will be slightly higher than the edge of the air filter half. Mark lines to position spacer (29) and bracket (28).

(4) Separate assembly halves.

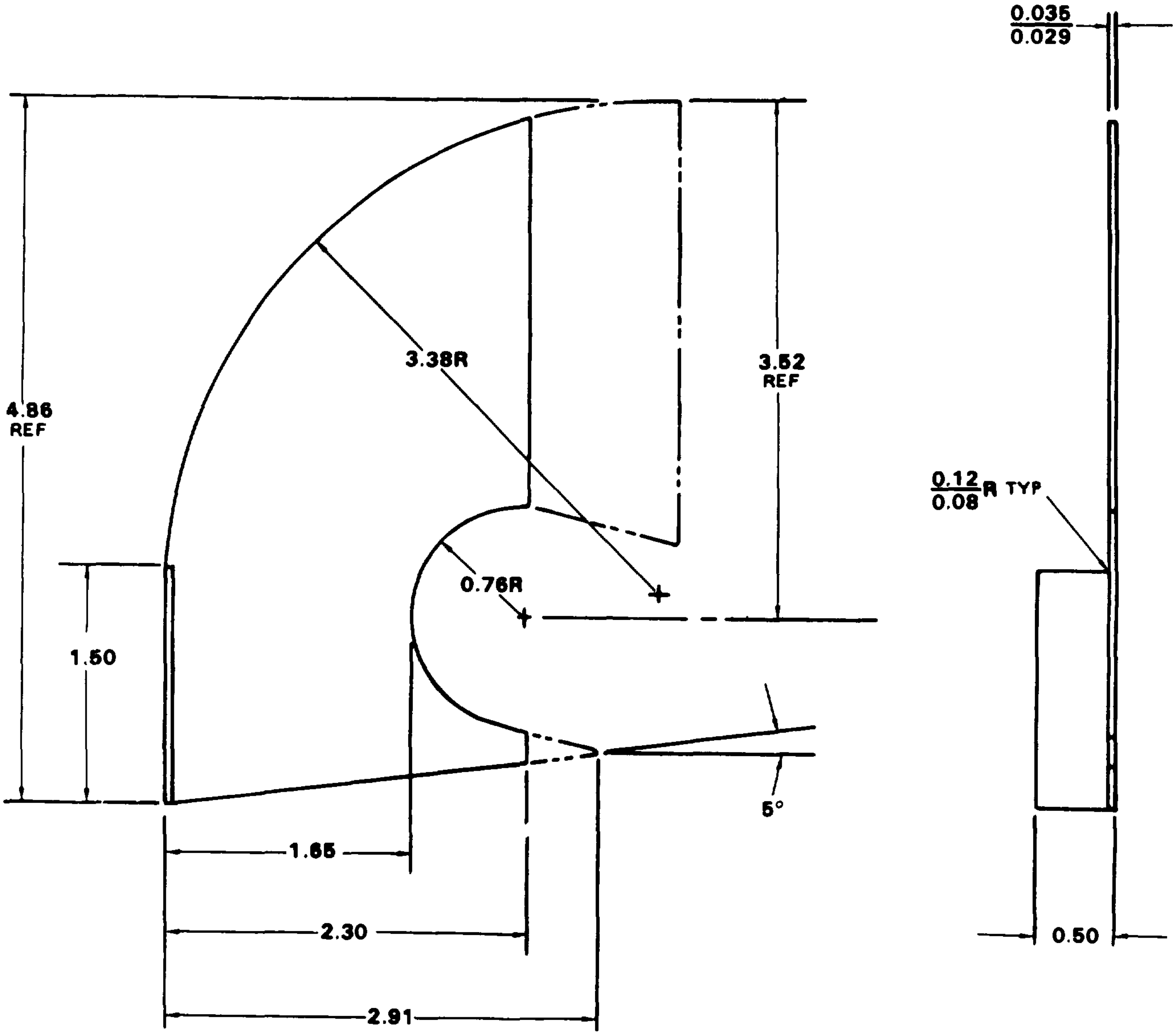
(5) Position spacer (29) and bracket (28) within marked lines and drill two 0.128 TO 0.133 inch holes for rivets.

NOTE

Use teflon tape (C118) between spacer (29) and bracket (28).

(6) Secure bracket (28) to spacer (29) with two rivets.

(7) Align assembly halves and identify center of bracket in line with hole of bracket on upper air filter half (2).



ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

MATERIAL: 6061-T6 ALUM (ITEM 17, TABLE 2-2)

209900-474B

Figure 4-10. Inlet Vane Reinforcement Doubler — Fabrication

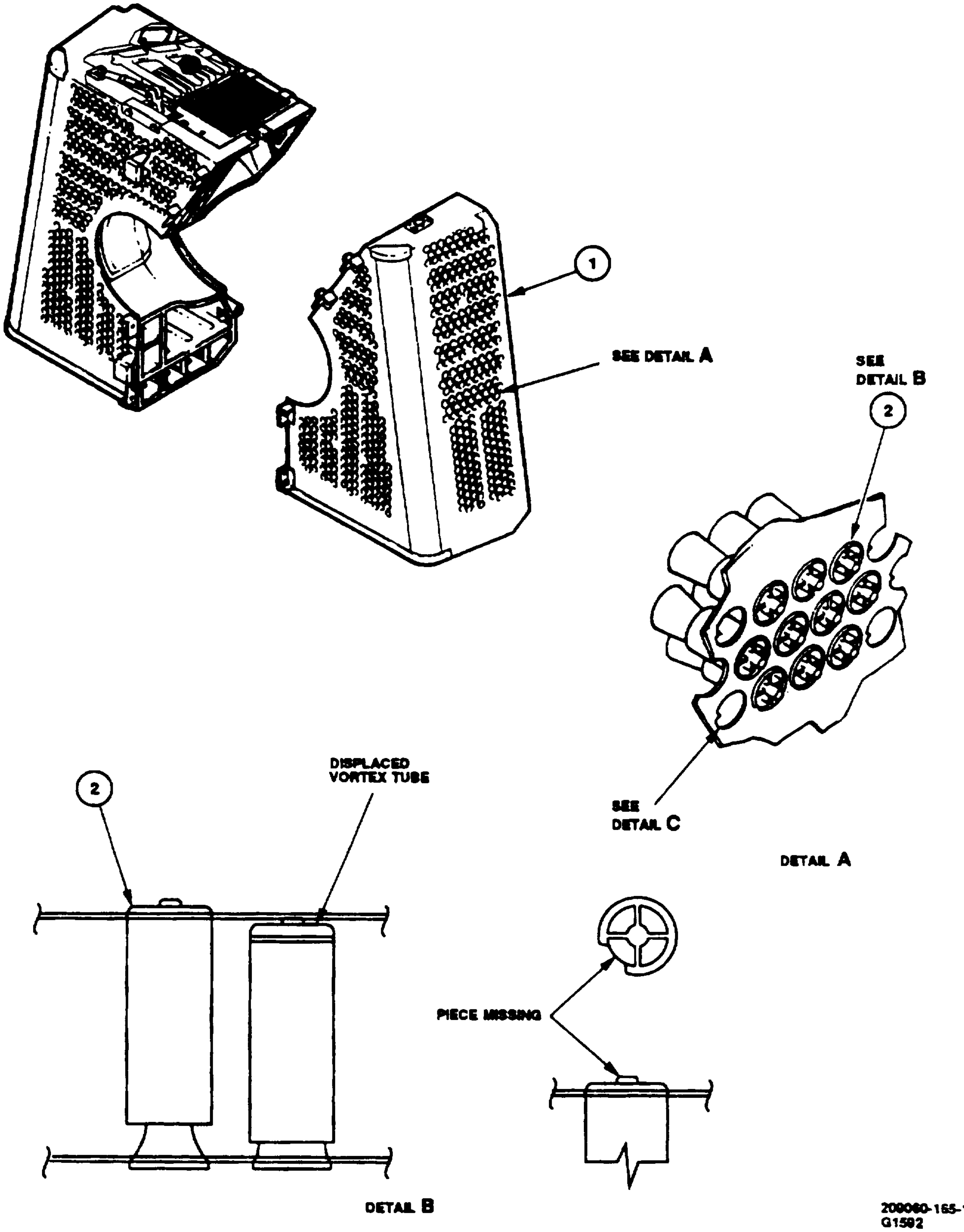
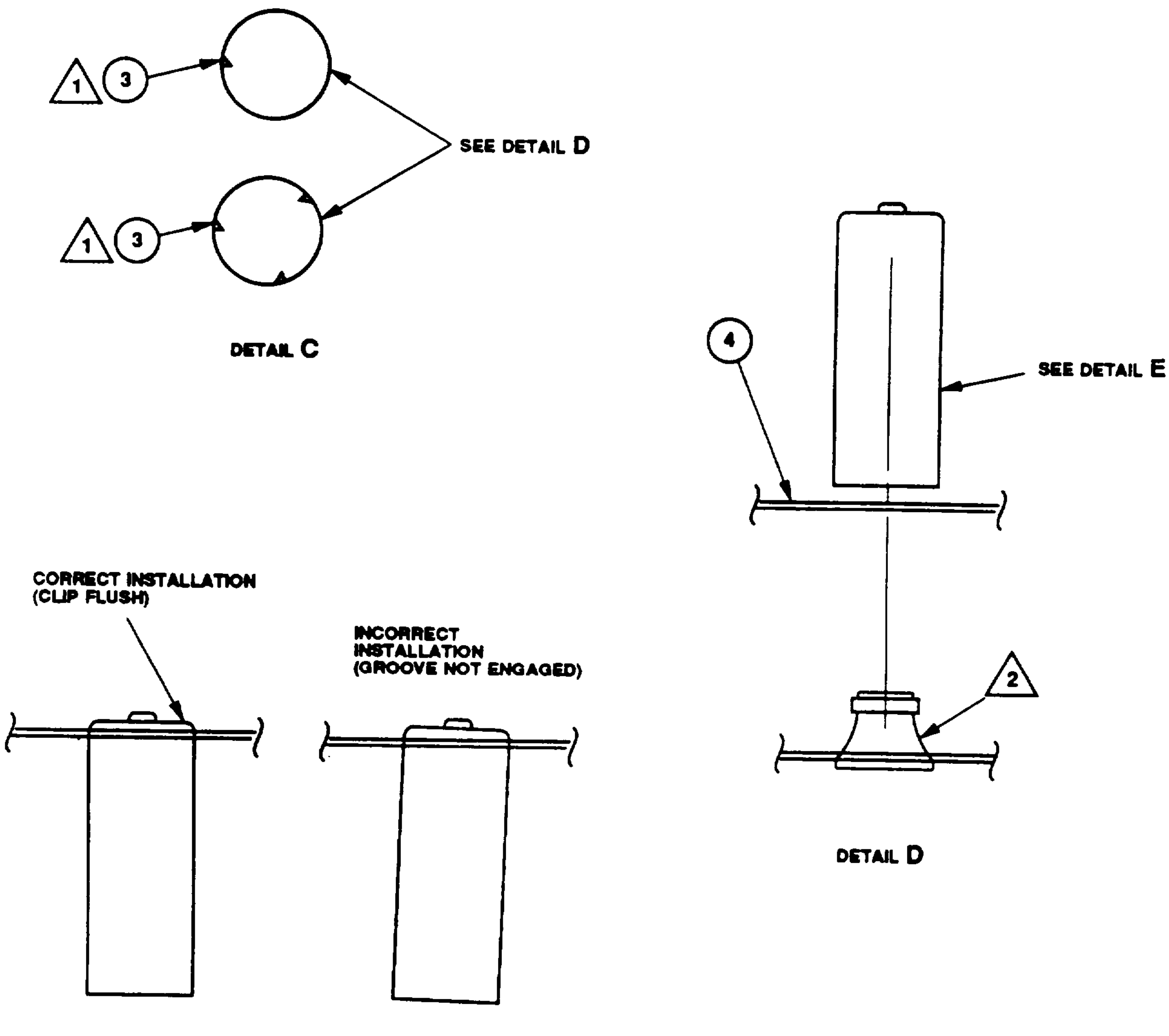


Figure 4-10.1. E M Centrisep Particle Separator - Repair/Replacement (After Incorporation of MWO 55-1520-236-50-12) (Sheet 1 of 2)



DETAIL E

1. Centrisep particle separator
2. Vortex tube
3. Notched vortex tube hole
4. Inlet panel

NOTES

1 There are two types of notched holes possible in air cleaners.

2 Do not damage or touch fixed tube during replacement.

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Figure 4-10.1. E M Centrisep Particle Separator – Repair/Replacernant (After Incorporation of MWO 55-1520-236-50-12) (Sheet 2 of 2)

(8) Drill a 0.250 TO 0.252 inch hole through bracket.

(9) (AVIM) Install new pin in bracket, and tack weld in two places, 180 degrees apart.

n. (AVIM) Replace new pin in bracket, and tack assembly half as follows:

(1) Remove rivets, and remove hook.

(2) Assemble upper and lower air fitter halves (2 and 14, figure 4-9) without gasket (26) assemblies.

(3) Position hook (30) on upper air filter half (2) in line with latch (22) on lower air filter half (14). Mark lines to position.

(4) Separate assembly halves.

(5) Position latch (22) within marked lines and drill 0.128 TO 0.133 inch holes for rivets.

NOTE

Use Teflon tape (C118) between hook (30) and mounting surface.

NOTE

If rivet holes are elongated during drilling or if new holes are drilled, back up sheet metal with doubler before riveting.

(6) Secure hook (27) with two rivets.

4-31.1. E M REPAIR OR REPLACEMENT–CENTRISEP PARTICLE SEPARATOR. (AFTER INCORPORATION OF MWO 55-1520-50-12)

a. Swirl tubes are divided into four groups, one on each side of the centrisep particle separator, and two on front side, separated by the parting surface. Fifty percent of the swirl tube tips are authorized to be missing from each group before replacement of any swirl tubes are required.

a.1. Replace particle separator that have 50% of swirl tube types missing from any one group or required 10% replacement of total particle separator tubes or group of 10 or more required replacement for other than missing tips.

b. Replace vortex tubes using repair kit (C143).

CAUTION

Pulling the vortex tube with excessive force will cause damage to the thin gauge sheet metal inlet panel.

CAUTION

The integrity of vortex tube hole notch (detail C) must be maintained to keep the repair tube from rotating.

NOTE

Should the vortex tube hole or hole notch In the inlet panel be enlarged or damage the air cleaner must be returned to manufacturer for overhaul.

(1) Remove remains of damaged vortex tube (2, figure 4-10.1, detail B) from centrisep particle separator (1) by carefully gripping the center of the vortex tube with needle nose pliars and twisting to break the tube into pieces.

NOTE

A shop towel is recommended for thumb protection and ease of inserting tube.

(2) Position the repair tube in vacant hole (Detail D), push tube through the hole using thumb pressure until groove in the tube OD engages the inlet panel (4). The repair tube is considered property installed when the groove on the repair tube fully engages with inlet panel hole (see detail E).

(3) Check for proper installation of repair tube as shown in detail E. The groove in the repair tube must fully engage the inlet panel. The repair tube must be tight and should not rotate or appear loose.

(4) Inspect engine inlet.

Replace flexible hose (19, figure 4-7.1) and scavenge ejector (23).

4-32. INSTALLATION – PARTICLE SEPARATOR. (PRIOR TO INCORPORATION OF MWO 55-1520-236-50-121

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

a. Wipe engine inlet housing clean with clean cloth moistened with dry cleaning solvent (C112).

b. Remove nuts (11, figure 4-9), washers (10), and sleeve spacers (9). Install ring assembly (4) with five studs of ring assembly positioned at the bottom, and with the center stud located at the 6 o'clock posltlon.

c. Secure ring assembly (4), with twenty-four sleeve' spacers (9), washers (10), and nuts (11). Torque nuts 70 TO 80 inch-pounds.

NOTE

Leave flange assembly (7) loose enough to be rotated.

d. Posltlon flange assembly (7) in front of airframe firewall and on engine inlet housing. Retain flange assembly loosely with V-band clamp assembly (32) and on firewall with former assemblies.

e. Position deflector assembly (12) over locating pins and studs on ring assembly (4) and press in until firmly seated.

f. Secure hose assembly (3, figure 4-7) to ejector unit inlet with clamp before installing lower air filter half (14, figure 4-9) and push hose onto discharge port of air cleaner.

NOTE

Washer (21) and nut (20), may be omitted from 6 o'clock position of ring assembly (4) to eliminate having to remove main driveshaft at next particle separator removal.

g. Position lower air filter half (14) on locatlng pins and studs on ring assembly (4) Secure with washers (21) and nuts (20). Torque 30 TO 35 inch-pounds

h. Connect nut of hose assembly to fitting on foward firewall and connect hose to elbow on lower baffle.

i. Install curvic coupling in output shaft of engine and Install main drlveshaft (paragraph 6-16)

j. Install lower half FOD (foreign object damage) screen (31). Refer to paragraph 4-38.

k. Position gasket assembly (26) over positioning pins (23) (R/H and L/H) side of lower air filter half (14).

l. Position upper air filter half (2) on lower half (14),

Rotate flange assembly (7) on engine inlet housing to align mounting bracket (hook) (6) with latch (1) on upper air filter half (2).

NOTE

Install V-band clamp assembly (32) with clamp latch on left side of engine and gap (drain) at the 6 o'clock position.

n. Secure flange assembly (7) with V-band clamp (32). Tap around V-band clamp from middle toward each end with a soft-faced mallet to seat properly. Torque V-band clomp nut 40 TO 50 inch-pounds. Lockwire V-band clamp latch per TM 55-2840-229-23.

CAUTION

Ensure that safety catch on latches is engaged by exerting a slight pull on release catch. Catch should not open.

o. Secure alr filter latches (1, 15, 16, and 22).

p. Check for proper seating of seals by appearance, Approximately 1/8 inch of rubber on gaskets (26) will be uniformly exposed. Seal (5) on flange assembly wlll be approximately half way compressed.

q. Install upper FOD screen (31). Refer to paragraph 4-38. Secure upper and lower FOD screens with latches (33).

r. Install baffle panels forward of firewall (paragraph 2-128).

4-32.1. E M I INSTALLATION – CENTRISEP PARTICLE SEPARATOR. (AFTER INCORPORATION OF MWO 55-1520-236-50-12)

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin and eyes.

a. Wipe engine inlet housing with dean cloth moistened with dry cleaning solvent (C112). Wipe dry before solvent evaporates.

a.1. Using v-bond damp (49, figure 4-7.1) install bellmouth (12) leave damp loose to position bellmouth assembly when installing particle separator.

Position scavenge ejector (23, figure 4-7.1) in place.

c. Install tube (38) to back side of scavenge ejector (23), and forward firewall.

d. Install screws (28) in scavenge ejector (23)

e. Install bracket assembly (46) with attaching hardware on top of scavenge ejector (23) with four screws (44) and washers (45).

f. Install tubes (32 and 33) between fittings on firewall (17) and fittings on bracket (37).

Install tubes (30, 31, and 35) to fittings on firewall (17).

h. Install tube (47).

i. Install plugs (34 and 36).

j. Install firewall fitting (39) with bolts (43), shims (40), washers (41) and nuts (42).

k. Install floor baffle (22) forward and aft sections over top of scavenge ejector (23) (paragraph 2-128.1).

l. Install flexible hose (19) with two loose damps (18 and 20) on scavenge ejector (23).

m. Position right side, centrisep particle separator (3) and connect flexible hose (19) to bottom.

n. Tighten flexible damps (18 and 20).

o. Install six bolts (10) and washers (11) through aft side of engine bellmouth (12) and bellmouth seal flanges (9) into nutplates (15) in aft side of centrisep particle separator (3).

p. Install right side firewall fitting (14) using bolts (27), washers (26) and nuts (25).

q. Position centrisep particle separator removable section (3) in line with centrisep particle separator fixed section (3) previously installed.

r. Install four washers (11) and bolts (10) through aft side of engine bellmouth (12) and bellmouth seal flange (9) into nutplates in centrisep particle separator.

s. Secure four fasteners (21) on forward left side of centrisep particle separator (3).

t. Secure latch (16).

NOTE

Install v-bond clamp assembly (48) with clamp latch on right side of engine and gap (drain) at the 6 o'clock position.

t.1. Secure bellmouth (12) with damp (48). Tap around damp from middle toward each end with soft-faced mallet to seat properly. Torque damp nut 40 to 50 inch-pounds. Lockwire damp latch per TM 55-2840-229-23.

CAUTION

Ensure that safety catch on latch is engaged by exerting a slight pull on release catch. Catch should not open.

u. Install baffles (1 and 2) (paragraph 2-128.1).

v. Connect oil hose quick disconnects (29).

Install center pylon left and right fairings (paragraph 2-82).

x. Close and secure transmission and engine cowling doors.

4-33. FOREIGN OBJECT DAMAGE SCREEN.

4-34. DESCRIPTION — FOD SCREEN.

The FOD screen is mounted on the forward side of the particle separator and prevents large foreign objects from entering particle separator.

4-35. REMOVAL — FOD SCREEN.

a. Remove top half of FOD screen (31, figure 4-9) from the particle separator as follows:

(1) Unlock both latches (33).

(2) Disengage hook (34) portions.

(3) Lift screen free of the particle separator.

b. If required. remove upper air filter half of particle separator paragraph 4-28).

c. Remove bottom half of FOD screen (31) from the particle separator as follows:

(1) Lift forwardsplit portion of the butt molding (figure 4-11) free of the vane and hold in position.

(2) Repeat preceding steps (1) and (2) for opposite side.

(3) Withdraw bottom half of FOD screen (31) from under the particle separator.

4-36. INSPECTION - FOD SCREEN.

a. Inspect FOD screens (31, figure 4-9) for damage.

b. Inspect hook assemblies (34) on FOD screens for distortion and for secure installation.

c. Inspect latch assemblies (33) on FOD screens for damage as follows:

(1) Erosion or damage that may cause tightness or binding.

(2) Cracks.

(3) Loose or missing rivets.

d. Inspect aft molding (figure 4-11) for cuts or other damage.

4-37. REPAIR — FOD SCREEN.

a. Replace components that fail to meet inspection requirements of paragraph 4-36.

b. Reshape deformed parts, if feasible. If reasonable conformity cannot be obtained, replace either half or both as required.

c. Replace FOD small mesh screen.

(1) Cut screen (1560-AH-1-080-3) in half lengthwise (figure D-185).

CAUTION

Maximum allowable overlay is two mesh openings and 0.070 inch gap.

NOTE

To prevent overlaping of screen on back edges of FOD screen some wedge cuts in screen will be necessary.

(2) Line screen (1560-AH-1-080-3) along leading edge of FOD screen. Form screen to existing FOD screen.

(3) Using lockwire (C-137), secure one end and single wire lace every fifth opening along outer perimeter of screen (1560-AH-1-080-3) to existing FOD screen.

(4) Repeat steps (2) and (3) for other half of FOD screen.

d (AVIM) Replace damaged hooks (34, figure 4-9) on upper screen (31) as follows:

(1) Remove rivets and remove hook (34).

(2) Assemble upper and lower screens and position hook (34) in line with latch (33) on lower screen (31).

(3) Mark lines to position hook (34).

(4) Separate assembly halves.

(5) Position latch (33) within marked lines and drill 0.128 TO 0.133 inch holes for rivets.

NOTE

If rivet holes are elongated during drilling, or if new holes are drilled, back up sheet metal with doubler before riveting.

(6) Secure hook (34) with two rivets.

e. Replace damaged latches (33, figure 4-9) on lower screen (31) as follows:

(1) Remove rivets and latch (33).

(2) Assemble upper and lower screens and position latch (33) on lower screen (31) in line with hook (34) on upper screen.

(3) Mark lines to position latch (33).

(4) Separate assembly halves.

(5) Position latch (33) within marked lines and drill 0.128 TO 0.133 inch holes for rivets.

NOTE

If rivet holes are elongated during drilling or if new holes are drilled, back up sheet metal with a doubler before riveting.

(6) Secure latch (33) with two rivets.

4-38. INSTALLATION – FOD SCREEN.

CAUTION

Ensure integrity of repairs. Materials used to make repairs may be ingested by engine if not properly secured.

a. Position bottom half of the foreign object damage screen (31, figure 4-9), aft molding side toward engine inlet, under the particle separator so butt molding (figure 4-11) is approximately 2.25 inches below horizontal centerline, and aft molding is seated over the particle separator split flange.

CAUTION

Improper seating of the aft molding over the separator split flange can result in cuts or other damage to the molding as well as placing excessive stress on all positions of the screen and latches.

b. Check for proper seating by running hand along the lower split flange to ensure that the molded channel is properly fitted over both sides of the split flange (figure 4-11).

c. insert aft molding while holding butt molding away from the vane in the separator (steps I and II, figure 4-11).

d. Line up the slot in forward portion of butt molding with the vane over which it is to be fitted and press into place. (step iii, figure 4-11).

NOTE

When properly installed, the notched area of the butt molding should be positioned behind the particle separator inlet curl. The forward portion of the molding should have one part of the split on the top of the vane and one part underneath the vane as shown in figure 4-11.

e. if removed, install top half of the particle separator (paragraph 4-32).

f. Position top half of the FOD screen (31, figure 4-9) so as to engage the aft screen molding slot over the separator split flange. Position the screen cutout over the latch (1) at the 12-o'clock position of the separator.

NOTE

Both latches (33) must be engaged with the mating hooks (34) before closing either latch to a locked position.

g. Secure top half to the bottom by engaging and locking both latches (33).

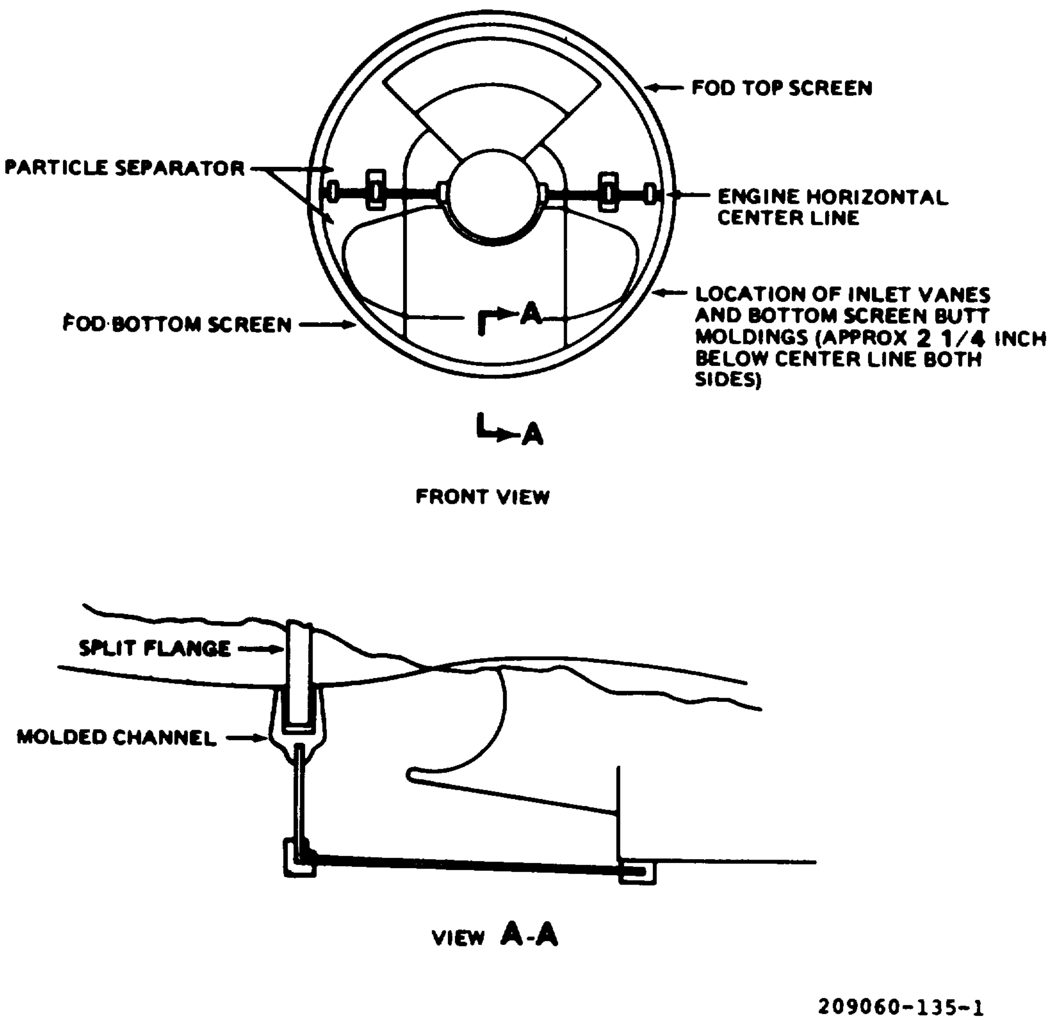


Figure 4-11. FOD (Foreign Object Damage) Screen Installation (Sheet 1 of 2)

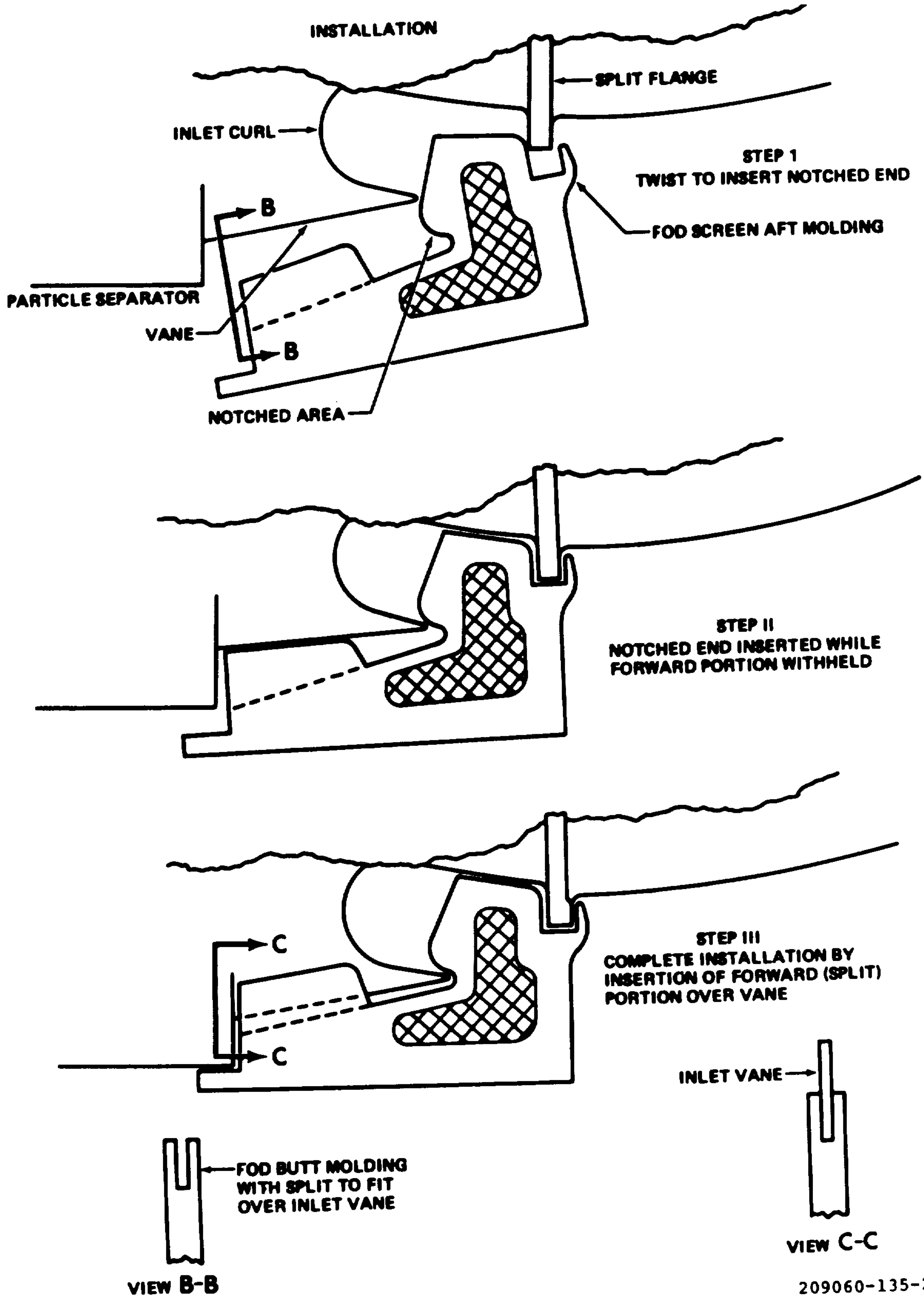


Figure 4-11. FOD (Foreign Object Damage) Screen Installation (Sheet 2 of 2)

SECTION IV. EXHAUST SYSTEM.

4-39. P E HAUST SYSTEM.

4-40. P E DESCRIPTION – EXHAUST SYSTEM.

The exhaust diffuser section on rear of the engine provides passage for gas flow from the combustion chamber. The exhaust passage is extended aft and slightly upward by a tailpipe and ejector assembly. A thermocouple assembly, mounted on the diffuser has probes in the exhaust stream to provide continuous indication through the exhaust temperature gage system. To aid in engine compartment cooling, a heat shield is mounted around the end of the diffuser, the tailpipe is covered by an insulation blanket, and the ejector surrounds the exhaust gas flow with a cooling air stream. The exhaust tailpipe and heat shield are mounted on flanges of the engine exhaust diffuser by V-bend clamps (figure 4-12).

4-41. P E REMOVAL – EXHAUST SYSTEM.

Premaintenance Requirements for Removal of Exhaust System

Condition	Requirements
Model	AH-1S P E
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C105), (C1 37)
Special Environmental Conditions	None

a. Disconnect drain lines from fittings on tailpipe and ejector.

b. Remove ejector and tailpipe fairing as follows:

(1) If ejector is attached to tailpipe, remove screws and washers at five sets of brackets to detach and remove ejector. Release fasteners along lower edge of fairing. Lift fairing rearward to remove.

(2) If ejector is attached to fairing, release fasteners and remove fairing with ejector attached. Detach ejector from fairing by removing screws and nuts at three mounting clips.

c. Loosen nuts to open V-band clamp which secures tailpipe to engine diffuser flange. Pull aft to disengage locating pins. Remove tailpipe.

d. Remove lockwire and unwrap insulation blanket from tailpipe.

e. Remove V-band clamp and heatshield from flange of diffuser support cone.

4-42. P E INSPECTION — EXHAUST SYSTEM.

a. Inspect tailpipe and ejector for cracks, dents, and burned out or buckled areas.

b. Inspect insulation blanket for visible damage.

c. Inspect heatshield for cracks and distortion.

4-43. P E REPAIR — EXHAUST SYSTEM.

a. Ejector (figure 4-12).

(1) Shallow dents and scratches may be disregarded.

(2) Cracks 3.0 inches or less in length maybe welded. Welds must be ground down as smooth as possible to match contour of ejector.

(3) Cracks in excess of 3.0 inches, tears or small bullet holes in any area of the ejector may be repaired by stop-drilling ends of each crack or tear and welding a patch of titanium, MIL-T-9046, Type 1, Composition C, over the crack or tear on both inside and outside of the ejector. Patch edge distance to be a minimum of 0.5 inch beyond stop-drill.

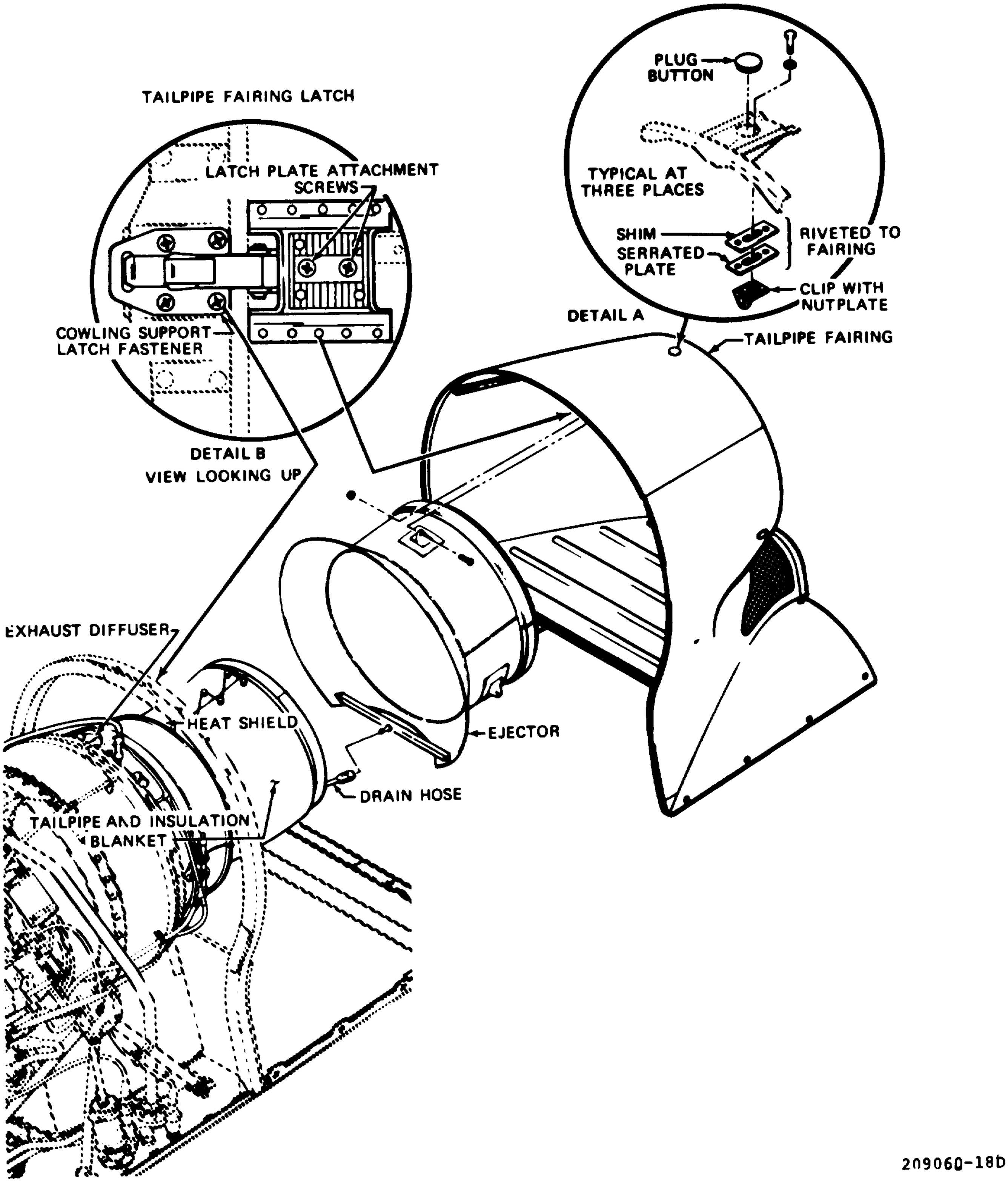


Figure 4-12. P f Exhaust System Components

(4) Cracks in the bellmouth-to-tube weld joint at angle bracket may be repaired and future cracking eliminated as follows:

(a) Remove angle bracket and spot-welded doubler. Fabricate a new doubler from titanium of same width but 0.5 inch longer than removed doubler. Position doubler so that it extends past cracked weld joint up onto bellmouth 0.6 inch. Form doubler to fit contour.

(b) Clean and reweld cracked joint. Grind weld smooth. Place new doubler in position and weld to assembly.

(c) Attach angle bracket per step (5) below, using rivet holes in ejector as a guide to drill through doubler.

(5) Replace brackets as follows:

(a) Drill out six rivets which attach angle to be repaired. Use rivet holes in ejector as a guide to align new angle, mark locations and drill six Number 30 (0.128) holes in angle.

NOTE

Prior to riveting new angle to ejector to tailpipe, align flange of new angle with flange of angle to tailpipe. Mark location for attachment bolt hole in new angle using mating hole in tailpipe angle as a guide. Maintain flat plane between the two angles within 0.020 inch TIR.

(b) Drill a number 1 (0.288) hole in angle flange at location determined in note above. Attach new angle to ejector with six rivets.

(6) Burned out parts or dents which cannot be smoothed out to original contour are cause for replacement.

b. Tailpipe.

(1) Scratches and shallow dents may be ignored.

(2) Cracks or tears in any area of the tailpipe may be repaired by stop-drilling ends of each crack and welding a patch of titanium over the crack or tear. The outside patch must have a 0.75 inch overlap of any damaged area. The inside patch must be approximately 0.50 inch larger than the outside patch in all dimensions (figure 4-13). The patch shall be welded on both inside and outside of the tailpipe. If the tailpipe ring is welded, care must be taken that the flange is filed or machined to a flat surface after welding to provide a flat seat against the attachment point on the engine.

(3) Burned out parts or damage greater than that which is repairable by patching is cause for replacement.

(4) Replace insulation blanket, if damaged.

c. Heat shield.

(1) Replace heat shield if cracks or distortion cannot be repaired or straightened.

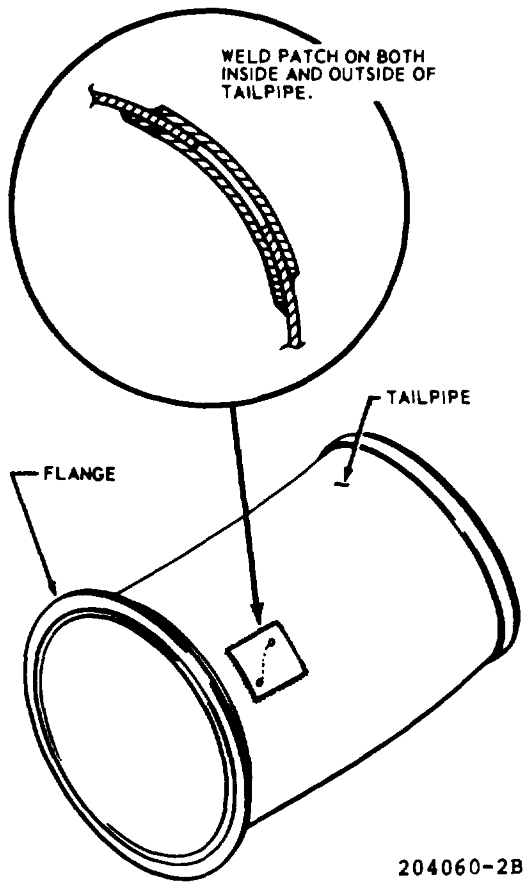


Figure 4-13. Engine Tailpipe Repair

4-44. P I INSTALLATION – EXHAUST SYSTEM.

a. Remove protective cover from engine exhaust diffuser.

b. Position tailpipe, with drain fitting down, on flange of exhaust diffuser, Make sure locating dowels are engaged, and that inside of pipe aligns with diffuser. Secure with V-bend clamp around mating flanges.

(1) Seat clamp by tapping with soft mallet from middle toward ends. Torque nuts 100 TO 130 inch-pounds.

(2) Check torque again after first ground run-Up.

c. If removed, install insulation blanket around tailpipe with joint at top. Secure with lockwire (C137) installed in zig-zag pattern (figure 4-12).

d. Position heat shield against flange of diffuser support cone. Secure with V-band clamp around matching flanges. Torque clamp nuts 40 TO 50 inch-pounds and safety clomp with lockwire (C138).

e. Install ejector and tailpipe fairing as follows:

CAUTION

Adjustment of latch mating fitting may be necessary to ensure proper closing of latch. Do not force latch closed. Slight tension shall remain on latch in the closed position.

(1) Place ejector into fairing, align clips and secure at three locations with screws and nuts. If necessary, remove plug buttons (detail A, figure 4-12) and loosen bolts to realign clips on serrated plates, tighten bolts, and reinstall plug buttons. Install fairing with attached ejector.

(2) Measure gap between tailpipe fairing engine cowl doors and pylon fairing, Inspect for a gap of 0.040 inch at the lower extremities of cowl components to a maximum of 0.190 inch at the top. If adjustment is necessary, proceed as follows:

(a) Loosen two attachment screws securing latch plate to tailpipe fairing bracket (detail B, figure 4-11). Latch shall remain fastened during adjustment.

(b) Adjust fairing to proper clearance, allowing serrated plate to self-adjust.

(c) After proper clearance is obtained, tighten two attachment screws.

f. Connect drain lines to fittings on tailpipe and ejector.

g. Seal all open areas between base of forward and/or aft firewall and engine deck (figure 4-14). Use sealant (C 105).

4-46. P I INFRARED (IR) SUPPRESSION SYSTEM.

4-46. P I DESCRIPTION — IR SUPPRESSION SYSTEM.

Some helicopters are equipped with an IR suppression system. This system includes an upturned, insulated exhaust duct assembly, an exhaust extension, and a forward duct assembly. For helicopters which do not have the system installed refer to paragraph 4-40.

Premaintenance Requirements For
IR Suppression System

Condition	Requirements
Model	AH-I S
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	Two
Consumable Materials	(C14), (C74), (C112), (C97)
Special Environmental Conditions	None

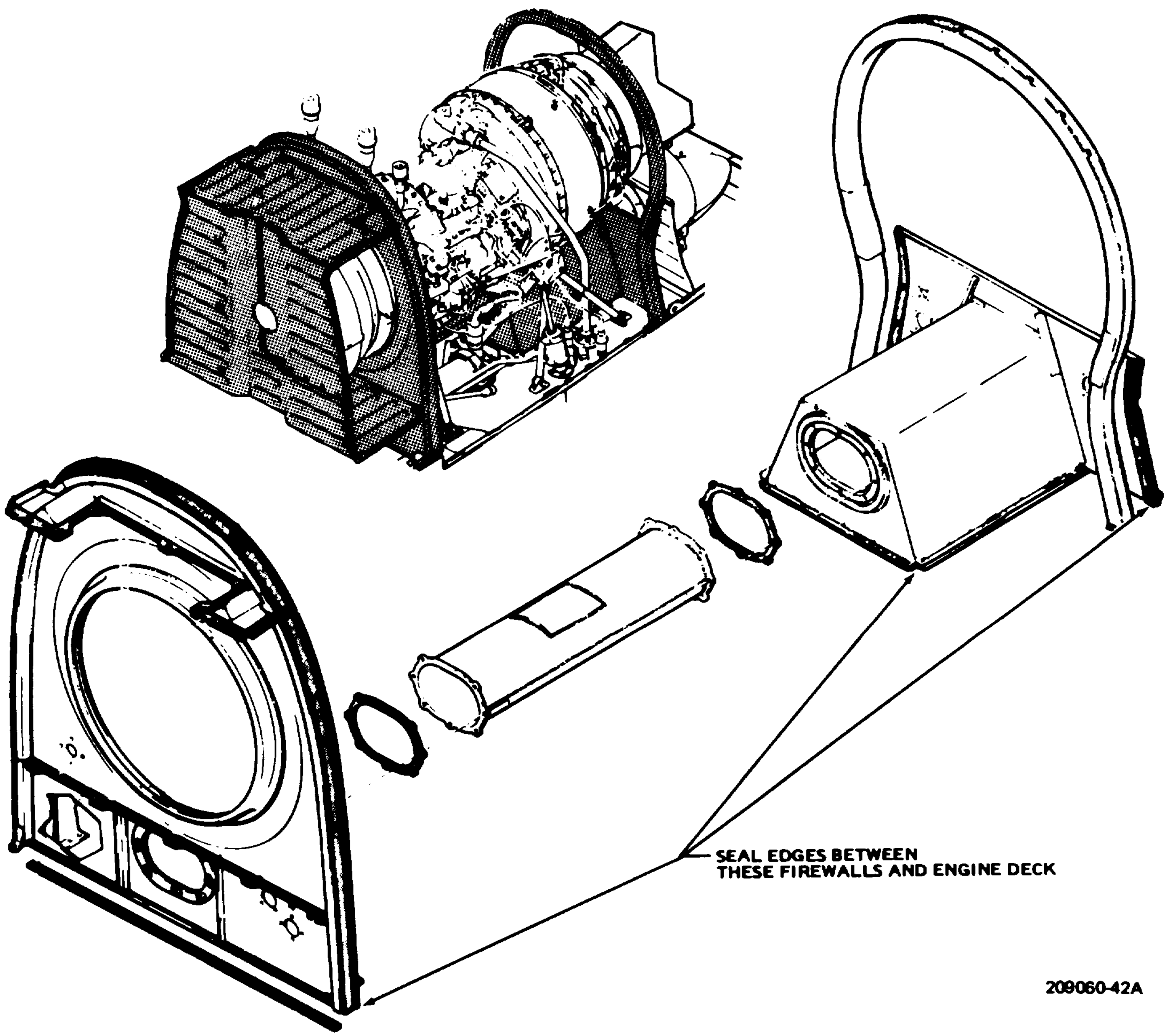


Figure 4-14. Engine Deck and Firewall Sealing

4-47. REMOVAL – IR SUPPRESSION SYSTEM.

a. Disconnect drain line (6, figure 4-15) from fitting on tailpipe (1).

b. Release fasteners on fairing (4) and remove fairing, duct assemblies (2 and 5), and extension (3) as an assembly.

c. Detach forward duct assembly(2) from exhaust extension (3) by removing bolts (13) and washers (12) from extension (3).

d. Detach exhaust extension (3) from aft duct assembly (5) by removing nuts (14) and washers (15) from lockpins (20).

e. Remove fairing assembly (7) from aft duct assembly (5) and fairing (4) by removing screws (16) and washers (17).

f. Detach aft duct assembly (5) from cowling (4) by removing 12 screws (18) and washers (19).

WITH IR SUPPRESSOR

1. Exhaust tailpipe
2. Duct assembly (forward)
3. Exhaust extension
4. Tailpipe fairing
5. Duct assembly (aft)
6. Drain line
7. Fairing assembly
8. V-band clamp
9. Engine diffuser
10. Insulation blanket
11. Lockwire
12. Washer
13. Bolt
14. Nut
15. Washer
16. Bolt
17. Washer
18. Washer
19. Bolt
20. Lockpin

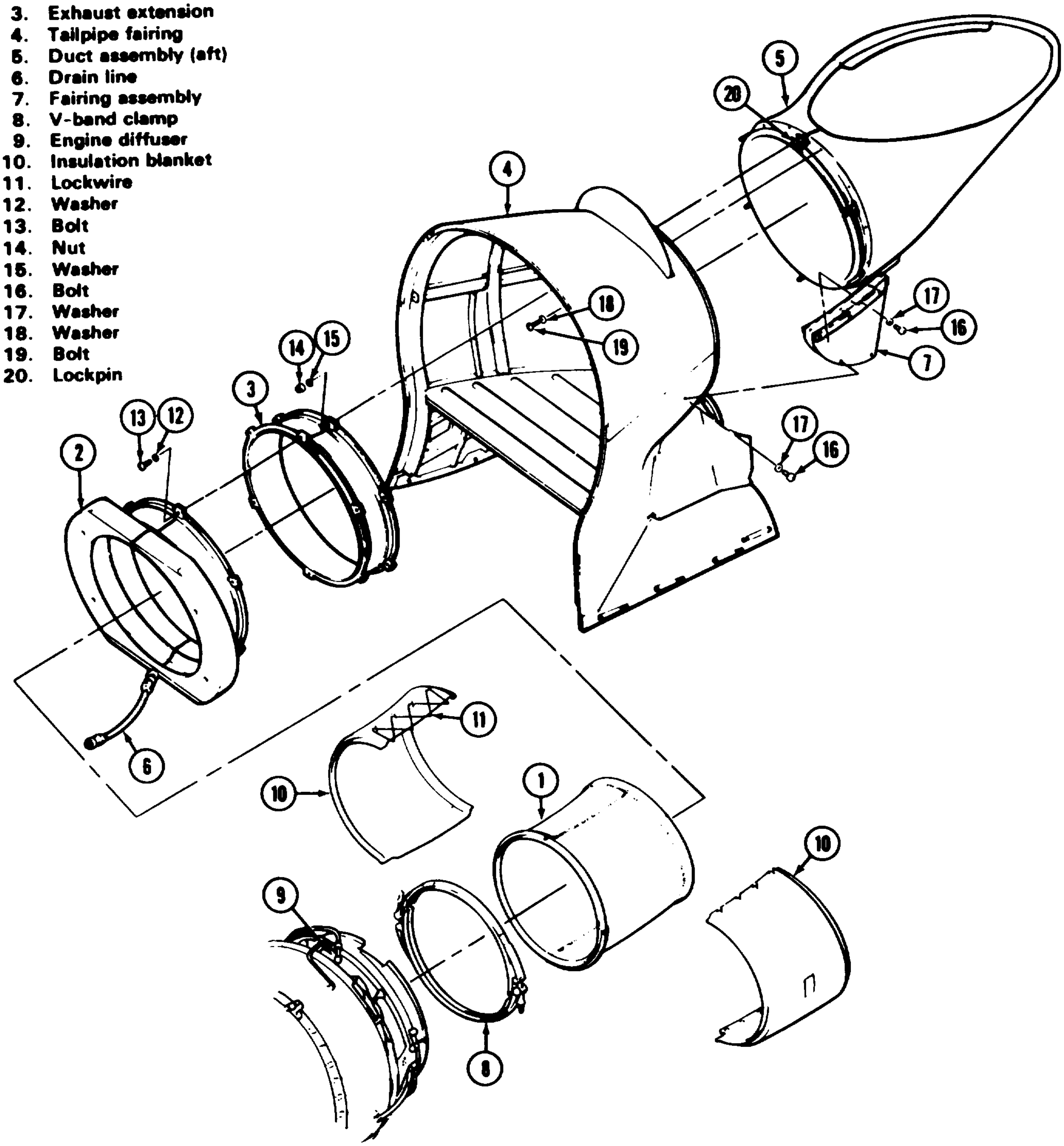


Figure 4-15. P[illegible] Exhaust System Components with IR Suppression — Installation

4-48. CLEANING — IR SUPPRESSION SYSTEM.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

CAUTION

Do not allow solvents to come in contact with insulation blanket.

Clean duct assemblies (2 and 5) and exhaust extension (3) with a wire brush and solvent (C112) when necessary. Clean clamps and heat shield with solvent (C112). Do not used solvent on insulation blanket.

4-49. INSPECTION — IR SUPPRESSION SYSTEM.

a. Inspect ducts for cracks, dents, and overheating.

(1) Cracks and holes in surface of duct should not exceed 3.0 inches in diameter after cleanup. Adjacent pair areas must allow a minimum of 2.0 inches of parent metal between patches.

(2) Aft exhaust cracks and holes in exterior surface of duct shall not exceed 4.0 inches in diameter after cleanup. Adjacent repair areas must allow a minimum of 2.0 inches of parent metal between patches.

(3) Damage which penetrates the aft exhaust duct (5) tempmat insulation between interior and exterior surfaces of duct shall not exceed 4.0 inches in diameter after cleanup.

(4) Dents in surface of duct are permissible provided surface is not broken and there are no sharp creases or projections into exhaust stream.

(5) Heating as evidenced merely by discoloration of the metal is permissible. However, if the condition becomes progressive, indicating a possible burnthrough, the part should be replaced.

b. Inspect ducts for exterior damage.

(1) Damage to circumferential mounting frames of duct assembly and exhaust extension (3) shall be evaluated locally as to feasibility to repair or need for replacement. It is deemed not feasible to replace the frame on duct.

(2) Damage to mounting flange and outlet rim of the aft exhaust duct (5) shall be evaluated locally as to feasibility to repair or need for replacement.

(3) Ensure that all attaching screws are secure.

(4) Check aft exhaust duct (5) and fairing (4) for security of mounting and for loose or missing rivets.

(5) Check that drain hose on forward exhaust duct is intact and securely attached.

4-50. REPAIR OR REPLACEMENT — IR SUPPRESSION SYSTEM (AVIM).

A repair kit (C97) is available for use in repairing damaged components. The kit contains the following materials.

QUANTITY	PART NUMBER	NOMENCLATURE
1	205-706-083-3	Patch
1	205-076-083-5	Patch
1	205-076-083-7	Patch
1 (16 oz. kit)	No. 19 (FSCM 80703)	Adhesive

a. Dents.

(1) Minor dents in exterior surfaces require no rework if surface is not broken, or if no sharp crease or projection exists in the interior surface.

(2) Work out minor dents having sharp projections into the interior of duct, by restoring to original contour and smoothing off any sharp projections with fine abrasive paper.

(3) Large dents (sucface impressions) shall be worked out by restoring the surface to original contour.

b. Cracks.

(1) All cracks shall be atop-drilled to prevent continuation.

(2) Cracks which penetrate interior surfaces of the foward exhaust duct or exhaust extension shall be repaired using method I. See table 4-1 and figure 4-16, detail A.

(3) Cracks in interior surface of aft exhaust duct shall be repaired using method II. Sea table 4-1 and figure 4-16, detail B.

(4) Cracks in exterior of aft duct shall be repaired using method III. Sea table 4-1.

(6) Two or more adjacent cracks, or two or more converging cracks, shall be treated as a single repair area.

c. Holes.

(1) Holes in the forward exhaust duct, or in exhaust extension, shall be repaired using method 1. Sea table 4-1.

(2) Holes in the interior surface only of aft exhaust duct shall be repaired using method II. See table 4-1.

(3) Holes which penetrate only the outer surface of the exhaust duct shall be repaired using method III. See table 4-1.

(4) Holes which penetrate completely through exterior and interior surfecea of aft exhaust duct shall be repaired using method II. See table 4-1.

Table 4-1. Repair Methods - IR Suppression System (AVIM)

METHOD I. See figure 4-16.

a. Stop drill crack at both ends.

b. If two or more cracks converge, cut out area encompassed by cracks and smooth out edges to form a hole, not to exceed 3.0 inches.

c. Trim patch, 205-706-083-3, as necessary, to provide a minimum of 0.25 inch edge distance between rivets and hole in parent metal, and between rivets and edge of patch.

d. Position patch and layout rivet hole locations.

e. Drill rivet holes and install rivets, with heads on interior of duct.

METHOD II. See figure 4-16.

a. Cut hole through outer surface of duct to encompass damaged area, not to exceed 4.0 inches in diameter.

b. Cut out and remove insulation material (tempmat) not to exceed 4.0 inches.

c. Cut out damaged area of interior surface of duct, not to exceed 3.0 inches in diameter.

d. Trim patch, 205-706-083-3, as necessary to provide a minimum of 0.25 inch edge distance between rivets and hole, and between rivets and edge of patch.

e. Position patch on outside of interior surface and layout rivet hole locations.

f. Drill rivet holes and install rivets with heads on interior of duct.

Table 4-1. Repair Methods — IR Suppression System (AVIM) (Cont)

g. Cut patch, 205-706-083-5, to fit insulating core area.

h. Apply adhesive from repair kit and install patch.

i. Trim patch, 205-706-083-7, to provide a minimum of 0.60 inch overlap on outer surface of duct.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

j. Lightly abrade area 0.60 inch wide around hole in outer surface. Clean areas with MEK (C74).

k. Apply adhesive (C14) to area around hole.

l. Remove backing and apply patch over hole. Press smoothly into place.

m. Allow adhesive to cure.

NOTE

Preferred cure time is 24 hours at 70 degrees F (21 degrees C). Cure time may be reduced by applying heat not to exceed 175 degrees F (80 degrees C) for one hour.

METHOD III. See figure 4-16.

a. Cut out damaged area of outer akin, not to exceed 4.0 inches in diameter.

b. Trim patch 205-708-083-7, to provide a minimum of 0.60 inch overlap on outer surface of duct.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

c. Lightly abrade area 0.60 inch wide around hole. Clean area with MEK (C74).

d. Apply adhesive (C14) to area around hole.

e. Remove backing from patch, and apply patch over hole. Press smoothly into place.

f. Allow adhesive to cure. See note in Method II.

Table 4-1. Repair Methods—IR Suppressor System (AVIM) (Cont)

METHOD IV. See Tables 4-1.1 and 4-1.2, and Figures 4.17 and 4.17.1.

a. Remove paint and generally clean around area to be repaired using a powered wire wheel.

b. Stop drill crack.

c. Repair crack using TIG Welder and Type 347 CRES filler rod. Maintain original separation of strut and inner body with use of a thin capper strip between affected parts of the weld to prevent their joining during welding. Argon as a backup gas is desirable.

d. Do not attempt to weld into a joint or any closer than 0.25 inch to braze alloy coating. Satisfactory braze repair methods are not available.

METHOD V. See Tables 4-1.1 and 4-1.2, and Figures 4.17 and 4.17.1.

a. Remove paint and generally clean around area to be repaired using a powered wire wheel.

b. If cracked, stop drill.

c. Prepare 0.50 inch oversize patch or doubler for repair area. For stainless steel areas the use of a patch or doubler made of 0.032 inch thick CRES 347 is recommended. The patch may be welded or riveted.

WELD PROCEDURE

Bring both sides of the crack to the same level and tack weld to assist in maintaining position during installation of patch or doubler. Use of Argon as a backup gas is desirable.

Da not attempt to weld into a joint or any closer than 0.25 inch to braze alloy coating. Satisfactory braze repair methods are not available.

RIVET PROCEDURE

Trim patch as necessary to provide a minimum of 0.25 inch edge distance between rivets and hole in parent material, and between rivets and edge of patch.

Position patch and layout rivet hold locations.

Drill rivet holes and install rivets.

METHOD VI. See Tables 4-1.1 and 4-1.2, and Figures 4.17 and 4.17.1.

a. Cut each end of the damage area just beyond last fracture noted with needle point shears.

b. Cut should be made beginning at fin edge and cutting at approximately 30° off vertical.

c. The fin section, isolated by these cuts, may be removed by flexing until completely breaking at the base.

d. Exposed bare aluminum surfaces should be covered with chemical film treatment per MIL-C-5541.

METHOD VII. See Tables 4-1.1 and 4-1.2, and Figures 4.17 and 4.17.1.

a. Remove paint and generally clean around ores to be repaired using wire wheel.

b. Weld bath ends of crack and also at spots along the crack atone inch intervals using a Hastelloy W rod. Use of Argon as a backup gas is desirable.

Table 4-1. Repair Methods-IR Suppressor System (AVIM) (Cont)

METHOD VIII. M See table 4-1.1.

a. Drill through rivet heads and tailpipe using 1/4 inch drill (0.250 inch dia) until the S8168-97C-0200 spacer holes are lightly chamfered.

b. Remove the expanded portion of the rivets from the interior surface of the stainless mounting ring by grinding.

CAUTION

Do not grind into the mounting ring surface.

c. Knock out rivets (NAS-139886-5) end spacers (NSN 5365-01-094-2453) from the stainless mounting ring with a punch or drift.

d. Knock out the rivets from spacers with a punch or drift.

e. Dress and/or shape the stainless mounting ring es required.

f. Check the diameters of holes in the stainless mounting ring for 0.192 to 0.196 inch diameter. For those holes falling within the 0.192 to 0.196 inch dimension, a blind rivet (standard) shall be used. For holes exceeding the 0.196 inch dimension but less than 0.210 inch diameter, an oversize blind rivet (repair) shall be used after drilling the stainless mounting ring, spaces and companion holes in tailpipe to 0.205 to 0.209 inch, No. 5 drill, For holes 0.210 inch or more, leave empty and apply replacement criteria of table 4-1.1, item 7a. Any aluminum tailpipe holes enlarged should be treated with chemical film (C31) or equivalent.

g. Install Cleco fasteners in every other hole with spacers or proper hole size in position, The sides of spacers that were lightly chamfered during removal should face the aluminum tailpipe.

NOTE

Should Cleco fasteners not be available, NO. 10 x 3/4 inch long screws and nuts may be used, but do not tighten at this time.

h. Insert spacers of proper hole size and rivets of proper size in remaining holes. The sides of spacers chamfered during disassembly should again face the aluminum.

NOTE

If No. 10 screws were used in lieu of Cleco fasteners, tighten the screws at thin time.

i. Pull rivets using a cherry installation toolkit (NSN 5130-00-478-7214). Use a Model G784 installation tool with a H681-6U 3/16 universal pulling head or equivalent.

j. Remove Cleco fasteners or screws and nuts and replace with rivets of proper size, pull the rivets in accordances with step i. above. Spacers must be positioned with the sides chamfered during disassembly facing the aluminum as in step g. above.

Table 4-1. Repair Methods-IR Suppressor System (AVIM) (Cont)

k. Inspect rivet installation in accordance with TM 55-1500-204-25/1.

METHOD IX. M See table 4-1.1.6.f:

One or two flat pieces of .016 or .020 inch stainless steel type 321,3 1/2 inches by 3 1/2 inches are to be attached by screws MS1957-31, nuts MS21043-08, with washers 5310-00-531-9514 to the inside of suppressor, spanning the joint between panels 2, 3, and 7 (see figure 4-15.2.). This is to repair the separation that sometimes occurs between these section.

Table 4-1.1 IR Suppressor Damage and Repair Limits (Non Structural Area)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
1. Strut, Fwd Portion (unfinned)	a. Cracks	a. Cracks in sheet metal surface not exceeding 1 in. and non-branching.	a. Branching or cracks 1 to 2 inches long STOP DRILL cracks longer than 2 inches weld per Table 4-1 Method VII.	a. 3 cracks each greater than 2.5 inches.
	b. Holes	b. Not more than 3 holes each less than 0.312 in. dia.	b. More than 3 holes or one hole larger than 0.312 in. diameter but less than 2 in. Patch, Table 4-1 Method V.	b. Holes greater than 2 in. diameter.
2. Strut, Aft Portion (cool skin & internal finned)	a. Internal separation	a. Less than 4 square inches.		a. 4 square inches any panel.
	b. Cracks in skin	b. Less than 5 linear inches.		b. 5 linear inches any panel.
	c. Holes in skin and loss of fins	c. Less than half dollar size.		c. One hole half dollar size.
3. Centerbody (unfinned)	a. Cracks	a. Cracks in sheet metal surfaces not exceeding 1 inch and non-branching	a. Tip of nose to 1 in. forward of louver doubler, stop drill & weld. From 1 in. in front to 2 in. aft of doubler, STOP DRILL only.	a. Any crack located 2 in. aft of doubler to end of unfinned material or 3 cracks total forward of this point each greater than 2.5 inches.
	b. Holes	b. No more than 3 holes each less than 0.312 inch dia.	b. Do not patch holes	b. In excess of negligible.
	c. Skin dents	c. Dents with no gouges, 0.25 in. deep, 3.0 in. diameter maximum.	c. Dents in excess of negligible limits that can be straight or patched - Table 4-1, Method V. See Note 1.	c. Dents that cannot be restored to serviceable limits.
4. Outerbody (unfinned)	a. Cracks	a. Cracks in sheet metal surfaces not exceeding 1 inch and non-branching.	a. Stop drill and weld cracks in total area which exceed 1 inch.	a. Any recracking of original weld repair which exceeds 2 inches.
	b. Holes	b. No more than 3 holes each less than 0.312 inch dia.	b. More than 3 holes or when holes have a diameter greater than 0.500 inch but less than 2 inches must be patched. See Table 4-1 Method V. See Note 1.	b. Hole exceeding 2 inch dia.

Table 4-1.1 IR Suppressor Damage and Repair Limits (Non Structural Area) (con't)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
	c. Skin dents	c. Dent with no cracks or gouges, 0.250 in. depth, 3 in. diameter maximum	c. Dents in excess of negligible limits that can be repaired. Table 4.1 Method V. See Note 1.	c. Dent that cannot be restored to serviceable condition.
5. Centerbody (internally finned) See Note 4.	a. Cracks each penal)	a. Cracks not exceeding one inch	a. Cracks exceeding 1 inch stop drill with 1/16 n. diameter drill going through one akin only. **CAUTION** **Do not weld or patch and weld panels.**	a Any circumferential crack exceeding 4 in. or more than 3 cracks each not to exceed 1 in. Any fore and aft crack traveling from one penal to at least 1 inch on an adjacent panel or 3 cracks on one panel.
	b. Holes each panel)	b. One hole quarter size or smaller	**b. N/A**	b. More than one hole or one hole larger than quarter size.
	c. crushed finned panel inlets or outlets (each panel)	c. Crush length less than 2 in.	c. Crush length greater than 2 in., straighten with common hand tools.	c. Areas which cannot be straightened to serviceable limits.
	d. Crushed area other than inlets or outlets each panel)	d. Crushed area depth 0.250 in. 3.0 in. diameter	d. N/A	d. Areas greater than negligible limits
	e. Internal separation (each panel)	e. One void 2 square inches or less.	e. N/A	e. More than one void, or one void larger than 2 square inches
6. Outerbody (internally finned) Sea Note 4.	a. Cracks (each panel)	a. Cracks not exceeding 1 in.	a. Cracks exceeding 1 in., stop drill with 1/16 in. drill going through one skin only. **CAUTION** **Do not weld or patch and weld panels. See Note 2.**	a. Any circumferential crack exceeding 4 in. or more than 3 cracks each not to exceed 1 in. Three fore and aft cracks traveling the entire length of the panel, or one crack traveling the entire length of the panel plus no more than one inch on an adjacent panel. In the case of the drain fitting panel, the unfinned outerbody can be considered an adjacent panel.
	b. Holes - hot skin (each panel)	b. One hole quarter size or smaller	b. N/A	b. More than one hole or one hole larger than quarter size.

Table 4-1.1 IR Suppressor Damage and Repair Limits (Non Structural Area) (Con't)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
	c. Holes -cool skin (each panel)	c. No more than 3 holes each less than 0.312 in. diameter	c. Less than 5 holes total, each less than 1 in. diameter-patch. See Table 4-1, Method V.	c. Holes greater than 1 in. diameter or more than 5 holes
	d. Crushed finned panal inlets outlets (each panel)	d. Crushed length lam than 2 in.	d. Crushed length greater than 2 in. straighten With common tools	d. Areas which cannot be straightened to serviceable limits
	D. Crushed finned area other than inlets & outlets (each pad)	e. Crushed area depth 0.25 in. 3.0 in. diameter maximum	e. N/A	e. Areas greater than negligible limits
	f. Internal separation (each panel)	f. Voids 2 square inches or less	f. N/A	f. More than one avoid or one void larger than 2 square inches
7. Externally finned aluminum section of suppressor assembly.	a. Loose rivets	a. Three loose/missing rivets. No more than 2 adjacent.	a. If more than 3 remove and replace loose rivets and replace missing rivets. Table 4-1, Method VIII.	a. Three missing rivets that cannot be replaced per Table 4-1, Method VIII. No more than 2 adjacent.
	b. skin dents	b. Dents with no cracks or gouges: Depth 0.250 inch: Diameter 3.0 inch.	b. Dents in excess of serviceable limits that can be straightened.	b. Dents that cannot be restored to serviceable limits.
	c. skin Cracks	c. Cracks not exceeding 1 inch in length and non-branching.	c. Branching cracks and cracks less than 4 inches in length that can be contained by stop drilling at each and.	c. Damage exceeds repeirable limits.
	d. Bent fins	d. Fins bent or crushed so as to impede air flow between fin rows less than 60 linear inches par quadrant. See Note 3.	d. See Note 3.	d. Bent fins in excess of negligible limits.

Table 4-1.1 IR Suppressor Damage and Repair Limits (Non Structural Area) (Con't)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
	e. Loose or missing fin sections.	e. Missing fin sections covering a total linear length of less than 60 inches per quadrant. See Note 3.	e. Fins separated from duct skin for more than 1 inch may be cut to the maximum serviceable limits. See Table 4-1, Method VI.	e. Missing fin sections in excess of serviceable limits.
	f. Cracked fins	f. Any vertical crack. Horizontal cracks are treated as loose fins.	f. Same as loose fins.	f. Same as loose fins.

NOTES:

1. Anv crack in inner skin of the internally finned outer body panel underneath the mount ring which are in line (aft) with a strut and run fore and aft, are not to be stop drilled or welded or patched. This type of crack is nonstructural and causes negligible cooling air leakage which is not detrimental to operation or performance of Unit.

2. Fin lengths are measured straight line point to point ignoring convolutions.

3. Repair of localized straightening of bent fins is permissible but repeated straightening will lead to metal fatigue and cracking.

4. The outerbody of suppressor shall consist of two areas. The outside of the outerbody is called the cool skin and the inside of the outerbody is called the hot skin. The centerbody of the suppressor will also consist of two areas. The outside of the centerbody is called the hot skin and the inside of the centerbody is called the cool skin.

Table 4-1.2 IR Suppressor Damage and Repair Limits (Major Structured Elements Only)
(See Figure 4-17.1)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
1. Plug-strut clip (Outer)	a. Cracks in plug strut clip from braze relief hole to outboard edge of clip.	a. One clip per strut may be cracked (maximum 4 clips cracked). One strut may have cracks in both clips while any other strut may have 1 clip cracked (maximum 3 clips cracked).	a. Cracks in excess of negligible damage limit must be weld repaired prior to next flight. See Table 4-1, Method IV.	a. N./A
	b. Cracks in plug-strut clip from inboard edge, thru the braze relief hole and continuing totlle outboard edge of clip.	b. A maximum of 2 non-adjacent clips may be cracked.	b. Cracks in excess of negligible damage limit must be weld repaired prior to next flight. See Table 4-1, Method IV.	b. N/A
	c. Crack in plug-strut clip to plug compound contour panel joint.	c. A maximum of 2 non-adjacent joints may be affectively cut.	c. Not repairable.	c. Damage in excess of the negligible damage limit.
2. channel & Clips	a. Cracks in channel from braze relief hole to outboard cap.	a. One channel per strut may be cracked (maximum of 4 channels cracked). one strut may have both channels cracked while any 2 of the remaining (non-adjacent) channels may be cracked (maximum of 4 channels cracked).	a. Damage in excess of the negligible damage limit must be weld repaired prior to the next flight. See Table 4-1, Method IV.	a. N/A
	b. Cracks in channel from inboard edge thru braze relief hole and continuing to the outboard cap.	b. A maximum of 2 non-adjacent channels may be cracked.	b. Damage in excess of the negligible damage limit must be weld repaired prior to the next flight See Table 4-1, Method IV.	b. N/A

Table 4-1.2. IR Suppressor Damage and Repair Limits (Major Structural Elements Only) (con't) (See Figure 4-17.1)

ITEM	DEFECT	NEGLIGIBLE DAMAGE LIMITS	REPAIRABLE DAMAGE LIMITS	DAMAGE REQUIRING REPLACEMENT
	c. Cracks along the junction of the channels and the main mount ring.	c. A maximum of 2 non-adjacent channel junctures may be cracked.	c. Damage in excess of the negligible damage limit must be weld repaired prior to the next flight. See Table 4-1, Method IV.	c. N/A
3. Struts (Aft Portion) (Hot Skin)	a. Cracks	a. Cracks not exceeding 1 inch and non-branching in any 1 or all akin surfaces.	a. Branching or cracks 1 to 3 inches in length in not more than 1 skin per strut, not more than 2 struts, must be stop drilled prior to next flight.	a. Damage in excess of repairable damage limit.
	b. Holes	b. No more than 3 holes each lace than 0.312 inch diameter.	b. Less than 5 holes total each less than 1 inch diameter - patch. See Table 4-1, Method V.	b. Holes greater than 1 inch diameter or in excess of 5 holes.
4. Main Mount Ring & Bracket	a. Cracks	a. Cracks which effectively eliminate any one fastener.	a. Cracks which effectively eliminate more than 1 fastener must be patched and weld repaired prior to next fright. See Table 4-1, Method V.	a. N/A
5. Plug-Strut Clip (Inner)	a. Cracks	a. A maximum of 2 non-adjacent clips may be cracked through. A maximum of 4 clips may be partially cracked.	a. Damage in excess of negligible limits shall be weld repaired. See Table 4-1, Method IV.	a. N/A
6. Braze Joint	a. Crack in the braze alloy joining two surfaces.	a. Up to 50% of perimeter of joint.	a. Greater than 50% of perimeter of joint, weld repair. See Table 4-1, Method VII. See Note 1.	a. N/A

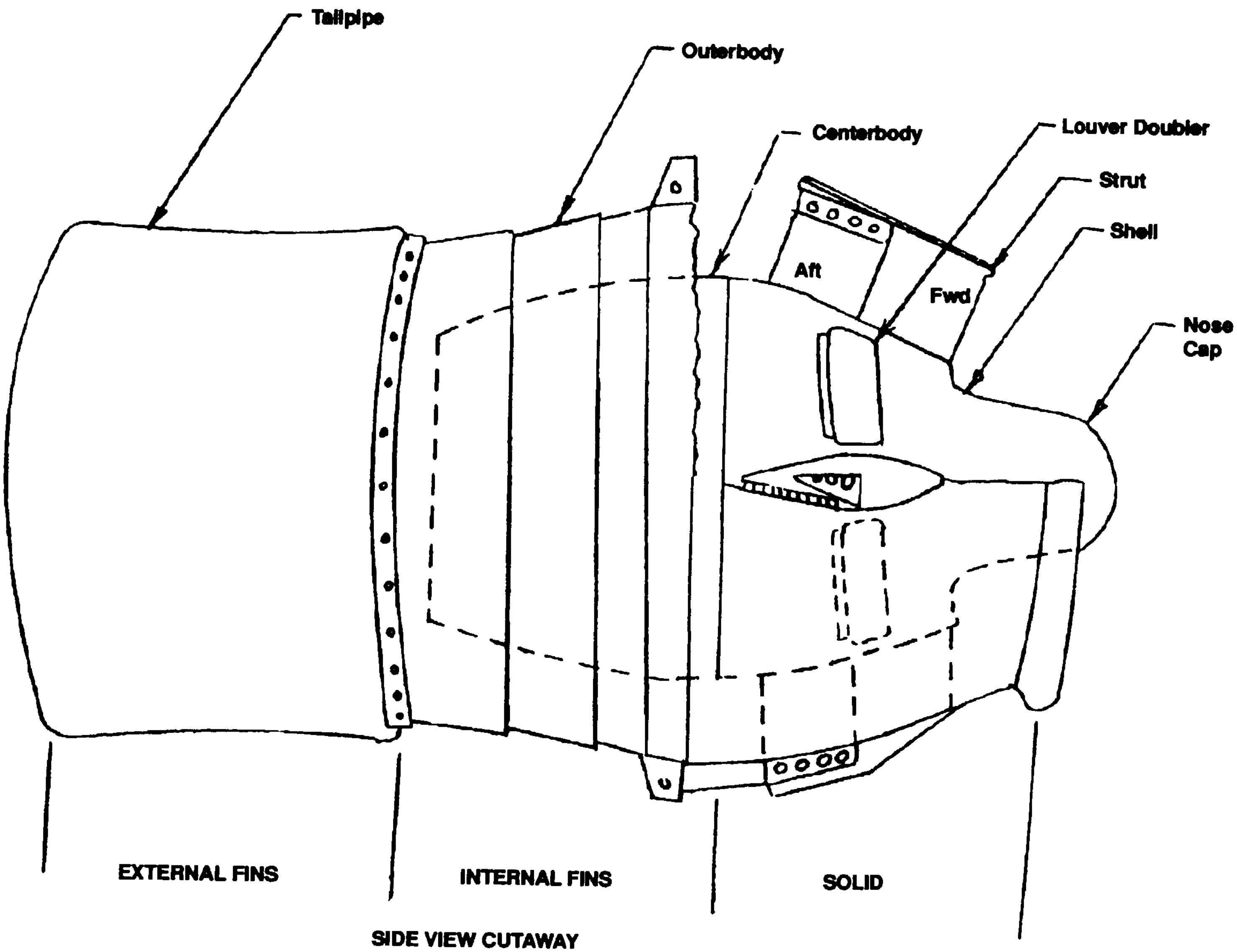


Figure 4-15.1. Hot Metal Plus Plume Suppressor

ITEM	
16	Outer Body Assembly
1	• Duct Assembly
2	• Arc Panel Assembly
3	• Panel Assembly
4	• Flange Girth Ring
5	• LH Bracket
6	• RH Bracket
7	• Panel Assembly

NOTE 1: Numbers in parenthesis below refer to parts listed in parenthesis above.

NOTE 2: Do not weld cracks in area B, hot skin side of panels.

NOTE 3: All crack lengths are measured point to point, ignoring convolutions.

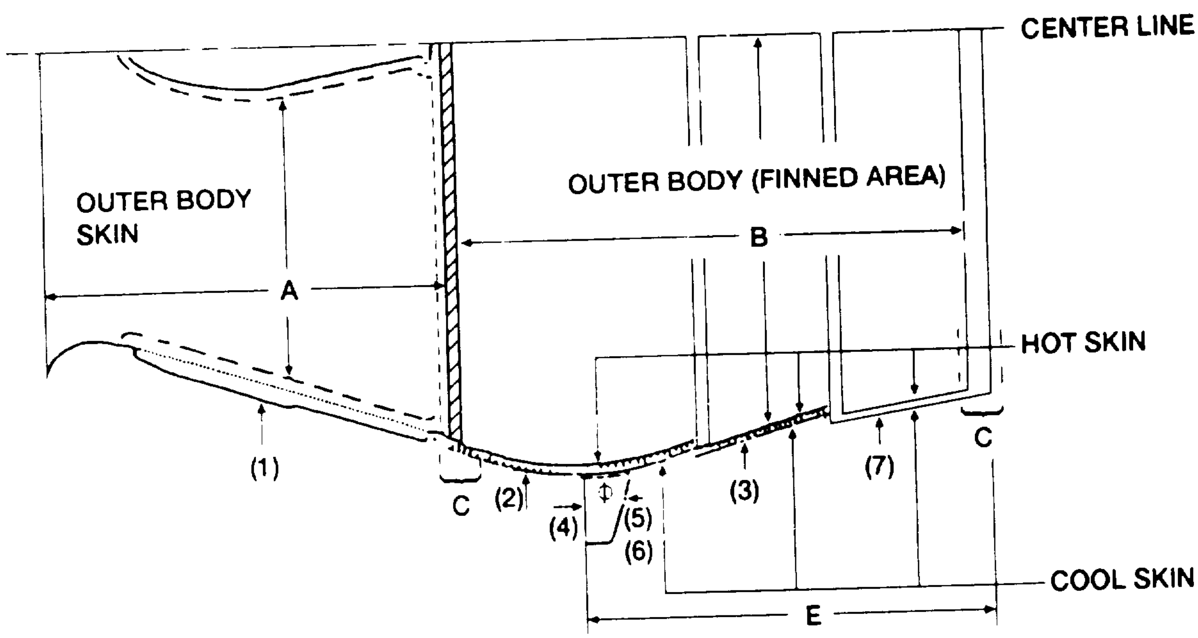
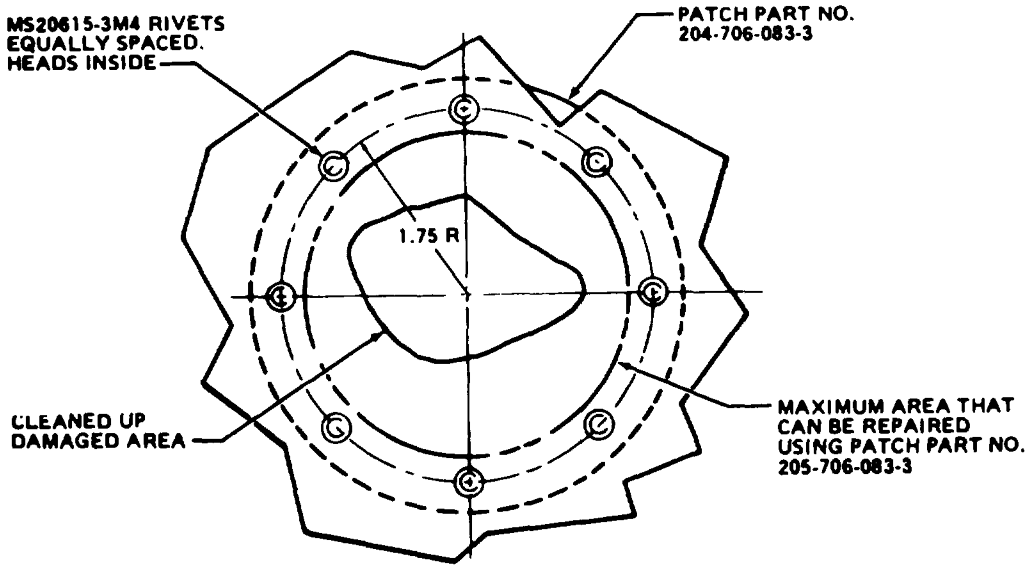
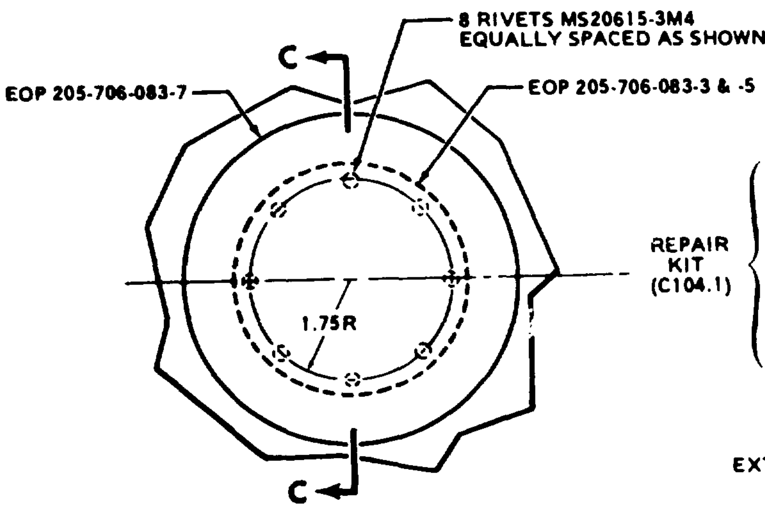


Figure 4-15.2. OUTER BODY HALF-SECTION



DETAIL A

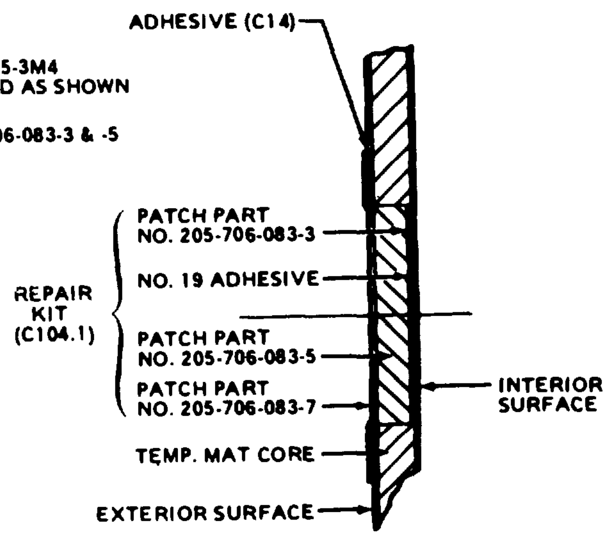
VIEW OF INSIDE SURFACE
OF 205-060-303-502
209-060-306-1



DETAIL B

VIEW ON EXTERIOR SURFACE OF EXHAUST DUCT

ALL DIMENSIONS ARE IN INCHES
UNLESS OTHERWISE NOTED.



VIEW C-C

NOTE

Sheet metal patches should have at least 2.0 inches of parent metal spacing between patch edges. No limit on number of patches.

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

209060-112A

Figure 4-16. Repair Procedures — Infrared Suppression System

4-51. M E INSTALLATION – IR SUPPRESSION SYSTEM.

CAUTION

Use extreme care in positioning the aft duct assembly (5, figure 4-15). Failure to do so will damage gasket.

a. Position aft duct assembly (5) on rear flange of fairing (4) with lower external supports extending over external supports mounted on the fairing transition section. Support aft duct assembly with 12 bolts and washers (18 and 19). Position fairing assembly (7) in place and secure to aft duct (5) and fairing (4) with 10 bolts and washers (16 and 17).

b. Position exhaust extension (3) inside fairing and mount to forward section of duct assembly (5) with nuts (14) and washers (15) on lockpins (20).

Install forward duct assembly (2) on forward section of exhaust extension (3) and install bolts (13) and washers (12).

d. Place fairing (4) with extension (3) and duct assemblies (2 and 5) installed, in place and over tailpipe (1). Engage fasteners around tailpipe fairing.

e. Connect drain line (6) to fitting on tailpipe.

4-52. M INFRARED (IR) SUPPRESSION SYSTEM.

4-53. M DESCRIPTION – IR SUPPRESSION SYSTEM.

The exhaust system on M coded (modernized) helicopters is an infrared suppression system comprised of the following major components: infrared suppressor, engine exhaust duct assembly, and infrared suppressor cowling (figure 4-17). The engine exhaust diffuser on the rear of the engine directs the engine exhaust gases into the exhaust duct and IR suppressor. To aid in exhaust compartment cooling, a heat shield is mounted around the end of the diffuser. The exhaust duct is covered with a Hi-temp insulating blanket, The IR suppressor and exhaust duct act as an ejector. mixing ambient air with exhaust gases. The exhaust duct and heat shield are mounted on flanges of the diffuser with V-band clamps. A countermeasures set is incorporated into the system (TM 11-1520-236-20).

Premaintenance Requirements for IR Suppression System

Condition	Requirements
Model	AH-1S M
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	Two
Consumable Materials	(C14), (C33), (C74), (C97)
Special Environmental Conditions	None

4-54. M REMOVAL – IR SUPPRESSION SYSTEM.

a. Remove both panels from IR suppressor cowling (7, figure 4-17).

b. Disconnect drain lines (10).

c. Disconnect countermeasures set (1) electrical cable connectors located on aft firewall.

CAUTION

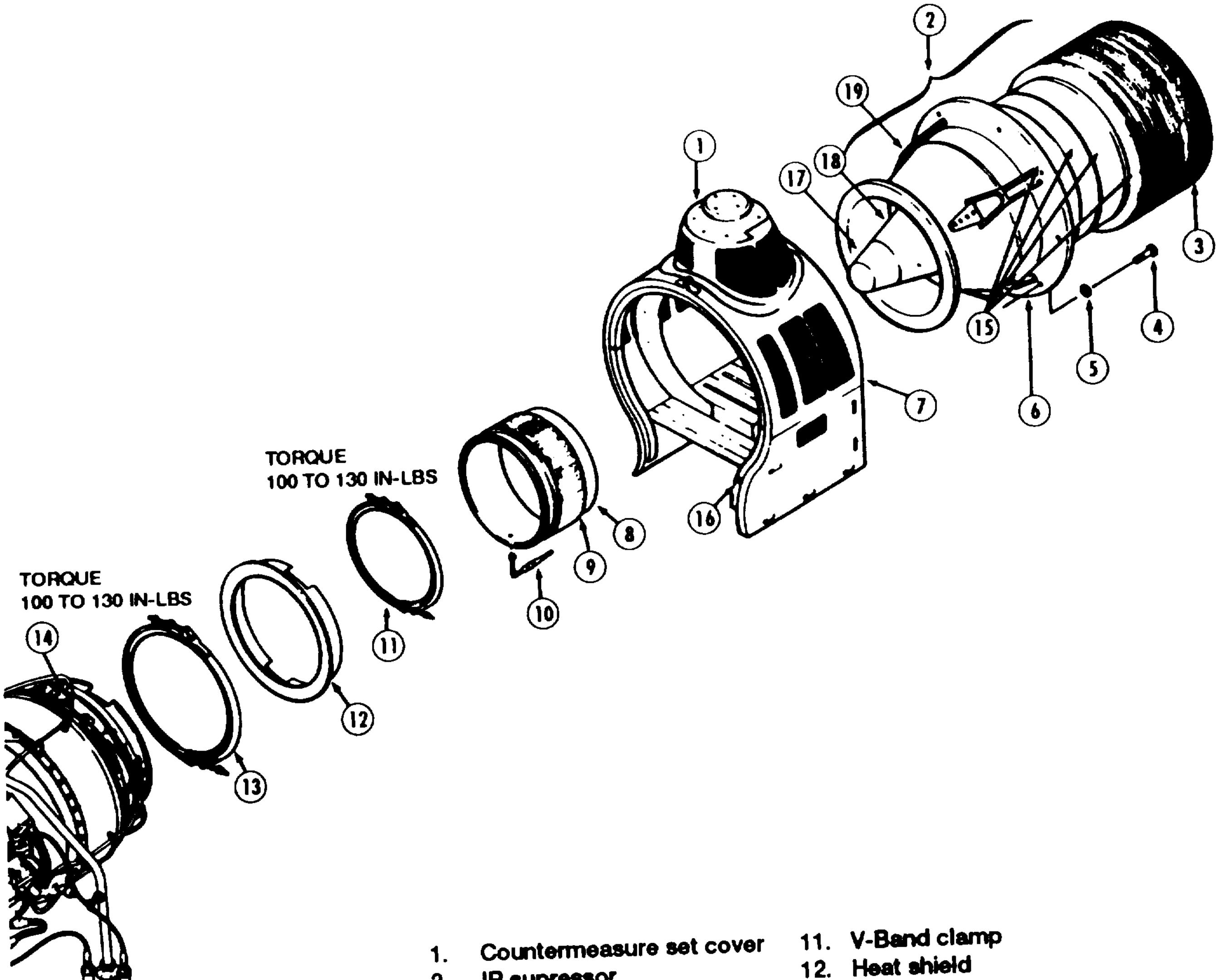
Support suppressor (2, figure 4-17) during removal. Improper handling can damage external cooling cores.

d. Remove eight bolts (4) and washers (5).

e. Remove suppressor (2) from cowling (7).

f. Remove cotter pins, washers and clevis pins from cowling (7) mounts. Remove bolts and washers that attach lower forward section of cowling frame (chapter 2).

g. Release top cowling latch and turnlock fasteners.



1. Countermeasure set cover
2. IR supressor
3. External cooling cores
4. Bolt
5. Washer
6. Supressor flange
7. Cowling
8. Exhaust duct
9. Insulation blanket
10. Fuel drain line
11. V-Band clamp
12. Heat shield
13. V-Band clamp
14. Engine diffuser
15. Cooling air passages
16. Electrical connector
17. Nose cap
18. Forward inner shell
19. Reinforcement sleeve

209060-122

Figure 4-17. **M** Exhaust System Components With IR Suppression — Installation

h. Remove cowling.

i. Loosen nuts to open V-band clamp (13). Remove heat shield (12) from diffuser.

j. Loosen nuts to open V-band clamp (11). Pull aft to disengage exhaust duct locating pins, and remove duct (8).

k. Place protective cover over diffuser opening.

NOTE

A straight pipe duct assembly exhaust ejector is installed on some AH-1S P M. The straight pipe is removed in the same manner, removing the same hardware as the iR Suppressor.

4-55 M CLEANING — IR SUPPRESSION SYSTEM.

a. Exhaust gas soot deposits should not be removed from internal parts of exhaust duct, heat shield and IR Suppressor except locally as necessary for close examinations and repairs.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation, avoid prolonged breathing of solvent vapors and contact with skin or eyes.

b. Clean clamps (11 and 13) with solvent (C112) and wire brush.

WARNING

Use safety glasses for eye protection when using compressed air.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation, avoid prolonged breathing of solvent vapors and contact with skin or eyes.

CAUTION

See paragraph 4-57.1 for special handling Instructions.

c. Clean blocked IR suppressor cooling passages (15) by blowing compressed air (0 TO 30 psi) through passages. If blocked with mud or other organic material, flush with one part cleaning compound (C33) and nine parts water by volume. If blockage is oil based, flush with solvent (C112).

CAUTION

Do not allow solvent to come in contact with countermeasures set cover.

NOTE

Paint discoloration in area other than aft of struts on the IR suppressor may indicate plugged cooling passages (16).

d. Install protective covering on countermeasures set cover (1) openings.

e. Clean IR suppressor cowling (7) with one part cleaning compound (C33) and nine parts water by volume and soft bristle brush,

4-56. M INSPECTION – IR SUPPRESSION SYSTEM.

a. Inspect clamps (11 and 13, fig. 4-17) heatshield (12), exhaust duct (8) and IR Suppressor (2) far cracks, dents, burned out, buckled areas or distortion, See tables 4-1.1 and 4-1.2 for damage and repair limits.

b. Inspect insulation blanket (9) and attaching fasteners for cuts, tears, distortion or other visible damage, Damaged fasteners are cause for rejection.

c. Inspect IR suppressor cowling (7) for cracks, tears, holes, and missing or broken hardware.

d. Inspect countermeasures set (1) for obvious damage.

e. Inspect IR suppressor (2) cooling passages for blockage. Paint discoloration in areas other than aft of struts may indicate blocked cooling passages.

f. Inspect IR suppressor (2) for damage.

g. Inspect V-band clamps (11 and 13) for serviceability.

h. Inspect bolts and nuts on V-band clamps (11 and 13) for thread damage or distortion.

4-57. M REPAIR-IR SUPPRESSION SYSTEM. (AVIM)

a. Replace exhaust system V-band clamps (11 and 13, figure 417) if damaged.

b. Replace damaged insulation blanket (9).

c. Replace heatshield (12) if cracks, holes or dents cannot be repaired.

d. Exhaust duct.

(1) Shallow dents and scratches are acceptable. Deep dents must be repaired by same method as outlined for holes.

(2) Repair cracks three inches long or less by welding. Grind weld as smooth as possible to match contour of duct.

(3) Cracks in excess of three inches, tears, small holes, and deep dents are acceptable if repaired by welding on patches.

(4) Replace duct if damaged beyond repair limitations.

e. IR suppresseor.

(1) Refer to table 4-1 for repair method. Fabricate patches for repair of unfinned suppressor area from 0.040 stainless steel (MIL-S-6721 Comp 347). Patch internal finned panel section with 0.020 stainless steel (MIL-S-6721 Comp 347).

(2) Repaint discolored painted areas, other than area aft of struts, after cleaning blocked cooling passages (TB 746-93-2).

(3) Replace Nose Cap, inapplicable, (17, Figure 4-17).

(4) Replace Forward Inner Shell, if applicable, (18, Figure 4-17).

(5) Replace Reinforcement Sleeve, if applicable, (19, Figure 4-17).

f. To replace broken or damaged cowling nut plates, refer to paragraph 2-19d.

4-57.1. HANDLING INSTRUCTIONS

NOTE

The finned surfaces of tailpipe assembly are susceptible to physical damage and require careful handling.

a. Removal of suppressor from the carton should be done by two people. After top of carton has been opened and tailpipe packing plug removed, lift outer carton vertically until the suppressor has been cleared.

b. Before removing suppressor from lower carton, a provision should be made for a suppressor support to receive the nose cone and allow the suppressor to stared fully supported in a vertical position, or for a protective support blanket on which to lay the sup presser in a horizontal position.

c. After first carton has been opened, the foam base used in shipping carton to support suppressor may be used as a support base. The cardboard liner surrounding the suppressor has no bottom and may be removed by lifting vertically in the same manner as the outer carton. This will leave the suppressor exposed from the mounting ring aft.

d. Using mounting that rests on four cardboard supports, lift suppressor from carton by placing hand inside of duct and thumb on lip of duct.

e. Suppressor should be rotated by two people, lifting it clear of its support. Do not roll suppressor in the horizontal position or along the aft edge of tailpipe.

f. Suppressor may be placed in upright position for inspection using care not to damage aft fins on tailpipe.

g. When installing suppressor on aircraft, the support sling should not be placed on tailpipe.

h. Tailpipe cover should be removed and installed with care to prevent snagging of fins.

i. For inspection refer to tables 4-1.1 and 4-1.2.

4-58. M STALLATION-IR SUPPRESSION SYSTEM.

a. Seal all open areas between base of forward and aft firewall and engine deck (figure 4-14). Use sealant (C105).

b. Remove protective cover from engine diffuser.

c. Install insulation blanket (9, figure 4-17). Lace blanket on top side of exhaust duct (8) using zig-zag pattern.

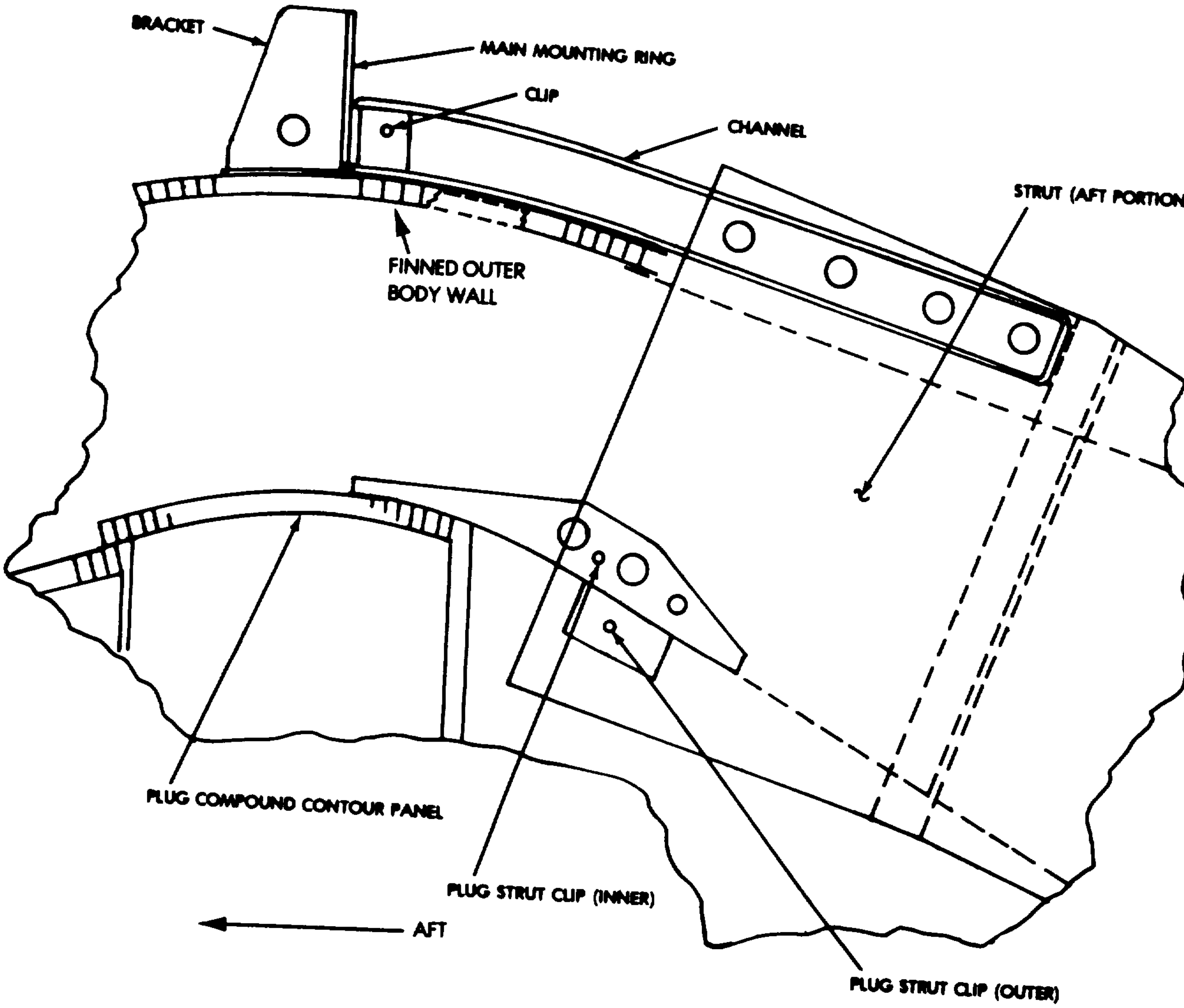


Figure 4-17.1.1 AH-1S Suppressor Major Structural Elements

g. Position heat shield (12) on diffuser support cone.

h. Secure V-band clamp (11). Seat clamp by tapping with soft mallet. Tap from center to ends while torquing bolts 100 TO 130 inch-pounds.

i. Position IR suppressor cowling (7) on helicopter and secure (paragraph 2-89).

j. Install IR suppressor (2, figure 4-17) on cowling (7) with drain fitting (10) pointed down. Secure with eight bolts (4) and washers (5). Torque bolts 70 inch-pounds.

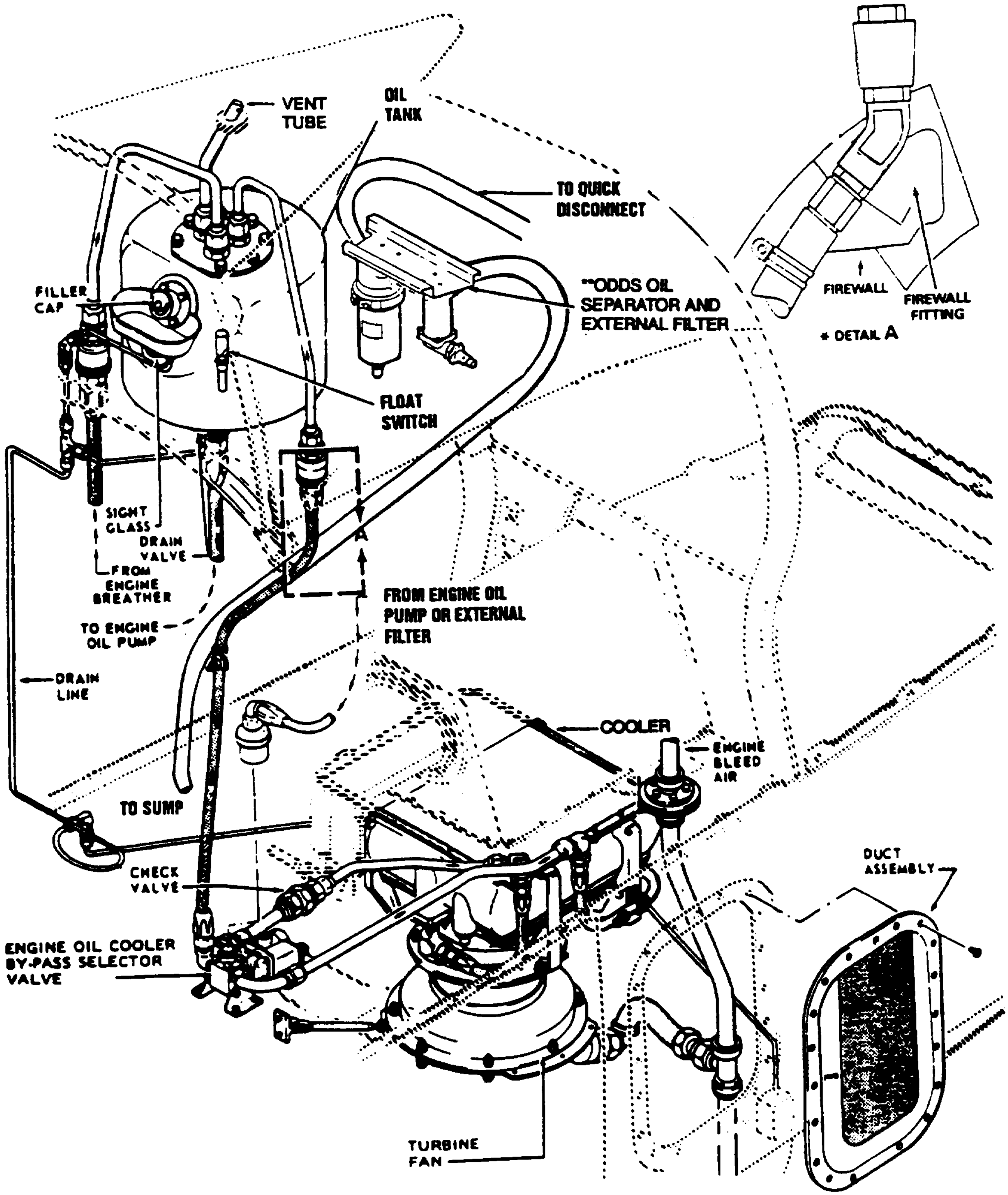
k. Connect countermeasures set electrical cable connection located on aft engine firewall.

l. Connect fuel drain lines (10) located on engine exhaust duct (8), and IR suppressor (2).

m. Install cowling fairing and secure with fasteners.

NOTE

A "straight pipe" duct assembly exhaust ejector is installed on some AH-1S (MC). The straight pipe is installed in the same manner using the same hardware as the IR Suppressor. Inspection and repair can be made in accordance with exhaust duct criteria.



* E M Applies to helicopter after MW0 55-1520-236-50-12 is incorporated.

** M Applies to helicopter after MW0 1-1520-236-50-30 is incorporated.

Figure 4-18. Engine Oil System Installation

d. Position exhaust duct (8) on flange of diffuser (9, figure 4-15) with drain fitting (10, figure 4-17) pointed down.

e. Engage exhaust duct (8) locating dowels with diffuser.

f. Secure mating flange with V-band damp (13). Seat clamp by tapping with soft mallet. Tap from center of damp to ends. Torque damp nuts 100 TO 130 inch-pounds.

NOTE

Torque on V-band clamps (11 and 13) must be rechecked after first engine runs.

SECTION V. OIL SYSTEM

4-59. OIL SYSTEM.

4-60. DESCRIPTION - OIL SYSTEM. (GENERAL)

Oil is supplied to the engine from a self-sealing tank mounted in the aft fairing above the engine (figure 4-18). After passing through the engine, oil is delivered from the scavenge side of the engine oil pump to a by-pass mounted on the engine compartment deck at left side. In normal operation, oil passes through the oil cooler and then returns to the tank. The coder is mounted below an engine deck opening, under a metal plenum. Cooling air is drawn in through a screened duct on left side of the fuselage up through the cooler, then aft to pass out through screened openings of the tailpipe fairing. A turbine fan driven by engine bleed air is mounted under the cooler. The engine oil cooler bypass selector valve (figure 4-18) is controlled by a float switch in the oil tank and the ENG OIL BYP switch on the pilot console. If oil level in the tank becomes low enough to operate the float switch, (3.8 quarts low from spill over) the ENG OIL BYPASS caution panel segment will light, and the valve will automatically shut off flowfothecooler and return engine oil directly to the tank. The pilot can use his switch to reopen the valve and use oil cooling when conditions warrant such action. The engine oil cooler temperature regulating valve, mounted in the oil cooler, automatically bypasses the oil cooler core when oil is cold. A chip detector drain plug at lower right on accessory gear box is wired to the ENGINE CHIP caution light.

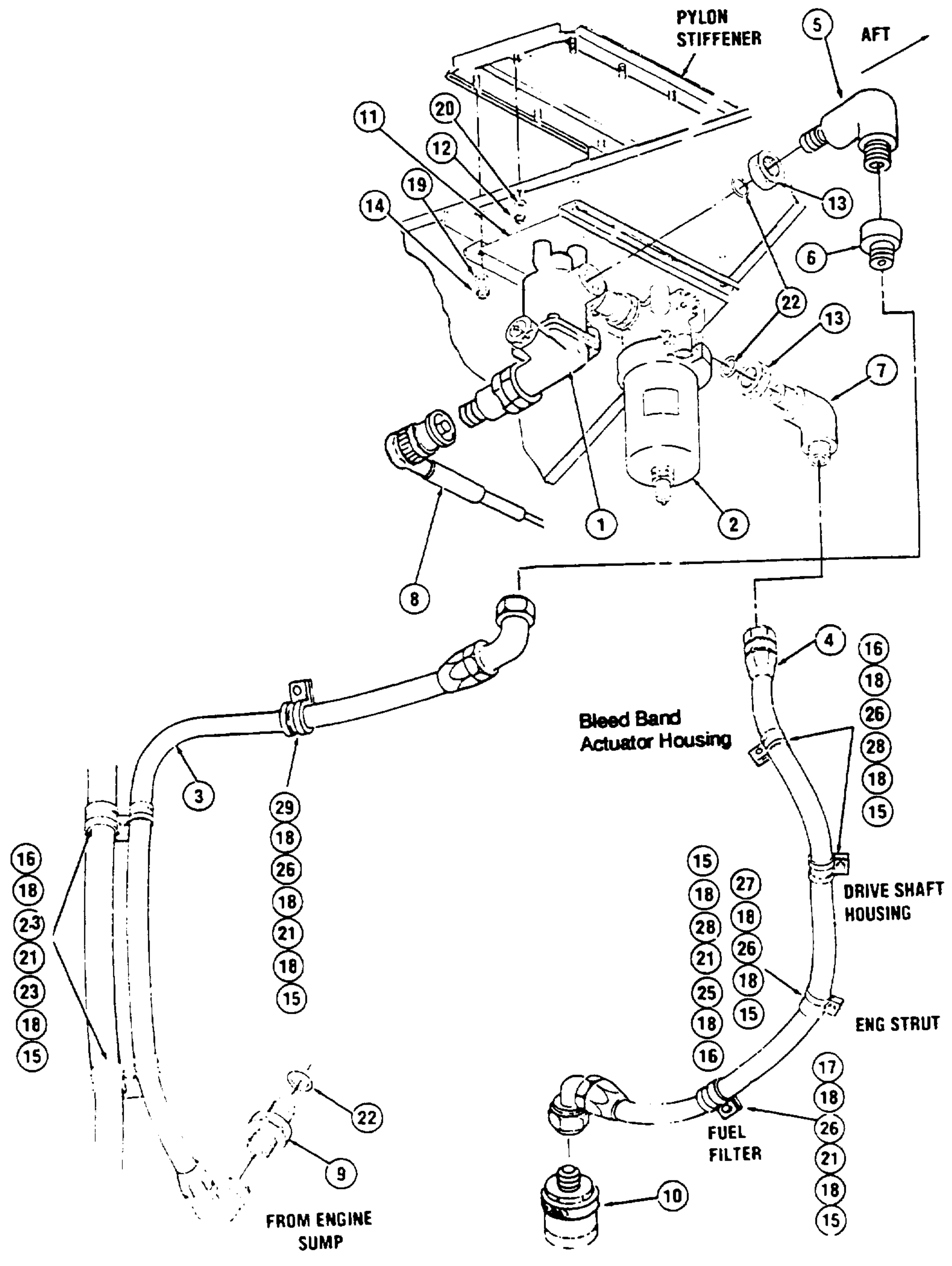
4-60.1 AIRCRAFT EQUIPPED WITH OIL DEBRIS DETECTION SYSTEM (ODDS).

a. The primary benefit of ODDS system is improved filtration of the engine and main transmission lubrication systems. The ODDS system is designed to provide early identification of potential component failures. Fine filtration (3 micron) increases system life by removing oil-borne particles which cause wear in the component. Analysis shows that catastrophic failure modes that are detected through spectrometric oil analysis (SOA)/AOAP will be detected by the ODDS system chip detectors. The ODDS equipped engine and main transission do not require routing oil sampling. Spectrometric oil analysis (SOA)/AOAP measures concentrations of wear metal debris in the three to ten micron range. Not enough debris of significant size particles exist to allow an accurate indication of wear metal concentration by spectrometric analysis. Therefore routine oil sampling is not required or authorized.

b. Although routine oil sampling of the engine and main transmission on ODDS equipped aircraft is not required or authorized, samples may be taken in the event of a chip light, and provided along with chip detector debris to an AOAP lab for analysis using ferrography or similar techniques. The results of this analysis will be used with the oil debris classification chart guidelines to determine the serviceability of the component.

c. Replacement of ODDS equipped engine and main transmission external oil filters are preformed “ON CONDITION” (as required by maintenance actions-such as bypass buttons, major component change, etc...). Since operation of fine filtration deans the lubricant in the component, do not replace lubricant when replacing the filter. Flushing and filtering of ODDS system and lubricant change is not required or authorized. Flushing, filtering, and lubricant change is only done during replacement of engine or main transmission.

d. During the modification of aircraft I.A.W. MWO 1-1520-236-50-30 (ODDS) chip detectors in the 42-and 90-degree gearbox were changed, they are not part of the ODDS oil filtering system and still require (SOA)/AOAP samples and inspections.



1. Oil separator
2. Oil filter
3. Hose (in)
4. Hose (out)
5. Coupling half, 90°
6. Coupling half, str
7. Elbow
8. Connector
9. Reducer
10. Quick-disconnect
11. Bracket
12. Nut
13. Nut
14. Nut
15. Nut
16. Screw
17. Screw
18. Washer
19. Washer
20. Washer
21. Spacer
22. Packing
23. Clamp
24. Clamp
25. Clamp
26. Clamp
27. Rivnut
28. Bracket
29. Screw
30. Screw

Figure 4-18.1. ODDS Oil Separator and Oil Filter Installation (MWO 1-1520-236-50-30)

4-61. TROUBLESHOOTING - OIL SYSTEM.

Use troubleshooting chart (table 4-2) in conjunction with oil system schematic (figure 4-19) to locate and correct malfunctions in the engine oil system.

NOTE

Before using this table, be sure all normal operational checks have been performed. In event of a malfunction which is not listed in this table, notify the next higher level of maintenance.

Table 4-2. Troubleshooting Engine Oil System

CONDITION

TEST OR INSPECTION

Corrective ACTION

CAUTION

Do not operate engine until it is determined that oil pump failure or oil starvation has not occurred.

1. No engine oil pressure.

STEP 1. Ensure that tank is filled to proper level. Fill tank to proper level if required (paragraph 1-4).

STEP 2. Check for loose connection and/or clogged hose. Inspect entire lubrication system for leaks and obstruction. Pay particular attention to quick disconnect fittings (figure 4-20).

STEP 3. Check for proper operation of oil pressure transmitting system.

Check system using pressure source at pressure tap. Replace oil pressure transducer if faulty. Replace oil pressure indicator if faulty. Check continuity of wiring circuit between transducer and indicator (paragraph 9-229).

STEP 4. Check that oil pump coupling is not sheared and female spline on oil pump driveshaft gear is not worn.

Table 4-2. Troubleshooting Engine Oil System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

Replace oil pump for sheared coupling. Inspect for worn spline on shaft gear. Refer to TM 55-2840-229-23 for removal and inspection procedures.

2. Fluctuating Oil Pressure.

STEP 1. Check oil quantity in tank.

Fill tank to proper level (paragraph 1-4).

STEP 2. Check for dirty piston in oil pump pressure regulating valve.

Remove, clean, and reinatall piston (TM 55-2840-229-23).

STEP 3. Check oil pump and/or oil pump driveshaft gear for failure.

Remove and replace oil pump or oil pump driveshaft gear (TM 55-2840-229-23).

STEP 4. Check for faulty transducer or circuit to indicator.

Perform continuity check and replace components as necessary (paragraphs 9-229 and 4-66).

3. Low engine oil pressure.

STEP 1. Check oil pressure transducer for faulty operation (paragraph 4-64).

Remove and replace faulty transducer (paragraphs 4-65 and 4-67).

STEP 2. Check for clogged oil fitter.

Clean oil filter (paragraph 7-47) or replace element in external oil filter (paragraph 4-61.17).

STEP 3. Check for low quantity in tank.

Fill tank to proper level (paragraph 1-4).

STEP 4. Check oil pump pressure regulating valve for proper adjustment.

Adjust regulating valve (TM 55-2840-229-23).

STEP 5. Check oil pump for faulty operation.

Remove and replace faulty oil pump (TM 55-2840-229-23).

4. High engine oil pressure.

STEP 1. Check for restrictions in oil flow lines.

NOTE

Oil pressure transducers may foil to either the high or low stole level of cockpit pressure gage. Test engine oil pressure transducer with o direct reading pressure gage before rnak-ing any adjustments to engine oil pressure.

Table 4-2. Troubleshooting Engine Oil System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

Check quick disconnect couplings for proper connections.

Clear oil lines of restrictions (figure 4-20).

STEP 2. Check oil pump pressure regulating valve for proper adjustment.

Adjust regulating valve. (TM 55-2840-229-23.)

STEP 3. Check oil pressure transducer for faulty operation (paragraph 4-64).

Remove and replace faulty oil pressure transducer (paragraphs 4-65 and 4-67).

NOTE

High engine oil pressure may be due to cold oil on start. Allow engine to reach operating temperature by operating engine at idle.

5. High engine oil temperature.

STEP 1. Ensure that cooling air inlet is not blocked.

Inspect screened inlet and remove all gross, leaves and other foreign material. Also check coder core air passage and remove any grass dirt or other foreign material (paragraph 4-79).

STEP 2. Ensure that oil cooler blower is operating correctly.

Check for proper blower operation. Repair and replace as necessary (paragraph 4-89).

STEP 3. Check that temperature regulating valve (20, figure 4-21) is not stuck in bypass position (paragraphs 4-79 and 4-80).

If valve is stuck in bypass position, remove and replace valve or oil cooler (paragraph 4-81).

STEP 4. Check that emergency bypass is not stuck in bypass position.

If valve is stuck in bypass position, remove and replace valve (paragraphs 4-94 and 4-97).

STEP 5. Check engine oil level.

Fill tank to proper level (paragraph 1-4).

STEP 6. Ensure that temperature indicating system is operating correctly.

Check operation of oil temperature indicator, resistance bulb and related circultry. Replace faulty components (paragraph 8-57).

STEP 7. Check for bleed air leak between engine and oil cooler turbine fan.

Isolate and correct any leaks (figure 4-18).

Table 4-2. Troubleshooting Engine Oil System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

STEP 8. Check operation of low level emergency system float switch in oil tank (paragraph 4-70).

Replace faulty float switch in oil tank (paragraph 4-71).

6. Low oil temperature.

STEP 1. Check operation of temperature indicating system.

Check operation of oil temperature indicator, resistance bulb. and related circuitry. Replace faulty components (paragraph 8-57).

STEP 2. Check that engine oil cooler bypass selector valve (figure 4-18) is not stuck in bypass position.

Replace oil cooler (paragraph 4-81).

7. No oil temperature.

STEP 1. Check operation of temperature indicating system

Check operation of oil temperature indicator, resistance bulb, and related circuitry. Replace faulty components (paragraph 8-57).

8. Excessive engine oil consumption.

STEP 1. Check for leakage at fittings and hose connection.

Tighten or replace fittings or hose assemblies.

NOTE

Refer to TM 55-2840-229-23 for additional excessive engine oil consumption troubleshooting procedures.

4-61.1. EXTERNAL OIL SEPARATOR (LUBRICLONE) (Helicopters with MWO 1-1520-236-50-30)

4-61.2. DESCRIPTION. A cyclonic oil separator and monitor (Lubriclone) (23.2, figure 4-4) is mounted overhead on bracket on firewall of engine compartment. Oil from engine sump enters tangential port, causing vortex flow in main chamber. Flow swirls particles outward and downward to small trap which contains chip detector. Oil exits at top and flows to external filter. Magnets in chip detector draw ferrous particles into the chip gap, where they are sensed and pulsed by oil debris detection system (ODDS). Small chips are pulsed (burned) away. Larger chips bridge a gap to light ENG CHIP caution light. Oil separator captures all particles over 100 microns and a proportion of particles between 15 and 100 microns which increases almost linearly with size.

4-61.3. REPLACEMENT OF DRAIN VALVE - OIL SEPARATOR. Proceed as follows: (figure 4-19.1)

a. Access oil separator by opening engine cowling.

b. Place container below oil separator to catch oil. Drain oil using drain valve (8).

c. Remove body of drain valve (8) and packings (7 and 15).

d. Install replacement body and new packing (7). Torque body to 16-20 inch pounds. Lockwire (C137) body.

e. Install new packing (15) on body.

f. Install cap on drain valve. Torque cap to 20-25 inch-pounds. Lockwire (C137) cap.

g. Service system with oil (paragraph 1-4).

4-61.4. REMOVAL - OIL SEPARATOR.

a. Access oil separator by opening engine cowling.

b. Disconnect connector (8, figure 4-18.1) from chip detector probe.

c. Place container below oil separator to catch oil. Remove lockwire and cap of drain valve (8, figure 4-19.1). Drain oil.

CAUTION

Make sure torques applied to fittings and hoses are not applied to ports or oil separator. Oil separator can be damaged.

d. Disconnect hose (3, figure 4-18.1) and coupling half (5) from coupling half (6) in inlet (aft) port.

e. Disconnect zero - clearance fitting of oil filter at fitting (6, figure 4-19.1) in outlet (right) port and discard packing (4).

f. Remove eight nuts (14, figure 4-18.1) and washers (19) and lower bracket (11).

g. Remove three bolts (2, figure 4-19.1), and washers (3) and remove oil separator.

h. Clean oil separator. Use solvent (C112) and clean cloths.

i. Inspect for serviceability and for cracks, particularly at ports and mounting holes.

j. If oil separator is to be replaced, disassemble as follows:

(1) Remove fitting (6) and packing (5) from outlet port. Remove coupling half (6, figure 4-18.1), nut (13), and packing (22) from inlet port. Discard packing.

(2) Remove body of drain valve (8, figure 4-19.1) and packings (7 and 15). Discard packings.

(3) Remove probe (14), body (12), cup (10), spring (9), and packings (13 and 11). Discard packings.

4-61.5. INSTALLATION - OIL SEPARATOR

CAUTION

Make sure torques applied to fittings and hoses are not applied to ports or oil separator. Oil separator can be damaged.

a. If oil separator is a replacement, assemble as follows:

(1) Install spring (9, figure 4-19.1), small end first, cup (10), packing (11), and body (12). Torque body to 32-38 inch-pounds and lockwire (C137). Install packing (13) and probe (14).

(2) Install packing (7) and body of drain valve (8). Torque body to 16-20 inch-pounds and lockwire (C137).

(3) Install fitting (6) and new packings (4 and 5) in outlet (right) port. Install packing (22, figure 4-18.1), nut (13), and coupling half (6) in inlet (aft) port.

b. Position oil separator below mount bracket (1, figure 4-19.1), outlet fitting inboard.

c. Install washers (3), and bolts (2). Torque bolts to 74-82 inch-pounds.

d. Position bracket (11, figure 4-18.1) on threaded studs of pylon stiffener and install eight washers (19) and nuts (14). Torque nuts to 120 to 140 inch-pounds.

e. (See figure 4-19.1.) Connect zero - clearance fitting of oil filter to fitting (6).

f. Install packing (15) on body of drain valve (8) and install cap. Torque cap to 20-25 inch-pounds. Lockwire (C137) cap.

g. Connect cable to chip detector probe (14).

h. Connect hose (3, figure 4-18.1) and coupling half (6) to coupling half (5).

i. Lockwire (C137) mounting bolts and cable plug.

j. Service system with oil (paragraph 14) and check for leaks at first runup (TM 55-1520-236-10).

4-61.6. OIL SEPARATOR CHIP DETECTOR (HELICOPTERS WITH MWO 1-1520-236-50-30)

4-61.7. DESCRIPTION - CHIP DETECTOR. A magnetic chip detector (14, figure 4-19.1) is installed in self-dosing valve in bottom of oil separator. Chip detector is connected to power module which pulses away nuisance chips and to ENG CHIP caution capsule in caution panel.

4-61.8. INSPECTION - CHIP DETECTOR.

NOTE

Chip detector is Inspected when ENG CHIP caution light comes on.

a. Disconnect cable plug from chip detector probe (14, figure 4-19.1)

b. Remove chip detector probe.

WARNING

If fragment can be Identified as piece from specific part, replace engine.

c. Inspect chip gap of chip detector probe for particles. Retain particles. (Refer to paragraph 4-61.9.) Discard packing (13).

d. Clean probe. Use dean cloths and cleaning solvent (C112).

e. install new packing (13) on chip detector probe (14).

f. Install chip detector.

g. Connect cable plug to chip detector and lockwire (C137).

4-61.8.1. ENGINE OIL CONTAMINATION TROUBLESHOOTING (HELICOPTERS WITHOUT MWO 1-1520-236-50-30) (ODDS)

a. If an excessive amount of chips is found on engine oil filter element chip detector, (figure 6-2, 6-2.1 and table 6-1.1) but output reduction carrier and gear assembly has freedom of movement and emits no unusual noises, proceed as outlined in steps (1) through (5). If contamination is caused by carbon particles, refer to step (6).

(1) Remove chips from engine internal oil filter element and retain for analysis. Clean filter element and reinstall.

(2) Drain all oil from accessory drive gearbox, oil tank, and oil cooler.

(3) Remove and inspect strainer for No. 2 bearing and strainer for No. 3 and 4 bearings for metal chips. If chips are present, remove and inspect three reduction gear oil transfer tube strainers and overspeed governor and tachometer drive oil throttle strainer. If metal chips have dogged more than one-third of flow area of any strainer, forward engine to overhaul. If amount of metal chips is not excessive, dean and reinstall strainers and proceed to Step (4).

(4) Replace oil filter (TM 55-2840-229-23). Presence of chips in strainers indicates oil fitter has been bypassed.

(5) Disconnect oil scavenge hose for No. 2 bearing and for No. 3 and 4 bearings and determine whether residual oil in these hose assemblies is contaminated with chips. If oil is contaminated, remove engine and forward to overhaul.

(6) If amount of carbon particles found on fitter element is excessive, proceed as follows:

(a) Drain oil from accessory drive gearbox, oil tank and oil cooler.

(b) Remove and inspect oil strainers for No. 2 bearing and for No. 3 and 4 bearings. If carbon partides are present, oil fitter has been bypassed. Remove clean, and reinstall reduction gear oil transfer tube strainers and overspeed governor and tachometer drive oil filter assembly (torquemeter). Clean and reinstall No. 2 and No. 3 and 4 bearing strainers.

(c) Clean and reinstall engine oil fitter assembly. (Refer to TM 55-2840-229-23.)

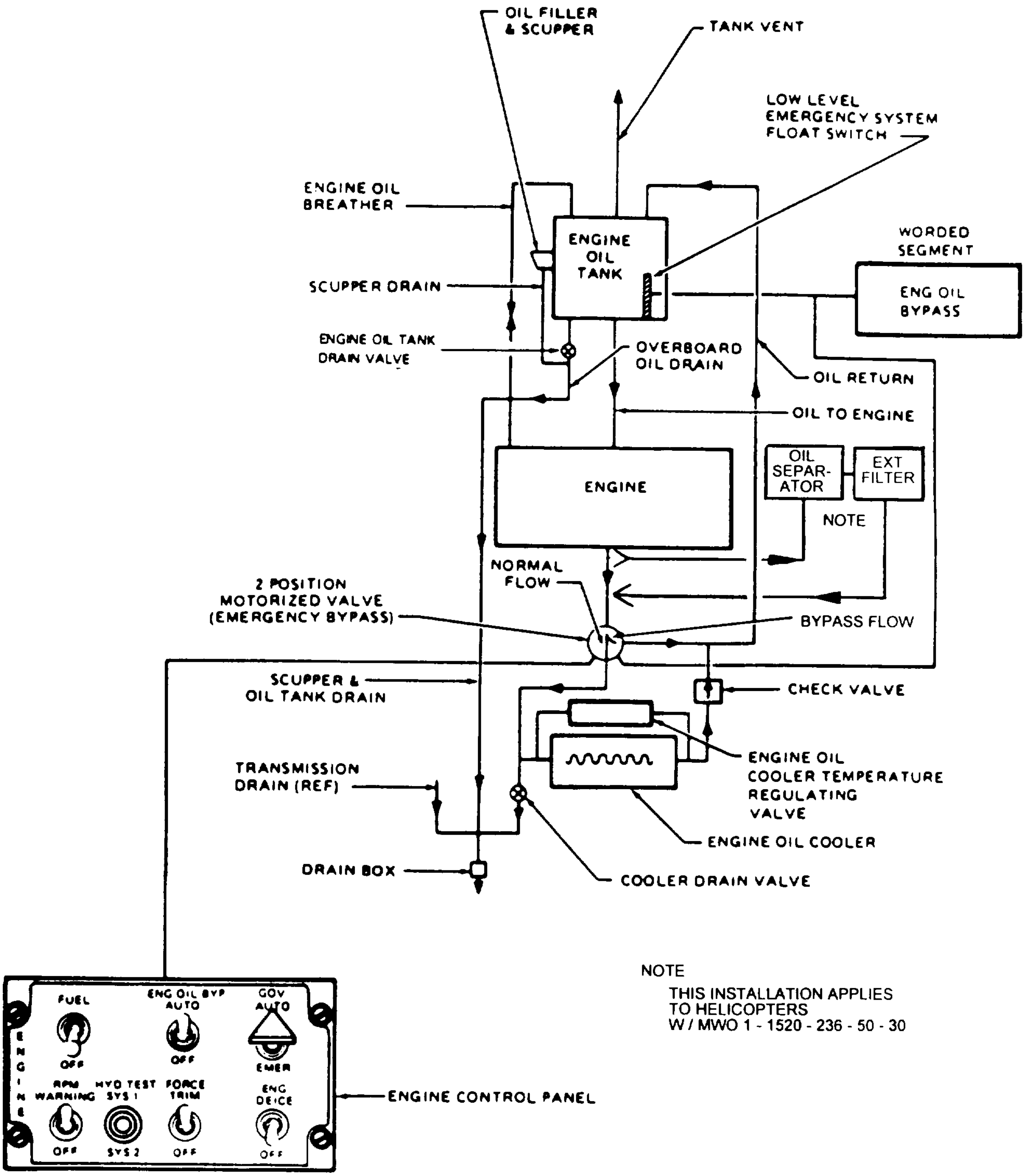
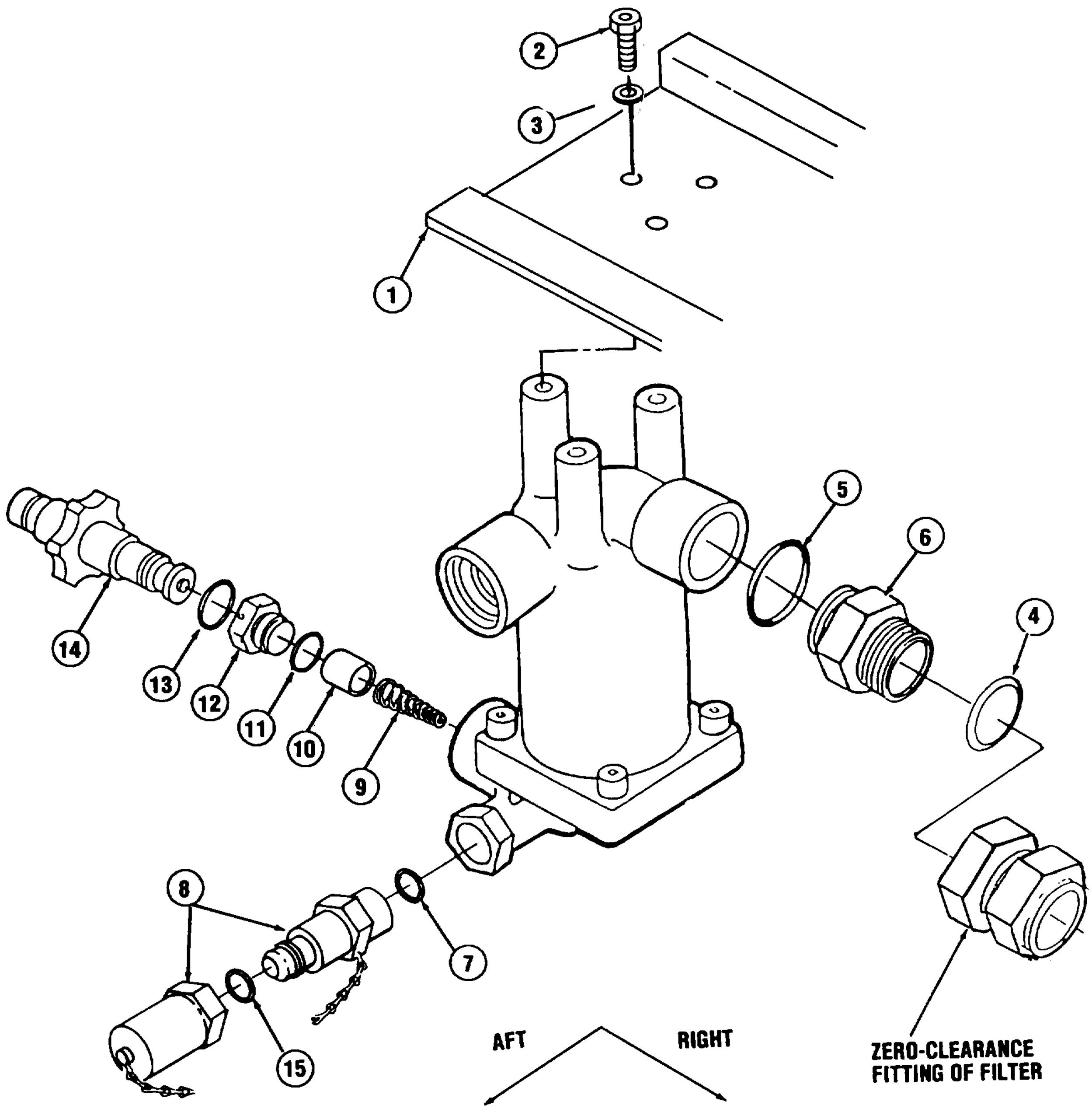


Figure 4-19. Engine Oil System Schematic



1. Bracket
2. Bolt
3. Washer
4. Packing
5. Packing
6. Fitting
7. Packing
8. Drain valve
9. Spring
10. Cup
11. Packing
12. Body
13. Packing
14. Chip detector probe
15. Packing

Figure 4-19.1. Oil Separator (Lubriclone) Assembly

Table 4-2.1. Oil Debris Classification Chart (Aircraft with ODDS)

Debris Type	Debris Description	Debris Source	Allowable Quantity & Size
A. Flakes–Magnetic	Thin, flat oblong particles with rounded or scalloped sides (like corn flakes).	Typically results from bearing spalling or other bearing or gear wear.	No more than 10 particles, none greater than 0.040 inch long. Very thin.
B. Granule–Magnetic	Fine powder–like clumps and/or irregular shaped debris (like coffee grounds).	Usually bearing/gear wear or scoring. Generally associated with fretting or components spinning in housings or on shafts. May be mixed with flakes or fragments.	No more than 50 particles. Length and width under 0.010 inch. Thickness varies but generally one–half of width.
C. Chunk/Fragment–Magnetic	Sometimes identifiable as fragment from specific component. Shape varies widely. Sometimes shows distinct fracture surface.	Indicates possible major failure of internal component–gear, bearing, etc. Can be maintenance induced or residual debris from a previous failure.	None of any size allowed.
D. Bronze–Non–magnetic	Granular, chunks, fragments, or powder–like golden particles.	Bearing cage wear or failure. Usually preceded by a chip light with small quantities of metallic (magnetic) debris. Usually 1–5 particles are present each event.	No more than 5 particles of any size.
E. Wire/Hair/Splinter/Sliver	Long, thin wire or hair–like particles (like steel wool or wood splinters). May have jagged edges and exhibit fracture planes.	Generally not significant wear mode. Often associated with maintenance induced debris. Usually 1–20 particles per event, of length 0.080 inch and thickness 0.010 to 0.012 inch.	No more than 40 particles of any size.
F. Cutting/Turning	Curled, twisted debris of varying length and thickness (like lathe turnings).	Usually maintenance–induced and not significant. However, recurrence of large quantities usually indicates abrasive wear by bearings or seals rotating in housings. Usually 5–20 particles per event, of length 0.080 inch and width 0.08 to 0.10 inch.	No more than 40 particles of any size.
G. Chrome/Silver	Large flat particles (like shavings, peelings).	Platings or coatings separating from parts such as bearings.	No more than 3 particles, none more than 0.08 inch long.
H. Aluminum/Magnesium	Granular, powder–like chunks or turning particles. Can be bright silver–white to gray if very fine.	Not usually significant. Wear of housings or damage to shims, spacers, cases, etc.	No more than 30 particles of any size.
I. Carbon	Black, usually granular or powder, may include chunks or slivers.	Usually due to wear of carbon seals. Other symptoms should be evident first, such as increased oil consumption, smoking, filter bypass, or leaking.	No maximum quantity/size. If more than 20 particles of any size is present, check seals and take appropriate maintenance actions.
J. Epoxy/Phenolic	Varies in color. Can be fibers, peelings, or plating–like particles.	Manufacturing debris of coating peeling.	No maximum quantity/size.
K. Sand/Dirt	Light or dark granular particles.	External contamination.	No maximum quantity/size.
L. Fibers/Lint	Color and types variable	External contamination.	No maximum quantity/size.

AIRCRAFT WITH ODDS

NOTE

Figure 4-19.2 has been deleted.

4-61.9. ENGINE OIL CONTAMINATION TROUBLESHOOTING (Helicopters with MWO 1-1520-236-50-30) (ODDS)

NOTE

It is very difficult to provide procedures for all types of chip light occurrences. Units should take full advantage of all information available, such as DA Form 2408-20 History, Oil Debris Classification Chart Supporting Oil Labs, CCAD Engine Service Center, etc . . . .

NOTE

Determine the different types of dedris on the chip detector, since it is possible to have more than one type of debris on the chip detector. An example would be the presence of both flakes and granules on the chip detector. More than 10 flakes or more than 50 granule particles would be cause for component removal. Any combination of less than 10 flakes and 50 granules would be acceptable.

NOTE

Replacement of external oil filter on ODDS aircraft is "ON CONDITION" and only when associated impending bypass indicator button is extended (second reset) or engine changed. The affected chip detector should also be removed and inspected whenever the impending bypass indicator button is extended. Shine fine filtration deans the lubricant in the component, do not replace the lubricant when replang filter. Flushing and filtering of system (unless there is a component replacement) is not required or authorized as this may mask problems and prevents trending of data.

a. In the event of engine chip light illumination:

(1) Inspect chip detector. If there are chips on detector but output reduction carrier and gear assembly has freedom of movement and emits no unusal noises, proceed as outlined in steps (2) through (7):

(2) Remove chips from chip detector. Classify debris I.A.W. Oil Debris Classification Chart (figure 4-19.2). Document findings on DA Form 2408-20, block 7.

NOTE

More frequent chip lights may be encountered in the first 50 hours of operation of a component which has undergone an overhaul or major repair, as well as break-in wear debris being present in lube system. This type of debris is normal and not indicative of a problem with ODDS system.

(3) Remove and inspect strainer for no. 2 bearing and strainer for no. 3 and 4 bearings for metal chips. Classify debris I.A.W. Oil Debris Classification Chart (figure 4-19.2), Document findings on DA Form 2408-20, block 7. If chips are present, remove and inspect three reduction gear oil transfer tube strainers and overspeed governor and tachometer drive oil throttle strainer. If metal chips have dogged more than one third of the flow area of any strainer classify debris I.A.W. Oil Debris Classification Chart (figure 4-19.2). Document findings on DA Form 2408-20, block 7, and forward engine to overhaul. If amount of metal chips is within limits, classify debris I.A.W. Oil Debris Classification Chart (figure 4-19.2). Document findings on DA Form 2408-20, block 7, then dean and reinstall strainers.

(4) Disconnect oil scavenge hose for no. 2 bearing and for no. 3 and 4 bearings and determine whether residual oil in these hose assemblies is contaminated with chips. If oil is contaminated, classify debris I.A W. Oil Debris Classification Chart (figure 4-19.2). Document findings on DA Form 2408-20, block 7. Remove engine and forward to overhaul.

(5) If evaluation of debris does not require component removal, classify debris I.AW. Oil Debris Classification Chart (figure 4-19.2). Document findings on DA Form 2408-20, block 7. Operate aircraft for one hour, (30 minutes flat pitch ground run and 30minutes hover in ground effect). Recheck drip detector. Classify debris I.A.W. Oil Debris Classification Chart (figure 4-19.2). Document findings on DA Form 2408-20, block 7.

(6) If the number or size of debris has increased remove defective component.

(7) If the number or size of debris decreases or remains the same return aircraft to service.

4-61.10. REMOVAL - CHIP DETECTOR PROBE.

Remove chip detector probe (14, figure 4-19.1) as follows:

a. Disconnect cable plug from chip detector.

b. Press probe (14) and turn counterclockwise to remove it.

4-61.11. REPLACEMENT OF SELF-SEALING VALVE. Replace defective parts only (figure 4-19.1).

a. Remove chip detector probe (paragraph 4-61.10).

b. Remove body (12), packing (11), cup (10), and spring (9). Discard packing.

c. Install spring (9), smaller end first, and cup (10). Install packing (11) on body (12) and install body. Torque body to 32-38 inch-pounds and lockwire (C137).

d. Install chip detector probe (paragraph 4-61.12).

4-61.12. INSTALLATION - CHIP DETECTOR PROBE. Install chip detector as follows: (figure 4-19.1).

a. Install new packing (13) on probe (14).

b. Install probe by pressing and turning CW.

c. Connect cable plug to chip detector and lockwire (C137).

4-61.13. EXTERNAL OIL FILTER (Helicopters with MWO 1-1520-236-50-30).

4-61.14. DESCRIPTION.

a. Oil filter (50, figure 4-4) is mounted overhead on bracket on firewall of engine compartment. Filter is in external oil circuit between oil separator and oil cooler. Filter includes 3-micron disposable element and popout differential pressure indicator. It bypasses at 7 to 9 psi; low-temperature lockout prevents actuation below 120° to 160°F. Filter design prevents re-entry of trapped debris into system during bypass. Drain valve on bottom of filter can be used to drain filter bowl for removal. Filter head is marked ENGINE.

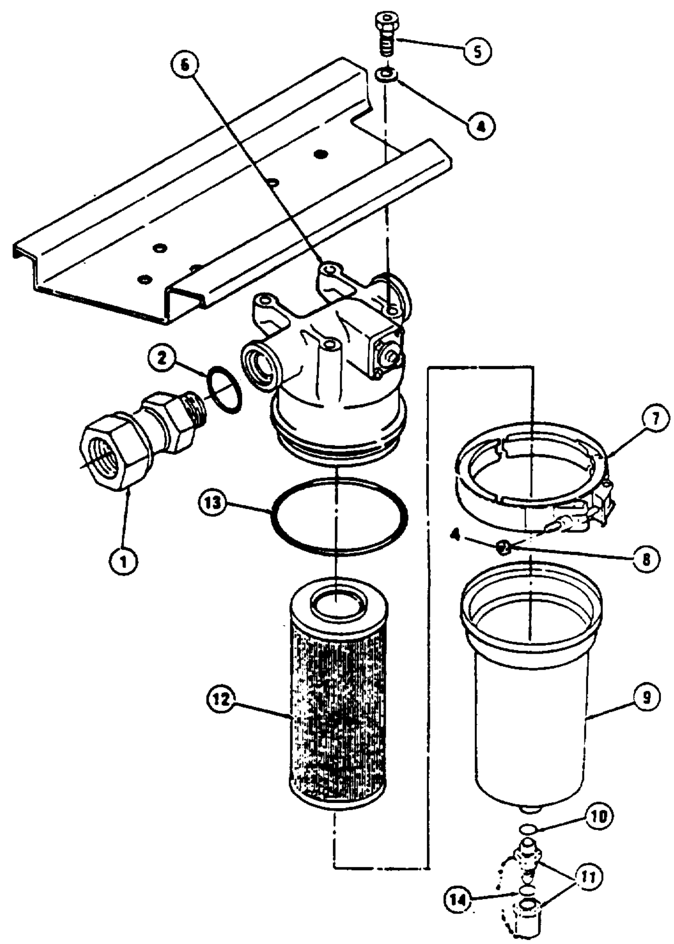
4-61.15. CLEANING - EXTERNAL OIL FILTER. Clean the filter bowl and head with clean cloth and solvent (C112). Dry with compressed air.

4-61.16. INSPECTION - EXTERNAL OIL FILTER.

a. Make sure filter head (6, figure 4-19.3) is marked ENGINE.

b. Check bypass indicator. Reset if extended. If reset, check for proper operation at next runup.

c. Inspect filter head and bowl (9) for corrosion, cracks, and evidence of leaks.



1. Zero-clearance fitting
2. Packing
3. Bracket
4. Washer
5. Bolt
6. Filter head
7. Coupling clamp
8. Nut
9. Filter bowl
10. Packing
11. Drain valve
12. Element
13. Packing
14. Packing

Figure 4-19.3. Engine External Oil Filter

4-61.17. REPLACEMENT OF ELEMENT OR BOWL- EXTERNAL OIL FILTER. Proceed as follows: (figure 4-19.3).

NOTE

Replacement of engine external oil filter on aircraft with ODDS is "ON CONDITION" change only when associated impending bypass indicator button is extended (second reset) or when engine is changed The affected chip detector should also be removed and inspected whenever the impending bypass indicator button is extended. Since operation with fine filtration deans the lubricant in the component do not replace lubricant when replacing filter. Flushing and filtering of system (unless there is a comp nenf replacement) is not required or au thorized as this may mask problems and prevents trending data.

a. Access oil fitter by opening engine cowling.

b. Place container below filter to catch oil. Remove Iockwire from cap of drain valve (11). Remove cap to drain oil.

c. Remove Iockwire and coupling damp (7).

d. Remove filter bowl (9) and element (12) downward.

e. Remove packing (13) from head (6).

f. Clean head and bowl. Use cloths and cleaning solvent (C112). Inspect bowl for cracks and serviceability.

g. Install new packing in head.

h. Install new or serviceable element in filter bowl.

i. Position bowl in head.

j. Install and tighten coupling damp. Torque coupling nut (8) to 40-50 inch-pounds. Lockwire (C137) clamp.

k. Install packing (14) and cap of drain valve (11). Torque cap to 20-25 inch-pounds. Lockwire (C137) cap.

I. Service system with oil (paragraph 1-4).

4-61.18. REPLACEMENT OF DRAIN VALVE - EXTERNAL OIL FILTER. Proceed as follows: (figure 4-19.3).

a. Access oil filter by opening engine cowling.

b. Place container below filter to catch oil. Drain oil using drain valve (11).

c. Remove body of drain valve (11) and packings (10 and 14) from bowl (9).

d. Install body and new packing (10) in bowl. Torque body to 16-20 inch-pounds. Lockwire (C137) body.

e. Install new packing (14) on body. Install cap on drain valve. Torque cap to 20-25 inch-pounds Lockwire (C137).

f. Service the system with oil (paragraph 14).

4-61.19. REMOVAL - EXTERNAL OIL FILTER. Access oil filter by opening engine cowling.

a. Place container below filter to catch oil. Remove lockwire from cap of drain valve (11, figure 4-19.3). Remove cap to drain oil.

b. Disconnect hose (4, figure 4-18.1) from elbow (7) in OUT port

c. Disconnect zero-clearance fitting (1, figure 4-19.3) from oil separator.

d. Remove eight nuts (14, figure 4-18.1) and washers (19) end lower bracket (11).

e. Remove four bolts (5, figure 4-19.3), and washers (4) from bracket (1) and remove fitter. Inspect filter head and bowl for serviceability.

f. If fitter or head will be replaced, remove fitting (1) and packing (2) from IN port of head (6). Remove elbow (7, figure 4-18.1), nut (13), and packing (22) from OUT port. Retain fitting and elbow. Discard packings.

4-61.20. REPLACE OF FILTER HEAD - EXTERNAL OIL FILTER. (See figure 4-19.3).

a. Remove filter (paragraph 4-61.19).

b. Remove Iockwire and coupling damp (7).

c. Remove fitter bowl (9) and element (12) downward. Remove and discard packing (13) from head. Inspect element.

CAUTION

Make sure replacement filter head is marked ENGINE. Otherwise, oil system performance will be degraded and pressure bypass mechanism will not function as required.

d. Install new packing (13) in replacement head (6).

e. Install serviceable element and bowl.

f. Install and tighten coupling damp. Torque coupling nut (8) to 40-50 inch-pounds

g. Install filter (paragraph 4-61.21).

4-61.21. INSTALLATION - EXTERNAL OIL FILTER.

a. If filter or head is a replacement, install fitting (1, figure 4-19.3) and new packing (2) in IN port. Install elbow, pointing downward (7, figure 4-18.1), packing (22) and nut (13) in OUT port.

b. Position oil filter below bracket (1, figure 4-19.3), IN port fitting toward oil separator fitting.

CAUTION

Make sure filter head Is marked ENGINE and that filter is installed IN port toward oil separator. Otherwise, oil system performance will be degraded and pressure bypass mechanism will not function as required.

c. Install four bolts (5), and washers (4). Torque bolts to 87-93 inch-pounds

d. Connect zero clearance fitting (1) to oil separator.

e. Connect oil hose (49, figure 44) (from valve fitting at service deck) to elbow in OUT port.

f. Install packing (15, figure 4-19.3) on body of drain valve (11).

g. Install cap on drain valve (11). Torque cap to 20-25 inch-pounds lockwire (C137) cap.

h. Service system with oil (paragraph 14) and perform maintenance operational check for leaks and proper operation at first runup (TM 55-1520-236-10).

4-62. OIL PRESSURE TRANSDUCER.

4-63. DESCRIPTION - OIL PRESSURE TRANSDUCER.

An oil pressure transducer is located on left forward side of engine. The oil pressure transducer transmits actual oil pressure to oil pressure gages on pilot and gunner instrument panel.

4-64. INSPECTION - OIL PRESSURE TRANSDUCER.

a. Inspect pressure transducer for leakage, proper operation, general condition and security.

b. Inspect pressure transducer for proper operation (paragraph 8-61)

4-65. REMOVAL - OIL PRESSURE TRANSDUCER.

Refer to paragraph 8-72.

4-66. REPAIR OR REPLACEMENT - OIL PRESSURE TRANSDUCER.

a. Replace transducer if inspection requirements are not met (paragraph 4-64).

4-67. INSTALLATION - OIL PRESSURE TRANSDUCER.

Refer to paragraph 8-74.

4-68. OIL TANK.

4-69. DESCRIPTION - OIL TANK.

The engine oil system tank is a self-sealing cell equipped with a filler cap, an oil level sight glass, and a scupper with drain line (figure 4-20). The tank is located in the aft fairing, secured by bolts on a horizontal firewall above the engine, and accessible for service through right side of transmission cowling. Bosses on bottom of the tank provide mounting for an outlet coupling, a drain valve (14), and a float switch assembly (25). A plate on top of the tank provides connections for a vent tube (1), and for oil return and engine breather line tubes.

4-70. INSPECTION – OIL TANK.

a. Inspect oil tank (7, figure 4-20) for evidence of leakage and general condition. If oil tank is damaged, send to depot maintenance for evaluation.

b. Inspect sight glass (21) for cracks, clear condition, and security.

c. Inspect filler cap and adapter (27) for correct locking action.

d. Inspect all detail parts of oil tank assembly for damage and corrosion

e. Inspect oil tank float switch assembly (25) for proper operation as follows:

(1) Fill oil tank to overfill (spillover) condition

(2) Apply electrical power to helicopter

(3) Using drain valve, remove oil from tank assembly. If low level warning switch is operating correctly and electrical circuit is intact, ENG OIL BYPASS caution panel segment should illuminate when approximately 3.8 quarts of oil are removed.

4-71. REMOVAL - OIL TANK.

a. Open engine compartment cowling. Remove center fairing to allow access through front of aft fairing.

WARNING

Prolonged contact with lubricating oil may cause a skin rash. Those areas of skin and clothing that come in contact with lubricating oil should be thoroughly washed immediately. Areas in which lubricating oil is used should be adequately ventilated to keep mist and fumes to a minimum.

b. Place a suitable vessel under drain line. Drain oil tank by opening valve.

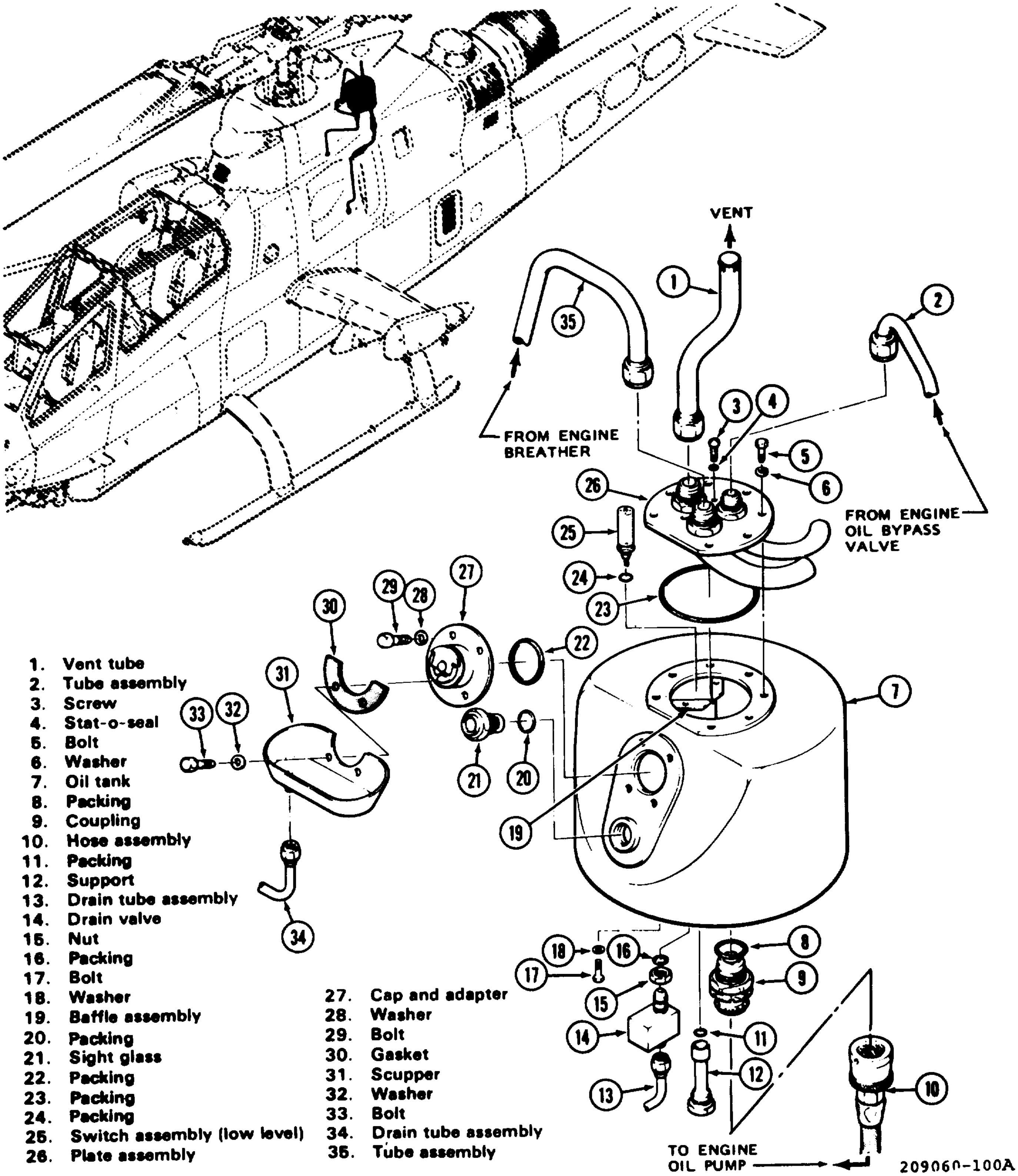
c. Disconnect hose assembly (10, figure 4-20) from coupling (9).

d. Disconnect drain tube assembly (13) from drain valve (14).

e. Disconnect drain tube assembly (34) from scupper (31).

f. Loosen nut (15) and remove drain valve (14). nut (15) and packing (16) from oil tank.

g. Remove coupling (9) and attached packing (8).



1. Vent tube
2. Tube assembly
3. Screw
4. Stat-o-seal
5. Bolt
6. Washer
7. Oil tank
8. Packing
9. Coupling
10. Hose assembly
11. Packing
12. Support
13. Drain tube assembly
14. Drain valve
15. Nut
16. Packing
17. Bolt
18. Washer
19. Baffle assembly
20. Packing
21. Sight glass
22. Packing
23. Packing
24. Packing
25. Switch assembly (low level)
26. Plate assembly
27. Cap and adapter
28. Washer
29. Bolt
30. Gasket
31. Scupper
32. Washer
33. Bolt
34. Drain tube assembly
35. Tube assembly

Figure 4-20. Oil Tank Installation

h. Disconnect engine breather tube assembly (35), vent tube (1), and engine oil bypass valve tube assembly (2) from oil tank plate assembly (26).

i. Disconnect electrical leads of float switch assembly (25) from relay on airframe. Remove support (12) and switch from tank.

j. Remove three bolts (17) and three washers (18). Remove oil tank assembly.

k. Disassemble detail parts of tank assembly as required to replace detail parts or replace oil tank (7).

4-72. CLEANING – OIL TANK.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with akin or eyes.

a. Clean oil tank (7, figure 4-20) externally and oil tank detail parts using dry cleaning solvent (C112). Drain off solvent and dry with filtered compressed air.

b. Clean minor corrosion from metal parts using sendpaper (C102).

4-73. REPAIR OR REPLACEMENT – OIL TANK.

a. Replace packings or gaskets under oil tank (7, figure 4-20) parts if leakage exists.

b. Replace oil tank (7, figure 4-20) and/or damaged fittings or detail parts that fail to meet inspection requirements (paragraph 4-70).

c. Replace tank (7) if punctured, cut or otherwise damaged. Send tank to depot maintenance for evaluation.

4-74. INSTALLATION – OIL TANK.

a. Ensure that filler cap and adapter (27, figure 4-20), scupper (31), sight glass {21), and plate assembly (26) are installed on tank.

b. Place tank (7) in position on horizontal firewall of aft fairing, with filler cap (27) forward. Align holes and install three bolts (17), with washer (18), through firewall into threaded inserts of tank.

c. Install coupling (9) with packing (8) in lower boss of oil tank. Connect hose assembly (10) to coupling (9).

d. Assemble nut (15) and packing (16) to drain valve (14). Install valve in drain port of tank and tighten nut (15). Connect drain tube assembly(13) to drain valve.

e. Install support (12) with packing (11) in tank assembly.

f. Assemble packing (24) to float switch assembly (25). Route wires of float switch through support (12) and secure float switch to support. Connect electrical leads to relay on airframe.

g. Connect tube assemblies (35), (2) and vent (1) to plate assembly (26).

4-76. SERVICING – OIL TANK.

Service oil tank in accordance with instructions contained in paragraph 1-4.

4-75. OIL COOLER.

4-77. DESCRIPTION – OIL COOLER.

The engine oil cooler is mounted on underside of the engine compartment deck. Its inboard side is attached to mating flanges of the transmission oil cooler, but there is no oil connection between the two oil coolers. The oil cooler is equipped with an integral bypass valve.

WARNING

Oil cooling turbine fan does not incorporate a protective fan screen. Do not attempt oil cooler or oil cooling turbine fan maintenance with engine operating. Disconnect bleed air hose prior to maintenance.

4-78. REMOVAL – OIL COOLER.

CAUTION

If oil cooler is known to have been contaminated with metal particles, replace cooler and tag removed cooler as being contaminated. Forward to depot. Refer to TM 55-1500-204-25/1 for detailed procedures.

CAUTION

Use back-up wrenches when removing and installing oil cooler drain fittings, valves and lines.

Premaintenance Requirements for Engine Oil Cooler

Condition	Requirements
Model	AH-1S
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C35), (C76), (C100), (C101), (C112)
Special Environmental Conditions	Dust Free

a. Remove oil cooling duct from left side and access door from right side of fuselage. Remove turbine fan and duct (paragraph 4-85).

b. Drain trapped oil from cooler.

c. Disconnect inlet and outlet oil lines from cooler fittings. Cap open lines.

WARNING

Prolonged contact with lubricating oil may cause a akin rash. Those areas of akin and clothing that come in contact with lubricating oil should be thoroughly washed immediately. Areas in which lubricating oil is used should be adequately ventilated to keep mist and fumes to a minimum.

d. Remove bolts (27, figure 4-21), nuts (29), and washers (28) that attach engine oil cooler to transmission oil cooler.

e. Remove bolts (1) and washers (2) around mounting flange of engine oil cooler. Remove cooler from fuselage.

f. If cooler is being replaced, remove inlet and outlet fittings and hardware for use on replacement assembly.

4-79. CLEANING – OIL COOLER (AVIM).

CAUTION

When using steam and compressed air, be careful not to damage air fins by high pressures.

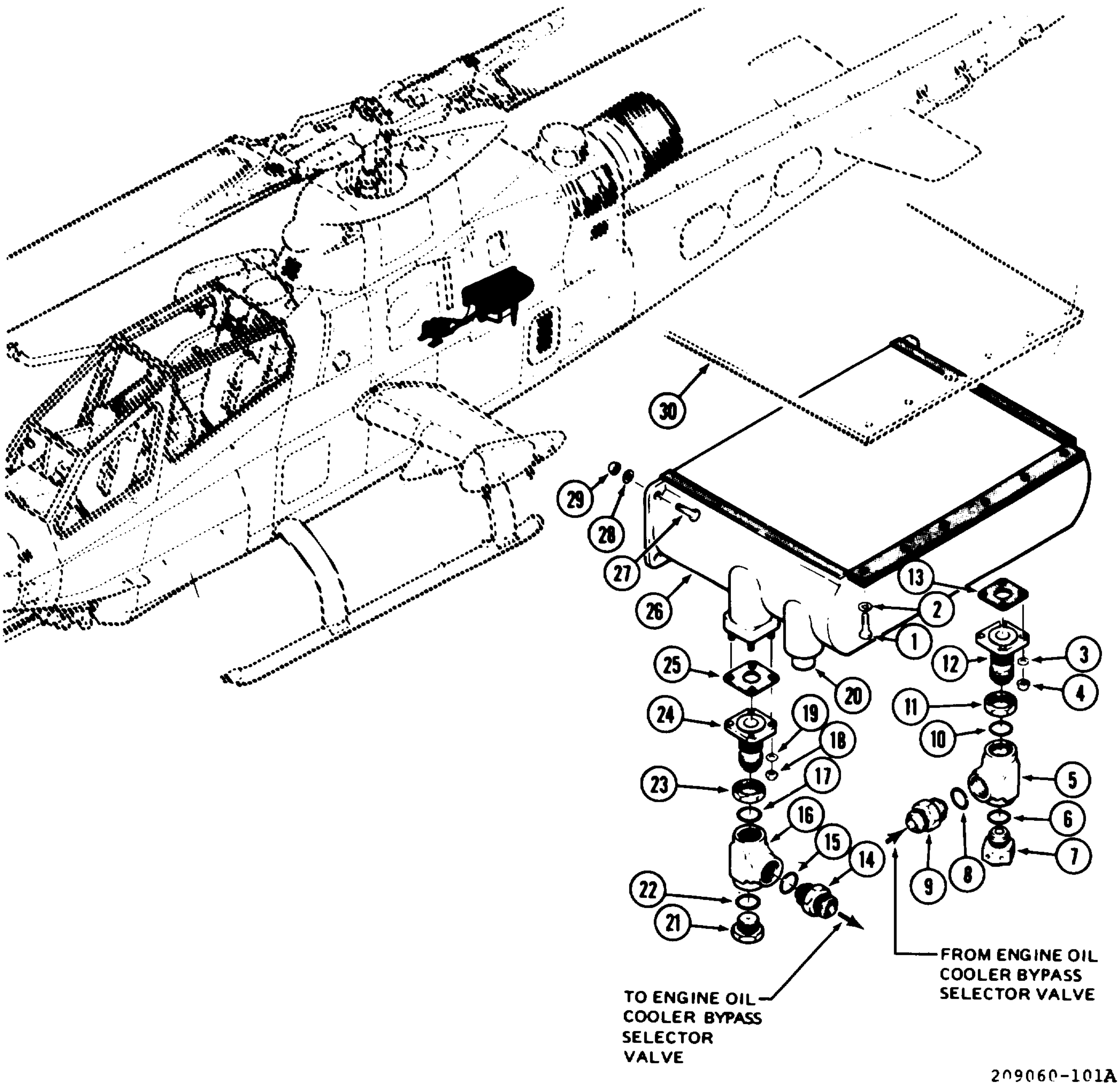
a. Steam clean the exterior surfaces and corrugated air fins of each core. Remove obstructions from air fins with a pick and compressed air.

b. Prepare oil cooler for internal cleaning as follows:

(1) Remove lockwire and unscrew oil cooler bypass valve body (20, figure 4-21) from valve housing in cooler.

(2) Press a rubber plug into the bypass opening in the valve housing.

(3) Reinstall temperature regulating valve (20) into valve housing so valve body bears up againstthe rubber plug.



1. Bolt	11. Nut	21. Plug
2. Washer	12. Fitting	22. Packing
3. Washer	13. Gasket	23. Nut
4. Nut	14. Union	24. Fitting
5. Tee	15. Packing	25. Gasket
6. Packing	16. Tee	26. Oil cooler
7. Plug	17. Packing	27. Bolt
8. Packing	18. Nut	28. Washer
9. Union	19. Washer	29. Nut
10. Packing	20. Temperature regulating valve	30. Airframe structure (Ref)

Figure 4-21. Engine Oil Cooler Installation

c. Connect oil cooler in line with cleaning equipment in reverse of normal flow for first flush (figure 4-22).

NOTE

Centrifugal pump in cleaning equipment must be capable of supplying fluid at approximately 40 gpm while maintaining pressure of 76 psi.

d. To remove oil and loose sludge and to reduce contamination of cleaning solutions during following operations, pre-clean cooler interior as follows:

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(1) Flush core, in reverse direction, with solvent (C112)for 30 minutes or until solvent appears clean.

(2) Reverse lines to cooler and flush core in direction of normal flow for approximately 15 minutes.

(3) Remove oil cooler from cleaning equipment and drain all fluid from cooler.

e. Remove dirt, carbon deposits, oil gum, lead deposits, and other contaminants by connecting oil cooler to cleaning equipment (figure 4-22). Use cleaning compound (C35).

(1) Flush core 30 TO 60 minutes in direction opposite to normal flow.

(2) Reverse lines and flush core in normal direction for 16 minutes.

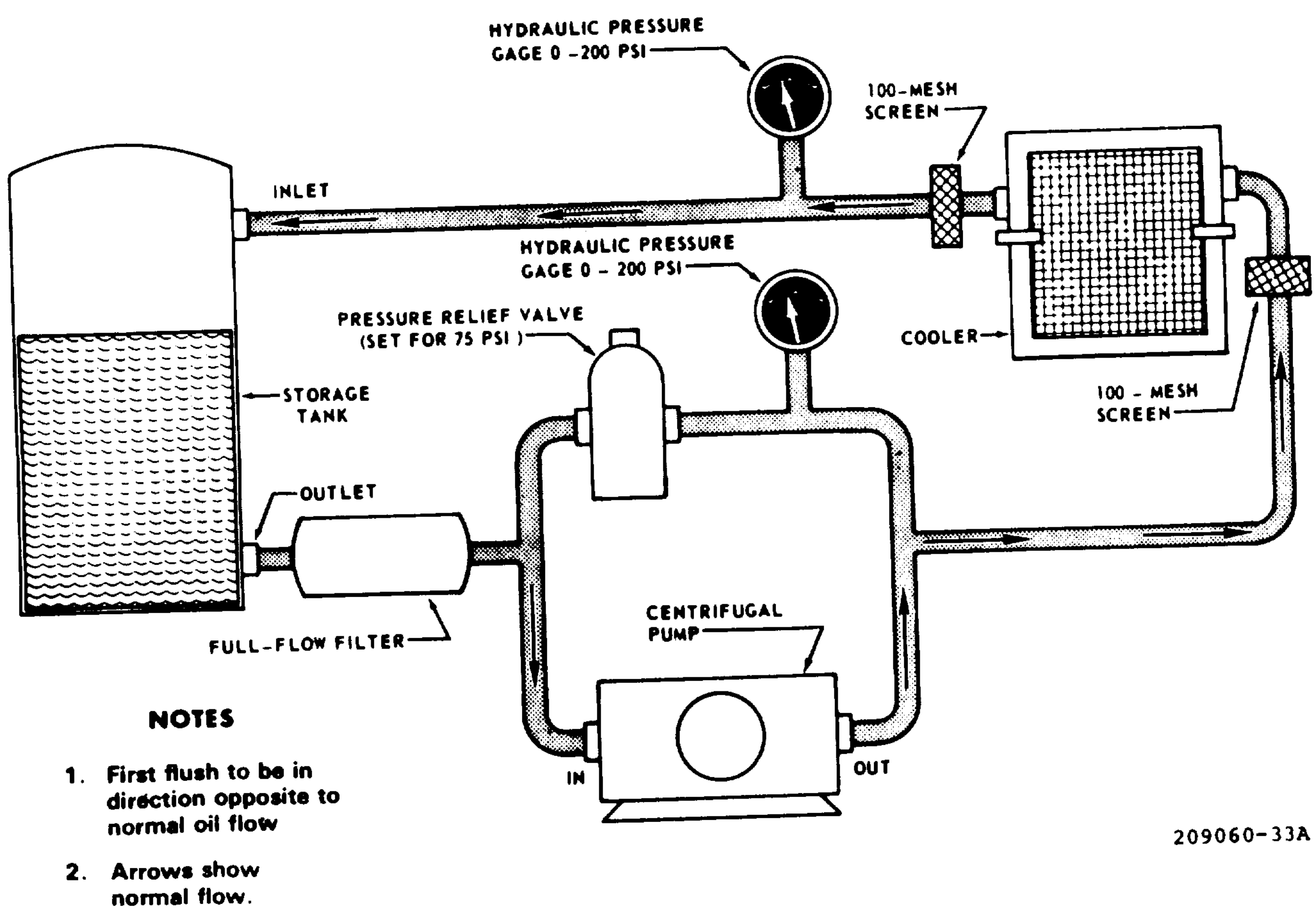


Figure 4-22. Oil Cooler Cleaning Schematic

(3) Remove plug installed in bypass opening of valve housing and insert plug in cooling section opening. Reinstall temperature regulating valve (20, figure 4-21).

(4) Flush oil cooler in normal direction for 16 minutes to clean bypass passage.

(5) Remove plug from cooling section opening in valve housing and install into bypass opening. Reinstall temperature regulating valve (20).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors I nd contact with skin or eyes.

f. Connect oil cooler to cleaning equipment containing cleaning compound (C35). Install 100-mash screen at inlet and outlet ports of oil cooler.

(1) Flush core for 10 minutes in each direction.

(2) Check 100-mesh screens between each flush.

(3) If screens are not clear, reflush core for 6 minutes in each direction, repeat until screens are clear.

g. Remove rubber plug from bypass valve housing m oil cooler.

4-80. INSPECTION – OIL COOLER.

a . Inspect air fins and air passages for distortion and foreign particles that may obstruct air flow.

b. Inspect cooler for damaged or bulged plates, cracked castings and flanges and broken welds. Inspect studs for stripped threads and cracked or ineffective lock rings.

c. Inspect all openings in oil cooler for evidence of foreign matter inside of the cooler.

d. Inspect rubber gaskets on top of cooler for security, rips, tears, or scores, and missing sections that may prevent gaskets from sealing.

e. Inspect temperature regulating valve (20, figure 4-21) and valve housing for stripped threads and distortion, scoring, or wear of the seal surfaces. Check functioning of bypass control valve as follows:

(1) Submerge valve in water heated to 150 TO 155 degrees F. (66 TO 68 degrees C) for five minutes. Valve should open.

(2) Remove valve from water and measure length and record.

(3) Submerge valve in water heated to 176 TO 180 degrees F. (80 TO 82 degrees C) for five minutes. Valve should open.

(4) Remove valve from water and measure length. Minimum acceptable increase in valve length from dimension recorded in step (2) is 0.080 inch.

f. With temperature regulating valve installed, pressure-check oil cooler.

(1) Make preliminary check of oil cooler for air bake as follow:

(a) Plug outlet port and connect an air line to inlet port.

(b) Connect other end of air line to an adjustable air pressure source and adjust pressure to 12 psig.

(c) Submerge cooler in water at approximately 140 degrees F (80 degrees C). Gradually heat water to 180 degrees F (82 degrees C) and check for leaks.

WARNING

Increase air pressure gradually to avoid bums from leakage and hot water.

(d) After 6 minutes of submersion, gradually increase air pressure to 100 psig. inspect cooler for leaks as evidenced by presence of air bubbles.

(e) Remove cooler from water and relieve air pressure.

(2) Make final check of oil cooler as follows:

(a) Dry oil cooler externally using compressed air.

(b) Plug outlet port and apply room temperature water at 400 psig to the other (inlet) port.

(c) Lock liquid in oil cooler for 10 minutes.

(d) Inspect cooler for visible leaks, blown or bulged plates.

(e) Release pressure and drain cooler.

4-81. REPAIR OR REPLACEMENT – OIL COOLER.

a. Replace oil cooler if damaged, other than minor distortion to air fins, is defective or if cooler fails to meet inspection requirements (paragraph 4-80).

b. Repair minor bends or distortion of accessible air fins with flat duckbill pliers.

c. Replace missing, torn, ripped, and scored gaskets with rubber (C101). Attach gaskets to oil cooler surface with rubber adhesive (C100). Replace engine oil cooler bypass selector valve seal.

d. Replace damaged or faulty engine oil cooler bypass selector valve or replace oil cooler.

e. If oil cooler is unserviceable, flush thoroughly with corrosion preventive oil (C76) as follows:

NOTE

The interior of the cooler should be completely dry before final flush with corrosion preventive oil to prevent fouling of the mixture.

(1) Connect cooler to cleaning equipment containing corrosion preventive oil and 100-mesh screens.

(2) Flush oil through cooler in each direction for 10 minutes.

(3) Check 100-mesh screens between each flush to ensure that no metal particles have appeared.

(4) Drain cooler and install plugs in both inlet and outlet ports. Secure bypass control valve with lockwire.

f. Prepare oil cooler for storage or shipment as follows:

(1) Flush oil cooler thoroughly with corrosion preventive oil (C76).

(2) Store cooler in container which will prevent damage during shipment or storage.

4-82. INSTALLATION – OIL COOLER.

a. If replacing cooler, install inlet and outlet fittings with new gaskets.

b. Position cooler on underside of support, below engine deck and secure to airframe with bolts (1, figure 4-21) and washers (2). Install bolts (27) through mating flanges of engine and transmission oil coolers, and secure with nuts (29) and washers (28).

c. Install trubine fan (paragraph 4-91).

CAUTION

Check proper alignment of flared ends of tubing to valves and fittings. Do not allow preloading or stresses due to misalignment or improper fit.

d. Align and connect oil lines to cooler fittings.

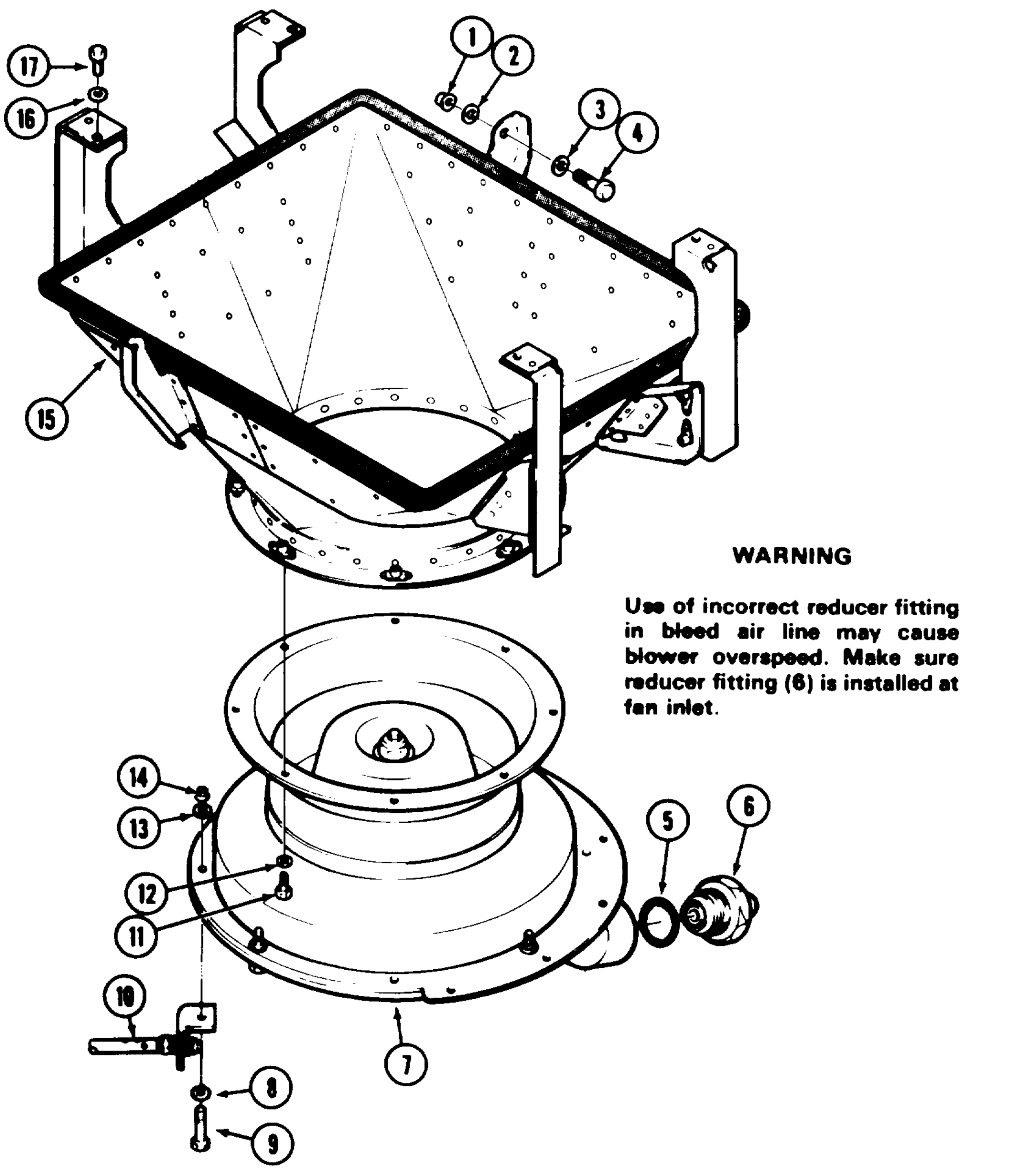
e. Install cooling duct and access door.

f. Service oil tank. Check for leaks and proper operation at next ground run. After completion of ground run, reservice oil tank as required.

4-83. OIL COOLING TURBINE FAN.

4-84. DESCRIPTION – OIL COOLING TURBINE FAN.

a. A turbine fan (7, figure 4-23) driven by engine bleed air is used to blow air through the engine and transmission oil coolers. A fan is suspended on an adapting duct under the coalers, in the fuselage compartment below the engine deck.



WARNING

Use of incorrect reducer fitting in bleed air line may cause blower overspeed. Make sure reducer fitting (6) is installed at fan inlet.

1. Nut
2. Washer
3. Washer
4. Bolt
5. Preformed packing
6. Reducer
7. Turbine fan
8. Washer
9. Bolt
10. Brace
11. Bolt
12. Washer
13. Washer
14. Nut
15. Duct assembly
16. Washer
17. Bolt

Figure 4-23. Engine Oil Cooler Turbine Fan

Premaintenance Requirements For Removal of Oil Cooling Turbine Fan

Condition	Requirements
Model	AH-1S
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C31), (C37), (C88 or C91), (C112), (C137)
Special Environmental Conditions	None

WARNING

Oil cooling turbine fan does not incorporate a protective fan screen. Do not attempt oil cooler or oil cooling turbine fan maintenance with engine operating, Disconnect bleed air hose prior to maintenance.

4-85. REMOVAL – OIL COOLING TURBINE FAN.

a. Remove oil cooling inlet air duct from left side of fuselage (figure 4-18). Remove access door from right side fuselage.

b. Disconnect bleed air hose from inlet reducer (6, figure 4-23).

c. Remove two nuts (14), two washers (13), two washers (8), and two bolts (9). Disconnect braces (10) and attached brackets from turbine fan (7).

d. If access to engine oil cooler is required, proceed as follows:

(1) Remove nut (1), bolt (4), and washers (2 and 3) attaching duct assembly (15) to each side of oil cooler.

(2) Remove four bolts (17) and four washers (16). Remove duct assembly (15).

e. Remove eight bolts (11) and either washers (12). Remove turbine fan (7).

4-86, DISASSEMBLY – OIL COOLING TURBINE FAN. (AVIM).

Disassemble turbine fan as follows (figure 4-24):

(1) Remove nuts (3), washers (4), and bolts (2) and remove cover and bellmouth assembly (1) from housing (16).

(2) Remove nut (14) and washer (15) from end of shaft (10).

(3) Remove nut (6) and washer (7) from shaft (10), then remove fan turbine assembly {5) and Woodruff key (11) from shaft.

(4) Cut lockwire and remove four screws (9) and retainer (8) from housing.

(5) Carefully pull shaft (10) with bearing (12) from housing as a unit.

NOTE

Do not remove identification plate (17) or rotation directional arrows from housing unless damaged.

(6) Using suitable bearing puller, remove bearing (12) from shaft (10) and bearing (13) from housing (16).

4-87. CLEANING – OIL COOLING TURBINE FAN.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

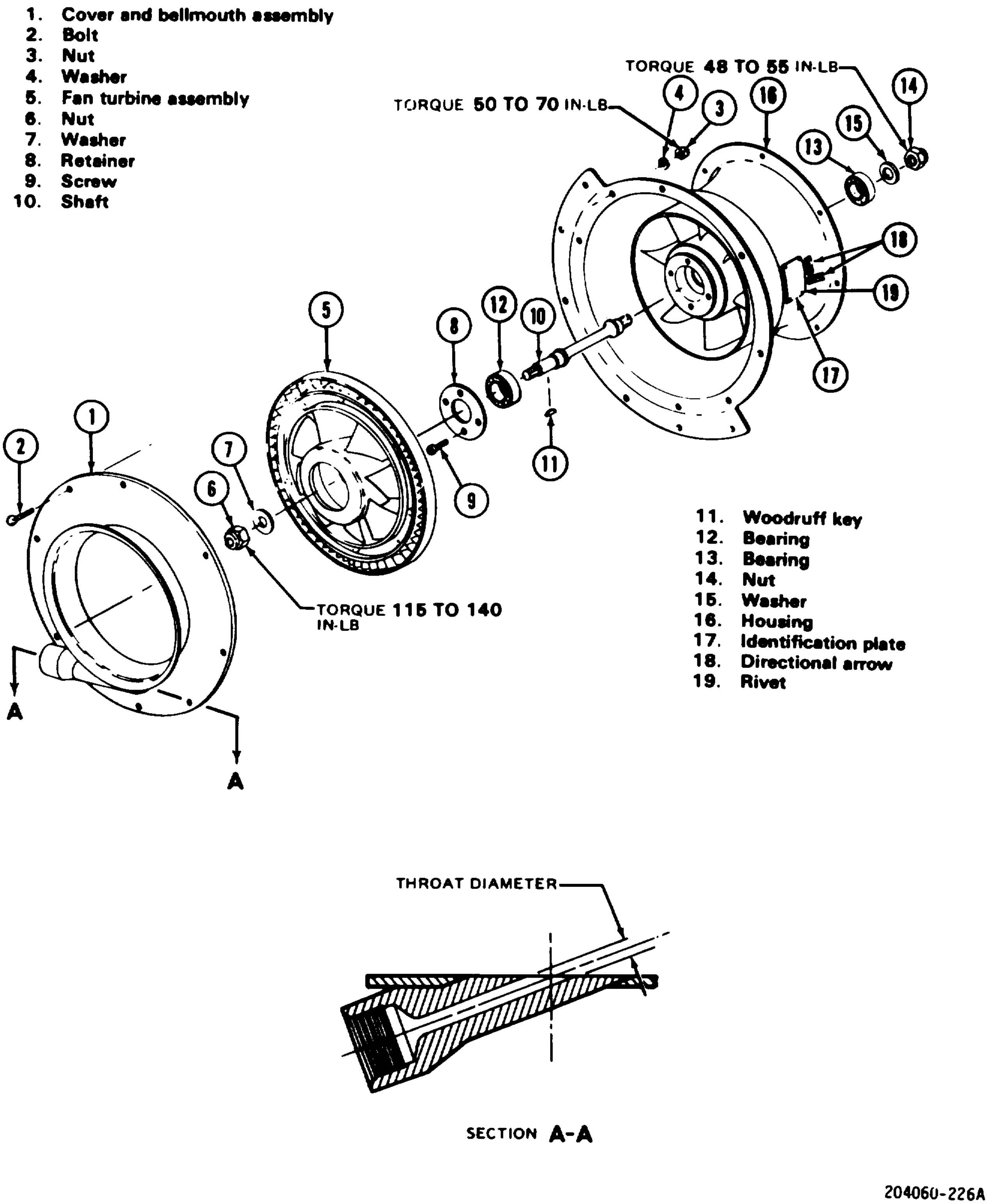


Figure 4-24. Oil Cooler Turbine Fan — Assembly

WARNING

Prolonged contact with lubricating oil may cause a akin rash. Those areas of akin and clothing that coma in contact with lubricating oil should be thoroughly washed immediately. Saturated clothing should be removed immediately. Areas in which lubricating oil is used should be adequately ventilated to keep mist and fumes to a minimum.

a. Clean all parts with lint-free cloths saturated with solvent (C112). A soft bristle brush may be used to dislodge stubborn deposits. Wipe dean and dry with filtered compressed air.

b. Remove corrosion deposits on shaft (10, figure 4-24) and housing (16) bearing liners using fine crocus cloth (C37). Clean parts after removing corrosion with corrosion preventive oil (C40).

4-88. INSPECTION — OIL COOLING TURBINE FAN.

Inspect blades on fan turbine assembly (5, figure 4-24) for bent blades, nicks, scratches, pitting, erosion, and cxacks. Replace fan and turbine assembly if any of these defects are found on the turbine blades.

b. Inspect all parts, other than turbine blades for nicks, burrs, scratches, dents, cracks and excessive wear. No cracks are acceptable. Minor mechanical damage is acceptable if polished out.

c. Inspect bearings (12 and 13) for spalling, cracks., and for roughness when rotated by hand, Any of these defects are cause to replace bearings.

d. Inspect parts for wear in accordance with table 4-3.

Table 4-3. Dimension Tolerance - Turbine Fan

FIG. NO.	INDEX NO.	NOMENCLATURE	REMARKS
4-24	1	Cover and Bell-mouth Assy Nozzle	Measure throat diameter in Section A-A with inside micrometer, Replace if throat diameter is over 0.3240 inch.
4-24	10	Shaft	Replace if front end bearing journal is not within 0.6695 TO 0.6691 inch diameter or if rear end bearing journal is not within 0.4726 TO 0.4722 inch diameter.
4-24	16	Housing	Replace if front bearing liner I.D. is greater than 1.3791 inches or if rear bearing liner I.D. is greater than 1.1034 inches.

4-89. REPAIR OR REPLACEMENT — OIL COOLING TURBINE FAN (AVIM).

a. Replace components that fail to meet inspection requirements of paragraph 4-88.

b. Replace nuts (3, 6, and 14, figure 4-24) regardless of condition when oil cooling fan is assembled.

c. Match-drill any replacement hanger brackets at installation with 0.280 TO 0.297 inch diameter holes through ends to match existing bolt holes in cooler flanges and deck structure and 0.256 TO 0.263 inch diameter holes in lower legs of hanger brackets to match existing holes in brackets on duct.

d. Refinish all exposed aluminum surfaces, after repair, with chemical film (C31) and repaint with one coat of primer (C88 or C91) as required.

4-90. ASSEMBLY — OIL COOLING TURBINE FAN. (AVIM).

Press bearing (12, figure 4-24) on shaft (1O) to seat firmly against shoulder on shaft.

CAUTION

Do not force bearings Into housing. If bearings do not slip into piece with slight hand pressure, check bearing liners for burrs or corrosion

b. Insert bearing (13) into housing (16). Add sealing compound (C105.4) to outside diameter of bearing (13). Insert bearing (13) into housing (16).

NOTE

Movement of the outer race of bearing (13) is permitted during non-powered operation.

c. Carefully insert shaft (10) with bearing (12) as a unit, into shaft bore of housing (16).

d. Position retainer (8) in housing with four screws (9). Tighten screws and seine with lockwire (C137).

e. Install Woodruff key (11) in ahaft (1O) end install fan turbine assembly (5) on shaft, align keyway in fan with key in shaft.

f. Install washer (7) and nut (6) on shaft and holding fan and turbine assembly to prevent rotation, torque nut 115 TO 140 inch-pounds.

g. Install washer (15) and nut (14) on shaft (10) and torque nut 48 TO 55 inch-pounds.

h. Position cover and bellmouth assembly (1) on housing (16) and secure with bolts (2), washers (4), and nuts (3). Torque nuts 50 TO 70 inch-pounds.

4-91. INSTALLATION — OIL COOLING TURBINE FAN.

a. If duct assembly (15, figure 4-23) has been removed, proceed as follows:

(1) Position duct (15) to oil cooler and bolts (4) washers (2 and 3) and nut (1).

(2) Secure duct to oil cooler flange and airframe structure with four bolts (17) and four washers (16).

b. Position fan (7) to duct (15) and install eight bolts (11) and eight washers (12).

c. Position two braces (1O), with attached brackets, on turbine fan (7) and install two bolts (9), washers (8 and 13), and nuts (14).

d. Connect bleed air hose to reducer (6).

e. Reinstall access door and cooling duct on fuselage openings.

f. At next ground run-up, check installation for leaks and proper operation.

4-92. ENGINE OIL COOLER BYPASS SELECTOR VALVE.

4-93. DESCRIPTION — ENGINE OIL COOLER BYPASS SELECTOR VALVE.

This valve is a two-position, motorized valve located on the left side of the engine compartment deck. It is connected in the engine to oil cooler line. See figure 4-18. The purpose of the valve is to automatically bypass the oil cooler when oil level is low. Refer to TM 55-1520-236-10 for additional information on switching action for this valve.

4-94. REMOVAL — ENGINE OIL COOLER BYPASS SELECTOR VALVE.

a. Open engine compartment cowling at left side.

b. Remove oil cooling duct (figure 4-18) from left side of fuselage. Drain oil cooler and lines.

c. Disconnect electrical cable connector from valve.

d. Disconnect engine scavenge oil hose from valve coupling. Disconnect oil cooler lines and tank return line from valve fittings. Cap open ends of lines.

e. Detach valve from brackets by removing two screws at each side. Lift out valve assembly.

f. Remove fittings from valve by removing attachment screws. Remove check valve and gasket from right fitting.

4-96. INSPECTION – ENGINE OIL COOLER BYPASS SELECTOR VALVE.

Inspect mating surfaces of valve and fittings for nicks and burrs. Inspect threads for damage.

4-96. REPAIR OR REPLACEMENT – ENGINE OIL COOLER BYPASS SELECTOR VALVE.

Replace any damaged fittings or attaching parts. Replace valve assembly if malfunction occurs.

4-97. INSTALLATION – ENGINE OIL COOLER BYPASS SELECTOR VALVE.

NOTE

Be sure flow arrow is toward fitting.

a. Assemble fittings on valve (figure 4-18) with attaching screws. Use new gasket when installing check valve in return line fitting.

b. Position valve assembly between brackets and install two screws at each side.

c. Connect oil cooler lines and tank return line valve fittings. Connect engine scavenge oil hose to coupling.

d. Connect electrical cable to connector on valve.

e. Service oil tank. Reinstall oil cooling duct with screws. Close cowling.

f. Check for leaks and proper operation at next ground run.

SECTION VI. IGNITION SYSTEM

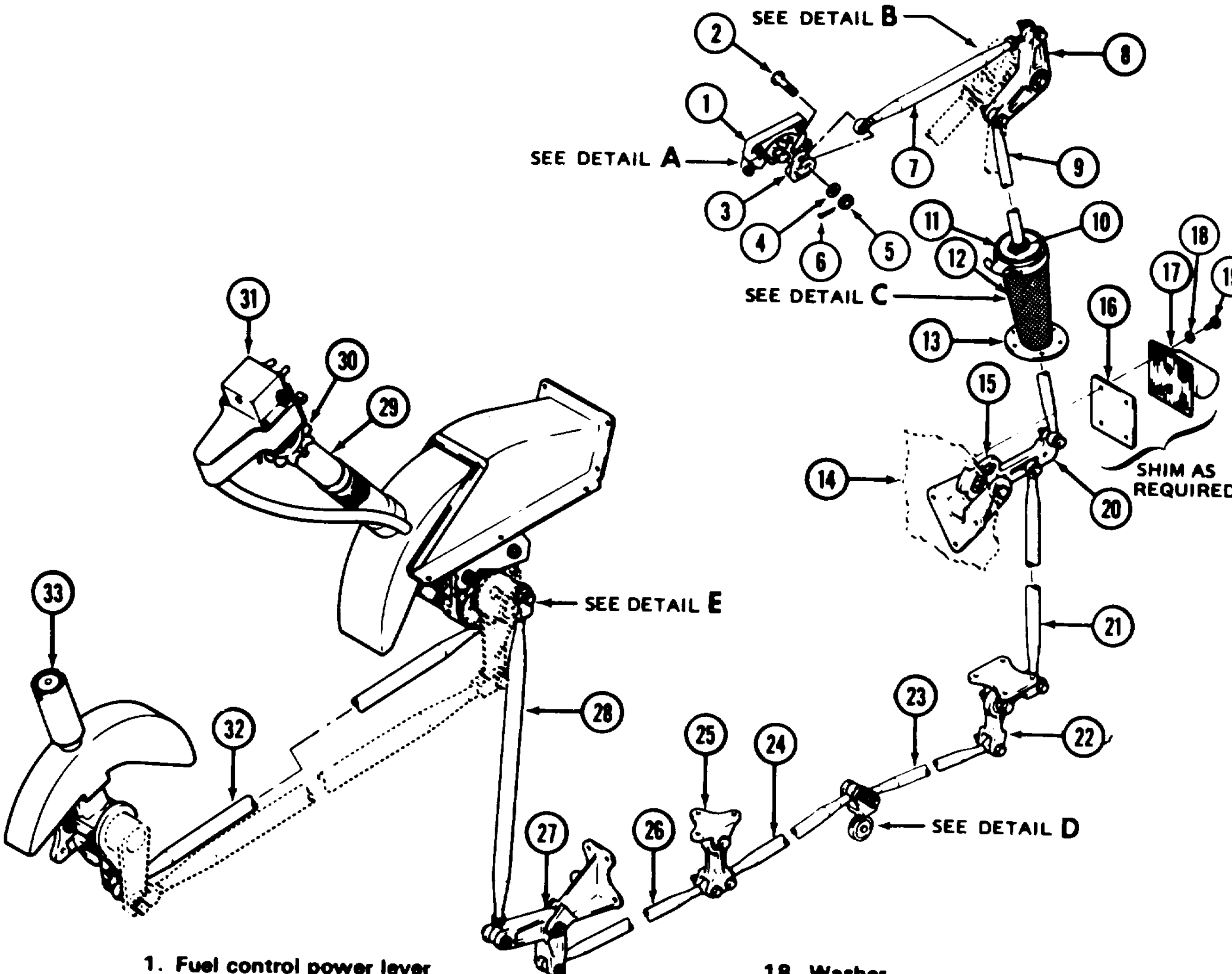
Refer to TM 55-2840-229-23

SECTION VII. POWER LEVER CONTROLS

4-98. POWER LEVER CONTROLS.

4-99. DESCRIPTION – POWER LEVER CONTROLS.

A mechanical linkage system, actuated by twist-grips on collective pitch control sticks, provides manual control of the power lever on the engine fuel control unit. The power lever modulates the engine from zero to full power by controlling the gas producer turbine RPM (N1) limits. The fuel control power lever shaft (l, figure 4-25) is serrated and grooved to accept control arm (3), and has a quadrant marked with power settings in its range of travel between stops which are preadjusted by the engine manufacturer or overhaul facility. The linkage is a series of control rods, bellcranks, idlers, and levers. control rods (7 and 28), at each end of the series, are adjustable. Bellcrank (20) has an adjustable connection for control rod (21), which determines the travel of linkage above the bellcrank. The idle stop cam (5) makes contact with the spring-loaded plunger of a solenoid (17) to arrest linkage motion at the engine idle position when power is being reduced from higher settings. The solenoid plunger can be retracted by use of the ENGINE IDLE STOP REL pushbutton switch, located on the pilot collective stick to allow control movements in the OFF position.



1. Fuel control power lever shaft end stops
2. Bolt
3. Arm
4. Washer
5. Nut
6. Cotter pin
7. Control rod
8. Lever
9. Control rod
10. Split bushing (bearing)
11. Boot retainer
12. Boot
13. Plate
14. Bulkhead (station 250)
15. Power lever cam (idle stop cam)
16. Base
17. Solenoid and bracket
18. Washer
19. Bolt
20. Bellcrank and support
21. Control rod
22. Bellcrank and support
23. Control rod
24. Control rod
25. Idler and support
26. Control rod
27. Bellcrank and support
28. Control rod
29. Pilot control grip
30. Throttle friction nut
31. Pilot collective stick
32. Control rod
33. Gunner control grip

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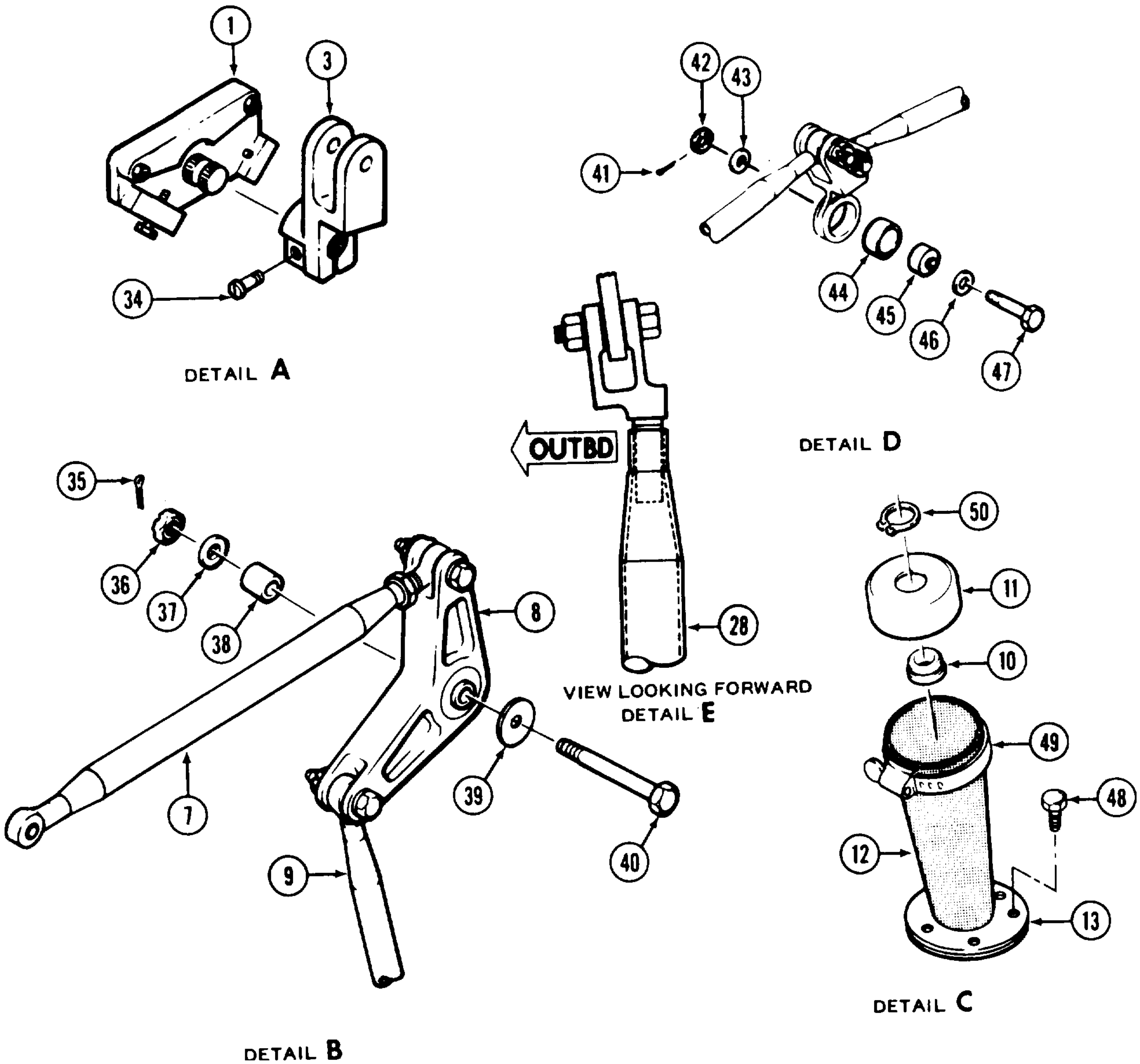
Figure 4-25. Power Lever Control System Installation (Sheet 1 of 2)



34. Screw
35. Cotter pin
36. Nut
37. Thin steal washer
38. Spacer, sleeve
39. Washer
40. Bolt
41. Cotter pin
42. Nut
43. Thin steel washer
44. Bushing sleeve
45. Bearing
46. Thin steel washer
47. Bolt
48. Bolt
49. Hose clamp
50. Retainer ring

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Figure 4-25. Power Lever Control System Installation (Sheet 2 of 2)

4-100. REMOVAL – POWER LEVER CONTROLS.

a. To remove control rod (28, figure 4-25): Remove screw-mounted access panel from left side of fuselage in line with lower end of pilot collective control stick. Remove bolts, nuts, washers, and cotter pins to remove control rod (28).

b. Leave lower linkage (22 through 27) in place for normal maintance and inspection. If necessary to replace damaged parts, obtain access by removing screw-mounted panels from lower skin and detach parts by removing bolts, washers, and nuts.

c. To remove bellcrank (20) and cam (15): Obtain access to compartment, below engine and behind aft fuel cell, by removing oil cooler air intake duct from left side of fuselage. Disconnect control rods (9) and (21) from bellcrank (20), keeping attaching parts with rod-ends. Remove attaching bolt and lift out bellcrank (20) with cam (15) attached. To remove cam (15), use an allen wrench to remove two special bolts and serrated washers.

d. To remove solenoid (17): Obtain access as in step (c). Disconnect electrical connector from solenoid. Remove four bolts (19) and washers (18) to detach solenoid assembly and base (16) from bulkhead (14).

e. To remove control rod (9) and boot (12): Loosen hose clamp (49) on boot (12). Disconnect control rod (9) from bellcrank (20) and lever (8). Remove control rod (9) with boot retainer (11) attached. Remove retainer ring (50) and split bushing (10) and separate boot retainer (11) from rod (9). Remove boot (12) from plate (13).

f. To remove lever (8): Disconnect control rods (7 and 9). Remove bolt (40), nut (36), washers (37 and 39), spacer (38), and cotter pin (35) to detach lever from engine mount pillow block.

g. To remove control arm (3): Disconnect control rod (7). Remove lockwire and screw (34) from arm. Pull arm from fuel control power lever shaft (1). Keep screw (34) with arm (3).

4-101. CLEANING – POWER LEVER CONTROLS.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

Clean external surfaces of parts by wiping with a cloth moistened with solvent (C112). Do not permit solvent to enter bearings or solenoid.

4-102. INSPECTION – POWER LEVER CONTROLS.

a. Control rods for cracks and general condition. End fittings for security. Bearings for binding or rough operation.

b. Bellcranks, levers, and idlers for security. cracks, or damage, binding, or rough bearings.

c. Solenoid for security and proper operation.

d. Boot assembly for cracks, tears, or wear.

4-103. REPAIR OR REPLACEMENT – POWER LEVER CONTROLS.

a. Replace parts which fail to meet inspection requirements of paragraph 4-102.

b. If solenoid replacement is required, install solenoid and bracket (17, figure 4-25) and base (16) with four bolts (19) and washers (18). Use shims as required so that plunger operates freely in bracket bushing.

4-104. INSTALLATION – POWER LEVER CONTROLS.

a. Position arm (3, figure 4-25) an fuel control power lever shaft (1). Install screw (34) through arm and groove on shaft. After rigging, lockwire (C137) screw (34).

b. Position lever (8) on outboard side of engine mount pillow block, with spacer (38) between lever (8) and pillow block and with marked arm of lever pointing up. Install bolt (40), washer (39), thin steel washer (37), nut (36), and cotter pin (35).

c. Adjust control rod (7) to nominal length of 11.17 inches between centers of rod-end bearings. Position adjustable end of control rod (7) in lever (8). Install bolt, washers, nut and cotter pin. Do not install forward end of control rod (7) to arm (3) at this time.

d. Place smooth side of idle stop cam (15) on bellcrank and support (20). Install two special bolts and serrated washers as shown on figure 4-26 to secure idle stop cam to bellcrank. Use Allen wrench at shank ends to tighten bolts. Place bellcrank in support and install bolt, thin washers, nut, and cotter pin. Cam position will be adjusted during rigging.

e. Attach solenoid and bracket (17, figure 4-25) and base (16) to bulkhead (14) with four bolts (19) and washers (18). Set solenoid position so that plunger will not engage idle stop cam (15) until ready for adjustment during rigging.

NOTE

If bracket (17) P/N 204-060-797-1 is installed, use shims P/N 120-031-12-7 to adjust solenoid. If bracket P/N 204-060-797-5 is installed, shims are not required.

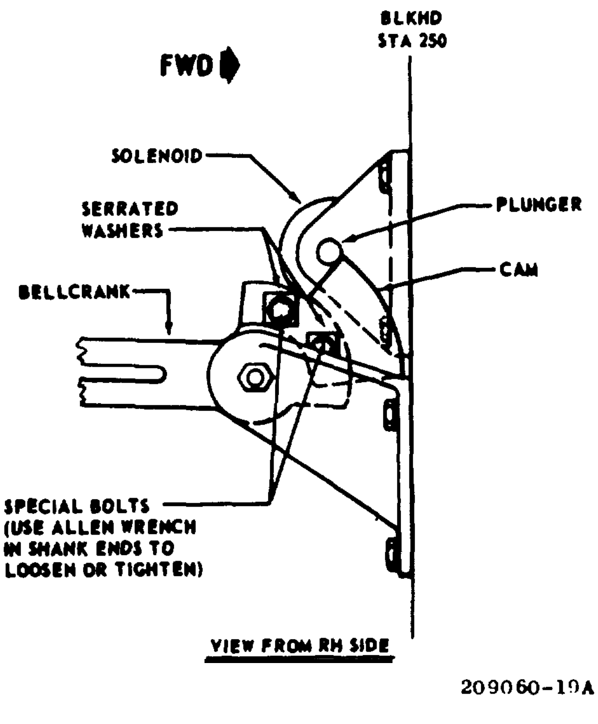


Figure 4-26. Engine Idle Stop Installation

f. Place boat retainer (11) on control rod (9). Insert split bushing (10) between rod (9) and boot retainer (11). Secure with retainer ring (50). Secure boot (12) with clamp on plate (13). Insert rod (9) down through boot and housing. Connect rod to lever (8) and bellcrank (20). At lower rod-end, insert bolt through large safety washer, rod-end, aluminum alloy washer, and bellcrank. Secure bolt with aluminum-alloy washer, nut, and cotter pin. Attach boat (12) to boat retainer (11) with hose clamp (49). Check for 0.06 inch minimum clearance between rod (9) and engine mount leg. If needed, install not more than three thin steel washers under spacer (38) on pivot bolt (40) of lever (8).

g. Connect control rod (21) to bellcrank (22) with bolt, two thin washers, nut, and cotter pin. At upper end, insert bolt through large safety washer, rod end, aluminum-alloy washer, slot of bellcrank, and a serrated washer. Set rod-end at middle of bellcrank slot and secure with nut and washer. Install cotter pin after rigging is complete.

NOTE

Center of rod (28) is determined by rod not clevis.

h. Adjust control rod (28) to nominal length of 20.0 inches between center of rod-end bearing and clevis. Position, clevis, with offset outboard, on throttle control bellcrank of pilot collective stick (31). Install bolt from inboard side, with thin washers under bolt head and nut. Connect rod (28) to bellcrank (27) in same manner. Install cotter pins when rigging is complete.

4-105. RIGGING – POWER LEVER CONTROLS.

a. Check that power lever control linkage is completely installed except as follows:

(1) Idle stop solenoid (17, figure 4-25) should not make contact with stop cam (15).

(2) Arm (3) should be installed in fuel control power lever shaft (1) as nearly parallel to shaft stop arm as serration alignment permits. Control rod (7) should not be connected to arm (3).

NOTE

Before starting rigging procedure, make sure rod (28) and rod (7) are at nominal length.

b. Center control rod (21) in bellcrank (20) before trying to obtain center of travel in step c.

c. Support free end of control rod (7) level with fuel control power lever shaft (1). Operate pilot control grip (29) to full on to full off, end check that end of control rod (7) moves equal distances from centerline of shaft (1) at both positions. Adjust control rode (7 and 28) to obtain equal movement noted above. Keep control rods (7 and 28) as close to nominal lengths as possible. Refer to paragraph 4-104, step c and step h for nominal lengths.

d. Position control rod (7) in arm (3). Install bolt (2) with head outboard (Until final adjustment on 5° cushion, and then install bolt head inboard), install washer (4) and nut (5). Do not install cotter pin (6) at this time.

e. Turn pilot control grip (29) in one direction until fuel control shaft bottoms on stop. Disconnect control rod (7) from arm and check that control grip (29) will turn approximately 5 degrees further before bottoming. Repeat procedure with grip rotated in opposiste direction. Make corrections by adjusting position of control rod (21) on slotted bellcrank (20). When satisfactory, leave control rod (7) connected to arm (3). Install cotter pin (6).

f. Operate control grip (29) to set power lever shaft stop arm (3) to 47 degree mark on fuel control. Adjust positions of idle stop cam (16) and solenoid (17) so that cam rests against extended plunger of solenoid. Check that solenoid bracket clears cam by 0.06 inch in all conditions.

CAUTION

Serrations of cam and square washers must be matched.

g. In next ground run, make final adjustment of idle atop cam to obtain 68 TO 72 percent gas producer rpm.

h. Lockwire (C137) screw (34).

i. Ensure that entire power lever control system has all required cotter pins installed and that controls move through full throw without binding or interference.

4-106. DROOP COMPENSATOR CONTROLS.

4-107. DESCRIPTION – DROOP COMPENSATOR CONTROLS.

Engine power turbine (N2 rpm) is controlled through the overspeed governor by means of an actuator and a droop compensator cam and linkage.

An electrically operated linear actuator (20, figure 4-27), controlled by the GOV RPM INCR/DECR switch on the pilot collective pitch control stick, moves a lever (21) on the fuel control overspeed governor to change settings of power turbine rpm. Droop compensation, to stabilize tpm as engine load fluctuates with changes of main rotor pitch, is provided by mounting the actuator to a cambox (19) which is mechanically linked to a bellcrank (2) in the collecting pitch control system. The droop conmpensator linkage consists of control rods, levers, arms, and belkcranks. Bellcrank (4) is attached on shaft (7) by means of a shear pin (9), which is designed to shear to allow unhindered operation of the collective pitch controls if the compensator linkage should becone fouled.

4-108. REMOVAL – DROOP COMPENSATOR CONTROLS.

a . Removal — Actautor and Control Lever.

(1) Open engine compartment cowling at left side.

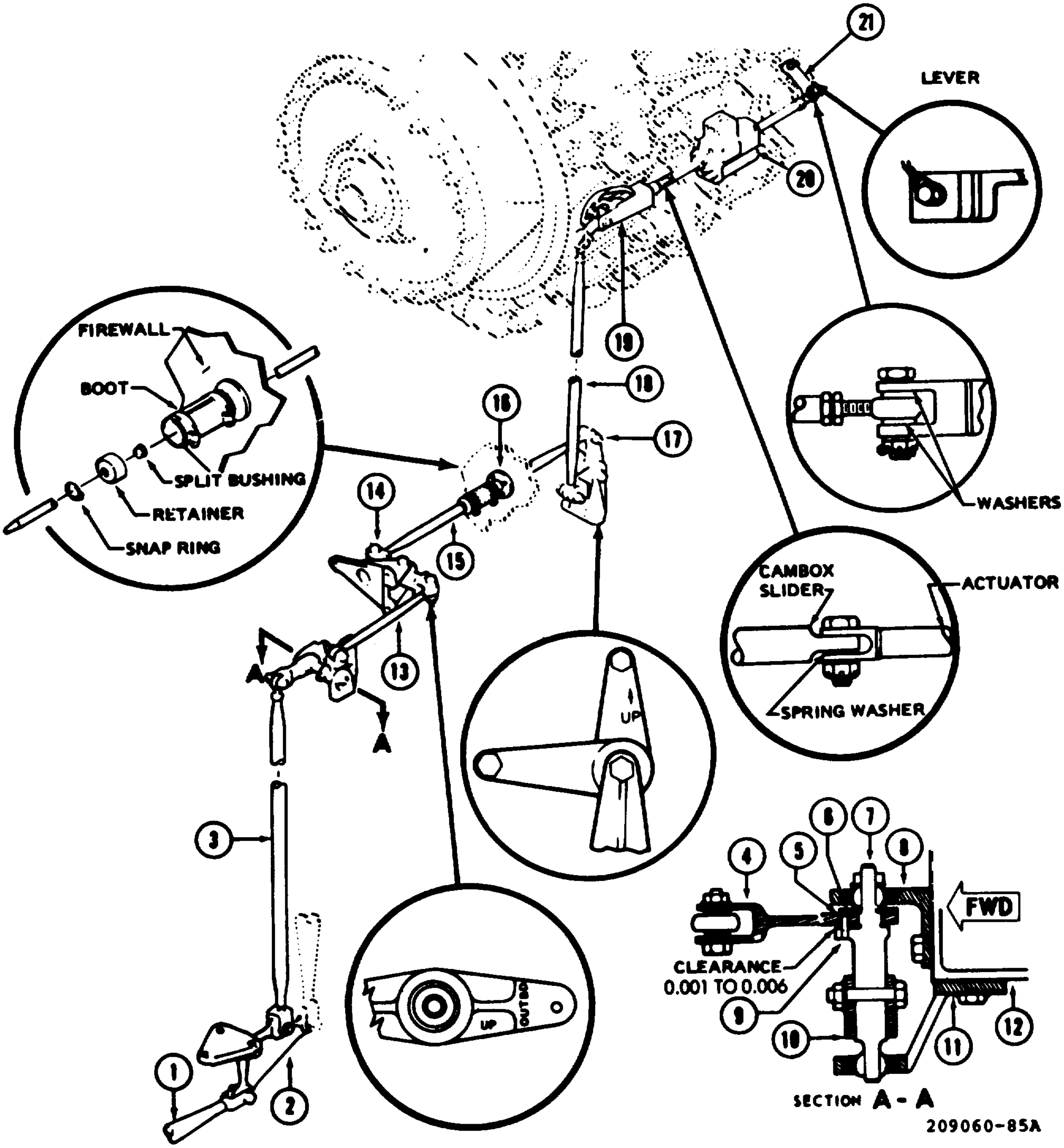
(2) Remove terminal cover with attaching screws from top of linear actuator (20, figure 4-27). Disconnect and stow electrical leads. Reininstall cover.

(3) Detach actuator jackshaft end-fitting from lever (21) on governor control shaft and from slider of cambox (19), by removing bolts with nuts, washers, and cotter pins. Use care to avoid losing spring washer, which is installed between actuator clevis and slidier, also washers installed between rod-end and lever (21).

(4) Remove lockwire and and clamping bolt, and pull lever (21) from serrated shaft at top of overspeed governor.

b. Removal - Cambox and Linkage.

(1) Disconnect control rod (18) from belkrank of cambox (19) by removing bolt with nut, washers, end cotter pin.



1. Collective system control tube
2. Bellcrank
3. Control rod
4. Bellcrank
5. Shims (2 max.)
6. Special washer
7. Shaft
8. Bracket
9. Shear pin
10. Lever
11. Bracket
12. Pylon support
13. Control rod
14. Arm and support
15. Control rod
16. Firewall retainer and boot
17. Lever and support
18. Control rod
19. Cambox assembly
20. Linear actuator
21. Lever on governor control shaft

Figure 4-27. Droop Compensator Controls Installation

(2) Remove nuts and washers from inboard ends of two bolts that attach cambox to support bracket. Remove cambox with bolts in place. Reinstall nuts and washers on bolts, with care that shims remain in place on bellcrank pivot bolt between bearing and sides of housing.

NOTE

As an altenate method, remove cambox and bracket as and assembly by removing two bolts that secure bracket to forward engine mount trunnion. Reinstall bolts to secure mount trunnion.

(3) To remove bellcrank (4) and shaft (7) and associated parts, disconnect control rods (3 and 13). Remove nut and washer from inboard end of shaft. Remove three attaching bolts and bracket (11) from outboard end of shaft. Pull shaft free of inboard bracket (8). Remove shaft assembly with bellcrank, shear pin (9), shims (5), and special washer (6). When replacement of shear pin (9) is required, remove old shear pin and install new shear pin as follows:

(a) Remove special washer (6) from shaft (7).

(b) Remove shims (5) from shaft (7).

(c) Use aluminum drift or press to remove shear pin (9) from bellcrank (4) and shaft (7).

(d) Remove belkcrank (4) from shaft (7).

NOTE

Sheer pin (9) must be an interenfence fit with bellcrank (4) and shaft (7). If pin hole or oounterbore in bellcrank (4) or shaft (7) is elongated, procure a new bellcrank or shaft.

(e) Position bellcrank (4) on shaft (7) with counterbore for head of shear pin (9) exposed.

(f) Press shear pin (9) into bellcrank (4) and shaft (7). Ensure that head of shear pin (9) is flush with surface of belkrank (4).

(g) Install shims (5) on shaft (7).

(h) Install special washer (6) on shaft (7).

(4) If control rod (15) must be removed, disassemble firewall retainer and boot (16).

(a) Remove cotter pin, nut, washers, and bolt from inboard end of arm (14).

(b) Remove cotter pin, nut, washers and bolt from upper end of lever (17).

(c) Loosen clamps on boot and retainer (16}.

(d) Pull control rod (15) forward through firewall and remove from helicopter.

(e) Remove clamps from boot and retainer (16).

(f) Remove boot from control rod (15).

(9) Remove snap ring, retainer and split bushing from control rod (15).

4-109. CLEANING – DROOP COMPENSATOR CONTROLS.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

Clean external surfaces of parts by wiping with a cloth moistened with solvent (C112). Do not permit solvent to enter bearings or actuator.

4-110. INSPECTION – DROOP COMPENSATOR CONTROLS.

a . Inspect linear actuator for evidence of damage or malfunction.

b. Inspect cambox for security of parts and smooth operation with no evidence of binding. Check for proper clearance of 0.001 TO 0.006 inch between bellcrank (4) cmd flange of shaft (7). (Refer to figure 4-27, view A-A.)

c. Check for broken shear pin (9, figure 4-27) by manually holding lever (10) and applying slight force to bellcrank (4).

d. Inspect other parts of droop compensator linkage for freedorn of operation, looseness, and damage.

4-111. REPAIR - DROOP COMPENSATOR CONTROLS.

a . Replace components that fail to pass inspection requirements of paragraphs 4-110.

b. Replace show pin (9, figure 4-27) in event of failure. Investigate cause of failure and correct any fouling of linkage or other faulty condition.

4-112. INSTALLATION – DROOP COMPENSATOR CONTROLS.

a . Cambox and Linkage.

(1) Position cambox (19, figure 4-27) on outboard side of bracket. Insert two bolts and secure with nuts and washers. Be sure shims are in piece on bellcrank pivot bolt.

(2) If bracket was removed, reinstall on two upper bolts of forward engine mount trunnion.

(3) Deleted.

(4) Adjust control rod (18) to nominal length of 19.0 inches between centers of rod-end bearings. Connect non-adjustable end to forward arm of lever (17) with bolt, thin aluminum alloy washers, nut, and inter pin. Adjustable end will be connected to belkrank of cambox (19) during rigging.

(5) If bellcrank (4), shaft (7), and associated parts are removed, reinstell as follows:

(a) Attach bracket (8) on pylon auppoft with two bolts and washers.

(b) Place shims (5), special washer (6), and thin steal washer on shaft.

(c) heart shaft through bearing of inboard bracket and secure with thin steel washer and nut. finger tight.

(d) Install bracket (11) over outboard and of shaft and attach to pylon support with two bolts and washers

(e) Tighten nut on inboard end of shaft.

(f) Check for 0.001 TO 0.006 inch clearance between bellcrank and shaft as shown. (See section A-A.) If necessary, disassemble to change shim thickness and reassemble.

(6) Adjust control rod (3) to nominal length of 32.46 inches between center of bolt holes in rod-end and clevis. Connect clevis to collective system bellcrank (2) forward hole with bolt, thin aluminum alloy washers, nut, and tatter pin. Align upper rod-and in fork of bellcrank (4), with a thin steal washer between each side of bearing and inside of fork. Install bolt secured by washer, nut, and cotter pin.

(7) Assemble retainer, split bushing, snap ring and boot with clamps on rod (15). Insert rod-end aft through firewalll retainer and connect to upper arm of lever (17) with bolt, thin aluminum alloy washers, nut, and cotter pin. Connect forward end of rod to inboard end of arm (14) in the same manner. Secure boot with clamps on retainers.

CAUTION

Arm (14) should be installed with angled clevis outboard and sloping down forward to meet with control rod (13).

b. Actuator and Control Lever.

(1) Place control lever (21) on control shaft of fuel control overspeed governor, approximately 90 degrees to centerline of stop arm on shaft. Install retaining bolt into lever and through shaft groove. Torque bolt 12 TO 15 inch-pounds. Lockwire (C137) bolt to lever.

(2) Align actuator (20) with front end-fitting clevis on end of cambox slider. Insert spring washer between clevis and underside of slider and install both from top, secured with washer and nut. Torque nut 5 to 15 inch-pounds. Install cotter pin.

(3) Attach actuator shaft rod end with a thin steel washer on each side of rod-end bearing into clevis of governor control lever with bolt (washer under heed). Install washer and nut, omit cotter pin until rigging is complete. If necessary, loosen bolts attaching cambox bracket on engine to align actuator to lever. Torque and lockwire bracket bolts (paragraph 4-120).

(4) Remove actuator terminal cover. Connect electrical leads on terminals. (See wiring diagrams, Appendix F.) Reinstall terminal cover.

4-111. REPAIR – DROOP COMPENSATOR CONTROLS.

NOTE

Collective pitch control system rigging must be complete before using this procedure.

CAUTION

The engine should beat flight idle before the rod end bearing is disconnected from the governor control lever.

a. Check that installation of governor control linkage is complete except:

(1) Actuator disconnected from governor control shaft lever (21). Support actuator near normal position, so that its jackshaft rod-end can be moved freely.

(2) Vertical control rod (18) disconnected from bellcrank of cambox (19) and adjust control rods 3 and 18 to their nominal length.

b. Set cam adjustment bolt in middle of slot, within 0.06 inch. Match serrations of square washer and cam while tightening nut on bolt.

c. Measure stroke of actuator jackshaft rod end while operating GOV RPM switch, on collective control stick, to INCR and DECR. Set actuator adjusting screw (or screws) to limit stroke to 1.20 inches. After adjustment, leave actuator at full INCR (retracted) position.

NOTE

If actuator has two adjustment screws: Electrically position actuator shaft to approximately midpoint of stroke. Turn both adjusting screws to obtain maximum stroke. Reduce stroke by turning each screw equal number of turns away from maximum adjustment until rod end travel length is 1.20 inches.

Place collective stick full down. Manually position cambox bellcrank so that 0.09 (± 0.03) inch of cam slot is visible below cambox housing. Adjust two vertical control rods (3 and 18, figure 4-27) to align and connect upper rod to cambox bellcrank at this setting.

CAUTION

Keep control rods as near as possible to nominal lengths, for safe thread engagement of rod ends.

e. At overspeed governor control shaft, adjust upper stop screw to extend 0.210 inch from its mounting boss. Adjust lower stop screw to extend not less than 0.060 inch from its boss. See figure 4-28. Check installation of lever on governor shaft, to be as nearly 90 degrees to shaft stop arm as serrations permit. If lever strikes overspeed governor case in this 90 degree position back lever off one serration at a time until lever clears overspeed governor case.

CAUTION

Never shorten either stop screw on governor to less than 0.060 inch length from Inner side of boss.

Insufficient stop clearance will cause shearing of pin (9, figure 4-27).

f. Move collective stick to full up position.

g. Manually position lever so that shaft stop arm is 0.010 inch from upper stop screw. (See figure 4-28.) Adjust actuator jackshaft rod-end and connect to lever at this setting, Install washers on both sides of rod-end bearing between bearing and lever (one washer on each side). Install rod-end bolt, washers, and nut (one washer under head of bolt and one washer under nut). Torque 12 TO 15 inch-pounds and install cotter pin. Check that rod-end is centered and torque jam nut 60 TO 85 inch-pounds, and lockwire.

h. Place collective control stick full down, Hold GOV RPM switch to DECR until actuator is fully extended. Adjust lower stop screw on governor to be 0.010 inch away from governor shaft stop arm. (See figure 4-28.) Tighten jamnuts and lockwire both stop screws.

1. After preliminary rigging by preceding steps, final rigging adjustments will be made as required in next ground-run or flight:

(1) Readjust actuator stroke as necessary to obtain 91 TO 101 percent with collective stick full down.

(2) Set cam to maintain 100 (±1) percent rpm engine output shaft speed from flat pitch

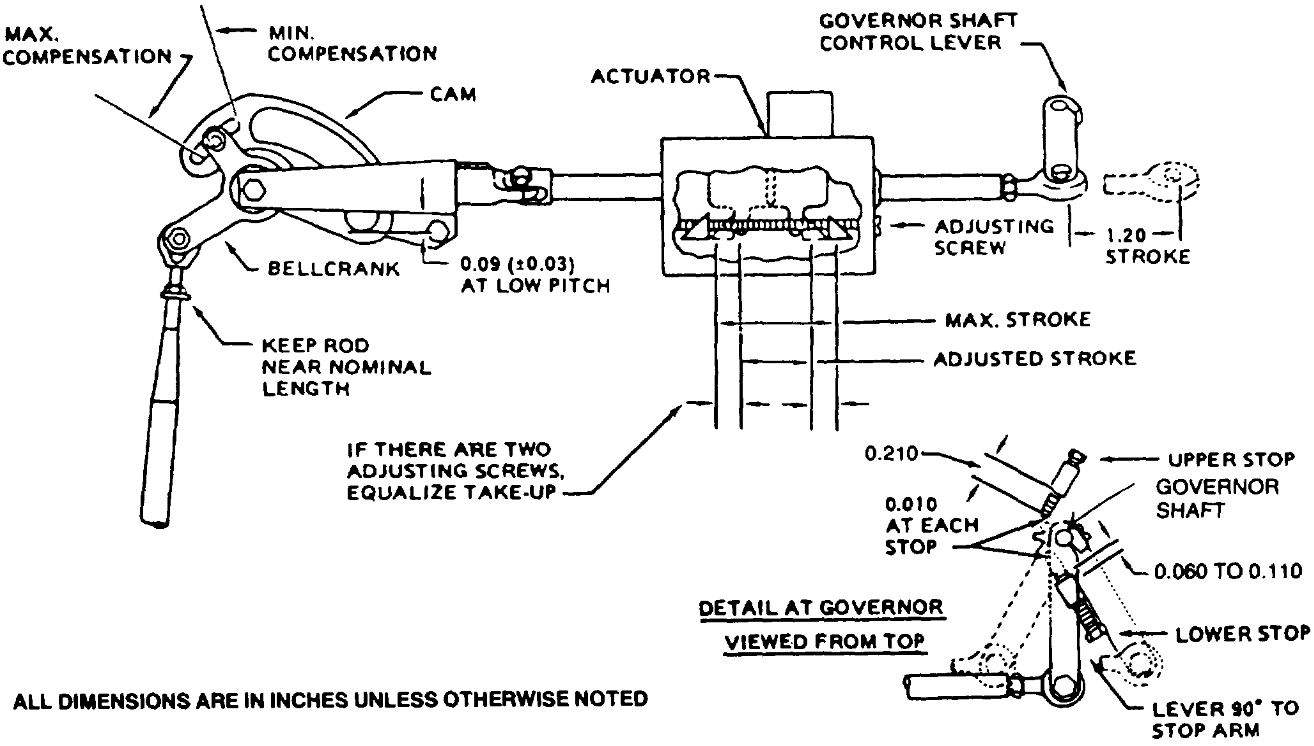


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Figure 4-28. Rigging Procedures — Droop Compensator Controls

to full power. If rpm droop occurs, move cam adjustment bolt toward forward (max. compensation) end of slot. If maximum cam compensation does not correct rpm droop, lengthen control rod attached to cambox bellcrank increasing amount of cam slot visible below cambox housing. Cam slot must not bottom out against follower in either extreme collective stick position.

CAUTION

Any adjustments made after preliminary rigging will require recheck and adjustment of governor stop screws in accordante with steps f., g., and h.

j. Check that all hardware is connected and cotter pin installed in bolt attaching actuator rod end to governor control lever.

SECTION VIII. QUICK CHANGE ASSEMBLY

4-114. QUICK CHANGE ASSEMBLY. (AVIM)

4-115. DESCRIPTION — QUICK CHANGE ASSEMBLY.

The engine quick change assembly consists of a basic T53-L-703 engine (as shipped in engine container) and all necessary adapting parts (generator, hoses, mounts brackets, etc.) to build a complete engine assembly.

When the engine buildup is complete in buildup stand, a defective engine maybe removed from helicopter and spare quick change assembly engine installed. This eliminates a time consuming task of removing components and adapting parts from defective engine and installing on replacement engine before installation.

Premaintenance Requirements for Engine Buildup (QCA)

Condition	Requirements
Model	AH-1S
Part No or Serial No.	All T53-L-703 Engines
Special Tools	(T9), (T19)
Test Eqiprment	None
Support Equipment	None
Minimum Personnel Required	Two
Consumable Material	(C13), (C85), (C113), (C137)
Special Environmental Conditions	None

4-116. REMOVAL – ENGINE FROM SHIPPING CONTAINER.

a. Remove engine records from records receptacle (figure 4-29).

b. Release air pressure from container by removing filter valve oore.

WARNING

Do not open oontainer until oompletety depressurized

c. Remove nuts and bolts securing upper half of container to bottom half.

CAUTION

When removing, ensure upper half of container does not strike engine.

d. Attach a suitable chain or cable to lifting eyes on container upper half. Using a suitable hoist, attached to chain, lift container upper half from lower half and set to one side. Reinstall filler valve core.

e. Attach lifting sling (T9) to attaching points on engine.

NOTE

One engine attaching point is located on the diffuser housing and one is located on the inlet housing.

f. Attach lifting sling (T9) to suitable hoist.

g. Remove nuts and washers that secure four shipping trunnions to mounts in lower half of shipping container.

h. Remove engine from shipping container.

i. Install engine in engine and transmission stand (T19).

j. Remove shipping trunnions from engine mount pads.

k. If another engine is not to be installes in shipping container proceed with the following:

(1) Reinstall shipping trunnions in bottom half of shipping container.

(2) Place top half of shipping container on bottom half. Install four bolts and nuts, one at each corner, tighten finger tight. Shift upper half of container as necessary to align flange bolt holes in top and bottom halves of container.

(3) Install bolts and nuts at midpoints of sides and ends of shipping container, and the bolts and nut at midpoints between them. Install all remaining bolts and nuts. Torque nuts in order of installation 500 TO 640 inch-pounds.

(4) Using clean dehydrated air, pressurize container 4 to 6 PSI. Check container seals for leaks by applying liquid soap (C113) and observing for air bubbles.

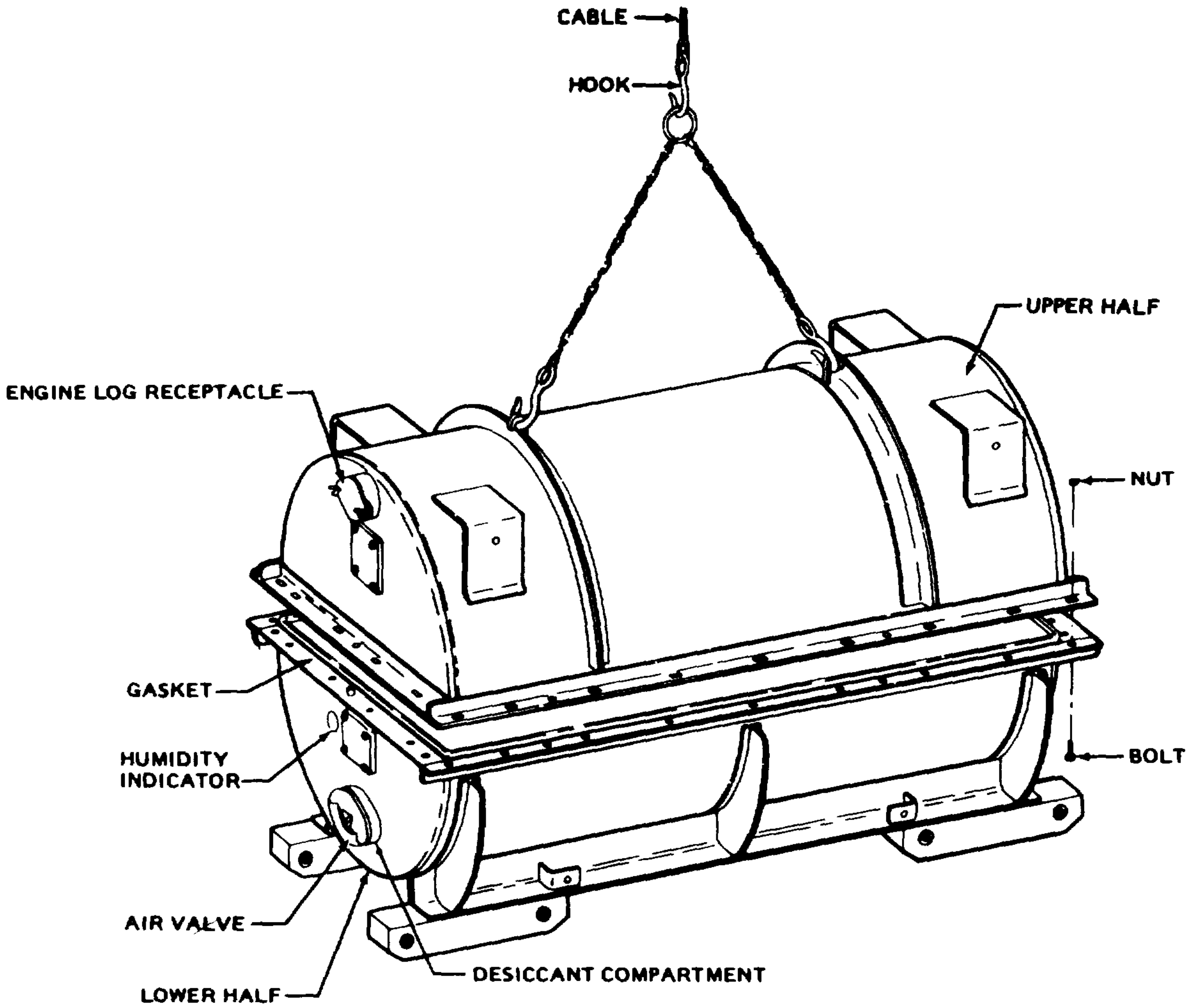

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Figure 4-29. Engine Shipping Container

4-117. INSTALLATION OF ENGINE IN BUILDUP STAND.

NOTE

Use of a buildup stand which will allow the engine to be placed in vertical position will facilitate installation of engine accessories.

a. Remove engine inlet cover.

b. Adjust hoist as necessary and guide engine into stand.

c. Loosen nuts that secure clamps to ring of stand and slide clamps toward outside diameter of plate, secure clamps in this position.

d. Guide front end of engine into opening of plate so that inlet housing is flush against rear of plate.

e. Position clamps over inlet housing flange and tighten nuts to secure engine to plate.

4-118. ENGINE PREPARATION.

WARNING

HANDLING IGNITION UNIT

The ignition unit contains a vary small amount of radioactive material (Cesium-Barium 137) and normally requires no handling precautions. However, severly damaged units that leave been broken open must be handled with forceps or gloves and disposed of in accordance with AR-755-15 and TB 55-1600-314-26.

Disconnect electrical lead (1, figure 4-30) from ignition unit (2). Install danger tag stating, “DO NOT CONNECT UNTIL GROUND RUN”.

a . Rotate engine in maintenance stand until in the vertical position.

b. Remove all plastic plugs from around engine inlet housing.

4-119. INSTALLATION – AFT ENGINE MOUNT TRUNNIONS.

a . Position fitting (1, figure 4-31) on left side of engine and install bolts (5) with washers under heads.

b. Tighten bolts and lockwire (C137).

c. Place bearing (4), washer (3), and nut (2), on fitting (1). Torque nut.

d. Install fitting (1) on right side of engine in accordance with step (1), (2), and (3).

4-120. INSTALLATION – COMPONENTS ON ENGINE LEFT SIDE.

a. Forward trunnion, cambox, and oil preassure transducer mounting bracket.

(1) Position trunnion (3, figure 4-32) on left side engine pad. Install cambox assembly mounting bracket (4) over top mounting holes of trunnion. Install one bolt (5) and washer (6) in upper left hale to attach cambox bracket and trunnion.

(2) Position oil pressure transducer bracket (7) over cambox and trunnion. Secure using three bolts (5) and three washers (6).

NOTE

Add AN960C816 and/or AN960C816L washers (8) as required (3 maximum) for flush fit between trunnion (3) and bracket (7).

(3) Tighten all bolts (5) and lockwire (C137) aft bolts together. After installation of engine, lockwire mount bolt to upper forward bolt, then to lower forward bolt.

b. Linear actuator and N1 and N2 control levers (figure 4-32).

(1) Position engine governor control shaft to mid-position between governor stops.

(2) Install lever (19, figure 4-32) on governor control shaft at ninety degree angle to centerline of shaft arm, as serrations permit. Install bolt (18) and lockwire (C137).

(3) Attach linear actuator (15) to lever (19) as fallows:

(a) Position linear actuator (15) with terminal block facing up. Position rod end of linear actuator (15) in lever (19) with washers (21) on each side of rod end.

(b) Install bolt (20) through lever and rod end. install nut (17). Tighten nut (17) and install cotter pin (16).

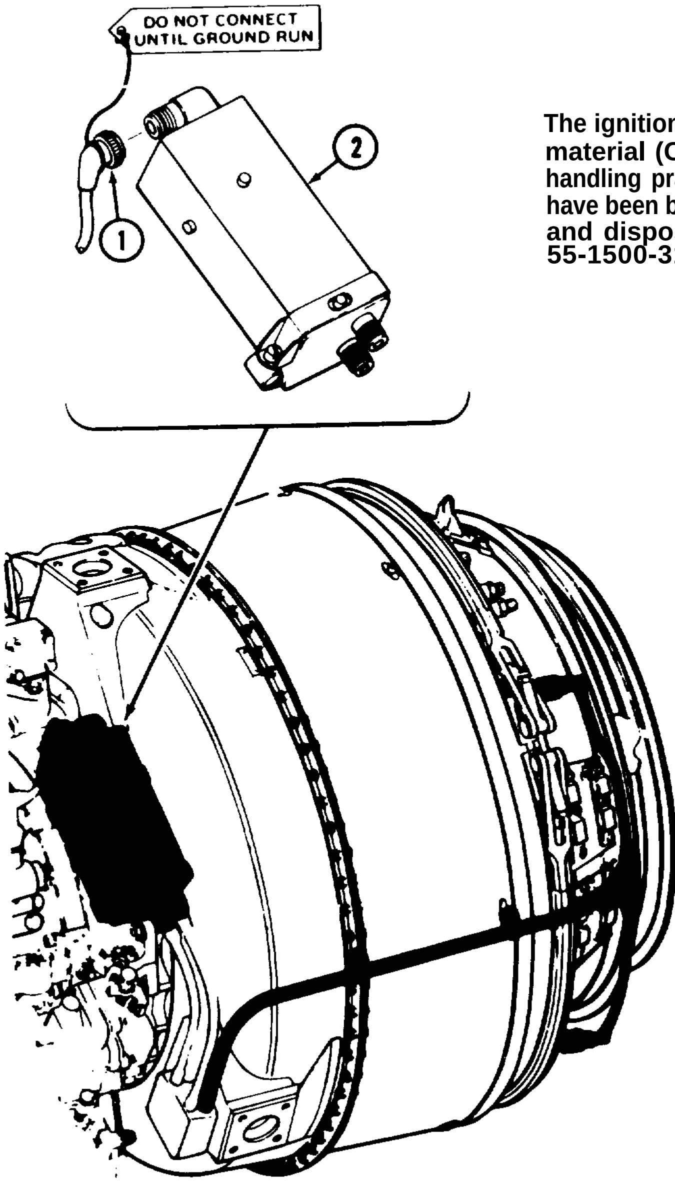
(4) Attach linear actuator (15) to cambox assembly as follows:

(a) Position slider of cambox assembly (9) in clevis of linear actuator (15) with spring washer (13) positioned against lower side of slider.

(b) install bolt (14) through slider and clevis. Install washer (12) and nut (11). Tighten nut and install cotter pin (10).

(5) Install power lever arm on fuel control as follows:

(a) Position power lever control arm (2) on fuel control power lever shaft as nearly parallel to fuel shaft stop arm as serrations will permit. Install screw (1) in arm and lockwire (C137) to hale in arm.



WARNING

HANDLING IGNITION UNIT

The ignition unit contains a very small amount of radioactive material (Cesium-Barium 137) and normally requires no handling pracautions. However severly damagad units that have been broken open must be handled with forceps or gloves, and disposed of in accordance with AR-756-15 and TB 55-1500-314-25.

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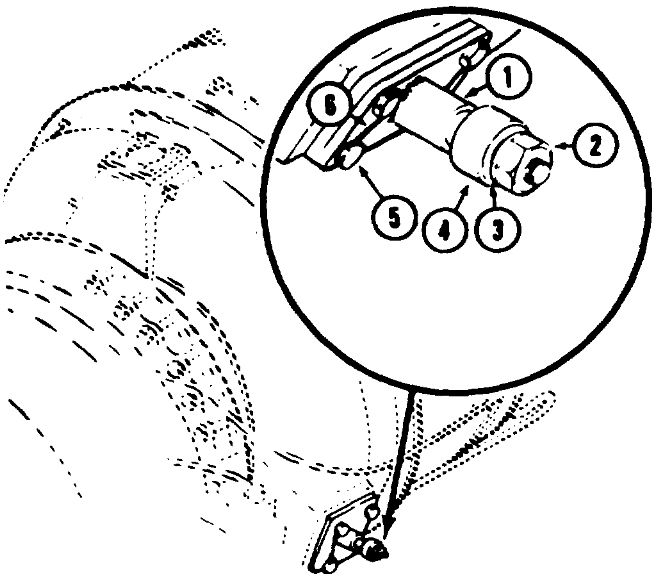
1. Electrical lead
2. Ignition unit

Figure 4-30. Ignition Unit



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1. Fitting
2. Nut
3. Washer
4. Bearing
5. Bolt
6. Lockwire

Figure 4-31. Aft Engine Trunnion Installation

(b) Check rigging (paragraph 4-113).

c. Power turbine tachometer generator (figure 4-33).

(1) Remove nuts and washers and remove shipping cover from tachometer generator mounting pad.

(2) Remove and discard gasket on mounting pad and install new gasket.

(3) Lubricate tachometer shaft using lubricant (C85).

(4) Position tachometer generator (26, figure 4-33) on mounting pad with electrical receptacle pointing up.

(6) Install washers (27) and nuts (28).

d. Oil pressure transducer.

(1) Attach transducer (13, figure 4-33) to bracket (18) as follows:

(a) Install clamp (23) over transducer (13}. Attach clip (19) to clamp using screw (24), washer (20), and nut (21).

(b) Install screw (9) through plate (10), bracket (18), and clip (19). Secure using nut (22).

e. Oil pressure switch.

(1) Install nut (7) and packing (6) on elbow (8).

(2) Install elbow (8) in oil pressure switch (4). Tighten nut (7).

(3) Attach oil pressure switch through plate (10) and bracket (18) using screws (3 and 11) and nuts (5 and 25).

(4) Install nut (16) and packing (17) on restrictor (15). Install tee in oil pressure port of engine. Tighten nut (16) fingertight.

(5) Install tube assembly (14) between lower port of restrictor (15) and elbow (8).

(6) Install tube assembly (12) between upper port of restrictor (15) and oil pressure transducer (13).

(7) Tighten nut (16). Tighten all tube assembly end nuts.

(8) Connect electrical plugs (cable assembly) to oil pressure switch (4) and oil pressure transducer (13).

f. Fuel pressure switches.

(1) Remove two plugs from lower fuel pump ports of fuel control.

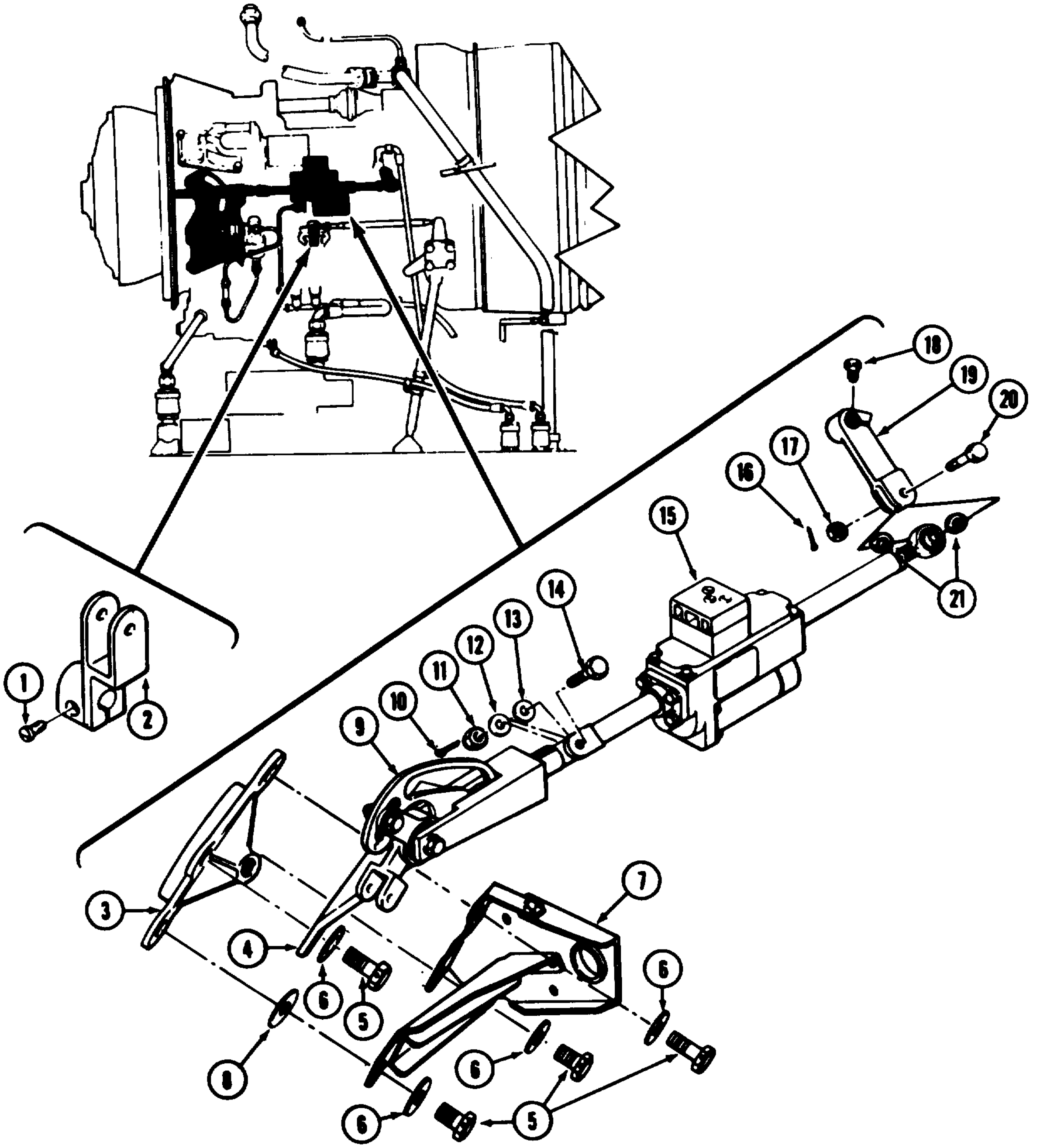
(2) Install two packings (1) on two pressure switches (2). Install pressure switches in ports and tighten.

(3) Connect electrical plugs to pressure switches (2).

4-121. INSTALLATION – COMPONENTS ON ENGINE RIGHT SIDE.

a. Starter-generator and shroud (figure 4-34).

(1) Remove nuts and washers and remove shipping cover from starter generator mounting pad.



1. Screw
2. Power control lever arm
3. Forward trunnion
4. Cambox mounting bracket
5. Bolts
6. Washers
7. Oil pressure transducer mounting bracket
8. Washer (shim)
9. Cambox
10. Cotter pin
11. Nut
12. Washer
13. Spring washer
14. Bolt
15. Linear actuator
16. Cotter pin
17. Nut
18. Bolt
19. Lever
20. Bolt
21. Washers

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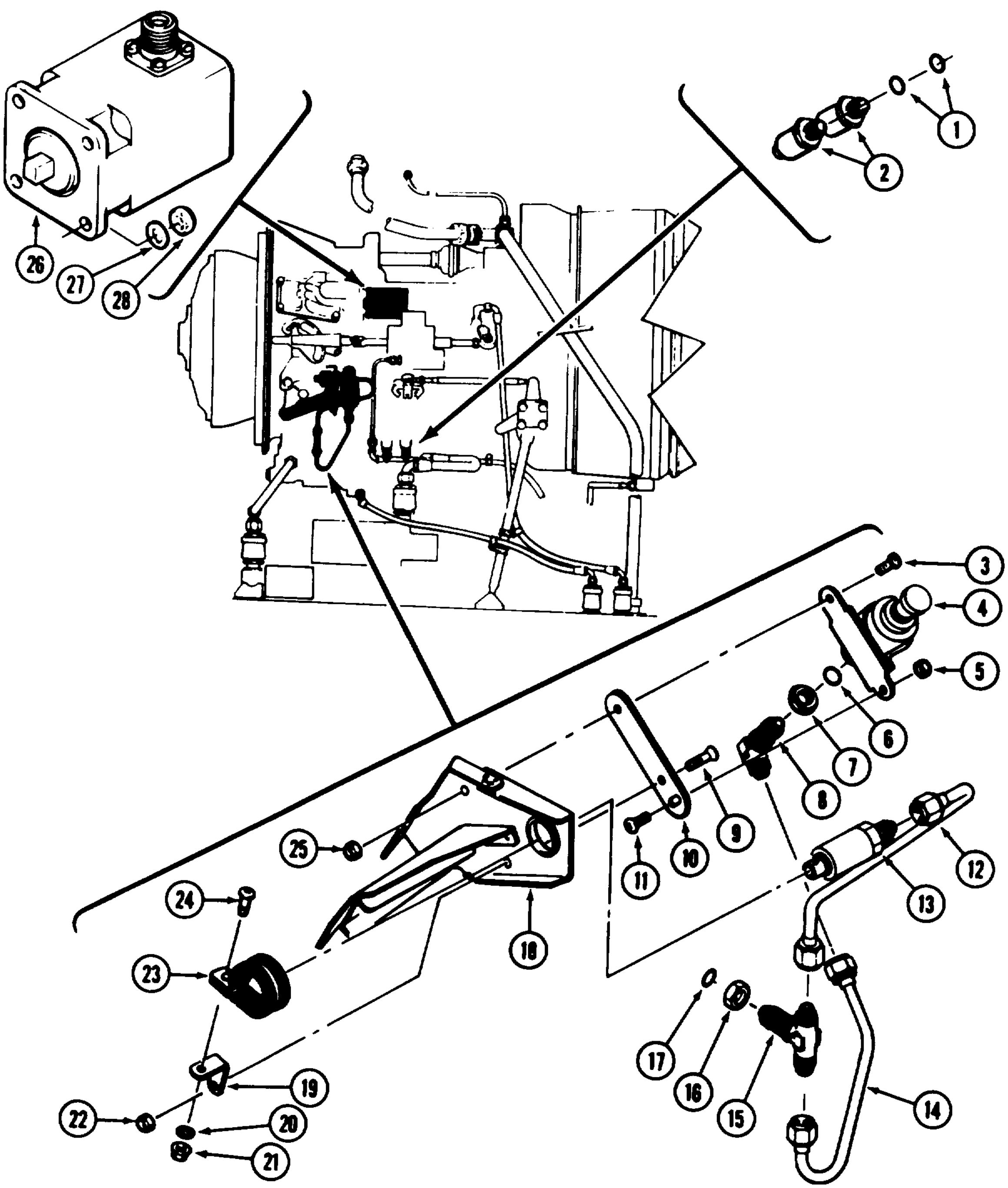
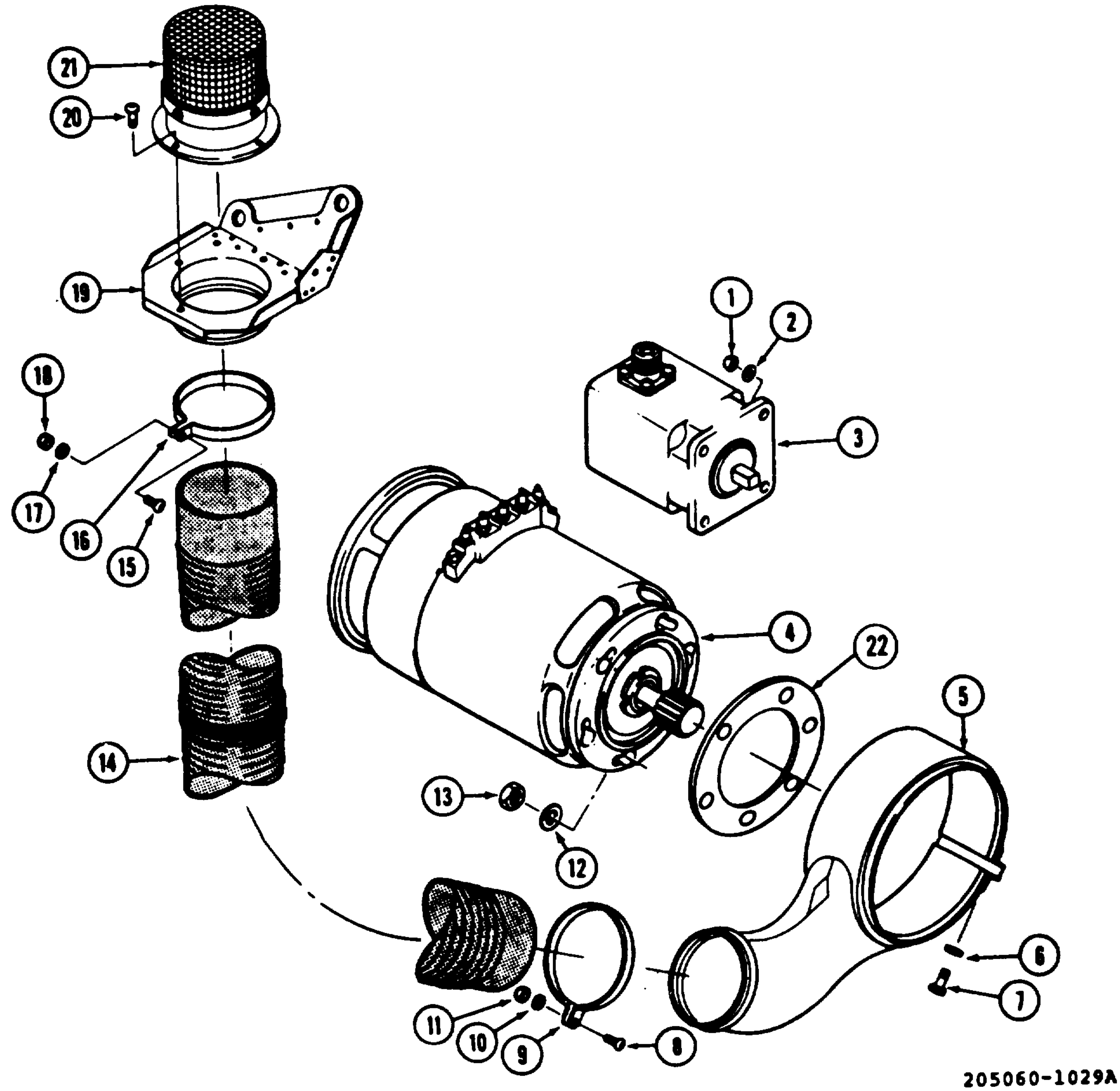
Figure 4-32. Trunnion, Cambox, and Line Actuator Installation



1. Packing (2 reqd),
2. Fuel pressure switch (2 reqd)
3. Screw
4. Oil pressure switch
5. Nut
6. Packing
7. Nut
8. Elbow
9. Screw
10. Plate
11. Screw
12. Tube assembly
13. Oil pressure transducer
14. Tube assembly
15. Restrictor
16. Nut
17. Packing
18. Bracket
19. Bracket
20. Washer
21. Nut
22. Nut
23. Clamp
24. Screw
25. Nut
26. Power turbine tachometer generator
27. Washer
28. Nut

Figure 4-33. Power Turbine Tachometer Generator, Oil Pressure Transducer, Oil Pressure Switch, and Fuel Pressure Stitch Installation



1. Nut
2. Washer
3. Gas producer tachometer generator
4. Starter generator
6. Shroud
6. Washer
7. Bolt
8. Screw
9. Clamp
10. Washer
11. Nut
12. Washer
13. Nut
14. Hose assembly
15. Screw
16. Clamp
17. Washer
18. Nut
19. Bracket
20. Screw
21. Air inlet adapter
22. Gasket

Figure 4-34. Starter-Generator and Gas Producer Tachometer Generator

(2) Install new gasket (22) on mounting pod.

NOTE

To aid in starter-generator installation, washers (12, figure 4-34) may be cemented to nuts (13) using adhesive (C12) or equivalent. Due to inaccessibility, upper left nut and washer may be omitted.

(3) Install nuts (13) and washers (12) on starter generator mounting studs.

NOTE

Coat startar-generator shaft and female slines in gearbox two-thirds full with lubricant (C85).

(4) Position inlet shroud (5) on starter-generator (4) with flange of shroud toward mounting generator mounting flange. Install bolts (7) with washers (6) under heads, do not tighten bolts (7) at this time.

(5) Engage starter-generator (4) splined shaft to drive splines. Install starter-generator mounting studs and turn generator to locked position. Ensure starter-generator is mounted with terminals at approximately seven o'clock position. Tighten nuts (13).

NOTE

Shaft splines maybe aligned by rotating the N1 tachometer generator driveshaft with a 1/4 inch extension.

(6) Ensure inlet shroud is positioned correctly and tighten bolts (7).

b. Gas producer tachometer generator.

(1) Remove nuts and washers and remove shipping cover from tachometer generator mounting pad, located on aft right side of engine accessory gearbox.

(2) Install new gasket on mounting pad.

(3) Lubricate tachometer driveshaft using lubricant (C85).

(4) Position tachometer generator (3) on engine mounting pad with electrical connection positioned up.

(5) Install washers (2) and nuts (1). Tighten nuts.

c. Hose, bracket and air inlet adapter (generator cooling).

(1) Install bracket (19, figure 4-33) to engine mount pad using existing engine supplied hardware.

(2) Install air inlet adapter (21) to bracket (19) using four screws (20).

(3) Install flex hose (14) between generator shroud and bracket.

(4) Secure hose to bracket using clamp (16), screw (15), washer (17), and nut (18).

(5) Secure hose to shroud using clamp (9), screw (8), washer (10), and nut (11).

d. Engine torque transducer hose and restrictor.

NOTE

Refer to paragraphs 8-111 and 8-113 for removal/installation instructions for engine torque transducers.

NOTE

Orifice in restrictor (4, figure 4-35) is 0.0250 to 0.0270 inch in diameter.

(1) Install restrictor (4, figure 4-35) with new packing.

(2) Install hose assembly (2) on restrictor (4).

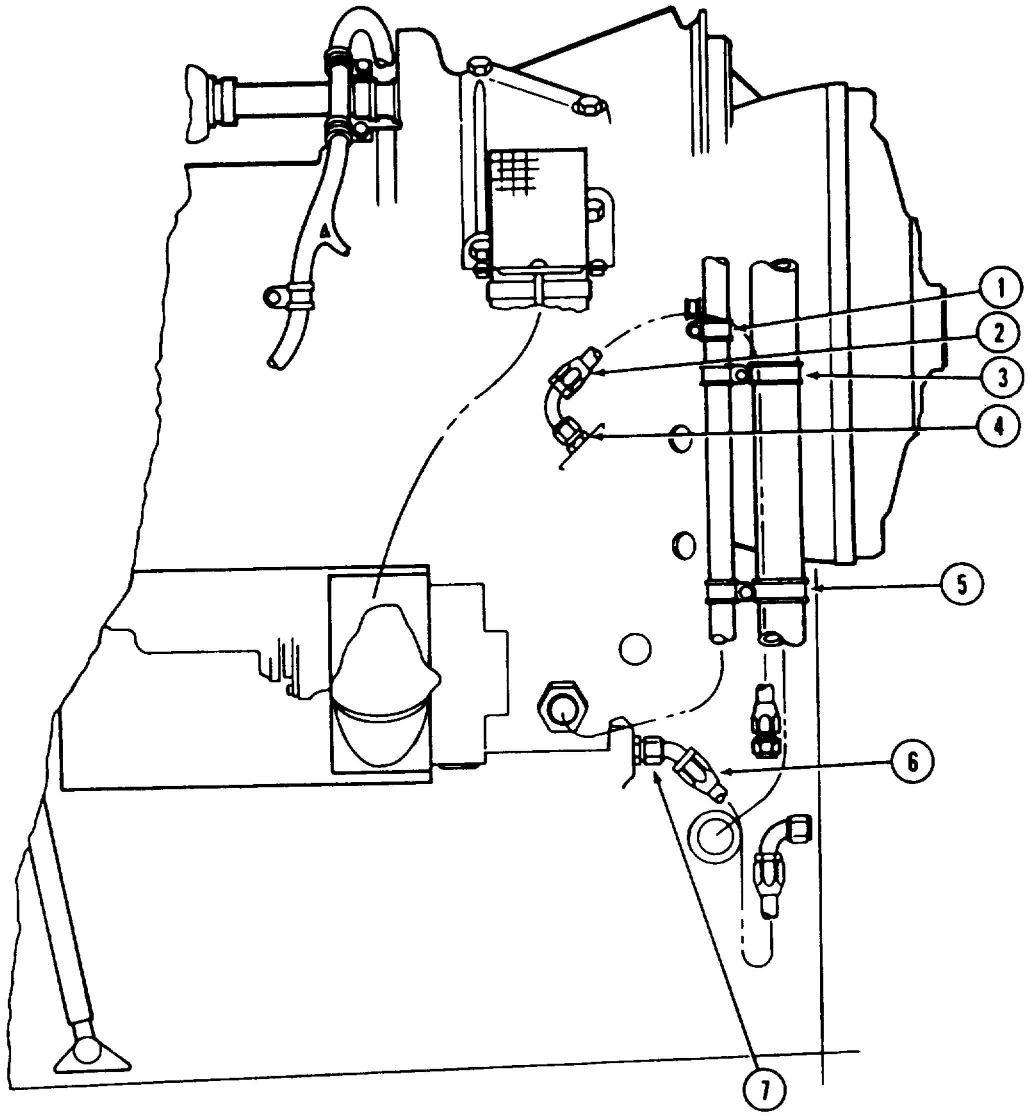
(3) Install two clamps (1).

(4) Install three clamps (3).

(5) Install three clamps (5).

(6) Install union (7) with new packing.

(7) Install hose assembly (6) on union (7).



1. Clamps
2. Hose assembly
3. Clamps
4. Restrictor and performed packing
5. Clamps
6. Hose assembly
7. Union and preformed packing

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Figure 4-35. Installation — Engine Torque Transducer Hose

4-122. INSTALLATION-HOSES, TUBES, AND FITTINGS.

a. Fuel drain hoses and tubing.

(1) Install packing (1, figure 4-35) on reducer (2). Install reducer in seal drain port of governor

(2) Install nut (5) and packing (4) on tee (6). Install tee in seal drain port of fuel control.

(3) Install tube assembly (3) between tee (6) and reducer (2).

(4) Connect hose assembly (7) to tee (6) at seal drain port of fuel control.

(5) Install hose assembly (12) to combustion chamber drain on engine assembly.

(6) Install three unions (13) with three packings (14) to cross (16). Install coupling (15) with one packing (14) to cross (16).

(7) Connect lower end of hose assembly (7) to forward port of cross (16).

(8) Connect lower end of hose assembly (12) to top port of cross (16).

(9) Connect lower end of hose assembly (21) to aft port of cross (16).

NOTE

Tube assembly (22) and hose assembly (21) are not installed at this time. Refer to paragraph 4-44, 4-51, or 4-58 as applicable for instructions to install drain lines.

(10) Clamp hose assembly (7) at two locations as shown in figure 4-36. Clamp in a butterfly fashion, secure using screws (8), washers (10), and nuts (11).

(11) Clamp hose assemblies (12) and (21) together using two clamps (20). Loosely assemble remaining two clamps (20), screw (17), washer (18), and nut (19). Leave clamp installation loose until after installation of electrical cables.

b. Starter, fuel filter, and oil bypass valve hoses - engine left side.

(1) Install hose assembly (1, figure 4-36) to manifold inlet port of engine. Refer to paragraph 10-62 for special inspection requirements for fuel hose assembly (12, figure 10-2). Install coupling (2, figure 4-37) in 90 degree end of hose assembly (1).

(2) Install nut (12) and packing (11) on elbow (13). Install elbow in bleed port of governor.

(3) Connect hose assembly (7) to elbow (13). Install coupling (8) to hose assembly (7).

(4) Install packing (15) on reducer (14). Install reducer (14) in seal drain port of starter-generator.

(5) Connect hose assembly (10) to reducer (14). Install coupling (9) to hose assembly (10).

(6) Install two clamps (5) on hose assemblies (7 and 10) at locations shown. Connect clamps together at each location using screw (6), washer (4), and nut (3). Leave clamps loose until engine installation.

(7) Install packing (19) on union (18). Install union (18) on OIL OUT port of engine.

(8) Install hose assembly (17) to union (18). Connect coupling (16) to opposite end of hose assembly (17).

(9) On helicopters with MWO 1-1520-236-50-30, connect hose (3, figure 4-18.1) between reducer (9) in sump and coupling halves (6 and 5) in IN port of oil separator. Connect hose (4) between elbow (7) in OUT port of oil filter and coupling (10).

c. Bleed air tubing installation. (Prior to incorporation of MWO 55-1520-236-50-12).

NOTE

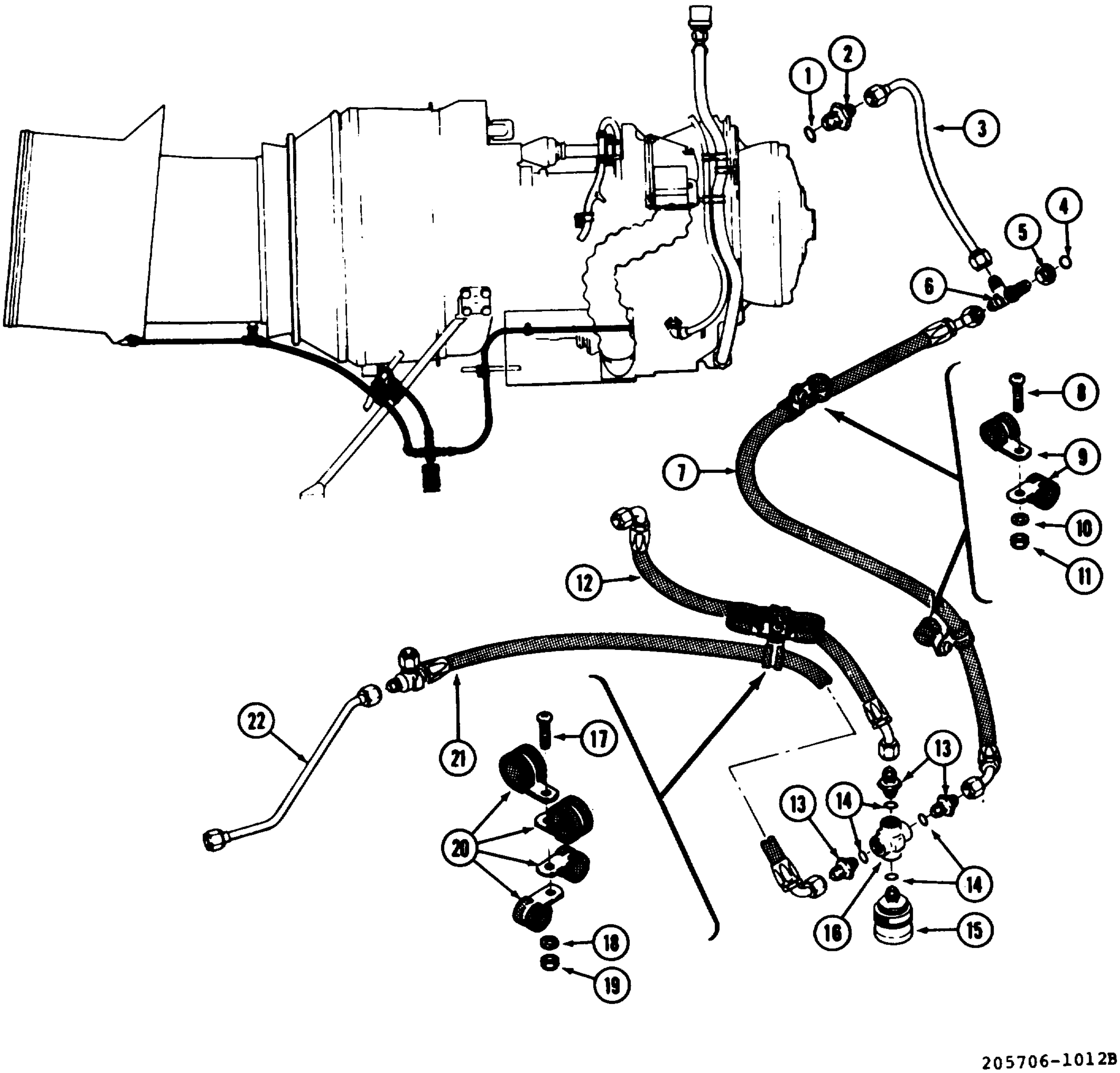
Install plugs in open ends of tuba assemblies (1 and 14, figure 4-38). Place half coupling (8) in plastic bag. Tubes and half coupling will be connected when engine is installed in helicopter.

(1) Install fitting (5, figure 4-38) with gasket (18) to top bleed air port of engine. Secure using four bolts (16) and four washers (17).

(2) Install packings (2 and 4) to reducer (3). Install reducer in port of fitting (5).

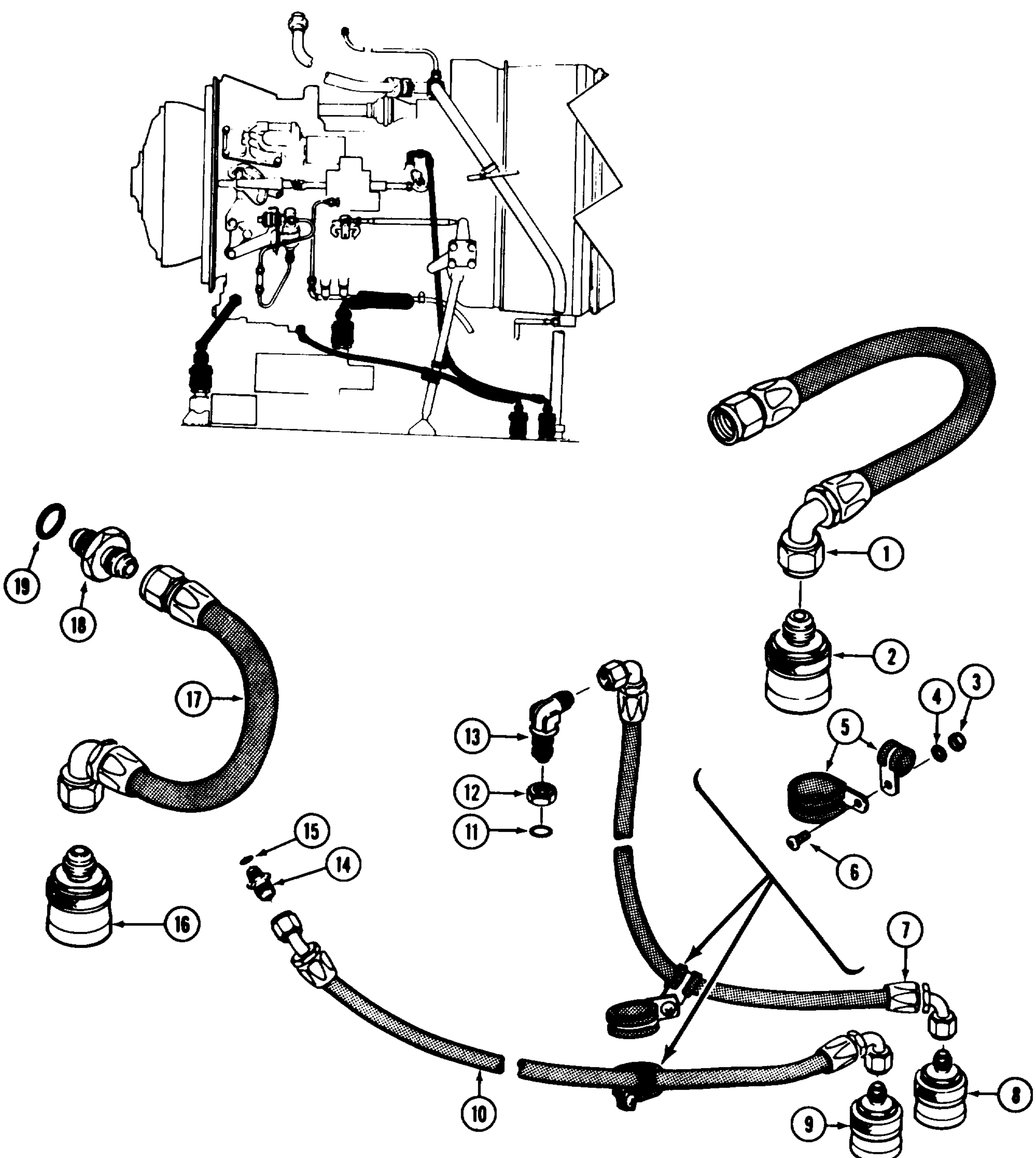
(3) Connect tube assembly (1) to reducer (3).

(4) Install tube assembly (14) to fitting (5) using coupling assembly (15). Install coupling half, washer, and packing on each end of fitting (5) and tube assembly (14). Place flexible center part of coupling over tube beads and tighten coupling halves.



1. Packing
2. Reducer
3. Tube assembly
4. Packing
5. Nut
6. Tee
7. Hose assembly
8. Screw
9. Clamp (2 reqd)
10. Washer
11. Nut
12. Hose assembly
13. Union (3 reqd)
14. Packing (4 reqd)
15. Coupling
16. Cross
17. Screw
18. Washer
19. Nut
20. Clamp (4 reqd)
21. Hose assembly
22. Tube assembly

Figure 4-36. **Installation — Fuel Drain and Bleed Lines**



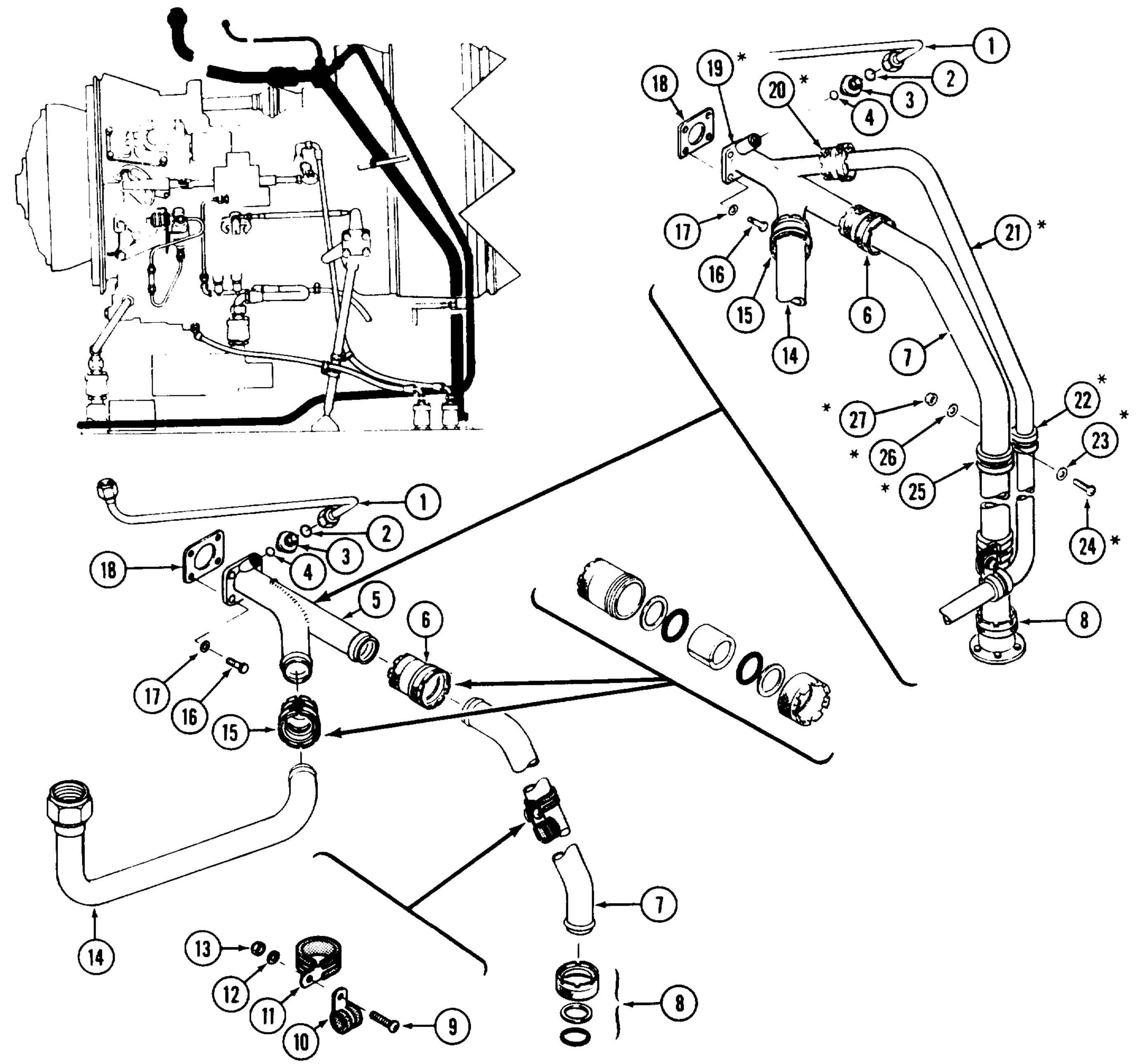
Hose assembly (fuel filter)
Coupling
Nut
Washer
Clamp (2 reqd)
Screw

7. Hose assembly (governor bleed)
8. Coupling
9. Coupling
10. Hose assembly (starter seal drain)
11. Packing
12. Nut

13. Elbow
14. Reducer
15. Packing
16. Coupling
17. Hose assembly (oil bypass valve)

18. Union
19. Packing

Figure 4-37. Installation — Starter, Fuel Filter, and Oil Bypass Valve Hose



1. Tube assembly	10. Clamp	*19. Fitting
2. Packing	11. Clamp	*20. Coupling assembly
3. Reducer	12. Washer	*21. Tube assembly
4. Packing	13. Nut	*22. Clamp (2 places)
5. Fitting	14. Tube assembly	*23. Washer (2 places)
6. Coupling assembly	15. Coupling assembly	*24. Screw (2 places)
7. Tube assembly	16. Bolt	*25. Clamp (2 places)
8. Half coupling	17. Washer	*26. Washer (2 places)
9. Screw	18. Gasket	*27. Nut (2 places)

* E M Applies to helicopters after MWO 55-1520-236-50-12 is incorporated.

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Figure 4-38. Installation — Bleed Air Tubing

(5) Install tube assembly (7) to fitting (5), using coupling assembly (6). Assemble as outlined in preceding step.

(6) Install clamp (11) on tube assembly (7). Secure to hose on engine assembly, using clamp (10), screw (9), washer (12), and nut (13). Arrange clamps in a butterfly fashion.

c. 1 E M Bleed air tubing installation. (After incorporation of MWO 55-1520-236-50-12)

NOTE

Install plugs in open ends of tube assemblies (1, 7, 14, and 21). Place half coupling (8) in plastic bag. Tubes and half coupling will be connected when engine is installed in helicopter.

(1) Install fitting (19) with gasket (18) to top bleed air port of engine. Secure using four bolts (16) and four washers (17).

(2) Install packings (2 and 4) to reducer (3). Install reducer in port of fitting (19).

(3) Connect tube assembly (1) to reducer (3).

(4) Install tube assembly (14) to fitting (19) using coupling assembly (15). Install coupling half, washer, and packing on each end of fitting (19) and tube assembly (14). Place flexible center part of coupling over tube beads and tighten coupling halves.

(5) Install tube assembly (7) to fitting (19) using coupling assembly (6). Assemble as outlined in preceding step.

(6) Install tube assembly (21) to fitting (19) with coupling assembly (20).

(7) Secure coupling assemblies (6, 15, and 20) with lockwire (C-138).

(8) Install clamps (22 and 25) on tube assemblies (7 and 21) in butterfly fashion using screws (24), washers (23 and 26), and nuts (27).

d. Oil hose assemblies.

(1) Install union (12, figure 4-39) with packing (11) in engine accessory gearbox port.

(2) Connect oil breather hose assembly (14) to union (12).

(3) Install coupling (13) to hose assembly (14).

(4) Install union (10) with packing (9) in OIL IN port of engine.

(5) Connect hose assembly (2) to union (10).

(6) Install coupling (1) to hose assembly (2).

(7) Install clamps (6 and 7) to oil hoses as shown. Secure to engine, using screw (8), spacer (5), washer (4), and nut (3).

(8) Install clamp (18) to hose assembly (2). Secure to tube on assembly, using screw (19), clamp (17), washer (16), and nut (15).

(9) Install clamp (22) to hose assembly (2). Install clamp (23) to hose assembly (14). Secure clamps together, using screw (24), washer (21), and nut (20).

4-123. P E INSTALLATION – HEAT SHIELD, TAILPIPE, AND EJECTOR.

NOTE

Installation of the following components should be accomplished after engine is installed in helicopter.

a. Attach heat shield (2, figure 4-40) to engine assembly, using clamp (1). Seat clamp using a plastic mallet while tightening. Torque clamp 100 TO 130 inch-pounds.

b. Attach tailpipe (5) to heatshield (2), using clamp (3). Seat clamp using a plastic mallet while tightening. Torque clamp 100 TO 130 inch-pounds.

c. Position ejector (9) over tailpipe. Secure ejector to aft fairing, using three screws(7) and three nuts (8).

d. Connect hose assembly (11) to tailpipe.

e. Install tube assembly between hose (11) and ejector (9).

4-124. M INSTALLATION – EXHAUST SYSTEM COMPONENTS (INFRARED SUPPRESSION SYSTEM).

NOTE

The infrared suppression system illustrated on figure 4-17 is attached to, and partially supported by, the IR suppressor cowling; therefore, infrared suppression system illustrated on figure 4-17 must be installed after engine is installed in helicopter.

a. Install Infrared Suppressor Cowling (7, figure 4-17) as outlined in paragraph 2-89.

b. Install Infrared Suppressor System Components as outlined in paragraph 4-58.

4-125. INSTALLATION – ENGINE ELECTRICAL CABLES.

NOTE

Refer to wiring diagram in Appendix F for wiring or connector identification.

a. Install nipples over ends of wires of starter-generator cable (6, figure 4-41).

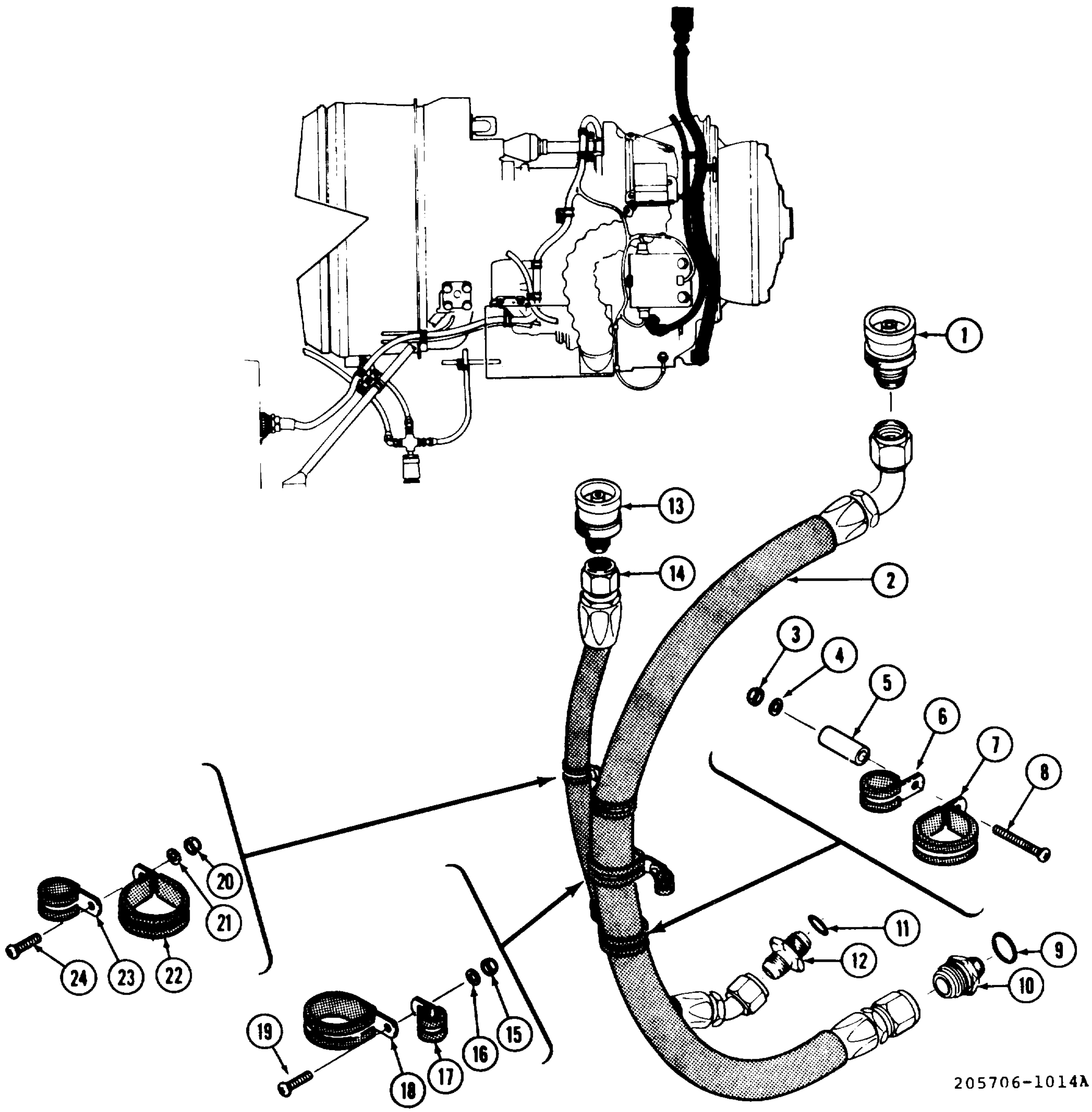
(1) One nipple on wires K5C4 and K5A1.

(2) One nipple on wires P26A1 and P26C4.

(3) One nipple on wires K4B4 and K4D4.

(4) One nipple on wire P25A16.

b. Remove nuts and washers from terminals C, B, and E of starter-generator.



1. Coupling
2. Hose assembly
3. Nut
4. Washer
5. Spacer
6. Clamp
7. Clamp
8. Screw
9. Packing
10. Reducer
11. Packing
12. Union
13. Coupling
14. Hose assembly
15. Nut
16. Washer
17. Clamp
18. Clamp
19. Screw
20. Nut
21. Washer
22. Clamp
23. Clamp
24. Screw

Figure 4-39. Installation — Oil Hose

1. Clamp
2. Heatshield
3. Clamp
4. Aft engine firewall
5. Tailpipe
6. Insulation (Ref)
7. Screw
8. Nut
9. Ejector
10. Tube assembly
11. Fuel hose

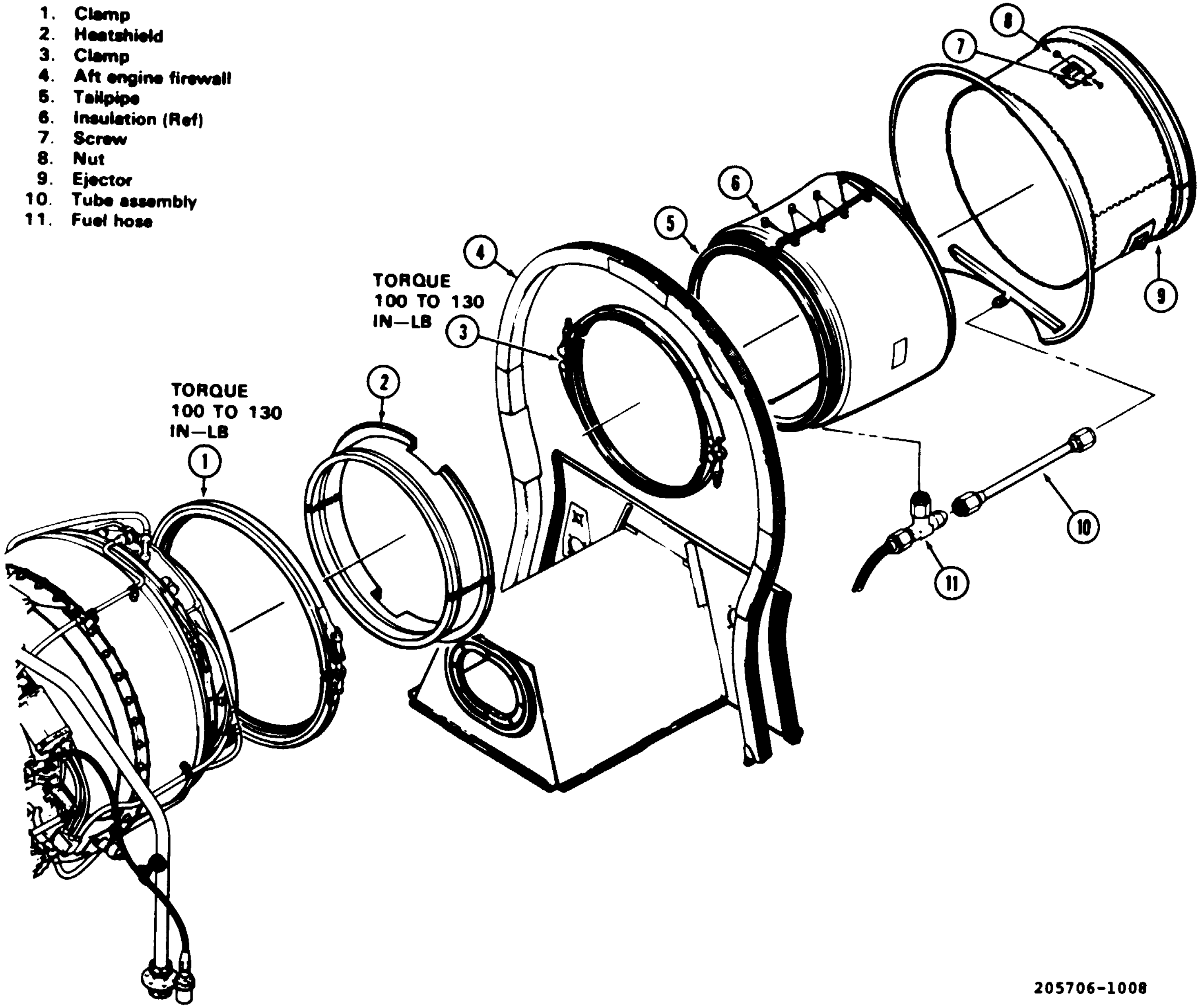


Figure 4-40. Installation — Heat Shield, Tailpipe and Ejector

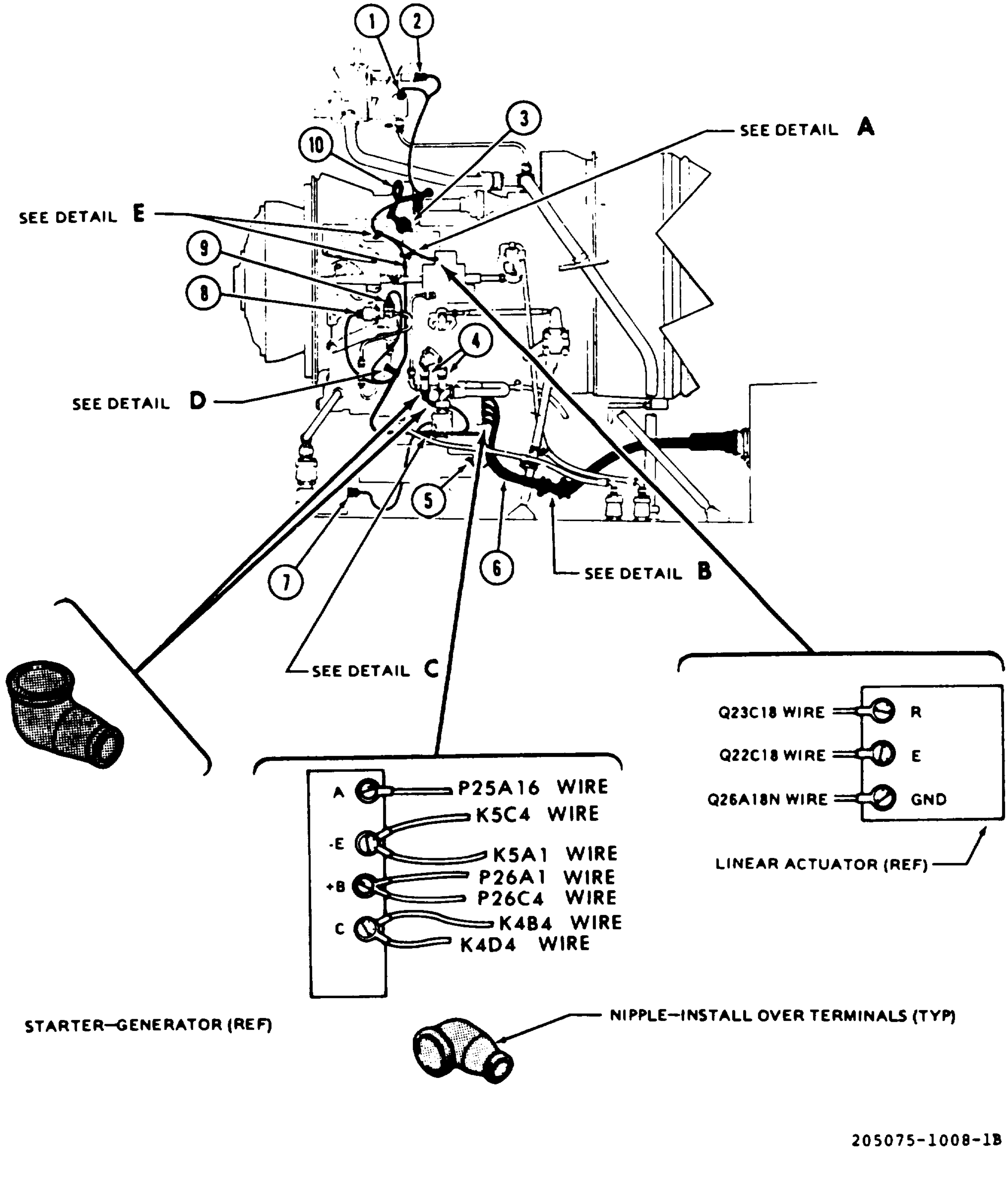
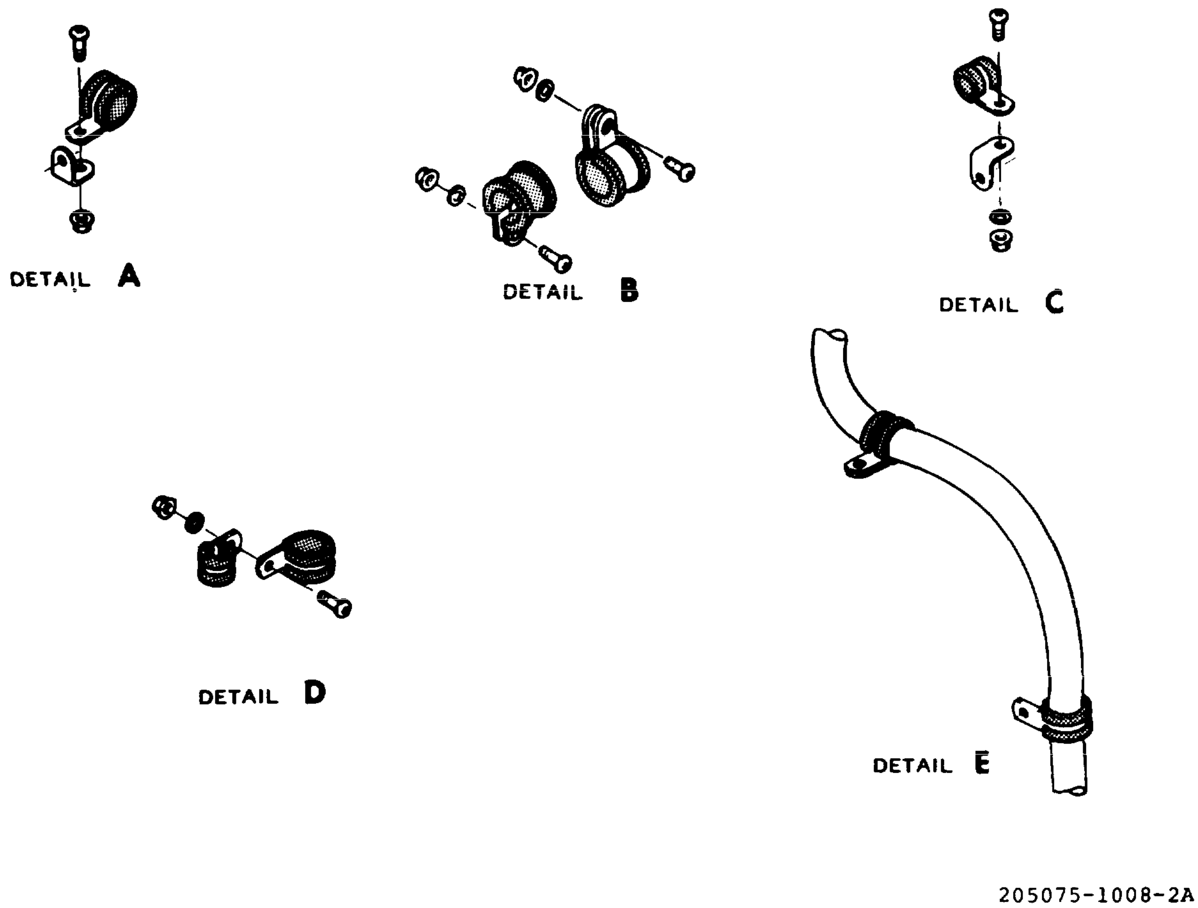


Figure 4-41. Electrical Cable Installation — Engine Left Side (Sheet 1 of 2)



1. Electrical connector (bleed air low level switch)
2. Electrical connector (engine oil low level switch)
3. Electrical connector
4. Fuel pressure switches
5. Electrical connector (fuel filter bypass)
6. Starter-generator cable
7. Electrical connector (engine oil bypass valve)
8. Electrical connector (engine oil pressure transducer)
9. Electrical connector (engine oil pressure switch)
10. Main engine cable

Figure 4-41. Electrical Cable Installation — Engine Left Side (Sheet 2 of 2)

NOTE

If terminals of starter-generator are too short, thin washers may be used.

c. Position wires K5C4 and K5A1 on terminal E, wires P26A1 and P26C4 on terminal B, wires K4B4 and K4D4 on terminal C and wire P25A16 on terminal A. Reinstall washers and nuts. Place nipples over terminals.

d. Loosely assemble clamps on starter generator cable. Clamps are used to secure cable during engine installation. See Detail B.

e. Position main engine cable (10) on engine and connect electrical connector (3) to airframe main connector.

f. Remove cover from linear actuator wire terminals and connect wiring (figure 4-41) as follows:

(1) Connect wire Q23C18 to terminal R.

(2) Connect wire Q22C18 to terminal E.

(3) Connect wire Q26A18N to terminal GND.

g. Secure wiring with bracket and clamp. See Detail A.

h. Connect electrical connector (8) to engine oil pressure transducer and connect electrical connector (9) to engine oil pressure switch.

i. Secure cable with clamps as shown in details D and E.

j. Install one nipple on wire W71D18 and one nipple on wire W71E18.

k. Remove nuts and washers from terminals of fuel pressure switches (4). Position one wire on each pressure switch and reinstall washers and nuts. Place nipples over terminals.

l. Connect electrical connector (5) to fuel filter bypass switch and connect electrical connector (7) to engine oil bypass valve.

m. Secure cable with bracket and clamp. See detail C.

n. Connect electrical connector (1) to bleed air valve and connect electrical connector (2) to engine oil low level switch receptacle.

o. Secure harness to bleed air duct with clamps. See figure 4-42, detail C.

p. Connect electrical connectors (1 and 2) to torque pressure transducers.

q. Assemble terminal board assembly details (6 thru 11) to engine support. Connect engine ground wires to terminal board ITBI. Secure wires to terminal board with washers (5), nuts (4), and cover (3).

r. Secure cable with clamps. See detail D.

s. On helicopters without MWO 1-1520-236-50-30, install nipple on wire W10C18. Remove nut and washer from terminal of chip detector (12). Install wire W10C18 on chip detector terminal. Reinstall washer and nut and place nipple over terminal. Secure wire with clamps. See detail E.

t. On helicopter with MWO 1-1520-236-50-30, connect cable plug (wire W10C18) to the oil separator chip detector.

u. Secure remainder of harness to engine using clamps and brackets. See details A, B, F, G, and H.

v. Secure exhaust thermocouple cable (13) to engine with clamp and bracket. See detail J.

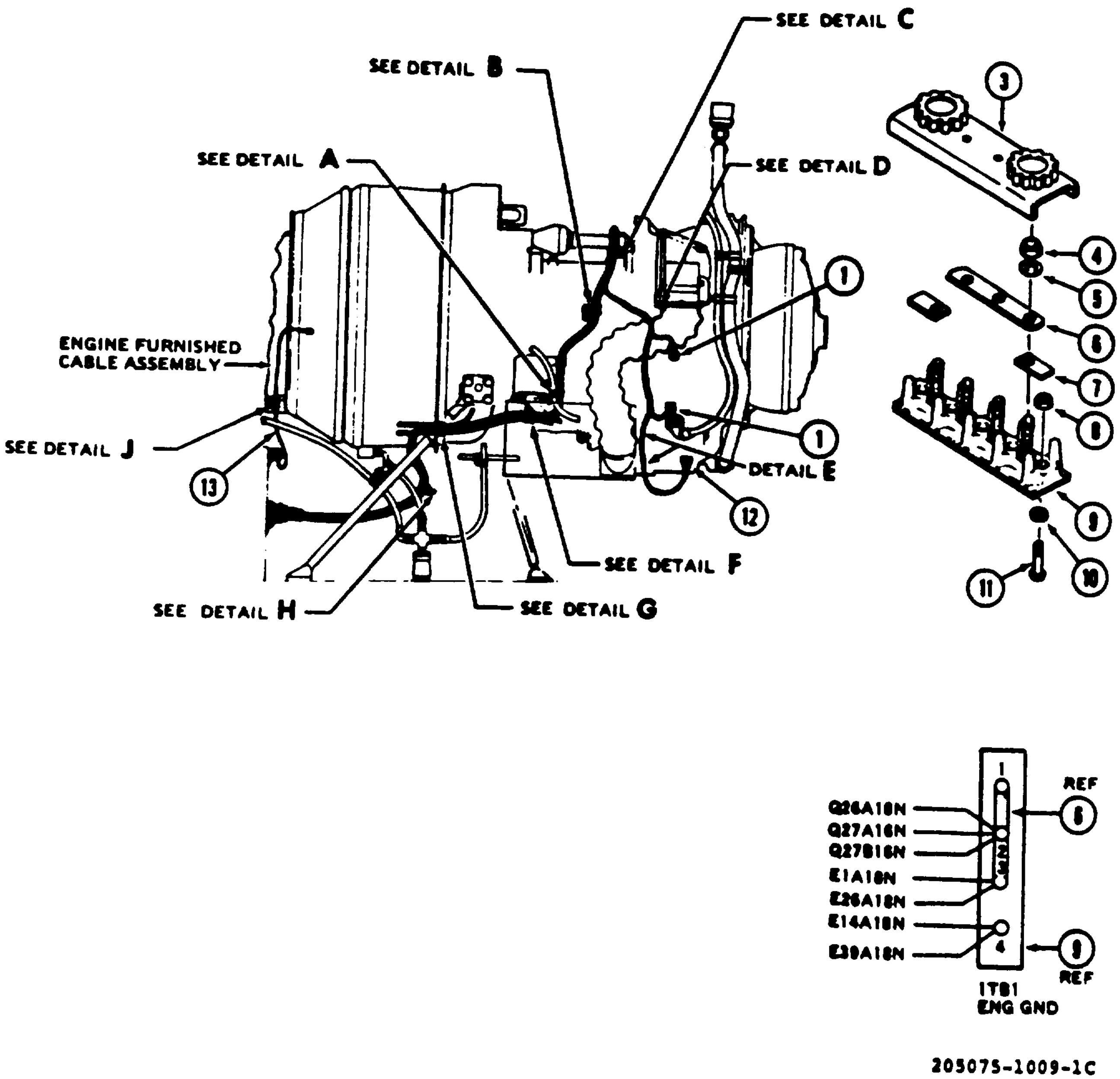
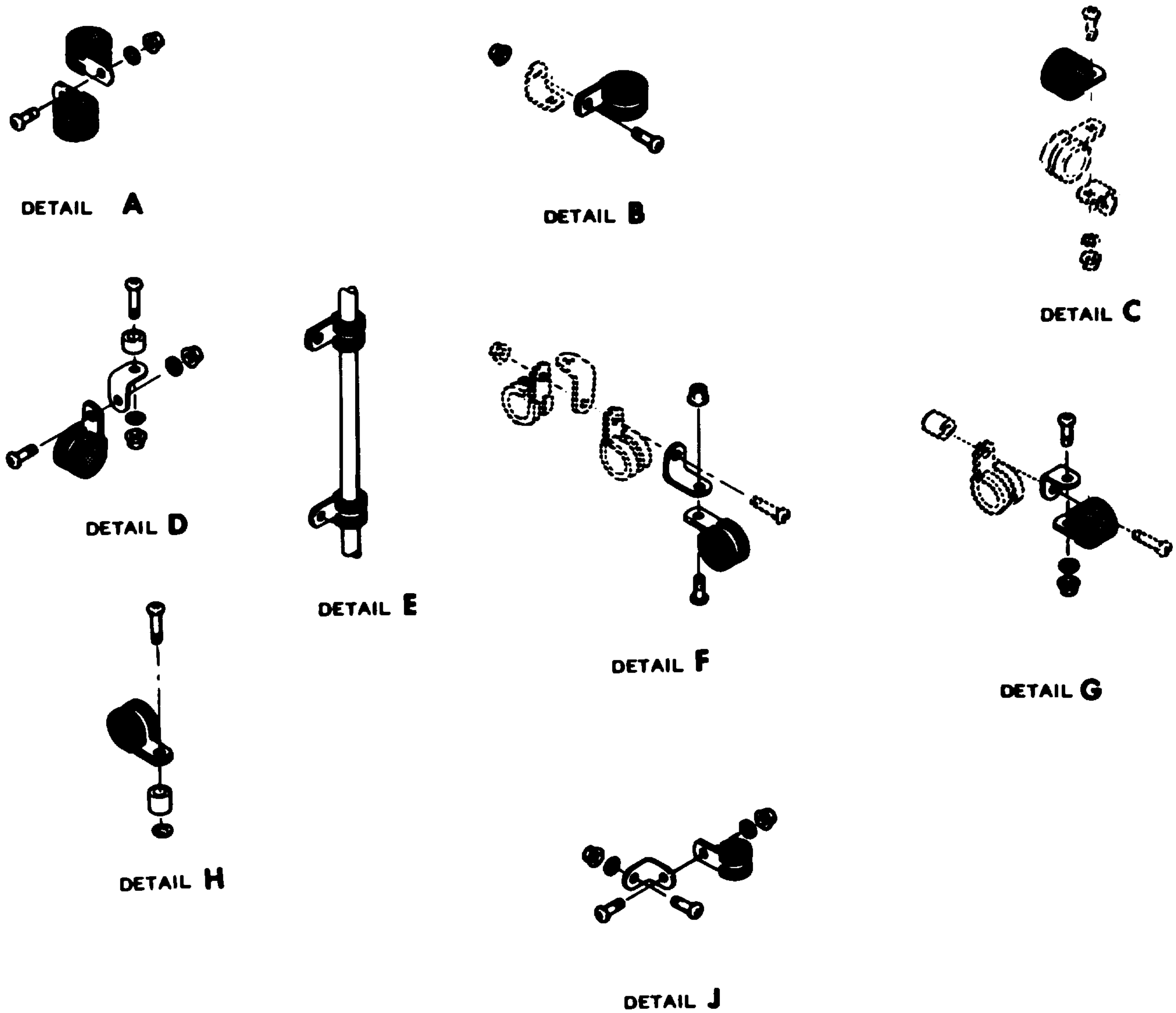


Figure 4-42. Electrical Cable Installation - Engine Right Side (Sheet 1 of 2)



1. Electrical connector
2. Electrical connector
3. Terminal board cover
4. Nut
5. Washer
6. Link
7. Insulator
8. Nut
9. Terminal board
10. Washer
11. Screw
12. Chip detector
13. Exhaust thermocouple cable

Figure 4-42. Electrical Cable Installation — Engine Right Side (Sheet 2 of 2)

CHAPTER 5

ROTORS

5-1. ROTOR SYSTEM.

5-2. DESCRIPTION — ROTOR SYSTEM.

The rotor system is comprised of the main rotor system and the tail rotor system. Refer to paragraph 5-4 for description of the main rotor system. Refer to paragraph 5-73 for description of the tail rotor system.

SECTION I. MAIN ROTOR SYSTEM

5-3. MAIN ROTOR SYSTEM.

5-4. DESCRIPTION — MAIN ROTOR SYSTEM.

The main rotor system consists of the main rotor hub and blade assembly, swashplate assembly, scissors and sleeve assembly and connecting tubes (pitch links). The main rotor hub trunnion (2, figure 5-1) and the main rotor mast (11) are splined in the area where the trunnion mounts on the mast so that the main rotor rotates with the mast. The trunnion is supported on the lower side with a cone set (not illustrated) and is secured by the mast nut (3). The mast nut also serves as a cap for the hollow mast and as a lifting eye.

NOTE

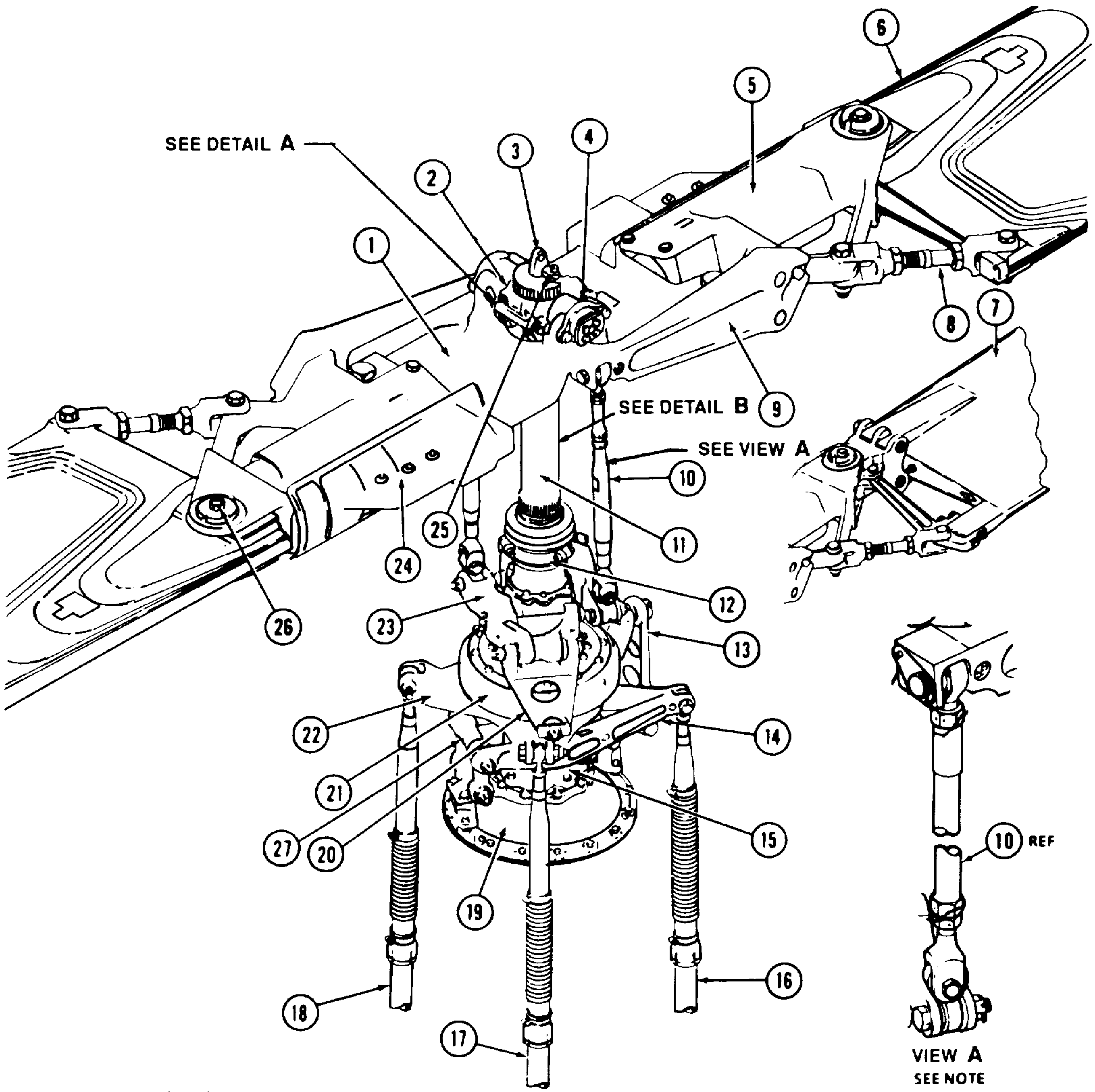
Refer to paragraph 5-25 for description of K747 main rotor blades (7, figure 5-1).

The main rotor hub is of the semi-rigid, underslung design consisting basically of the yoke (1), trunnion (2), elastomeric bearing (4), yoke extensions, pitch horns (9), drag braces (8), and grips (5). The yoke is mounted to the trunnion by elastomeric bearings (4) which permit rotor flapping. Cyclic and collective pitch change inputs are received through pitch horns mounted on the trailing edge of the grips. The grips in turn are permitted to rotate about the yoke extensions on teflon impregnated fabric friction bearings resulting in the desired blade pitch. Adjustable drag braces (8) are attached to the grips (5) and main rotor blades maintaining alignment. Blade centrifugal loads are transferred from the blade grips to the extensions by wire wound, urethane coated, tension torsion straps. The hub moment spring assembly (MWO 55-1520-244-50-3 Incorporated) consists of an elastomeric spring (28), support assembly (29), plates (30) and straps (31). The hub moment spring assembly prevents the main rotor hub from contacting the mast during high flapping maneuvers.

The swashplate inner ring (22), outer ring (21), swashplate support (15), anti-drive link (13) and scissors and sleeve assembly (23) serve to control the pitch of the main rotor blades.

Forward and aft cyclic input and lateral cyclic input from the pilot/gunner is transmitted from the hydraulic control cylinders (18 and 17) to the non-rotating swashplate inner ring (22). The anti-drive link (13) is connected to the aft swashplate support horn and prevents the swashplate inner ring (22) from rotating about the outer ring (21). The control is changed to rotating at the swashplate outer ring (21). It is then transmitted through the scissors and sleeve assembly (23), and pitch links (10) to the main rotor hub pitch horns (9) and main rotor blades.

Collective control input from the pilot/gunner is accomplished through the collective control cylinder (16), collective levers (14), scissors and sleeve assembly (23) and the friction collet (12). The collective lever (14) is attached to the lower end of the scissors and sleeve assembly (23) and moves these parts vertically. The sleeve is inside the swashplate and does not rotate, and the scissors are mounted at the top of the sleeve with a hub and bearings. A spline plate, bolted to the top of the hub, contacts splines on the main rotor mast (11). An extension on top of the spline plate carries a friction collet (12) which bears on a sleeve bonded on the mast. The spline plate can move vertically on the main rotor mast to permit vertical movement of the scissors and sleeve assembly. The spline plate rotates with the main rotor mast and causes the scissors hub, scissors and swashplate outer ring (21) to rotate with the mast. Collective pitch control input and cyclic pitch control input to the scissors is transmitted through the pitch links (10) to the main rotor blade pitch horns (9).



1. Main rotor hub yoke
2. Trunnion
3. Mast nut
4. Elastomeric bearing
5. Grip
6. Main rotor blade B-540
7. Main rotor blade K-747
8. Drag brace
9. Pitch horn
10. Pitch link assembly
11. Mast
12. Friction collet
13. Antidrive link
14. Collective lever
15. Swashplate support
16. Collective control hydraulic cylinder
17. Lateral cyclic control hydraulic cylinder
18. Fore and aft cyclic control hydraulic cylinder
19. Transmission
20. Drive link
21. Swashplate outer ring
22. Swashplate inner ring
23. Scissors and sleeve assembly
24. Sand deflector
25. Mast nut lock
26. Main rotor blade retention bolt
27. Collective idler

NOTE: View A applicable after MWO 55-1520-244-50-9 is incorporated.

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Figure 5-1. Main Rotor System (sheet 1 of 2)

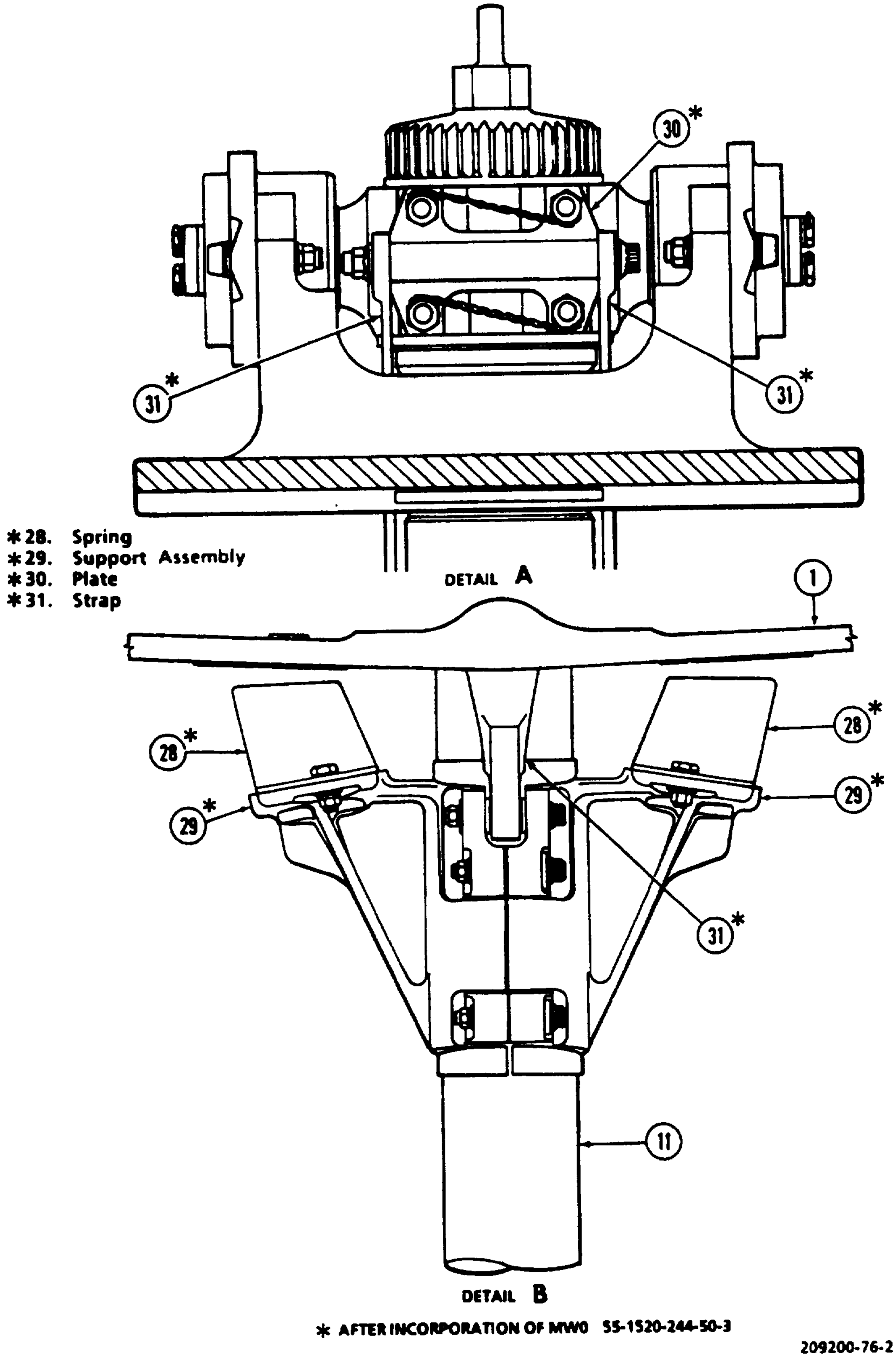


Figure 5-1. Main Rotor System (Sheet 2 of 2)

5-5. ADJUSTMENT-MAIN ROTOR SYSTEM.

Refer to Section VIII.

5-6. OPERATIONAL CHECK-MAIN ROTOR SYSTEM.

Perform the following checks after installation of main rotor system.

a. Track main rotor blades (paragraph 5-114).

b. Perform functional test flight (TM 55-1520-236-MTF).

c. If fictional test flight performed Ill preceding step indicates that additional adjustments and/or maintenance is required, troubleshoot the main rotor system in accordance with paragraph 5-7.

5-7. TROUBLESHOOTING-MAIN ROTOR SYSTEM.

Utilize figures 5-93 through 5-96 to troubleshoot the main rotor system.

SECTION II. MAIN ROTOR HUB AND BLADES

5-8. B540 MAIN ROTOR HUB AND BLADES.

5-9. B540 DESCRIPTION-MAIN ROTOR HUB AND BLADES.

The semi-rigid type main rotor consists of two metal blades (31, figure 5-2) and the hub. The hub yoke (24) is underslung relative to the trunnion (1). The trunnion is attached to the yoke with elastomeric bearings (2). The splined hub trunnion mounts on the main rotor mast. The elastomeric bearings allow the hub yoke and blades to move on the flapping axis. The hub moment spring assembly (MWO 55-1520-244-50-3 Incorporated) prevents main rotor hub from contacting the mast during high tipping maneuvers. The grips (19) rotate on the yoke extensions for change in blade pitch when pitch horns (20) are raised or lowered by control linkage. Blade alignment is maintained by adjustable drag braces (12). Refer to paragraph 5-25 for K747 blades. Special torque values for the main rotor system are shown on figure 5-3.

5-10. CLEANING-MAIN ROTOR HUB AND BLADES.

a. Clean blades thoroughly with cleaning compound (C33).

b. Rinse with clear water and allow to dry.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

CAUTION

The erosion guard on K747 main rotor blades is very susceptible to solvents. Use care to prevent spillage or run-off of solvent onto the guard.

c. Remove stubborn deposits with a cloth dampened with solvent (C112), except on K747 blade the erosion guard shall be cleaned only with detergent (C50) or clean compound (C33).

d. Clean main rotor hub with cloths dampened with solvent (C112).

5-11. INSPECTION-MAIN ROTOR HUB AND BLADES.

NOTE

Refer to TM 55-1600-322-24 for inspection criteria of Teflon lined bearings.

a. Remove two send deflectors, if installed, from each main rotor hub to be inspected.

b. Check the clearance between each extension and grip assembly by inserting the 0.100 to 0.125 inch thick strap between them. Move the strap through the full range of gap between grip and extension with hub and metal blade angle set in accordance with paragraph 5-14.q.(5) and for clearance on hubs with fiberglass blades in accordance with paragraph 5-14. q. (6). Disconnect pitch links per paragraph 5-12.b. Rotate hub end blade and check for clearance with a total positive angle of attack of 17 degrees on hub with metal blades or 20 degrees on hub with fiberglass blades. Rotate hub and blades and check for zero angle of attack. Main rotor hubs which do not allow the 0.100 to 0.125 inch thick strap to pass should be disassembled for visual check for interference, rubbing or other signs of contact between grip and extension. Inspect carefully the outboard end of extension barrel and grip for interference. If there are no visual signs of contact on grip and extension the hub maybe reassembled. All parts with signs of interference must be replaced.

(1) Feathered, plus 8 degrees.

(2) Neutral.

(3) Feathered, minus 4 degrees.

c. Replace extension assembly if any clearances cannot be met.

d. Inspect elastomeric bearing retainers (3, figure 5-30) for looseness. If retainer is loose, retorque four (4) bolts (1, figure 5-30) 120-160 inch-pounds, if retainer is still loose, replace bolts. Lockwire (C137) bolts in pairs.

5-12. REMOVAL — MAIN ROTOR HUB AND BLADES.

Premaintenance Requirements for Removal of Main Rotor Hub and Blades

Condition	Requirements
Model	AH-1E, F, & P
Part No. or Serial No.	All
Special Tools	(T15), (T16), (T17), (T24), (T29), (T34), (T35), (T45), (T59)
Test Equipment	None
Support	None
Minimum Personnel Required	Four
Consumable Materials	None
Special Environmental Conditions	None

a. Remove trunnion bolt and install eyebolt (figure 5-4).

b. On helicopters not modified by MWO 55-1520-244-50-9, remove lockwire from bolts (23, figure 5-2). Remove bolts (23, figure 5-2) and washers (22) at each pitch horn (20). Secure barrel nuts and retainers (21) in position. On helicopters modified by MWO 55-1520-244-50-9, remove lockwire from bolts (23). Remove bolts (23) and bushing assembly (22A). Secure barrel nuts and retainers (21) in position.

(1) If removal of pitch link assemblies (15) is not required, secure pitch link assemblies (15) to mast (14) with maslking tape to prevent damage in the event mast (14) is rotated.

(2) If removal of pitch link assemblies (15) is required, remove cotter pins (36), nuts (35), washers (33 and 34), and bolts (32).

(3) If removal of universal bearing (30) is required, remove cotter pins (29), nuts (28), washers (27), and bolts (26).

c. Install main rotor grip lock (T59) on each pitch horn and eyebolt (figure 5-4).

d. Remove bolt (6, figure 5-2) and lock (5).

e. Install socket (T16) (6, figure 5-5) on mast nut (8). Position reaction torque adapter (T17) (7) on trunnion (10). Ensure that it is in correct position on top of trunnion. Position torque multiplier (T15) power wrench (4) on reaction torque adapter (7) and ensure that the through pins on the wrench reaction arm engage the holes in the adapter. Position the 3/4 inch square drive bar (5) into the square drive of the power wrench and turn the ratchet indexer (3) counterclockwise until the drive bar drops into socket (6). Install input crank handle (2) on power wrench (4).

f. Turn input crank handle (2) in a counterclock wise direction, observing power wrench indicator (1) on power wrench as input crank handle is turned. When breakaway torque of approximately 650 foot-pounds is reached, the power wrench indicator will reverse as the mast nut (8) loosens. When this occurs remove the special tools and complete removal of the mast nut (8) and washer (9) manually. Inspect mast nut for mechanical damage or corrosion. The same damage limits for the top part of the trunnion, per figure 5-40, page 5-88, can be applied to the mast nut.

g. Remove three nuts (10, figure 5-2), washers (g), bolts (7), sand deflector (8), and spacers (11). Remove opposite sand deflector *in the same* manner.

h. Detach supports (40) from straps (42) by removing nuts (41), washers (36), and bolts (35). Remove bolts (37), washers (38), and nuts (39). (MWO 55-1520-244-50-3 Incorporated)

i. Position hoist assembly (T45) (or equivalent) directly over mast in accordance with instructions contained in paragraph 1-48.

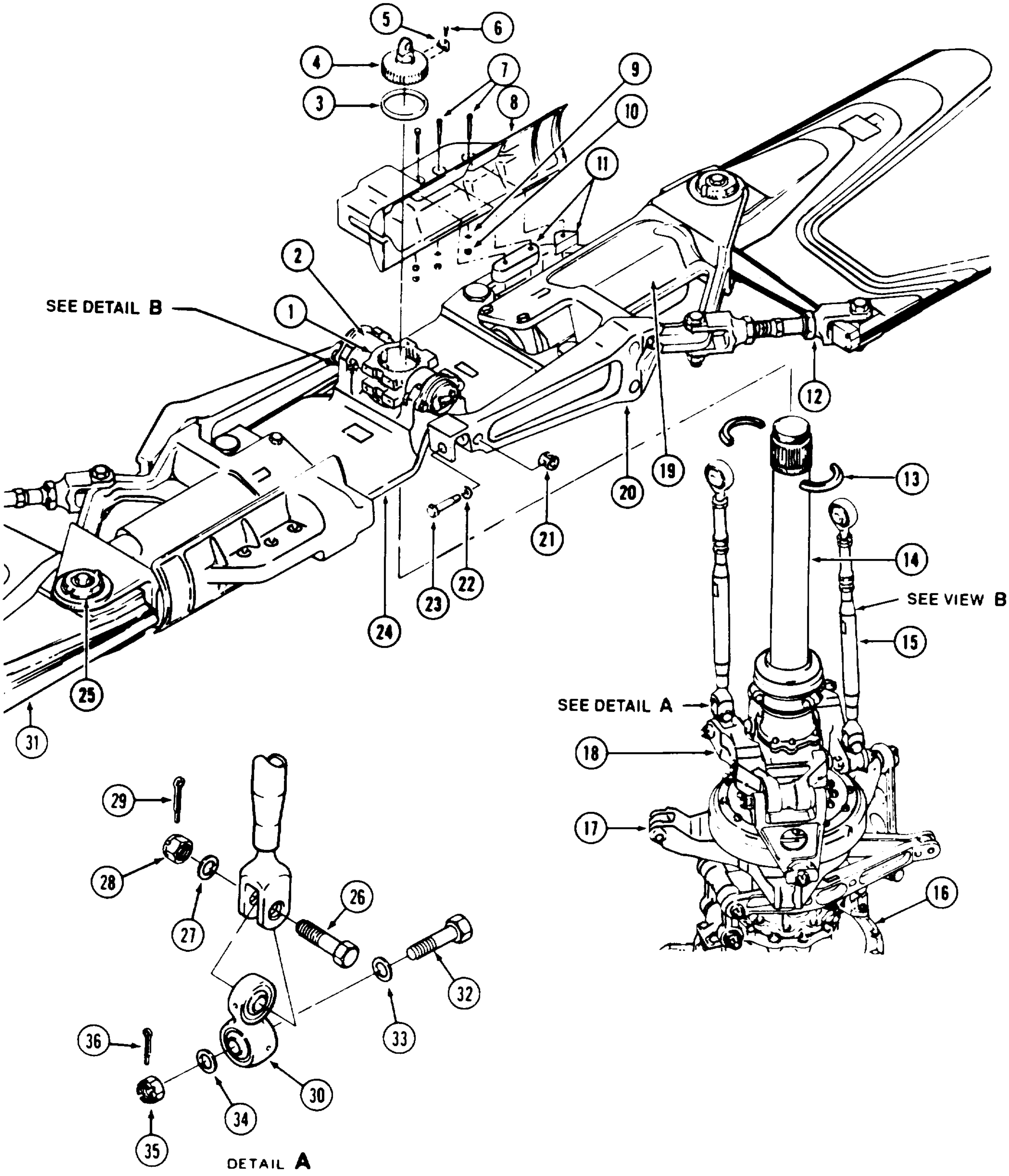
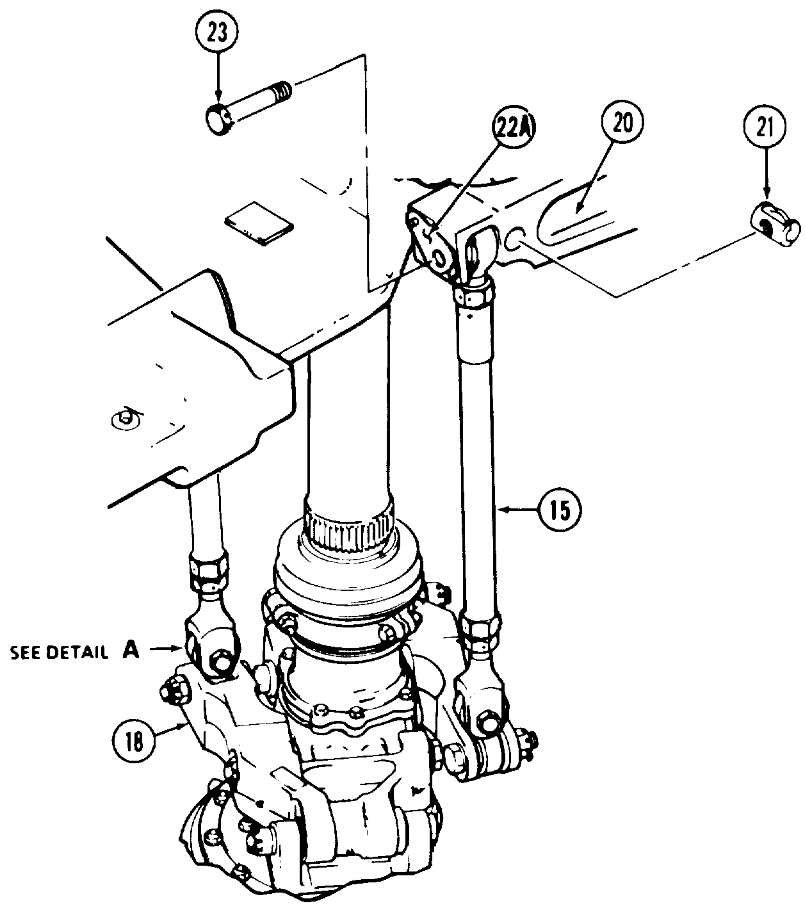


Figure 5-2. Main Rotor Installation (Sheet 1 of 3)



1. Trunnion
2. Elastomeric bearing
3. Washer
4. Mast nut
5. Lock
6. Bolt
7. Bolts (3 reqd)
8. Sand deflector
9. Washer (3 reqd)
10. Nut (3 reqd)
11. Spacers
12. Drag brace assembly
13. Cone set
14. Mast
15. Pitch link assembly
16. Transmission
17. Swashplate and support assembly
18. Scissors and sleeve assembly
19. Grip
20. Pitch horn
21. Barrel nut and retainer
22. Washer
22A. Bushing assembly
23. Bolt
24. Yoke
25. Blade retention bolt assembly
26. Bolt
27. Washer
28. Nut
29. Cotter pin
30. Universal bearing
31. Main rotor blade
32. Bolt
33. Washer
34. Washer
35. Nut
36. Cotter pin

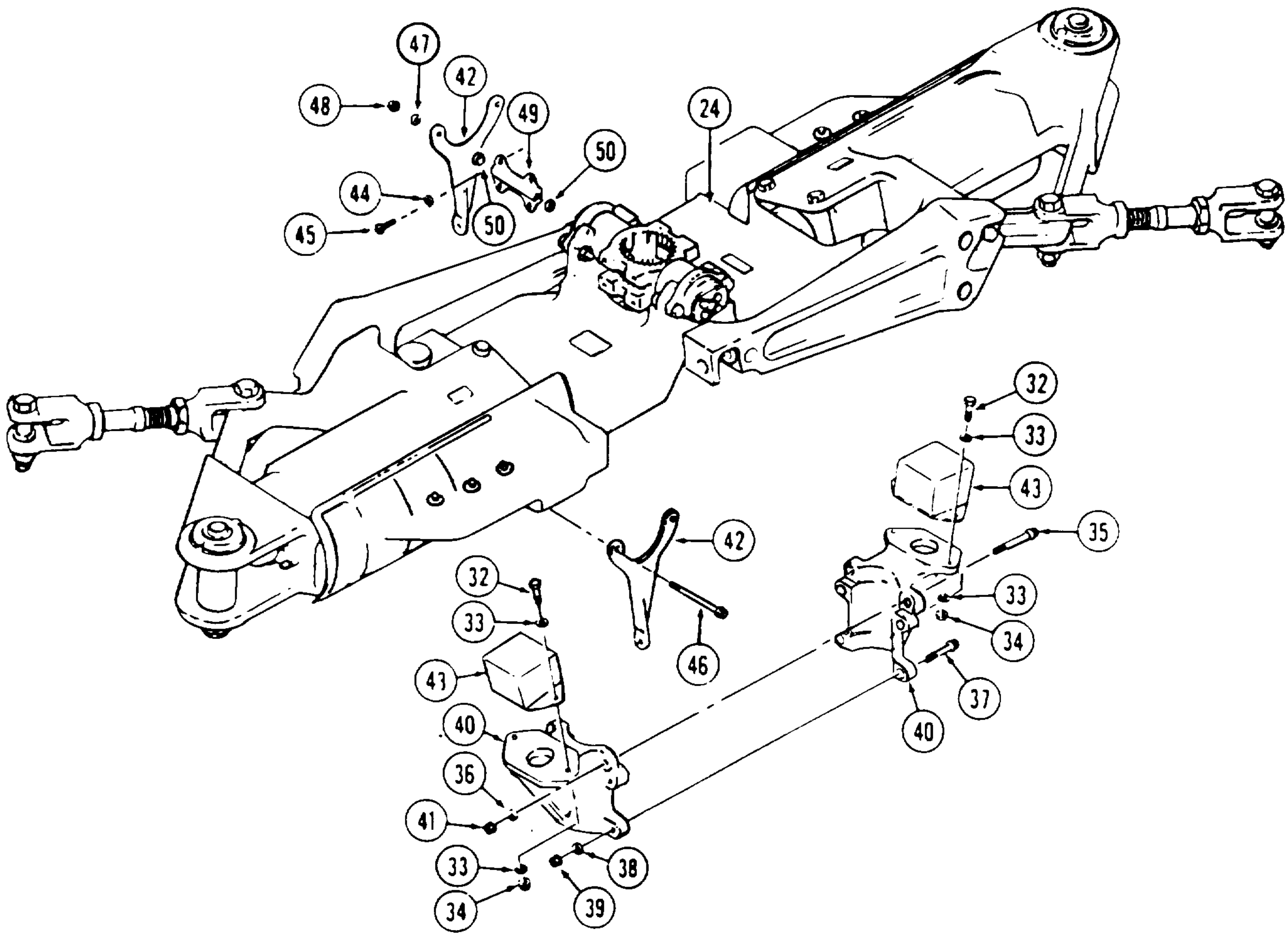
NOTES:

1. See Figure 5-3 for installation torque values.

2. View B applicable after MWO 55-1520-244-50-9 is incorporated.

209200-83-2

Figure 5-2. Main Rotor Installation (Sheet 2 of 3)



*AFTER INCORPORATION OF MWO 55-1520-244-50-3
DETAIL B *

32. BOLT	41. NUT
33. WASHER	42 STRAP
34. NUT	43. SPRING
35. BOLT	44. WASHER
36. WASHER	45. BOLT
37. BOLT	46. BOLT
38. WASHER	47. WASHER
39. NUT	48. NUT
40. SUPPORT	49. PLATE
	50. WASHER

Figure 5-2. Main Rotor Installation (Sheet 3 of 3)

j. Position two rotor slings (T24) on main rotor hub and attach to hiost. (Do not wrap liftng sling cable around sharp corners on rotor hub.)

k. Attach a tiedown assembly on each rotor blade for use in guiding and steadying rotor during removal.

CAUTION

Loosen nut (48, figure 5-2) prior to removal of hub moment springs and sup ports to prevent damage to assembly.

l. Carefully hoist the main rotor hub and blade assembly dear of the mast.

m. Remove cone set (13). Attach cone set halves together and retain as a matched set.

n. Place adapter plate (T34) on buildup bench (T29) and position hub and blade assembly on the bench. Place padded supports under each bide. See future 5-6 for view of hub mounted on buildup bench.

o. Install sand defectors (8), spacers (11), washers (9), bolts (7), and nuts (10) that were removed in step g.

5-13. ALIGNMENT – MAIN ROTOR HUB AND BLADES.

Premaintenance Requirements for Alignment of Main Rotor Hub and Blades

Condition	Requirements
Model	AH-1E, F,& P
Part No. or Serial No.	All
Special Tools	(T59), (T34), (T29), (T30), (T31), (T38), (T39)
Test Equipment	Protractor
Support Equipment	Main rotor blade support with wheels (two required)
Minimum Personnel Required	Two
Consumable Materials	None
Special Environmental Conditions	None

a. Install main rotor grip locks (T59) on each pitch horn if not previously accomplished (figure 5-4).

b. Remove nuts (46, future 5-2), washers (47), and bolts (46). Remove straps (42). Remove lockwire, bolts (45), and washers (44). Remove plates (49) and washers (50) (MWO 55-1520-244-50-3 Incorporated). Install flap stop plates (T39) to lock trunnion.

c. Position main rotor hub and blade assembly on stands for accomplishment of alignment procedure as follows:

(1) Place adapter plate (T34) on build-up bench (T29).

(2) Place main rotor hub and blade assembly on build-up bench shown on figure 5-6.

(3) Place stand equipped with wheels under each blade to support the blades at a precone angle of approximately 2-1/2 degrees up so blades will move easily in grips if drag brace adjustment is required.

(4) Remove main rotor grip locks (T59). Install barrel jacks (figure 5-4.1) as a work aid as shown in figure 5-4.2. Place protractor on machined surface adjacent to blade retention bolt assembly (25, figure 5-2) and shim or wedge each blade support stand and adjust barrel jack on main rotor grip to obtain zero degree chordwise.

d. Position alignment scope support (T38) over elastomeric bearings as shown in figure 5-6.

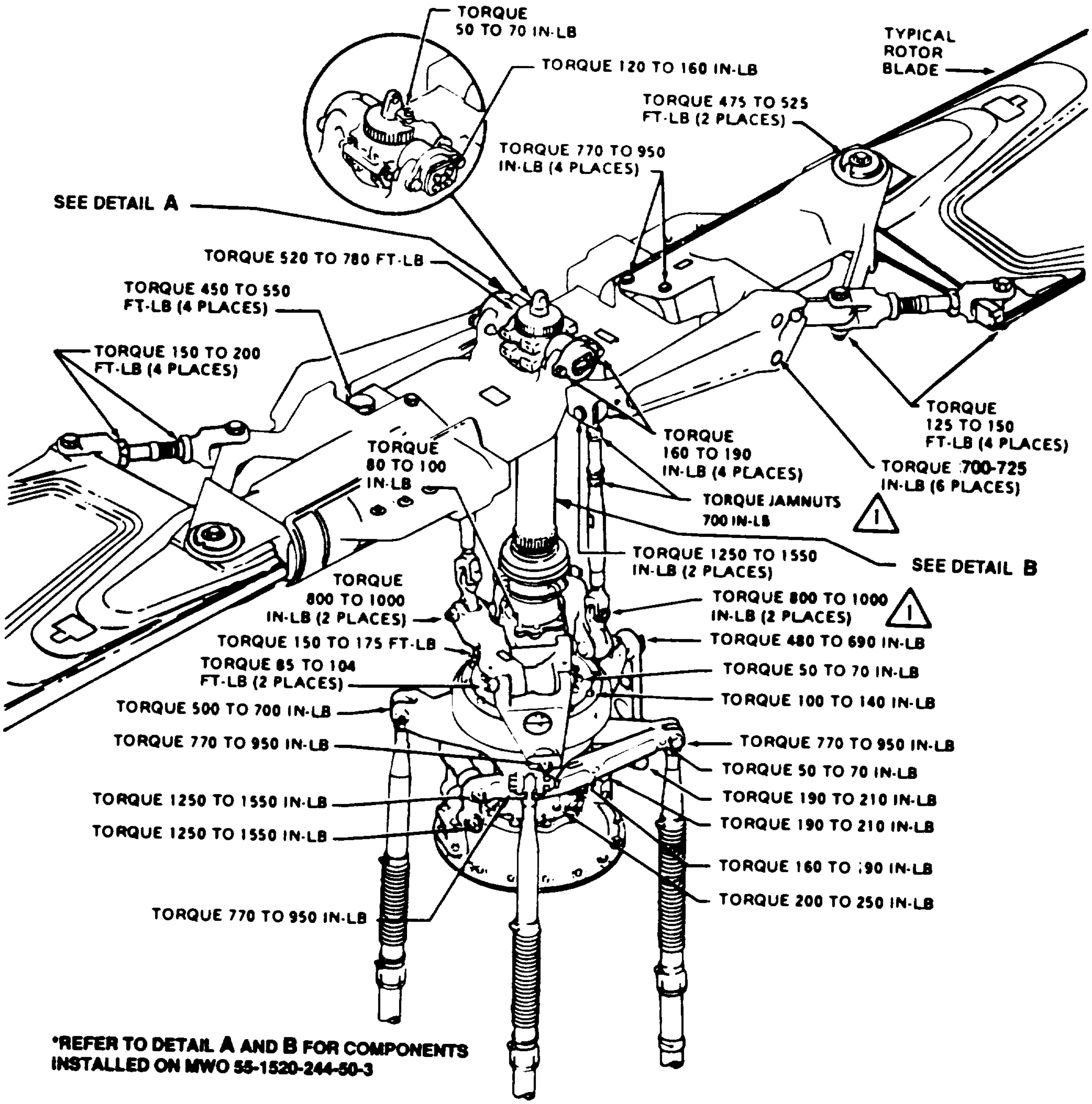
e. Install and adjust scope (T30) as follows:

(1) Position scope (T30) on support as shown on figure 5-6.

(2) Zero cross-hair on an object approximately fifty feet away. Draw a vertical line on the object to align with the vertical cross-hair.

(3) Loosen damp screws, rotate scope 180 degrees on scope tube axis, and tighten damp screws.

(4) Observe vertical line drawn in step (2). If vertical cross-hair aligns with first vertical line drawn in step (1), proceed to step f. If vertical cross-hair does not align with first vertical line drawn, draw a second vertical line on object to align with vertical cross-hair. Measure one half the distance between the two vertical lines and draw a third vertical line.



*REFER TO DETAIL A AND B FOR COMPONENTS INSTALLED ON MWO 55-1520-244-50-3

NOTE:

1 Torques shown are applicable prior to incorporation of MWO 55-1520 244-50-9. See view A for torques applicable after incorporation of MWO 55-1520-244-50-9

Figure 5-3. Main Rotor System Torque Values (Sheet 1 of 3)

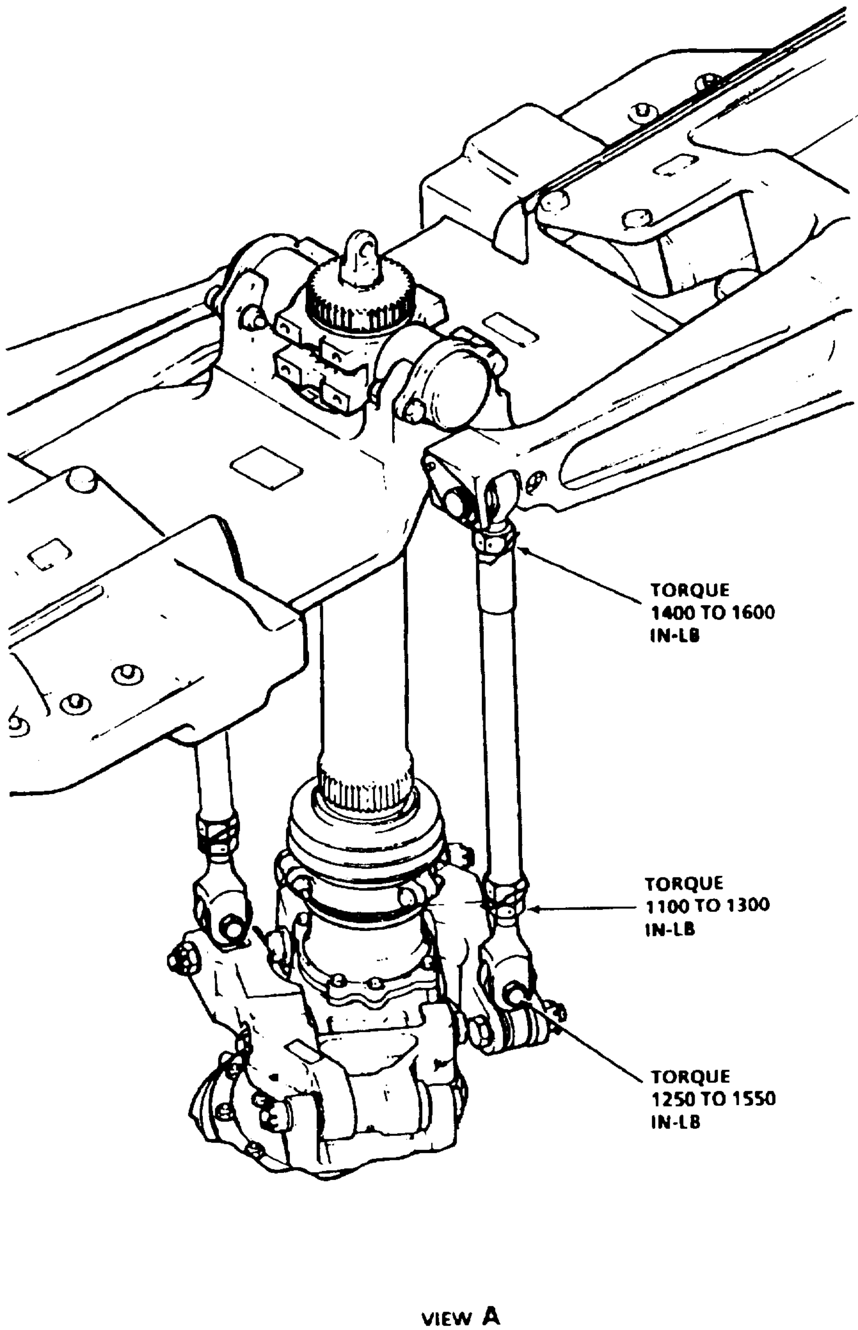


Figure 5-3. Main Rotor Installation Torque Values (Sheet 2 of 3)

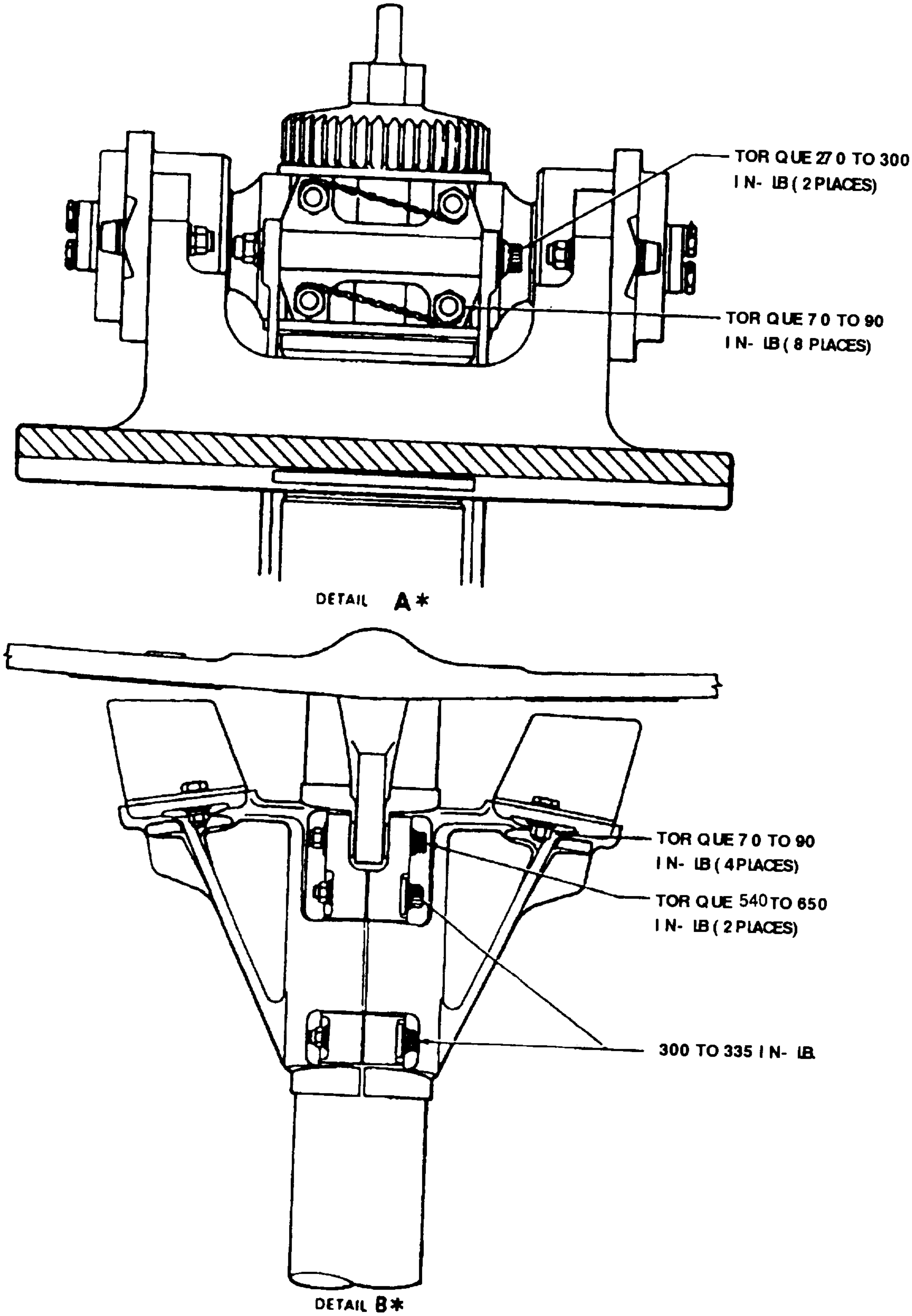


Figure 5-3. Main Rotor Installation Torque Values (Sheet 3 of 3)

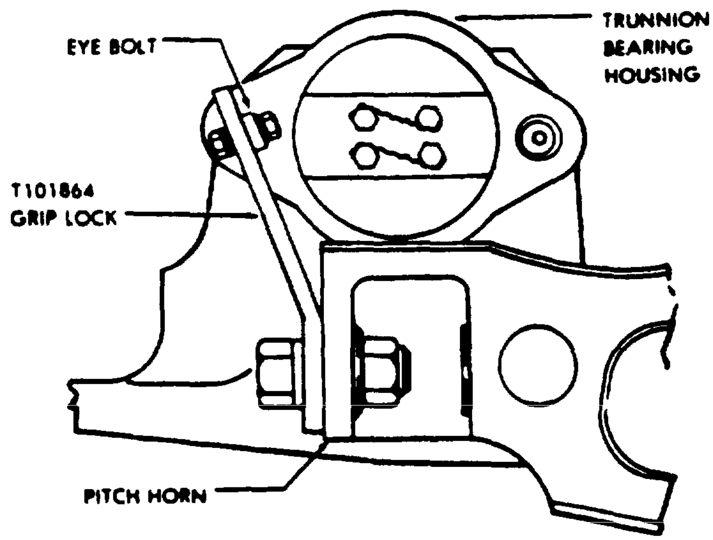


Figure 5-4. Tool Application - Grip Lock Installation on Pitch Horn

(5) Adjust screw on side of scope to align vertical cross-hair with third vertical line drawn in step (4).

(6) Loosen clamp screws, rotate scope 180 degrees on scope tube axis, and tighten clamp screws.

(7) Observe third vertical line drawn in step (4). If vertical cross-hair in scope aligns with third vertical line drawn in step (4), proceed to step f. If vertical cross-hair in scope does not align with third vertical line drawn in step (4), repeat adjustment procedure as required until vertical cross-hair in scope will align with same vertical mark when scope is rotated 180 degrees.

f. Locate alignment drive screw (12, figure 5-13 or 17, figure 5-16). Sight through alignment scope (T30) and determine whether the alignment drive screw is lined up with the scope cross-hair with 0.000 inch forward to 0.100 inch aft. if drive screw is aligned within tolerance, proceed to step h. If drive screw is not aligned within tolerance, align blade as follows:

(1) Remove locking screw (20, figure 5-10), nut (18) and washer (19).

(2) Loosen nut (17) with socket wrench (T31).

(3) Loosen nuts (11 and 21).

(4) Loosen two jamnuts on drag brace (15).

g. Adjust drag brace (15, figure 5-10) to move blade tip and bring alignment drive screw within tolerance. Ensure that the wheels under the stand supporting the blade are free to roll when the drag brace is adjusted. After the blade is aligned, torque jam nuts on the drag brace 150 TO 200 foot-pounds and recheck to ensure that blade alignment is still within limits.

NOTE

After alignment, ensure that all inner threads of the clevis ends are in contact with those of the drag brace, and the drag brace is no less than flush with the clevis ends.

h. Reverse scope to check and adjust alignment of opposite blade. Maximum tolerance of alignment between two blades is 0.050 inch.

L Torque nuts (11) and (21) on both blades 125 TO 150 foot-pounds after blades are aligned.

j. Use wrench (T31) to torque nuts (17) to 475 TO 525 foot-pounds. Align a notch in nut with a hole in bolt. Install locking screw (20) with head in direction that centrifugal force will keep locking screw in. In some cases, this may require the locking screw to be installed from the inside bolt. Install washer (19) and nut (18).

k. Verify blade alignment.

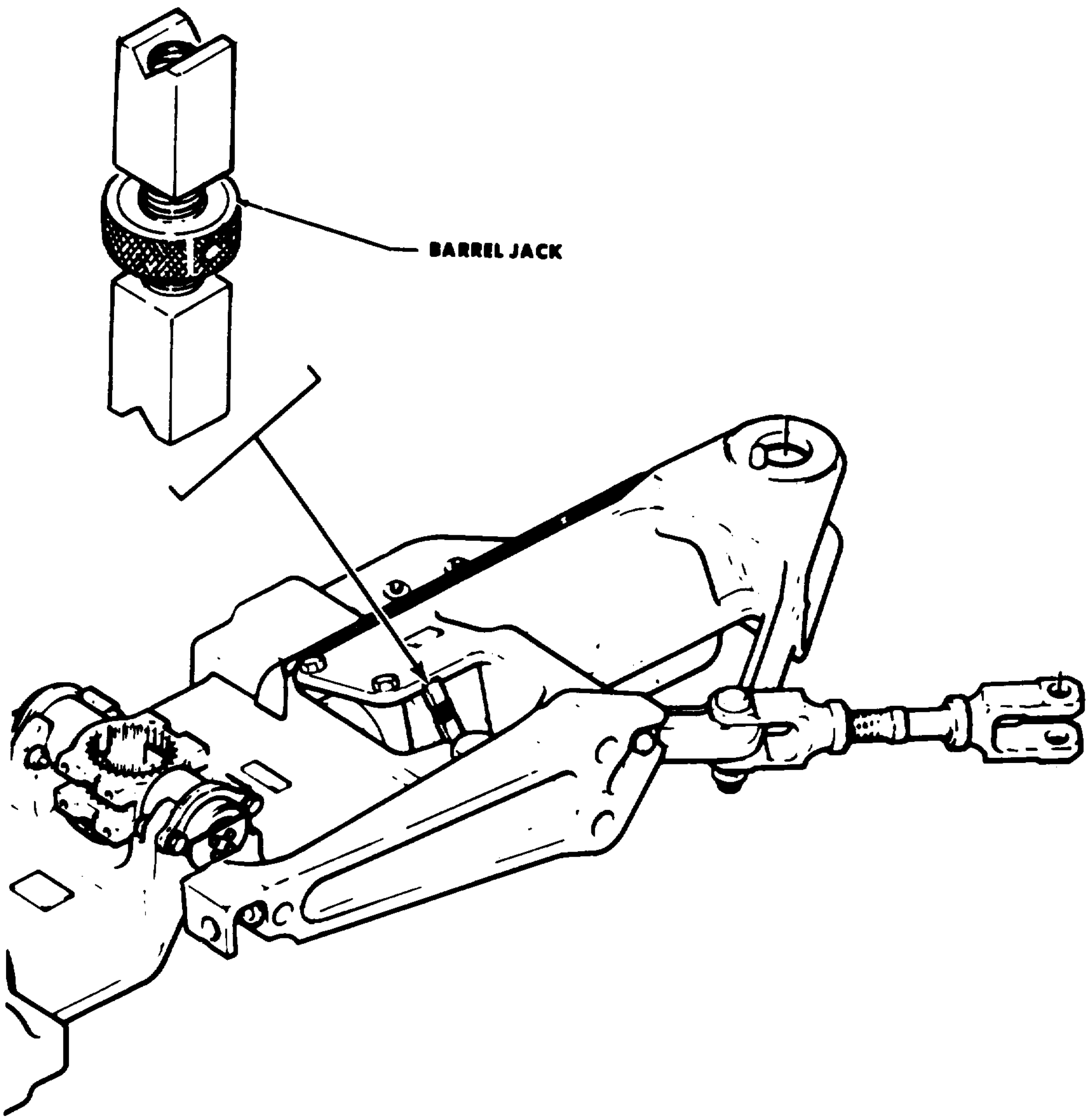
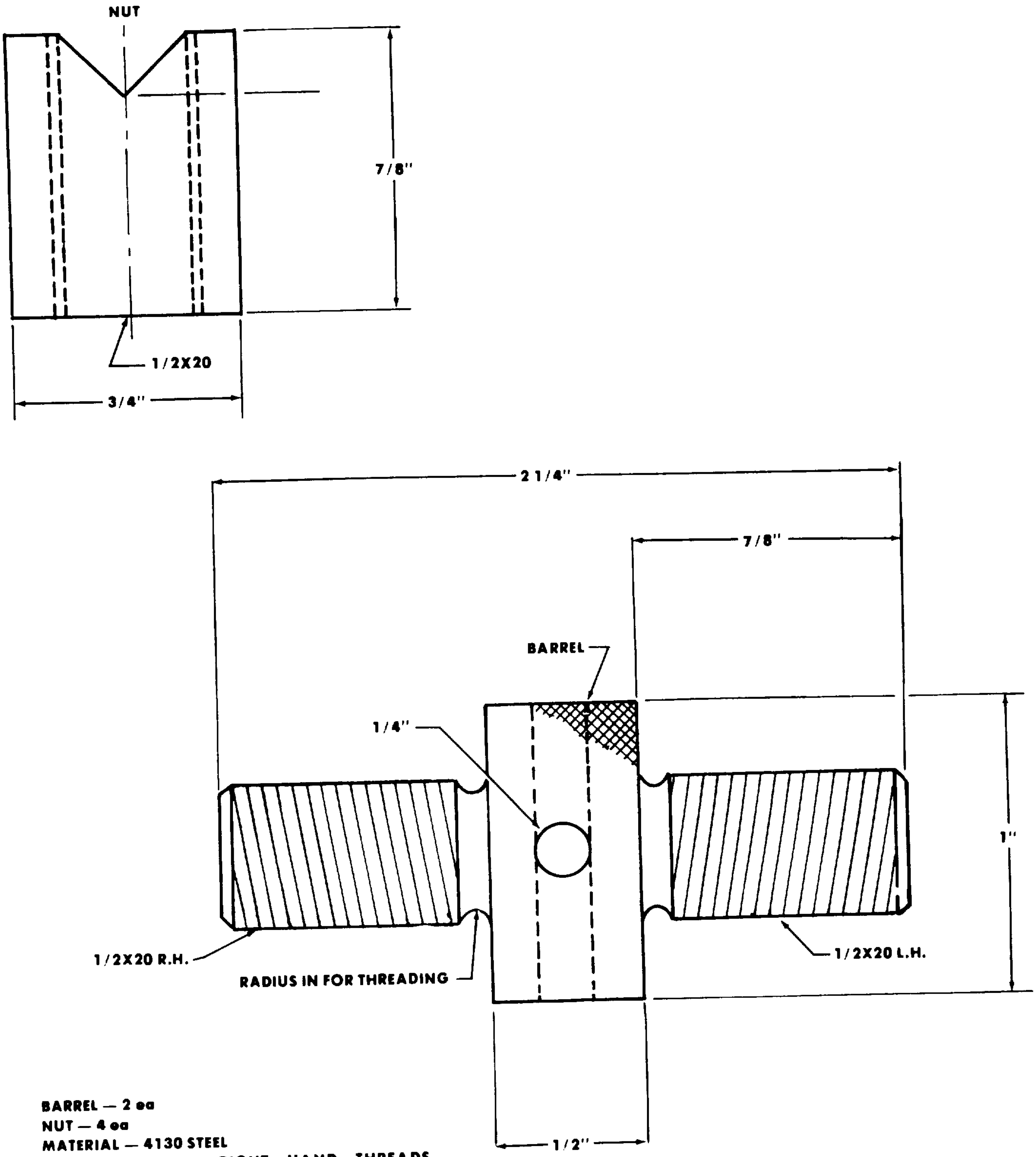
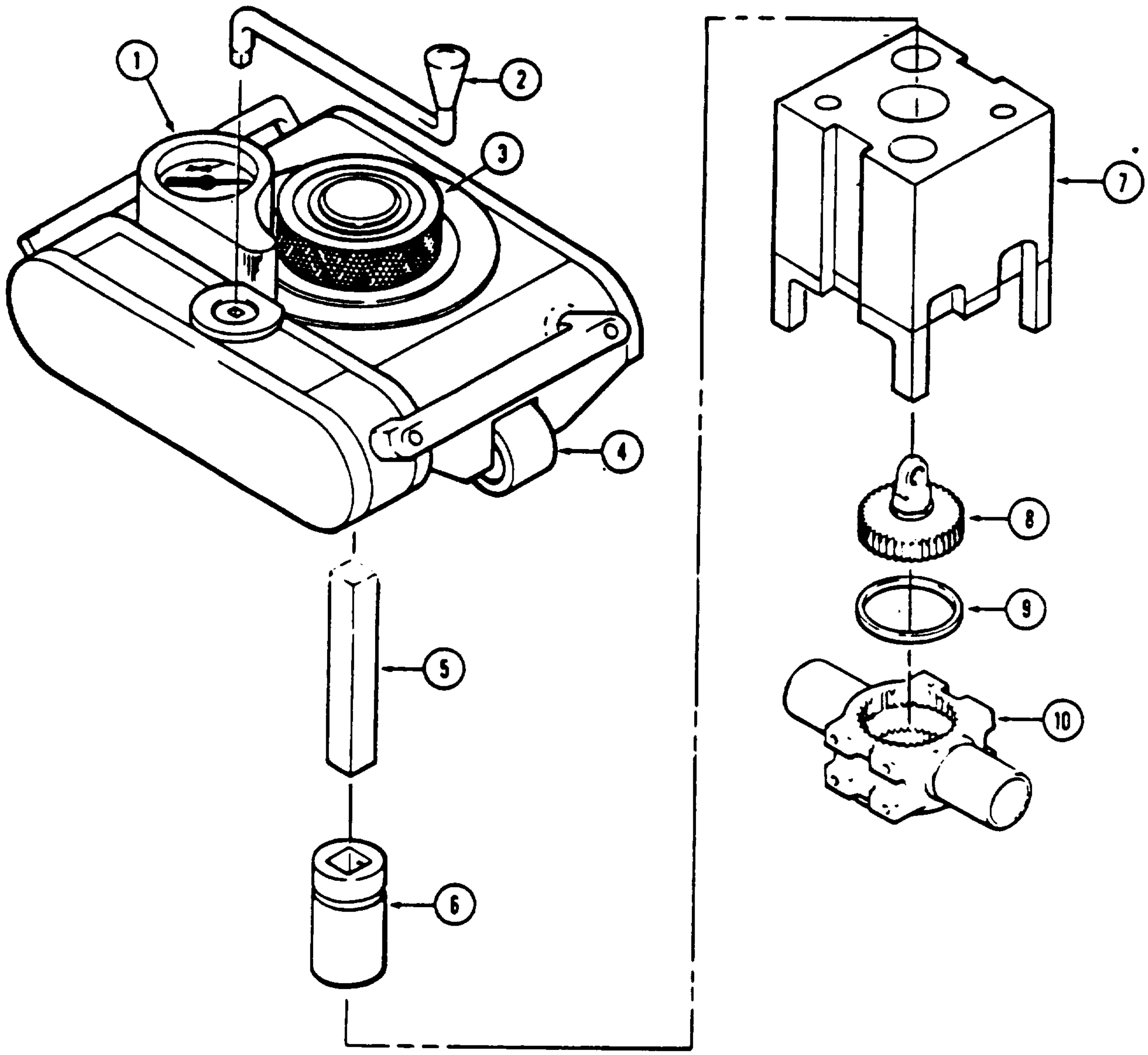


Figure 5-4.1. Barrel Jack Installation



BARREL — 2 ea
NUT — 4 ea
MATERIAL — 4130 STEEL
NOTE: LEFT AND RIGHT HAND THREADS ALL CORNERS CUT APPROX 1/32 LARGE PART OF BARREL IS KNURLED. USE 1/4 ROD TO AID IN TURNING. GRIND APPROX 90° CUT IN NUT.

Figure 5-4.2. Barrel Jack Work Aid



1. Power wrench indicator
2. Input crank handle
3. Knurled ratchet indexer
4. Power wrench PD1201
5. Drive bar
6. Socket PD2659
7. Reaction torque adapter PD2660
8. Mast nut
9. Washer
10. Trunnion

Figure 5-5. Tool Application - Main Rotor Mast Nut Removal/Installation

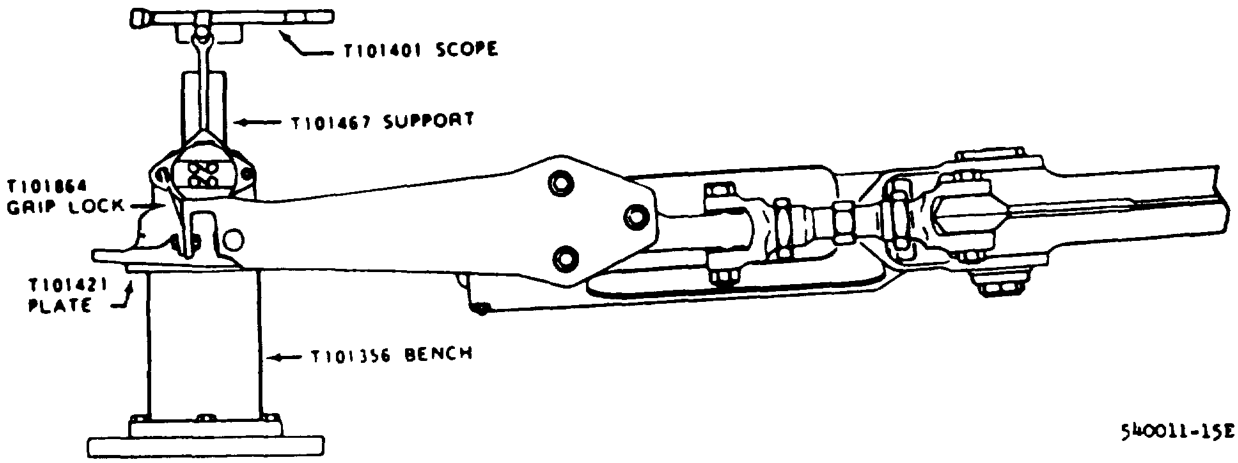


Figure 5-6. Tool Application - Alignment of Main Rotor Hub and Blade

5-14. INSTALLATION — MAIN ROTOR HUB AND BLADES.

Premaintenance Requirement for Installation of Main Rotor Hub and Blades

Conditions	Requirements
Model	AH-1P/E/F
Part No. or Serial No.	All
Special Tools	(T15), (T16), (T17), (T24), (T30), (T31), (T45), (T59)
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	Four
Consumable Materials	(C1), (C7), (C14), (C19), (C20), (C23), (C27), (C31), (C32), (C33), (C40), (C41), (C43), (C55), (C58), (C66), (C68), (C69), (C74), (C75), (C77), (C83), (C88), (C91), (C102), (C103), (C112), (C115), (C123), (C125), (C126), (C127), (C135) (C137), (C138)
Special Environmental Conditions	None

CAUTION

If torque multiplier (T15) is not available, main rotor mast nut must be re-torqued after five to ten hours operation. Refer to paragraph 1-57, Special Inspection.

a. Install main rotor grip locks (T59) on each pitch horn if not previously accomplished (figure 5-4) and remove flap stop plates (T39).

b. Remove sand deflectors (8, figure 5-2) if not previously accomplished, by removing three nuts (10), washers (9), bolts (7), sand deflector (8) and spacers (11).

c. Position hoist (T45) (or equivalent) directly over mast in accordance with instructions contained in paragraph 1-48.

d. Position two slings (T24) on main rotor hub and attach to hoist. (Do not wrap lifting sling cable around sharp corners on rotor hub.) Hoist hub and blade assembly into position above mast. Use blade tie down assemblies to guide and steady the blades during hoisting.

CAUTION

Never apply corrosion preventive compound or any kind of grease on or near teflon bearings. Teflon bearings are used in the hub, the friction collet, and the swashplate and support assembly. This instruction applies regardless of helicopter status (operation, in storage, or In preparation for overseas ship ment).

e. Coat splines of mast (14) with corrosion preventive compound (C41 or C43).

CAUTION

Ensure that cone set is a matched set. Rotor hub must be aligned carefully to avoid damaging mast threads.

NOTE

Do not coat the mast threads of split cone groove with corrosion preventive compound (C41 or C43).

Split cones are installed with equal end gap spacing. If the split cones touch at anytime thereafter, there is no need to respace them.

f. Inspect split cones (13) for any nicks, scratches, indentions, and deformities of any type. Dropping the split cone does not constitute automatic replacement unless the damage limits shown in figure 5-7 are exceeded. Place cone set (13, figure 5-2) in groove of mast upper splines with bevel side up and the gaps evenly spaced.

g. Align master spline in hub with master spline on mast. Carefully lower the hub and blade on the mast splines to avoid damage to mast threads. Lower the hub assembly slowly until it rests on the cone set.

h. Remove excess corrosion preventive compound.

i. Remove hoisting slings.

NOTE

Before installing retaining nut, be sure cap plug is installed in mast.

j. Install washer (3, figure 5-2) and mast nut (4). Tighten mast nut snug with socket (T16). Install main rotor mast nut special installation tools in accordance with paragraph 5-12(e). Turn input crank handle (2, figure 5-5) in a clockwise direction and observe indicator (1) on torque multiplier (T15). Torque to 650 foot-pounds. Continue to observe the indicator for three full minutes. It will be normal if the indicator reading decreases. This is caused by seating of the cone set. Do not back off torque if the indicator reading decreases.

k. If the indicator reading decreases during the three minute observation period in the preceding step, retorque to 650 foot-pounds and monitor for one minute. Repeat one additional time if necessary. After obtaining 650 foot-pound indication with no loss, turn the crank counterclockwise until the torque indicator returns to zero (green) to remove holding force on the wrench.

l. Remove crank handle, power wrench, drive bar, adapter and socket.

m. Check lock (5) installation to ensure that it will align. If lock (5) will not align, reinstall the power wrench and increase torque, but do not exceed 780 foot-pounds. Use the protractor on the face of the power wrench (3, figure 5-5) to estimate the degree of turn required to obtain alignment.

n. Install lock (5, figure 5-2) and bolt (6). Lockwire (C137) bolt head.

o. Install spacers (11) and sand deflectors (8) with three bolts (7), washers (9), and nuts (10). If spacers do not fit snugly in place, wrap with tape (C126) until snug fit is obtained.

p. Remove main rotor locks (T59) from pitch horns. Remove eyebolts shown on figure 5-4 and replace with trunnion bearing retaining bolts. Torque nuts 160 TO 190 inch-pounds. If more than five threads show at nut, add a washer under the nut.

CAUTION

Close-tolerance, high-tensile bolts and special washers are used in the main rotor flight control linkage. Refer to TM 55-1520-236-23P for part numbers.

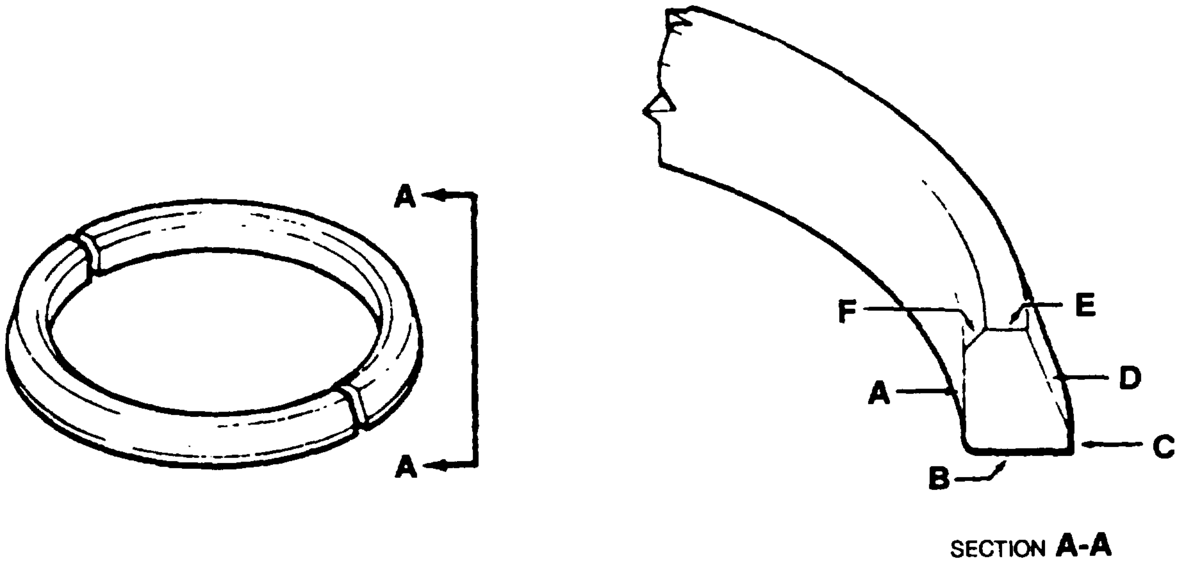
NOTE

If same rotor and associated parts are being reinstalled, the pitch link assemblies (15, figure 5-2) should already be installed on the scissors and it will not be necessary to adjust pitch link assemblies to nominal length. In this case, skip steps (1) through (3) and install pitch link assemblies per steps (4) through (6).

q. Install pitch link assemblies (15, figure 5-2).

WARNING

Use only new, unused nut referenced for installation in step (1) below.



1. No cracks are acceptable

2. Damage to surfaces A, C, E and F may be considered negligible and not requiring repair if the depth of damage does not exceed 0.010 and if the minimum radi observed in the damage area are not less than 0.025.

3. Nicks, scratches and dents on surface B up to 0.005 inch deep are acceptable if polished out as follows:

   a. Place a sheet of 600 grit sandpaper (C102) on a surface plate or on a piece of smooth glass as large as the sheet of sand paper.

   b. Hold two halves of split cone set together and polish out damage on surface B by moving the split cone set (surface B) on the sandpaper. The same amount of material must be removed from both halves on the set.

   c. When damage has been polished out, the minimum acceptable dimension from surface B to surface E is 0.370; also, the dimension must be equal at all points.

4. Surfaces A and D must not have any protrusions above the surrounding surface. Dents and scratches not in excess of 0.010 in depth maybe polished out with crocus cloth.

5. Ail edges maybe chamfered 0.030.

6. All dimensions are inches unless otherwise noted.

Figure 5-7. Damage Limits — Cone Set

NOTE

During installation of pitch link assembly (15), assure that the universal link bolts are Installed and torqued correctly. The upper universal bolt will be installed with the bolt head Inboard (toward mast). The lower universal bolt will be installed with the bolt head toward opposite scissors link. Torque nut on bolts 800 TO 1000 inch-pounds and install cotter pins.

NOTE

The adhesive bond can be broken when the adjustment barrel jam nuts are loosened and torqued without using a backup wrench on the adjustment barrel wrench flats.

(1) If previously removed, install universal bearing (30) on pitch link assembly (15) with bolt (26), washer (27) installed on thread portion only, and new nut (28). Prior to incorporation of MWO 55-1520-244-50-9, torque nut 600 TO 1000 inch-pounds and install cotter pin (29). After incorporation of MWO 55-1520-244-50-9, torque nut (28) 1250 TO 1550 inch-pounds and install cotter pin (29). Repeat procedure for opposite pitch link assembly.

(2) Prior to incorporation of MWO 55-1520-244-50-9, measure both pitch link assemblies, and if necessary adjust length to 27.05 inches as shown in figure 5-8. Also, comply with the equal thread requirement shown. Tighten jamnuts at each end of barrel snug. Do not torque at this time.

(2.1) After incorporation of MWO 55-1520-244-50-9, measure both pitch link assemblies (15) and if necessary adjust length to 27.00 TO 27.05 inches as shown in figure 5-8. Also, comply with the initial setting of 2.495 to 2.505 inches on rod end bearing as shown. Tighten jamnuts at each end of tube assembly finger-tight. Do not torque at this time.

WARNING

Use only new, unused nut referenced for installation in step (3) below.

CAUTION

Ensure proper shimming of scissors lever clevis end of bushings outboard surfaces. Refer to paragraph 5-60.

(3) Prior to incorporation of MWO 55-1520-244-50-9, install universal bearing end of pitch link assembly (15, figure 5-2) on scissors (18) with bolt (32), washer (33 and 34), and new nut (35). Torque nut (35) 800 TO 1000 inch-pounds and install alter pin. Repeat procedure for opposite pitch link assembly.

WARNING

Bushing assembly, P/N 209-010-523-107 is required in modified pitch horn assembly, P/N 209-010-109-109, to properly Install old pitch link assembly, P/N 209-010-460-1. Bushing assembly, P/N 209-010-523-107 is not used in modified pitch horn assembly, P/N 209-010109-109 to install new pitch link assembly, P/N 209-010-520-103.

NOTE

Bolt (23) may not extend past barrel nut (21) the necessary minimum three threads As long as the end of the bolt Is visible and flush with aft side of barrel nut and proper torque has been accomplished, this Is an acceptable condition.

(4) Prior to incorporation of MWO 55-1520-244-50-9 install barrel nut (21, figure 5-2) if not previously installed in pitch horn (20). Prior to installing pitch link assembly, insert bolt (23), check and record tare torque (friction torque). Tare torque must be a minimum of 32 inch-pounds. if tare torque is below limits, replace barrel nut (21) and recheck.

(4.1) Remove bolt (23) and install barrel end of pitch link assembly (15) to pitch horn (20). Install recessed washer (22) (with recess toward bolt head) and install bolt (23). Torque bolt (23) 1250 TO 1550 inch-pounds above the tare torque previously recorded. For example: If tare torque was 100 inch-pounds, you would torque the bolt 1350 TO 1650 inch-pounds Lockwire (C137) bolt (23) to the hole in pitch horn (20). Repeat the procedure for the opposite side.

WARNING

Ensure that the self-locking feature of barrel nut (21) has adequate tare torque, minimum of 32 inch-pounds

NOTE

Bolt (23) may not extend past barrel nut (21) the necessary minimum three threads. As long as the end of the bolt Is visible and flush with aft side of barrel nut and proper torque has been accomplished, this is an acceptable condition.

(4.2) After incorporation of MWO 55-1520-244-50-9 install barrel nut (21) if not previously installed in pitch horn (20). Prior to installing pitch link assembly, insert bolt (23), check and record tare torque (friction torque). Tare torque must be a minimum of 32 inch-pounds. if tare torque is below limits, replace barrel nut (21) and recheck.

CAUTION

Ensure tangs of bushing (22A) are engaged into slots on upper rod end bearing of pitch link assembly (15).

(4.3) After incorporation of MWO 55-1520-244-50-9 remove bolt (23) and install rod end bearing end of pitch link assembly (15) to pitch horn (20). Install bushing (22A) on pitch horn (20) and install bolt (23). Torque bolt (23) 1250 to 1550 inch-pounds above the tare torque previously recorded. For example: ii tare torque was 100 inch-pounds, you would torque the bolt 1350 TO 1650 inch-pounds. Lockwire (C137) bolt (23) to the hole in bushing assembly (22A). Repeat procedure for opposite pitch link assembly.

WARNING

Use only new, unused nut referenced for installation In step (4.4) below.

CAUTION

Ensure proper shimming of scissors lever clevis end of bushings outboard surfaces. Refer to paragraph 550.

(4.4) After incorporation of MWO 551520-244-50-9 install universal bearing end of pitch link assembly (15) on scissors (18) with bolt (32), washer (33 and 34), and new nut (35). Torque nut (35) 800 TO 1000 inch-pounds and install cotter pin. Repeat procedure for opposite pitch link assembly.

WARNING

Ensure that the lockwire is installed correctly.

Ensure that the safety wire is Installed correctly.

Ensure that threads are showing in barrel inspection holes.

(5) B540 Adjust length of pitch link assemblies to set main rotor hub grips to a minimum pitch angle of 8-1/2 degrees (± 1/4 degree) as follows:

(a) Position collective controls to full down position. Set cyclic to center position.

(b) Place a protractor on machined surface of one blade grip near blade retention bolt and measure angle. Record reading and repeat for opposite grip. the total reading for both blades should be 17 degrees (± 1/2 degree). If angle is not within limits, adjust both pitch link assemblies in same direction and in equal amounts until angle is within limits.

WARNING

Prior to incorporation of MWO 55-1520-244-50-9, threads must show in barrel inspection holes. After MWO 55-1520-244-50-9 is incorporated, exposed threads *ail not exceed 1.00 inch on each end.

NOTE

Additional pitch link assembly adjustment may be required at time of maintenance test flight. Prior to incorporation, of MWO 55-1520-244-50-9, it is not necessary to maintain exposed threads equal within 0.060 Inch after initial adjustment. After MWO 55-1520-244-50-9 is incorporated, it is not necessary to maintain exposed threads equal within 0.12 inch after Initial adjustment

(c) Prior to incorporation of MWO 55-1520-244-50-9, check rod end bearings on both pitch link assemblies to ensure that both are centered (figures 5-8 and 5-9). Adjust upper rod end bearing to obtain alignment if necessary. After alignment is correct, torque both jamnuts on barrel 700 inch-pounds. Lockwire (C138) upper jamnut to barrel. Lockwire (C138) barrel and lower jamnut to pitch link tube assembly.

NOTE

After application of lockwire, apply a thin coat of sealant (C105) around the lock nut and threads of the rod end to prevent water intrusion.

(c.1) After incorporation of MWO 55-1520-244-50-9, make sure that alignment of pitch link assembly is correct and torque both jamnuts on tube assembly. Torque upper jamnut closest to rod end bearing 1400 TO 1600 inch-pounds and lower jam nut closest to universal bearing 1100 TO 1300 inch-pounds. Lockwire (C138), jamnuts to pitch fink tube assembly.

(6) K747 Adjust length of pitch fink assemblies to set main rotor hub grips to a minimum pitch angle of 9- 3/4 degrees (± 1/2 degree) as follows:

(a) Position collective controls to full down position. Set cyclic to center position.

(b) Place a protractor on machined surface of one blade grip near blade retention bolt and measure angle. Record reading and repeat for opposite grip. The total reading for both blades should be 19-1/2 degrees (±1 degree). If angle is not within limits, adjust both pitch link assemblies in same direction and in equal amounts until angle is within limits.

WARNING

Prior to incorporation of MWO 55 -1520-244-50-9, threads must show in barrel inspection holes. After MWO 55-1520-244-50-9 is Incorporated, exposed threads shall not exceed 1.00 inch on each end.

NOTE

Additional pitch link assembly adjustment may be required at time of maintenance test flight. Prior to incorporation of MWO 55-1520-244-50-9, it is not necessary to maintain exposed threads equal within 0.060 inch after initial adjustment. After MWO 55-1520-244-50-9 is incorporated, it is not necessary to maintain exposed threads equal within 0.12 inch after initial adjustment.

(c) Prior to incorporation of MWO 55-1520-244-50-9, check rod end bearings on both pitch link assemblies to ensure that both are centered (figures 5-8 and 5-9). Adjust upper rod end bearing to obtain alignment if necessary. After alignment is correct, torque both jamnuts on barrel 700 inch pounds. Lockwire (C138) upper jamnut to barrel. Lockwire (C138) barrel and lower jamnut to pitch link assembly tube.

NOTE

After application of lockwire, apply a thin coat of sealant (C105) around the lock nut and threads of the rod end to prevent water intrusion.

(c.1) After incorporation of MWO 55-1520-244-50-9, make sure that alignment of pitch link assembly is correct and torque both jamnuts on tube assembly. Torque upper jamnut closest to rod end bearing 1400 TO 1600 inch-pounds and lower jamnut closest to universal bearing 1100 TO 1300 inch-pounds. Lockwire (C138), jamnuts to pitch link assembly tube.

(7) Lubricate lower bearing on pitch link assemblies (15, figure 5-2) with grease (C58).

NOTE

To prevent interference between the trunnion (1, figure 5-2) and strap (42), AN960-716L washers (50) may be placed between strap (42) and the plate (49) on bolt (46). A maximum of two washers may be used per bolt.

(8) Install plates (49, figure 5-2) using bolts (45) and washers (44). Torque bolts 70 T0 90 inch-pounds. Lockwire bolts (45) in pairs as shown using MS20995C32 lockwire (C137). Install straps (42) using bolts (46), washers (47), and nuts (48). Torque nuts (48) 270 TO 300 inch- pounds. Attach supports (40, detail B) to straps (42) using bolts (35), washers (36), and nuts (41). Torque nuts (41) 540 TO 650 inch-pounds. Install bolts (37), washers (38), and nuts (39). Torque nuts (39) 300 TO 335 inch-pounds.

WARNING

K747 main rotor blades have a tendency to attain a higher percent RPM during autorotation than B540 main rotor blades DO NOT RIG beyond the limits established in paragraph 5-14, step (q) to obtain a lower main rotor percent RPM.

r. Perform maintenance test flight to ensure that main rotor rigging is satisfactory (TM 55-1520-236 MTF).

s. It the maintenance test flight indicates the need for rotor adjustment recheck blade alignment with blades on helicopter. Using alignment scope (T30), make required adjustments. (Maximum tolerance of alignment between two blades is 0.050 inch.)

5-15. ADJUSTMENT — MAIN ROTOR HUB AND BLADES.

Refer to paragraph 5-114

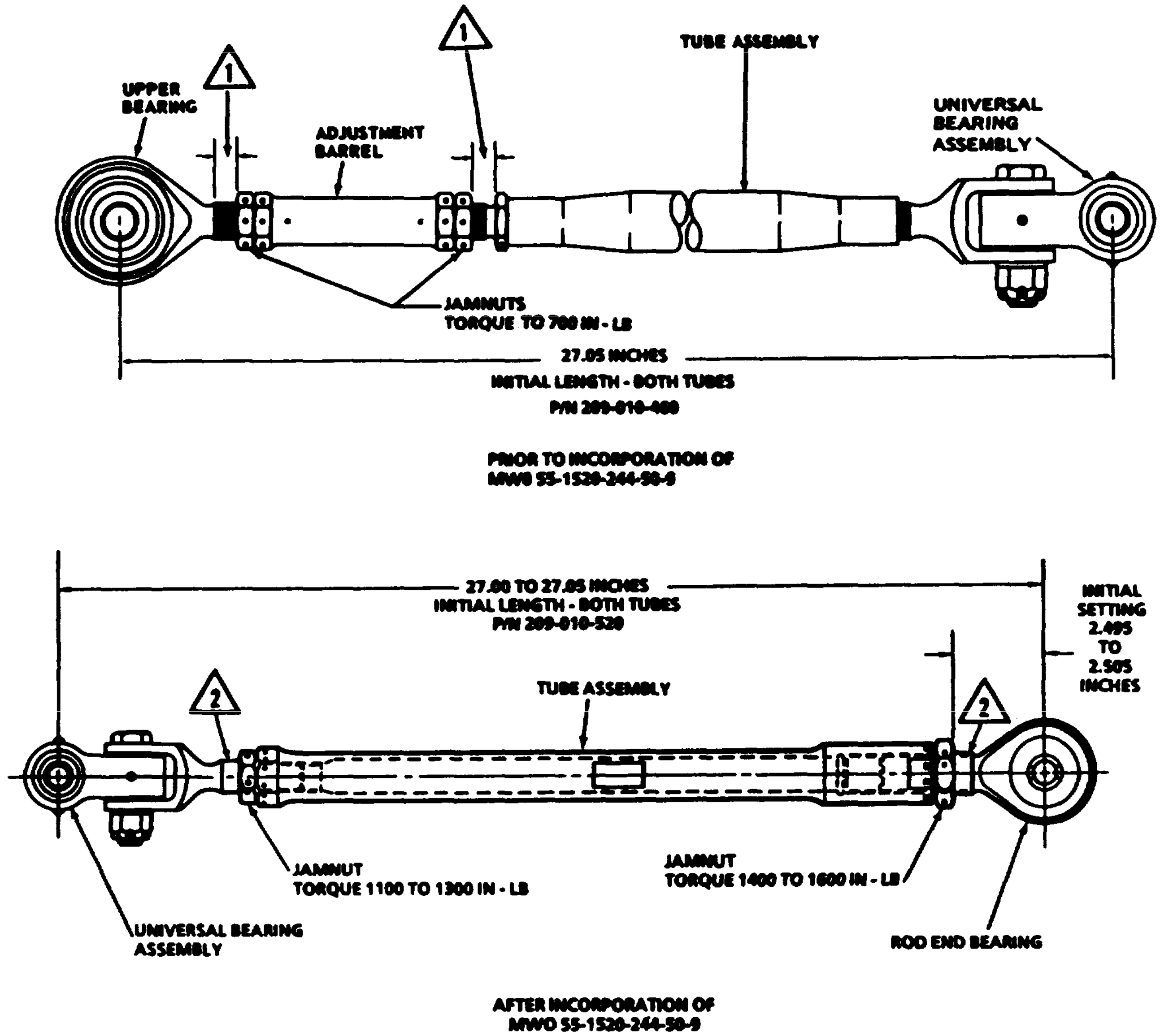
5-16. B540 MAIN ROTOR BLADES.

WARNING

Use of paragraphs 5-17 through 5-24 for K747 main rotor blades will result in severe damage.

NOTE

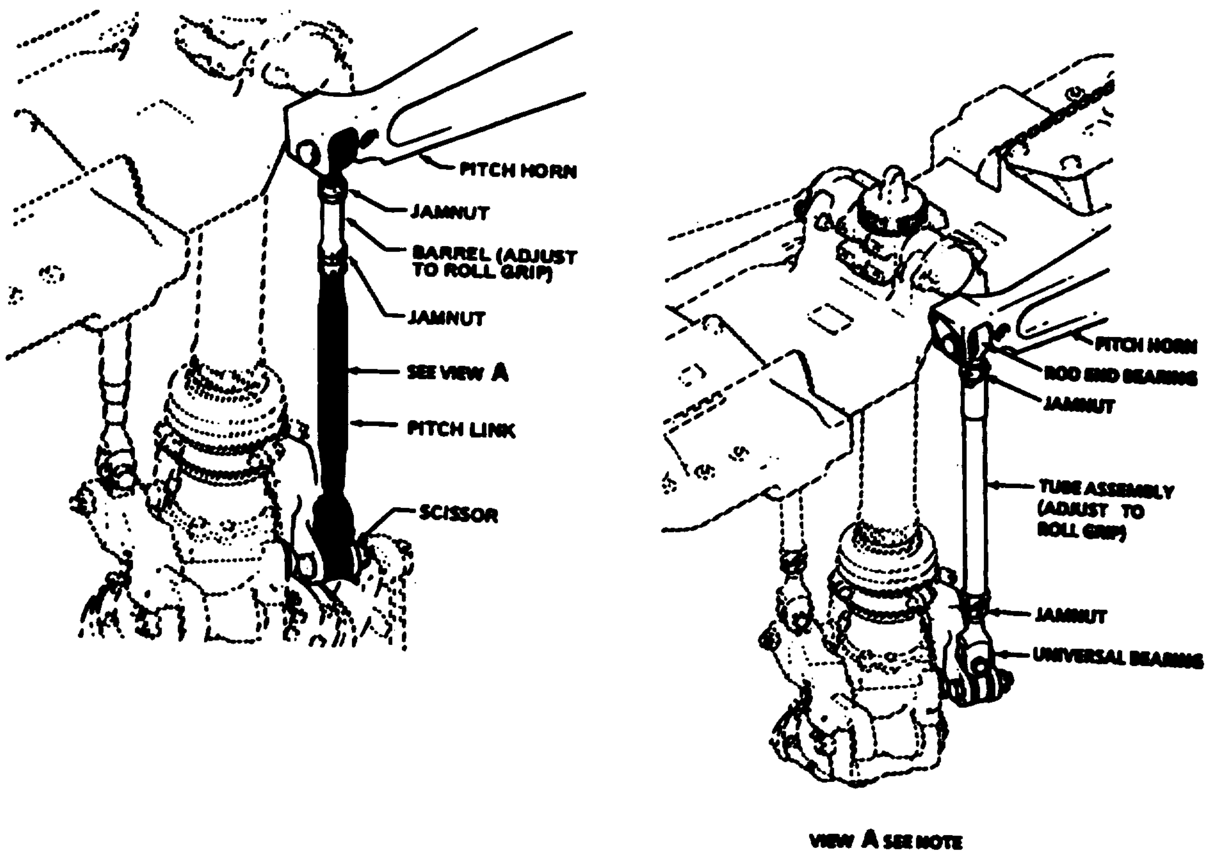
When operating aircraft in geographical areas where excessive blade erosion will occur, refer to TB 1-1615-351-23 for instructions for application of anti-erosion tape procedures.



NOTES:

1. During initial setting, adjust rod end and barrel so these dimensions are equal within 0.060 inch.
2. During initial setting make adjustments to rod end bearing and clevis so that exposed threads are equal at each end within 0.12 inch.

Figure 5-8. Pitch Link Assembly Adjustments



NOTE: View A applicable after MWO 55-1520-244-50-9 is incorporated.

Figure 5-9. Pitch Link Assembly

NOTE

Refer to paragraph 5-25 for maintenance of K747 main rotor blades.

NOTE

When operating aircraft in geographical areas where excessive blade erosion will occur, refer to TB 1-1615-351-23 for instructions for application of anti-erosion tape procedures.

5-17. DESCRIPTION – B540 MAIN ROTOR BLADES.

The main rotor blades are metal, bonded assemblies. Each blade is attached in the hub with a retaining bolt assembly and is held in alignment by adjustable drag braces.

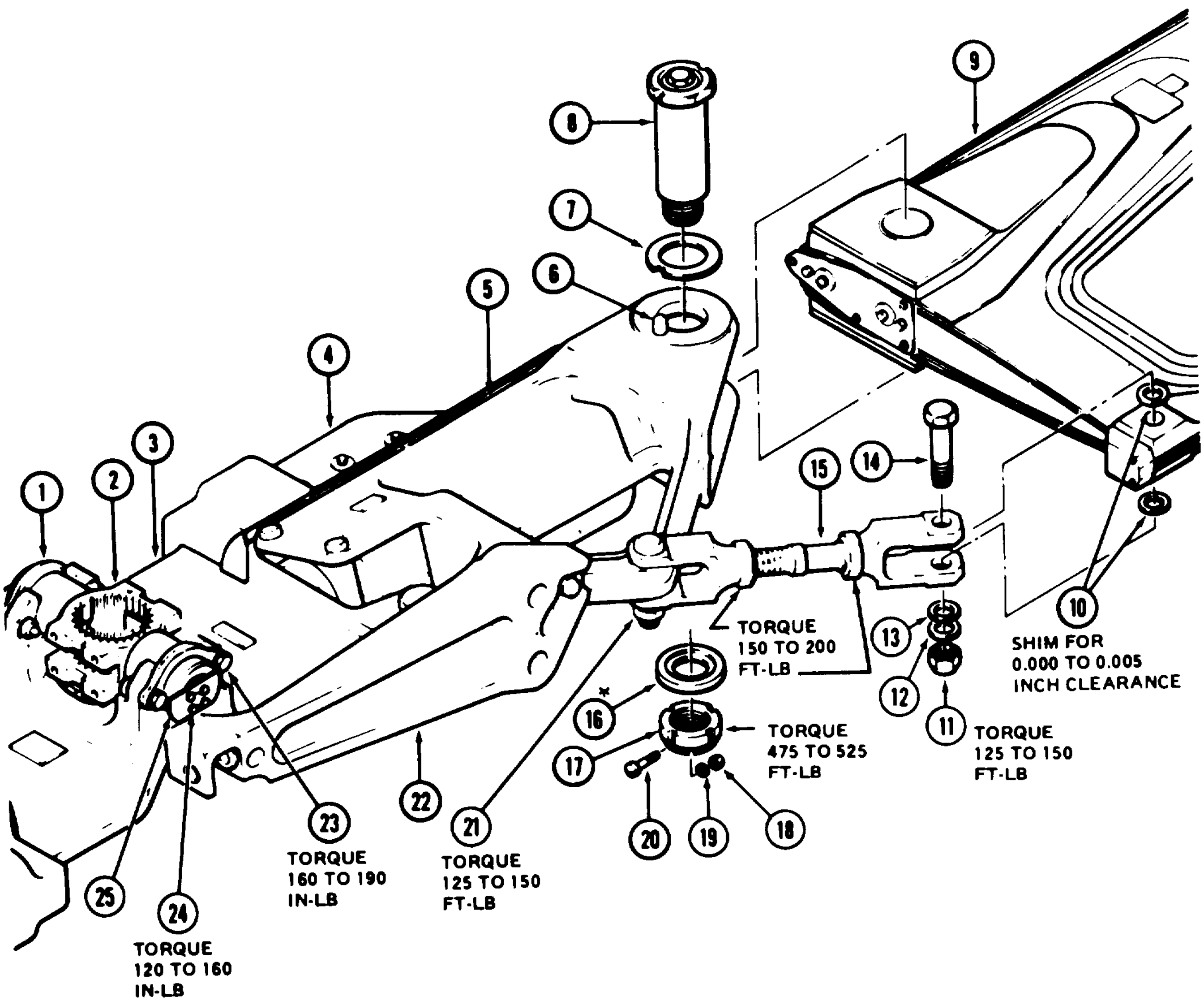
5-18. REMOVAL — B540 MAIN ROTOR BLADES.

a. Position main rotor hub and blade assembly on buildup bench (paragraph 5-12, step n). Place padded supports under blades so that leading edge is approximately straight.

b. Remove locking screw (20, figure 5-10) washer (19), and nut (18).

c. Remove nut (17) and washer (16) with blade bolt wrench (T31).

d. Remove nut (11), washers (12 and 13) and bolt (14). Loosen nut (21) and swing drag brace (15) away from rotor blade. Retain shims (10) for reinstallation.



1. Elastomeric bearing
2. Trunnion
3. Yoke
4. Sand deflector
5. Grip
6. Locating pin
7. Washer
8. Blade retaining bolt
9. Main rotor blade (typical)
10. Shims
11. Nut
12. Washer
13. Washer
14. Bolt
15. Drag brace
16. Washer *(installed with counterbore up against blade)
17. Nut
18. Nut
19. Washer
20. Screw
21. Nut
22. Pitch horn
23. Bolt
24. Bolts
25. Retainer

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Figure 5-10. Main Rotor Hub and Blade Assembly

CAUTION

Avoid blade contact with the drag brace and hub during removal procedure to prevent possible blade damage.

e. Remove blade retaining bolt (8) and washer (7). Slowly raise and lower blade tip while tapping bolt with fiber mallet. If bolt is difficult to remove, use a bolt removal work aid similar to the one shown in figure 5-11 as follows:

(1) Remove threaded plugs from upper and lower ends of blade retaining bolt. If weights are present in bolt, retain for reinstallation.

(2) Position work aid on bolt as shown in figure 5-12 and place a piece of hard rubber or similar material between work aid tuba and grip to prevent marring the grip. Hold puller rod and tighten hexagon nut to remove blade retaining bolt.

(3) Remove work aid from blade retaining bolt. Reinstall weight and plugs in blade retaining bolt and identify the blade retaining bolt for reinstallation in the same grip.

f. Remove blade from grip and place in a padded stand.

g. Remove opposite blade from hub in same manner.

5-19. CLEANING – B540 MAIN ROTOR BLADES.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

a. Clean main rotor blade with cleaning compound (C33).

b. Remove stubborn deposits with a cloth dampened with solvent (C112).

5-20. INSPECTION – B540 MAIN ROTOR BLADES.

a. Inspect blade historical records and the blade for evidence that the blade has been subjected to an accident or incident outside the realm of normal usage. If such evidence exists, perform Special Inspections outlined in paragraph 1-57.

b. Inspect blade for nick, scratch, dent and corrosion damage (figure 5-14).

(1) Nicks and scratches anywhere on the surface of the skins or trailing edge strip that do not exceed 0.008 inch in depth are acceptable if they are polished out.

NOTE

If a nick or scratch in the skin in excess of 0.008 inch depth can be polished smooth without leaving the skin in the polished area so thin that skin can be dented with fingernail pressure, a patch may be applied over the area. Refer to paragraph 5-21 for instructions to apply patch to this type damage.

(2) Nicks and notches in the extreme trailing edge of the blade that are 0.120 inch or less in depth are acceptable if they are polished and faired out over a minimum distance of 2 inches on each side of the nick or notch.

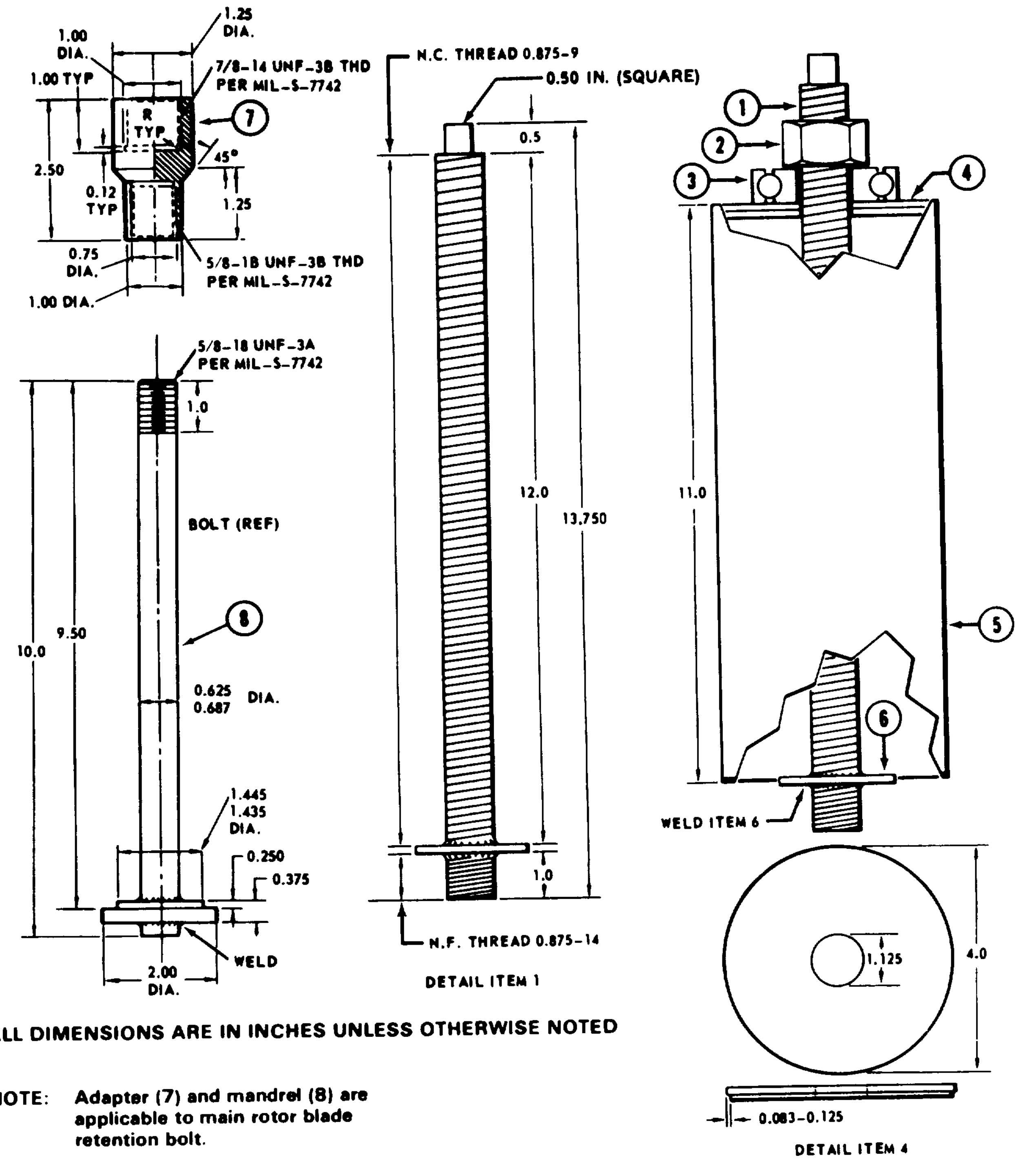
(3) Any dent in the skin in the outboard four feet of the blade that does not tear the skin, produce an unacceptable void or affect flight characteristics is acceptable without repair.

(4) Dents in the skin inboard of the station located four feet inboard of the tip of the blade that do not exceed 0.060 inch are acceptable without repair.

(5) If a nick or scratch exists in a sharp dent in the skin, the total depth of both must not exceed 0.060 inch. Nicks and scratches must be polished out. Refer to step (1).

(6) Nicks or scratches in the abrasion strips, doublers. Grip plates or drag plates that are not in excess of 0.012 inch in depth are acceptable if they are polished out.

(7) If a leading edge abrasion strip is worn, eroded or damaged so that any holes appear, the



ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

NOTE: Adapter (7) and mandrel (8) are applicable to main rotor blade retention bolt.

LEGEND

1. Pull rod assembly 4130 (or better), 1.0 O.D. — 13.750 long
2. Hex nut 0.875 NC (9) thread
3. Bearing (thrust) inner race I.D. 0.080 — 0.093
4. Plate, steel or aluminum, 4.0 O.D., 0.375 thick
5. Tube, steel or aluminum, wall thickness 0.083 — 0.125
6. Steel flat washer, 2.0 O.D. — 0.875 I.D.
7. Adapter 4130 (or better)
8. Mandrel 4130 (or better)

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Figure 5-11. Work Aid for Main Rotor Blade Bolt Removal – Fabrication Instructions (AVIM)

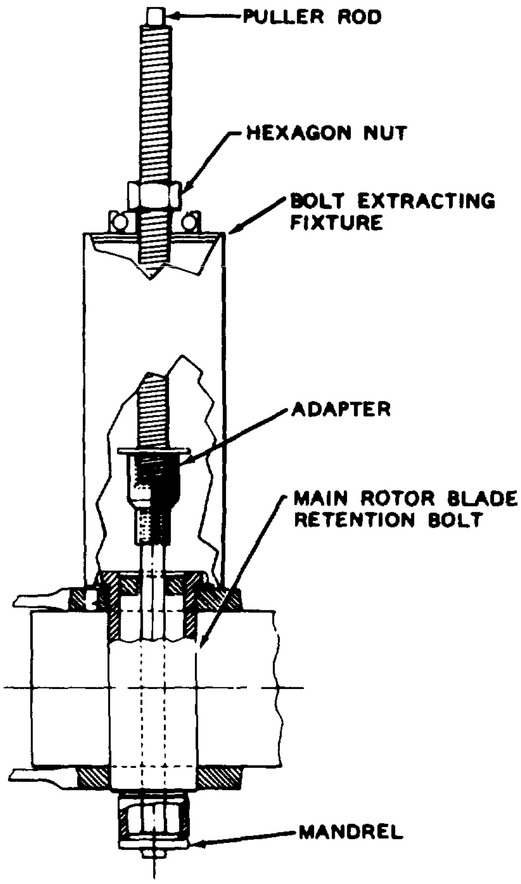


Figure 5-12. Work Aid Application — Main Rotor Blade Retaining Bolt Removal

blade must be sent to next higher maintenance level for repair.

c. Inspect blade abrasion strip splice joints.

NOTE

Main rotor blade abrasion strip splice joints (8 and 10, figure 5-13) may have no covers, may be covered with polyurethane Tape, or may have splice covers (6 and 9) installed.

(1) If no covers or tape am installed on splice pints (8 and 10), inspect for loss of filler material and corrosion. If damage is detected, sand blade to depot maintenance level for repair.

(2) If polyurethane tape is bonded over splice pints (8 and 10), inspect the tape for security and wear. Replace tape if insecure or worn (paragraph 5-21, e).

(3) If splice covers (6 and 9) are installed over splice joints (8 and 10), preform following inspection:

(a) Inspect covers for wear, corrosion, distortion and holes, If damage is detected, replace cover (paragraph 5-21, e).

(b) Inspect covers for secure bonding. If bond voids exist, replace covers (paragraph 5-21, e).

d. Inspect blade for void damage.

NOTE

A void is defined as an unbended area that is supposed to be bonded. Many sub-definitions of voids are given such as lack of adhesive, gas pocket, misfit, etc. However, this manual makes no distinction among these, grouping them all under one general term (“Void”).

(1) Voids between the spar assembly and the abrasion strip outboard of station 100.

(a) A 1.0 inch wide maximum void between abrasion strip and spar at extreme leading edge is acceptable, to within 1.0 inch of the tip of the blades.

(b) Other voids shall not exceed 40 square inches in any single void. If voids come closer than 1.0 inch to each other, consider them a single void.

(c) Voids within 0.38 inch of edge of abrasion strip are not acceptable.

(d) Edge voids 0.25 inch deep or less between the abrasion strip and the splice cover are acceptable when sealed with adhesive.

(2) Voids between the spar assembly and the abrasion strip inboard of station 100.

(a) A 1.0 inch wide maximum void between abrasion strip and spar is acceptable at the extreme leading edge.

(b) Voids between abrasion strip and spar shall not exceed 10.0 square inches in any single void. Minimum spacing between void centers must exceed 3.0 inches.

(c) Voids within 0.38 inch of edge of the abrasion strip are not acceptable except at the butt end, per step (a) above.

(d) Edge voids 0.25 inch deep or less between the abrasion strip and the splice cover are acceptable when sealed with adhesive.

(e) Voids defined in steps (a), (b), and (c) that are apparent at the butt end of the blade must be sealed with adhesive (paragraph 5-21, f).

(3) Voids at butt end of blade.

(a) Voids are not acceptable within 0.6 inch of the front or rear edge of either grip plate or grip pads, viewing the "Section" of the butt end.

(b) Voids between trailing edge extrusion and skin deeper than 1.0 inch nor wider than 1.0 inch are acceptable if sealed with adhesive.

(c) Any other void not longer than 1.0 inch or deeper than 0.35 inch is acceptable if sealed with adhesive.

(d) Voids are not acceptable between the spar and spar closure.

(4) Voids in the retention area, inboard of station 100.00.

(a) Edge voids of 0.10 inch maximum depth on edge of the doublers are acceptable if sealed with adhesive. Edge voids are not acceptable in outboard 7 inches of each finger of the doublers. Edge voids in the outer 3 inches of grip plate and outer 1.5 inches of the drag plate are not acceptable. Up to 0.50 inch maximum may be removed from the outboard tip in the drag plate tang, grip plate tang, or outboard tip of doublers to eliminate a void.

(b) Voids between the doublers, doubler and skin, doubler and grip plate, grip plate and grip pad are not acceptable, except as allowed in steps (3) (c) and (4) (a) above.

(c) Voids between the skin and the core shall not exceed 1.0 inch by 25.0 inches spanwise. The total area of all voids must not exceed 30 square inches.

(d) Edge voids between the edge of the skin and the trailing edge extrusion that are less than 0.06 inch wide by any length or less than 0.25 inch wide by 7 inches long are acceptable if they are sealed with adhesive.

(e) Other voids between the skin and the trailing edge extrusion which do not exceed one-half the width of the faying surfaces by 20.0 inches long or 0.60 inch wide by any length are acceptable.

(f) Voids other than edge voids between the skin and the spar that are less than 1.25 inch and less than one-half the width of faying surfaces are acceptable.

(5) Voids under skin, outboard of Station 100.

(a) Voids between the skin and trailing edge extrusion shall not exceed one-third the width of the faying surfaces.

(b) Voids between the skin and the core must not exceed 1.0 inch in width chordwise. If two voids are within 1.0 inch of each other, consider them as one void.

Voids between the skin and core adjacent to the spar shall not exceed 1.0 inch wide by 15 inches long spanwise. At the splice between the inboard and outboard core (Station 156), a void of 0.50 inch maximum spanwise by the full chordwise width of the core is acceptable.

(c) Voids between the skin and the spar not wider (chordwise) than one-third the width of the mating surfaces are acceptable. Edge voids are not acceptable.

(d) Edge voids between the edge of the skin and the trailing edge extrusion that are less than 0.06 inch wide by any length or less than 0.25 inch wide by 10.0 inches long are acceptable if they are sealed with adhesive.

NOTE

Where two voids of two different types are closer than 1.0 inch apart consider them as one void and apply the more strict limitations. (Example: Voids between skin and trailing edge extrusion next to a void between the akin and the core.)

e. Inspect blade for worn retention bolt hole and worn drag brace bolt hole.

(1) If wear allowance listed in steps (2) or (3) below is exceeded, send blade to next higher maintenance level.

(2) Main retention bolt hole is oversize when the diameter exceeds 2.505 inches.

(3) Drag plate bolt hole is oversize when the diameter exceeds 0.877 inch.

f. Inspect blade for cracks.

(1) Visually inspect top and bottom surfaces along entire length of blade for damage. Any fatigue crack at any location is cause for blade replacement. Evaluate cracks caused by strikes and other damage to other damage criteria.

(2) Penetration through spar or trailing edge strip is cause for blade replacement.

(3) Damage penetrating skin and at least 1.0 inch from doublers may be repaired, provided that after cleanup, damage does not exceed 2.0 inches in diameter.

(4) Spanwise damage penetrating skin at least 1.0 inch from doublers may be repaired, provided that after cleanup, using an oblong hole, damage does not exceed 4.0 inches by 1.0 inch and direction of oblong hole falls within 15 degrees of a line parallel to leading or trailing edge of blade.

g. Inspect blade for holes in skin. If any holes are found, classify them as reparable by patching or nonreparable in accordance with the following limits (figure 5-14)

CAUTION

Repairs inboard of station 210 must be inspected daily for cracks.

(1) No patches are permitted within 1.0 inch of doublers.

(2) Inboard of station 216, only one repair on same chordline is permitted. After cleanup, holes are limited to 2.0 inches maximum diameter and are restricted to a minimum of 2.0 inches between repairs.

(3) Between station 216 and station 240, two holes are permitted on same chordline on same skin surface. Maximum diameter of holes is 2.0 inches and a minimum spacing of 2.0 inches after cleanup is required between repairs.

(4) Between station 240 and outboard tip of blade, two holes are permitted on same chordline on same skin surface. Maximum diameter of holes is 3.0 inches and a minimum spacing of 2.0 inches is required between repairs after cleanup.

(5) Spanwise holes maybe repaired providing that after cleanup, damage does not exceed 1.0 inch wide and 4.0 inches long. Direction of oblong hole must fall within 15 degrees of a line parallel to leading or trailing edge of blade. Ends of the hole must have a minimum radius of 0.25 inch to break corners.

(6) Any damage or defect in the skin that can be polished smooth without leaving the skin in the area so thin that it can be dented with fingernail pressure does not require a cutout. In these cases a patch must be applied as though a hole exists. Maximum diameter of a patch of this type is 4.0 inches with a minimum of 0.75 inch of bonded area around the perimeter of the dent.

h. Inspect main rotor blade trim tab for the following defects:

(1) Distortion that can be repaired by straightening.

(2) Cracks, tears, rips and holes. This type damage must be repaired by replacement of the trim tab.

i. Inspect blade for secure installation of balance weights (18, figure 5-13). Inspect cover plate (1) and tip cap (13) for secure installation. If the cover plate and/or tip cap is loose, inspect weights under the rover plate and/or tip cap for secure installation of weights.

j. Inspect main rotor blade for the following defects and replace blades damaged to the extent described:

(1) Any penetration damage through spar or trailing edge strip, doublers, grip plates or drag plates.

(2) Skin penetration in any area exceeding limits allowed for patching.

(3) Water in honeycomb core.

(4) Voids between skin and honeycomb core larger than 30 square inches.

(5) Edge voids deeper than 0.50 inch in tip end of any doublers or grip plates.

(6) Edge voids in the leading edge of the doublers that exceed 0.060 inch in depth and at the trailing edge of the doublers that exceed 0.10 inch in depth.

(7) Any corrosion that penetrates entirely through skin.

(8) If one or more cracks develop and extend from a previously repaired area.

(9) More than two patches on the same chordline on the same side (paragraph 5-20, g, (4).

(10) Obvious deformation of blade.

k. Tip balance weight inspection.

(1) Remove tip cap from rotor blade.

(2) Visually inspect lead weights for distortion. Distorted weights are cause for blade removal.

(3) Inspect for loose weights. Loose weights alone are not cause for blade removal. Inspect stud retention nuts for looseness by applying 30 inch pound torque. Torque loose stud retention nuts to 130 to 145 inch pound.

(4) Striking of rotor blades to check for loose balance weights is not an acceptable inspection procedure.

(5). Inspect studs for looseness and distortion. Loose or distorted studs are unacceptable and is cause for blade removal.

5-21. REPAIR — B540 MAIN ROTOR BLADES.

NOTE

Repair at AVIM is limited by available tools, equipment, personnel and skills. Send blades to Depot Maintenance for major repair.

a. Polish out nick and scratch damage in skin that is within limits stated in inspection paragraph 5-20b. Use 320 grit sandpaper (C102) to polish out damage. Use fine aluminum wool (C20) or scotchbrite (C103) to finish polishing the area. Rub spanwise to remove sandpaper marks and polish to a fine finish. Touch up repair area with alodine (C31), primer (C88 or 91) and paint to match surrounding area (paragraph 5-24).

b. Polish out nick and scratch damage in the abrasive strips, doublers, grip plates, and drag plates that is within limits stated in inspection paragraph 5-20b. Use 400 grit sandpaper (C102) or equivalent. Steel wool (C115) may also be used providing that no aluminum parts are touched with it. Touch up repair area with primer and paint to match surrounding area (paragraph 5-24).

c. Repair nick, scratch, and notch damage in the trailing edge strip that is within limits stated in inspection paragraph 5-20,b. Use varying grades of sandpaper (C102) to polish out damage and fair out over a distance of 2.0 inch minimum on each side of damage. Touch up repair area with primer (C88 or C91) and paint to match surrounding area (paragraph 5-24).

d. (AVIM) Repair hole damage and nick or scratch damage in skin that is within limits stated in inspection paragraph 5-20, g.

NOTE

If a nick or scratch in the skin in excess of 0.008 inch depth can be polished smooth without leaving the skin in the polished area so thin that skin can be dented with fingernail pressure, apply patch over area without cutting a hole. Comply with step (1). Skip steps (2) and (3) and proceed with step (4). Otherwise proceed with steps (1) through (8).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation Avoid prolonged breathing of vapors and contact with skin or eyes.

CAUTION

Do not allow MEK to enter the blade.

(1) Remove paint from repair area with MEK (C74). Remove paint primer by sanding spanwise using 300 grit sandpaper (C1 02).

(2) Draw a circle around the damaged area just large enough to encompass damage.

(3) Remove skin just inside the circled area, disturbing the honeycomb core as little as possible. Heat the cut out disk to 200 degrees F (93 degrees C) maximum and lift out the disk of skin while heated.

(4) Deburr edges of hole and polishout scratches and nicks.

(5) Prepare a patch to cover the hole that will overlap by 0.75 inch. Fabricate patch from 2024-T3 aluminum (4, table 2-2) large enough to overlap the hole at least 0.75 inch all around the perimeter. Deburr and blend out edges. Sand the bond area of patch and blade with 400 grit sandpaper (C102).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

(6) Clean bond area on patch and blade with MEK (C74). Dry with a clean cloth.

CAUTION

Area must be clean, dry, and free of grease. Oil and wax.

(7) Apply adhesive (C14) to patch area around hole and to patch. Apply patch to blade and move slightly under pressure to expel alr and prevent voids in bond. Blend out excess adhesive.

(8) Hold patch in place with rubber bands (made from inner tube) or other mechanical means. Refer to table 1-11, for adhesive, mix ratio, pot llfe. and curing schedule.

e. Repair blade abrasion strip splice joints.

(1) Splice joints covered with polyurethane tape.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

NOTE

Polyurethane tape bonded in place over the splice joints is recommended for dusty or sandy environments to provide protection for the joint filler material.

(a) Remove insecure or worn polyurethane tape from splice joint (8 or 10, figure 5- 13) with sharp, plastic scraper and small amount of MEK (C74).

(b) Remove tape residue from abrasion strip with cloth dampened with MEK (C74) and plastic scraper, then sand with 100 grit or finer sandpaper (C102), Sand in spanwise direction.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

(c) Clean leading edge of rotor blade, in area where tape will be applied, with clean cloth dampened with aliphatic naptha (C75).

(d) Cut a piece of polyurethane tape (C125) seven inches long.

(e) Center polyurethane tape chordwise over the splice joint, press into place, and force out all air bubbles. If necessary, make pin hole in tape to allow trapped air to escape

(2) Splice joints covered with splice cover.

CAUTION

Do not exceed 200 degrees F (93 degrees C) during splice cover removal or damage to rotor blade may result.

(a) Heat damaged or insecure splice cover to 200 degrees F (93 degrees C) maximum with a heat gun and maintain temperature during removal of cove r

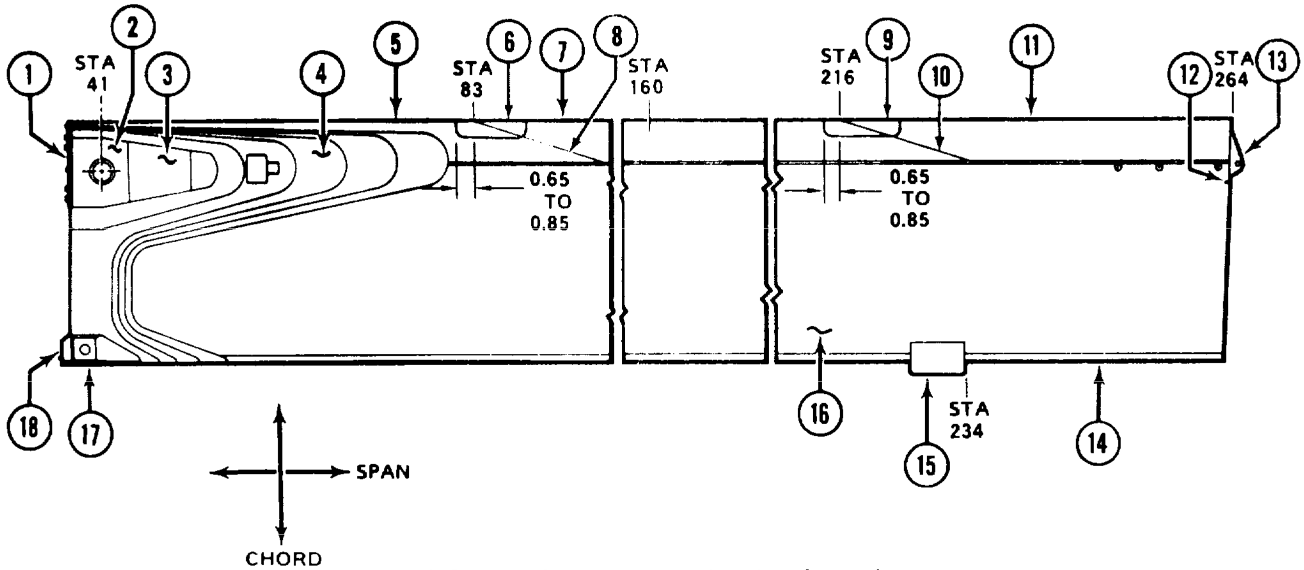
WARNING

When removed, cover will be extremely hot. Handle only with appropriate tools, and place in safe area to cool after removal.

(b) Remove cover with putty knife or chisel, being careful not to damage rotor blade.

WARNING

Allow rotor blade to cool completely before proceeding.



1. Cover plate
2. Grip pad
3. Grip plate
4. Doublers
5. Abrasive strip
6. Splice cover
7. Abrasive strip
8. Splice joint (scarf joint)
9. Splice cover
10. Splice joint (scarf joint)
11. Abrasive strip
12. Alignment screw
13. Tip cap
14. Trailing edge strip
15. Trim tab
16. Skin
17. Drag plate
18. Balance weight

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Figure 5-13. B540 Main Rotor Blade

(c) After rotor blade is cool, mask area of rotor blade around splice cover installation area with tape (C133). Leave a one inch border between where new splice cover will go and masking tape.

(d) Remove old adhesive, paint and other contaminants from masked-off area with 100 grit or finer sandpaper (C102). Sand in spanwise direction

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

(e) Clean masked-off area with clean cloth dampened with MEK (C74) and wipe dry with clean cloths.

NOTE

Wear clean, dry gloves when handling parts that have been prepared for bonding. Avoid contamination of parts with oil, grease, or mold release.

(f) Remove peel ply from inside surface of new splice cover.

(g) Lightly sand cured adhesive on new splice cover with 300 grit sandpaper (C102). Wipe off residue with clean cloth.

(h) Refer to table 1-11 for instructions to mix adhesive (C14). Apply thin coat of adhesive (C14) to inside surface of new splice cover and to mating surface of rotor blade. Use wooden spatula and rub adhesive around on splice cover and blade to assure complete wetting of mating surfaces.

(i) Position new splice cover (6 or 9, figure 5-13) on rotor blade as shown in figure 5-13.

(j) Move splice cover back and forth slightly to expell air pockets.

(k) Wipe off excess adhesive and fair in adhesive at edges of cover.

(l) Place cellophane (C27) over splice cover to prevent adhesion to bands installed in following step.

(m) Place heavy rubber bands or bungee cords around rotor blade to hold splice cover in place.

(n) Allow adhesive to cure in accordance with instructions in table 1-11.

(o) Fair in adhesive by sanding with 180 grit or finer sandpaper (C102), Touch up finish on rotor blade (paragraph 5-24).

f. Repair voids as follows:

(1) Repair voids up to a maximum of 0.50 inch from tips of drag plate tang, grip plate tang, or outboard tip of doublers as follows:

(a) Cut material from grip, drag plate or doubler a maximum of 0.50 inch, following the same radius as original tip. Use extreme care to avoid cutting into adjacent parts.

(b) After cutting, deburr and break sharp edges.

(c) Refinish in accordance with procedures in paragraph 5-24.

(2) Seal edge voids 0.25 inch deep or less between the abrasion strip and the splice cover by cleaning the area and filling void with adhesive (C14),

(3) Repair void damage that is within limits defined in inspection paragraph 5-20 steps d. (3), d. (4), and d. (5) by sealing with adhesive. Clean area to be sealed and fill void with adhesive (C14).

g. Repair distorted main rotor blade trim tab that is within limits stated in inspection, paragraph 5-20, h.

(1) Straighten the trailing edge of the main rotor trim tab with a mallet and a heavy back-up block.

(2) Set trim tab to trail with tab bending tool (T47) and tab bending gage (T41).

h. (AVIM) Remove damaged main rotor blade trim tab and install new trim tab if replacement is indicated by inspection paragraph 5-20, h.

(1) Cut through the trim tab (8, figure 5-14) at a line approximately one-eighth inch aft, and parallel to blade trailing edge.

(2) Drill out rivets, if installed, attaching trim tabs to rotor blade.

(3) Apply heat to tab with a heat gun, but do not exceed 200 degrees F (93 degrees C), Start at outer corner of trim tab and peel tab off blade in spanwise direction.

(4) Mask blade area around trim tab; allow one-half inch border from trim edge for squeeze-out.

(5) Remove old adhesive in masked area by sanding spanwise with 180 grit sandpaper (C102), Use progressively finer sandpaper 320 and 400 grit to obtain a smooth finish.

WARNING

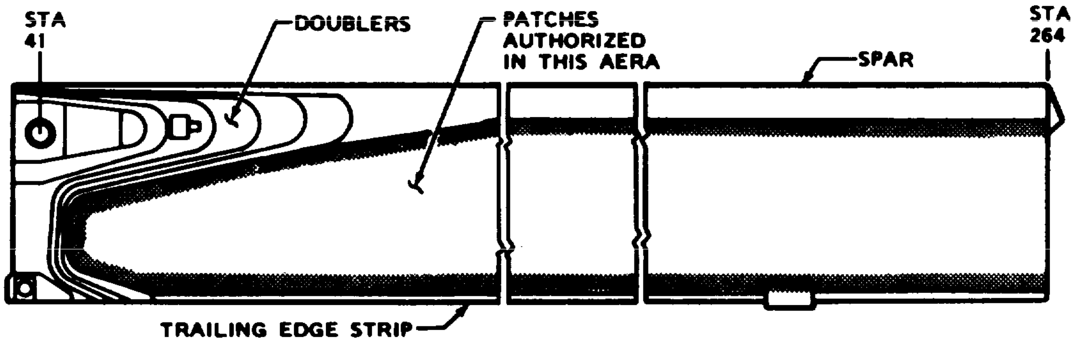
Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

(6) Clean trim tab area of blade with cloths moistened with MEK (C74). Dry the area with dry, clean cloth.

(7) Fill rivet holes in trim tab area of rotor blade, if existing, with adhesive (C8). Refer to table 1-11 for instructions to mix adhesive.

(8) Drill nine Number 30 holes in new trim tab as illustrated in figure 5-15. (If the previous trim tab was riveted, reverse top and bottom hole locations with trim tab.) Deburr all holes.

(9) Position trim tab on rotor blade in the install position and using holes in trim tab as template, drill matching Number 30 holes to a maximum depth of 0.125 inch in rotor blade.



ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

NOTES:

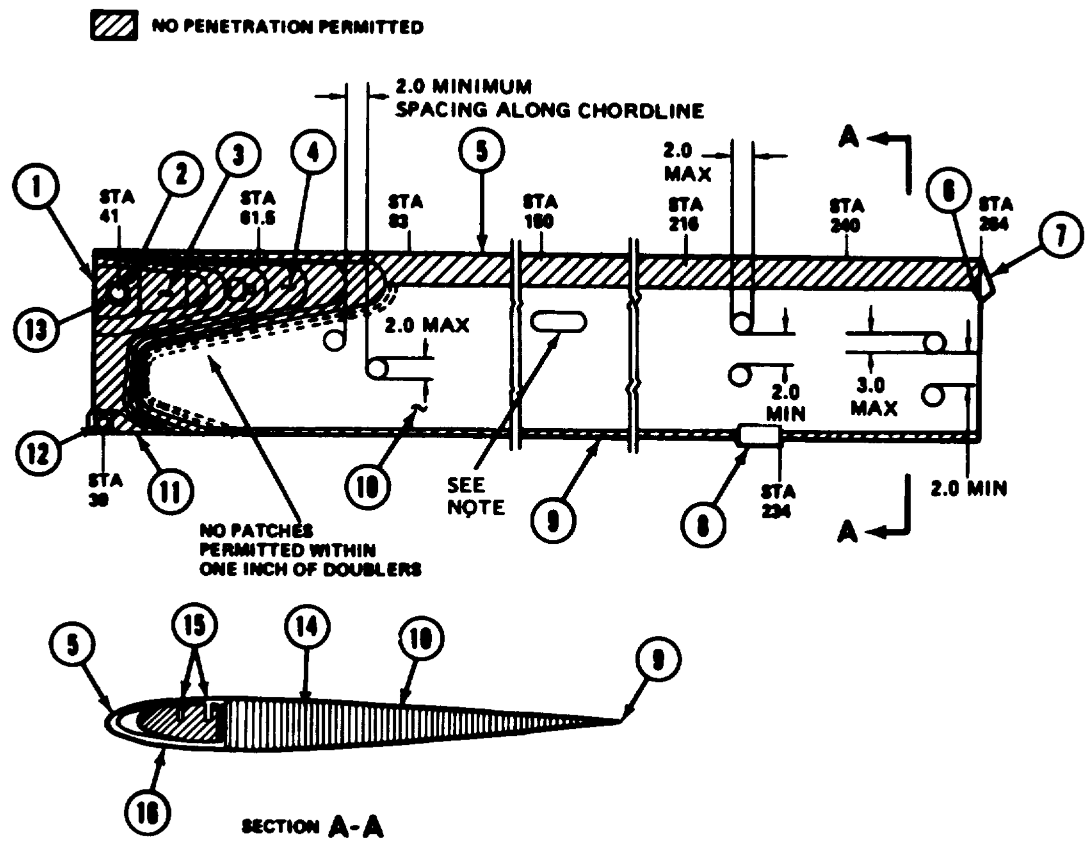
1. **No patches are permitted within one inch of the doublers, spar, trailing edge strip and the tip of the blade (shaded area). Refer to note 2 and the table below to accurately define the patchable area.**

2. **On blade P/N 540-015-001-1, the trailing edge strip tapers uniformly between station 95.0 and 220.0. Trailing edge strip width is constant either side of these stations.**

Chordwise limits of patchable area at various stations for blades			
BLADE P/N	**BLADE STATION**	**AFT OF LEADING EDGE**	**FORWARD OF AFT EDGE**
540-015-001-1	80.0	9.76	——
540-015-001-1	140.0	6.70	——
540-015-001-1	95.0	——	4.145
540-015-001-1	220.0	——	2.245

540011-186-1C

Figure 5-14. B540 Main Rotor Blade Authorized Patch Area (AVIM) (Sheet 1 of 2)



ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

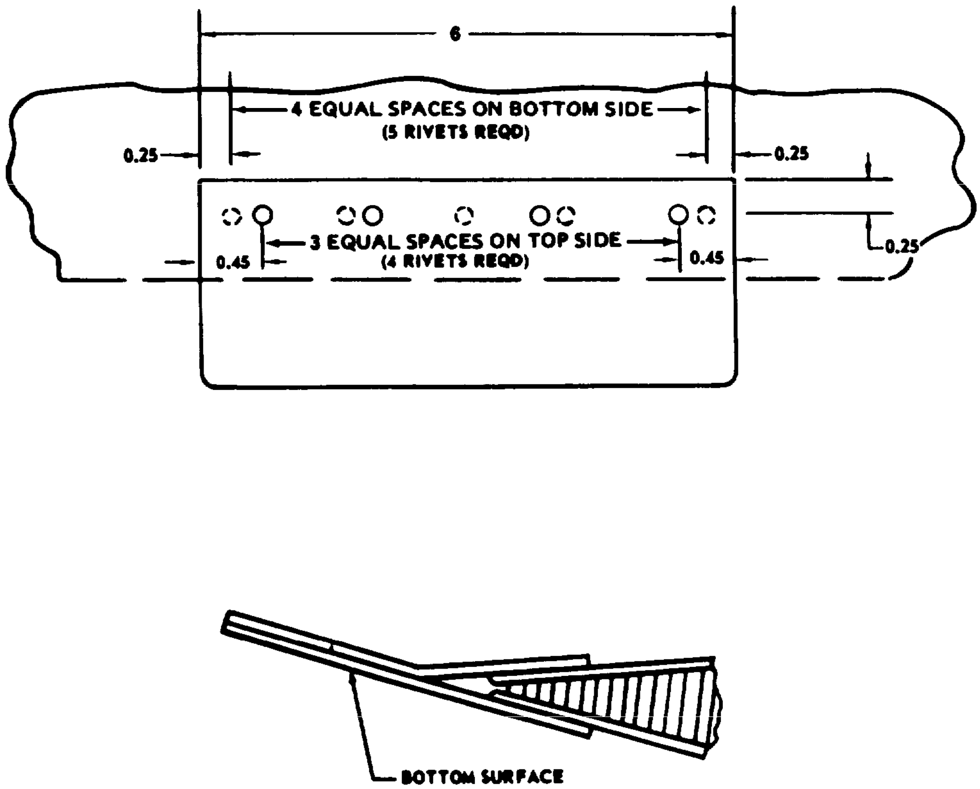
NOTE

An oblong hole is permissible if the general direction of the hole is within 15 degrees of a line parallel to the leading or trailing edge of the blade. Maximum size of the hole shall not exceed 1 inch wide by 4 inches long. The ends of the hole must have a minimum radius of 0.25 inch to break corners.

1. Cover plate
2. Grip pad
3. Grip plate
4. Doublers
5. Abrasive strip
6. Alignment screw
7. Tip cap
8. Trim tab
9. Trailing edge strip
10. Skin
11. Drag plate
12. Bushing, drag brace
13. Bushing, retention bolt
14. Honeycomb core
15. Screw
16. Spar

540011-186-2B

Figure 5-14. B540 Main Rotor Blade Authorized Patch Area (AVIM) (Sheet 2 of 2)



ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

209011-32C

Figure 5-15. B540 Main Rotor Blade Trim Tab Installation

(10) Remove trim tab from rotor blade, sand and smooth areas around drilled holes in trim tab and blade.

(11) Sand inside mating sides of trim tab with 200 grit sandpaper (C102) and finish with 400 grit sandpaper (C102).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with akin or eyes.

(12) Clean mating surfaces of rotor blade and trim tab with cloth moistened with MEK (C74); then dry surfaces with clean, dry cloth.

(13) Spread a thin film of adhesive (C14) on mating areas of rotor blade and trim tab.

(14) Position and secure trim tab in install position on rotor blade, with holes in trim tab aligned with corresponding holes in rotor blade.

(16) Install a special blind rivet in each of nine holes drilled in trim tab and blade; dip each rivet in adhesive used in step (13) before installation.

(16) Use two wooden blocks approximately the same size as trim tab and two sections of hard rubber 0.0625 inch thick and approximately the same size as the wooden blocks to use as pressure pads. Place the rubber sections next to the trim tab bond area and place the wooden blocks over the rubber sections; apply 2 TO 10 PSI pressure on the trim tab bond area. Allow adhesive to cure in accordance with instructions in table 1-11.

(17) Remove pressure pads after curing time and smooth squeeze-out with 180, 320, and 400 grit sandpaper (C102).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

(18) Clean up adhesive squeeze out in trim tab area with MEK (C74) and dry with clean, dry cloth.

(19) Apply ten percent solution of chromic acid (C1) and dry with clean, dry cloth.

(20) Apply one coat of epoxy primer (C88 or C91) to trim tab, and adjacent blade area and allow to dry for period of 30 minutes to four hours.

NOTE

Adhesion difficulty will be encountered if acrylic lacquer is not applied within a four hour period.

(21) Apply lacquer (C66) to trim tab and adjacent blade area.

i. Send blade to next higher maintenance level if any weights are missing or if there is any evidence of loose mounting or shifting of weights.

j. Preparation for storage or shipment of main rotor blades.

NOTE

The following instruction cover storage or shipment of main rotor blades in either cardboard or metal containers.

(1) Condemn, demilitarize and locally dispose of any blade which has incurred non-reparable damage. Refer to inspection paragraph 5-20, j.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

(2) Thoroughly remove foreign matter from entire exterior surface of blade. Use clean cheese cloth dampened with naphtha (C75)

(3) Tape all holes in the blade such as bullet damage, tree damage, foreign object damage, etc. to protect the interior of the blade.

(4) Apply a coating of wax (C135) to all exterior surfaces of the blade, except the main retention bolt hole and the drag brace retention hole. If non-siliconed composition wax is not available, coat exterior blade surfaces with oil (C77).

(5) Apply grease (C55) to main bolt hole and drag brace retention bolt hole.

(6) Wrap blade with barrier material (C23), shiny side next to the blade, at all locations where the blade will contact the hog hair supports (5 places) and secure with tape (C127).

(7) Secure contours to the blade at the paper wrapped areas.

(8) Attach a properly filled out DO Form 15772 (Unserviceable/Repairable Tag) directly to the blade.

(9) Secure blade to shock mounted support.

(10) Secure lid. If cardboard container is used, bend container shut with 0.50 inch steel bends. If metal container is used, install top half of container with top cushions attached, on lower half of container and secure with turnlock fasteners.

5-22. INSTALLATION – B540 MAIN ROTOR BLADES.

WARNING

Main rotor blades (540-011-001-5) dull not be intermixed with main rotor blades (540-011-250-1/540-015-001-1) because of weight and stiffness variations.

NOTE

Main rotor blades (540-011-250-1) and main rotor blades (540-015-001-1) may be intermixed

a. Position main rotor hub on a build-up bench in accordance with instructions contained in paragraph 5-12, I. Check that locating pin (6, figure 5-10) is installed in upper surface of each grip (5) at inboard side of retaining bolt hole.

b. Apply corrosion preventive compound (C41) to blade retaining nuts in hub grip and blade butte. Insert blade (9) in grip. Place washer (7) on retaining bolts (8). Align bolt holes carefully end insert bolt from top. If bolt binds, move tip of blade up and down slowly to find position which allows bolt to pass through without binding. Seat bolt and washer with notches on locating pin (6).

c. Place padded support under blade approximately one third blade length inboard from blade tip.

CAUTION

Install washer (16) with counterbore up facing grip.

d. Install washer (16) with counterbore up as Illustrated and install nut (17). Do not tighten nut at this time.

NOTE

Do not take a total measurement and split the shims evenly as this may cause a bind in the dreg brace.

e. Align drag brace (15) and blade for installation of bolt (14). Select shims (10) in order to obtain a clearance of 0.000 to 0.005 inch total. Measure the clearance from the upper surface of the drag plate to the clevis arm and shim. Measure the clearance on the bottom of the blade (some area) and shim. Install bolt (14), shims (10), washers (12 and 13), and nut (11). Instal washers (12 and 13) on lower side as illustrated. Do not tighten nut at this time. Apply corrosion preventive compound (C43) to drag brace bolts and clevis holes.

f. Install opposite blade in the same manner.

g. If the blades are to be aligned in the hub, follow instructions contained in paragraph 5-13.

h. if the blades are not to be aligned in the hub, torque both nuts (11) 125 TO 150 foot-pounds.

i. Use (T31) wrench to torque nuts (17) to 475 TO 525 foot-pounds. Align o notch in nut with a hole in bolt. install locking screw (20) with head in direction that centrifugal force will keep locking screw in. In some cases, this may require the locking screw to be installed from the inside of bolt. Install washer (19) and nut (18).

Install main rotor grip locks (T59) on each pitch horn if not previously accomplished (figure 5-4).

5-23. ALIGNMENT — B540 MAIN ROTOR BLADES.

Refer to paragraph 5-13.

5-24. PAINTING — B540 MAIN ROTOR BLADES (AVIM).

a. Remove tip cap assembly (7, figure 5-1 4) and plug the holes in the end of the spar and inertia weight to keep paint out.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin and eyes.

b. Degrease with naphtha (C75) or any good decreasing solvent.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

c. Using MEK (C74), strip old paint from blade area to be refinished.

d. If skins are pitted or eroded (especially in the area just behind the abrasion strip) polish out the pits with 320 grit sandpaper (C102). Use fine aluminum wool (C20) and 320 grit sandpaper (Cl 02) to finish polish the damaged area. Rub spanwise to remove burnishing or sandpaper marks and all traces of pitting. If the depth of the repaired area is no greater than 0.008 inch the repair is satisfactory

NOTE

Prior to refinishing, blade must have all scratches, nicks, dents, etc. repaired as shown under repair or nicks, dents, scratches, notches, and bent trim tab.

e. Using abrasive cloth (C36) or equivalent, remove all surface oxides and all aged chemical conversion coatings from all bare aluminum surfaces.

f. Wash blade with compound (C32) or equivalent. Achieve water break free surface, which will be evident by continuous unbroken film of water on the surface after thoroughly rinsing the soap from the surface

NOTE

From completion of f. above through final painting, surfaces of blades should not be handled with bare hands.

g. On all surfaces where corrosion was present, use application of all phosphoric solution (C19). On al bare aluminum, apply brush or spray application of alodine (C31).

h. Thoroughly dry the cleaned surfaces. Apply a 0.3 TO 0.5 mil thick coat of primer (C88 or C91). Allow to air dry from 45 minutes to 8 hours before next step.

i. Paint main rotor blades as follows:

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes,

(1) Mix a small quantity of adhesive (C7) according to directions on container. Mix 13 to 15 percent by weight of primer (C88 or C91) into the adhesive (C7). Mix thoroughly, and then to sprayable consistency by adding MEK (C74). Do not exceed 50 percent by volume; 35 percent should produce a sprayable consistency. The pot life of the epoxy primer mixture is approximately 3 hours.

(2) Apply three wet spray coats of adhesive mixture from the butt end of the blade to a distance of 0.75 inch to 3 inches outboard (follow contour of the largest doubler, including the tip and root covers. Do not apply to surfaces of the grip plates and drag plates that become faying surfaces with the grips and drag braces.

(3) Apply three wet spray coats of adhesive mixture over all adhesive squeeze-outs and surfaces of the trim tab. Extend outer edge of the adhesive onto the blade surface a minimum 0.50 inch beyond the squeeze-out.

(4) Apply one wet spray coat of adhesive the entire length of both sides of the blade, using the skin stop on the spar as the centerline of spray.

(5) Apply one wet spray coat of adhesive the entire length of both sides of the blade, using the butt joint between the trailing edge strip and the skin as the centerline of spray.

(6) Apply first coat of lusterless black lacquer (C86.3) to the upper and lower surfaces of the blade. Allow one hour minimum drying time, then apply second coat. Allow one hour minimum drying time before putting any other paint over the second coat. Spray only the repaired areas. Paint thickness to be approximately 1.2 TO 1.5 mils.

j. Unplug holes in end of spar and interia weight and install tip cap assembly.

5-25. K747 MAIN ROTOR BLADES.

5-26. DESCRIPTION – K747 MAIN ROTOR BLADES.

NOTE

When operating aircraft in geographical areas where excessive blade erosion will occur, refer to TB 1-1615-351-23 for instructions for application of anti-erosion tape procedures.

NOTE

After incorporation of drag strut K747-082-1 and root fitting K747-083-1, per MWO 55-1520-244-50-11, main rotor blades K747-003205, -209, and -303, become K747-003-309, -401, and -403, respectively

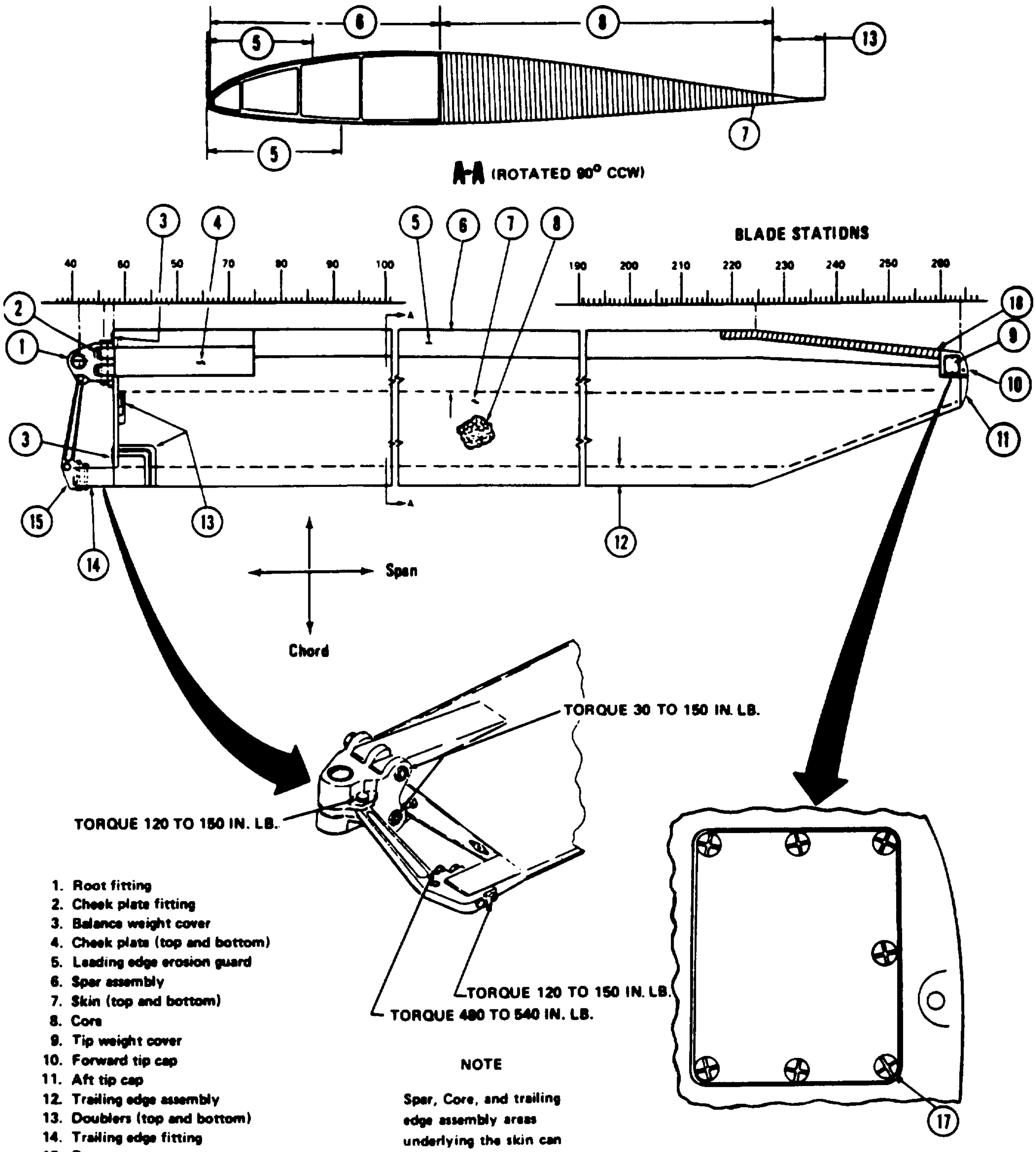
a. The K747-003 improved main rotor blade (figures 5-16 and 5-16.1) is an advanced technology composite structure which offers improved performance, reliability, maintainability, and reduced radar cross section, It is a glass fiber epoxy resin bonded assembly with an elastomerit erosion guard. The blade is attached in the hub with a retaining bolt assembly (root fitting) and is held in alignment by a drag strut.

b. Difference Between Models. K747-003 series main rotor blades have the following part numbers and differences as noted (See table 5-1).

(1) K747-003-205/-309 incorporates an improved blade weight retention (IBWR) feature not implemented in earlier K747 blades. (See figures 5-17 and 5-18.) This change alters physical appearance in that a slightly raised area is visible on the top and bottom of the leading edge (LE) erosion guard surfaces between stations 213.5 and 260.0. An almost invisible seam maybe detected at station 213.5. The leading edge erosion guard is completely composed of estane material. No other material composition is used.

(2) K747-003-205/-309 Deviation implements the use of fluorocarbon leading edge erosion guard material between stations 213.5 and 260.0. This is a higher impact resistant material covering implemented IBWR features, A very slight difference in sheen between the estane and fluorocarbon material may be detected. A very slight seam may be visible at station 213,5. If these differences are not readily apparent, the blade log component DA Form 2408-16 must be consulted.

(3) K747-003-209/-401 is visually the same as the 205/-309 blade with the exception of the leading edge erosion guard. A full fluorocarbon guard is used instead of a full guard composed of estane materials. If there is any doubt as to material composition, the blade log component DA Form 2408-16 and blade ID plate must be consulted.

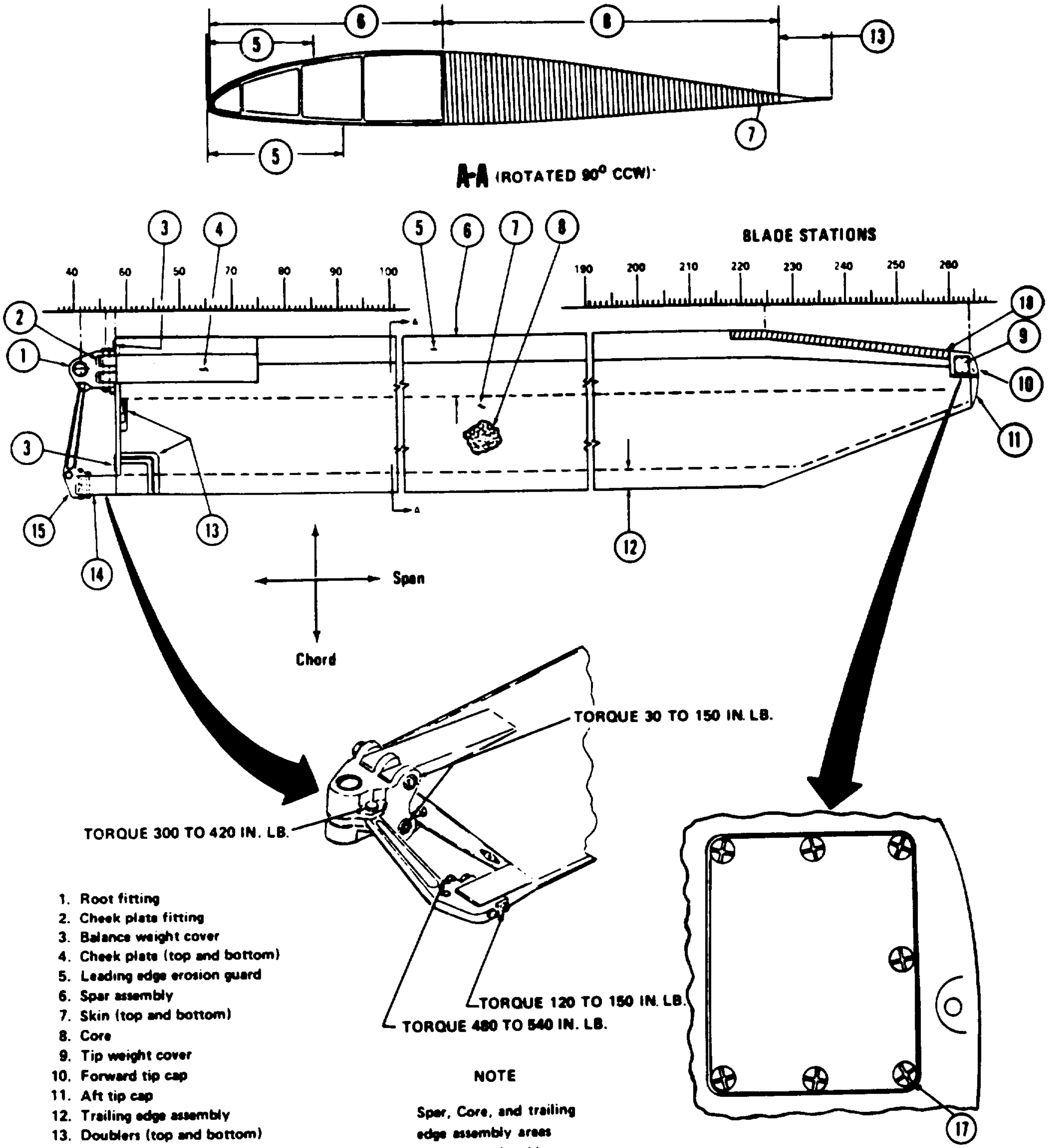


1. Root fitting
2. Cheek plate fitting
3. Balance weight cover
4. Cheek plate (top and bottom)
5. Leading edge erosion guard
6. Spar assembly
7. Skin (top and bottom)
8. Core
9. Tip weight cover
10. Forward tip cap
11. Aft tip cap
12. Trailing edge assembly
13. Doublers (top and bottom)
14. Trailing edge fitting
15. Drag strut
16. Deleted
17. Alignment screw
18. Stainment steel erosion guard (-303 blade only)

NOTE

Spar, Core, and trailing edge assembly areas underlying the skin can be identified by the difference in sound when the blade surface is tapped with a coin.

Figure 5-16. K747 Main Rotor Blade (Part Numbers K747-003-205, -209, -303)

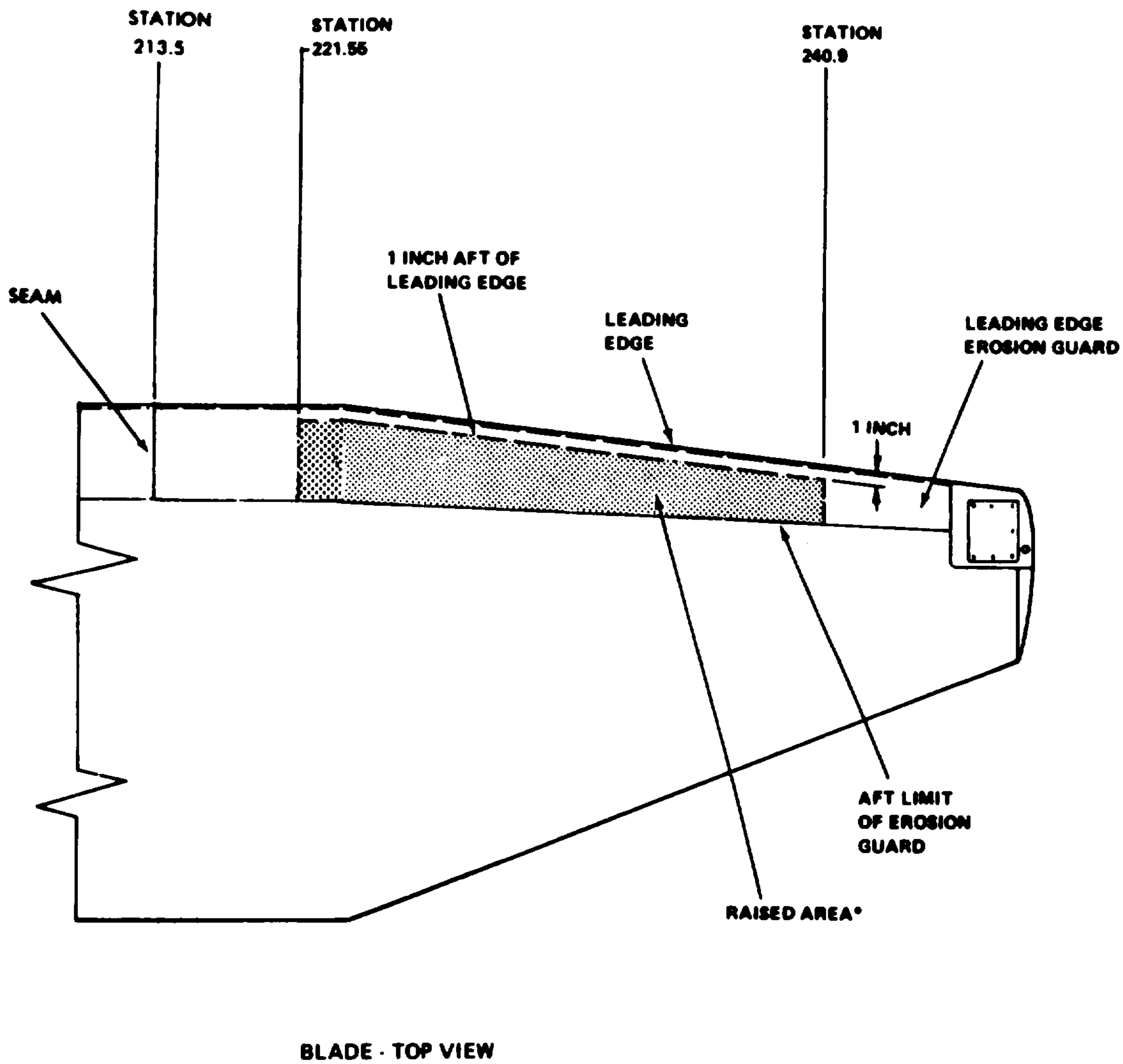


1. Root fitting
2. Cheek plate fitting
3. Balance weight cover
4. Cheek plate (top and bottom)
5. Leading edge erosion guard
6. Spar assembly
7. Skin (top and bottom)
8. Core
9. Tip weight cover
10. Forward tip cap
11. Aft tip cap
12. Trailing edge assembly
13. Doublers (top and bottom)
14. Trailing edge fitting
15. Drag strut
16. Deleted
17. Alignment screw
18. Stainment steel erosion guard (-403 blade only)

NOTE

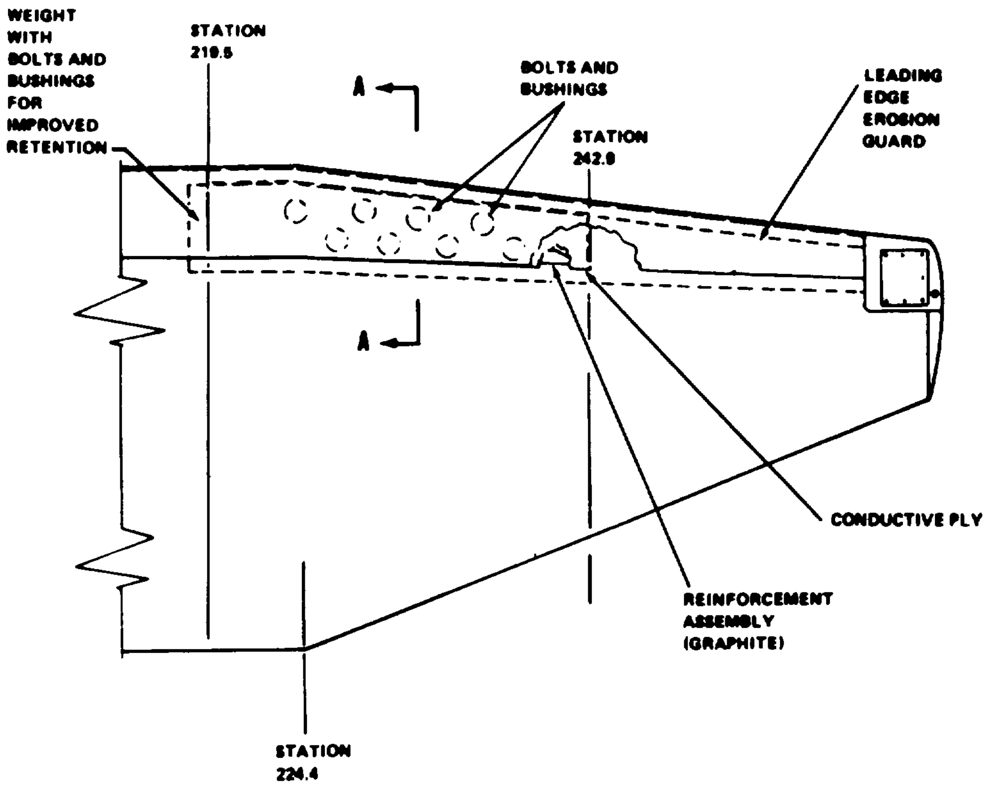
Spar, Core, and trailing edge assembly areas underlying the skin can be identified by the difference in sound when the blade surface is tapped with a coin.

Figure 5-16.1. K747 Main Rotor Blade (Part Numbers K747-003-309, -401, -403)



*AREA RAISED APPROXIMATELY .040 INCH ABOVE SURROUNDING BLADE SURFACES. SPANWISE, AREA EXTENDS FROM STATION 221.55 TO STATION 240.9. AREA EXTENDS CHORDWISE FROM 1 INCH AFT OF LEADING EDGE TO AFT LIMITS OF EROSION GUARD. (RAISED AREA EXISTS ON TOP AND BOTTOM BLADE SURFACES) THE FINISH OF THE RAISED AREA MAY EXHIBIT REDUCED SHEEN.

Figure 17. External Appearance Changes to K747-003-205/-309, -209/-401, and -303/-403 Blades Resulting From Improved Weight Retention Features.



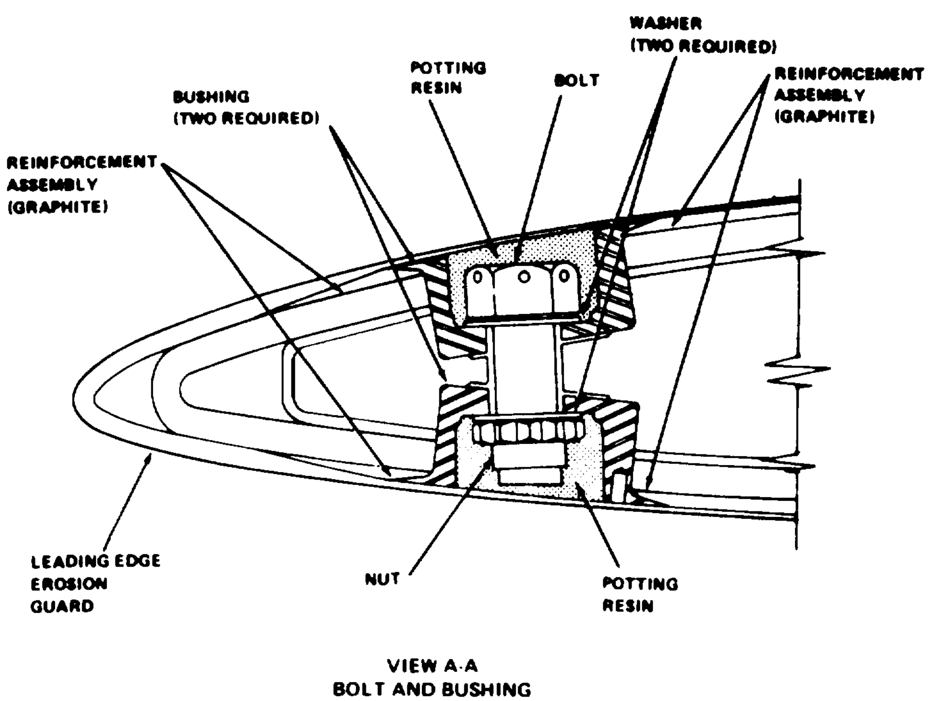
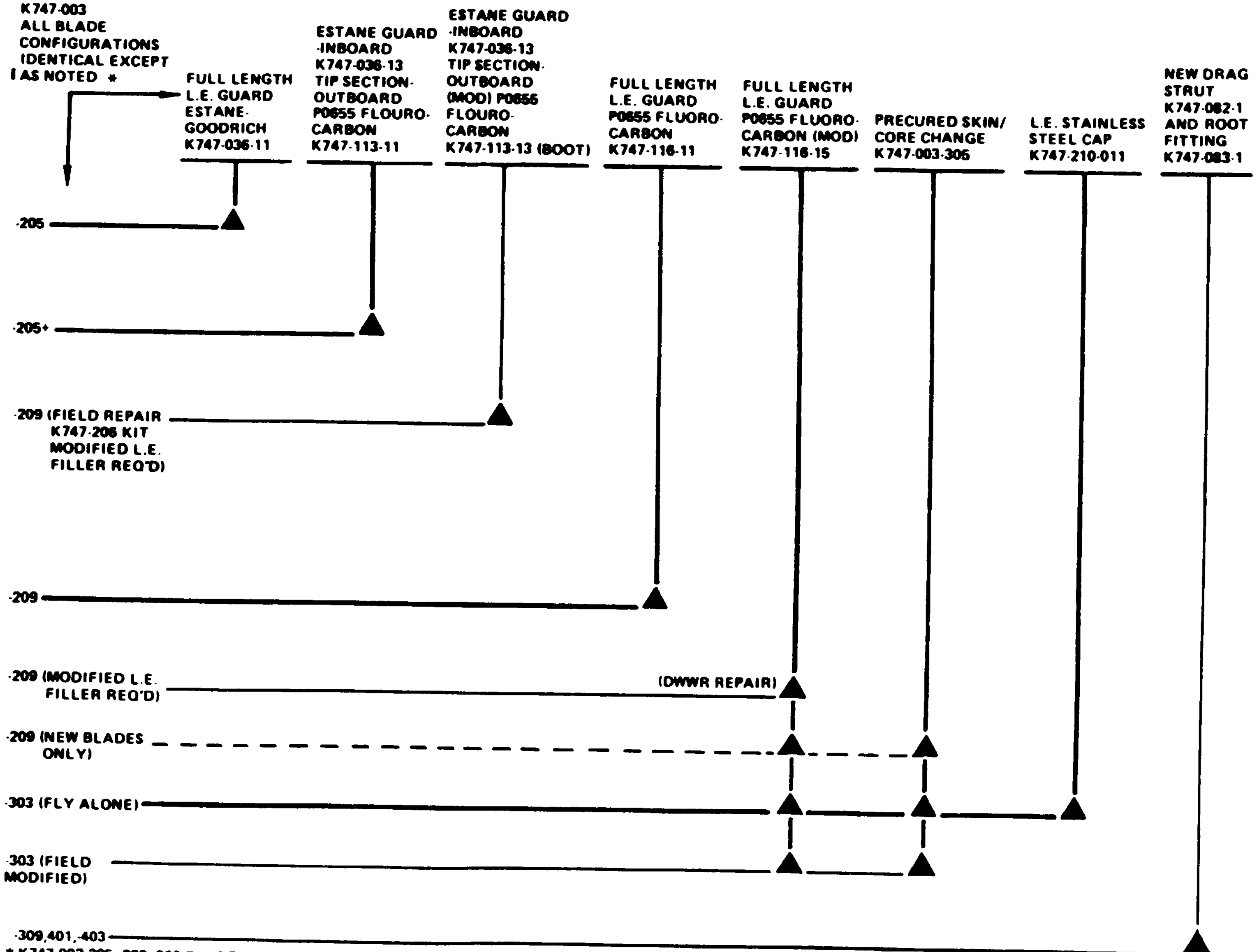


Figure 5-18. Internal Modifications Incorporated in K747-003-205/-309, -209/-401, and -303/-403 Blades for Improved WeightRetention.

TABLE 5-1. DIFFERENCE BETWEEN MODELS



* K747-003-205,-209,-303 BLADES BECOME K747-003-309,-401 OR -403 BLADES, RESPECTIVELY, AFTER INSTALLATION OF K747-082-1 DRAG STRUT AND K747-083-1 ROOT FITTING.

CAUTION

K747-003-303/-403 blades shall only be flown with other -303/-403 blades They shall not be flown with K747-003-205/-309, -205/-309 deviation, -209/-401, or -303/-403 field modified blades. The K747-003-303/-403 blade can be easily identified by the stainless steel erosion guard installed on the outboard leading edge. Do not mistake a -303/-403 field modified blade (stainless steel guard removed and screws and shieids Installed) for -303/-403 blade.

(4) K747-003-303/-403 incorporates all the improvements of the -209/-401 blade and adds a stainless steel erosion guard over the fluorocarbon guard on the blade outer leading edge. Stainless steel guard location is between stations 217.5 and 261.0. The -303/-403 blade cannot be mixed with other blade models for flight. All skin/core repairs and repair kits used to repair -205/-309, -205/-309 deviation, and -209/-401 blades can be used to repair the -303/-403 blade.

CAUTION

K747-003-303/-403 field modified blades shall not be flown with K747-003-303/-403 blades. K747-003-303/-403 field modified blades are easily indentified by the adsence of a stainless steel erosion guard and by six shields secured by self-locking screws located on the outboard area of the fluorocarbon erosion guard,

(5) K747-003-303/-403 field modification removes the stainless steel erosion guard from the -303/-403 blade. This modification makes the -303/-403 blade compatible for use with the -205/-309, -205/-309 deviation, -209/-401, and other -303/-403 field modified blades only. Al skin/core repairs and repair kits used to repair -205/-309, -205/-309 deviation, and -209/-401 blades can be used to repair -303/-403 field modified blades.

5-27. REMOVAL — K747 MAIN ROTOR BLADES.

a. Position main rotor hub and blade assembly on build-up bench (paragraph 5-12m). Place padded supports under blades so that leading edge is approximately straight.

b. Remove locking screw (20, figure 5-10).

c. Remove nut (17) and washer (16) with blade bolt wrench (T31).

d. Remove nut (11), washers (12 and 13), and bolt (14). Loosen nut (21) and swing drag brace (15) away from rotor blade. Retain shims (10) for reinstallation.

CAUTION

Avoid blade contact with the drag brace and hub during removal procedure to prevent possible blade damage.

e. Remove blade retaining bolt (8) and washer (7). Slowly raise and lower blade tip while tapping bolt with fiber mallet. If bolt is difficult to remove, use a bolt removal work aid similar to the one shown in figure 5-11. Remove blade retaining bolt as follows:

(1) Remove threaded plugs from upper and lower ends of blade retaining bolt. If weights are present in bolt, retain for reinstallation.

(2) Position work aid on bolt as shown in figure 5-12, and also place a piece of hard rubber or similar material between work aid tube and grip to prevent marring the grip. Hold puller rod and tighten hexagon nut to remove blade retaining bolt.

(3) Remove work aid from blade retaining bolt. Reinstall weight and plugs in blade retaining bolt and identify the blade retaining bolt for reinstallation in the same grip.

f. Remove blade from grip and place in a padded stand.

g. Remove opposite blade from hub in same manner.

5-28. CLEANING — K747 MAIN ROTOR BLADES.

a. Clean main rotor blade with one part cleaning compound (C33) and nine parts water.

CAUTION

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

CAUTION

The erosion boot Is very susceptible to solvents Use care to prevent spillage or inn-off of solvents onto the boot

b. Remove stubborn deposits with a cloth dampened with solvent (C112) except the boot shall be cleaned only with detergent (C50) or one part cleaning compound (C33) and nine parts water.

5-29. INSPECTION — K747 MAIN ROTOR BLADES.

a. Inspect blade historical records and the blade for evidence that the blade has been subjected to an accident, overspeed or incident outside the realm of normal usage. If such evidence exists, perform special inspections outlined in paragraph 1-57.

b. Inspect blades for damage. Classify damage as acceptable or repairable, using the limits in tables 5-1.1 and 5-1.2. Acceptable damage shall not be repaired. Blades having damage which is not acceptable or repairable shall be replaced.

c. The top of the painted surface shall be used to measure dents, cuts and scratches by using a dial indicator with a probe. The fibers of the basketweave may appear to be raised or rough; this is not cause for rejection.

NOTE

Faces of the spar wrap fittings with cracks at the 6 o'clock and 12 o'clock positions, plus or minus 30°, are acceptable. Cracks on all eight faces and across the bolt hole on one blade are acceptable. Multiple cracks on one face at the 6 and/or 12 o'clock position are acceptable providing no metal Is lost.

d. Inspect mot fitting for damage in accordance with figures 5-19 and 5-19.1.

NOTE

Ensure the cotter pins are Installed in the castellated nuts on the attaching hardware of the root fitting. Root fitting attaching hardware may turn by hand. This Is not an Indication of a loss of torque and Is an acceptable Installation.

e. Inspect drag strut for damage in accordance with figures 5-20 and 5-20.1.

f. Tap test blade spar area for cracks between stations 70 to 90 from the leading edge erosion guard to back side of spar. The tap sound from untracked area to cracked area is from a solid sound to a highly muffled sound.

5-29.1. INSPECTION — K747 MAIN ROTOR BLADE TIP WEIGHT RETENTION.

a. Inspect blades in tip area of leading edge of erosion guard. Both upper and lower surfaces of the blade must be inspected. Inspector crescent-shaped, raised areas or circular delamination of the erosion guard from the spar. These will appear as circular raised areas approximately 2.0 inches in diameter, not to exceed 0.060 inch in height. (See figure 5-21.)

b. If discrepancy noted in step a above is detected but still within limits look for the following conditions:

(1) High torque.

(2) High fuel consumption.

(3) Low engine performance.

c. If the discrepancy noted in step a above is detected, replace the blade.

5-30. REPAIR OR REPLACEMENT – K747 MAIN ROTOR BLADES.

WARNING

The fallowing protective equipment must be used when working with fiberglass repair kits:

Respirator, Chemical Cartridge
Respirator, Disposable Half-Mask
Gloves, Rubber: Acid, Alkali Resistant, Black
Apron, Impermeable: Duck, Rubber Coated
Goggles, Industrial for Chemical Handling
Faceshield, Industrial, Hinged Window

CAUTION

Use only tools specified for repair of K747 main rotor blades.

a. Main rotor blades meeting ail of the following requirements shall be repaired.

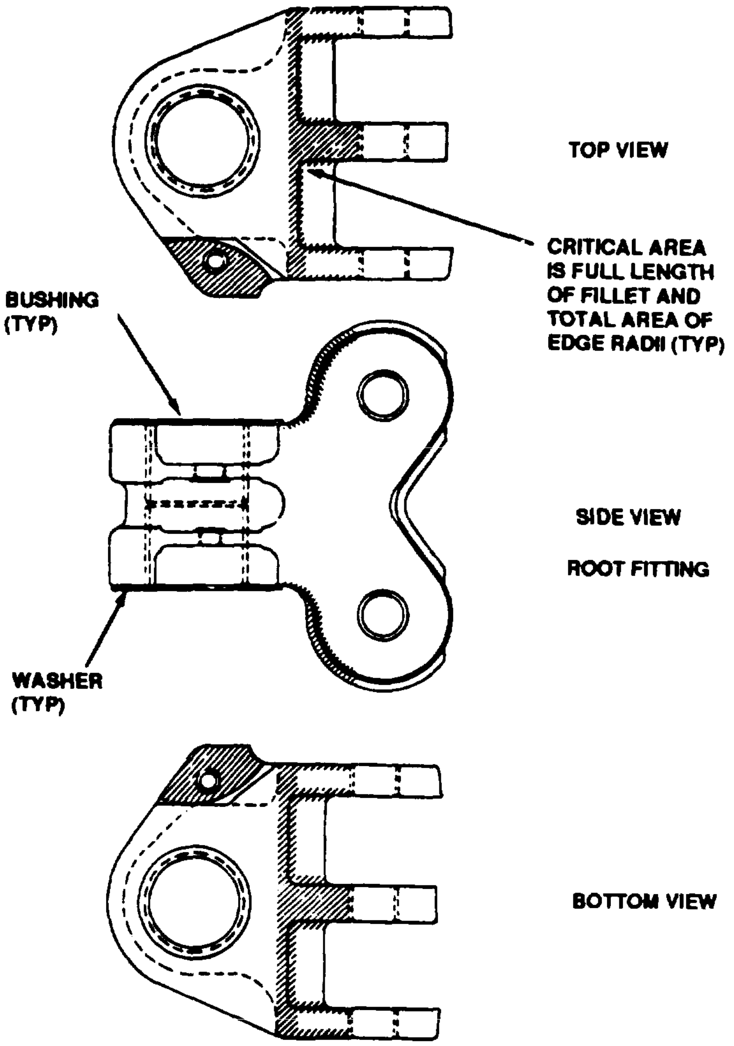
(1) Blades shall have only damage that is listed as repairable or acceptable in tables 5-1.1 and 5-1.2, and damage shall not be in any area previously repaired. Damage listed as acceptable shall not be repaired.

(2) All required repairs shall be within the proximity limits shown in figure 5-22.

(3) Blade shall contain sufficient existing balance weight to permit adjustment of Made balance as shown in figure 5-23.

(4) Blades showing evidence of blade weight retention failure as defined in paragraph 5-29.1 shall not be repaired.

b. Main rotor blades not meeting the requirements of step a. above, shall be replaced

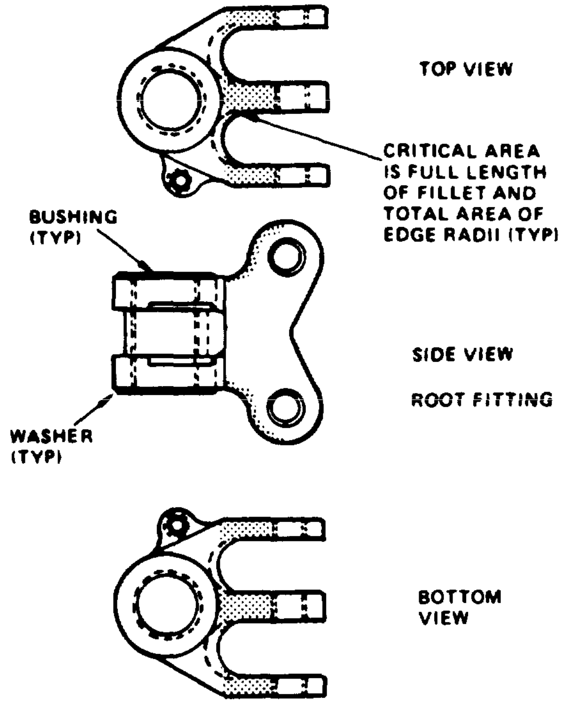


NO CRACKS PERMITTED

TYPE OF DAMAGE	MAXIMUM DEPTH ALLOWED: CRITICAL AREA	MAXIMUM DEPTH ALLOWED: NON-CRITICAL AREA
NICKS, SCRATCHES	0.005 IN. ACCEPTABLE *0.010 IN. REPARABLE	† 0.015 IN. ACCEPTABLE † 0.030 IN. REPARABLE ‡
CORROSION	*0.010 IN. REPARABLE	0.030 IN. REPARABLE ‡

† EXCEPT FOR EXTERIOR SURFACES OF K747-012-19 BUSHING FLANGE AND K747-012-17 WASHER.
THESE LIMITS ARE: 0.030 IN. IS ACCEPTABLE.
0.030 - 0.060 IN. IS REPARABLE TO 20% OF SURFACE AREA.
* REWORK MAY EXTEND TO 100% OF SURFACE AREA.
‡ BY POLISHING.

Figure 5-19. Damage Limits - Root Fittings (P/N K747-061-5) (K747 Blade)

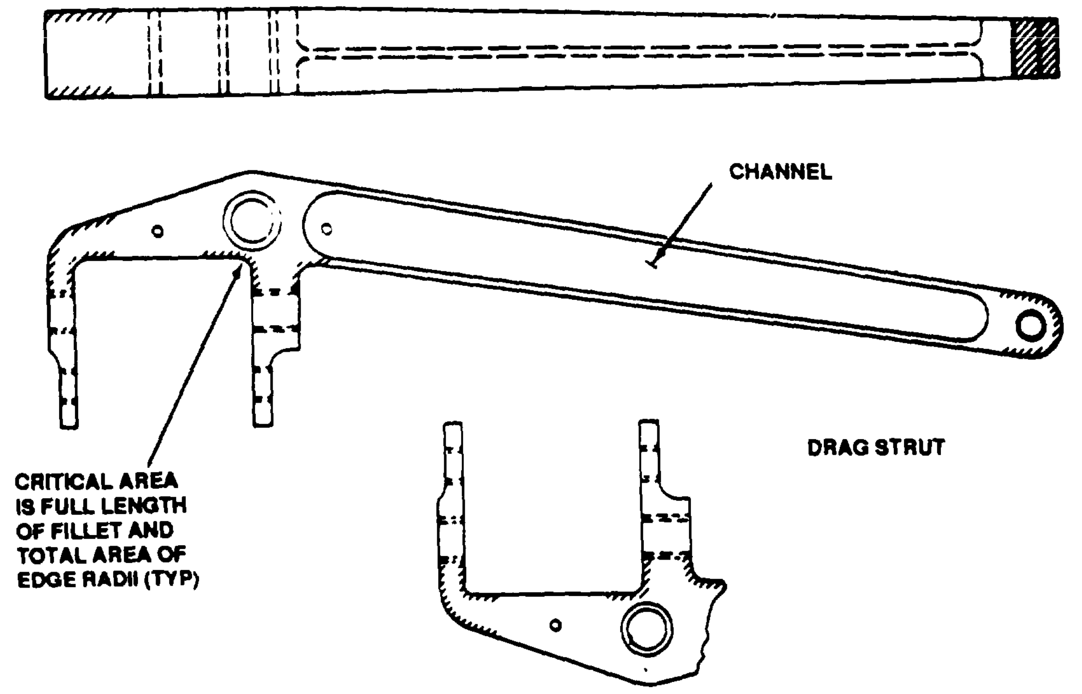


NO CRACKS PERMITTED

TYPE OF DAMAGE	MAXIMUM DEPTH ALLOWED	
	CRITICAL AREA	NON - CRITICAL AREA
NICKS, SCRATCHES	0.005 IN. ACCEPTABLE *0.015 IN. REPAIRABLE †	† 0.010 IN. ACCEPTABLE † 0.030 IN. REPAIRABLE ‡
CORROSION	*0.015 IN. REPAIRABLE †	‡ 0.030 IN. REPAIRABLE †

† EXCEPT FOR EXTERIOR SURFACES OF THE BUSHING FLANGE AND WASHER THESE LIMITS ARE: 0.030 IN. IS ACCEPTABLE.
0.030 - 0.060 IN. IS REPAIRABLE TO 20% OF SURFACE AREA.
* REWORK MAY EXTEND TO 100% OF SURFACE AREA.
‡ BY POLISHING.

Figure 5-19.1. Damage Limits - Root Fittings - Part Number K747-083-1 (K747 Blade)



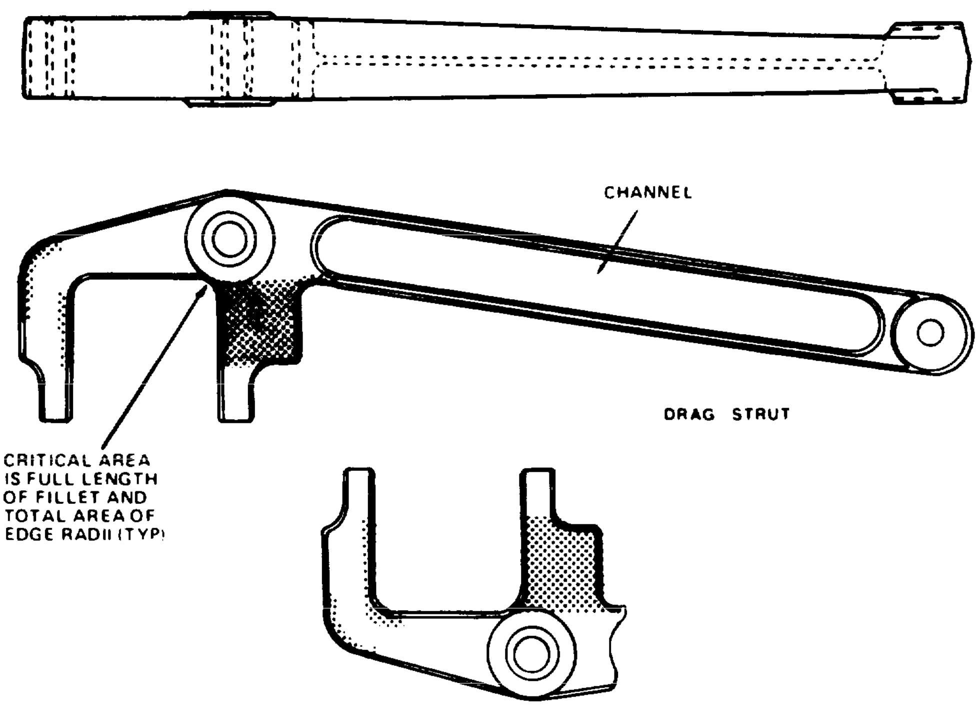
NO CRACKS PERMITTED

TYPE OF DAMAGE	MAXIMUM DEPTH ALLOWED	
	CRITICAL AREA	NON-CRITICAL AREA
NICKS, SCRATCHES	0.005 IN. ACCEPTABLE 0.015 IN. REPARABLE ‡	† 0.005 IN. ACCEPTABLE † 0.030 IN. REPARABLE ‡
DENTS		†† 0.020 IN. ACCEPTABLE
CORROSION	0.015 IN. REPARABLE ‡	*† 0.030 IN. REPARABLE ‡

NOTES

† IF BOTH SURFACES OF THE CHANNEL MUST BE REWORKED, MINIMUM THICKNESS OF CHANNEL WELL SHALL BE 0.150 IN.
†† PROVIDED DENT HAS RADIUS LARGER THAN 0.50 INCH. IF RADIUS IS SMALLER THAN 0.50 INCH AND DENT IS SHORT, TREAT AS NICK AND BLEND TO 0.020 IN.
* REWORK MAY EXTEND TO 100% OF SURFACE AREA.
‡ BY POLISHING.

Figure 5-20. Damage Limits - Drag Strut (P/N K747-072-1) (K747 Blade)



NO CRACKS PERMITTED

TYPE OF DAMAGE	MAXIMUM DEPTH ALLOWED	
	CRITICAL AREA	NON-CRITICAL AREA
NICKS, SCRATCHES	0.005 INCH ACCEPTABLE ‡0.015 INCH REPAIRABLE	†0.005 INCH ACCEPTABLE ‡††0.030 INCH REPAIRABLE
DENTS		††0.020 INCH ACCEPTABLE
CORROSION	‡0.015 INCH REPAIRABLE	‡*†0.030 INCH REPAIRABLE

† IF BOTH SURFACES OF THE CHANNEL MUST BE REWORKED, MINIMUM THICKNESS OF CHANNEL WELL SHALL BE 0.150 INCH.
†† PROVIDED DENT HAS RADIUS LARGER THAN 0.50 INCH. IF RADUIS IS SMALLER THAN 0.50 INCH AND DENT IS SHORT, TREAT AS NICK AND BLEND TO 0.020 INCH
* REWORK MAY EXTEND TO 100% OF SURFACE AREA.
‡ BY POLISHING.

Figure 5-20.1 Damage Limits - Drag Strut (Part Number K747-082-1) (K747 Blade)

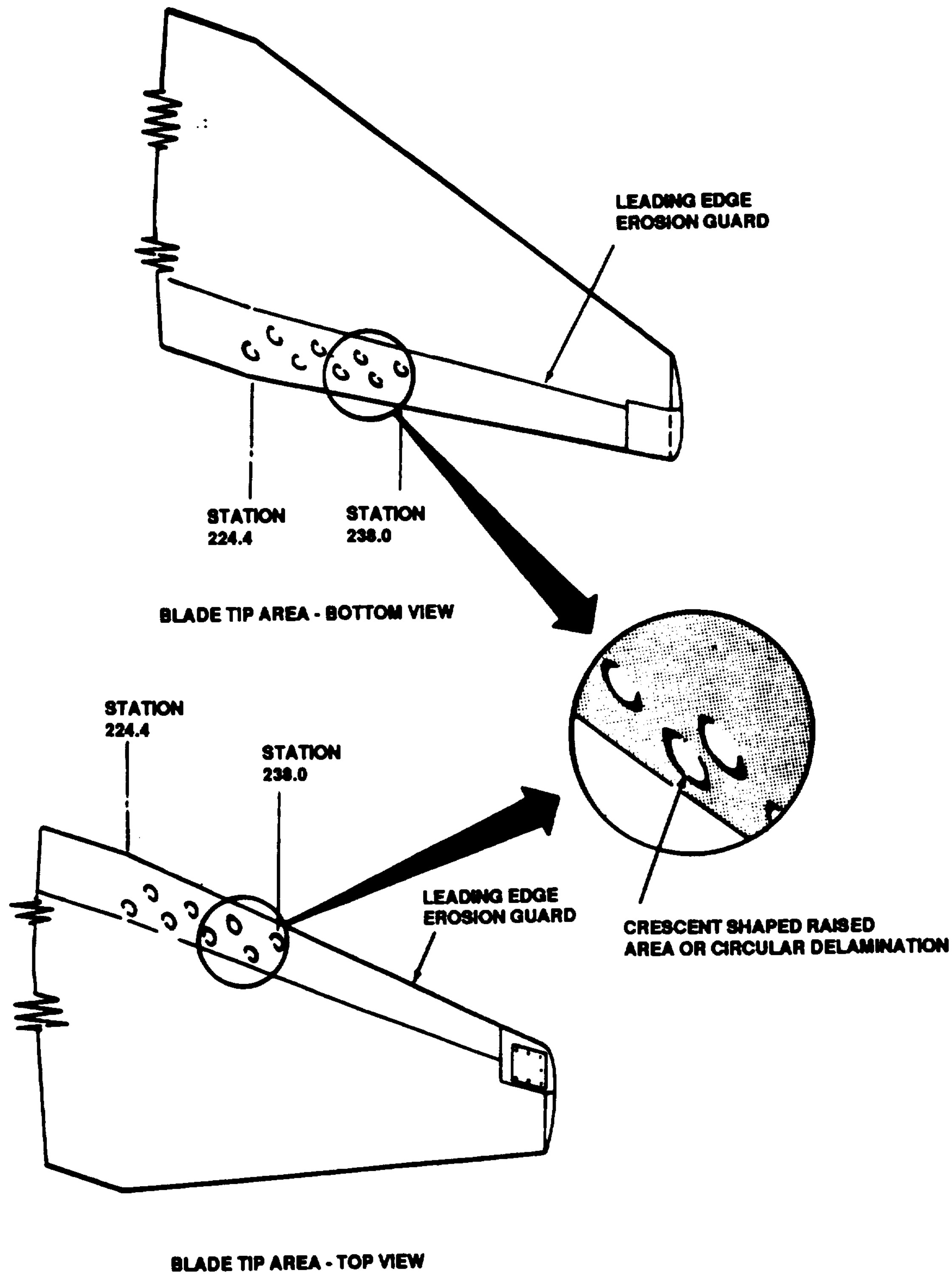
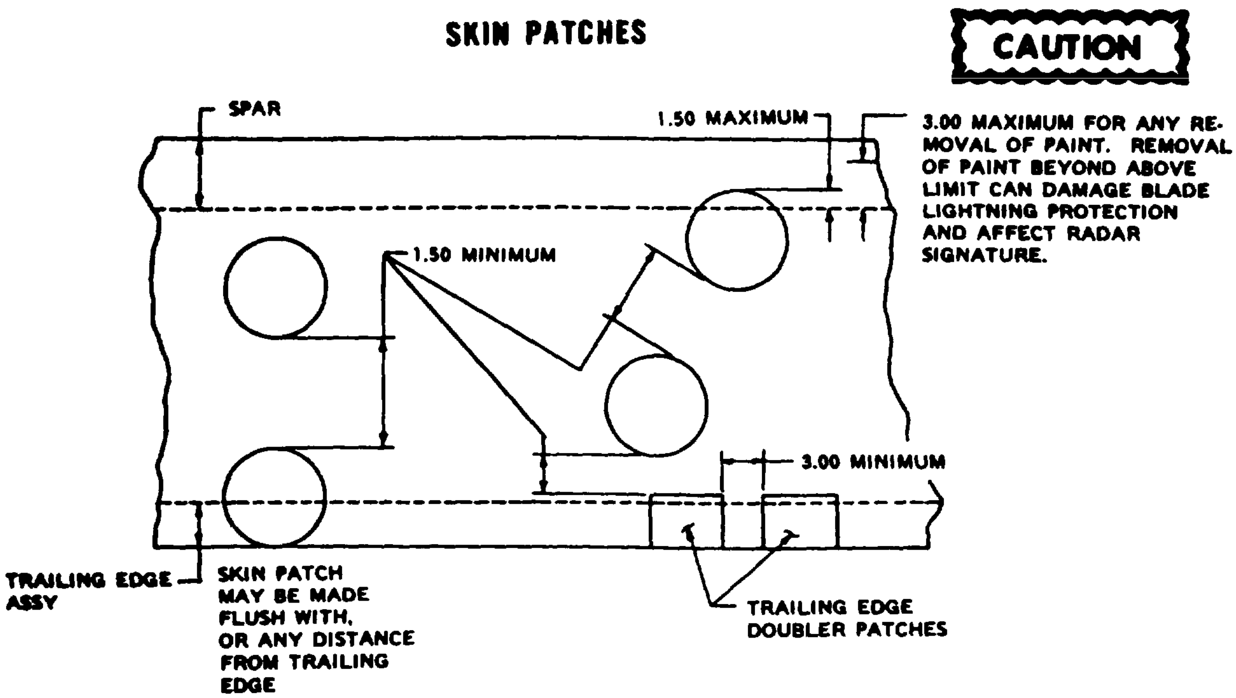


Figure 5-21. Inspection of K747-003-205/-309, -209/-401, and -303/-403 Blades for Loss of Blade Weight Retention Integrity



NOTE

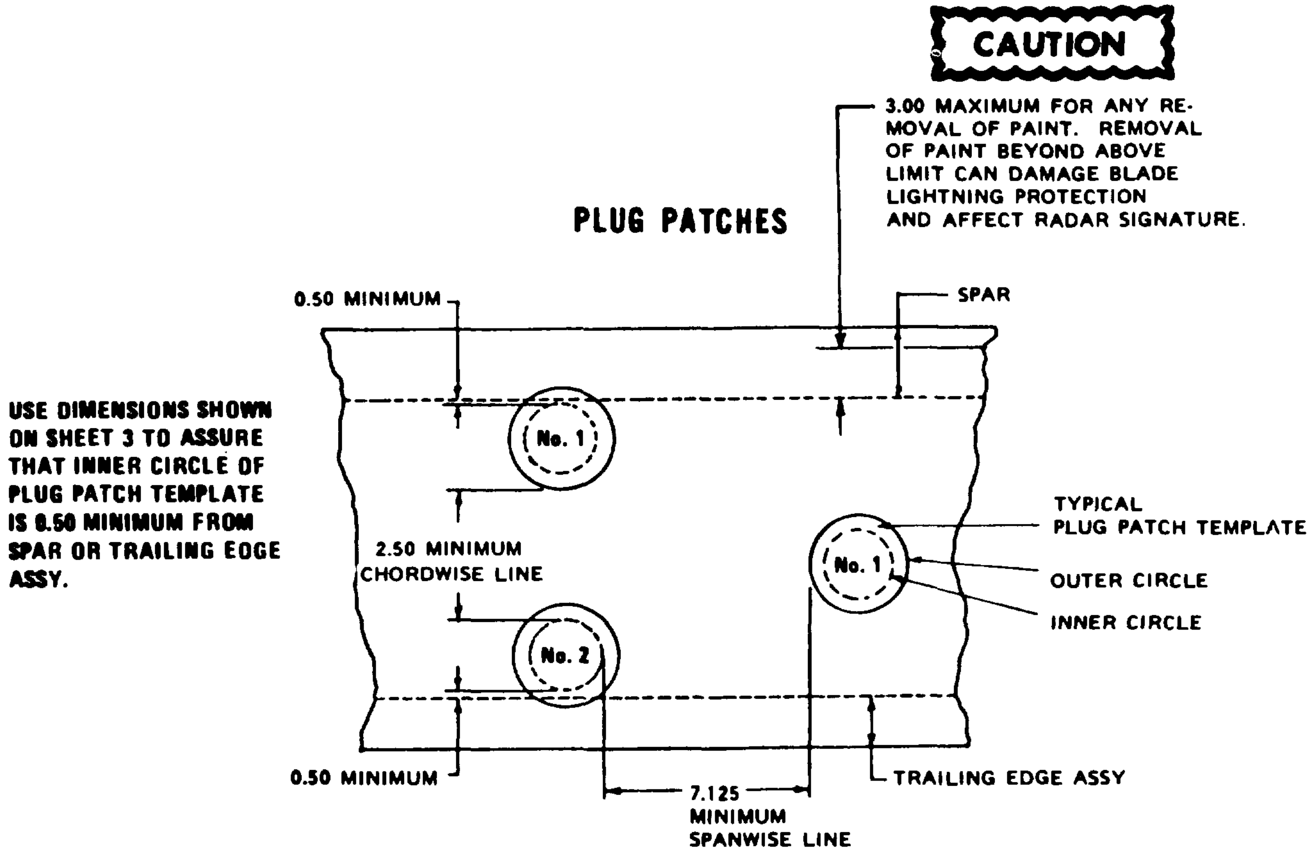
FOR EACH KIND OF PATCH (SKIN, TRAILING EDGE, OR PLUG) MINIMUM PROXIMITY LIMITS SHOWN FOR DISTANCES BETWEEN PATCHES ARE ALSO THE MINIMUM PROXIMITY LIMITS BETWEEN THE PATCH SHOWN AND:

1. CHEEK PLATES
2. DOUBLERS
3. ANY OTHER PATCH OF ANY KIND

ALL DIMENSIONS ARE IN INCHES.

209747-5-1

Figure 5-22. Proximity Limits for Patches - K747 Main Rotor Blades (Sheet 1 of 3)



NOTE

FOR EACH KIND OF PATCH (SKIN, TRAILING EDGE, OR PLUG) MINIMUM PROXIMITY LIMITS SHOWN FOR DISTANCES BETWEEN PATCHES ARE ALSO THE MINIMUM PROXIMITY LIMITS BETWEEN THE PATCH SHOWN AND:

1. CHEEK PLATES
2. DOUBLERS
3. ANY OTHER PATCH OF ANY KIND

ALL DIMENSIONS ARE IN INCHES.

209747-5-2

Figure 5-22. Proximity Limits for Patches. K747 Main Rotor Blades (Sheet 2 of 3)

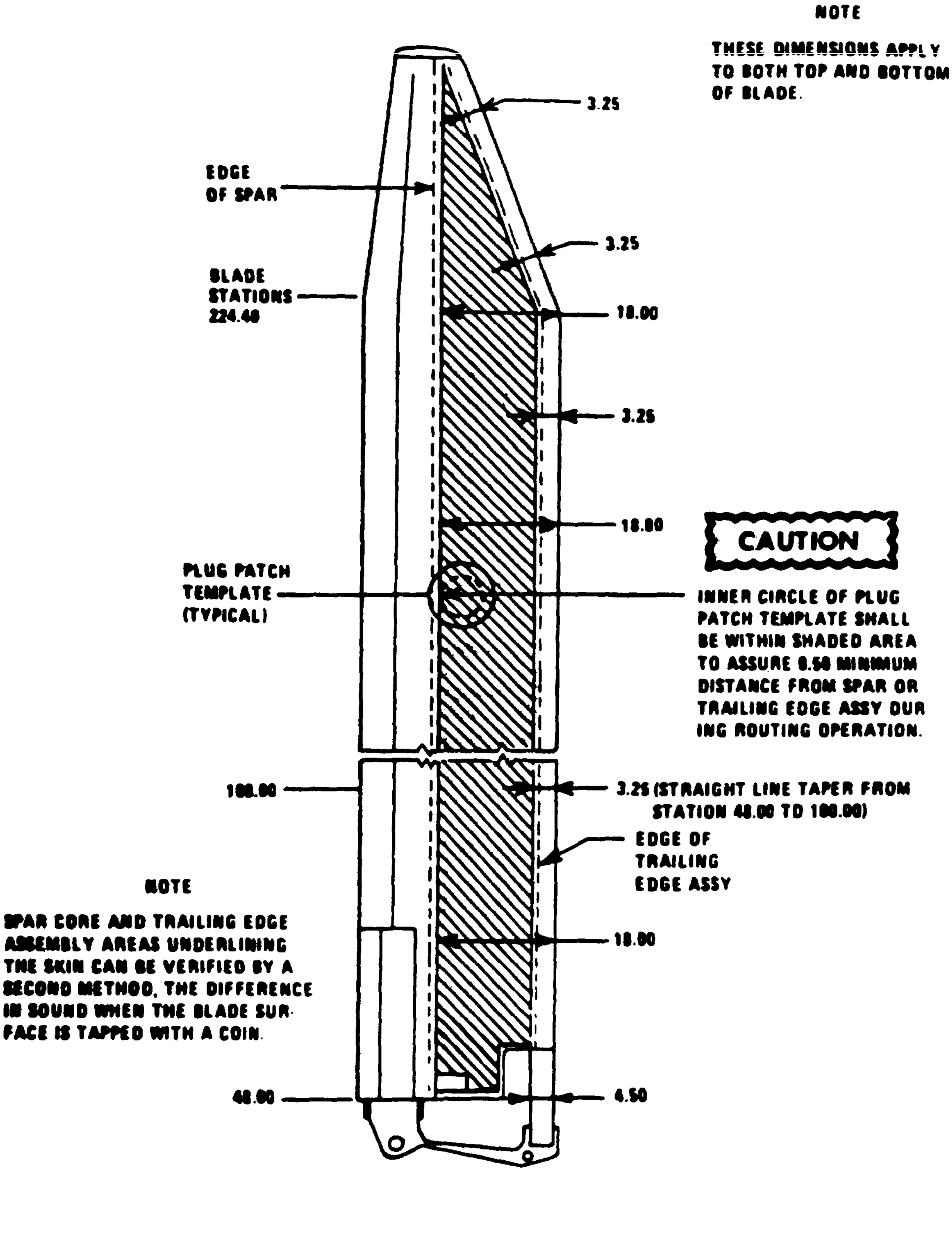
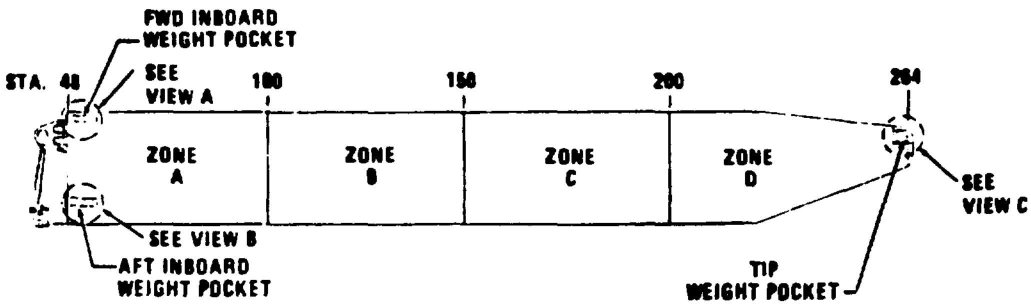


Figure 5-22. Proximity Limits for Patches - K747 Main Rotor Blades (Shoot 3 of 3)

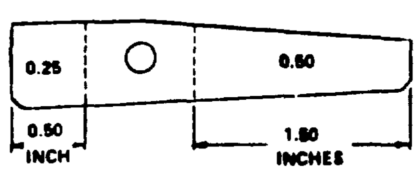


TYPE OF PATCH	SPANWISE CORRECTION SEE NOTES 1 AND 2				CHORDWISE CORRECTION SEE NOTE 3
	ZONE A	ZONE B	ZONE C	ZONE D	QUANTITY OF WEIGHTS
TRAILING EDGE DOUBLER	0.75	1.25	1.75	2.00	3
3 - IN. SKIN	0.00	0.25	0.25	0.25	0
6 - IN. SKIN	0.50	0.75	1.00	1.25	1
9 - IN. SKIN	1.25	2.00	2.75	3.75	3
3 x 0.25 - IN. PLUG	0.25	0.75	1.00	1.25	1
3 x 0.50 - IN. PLUG	0.50	0.75	1.00	1.25	1
3 x 1.25 - IN. PLUG	0.75	1.25	1.75	2.00	1
3 x 1.75 - IN. PLUG	0.75	1.25	1.75	2.00	1
7 x 0.25 - IN. PLUG	1.75	2.75	3.75	4.75	4
7 x 0.50 - IN. PLUG	1.75	2.75	3.75	4.75	4
7 x 1.25 - IN. PLUG	2.25	3.75	5.00	6.25	4
7 x 1.75 - IN. PLUG	2.50	4.25	5.75	7.00	4
EROSION GUARD PATCH (SEE NOTE 4)	0.50	0.75	1.00	1.25	1

NOTES

1. Remove listed quantity of K747-063-11 tip weights for each patch made in each zone. See view C, sheet 2.

2. To remove partial K747-063-11 tip weights, cut off 0.25 and/or 0.50 using following dimensions:



3. Move listed quantity of K747-056-11 weight washers from aft inboard weight pocket to forward inboard weight pocket for each blade patch made. See views A and B, sheet 2.

4. For each leading edge erosion guard patch made, move one K747-056-11 weight washer from forward inboard weight pocket to aft inboard weight pocket. See views A and B, sheet 2.

5. If a single patch is in two zones, use data for the most outboard of the two zones.

Figure 5-23. Balance Adjustment for Patches (K747 Blade) (Sheet 1 of 2)

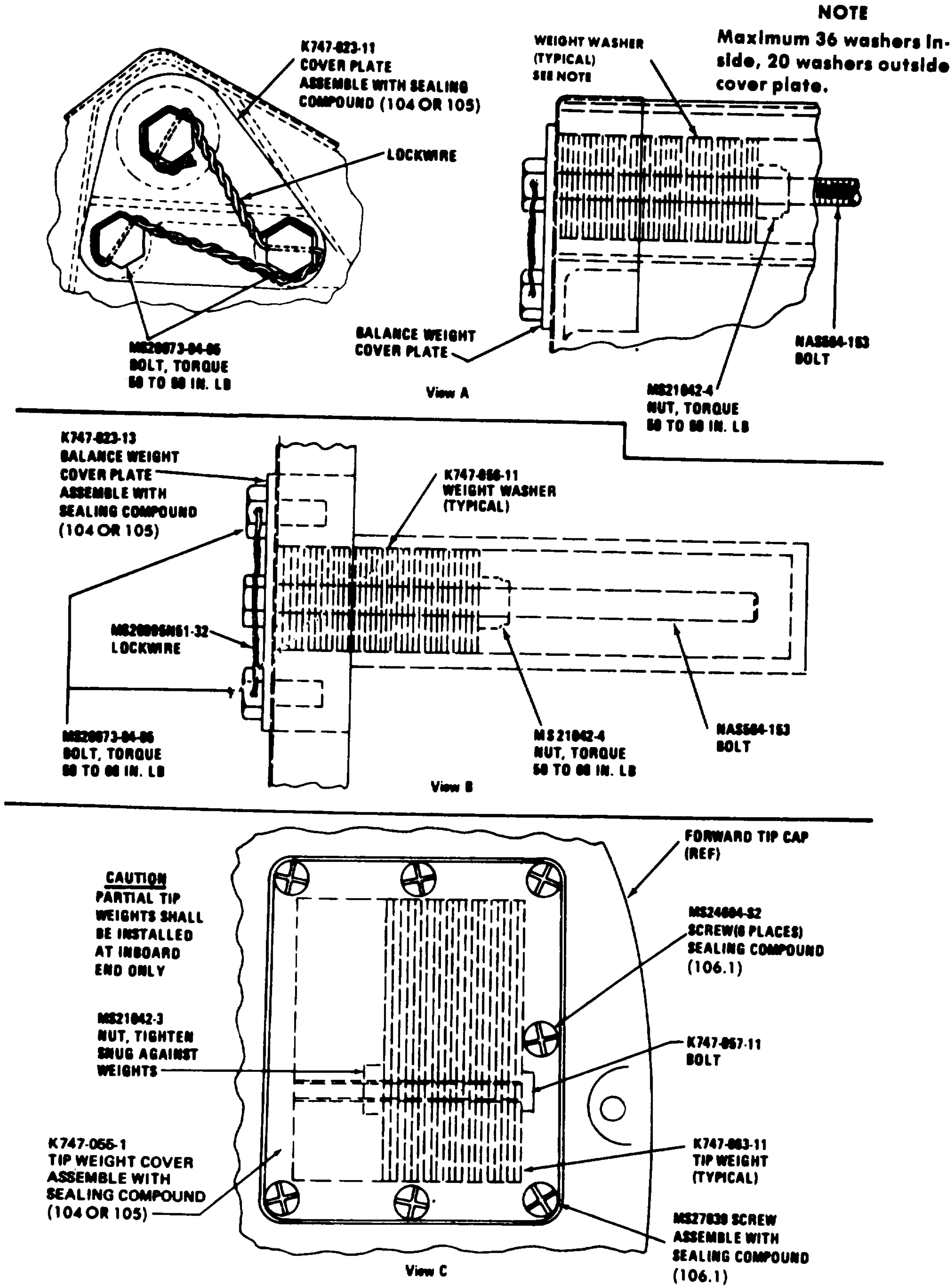


Figure 5-23. Balance Adjustment for Patches (K747 Blade) (Sheet 2 of 2)

Table 5-1.1 Classification of Damage - K747 Main Rotor Blades

MAIN ROTOR BLADE COMPONENT	TYPE OF DAMAGE A = Acceptable. Do not repair. U = Unacceptable, Replace R = Reparable if within requirements of paragraph 5-30				ALL DIMENSIONS ARE IN INCHES.
	NICKS, SCRATCHES, SKIN EROSION	DENTS	VOIDS	CUTS, TEARS, CRACKS	OTHER
a. Skin Over Core (Top or Bottom) NOTE 0.015 is approximately full depth of skin.	A to 0.005 deep. If 0.005 deep any intersections must be 0.50 apart min. R 0.005-0.015 deep if within area of 7.0 dia circle. (by skin patch)	A To 0.050 deep if no cracks or voids. If 0.050 deep must be 6.0 apart min. R If within area of 7.0 dia circle. (under 1.0 dia by skin patch, over 1.0 dia by plug patch)	A To 2.0 dia, and must be 2.0 apart min. R If within area of 7.0 dia circle. (by plug patch) NOTE **Voids may be detected by difference in sound when blade surface is tapped with a coin.**	R If within area of 7.0 dia circle. (under 1.0 dia by skin patch, over 1.0 dia by plug patch) R Resin starved skin is revealed along the 45° basketweave. The dry rovins stop where it goes under the adjacent basketweave. The paint system will be cracked & fiberglass will show as white strains. Repair with skin patch.	Punctures R If within area of 7.0 dia circle. (under 1.0 dia by skin patch, over 1.0 dia by plug patch) R Erosion of Paint IAW 5-31.18 refinishing paint. A Chordwise ridges or raised areas at stations 86 and 177. Diagonal ripples aft of spar stations 48-70 & 224-260.
b. Skin Over Spar or Trailing Edge Assy. (Top or Bottom) NOTES (1) 0.015 is approximately full depth of skin (2) Critical areas are two bands extending length of blade 0.5 fwd from spar/core joint. and 0.5 aft from trailing edge/core joint.	A No limit on length proximity or intersections. (1) To 0.005 deep in critical areas. (2) To 0.015 deep in other areas. R To 0.015 deep in critical areas if within area of 7.0 dia circle. (by skin patch)	A To 0.015 deep if no cracks or voids. If 0.015 deep center must not be in critical area, and must be 1.5 apart min. R Outboard of STA 65.7: over 0.015 deep, if not over 1.0 from blade trailing edge, and not over 3.0 spanwise. (by trailing edge doubler)	A (1) Within 0.25 of blade trailing edge, no limit on length. (2) Over 0.25 from blade trailing edge, to 1.0 dia and must be 2.0 apart min.	R (1) Outboard of STA 65.7: if not over 1.0 from blade trailing edge, and not over 3.0 spanwise. (by trailing edge doubler) (2) If 0.50 min from spar or trailing edge assy and within area of 7.0 dia circle (by skin patch)	R Blisters: Remove paint with 220 sandpaper (C102) & repaint IAW 5-31.18.
c. Skin Doublers at Inboard end. (Top or Bottom)	A To 0.015 deep on exposed surfaces only. No limit on proximity.	A To 0.015 deep if no cracks or voids. No limit on proximity	A (1) Leading edge doublers: 0.125 max at any edge. No limit on cumulative length. (a) 0.025 max at any edge. No limit on cumulative length. (b) 1.0 max dia if at least 2.0 from edge and any other void.		

Table 5-1.1. Classification of Damage - K747 Main Rotor Blades (Continued)

TYPE OF DAMAGE A = Acceptable. Do not repair. U = Unacceptable, Replace
R = Reparable if within requirements of paragraph 5-30

ALL DIMENSIONS ARE IN INCHES.

MAIN ROTOR BLADE COMPONENT	NICKS, SCRATCHES, SKIN EROSION	DENTS	VOIDS	CUTS, TEARS, CRACKS	OTHER
d. Trailing Edge Assembly NOTE Depths listed are in addition to the 0.015 depth of overlying skin.	A (1) Inboard of STA 48.0: to 0.015 deep. (2) STA 48.0 to 65.7. (a) To 0.010 deep any length. (b) 0.010-0.030 deep, total cumulative length must be under 5.0 in any 10.0 length of span. (3) Outboard of STA 65.7. (a) To 0.010 deep. (b) To 0.030 deep if within 1.0 of trailing edge, total cumulative length must be under 5.0 in any 10.0 length of span. R Outboard of STA 65.7: if not over 1.0 from blade trailing edge, and not over 3.0 spanwise. (by trailing edge doubler) patch		A (1) Inboard of STA 48.0 if not within 0.50 of blade trailing edge or joint with core. (2) Outboard of STA 48.0: to 0.125 forward from blade trailing edge. R Outboard of STA 65.7: if not over 1.0 from blade trailing edge and not over 3.0 spanwise (by trailing edge doubler) patch	A Inboard of STA 48.0 to 0.015 deep. R Outboard of STA 65.7: if not over 1.0 from blade trailing edge, and not over 3.0 spanwise. (by trailing edge doubler) patch	Punctures R Outboard of STA 65.7: if not over 1.0 from blade trailing edge, and not over 3.0 spanwise (by trailing edge doubler) patch
e. Trailing Edges Filled Area Sta 48 to 66.				A To 0.150 deep. R Greater than 0.150 deep. U Penetration of gold/brown substrate (spline).	

Table 5-1.1. Classification of Damage - K747 Main Rotor Blades (Continued)

MAIN ROTOR BLADE COMPONENT	TYPE OF DAMAGE A = Acceptable. Do not repair. U = Unacceptable, Replace R = Reparable if within requirements of paragraph 5-30				ALL DIMENSIONS ARE IN INCHES.
	NICKS, SCRATCHES, SKIN EROSION	DENTS	VOIDS	CUTS, TEARS, CRACKS	OTHER
f. Leading Edge Erosion Guard. (1) Estane Material Seal all blemishes regardless of depth with sealing iron.	A (1) To 0.050 if distance from guard trailing edge is over 1.0 on top or 2.0 on bottom. (2) To a depth that does not expose under surface if distance from guard edge is not over 1.0 on top or 2.0 on bottom,.		A (1) Deleted. (2) 1.5 max dia if at least 4.0 from edge and any other void. R (1) Edge void of any length, to 1/2 of guard chordal width, top or bottom. (2) At spanwise ends (STA 75.0 and 260.0) to 2.0 spanwise. (3) Voids in midspan shall be injected with (C98) and apply pressure.		Erosion A Until loss of weight causes helicopter vibration. Return to Depot Punctures R (1) To 0.125 width, any length. (2) To 0.5 width, 6.0 max length. (3) To 0.75 width, 2.0 max length. U Circular delaminations or crescent shaped raised areas over blade weight retention from Station 224.4 to Station 238.0 unacceptable if height exceeds 0.060 inch.
(2) Fluorocarbon Material Use Kit K747-207 for filling damage less than 3 sq. inches. Use Kit K747-206 for replacement of guard outboard of STA 213.5 for damage greater than 1 sq. inch. Fill all blemishes.	R Up to 1 sq. inch in area. Up to full depth.	R Up to1 sq. inch in area. Up to full depth.	R Up to 3 sq. inches in area. Up to full depth.	R Up to 3 sq. inches in area. Up to full depth.	EROSION A Until loss of weight causes helicopter vibration. U Circular delaminations or crescent shaped raised areas over blade weight retention from Station 224.4 to Station 238.0 unacceptble if height exceeds 0.060 inch.

Table 5-1.1. Classification of Damage - K747 Main Rotor Blades (Continued)

MAIN ROTOR BLADE COMPONENT	TYPE OF DAMAGE A = Acceptable. Do not repair. U = Unacceptable, Replace R = Reparable if within requirements of paragraph 5-30				ALL DIMENSIONS ARE IN INCHES.
	NICKS, SCRATCHES, SKIN EROSION	DENTS	VOIDS	CUTS, TEARS, CRACKS	OTHER
g. Stainless Steel erosion guard K747-003-303/-403 blade.	A • Surface nicks causing metal displacement of 0.002 inch or less. • Edge nicks of 0.002 inch depth or less. R • Surface nicks causing metal displacement greater than 0.002 inch and less than 0.015 inch deep and not exceeding a concentration of more than 1 sq. inch in a 4-inch diameter circle repair by blending. • Edge nicks greater than 0.002 and less than 0.015 inch deep - repair by blending. U Any nicks greater than 0.015 inch deep - replace guard.	A Smooth edge/smooth bottom surface dents less than 0.060 inch deep and not exceeding 4 dents per 4 inch diameter circle. Dents within circle must be separated by at least the minimum dimension of smallest dent. The maximum minimum dimension is 0.250. R Sharp edged dents not exceeding 0.005 inch depth or concentration of 10 for any given 4 inch circle - repair by blending. U • Smooth edge/smooth bottom surface dents exceeding requirements of "A" - replace S/S guard. • Sharp edged dents exceeding requirements of "R" - replace guard.		U None permitted. Replace guard.	Tapered seats at fastener locations. A • Up to 0.002 inch coining depth caused by fastener. • Smooth abrasion due to fastener head contact. U Greater than 0.002 inch coining depth caused by fastener - replacement required.
h. Aft Tip Cap	A To 0.060 deep. No limit on length or number.				R Cracks-Rout out damage to 0.060. Bond with C14.

Table 5-1.2. Classification of Damage - K747 Main Rotor Blades

TYPE OF DAMAGE — A - Acceptable. Do not repair. U - Unacceptable. Replace. R - Reparable if within requirements of paragraph 530.

All DIMENSIONS ARE IN INCHES.

COMPONENT	NICKS, SCRATCHES, SKIN EROSION	CORROSION
A. Root fitting	See figure 5-19	See figure 5-19
b. Drag Strut	See figure 5-20	See figure 5-20
c. Root fitting bolt	A To 0.050 deep on hex head and exposed thread ares.	R To 0.050 deep on hex head and exposed thread area (by polishing).
d. Cheek plate assembly	A Inboard of sta 48 to 0.015, no limit on length or number.	R To 0.035 deep.
e. Cheek plate fitting	A To 0.015 deep on exposed surfaces. A Cracks at 12 & 6 o'clock positions on faces with root fitting removed. R 0.015-0.030 deep on exposed surfaces (by polishing).	R To 0.030 deep on exposed surfaces (by polishing).
f. Balance weight covers	A Nicks, scratches, dents, and bends to 0.035 deep. R Bends and distortion over 0.035 deep (by mechanical straightening).	
g. Trailing edge fitting	A To 0.015 deep on exposed surfaces. R 0.015-0.030 deep on exposed surfaces (by polishing). No limit on length or number	R To 0.030 deep on exposed surfaces (by polishing).

Table 5-1.2. Classification of Damage - K747 Main Rotor Blades (Continued)

TYPE OF DAMAGE — A – Acceptable. Do not repair. U – Unacceptable. Replace. R – Reparable if within requirements of paragraph 5-30.

ALL DIMENSIONS ARE IN INCHES.

COMPONENT	NICKS, SCRATCHES, SKIN EROSION	CORROSION
h. Tip cap, forward (see note)	A To 0.030 deep. R 0.030-0.060 deep (by polishing).	Erosion: A Until loss of weight causes helicopter vibration. R Gap around tip cap. Sealer missing. Apply sealant (C107).
i. Tip weight cover	No limit on length or number. A To 0.030 deep. R 0.030-0.060 deep (by polishing).	Erosion A To 0.030 deep.

NOTE: The balance weights consist of several plates that are free to move within the cavity of the tip-balance weight cap. If the cavity is not full, the balance weight plates are able to move, producing the clicking noise during the static vertical movement of the blade. The clicking noise is to be considered normal, unless the tip-balance weight cap is not properly secured to its attaching pocket bracket.

WARNING

K747 main rotor blades shall not be intermixed with main rotor blades of any other typo on the same helicopter, because of performance differences.

NOTE

The following repairs con be made on the top and bottom of main rotor blade while blade, are installed on helicopter. When repair limits are questioned, proceed to next critical repair procedure.

5-30.1. REMOVAL AND REPLACEMENT OF ROOT FITTING - K747 MAIN ROTOR BLADES (K747-003-205, -209, -303 BLADES) (AVIM).

a. Remove K747 main rotor blade assembly (paragraph 5-27).

b. Remove cotter pin (1, figure 5-24), nut (2), washers, (3) bushing (3.1), and bolt (4).

c. Remove cotter pins (5 and 10), nuts (6 and 11), washers (7, 12, and 12.1), and bolts (9 and 14). Using tapered pin, gently drive bushings (8 and 13) oft to remove.

d. Remove drag strut (15) and set aside.

NOTE

Drag strut (15) is not interchangeable between rotor blades and must be reinstalled to match up with the rotor blade from which it was removed.

e. Remove cotter pins (16), nuts (17), washers (18, 19, and 21), and bolt (22) to remove root fitting (23). Do not remove bushings (20).

f. Replace root fitting (23) with a serviceable root fitting.

g. To install root fitting (23), position on blade, using o soft-hooded mallet.

h. Insert two locator pins, to assure holes or. in alignment. Dowel pins ore acceptable.

1. Remove top locator pin and install washers (21) os required on bolt (22). Drive bolt into position using soft-hooded mallet.

j. Remove lower locator pin and install washers (21) as required on bolt (22). Drive bolt into position using soft-headed mallet.

k. Install washers (18 and 19) and nut (17) on each bolt (22).

l. Draw nuts up tight to ensure bolt heads are properly sooted. This prevents any possibility of false readings when torquing nuts to specification.

m. Back off nuts for torquing. Torque nuts 30 to 150 inch-pounds. Adjust to ensure cotter pin hole alignment. Shim os necessary to gain hole alignment within torque range. Use washers (19) for shimming.

n. Install new cotter pin (16) in bolts. Trim cotter pin length. Bend long cotter pin length over end of bolt and short length towards bolt head.

o. Position dreg strut (15) on blade. Align aft inboard and outboard bushings of drag strut with bushing holes in trailing edge wrap fitting.

p. Install aft inboard bushing (8) and outboard bushing (13). Use a soft-heeded mallet, if necessary. Install bushing in oft to forward direction (trailing edge).

q. Install washer (7) on inboard bolt (9). Insert bolt (9) through trailing edge wrap fitting and drag strut (15) in an aft to forward direction. Use a softheaded mallet. Install washer (7) and nut (6) on bolt (9).

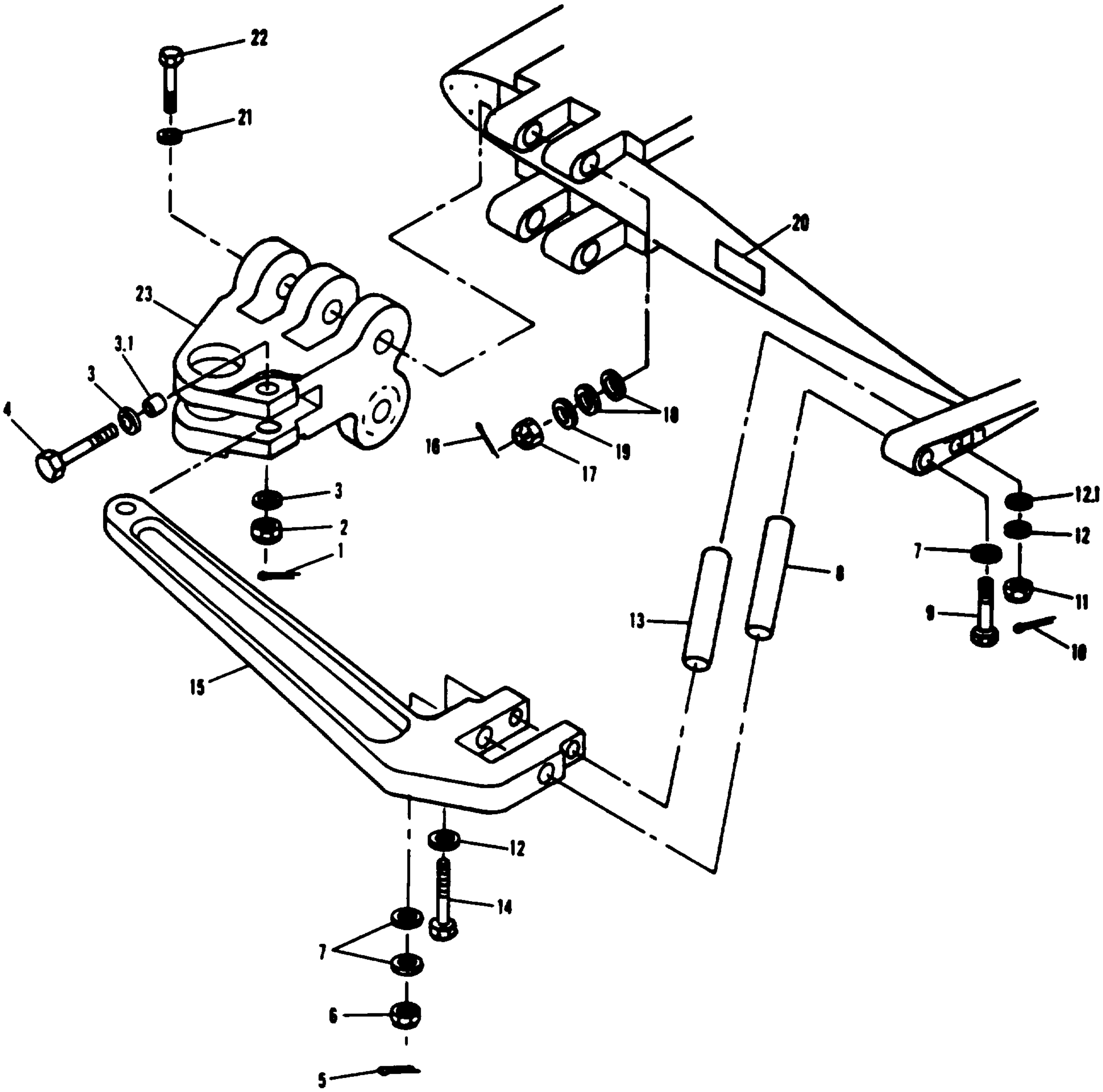
r. Install washers (12 and 12.1) on outboard bolt (14. Insert bolt (14) through drag strut (15) and trailing edge wrap fitting in forward to aft direction. Use a soft-headed mallet. Install washers (12 and 12.1) and nut (11) on bolt (14).

s. Install bushing (3.1) in root fitting (23). Install washer (3) on bolt (4). Insert bolt (4) through root fitting (23) and dreg strut (15). Install washer (3) and nut (2).

t. Drew nuts (2, 6, and 11) up tight to ensure bolt heads are properly seated. This prevents any possibility of false readings when torquing nuts to specification.

u. Torque nut (6) to 480 to 540 inch-pounds. Ensure cotter pin hole alignment. Torque nuts (2 and 11) to 120 to 150 inch-pounds. Ensure cotter pin alignment.

v. Install new cotter pins (1, 5, and 10). Trim cotter pin length. Bend long cotter pin length over end of bolt and short length towards bolt hood.



1. COTTER
2. NUT
3. WASHER
3.1. BUSHING
4. BOLT
5. COTTER PIN
6. NUT
7. WASHER
8. BOLT
10. COTTER PIN
11. NUT
12. WASHER
12.1. WASHER
13. BUSHING
14. BOLT
15. DRAG STRUT
16. COTTER PIN
17. NUT
18. WASHER
19. WASHER
20. PLATE, IDENTIFICATION
21. WASHER
22. BOLT
23. ROOT FITTING

Figure 5-24. Root Fitting Assembly (K747-205, -209, -303 Blades)

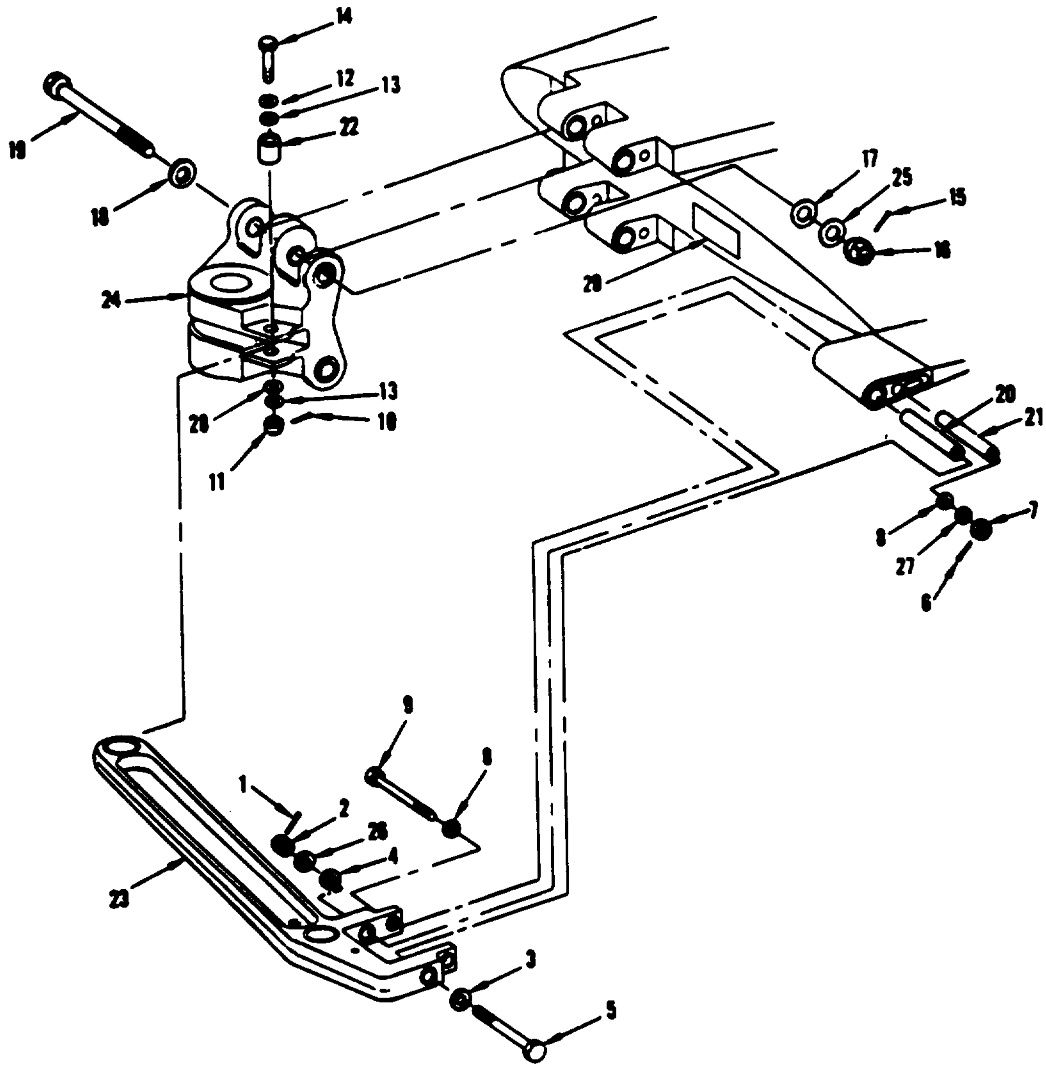


Figure 5-24.1. Root Fitting Assembly (-309, -401, -403 Blades)
(Sheet 1 of 2)

1. COTTER PIN
2. NUT
3. WASHER
4. WASHER
5. BOLT
6. COTTER PIN
7. NUT
8. WASHER
9. BOLT
10. COTTER PIN
11. NUT
12. WASHER
13. WASHER
14. BOLT
15. COTTER PIN
16. NUT
17. WASHER
18. WASHER
19. BOLT
20. BUSHING, INBOARD
21. BUSHING, OUTBOARD
22. BUSHING, SLIP FIT
23. DRAG SRUT
24. ROOT FITTING
25. WASHER
26. WASHER
27. WASHER
28. WASHER
29. PLATE IDENTIFICATION

Figure 5-24.1 Root Fitting Assembly (-309, -401, -403 Blades)
(Sheet 2 of 2)

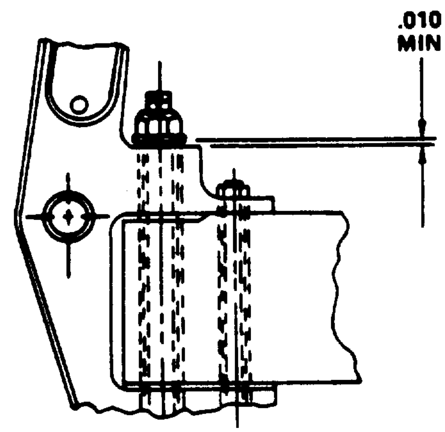


Figure 5-24.2. Drag Strut Assembly (-309, -401, -403 Blades)

5-30.2. REMOVAL AND REINSTALLATION OF ROOT FITTING - K747 MAIN ROTOR BLADES (K747-003-309, -401, -403 BLADES).

a. Remove K747 main rotor blade assembly (paragraph 5-27).

b. Remove cotter pins (1 and 6, Figure 5-24.2), nuts, (2 and 7), washers (3, 4, 8, 26, 27), and bolts (5 and 9), from drag strut at trailing edge wrap fitting.

c. Remove cotter pin (10), nut (11), washers (12, 13, and 28), and bolt (14), scouring drag strut to root fitting.

d Remove bushing (22) from leading edge of drag strut at root fitting.

CAUTION

Do not drive inboard aft drag strut bushing out in direction of leading edge. Irreparable damage to the drag strut could result. Support drag strut assembly during bushing removal.

e. Drive two bushings (20 and 21) out of drag strut and trailing edge wrap fitting in aft direction, supporting drag stint assembly during bushing removal, using a phenolic, aluminum, or wooden dowel and a soft-headed hammer. Keep dowel axis in line with axis of bushing being removed.

f. Remove drag strut from bide and set aside.

NOTE

Drag strut (23) is not interchangeable between rotor blades and must be reinstalled to match up with the rotor blade from which it was removed.

g. Remove cotter pins (15), nuts (16), washers (17, 18, 25), and bolts (19), to remove root fitting.

h. Replace root fitting (24) only if required. Refer to Table 5.1.1 and Figure 5-19.2.

i. To install root fitting (24), position on blade using a soft-headed mallet.

j. Insert two locator pins, to ensure holes are in alignment. Dowel pins are acceptable.

CAUTION

Beveled ID on washer (18) must face bolt head. Do not damage bolt threads or bushing bores when installing bolts.

k. Apply corrosion preventive compound, Brayco 599 (C44.1) to bolt shank. Remove top locator pin and install washer (18), beveled ID toward bolthead, on bolt (19). Drive bolt into position using a soft-headed mallet.

l. Apply corrosion preventive compound, Brayco 599 (C44.1) to bolt shank. Remove lower locator pin and install washer (18), beveled ID toward bolthead, on bolt (19). Drive bolt into position using a soft-headed mallet.

m. Install washer (17) under nut (16) on each bolt. If required, add washers (17 and/or 25) under nut (16) on each bolt to obtain cotter pin hole alignment.

n. Draw all nuts up tight to ensure boltheads are properly seated. This prevents any possibity of false readings when torquing nuts to specification.

o. Back off nuts for torquing. Torque nuts to 30 to 150 inch-pounds. Adjust to ensure cotter pin hole alignment.

p. Install new rotter pins (1, 6 and 10). Trim cotter pin length. Bend long cotter pin length over end of bolt and bend short length toward bolt head. Ensure that no sharp edges are exposed.

5-31. POLISHING AND CORROSION TREATMENT. K747 MAIN ROTOR BLADES (AVUM).

a. Polish out nicks, scratches, and corrosion on ex. posed metallic parts with No. 320 or finer sandpaper (C102) and touchup os required in accordance with paragraph 5-31.18:

b. Repairs requiring removal of drag strut (15, figure 5.16) may be made by removing attaching hardware. Following repairs as specified in step a. above, reinstall dreg strut using figure 5-16 as a guide.

5-31.1. APPLICATION OF SKIN PATCH - K747 MAIN ROTOR BLADES (AVUM).

CAUTION

Blade must contain sufficient balance weight to permit adjustment of blade balance after repair. Refer to paragraph 5-30 before starting any repair.

Grease or lead pencils will not be used. Only ball point pens will be used to make lines as shown. Marks other than those specified can weaken the repair..

a. Obtain blade repair tool set P/N K747-401-1 (T8).

b. Position blade for acces to damaged area (figure 5-25). Support blade to prevent movement and droop.

c. Measure diameter of damage.

d. Obtain adhesive package (C4) or alternate (C14).

e. Obtain skin patch repair kit no larger than necessary to overlap damage 1 inch all around. Skin patch kits are available in the following sizes:

Kit No.	Patch Diameter
K747-201-1	3 inch
K747-201-3	5 inch
K747-201-5	9 inch

f. Damage passing through both skins with core damage of less than 1 inch diameter shall be repaired by applying a skin patch to both top and bottom sides of blade.

g. Plato the template (kit) an the blade. Position the inner circle to enclose the damage. Hold the template from dipping, and draw a line around the outer circle of the template (View A, figure 5.25).

CAUTION

Excessive sanding will weaken blade skin. Sand only until yellow color is removed.

h. Starting with 120 grit and finishing with 220 grit abrasive paper (kit), sand the paint and yellow primer from the blade from the area within the guide circle. Sand only until yellow color is removed. Do not send skin fibers. Also, sand off any damaged matertial raised above normal contour of blade (View A, figure 5-25).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

CAUTION

Care shall be taken to prevent MEK from entering core area of blade. Spillage shall be avoided. MEK can damage leading edge erosion guard.

i. Put on cotton gloves (kit), then plastic gloves (kit). Leave on until completion of step r. Dampen cheesecloth (kit) with MEK (C74).

j. Wipe off all sanding dust.

k. Use template to redraw guide circle.

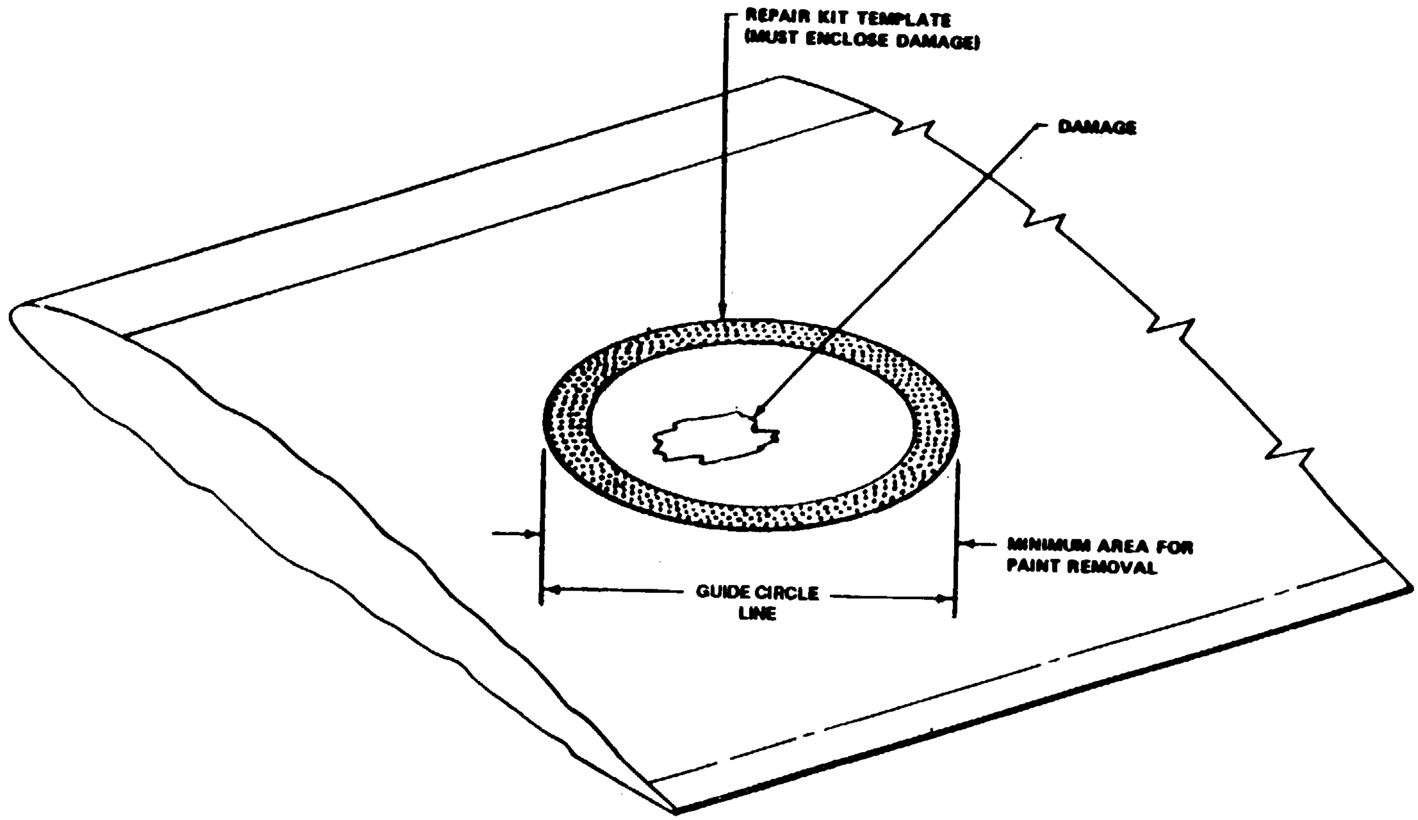
l. Cut short lengths of the masking tape (kit) and mask around the outside of guide circle (View B, figure 5-25).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

CAUTION

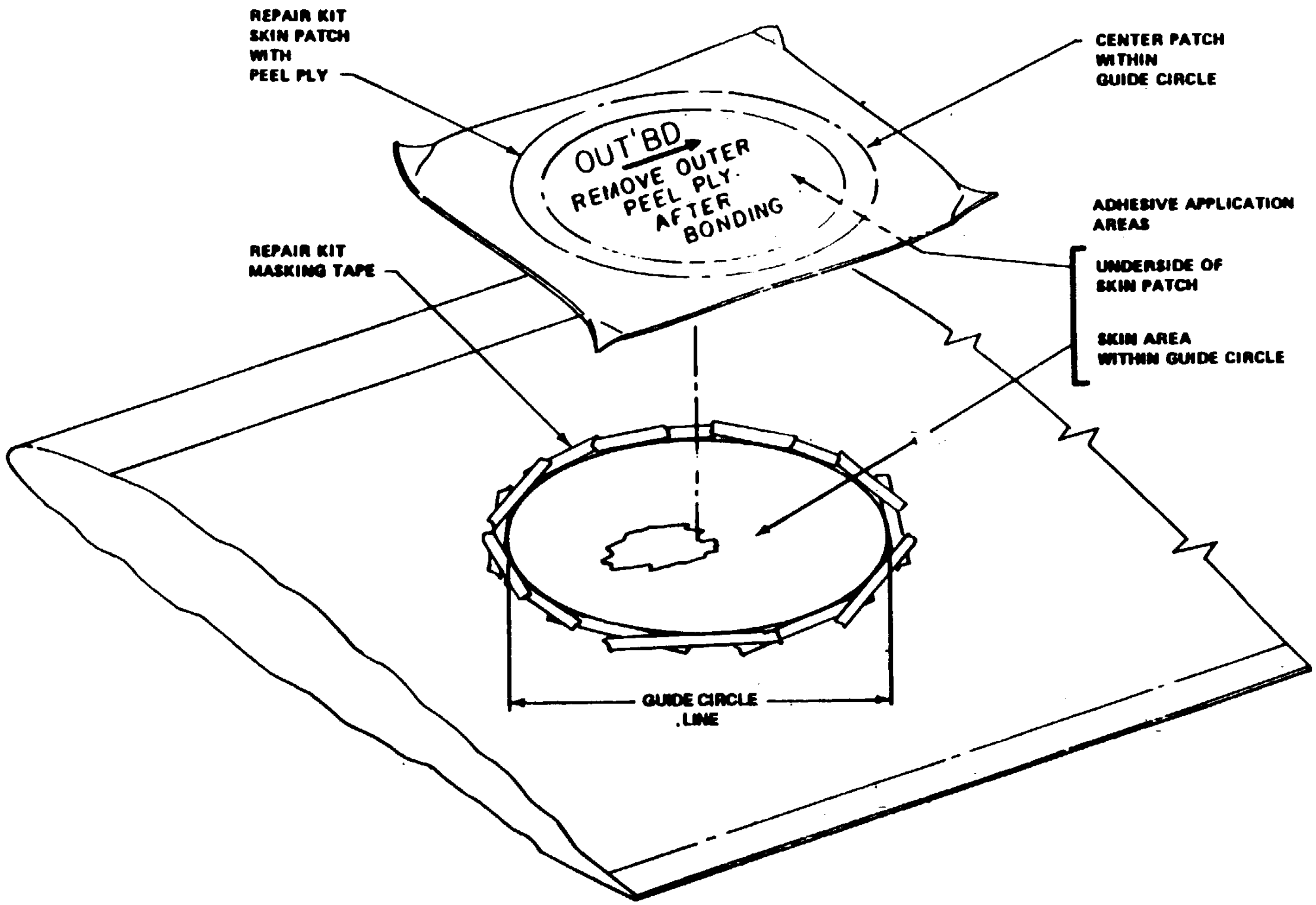
Care shall be taken to prevent MEK from entering core area of blade. Spillage shall be avoided. MEK can damage leading edge erosion guard.



View A. Marking work area

209747-7-1

Figure 5-25. Application of Skin Patch (K747 Blade) (Sheet 1 of 2)



View B. Application of adhesive, and positioning of patch.

209747-7-2

Figure 5-25. Application of Skin Patch (K747 Blade) (Sheet 2 of 2)

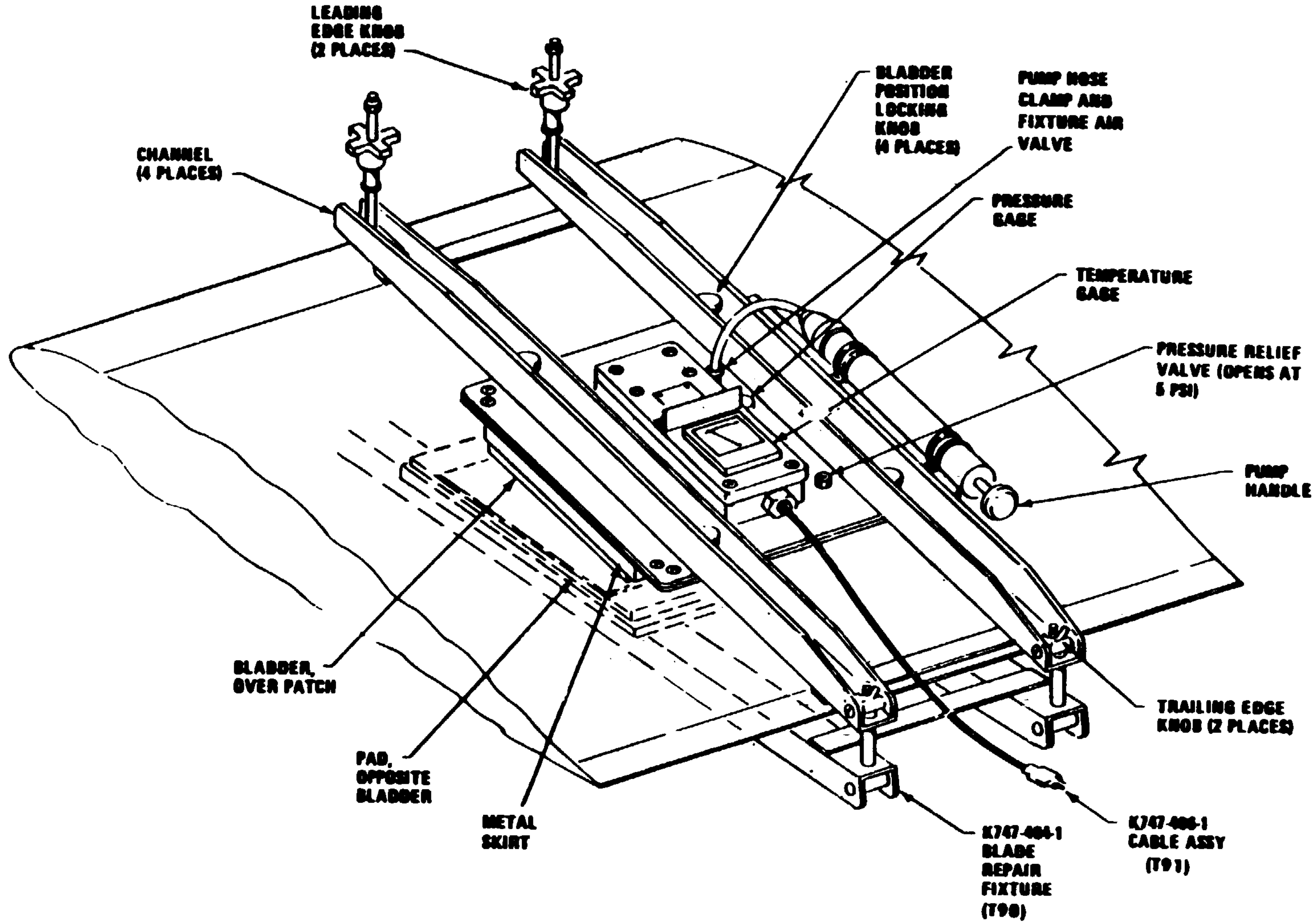


Figure 5-26. Curing Patch with Blade Repair Fixture (K747 Blade)

m. Dampen clean cheesecloth (kit) with MEK (C74) and clean inside masked area. Wipe with clean dry cheesecloth before dampness evaporates.

WARNING

Adhesive contains toxic ingredients. Provide adequate ventilation and protect the skin and eyes from contact with uncured resins or curing agent. Wash off uncured resins and curing agent from skin with warm water and soap. Avoid use of solvents for cleaning the skin.

NOTE

Never mix less than a complete two-part package of adhesive (C4). Mix the full batch and then discard the excess after the repair is completed.

n. Mix adhesive (C4) per manufacturer's instructions. Stir with wooden spatula until color is uniform and all streaks have disappeared. Adhesive (C14) may be used as an alternate.

NOTE

Pot life of adhesive (C4) is 15 minutes at 75° F (23.8° C). It is shorter at higher temperatures. Always check package dates to make sure the maximum adhesive life time limit of 1 year is not exceeded. Pot life of adhesive (C14) is approximately 1/2 to 1 hour at 75° F (23.8° C).

o. Using clean one inch brush (kit), apply a light coot of adhesive to blade skin, within guide circle, and to underside of skin patch (View B, figure 5-25).

p. Center skin patch within guide circle, with stenciled arrow pointing outboard (spanwise), and press firmly into place. Slide patch back and forth slightly under hand pressure to even adhesive. Use light hand pressure to squeeze the patch from the center to edge to work out any air bubbles.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

CAUTION

Care shall be taken to prevent MEK from entering core area of blade. Spillage shall be avoided. MEK can damage leading edge erosion guard.

q. Using clean cheesecloth (kit) dampened with MEK (C74), temporarily lift edges of peel-ply and wipe off excess adhesive.

r. Place masking tape over edge of patch in four places to prevent movement of patch. Place two long pieces of masking tape at right angles, centered over the patch spanwise and chordwise and extending beyond the dimensions of the blade repair fixture bladder.

s. Install blade repair fixture (T90) (figure 5-26).

(1) Install from trailing edge side of blades only.

(2) Center bladder over repair area and secure.

(3) Center pad opposite bladder and secure.

CAUTION

Tightening of locking knobs so that metal skirt around bladder is closer than 0.125 inch to blade can damage blade.

(4) Tighten fixture channel locking knobs until metal skirt around bladder is approximately 0.125 inch from blade skin.

(5) Actuate hand pump to obtain 4 psi minimum reading on pressure gage. Disconnect pump hose clamp from air valve.

NOTE

During curing, it may be necessary to periodically reconnect hose and to actuate pump to maintain 4 psi minimum.

(6) Connect 110 volt AC electrical power for curing time.

(a) 30 minutes for patches that overlap spar or trailing edge assembly.

(b) 15 minutes for patches that do not overlap areas defined in step (a).

(7) At end of curing time, disconnect electrical power and relieve air pressure by lifting center portion of relief valve.

t. Remove repair fixture from blade.

u. Refinish repair area.

(1) Remove peel-ply and masking tape from blade.

CAUTION

Sanding skin fibers can weaken blade.

(2) Using 220 or finer grit abrasive paper (kit), feather edge of adhesive squeeze-out around patch.

(3) Paint repaired area in accordance with paragraph 5-31.18.

v. Adjust blade balance weights as required by figure 5-24.

w. K747 blade repairs are requird to be logged in DA Form 2408-13 and -16. A permanent racord must be maintained to determine the minimum spacing requirements between repairs. Once a repair has been made, it is not possible to determine which type of repair has been applied.

5-31.2. INSTALLATION OF PLUG PATCH - K747 MAIN ROTOR BLADES (AVIM).

CAUTION

Blade must contain sufficient balance weight to permit adjustment of blade balance after repair. Refer to paragraph 5-30 before starting any repair.

a. Position blade for access to damaged area. Support blade to prevent movement and droop.

b. Measure diameter and depth of damage. (See figure 5-27)

c. Obtain plug patch repair kit no larger than necessary to replace damage. A core void 1 inch or less in diameter is permitted after repair. Plug patch kits are available as shown in table 5-2.

Table 5-2 Plug Patch Data

Kit Part No.	Plug Dia.	Plug Depth	Adhesive* Pkg Req. (32 grams ea)	Minutes Cure Patch Over Core Only	Patch Over Core/Spar Core/Trailing Edge
K747-201-7	3 in.	0.250 in.	0.333	15	30
K747-201-9	3 in.	0.500 in.	0.333	15	30
K747-201-101	3 in.	1.250 in.	0.666	30	30
K747-201-103	3 in.	1.750 in.	1.0	30	30
K747-201-105	7 in.	0.250 in.	1.0	15	30
K747-201-107	7 in.	0.500 in.	1.250	15	30
K747-201-109	7 in.	1.250 in.	2.0	45	45
K747-201-111	7 in.	1.750 in.	2.500	45	45

*Thirty-two grams of mixed adhesive (C14) will be equal to one adhesive kit (C4). 209747-10

d. Damage not more than 1.750 inches deep can be repaired with a single patch. Damage that passes completely through blade and is larger then 1 inch in diameter, will be repaired by installing plug patches from both top and bottom sides of blade. Install larger diameter and depth plug patch first (figure 5-28).

e. Obtain required number of adhesive packages (C4) as shown in table 5-2. If adhesive (C14) is used, obtain an equal amount.

CAUTION

Grease, or lead pencils will not be used. Only ball point pens will be used to make lines as shown. Marks other than those specified can weaken the repair.

f. Place the template (kit) on the blade. Position the inner circle to enclose the damage. Hold the template from slipping and draw lines around the inner and outer circles of the template (View A, figure 5-27).

CAUTION

Excessive sanding will weaken blade skin. Sand only until yellow color is removed.

g. Starting with 120 grit and finishing with 220 grit abrasive paper (kit), sand the paint and the yellow primer from the blade from the area between circles A and B. Sand only until yellow color is removed. Do not sand skin fibers (View A, figure 5-27).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

CAUTION

Care shall be taken to prevent MEK from entering core area of blade. Spillage shall be avoided. MEK can damage leading edge erosion guard.

h. Put on cotton gloves (kit), then plastic gloves (kit). Dampen cheesecloth (kit) with MEK (C74). Wipe off sanding dust.

i. Redraw circle A. This circle is the routing guideline.

WARNING

Disconnect router cord from outlet before. changing or installing bits or end mills, or making adjustments.

Insure router switch is in off position before connecting router to electrical power.

Keep hands and fingers away from rotating bits and end mills.

Guide router with both hands on router grip.

Use personal protection equipment; respirator, goggles, apron, etc.

CAUTION

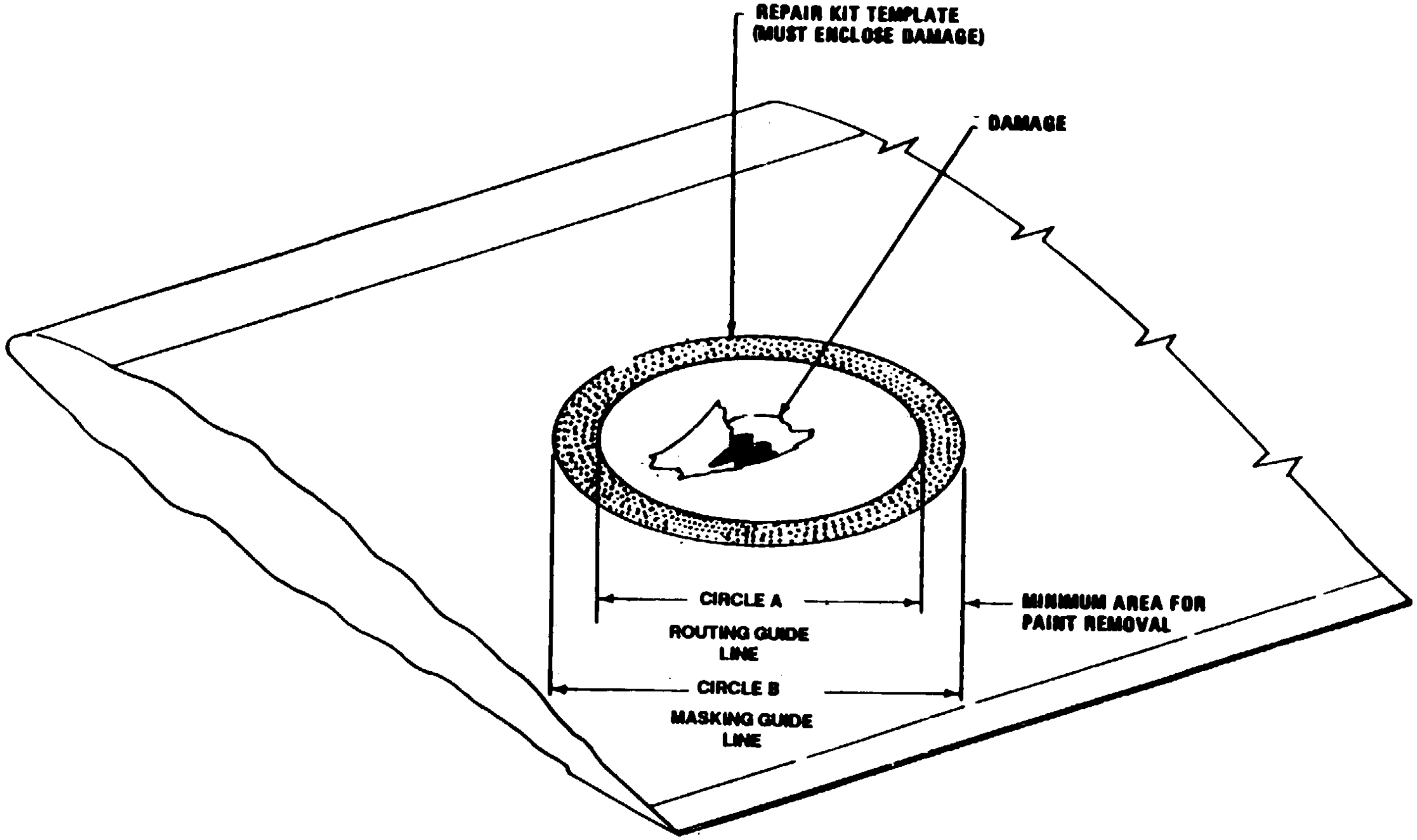
During all routing operations, long dimension of route base shall be kept in spanwise direction.

End mills will burn out if used to cut skin.

it is absolutely necessary to take every precaution not to damage the spar and trailing edge during routing. The spar in the loading edgo and trailing edge can be located by using the Instructions in figure 5-23.

j. Insert rasp-type bit, P/N 4-BR, in router collet. Set router depth of cut for 0.1875 inch. Rout a complete circle through the skin, inside of, and following circle A (View B, figure 5-27).

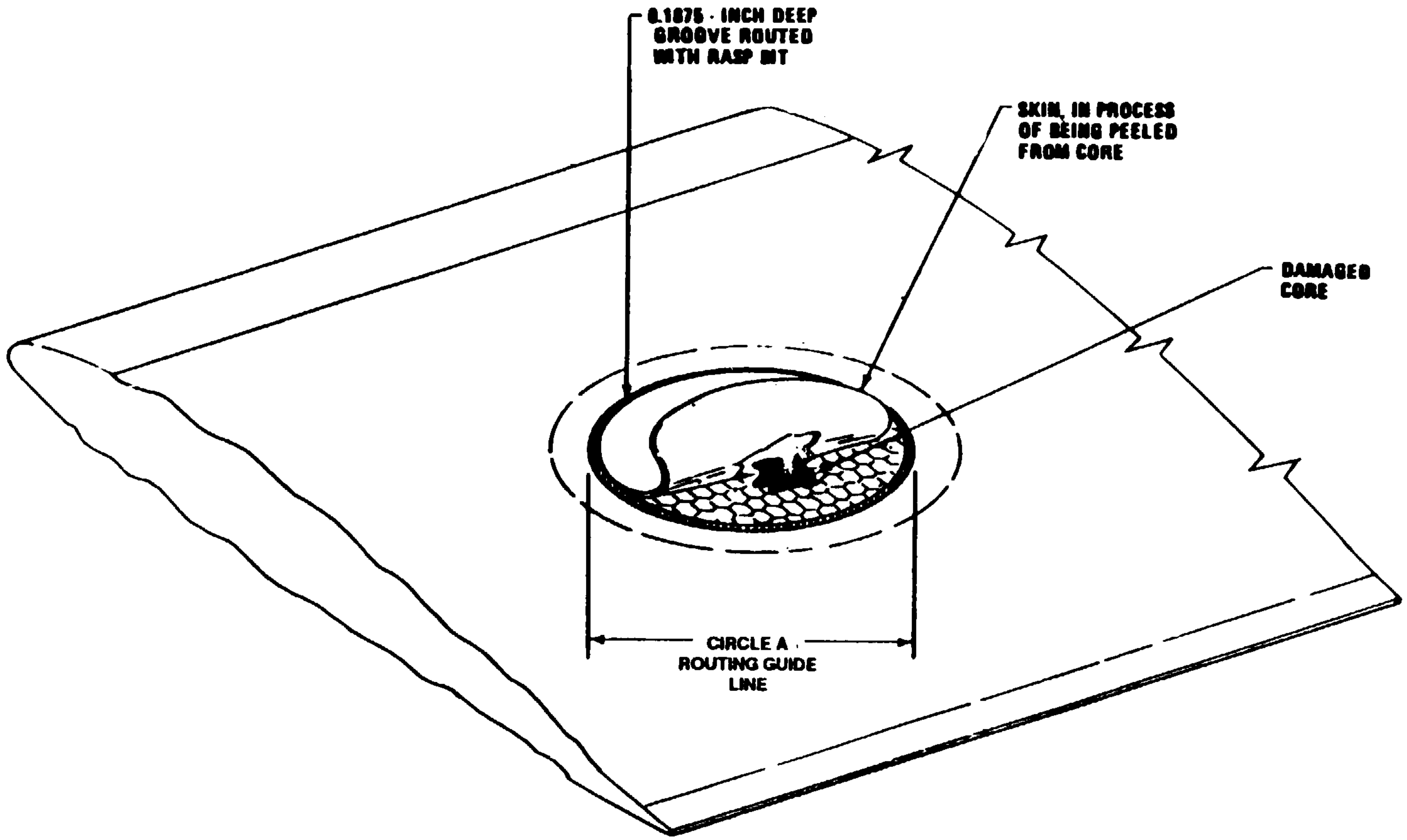
k. Using duckbill pliers, lift the edge of the cut circle of skin and peel the cut circle of skin off core (View 8, figure 5-27). After removing skin, check depth of core at trailing edge of circle. Core thickness at trailing edge side less than depth of plug selected will require use of more shallow plug or a double plug patch repair.



View A. Marking work area

209747-9-1

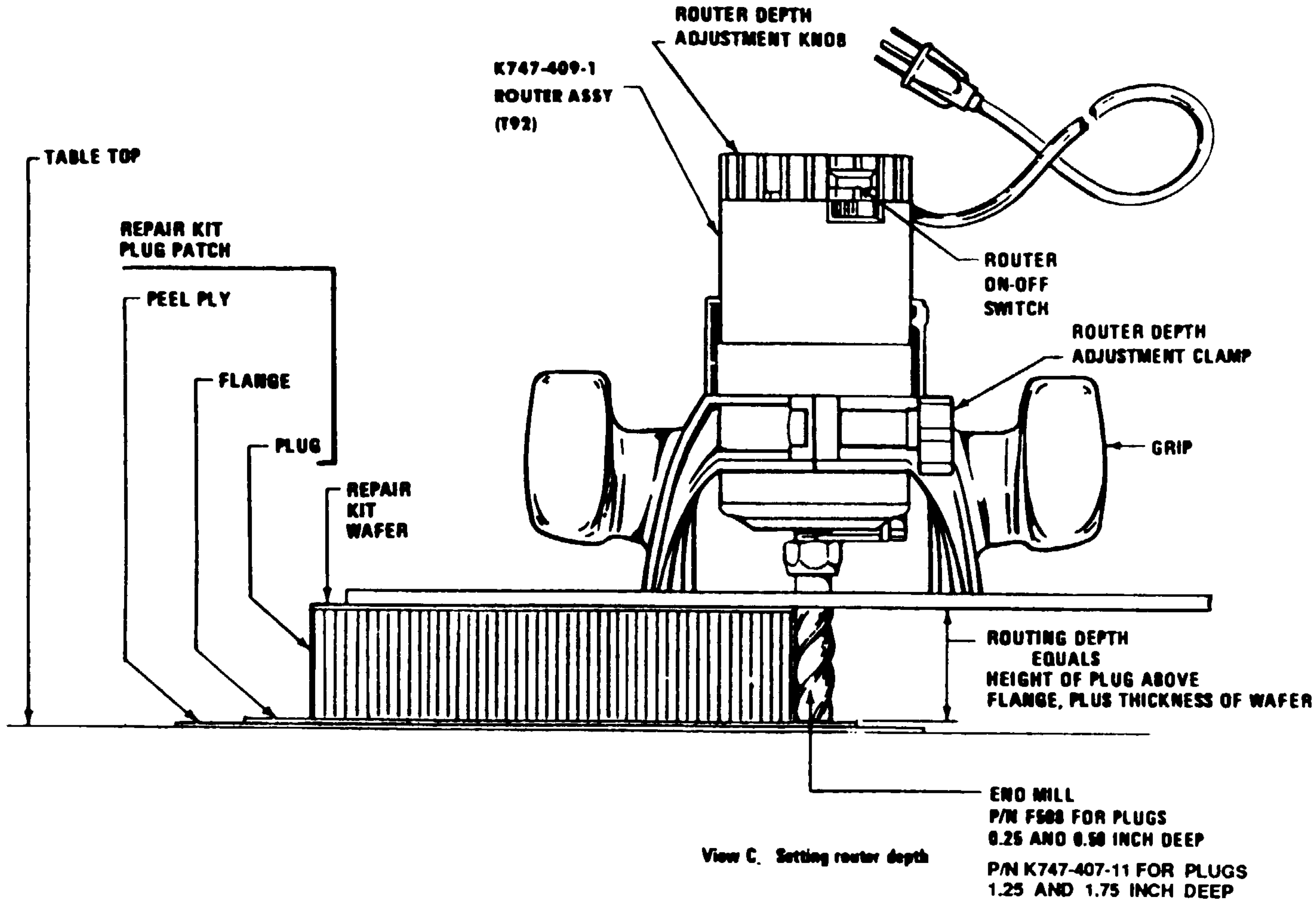
Figure 5-27. Installation of Plug Patch (K747 Blade) (Sheet 1 of 4)



View B. Removal of damaged skin

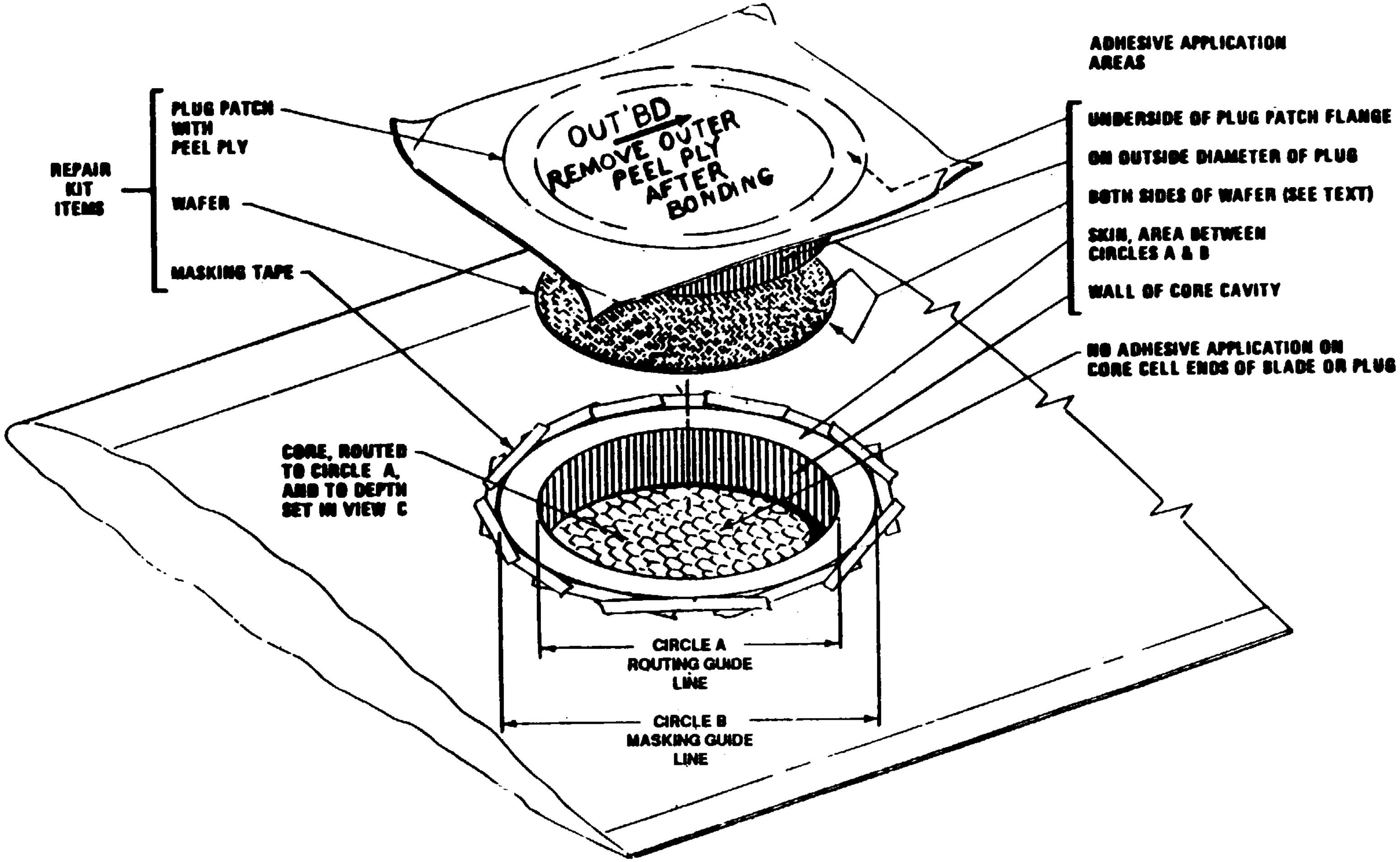
209747-9-2

Figure 5-27. Installation of Plug Patch (K747 Blade) (Sheet 2 of 4)



View C. Setting router depth

Figure 5-27. Installation of Plug Patch (K747 Blade) (Sheet 3 of 4)



View D. Insertion of patch

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Figure 5-27. Installation of Plug Patch (K747 Blade) (Sheet 4 of 4)

l. Insert end mill in router collet. Set router depth of cut to match depth of plug plus thickness of wafer (kit) (View C, figure 5-27). Rout out core. First rout a complete circle, following inside circle A. Then rout out remainder of core moving router in chordwise direction (View D, figure 5-27).

m. Wipe off all cuttings, sanding dust, etc. from repair ores.

n. Use template to redraw circle B.

o. Cut short lengths of masking tape (kit) and mask around the outside of circle B (View D, figure 5.27).

p. Put on cotton gloves (kit), then plastic gloves (kit). leave on until completion of step y.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

CAUTION

Care shall be taken to prevent MEK from entering core area to blade. Spillage shall be avoided. MEK can damage leading edge erosion guard.

Surfaces to be bonded must be clean, dry, and free of finger prints and all foreign matter.

q. Dampen clean cheesecloth (kit) with MEK (C74) and clean skin inside masked area. Also, clean both sides of wafer (kit) and underside of plug patch flange. Wipe with clean, dry cheesecloth before dampness evaporates.

WARNING

Adhesive contains toxic ingredients. Provide adequate ventilation and protect the skin and eyes from contact with uncured resins or curing agent. Wash off uncured resins and curing agent from skin with warm water and soap. Avoid use of solvents for cleaning the skin.

NOTE

Never mix less than a complete two-part package of adhesive (C4). When less than a full batch is required, mix the full batch and then discard the excess after the repair is completed.

Pot life of adhesive (C4) is 15 minutes at 75° F (23.8° C). It is shorter at higher temperatures. Always check package dates to make sure the adhesive life limit of 1 year is not exceeded. Work without delay. Pot life of adhesive (C14) is approximately 1/2 to 1 hour at 75° F (23.8° C).

r. Mix adhesive (C4) per manufacturer's instructions. Stir with wooden spatula until color is uniform and all streaks have disappeared. Repeat if more than one package is needed. Transfer adhesive to plastic coated paper cups.

s. Using clean one inch brush (kit), apply a liberal coat of adhesive to one side of wafer (kit) (View D, figure 5-27).

t. If repair is on top of blade, place wafer in routed cavity with adhesive side down.

u. If blade is installed on helicopter and repair is on bottom of blade, place adhesive side of wafer against plug (kit) with open ends of plug core up.

CAUTION

Adhesive should not be packed into cells of blade core or plug patch. Excess adhesive can cause blade to be out of balance.

v. Using spatula or brush (kit), apply a liberal coat of adhesive to walls of cavity in blade core.

w. Using brush (kit), apply a light coat of adhesive to:

(1) Blade skin in masked off area around core cavity.

(2) Plug patch flange surrounding plug.

(3) Outside diameter of plug.

(4) Second side of wafer.

x. Position plug patch in cavity with stenciled arrow pointing outboard (spanwise) and press firmly into place. Use light hand pressure to squeeze patch area overlapping blade skin to expel excess adhesive and air bubbles.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

CAUTION

Care shall be taken to prevent MEK from entering core area of blade. Spillage shall be avoided. MEK can damage leading edge erosion guard.

y. Using clean cheesecloth (kit) dampened with MEK (C74), temporarily lift edges of peel-ply and wipe off excess adhesive.

z. Place two long pieces of masking tape at right angles, centered over the patch spanwise and chordwise and extending beyond the dimensions of the blade repair fixture bladder.

aa. Install blade repair fixture (figure 5-26).

(1) Install from trailing edge side of blade only.

(2) Center bladder over repair ares and secure.

(3) Center pad apposite bladder and secure.

CAUTION

Tightening of locking knobs so that metal skirt around bladder is closer than 0.125 inch to blade can damage blade.

(4) Tighten fixture channel locking knobs until metal skirt around bladder is approximately 0.125 inch from blade skin.

(5) Actuate bond pump to obtain 4 psi minimum reading an pressure gage. Disconnect pump base clamp from air valve.

NOTE

During curing, it may be necessary to periodically reconnect hose, and to actuate pump to maintain 4 psi minimum.

(6) Connect 110 volt ac electrical power for curing time shown in table 5-2.

(7) At end of curing time, disconnect electrical power, and relieve air pressure by lifting center portion of relief valve.

ab. Remove repair fixture from blade.

ac. Refinish repair area.

(1) Remove peel-ply and masking tape from blade.

CAUTION

Sanding skin fibers can weaken blade skin.

(2) Using 220 grit abrasive paper (kit), feather edge of adhesive squeeze-out around plug patch.

(3) Paint repaired area in accordance with paragraph 5-31.18.

ad. Adjust blade balance weights as required by figure 5-24.

ae. K747 blade repairs are required to be logged in DA Form 2408-13 and -16. A permanent record must be maintained to determine the minimum spacing requirement between repairs. Once a repair has been made, it is not possible to determine which type of repair has been applied.

5-31.3. REPAIR OF TRAILING EDGE FILLED AREAS - K747 MAIN ROTOR BLADES (AVIM).

a. This repair is for cracks, chips or missing pieces of trailing edge filler substance which has been applied to the trailing edge between stations 48.0 and 66.0.

b. Determine depth of damage at deepest point. If depth of damage is less then 0.150 inch. no repair is necessary. If depth of damage is greeter then 0.150 inch but less then 0.250 inch, proceed to step f. If depth of damage is greater than 0.250 inch, proceed os follows.

c. Remove point from surface of damaged area by hand abrading with 220 grit abrasive paper to expose red/purple filler and clear skin bon. ding resin.

CAUTION

Remove only red/purple colored filler. Do not chip toward skin surface as damage to bonded skin may result. Do not penetrate the gold/brown substrate under the red/purple filler.

d. Carefully enlarge damaged area at deepest point of damage, exposing gold/brown substrate.

e. Inspect gold/brown substrate for cracks. If there are cracks in gold/brown substrate, blade is not repairable. If there are no cracks, proceed as follows.

f. Obtain adhesive package (C4) or alternate (C14).

g. Remove paint from surface of damaged area by hand abrading with 220 grit abrasive paper.

WARNING

Adhesive contains toxic ingredients. Provide adequate ventilation and protect the skin and eyes from contact with uncured resins or curing agent. Wash off uncured resins and curing agent from skin with warm water and soap. Avoid use of solvents for cleaning the skin.

NOTE

Never mix less than a complete two-part package of adhesive (C4). When less than a full batch is required, mix the full batch and then discard the excess after the repair is completed.

Pot life of adhesive (C4) is 15 minutes at 75° F (23.8° C). It is shorter at higher temperatures. Always check package dates to make sure the adhesive life limit of 1 year is not exceeded. Work without delay. Pot life of adhesive (C14) is approximately 1/2 to 1 hour at 75° F (23.8° C).

h. Mix adhesive (C4) per manufacturer's instructions. Stir with wooden spatula until color is uniform and all streaks have disappeared. Transfer adhesive to plastic coated paper cup.

i. Using a wooden spatula, fill the damaged area with adhesive.

j. Allow adhesive to cure at room temperature for 8 hours.

k. Use 220 grit abrasive paper and hand abrade adhesive to the contour of the trailing edge.

f. Refinish repair area in accordance with paragraph 5-31.18.

5.31.4. APPLICATION OF TRAILING EDGE DOUBLER PATCH. K747 MAIN ROTOR BLADES (AVIM).

CAUTION

Blade must contain sufficient balance weight to permit adjustment of blade balance after repair. Refer to paragraph 5-30 before starting any repair.

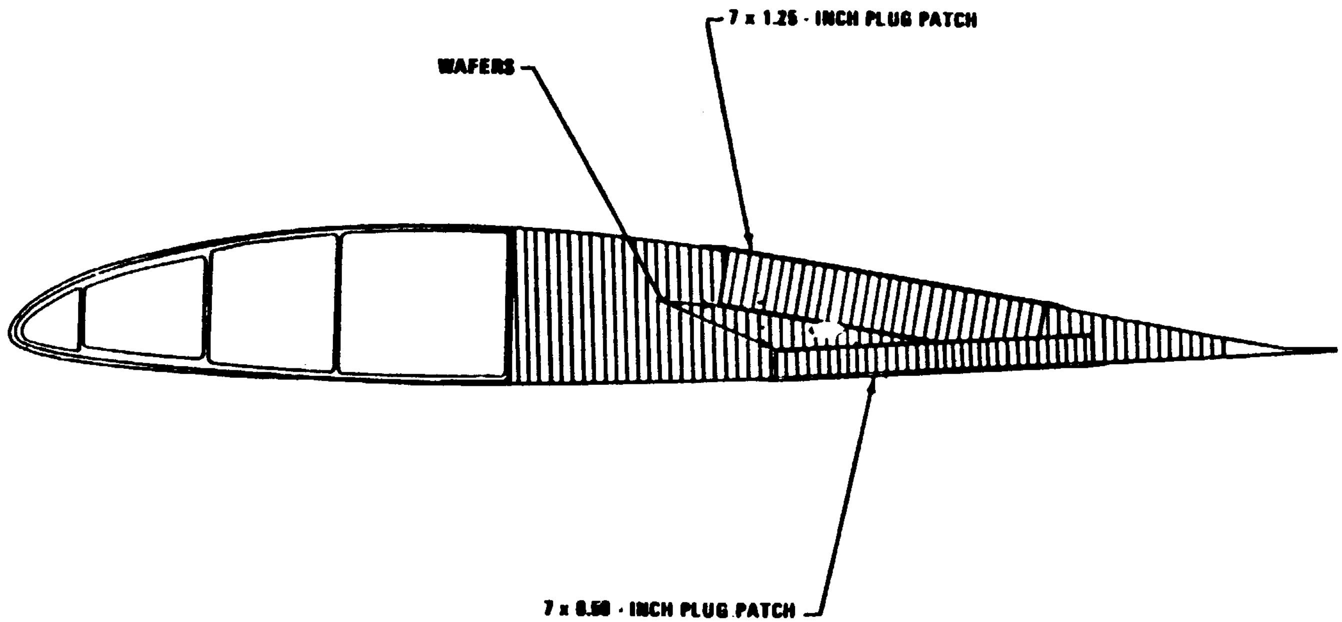
a. Position blade for access to damaged area. (See figure 5-28.1.)

b. Support blade to prevent movement and droop.

c. Obtain trailing edge doubler patch repair kit P/N K747-201-113, and adhesive package (C4). Adhesive (C14) maybe used as an alternate.

CAUTION

Grease or lead pencils will not be used. Only ball point pens will be used to make lines as shown. Marks other than those specified can weaken repair.



NOTE

LARGER PLUG PATCH
IS INSTALLED FIRST

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Figure 5-29. Typical Double Plug Patch Repair (K747 Blade)

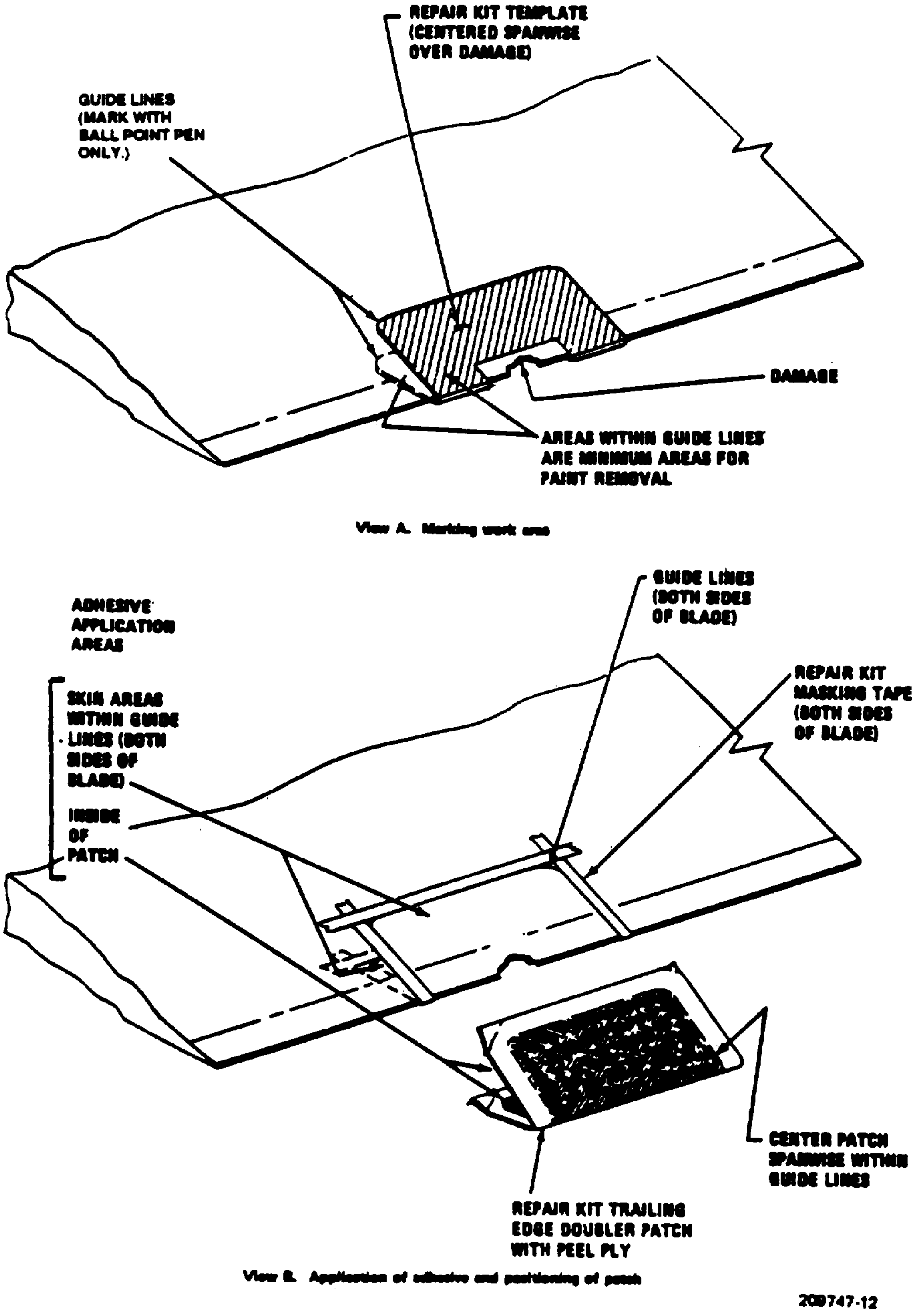


Figure 5-28.1 Application of Trailing Edge Doubler Patch (K747 Blade)

d. Place the template (kit) on the blade, centering it spanwise over the damage. Hold the template from slipping and draw a line around the template on both the top and bottom of the blade (View A figure 5-28.1).

CAUTION

Excessive sanding will weaken blade skin. Sand only until yellow color is removed.

e. Starting with 120 grit and finishing with 220 grit abrasive paper (kit), sand the point and the yellow primer from the blade from the area within the guide lines an both sides of blade and along trailing edge. Sand only until yellow color is removed. Also sand off any material that may be raised above the normal contour of the blade at edges of damage. Da not sand undamaged skin fibers (View A, figure 5-28.1).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

CAUTION

Spillage of MEK shall be avoided. MEK can damage leading edge erosion guard.

f. Put on cotton gloves (kit), then plastic gloves (kit). Leave on until completion of step o. Dampen cheesecloth (kit) with MEK (C74).

g. Wipe off all cuttings, sanding dust, etc. from repair area.

h. Use template to redraw guide lines (View A, figure 5-28.1).

I. Cut lengths of masking tape (kit) and mask around the outside of the guide lines (View B, figure 5-28.1).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

CAUTION

Spillage of MEK shall be avoided. MEK can damage leading edge erosion guard.

Surfaces to be bonded must be clean, dry and free of finger prints and all foreign matter.

j. Dampen clean cheesecloth (kit) with MEK (C74) and clean skin inside masked area. Wipe with clean dry cheesecloth before dampness evaporates.

WARNING

Adhesive contains toxic ingredients. Provide adequate ventilation and protect the skin and eyes from contact with uncured resins or curing agent. Wash off uncured resins and curing agent from skin with warm water and soap. Avoid use of solvents for cleaning the skin.

NOTE

Never mix less than a complete two-part package of adhesive (C4). When less than a full batch is required, mix the full batch and then discard the excess after the repair is completed.

Pot life of adhesive (C4) is 15 minutes at 75° F (23.8° C). It is shorter at higher temperatures. Always check package dates to make sure the adhesive life limit of 1 year is not exceeded. Work without delay. Pot life of adhesive (C14) is approximately 1/2 to 1 hour at 75° F (23.8° C).

k. Mix adhesive (C4) per. manufacturer's instructions. Stir with wooden spatula until color is uniform and all streaks have disappeared. Transfer to plastic tooted paper cup.

l. Using clean one inch brush (kit), apply a light coat of adhesive to inside surfaces of doubler patch (View B, figure 5-28.1) and to skin.

m. Center doubler patch within guide lines and press into place. Slide patch back and forth slightly under hand pressure to even adhesive. Push patch firmly against trailing edge and center within guide lines. Use light bond pressure to squeeze the patch from the center to edges to work out any air bubbles.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

CAUTION

Spillage of MEK shall be avoided. MEK can damage leading edge erosion guard.

n. Using clean cheesecloth (kit) dampened with MEK (C74), temporarily lift edges of peel-ply and wipe off excess adhesive.

o. Place masking tape ever edges of patch to prevent movement of patch.

p. Install blade repair fixture (figure 5-26).

(1) Install from trailing edge side of blade only with bladder side on blade upper surface.

(2) Position bladder aver repair area and secure.

(3) Center pad opposite bladder and secure.

CAUTION

Tightening of locking knobs so that metal skirt around bladder is closer than 0.125 inch to blade can damage blade.

(4) Tighten fixture channel lacking knobs until metal skirt around bladder is approximately 0.125 inch from blade skin.

(3) Actuate hand pump to obtain 4 psi minimum reading on pressure gage. Disconnect pump hose from air valve.

NOTE

During curing, it may be necessary to periodically reconnect hose and to actuate pump to maintain 4 psi minimum.

(6) Connect 110 volt ac electrical power for 30 minutes, or 2 hours if adhesive (C14) is used.

(7) At end of 30 minutes, disconnect electrical power and relieve air pressure by lifting center portion of relief valve.

q. Remove repair fixture from blade.

r. Refinish/repair area.

(1) Remove peel-ply and masking tape from blade.

CAUTION

Sanding fibers can weaken blade skin.

(2) Using 220 grit abrasive paper (kit), feather edge of adhesive squeeze-out around patch.

(3) Paint repaired area in accordance with. paragraph 5-31.18.

s. Adjust blade balance weights as required by figure 5-24.

t. K747 blade repairs are required to be logged in DA Farm 2408-13 and -16. A permanent record must be maintained to determine the minimum spacing requirement between repairs.

5-31.5. FIBER SEPARATION AND RESIN CRACKS - TRAILING EDGE SPLINE - K747 MAIN ROTOR BLADES.

a. The trailing edge spline, located at station 49.00 to 41.00, is made up of Kevlar fibers in a matrix of cured resin. Fiber separations may give the false appearance of a crack. Fiber separations filled and unfilled with resin are acceptable to the standards specified below. (See figure 5-28.2.)

NOTE

There is no limit on length, location, or closeness of separations in each respective area.

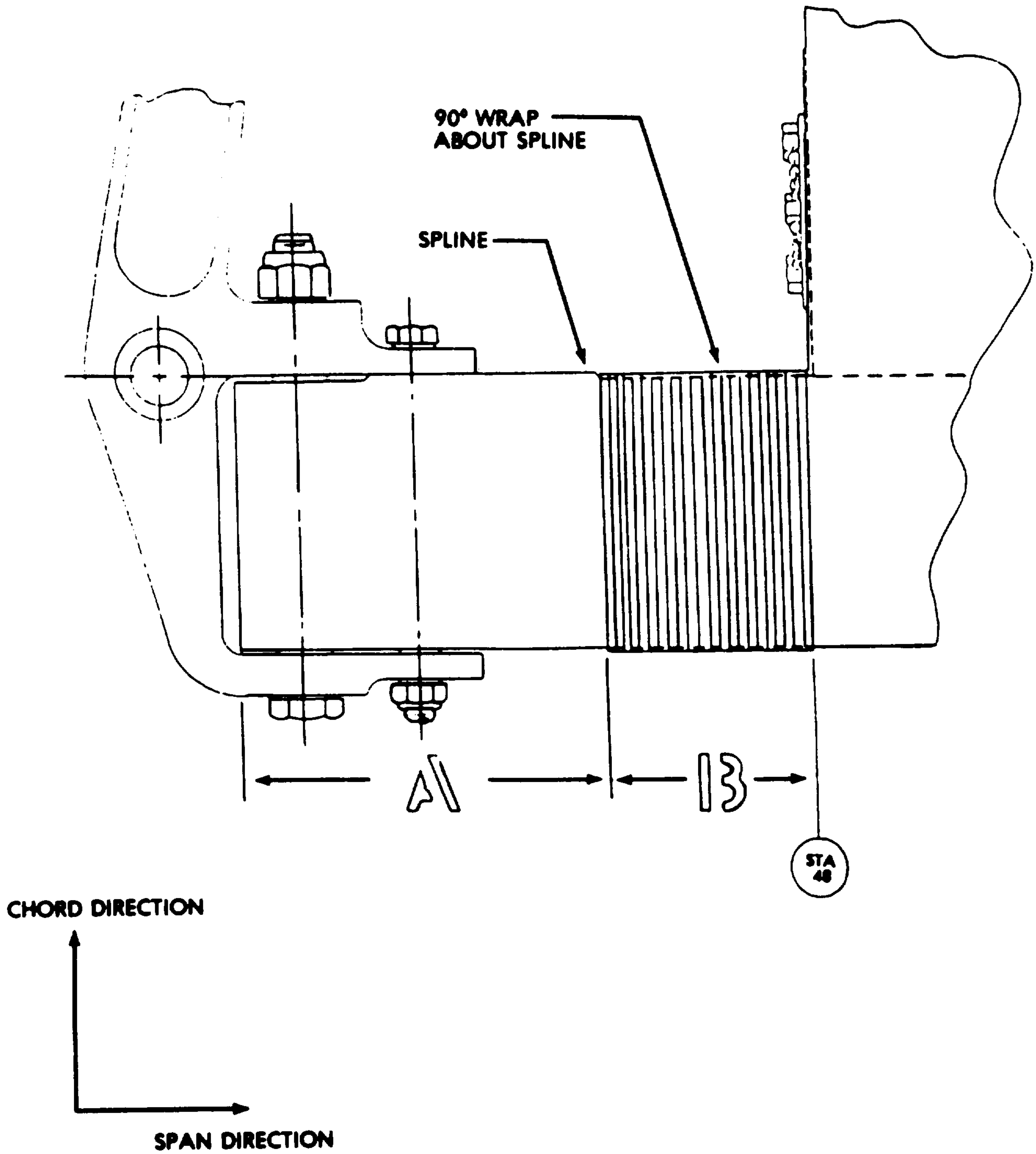


Figure 5-28.2. Spline Repair (K747 Blade)

b. Area A. Fiber separations not filled with resin are acceptable to a depth of 0.060 inch. Fiber separations with a depth of 0.060 to 0.200 inch shell be filled with sealer (C105) or adhesive (C14). Fibers ore oriented spanwise in this area, therefore, separations are generally oriented spanwise, too.

c. Area B. Fiber separations not filled with resin are acceptable to a depth of 0.025 inch. Fiber separations with o depth greater than 0.025 inch have penetrated into the area A type composite material and, therefore, foil under the area A allowable. Fiber separations may be filled with sealer (C105) or adhesive (C14) as desired.

d. K747 blade repairs are required to be logged in DA Form 2408-13 and -16. A permanent record must be maintained to determine the minimum spacing requirement between repairs. Once a repair has been made, it is not possible to determine which type of repair has been applied.

5.31.6. REBONDING DELAMINATED LEADING EDGE EROSION GUARD - K747 MAIN ROTOR BLADES (AVUM) .

a. Position blade for access to delaminated erosion guard. Support blade to prevent movement and droop. (See figure 5-28.3.)

b. Obtain erosion guard patch kit P/N K747-201-119 and epoxy resin (C98).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged broathing of vapors and contact with skin or eyes.

CAUTION

Isopropyl alcohol can damage leading edge erosion guard. Avoid spillage.

c. Prior to cleaning both the erosion guard and the blade surface, peel back the erosion guard approximately 0.5 inch to insure that total void or delaminated area is identified for repair. Using cotton tipped swab (kit) dipped in isopropyl alcohol (C64) solvent, clean surfaces to be banded.

d. Using masking tape (kit), mask blade along trailing edge of boot to prevent squeezed-out adhesive from coming in contact with the exposed blade surface.

e. Put on cotton gloves (kit), then plastic gloves (kit).

WARNING

Adhesive contains toxic Ingrediants. Provide adequate ventilation and protect the skin and eyes from contact with uncured rosins or curing agent. Wash off uncured rosins and curing agent from skin with warm water and soap. Avoid us. of solvents for cleaning the skin.

Protectiva equipment must be used when performing those repairs.

CAUTION

Both erosion guard and blade leading edge surfaces must be clean, dry, and free of finger prints and foreign matter.

f. Mix 100 parts/weight of epoxy resin (C98) with 12 parts/weight of DTA activator (C98) in a clean glass, metal, polyethylene, or plastic coated paper container.

NOTE

Pot life of adhesive is 15 minutes at 75° F (23.8° C). It is shorter at higher temperatures. Always check package dates to make sure the adhesive life limit of 1 year is not exceeded. Work without delay.

g. Using clean 0.25 inch brush (kit), apply a light coat of adhesive (C98) to both surfaces to be bonded.

h. Using finger pressure, press erosion guard to blade while working out excess adhesive from under the erosion guard. Wipe away excess adhesive with clean cheesecloth (kit) to prevent adhesive from running off the masking tape onto the exposed blade surface.

i. Lay teflon parting blanket (kit) over repair. Place masking tape (kit) over edges of parting blanket to prevent movement.

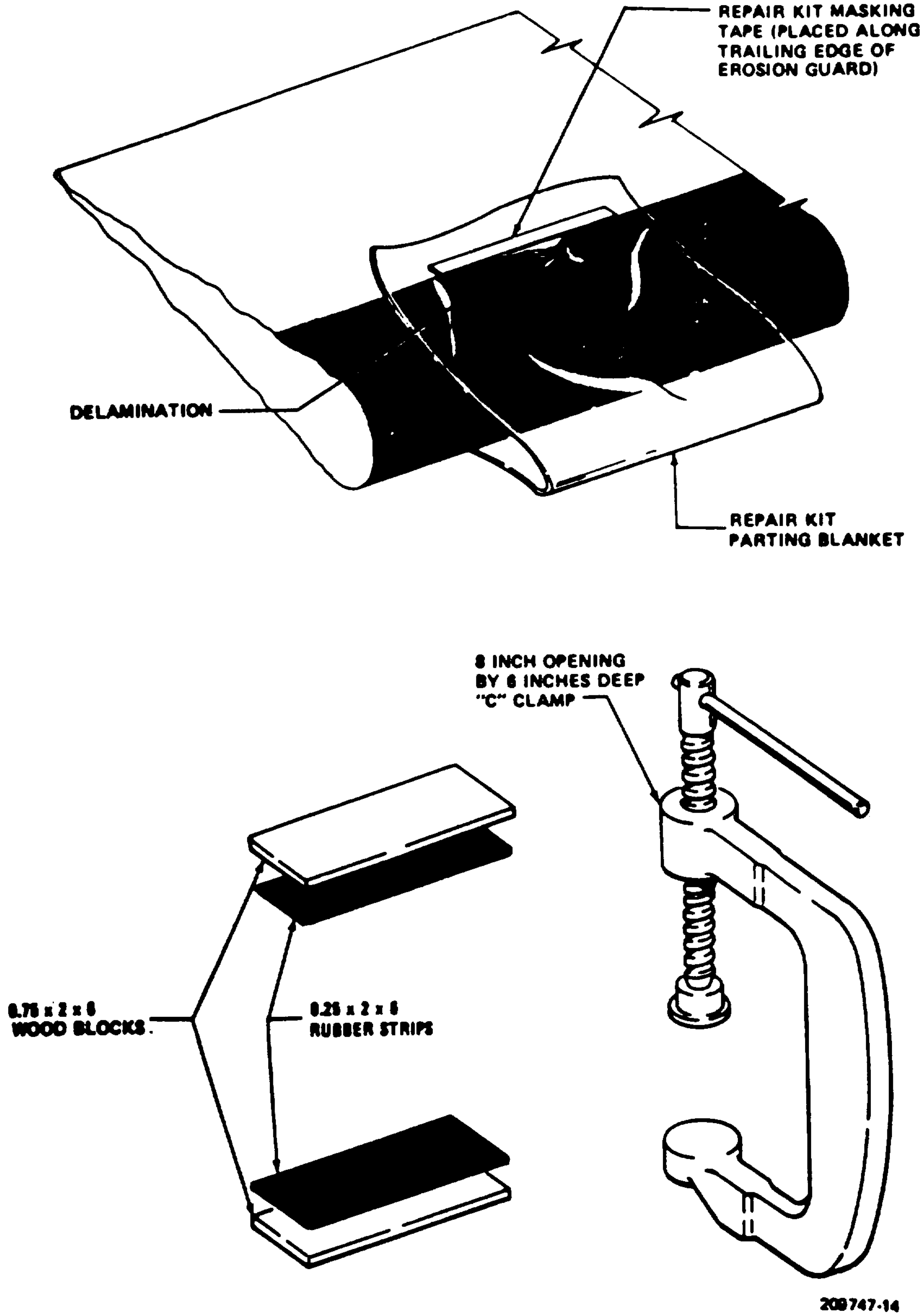


Figure 5-28.3. Rebonding Delaminated loading Edge Erosion Guard (K747 Blade)

j. Obtain two wooden blocks approximately 0.75 x 2 x 6 inches and a C clomp (8 inch opening by 6 inches deep). Place 0.25 x 2 x 6 inches strip of rubber between block and parting blanket. Place remaining block and rubber strip on opposite surface and, using C clamp, apply light pressure to rebonded area.

k. At end of four hours, at room temperature, remove clomp, blocks, rubber strip, parting blanket and masking tape.

5-31.7. REPAIR OF ESTANE EROSION GUARD K747-003-205/-309 MAIN ROTOR BLADES (AVUM).

a. This repair is for station 213.5 inboard, however, may be used outboard of station 213.5 (on estane material only) when time requirements dictate a need for quick repair. Obtain leading edge erosion guard patch kit P/N K747-201-119.

CAUTION

Excessive heat will cause the estane to loose its properties and bulge. Use

b. The cuts and nicks are repaired by softening the guard with sealing iron (T89).

c. Set the temperature at the minimum. Use just enough heat to cause the estane guard material to be soft. Keep the iron moving.

d. Small damage con be repaired by moving the material from each side of the damage with the sealing iron.

e. A 0.25 inch damage can be repaired by adding slivers of estane guard (kit).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

f. Using a clean 1-inch brush, apply one coat of MEK (C74). Do not overbrush the some ares more than three times.

g. Allow to air dry for a minimum of 1 hour.

NOTE

The coating will develop optimum durability in approximately 6 to 8 hours. Flying in rain conditions with less drying time may cause rapid erosion of resurfaced area.

5-31.8. REPAIR OF FLUOROCARBON EROSION GUARD. K747 MAIN ROTOR BLADES (AVUM) .

a. This procedure uses kit P/N K747-207-1 for the repair of nicks and cuts which involve loss then one square inch of damaged area in the following areas:

(1) K747-003-205/-309, between stations 213.5 and 260.0 where fluorocarbon leading edge erosion guard replacement has been accomplished. Check blade DA Form 2408-16 to determine this fact.

(2) K747-003-209-401 and -303/-403, any leading edge erosion guard surface.

CAUTION

Do not cut into the spar when cutting away damaged leading edge erosion guard areas.

b. Remove damaged leading edge erosion guard in area being repaired. Cut material away using a razor blada or equivalent to form an oval area. The sides of cut must slope inward toward center of damaged area. (See figure 5-28.4.)

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

c. Wipe exposed area with a cheesecloth (C30) dampened with MEK (C74).

d. Form a mold to contain injected adhesive. Proceed as follows:

(1) Cut a piece of #Y8412 tape (kit) in a rectangle which is approximately 1/2 inch larger than repair area.

(2) Cut a second piece of #Y8412 tape (kit) one inch larger in length and width than the piece cut above.

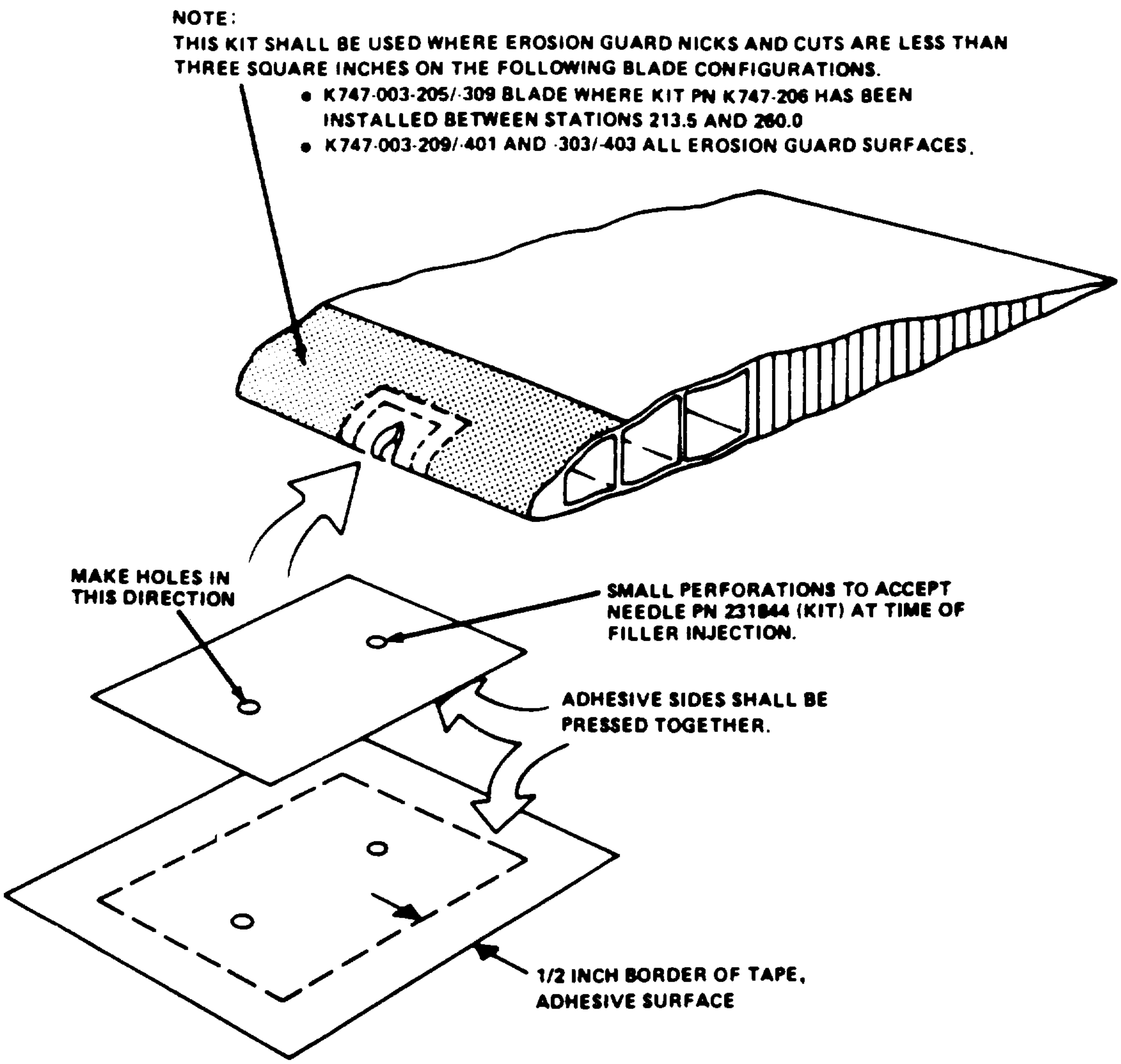


Figure 5-28.4 Typical Repair of Fluorocarbon Erosion Guard Nicks and Cuts Using Kit, PN K747-207

(3) Position smaller piece of tape (mating the adhesive surfaces) in the center of the larger one. A 1/2 inch exposod adhesive border will result. (See figure 5-28.4.)

(4) Locate tape mold centrally over damaged area so meting surface (adhesive border) faces outward. Poke two holes in the tape, one at each end of major axis of cut out repair area. The two hales should be mode with a 5/64 inch diameter drill bit and be large enough to accept syringe supplied with kit.

(5) Turn tape over (mating surface toward blade) and press into position as shown in figure 5-28.4. Ensure good tape adhesion is made. Do not press tape mold into void.

WARNING

Adhesive contains toxic ingredients. Provide adequate ventilation and protect the skin and eyes from contact with uncured resins or curing agent. Wash off uncured resins and curing agent from skin with warm water and soap. Avoid use of solvents for cleaning the skin.

Wear polyethylene gloves while mixing and injecting adhesive material.

NOTE

Pot life of adhesive is approximately 15 to 20 minutes. Do not use out-of-date adhesive. Work without delay.

e. Mix adhesive filler in plastic syringe by following manufacturer's instructions.

f. Inject adhesive filler into one hole until it seeps from second hole. Reverse action by injecting into second hole until the adhesive filler seeps from first hole. Ensure no air pockets are left beneath tape meld.

g. Cure repair using one of the following procedures:

(1) Three days at room temperature.

(2) Four hours at room temperature followed by 4 hours at 160 ± 10° F (71 ± 6° C). (Heat con be applied by lamps or a hot air gun.)

h. Cut excess adhesive protruding from injection holes with a razor blade.

i. Remove tape mold and abrade any high spots or excess matertial from erasion guard surface. Blend patch to match contour of surrounding areas using 240 grit abrasive paper.

5-31.9 APPLICATION OF LEADING EDGE EROSION GUARD PATCH . K747-003-205/-309 MAIN ROTOR BLADES (AVUM).

a. This repair is for station 213.5 inboard, however, may be used outboard of station 213.5 (on estane material only) when time requirements dictate o need for quick repair.

CAUTION

Blade must contain sufficient balance weight to permit adjustment of blade balance after repair. Refer to paragraph 5-30 before starting any repair.

b. Position blade for access to damaged leading edge erosion guard. Support blade to prevent movement and droop.

c. Obtain leading edge erosion guard patch kit P/N K747-201-119 and estane contact cement. Prepare estane contact cement far estane erosion guards as follows:

(1) Obtain a piece of estane material and some MEK (C74).

(2) Cut estane material into very small slivers approximately 0.025 inch in size.

(3) Combine estane and MEK. Suggested mix ratio is 15 grams of estane to 85 grams of MEK. Allow to stand for 24 hours. Agitate intermittently throughout this 24 hour period to ensure that the estane is totally dissolved.

(4) The solution is now ready to use and should be agitate before any such use.

CAUTION

Grease or lead pencils will not be used. Only ball point pen will be used to make lines as shown. Marks other than those specified can weaken repair.

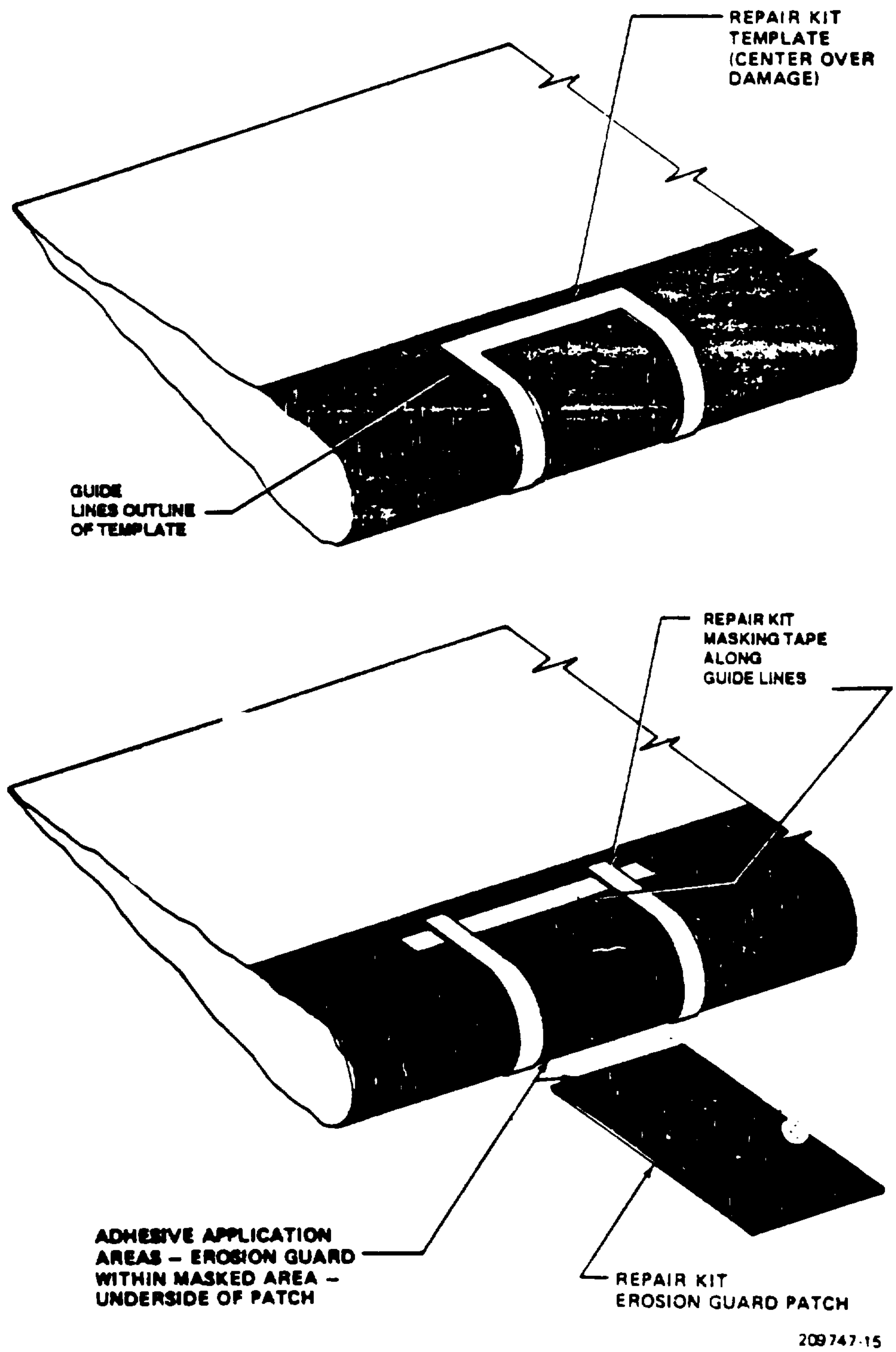


Figure 5-28.5. Application of Loading Edge Erosion Guard Patch (K747 Blade)

d. Place the template (kit) on the erosion guard centering it over the damage. Hold template from slipping and mark outline of template on erosion guard. (See figure 5-28.5).

e. Cut lengths of masking tape (kit) and mask around outside of the guide lines.

f. Using 180 or 220 grit sandpaper (kit), abrade area of erosion guard inside guidelines and underside surface of patch.

g. Put on cotton gloves (kit) and then plastic gloves (kit). Leave on until completion of step 1.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

h. Using clean cheesecloth (kit), and isopropyl alcohol (C64) solvent, wipe surfaces to be bonded.

i. Using clean one inch brush (kit), apply a light coat of estane contact cement within masked area of erosion guard and to the underside surface of the patch. Allow to air dry for five minutes.

CAUTION

Patch will adhere to erosion guard on contact. Make certain that patch is correctly aligned before making contact.

j. Starting towards leading edge of blade, install patch, working it carefully into place with fingers, using extreme care not to entrap air under patch. Press all areas of patch firmly into contact with erosion guard.

k. Remove masking tape.

l. Using one inch brush (kit), apply a medium thick coat of estane contact cement to the patch, extending over the edges of the patch to blend into adjacent area of the erosion guard.

m. Adjust blade balance weights as required by figure 5-23.

n. Allow to air dry 12 hours.

5-31.10. APPLICATION OF LEADING EDGE EROSION GUARD - K747 MAIN ROTOR BLADES (AVIM).

a. This repair is for use between stations 213.5 and 260.0 using kit P/N K747-206-1.

b. Remove the leading edge erosion guard between stations 215.5 and 260.0.

CAUTION

Grease or lead pencils will not be used. Use only a ball point pen.

(1) Mark a straight line chordwise on the top, bottom, and leding edge erosion guard surfaces at station 215.5 for defining the cut line. (See figure 5-28.6.)

CAUTION

Care must be exercised when cutting, lifting, or peeling leading edge erosion guard from skin, spar and filler surfaces. Damage to the spar or graphite/doubler components could result in scrapping of blade.

(2) Cut with a sharp knife and lii the leading edge erosion guard edge at station 215.5 on blade top surface using a one inch chisel or sharpened file blank. Peel leading edge erosion guard away in the outboard direction, working it loose by hand with a sharpened file blank.

(3) Repeat preceding step for blade bottom surfaces. Observe the necessary caution.

NOTE

A new thicker erosion guard repair part is supplied in kit K747-206-1. Some blades may still have a thinner original or replacement fluorocarbon erosion part in position. It is necessary to check each blade prior to application of a repair part to determine if the part being removed is the early thin or later thick dimension. All blades having a full estane or early fluorocarbon erosion guard, or a thin replacement fluorocarbon outboard guard section will require recontouring of the blade leading edge filler material.

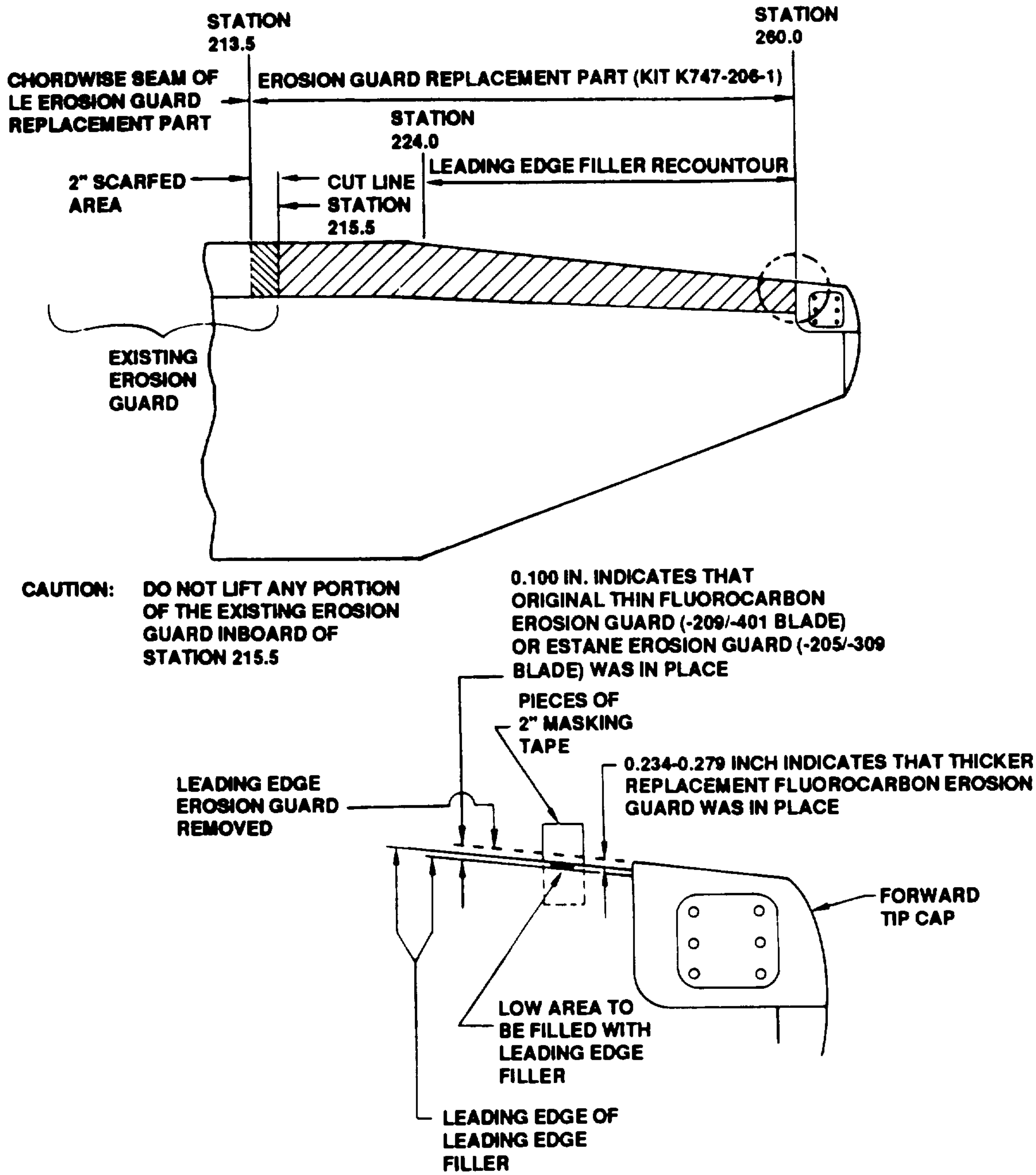


Figure 5-28.6 Placement of Erosion Guard Replacement Part (Kit K747-206-1) Method for Determining Current Boot Material and Thickness (K747 Blade Series)

c. Check dimensions of blades as shown in figure 5-28.6. If it is determined that the erosion guard just removed was one of the early thin parts, it will be necessary to recontour the leading edge filler to accommodate the new thicker replacement part. Do so using the following procedure.

(1) Using a ball point pen, locate and mark station 224.0 on leading edge of blade.

(2) At station 260.0 joint of forward tip cap and blade, measure distance from leading edge of tip cop to leading edge of blade. This dimension should be 0.234 to 0.279 inch. If dimension is not within the range, proceed to next step. If dimension is within the range, proceed to step d.

(3) Measure distance of 0.250 inch from leading edge of tip cap and mark blade tap and bottom surface. Draw a line on the blade top and bottom surface using a ball point pen and a straight edge between station 224.0 leading edge and set back dimension at station 260.0.

(4) Abrade a flat vertical surface of the leading edge filler along the two lines just drown. Use 50 to 80 grit abrasive paper wrapped on a wooden block.

(5) Radius the flat vertical surface of the leading edge filler just abraded. First radius at station 260.0 using a 5/64 radius gage. Then radius the leading edge from the existing radius at station 224.0 to the 5/64 radius at station 260.0.

(6) Lay a straight edge with edge coated with chalk, against leading edge of blade between the station 260.0 indent and station 224.0 as marked. There should be no gap greater than 0.010 inch between them. To bring any gaps within tolerance, proceed as follows:

(a) Far any high spots, hand abrade using 50 and 80 grit abrasive paper wrapped on a wooden black for a straight edge contour.

(b) For any low spots, it will be necessary to fill with leading edge filler. Refer to paragraph 5-31.12 for mixing filler resin (C53.1). Refer to figure 5-28.6 for attaching masking tape mold. Using wooden spatula, apply a sufficient amount of filler at low spot to do the repair. Wrap masking tape over repair surface and let dry for 15 minutes. Abrade as in stop (a) above for a straight edge contour.

CAUTION

Use protective equipment over eyes and mouth when abrading. Be careful not to abrade or nick spar surfaces.

(7) Check leading edge filler on both top and bottom surfaces for any depressions between stations 260.0 and 224.0 and fill as in step (b) above. Using a right angle air motor and a 3 inch x 80 grit abrasive disc, abrade surfaces to a smooth contour.

(8) Using a vacuum or a clean, dry, oil-free cloth, clean both blade surfaces of any abrading dust.

d. Prepare blade surfaces for application of leading edge erosion guard part.

CAUTION

Care must be exercised not to abrade spar surfaces.

Removal of paint from blade surface any distance greater than 1/4 inch aft of erosion guard trailing edge will destroy blade lightning protection.

(1) Abrade faying surfaces of blade to remove any adhesive residue left from erosion guard removal. Use a disc sender and a 3 inch x 120 grit abrasive disc.

CAUTION

Grease or load pencils will not be used. Use only a ball point pen.

(2) Mark a straight line parallel to cut line on the top, bottom, and leading edge erosion guard surfaces at station 213.5 for defining the scarf line. (See figure 5-28.6.)

(3) Scarf remaining leading edge erosion guard from surface at station 213.5 down to spar at station 215.5. Use marks made in step (2) above as guidelines. Check scarfed surface with a straight edge. Use a disc sander and a 3 inch x 24 grit, then 80 grit abrasive disc.

(4) Abrade blade bottom surface to accept a 1 x 6 inch test sample. Use 120 grit abrasive paper. (See figure 5-28.9.)

(5) Restore any uralite surfaces (aver weight retention bolts) which may have been damaged during leading edge erosion guard removal using the following method. If no damage occurred in this area, proceed to step (6).

(a) Remove any loose uralite from damaged area.

(b) Place bag sealant, if needed, around damaged uralite area to act as a dam as shown in figure 5-28.7.

CAUTION

Filler resin contains toxic ingredients. Provide adequate ventilation and protect skin and eyes from contact with uncured resins or curing agent. Wash off uncured resins or curing agent from skin with warm water and soap. Avoid use of solvents for cleaning skin.

NOTE

Filler resin should be thoroughly mixed until all streaks in the mixture are eliminated. Do not whip any air into mixture.

Blade may be tilted to level resin in the dam around the repair area.

(c) Mix enough potting resin (C86.2) part A 100 parts/weight with part B 40 parts/weight to restore area being repaired.

(d) Pour resin into and fill area dammed by bag sealant (if used) or wipe in place with a squeegee.

(e) Allow resin to cure for a minimum of 12 hours at 75° F (23.8° C).

CAUTION

Do not abrade any surface surrounding uralite potting resin. Damage would be inflicted that would require depot repair.

(f) Remove bag sealant dam surrounding the cast resin (if used). Abrade resin flush with blade contour using a 3 inch x 24 grit then 80 grit sanding disc.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

(6) Wipe any foreign material from blade repair area using a cheesecloth (C30) dampened with solvent (C132). Repeat this step two more times, wiping solvent dry before it evaporates. Allow 15 minutes for solvent evaporation.

(7) Wipe replacement erosion guard on mating and outside surfaces with MEK (C74). Repeat this step two more times, wiping solvent dry before it evaporates. Allow 15 minutes to dry.

(8) Apply 2 inch wide nylon tape to both top and bottom blade surfaces as shown in figure 5-28.8, detail A. The tape should be 0.250 inch oft of erosion guard trailing edge on blade top and bottom surfaces. This will provide an area to include a test specimen under vacuum bagging on blade bottom surface as shown in figures 5-28.8, detail A, and 5-28.9.

NOTE

Do not remove paper backing on bag sealant or double faced tape. Keep adhesive bonding surfaces clean.

(9) Apply bag sealant and tabs of double faced tape (C128.1). Secure vacuum hoses and vacuum gage as shown in figure 5-28.8, detail B. A vacuum hose should be applied to both blade sides.

(10) Pre-fit 2.50 inch wide bleeder cloth to the blade as shown in figure 5-28.8, detail C, and remove.

(11) Pre-fit replacement erosion guard part to blade.

(a) Trim extreme ends of replacement guard at flash lines.

NOTE

Guard material may be slightly stretched to fit.

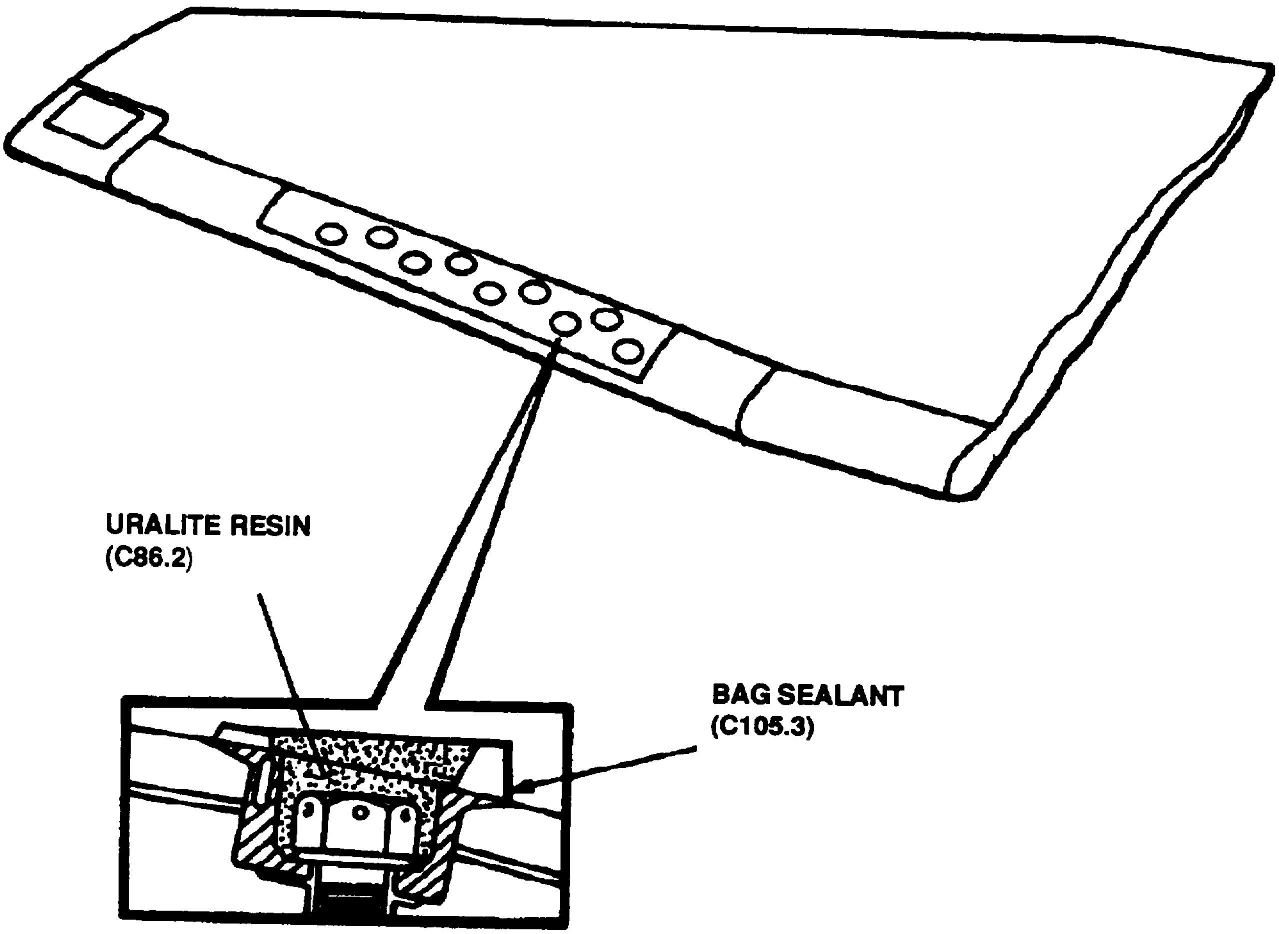


Figure 5-28.7. K747 Blade Uralite Repair

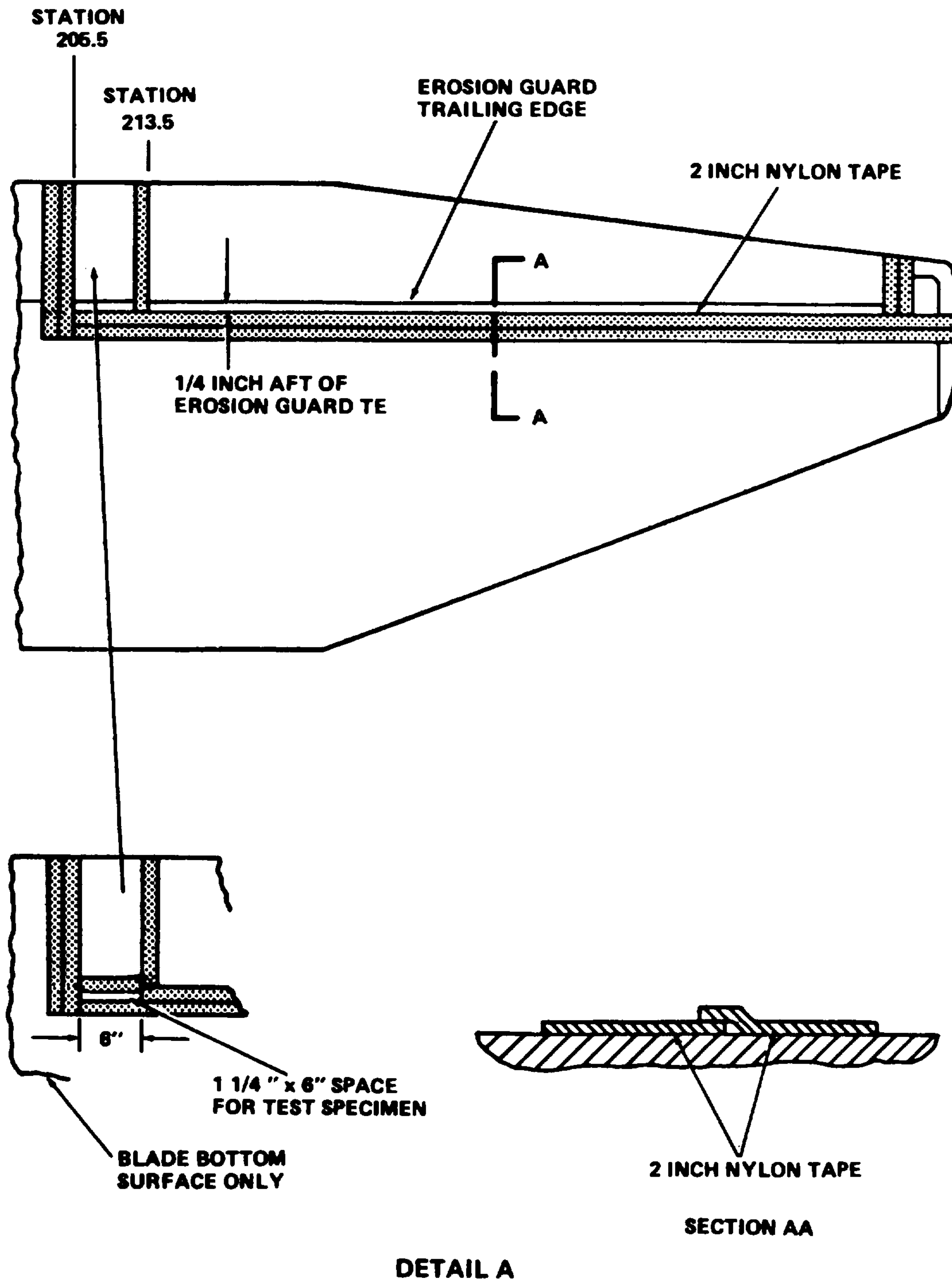


FIGURE 5-28.8. APPLICATION OF VACUUM BAGGING MATERIALS AND PLACEMENT OF EROSION GUARD (SHEET 1 of 4)

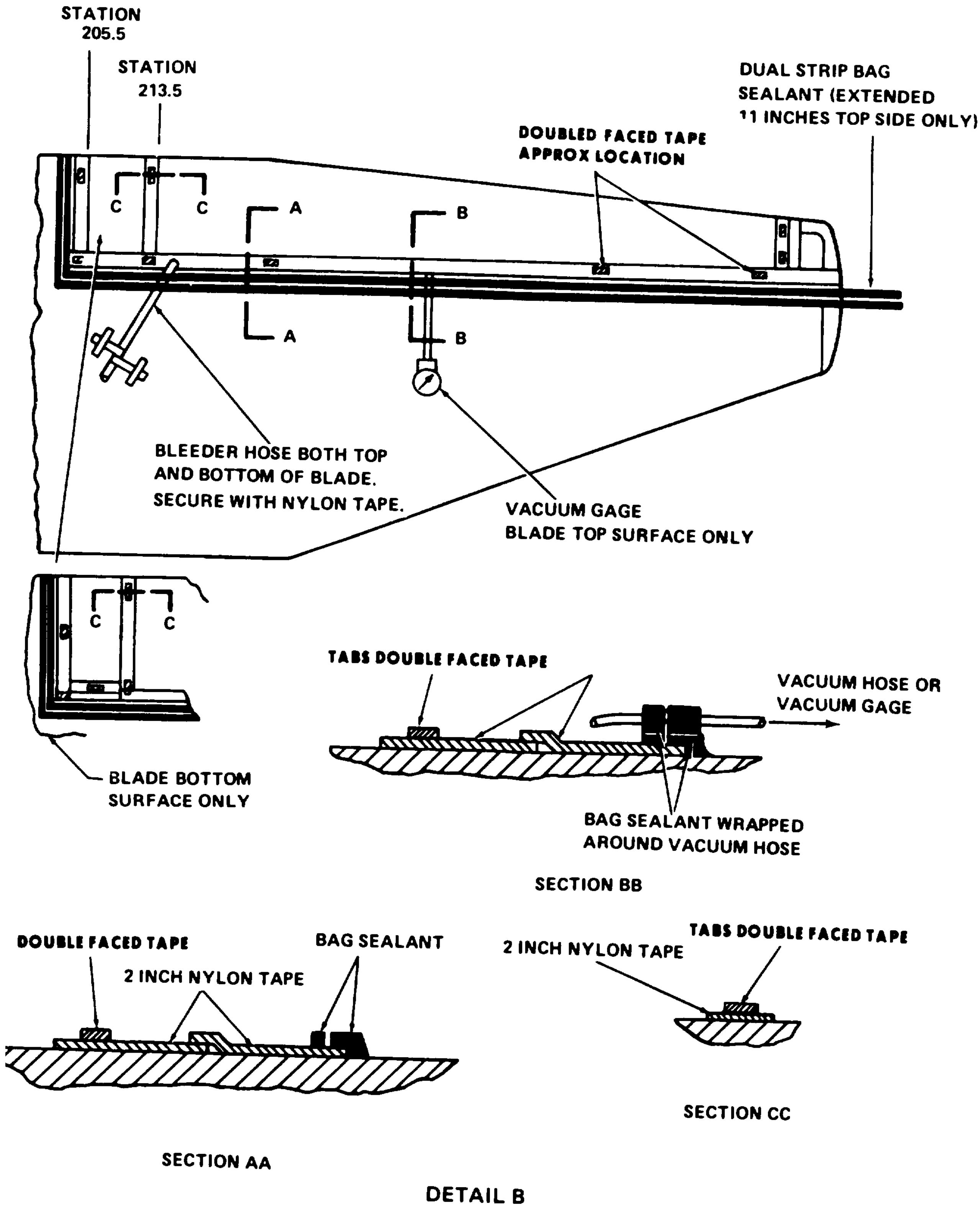


FIGURE 5-28.8. APPLICATION OF VACUUM BAGGING MATERIALS AND PLACEMENT OF EROSION GUARD (SHEET 2 of 4)

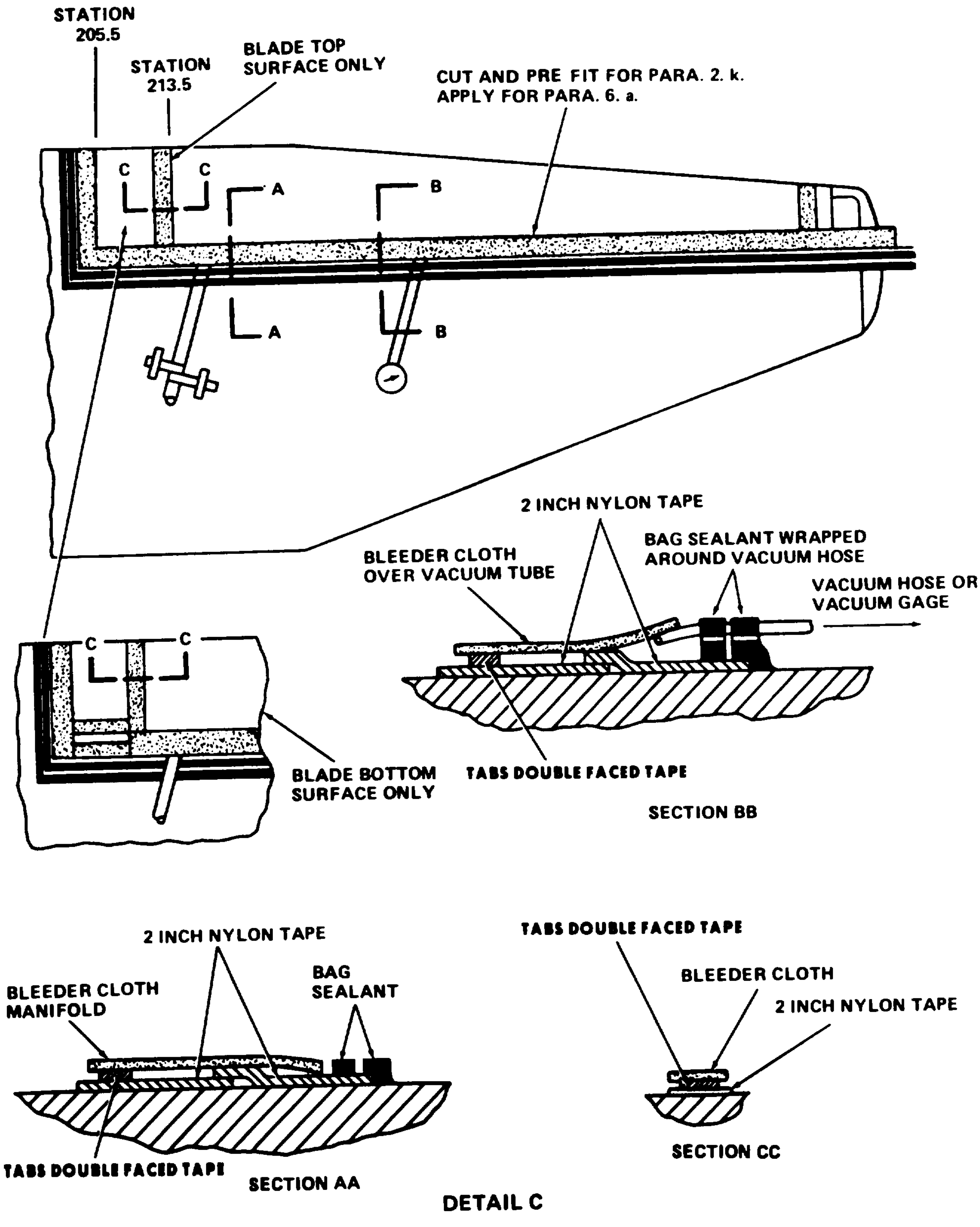


FIGURE 5-28.8. APPLICATION OF VACUUM BAGGING MATERIALS AND PLACEMENT OF EROSION GUARD (SHEET 3 of 4)

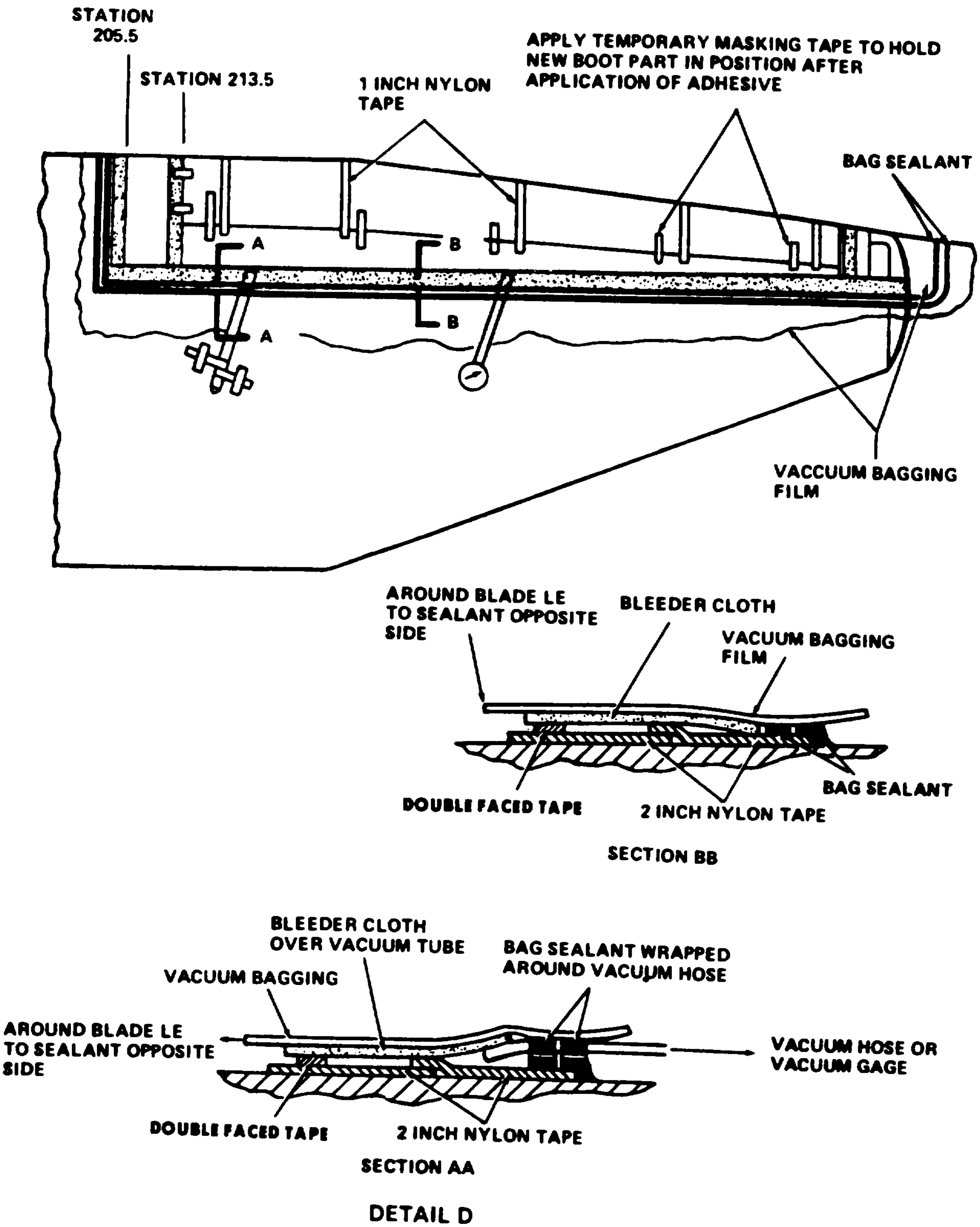


FIGURE 5-28.8. APPLICATION OF VACUUM BAGGING MATERIALS AND PLACEMENT OF EROSION GUARD (SHEET 4 of 4)

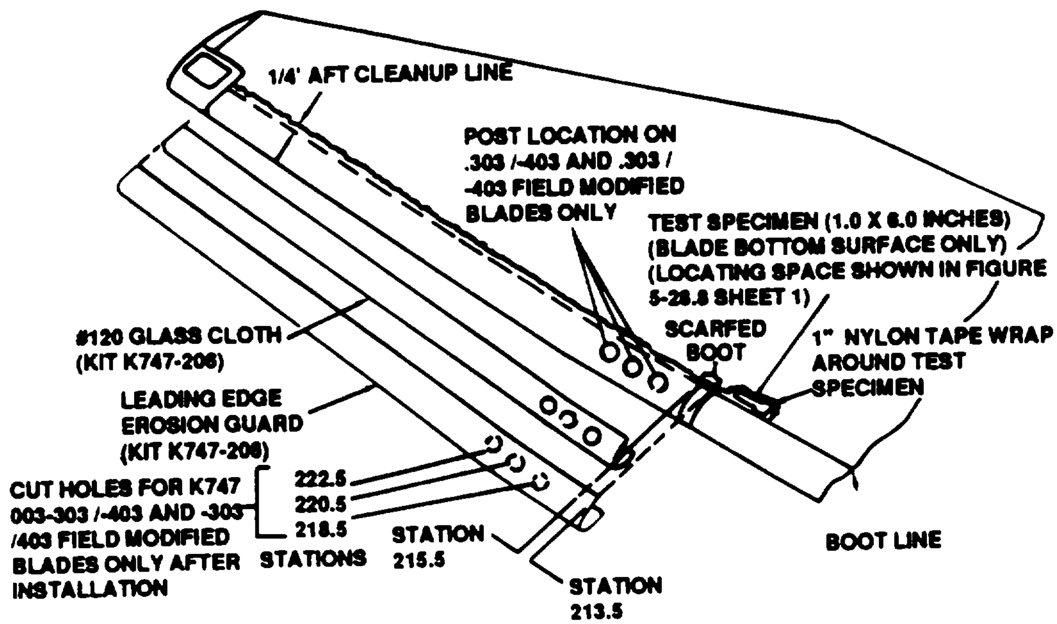


Figure 5-28.9. Repair Parts and Specimen Orientation (Kit, PN K747-206)

(b) Fit erosion guard to blade leading edge. Temporarily secure in position with strips of masking tape. (See figure 5-28.8, detail D.)

(c) Trim extreme ends of replacement guard part at station 213.5 and then at station 260.0 to fit, if necessary.

(d) Apply a wrap of 1 inch wide nylon tape to one end of 1 x 6 inch test specimen as shown in figure 5-28.9.

(e) Remove erosion guard and the masking tape securing it.

(12) Abrade mating surfaces of replacement erosion guard and test specimen as follows:

CAUTION

Abrasion should be done on smooth, hard surface at low rpm.

(a) Abrade inboard end of replacement erasion guard part that will be fitted between stations 213.5 and 215.5. Taper guard material from stations 215.5 to 213.5 to fit scarfed surface of existing guard. Use a disc sender and 3 inch x 60 grit abrasive disc.

CAUTION

Care must be exercised not to rip or gouge material when abrading replacement guard part.

(b) Hand abrade remaining replacement port mating surface. Use 180 grit abrasive paper.

(c) Abrade mating surface of test specimen. Use a disc sander and a 3 inch x 80 grit abrasive disc.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

(13) Wipe replacement erosion guard on mating and outside surfaces with MEK (C74). Repeat this step two more times. Wipe solvent dry before it evaporates. Allow 15 minutes to dry.

(14) Wipe blade repair area surfaces with cheesecloth (C30) dampened with solvent (C132). Repeat this step two more times, wiping solvent dry before it evaporates. Allow 15 minutes to dry.

NOTE

Wear clean white gloves from this point in repair until the vacuum bagging material is in place. This will aid in preventing contamination of bond surfaces with skin oils.

(15) Inspect repair for cleanliness and surface preparation.

WARNING

Adhesive contains toxic ingredients. Provide adequate ventilation and protect the skin and eyes from contact with uncured resins or curing agent. DTA can cause blindness and burns. Wash off uncured resins and curing agent from skin with warm water and soap. Avoid use of solvents for cleaning the skin. Wear polyethylene gloves over cotton gloves for this task.

NOTE

Pot life of adhesive is approximately 30 minutes at 75° F (23.8° C). It is shorter at higher temperatures. Always check package dates to make sure the adhesive life limit is not exceeded. Work without delay. Record time at which adhesive was mixed as an aid in determining pot life.

e. Mix and apply adhesive (C13.1).

(1) Mix 100 ports/weight of epoxy resin (Epon 826) with 10 parts/weight of Versamid 125 and 6 parts/weight DTA activator. Stir until streaks disappear. Do not induce air bubbles while stirring.

(2) Apply a uniform light coat of adhesive to blade bottom surface, leading edge, and top surface. Use a 3 inch paint roller for adhesive application.

f. Apply the #120 glass cloth, leading edge guard, and test specimen to blade.

(1) Place #120 glass cloth in position os shown in figure 5-28.9. Smooth into place by bond. Using scissors, trim gloss cloth to fit exactly.

(2) Using a 3 inch paint roller, apply a uniform coat of adhesive to the gloss cloth just positioned.

g. Install leading edge erosion guard and test specimen in position on blade.

(1) Using a 3 inch paint roller, apply a uniform light coat of adhesive to meting surface of the replacement guard.

(2) Apply o light coot of adhesive to meting surface of test specimen.

(3) Place test specimen in position on blade bottom surface in areas shown in figure 5-28.9.

(4) Position guard replacement on the blade and bond work it around the leading edge chordwise far full span length of the part. It may be necessary to stretch replacement part for a good spanwise fit.

(5) Remove any adhesive on the outside surface of the leading edge erosion guard with solvent (C132).

(6) Temporarily tape leading edge guard and test specimen in place with masking tape. Apply 1 inch wide nylon tape to hold part and test specimen in position. Remove masking tape carefully. (See figure 5-28.8, detail D.)

h. Vacuum bog repair in accordonce with the following procedures after reviewing figures 5-28.8 and 5-28.9.

(1) Remove backing of double faced tape and bog sealant.

(2) Apply bleeder cloth as shown in figure 5-28.8, detail C.

(3) Install vacuum bagging and press into position on bag sealant. Smooth out any wrinkles in bagging materiel. Keep tension on bogging material as it is pulled into position. Ensure o good seal. (See figure 5-28.8, detail D.)

(4) Apply vacuum to vacuum hose and obtain 20 inches Hg vacuum under bagging.

(5) Coot bogging material with petrolatum (C83.1) to act as lubricant for the squeegee.

(6) Squeegee leading edge erosion guard along leading edge and test specimen. Roll any excess adhesive outboard toward bleeder cloth eliminating any air packets under leading edge erosion guard. (See figure 5-28.10.) Do top surface first, then bottom.

(7) Inspect leading edge erosion guard surface for any soft spots including the test specimen. Soft spots are an indication of air pockets. Rework bagging using a squeegee to remove air pockets, as required, by doing bottom surface, then top.

(8) Check far any vacuum leaks by pressing vacuum bagging firmly against vacuum sealant and eliminating any leaking bag creases.

i. Cure repair using one of three following time ternperature sequences.

(1) Roam temperature (75° F (23.8° C)) for 24 hours minimum. Vacuum bagging, bleeder and masking materiel may be removed from blade after 12 hours (optionol 24 hours).

CAUTION

Do not hat any estane leading edge erosion guard material if it exists (inboard of station 213.5) above 140° F (60° C).

(2) Room temperature (75° F (23.8° C)) for 16 hours minimum fallowed by 130± 10° F (54.4 ± 6° C) for 2 hours minimum. Remove bogging, bleeder and masking materiels.

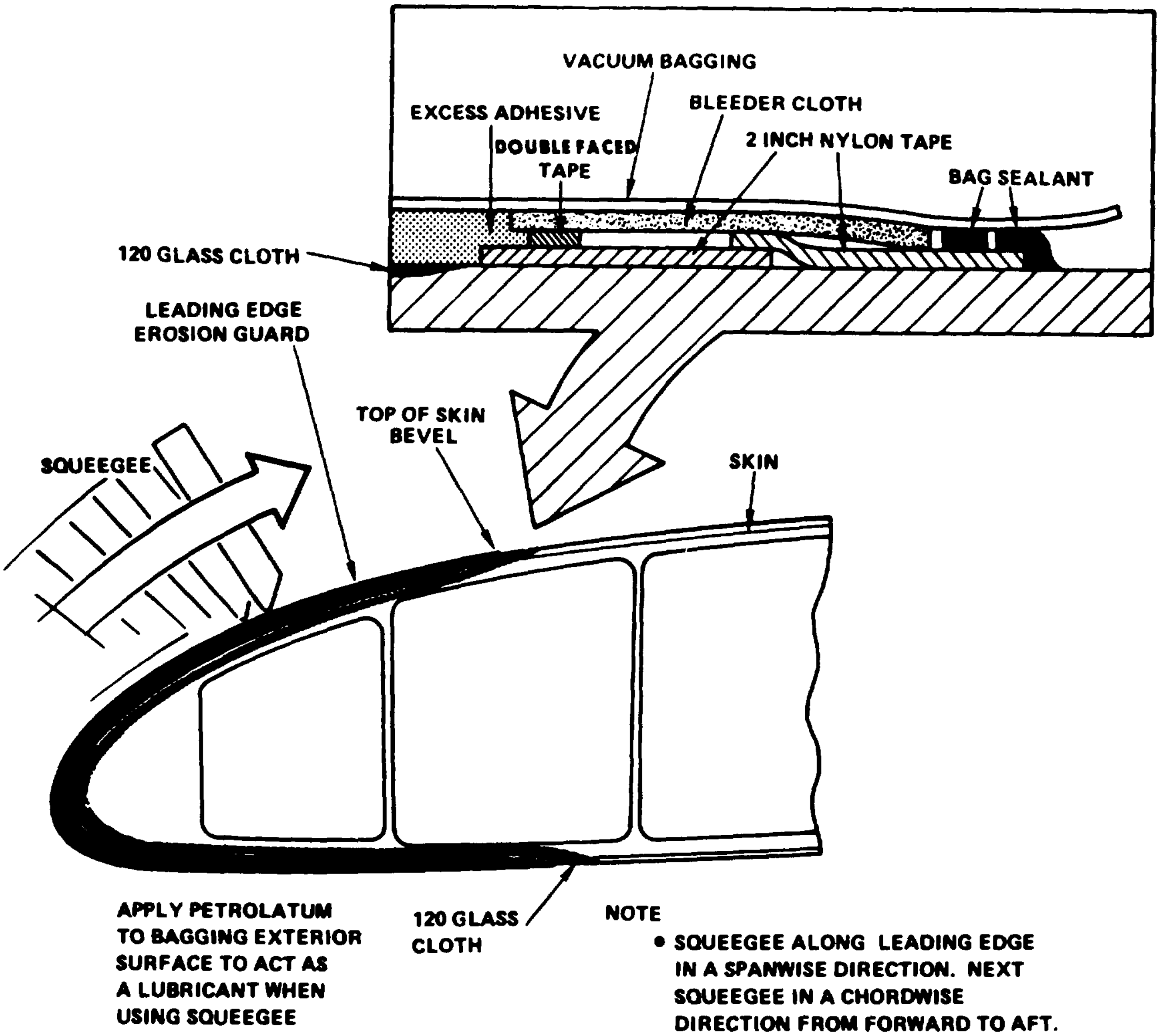
(3) 130 ± 10° F (54.4 ± 6° C) for 4 hours minimum. Remove bagging, bleeder and masking materials.

j. Remove all vacuum bagging materiols from blade. Use care not to disturb test specimen.

k. Remove any excess adhesive from leading edge erosion guard and blade areas using putty knife, solvent (C132), and scotch brite (C103).

CAUTION

When feathering chordwise seam at station 213.5, extreme caution must be exercised not to frictionally heat the guard material. Use short, light, quick strokes with the sanding tools.



NOTE

- SQUEEGEE ALONG LEADING EDGE IN A SPANWISE DIRECTION. NEXT SQUEEGEE IN A CHORDWISE DIRECTION FROM FORWARD TO AFT. WORK EXCESS ADHESIVE AND ANY AIR POCKETS FROM UNDER THE REPLACEMENT LE EROSION GUARD SECTION.
- ALLOW NO WRINKLES IN THE VACUUM BAGGING MATERIAL.
- INSPECT BOTH LEADING EDGE AND FLAT SURFACES OF LE EROSION GUARD FOR ANY SOFT SPOTS IN BOOT MATERIAL AS EVIDENCE OF AIR POCKETS.

FIGURE 5-28.10. VACUUM BAGGING FOR INSTALLATION OF EROSION GUARD REPAIR KIT, PN K747-206

l. Feather peripheral seams of repair area and test specimen. Use o disc sender and 3 inch x 80 grit abrasive disc. Follow with 120 grit if necessary. Do not feather trailing edge of leading edge erosion guard.

NOTE

A peel test will be peformed 24 hours after the cure cycle is completed. Do not exceed limits of fish scale during the peel test.

m. Perform a peel test on test specimen attached to blade surface.

(1) Securely attach a C clamp to taped I nd of test specimen.

(2) Attach a fish scale (capable of measuring 15 or 20 pounds) to C clamp.

(3) Pull specimen bock across its longitudinal axis Record on component DA Form 2408-16, the amount of force measured on the stole to peel specimen from blade, the minimum accepted peel strength is 6 pounds which ensures a good adhesive bond. This stop will be verified by a QA/QC inspector.

(4) If peel test results ore less then 6 pounds, the bond is unacceptable. The new leading edge erosion guard must be replaced by repeating this procedure.

n. Remove the test specimen (if it did not come off during peel (test) and any residue left by test specimen. Use a disc sander with 3 inch x 80 grit abrasive disc. Follow with 120 grit if necessary.

o. Restore blade finish in accordance with paragraph 5-31.18.

5-31.11. BONDING OF LEADING EDGE EROSION GUARD STATION 213.5 OUTBOARD - K474-003-303/ -403 AND -303/-403 FIELD MODIFIED MAIN ROTOR BLADES (AVIM).

e . Make up six bonding intensifiers by attaching together two AN960-1416 washers, one AN970-5 washer, and one AN960-1416 washer in that sequence. Attach by spot welding or using a suitable adhesive.

CAUTION

When using the squeegee to eliminate any air pockets under leading edge erosion guard, extra care should be exercised to press erosion guard securely around circumferences of posts, both blade surfaces.

b. Install the fluorcarbon erosion guard in accordance with paragraph 5-31.10a thru h. Be sure to cover both ands of posts with circular tabs of masking tape. to prevent entry of adhesive into post holes.

c, After vacuum bagging has been completed, install the six intensifiers, made in step a above.

(1) Position an intensifier, with the two AN960-1416 washer side towards blade surface, over opposite post humps on both blade surfaces. Make sure the two intensifiers are seated overtly around humps. Install a C clamp around them and tighten clomp only until intensifiers ore bottomed around post circumferences. Repeat for other two posts.

(2) Squeegee ores around post to remove any air bubbles that may hove formed when securing clamps.

d. Cure repair in accordance with paragraph 5-31.10i. Remove clamps, intensifiers, and vacuum bogging materials.

e. Cut holes in fluorocarbon erosion guard over ends of posts, both blade surfaces, as follows:

(1) Manufacture a 2 x 6 inch, hole cutting template out of any suitable material. Drill three 1 inch diameter holes with their centers spaced 2 inches apart.

(2) Place template over post hole area with template holes seated evenly around the humps. Scribe circles at humps using a lead pencil.

(3) With template removed and using a utility knife with a sharp cutting edge, cut around circumference of marked circles with cutting plane of blade slanted towards posts. Ensure that erosion guard and fiberglass layer is completely severed and pry off the rubber plugs. Remove masking tape over ends of posts.

(4) Using a right angle air motor with a 1-1/2 inch x 80 grit abrasive disc, chamfer edge of rubber around holes.

(5) Repeat steps (2) thru (4) above for other side of blade.

f. Proceed with paragraph 5-31.10k thru p.

531.12 REPAIR OF DAMAGED PORTION OF LEADING EDGE FILLER - K747 MAIN ROTOR BLADES (AVIM).

NOTE

Repair of loading edge filler is limited to replacement of filler, not to exceed 6 Inches In length, and only one repalr par blade.

a. This repair is to be used for damage between stations 224.4 and 260.0.

b. Position blade, top surface up, in fixed rack

CAUTION

Provide adequate ventilation to remove any vapor concentrations in the area.

Wear polythylene gloves over cotton gloves to prevent skin contact with solvent and eliminate possibility of getting skin oils on blade surfaces.

Wear splash-proof goggles when working with solvent

c. Remove any contamination by wiping repair area with a cheesecloth (C30) dampened with solvent (C132). Repeat this step three times, wiping solvent dry before it evaporates.

d. Apply several strips of 2 inch wide masking tape (to form a mold) to blade bottom surface. (See figure 5-28.11.) Do not attach tape to blade top surface.

NOTE

Both parts of two-part urethane filler must be at room tepmerature (70° F (21° C)) before use.

Two-part urethane filler must be thoroughly mixed in order to preserve repair strength.

Surfaces to be bonded must be clean, dry, and free of finger prints and all foreign matter.

The resin compound used in casting leading edge filler is fast setting ly 15 minutes between mixing and gelling). Work without delay.

e. Mix filler resin (C53.1).

(1) Stir base and catalyst in their respective supply containers until thoroughly mixed.

(2) Weigh out equal amounts by wiehgt (as required) of catalyst and base material in separate paper cups.

(3) Combine catalyst into base and stir with a wooden spatula. Ensure a thorough mixutre is obtained.

f. Pour filler into the masking tape mold applied to blade surface. Fold masking tape over blade leading edge and attach to blade top curface. (See figure 5-28.11.)

g. . Remove masking tape mold after 15 to 20 minutes. Rough sand the filler, removing high spotes and excess material. Use right angle air mototr and 3 inch x 60 grit adhesive disc.

NOTE

A straight egde used as a guide and flat wood block covered by 50 grit abrasive paper provides ameans of obtaining finished contour and leading edge acceptable limits

h. Fine sand filler to match blade outline and oontour. Place a straight edge across the leading edge to gage leading edge outline. Use a wooden block (approximately 10 to 12 inches in length) covered with 50 grit abrasive paper.

i. Repeat previous task for both and bottom filler surfaces. Always use the straight edge as a guide in obtaining proper contour.

j. Install leading edge erosion guard in accordance with paragraph 5-31.10.

k. Refinish by painting affected areas in accordance with paragraph 5-31.18.

1. K747 blade repairs are required to be logged in DA Form 2408-13 and -16. A permanent reoord must be maintained to determine the minimum spacing requirement between repairs. Once a repair has been made it is not possible to determine which type of repair has been applied.

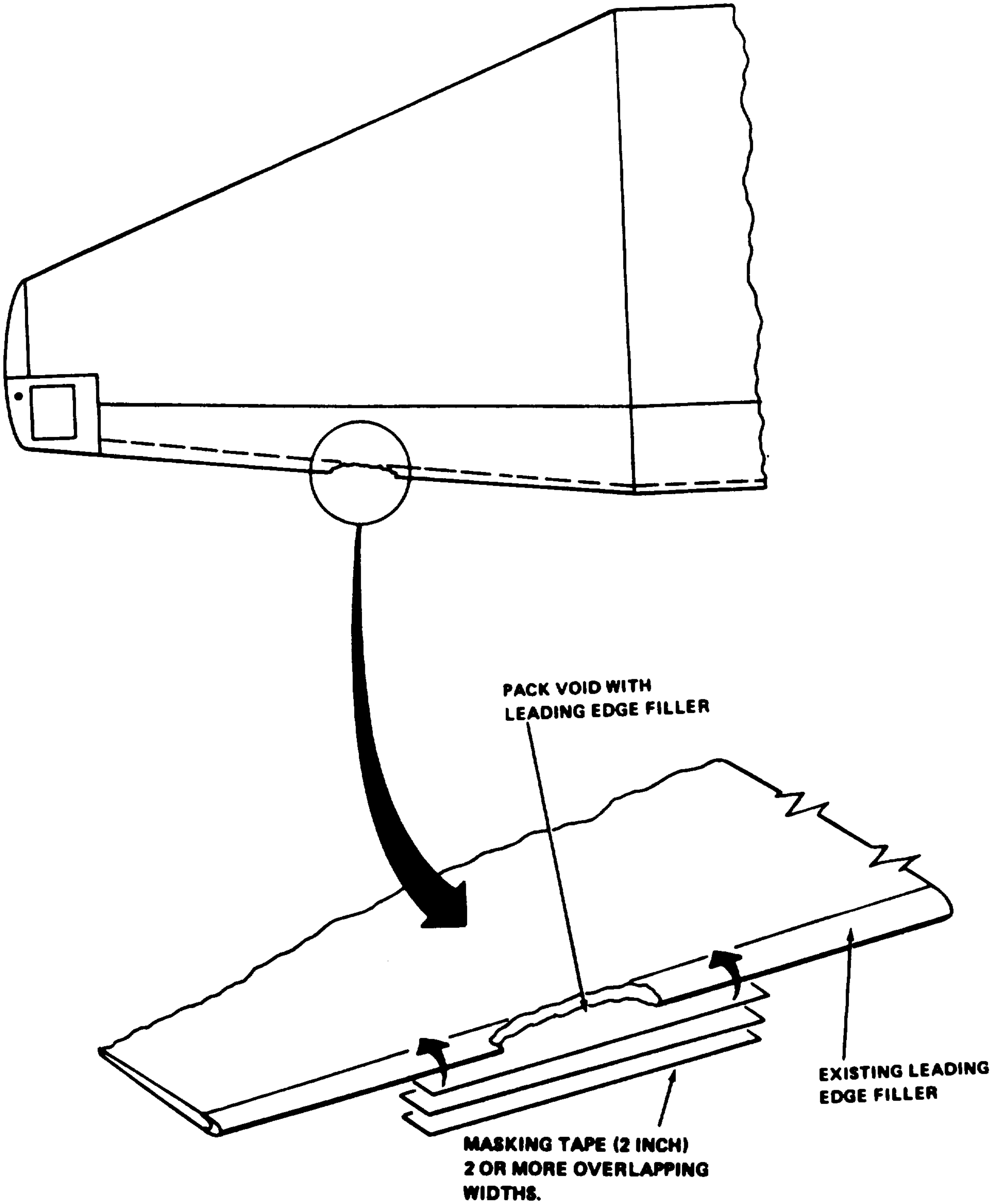


Figure 5-28.11. Improvised Mold For Casting A Small Section Of loading Edge Filler

5-31.13. REMOVAL OF STAINLESS STEEL EROSION GUARD - K747-003-303/-403 MAIN ROTOR BLADE.

a. Inspect erosion guard for damage. Refer to table 5-1.1 for limits.

b. Remove six screws (3, figure 5-28.12) securing erosion guard (1) to blade posts (4), using a No. 4 Philips screwdriver. Remove two screws (2) securing erosion guard to forward tip cop, using a standard Philips screwdriver. Retain screws (2 and 3) for later use.

CAUTION

To prevent scoring of primer coating on inside surface of stainless steel erosion guard and surface of fluorocarbon erosion guard when prying them apart, file a radius on working edges and corners of putty knife.

NOTE

It is advisable to wear a leather glove to cushion the palm for this task.

c. Insert putty knife under lip of stainless steel erosion guard, with rounded underside edge against fluorocarbon erosion guard. Starting at outboard end of guard and working towards inboard end, apply o firm wedging force to pry stainless steel guard loose from sealant.

d. Turn blade over in rock and repeat step b above for loosening stainless steel guard on underside of blade. Remove guard when completely broken free of sealant.

e. The sealer residue can be removed from fluorocarbon erosion guard by rubbing with the open palm or a cloth. Lightly abrade both top and bottom surfaces of fluorocarbon erosion guard with a layer of screen cloth (C36.1) wrapped around a wooden block only to give erosion guard surface a dull finish.

f. Remove any foreign material and residue from blade surfaces. Use a vacuum or clean, dry, oil-free cloth.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or yes.

g. If the stainless steel erosion guard is to be reinstalled, lightly wipe inside surface with cheesecloth dampened with MEK (C74) to remove sealant residue.

5-31.14. INSTALLATION OF STAINLESS STEEL EROSION GUARD - K747-003-303/-403 MAIN ROTOR BLADES (AVIM).

a. Prepare blade for installation of stainless steel erosion guard.

(1) locate stainless steel erosion guard on fluorocarbon erosion guard to align mounting holes. Install screws (2 and 3, figure 5-28.12) and tighten until they bottom out.

(2) Mask erosion guard area using one inch nylon tape (C118.1) positioned 1/4 inch from periphery of stainless steel erosion guard, both surfaces of blade. (See figure 5-28.13.)

(3) Remove the eight self-locking screws from stainless steel erosion guard and remove guard from blade. Discard screws.

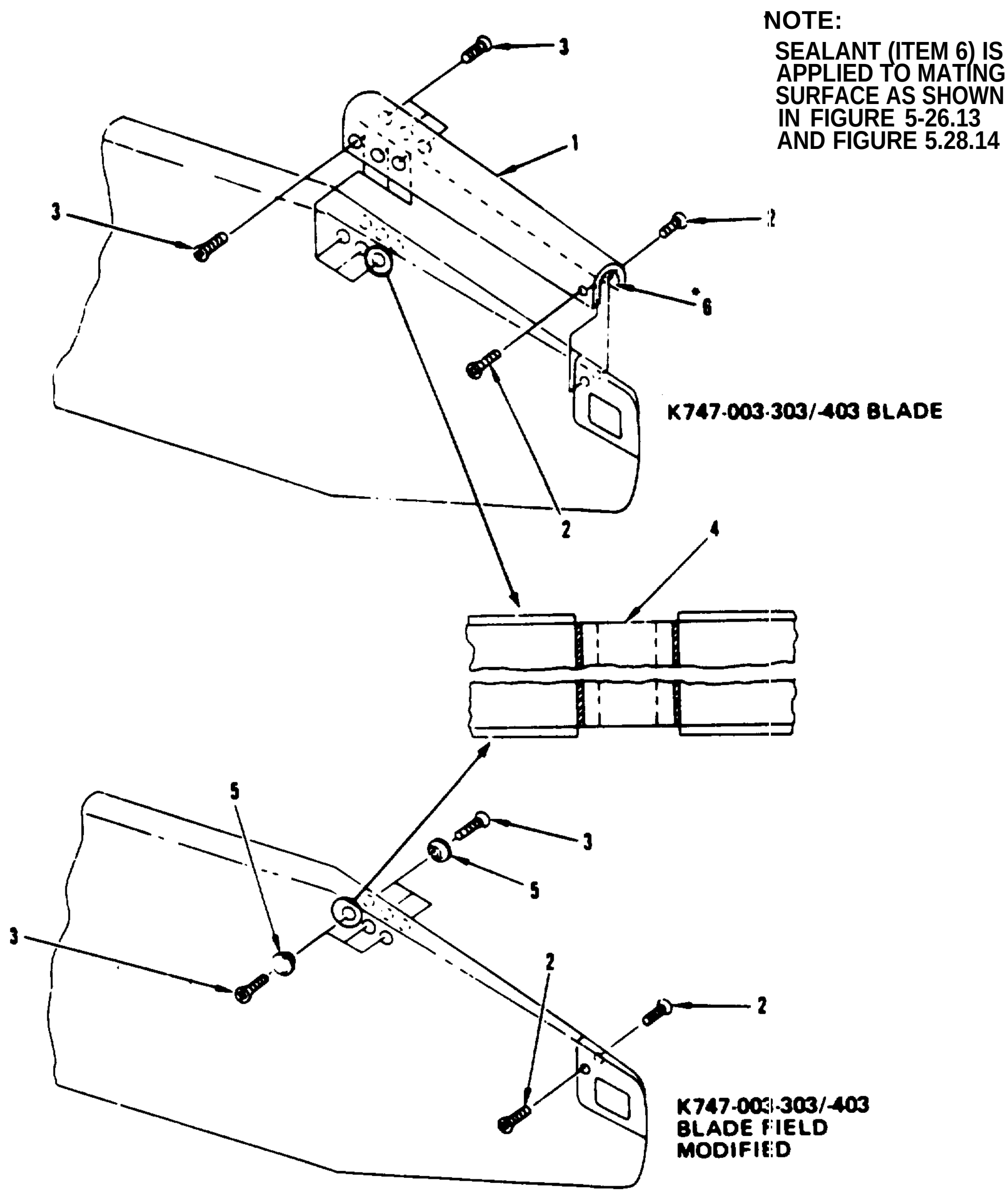
WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

(4) Wipe both surfaces of fluorocarbon erosion guard with cheesecloth (C30) dampened with MEK (C74) to remove contamination in area framed by nylon tape.

CAUTION

Surfaces to be bonded must be clean, dry, and free of finger prints and all foreign matter. Wear cotton gloves when handling these surfaces.



INDEX	NOMENCLATURE	QTY
1	EROSION GUARD, STAINLESS STEEL	1
2	SCREW, SELF-LOCKING	2
3	SCREW, SELF-LOCKING	6
4	POST	3
5	SHIELD	6
*6	SEALANT - PROSEAL 890 (C105)	A/R

Figure 5-28.12. Repair Parts Orientation Use for Removal and Installation of Stainless Steol Erosion Guard - K747-003-303/-403 and -303/-403 Field Modified Blades.

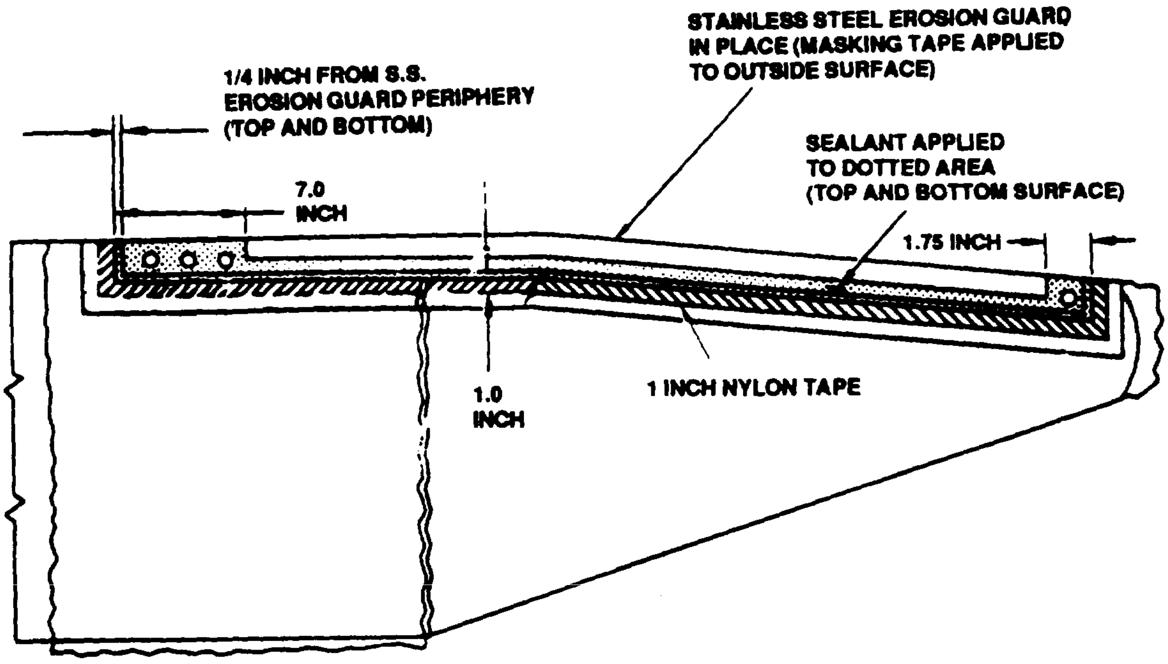


Figure. 5-28.13 Preparation of K747-003-303/-403 Blade for Application of Sealant

b. Prepare the replacement stainless steel erosion guard for installation by masking outside surface using masking tape (C123) to protect the surface from sealant. Using a sharp knife, cut out the eight mounting holes in tape.

WARNING

Sealant contains toxic ingredients. Provide adequate ventilation to remove any vapor concentrations in the area. Wear polyethylene gloves over cotton gloves to prevent skin contact with sealant ingredients and eliminate possibility of getting skin oils on repair area surfaces. Wear splash-proof goggles when working with sealant.

NOTE

Pot life of is 30 minutes at 75° F (23.8° C). It Is shorter at higher temperatures. Work without delay.

c. Prepare Proseal 890 (C105). Mix 1 part/weight of accelerator to 10 parts/weight of base in a plastic coated paper container. Use a wooden stirrer and mix sealant to a uniform color and consistency.

d. Apply sealant with a stiff-bristled brush, to inner surface of stainless steel erosion guard and framed are bf fluorocarbon erosion guard. Apply only to area shown in figure 5-28.14.

NOTE

Exercise care to prevent sealant from entering threaded area of post holes.

e. Position stainless steel erosion guard over fluorocarbon erosion guard, until mounting holes are aligned.

CAUTION

The self-locking screws can be used only once. New screws are required for each installation.

f. Install six NAS1189E5P8B screws (3, figure 5-28.12) in blade posts (4) and two NAS1189E4P6B screws (2) in forward tip cop, using o No. 4 Philips screwdriver and o standard Philips screwdriver, respectively. Hand tighten all screws to achieve clomping of stainless steel erosion guard. QA/QC inspection is required.

g. Manufacture a holding fixture out of plywood stock and install over stainless steel guard as shown in figure 5-28.15. The strips of industrial tape around the three leading edge contour block details and trailing edge of blade are to be wrapped tight enough to seat blocks evenly and securely against leading edge contour of guard. Tighten the six 6 inch C clamps sufficiently to seat the two spanwise details securely against top and bottom surfaces of guard.

h. Cure Proseal 890 (C1105) at roam temperature (70°F (21°C) far 24 hours. An alternate method is to apply heat using a suffcient number of infrared lamps to provide 140 to 180°F far one hour.

i. Upon completion of cure, remove holding fixture and tape from blade surfaces.

j. Remove masking tape from stainless steel erosion guard and feather sealant at trailing edge of guard using o layer of screen cloth (C36.1) wrapped around o wooden block.

5-31.15. CHANGING K747-003-203/-403 BLADE TO -303/-403 FIELD MODIFIED BLADE (AVIM).

a. Remove the stainless steel erosion guard in accordance with paragraph 5-31.13. The shields and installation instructions which come with the -303 blade ore always retained for use when converting.

CAUTION

The self-locking screws can be used only once. New screws are required for each installation.

b. Insert three K747-209-11 shields (5, figure 5-28.12) into the fluorocarbon erosion guard holes on the top blade surface. Install three new NAS1189E5P8B screws (3) into the blade posts (4) using a No. 4 Philips screwdriver. Install one new NAS1189E4P6B screw (2) into the forward tip cap using o standard Philips screwdriver. The four screws are to be hand tightened only. Turn blade over in rack and repeat procedure for bottom blade surface.

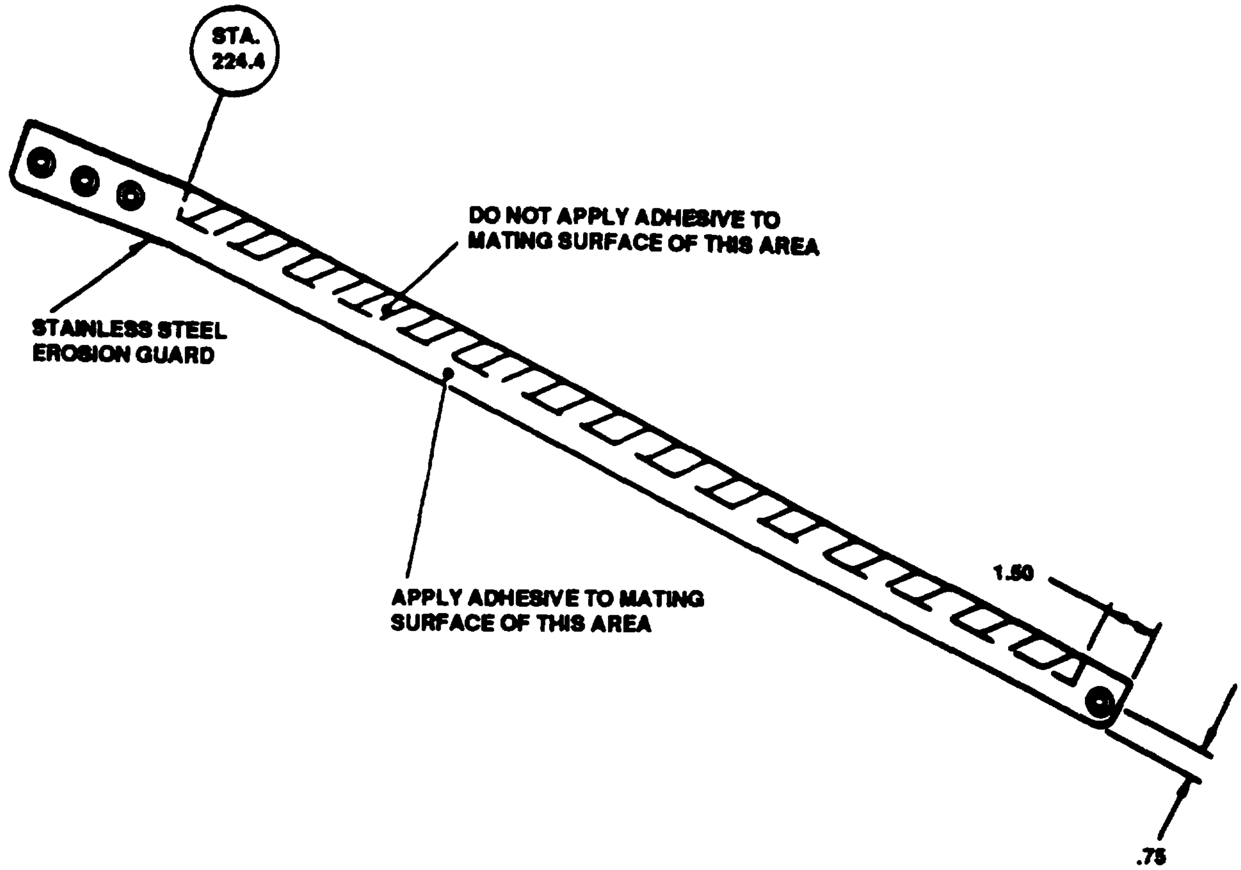


Figure 5-28.14. Application of Sealant to Steel Guard for K747-003-303/-403 Blade.

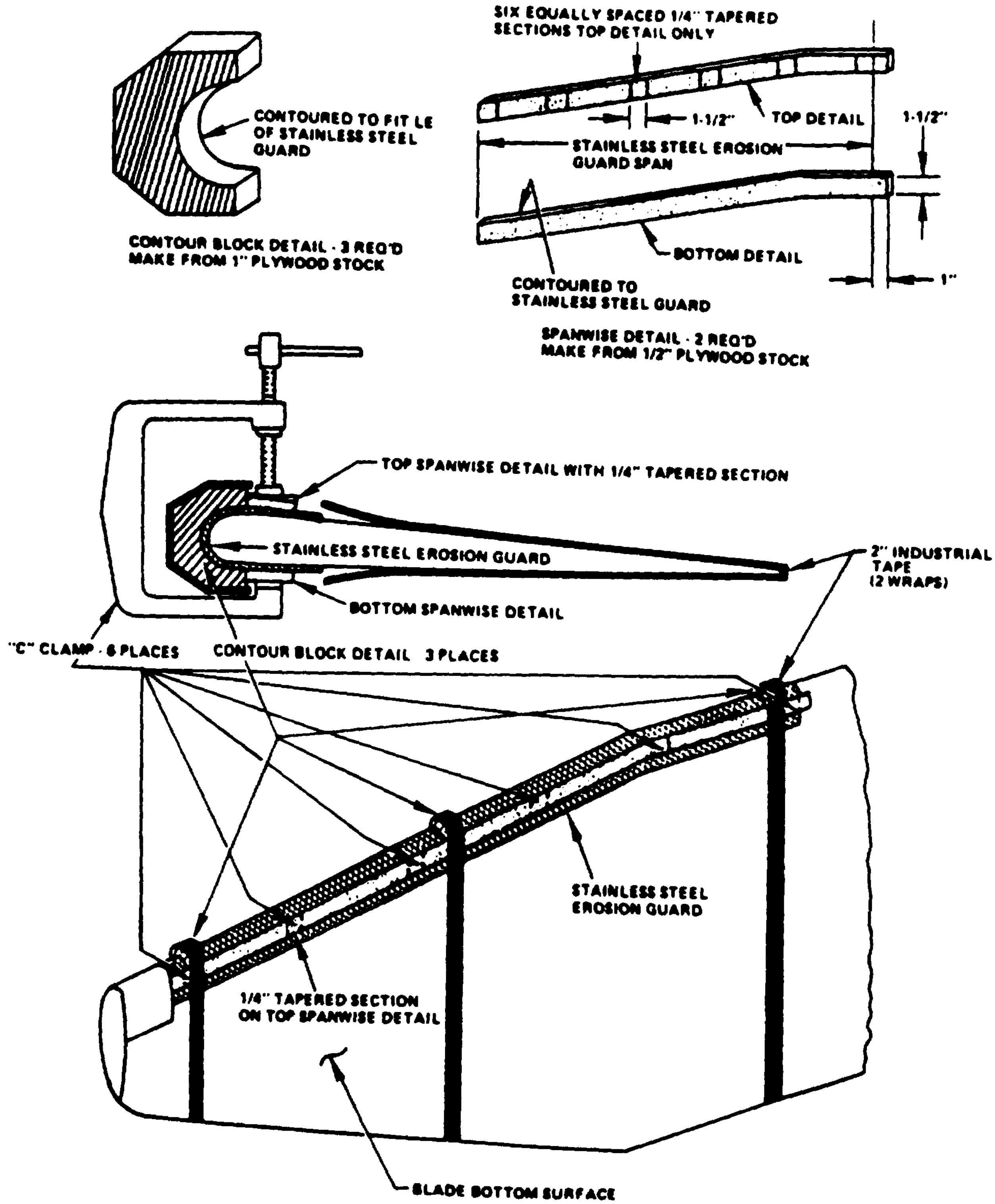


Figure 5-28.15 Stainless Steel Erosion Guard Holding Fixture

531.16. CHANGING K747-003-303/-403 FIELD MODIFIED BLADE TO -303/403 BLADE (AVIM).

a. Remove screws (2 and 3, figure 5-28.12) and six shields (5) from their locations on top and bottom blade surfaces. Discord screws.

b. Install K747-210-11 stainless steel erosion guard (1) in accordance with paragraph 5-31.14.

c. Retain shields and installation instructions for use during any future conversion to K747-003-303/-403 field modified blade.

5-31.17 REPLACING SECTIONS OF EROSION GUARD - K747-003-205/-309 MAIN ROTOR BLADE (AVIM).

a. This repair is for station 213.5 inboard. Obtain kit P/N K747-201-119.

b. Position blade for access to damaged leading edge erosion guard. Support blade to prevent movement and droop.

c. Using sharp knife, remove all damage from guard including separated guard. Cut the guard in such a pattern that con be duplicated with o like patch (circle, square, rectangle).

d. Use 180 to 240 grit abrasive paper (C102) to remove guard adhesive, Avoid removing any of the spar. This will appear os white dust.

WARNING

Isopropyl alcohol is flammable. Keep away from heat and open flame. Provide adequate ventilation when using. Avoid breathing vapors and prolonged contact with skin.

CAUTION

Isopropyl alcohol can damage leading edge erosion guard. Avoid spillage.

e. Using cotton tipped swab (kit), dip in isopropyl alcohol (C64) solvent. Clean surfaces to be bonded.

f. Using masking tape (kit), mask around cut out section to protect guard from solvents and adhesive.

g. Make a pattern from cut out section. This pattern will be used to make the replacement patch, Use the 4 x 8 inch patch from kit. Fit patch to mote removed section.

WARNING

Adhesive contains toxic ingredients. Provide adequate ventilation and protect the skin and eyes from contact with uncured resins or curing agent. DTA can cause blindness and burns. Wash off uncured resins and curing agent from skin with warm water and soap. Avoid use of solvents for cleaning the skin. Wear polyethylene gloves over cotton gloves for this task.

Once the contact cement and the patch come in contact, the patch cannot be moved if it is mislocated. It will be necessary to enlarge the repair sections.

CAUTION

Surfaces to be bonded must be clean, dry, and free of finger prints and all foreign matter.

h. Bonding the guard patches. The preferred method to secure the guard patch to the guard is to use contact cement. Suggested mix ratio is 15 grams of estane to 85 grams of MEK (C74). Cure time is 30 minutes.

NOTE

Patch should overlap by 0.50 inch.

NOTE

Pot life of adhesive is 15 minutes at 75° F (23.8° C). It is shorter at higher temperatures. Work without delay.

i. Alternate method.

(1) The alternate method to secure the guard patch to the guard is to use epoxy resin EA828 (C98). The patch can be moved into position after contacting the adhesive.

(2) Mix 100 parts/weight of resin EA828 with 10 parts/weight of DTA activator (C98) in a clean glass, metal, polyethylene, or plastic coated paper container.

(3) Using 0.25 inch brush (kit), apply a light coat of adhesive to both surfaces to be bonded.

(4) Using finger pressure, press erosion guard to blade while working out excess adhesive from under the erosion guard. Wipe away excess adhesive with clean cheesecloth (kit) to prevent adhesive from running off the masking onto the exposed blade surface.

(5) Lay teflon parting blanket (kit) over repair. Place masking tape (kit) over edges of parting blanket to prevent movement.

(6) Obtain two wooden blocks approximately 0.75 x 2 x 6 inches and a C clamp (8 inch opening by 6 inches deep). Place 0.25 x 2 x 1 inch thick rubber strip (or suitable substitute) between block and parting blanket. Place remaining block and rubber strip on opposite surface and, using C clamp, apply light pressure to rebonded area.

NOTE

Pressure can be applied by vacuum or strips of rubber around the blade. These methods should be used on the leading edge where clamps would not be practical.

(7) After four hours at room temperature, remove clamp, blocks, rubber strip, parting blanket, and masking tape.

(8) After cure cycle, bond the patch to the guard by applying heat with a sealing iron as described in paragraph 5-31.7.

5-31.18. REFINISHING PAINT - K747 MAIN ROTOR BLADES (AVIM).

NOTE

When actual operational emergencies require immediate use of the helicopter, touchup painting may be deferred until termination of the actual emergency.

CAUTION

The only paint refinishing authorized is the touchup of repaired areas and areas immediately adjacent to repaired areas. This restriction is necessary to maintain lightning protection and radar signature characteristics of the blade. Refinishing paint must not be applied to leading edge erosion guard.

Only material from the same kit shall be mixed, except that two or more kits may be mixed in the same vessel, provided the kits are all manufactured by the same vendor. Established mixing ratios must be followed closely; otherwise, the primer will exhibit unsatisfactory film properties, such as poor adhesion, poor chemical resistance, or inadequate drying. Component II shall always be added to component I.

NOTE

The epoxy polyamide primer is supplied as a two component kit. Pot life is limited and only that amount which can be used in less than 8 hours should be mixed.

a. Mix component I and II in a one to one ratio by volume. Each component shall be well agitated and shall be poured separately into the proper container. The material temperature should be at least 70° F (21° C). Component I shall be poured into the empty container, the component II shall be slowly poured into component I with constant stirring.

b. Thinning (for spraying). The mixed epoxy polyamide primer shall be reduced for spraying with one volume of thinner (C131) to two volumes of mixed primer. The thinned primer shall be stirred thoroughly, strained, and allowed to stand for about 30 minutes prior to use. The thinning ratio may be varied slightly to obtain the proper spraying viscosity. The 30 minute standing period is necessary to:

(1) Permit the chemical components to partly react.

(2) Shorten the drying time.

(3) Reduce cratering.

(4) Preclude component II from sweating out or migrating.

(5) Allow any bubbles (formed while stirring) to escape.

c. Feather edges of finish next to repair area with 400 grit abrasive paper.

d. Remove sanding dust using clean cheesecloth (C30) dampened with thinner (C131).

e. Mask off touchup area.

f. Wipe area with 50/50 mix of MEK (C74) and lacquer thinner (C129).

g. Apply primer (C88) slightly overlapping repair area. Allow to dry approximately 5 minutes.

h. Apply a cross coot of primer and allow to dry about 30 minutes. If temperature is below 70° F (21° C), allow to dry about 2 to 3 hours. Do not apply below 50° F (10° C).

1. Brush applicotion. Mix one volume of component I to one volume of component II. If thinning is required, use thinner (C131). Apply only one brush coat of primer. The same temperature limitations in step h above apply.

2. Mix component I and II of polyurethane (C86.1) in the correct ratio according to manufacturer's instructions.

k. Cross spray polyurethane (C86.1) over the primer to a thickness of 0.0010 to 0.0015 inch.

NOTE

Avoid overspray onto existing polyurethane finish. Polyurethane will not adhere properly to a previously coated area.

l. Allow to dry approximately 6 hours before releasing helicopter for flight.

5.31.19. MASKING AND REFINISHING LEADING EDGE EROSION GUARD - K747 MAIN ROTOR BLADES (AVIM).

NOTE

This procedure is for use at station 213.5 outboard after installation of repair kit P/N K747-206.

a. Ensure blade is properly grounded.

b. Mask area far application of primer.

(1) Apply masking tape and brown paper at the forward side of the erosion guard trailing edge on both blade top and bottom surfaces. Brown paper will be applied to cover unaffected blade surfaces and erosion guard area from primer and polyurethane overspray. (See detail A, figure 5-28.16.)

(2) Apply a second strip of masking tape overlapping the first strip applied. The trailing edge of the second masking being applied must be along a line 0.100 inch oft of the erosion guard trailing edge. (See detail B, figure 5-28.16.)

CAUTION

When abrading the polyurethane finish, care must be exercised to only scuff the surface to allow primer adhesion. Do not remove the full coating thickness.

c. Abrade the polyurethane top coat on exposed blade top and bottom surfaces from station 205.5 outboard. Use 360 grit abrasive paper and just scuff the surface lightly.

WARNING

Primer and thinner mixture contains toxic ingredients. Provide adequate ventilation and protect the skin and eyes from contact with uncured resins or curing agent. Wash off any primer from skin with warm water and soap. Avoid use of solvents for cleaning the skin.

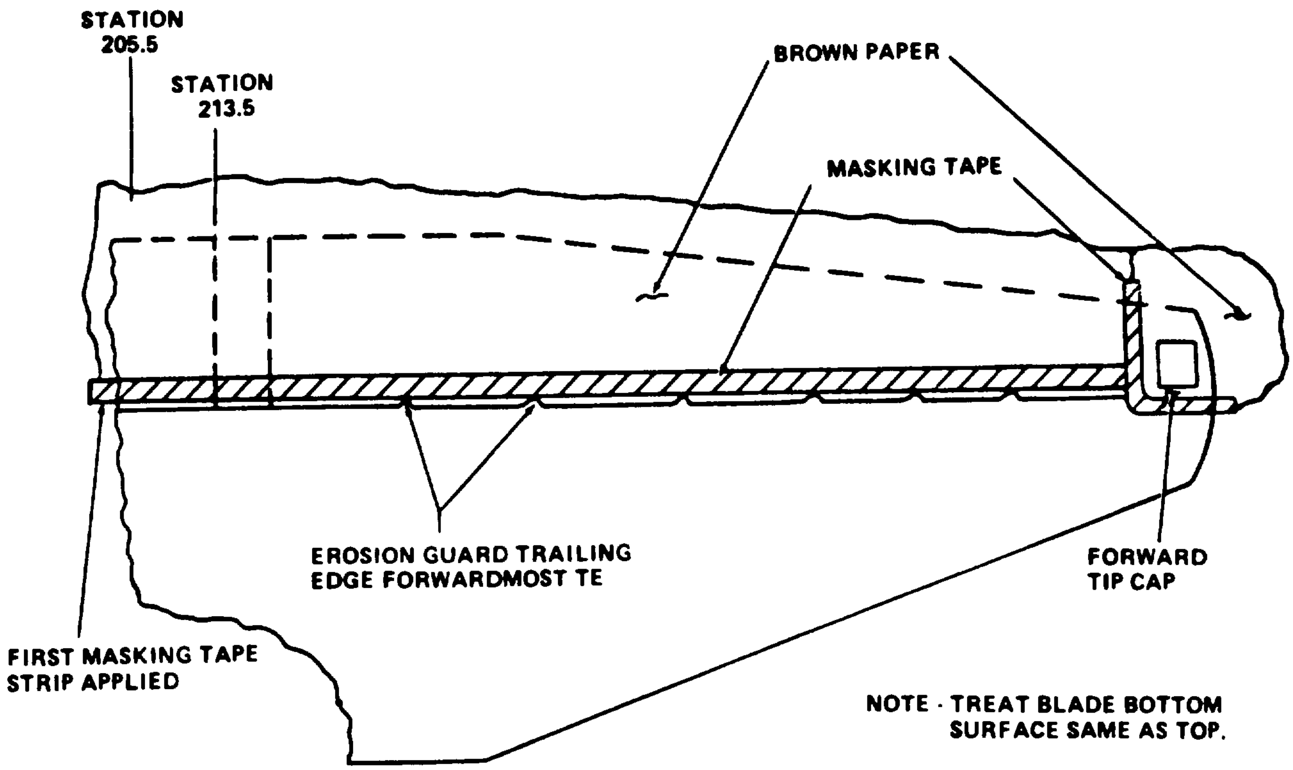
NOTE

Epoxy polyamide primer is supplied as a two component kit. Pot life is limited to 8 hours from mixing. Mix only the amount needed. Material temperature shall be at least 70° F (21° C) before mixing.

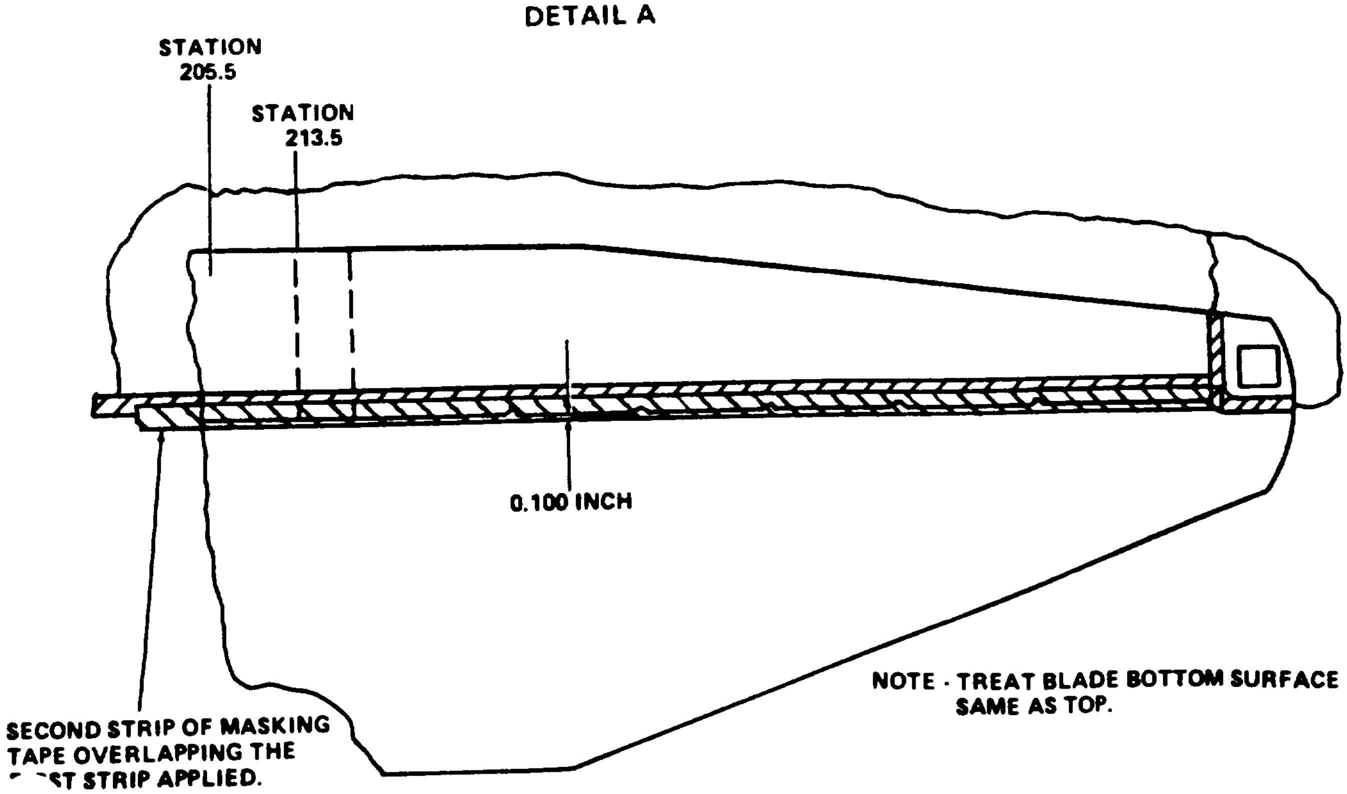
d. Mix and prepare primer for use.

(1) Stir component I and II in their respective supply containers. Ensure thorough mixing occurs.

(2) Combine an equal volume of component II into component 1. Stir constantly while combining and mixing. Do not induce air bubbles in the mixture.



DETAIL A



DETAIL B

FIGURE 5-28.16. MASKING FOR PAINT TOUCH-UP AFTER
INSTALLATION OF KIT K747-206

NOTE

Thinning ratio of mixed primer and thinner may be varied slightly to obtain a proper spraying viscosity.

(3) Thin the mixed primer for spraying using a volume ratio of 1 part primer to 2 parts thinner (C131). Stir the thinned mixture thoroughly. Do not induce air bubbles. Strain the mixture and allow to stand for 30 minutes prior to use.

CAUTION

Surfaces to be primed must be clean, dry and free of finger prints and all foreign matter.

e. Wipe the scuffed area with a 50/50 mixture of MEK (C74) and lacquer thinner (C129).

WARNING

Primer and thinner mixture contains toxic ingredients. Provide adequate ventilation and protect the skin and eyes from contact with uncured resins or curing agent. Wash off any primer from skin with warm water and soap. Avoid use of solvents for cleaning the skin.

f. Apply a full coat of primer to the bare area next to the second masking tape applied. Apply a mist coat of primer to the areas scuffed. Allow 1 hour drying time prior to application of polyurethane paint.

g. Remove the second piece of masking tape applied which extends 0.100 inch aft of the erosion guard trailing edge.

h. Hand abrade the ridge where the epoxy primer ends. Use 360 grit abrasive paper.

i. Mix components I and II of the paint (C86.1) as per manufacturer's instructions. Heed the manufacturer's warnings and cautions.

j. Dust sanding residue from the blade surface.

k. Apply a mist coat of paint (C86.1) to the blade areas framed by masking tape. Allow the mist coat to dry for 30 minutes.

l. Apply a full coat of paint (C86.1) to the misted area. Do not exceed 0.0010 to 0.0015 inch thick.

m. Remove remaining masking and allow to dry for 6 hours minimum before blade is used for flight.

5-31.20. REPAIR OF AFT TIP CAP - K747 MAIN ROTOR BLADES (AVIM)

a. Cracks in aft tip cap may be sanded and routed to a depth of 0.060 inch.

b. Apply adhesive EA934NA (C14). Smooth to contour of cap by sanding.

c. Paint repair area in accordance with paragraph 5-31.18.

5.32. PREPARATION FOR STORAGE OR SHIPMENT. K747 MAIN ROTOR BLADES.

a. The following instructions cover storage or shipment of main rotor blades in container P/N K747-001.

(1) Thoroughly remove foreign matter from entire exterior surface of blade using clean cheesecloth (C30).

NOTE

Tape all holes in the blade (bullet damage, tree damage, foreign object damage, etc.) to protect the interior of the blade.

(2) Thoroughly clean root fitting. Apply grease (C55) to root fitting bolt hole, drag brace bolt hole, and all exposed unpainted surfaces.

(3) Wrap blade with barrier material (C23), shiny side next to blade, at all locations where blade will contact the molded hair supports (5 places) and secure with pressure sensitive tape (C127).

(4) Attach a properly filled out DD Form 1577-2 (Unserviceable/Repairable) tag directly to the blade.

(5) Place blade in container.

(6) Secure blade to shock mounted support.

(7) Secure lid.

(8) Secure blade log in container log compartment.

5-33. INSTALLATION — K747 MAIN ROTOR BLADES.

WARNING

Do not use finger to line up shims.

a. Obtain a balanced main rotor hub (paragraph 5-45).

b. Support main rotor hub on a build-up bench in accordance paragraph 5-12m. Check that locating pin (6, figure 5-10) is installed in upper surface of each grip (5) of inboard side of retaining bolt hole.

c. Install drag strut (15, figure 5-16).

d. Remove preservative grease from blade grip bore and retaining bolt.

e. Apply corrosion preventive compound (C44) to blade retaining bolt, hub grip and blade butts. Slide blade (9, figure 5-10) gently into grip (use of sling is optional). Place washer (7) on retaining bolt (8). Align bolt holes carefully and insert bolt from top. If bolt binds, move tip of blade up and down slowly to find position which allows bolt to pass through without binding. Seat bolt and washer with notches on locating pin (6).

f. Place padded support under blade approximately one third blade length inboard from blade fin.

CAUTION

Install washer (16) with counterbore up facing grip.

The erosion guard is a polycarbonate material which will cut easily upon impact with a rigid structure. Seal all openings immediately with sealing iron.

g. Install washer (16) with counterbore up as illustrated and install nut (17). Do not tighten nut at this time.

h. Preset drag brace (15) length to 14.750 inches, hole center to hole center. Align clevis of drag brace (15) on bolt hole of the blade drag plates. Install shims (10) equally between clevis and upper and lower drag plates to obtain 0.000 to 0.005 inch clearance. Install bolt (14) and secure with two washers (12 and 13) and nut (11) on lower end. Do not tighten at this time.

i. Install opposite blade in the some manner.

j. If the blades are to be aligned in the hub, follow instructions in paragraph 5-13.

k. If the blades are not to be aligned in the hub, torque both nuts (11) 125 to 150 foot- pounds.

l. If the blades are not to be aligned in the hub, use wrench (T31) to tighten nuts(17) to a torque of 475 to 525 foot-pounds. Align a notch in the nut with a hole in the bolt. Install locking screw (20) with head in a direction so that centrifugal force will keep the locking screw in. In some cases, this may mean the locking screw may be installed from the inside of the bolt. Install washer (19) and nut (18).

m. install grip locks (T59) on each pitch horn, if not previously accomplished (figure 5-4).

5-34. ALIGNMENT — K747 MAIN ROTOR BLADES.

Refer to paragraph 513.

5-35. MAIN ROTOR HUB.

5-36. DESCRIPTION — MAIN ROTOR HUB.

The Main Rotor Hub major components are the yoke, trunnion, yoke extensions, blade grips, drag braces, pitch horns, and elastomeric bearings (figures 5-29 and 5-30). The elastomeric bearings (6, figure 5-30) are composed of alternating layers of an elastic material (elastomer) with concentric cylindrical metal laminations molded to steel inner and outer housings. The bearing outer housing is bolted to the trunnion. Movement of the hub and blades on the flapping axis is accomplished by flexing of the bearing elastomer.

5-37. REMOVAL — MAIN ROTOR HUB.

Premaintenance Requirements for Removal of Main Rotor Hub

Condition	Requirements
Model	AH-1S
Part No. or Serial No.	All
Special Tools	(T59), (T16), (T17), (T15), (T24), (T29), (T45)
Test Equipment	None

Conditions	Requirements
Consumable Materials	None
Special Environmental Conditions	None
Support Equipment	None
Minimum Personnel Required	Two

a. Remove main rotor hub and blades from helicopter (paragraph 5-12).

b. Remove main rotor blades from hub (paragraph 5-18).

5-38. INSPECTION — ASSEMBLED MAIN ROTOR HUB.

a. Inspect exposed surfaces of assembled main rotor hub for nicks, scratches, and corrosion. See figures 5-31, 5-34, 5-35, 5-36, 5-37, 5-38, 5-40, and 5-41 for damage limits. Inspect sand deflectors for cracks (paragraph 5-41, m).

b. Inspect open bolt holes for scratches, gouges and corrosion.

c. Inspect elastomeric bearings for elastomer squeeze-out and delamination. Crazing and slight cracking of elastomer due to weather exposure is not cause for replacement.

d. inspect chafing pad (figure 5-42) for scuffing due to contact between parts. If chafing pad is worn through, inspect yoke (figure 5-34) and grip (figure 5-35).

NOTE

Interference will not occur in normal operation, but can occur at extreme control positions during ground operation of controls with external hydraulic power applied while main rotor is static.

Inspect buffer pads (figure 5-42.1) for scuffing or damage due to contact between the pads and the hub moment springs (MWO 55-1520-244-50-3 Incorporated).

f. Inspect trunnion for damaged splines. See figure 5-40 for allowable damage limits.

g. If any damage is present for which no limits are specified and/or there is damage beyond limits shown on figure 5-40, replace the affected part.

h. Inspect hub historical records and the hub for evidence that the hub has been subjected to an accident or incident outside the realm of normal usage. If such evidenoe exists, perform special inspections outfined in paragraph 1-57.

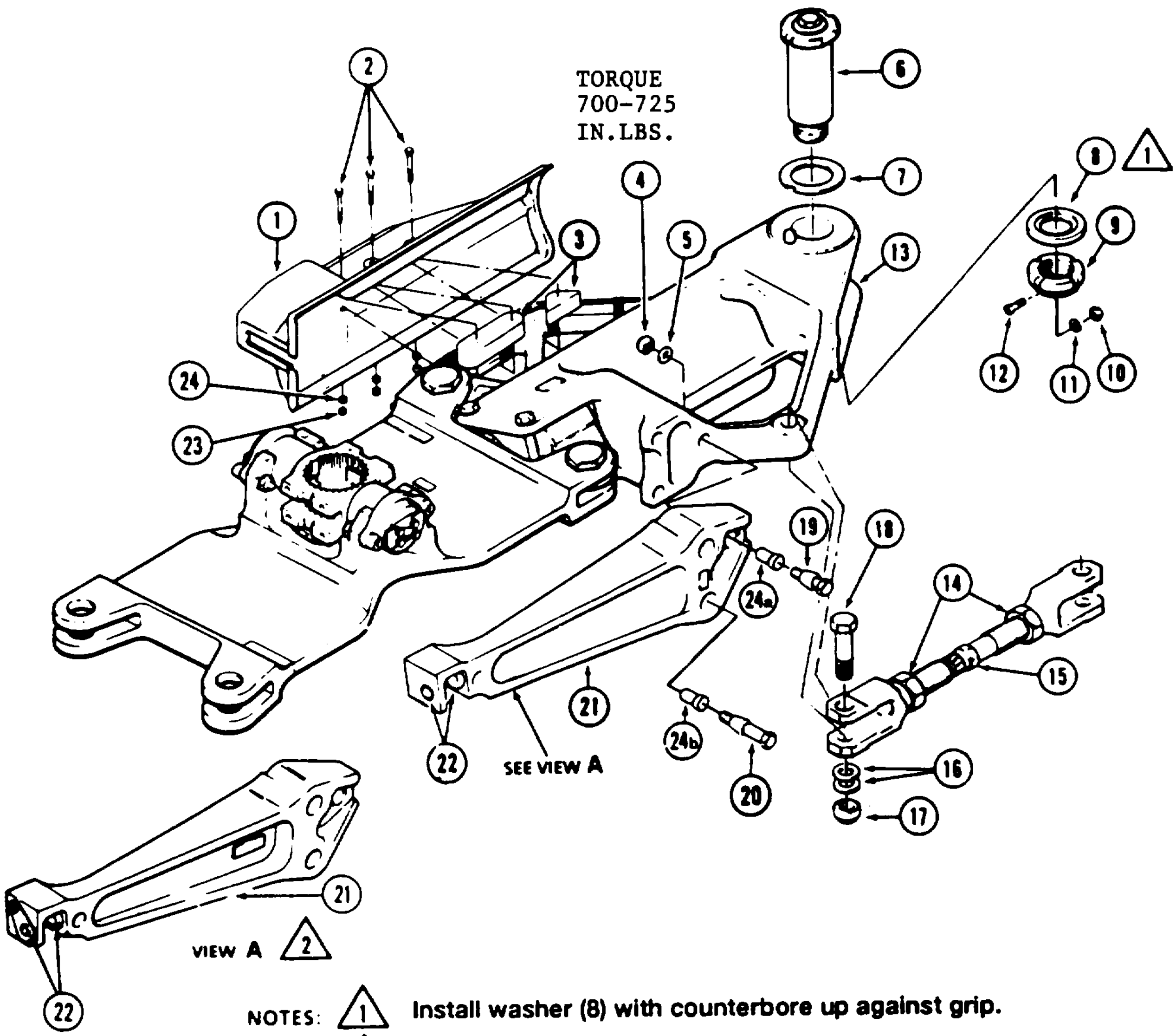
i. Identify hub components which will reach retirement time prior to next scheduled inspection for replacement (paragraph 1-58).

j. Disconnect pitch change links at pitch horns and inspect feathering axis bearings for binding, and/or ratcheting while feathering grips to each end of travel.

5-39. DISASSEMBLY — MAIN ROTOR HUB (AVIM).

Premaintenance Requirements for Disassembly of Main Rotor Hub

Condition	Requirements
Model	AH-1 E/F/P
Part No. or Serial No.	All
Special Tools	(T729), (T31), (T34), (T39), (T40), (T42), (T44), (T53), (T59)
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	Two
Consumable Materials	(C4.1), (C4.2), (C6) (C8), (C31), (C35.1) (C36), (C37), (C39.1) (C51), (C74), (C87) (C88), (C91), (C102) (C103), (C105), (C112) (C116)
Special Environmental Conditions	None



NOTES: 1 Install washer (8) with counterbore up against grip.

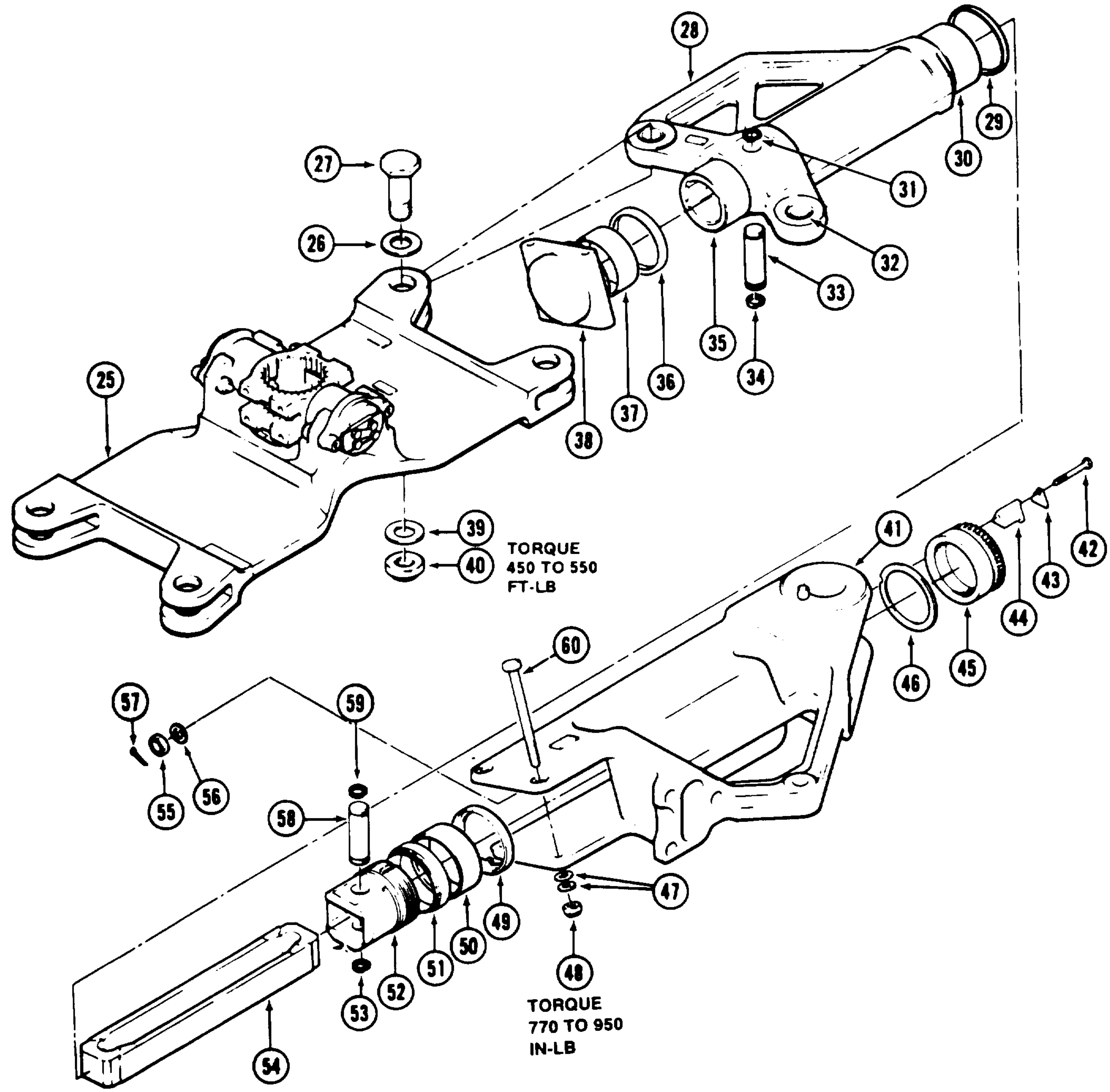
2 View A applicable after MWO 55-1520-244-50-6 is incorporated

1. Sand deflector
2. Bolts
3. Shims (spacers)
4. Special nut
5. Special washer
6. Bolt assembly
7. Keyway washer
8. Special washer
9. Special nut
10. Extended washer nut
11. Steel washer
12. Screw
13. Grip
14. Jamnut
15. Drag brace
16. Steel washers
17. Nut
18. Bolt
19. Special bolt
20. Special bolt
21. Pitch horn assembly
22. Bushings
23. Nuts
24. Washers

24a. Bushing

24b. Bushing

Figure 5-29. Main Rotor Hub Yoke Extension and Grip Assembly (Sheet 1 of 2)



25. Yoke
26. Special washer
27. Bolt
28. Yoke extension
29. Yoke ring (radius rings)
30. Sleeve
31. Retaining ring
32. Shim (buffer pad)
33. Pin
34. Retaining ring
35. Sleeve
36. Seal
37. Bearing
38. Housing
39. Special washer
40. Self-locking nut
41. Grip
42. Bolt
43. Clamp
44. Retainer (lock)
45. Dome nut
46. Washer
47. Steel washer
48. Self-locking nut
49. Strap indexing ring
50. Bearing
51. Grip bearing dust seal
52. Fitting
53. Retaining ring
54. Strap
55. Slotted nut
56. Thin steel washer
57. Cotter pin
58. Pin
59. Retaining ring
60. Bolt

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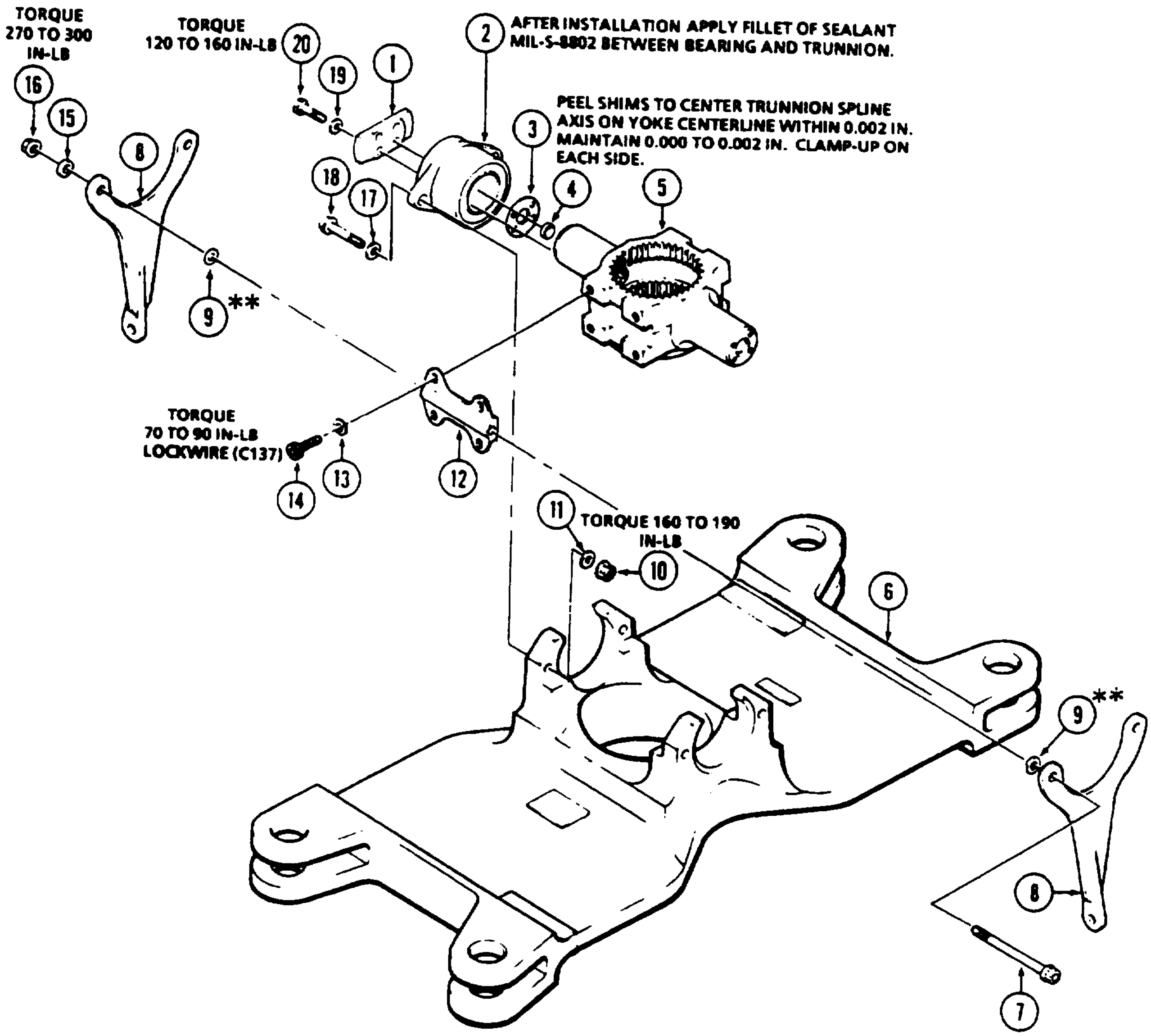
Figure 5-29. Main Rotor Hub Yoke Extension and Grip Assembly (Sheet 2 of 2)



1. Retainer	6. Yoke	11. Washer	*16. Nut
2. Elastomeric Bearing	*7. Bolt	*12. Plate	17. Washer
3. Shims	*8. Strap	*13. Washer	18. Bolt
4. Disk	*9. Washer	*14. Bolt	19. Washer
5. Trunnion	10. Nut	*15. Washer	20. Bolt

¤After incorporation of MWO 55-1520-244-50-3.

**To prevent interference place maximum of two washers between strap and plate.

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Figure 5-30. Main Rotor Hub Yoke and Trunnion

a. Position main rotor hub on build-up bench (T29) equipped with adapter plate (T34) if not previously accomplished in accordance with instructions contained in paragraph 5-12, m.

b. Remove main rotor blades from hub if not previously accomplished (paragraph 5-18).

c. Identify blade retaining bolt assemblies (6, figure 5-29), including washers (7, 8, 11), screw (12), and nuts (9 and 10), for reinstallation in the same grip. Use paint or felt tip pen. Remove both bolts. Use socket wrench (T31) to remove nuts from blade retaining bolts. Use work aid shown in figure 5-12 to remove blade retaining bolts if necessary (paragraph 5-18).

NOTE

Units operating AH-1 aircraft may remove the sand deflectors P/N 540-011-174-11, NSN 1615-00-116-7110, from the rotor head. Upon removal, deflectors should be inspected for serviceability and repaired as required. The deflectors will be retained as part of the aircraft mission equipment. Deflectors will be installed in extreme sand/dust conditions or in arctic areas where there are extreme ice/snow conditions. Both deflectors must be either installed on the aircraft or removed from the aircraft.

d. Remove three bolts (2, figure 5-29), nuts (23), washers (24), sand deflector (1), and spacers (3). Remove opposite sand deflector in the same manner.

e. Remove bolt (18), washers (16), nut (17), and drag brace (15). Remove opposite drag brace in same manner.

f. Remove bolts (19 and 20) and pitch horn (21). Remove opposite pitch horn in the same manner.

g. Remove cotter pin (57), nut (55), and washer (58) from bolt (42). Remove bolt (42), damp (43) and lock (44). Remove dome nut (45) and washer (46).

h. Remove nuts (48) and washers (47) from bolts (60). Remove bolts. Remove blade grip (41) from yoke extension (28). Use care to prevent damage to threads on fitting (52) and damage to dust seal (51). The dust seal (51), bearing (50) and strap indexing ring (49) should be bonded to the grip near the outboard end.

i. Remove the opposite grip in the same manner outlined in steps g. and h.

j. Remove nuts (40), washers (39), bolts (27) and washers (26). Remove yoke extension (28) and housing (38) from yoke (25). Remove housing (38) from extension. Remove opposite yoke extension in the same manner.

k. Clean sealant from retaining rings (31, 34, 53, and 59) with a sharp plastic scraper. Remove pin (33 and 58) and strap (54). Remove opposite strap in the same manner.

l. Remove yoke and trunnion from build-up stand and place on a work-bench with supports under the flat portion of the yoke.

m. Identify elastomeric bearings (2, figure 5-30) trunnion (5) and yoke (6) with felt-tipped marker so the bearings and trunnion can be reinstalled in the same position on the yoke.

n. Remove four bolts (20), washers (19) and retainer (1) from each side of trunnion.

o. Remove two nuts (10), washers (11), internal hex bolts (18) and recessed washers (17) to free one elastomeric bearing from yoke. Thread a bolt with 1/2 x 20 UNF threads into tapped hole in elastomeric bearing (2). Torque bolt 100 foot-pounds maximum to remove elastomeric bearing from yoke and trunnion. Heat to 200 degrees F maximum if necessary to aid removal. Remove opposite elastomeric bearing in the same manner and remove trunnion (5) from yoke (6).

p. Remove shims (7) from both sides of trunnion and identify for reinstallation in the same location.

q. Remove straps (8) from trunnion (5) by removing nuts (16), washers (15), washers (9), and bolts (7). Remove plates (12) by removing lockwire (C137), bolts (14), and washers (13) (MWO 55-1520-244-50-3 Incorporated).

5-40. CLEANING MAIN ROTOR HUB (AVIM).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

a. Clean all metal parts with solvent (C112) and dry with compressed air.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

CAUTION

Do not allow MEK to saturate the Teflon bearings or contact the elastomer portion of elastomeric bearings.

b. Clean Teflon bearings in housing (38, figure 5-29) and grip (41) with dean cloths dampened with MEK (C74).

c. Clean sealant and zinc ohromate primer from spindles of trunnion and inner metal housing of elastomeric bearings (2, figure 5-30). Use a sharp plastic scraper and cloths moistened with MEK (C74). Do not allow the MEK to contact the elastomeric bearings.

5-41. INSPECTION — DISASSEMBLED MAIN ROTOR HUB (AVIM).

NOTE

Bearings (37 and 50, figure 5-29) will normally be inspected while installed in housing (38) and grip (41), respectively.

a Inspect liner portion of bearings (37 and 50, figure 5-29) for secure bonding to the stainless steel sleeve (outer potion) of bearings. Inspect liner portion of the bearings for wear and damage. Sea figure 5-31 for examples of bearing wear patterns to determine if bearings are satisfactory for further servics

b. Inspect yoke extension for damaged, worn or loose bearing sleeves (30 and 35, figure 5-29). If the bearing sleeves are loose or have damage in excess of limits shown in figure 5-32, the yoke extension must be replaced. If bearing sleeves have any superficial marks, polish out marks with Scotchbrite (C103) and reinspect the bearing sleeves. If tungsten carbide coated sleeves (i.e. 540-011-153-17 extensions or new spare sleeves) are found to have mechanical/corrosion damage within limits, repair by using jewelers files or similar items capable of cutting a surface with a hardness of RC70. If such items are not available, replace extensions.

c. Inspect yoke extensions for worn or missing buffer pads (32, figure 5-29) - four pads on each extension.

d. Inspect mating surfaces of the hub components for damage. See figure 5-32, 5-34, 5-35 and 5-36 for damage limits for individual hub components to determine whether damage exceeds limits. All hub components must assemble without misalignment or cocking after polishing out mechanical and corrosion damage.

e. Inspect the holes in the hub components illustrated in figure 5-33 for wear in excess of limits.

f. Inspect seals (36, figure 5-29) for damage which would affect function and for secure bonding to housings.

g. Inspect grip bearing dust seals (51) for damage which would affect function and/or secure bonding to grips.

A

Typical bearing surface satisfactory for reuse. Transfer of material is normal, will appear as glazed surface.

B

Slight wear resulting from normal usage. Bearing is reusable.

C

Acceptable wear pattern, will appear to be glazed.

D

Unacceptable. Bearing must be replaced.

Figure 5-31. Main Rotor Bearing Wear Patterns

h. Inspect radius rings (29) for damage and wear. Replace radius rings if the following limits are exceeded:

(1) Cracks in the carbon face running from the inside diameter to the outside diameter.

(2) Grooves in the carbon face which reveal uneven contact with seal.

(3) Any chips of carbon missing from the carbon face.

(4) Unbended abrasion shield.

NOTE

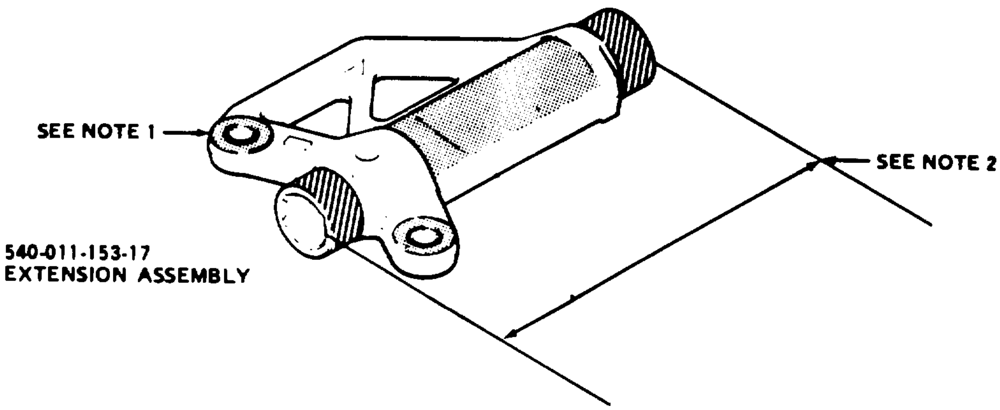
Partially unbended abrasion shield. discoloration of the shield and/or leas than 10 cracks in the shield are not cause for replacement.

i. Inspect straps (54) for damage and wear in excess of the following maximum limits:

NOTE

When replacing straps, do not intermix part numbers.

(1) Fifty loose wire ends protruding through the urethane coating of strap in any one corner and/or 400 loose ends over the entire strap assembly. If a lesser number of wire ends are found,



TYPE OF DAMAGE	DAMAGE LOCATION SYMBOLS		
	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED		
CRACKS ALLOWED	None	None	None
NICKS, SCRATCHES DENTS AND CORROSION	0.002	0.020	0.060
MAXIMUM AREA PER FULL DEPTH REPAIR	0.25 Sq. In.	Not Critical	Not Critical
NUMBER OF REPAIRS	Not Critical	Not Critical	Not Critical
EDGE CHAMFER	0.040	0.040	0.080
BORE DAMAGE	0.002 for 1/4 Circumference		

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

NOTES:

1. **The area of repair on surfaces mating with the yoke should not exceed one-half of any quadrant.**
2. **Thickness of barrel wall is 0.100 minimum.**

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Figure 5-32. Damage Limits - Main Rotor Hub Yoke Extension

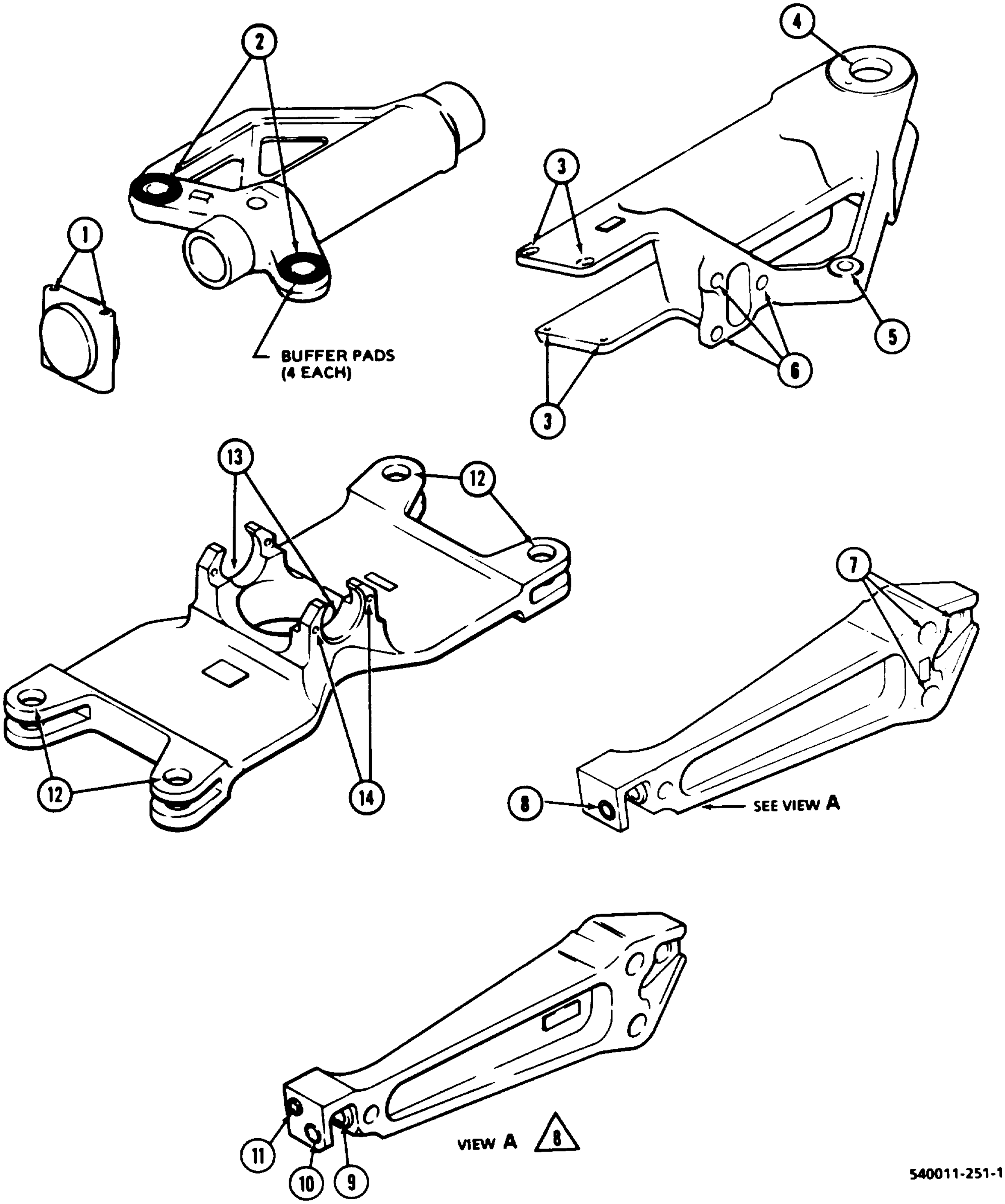

Figure 5-33. Damage Limits - Main Rotor Hub Bolt Holes (Sheet 1 of 2)

MAIN ROTOR HUB BORE INSPECTION

NOMENCLATURE	HOLE NO.	BORE	MAX. I.D.
Inboard Bearing Housing	1	Attachment Bolt Holes I. D.	0.5030
Yoke Extension	2	Attachment Bolt Holes	1.2503
Grip	3	Inboard Bearing Housing Attachment Bolt Holes	0.5025
	4	Blade Retention Bolt Holes	2.5015
	5	Drag Brace Attachment Bolt Holes	0.8760
	6	Pitch Horn Bushing Holes	0.8735
Pitch Horn	7	Attachment Bolt Holes	0.8728
	8	Inboard Bushing	0.6268
	9	Bushing (Installed) Bore Bushing (Removed) Bore	0.6268 0.8760
	10	Bushing (Installed) Bore Bushing (Removed) Bore	0.8785 1.0990
	11	Anti-torque Pin (Installed) Bore Anti-torque Pin (Removed) Bore	N/A 0.2505
Yoke	12	Extension Attachment Bushing Holes	1.2503
	13	Trunnion Bore	3.2530
	14	Trunnion Attach Holes	0.3850

NOTES:

1. Damage and repair to the walls of hole No. 3 are limited to maximum depth of 0.005 and to holes No. 10, 0.002.
2. Repaired area in trunnion bore, hole No. 13, may not exceed one-fourth the circumference.
3. Damage and repairs on the walls of bolt holes No. 2, 4, 5, and 12 is limited to a maximum depth of 0.010.
4. Repaired area on walls of holes No. 2, 3, 4, 5, 6, 7, and 12 may not exceed one-fourth circumference.
5. Damage and repairs on the walls of bolt holes No. 7 is limited to a maximum depth of 0.001.
6. Damage and repair limit on trunnion attach holes No. 14, is 0.002 on the full circumference.
7. Damage and repair on walls of holes No. 9, 10, and 11 shall not exceed 0.001 inch depth for one-fourth the circumference.
8. View A applicable after MWO 55-1520-244-50-6 is incorporated.
9. All dimensions are in inches unless otherwise noted.

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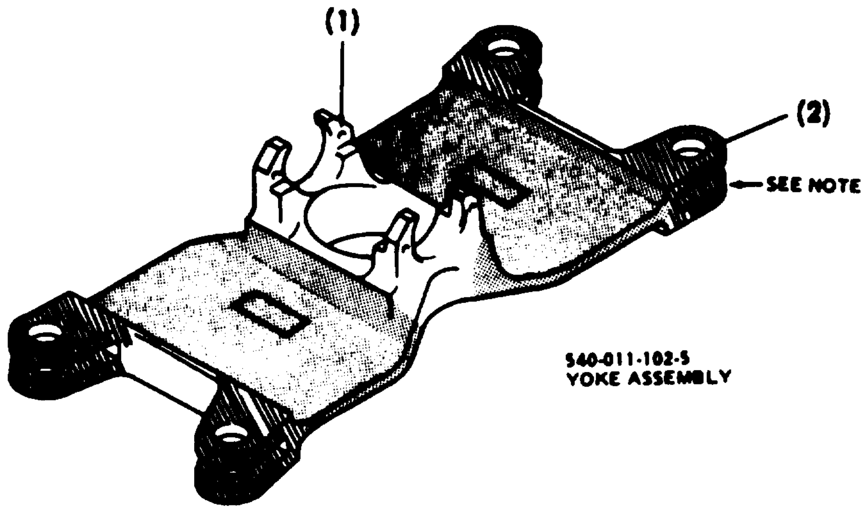
Figure 5-33. Damage Limits – Main Rotor Hub Bolt Holes (Sheet 2 of 2)



DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED		
	(dark shaded)	(light shaded)	(unshaded)
CRACKS ALLOWED	None	None	None
NICKS, SCRATCHES DENTS AND CORROSION	0.010	0.010	0.020
MAXIMUM AREA PER FULL DEPTH REPAIR	Not Critical	0.10 Sq. In.	Not Critical
NUMBER OF REPAIRS	Not Critical	Not Critical	Not Critical
EDGE CHAMFER	0.040	0.060	0.10

INSIDE DIAMETER of	MFG. DIM.	MAX. SERVICE LIMIT
Trunnion Bearing Mounting Holes (4 places)	0.376 - 0.383	0.385
Bushings (4 places)	1.2495 - 1.2500	1.2520

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

NOTE:
The maxium area of repair on inner surfaces of lugs is one-half of any quadrant.

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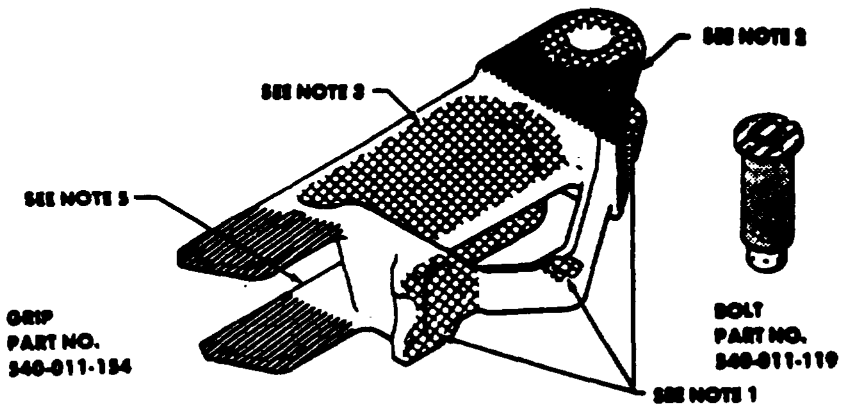
Figure 5-34. Damage Limits - Main Rotor Hub Yoke



DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED				
NICKS, SCRATCHES, DENTS AND CORROSION	0.020 In.	0.040 In.	0.060 In.	0.005 In.	0.010 In.
MAXIMUM AREA PER FULL DEPTH REPAIR	Not Critical	Not Critical	Not Critical	0.25 Sq. In.	Not Critical
NUMBER OF REPAIR AREAS	Not Critical	Not Critical	Not Critical	Two	Not Critical
EDGE CHAMFER	0.040 In.	0.060 In.	0.080 In.	--- ---	0.030 In.

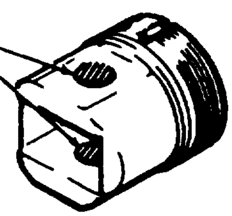
BORE DAMAGE: 0.002 Inch for 1/4 Circumference

NO CRACKS ALLOWED.

NOTES:

1. The maximum allowable area of repair on surfaces mating with the blade, drag brace and pitch horn is one-half of any quadrant.
2. Thickness of blade tang must be 0.280 minimum.
3. Thickness of wall must be 0.090 minimum.
4. Thread damage:
   - Depth: One-third of thread
   - Length: One-half inch
   - Number: One
5. Inside diameter of grip with bearing removed (maximum)-4.501 inch. Scratches and scoring (maximum)-0.001. No corrosion before or after cleanup. Repair criteria-None.

Figure 5-35. Damage Limits - Main Rotor Hub Grip.



DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE		
	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED	
CRACKS ALLOWED		None
MECHANICAL DAMAGE	0.0005	0.005
CORROSION DAMAGE	0.0005	0.005
MAXIMUM AREA PER FULL DEPTH REPAIR		0.5 Sq. In.
NUMBER OF REPAIRS		One Inside One Outside
EDGE CHAMFER		0.020
BORE DAMAGE	NOTES 1 and 2.	
THREAD DAMAGE		
Depth	One-quarter of Thread	
Length	0.50	
Number	One	

NOTES:

1. If retention strap pin holes are out of round in excess of 0.001, replace retention strap fitting.
2. If retention strap pin holes are out of round in excess of 0.0015 with the larger dimension in spanwise direction, scrap the main rotor hub assembly that the retention strap fitting was installed.

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

Figure 5-36. Damage Limits — Main Rotor Hub Strap Fitting record the serial number of the strap and the number of wire ends found in the historical record of the main rotor hub.

(2) Use a ten power magnifyhg glass to check for cracks in flanges of strap bushings and urethane wedges. A crack in these parts is cause for rejection of the strap.

(3) Severe rupture of the urethane coating is cause for rejection.

(4) Displacement of urethane wedges between bushing and inner surface of wire bundle is cause for rejection.

NOTE

A permanent set twist in the strap and/or a slight bulging of wire cross section is normal and not cause for rejection of the strap.

(5) Pins (33 and 58) for visible surface contact with mating parts. Visible surface wear is cause for rejection.

j. Inspect attaching bolts, nuts, and washers for damage and corrosion.

k. Inspect retainers (1, figure 5-30) for obvious damage.

l. Inspect disks (4) for obvious damage.

m. Inspect sand deflectors (1, figure 5-29) for cracks, abrasion damage, oversize bolt holes and corroded, worn, darnaged, separated or missing washers. Replace sand deflectors having any cracks greater than two inches in length in any portion. Cracks less than two inches in length are acceptable if stop drilled, provided crack does not permit material fallout.

n. Inspect elastomeric bearings for damage in accordance with instructions on figure 5-41.

o. Inspect elastomeric bearing housing for cracks by magnetic particle method (TM 43-0103) if cracks are suspected.

p. Inspect hub components illustrated in figures 5-32 through 5-41 for damage in excess of limits.

q. Inspect yoke for damages and/or missing chafing pads (figure 5-42).

r. Inspect yoke for loose or missing buffer pads (figure 5-42.1). (MWO 55-1520-244-50-3 incorporated).

5-42. REPAIR — MAIN ROTOR HUB (AVIM).

NOTE

If allowable repair limits on yoke are exceeded, send the yoke to Depot Maintenance. Replace other parts that have damage in excess of repair limits.

a. Polish out all traces of corrosion and mechanical damage on hub components. Polish out corrosion darnage on aluminum parts to twice the depth of the pit. Use fine to medium grades of abrasive cloth (36) or fine India stone (C116). Blend the edges of the repair into the surrounding area with a smooth contour, Make final cleanup with crocus cloth (C37) to obtain a smooth, scratch-free surface. If damage exceeds limits specified in paragraph 5-41 dispose of part locally.

b. if cadmium plate is removed, proceed as follows: Clean area with MEK (C74). Prime area with two coats of unreduced Zinc Chromate Primer (C91). Allow first mat to curs 30 minutes before applying second coat.

c. Touch up rework areas on aluminum parts with chemical film (C31).

d. Replace damaged or missing buffer pads (32, figure 5-29) as follows:

CAUTION

Do not remove cadmium plate from yoke extension except in the area where buffer pads will be installed.

(1) Remove any buffer pad material that remains bonded to the yoke extension with a plastic or aluminum scraper

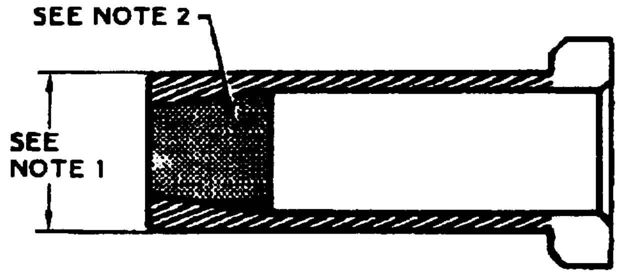
WARNING

Cleaning solvent is flameable and toxic. Pro vide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

(2) Clean area where the new buffer pad will be installed with 400 grit sandpaper (C102). Remove residue with dean cloths dampened with MEK (C74). Clean the side of the new buffer pad that will be bonded in the same manner.

WARNING

Use primer in a well ventilated area away from open frame.



DAMAGE LOCATION SYMBOLS	(hatched)	(shaded)	(clear)
TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED		
MECHANICAL AND CORROSION	0.002 in.	0.002 in.	0.010 in.
MAXIMUM AREA PER FULL DEPTH REPAIR	Not critical	Not critical	Not critical
NUMBER OF REPAIRS	Not critical	Not critical	Not critical

NOTES:
1. **Outside diameter to be within 0.8679 to 0.8721 inches.**
2. **Internal tapered area only.**
3. **Usable on pitch horn (P/N 209-010-109).**

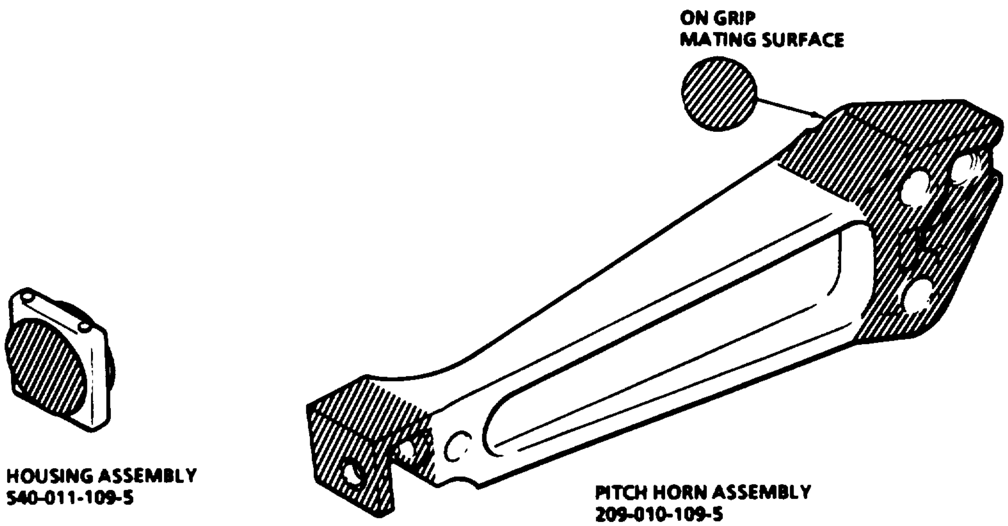
540011-213

Figure 5-37. Damage Limits-Pitch Horn Bushing

(3) Apply a coat of primer (C87) to the cleaned surfaces of the yoke extension and allow to cure for thirty minutes.

(4) Mix adhesive (C8). Refer to table 1-11, for adhesive, mix ratio, pot life, and curing schedule. Apply a thin coat of adhesive to the mating surfaces of the buffer pad and the yoke extension. Position the buffer pad on the yoke extension and clamp in place. Use a C-clamp and two flat smooth plates or use a bolt and two plates with holes in the plates for the bolt. Use a cellophane or polyethylene tape between the buffer pad and the plates. Refer to table 1-11 for adhesive, mix ratio, pot life, and curing schedule.

(5) Remove clamp and use 180 grit sandpaper (C102) to remove any excess adhesive that was squeezed out during bonding. Avoid removing cadmium plate from yoke extension. If necessary, touch up cadmium plate (step b).



DAMAGE LOCATION SYMBOLS

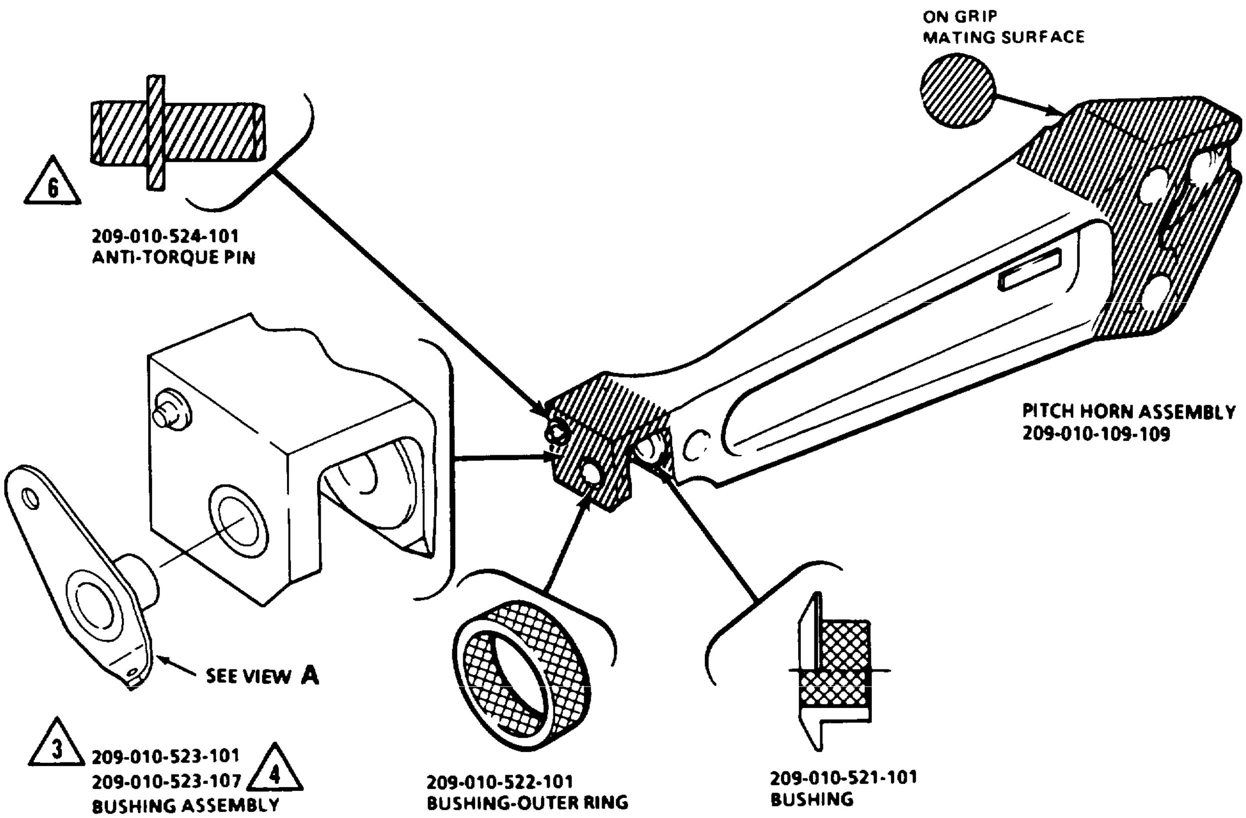
TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED (hatched)	(open)
CRACKS ALLOWED	None	None
NICKS, SCRATCHES AND SHARP DENTS	0.020	0.040
CORROSION:		
Before Repair	0.010	0.020
After Repair	0.020	0.040
MAXIMUM AREA PER FULL DEPTH REPAIR	0.25 Sq. In.	0.50 Sq. In.
NUMBER OF NONOVER-LAPPING REPAIRS	Two per segment	4
EDGE CHAMFER	0.050	0.100
BORE DAMAGE TO BUSHING	0.001 In. for 1/4 circumference	

NOTES:

1. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE STATED.
2. CORROSION DAMAGE MUST BE CLEANED UP TO TWICE THE DEPTH OF DAMAGE, NOT TO EXCEED ABOVE LIMITS, ON ALUMINUM PARTS.

540011-252

Figure 5-38. Damage Limits – Main Rotor Hub Fitch Horn 209-010-109-5
(Prior to Incorporation of MWO 55-1520-244-50-6)

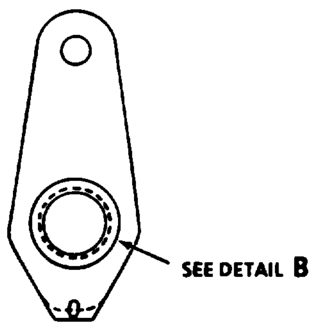


DAMAGE LOCATION SYMBOLS FOR PITCH HORN

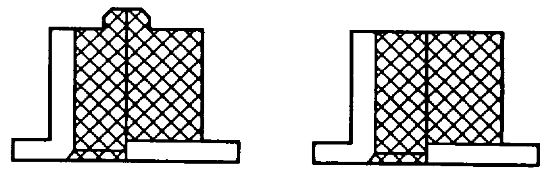
TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED		
	(hatched)	1 (cross-hatched)	(clear)
CRACKS ALLOWED	None	None	None
NICKS, SCRATCHES AND SHARP DENTS	0.020 In.	0.001 In.	0.040 In.
CORROSION:			
Before Repair	0.010 In.	0.001 In.	0.020 In.
After Repair	0.020 In.	0.001 In.	0.040 In.
MAXIMUM AREA PER FULL DEPTH REPAIR	6 0.25 Sq. In.	0.050 Sq. In.	0.50 Sq. in.
NUMBER OF REPAIRS	Two Per Segment	4	4
EDGE CHAMFER	0.050 In.	0.020 In.	0.100 In.
BORE DAMAGE	0.001 In. for 1/4 circumference		

209010-237-1A

Figure 5-38.1. Damage Limits – Main Rotor Hub Pitch Horn 209-010-109-109 (After Incorporation of MWO 55-1520-244-50-6 and MWO 55-1520-244-50-91 (Sheet 1 of 2)



209-010-523-101 3
209-010-523-107 4
VIEW A



209-010-523-101 3 209-010-523-107 4

DETAIL B

DAMAGE LOCATION SYMBOLS FOR BUSHINGS

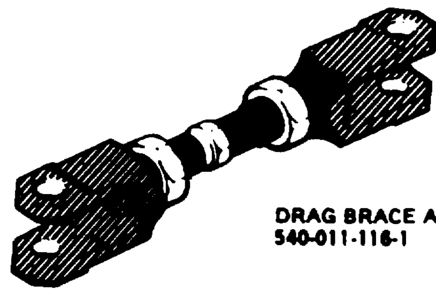
TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED (1 shaded)	(unshaded)
MECHANICAL CORROSION	0.001 In. for 1/4 circumference	0.010 In.
MAXIMUM AREA PER FULL DEPTH REPAIR	0.05 Sq. in.	0.10 Sq. In.
NUMBER OF REPAIRS	4	4
CRACKS	None	None
BORE DAMAGE TO BUSHINGS	0.001 In. for 1/4 circumference	

NOTE:

1. Shaded area represents inside and outside diameter of bushings.
2. Useable on main rotor hub (P/N 540-011-101-131).
3. Installed by MWO 55-1520-244-50-9.
4. Installed by MWO 55-1520-244-50-6.
5. Corrosion must be cleaned up to twice the depth of damage, not to exceed above limits, on aluminum parts.
6. Repair area not to exceed 1/3 circumference of pin.

209010-237-2A

Figure 5-38.1. Damage Limits – Main Rotor Hub Pitch Horn 209-010-109-109
(After Incorporation of MWO 55-1520-244-50-6 and MWO 55-1520-244-50-9) (Sheet 2 of 2)



DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED		
CRACKS ALLOWED	None	None	None
NICKS, SCRATCHES DENTS AND CORROSION	0.010	0.020	0.030
MAXIMUM AREA PER FULL DEPTH REPAIR	0.25 Sq. In.	0.25 Sq. In.	Not Critical
NUMBER OF REPAIRS	One Per Tange	Two Per Segment	Not Critical
EDGE CHAMFER	0.030	0.030	0.060
THREAD DAMAGE			
Depth	One-third of Thread		
Length	0.25		
Number	Two Per Segment		
BORE DAMAGE	0.001 for 1/4 Circumference		

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

540011-132E

Figure 5-39. Damage Limits — Main Rotor Drag Brace

(6) Check fit of yoke extension to yoke. If the new buffer pads are too thick, sand the pads with fine grit sandpaper (C102) to obtain a slip fit. The correct dimension is 1.377 TO 1.379 inches over the yoke extension and the buffer pad on each side of the extension.

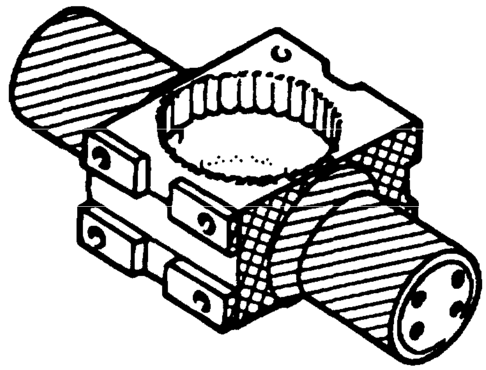
e. Replace radius ring (29, figure 5-29) which failed to pass inspection as follows:

(1) Remove radius ring (29) with a soft aluminum drift.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

(2) Clean adhesive from yoke extension with a plastic scraper and clean cloths, moistened with MEK (C74).



540-011-192-3
TRUNNION

DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED		
MECHANICAL AND CORROSION	0.002 In.	0.010 In.	0.020 In.
MAXIMUM AREA PER FULL DEPTH REPAIR	0.10 Sq. In.	0.010 Sq. In.	0.50 Sq. In.
NUMBER OF REPAIRS	Not Critical	One Per Segment	Not Critical
EDGE CHAMFER	0.040 In.	0.040 In.	0.040 In.

SPLINE DAMAGE

Depth	One-third of Spline
Length	One-half Spline
Number	Three Splines

SPLINES ARE NOT PART OF THE WHITE AREA WHEN USING THE DAMAGE SYMBOLS.

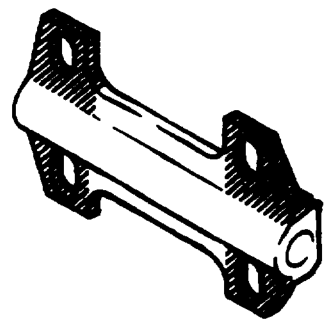
THREAD DAMAGE

Depth	One-third of Thread
Length	0.25 Inch
Number	One Per Segment

SPINDLE DAMAGE

O.D.	1.848 -1.849
Minimum O.D.	1.847
Spindle concentricity	.003 TIR

Figure 5-40. Damage Limits - Main Rotor Hub Trunnion



209-011-208-101 PLATE *

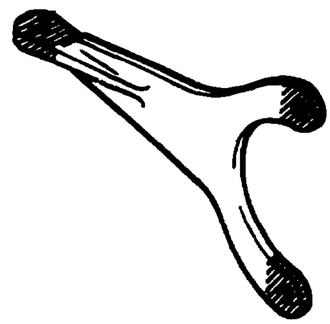
	DAMAGE LOCATION SYMBOLS (hatched)	DAMAGE LOCATION SYMBOLS (open)
TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED	
NICKS, SCRATCHES, DENTS AND CORROSION	0.010 IN.	0.020 IN.
MAXIMUM AREA PER NONOVERLAPPING FULL DEPTH REPAIR	0.10 SQ. IN.	0.25 SQ. IN.
NUMBER OF NONOVERLAPPING REPAIR AREAS	ONE PER LUG	4
EDGE CHAMFER	0.030 IN.	0.050 IN.
BORE DAMAGE	0.002 IN. FOR 1/4 CIRCUMFERENCE AND 1/2 BORE LENGTH	

* After incorporation of MWO 55-1520-244-50-3

NOTE: No cracks allowed.

209011-40

Figure 5-40.1. Damage Limits - Hub Moment Spring Plate



209-011-201-103 STRAP *

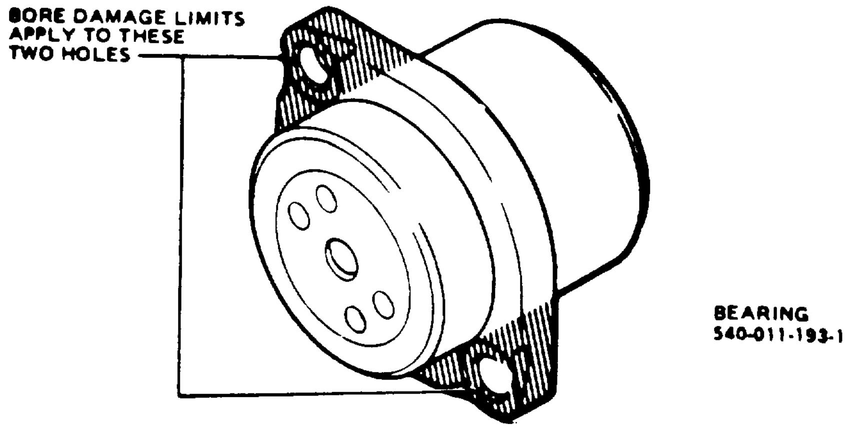
TYPE OF DAMAGE	DAMAGE LOCATION SYMBOLS (hatched)	(open)
	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED	
NICKS, SCRATCHES, DENTS AND CORROSION	0.010 IN.	0.020 IN.
MAXIMUM AREA PER NONOVERLAPPING FULL DEPTH REPAIR	0.10 SQ. IN.	0.25 SQ. IN.
NUMBER OF NON OVERLAPPING REPAIR AREAS	ONE PER LUG	4
EDGE CHAMFER	0.030 IN.	0.060 IN.
BORE DAMAGE	0.002 IN. FOR 1/4 CIRCUMFERENCE	

* After incorporation of MWO 55-1520-244-50-3

NOTE: No cracks allowed.

209011-41

Figure 5-40.2. Damage Limits - Hub Moment Spring Strap



DAMAGE AREA REPAIR SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED	DOES NOT APPLY TO BORES
CRACKS ALLOWED (See Note 1)	None	None
NICKS, SCRATCHES, SHARP DENTS AND CORROSION	0.010	0.020
MAXIMUM AREA PER FULL DEPTH REPAIR	0.10 Sq. In.	0.10 Sq. In.
NUMBER OF REPAIRS	One Per Lug	Not Critical
EDGE CHAMFER	0.030	0.060
BORE DAMAGE ELASTOMER (See Note 2)	0.002 for 1/4 Circumference	

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

NOTES

1. Inspect elastomeric bearing housing for cracks by the magnetic particle method, TM 43-0103 if there is any doubt about serviceability of elastomeric bearings after inspection, forward the bearings to higher level of maintenance for evaluation.

2. Inspect elastomeric bearings with a 10 power magnifying glass for delamination of the concentric metal laminations and the elastomer. Also inspect for delamination of the bearings inner and outer housings. Crazing or cracking of the elastomer or shedding off of small scraps at end of bearing due to weather exposure is not cause for rejection. Use a standard 0.005 inch, blunt-end, feeler gage to check for delamination in excess of the following limits:

Gage Penetration	% Area/Laminate
0.000 TO 0.250	50%
0.000 TO 0.500	25%

3. **Replace any bearing found to have a cracked concentric metal laminations. Cracked concentric metal laminations may be detected by either visual inspection or by running a fingernail along the edge of the shim.**

Figure 5-41. Damage Limits — Main Rotor Hub Elastomeric Bearing.

WARNING

Use primer in a well ventilated area and away from open flame.

(3) Apply a light coat of primer (C87) to mating surfaces of yoke extension and radius ring and allow to cure for thirty minutes.

(4) Mix adhesive (C8). Refer 10 table 1-11, for adhesive, mix ratio, pot life, and curing schedule. Apply a thin coat of adhesive to the mating surfaces of the yoke extension and the radius ring.

(5) Press the radius ring into position on the yoke extension. Ensure that the radius ring is completely seated, Wipe off excess adhesive. Install grip (41) and housing (38) on yoke extension (28). Install dome nut (45) and tighten until grip bearing dust seal (51) evenly contacts radius ring (29) and then tighten an additional one-half turn. Refer to table 1-11, for adhesive, mix ratio, pot life, and curing schedule.

(6) Remove dome nut (45), grip (41) and housing (38) and ensure that radius ring is completely seated on yoke extension (28).

NOTE

Chafing pads are located on the upper and the lower surfaces of the yoke.

f. Replace damaged or missing chafing pads (figure 5-42).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

(1) Remove any chafing pad material that remains on the yoke with a plastic scraper and clean cloths dampened with naphtha (C75). Do not remove paint.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and con-

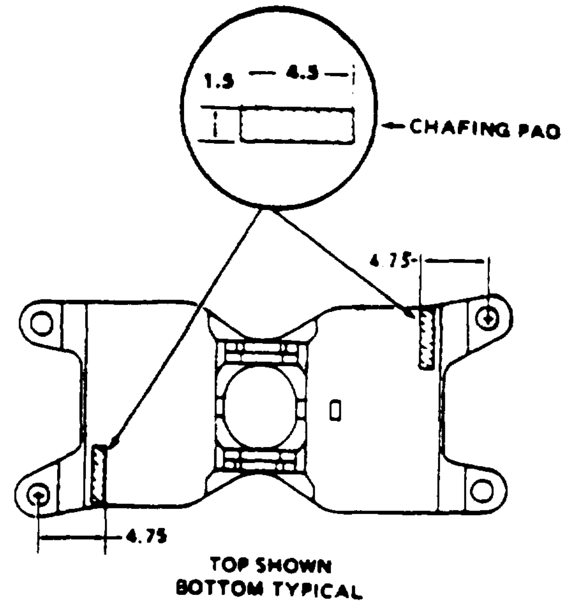


Figure 5-42. Main Rotor Hub Yoke Chafing Pad Installation Dimensions

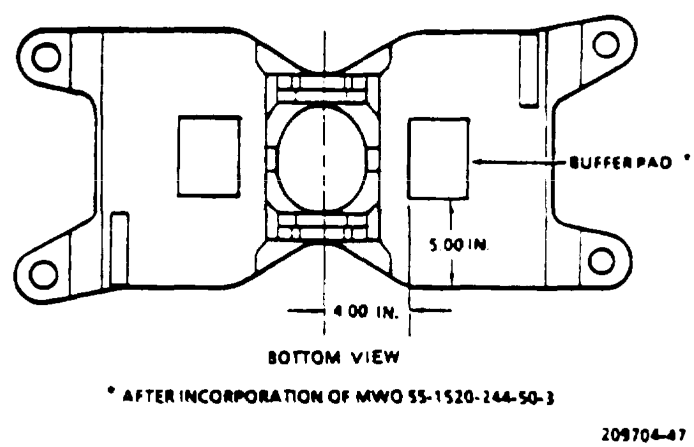


Figure 5-42.1. Main Rotor Hub Yoke Buffer Installation — Dimensions

(2) Clean new chafing pad with MEK (C74) Treat the side of the pad that is to be bonded with tetra-etch (C61).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

(3) After etching, rinse the chafing pad with MEK (C74).

(4) Mix adhesive (C14). Refer to table 1-11, for adhesive mix ratio, pot life, and curing schedule. Apply a thin coat of adhesive to the mating surfaces of the chafing pad and the yoke.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

(5) When adhesive applied in preceding step becomes tacky, install chafing pad at location illustrated in figure 5-42 Work out any air pockets and excess adhesive with a cloth dampened with MEK (C74). Apply weights or use a clamp to hold chafing pad firmly in position. Refer to table 1-11 for adhesive, mix ratio, pot life, and curing schedule.

g. Replace seal (36, figure 5-29) and baring (37) in bearing housing (38) as follows:

(1] Grasp seal (36) with duck bill pliers and tap pliers with mallet to remove the seal.

(2) Install bearing puller (T44) into housing (38). Use the aluminum block as shown in figure 5-43 to prevent damage to the housing. Apply moderate tension with puller.

CAUTION

Do not use flame any form on the housing assembly.

(3) Apply treat to housing with heat lamp for approximately thirty minutes or until yielding of adhesive is evident. Increase tension with puller and remove bearing (37)

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

(4) Clean all traces of adhesive from bearing housing (38) with a plastic scraper and cloths moistened with MEK (C74)

WARNING

Use primer in a well ventilated area and away from open flame.

(5) Apply a light coat of primer (C87) and allow to cure for thirty minutes.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

CAUTION

Ensure that adhesive does not contact teflon bearing fabric.

(6) Mix adhesive (C8). Refer to table 1-11, for adhesive. mix ratio, pot life, and curing schedule. Apply a coat of adhesive to the mating surfaces of bearing (37) and housing (38). Install bearing in housing and seat fully as shown in figure 5-43. Wipe off excess adhesive with a cheese cloth moistened with MEK (C74). Refer to table 1-11, for adhesive, mix ratio, pot life, and curing schedule.

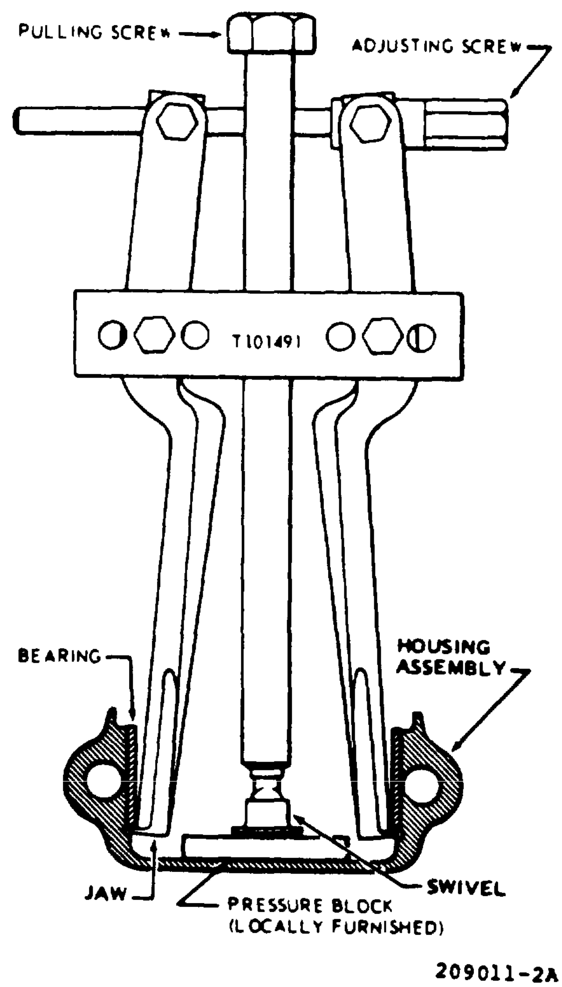


Figure 5-43. Tool Application. Bearing Removal From Housing

NOTE

Larger metal surface of seal which is marked with part number will be installed flush against bearing, inboard of bearing cap.

(7) Apply a thin, even coat of adhesive (C6) to mating surface of seal (36, figure 5-29). Allow adhesive to dry about ten minutes or until it becomes tacky and press seal into housing (38) with lip of seal facing outboard. Allow it to cure for four hours at 70 TO 80 degrees F (21 TO 27 degrees C).

NOTE

Following step applies to helicopters with MWO 55-1520-244-50-3 incorporated.

(8) Replace damaged or missing buffer pads (figure 5-42.1) as follows:

WARNING

Provide adequate ventilation when using methyl-ethyl-ketone (MEK). Avoid breathing solvent vapors and avoid prolonged skin contact.

NOTE

Buffer pads are located on bottom surface of the yoke.

(a) Remove buffer material remaining on yoke using a plastic scraper and cleaning cloth (C35.1) dampened with MEK (C74).

(b) Sand area on yoke where buffer is to be bonded using 400 grit sandpaper (C102).

(c) Clean area with cleaning cloth (C35.1) dampened with MEK (C74). Dry with clean dry cleaning cloth.

(d) Apply light coat of adhesive promoter (C4.2) to cleaned area. Use only enough to wet surface. Let dry for thirty minutes.

(e) Lightly abrade side of new buffer to be bonded to yoke using 400 grit sandpaper (C102). Remove sanding residue with dry compressed air.

(f) Mix adhesive (C4.1) according to instructions on container.

(9) Apply mixed adhesive to mating surfaces of buffer and yoke.

(h) Position buffer on yoke at location shown in figure 5-42.1. Work out any air pockets and excessive adhesive using a cloth dampened with MEK (C74).

(i) Apply clamp or weight to hold buffer until adhesive cures. Cure adhesive for 24 hours at 75 ± 10 degrees F (23.8±55 degrees C).

(j) Prime bare areas around buffer using one coat primer (C88).

(k) Paint primed areas using two coats urethane coating (C39.1) No. 37038.

h. Replace seal (51, figure 5-29) and bearing (50) in grip (41) as follows:

NOTE

if bearing (50) is satisfactory for further service, perform only the steps applicable to removal and installation of seal (51).

(1) Grasp seal (51) with duck bill pliers and tap pliers with mallet to remove seal.

(2) install bearing remover (T40) in grip with slot of tool over tang of strap indexing ring (49). See figure 5-44 for view of installed tool. Drive ring and bearing from grip.

(3) Clean all old adhesive from grip with plastic scraper.

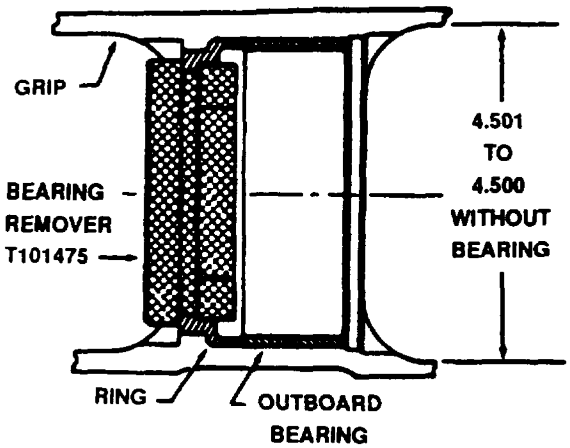


Figure 5-44. Tool Application — Bearing Removal From Grip

(4) Install strap indexing ring (49, figure 5-29) in grip with lugs on ring engaged with slots in grip. Fill keyway gap between strap index ring and grip with sealant (C105).

(5) Press new bearing (50) into grip with arbor (T42). See figure 5-45 for view of installed tool with ring of tool positioned to engage bearing. Press bearing into grip as described in figure 5-45 until it fully engages the strap indexing ring. Remove dome nut and special tools.

(6) Apply a thin even coat of adhesive (C6) to mating surfaces of dust seal (51, figure 5-29) and grip (41). Allow adhesive to dry about ten minutes or until it becomes tacky. Position dust seal on arbor of seal tool (T42) as shown on figure 5-45 and position in grip. Press dust seal into grip as described in the note in figure 5-45, until it fully engages the seat. Remove dome nut and special tools. Spread any excess cement that has squeezed out to form a filler between the dust seal and the grip.

i. Repair sand deflector.

(1) Cracks of two inches in length or less may be stop drilled.

(2) Corrosion, erosion, or damage to doublers may be polished out and painted with primer (C88 or C91).

(3) Surface damage (nicks, scratches, sharp dents) on doubler (aluminum strip) must not exceed 0.020 inch in depth. Corrosion damage shall be polished out to twice the depth of the pit, but must not exceed 0.020 inch in depth. Polish out damage using fine India Stone (C116), 400 grit or finer sandpaper (C102) or soft wire brush on air motor. Treat all polished areas with alodine (C31).

(4) Replace corroded, worn, damaged, separated, or missing washers (AN970-4) as follows:

(a) Remove all remaining adhesive using aluminum or plastic scraper.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

(b) After removing all traces of old adhesive, wipe area with MEK (C74) and allow to dry.

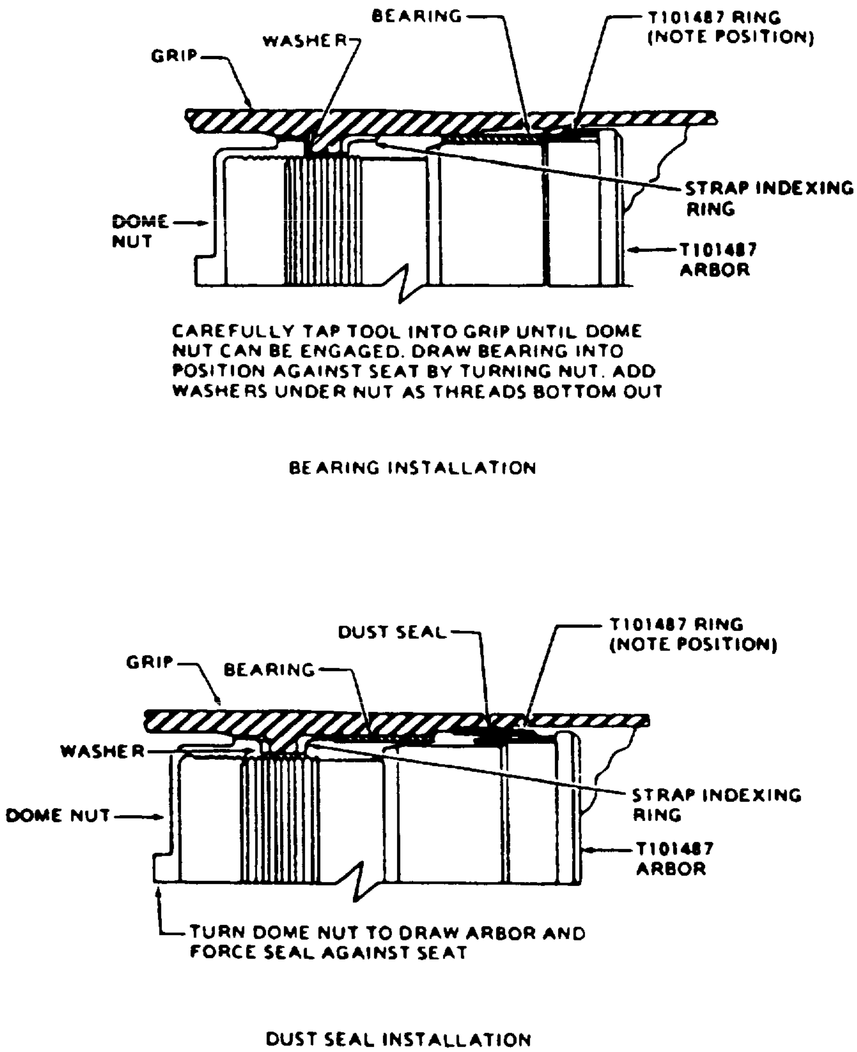


Figure 5-45. Tool Application — Bearing and Seal Installation in Grip

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

(c) Lightly sand surface on one side of new washer using 320 grit sandpaper (C102). Clean area with MEK (C74) and allow to dry.

(d) Apply a thin coat of adhesive (C8) to sanded and cleaned surface of washer and position on deflector.

NOTE

Two, flat smooth plates may be clamped on deflector using C clamp or plates with holes through both plates. Refer to table 1-11, for adhesive, mix ratio, pot life, and curing schedule.

(5) Paint repaired sand deflector.

(a) Upon completion of repair apply one coat of epoxy primer (C88 or C91) followed by one coat of epoxy coating (MIL-C-22750B Color 16473 per FEDERAL STANDARD 595).

(b) Air dry. Refer to table 1-11, for adhesive, mix ratio, pot life, and curing schedule.

NOTE

The installation of sand and dust deflector is optional.

j. Pitch horn (P/N 209-010-109). Replace worn or damaged bushings (20) figure 5-29 in pitch horn (21). Replace bushings (24a) and (24b), exceeding the limits of figure 5-37.

NOTE

Bushings are the expandable type and should not be a tight fit except under torque load

(1) Replace bushing (22), exceeding the limits of Figure 5-37.

WARNING

Before using methyl-ethyl-ketone, extinguish all open flames and turn off electrical equipment. Vapors are highly flammable, avoid prolonged breathing of vapors and repeated skin contact. Use in well ventilated area.

(2) Clean primer from bores using cheesecloth (C30) dampened with methyl-ethyl-ketone (C74).

(3) Inspect pitch horn bores for damage. Damage not to exceed 0.002 inch for one fourth circumference.

(4) New bushings will be installed during assembly.

5-43. ASSEMBLY-MAIN ROTOR HUB.

NOTE

After assembly, trunnion must have 0.000 to 0.002 inch clamp-up on each end (0.002 to 0.004 inch total) and must be centered within 0.002 inch.

a. Position trunnion (5, figure 5-30) in ears of yoke (6).

b. Install disk (4) in counterbore in end of each trunnion spindle.

c. Obtain four new shims (3).

d. Place two new shims (3) in each elastomeric bearing (2). Align holes in shims and bearings. Use two bolts (20) to maintain alignment.

e. Carefully push bearings over end of trunnion spindles. Thread bolts (20) into trunnion finger tight.

f. Install two bolts (18) to secure, each elastomeric bearing (2) to the yoke (6). Install recessed washers (17) on bolts (18) with recessed side toward bolt heads. Install receded washers (11) with recessed side toward nuts (10). Tighten nuts (10) on one bearing (2) sufficiently to hold flange of bearing against yoke. Leave nuts (10) on opposite bearing loose.

g. Ensure that trunnion spindles are fully seated in bearings (2) against shims (3).

h. Use a feeler gage and measure gap between flange of elastomeric bearing (2) and yoke (6) on side where nuts (10) are loose, record this dimension. If no gap is present, shims (3) are too thin. Remove elastomeric bearings (2) and add equal amount of shims (3) to each bearing until gap is achieved. Measure and record gap dimensions as described above.

i. Remove elastomeric bearing (2) from trunnion and remove shims (3) from bearings. Keep shims with bearing from which they were removed.

j. Divide the dimension recorded in step (h) by two. Record this dimension. Peel laminations equal to this dimension plus 0.000 minus 0.002 from shim (3) for each bearing (2). See the following example:

Dimension of original measured gap. . . . 0.022 inch

Original gap divided by two . . . . 0.011 inch

Thickness of laminations to be removed
from shim for each bearing . . . 0.009 to 0.011 inch

k. Measure thickness of shims after adjustment. The thickness of shims (7) for each elastomeric bearing must be equal within 0.002 inch.

l. Reinstall bearings to trunnion as prescribed above and check for gap under trunnion bearing flange. Repeat above procedure until a clamp-up of 0.000 TO 0.002 inch is obtained between yoke and bearing flange on each side (0.000 TO 0.004 inch gap between yoke and bearing housing flange on side being checked). Torque nuts (11) 160 TO 190 inch pounds.

m. Center trunnion as follows:

(1) Modify plug of grip spacing tool (T53) as shown in figure 5-46, to make work aid for centering trunnion.

(2) Position work aid in trunnion as shown in figure 5-46.

(5) Rotate work aid 180 degrees and repeat steps (3) and (4).

(6) If recorded measurements are not equal within 0.002 inch, determine difference and divide this dimension by two. This determines the thickness of shim which must be transferred from side with higher measurement to side with lower measurement.

(7) Disassemble the trunnion/bearing assembly as necessary to gain access to the shims under both bearings and transfer shims as determined necessary above.

(8) Reinstall bearings to trunnion as described above and recheck trunnion centering. Repeat process if trunnion is not centered within 0.002 inch.

NOTE

During the following operation, ensure shims are retained with their respective bearings.

n. When trunnion is centered within 0.002 remove nuts (10, figure 5-30), washers (11), bolts (18), and washers (17). Remove trunnion (5) and elastomeric bearings (2) from yoke (6) and separate.

o. Bond elastomeric bearings (2) to trunnion (5) as follows:

(1) Abrade mating areas of trunnion (5) and elastomeric bearings (2) with 400 grit abrasive cloth (C36).

(2) Clean abraded areas of trunnion and bearings with alcohol (C18).

NOTE

Ensure that shims (3) are installed in the correct elastomeric bearing (2).

(3) Place disks (4) in counterbore in each end of trunnion (5). Place shims (3) in elastomeric bearings (2). Align holes in shims and bearings. Use two bolts (20) to maintain alignment.

(4) Apply unreduced zinc chromate primer (C91.1) to mating surfaces of elastomeric bearings (2) and yoke (6).

(5) Apply unreduced zinc chromate primer (C91.1) to mating surface of elastomeric bearing (2) and trunnion (5).

(6) Carefully push bearings over ends of trunnion spindles while primer is still wet. Remove bolts (20), place retainers (1) on elastomeric bearings (2). Install bolts (20) and washer (19), tighten bolts fingertight.

(7) Place assembled trunnion and bearings on yoke (6). Install bolts (18) recessed washers (17 and 11), and nuts (10). Torque nuts (10) 160 TO 190 inch-pounds.

(8) Torque bolts (20) 120 TO 160 inch-pounds and lockwire (C137) in pairs. Remove excess primer from face of trunnion spindles and bearings.

(9) Deleted.

(10) Apply fillet of sealant (C105) between bearings (6) and trunnion (9) as shown in figure 5-46.

p. Place an adapter plate (T34) on buildup bench (T29). Install the yoke and trunnion on the buildup bench (figure 5-47).

q. Inspect both yoke extensions (28, figure 5-29) to ensure that radius rings (29) are installed and are in satisfactory condition. Position yoke extension (28) on yoke with web on leading edge side and install bolt (27), special washeras(26 and 39) and nut (40) at this time. Install opposite yoke extension in the same manner.

r. Position strap (54) in firing (52). Install retaining ring (59) on pin (58). Install pin through fitting and strap. Install retaining ring (53). Coat ends of pin with sealant (C104). Assemble opposite strap and fitting in same manner.

s. Insert assembled strap (54) and fitting into outboard end of yoke extension (28). Install retaining ring (31) on pin (33) and install pin through yoke extension and strap. Install retaining ring (34). Coat both ends of pin with sealant (C105). Install opposite strap in same manner.

t. Hinge yoke extension (28) forward on bolt (27). Inspect housing (38) to ensure that a serviceable bearing (37) and seal (36) are properly installed. Position housing (38) on yoke extension. Hinge the yoke extension back into position and install bolt (27), special washers (26 and 39) and nut (40) in trailing edge hole. Torque nut (40) 450 TO 550 foot-pounds. Install opposite housing in the same manner.

CAUTION

Do not install washers under heads of bolts (60).

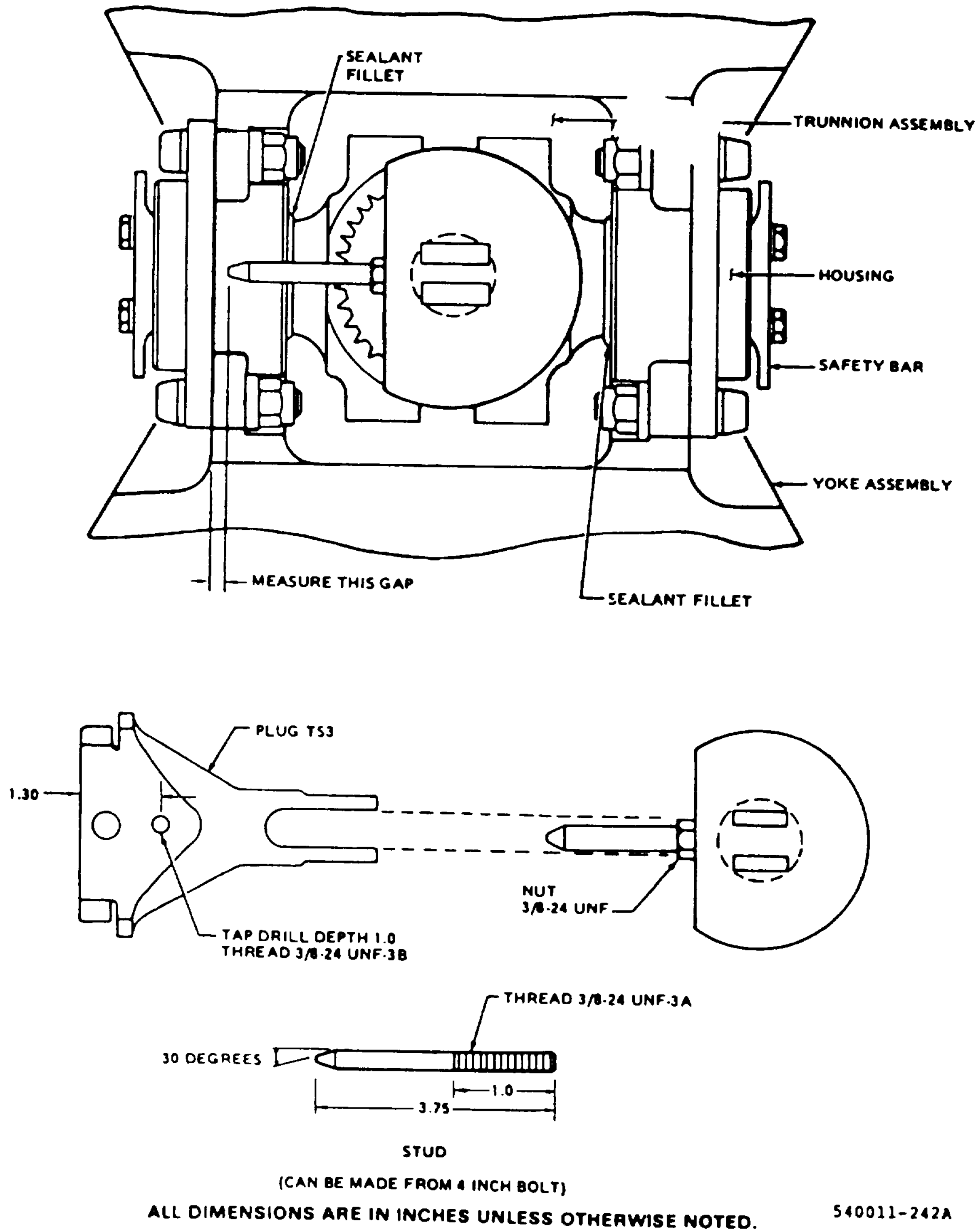
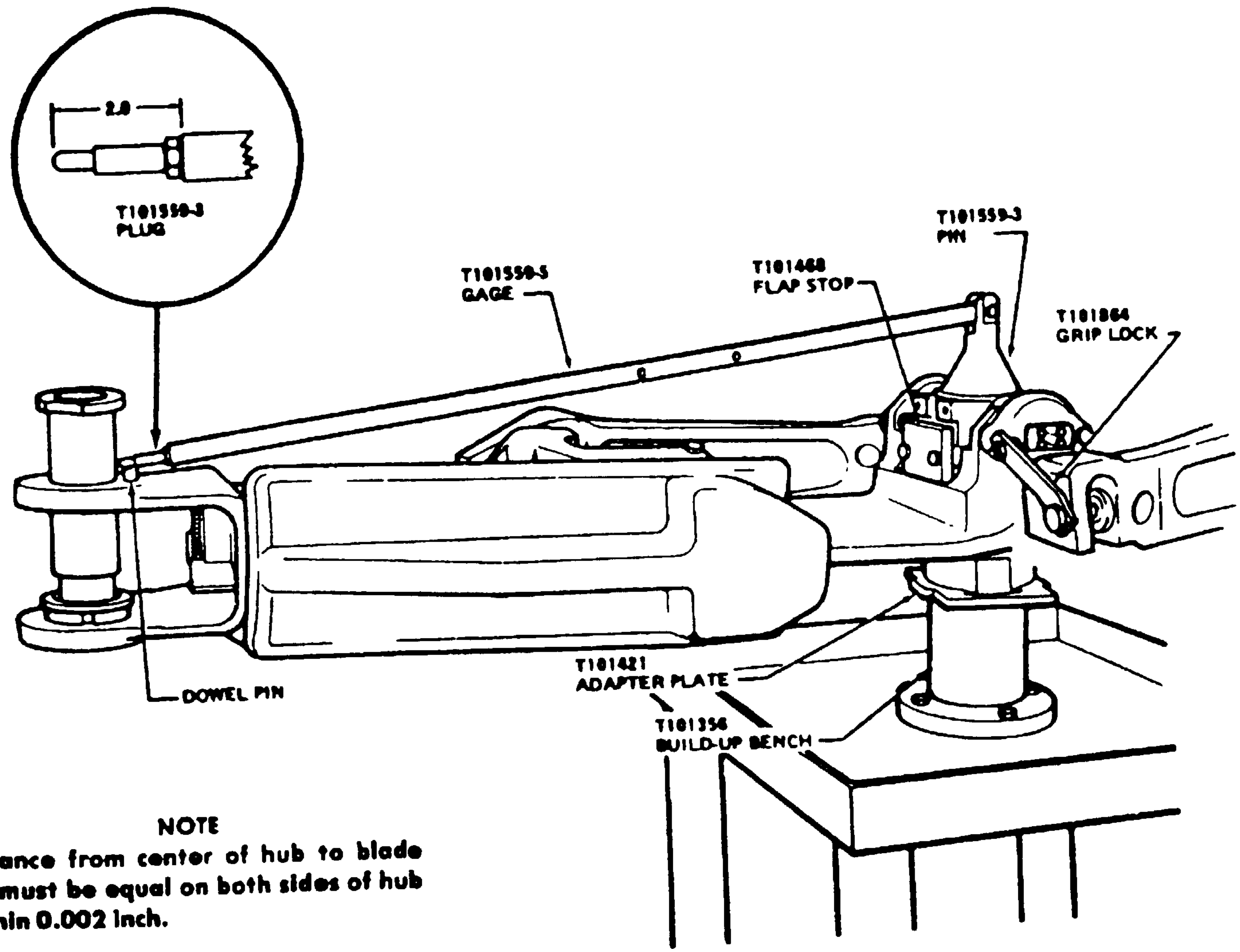


Figure 5-46. Tool Application — Main Rotor Hub Trunnion Centering



NOTE

Distance from center of hub to blade pin must be equal on both sides of hub within 0.002 inch.

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

Figure 5-47. Tool Application — Grid Spacing Adjustment *u.* Inspect grip (41) to ensure that strap indexing ring (49) bearing (50) and dust seal (51) are properly installed. Apply a coating of sealant (C105) to both slots in fitting (52) so that this area will be sealed when the grip is installed. Slide the grip (41) on the grip extension with the side with provisions for mounting the pitch horn on the trailing edge side. Engage the lugs on the strap indexing ring in the grip with the slots in fitting (52). Work grip onto extension far enough to expose three threads on fitting (52). Use a fiber mallet to tap grip onto extension.

v. Install washer (46) and start dome nut (45). Install two bolts (60) through grip and housing. Install a maximum of four steel washers (47) on each bolt as required and install nuts (48). Torque nuts 770 TO 950 inch-pounds. Install opposite grip in same manner. Rotate grips gently through their full travel, ensuring there is no interference between grip and extension.

NOTE

Check clearance of extension and grip assembly. Refer to paragraph 5-11.a.

w. If drag brace (15) was disassembled, install jamnuts (14) and clevis ends on drag brace. Adjust clevis until approximately 0.25 inch of threads are exposed on each end and the dimension between centers of clevis holes is 14.732 inches. Tighten jamnuts (14) snug but do not torque. Position drag brace on grip and install bolt (18), washers (16) and nut (17). Do not torque nut (17) at this time. Install opposite drag brace in the same manner.

CAUTION

Only bolts, nuts, washers, and bushings that have been degreased will be used to attach pitch horn to grip. During reassembly of pitch horn to grip care should be taken to ensure that the bolts, nuts, washers, and bushings are clean and free of any lubricant other than the dry film lubricant.

NOTE

If new bofts are not available, old bofts may be reused after disassembly of pitch horn from grips. Reused bolts must be degreased and peas visual and magnetic particle inspection prior to reinstallation. Bolts, nuts, washers, and bushings will be vapor degreased using PD680, Type 2. If vapor degreesed equipment is not available, soak in PD680, Type 2 for one hour and wipe off grease and PD680 using a lint free cloth prior to installation. Use of alternate cleaning agents is not recommended as it may remove dry film lubricant protective coating.

x. Pitch horn (P/N 209-010-109) for main rotor hub assemblies (P/N 540-011-101-5, -17, and -25).

(1) Install bushings (22) figure 5-29 (P/N 209-010-111) into pitch horns (21).

(2) Fit pitch horn (21) to grip (13) with bushings (22) engaging bores in grip.

CAUTION

Washers with chamfered side must face bolt.

NOTE

Clevis on pitch horn (21) should be facing down.

Bolt 209-010-112-1 may be used in place of bolt 209-010-112-3

(3) Install bolts (19) and (20) (P/N 209-010-112) through pitch horn (21) and grip (13) with new washers (5) and nuts (4). Use two washers under nuts, as required for thread engagement.

NOTE

Bolts (19) and (20) (P/N 209-010-112) are properly installed when seated internally, boltheads will not be in contact with pitch horn (21) or bushing (22).

(4) Nuts are to be torqued to 700-725 inch-pounds using the following torque procedure.

(a) Torque nut to 700-725 inch-pounds.

(b) Tap the pitch horn and grip around the bolted area to set the parts. Use a rawhide or non-metal hammer.

(c) Retorque to 700-725 inch-pounds.

(d) Fly main rotor head for one hour and retorque to 700-725 inch-pounds.

(5) Repeat step (1) through (4) for installation of opposite pitch horn.

y. Replace tape (C127) on inboard spacer (3) if required to obtain a snug fit. Position two spacers (3) in web of yoke extension. If previously removed position sand deflector (1) on yoke extension and install three bolts (2) through sand deflector and spacers. Ensure that there is adequate clearance between deflector and yoke (25) at both upper and lower surfaces. Install opposite sand deflector in the same manner.

z. Adjust grip space as follows:

(1) Install bolt assembly (6) in each grip.

(2) Install two flap stops (T39) on trunnion with 540 side down as shown on figure 5-47. Use 3/8 inch UNF threaded bolts of suitable length to secure flap stops to trunnion. Ensure that trunnion is level (zero degrees) to yoke.

(3) Remove one bolt (4, figure 5-30) from each trunnion bearing and install two grip locks (T59) as shown on figure 5-47.

CAUTION

During all grip spacing procedures, ensure that grips are properly seated against dome nuts.

(3.1) Back dome nut off one full turn in excess of that required for adjustment. With a fiber mallet, tap grip in an outboard direction. Turn dome nut clockwise while observing dimension “A” (figure 5-48), It the dimension doses, the grip is properly seated.

(4) lighten dome nut (45, figure 5-29), installed in step v. until dimension between radius ring (29) and outside metal ring of dust seal (51) is 0.001 inch. See dimension “A” on figure 5-48. Adjust opposite grip in the same manner.

(5) Install grip spacing gage (T53, figure 5-47). Adjust tip on gage to 2.0 inch dimension as illustrated. Install plug in trunnion and secure with knurled screw. Locate hole marked “540-011-101” on gage of spacing gage (T53) and attach gage to plug with bolt through this hole. Raise blade bolt and position tip of spacing gage (T53) so that it rests on dowel pin in grip as shown. Measure and record distance between blade bolt and tip of grip spacing tool. Reverse grip spacing gage and measure distance on opposite blade bolt.

CAUTION

During all grip spacing procedures, ensure that grips are properly seated against dome nuts.

(5.1) Deleted.

(6) Loosen dome nut (45, figure 5-29) on grip (41) that was found to be most inboard in the preceding step. Adjust this dome nut as required until the dimension is equal to that of the most outboard grip within 0.002 inch.

(7) Check seal gap dimension “A” shown on both grips. Dimension “A must be 0.001 TO 0.040 inch.

NOTE

Tolerance dimension “A” can be eased up to 0.060 inch provided an assurance check will be made anytime the grip spacing exceeds 0.040 inch. Correct procedures and seal to radius ring will be verified.

(8) Install look (44), damp (43), bolt (42), thin steel washer (56), nut (55), and cotter pin (57).

(9) Remove grip spacing gage.

(10) Install blade bolt (6), keyway washer (7), special washer (8), special nut (9), screw (12), washer (11), and nut (10). Do not torque special nut (9).

(11) Remove two flap stops (T39).

NOTE

All bolted joints and faying surfaces to be assembled with corrosion preventive compound (C44). Steps 12, (a), and (b) apply to helicop ters with MWO-1520-244-50-3 incorporated.

(12) Position plates (12, figure 5-30) on trunnion (5) and install bolts (14) and washers (13). Do not torque bolts at this time,

(a) Seat plates (12) on bottom edge of trunnion slot. Torque bolts (14) 70 TO 90 inch-pounds and lookwire (C137).

(b) Install straps (8) to plates (12) using bolts (7), washers (9 and 15), and nuts (16). Refer to note for washers (9), figure 5-30. Torque nuts (16) 270 TO 300 inch-pounds.

(13) Remove two grip locks (T59). Install bolts (18, figure 5-30) with recessed washers (17). Install washer with recessed side toward bolt head. Install recessed washer (11) with recessed side next to nut (10). Use more than one special washer (11) to obtain proper engagement of nut if necessary. Torque aft four nuts (10) 160 TO 190 inch-pounds.

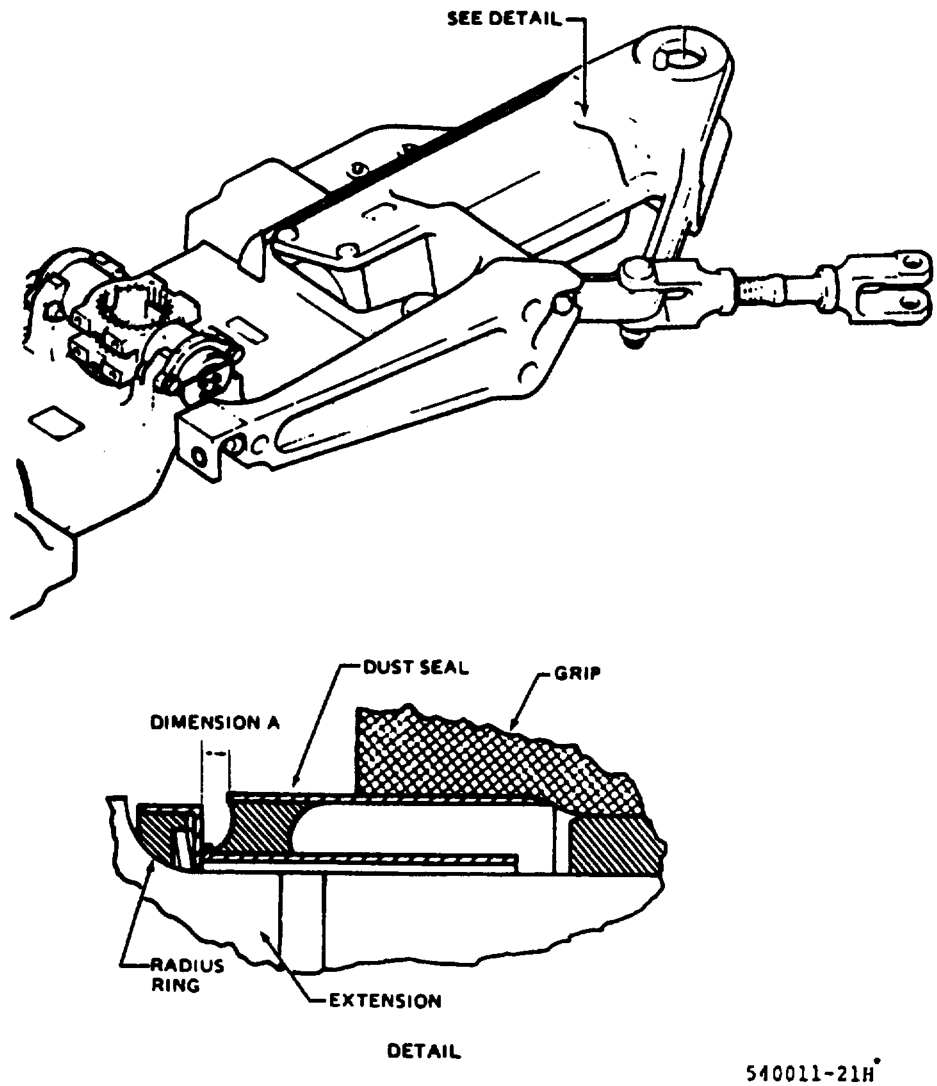


Figure 5-48. Main Rotor Hub Grip Dust Seal to Radius Ring Dimension

CAUTION

After nuts (11) are tightened, no more than five threads of bolts are permitted to be exposed beyond nuts (11), and a minimum of three threads must be exposed to ensure the seif-locklng feature of the nuts Is engaged.

aa. Installation of identification plate.

CAUTION

Stamping directly on the surface of any detail hub part or Installed data plate Is prohibited.

(1) Stamp applicable data on replacement plate using 1/16 inch characters.

(2) Lightly sand contact area on component and mating surface with No. 180 grit abrasive cloth (36).

WARNING

Before using naphtha or methyl-ethyl-ketone, extinguish all open flames and turn off electrical equipment. Vapors are highly flammable. Avoid prolonged breathing of vapors and repeated skin contact. Use in well ventilated area.

(3) Remove sanding residue using cheesecloth (C30) dampened with naphtha (C75).

(4) Mix EC2216 adhesive (C7) 100 parts base to 140 parts hardener. Apply adhesive within 20 minutes to both mating surfaces and join parts.

NOTE

Pot life of adhesive is 100 to 130 minutos.

(5) Fair out adhesive. Remove excess adhesive using cheesecloth (C30) dampened with methyl-ethyl-ketone (C74).

(6) Maintain firm contact pressure and cure for 24 hours at 70°F (21°C) or 30 to 60 minutes at 200°F (93° C), Edge voids ore not allowed, Maximum strength. achieved on 6 to 7 days.

ab. Balance main rotor hub assembly (paragraph 5-45).

5-44. PAINTING – MAIN ROTOR HUB.

NOTE

Painting an assembled main rotor hub is limited to touch-up of damaged finish on yoke, grips and pitch horns.

a. Clean the area to be repaired by sanding with 320 grit or finer sandpaper (C102). Either wet or dry sanding is satisfactory. Fair-in the undamaged lacquer finish around the repair area.

b. Apply chemical film treatment (C31) to bare metal areas on the aluminum pitch horns after sanding. Use the following procedure:

NOTE

Chemical film treatment is not required on the yoke or the grips. If these parts are being touched-up, proceed to step c.

(1) If the area where chemical film is to be applied is not completely clean from the sanding operation, scrub the area with Scotchbrite (C 103) and rinse with clean water.

(2) Apply chemical film (C31) to bare metal with a brush or swab for one to three minutes then rinse with clear water. Allow to air dry, use compressed air, or clean dry cloths to dry area.

c. Apply primer to repair area as follows:

(1) Prepare two-part epoxy primer (C88 or C91) according to instructions on container.

(2) Mask-off areas adjacent to repair area with masking tape (C123).

(3) Immediately prior to applying primer, clean area with a tack rag (C119).

(4) Spray on very thin coat of primer prepared in step (1).

NOTE

Apply acrylic lacquer over primer within one to eight hours.

d. Apply acrylic lacquer to repair areas as follows:

NOTE

If primer applied in preceding step has dried for more than eight hours, apply a mist coat of the same primer then apply lacquer per this paragraph within one hour.

(1) Prepare gray acrylic lacquer in accordance with instructions on container.

(2) Spray on very thin coat. Allow to dry thirty minutes and apply second coat. If second coat is not applied within one hour, clean with tack rag (C119), or equivalent, prior to application of second coat.

(3) Remove masking tape from repair area.

5-45. BALANCING — MAIN ROTOR HUB (AVIM).

NOTE

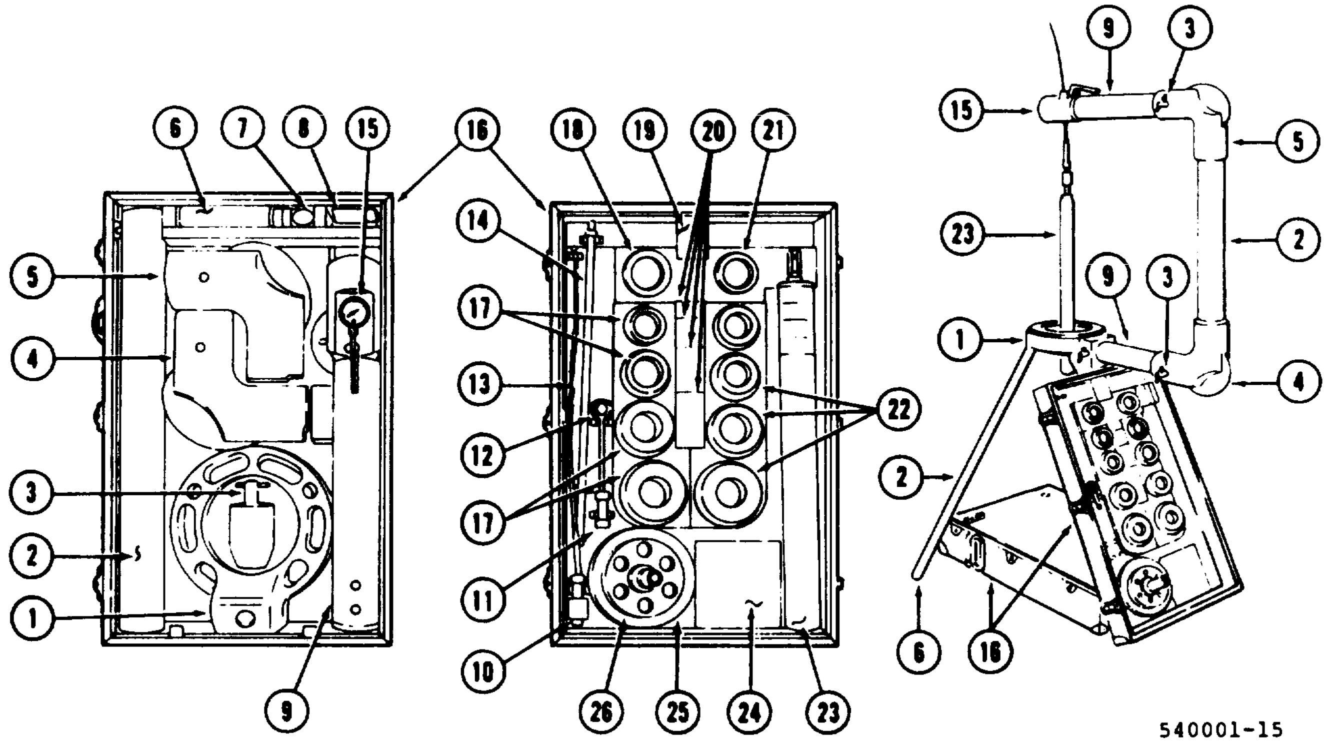
Refer to TM 55-4920-201-14 for additional information on balancing tools if required.

a. Setup the hub balancing stand and accessories from balance kit (T73) as follows:

(1) Assemble hoist support structure with tube assembly P/N 2769 instead of tube assembly P/N 2288 shown in figure 5-49 to provide additional hoist arm height.

(2) Center fixture (11, figure 5-50) from kit (T73) on work stand.

(3) Install adapter (12), heavy end downward, over top of fixture (11) and seat on upper shoulder of fixture central projection. Lock adapter in this position by tightening adapter setscrew (13) using 1/8 hex wrench from kit (T73), (T70), or (T69).



1. Stand table assembly (2291)
2. Tube, 2-7/8 inch diameter long (2288) with leg assemblies — stand long (2364)
3. Pin — hoist support (2285)
4. Elbow (2284-1)
5. Elbow (2284-2)
6. Stand leg extensions (2365)
7. Stub leg (2366)
8. 1/8 Inch hex wrench
9. Tube, 3 inch diameter (2286) with tube, 2-7/8 inch diameter — short (2287)
10. Quick-disconnect coupling (2266)
11. "Quickie" coupling (2260-1)
12. Alternate hoist eye assembly
13. 3/16 inch suspension cable (2264)
14. .1/16 Inch suspension cable (2262)
15. Hydraulic pump assembly (2282)
16. Storage, carrying, and work support case (2272)
17. SAE 20, 30, 40, 50, and 51 spline rear cones (2223, 2205, 2207, and 2228)
18. Flange type 1, 2, 3, and 4 rear bushing (2210)
19. Work stand stub leg support
20. Spacers (2201, 2202, 2203, and 2204)
21. SAE 20 spline front bushing (2211)
22. SAE 20, 30, 40, 50, and 51 spline front cones (2224, 2206, 2208 and 2227)
23. Balancing arbor (2259)
24. Packing layout
25. Flanged type 1, 2, 3, and 4 front plate (2209)
26. Hand wheel (2215)

Figure 5-49. Rotor Balancing Kit P/N 7A050

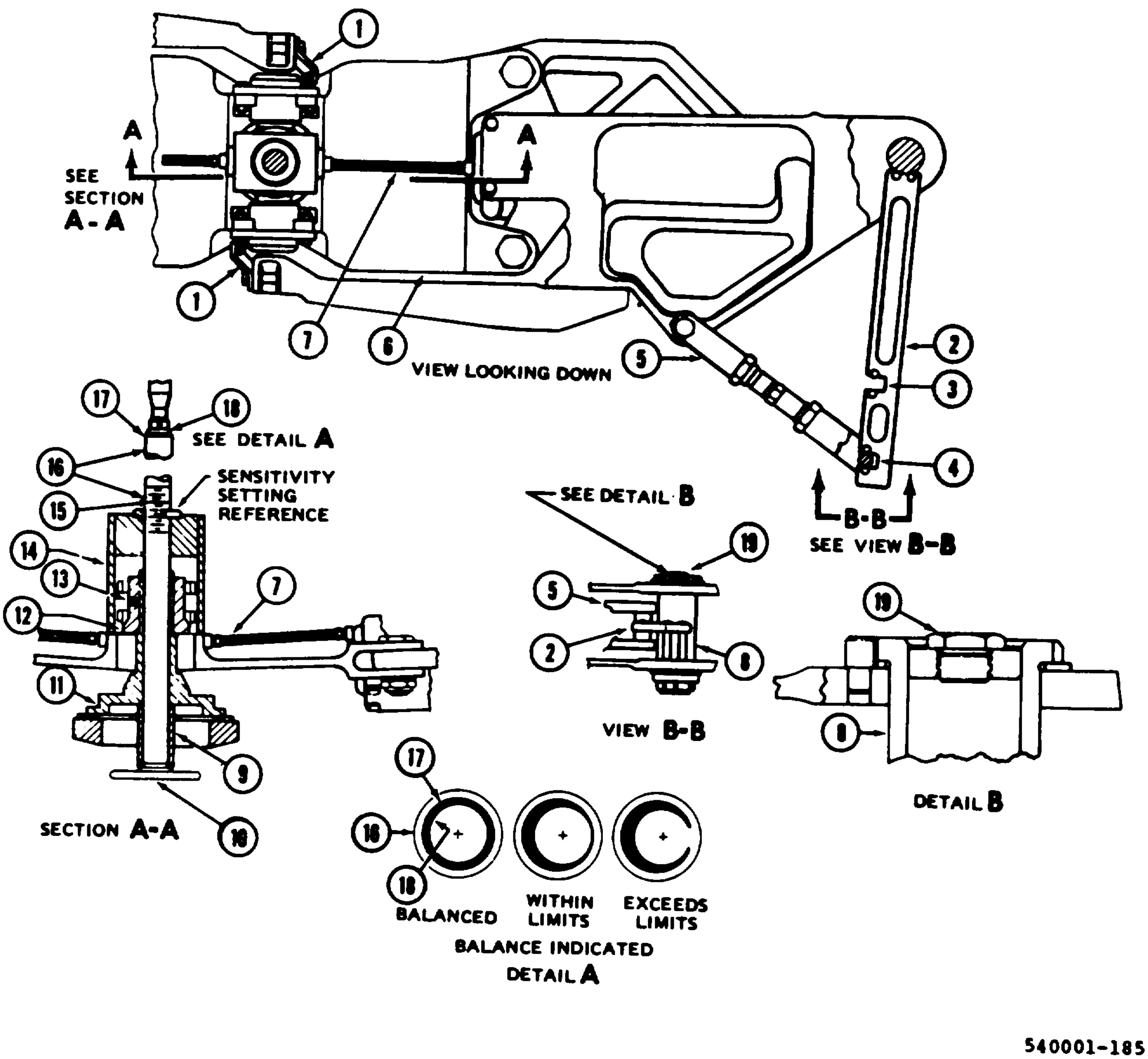
b. Balance main rotor hub assembly as follows:

(1) Carefully lower rotor hub assembly (6, figure 5-50) over fixture (11); align inside diameter of splined trunnion with piloting diameter of adapter (12), and ensure that cone surface of splined trunnion seats firmly on cone surface of adapter (12).

(2) Install yoke (14), legs downward, on arbor (16) and position so that top surface of its locking collar sensitivity setting reference aligns with 15-3/8 inch position on arbor scale (15). Lock yoke firmly in this position on arbor with its collar screw, using 3/16 inch hex wrench from kit (T73).

(3) Install arbor (16) downward through rotor trunnion and fixture assembly. Seat legs of yoke (14) in milled areas on top surfaces of hub yoke; center with scribed lines.

(4) Position jacks (7) on top surface of the rotor hub yoke so that their inboard ends bear against the central boas of the hub yoke, centered below the



1. Grip lock (Bell P/N T101864)
2. Gage (Marvel P/N 2486 from 7HELO66 kit)
3. Gage inner position
4. Gage outer position
5. Drag brace
6. Rotor hub assembly
7. Jack (Marvel P/N 2865 from 7HELO66 kit)
8. Blade retaining bolt
9. Spacer (Marvel P/N 2203 from 7A050 kit)
10. Handwheel (Marvel P/N 2215 from 7A050 kit)
11. Fixture (Marvel P/N 2337 from 7HELO54 kit)
12. Adapter (Marvel P/N 2588 from 7HELO66 kit)
13. Adapter set screw
14. Yoke (Marvel P/N 2846 from 7HELO66 kit)
15. Arbor scale
16. Balancing arbor (Marvel P/N 2259 from 7A050 kit)
17. Indicator disk
18. Indicator collar
19. Plug (AN814-10D)

Figure 5-50. Tool Applicatlon - Main Rotor Hub Balancing scribe lines mentioned in step (3). Position outboard ends of jacks (7) against the shoulders of the inboard bearing housing of the blade grip assemblies. Adjust jacks to provide uniform outward pressure sufficient to ensure blade grips are seated in their full outward positions.

(5) Install spacer (9) over lower end of arbor; install handwheel (10) in lower end of arbor and tighten to clamp both legs of yoke firmly against top surfaces of hub yoke.

(6) Position two gages (2) on hub as illustrated to adjust drag braces (5) to symmetrical angular positions. Remove gage from rotor hub during subsequent balance check.

(7) Install quick-disconnect assembly with 3/16 inch cable from kit (T73) on arbor suspension rod and hoist balancing assembly approximately 1/4 inch off work stand with hydraulic pump (15, figure 5-49). Check to ensure that suspended assembly is free from interference with work stand and adjacent objects. If handwheel (10, figure 5-50) is not free of interference with the stand table, adjust the level of the stand assembly by installing suitable blocks under the two tubular stand leg extensions (6, figure 5-49).

(8) After it is determined that the handwheel (10, figure 5-50) suspends free of interference, lower the hub to rest on the stand.

(9) Place a bubble protractor on the machined surfaced next to the blade retaining bolt and set both blade grips to zero degrees. Both grips must be equal within zero degrees, five minutes.

(10) Raise assembly approximately 0.25 inch off work stand to obtain balance readings.

(11) Observe balance indication at indicator disk (17, figure 5-50) to determine whether the hub is in balance. See figure 5-50, Detail A for examples of balance indications at indicator disk.

(12) Balance hub assembly chordwise by placing weight on pitch horn (light) at blade station 0.000. See Detail A, figure 5-50 for balance indications.

NOTE

Chordwise balance is accomplished only to aid in spanwise balance. The weight will be removed from the pitch horn after spanwise balance is complete.

(13) Balance spanwise about blade station 0.000 by inserting lead wire, lead wool slugs or 0.44 inch diameter shot into cavity of blade bolt assembly (8). Hub shall be balanced within limits shown in detail A, figure 5-50.

(14) Install plug (19) into blade bolt (8) when balance has been accomplished. Remove balance weight that was used for chordwise balance in step (12).

(15) Color code hub assembly parts after balance to ensure that parts of hub remain in same respective position as they were when hub was balanced.

(16) Remove hub balance stand and accessories.

5-46. INSTALLATION – MAIN ROTOR HUB.

Refer to paragraph 5-14.

SECTION III. MAIN ROTOR CONTROLS

5-47. MAIN ROTOR CONTROLS – PYLON ASSEMBLY.

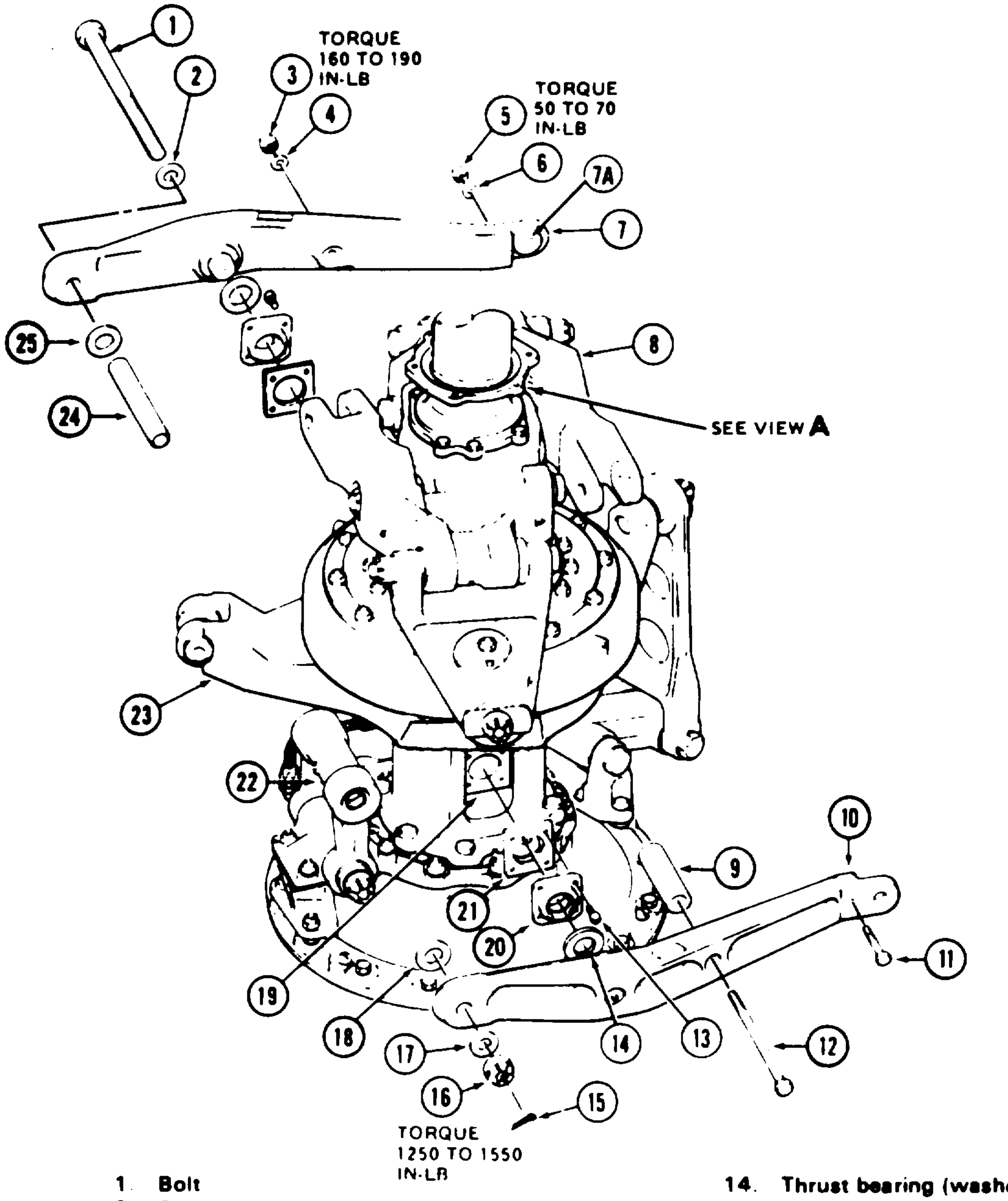
5-48. DESCRIPTION – MAIN ROTOR CONTROLS.

The two major assemblies of the main rotor controls are the swashplate and support assembly and the scissors and sleeve assembly. The pitch links (10, figure 5-1), collective lever (14), the idler assembly (27) that attaches the forward end of the collective lever to transmission case (19), and the collective friction mechanism shown in figure 5-51, detail view A, are included in the main rotor controls. Refer to paragraph 5-4 for description of main rotor controls function, Refer to paragraph 5-65 for description of swashplate. Refer to paragraph 5-55 for description of scissors and sleeve.

5-49. REMOVAL – MAIN ROTOR CONTROLS.

CAUTION

Remove scissors and sleeve with caution to avoid damage to mast.



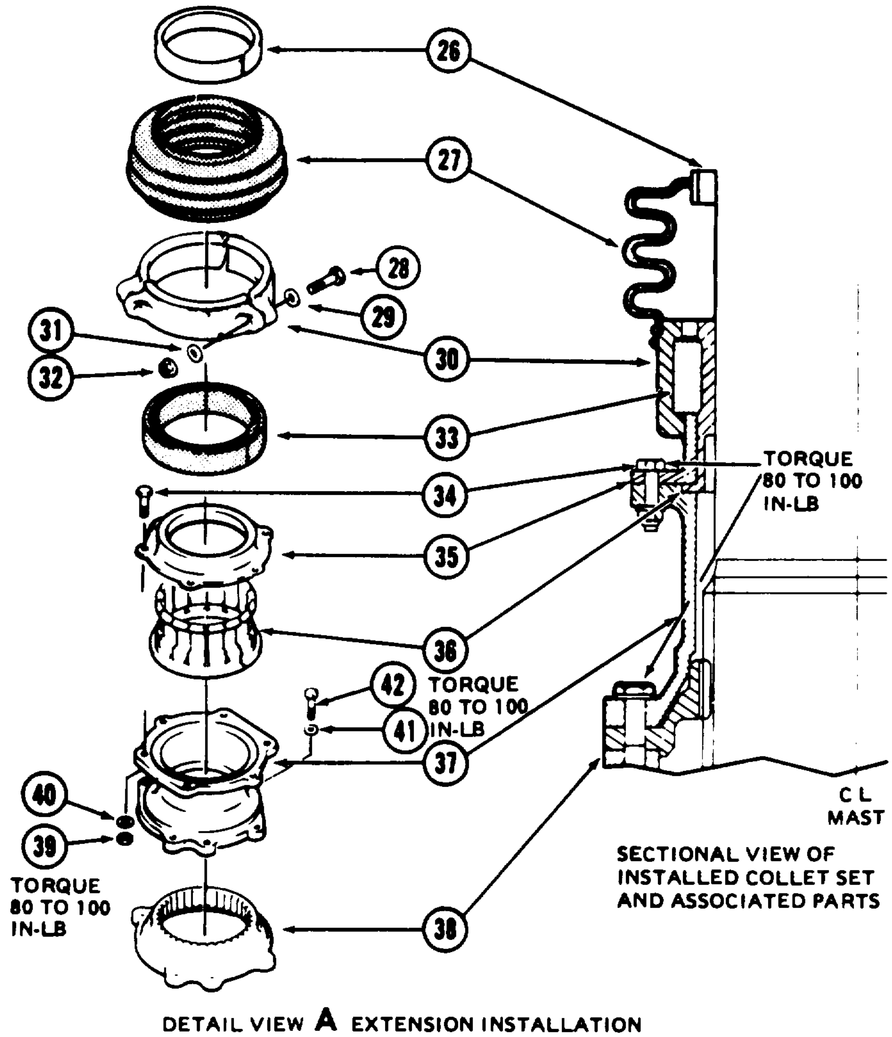
1. Bolt
2. Special washer
3. Nut
4. Washer
5. Nut
6. Washer
7. Lever assembly

7A. Bushing

8. Scissors and sleeve assembly
9. Spacer
10. Lever assembly
11. Bolt
12. Bolt
13. Screw
14. Thrust bearing (washer)
15. Cotter pin
16. Nut
17. Special washer
18. Thrust washer
19. Collective sleeve
20. Bearing assembly
21. Spacer plate
22. Idler assembly
23. Swashplate and support assembly
24. Bearing inner race
25. Thrust washer

209200-44-1A

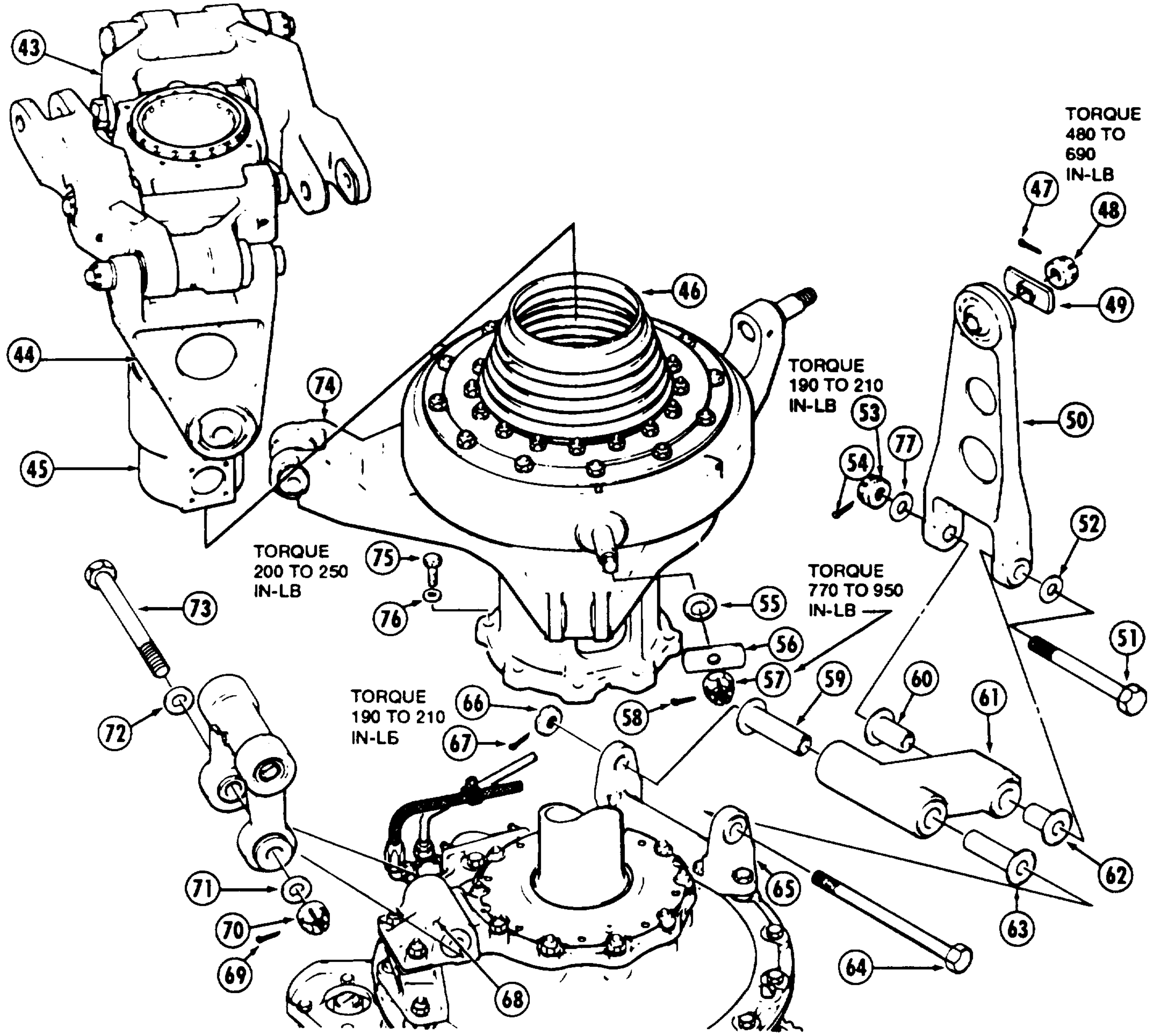
Figure 5-51. Main Rotor Controls Installation (Sheet 1 of 3)



26. Spacer
27. Upper boot
28. Bolt
29. Washer
30. Clamp assembly
31. Washer
32. Nut
33. Rubber ring
34. Bolt
35. Retainer
36. Collet set
37. Extension
38. Spline plate
39. Nut
40. Washer
41. Washer
42. Bolt

209200-48C

Figure 5-51. Main Rotor Controls Installation (Sheet 2 of 3)



43. Scissors and sleeve assembly
44. Drive link
45. Collective sleeve
46. Lower boot
47. Cotter pin
48. Nut
49. Special washer
50. Anti-drive link
51. Bolt
52. Special washer
53. Nut
54. Cotter pin
55. Special washer
56. Special washer
57. Nut
58. Cotter pin
59. Sleeve bushing
60. Sleeve bushing
61. Bellcrank
62. Sleeve bushing
63. Sleeve bushing
64. Bolt
65. Support
66. Nut
67. Cotter pin
68. Boss
69. Cotter pin
70. Nut
71. Special washer
72. Special washer
73. Bolt
74. Swashplate and support assemb.,
75. Bolt
76. Washer
77. Special washer

209200-44

Figure 5-51. Main Rotor Controls Installation (Sheet 3 of 3)

a. Remove main rotor hub and blades (paragraph 5-12).

b. Remove pitch link assemblies (15, figure 5-2) from scissors. Refer to paragraph 5-12, step b for procedures.

b.1. Remove pylon cowling (paragraph 2-78) and anti-collision light as required.

c. Remove friction collet set (36, figure 5-51) as follows:

(1) Cut lockwire and remove spacer (26) and upper boot (27).

(2) Remove bolts and clamp assembly (30). (Keep three parts of clamp together as a set).

(3) Remove rubber ring (33).

(4) Remove nuts (39) and bolts (34). Remove retainer (35) and collet set (36). Identify collet set for reinstallation as a set.

d. Remove extension (37) and spline plate (38) as follows:

(1) Check wear on spline plate prior to removed.

(a) Attach dial indicator on mast as shown in figure 5-52 with indicator probe against flat of one of the attachment bolts.

(b) Measure and record amount of radial looseness by rotating scissors and sleeve assembly hub (6, figure 5-52) forward and then back to spline contact. Maximum allowable amount of radial looseness measured in this manner is 0.040 inch.

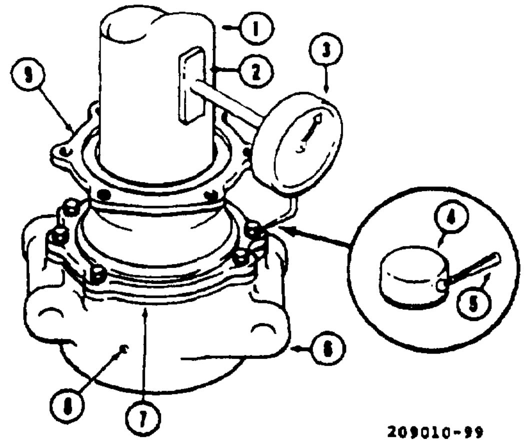
(2) If scissors and sleeve assembly is to be reinstalled without complete disassembly and inspection, check wear on thrust washers (7, figure 5-53) prior to removal. Maximum allowable looseness at thrust washers is 0.060 inch as shown in illustration.

(3) Remove bolts (42, figure 5-51) and remove extension and spline plate. Identify spline plate as satisfactory or as worn beyond limits noted in preceding step (1).

e. Remove collective levers as follows:

(1) Disconnect collective system control tube from collective lever assemblies (7 and 10).

(2) Remove bolts (1, 11, and 12). Separate collective lever halves (7 and 10) from collective sleeve (19) and link (22). Keep spacer (9), thrust



1. Mast
2. Magnet
3. Dial indicator
4. Bolt head
5. Indicator probe
6. Hub assembly
7. Spline plate
8. Grease fitting
9. Extension

Figure 5-52. Tool Application--Spline Plate Wear Measurement

bearing washer (14), thrust washer (18), bearing inner race (24) and similar parts on the opposite side with the collective lever halves for reassembly.

f. Remove link assembly (22) as follows:

(1) Remove cotter pin (69), nut (70), washers (71 and 72) and bolt (73).

(2) Prior to disconnecting link assembly (22) from boss (68) measure clearance between link bushing and head of boss bushing. Minimum allowable clearance is 0.0615 inch. Clearance between end of boss bushing and link, minimum allowable clearance is 0.0595 inch.

(3) Remove link assembly from boss (68).

g. Prior to disconnecting anti-drive link, check for excessive wear in drive link bearings. Rotation of swashplate inner ring, measured at swashplate aft horn pin, in excess of 0.110 inch indicates worn anti-drive link bearing and bushings. Remove anti-drive link (50) as follows:

(1) Prior to removal of anti-drive link (50) measure clearance between anti-drive link (50) and bellcrank (61). Maximum allowable clearance is 0.015 inch.

(2) Remove cotter pin (54), nut (63), washer (77), bolt (51), and washer (52).

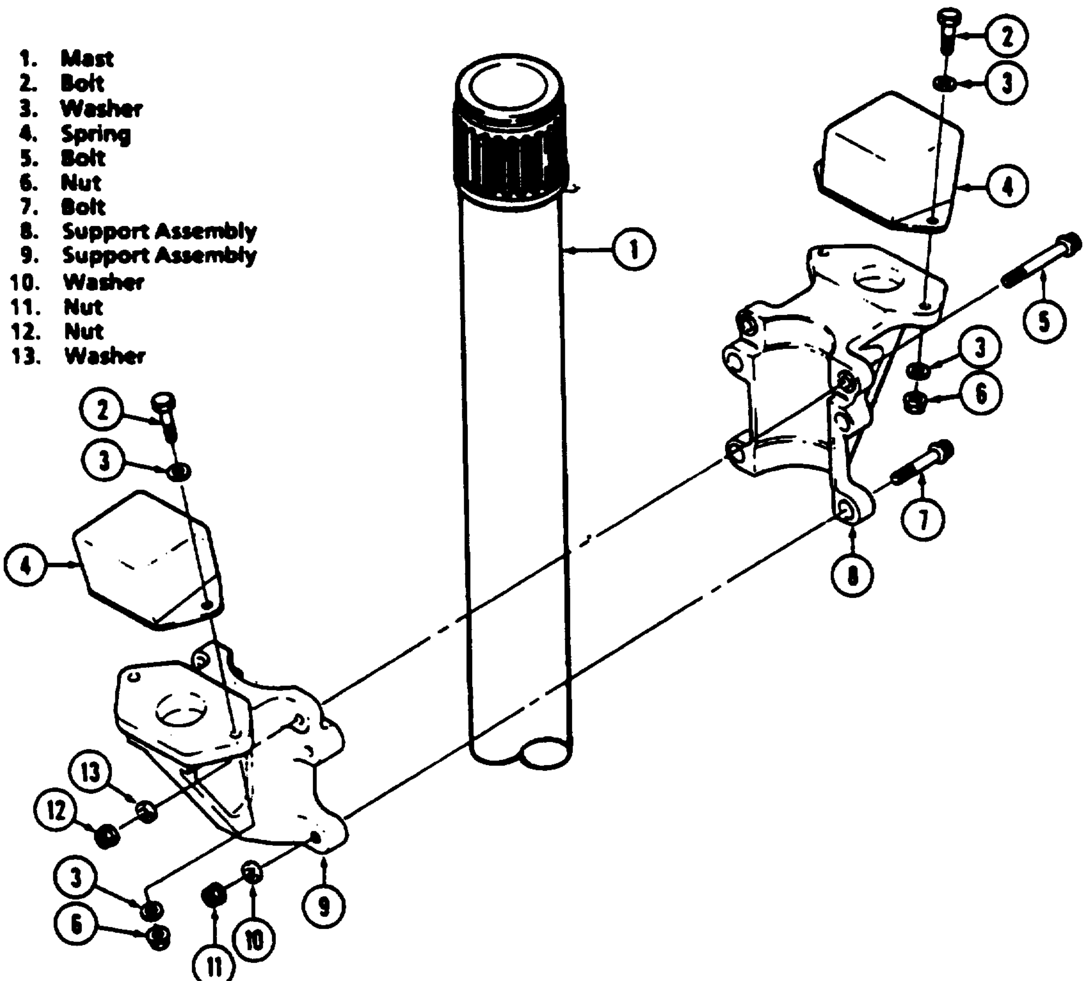


Figure 5-52.1. Hub Moment Spring support Assembly — Installation (MWO 55-1520-244-50-3 Incorporated)

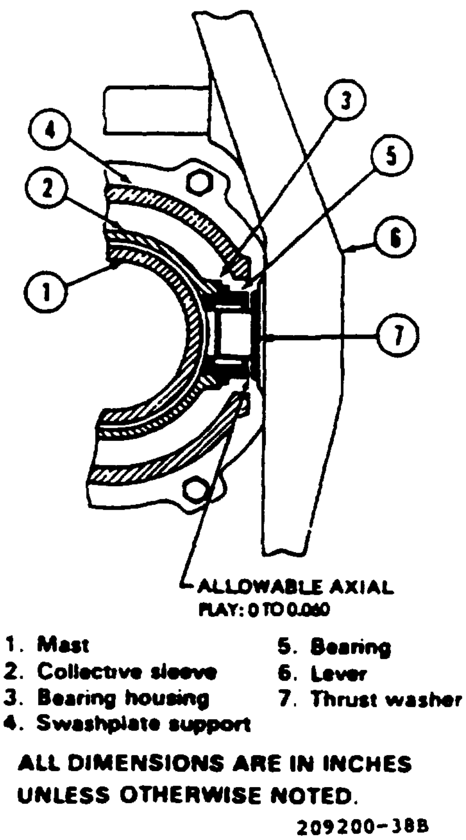


Figure 5-53. Collective Lever Thrust washer wear Limits

(3) Remove cotter pin (47), nut (48), and special washer (49).

(4) Remove anti-drive link.

(5) Install bolt (51) in bellcrank (61) to secure sleeve bushings (60 and 62).

h. Remove bellcrank assembly (61) as follows:

(1) Remove cotter pin (67), nut (66) and bolt (64).

(2) Remove bellcrank (61) from support (65).

(3) Install bolt (64) in bellcrank (61) to secure sleeve bushings (59 and 63).

i. Remove support assembly (65) as follows:

(1) Remove four bolts, nuts and washers that secure support assembly (65) to transmission.

(2) Use a sharp plastic scraper to separate bead of sealant from support assembly.

(3) Remove support assembly from transmission.

j. Remove scissors and sleeve assembly (paragraph 5-58).

k. Remove swashplate and support (paragraph 5-68).

5-50. INSPECTION — MAIN ROTOR CONTROLS.

a. Prior to incorporation of MWO 55-1520-244-50-9 inspect pitch link assemblies (10, figure 5-1) for damage such as metal to metal contact on upper bearing housing, normal bearing wear, surface wear and straightness of tube assembly. All damage limits are given on figure 5-54.

(1) When inspecting the pitch link assembly, mask the ends of the tube to prevent liquid material from contacting the metal set material. Mask the center of the tube length so that only the top and bottom three inches of the tube are exposed.

NOTE

The success and reliability of penetrant inspection depend upon the thoroughness with which the inspector prepares the part from the pm-cleaning process all the way through to the final interpretation of the indications. All inspections should be with the fluorescent penetrant (Type I, Method C) in strict accordance with TM 43-0103.

WARNING

Prolonged or repeated inhalation of vapors or powders may result in irritation of the mucous membrane areas of the body. Provide adequate ventilation.

Continual exposure to penetrant inspection materials may cause skin irritation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

Injury to eyes and skin may occur when backlight is not used in accordance with manufacturer's inspections. Unfiltered light sources (if filter is required) may possibly damage the eyes.

WARNING

Temperatures in excess of 120 degrees F may cause bursting of pressurized cans and injury to personnel.

Volatile fumes may occur, creating both afire and health hazard.

NOTE

Paint will not be removed by mechanical means under any circumstances because it may mask over any potential surface cracks.

(2) With a soft hair brush, apply MEK (Methyl-Ethyl-Ketone) C74), or paint remover (TTR248B) and remove the paint.

NOTE

The gold colored finish on the metal is a very thin them-coat metal primer. This material is not, repeat not to be removed. Inadvertent removal of this metal primer does not warrant part rejection.

(3) Clean the prepared surfaces with a soft cloth.

(4) Apply a fluorescent dye penetrant to the prepared surfaces from either a spray can or with a soft hair brush and in strict conformance to the procedure specified in TM 43-0103, Chapter 6.

(5) Allow penetrant to dwell for a minimum of 30 minutes.

(6) Clean off all excess penetrant in accordance with TM 43-0103, standard procedures. (Check for complete excess penetrant removal from surface by using a blacklight).

(7) Apply applicable developer consistent with Type I, Method C penetrant method in TM 43-0103.

(8) Inspect suspected area with blacklight source in subdued white light.

NOTE

Normal manufacturing machining marks may be observed on the tube surfaces. These will not be cause of part rejection.

(9) If any apparent cracks appear (or suspect surface defects), the suspect area must be reevaluated utilizing certified ND I personnel with the Eddy Current method per TM 43-0103, Chapter 3, (Tube material is 2024 aluminum.)

NOTE

If a physical or penetrant crack is observed and confirmed, report failures on QDR Form 368 in accordance with DA PAM 738-751 and hold tube as an exhibit.

(10) Clean tube with advent and wipe dry.

(11) Inspecting for straightness is done by doing a Total Inline Runout (TIR).

(12) Deleted

(13) Set up bearing blocksfor pitch tube so that the edges of tube are resting between roller bearings.

(14) Set up indicator within a 1/4-inch from the edge of the larger diameter of the pitch tube. Dial indicator must not contact necked down area.

(15) Rotate pitch tube to find highest and lowest reading and zero dial at that position.

(16) Rotate pitch tube and record the total bend. Maximum allowed TIR is 0.020 inch; tubes in excess of 0.020 inch shall be reported and held as an exhibit.

(17) Repaint areas to original color of tube using paint (C86.1).

a.1. After incorporation of MWO 55-1520-244-50-9 inspect Elastomeric Rod End Bearings for serviceability.

(1) Remove Rod End Clevis Bolt (26, figure 5-2).

CAUTION

Do not rotate Pitch Link beyond the maximum 13 inches or damage to the Bearing could occur.

(2) Attach Spring Scale to lower end of Pitch Link and rotate outward so that a torsional load is applied to the Rod End Bearing.

(3) Check that a minimum of 20 Ibs of force is required to move the Rod End Clevis 13 inches. Reference figure 5-53.1.

(4) If Pitch Link rotates freely at the Elastomeric Rod End Bearing prior to 20 Ibs of force replace Rod End, reference figure 5-53.2.

(5) Reconnect Pitch Link Clevis Bolt (26).

b. Inspect friction collet set (36, figure 5-51) for missing fingers, cracks and scoring. Check for loose or missing teflon strips.

c. Inspect rubber ring (33), boot (27) and boot (46) for damage and deterioration. Inspect boot (46) for tearing and for evidence of broken spring. Team are not permitted. When spring is broken, inspect wire loops inside boot convolutions. If wires are loose enough to fall out, or corroded, remove and discard defective wire loops. The aircraft may be flown with any number of wire loops removed.

d. Inspect extension (37) and retainer (35) for obvious damage that would affect function.

e. Inspect spline plate (38) as follows:

(1) Inspect for damage in excess of limits shown m figure 5-55.

(2) Inspect for cracks by fluorescent penetrant method. Refer to TM 43-0103.

(3) Refer to paragraph 5-49.d. for instructions to cheek spline plate for excessive wear while installed.

f. Inspect clamp assemblies (30, figure 5-51) for cracks, corrosion and deformation.

g. Inspect collective levels (7 and 10) as follows:

(1) Inspect for damage in excess of limits shown in figure 5-56.

(2) Inspect for cracks by magnetic particle method. Refer to TM 43-0103.

(3) Inspection (7A, figure 5-51) for damage or excessive wear.

g.1. Deleted.

h. Inspect of collective lever link assembly (22) as follows:

(1) Inspect for damage in excess of limits shown in figure 5-57.

(2) Inspect bearings (3 and 5, figure 5-56) for secure installation in link and for missing or damaged rollers. Install bearing inner race (24, figure 5-51) and

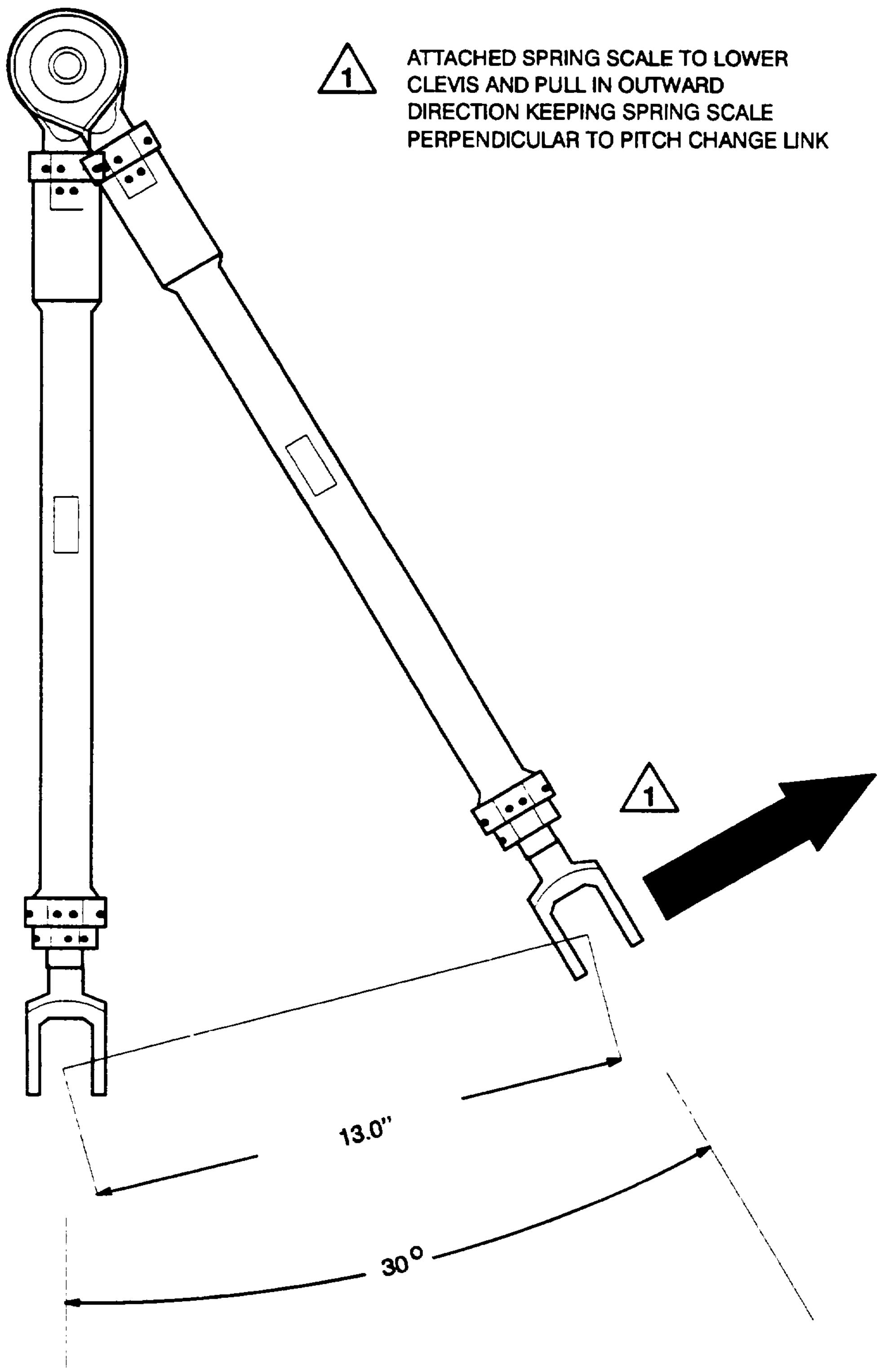


Figure 5-53.1. Rod End Clevis Movement

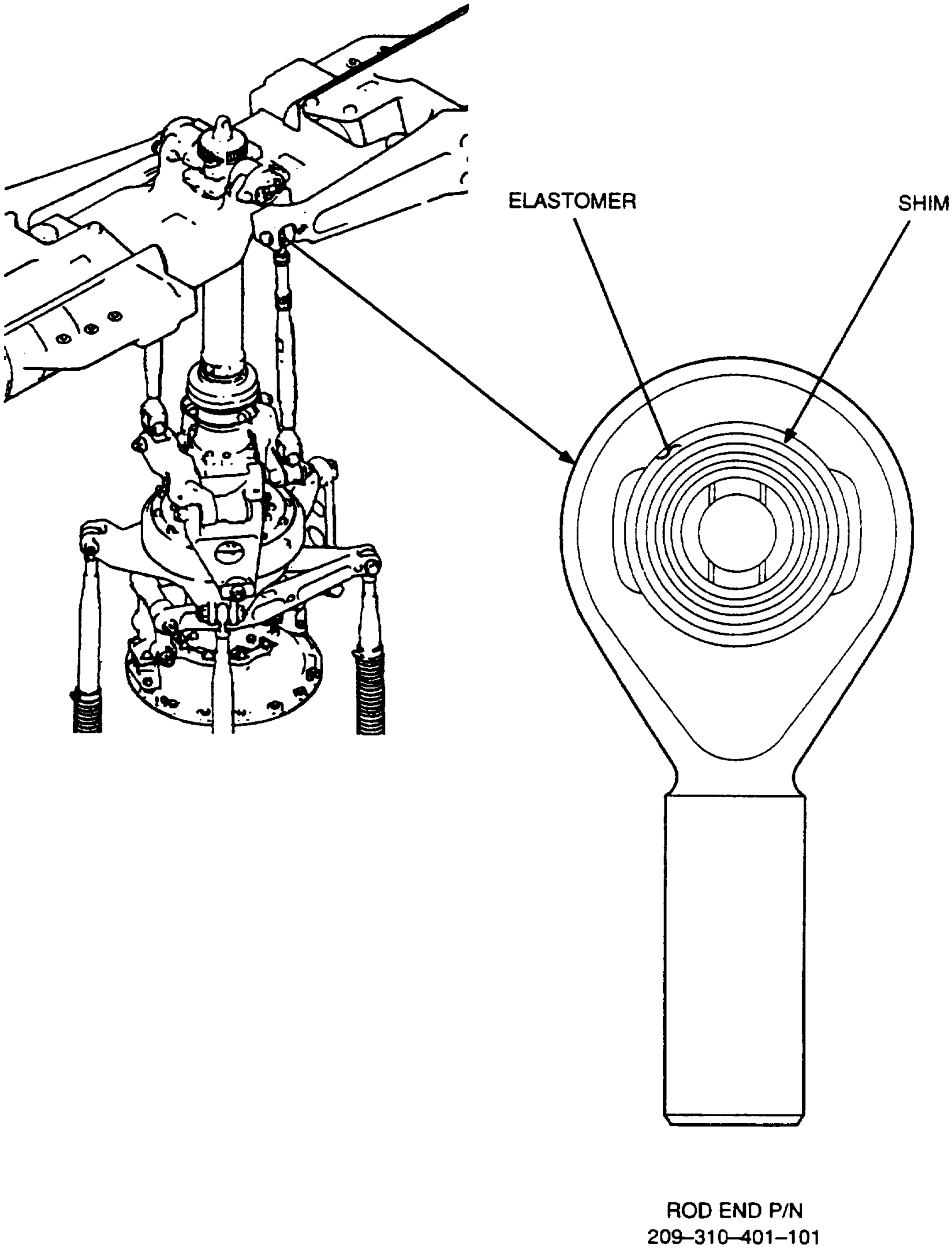
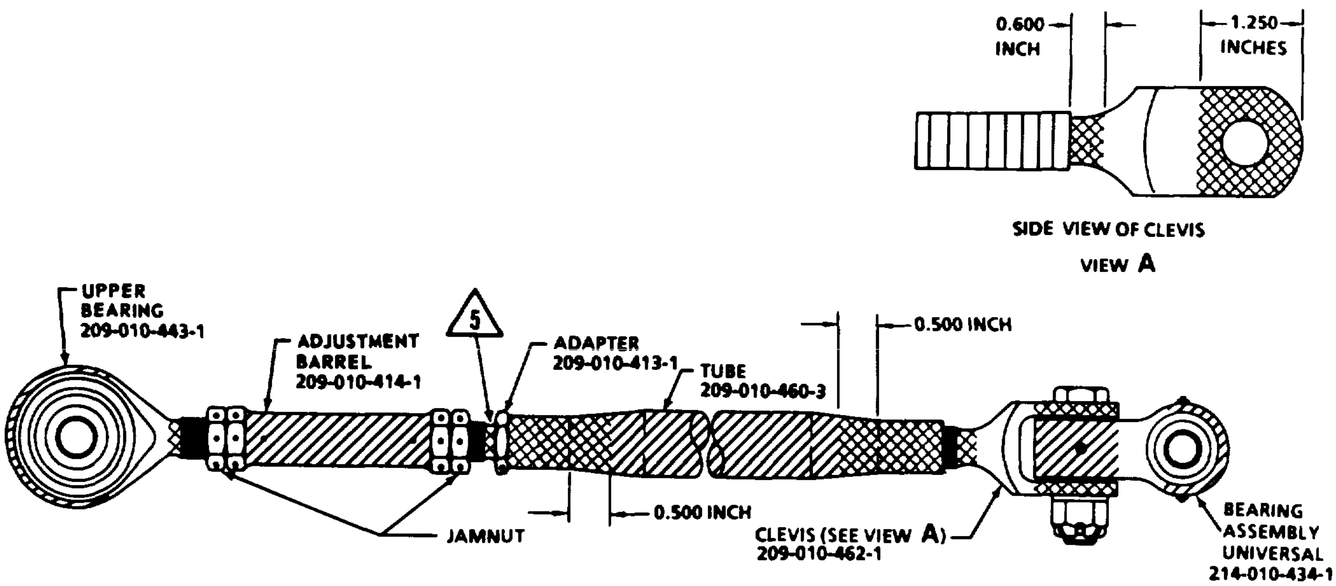


Figure 5-53.2. Rod End Bearing.



TYPE OF DAMAGE AND AREA OF REPAIR			
NO CRACKS ALLOWED			
NICKS, SCRATCHES, SHARP DENTS	Aluminum-None allowed Steel-0.005 Inch	0.010 Inch maximum depth before and after repair	0.020 Inch maximum depth before and after repair
CORROSION	Aluminum-None allowed Steel-0.005 Inch before and after repair	On aluminum parts 0.005 inch maximum depth before repair and 0.010 inch after repair	
		On steel parts 0.010 inch before and after repair	On steel parts 0.020 inch before and after repair
AREA OF FULL DEPTH REPAIR	Aluminum-None allowed Steel-0.050 Square inch	0.10 Square inch 15	0.10 Square inch
NUMBER OF NON-OVERLAPPING REPAIRS	Aluminum-None allowed Steel-1 per area	Aluminum-4 per area Steel-2 per area	4 per area
BORE DAMAGE		0.001 Inch for 1/3 circumference	

209010-239-1A

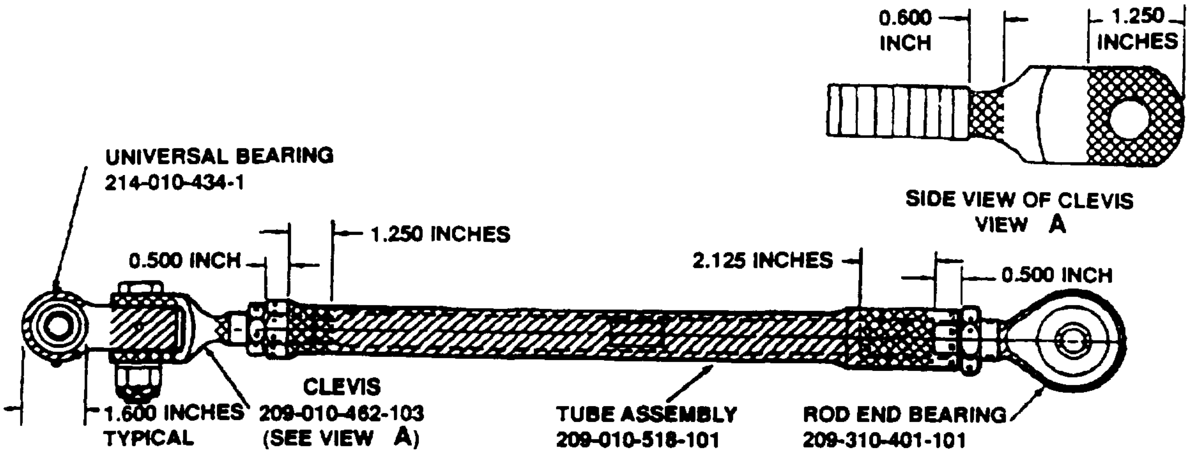
Figure 5-54. Damage Limits – Pitch Link Assembly
(Prior to Incorporation of MWO 55-1520-244-50-9) (Sheet 1 of 2)

NOTES:

1. All edges maybe radiused or chamfered 0.030 inch to remove nicks or dents.
2. Repair of nicks and dents on threads must not exceed one-third of the thread depth. Length of repair shall not exceed 0.250 inch. Each threaded segment may have two repair areas.
3. Coat repair areas on steel parts with brush cadmium or zinc chromate and aluminum parts with zinc chromate. Do not use zinc chromate on threads.
4. Corrosion must be cleaned up to twice the depth of damage on aluminum. Corrosion must be cleaned up to remove all trace of damage on steel.
5. Minimum radius of repair on adapter is 0.100 inch. The repair must be polished to match the surrounding surfaces.
6. Maximum play in bearing Part No. 209-010-443-1 is 0.020 inch axial or radial.
7. Maximum play in bearings in universal Part No. 214-010-434-1 is 0.010 inch axial or radial.
8. Do not remove adapter or clevis from tube.
9. Visual irregularities caused by the swaging operation at each a nd considered acceptable provided there are no sharp edges or grooves.
10. Visually inspect tubes for any indications of bending. No bending allowed.
11. Do not change color of tube when repainting or touchup.
12. Every 150 hours at phase inspect control tubes for TIR. No more than 0.020 inch is allowed. Set up indicator within 0.250 inch from edge of larger diameter of pitch tube. Dial indicator must not contact necked down area.
13. Repaired areas may not overlap.
14. No cracks allowed.
15. The width of repairs to the 209-010-460-3 tube cannot exceed 1/3 of the tube circumference.

209010-239-2A

Figure 5-54. Damage Limits – Pitch Link Assembly
(Prior to Incorporation of MWO 55-1520-244-50-9) (Sheet 2 of 2)



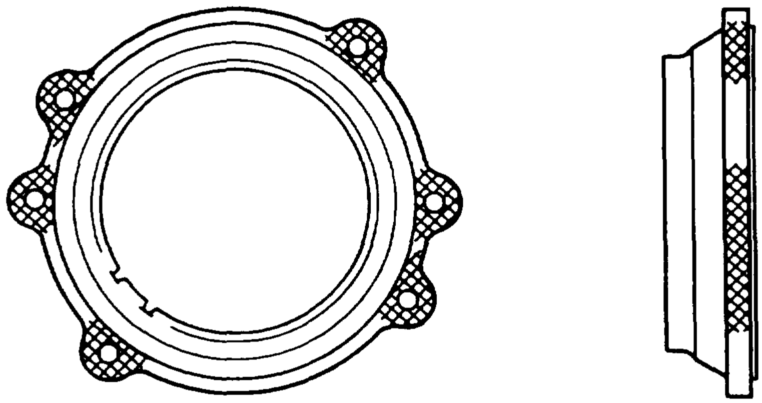
TYPE OF DAMAGE AND AREA OF REPAIR			
NO CRACKS ALLOWED			
NICKS, SCRATCHES, SHARP DENTS, AND CORROSION	0.005 inch maximum depth before and after repair	0.010 inch maximum depth before and after repair	0.010 inch maximum depth before and after repair
AREA OF FULL DEPTH REPAIR	0.050 Square inch	0.10 Square inch 9	0.10 Square inch
NUMBER OF NONOVERLAPPING FULL DEPTH REPAIRS	1 Per area	2 Per area 9	4 Per area
BORE DAMAGE		0.001 inch for 1/3 circumference	

NOTES

1. All edges may be radiused or chamfered 0.030 inch to remove nicks or dents.
2. Repair of nicks and dents on threads must not exceed one-third of the thread depth. Length of repair shall not exceed 0.250 inch. Each threaded segment may have two repair areas.
3. Coat repair areas on steel parts with brush cadmium or zinc chromate. Do not use zinc chromate on threads.
4. Corrosion must be cleaned up to remove all traces of damage on steel.
5. Minimum radius of repair on adapter is 0.100 inch. The repair must be polished to match the surrounding surfaces.
6. Deleted.
7. Maximum play in bearings in universal Part No. 214-010-434-1 is 0.010 inch axial or radial.
8. Do not change color of tube when repainting or touchup.
9. Repairs to the 209-010-518-101 tube cannot exceed 1/3 of tube circumference. Four repairs are allowed on 209-010-518-101 tube in this area.
10. Repairs may not overlap.

209010-238A

Figure 5-54.1 Damage Limits-Pitch Link Assembly 209-010-520-103
(After Incorporation of MWO 55-1520-244-50-9)



209-010-420-1
SPLINE PLATE

TYPE OF DAMAGE	DAMAGE LOCATION SYMBOLS: MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED (crosshatched, 2)	(open)
CRACKS ALLOWED	None	None
NICKS AND DENTS	0.010	0.020
CORROSION	0.005	0.010
MAXIMUM AREA PER FULL DEPTH REPAIR	0.10 Sq. In.	0.25 Sq. In.
NUMBER OF NONOVERLAPPING REPAIRS	One Per Segment	4
EDGE CHAMFER	0.030	0.060
SPLINE DAMAGE:		
Depth	One-Third of Spline	
Length	One-Half of Spline	
Number	Three	
BOLT BORE DAMAGE	0.002 Full Circumference	

NOTE:

1. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

2. REPAIRS NEAR THE BOLT HOLES MUST BE MADE UNIFORMLY AROUND THE BORE SO THAT THE BOLT HEAD HAS A FLAT AND SQUARE BEARING SURFACE.

209010-80E

Figure 5-55. Damage Limits – Spline Plate

COLLECTIVE LEVER
209-010-406-5

DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED	
CRACKS ALLOWED	None	None
NICKS AND DENTS CORROSION	0.010	0.020
MAXIMUM AREA PER FULL DEPTH REPAIR	0.10 Sq. In.	0.50 Sq. In.
NUMBER OF REPAIRS	Two Per Segment	Not Critical
EDGE CHAMFER	0.030	0.060
BORE DAMAGE	0.002 Depth for 1/4 Circumference	

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

209010-75C

Figure 5-56. Damage Limits — Collective Lever

check for radial looseness. (Maximum allowable radial looseness is 0.010 inch.)

(3) Inspect bushings (6, figure 5-58) for secure installation in link and for deterioration and separation.

(4) Inspect lubrication fitting (7) for damage that would affect function.

(5) Inspect for cracks by fluorescent penetrant method. Refer to TM 43-0103.

i. Inspect swashplate anti-drive link (50, figure 5-51) as follows:

(1) Inspect for damage in excess of limits shown in figure 5-59.

(2) Inspect bushings (5, figure 5-60) for wear and damage.

(3) Inspect identification plate (3) for secure installation and legible markings.

(4) Inspect link (4) by fluorescent penetrant method. Refer to TM 43-103.

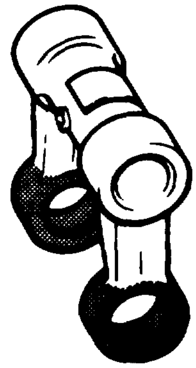
j. Inspect swashplate anti-drive assembly bellcrank (61, figure 5-51) as follow.

(1) Inspect four teflon lined bearing bushings in the bellcrank for damage, wear and corrosion.

(2) Inspect for cracks by fluorescent penetrant method. Refer to TM 43-0103.

(3) Inspect for damage in excess of limits shown in figure 5-61.

k. Inspect sleeve bushings (59, 60, 62 and 63, figure 5-51) for distortion of teflon and mechanical damage.



209-010-409-1
IDLER ASSEMBLY

DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED	
CRACKS ALLOWED	None	None
NICKS SCRATCHES, DENTS AND CORROSION	0.010	0.030
MAXIMUM AREA PER FULL DEPTH REPAIR	0.10 Sq. In.	0.25 Sq. In.
NUMBER OF REPAIRS	One Per Lug	Not Critical
EDGE CHAMFER	0.030	0.060
BORE DAMAGE	0.002 for 1/4 Circumference	

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

209010-76C

Figure 5-57. Damage Limits - Collective Lever Idler Link

1. Inspect support assembly (65) as follows:

(1) Inspect for damage in excess of limits shown in figure 5-62.

(2) Inspect bushings (2, figure 5-63) for secure installation in the support.

(3) Impact for cracks by fluorescent penetrant method. Refer to TM 43-0103.

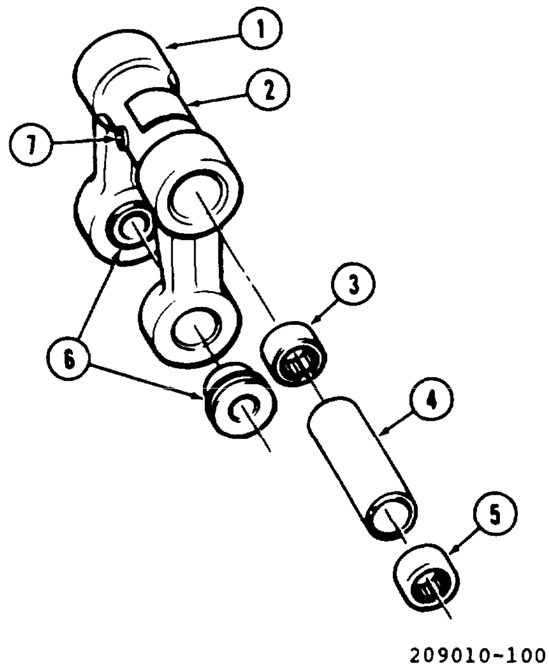
m. Inspect scissors and sleeve assembly (paragraph 5-60).

n. Inspect swashplate and support (paragraph 5-69).

5-51. REPAIR – MAIN ROTOR CONTROLS (AVIM).

a . Repair pitch links (10, figure 5-1) as follows:

(1) Polish out corrosion and mechanical damage that is within limits shown in figure 5-54 with 300 grit or finer sandpaper (C102). Touch-up repair areas as described in figure 5-54.



1. Link assembly
2. Identification plate
3. Roller bearing
4. Sleeve
5. Roller bearing
6. Bushing
7. Lubrication fitting

Figure 5-58. Collective Lever Idler Link Assembly

(2) Replace bearings if worn beyond limits shown in figure 5-54. Set pitch links to 27.05 inch initial length as shown in figure 5-8.

b. Replace the following parts if worn or damaged in excess of limits:

(1) Friction collet set (36, figure 5-51).

(2) Rubber ring (33).

(3) Boot (27).

(4) Boot (46).

c. Replace extension (37) and/or retainer (35) if damaged to the extent that function would be affected.

d. Repair spline plate (38) as follows:

(1) Polish out mechanical and corrosion damage that is within limits shown in figure 5-55. Use fine to medium abrasive cloth (C36) or fine India stone (C116). Blend repair smoothly into surrounding area. Replace part if repair exceeds allowable area and/or depth limits.

(2) Touch-up repair areas with primer (C88 or C91).

e. Replace clamp assembly (30, figure 5-51) if any of the sections are cracked, deformed, or severely corroded.

f. Repair collective levers (7 and 10) as follows:

(1) Polish out mechanical and corrosion damage that is within limits shown in figure 5-56 with 300 grit or finer sandpaper (C102) and scotchbrite (C103).

(1A) If bushing (7A, figure 5-51) is damaged or excessively worn, it should be replaced.

(2) Touch-up repair areas with primer (C88 or C91).

g. Replace components of collective lever idler link (22, figure 5-51) which have damage in excess of limits specified in inspection paragraph 5-50, as follows:

(1) Replace damaged lubrication fitting (7, figure 5-58), as follows:

(a) Carefully remove old lubrication fitting to avoid damage to link.

(b) Press new lubrication fitting into link.

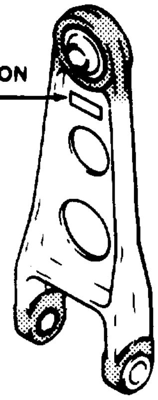
(c) Attach a grease gun serviced with clean grease (C58) to fitting and check to ensure that fitting is properly installed.

(2) Replace damaged identification plate (2) as follows:

NOTE

If data to be stamped on identification plate is not available, send affected assembly to Depot Maintenance for evaluation.

(a) Stamp all data from the old identification plate on the new identification plate.



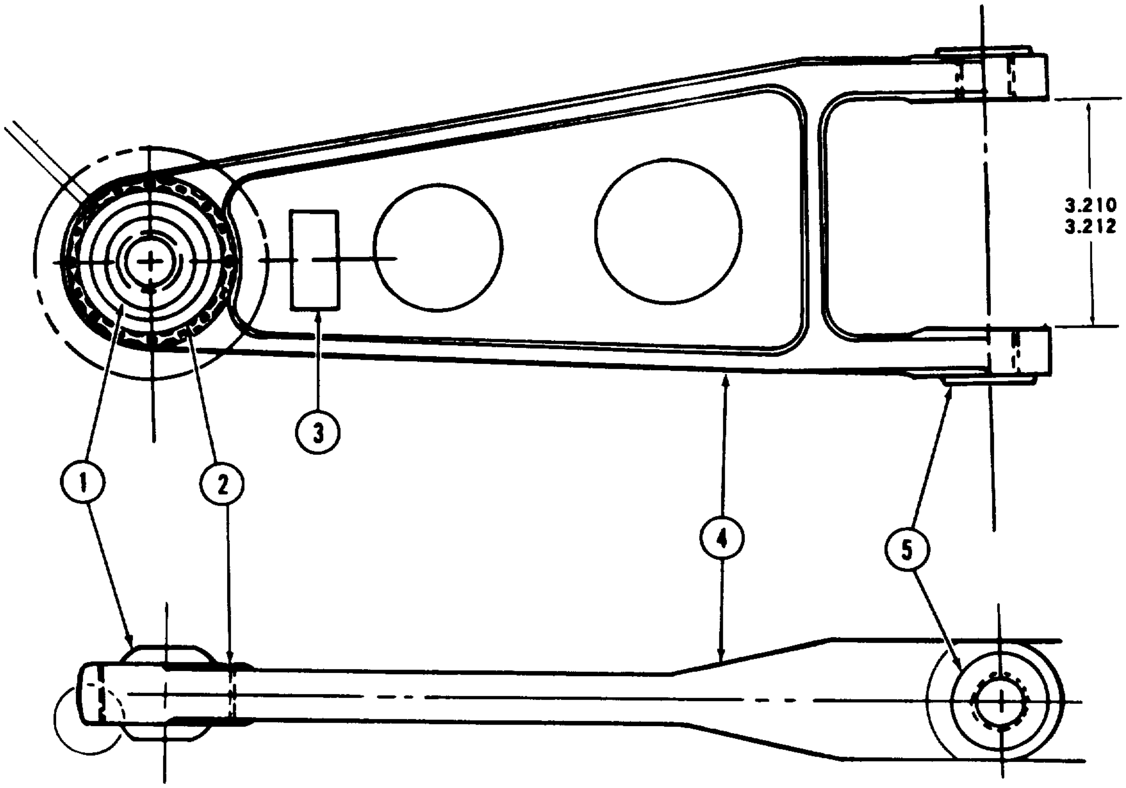
DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED	
CRACKS ALLOWED	None	None
NICKS, SCRATCHES, SHARP DENTS	0.010 Before and After Repair	0.030 Before and After Repair
CORROSION	0.005 Before Repair 0.010 After Repair	0.010 Before Repair 0.020 After Repair
AREA OF FULL DEPTH REPAIR	0.10 Sq. In.	0.25 Sq. In.
NUMBER OF REPAIR AREAS	One Per Lug	Not Critical
EDGE CHAMFER	0.030	0.060
BORE DAMAGE	0.002 Depth for 1/4 Circumference	
BUSHING OR BEARING SLEEVE LOOSENESS	Scrap Link if Bushings or Bearing Sleeve is Loose in Link.	
BEARING AXIAL PLAY	Maximum Allowable Axial Play in Bearing is 0.015.	
BEARING RADIAL PLAY	0.020 inch Maximum	
BEARING BREAKAWAY TORQUE	Maximum Allowable Breakaway Torque is 20 inch-pounds	

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

204010-24H

Figure 5-59. Damage Limits — Swashplate Anti-Drive Link

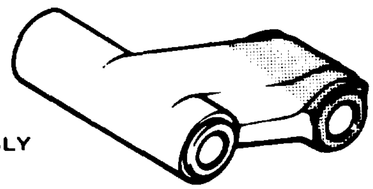


ALL DIMENSIONS ARE IN INCHES UNLES OTHERWISE NOTED.

1. Bearing
2. Sleeve bushing
3. Identification plate
4. Anti-drive link
5. Bushing

209010-108A

Figure 5-60. Swashplate Anti-Drive Link Assembly



DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED (shaded area)	(unshaded area)
CRACKS ALLOWED	None	None
NICKS, SCRATCHES AND DENTS	0.020	0.040
CORROSION	0.010	0.020
MAXIMUM AREA PER FULL DEPTH REPAIR	Not Critical	Not Critical
NUMBER OF REPAIRS	Two	Not Critical
EDGE CHAMFER	0.040	0.080
BORE DAMAGE	0.002 for 1/4 Circumference	

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

540001-14C

Figure 5-61. **Damage Limits — Swashplate Anti-Drive Assembly Bellcrank**

CAUTION

Do not heat link assembly (1) to temperature above limit noted in following step.

(b) Remove old identification plate from link assembly. Heat link assembly to 200 ± 15 degrees F (93 ±9 degrees C) to loosen adhesive.

(c) Mask off face side of new identification plate and the area of the link assembly where identification plate will be installed.

(d) Clean masked-off area on link assembly with 300 grit or finer sandpaper (C102).

(e) Form new identification plate to fit closely on link assembly.

WARNING

Cleaning solvent is flammable and toxic, Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

(f) Scrub mating surfaces of identification plate and link assembly with cheesecloth (C30) dampened with aliphatic naphtha (C75), Wear clean white cotton gloves (C54) when handling parts after cleaning and prior to bonding.

(g) Mix two-part adhesive (C7) in accordance with instructions on container. Apply a thin coat of adhesive to each of the mating surfaces as soon as possible after mixing. Place identification plate on link and anchor in position with clamps or rubber bands.

DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED	
CRACKS ALLOWED	None	None
NICKS, DENTS AND AND SCRATCHES	0.020	0.040
CORROSION	0.010	0.020
MAXIMUM AREA PER FULL DEPTH REPAIR	0.010	Not Critical
NUMBER OF REPAIRS	One Per Lug	Not Critical
EDGE CHAMFER	0.040	0.060
BORE DAMAGE	0.002 for 1/4 Circumference	

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

540001-13C

Figure 5-62. Damage Limits – Swashplate Anti-Drive Assembly Support

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

(h) Clean adhesive squeeze-out from parts with cheesecloth and MEK (C74) before adhesive cures.

(i) Remove masking tape before adhesive cures.

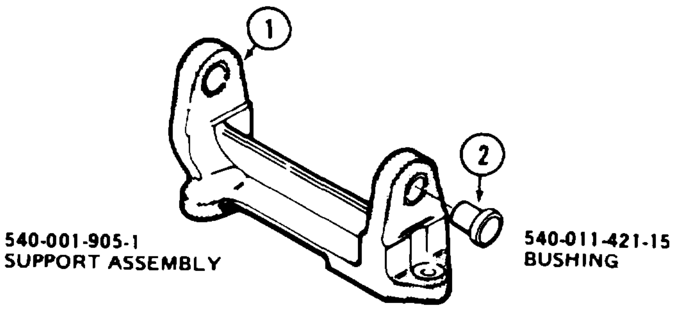
(j) Allow adhesive to cure for 24 hours at room temperature (approximately 75 degrees F) (24 degrees C). Full strength will be reached in six to seven days.

(3) Replace damaged bushing (6) as follows:

CAUTION

Do not heat link assembly (1) to temperature above limits noted in following step.

(a) Support link assembly with suitable sleeves and supports to avoid distortion and press out two bushings (6). The bushings must be pressed outboard from the link as illustrated.,if bushings area tight fit in the link, to a maximum of 200±15 degrees F (93 ±9 degrees C). Then press bushings out.



1. Swashplate anti-drive support assembly
2. Bushing

Figure 5-63. Swashplate Anti-Drive Assembly Support

(b) Clean bores where two bushings (6) will be installed.

(c) Select suitable sleeves and support blocks to support legs of link assembly (1) during installation of bushings (6).

CAUTION

Do not heat link assembly (1) to temperature above limit noted in following step.

CAUTION

Do not chill bushings (elastomeric-type bushings) (6) during Installation procedure.

(d) Heat link assembly (1) to 200 ±15 degrees F (93 ± 9 degrees C). Coat mating surface of bushings (6) with primer (C88 or C91) and install with flanges outboard as illustrated while primer is wet.

(4) Replace damaged bearings (3) and (5) as follows:

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

(a) Clean bore of link assembly (1) where bearings will be installed. Clean new bearings (3 and 5) and sleeve (4) with dry cleaning solvent (C112). Allow bearings to dry thoroughly and hand pack with grease (C58).

(b) Apply a thin coat of corrosion preventive compound (C44) to mating surfaces of sleeve (4) and bearings (3 and 5). Press spacer and bearings into link.

(c) Polish out mechanical and corrosion damage that is within limits shown in figure 5-57.

h. Repair swashplate anti-drive link (50, figure 5-51) as follows:

(1) Polish out corrosion and mechanical damage that is within limits shown in figure 5-59 with 300 grit or finer sandpaper (C102) and scotchbrite (C103). Touch-up repair areas with alodine (C31).

(2) Replace damaged or missing identification plate (3, figure 5-60) as outlined in step g. (2)(b) above for the collective lever idler link. Install identification plate on side of link illustrated in figure 5-60.

(3) Replace bearing in anti-drive link (1, figure 5-60) if damaged or radial looseness is in excess of limit shown in figure 5-59, or if loose in the sleeve bushing. (Refer to TM 55-1500-322-24.)

(4) Replace damaged bushings (5) as follows:

(a) Support link (4) and press out damaged bushings (5).

(b) Inspect link bore where bushings were removed for damage in excess of limit shown in figure 5-59. If damage exceeds limits, dispose of link locally.

(c) Support link (4) and press new bushings (5) into place with bushing flanges outboard as illustrated.

(d) Check for 3.210 TO 3.212 inch dimension between two bushings (5) as illustrated. Mill ends of bushings if necessary.

(e) Check for 0.6241 TO 0.6255 inch inside diameter of bushings after installation.

(i) Repair swashplate anti-drive assembly bellcrank (61, figure 5-51) as follows:

(1) Replace teflon lined bearing bushings that failed to pass inspection as follows:

CAUTION

Do not heat bellcrank to temperature in excess of 200 degrees F (93 degrees C).

NOTE

The four teflon lined bearing bushings are bonded m the bellcrank.

(a) Remove damaged bearing bushings from bellcrank. If only one bearing bushing is damaged also remove the opposite bearing bushing. If the bearing bushings are difficult to remove, heat the bellcrank to 200 degrees F (93 degrees C) maximum to aid in removal.

(b) Inspect bore where bearing bushing were removed. If bore damage is in excess of the limit shown in figure 5-61, dispose of bellcrank locally.

(c) Clean the bore where the new bearing bushings will be installed with technical trichloroethylene (C132) and clean cloths. Clean the mating surfaces of the new bearing bushings in the same manner.

(d) Apply sealing and retaining compound (C106) to mounting surfaces of bearing bushings and bellcrank with a clean cotton swab. Allow to dry for three minutes prior to application of sealant.

(e) position new bearing bushings in bellcrank. Hold in alignment with flanges against bellcrank. Use a bolt or other work aid to secure bearing bushings.

(f) Apply sealing and retaining compound (C106) to joint around flanges of bearing bushings. Capillary action will draw the sealant into the joint Clean off excess sealant with a clean cloth. Allow to cure for 60 TO 90 minutes at room temperature.

(2) Polish out corrosion and mechanical damage that is within limits shown in figure 5–61.

j. Replace sleeve bushings (59, 60, 62 and 63, figure 5-51) that were found to be damaged during inspection.

k. Repair support assembly (65) as follows:

(1) Polish out corrosion and mechanical damage that is within limits of figure 5-62.

(2) Replace damaged or missing bushings in support assembly (65, figure 5–51) as follows.

(a) Press damaged bushings (2, figure 5-63) out of support assembly. Use suitable supports to avoid distortion during pressing operation. Inspect bores where bushings were removed If bore damage is in excessof limit shown in figure 5-62, dispose of support assemby locally.

(b) Coat new bushings (2, figure 5-63) with primer (C88 or C91) and press into support (1) whale primer is wet. Install the bushings with flanges outboard Use suitable supports to avoid distortion during pressing operation.

l. Repair scissors and sleeve assembly (paragraph 5-61).

m. Repair swashplate and support assembly (paragraph 5-70).

5-52. INSTALLATION — MAIN ROTOR CONTROLS.

a. Install swashplate and support assembly (paragraph 5-71).

b. Install scissors and sleeve assembly (paragraph 5-63).

5-53. ADJUSTMENT — MAIN ROTOR CONTROLS.

a. Rig main rotor controls (paragraph 11-7 and 11–29).

b. B540 Track main rotor blades (paragraph 5- 114), step b).

c. K747 Track main rotor blades (paragraph 5-114, step c.

d. Adjust pitch links (paragraph 5-14).

e. Adjust swashplate uniball friction (paragraph 5-66).

f. Adjust friction on collet set (36, figure 5-51) (paragraph 5-63)

g. Lubricate idler assembly (22, figure 5-51) (paragraph 1-29).

5-53.1. MAIN ROTOR HUB MOMENT SPRINGS AND SUPPORTS (MWO 55-1520-244-50-3 INCORPORATED).

5-53.2. DESCRIPTION — MAIN ROTOR HUB MOMENT SPRINGS AND SUPPORTS.

The main rotor hub moment springs consist of elastomerit elements that attach to mast mounted supports. These springs prevent the hub from contacting the mast during high flapping maneuvers. Spring contact induces a moment on the mast causing the helicopter fuselage to move away from the tilting rotor plane. This results in warning vibrations which indicate to the pilot that the helicopter is approaching dangerously high flapping angles.

NOTE

The springs (43) shall be removed prior to operating aircraft when oat Is below -25 degrees Fahrenheit or if this temperature is antcipated to occur during flight. The springs (43) shall be reinstalled when oat Is expected to remain above -25 degrees Fahrenheit or the threat of sub-25 degrees Fahrenheit no longer exists.

5-53.3 CLEANING — MAIN ROTOR HUB MOMENT SPRINGS AND SUPPORTS.

Clean hub moment springs and supports with cleaning compound (C33).

b. Rinse with dear water and allow to dry.

CAUTION

Loosen nut (48, figure 5-2) prior to removal of hub moment springs and Supports to prevent damage to assembly.

5-53.4. REMOVAL — MAIN ROTOR HUB MOMENT SPRINGS AND SUPPORTS.

a. Clean hub moment spring and supports with cleaning compound (C33).

b. Remove nuts (41, figure 5-2), washers (36), and bolts (35).

c. Remove nuts (39), washers (36), and bolts (37).

d Remove support assemblies (40) from mast (14).

Remove nuts (34), washers (33), and bolts (32) from support assemblies (40) to remove springs (43).

5-53.5 INSPECTION – MAIN ROTOR HUB MOMENT SPRINGS AND SUPPORTS.

a. Inspect supports for damage in excess of limits shown in figure 5-63.1.

b. Inspect springs for damage in excess of limits shown in figure 5-63.2.

5-53.6. REPAIR — MAIN ROTOR HUB MOMENT SPRINGS AND SUPPORTS.

a. If any damage is present for which no limits are specified and or there is damage beyond limits shown on figure 5-63.1 or 5-63.2, replace the affected part.

b. Polish out all traces of corrosion and mechanical damage on spring and support components. Polish out corrosion damage on aluminum parts to twice the depth of the pit. Use fine to medium grades of abrasive cloth (C36) or fine india stone (C116). Blend the edges of the repair into the surrounding area with a smooth contour. Make final cleanup with crocus cloth (C38) to obtain a smooth, scratch-free Sulfate.

c. Touchup rework areas on aluminum parts with chemical conversion material (C30.1).

d. Coat all exposed surfaces with one coat of polyamide epoxy primer (C88).

e. Paint all primed surfaces with two coats of flat black acrylic lacquer (C70).

5-53.7. INSTALLATION — MAIN ROTOR HUB MOMENT SPRINGS AND SUPPORTS.

a . Apply corrosive preventive compound (C44) to all bolted joints and faying surfaces to be assembled

b. Position springs (43, figure 5-2) on supports (40).

c. Install bolts (32), washers (33), and nuts (34).

d. Torque nuts (34) 70 TO 90 inch-pounds.

e. Position supports (40) on mast (14).

f. Install bolts (35), washers (36), and nuts (41). Ensure that bolt heads are installed in the support half with chamfered holes and that washers are installed under nut only.

g. Install bolts (37), washers (38), and nuts (39). Ensure bolt heads are installed in the supprt half with chamfered holes and that washers arc installed under nut only.

h. Cross torque nuts (41), min 25 inch-pounds increment to 540-650 inch-pounds.

l. Cross torque nuts (39), m increments of 15 inch-pounds to ensure the gap between the support set halves is equal within 0.030 inch. Torque to 300-335 inch-pounds

NOTE

When removing the elastomeric springs due to cold weather, remove only the springs and attaching hardware. DO NOT REMOVE THE SUPPORTS.

5-54. SCISSORS AND SLEEVE.

5-55. DESCRIPTION — SCISSORS AND SLEEVE.

The scissors and sleeve assembly is a component of the main rotor controls. The scissors are attached to the swashplate by the drive links for cylic control of the main rotor. The scissors are attached to the collective control item through the hub (12 figure 5-64) and collective sleeve (19, figure 5-51) and lever assemblies (7 and 10) for collective pitch control of the main rotor. Refer to paragraph 5-4 for description of the function of the scissors and sleeve in the main rotor system.

Premaintenance Requirements for Scissors and Sleeve Assembly

Condition	Requirements
Model	AH-1 P/E/F
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	Two
Consumable Materials	(C23), (C36), (C58), (C74), (C91), (C112), (C116),(C137)
Special Environmental Conditions	None

5-56. CLEANING — SCISSORS AND SLEEVE.

a. Clean installed scissors and sleeve with clean cloth.

b. Clean scissors and sleeve that has been removed from helicopter as follows:

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

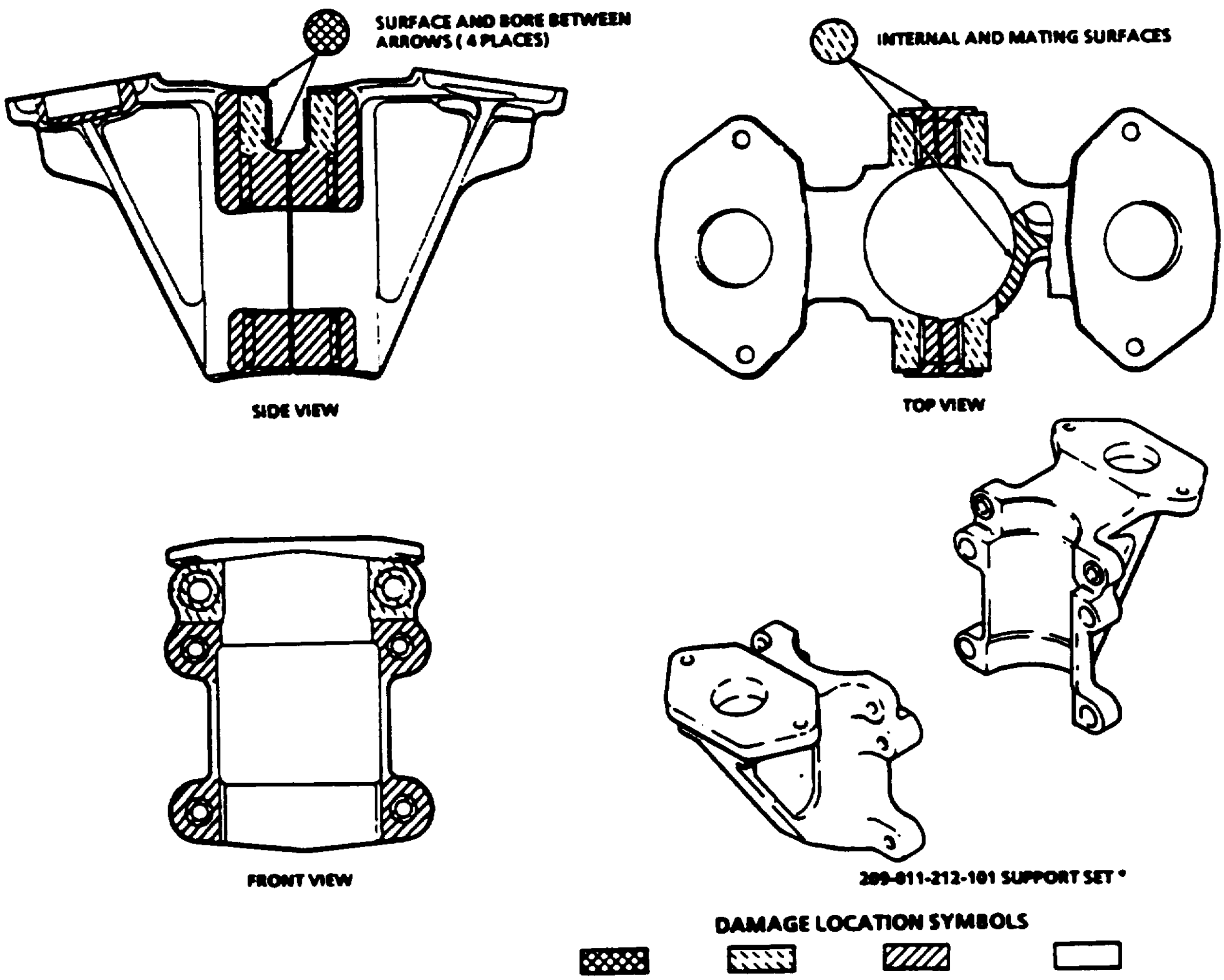
(1) Clean hub (12, figure 5-64) and sleeve (13) with clean cloths dampened with dry cleaning solvent (C112). Do not allow solvent to contaminate bearings located inside hub (12).

(2) Deleted

5-57. LUBRICATION — SCISSORS AND SLEEVE.

a. Lubricate an installed scissors and sleeve as shown on lubrication chart in Chapter 1.

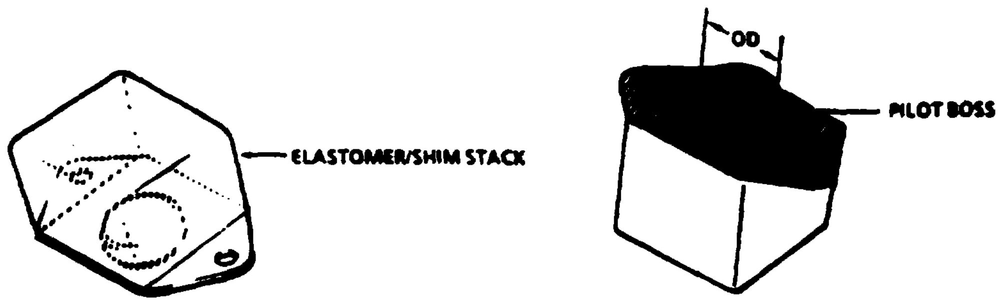
b. Deleted.



TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED			
NICKS, SCRATCHES, DENTS, AND CORROSION	0.001 In.	0.005 In.	0.010 In.	0.020 In.
MAXIMUM AREA PER NON-OVERLAPPING FULL DEPTH REPAIRS	0.10 Sq. in.	0.10 Sq. in.	0.10 Sq. in.	0.30 Sq. in.
NUMBER OF NONOVER-LAPPING REPAIRS ALLOWED	1 Per area	4	4	Not critical
EDGE CHAMFER	0.040 In.	0.040 In.	0.040 In.	0.060 In.
BORE DAMAGE - SUPPORT	0.002 In. for 1/4 of circumference			
BORE DAMAGE - BUSHING	0.001 In. for 1/4 of circumference			
CRACKS	None allowed			

209011-39

Figure 5-63.1. Damage Limits -Hub Moment Spring Support Part Number 209-011-212-101 (MWO 55-1520-244-50-3 Incorporated



209-310-100-105 HUB MOMENT SPRING *

DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED
NICKS, SCRATCHES, DENTS AND CORROSION	0.020 IN.
MAXIMUM AREA PER NONOVERLAPPING FULL DEPTH REPAIR	0.25 SQ. IN.
NUMBER OF NONOVERLAPPING REPAIR AREAS	5
EDGE CHAMFER	0.060 IN.

NOTES

1. Delamination of rubber from base or shims is allowable up to 0.25 inches deep, measured with a 0.010 feeler gage.
2. Cracks in the shim are cause for rejection.
3. Outside diameter (OD) of pilot boss must be minimum of 1.7295 inches.
4. Inside diameter of mounting holes must be maximum of 0.400 inches.
5. No cracks allowed in steel parts.

*After incorporation of MWO 55-1520-244-50-3.

209310-1

Figure 5-63.2. Damage Limits — Hub Moment Spring

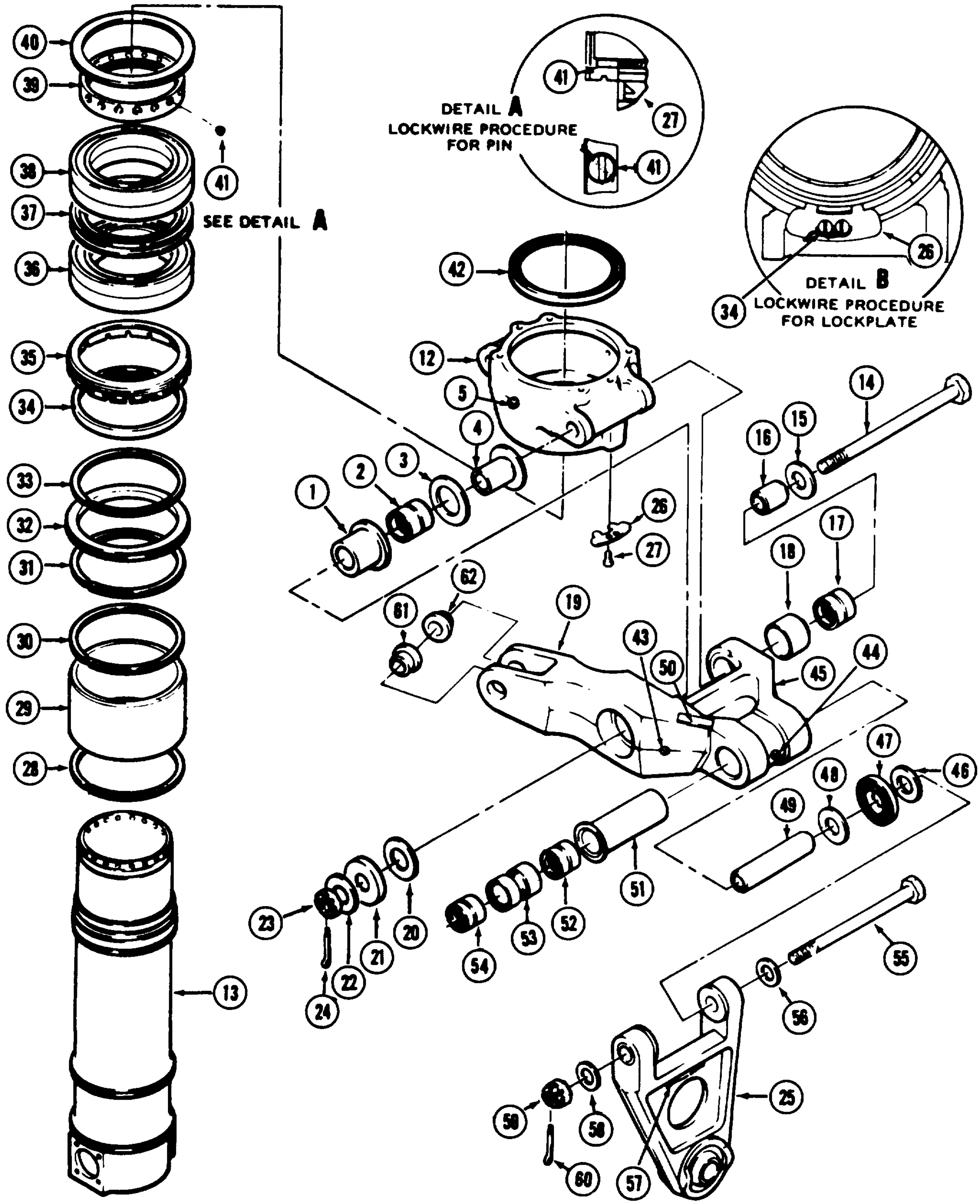


Figure 5-64. Scissors and Sleeve Assembly (Sheet 1 of 2)

1. Retainer
2. Bearing
3. Spacer
4. Bearing inner race
5. Lubrication fitting
6. Screw (Round head drive screw)
7. Identification plate
8. ~~Screw (Round head drive screw)~~
9. Identification plate
10. Nut
11. Pin
12. Hub assembly
13. Collective sleeve
14. Bolt
15. Special washer
16. Bearing inner race
17. Bearing
18. Sleeve bushing
19. Scissors assembly
20. Special washer
21. Cap washer
22. Special washer
23. Nut
24. Cotter pin
25. Link assembly
26. Lockplate
27. Screw
28. Retaining Ring
29. Bearing Sleeve
30. Retaining Ring
31. Retaining Ring
32. Spacer
33. Retaining Ring
34. Seal
35. Nut
36. Bearing Set
37. Spacer
38. Bearing Set
39. ~~Nut~~
40. Spacer Ring
41. Pin
42. Seal
43. Lubrication fitting
44. Lubrication fitting
45. Lubrication fitting
46. Shim
47. ~~Housing and seal~~
48. Washer
49. Bearing inner race
50. Identification plate
51. Retainer
52. Bearing
53. Sleeve spacer
54. Bearing
55. Bolt
56. Washer
57. Identification plate
58. Washer
59. Nut
60. Cotter pin
61. Bushing Assembly
62. Bushing Assembly

Figure 5-64 Scissors and Sleeve Assembly (Sheet 2 of 2)

5-58. REMOVAL – SCISSORS AND SLEEVE.

CAUTION

Remove scissors and sleeve with caution to avoid damage to mast.

a. Remove main rotor (paragraph 5-12) and hub moment spring assembly (paragraph 5-53.4).

b. Cut lockwire and remove spacer (26, figure 5-51) and upper boot (27).

c. Remove bolts, nuts and washers and remove clamp assembly (30). (Keep three parts of clamp together as a set.)

d. Remove rubber ring (33).

e. Remove nuts (39) and bolts (34). Remove retainer (35) and collet set (36). Identify collet set for reinstallation as a set.

f. Check wear on spline plate prior to removal (paragraph 5-49).

g. If scissors and sleeve assembly is to be installed without complete disassembly and inspection, check wear on thrust washers (7, figure 5-53) prior to removal. Maximum allowable play at thrust washers is 0.060 inch as shown on illustration.

h. Remove bolts (42, figure 5-51) and remove extension and spline plate. Identify spline plate as satisfactory or as worn beyond limits noted in preceding step f.

i. Disconnect collective system control tube from collective lever assemblies (7 and 10). Remove bolts (1, 11, and 12). Separate collective lever halves (7 and 10) from collective sleeve (19) and idler assembly (22). Keep spacer (9), thrust bearing washer (14), thrust washer (18), bearing inner race (24) and similar parts on the opposite side with the collective lever halves for assembly.

j. Remove screws (1 3), bearing assembly (20) and spacer plate (21). Remove similar parts from opposite side.

k. Remove cotter pin (58), nut (57), and special washer (56). Remove drive link from swashplate. Remove special washer (55). Remove opposite drive link in the same manner.

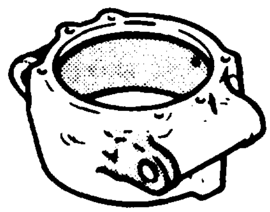
l. Cut lockwire and detach lower boot (46) from collective sleeve.

CAUTION

Do not allow scissors lever to contact scissors hub as damage to lever could result, Block scissors lever with wood or other suitable material to prevent damage.

m. Lift scissors and sleeve assembly (43) out of swashplate and off mast. Use caution to prevent damage to friction sleeve and mast splines during removal.

n. If swashplate is not to be removed, cover open area around top of lower boot (46) to prevent entry of foreign materials.



209-010-407-1
HUB ASSEMBLY

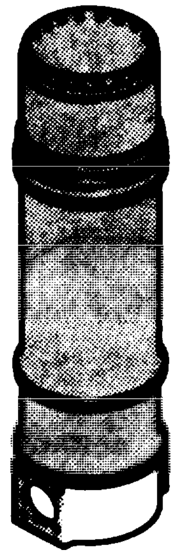
DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED	
CRACKS ALLOWED	None	None
SCRATCHES, DENTS AND CORROSION	0.010	0.035
MAXIMUM AREA PER FULL DEPTH REPAIR	0.15 Sq. In.	0.25 Sq. In.
NUMBER OF REPAIRS	One Per Lug	Not Critical
EDGE CHAMFER	0.020	0.050
THREAD DAMAGE		
Depth	One-Third of Thread	
Length	One-Half of Thread	
Number	Two	
BORE DAMAGE	0.002 for 1/4 Circumference	

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

209010-77C

Figure 5-65. Damage Limits - Hub, Sleeve, Scissors and Link (Sheet 1 of 4)



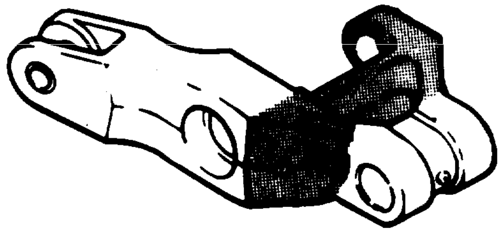
DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED (shaded)	(unshaded)
CRACKS ALLOWED	None	None
NICKS, SCRATCHES DENTS AND CORROSION	0.010	0.020
MAXIMUM AREA PER FULL DEPTH REPAIR	0.50 Sq. In.	0.50 Sq. In.
NUMBER OF REPAIRS	Not Critical	Not Critical
EDGE CHAMFER	0.020	0.040
THREAD DAMAGE		
Depth	One-Third of Thread	
Length	One-Quarter Inch	
Number	Two Per Segment	
BORE DAMAGE	0.002 for 1/4 Circumference	

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

540011-152C

Figure 5-65. Damage Limits - Hub, Slave, Scissors and Link (Sheet 2 of 4)



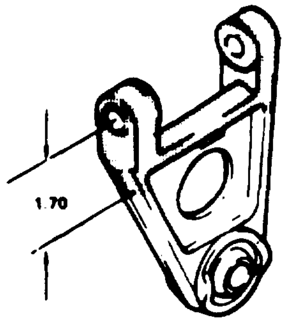
DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED (■)	(□)
CRACKS ALLOWED	None	None
NICKS, SCRATCHES, SHARP DENTS	0.020	0.030
CORROSION DAMAGE		
Before Repair	0.010	0.015
After Repair	0.020	0.030
MAXIMUM AREA PER FULL DEPTH REPAIR	0.25 Sq. In.	0.40 Sq. In.
NUMBER OF REPAIRS	Not Critical	Not Critical
EDGE CHAMFER	0.040	0.060
BORE DAMAGE	0.001 for 1/4 Circumference	

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

209010-78C

Figure 5-65. Damage Limits - Hub, Sleeve, Scissors and Link (Sheet 3 of 4)



DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED (shaded symbol)	(open symbol)
CRACKS ALLOWED	None	None
NICKS, SCRATCHES, SHARP DENTS	0.020	0.030
CORROSION DAMAGE		
Before Repair	0.010	0.015
After Repair	0.020	0.030
MAXIMUM AREA PER FULL DEPTH REPAIR	0.10 Sq. In.	0.25 Sq. In.
NUMBER OF REPAIRS	One Per Lug	Not Critical
EDGE CHAMFER	0.040	0.060
BORE DAMAGE	0.001 for 1/4 Circumference	

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

209010-79C

Figure 5-65. Damage Limits – Hub, Sleeve, Scissors and Link (Sheet 4 of 4)

5-59. DISASSEMBLY — SCISSORS AND SLEEVE.

a. Remove bolt (55, figure 5-64) and remove link (25). Retain shim (46) for reassembly.

b. Remove housing (47), washer (48) and inner race (49) from scissor.

c. Remove opposite scissor and link in the same manner described in the preceding steps.

d. (AVIM) remove cotter pin (24), bolt (14), and washers (15, 20, 21, and 22). Remove scissors assembly (19) from hub.

e. Remove inner races (4 and 16) and spacer (3).

f. Install wrench (T29.3) on top of hub (12) with two bolts. Invert assembly and secure wrench in a vise.

Remove two screws (27) and lock plate (26). Disengage spiral retaining rings (31 and 33) and move spacer (boot support ring) (32) away from mounting shoulder for access to bottom of hub.

h. Use wrench (T15.2, T29.3, or T44.1) to turn nut (35) out of hub. Remove assembly from vise and remove took.

i. Place sleeve assembly on a press with halves of support (T29.1) placed under hub. Insert small end of ram adapter (T29.2) in top of sleeve. Press sleeve assembly out of hub. Remove seal (42) from hub. Remove spacer ring (40) from bearing stack of sleeve.

j. Remove lockwire and pin (41). Install wrench (T15.2, T29.3, or T44.1) with pins engaged in holes of nut (39). Insert bar (T34.1) in holes at lower end of sleeve and hold against turning while removing left-hand threaded nut. Remove took

k. Place sleeve assembly on a press with support halves (T29.1) placed under inner race of lower bearing. Remove bearing sets (36 and 38) and spacer set (37) by pressing out sleeve assembly.

l. Remove loose nut, retaining rings (28 and 30) support ring from sleeve assembly. Use adapter (T29.2).

m. Remove retaining rings (31 and 33) and bearing sleeve (29) from collective sleeve (13).

5-60. INSPECTION — SCISSORS AND SLEEVE (AVIM).

a. Identify scissors and sleeve components which will reach retirement time prior to next scheduled inspection for replacement. Refer to overhaul and retirement schedule.

b. If scissors and shave assembly is to be installed without complete inspection, make the following inspection to ensure that parts are suitable for installation on helicopter:

(1) Check end play between scissors and sleeve assembly (43, figure 5-51) and link (44) for maximum axial looseness of 0.080 inch.

(2) Upper and lower boots (27 and 46) for tears and deterioration.

(3) Rubber ring (33) for deterioration and damage.

(4) Collet set (36) for missing fingers, cracks, scoring or other damage.

(5) Bearing assemblies (20) for bindng, roughness and maximum radial play of 0.010 inch.

(6) Spherical bearing in drive link (44) for roughness binding and maximum axial play of 0.015 inch if excessive vibration does not oocur.

(7) Scissors levers for gouges and scratches especially on underside of pivot leg (figure 5-65).

(8) Swashplate horns for scoring.

(9) Spline plate wear in excess of 0.040 inch limit measured in paragraph 5-58f.

(10) Inspect drive link bushing for cracks. With drive link disconnected at lower end, check for binding or stiffness when swiveling drive link up and down. If binding or stiffness is noticed, removal of the drive link is required to check for cracked bushings. If cracked bushings are found, inspect mating surface of the scissors lever for mechanical damage caused by the cracked bushings.

c. Inspect hub, sleeve, scissors and link for corrosion and mechanical damage in excess of limits and mechanical damage in excess of limits shown in figure 5-65. Inspect clevis end of scissors outboard of bushing. If recessed between bushing end and clevis outer surface exceeds 0.004 inch a shim is required. Refer to para 5-61.f. (7) for installation instructions. Do not disassemble hut (12, figure 5-64) from sleeve (13), and do not remove bearings and bearing retainers (1) or (51) to make this inspection. Inspect drive link (25, figure 5-64), spherical bearing for roughness, binding, axial play slippage mork, and alignment. A maximum of 0.015 inch axial play is permissible if excessive vibration does not occur.

NOTE

The spherical bearing wear will be in both the radial and axial direction. However, the only criteria necessary for determining serviceability will be to measure the axial play.

d. Inspect bolts (14 and 55) and washers (3,20,21 and 22) for damage that would affect function. Maximum lateral chucking of the scissors lever (19) will be 0.020 inch. There will be no longitudinal chucking permissible of bolt (14).

e. Inspect bearing sets (36 and 38) as follows:

(1) Inspect for roughness and /or brinelling. Reject bearings with brinelling damage that is visible under 5 power magnification.

(2) Inspect for galled or flaked area on balls and raceways. Use a strong light when making this inspection

f. Inspect inner races (4, 16 and 49) for damage. If other then a mooth, unscored surface is found, replace the affected inner race and the bearing that matches that damaged area.

g. Inspect bearing (2, 17, 52 and 54) while bearings are installed in scissors. If any bearing damage is detected replace in accordance with paragraph 5-61.

h. Inspect spacer sets (32 and 37) for corrosion, scoring and other mechanical damage. No repair authorized.

i. Visually inspect sleeve (29) for indications of wear at contact points with retaining rings (28 and 30).

j. Visually inspect cap washer (21), housing (47), retaining rings (28, 30, 31, and 33), spacer (32), lock plate (26), pin (41), spacer ring (40) and spacer (37) for crocks, corrosion and deformation.

k. Inspect nut (39) and similar nut in lower side of hub (12) with the nuts installed in the hub. Inspect for mechanical damage and corrosion. Inspect pin (11) for secure installation. Inspect locking plate device or nut in lower side of hub (12) far secure installation.

l. Inspect lubrication fittings (5, 43, 44, and 45) for damage that would affect function.

m. Inspect identification plates (7, 9, 50, and 57) for secure installation and legible markings.

n. Inspect the following parts by magnetic particle method code M, or fluorescent penetrant method, Code F (TM 55-1500-335-23), Items are indexed to figure indicated.

FIGURE	ITEM	NOMENCLATURE	CODE
5-64	19	Scissors	F
5-64	14	Bolt	M
5-64	55	Bolt	M
5-64	25	Link	F

o. Position unworn bolt (55) in link (25). If the bolt does not fit freely through bushings, replace the link. Check the opposite link in the same manner.

p. Use a straight edge to check the cylindrical portion of the collective sleeve for deformation. If warpage is in excess of 0.005 inch in a 5.0 inch length, replace the sleeve.

q. Use straight edge to check all machined flat surfaces surrounding lugs, holes and bushings for deformation. If deviations excess 0.002 inch, replace the part.

r. Inspect fingers for loose, missing and badly worn teflon. No missing fingers, badly worn teflon pads, crocks or scoring allowed.

6-61. REPAIR - SCISSORS AND SLEEVE (AVIM).

CAUTION

Repair by use of grinding wheel is not allowed.

a. Polish out corrosion and mechanical damage on ports inspected in paragraph 5-60. Use fine to medium abrasive cloth (C36), crocus cloth (C37) or fine India stone (C116). Blend repair smoothly into surrounding area. Replace port ,if repair exceeds allowable area and/or depth limits.

b. Replace defective scissors bearings (52 and 54, figure 5.64) os follows:

(1) Insert a punch through retainer (51) and tap out bearings (52 and 54) and spacer (53). Inspect retainer ID for scoring. Maximum allowable depth of score marks after cleanup is 0.002 inch. Clean retainer and apply a light film of grease (C58) to retainer bearing bore.

WARNING

Use solvent in a well ventilated area. Avoid prolonged breathing of vapors and do not use in an area with open flame or high temperature.

(2) Clean bearings with solvent (C112) and hand pack bearings with grease (C58).

(3) Press bearing (52) into retainer (51); press spacer (53) into retainer.

(4) Press bearing (54) into retainer with the seal side of the bearing facing outboard.

c. Replace defective bearing (2). Replacement procedures for bearing (2) are the same as bearings (52 and 54), step b. above.

WARNING

Use solvent in a well ventilated area. Avoid prolonged breathing of vapors and do not use in an area with open flame or high temperature.

d. Replace defective bearing (17). Position scissors on a suitable support and apply pressure to bearing race. Inspect sleeve (18) for scoring. Score marks must not exceed 0.002 inch depth after cleanup. Clean new bearing with solvent (C112) and hand pack bearing with grease (C58). Apply heat lamp to scissors and press in new bearing (17). Check that bearing ends are equally spaced on each side of scissors tang.

e. Protect bearings from contamination until reassembly.

f. Replace damaged or worn bushings (61 and 62), as follows:

(1) Support the clevis end of scissors so os to prevent o bending load on tang, and press defective bushing from scissor.

WARNING

Use solvent in a well ventilated area. Avoid prolonged breathing of vapors and do not use in an area with open flame or high temperature.

(2) Inspect bushing bores in scissors for scoring after bushings ore pressed out. Polish out scoring type damage to 0.002 inch maximum depth. Clean holes in clevis and clevis inboard feces with solvent (C112).

(3) Coot bushing OD with wet, unreduced primer (C91), Ensure that primer does not contact buffer material on underside of bushing flange. Apply a heat lamp to end of scissors and press bushings into clevis holes with bushing flanges facing inboard. Check that bushings ore fully seated.

(4) line ream bushings to 0.6250 to 0.6255 inch diameter.

(5) Mill inboard bushing feces to establish 1.250 to 1.252 inch dimension between feces. Keep flange wall thickness equal within 0.005 inch.

(6) Chamfer the edge ID on inboard side of bushings 0.005 to 0.010 inch x 45 degrees.

(7) When recess exceeds 0.004 maximum (figure 5-65.1) between end of bushing (6) and 62, figure 5-64) and outboard surface of the scissors (19), install a 120-006C7E21 shim and peel as required to meet 0.002 to 0.004 maximum recess. Bond shim in place on end of bushing using o cyanoacrylate adhesive (C12.1).

g. Replace following ports if worn or damaged in excess of limits:

(1) Upper and lower boots (27 and 46, figure 5-51).

(2) Rubber ring (33).

(3) Collet set (36).

(4) Bearing assemblies (20).

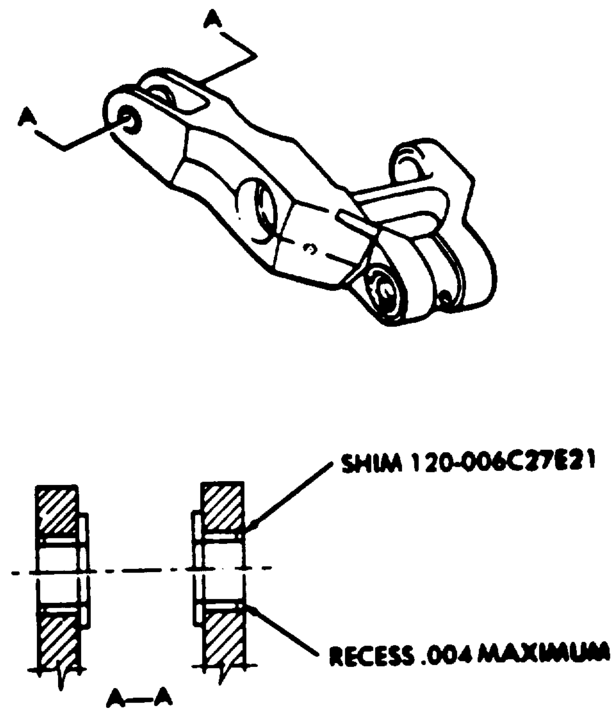


Figure 5-65.1. Installation of Shims

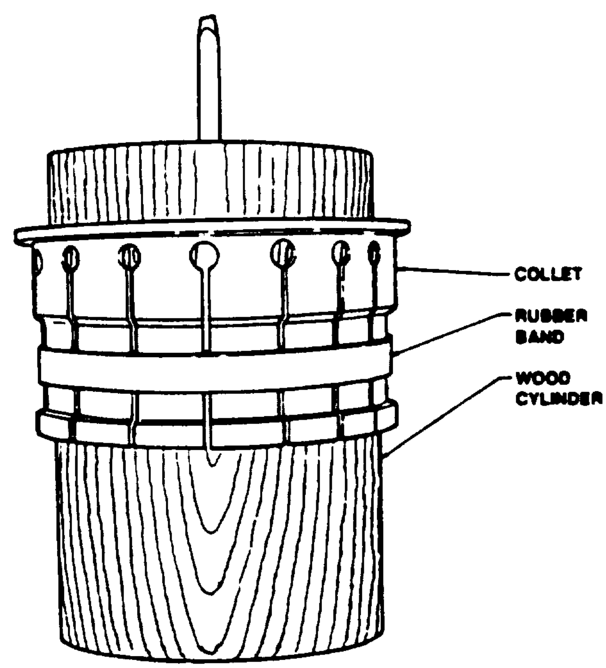


Figure 5-65.2. Collet Work Aid

h. Replace damaged or missing lubricatlon fittings (5, 43, 44 and 45, figure 5-64) by procedure outlined in paragraph 5-51, g.

i. Replace damaged or missing identification plates as follows:

NOTE

If data to be stamped on identification plate is not available, send affected assembly to Depot Maintenance.

(1) Identification plates (50 and 57, figure 5-64) are banded in place. Replace these Identification plates by some procedure outlined for collective lever idler link (paragraph 5-51).

(2) Identification plates (7 and 9) are secured with screws (round heed, drive screws) (6 and 8). Replace these Identification plates by the some procedures outlined in the preceding step except attach the identification plates to the hub with screws Instead of adhesive.

j. Collet fingers teflon can be rebonded with Versilock 204 (C17.1) end accelerator 5 (C9.1) utilizing work aid (Figure 5-65.2). Teflon pads from collet set may be used on other collet sets.

k. Collets may be used in mixed sets providing minimum gap of 0.040 inch each side is maintained.

5-62. ASSEMBLY — DRIVE LINK.

a. Assemble inner rote (49) washer (48) and housing (47) to scissor.

b. Attach link (25) to scissors (19) with inner race (49), washer (48) and housing (47) in position, but da not Install shim (46) at this time. Install nut (59) on bolt (55) finger tight.

c. Measure gap between housing (47) and bushing face of drive link (25) with feeler gauge. Record this figure. Prepare a shim (46) by peeling off laminations to obtain a shim thickness 0.000 to 0.002 inch less than measured gap. Remove bolt (55) and reinstall with inner rote (49) shim (46) washers (48, 56, and 58) and housing (47) in position. Torque nut (59) 85 to 104 foot-pounds and install tatter pin (60). Repeat for opposite scissors and link.

NOTE

End play between scissors and drive link is necessary after establishing torque. Maximum end play shall not exceed 0.116 inch.

5-62.1 ASSEMBLY — SCISSORS AND SLEEVE (AVIM).

a. Position spacer (32) and retaining rings (31 and 33) loosely on collective sleeve. Use adapter (T29.2) to press seal (34) into nut (35), with seal lip toward notched side of nut. Place nut, notched side down, loosely on sleeve below shoulder. Take suitable precautions to avoid marring loose parts in handling.

NOTE

The mating surfaces of the bearings in the bearing set should be wiped free of excess grease before they are installed.

Assemble bearing sets (36 and 38) and spacer (37) according to etched numbers and V-mark on outer races of bearings. Use adapter (T29.2) to press bearing stack on upper end of sleeve, with V-mark pointing up.

c. Start left-hand threaded nut (39) on sleeve. Install wrench (T29.3) with pins engaged in holes of nut. Hold sleeve with bar (T34.1) through holes at lower end. Apply maximum torque, 200 foot-pounds, to nut (39). Allow the stack-up to set for 10 minutes, release the torque, and then torque nut to 150 foot-pounds. Increase torque as needed, maximum 200 foot-pounds, to align a hole in the nut with a hole in the collective sleeve. Do not loosen the nut. Reduce torque to align the holes. Install pin (41). Remove tools. Secure pin with lockwire. Insert lockwire through drilled head and twist in space between sleeve and nut.

d. Use adapter (T29.2) to press seal (42) with lip upward, into top of hub until bottom of seal IS flush with or slightly below lower edge of hub seal bore.

e. Place sleeve assembly on a press with support halves (T29.1) under bottom bearing of stack. Place spacer ring (40) on top of bearing stack. Press hub assembly down over bearings. Remove assembly from press.

f. Install wrench (T29.3) on top of hub with two bolts. Secure wrench in vise. Start lower nut (35) into hub and torque 400 TO 500 foot-pounds. Use wrench (T44.1).

g. Position lockplate (26) on hub with tabs engaged in two notches of nut and secure to bottom of hub with two screws (8). Lockwire screws together as shown in detail B. If lockplate does not align, use a new plate and drill two 0.198 TO 0.204 inch diameter holes to match tapped holes in hub. Remove tools.

h. Install ring (32) on collective sleeve with retaining rings (31 and 33) in mounting grooves of collective sleeve below hub.

i. Lubricate bearing sets (36 and 38, figure 5-64) as follows:

WARNING

Use solvent in a well ventilated area. Avoid prolonged breathing of vapors and do not use in an area with open flame or high temperature.

(1) Wash bearing sets (36 and 38) in solvent (C112) and air dry.

(2) Hand pack bearing sets (36 and 38) with grease (C58).

(3) Protect bearing sets (36 and 38) from contamination until installation.

j. Position bearing sleeve (29) on collective sleeve (13), and install retaining rings (28 and 30) in grooves near lower end of sleeve.

k. Install scissor (19) on hub with inner races (4 and 18), spacer (3), washer (20), cap washer (21) and special washers (15 and 22) in position. One special washer (15) must be under bolt head and one special washer (22) must be under nut. The bolt head must face in direction of rotation. Torque nut (23) to 150 TO 175 foot-pounds and install cotter pin. Repeat for opposite scissors.

1. Lubricate all bearings in scissors and hub as specified in Chapter 1.

5-63. INSTALLATION — SCISSOR AND SLEEVE.

a. Install swashplate and lower boot if not previously accomplished (paragraph 5-71).

b. Coat mating splines on mast and in scissors and sleeve assembly spline plate (38, figure 5-51) with grease (C58).

c. Carefully lower scissors and sleeve assembly over mast. Insert lower end of collective sleeve down through lower boot (46) and top of swashplate support. Use care to avoid damage to teflon-lined bearing inside support.

d. Turn collectives sleeve (19) so that the two bearing mounting bosses at lower end are aligned with openings in swashplate support as illustrated, Position spacer plate (21) and bearing assembly on boss with the "TOP" marking up so that curved inner surfaced of bearing housing is aligned to mast surface. Install screws (13) and lockwire (C137) in pairs vertically. Install opposite bearing assembly in same manner.

d.1. Install idler link assembly (2) to boss (68) with bolt (73), washer (72), special washer (71), nut (70) and cotter pin (69). Install nut finger tight.

e. Install collective lever halves (7 and 10) as follows:

(1) Place a thrust bearing (washer) (14) over the bearing boss of each lever half.

(2) Mount lever halves on bearing assemblies (20) and install bolt (11), washer (6) and nut (5). Install nut finger tight.

(3) Position lever halves on link (22), with inner rata (24) and thrust washers (18 and 25) in place. Install bolt (1), washers (2 and 17) and nut (16). Install nut finger tight.

(4) Position spacer (9) between levers and install bolt (1 2). Install washer (4) and nut (3). Install nut finger tight.

(5) Torque nut (5) 50 TO 70 inch-pounds

(6) Torque nut (3) 160 TO 190 inch-pounds

(7) Torque nuts (16 and 70) 1250 to 1550 inch-pounds and install cotter pins (15 and 69).

(8) Check for maximum of 0.060 inch clearance between thrust washers and bearing housings. A minimum zero clearance is acceptable as long as no binding is evident. Clearance is to be measured collectively from both levers.

CAUTION

Special Washers (49 and 56, figure 5-51) are not interchangeable and must be installed in correct location to perform fail-safe function.

f. Place a special washer (55, figure 5-51) with chamfer facing outboard on swashplate outer ring as Illustrated. Position drive link (44) on swashplate. Install special washer (56) with collar inboard and the letters "AFT" facing outboard. Install nut (57) and torque 770 TO 950 inch-pounds and install cotter pin. Bend cotter pin ends closely around nut to avoid contact with swashplate during operation. Install opposite drive link in the same manner.

WARNING

Measure vertical clearance from the bottom of both drive links, P/N 209-010-408-7, to all three horns of stationary swashplate. The minimum clearance must not be less than .035 (thirty five thousandths) inch. Replace swashplate if clearance is below minimum.

g. Slip lower boot (46) on grooved ring on collective sleeve hub and on grooved ring on collective sleeve below hub. Secure both ends of boot with lockwire (C137).

h. Install extension (37) and associated parts shown on detail view A as follows:

(1) Coat mating splines on mast and spline plate (38) with grease (C58). Position spline and extension (37) on mast and install bolts (42) and washers (41). Torque bolts evenly 80 TO 100 inch-pounds and lockwire (C137) in sets of three.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

(2) Clean friction sleeve on mast, damp assembly (30), retainer (35), collet set (36) and extension (37) with MEK (C74).

(3) Seat collet set (36) in top of extension (37) and install retainer (35) with bolts (34), washers (40) and nuts (39). Torque nuts evenly 80 TO 100 inch-pounds.

(4) Position rubber ring (33) around collet set (36) and on top of retainer (35). Place clamp assembly (30) around rubber ring and install bolts (28), washers (29 and 31) and nuts (32). Tighten nuts evenly so that gaps between damp sections are equal within 0.0625 inch.

NOTE

Install bolt head (28) in the direction of rotation.

l. Adjust collet mast friction collet es follows:

(1) Disconnect collective control from oollective lever halves (7 and 10). Disconnect pitch finks (15, figure 5-2) from main rotor.

CAUTION

Do not exceed 130 Inch-pounds torque on nuts (32, figure 5-51) when performing stop (2) below.

Car. should be ob\served when placing collective levers (7 and 10, figure 5-51) In full down position to avoid damaging support assembly (23).

(2) Attach a force gage (fish scale) to collective lever halves (7 and 10) at point where collective controls ore normally attached. Place collective levers in full down position and measure amount of force in pounds required to noise to collective levers. Adjust torque on nut (32) as required to obtain a load of 125 TO 135 pounds on the force gage (fish scale) as required to raise the collective levers.

(3) Attach collective controls to collective lever halves (7 and 10) with bolt, washers, nut and cotter pin. Attach pitch link (15, figure 5-2) to main rotor.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

CAUTION

Do not exceed 130 inch-pounds torque on nuts (32, figure 5-51) when performing stop (4) below.

(4) Between five and ten hours of operation following installation, check friction os outlined in steps (1), (2) and (3) above. If friction is not within limits, adjust torque on nuts (32) os required. If correct friction cannot be obtained within limits, check for grease on mast friction sleeve and clean with MEK (C74) if applicable. Recheck friction and adjust as required.

NOTE

If friction is not within limits specified above and adjustment is necessary, repeat step (4) above after the next 5 to 10 hours of operation.

j. Install upper boot (27) with spacer (26). Secure upper boot with lockwire (C137).

k. Install main rotor hub and blade assembly (paragraph 5-14) and hub moment spring assembly (paragraph 5-53.7).

j. Perform maintenance test flight (TM 55-1520-236-MTF).

5-64. SWASHPLATE AND SUPPORT.

5-65. DESCRIPTION - SWASHPLATE AND SUPPORT.

The swashplate and support assembly is a component of the main rotor controls (figure 5-66). The swashplate support is on open cylinder with a flange for mounting to the transmission at the lower end and spherical surface or uniball at the upper end far mounting the swashplate. Side openings are provided to accommodate the collective lever halves which move the collective sleeve. The swashplate inner ring is clamped on the pivot ball of the support by upper and lower sets of contoured, teflon-lined bearings. This design allows the swashplate to tilt in any direction when actuated by the cyclic control rods. The anti-drive link prevents the inner ring from rotating. The swashplate outer ring tilts with the inner ring, but rotates with the scissors and most. It is mounted to the inner ring through o duplex ball thrust bearing, and is connected to the scissors with two drive links.

Premaintenance Requirements for Swashplate and Support

Condition	Requirements
Model	AH-1P/E/F
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	Two
Consumable Materials	(C14) (C43) (C58) (C74) (C87) (C105) (C112) (C137)
Special Environmental Conditions	None

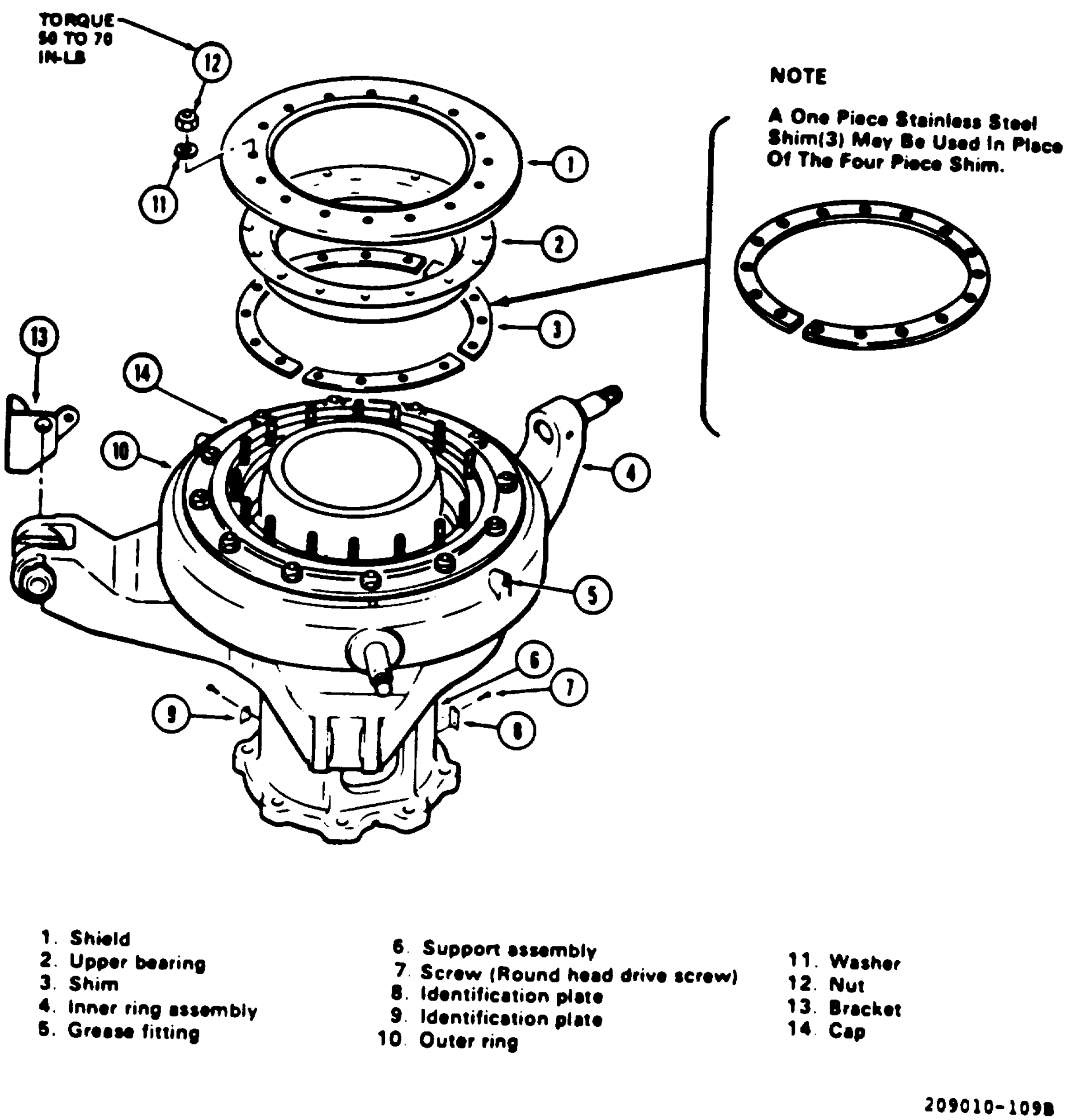


Figure 5-66. Swashplate and Support Assembly

5-66. ADJUSTMENT – SWASHPLATE AND SUPPORT,

a. Adjust friction on swashplale installed on helicopter as follows:

(1) Disconnect anti-drive link (50, figure 5-51), lateral control tube (17, figure 5-1) and fore and aft Control lube (18) from swashplate inner ring assembly

(2) Disconnect scissors and sleeve drive links (44, figure 5-51) from swashplate outer ring assembly.

(3) Apply a force gage (fish scale) to a bolt inserted through either lateral or fore and aft clevis on control horn inner ring.

(4) Check for 15.5 TO 20 pounds of force required to actuate swashplate about the uniball. If

friction is within limits, reconnect the items that ware disconnected in steps (1) and (2). If friction is not within limits, adjust and recheck thickness of shim (3, figure 5-66).

CAUTION

Ensure that wood wedges remain in position to support inner ring during shim adjustment procedure or uniball damage may result:

(a) Insert two wood wedges under swashplate inner ring to support the ring during shim adjustment procedure.

NOTE

A one piece stainless steel shim (3) may be used in place of the four piece shim in the steps below.

(b) Remove shield (1), upper bearing (2) and shims (3). Measure thickness of each section of shim with a micrometer. All four shim sections must be the same thickness.

(c) Remove or add one shim laminate to each of the four shim sections (pieces).

CAUTION

Do not apply more than 70 inch-pounds torque to nuts (12) that secure upper bearing and shield (1) for any reason.

(d) Recheck shim (3) to be sure all sections (pieces) are the same thickness and install the shim. Ensure that the inner diameter of shim (3) does not extend over the edge of inner ring (4). Fill gaps between ends of sections of shim (3) with corrosion preventive compound (C43). Install upper bearing (2) and shield (1). Install aluminum washers (11) and nuts (12). Torque nuts evenly 50 TO 70 inch-pounds while rocking ring assembly to ensure seating of bearings.

(e) Repeat friction check and if friction is not within limits, disassemble and make additional adjustment of thickness of shims (3).

(f) After friction is adjusted within limits, if sealant is missing, apply a continuous bead of polysulfide sealant (C105) around entire outer circumference of joint between cap (14) and outer ring (10).

(g) Remove wood wedges that ware placed under inner ring in step (a).

(h) Lubricate thrust bearing through fittings on outer ring (10) with grease (C58).

(6) Install anti-drive link (50, figure 5-51) and drive links (44).

b. Install hydraulic control cylinders for lateral and fore and aft controls (paragraphs 7-63, P 7-203 E M).

5-67. LUBRICATION – SWASHPLATE AND SUPPORT.

CAUTION

Ensure cotter pins, nuts, and special washers are removed and drive links

Lubricate swashplate and support as shown on lubrication chart in Chapter 1.

5-68. REMOVAL – SWASHPLATE AND SUPPORT.

CAUTION

Remove swashplate and support carefully to avoid damage to meet.

a . Remove main rotor hub and blade assembly (paragraph 5-12).

b. Remove scissors and sleeve assembly (paragraph 5-58).

c. Remove nut (48, figure 5-51), special washer (49) and disconnect anti-drive link (50) from rear horn of swashplate.

d. Disconnect cyclic control cylinder tube, elevator control tube and spring from right forward horn of swashplate.

e. Disconnect cyclic control cylinder and spring from left forward control horn.

CAUTION

Do not rotate inner ring unnecessarily while swashplate linkage is disconnected.

f. Remove bolts (75) and washers (76). Lift swashplate and support off mast. Use caution to avoid damage to mast friction sleeve and mast splines.

g. Remove bolt (51) and remove anti-drive link (5). Remove bolt (64) and remove bellcrank (61). Remove support (65).

5-69. INSPECTION — SWASHPLATE AND SUPPORT.

NOTE

If allowable inspection limits are exceeded, forward swashplate and support to depot maintenance.

a. Inspect swashplate inner ring horns for wear caused by improperly installed cotter pins in drive link to swashplate attachment bolts. Maximum permissible wear is 0.060 inch.

b. Rotate outer ring and check for binding and roughness of bearings. No binding or roughness is acceptable.

NOTE

Rotation of the swashplate inner ring, measured at the swashplate aft horn pin, in excess of 0.110 inch indicates worn anti-drive link bushings or bellcrank bushings.

c. Inspect swashplate and support assembly for nicks, dents, and corrosion. Refer to figure 5-67 for limits,

d. Inspect swashplate and support for specific damage as follows:

(1) Inspect flat surfaces at ends of collective lever pivot boss and for o distance of 0.75 inch on support from flat surface faces of boss. Mechanical damage shell not exceed 0.010 inch in depth and corrosion shall not exceed 0.005 inch in depth in these areas. Measure clearance between swashplate anti-drive link and bellcrank. Maximum allowable clearance is 0.015 inch. Also measure clearance between bellcrank and support. Maximum allowable clearance is 0.015 inch.

(2) Inspect hard anodized surface of pivot ball for any visible damage to surface, Minor damage (nicks, gouges, dents, scratches) to the hard coat surfaces of spherical ball is acceptable within the following:

(a) On spherical surface outside of teflon bearing working area - a maximum number of four (4), 0.160 inch in any one direction, and 0.005 inch in depth. Scratch maximum length is 0.500 inch,

(b) On spherical surface within the teflon bearing working areas - a maximum number of four in depth. Scratch maximum length is 0.500 inch.

(c) Minute pinhead size nicks that are not clustered - maximum of nine (9).

(d) Combination of (a) and (b) above - a maximum of four (4) if damage is on the maximum side, or a maximum of six (6) if damage is an the minimum side.

e. Check security of pin in aft horn of swashplate inner ring. No noticeable looseness is acceptable.

f. Check friction of swashplate to uniball. Refer to paragraph 5-66.

NOTE

If friction check is made with swashplate and support installed on transmission, disconnect drive links, anti-drive link, control tube and spring from inner ring.

g. Inspect bushings in inner ring at control tube attaching points for looseness, wear and mechanical damage. Maximum allowable wear on bushing inner faces contacted by control tube bearings is 0.060 inch.

h. Inspect support, inner ring and outer ring for damaged grease fitting and missing or damaged identification plates.

i. Inspect bracket (13, figure 5-66). Replace if loose or missing. Clean mating surface of inner ring (4) with MEK (C74) and wipe dry with a clean cloth. Apply primer (C87) to surface and allow to air dry. Remove protective peel ply from film adhesive on bracket (13). Coat mating surface of bracket (13) with adhesive (C14). Install bracket (13) on inner ring (4) with radius of bracket parallel to edge of inner ring and with holes aligned. Use caution to prevent adhesive squeese-out from obstructing bolt hole. Maintain firm contact pressure while adhesive cures.

j. Inspect for vertical and/or chuck movement between support inner and outer rings. No vertical and/or chuck movement is allowed in this area.

5-70. REPAIR - SWASHPLATE AND SUPPORT.

NOTE

Replace swashplate and support If allowable inspectlon limits are exceeded. Send unserviceable swashplate and support to next higher maintenance level.

a. Polish minor damage to the hard anodized surface if required with crocus cloth (C37) to remove all sharp edges. Use caution when polishing out damage. The hard anodized surface is 0.001 to 0.003 inch thick. Refer to figure 5-67 to identify area that has hard anodized surface. If hard anodized surface is removed during cleanup, return swashplate and support assembly for overhaul.

b. Replace grease fitting. Refer to paragraph 5-51 g.

c. Replace identification plates secured with drive screw as follows: (AVIM)

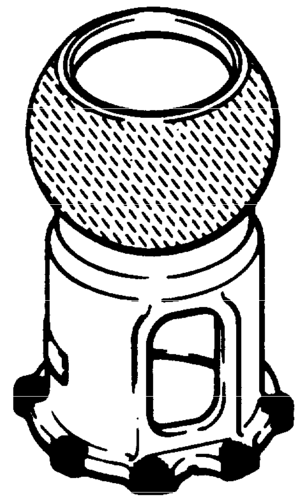
NOTE

If data to be stamped on identification plate is not available, send affected assembly to Depot Maintenance.

(1) Stamp all data from old identification plate on the new identification plate.

(2) Remove screws (7, figure 5-66) and remove old identification plate (8 or 9) from support assembly.

(3) Remove and replace retaining ring (15) and bearing bushing (16) if damaged.



SUPPORT ASSEMBLY
209-010-404-1

DAMAGE LOCATION SYMBOLS

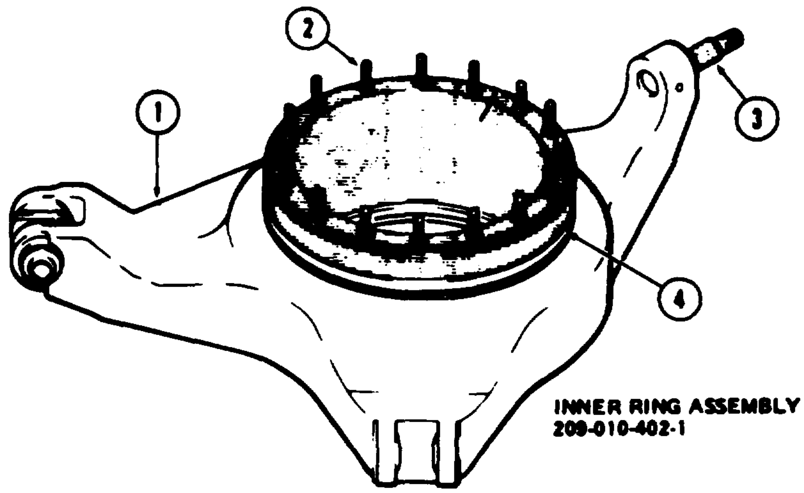
TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED		
CRACKS ALLOWED	None	None	None
NICKS, SCRATCHES, AND SHARP DENTS	0.020	This is Hard Anodized Surface	0.040
CORROSION DAMAGE			
Before Repair	0.010		0.020
After Repair	0.020		0.040
MAXIMUM AREA PER FULL DEPTH REPAIR	0.10 Sq. In.	See Note 2	Not Critical
NUMBER OF REPAIRS	One Per Lug		Not Critical
EDGE OF CHAMFER	0.060		0.060

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

NOTES:

1. Mount bolt hole bore damage limits is 0.002 on full circumference.
2. If corrosion damage penetrates the hard anodized surface, replace the support. Complete description of specific damage criteria and repair is provided in paragraphs 5-69 and 5-70.

Figure 5-67. Damage Limits — Swashplate and Support Assembly (Sheet 1 of



1. Swashplate inner ring
2. Stud
3. Pin
4. Sleeve

TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED	
	DAMAGE LOCATION SYMBOLS (shaded)	DAMAGE LOCATION SYMBOLS (unshaded)
CRACKS ALLOWED	None	None
NICKS, SCRATCHES, AND SHARP DENTS	0.010	0.040
CORROSION DAMAGE		
Before Repair	0.005	0.020
After Repair	0.010	0.040
MAXIMUM AREA PER FULL DEPTH REPAIR	0.10 Sq. In.	Not Critical
NUMBER OF REPAIRS	Not Critical	Not Critical
EDGE CHAMFER	0.060	0.060
BORE DAMAGE	0.001 for 1/4 Circumference	

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

NOTES:

1. Pivot bore dmage is 0.001 for one-fourth of circumference.
2. Thread Damage:
   Depth: One-Third of Thread
   Length: 0.25
   Number: One Stud or Pin
3. Replace sleeve (4) if seal mating surface is damaged.
4. Damage to anti-drive gear by cotter pin may be polished to 0.060 maximum depth.

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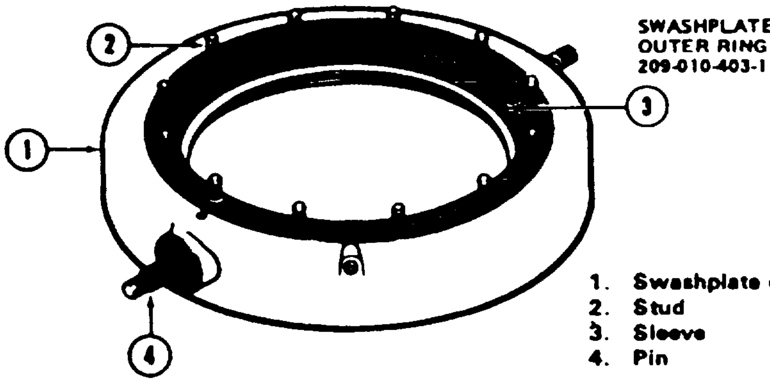
Figure 5-67. Damage Limits — Swashplate and Support Assembly (Sheet 2 of 3)



DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED	
CRACKS ALLOWED	None	None
NICKS, SCRATCHES, AND SHARP DENTS	0.010	0.040
CORROSION DAMAGE		
Before Repair	0.005	0.020
After Repair	0.010	0.040
MAXIMUM AREA PER FULL DEPTH REPAIR	0.10 Sq. In.	Not Critical
NUMBER OF REPAIRS	Not Critical	Not Critical
EDGE CHAMFER	0.060	0.060
THREAD DAMAGE		
Depth	One-Third of Thread	
Length	0.25	
Number	One Per Stud or Pin	

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

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Figure 5-67. Damage Limits — Swashplate and Support Assembly (Sheet 3 of 3)

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

(3) Clean area for identification plate on support assembly with dean cloth saturated with solvent (C112).

CAUTION

Do not overtorque screws.

(4) Position new identification plate on support (6). Place drive screw (7) through identification plate and in hole in support. Drive screw in until identification plate is tight against support.

5-71. INSTALLATION — SWASHPLATE AND SUPPORT.

NOTE

If swashplate and support assembly is new, lubricate in accordance with Figure 1-5, item 7, prior to installation.

a. Install swashplate and support as follows:

(1) Install support assembly (65, figure 5-51) on transmission.

(2) Install bellcrank (61) on support (65) with bolt (64) and nut (66). Torque nut 190 TO 210 inch-pounds and install cotter pin.

NOTE

Raised letters "AFT" identifies rear side of anti-drive link and must be positioned toward rear of helicopter.

(3) Install anti-drive link (50) on bellcrank (61) with bolt (51), washer (52), and nut (53). Torque nut 190 TO 210 inch-pounds and install cotter pin.

NOTE

In order to obtain a proper cotter key hole alignment, install one AN960PD1016 washer under nut (53).

(4) Lower swashplate and support assembly over mast onto top of transmission. Avoid damage to mast splines.

(5) Align holes in swashplate support with holes in transmission cap. Install bolts (75) with washers (76) and torque 200 TO 250 inch-pounds. Lockwire (C137) bolt heads in pairs.

(6) Turn swashplate inner ring to align stud with anti-drive link (50). Position link on stud and install special washer (49) with marked surface facing aft. Install nut (48) and torque 480 TO 690 inch-pounds. install cotter pin.

b. Connect lateral control tube (17, figure 5-1) to left horn of swashplate inner ring (22).

c. Connect fore-and-aft hydraulic cylinder control tube (4, figure 11-12), elevator control tube (3), and ,spring (2) to right horn of swashplate (1).

d. Position lower boot (46, figure 5-51) loosely on swashplate.

e. Install scissors and sleeve assembly (paragraph 5-63).

SECTION IV. TAIL ROTOR SYSTEM

5-72. TAIL ROTOR SYSTEM.

5-73. DESCRIPTION — TAIL ROTOR SYSTEM.

A two blade, controllable pitch tail rotor hub and blade is located on the right side of the tail rotor gearbox. H is composed of two assemblies, the hub assembly, blades, and controls. The hub assembly employs a preconed, flex-beamed type yoke connected to the blades by means of self-lubricated spherical pitch change bearings, and a two-piece, trunnion, connected to the yoke by self-lubricated spherical flapping bearings. The trunnion, splined to the tail rotor shaft, drives the tail rotor hub and rotor blade and serves as a flapping stop for the tail rotor.

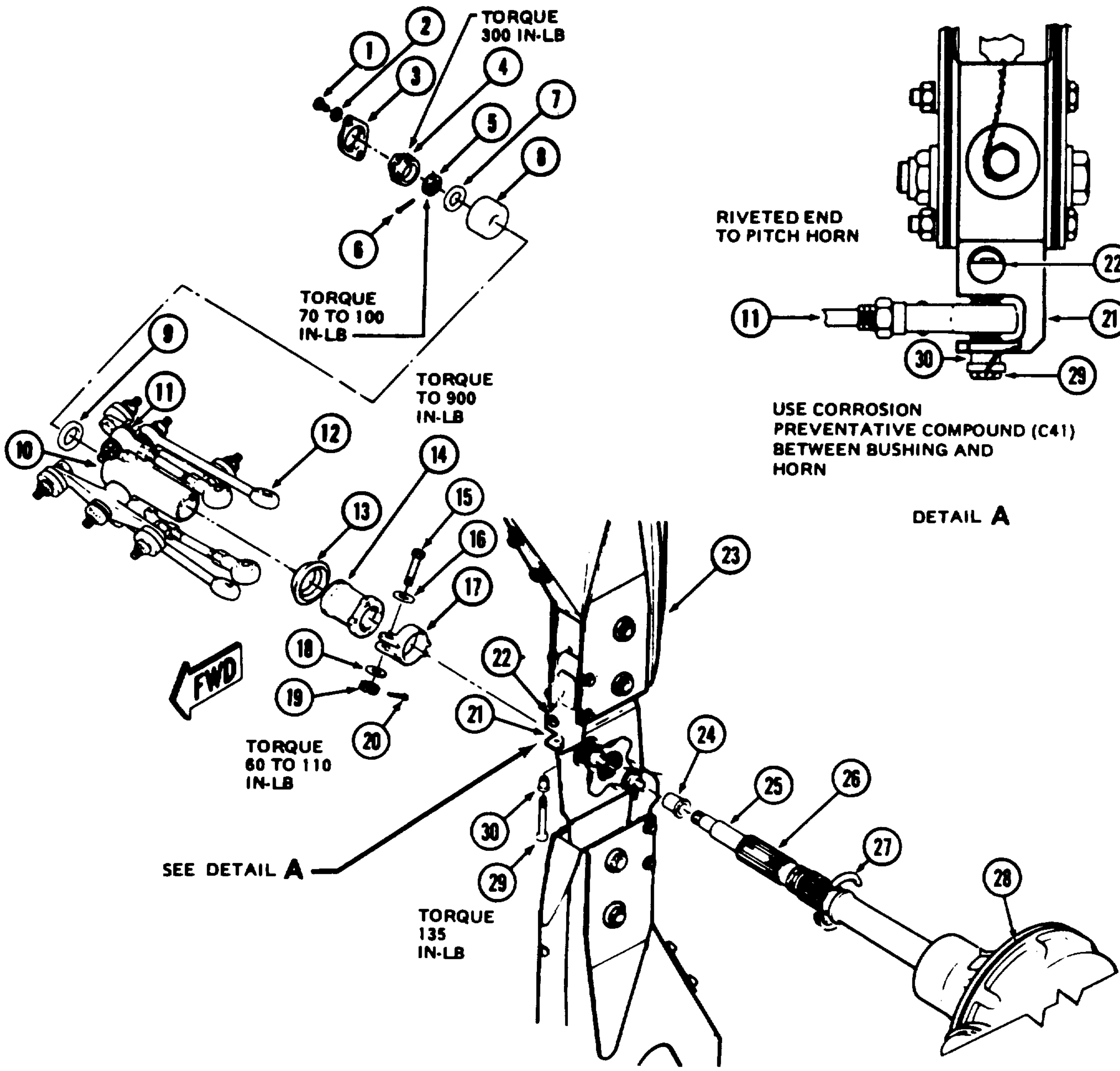
5-74. CLEANING-TAIL ROTOR SYSTEM

a. Clean tail rotor blades (23, figure 5-68) with cleaning compound (C33).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

b. Remove stubborn deposits with a clean cloth dampened with solvent (C112).



1. Screw
2. Washer
3. Lock
4. Retainer
5. Nut
6. Cotter pin
7. Steel washer
8. Bearing
9. Nylatron washer
10. Crosshead
11. Pitch link
12. Counterweight link
13. Shield
14. Retaining nut
15. Bolt
16. Washer
17. Counterweight support
18. Washer
19. Nut
20. Cotter pin
21. Pitch horn
22. Barrel nut and retainer
23. Hub and blade assembly
24. Sleeve
25. Control tube
26. Gearbox output shaft
27. Split cone set
28. Tail rotor gearbox
29. Bolt
30. Bushing

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Figure 5-68. Tall Rotor Installation

c. Clean hub assembly (23) with solvent (C112) and dry with filtered, compressed air.

5-75. LUBRICATION – TAIL ROTOR SYSTEM .

Lubricate tail rotor system as shown on lubrication chart in Chapter 1.

5-76. ADJUSTMENT – TAIL ROTOR SYSTEM.

Refer to paragraph 5-115 for adjustment.

5-77. INSPECTION – TAIL ROTOR SYSTEM.

a. Inspect tail rotor assembly and control linkage for security, completeness and lubrication.

b. Inspect tail rotor blades in accordance with paragraph 5-110.

c. Inspect tail rotor hub assembly in accordance with paragraph 5-93.

5-78. TROUBLESHOOTING – TAIL ROTOR SYSTEM.

Troubleshoot problems in the tail rotor system using table 5-3.

NOTE

Before using Table 5-3, ensure that all normal operational checks have been performed. If there is a malfunction which is not listed in this table, notify the next higher level of maintenance.

Table 5-3. Troubleshooting — Tail Rotor System

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. High Frequency Vibration.

STEP 1. Check tail rotor track (paragraph 5-115).

Adjust pitch link to bring tail rotor in track (paragraph 5-115).

STEP 2. Tail rotor out of balance,

Remove tail rotor and balance (paragraph 5-86).

STEP 3. Check for worn or loose trunnion bearings (paragraph 5-93).

Replace trunnion bearings (paragraph 5-94).

STEP 4. Check for loose or worn blade retention bearings (paragraph 5-93).

Replace blade retention bearings (paragmph 5-94).

STEP 5. Check for loose tail rotor hub retaining nut (paragraph 5-87).

Inspect and retorque nut (paragraph 5-87).

Table 5-3. Troubleshooting – Tail Rotor System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

STEP 6. Check for bent pitch change links (paragraph 5-102).

Replace pitch change link (paragraph 5-104).

STEP 7. Check for worn or loose pitch change link bearings (paragraph 5-102).

Replace pitch change link (paragraph 5-104).

STEP 8. Check for worn or loose pitch change crosshead bearing (paragraph 5-102).

Replace pitch change bearing (paragraph 5-104).

STEP 9. Check for loose or improperly torqued biped and tripod engine mounts (paragraphs 2-192 and 2-198).

Retorque bipod and tripod engine mount bolts (paragraphs 2-194 and 2-200).

STEP 10. Check for loose mounting bolts on intermediate and tail rotor gearboxes (paragraphs 6-99 and 6-115).

Retorque mounting bolts (paragraphs 6-105 and 6-121).

STEP 11. Check for elongated mounting bolt holes for intermediate and tail rotor gearboxes.

Refer to paragmph 6-121 for limits for tail rotor mounting bolt holes in support fitting. Refer to Paragraph 6-105 for limits for intermediate gearbox mounting bolt holes.

STEP 12. Check hanger bearings and couplings for loss of lubrication, seal failure, and coupling clamps for loose retention bolts.

Refer to table 6-1 drive train.

2. Inability to make normal right or left turn in flight.

STEP 1. Check tail rotor rigging.

Refer to paragraph 11-73 for rigging check. Refer to paragraph 5-115 for tracking instructions.

SECTION V. TAIL ROTOR HUB AND BLADE ASSEMBLY

5-79. TAIL ROTOR HUB AND BLADE ASSEMBLY.

5-80. DESCRIPTION – TAIL ROTOR HUB AND BLADE ASSEMBLY.

The tail rotor hub and blade assembly counteracts torque of the main rotor and provides directional control. It consists of the hub and two blades. The hub assembly has a preconed, flex-beamed-type yoke and a two-piece, trunnion, connected to the yoke by self-lubricating spherical flapping bearings. The trunnion, splined to the tail rotor gearbox shaft drives the blades, and serves as a flapping stop for the tail rotor. The yoke has two self-lubricating, spherical bearings for attaching points for each rotor blade. Rotor pitch change is accomplished at these bearings. The blades are all metal bonded assemblies with a stainless steel spar and honeycomb core. A system of counterweights is attached to the pitch control system to balance control forces and assist in controlling blade pitch.

Premaintenance Requirements for Tail Rotor Hub and Blade Assembly

Condition	Requirements
Model	AH-1E/F/P
Part No. or Serial No.	All
Special Tools	(T4)
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C60) (C114) (C137)
Special Environmental Condition	None

5-81 . REMOVAL – TAIL ROTOR HUB AND BLADE ASSEMBLY.

a. If the rotor and controls are to be reinstalled, check color code dots and, if missing, reapply color code so that parts can be reinstalled in the same relative position.

b. Remove bolts and separate both counterweight links (12, figure 5-68) from counterweight support (17).

c. Remove lockwire, screws (1), washer (2), lock (3), and retainer (4) from crosshead (10).

d. Push right pedal forward against stop and remove cotter pin (6), nut (5) and washer (7) from end of pitch change control tube (25).

e. Grip both tail rotor blades firmly with hands and twist blades to disengage bearing (8) from control tube (25). Remove nylatron washer (9) from crosshead.

NOTE

If outer race of bearing (8) separates from inner race, remove inner race as outlined in step f., and dispose of bearing locally.

f. Push left pedal forward against stop and place 1 1/16 wrench between inner race of bearing (8) and crosshead (10). Push right pedal to disengage inner race from control tube (25).

g. Disconnect pitch links (11) from each tail rotor blade pitch horn (21) by removing lockwire and bolt (29). If same tail rotor is to be reinstalled, secure bushing (30) and barrel nut and retainer (22) in place with bolt (29). If new tail rotor is being installed, remove bushing (30) and barrel nut and retainer (22).

h. Remove crosshead assembly (10, figure 5-68) from gearbox output shaft (26).

i. Cut lockwire and remove shield (13) and retaining nut (14) as an assembly. Remove counterweight support (17).

j. Move hub and blade assembly (23) outboard on splines and remove split cone set (27) as it is released. Secure and retain cone set (27) as a matched set. Remove hub and blade assembly from gearbox and place on a rack to prevent damage to blades.

NOTE

Sleeve (24) normally remains on control tube (25) unless the sleeve or control tube is to be replaced.

k. If sleeve (24) is to be replaced, pull sleeve outboard to engage threads and turn until disengaged.

5-82. DISASSEMBLY – TAIL ROTOR HUB AND BLADE ASSEMBLY.

a. Remove tail rotor hub and blade assembly from helicopter (paragraph 5-81). Place the tail rotor assembly on a padded bench or similar work area to prevent damage.

b. Prior to disassembly, check condition of retention bearings in the yoke. Move the blades through full throw on the pitch change axis end check the bearings by feel. If the blades do not mow freely on the bearings, identify the faulty bearings for replacement.

NOTE

The tail rotor hub and blade assembly must be rebalanced if any parts are replaced or repaired. It is good practice to index special balance washers and bolts at time of disassembly so that these parts can be reassembled in the same location. This will make rebalancing easier.

c. Remove nuts (5 and 10, figure 5-69) and all balance washers. Remove bolts (20 and 25) and special washers (19 and 26).

d. Remove opposite blade in the same manner.

5-83. INSPECTION – TAIL ROTOR HUB AND BLADE ASSEMBLY.

a. Inspect tail rotor hub assembly (paragraph 5-93).

b. Inspect tail rotor blade assembly (paragraph 5-110).

c. Inspect pitch change horn (paragraph 5-110).

d. Inspect bolts and nuts for thread damage and general condition.

5-84. REPAIR – TAIL ROTOR HUB AND BLADE ASSEMBLY.

a. Repair tail rotor hub assembly (paragraph 5-94).

b. Repair tail rotor blade assembly (paragraph 5-111).

c. Repair pitch horn assembly (paragraph 5-111).

d. Replace worn or damaged bolts and nuts.

5-85. ASSEMBLY – TAIL ROTOR HUB AND BLADE ASSEMBLY.

CAUTION

Check for correct washers with chamfered internal diameter under bolt head.

a . Position hub assembly (1, figure 5-69) on bench with date plate side up. Install blade (14) on hub yoke with the data plate side up. Install bolts (20 and 25) with special washers (19 and 26) under bolt heads. Install special washers (2 and 13) next to blade. If balance washers (3, 4, 11, and 12) were indexed at time of disassembly, reinstall them m the same position. Ifthey were not indexed, do not install them until the assembly is balanced. Install nuts (5 and 10) but do not torque until after the assembly has been balanced.

b. Install opposite blade in the same manner. The four blade retention bolts (20 and 25) maybe installed from either side, but all four bolts must be installed from the same side.

c. Position pitch horn (15) on blade and install bolts (22 and 23) with steel washers (21 and 24) under heads, Install the bolts with heads in same directions as bolts (20 and 25). I nstall steel washers (6 and 9) end nuts (7 and 8). Torque nuts 60 inch-pounds. If balance washer (18) was indexed at disassembly, install it at this time with steel washer (17) and bolt (16). If the balance washers were not indexed, install bolt (16) and steel washer (17). Do not torque until after the assembly has been balanced.

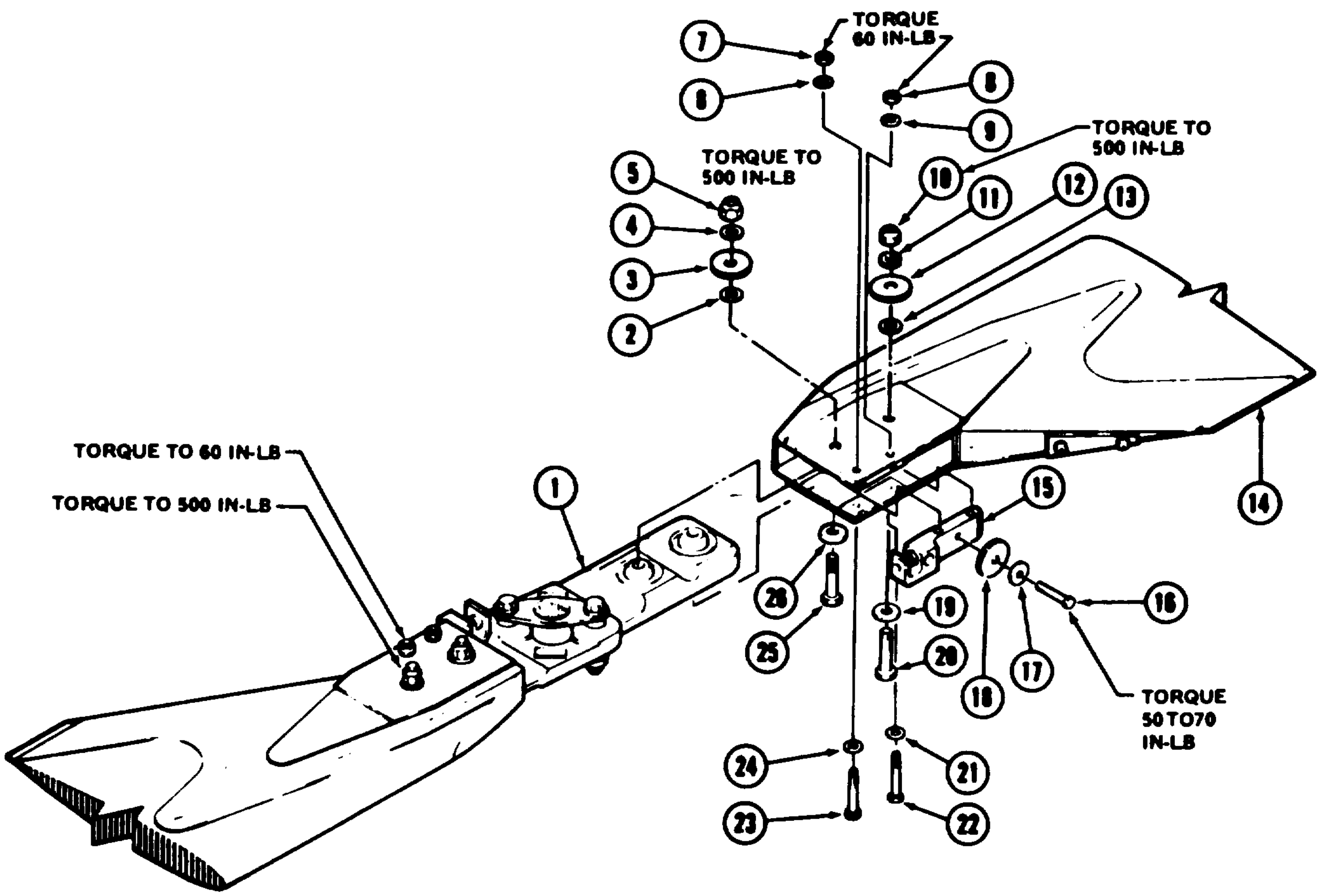
d. Install the opposite pitch horn in the same manner.

e. Balance tail rotor hub and blade assembly in accordance with paragraph 5-86.

5-86. BALANCING – TAIL ROTOR HUB AND BLADE ASSEMBLY.

Premaintenance Requirements For Tail Rotor Hub and Blade Assembly

Condition	Requirements
Model	AH-1P/E/F
Part No. or Serial No.	All
Special Tools	(T73) (T74) (T90)
Test Equipment	None



1. Hub
2. Special washer
3. Balance washer
4. Balance washer
5. Nut
6. Steel washer
7. Nut
8. Nut
9. Steel washer
10. Nut
11. Steel washer
12. Balance washer
13. Special washer
14. Blade
15. Pitch horn
16. Bolt
17. Steel washer
18. Balance washer
19. Special washer
20. Bolt
21. Steel washer
22. Bolt
23. Bolt
24. Steel washer
25. Bolt
26. Special washer

Flgure 5-69. Tall Rotor Hub and Blade Assembly

Condition	Requirements
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C41) (C58) (C112) (C137)
Special Environmental Conditions	Draft-free room

NOTE

The area used for balancing must be a room which can be closed off to provide a draft-free environment.

a. Assemble parts of rotor balancing kit (T73) that are shown on the right side of figure 5-49, except do not install balancing arbor (23) Use arbor (6, figure 5-70) to balance tall rotor.

b. Install fixture (2, figure 5-70) on lower end of arbor (6) and tighten the two lower set screws (10) There are a total of four set screws in fixture (2) Do not tighten the two upper set screws ,101.

NOTE

Prior to installing post assemblies (15), adjust movable index pin (8) of the positioning post to a dimension of 1.765 inch (Length L in view B). Tighten the locking set screw in index pin (8), using 3/32 inch hex wrench to maintain proper setting. (1.765 inch will achieve a zero degree pitch in the tail rotor blades.)

c. Install two post assemblies (15) in the outboard holes in fixture (2). These holes are designated "A" in View A. Thread the posts into the fitting to full thread depth and tighten finger tight.

d. Place the arbor and fixture on a work bench with the arbor vertical. Install pilot bushing (4) on arbor with larger diameter end down as illustrated.

e. Place the tail rotor hub and blade assembly on the arbor with the data plate side of the rotor yoke (3) facing up.

f. Install a floating bushing (9) in each pitch horn (16) if not previously accomplished. Rotate the rotor on the arbor until index pins (8) are fully seated with the set screw side of index pin in the floating bushings and the floating bushings are fully seated in the pitch horn.

g. Install positioning yoke (5) on arbor in same relative position to rotor yoke as illustrated in "top view". Locate the 6-3/8 inch mark on the scale marked on arbor (6). Align the upper surface of the positioning yoke, which is identified on figure 5-70. "Sensitivity Setting Reference Surface", with the 6-3/8 inch mark on the scale. Tighten two set screws (7) to secure the positioning yoke to the arbor.

h. Move the tall rotor assembly and balancing tools to the stand that was assembled in step a Attach arbor (6) to the stand with cable P/N 2264, (13, figure 5-49) and quick disconnect coupling P/N 2266 (10) Operate hydraulic pump (15) to take up slack in cable

i. Loosen two lower set screws (10, figure 5-70) (The two upper set screws should already be loose as directed in step b) This will allow fixture (2) to slide down and contact workstand (1). Open the hydraulic pump valve to lower the arbor and rotor assembly until these parts are resting on fixture (2). Ensure that all the following conditions are met, and then tighten two lower set screws (10).

(1) Fixture (2) must be seated firmly on workstand (1).

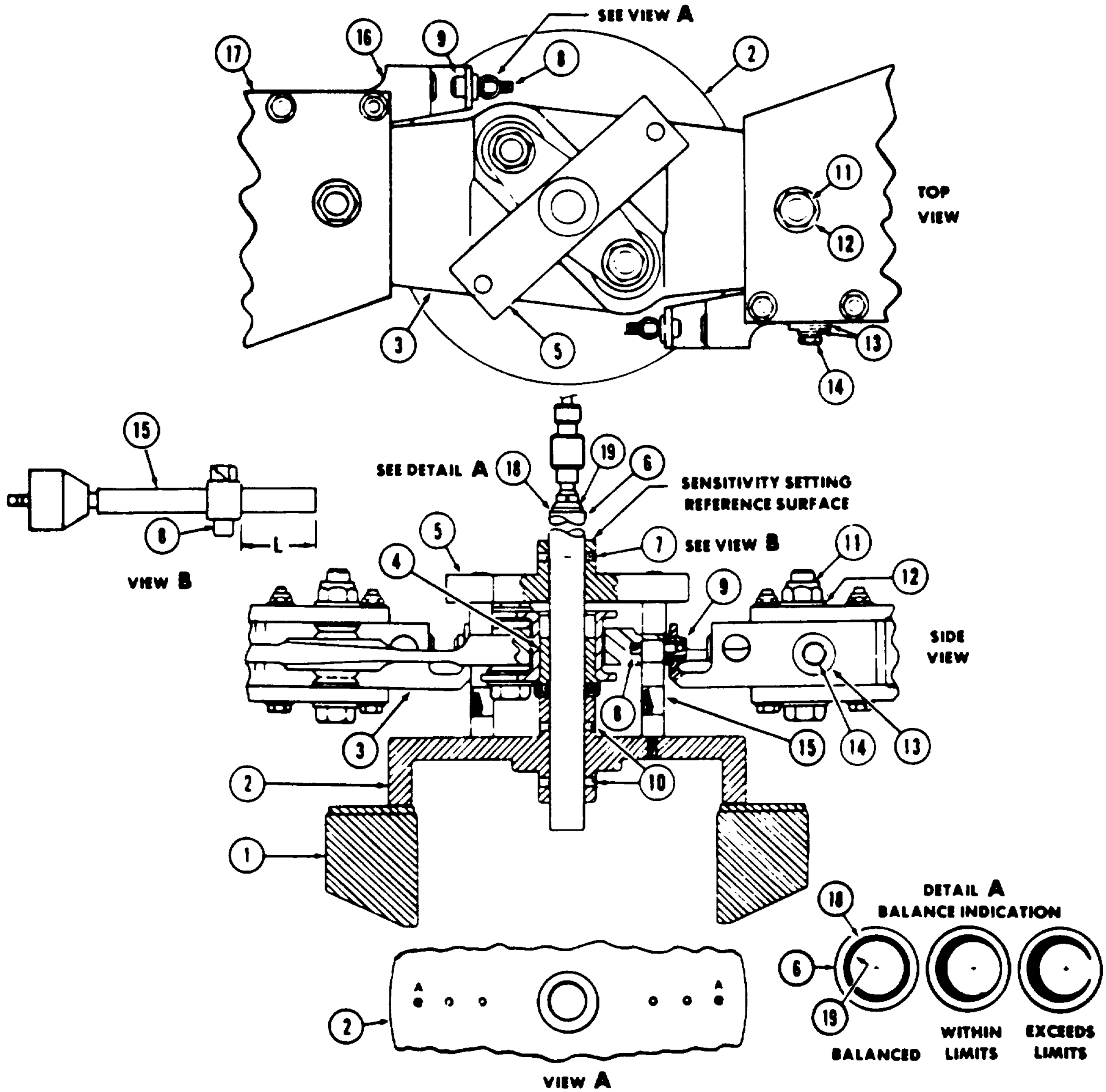
(2) Pilot bushing (4) must be seated firmly on fixture (2)

(3) The rotor yoke (3) must be seated firmly on pilot bushing (4)

(4) The pitch horns (16), floating bushings (9) and indexing pins (8) must be fully engaged,

(5) The positioning yoke (5) must be oriented with the rotor yoke as shown in the "top view". The legs of positioning yoke (5) must contact a flat surface of the rotor yoke

j. Operate hydraulic pump (15, figure 5-49) to raise the assembly approximately 0.25 inch above stand table. Close doors and windows, stop fans, etc., to make the area draft free Allow the rotor to stabilize and observe the balance indication on the black disc (detail A, figure 5-70) Record the indication and correct imbalance as outlined in steps k. and 1.



1. Workstand (7A050 KIT)
2. Fixture, 2532 (7HEL153 KIT)
3. Rotor Yoke
4. Pilot Bushing, 2529 (7HEL153 KIT)
5. Positioning Yoke, 3091 (7HEL074 KIT)
6. Arbor, 2516 (7HEL153 KIT)
7. Set Screw
8. Indexing Pins
9. Floating Bushing
10. Set Screws
11. Bolts, Blade Attaching
12. Washers, Spanwise Balance
13. Washers, Chordwise Balance
14. Bolt
15. Post Assemblies, 2939 (7HEL153 KIT)
16. Pitch Horn
17. Rotor Blade
18. Indicator Disc
19. Indicator Bushing

Figure 5-70. Tool Application . Tall Rotor Hub and Plate Assembly Balancing

k. Correct chordwise balance by adding balance washers (18, figure 5-69) and steel washers (17) within the following limitations:

(1) Use any combination of balance washers (18) P/N AN970-4 and steel washers (17) P/N AN960-416 with a maximum of ten washers used on one bolt.

(2) Use a bolt (16) of proper length to accommodate washers. Minimum length bolt is P/N AN4H-4A. Maximum length bolt is P/N AN4H-10A.

(3) At least one washer (17) or (18) must be used if bolt (16) is installed.

(4) After chordwise balance is attained, lower the assembly until it rests on stand. Torque bolts (16) 50 TO 70 inch-pounds, Do not lockwire at this time.

l. Correct spanwise balance by adjusting balance washers (3, 4, 11 and 12). Operate hydraulic pump on stand to raise the rotor assembly approximately 0.25 inch above stand table and add washers within the following limitations:

(1) When adding washers to rotor assembly spanwise, add balance washers to outboard bolts (20) first. Leave special washers (2, 26, 19, and 13) P/N 140-007-33-32C4 next to blade. Assemble the washers listed in step (2) below with the heaviest washers next to washers (2 and 13).

(2) Use combinations of balance washers (3 and 12) P/N AN970-8, balance washers (4 and 11) P/N AN960-816 and thin steel washers P/N AN960-816L (not illustrated) as required to balance the assembly.

(3) Use bolts (20) and (25) of the proper length to accommodate washers. Minimum length bolt is P/N NAS1308-34. Maximum length bolt is P/N NAS1308-36.

CAUTION

After nuts are torqued no more than five threads of bolts are permitted to be exposed beyond nuts, and a minimum of one thread plus the chamfer of the bolt must be exposed to ensure the self-locking feature of the nuts is engaged.

(4) After spanwise balance is attained, recheck chordwise balance and then lower the rotor assembly until it rests on the stand. Torque nuts (5 and 10) and corresponding nuts on opposite blade to 500 inch-pounds.

(5) Lockwire two bolts (16) to hole in pitch horn with lockwire (C137).

m. Remove tail rotor assembly from balancing tools as follows:

(1) Disconnect arbor (6, figure 5-70) from stand.

(2) Remove the tail rotor assembly and arbor from the stand and place on a work bench.

(3) Loosen two set screws (7) and remove positioning yoke (5) from arbor (6).

(4) Rotate rail rotor assembly to disengage indexing pins (8) from pitch horns and remove tail rotor assembly from arbor (6). Secure floating bushings (9) to pitch horns.

(5) Disassemble pilot bushing (4), arbor (6), post assemblies (15) and fixture (2).

5-87. INSTALLATION-TAIL ROTOR HUB AND BLADE ASSEMBLY.

a. Position hub and blade assembly (23, figure 5-68) on gearbox output shaft (26) with data plate side of hub outboard and trunnion flap stops inboard. Align master tooth of trunnion with master spline of gearbox output shaft and install hub and blade assembly on shaft until trunnion is just started on second set of splines.

NOTE

Install split cones as matched set only.

Prior to installation, inspect split cones for any nicks, scratches, indentations, or any type deformities in the cones. If damaged replace.

b. Place cone set (27), with bevel outboard, in groove between splines and shoulder on gearbox output shaft. Ensure that cone set end gaps are equal and slide hub and blade assembly inboard to seat trunnion to cone set.

NOTE

Spacing between split cone sets may vary after operation. This variation of spacing does not adversely affect the assembly.

c. Install counterweight support (17) on gearbox output shaft and seat against hub. Install retaining nut (14) and shield (13) as an assembly. Hold rotor at hub, rotate retaining nut (14) as far clockwise as possible and hold in position. Torque retaining nut (14) to 900 inch-pounds with spanner wrench. Make final check to ensure that split cones set (27) is properly seated. Lockwire retaining nut (14) to counterweight support with lockwire (C137).

d. Install control tube (25) and sleeve (24) if not previously accomplished (paragraph 5-105).

e. Assemble crosshead and controls if not previously accomplished (paragraph 5-104).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

f. Wash bearing (8) and cavity of retainer (4) with dry cleaning solvent (C112) and allow to air dry.

g. Handpack bearing (8), fill cavity of retainer (4) and lubricate spline surfaces or crosshead (10) with grease (C58).

WARNING

Ensure that cotter pin (6) is properly installed during the following step. After installation of retainer (4) it will not be possible to inspect cotter pin.

h. Place nylatron washer (9) and bearing (8) in outboard and of crosshead (10). Align master splines and position crosshead assembly on gearbox output shaft. Install steel washer (7) and new nut (5) on end of control tube (25). Ensure that nylatron washer (9) is property seated. Torque nut 70 TO 100 inch-pounds and install cotter pin (6).

NOTE

Do not Intermix P/N 212-010-711-1 and -3 counterweight links.

i. Connect counterweight link (12) to counterweight support (17) with bolt (15), two washers (16 and 18) and nut (19). Torque nut 6010 110 inch-pounds and install cotter pin (20). Install opposite link in same manner.

j. Coat mating surface of both bushings (30) and pitch horns (21) with corrosion preventive compound (C41).

k. Position barrel nut and retainer (22) in hole in pitch horn (21). Position riveted end of pitch link (11) in pitch horn (21) and install bolt (29) and bushing (30) with flange next to bolt head. Torque bolt 135 inch-pounds and lockwire bolt to pitch horn with lockwire (C137). Install opposite pitch link in same manner.

Check both bushings (30) to ensure that bushing flanges do not seat against pitch horn (21).

WARNING

Ensure that cotter pin (6) is correctly installed prior to installation of retainer (4).

l. Install retainer (4) on crosshead (10) and torque retainer to 300 inch-pounds.

WARNING

Ensure that lock (3) is properly installed to secure retainer (4) to crosshead (10).

Failure to comply can result in loss of directional control.

m. Install lock (3) on crosshead with two washers (2) and two screws (1). Lockwire (C137), screws and deform lock (3) into notches of retainer (4) in two places near screws (1).

n. Lubricate at grease fitting in retainer (4) with two shots of grease (C58).

5-88. TEST PROCEDURES — TAIL ROTOR HUB AND BLADE ASSEMBLY.

a. Perform rigging check (paragraph 11-73).

b. Perform tracking checks (paragraph 5-115).

SECTION VI. TAIL ROTOR HUB AND CONTROLS

5-89. TAIL ROTOR HUB.

5-90. DESCRIPTION – TAIL ROTOR HUB,

The hub assembly employs a preconed, flex-beamed type yoke connected to the blades by means of self-lubricated spherical pitch change bearings, and a two-piece, trunnion, connected to the yoke by self-lubricating spherical flapping bearings. The trunnion, splined to the tail rotor gearbox output shaft, drives the tail rotor hub and blade, and serves as a flapping stop for the tail rotor.

Premaintenance Requirements for Tail Rotor Hub

Condition	Requirements
Model	AH-1P/E/F
Part No. or Serial No.	All
Special Tools	(T54)

Condition	Requirements
Test Equipment	None
Support Equipment	Drill Press
Minimum Personnel Required	One
Consumable Materials	(C25) (C37) (C66) (C88 or C91) (C102) (C103) (C112) (C116)
Special Environmental Conditions	None

5-91. REMOVAL – TAIL ROTOR HUB.

Remove tail rotor hub assembly (paragraph 5-81).

5-92. DISASSEMBLY – TAIL ROTOR HUB.

a. Remove nut (9, figure 5-71), washer (8), bolt (1) and washer (2). Remove similar parts on the opposite aide of the trunnion.

b. Remove trunnion halves (3 and 7). (The trunnion halves are a matched set, keep the parts together for reinstallation.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

c. Clean hub parts with solvent (C112).

5-93. INSPECTION – TAIL ROTOR HUB.

a. Special inspection of tail rotor hub.

(1) Inspect the tail rotor historical records, and the tail rotor hub for evidence that the tail rotor has been subjected to an accident or incident outside the realm of normal usage. If such evidence exists, perform applicable special inspections for overspeed, sudden stoppage, engine compressor stall and overtorque outlined in Chapter 1 and steps (2) through (6).

(2) Inspect yoke (5, figure 5-71) and trunnion halves for obvious damage such as deformation. Replace hub if any part is deformed.

(3) Inspect parts for surface damage in excess of limits shown in figure 5-72 and 5-73.

(4) Inspect trunnion retention bolts (1, figure 5-71) and blade retention bolts for shear offset. Replace hub if l ny bolts show shear offset.

(5) Inspect bearings (4 and 6) for looseness in yoke, step b. (2).

(6) inspect yoke (5) and trunnion halves (3 and 7) by fluorescent penetrant method, Refer to TM 55-1500-335-23,

NOTE

When finish Is removed from yoke, repaint using primer (C88 or C91) and overspray with lacquer (C66).

Bearing removal is not necessary for yoke penetrant inspection. Bearings should be covered to prevent entry of penetrant.

b. Normal inspection of tail rotor hub.

(1) Move bearings (4 and 6) through full throw and check for corrosion. If any corrosion is detected, remove with Scotchbrite (C103) and clean cloths.

(2) Chock borings (4 and 6) for indication of teflon deterioration, bond seporation, and teflon protruding from bearing. Replace bearings if the above conditions exist. Chock bearings (4 and 6) for axial looseness. Maximum allowable axial looseness is 0.015 inch. Replace borings if axial limits ore exceeded.

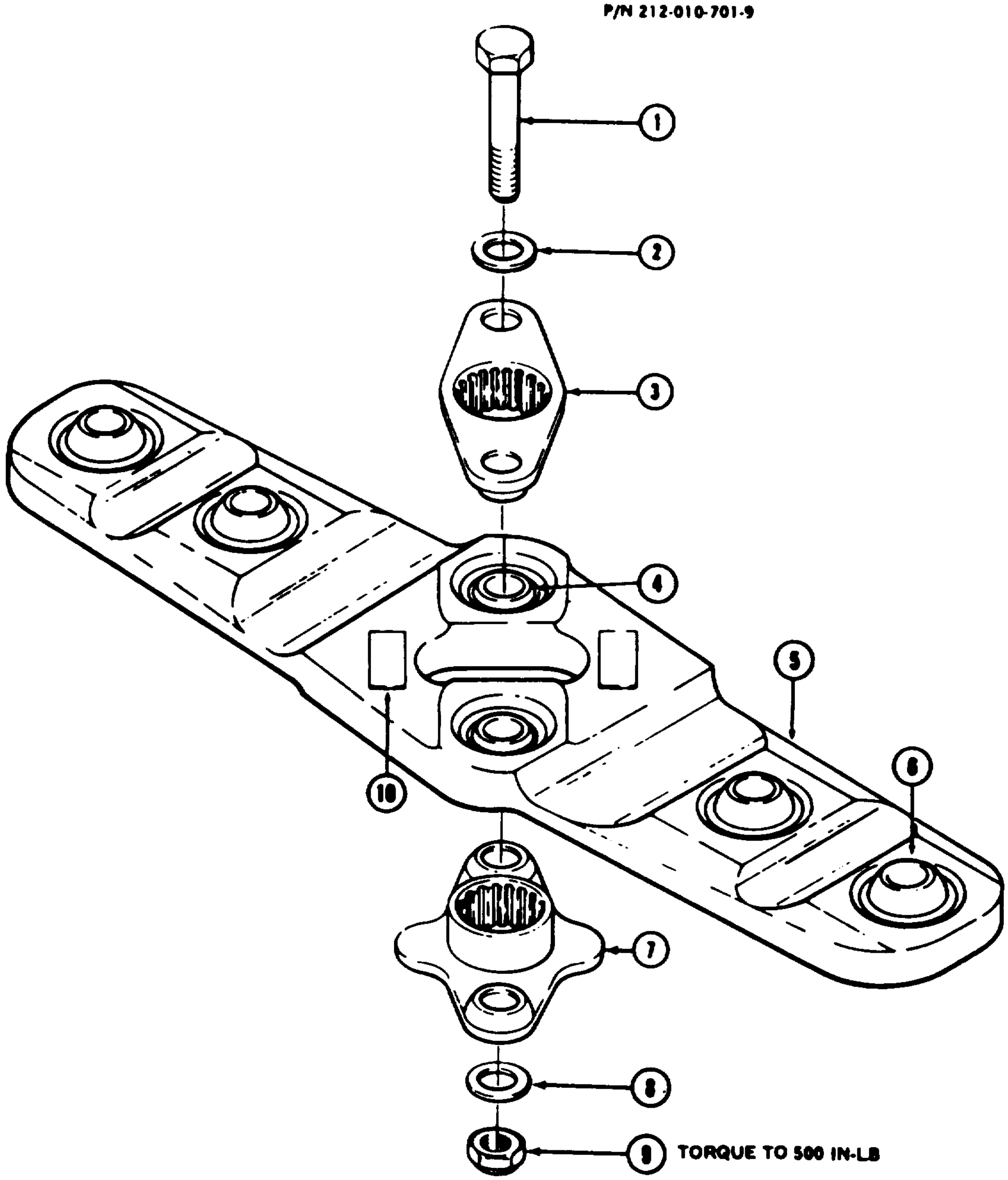
NOTE

Due to the spherical shape of the bearing any looseness in the radial direction will also result in axial looseness. For this reason measuring axial looseness only is adequate for determining bearing serviceability.

(3) Deleted

(4) Inspect yoke for mecnanical and corrosion damage. If damage exceeds limits shown in figure 5-72, send to next higher maintenance level.

(5) Inspect trunnion set for mechanical and corrosion damage, and wear damage on the splines. If damage and/or or exceeds the limits shown in figure 5-73 on either trunnion half, dispose of both halves of set locally

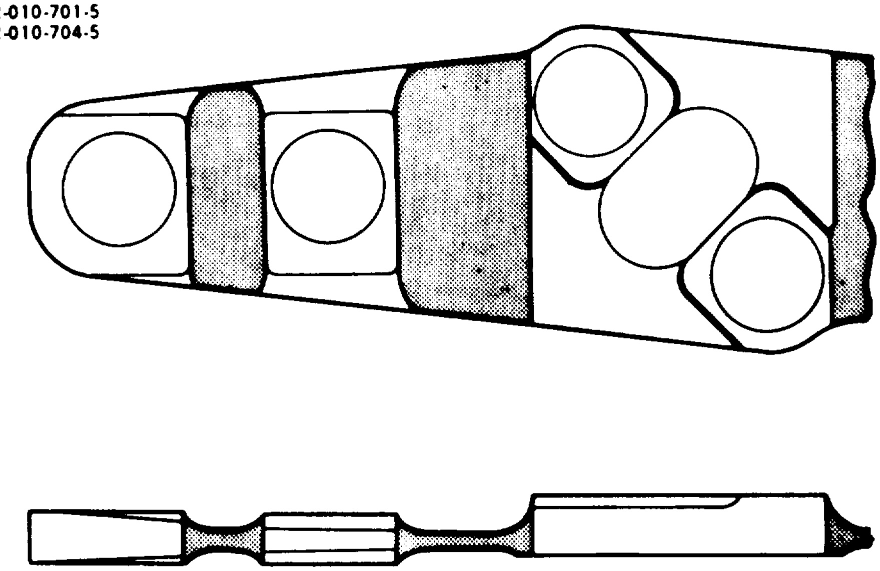


1. Bolt
2. Washer
3. Trunnion half
4. Trunnion bearing
5. Yoke
6. Blade retention bearing
7. Trunnion half
8. Washer
9. Nut
10. Data plate

212010-63B

Figure 5-71. Tall Rotor Hub Assembly

HUB YOKE ASSEMBLY
212-010-701-5
212-010-704-5



DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED	
CRACKS ALLOWED	None	None
NICKS, SCRATCHES, DENTS AND CORROSION	0.002	0.005
MAXIMUM AREA PER FULL DEPTH REPAIR	0.10 Sq. In.	0.15 Sq. In.
NUMBER OF REPAIRS	One Per Segment	Not Critical
EDGE CHAMFER	0.010	0.020
BORE DAMAGE	0.002 for 1/4 Circumference	

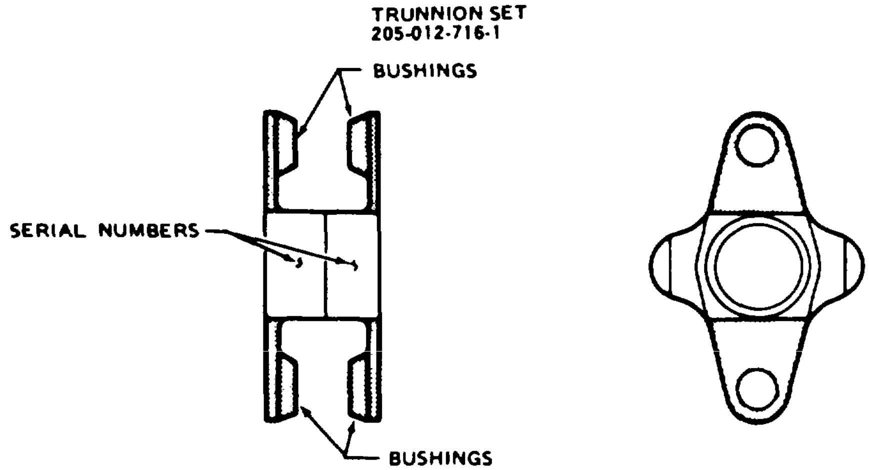
MAXIMUM HUB YOKE DIAMETER

BLADE RETENTION BEARING	1.4385
TRUNNION BEARING	1.1885

212010-42C

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

Figure 5-72. Damage Limits — Tail Rotor Hub Yoke



DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED	
CRACKS ALLOWED	None	None
NICKS, SCRATCHES, DENTS AND CORROSION	0.005	0.010
MAXIMUM AREA PER FULL DEPTH REPAIR	0.05 Sq. In.	0.10 Sq. In.
NUMBER OF REPAIRS	One Per Lug	Two
EDGE CHAMFER	0.010	0.020
SPLINE DAMAGE		
Depth	One-Third of Spline	
Length	One-Half of Spline	
Number	Three Splines	

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

Figure 5-73. Damage Limits – Tail Rotor Hub Trunnion Set

5-94. REPAIR – TAIL ROTOR HUB (AVIM).

a. Replace bearings (4 and 6, figure 5-71) which did not pass inspection.

(1) Press worn bearings from yoke. Use a sleeve of slightly larger diameter than the bearing outside diameter to support the yoke. Use a sleeve of slightly smaller diameter than the bearing sleeve to press the bearing and bearing sleeve out of the yoke.

(2) Clean primer and dirt from the yoke.

NOTE

Remove preservative oil from bearings (6) using solvent (C132 or C112) prior to installing now bearings.

(3) Apply primer (C88 or C91) to mating surface of yoke and of new bearing.

(4) Position bearing in yoke while primer is still wet. Use a backstop so that bearing can be set with one operation. Clean off excess primer and prevent primer from entering bearing.

(5) Select proper anvil (backstop) and staking tool from staking tool set (T54) for the bearing being installed. Use staking tool, T101577-11, and anvil (backstop), T101577-13, to stake bearings (6). Use staking tool, T101577-17, and anvil (backstop), T101577-19, to stake bearings (4). (See figure 5-74 for views of assembled staking tools).

(6) Install staking tool, selected in preceding step, in chuck of a hand-feed type drill press. Lubricate staking tool rollers with lubricating oil.

(7) Place anvil (backstop) selected instep (5) on drill press table with flanged side down (figure 5-75, detail A). Position yoke on drill press with bearing to be staked in contact with anvil. Lower the drill press chuck and the staking tool and check to ensure that the anvil bearing and staking tool are aligned and that the staking tool rollers are in contact with the groove in the bearing.

CAUTION

Ensure drill press speed is between 250 and 350 RPM. Excess speed will cause staking tool to over stake the bearing.

(8) Set drill press speed at 250 to 350 RPM. Start the drill press and apply steady hand pressure to the feed lever for a minimum often seconds. Raise drill press chuck and staking tool. Check to determine the amount that the bearing has been staked in comparison with figure 5-75, detail B.

NOTE

Rotating the yoke 90 degrees while maintaining applied pressure will help to ensure uniform staking.

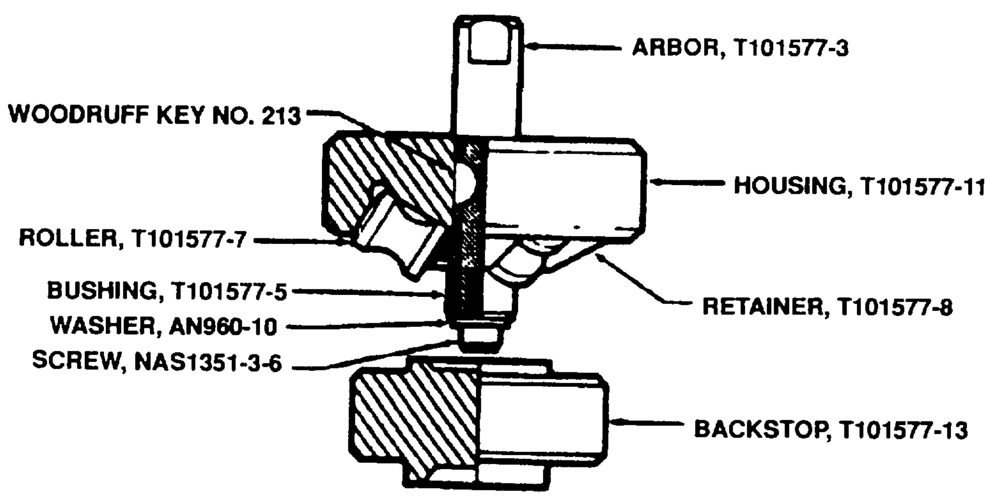
(9) Reposition the anvil (backstop) with the flangedside up. Invert the yoke and stake the opposite side of the bearing in the same manner. Repeat staking the bearing in small increments to attain the 0.008 inch maximum gap shown in figure 5-75, detail B.

(10) Check the bearing position in the yoke to ensure that it is within the limits shown in Figure 5-75, detail B.

(11) Check the bearing by feel for smooth operation. Check the bearing visually to ensure that the ball was not scored by the staking tool.

b. Polish out any mechanical damage and corrosion damage on the yoke and on the trunnion that was not accomplished during inspection. Polish out damage on trunnion splines as well as the outer surfaces. Use crocus cloth (C37) 300 grit sandpaper (C102), and fine India stone (C116) to polish out the damage and to leave a smooth, scratch-free surface. If damage exceeds the limits shown in figures 5-72 and 5-73, dispose of the damaged part locally.

c. Touch-up repair areas with brush cadmium plate (C25) or primer (C88 or C91). Do not apply coating to trunnion spline.



NOTE

Assemble tool as illustrated above for staking tail rotor blade retention (pitch change) bearings.

Figure 5-74. Bearing Staking Tool P/N T101577 (Sheet 1 of 2)

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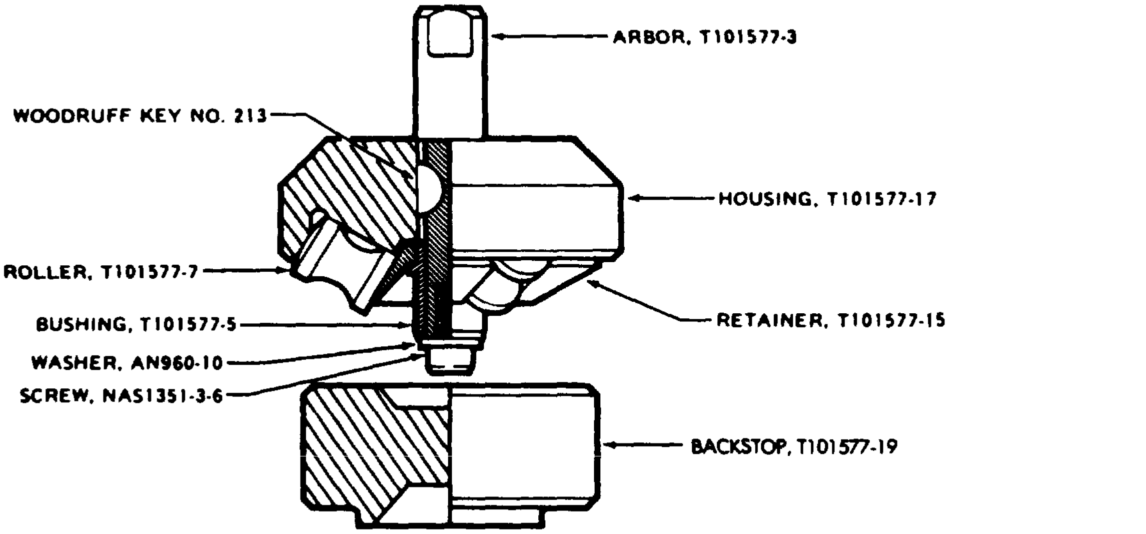


NOTE

Assemble tool as illustrated above for staking tail rotor yoke trunnion (flap) bearings.

Figure 5-74. Bearing Staking Tool P/N T101577 (Sheet 2 of 2)

5-95. Assembly — Tail Rotor Hub.

a. Inspect trunnion halves (3 and 7, figure 5-71) to ensure that they are a matched set.

b. Position trunnion half (3), on the data plate side of yoke (5). Position trunnion half (7), with the flapping atop ear, on the opposite side of yoke with the master spline of trunnion halves aligned.

c. Install two bolts (1) with washers (2) under boll heads and washers (8) under nuts (9). Torque nuts evenly to 500 inch-pounds.

5-96. INSTALLATION – TAIL ROTOR HUB.

Install tail rotor hub (paragraph 5-87).

5-97. TAIL ROTOR CONTROLS.

5-98. DESCRIPTION – TAIL ROTOR CONTROLS.

The tail rotor controls consist of a lever assembly, idler, control tube, crosshead, pitch links, counterweight links, weights, retainer, support and cone set. Pedal movement is transmitted through linkage to lever assembly (48, figure 5-76). The idler (47) attaches lever (48) to the tail rotor gearbox. The idler also serves as the pivot for lever (48). Movement from lever (48) is transmitted through control tuba (34) to the crosshead (1 3). Pitch change links (31), attached to the crosshead and pitch horn, change blade pitch. Two counterweight assemblies, consisting of a bellcrank (27) with weights (17) attached to each end is mounted on spindles extending from crosshead perpendicular to pitch link clevises. A fixed link (26) connects mid-point of each bellcrank to a common support (33) mounted next to hub.

5-99. REMOVAL – TAIL ROTOR CONTROLS.

a. Remove crosshead, bellcrank weights and links as on assembly (paragraph 5-81).

b. Remove counterweight support (paragraph 5-81).

c. Slide sleeve (35, figure 5-76) outboard on control tube (34) slightly and rotate counterclockwise to engage threads. Continue to rotate

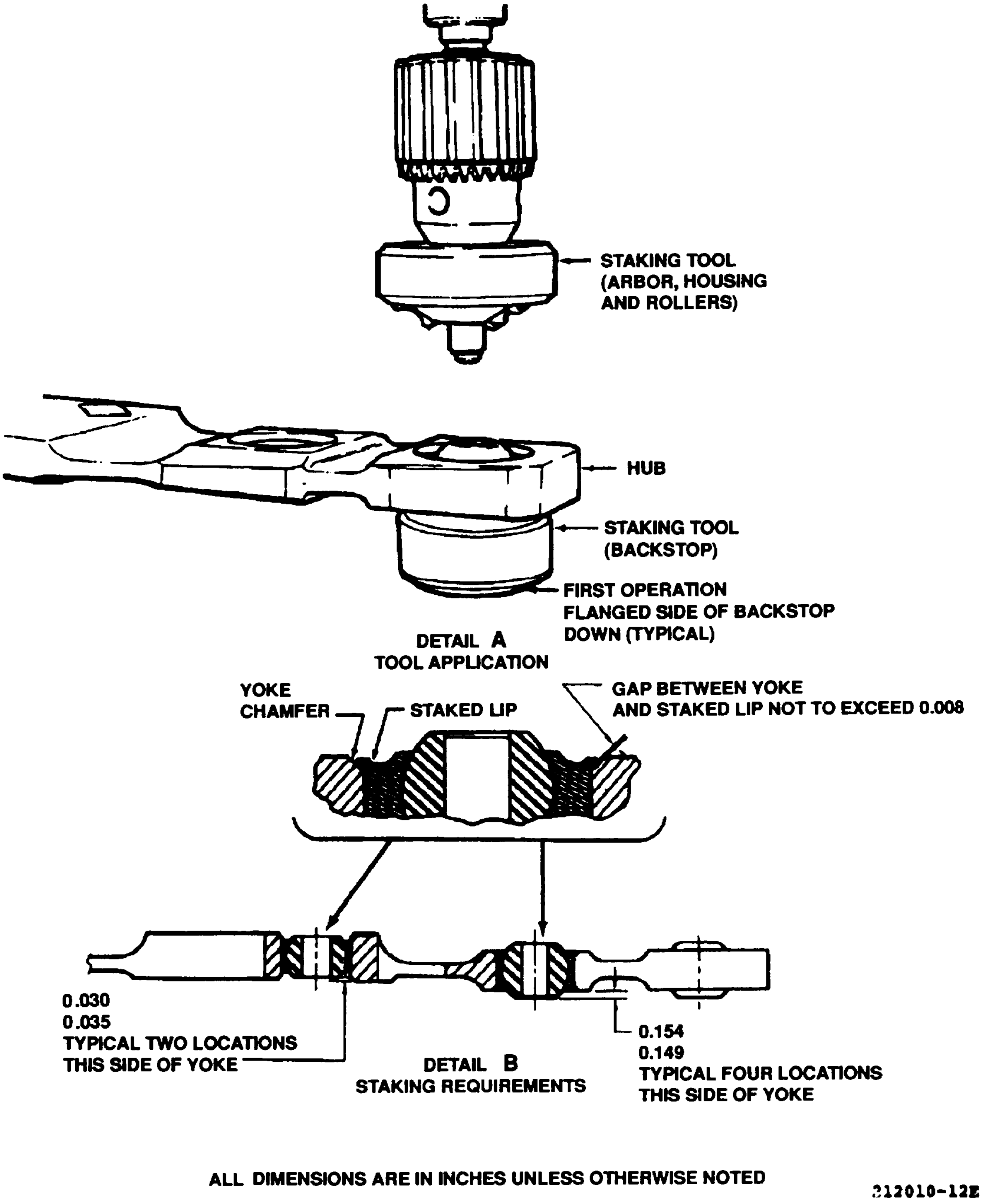


Figure 5-75. Tool Application-Bearing Installation (Staking) in Tail Rotor Yoke

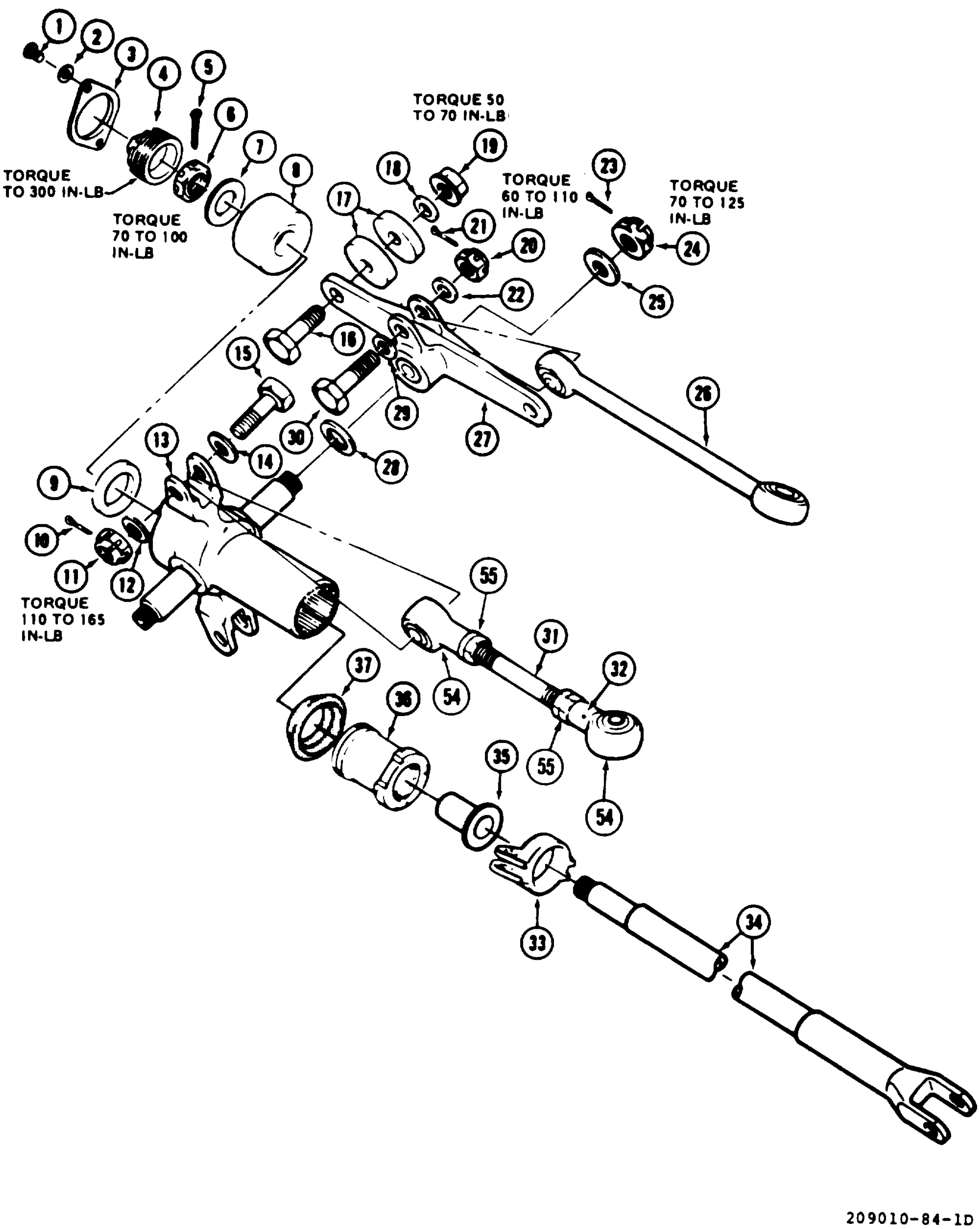
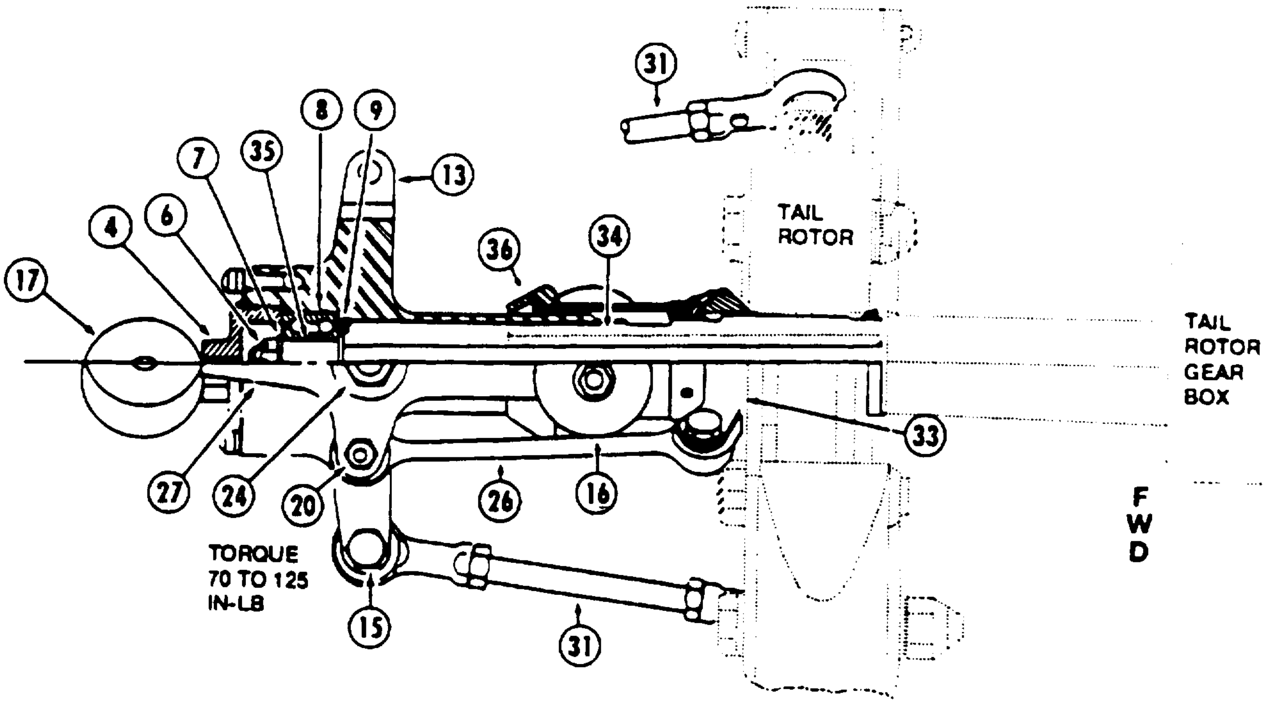


Figure 5-76. Tail Rotor Controls — Crosshead, Weights, Links and Control Tube (Sheet 1 of 3)



VIEW OF ASSEMBLED TAIL ROTOR CONTROLS
PARTIALLY SECTIONED TO SHOW INTERNAL PARTS

1. Screw
2. Steel washer
3. Lock
4. Retainer
5. Cotter pin
6. Nut
7. Steel washer
8. Bearing
9. Nylatron washer
10. Cotter pin
11. Nut
12. Steel washer
13. Crosshead
14. Steel washer
15. Bolt
16. Bolt
17. Weight
18. Steel washer
19. Nut
20. Nut
21. Cotter pin
22. Steel washer
23. Cotter pin
24. Nut
25. Special washer
26. Counterweight link
27. Counterweight bellcrank
28. Nylatron washer
29. Steel washer
30. Bolt
31. Pitch link
32. Rivet (Note)
33. Counterweight support
34. Control tube
35. Sleeve
36. Tail rotor retaining nut
37. Shield
38. Packing
39. Nut and steel washer
40. Housing
41. Housing
42. Retaining ring
43. Excluder
43.1. Packing
44. Race
45. Bolt, steel washer, nut and cotter pin
46. Bolt, steel washers, nut and cotter pin
47. Idler
48. Lever assembly
49. Bolt, steel washers, nut and cotter pin
50. Bolt, steel washers, nut and cotter pin
51. Link assembly
52. Bearing
53. Bolt, steel washers, nut and cotter pin
54. Bearing, rod end
55. Jam nut

Note: Enlarge hole to rivet size.

Figure 5-76. Tail Rotor Control – Crosshead, Weights Links and Control Tube (Sheet 2 of 3)

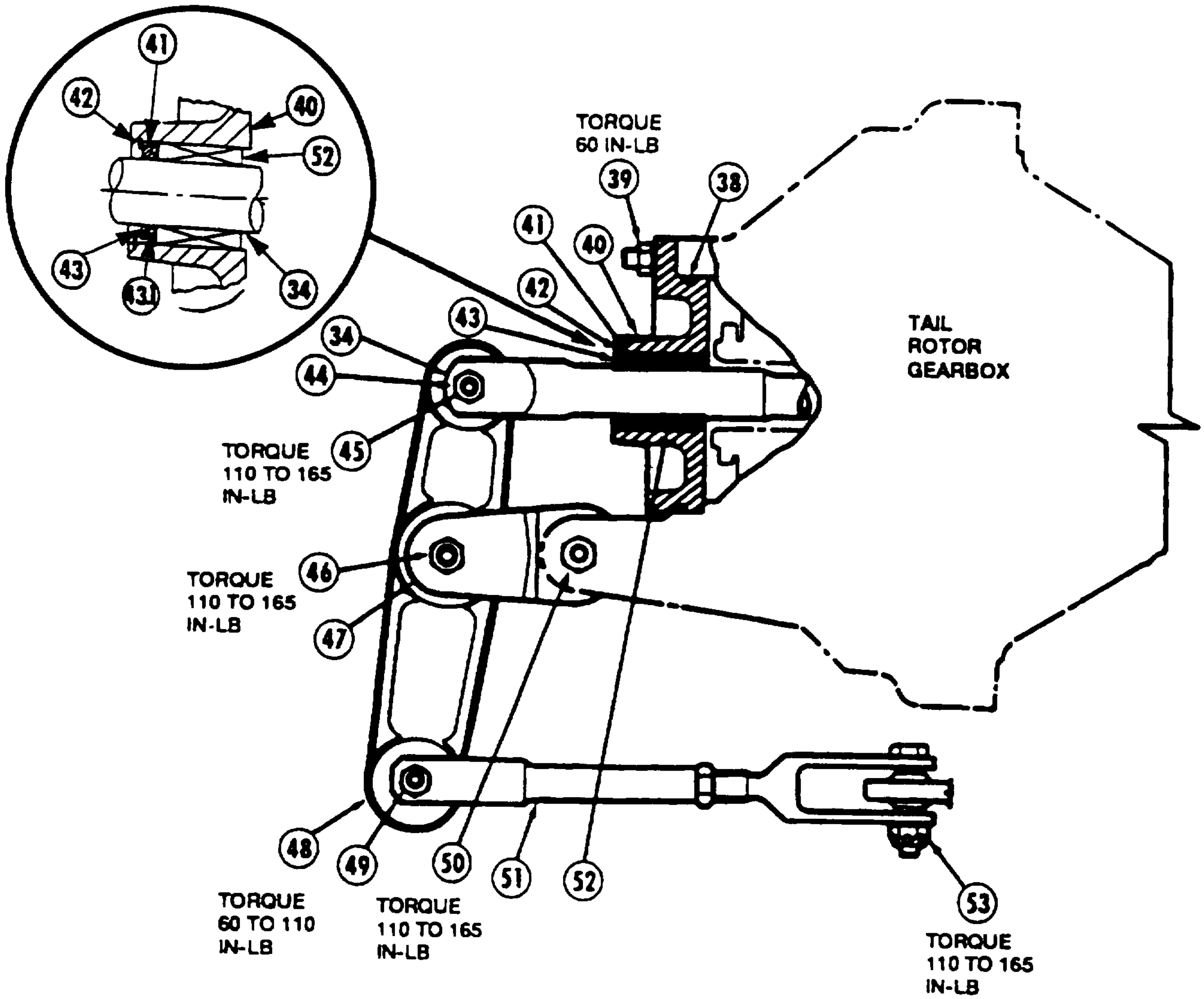


Figure 5-76 Tail Rotor Control – Crosshead Weight Links and Control Tube (Sheet 3 of 3)

counterclockwise until threads are disengaged and remove sleeve.

d. Remove attaching bolts and remove lever (48) idler (47) and link (51).

e. Remove control tube (34) from left side of gearbox.

f. Remove nuts and washer (39). Remove housing (40). Remove retaining ring (42), housing (41), excluder (43) and bearing (52).

5-100. DISASSEMBLY — TAIL ROTOR CONTROLS.

a. Remove tail rotor retaining nut (36, future 5-76) and sheild (37) from crosshead (13) if not previously accomplished.

Remove cotter pin (10). Remove nut (11), bolt (15) and pitch link (31). Remove opposite pitch link in the same manner.

c. Remove nut (19), bolt (16), washer (18) and weights (17), Remove remaining weights in the same manner.

d. Remove cotter pin (21). Remove nut (20), washer (22), bolt (30), washer (29) and counterweight link (26). Remove opposite counterweight link in the same manner.

e. Remove cotter pin (23). Remove nut (24), washer (25), bellcrank (27), and washer (28). Remove opposite bellcrank in the same manner.

5-101 . CLEANING — TAIL ROTOR CONTROLS.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

Clean the parts disassembled in paragraph 5-100 with solvent (C112) and dry with filtered, compressed air. Use only solvent (C112) on bearing (8, figure 5 76).

5-102. INSPECTION — TAIL ROTOR CONTROLS.

NOTE

A total indicator reading (TIR) is not required every time the tail rotor control tube is removed for other maintenance. A TIR is only for suspected damage and at the scheduled inspections.

a. Inspect crosshead (13, figure 5-76) for damage in excess of limits shown in figure 5-77.

b. Inspect counterweight belkrank (27, figure 5-76) for damage in excess of limits shown in figure 5-78.

c. Inspect pitch links (31, figure 5-76) for damage in excess of limits shown in figure 5-79.

d. Inspect counterweight links (26, figure 5-76) for damage in excess of limits shown in figure 5-80.

e. Inspect counterweight support (33, figure 5-76) for damage in excess of limits shown in figure 5-81.

NOTE

The control tube support can be any fixture, locally manufactured which can be placed on a flat surface and the tube rotated along the center axis in order to check for straightness using a dial indicator.

f. Inspect tail rotor control tube (34, figure 5-76) for damage in excess of limits shown in figure 5-82. Mount the control tube on centers and check runout, Maximum allowable runout in other areas is 0.020 inch. Inspect two corks for secure installation in tube and for damage. Inspect threads for damage.

g. Inspect link assembly (51, figure 5-76) for damage in excess of limits shown in figure 5-83.

h. Inspect idler (47, figure 5-76) for damage in excess of limits shown in figure 5-64.

i. Inspect lever assembly (48, figure 5-76) for damage in excess of limits shown in figure 5-85. Inspect bearings in lever for wear.

j. Inspect housing (40, figure 5-76) for corrosion and mechanical damage.

k. Inspect retaining ring (42) for damage that would affect function.

I. Inspect housing (41) and excluder (43) for damage that would affect function.

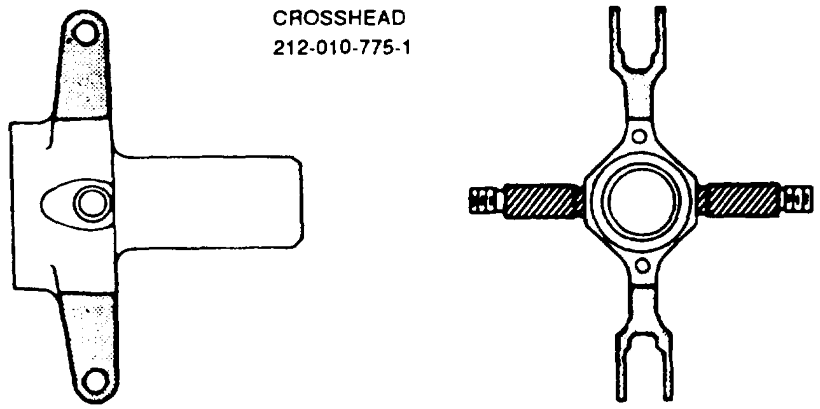
m. Inspect bearing (52) for damage that would affect function,

n. Inspect shield (37) for cuts and deterioration.

o. Inspect tail rotor retaining nut (36, figure 5-76) for damage in excess of limits shown in figure 5-86.

p. Inspect race (44) for corrosion and wear that would affect function.

q. Inspect sleeve (35) for corrosion, wear, and damaged threads.



DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED		
CRACKS ALLOWED	None	None	None
NICKS, SCRATCHES, DENTS AND CORROSION	0.002	0.005	0.010
MAXIMUM AREA PER FULL DEPTH REPAIR	0.05 Sq. In.	0.05 Sq. In.	0.15 Sq. In.
NUMBER OF REPAIRS	One Per Zone	One Per Lug	Not Critical
EDGE CHAMFER	Not Applicable	0.010	0.020

SPLINE DAMAGE

Depth	One Third of Spline
Length	One Third of Spline
Number	Two

THREAD DAMAGE

Depth	One Third of Thread
Length	0.25
Number	One Per Segment

BORE DAMAGE 0.002 for 1/4 Circumference

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

212010-45E

Figure 5-77. Damage Limits — Tail Rotor Control Crosshead

r. Inspect bearing (8) for evidence of separation of races. Rotate bearing manually, If roughness is noted or if axial looseness exceeds 0.005 inch, dispose of bearing locally.

s. If damage occurs, inspect the following parts by magnetic particle method, Code M, or fluorescent penetrant method, Code F, (TM 55-1500-335-23). Items ore indexed to figure 5-78.

ITEM	NOMENCLATURE	CODE
13	Tail Rotor Controls Crosshead	F
26	Counterweight Link	F
27	Counterweight Bellcrank	F
33	Counterweight Support	F
34	Tail Rotor Control Tube	M
36	Tail Rotor Retaining Nut	M
47	Idler	F
48	Lever Assembly	F
51	Link Assembly	M

5-102.1. DISASSEMBLY - TAIL ROTOR PITCH CHANGE LINK. (AVIM)

a. Remove rivet (32, figure 5-76) from rod end.

b. Loosen Jam nuts (55) and remove rod end assemblies (54) from link (31).

c. Remove jam nuts (55).

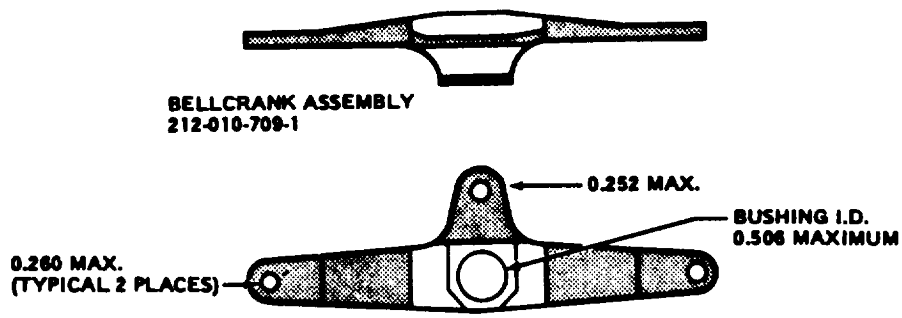
5-102.2 ASSEMBLY - TAIL ROTOR PITCH CHANGE LINK. (AVIM)

a. Thread jam nuts (55) onto link (31).

b. Thread rod end assemblies (54) onto link (31).

c. Aline rivet hole in rod end (54) and link (31), install rivet (32).

d. Torque jam nuts (55).



DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED	
CRACKS ALLOWED	None	None
NICKS, SCRATCHES, DENTS AND CORROSION	0.005	0.010
EDGE CHAMFER	0.020	0.030
MAXIMUM AREA PER FULL DEPTH REPAIR	0.10 Sq. In.	0.15 Sq. In.
NUMBER OF REPAIRS	One Per Lug	One
BORE DAMAGE	0.002 for 1/4 Circumference	
BEARING LIMIT	Diameter Cannot Exceed 0.506	

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

NOTE: Coat repair areas with primer (C88 or C91).

212010-43H

Figure 5-78. Damage Limits – Tail Rotor Control Counterweight Bellcrank

5-103. REPAIR – TAIL ROTOR CONTROLS.

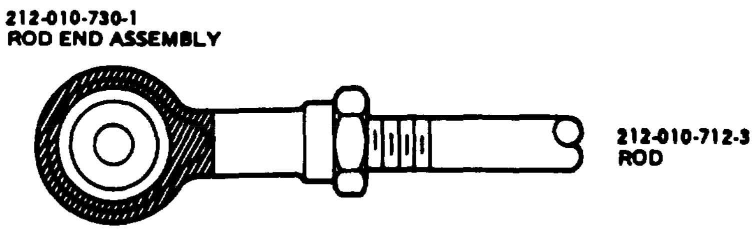
a. Replace any part which failed to pass inspection in paragraph 5-102.

b. Polish out mechanical and corrosion damage that is within limits specified in paragraph 5-102. Use 300 grit or finer sandpaper (C102) and scotchbrite (C103). Touch up repair areas with primer (C89).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

c. Replace loose or damaged corks in control tube. Clean area where cork will be installed with



DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED	
		
CRACKS ALLOWED	None	None
NICKS, SCRATCHES, DENTS AND CORROSION	0.005	0.010
EDGE CHAMFER	0.010	0.020
MAXIMUM AREA PER FULL DEPTH REPAIR	0.05 Sq. in.	0.10 Sq. in.
NUMBER OF REPAIRS	One Per Segment	One Per Segment

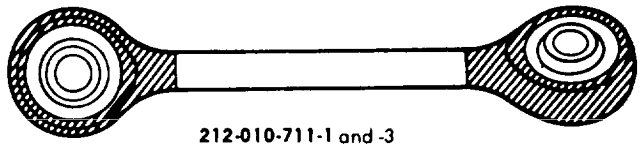
ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

NOTES:

1. Repair of nicks and dents on threads must not exceed one-third of the thread depth. Length of repair shall not exceed 0.250. Each threaded segment may have one repair.
2. Minor damage to jam nut is acceptable.
3. Coat repair areas with primer (C88 or C91).
4. Replace link if axial or radial play in either bearing exceeds 0.020.
5. Maximum width of polish-out repair on rod is one-third of the circumference of the rod.

212010-44D

Figure 5-79. Damage Limits — Tail Rotor Controls Pitch Link



DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED (hatched)	(plain)
CRACKS ALLOWED	None	None
NICKS, SCRATCHES, AND DENTS	0.005	0.010
CORROSION		
Before Repair	0.002	0.005
After Repair	0.005	0.010
MAXIMUM AREA PER FULL DEPTH REPAIR	0.05 Sq. In.	0.10 Sq. In.
NUMBER OF REPAIRS	One Per End	One
EDGE CHAMFER	0.020	Not Applicable

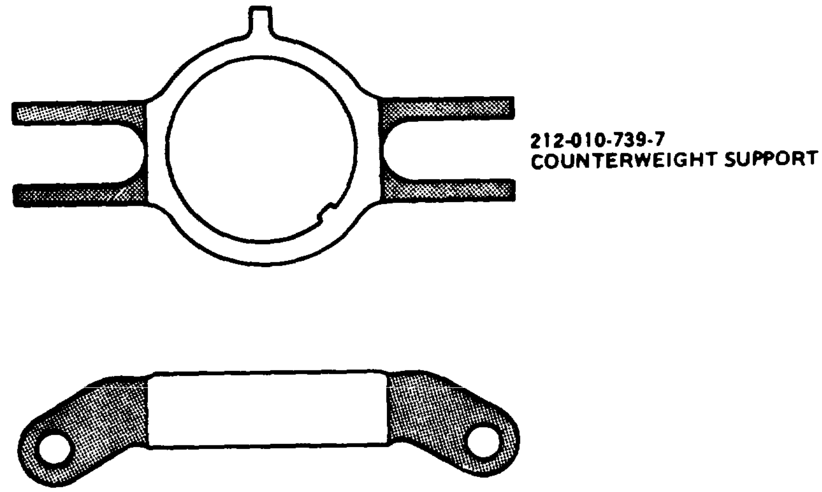
ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

NOTES:

1. Polish out nicks and dents in edges to remove all damage and finish with a smooth radius or chamfer. If maximum depth to remove all damage exceeds 0.020 and/or the width of the repair exceeds one-third circumference, dispose of link locally.
2. Touch up repair area with primer (C88 or C91).
3. Spherical bearing axial wear limit is 0.020. If either bearing is worn beyond this limit, dispose of link locally. Repair of the link by replacement of bearings is not authorized.

212010-47H

Figure 5-80. Damage Limits — Tail Rotor Control Counterweight Link



DAMAGE LOCATION SYMBOLS

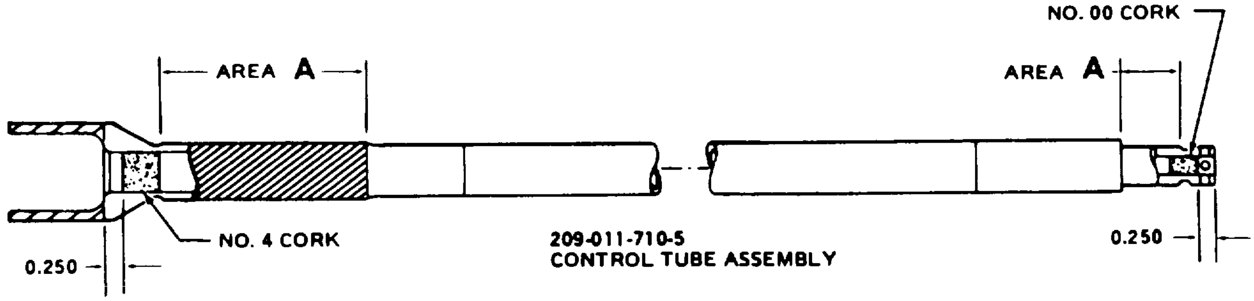
TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED (■)	(□)
CRACKS ALLOWED	None	None
NICKS, SCRATCHES, DENTS AND CORROSION	0.005	0.010
EDGE CHAMFER	0.010	0.020
MAXIMUM AREA PER FULL DEPTH REPAIR	0.05 Sq. In.	0.10 Sq. In.
NUMBER OF REPAIRS	One Per Lug	Two
BORE DAMAGE	0.002 for 1/4 Circumference	

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

NOTE: Coat repair areas with primer (C88 or C91).

212010-16L

Figure 5-81. Damage Limits — Tail Rotor Active Counterweight Support



DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED		
CRACKS ALLOWED	None	None	None
NICKS, SCRATCHES, DENTS AND CORROSION	0.002	0.005	0.010
MAXIMUM AREA PER FULL DEPTH REPAIR	0.05 Sq. In.	0.05 Sq. In.	0.25 Sq. In.
NUMBER OF REPAIRS	One per tang	Two	Not Critical
EDGE CHAMFER	0.010	0.020	0.030
THREAD DAMAGE			
DEPTH	One-third of thread		
LENGTH	0.10		
NUMBER	Two		

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

NOTE: Maximum allowable runout, with control tube mounted on centers, is 0.010 TIR (Total Indicator Reading) in areas designated A. Maximum allowable run out in other areas is 0.020 TIR.

209011-28C

Figure 5-82. Damage Limits — Tail Rotor Control Tube

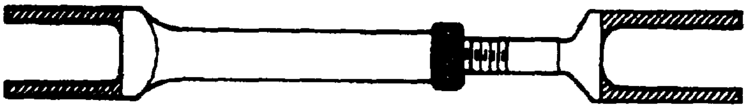
solvent (C112) and allow to dry. Coat new cork with shellac (C108) and press into position illustrated in figure 5-82.

5-104. ASSEMBLY – TAIL ROTOR CONTROLS.

a. Position nylatron washer (28, figure 5-76), bellcrank (27) and special washer (25) on crosshead (13). Install nut (24) and torque 70 TO 125 inch-pounds. Install cotter pin (23). Install opposite bellcrank in the same manner. If cotter pins do not engage castellations in nuts, add one thin steel washer under nuts (24).

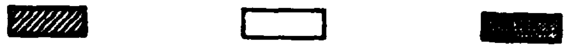
CAUTION

Weights (17) must be installed on outboard side of bellcranks (27) as illustrated or interference may occur.



209-011-713-1
LINK ASSEMBLY

DAMAGE LOCATION SYMBOLS



TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED		
CRACKS ALLOWED	None	None	None
NICKS, SCRATCHES, SHARP DENTS	0.005	0.010	0.020
CORROSION	0.0025	0.005	0.010
AREA OF FULL DEPTH REPAIR	0.05 Sq. In.	0.20 Sq. In.	0.20 Sq. In.
NUMBER OF REPAIRS	One Per Lug	See Note 5	Two
THREAD DAMAGE:			
DEPTH:	One-third of thread		
LENGTH:	One-quarter inch		
NUMBER:	Two		

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

NOTES:

1. Damage and subsequent repair to threads must not exceed one-third of the thread depth. Length of repair shall not exceed 0.25. The threaded segment may have two repairs.
2. AU edges maybe radiused or chamfered 0.020 to remove nicks and dents.
9. Corrosion must be cleaned up to twice the damage depth.
4. Coat repair areas with primer (C88 or C91).
5. Long clevis-two repairs; short clevis-one repair.

209011-29C

Figure 5-83. Damage Limits-Link Assembly

b. Install weights on each end of the two bellcranks (27). Install the same weights that were removed if they were indexed, if not, install two weights (17) and one steel washer (18) at each of the four locations. Install bolt (16) and nut (19). Torque nut 60 TO 70 inch-pounds.

CAUTION

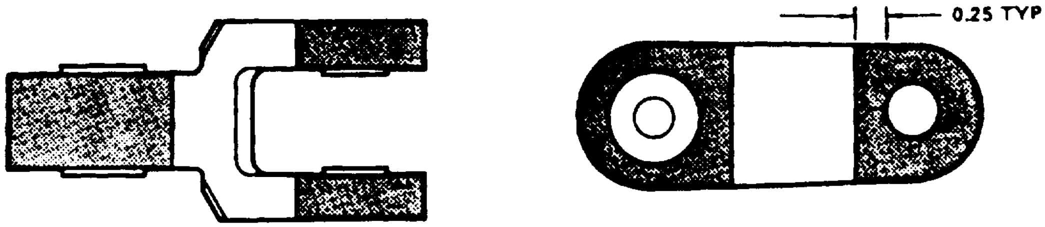
Do not intermix link P/N 212-010-711-1 with link P/N 212-010-711-3.

c. Position counterweight link (26) in bellcrank (27) and install bolt (30, figure 5-76) with steel washer (29) under head and steel washer (22) under nut (20). Torque nut 60 TO 110 inch-pounds and install cotter pin (21). Install opposite counterweight link in the seine manner. If cotter pins do not engage castellations in nuts, add one thin steel washer under nuts (20).

d. Adjust both pitch links (31) to 6.115 ±0.010 inch dimension between centers of bearings. This will yield a distance of 2.72-2.92 inches between inside face of jam nuts. (Refer to chapter 11 for additional rigging instructions.)

e. Position pitch link (31) in crosshead (13) with the end with rivet (32) installed away from the cross-head as illustrated. Install bolt (15) with steel washer (14) under head and steel washer (12) under nut (11). Torque nut 110 TO 165 inch-pounds and

209-011-711-1
IDLER ASSEMBLY



DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED	
CRACKS ALLOWED	None	None
NICKS, SCRATCHES, SHARP DENTS	0.010	0.030
CORROSION		
Before Repair	0.005	0.015
After Repair	0.010	0.030
MAXIMUM AREA PER FULL DEPTH REPAIR	0.25 Sq. In.	0.50 Sq. In.
NUMBER OF REPAIRS	One Per Segment	Two

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

NOTES:

1. Edges maybe radiused or chamfered 0.040 to remove nicks and dents.
2. Corrosion must be cleaned up to twice damage depth.
3. Coat repair areas with brush on chemical film (C31).
4. Bearing radial wear limit maximum 0.004 inch.

Figure 5-84. Damage Units — Idler

install cotter pin (10). Install opposite pitch link in same manner. If cotter pins do not engage castellations in nuts, add one thin steel washer under nuts (11).

5-105. INSTALLATION — TAIL ROTOR CONTROLS.

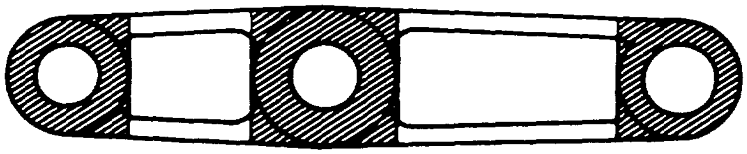
a. Install bearing (52, figure 5-76) in housing (40) Wet mating surfaces of bearing (52) and control tube (34) with lubricant (C79 or C80). Install excluder (43) so that packing (43.1) sits inboard. Install housing (41) in housing (40). Apply a small amount of sealant (C107.5) between the two housings. Secure excluder (43) and housing (41) with retaining ring (42).

b. Install new packing (38) on housing (40).

c. Apply unthinned primer (C88 or C91) to surface of housing (40) that contacts gearbox and install housing while primer is wet.

d. Install steel washers and nuts (39). Torque evenly to 60 inch-pounds. Apply sealing compound (C107) around joint where housing contacts gearbox.

e. Position idler (47) on gearbox case and secure with bolts, steel washers and nuts (50). Apply sealing



209-011-712-1
LEVER ASSEMBLY

DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED	
CRACKS ALLOWED	None	None
NICKS, SCRATCHES, SHARP DENTS	0.010	0.020
CORROSION		
Before Repair	0.005	0.010
After Repair	0.010	0.020
MAXIMUM AREA PER FULL DEPTH REPAIR	One-Half of Any Quadrant	0.50 Sq. In.
NUMBER OF REPAIRS	One Per Segment	One Per Segment

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

NOTES:

1. Edges may be radiused or chamfered 0.040 to remove nicks and dents.
2. Corrosion must be cleaned up to twice damage depth.
3. Coat repair areas with brush on chemical film (C31).
4. Bearing radial wear limit maximum 0.004 inch.

209011-12G

Figure 5-85. Damage Limits — Lever

compound (C107) to mating surfaces of washers and case during assembly procedure. Torque nut 110 TO 165 inch-pounds and install cotter pin.

WARNING

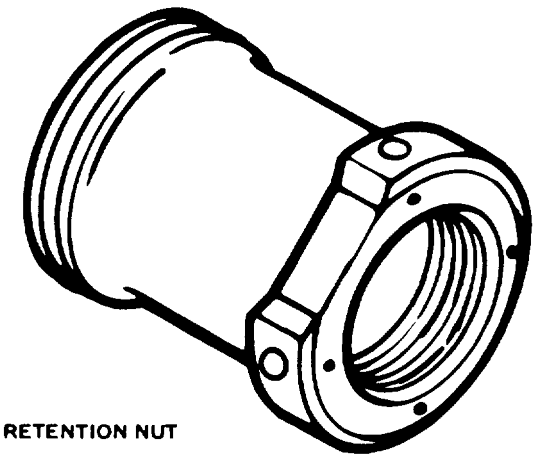
Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

f. Using solvent (C112) wash bearing in lever assembly (48) which attaches to control tube (34) to remove preservate and/or dirt. Hand pack bearing with grease (C58).

g. Position lever assembly (48) on idler (47) and install bolt, steel washer and nut (46). Torque nut 110 TO 165 inch-pounds and install cotter pin.

h. Disassemble link assembly (51). Apply corrosion preventive compound (C41) to the threads and barrel sect ion of the link assembly but not to the clevis section. Assemble the link and adjust to length of 7.5 inches between centers of bolt holes. Tighten jamnut to secure link assembly parts in position.

i. Secure link assembly (51) to lever (48) with bolt, steel washers, and nut (49). Torque nut 60 TO 110 inch-pounds and install cotter pin.



212-010-706-1
TAIL ROTOR RETENTION NUT

DAMAGE LOCATION SYMBOL

TYPE OF DAMAGE	MAXIMUM DEPTHS AND REPAIR AREAS ALLOWED
CRACKS ALLOWED	None
SCRATCHES, DENTS AND CORROSION	0.010
MAXIMUM AREA PER FULL DEPTH REPAIR	0.10 Sq. In.
NUMBER OF REPAIRS	2
EDGE CHAMFER	0.030
THREAD DAMAGE	
Depth	One-third of thread
Length	One-fourth of inch
Number	One

ALL DIMENSIONS IN INCHES UNLESS OTHERWISE NOTED

209010-116

Figure 5-86. Damage Limits — Tail Rotor Retention Nut

j. Secure link assembly (51) to control linkage with bolt, steel washers and nut (53). Torque nut 110 TO 165 inch-pounds and install cotter pin.

k. Secure control tube (34) to lever assembly(48). Position race (44) through bearing in lever and secure with bolt, steel washers and nut (45). Torque nut 110 TO 165 inch-pounds and install cotter pin.

l. Position sleeve (35) on control tube (34) with flange inboard. Rotate sleeve clockwise to engage threads. Continue to rotate until sleeve is past threads and fully seated on control tube shoulder.

m. Install assembled crosshead, weights, and links. Refer to paragraph 5-87, step e. through step n. to complete installation of control and tail rotor.

n. Ensure that weights (17) are installed on outboard side of bellcranks as illustrated and that weights do not contact other parts when controls are moved through full throw.

o. Check rigging of tail rotor (paragraph 11-73).

p. Track tail rotor (paragraph 5-115), Tail rotors with pitch link measurement as stated in paragraph 5-104.d. do not require tracking.

5-106. LUBRICATION-TAIL ROTOR CONTROLS.

Lubricate tail rotor controls as shown on lubrication chart in Chapter 1.

SECTION VII. TAIL ROTOR BLADES

5-107. TAIL ROTOR BLADES.

5-108. DESCRIPTION-TAIL ROTOR BLADES.

The tail rotor blade is of all-metal, bonded construction. Upper and lower aluminum alloy skins are bonded to an aluminum honeycomb core. Externally attached balance weights and balance screws inside the blade tip facilitate blade balancing.

Premaintenance Requirements For Tail Rotor Blade Assembly

Condition	Requirements
Model	AH-1P/E/F
Part No. or Serial No.	All
Special Tools	None
Test Equipment	None
Support Equipment	Paint Spray Equipment
Minimum Personnel Required	One
Consumable Materials	(C1) (C5) (C14) (C19) (C20) (C31) (C32) (C44) (C68) (C69) (C74) (C75) (C88 or C91) (C102) (C103) (C112)
Special Environmental Conditions	None

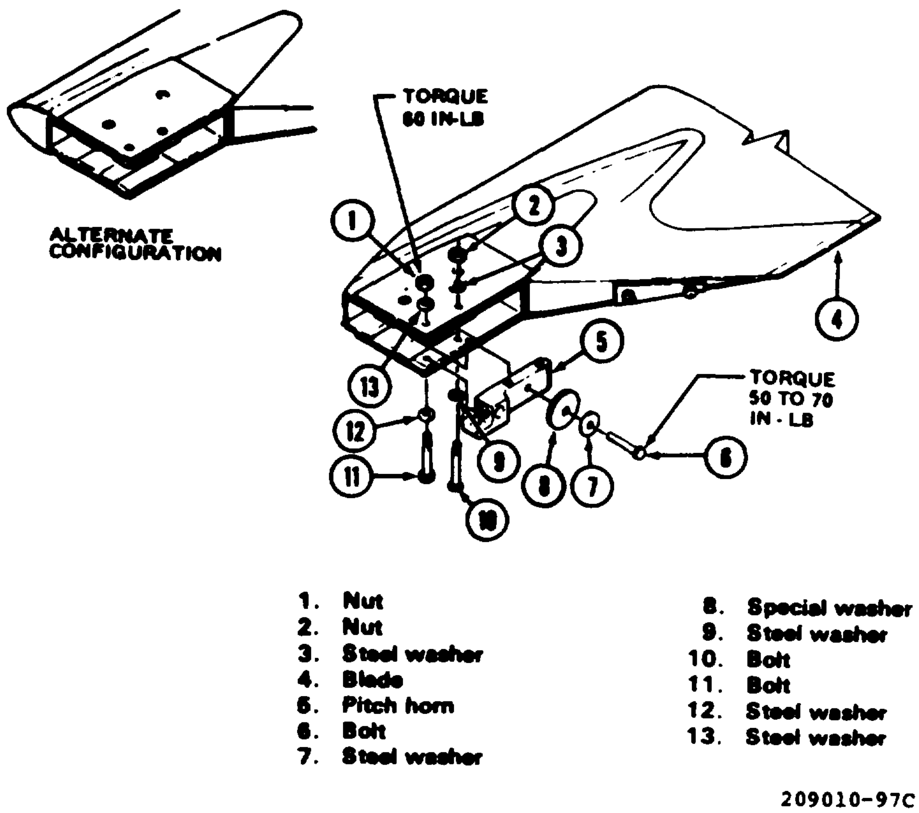
5-109. REMOVAL-TAIL ROTOR BLADES

a. Remove tail rotor hub and blade assembly from helicopter (paragraph 5-81). Place the tail rotor assembly on a padded bench or similar work area to prevent damage. Disassemble tail rotor hub and blade assembly (paragraph 5-82).

NOTE

The tail rotor hub and blade assembly must be rebalanced if any parts are replaced or repaired. It is good practice to index special balance washers and bolts at time of disassembly so that these parts can be reassembled in the same location. This will make rebalancing easier.

b. Cut lockwire and remove bolt (6, figure 5-87) and washers (7 and 8) from blade. Remove corresponding parts from opposite blade.



Flgure 5-87. Tail Rotor Blade Pitch Horn Installation

c. Remove nuts (1 and 2), and washers (3 and 13). Remove bolts (10 and 11) and washers (9 and 12). Remove pitch horn. Remove opposite pitch horn in the same manner.

5-110. INSPECTION – TAIL ROTOR BLADES.

NOTE

If during a movement a tinkle or a sandy sound emits from inside of blades, the presence of this condition is not cause for rejection of the blades. This sound is debrls (particles of aluminum honeycomb) that were not thoroughly removed during blade manufacture.

NOTE

Any damage caused by external forces to installed blades that requires blade replacement will cause mandatory tall rotor yoke replacement. Evidence or documentation of any abnormal side load applied to the blade as a result of ground mishap sufficient to cause yoke to impact severely on flapping stop Is cause for removal.

a . Inspect tail rotor historical records and the tail rotor blades for evidence that the blades have bean subjected to an accident or incident outside the realm of normal usage. If such evidence exists, perform applicable special inspections fro overspeed, sudden stoppage, hard landing and overtorque outlined in Chapter 1 and the following:

NOTE

If there is no evidence of accident or incident, proceed to step b.

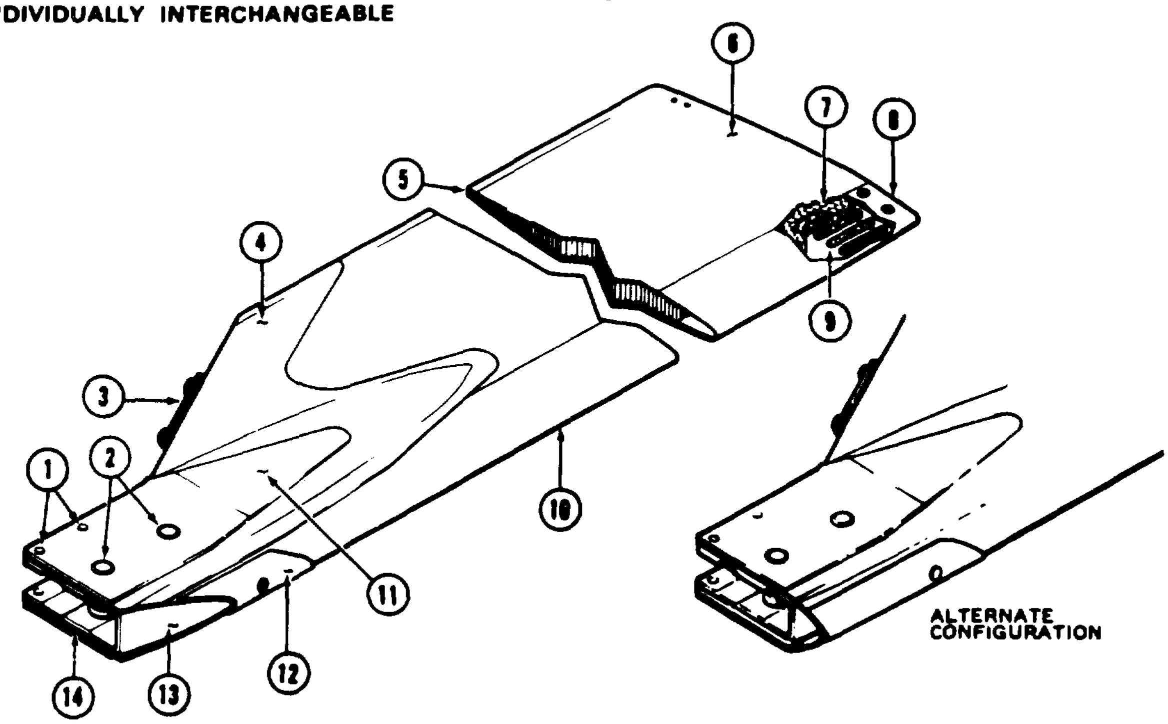
(1) Overspeed inspection:

(a) Check for bond separation anywhere on the blade. If any separation exists, dispose of the blade locally.

(b) Check balance screws (9, figurs 5-88) and external balance weights (3) for movement. If any of these parts have moved outboard due to centrifugal force, dispose of blade locally.

(c) Check the blade grip bolt hole bushings (2) for evidence of looseness. If any of the four bushings are loose, forward the blade to next higher maintenance level for repair.

NOTE: ALTERNATELY CONFIGURED TAIL ROTOR BLADES ARE INDIVIDUALLY INTERCHANGEABLE



1. Pitch horn bolt holes
2. Blade grip bolt hole bushings
3. External balance weights
4. Doubler
5. Trailing edge
6. Skin
7. Honeycomb core
8. Tip block
9. Balance screws
10. Spar
11. Grip plate
12. Drain hole doubler
13. Butt block
14. Inner grip plate

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Figure 5-88. Tail Rotor Blade Assembly

(d) Inspect four external buffer pads (figure 5-92) for looseness or damage. If any of the four buffer pads are loose or damaged, forward the blade to next higher maintenance level for repair.

(e) If blade passes inspections noted in steps (a), (b), (c), and (d), end there is no other visible damage, the blade is serviceable.

(2) Sudden stoppage inspection:

(a) Inspect the blades visually for evidence that the blade has come in contact with the ground, tailboom or other foreign object. If such evidence is found, replace both blades.

(b) Inspect the blade skin visually for wrinkles and deformations. If this damage is present, replace damaged blade. Inspect opposite blade for damage and replace as necessary.

(c) If blade passes inspections noted in steps (a) and (b), and there is no other visible damage due to sudden stoppage, the blade is serviceable.

(3) Hard landing inspection:

(a) Inspect the blades visually for evidence that the blade has come in contact with the ground, tailboom or other foreign object. if such evidence is found, return both blades to depot level maintenance.

(b) Check for bond separation anywhere on the blade. If any separations exist, dispose of blade locally.

(c) Check root end weights for evidence they have moved. If such evidence is found, dispose of blade locally.

(d) If one of the blades of a pair has been damaged badly enough that metal has been torn or any bond lines have been separated, dispose of blades locally.

(e) If one of the blades of a pair has been damaged slightly by denting, scrap that blade; but the other blade may be reused after inspection by depot level maintenance for water tightness and spanwise balance.

b. Accomplish normal inspection of tail rotor blades and pitch horns by inspecting blades visually and with standard inspection equipment. Classify any damage present as negligible, reparable at AVIM level, reparable at Depot, or nonreparable.

(1) Neligible damage:

NOTE

Blades with only negligible damage may be returned to service without repair.

(a) Non-sharp dents located inboard of Station 30.0 that are not in excess of 0.015 inch deep are negligible (figure 5-89).

(b) Non-sharp dents located outboard of Station 30.0 that are not in excess of 0.030 inch are negligible (figure 5-89).

(c) Voids between doublers (4, figure 5-88) and skin (6) or spar (10) which do not exceed 0.50 inch chordwise by 2.0 inches spanwise and are not within 0.50 inch of the edge of doubler are negligible.

(d) Voids between the skin (6) and spar (10) which do not exceed 0.50 inch chordwise by 2.0 inches spanwise and are not within 0.250 inch of the edge of the skin and are not in the outboard area where the skin overlaps the spar are negligible. Voids between the skin and spar in the outboard area where the skin overlaps the spar which do not exceed 0.250 inch chordwise and 2.0 inches spanwise are negligible.

(e) Voids between the skin (6) and honeycomb core (7) which do not exceed 0.50 inch chordwise by 2.0 inches spanwise are negligible.

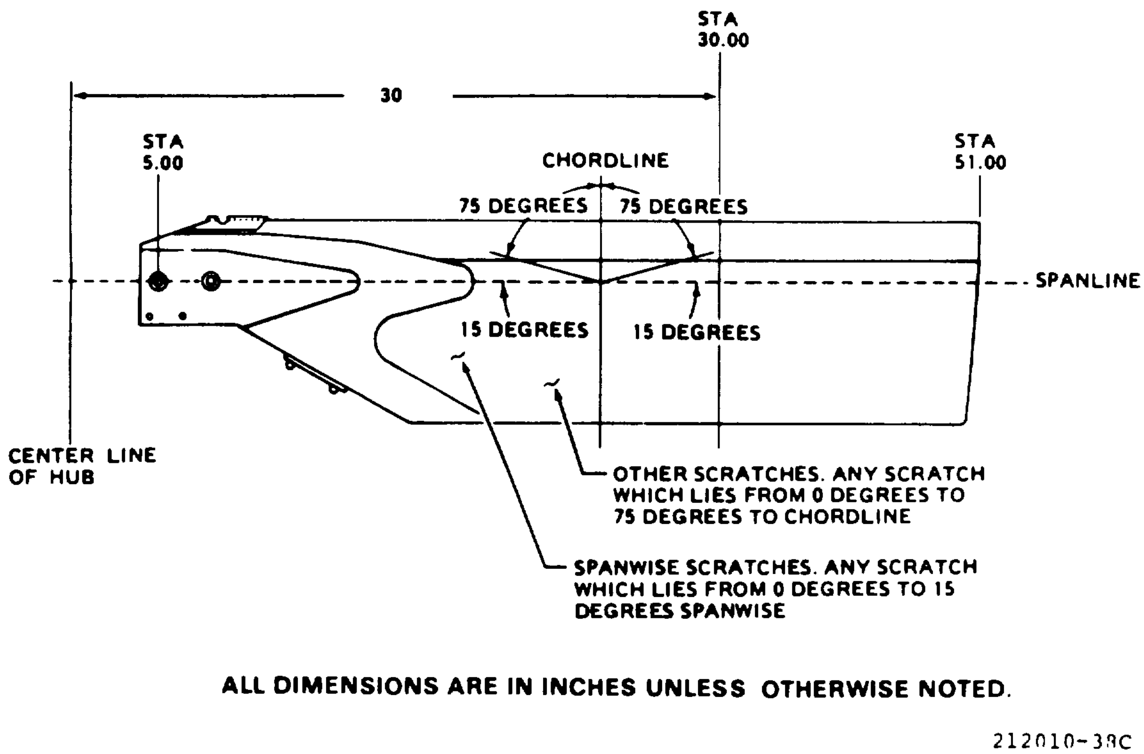


Figure 5-89. Tail Rotor Blade Station Diagram and Scratch-Type Damage Area Locations

(2) Nick, dent and scratch type damage reparable at AVIM level maintenance:

NOTE

Blades with the type damage defined in this paragraph require that the damage be polished out to the depth required to remove the damage including any nicks or scratches which may be present in dents. Use 300 grit or finer sandpaper (C102) and scotchbrite (C103). Do not fair-in or fill sharp or non-sharp dents with adhesive as this would interfere with subsequent inspections for crocks. Touch-up paint in areas where mechanical damage is polished out.

(a) Nicks and scratches inboard of Station 30.0 which run within 0 TO 15 degrees of the span line and are not in excess of 0.005 inch depth (figure 5-89).

(b) Nicks and scratches inboard of Station 30.0 which run within 0 TO 76 degrees of the chordline and are not in excess of 0.003 inch in depth (figure 5-89).

(c) Sharp dents inboard of Station 30.0 which are not in excess of 0.010 inch in depth.

(d) Non-sharp dents inboard of Station 30.0 which are not in excess of 0.030 inch in depth.

(e) Nicks and scratches outboard of Station 30.0 which are not in excess of 0.010 inch in depth.

(f) Sharp dents outboard of Station 30.0 which are not in excess of 0.015 inch in depth.

(g) Non-sharp dents outboard of Station 30.0 and also outside of patchable area which are not in excess of 0.040 inch in depth.

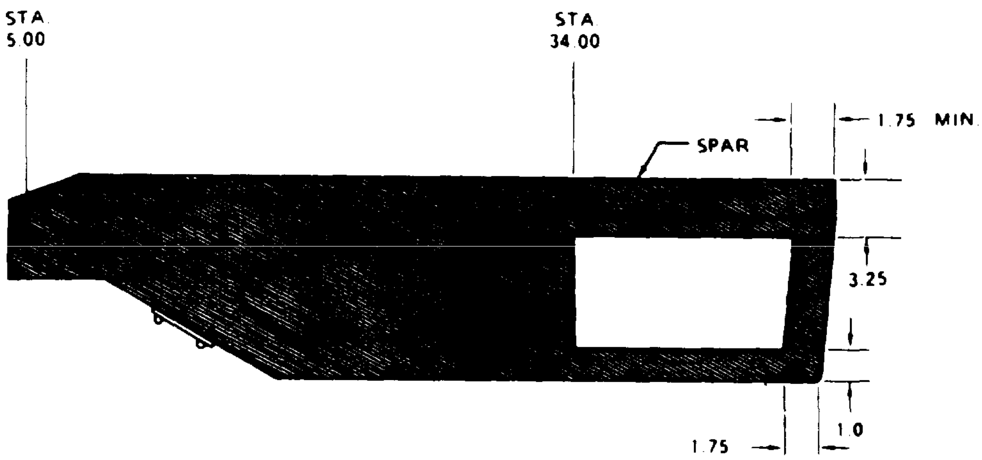
(h) Non-sharp dents outboard of Station 30.0 and also within patchable area as shown in figure 5-90 which are not in excess of 0.125 inch in depth.

(i) Nicks and scratches in the trailing edge up to 0.030 inch in depth chordwise are reparable, but the damage must be polished out over a distance of three inches on each side of the defect.

(3) Voids reparable at AVIM level maintenance:

NOTE

Blades which have voids within the limits defined in this paragraph require that the voids be repaired to return the blades to serviceable condition. Refer to paragraph 5-111 for repair instructions.



ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

NOTE: NO REPAIR PERMITTED IN HATCHED AREA EXCEPT AS NOTED IN TEXT.

209010-39C

Figure 5-90. Tail Rotor Blade - Area Authorized for Patch-Type Repair

NOTE

A void is defined as an unbended area that is supposed to be bonded. Many sub-definitions of voids have been made such as lack of adhesive, gas pocket, misfits, etc. However, the general term "void" as used herein makes no distinction between those definitions.

(a) Determination of limits when two or more separate voids are involved:

1 When separate voids are closer together than one inch, consider them as one void.

2 If the voids are in two areas, such as one void between the core and the skin that is located within one inch of a void between the skin and the doubler, consider them as one void and use the limits for the area that are most strict.

(b) Edge voids between butt block (13, figure 5-88) and spar (10) or inner grip plates (14) within the following limits:

1 Butt block and spar: any length and 0.250 inch in depth.

2 Butt block and inner grip plate: 1.50 inches in length and 0.250 inch in depth.

(c) Edge voids which are a maximum of 0.060 inch in depth or 2.0 inches in length and are located between the following components.

1 Grip plates (11) and doublers (4).

2 Doublers (4) and skin (6).

3 Doublers (4) and spar (10).

4 Inner grip plates (14) end skin (6).

5 Inner grip plates (14) and spar (10).

6 Butt block (13) and skin (6).

7 Skin (6) and spar (10).

8 Skin (6) and tip block (8) .

(d) Edge voids which are a maximum of 0.120 inch in-depth (chordwise) and 3.0 inches in length (spanwise] and are located between skin (6) and trailing edge strip (5).

(e) Edge voids which are a maximum of 0.50 inch in width (chordwise) between the spar (10) and tip block (8).

(4) Damage to skins that is reparable at AVIM level maintenance.

(a) Damage caused by a foreign object that results in a crack or hole in the skin and is located in the authorized area for repair by patching as shown in figure 5-90.

(b) Nick and scratch type damage that exceeds the limits defined in step b. (2), and is located in the authorized area for repair by patching as shown in figure 5-90.

(c) The maximum size of hole that can be repaired is restricted by the requirement that all of the defect must be cut out and the maximum size of cut is 1-1/2 inch diameter.

(5) Cracks in adhesive at bond line that are reparable at AVIM level maintenance:

(a) Cracks in adhesive at bond line between the phenolic blocks and skin, spar inside the drain hole, inner grip plates or joint between phenolic blocks are reparable by sealing. Inspect adhesive at bond lines in blade butt area for cracks. Place inspection emphasis on the areas shown in figure 5-91.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

CAUTION

Do not saturate the bond lines with MEK es it will soften the adhesive.

(b) If cracks in adhesive are suspected, remove paint from area with clean cloths dampened with MEK (74) and reinspect.

(6) Blade damage that is nonreparable:

(a) Fatigue cracks at any location on the blade require local disposition of the cracked blade.

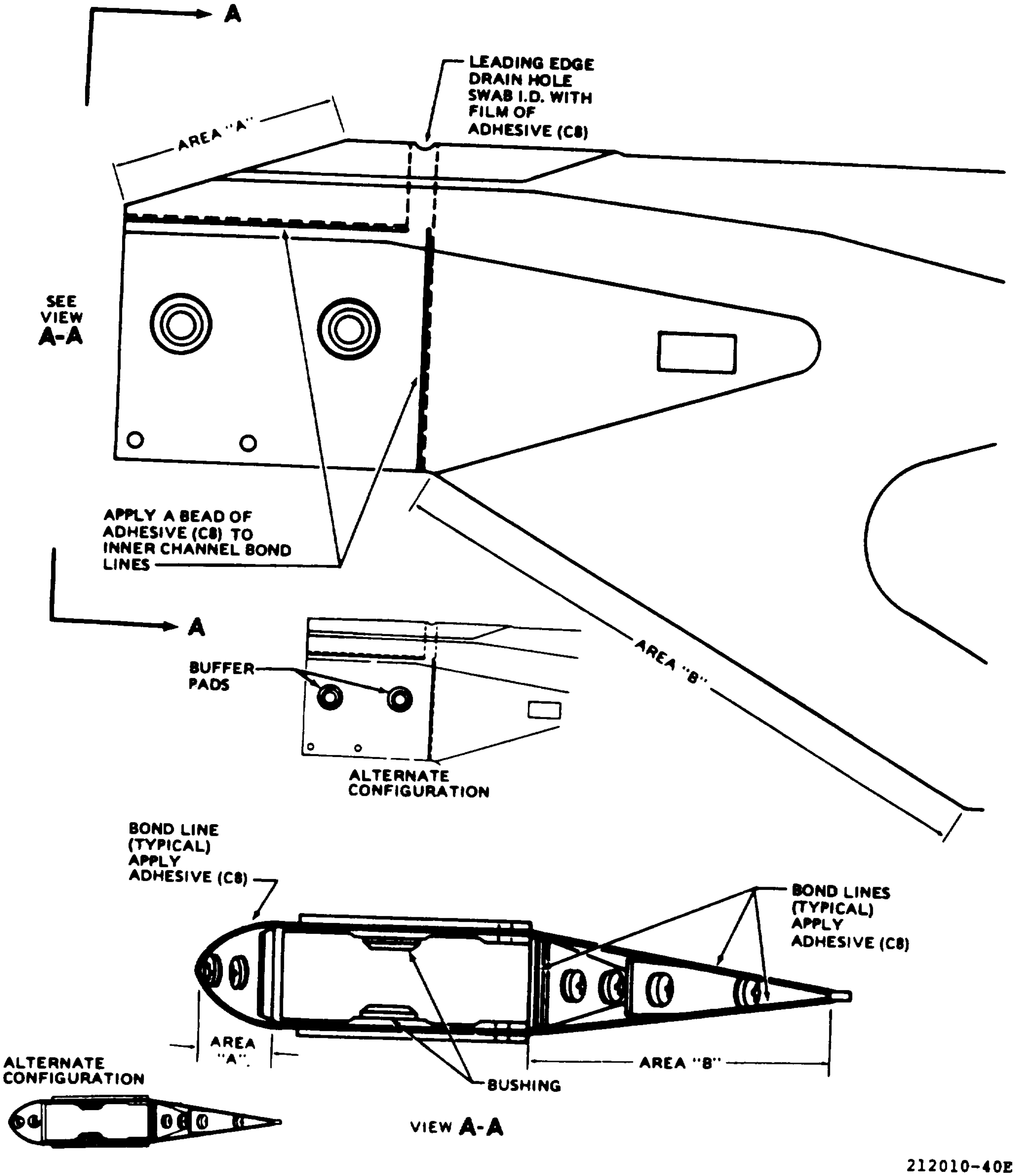


Figure 5-91. Tail Rotor Blade Butt Area Repair

(b) A blade with water in honeycomb core.

(c) A blade with one or more cracks developed in a previously repaired area.

(d) A blade with nicks or cracks that are located in dents and the total depth is in excess of the limits specified in steps b. (2) (c) through b. (2) (h) if damage is not within area where patches are allowed.

(e) A blade with any void within 0.50 inch of the edges of the drain hole doubler (12, figure 5-88).

(f) A blade with any void between the drain hole doubler (12) and spar (10) within 0.50 inch of the edge of the drain hole.

(g) A blade with one or more holes that do not fall within the area authorized for patches as shown in figure 5-90 and/or a blade with a hole that exceeds the 1.5 inch diameter restriction noted in step b. (4) (c).

(h) A blade with any corrosion that penetrates entirely through the skin.

(i) A blade that is worn completely through the spar at the tip.

(j) A blade with edge voids deeper than 0.1 inch at the tip end of any of the root end doublers or grip plates.

(k) A blade with edge voids in the leading edge or trailing edge of the doublers that are 0.25 inch or more in depth and show indications of corrosion in the void.

(l) A blade that failed to pass the special inspections for overspeed, overtorque and sudden stoppage.

(7) Inspect tail rotor pitch horns as follows:

(a) Inspect pitch horns for damage in excess of the limits shown in figure 5-92.

(b) Inspect threaded insert for damage to threads.

(c) Slide a new pitch link bolt through the bushing and matching hole used for attaching the pitch link. If the bolt does not fit freely through the holes, the pitch horn is not suitable for further service.

(d) Inspect for distortion of the pitch horns with a straight edge placed against the machined surfaces. Any distinct deviation from flat indicates that the pitch horn is distorted and not suitable for further service.

(e) Inspect pitch horns for cracks by fluorescent penetrant method (TM 43-0103).

5-111. REPAIR – TAIL ROTOR BLADES (AVIM).

a. Replace any blade which has incurred nonreparable damage (paragraph 5-110).

b. Repair blades with voids that are within the limits specified in paragraph 5-110.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

CAUTION

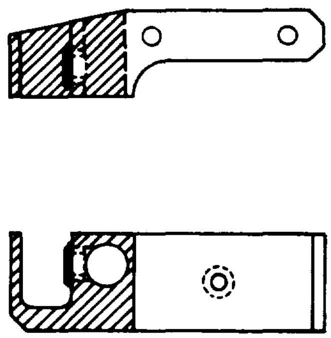
Do not allow MEK to enter rotor blade when removing paint to inspect for cracks or when cleaning prior to sealing edge voids. MEK will soften the adhesive used in manufacture of the rotor blades.

(1) Clean area around reparable edge voids with a clean cloth moistened with MEK (C74) and dry with a clean cloth,

(2) Prepare a small quantity of adhesive (C14) in accordance with the manufacturers instructions. Apply the adhesive to the edge void with the flat side of an applicator such as a wooden tongue depressor. Fill the void with adhesive as deeply as possible.

c. Repair blades with crack and hole type damage in the skin by patching if the damage is within limits specified in paragraph 5-110.

(1) Ensure that the damage to be patched is in the authorized area for patches (figure 5-90).



212-010-716-9
PITCH HORN

DAMAGE LOCATION SYMBOLS

TYPE OF DAMAGE	MAXIMUM DEPTH AND REPAIR AREAS ALLOWED	
CRACKS ALLOWED	None	None
NICKS, SCRATCHES, AND DENTS	0.010	0.020
CORROSION		
Before Repair	0.005	0.010
After Repair	0.010	0.020
MAXIMUM AREA PER FULL DEPTH REPAIR	0.05 Sq. In.	0.10 Sq. In.
NUMBER OF REPAIRS	One	Two
EDGE CHAMFER	0.020	0.040
BORE DAMAGE	0.002 for 1/4 Circumference	

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

212010-46E

Figure 5-92. Damage Limits — Tall Rotor Blade Pitch Horn

(2) Remove paint in area to be patched with 120 grit sandpaper (C102). After paint is removed, smooth the area with 250 grit sandpaper (C102).

(3) Cut out the damaged skin with a hole saw or use a sharp instrument to cut through the skin. Do not exceed the 1.50 inch diameter maximum cut out.

(4) Heat the cut out disc of skin to 200 degrees F (maximum) and remove the disc while it is heated. Avoid damage to the honeycomb core.

(5) Deburr the edges of the hole and polish out any scratches and nicks. Use 350 grit or finer sandpaper (C102) and scotchbrite (C103).

(6) Cut a patch from aluminum alloy sheet 0.020 inch thick. The patch must be large enough to overlap the hole at least 0.750 inch all around the perimeter. Deburr the edges of the patch.

(7) Clean the side of the patch that will be bonded by sanding with 250 grit sandpaper (C102).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

(8) Wipe the mating surfaces of the patch and blade with a clean cloth dampened with MEK (C74).

(9) Apply a thin coat of adhesive (C14) to the mating surfaces of the patch and blade. Place the patch on the blade, press down on the patch and move it back and forth slightly to expel all air pockets in the adhesive, Blend the excess adhesive around the edge of the patch.

(10) Maintain pressure on the patch. Use weights, clamps or rubber bands cut from inner tubes.

(11) Refer to table 1-11, for adhesive, mix ratio, pot life, and curing schedule.

(12) Touch up paint in area of patch (paragraph 5-112 and TB 746-93-2).

d. Repair blades with nick, scratch, dent and notch damage that is within the limits specified in paragraph 5-110.

(1) Polish out all nicks and scratches, Use aluminum wool (C20) on aluminum pans. Use sandpaper (C102) on stainless steel spar.

(2) Polish out damage in trailing edge over a distance of three inches on each side of the defect. Use a steel hand file to remove most of the damage then smooth out the area with aluminum wool (C20).

(3) Touch up paint in area of repair (paragraph 5-112 and TB 746-93-2).

e. Replace loose or damaged buffer pads

NOTE

Exercise extreme care to ensure grip plates are not gouged or otherwise damaged.

(1) Remove old pad, using a knife or similar tool.

(2) Remove any remaining adhesive by sanding in a spanwise direction to bare metal. Surface finish shall be 32 RMS or better.

NOTE

Use cellophane or similar material between washers and buffer pads to prevent adhesive squeeze-out from contacting washers.

(3) Bond new buffer pads to blade, using adhesive (C14). Apply pressure to pad by installing a 0.5 inch diameter bolt through a blade bolt hole with an AN970-8 washer under both the bolt head and the nut. Tighten nut to apply pressure on buffer pad. Refer to table 1-11, for adhesive, mix ratio, pot life, and curing schedule.

(4) Refinish blade as required

f. Repair blades with cracks in adhesive at bond line detected in inspection described in paragraph 5-110, as follows:

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

CAUTION

Do not saturate the bond lines with MEK as it will soften the adhesive.

(1) Clean area around cracks in adhesive at bond line in area illustrated in figure 5-91 with MEK (C74). Dry area with clean cloths.

(2) Apply a thin film of adhesive (C14) to the bond lines shown in figure 5-91 areas A and B.

(3) Apply a small bead of adhesive (C14) to area shown in figure 5-91.

(4) Swab the inside diameter of the leading edge drain hole with a thin film of adhesive (C14) to ensure that adequate sealing exists (figure 5-91).

(5) Refer to table 1-11, for adhesive, mix ratio, pot life, and curing schedule.

(6) Touch up paint in repair area (paragraph 5-112 and TB 746-93-2).

(7) Balance the tail rotor hub and blade assembly prior to installation on helicopter (paragraph 5-86).

g. Repair pitch horn as follows:

(1) Polish out mechanical and corrosion damage on pitch horns. Use 300 grit or finer sandpaper (C102) and scotchbrite (C103). Inspect repaired areas to ensure that limits shown in figure 5-92 have not been exceeded.

(2) Touch up repaired areas with chemical film (C31).

(3) Replace pitch horn (5, figure 5-87) if hole for floating bushing exceeds 0.5005 inch or is corroded.

(4) Replace bushing (30, figure 5-68) if bolt is loose in bushing or if bushing is loose in pitch horn.

5-112. PAINTING – TAIL ROTOR BLADES (AVIM).

a. Paint touchup is required when paint is deteriorated and/or the paint is removed to repair scratches, nicks, or dents. Refer to TB 746-93-2.

b. Prepare blade for painting as follows:

(1) Polish out nick, scratch, and dent damage (paragraph 5-111).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

(2) Clean area where paint is to be applied with aliphatic naphtha (C75).

(3) Mask off or plug retention bolt holes and mask off holes for attaching the pitch horns to prevent entry of refinishing materials.

(4) Remove all surface oxides and aged paint from aluminum surfaces.

(5) Wash blade with cleaning and polishing compound (C32). Thoroughly rinse soap from blade and check for a water break free surface which is a continuous unbroken film of water on the surface. Repeat washing as required until the water break free surface is attained.

CAUTION

Do not touch blades with bare hands during remaining procedures or quality of paint will be adversely affected.

(6) Apply coat of chemical film (C31) to bare aluminum surfaces.

NOTE

If chemical film is not available, substitute commercial "Metal-Prep", alcoholic phosphoric solution (C19) or solution of chromic acid (C1).

c. Apply finish to blade as follows:

(1) Apply one coat of primer (C88 or C91) to the touch up area.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of vapors and contact with skin or eyes.

(2) Mix a small quantity of adhesive (C5) according to directions on container. Mix 13 TO 15 percent by weight of primer (C88 or C91) into the adhesive (C5). Mix thoroughly and thin to sprayable consistency by adding MEK (C74). Do not exceed 50 percent by volume; 35 percent should produce a sprayable consistency. The pot life of the epoxy primer mixture is approximately three hours.

(3) Ensure that masking tape applied in step b. (3) is still in place. Apply three wet spray coats of the adhesive prepared in the preceding step to all surfaces at the root of the blade for a distance of 0.750 inch to 2 inches outboard of the perimeter of the doublers. Allow each coat to dry 45 TO 60 minutes. Make each coat 1.6 TO 2.0 mils thick. Apply one wet spray coat of the same adhesive material to

the entire length of the blade on both sides. Use the leading edge of the skin as the centerline of the spray.

(4) After the final coat is applied in preceding step, allow the blade to air dry for 16 TO 24 hours.

(5) Apply one thin mist coat of primer (C88 or C91) to all touch up areas and allow to dry for a minimum of 45 minutes and a maximum of 8 hours prior to applying next coat.

NOTE

It is necessary to cover all touch up areas with primer (C88 or C91) and comply with the time limit noted in step (5) or the finish cost of lacquer will not adhere to the blade.

(6) Apply the final coats of lacquer to the touch up areas only. Use lacquer (C68) to touch up areas except on the blade tip. Use lacquer (C69) on touch up areas of the six inch wide band on the blade tip. Paint thickness to be approximately 1.2 TO 1.5 mils.

(7) Air dry the blade for 3 hours prior to handling and for 48 hours prior to flying. If a faster cure time is required, air dry the blade 1 hour. Remove the roasting tape and oven dry the blade at 180 to 190 degrees F (82 TO 88 degrees C) for 1 hour.

(8) Apply a coating of corrosion preventive compound (C44) to the inside of the retention bolt bushings.

5-113. INSTALLATION-TAIL ROTOR BLADES.

a. Position hub assembly (1, figure 5-69) on bench with data plate side up. Slide blade (14) on hub yoke with the data plate side up. Install bolts (20 and 25) with special washers (19 and 26) under bolt heads. Install special washers (2 and 13) next to blade. If special balance washers were indexed at time of disassembly, reinstall them in the same position. If they were not indexed, do not install them until the assembly is balanced. Install nuts (5 and 10) but do not torque until after the assembly has been balanced.

b. Install opposite blade in the same manner. The four blade retention bolts (20 and 25) maybe installed from either side but all four bolts must be installed from the same side.

c. Position pitch horn (5, figure 5-87) on blade and install bolts (10 and 11) with steel washers (9 and 12) under heads. Install bolts with heads facing same direction as blade retention bolts (20 and 25, figure 5-69). Install steel washers (3 and 13, figure 5-87) and nuts (1 and 2). Torque nuts 50 TO 70 inch-pounds. If special washer (8) was indexed at disassembly, install it at this time with steel washer (7) and bolt (6). If special washer (8) was not indexed, install steel washer (7) and bolt (6). Do not torque until assembly has been balanced.

d. Install the opposite pitch horn in the same manner.

SECTION VIII. TRACKING AND BALANCING PROCEDURES

5-114. TRACKING AND BALANCING-MAIN ROTOR BLADES.

NOTE

For Aviation Vibration Analyzer (AVA) refer to TM 1-6625-724-13&P.

Premaintenance Requirements for Main Rotor Hub and Blade Assembly-ticking

Condition	Requirements
Model	AH–1P/E/F
Part No. or Serial No.	All
Special Tools	(T41) (T47)
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	Two
Consumable Materials	(C123) (C138)
Special Environmental Conditions	None

a. Following replacement or installation of the main rotor hub, blades or pitch link assemblies, track the main rotor blades.

b. B540 Perform following procedures as required for acceptable smooth operation of main rotor. Recommended sequence of procedures is also provided in charts (figures 5-93, 5-94, and 5-95).

WARNING

Runup of helicopter shall be performed only by personnel authorized by AR 95-1.

NOTE

The VIBREX 4591 system is the preferred method of tracking main rotor blades. (Refer to paragraph 5-116.)

(1) Coat tracking tips of rotor blades with suitable grease pencils, using different colors on each blade as preparation for use of tracking flag. Set both trim tabs at trail (zero degrees) using gage (T41) and tab bender (T47).

(2) Perform a low speed blade track at 71 percent rpm (figure 5-97). If track is satisfactory, omit step (3) and proceed to Step (4).

(3) Prior to incorporation of MWO 55 -1520-244-50-9, correct a low speed out-of-track condition by shortening pitch link assembly attached to the low blade to roll the blade up (figure 5-9). Loosen jamnuts and turn barrel to shorten tube. Turning barrel three turns will change blade track approximately 0.375 inch. Tighten and lockwire (C1 38) nuts. Repeat checks and adjustments until satisfactory.

NOTE

After application of lockwire, apply a thin coat of sealant (C105) around the lock nut and threads of the rod end to prevent water intrusion.

(3.1) After incorporation of MWO 55-1520-244-50-9, correct a low speed, out-of-track condition by shortening pitch link assembly attached to the low bide to roll the blade up (figure 5-9). Loosen jamnuts and turn lube assembly to shorten tube.Tuting tube one and one-half turns will change bide track approximately 0.375 inch. Tighten and lockwire (C138) nuts. Repeat checks and adjustments until satisfactory.

(4) Perform a high speed track at 100 percent rpm. If out-of-track, record which blade is low but make no adjustments.

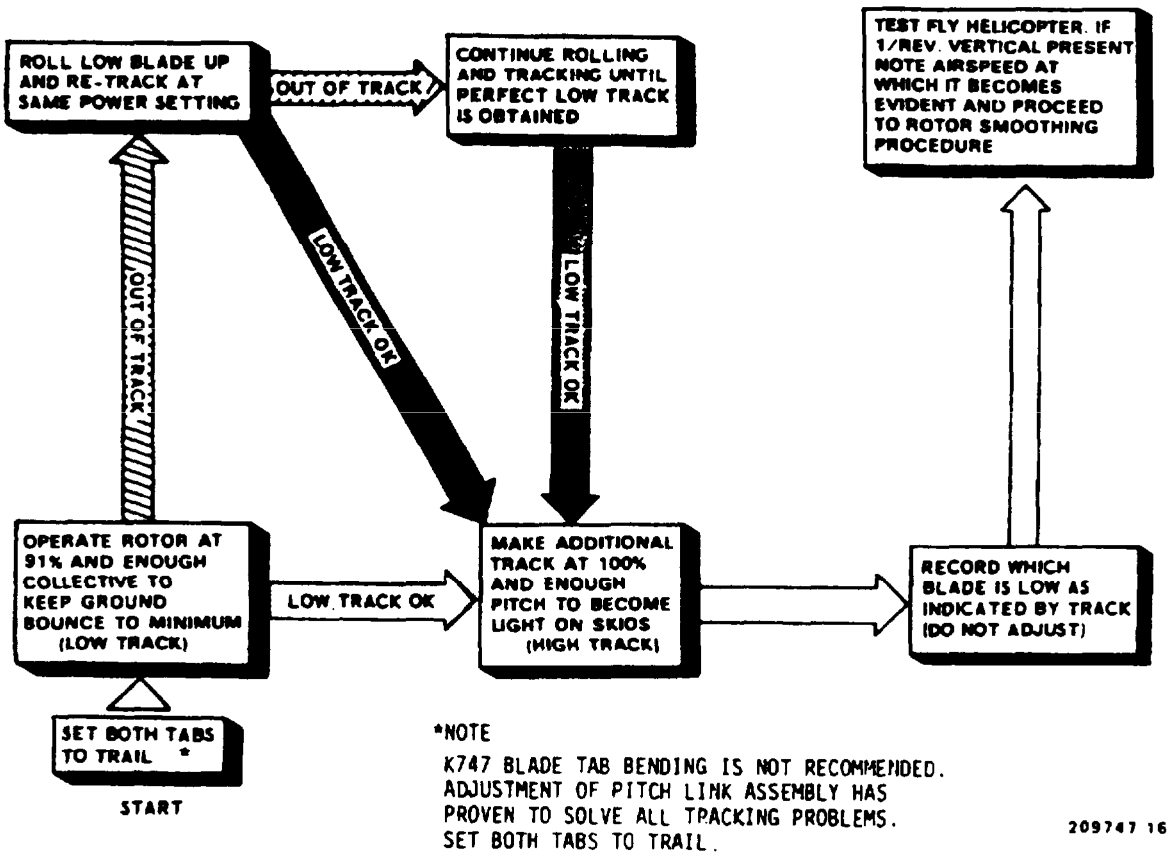


Figure 5-93. Main Rotor Tracking Chart

(5) Test fly helicopter. If vertical vibration is not evident proceed to step (6). If vertical vibration requires correction, begin sequence of adjustments indicated in figure 5-94 as applicable according to airspeed where vibration occurs.

(a) When bending blade trim tabs, do not exceed 8 degrees up and/or 8 degrees down (16 degrees maximum both blades).

(b) To roil a blade, adjust pitch link assembly as in step (3) or (3.1) above.

(c) To sweep a blade, loosen jam nuts on blade drag brace (12, figure 5-2) enough to turn barrel one full turn as shown by decal arrows. Torque jam nuts 150 TO 200 fret-pounds without moving barrel. Record ail such adjustments, and do not exceed TWO full turns total adjustments.

NOTE

A blade shall never be swept forward of the original aligned (paragraph 5-13) position.

NOTE

The blade sweep adjustment is also used to correct lateral vibration. (Refer to step (6)).

NOTE

If maximum blade sweep adjustment falls to correct rotor vibrations, remove main rotor hub and blade assembly and align blades (paragraphs 5-12 and 5-13).

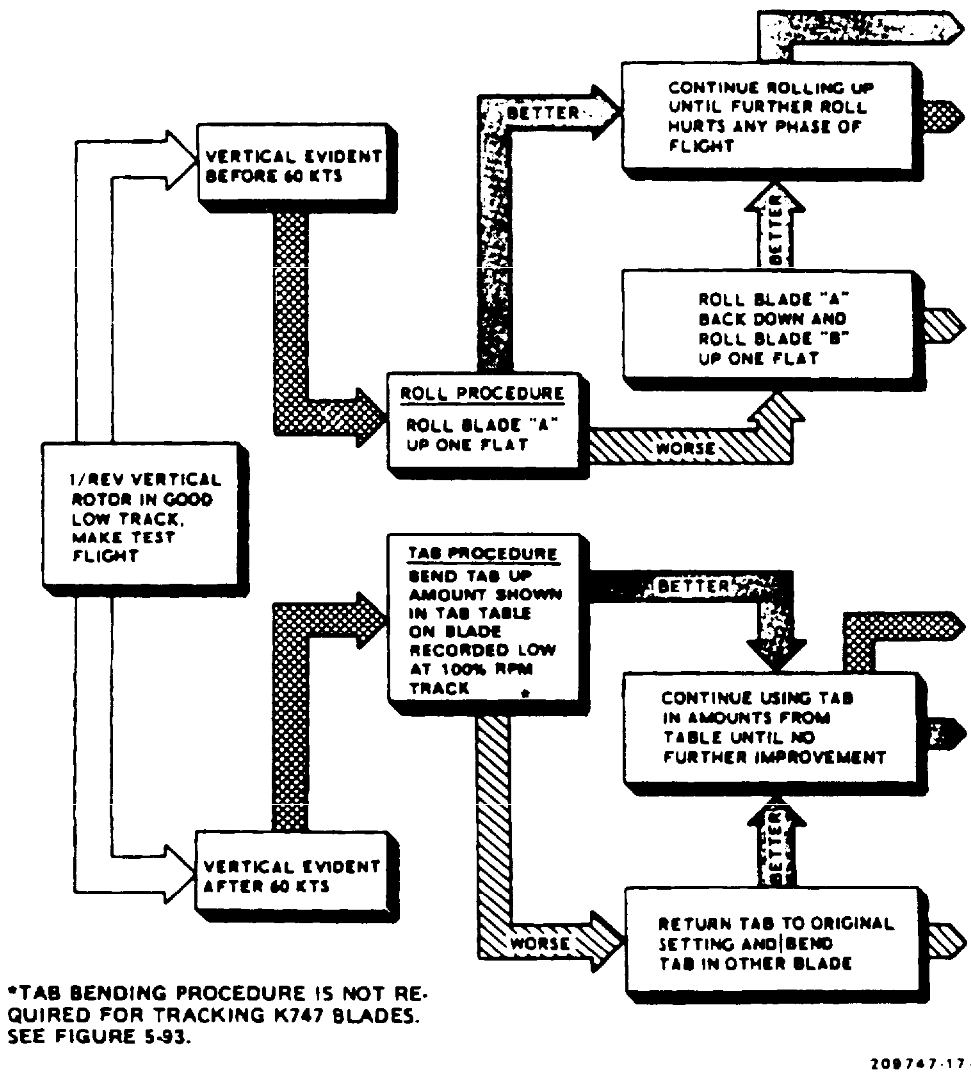
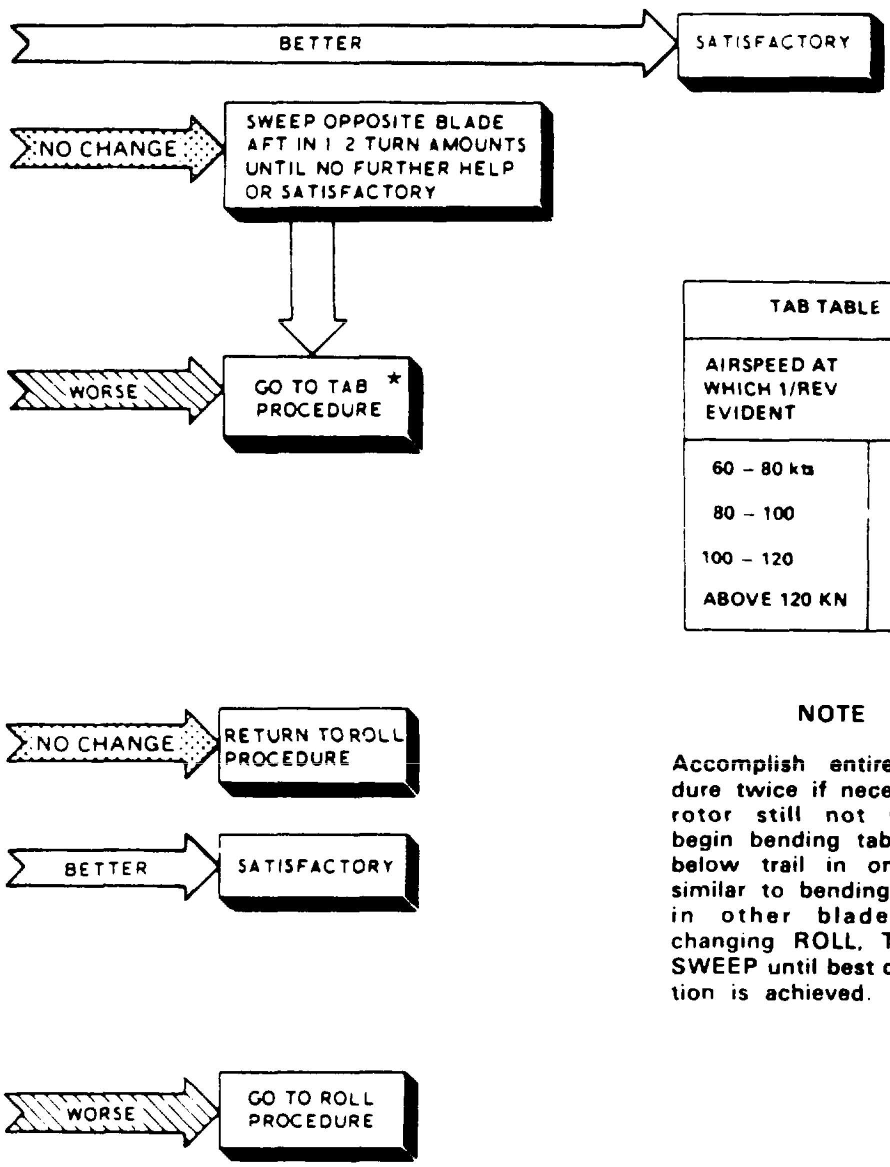


Figure 5-94. Vertical Vibration Correction Chart (Sheet 1 of 2)



TAB TABLE *	
AIRSPEED AT WHICH 1/REV EVIDENT	TAB
60 – 80 kts	4°
80 – 100	3°
100 – 120	2°
ABOVE 120 KN	1°

NOTE

Accomplish entire procedure twice if necessary. If rotor still not smooth, begin bending tab DOWN below trail in one blade similar to bending tab UP in other blade. Keep changing ROLL, TAB and SWEEP until best combination is achieved.

* TAB BENDING PROCEDURE IS NOT REQUIRED FOR TRACKING K747 BLADES SEE FIGURE 5-95.

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Figure 5-94. Vertical Vibration Correction Chart (Sheet 2 of 2)

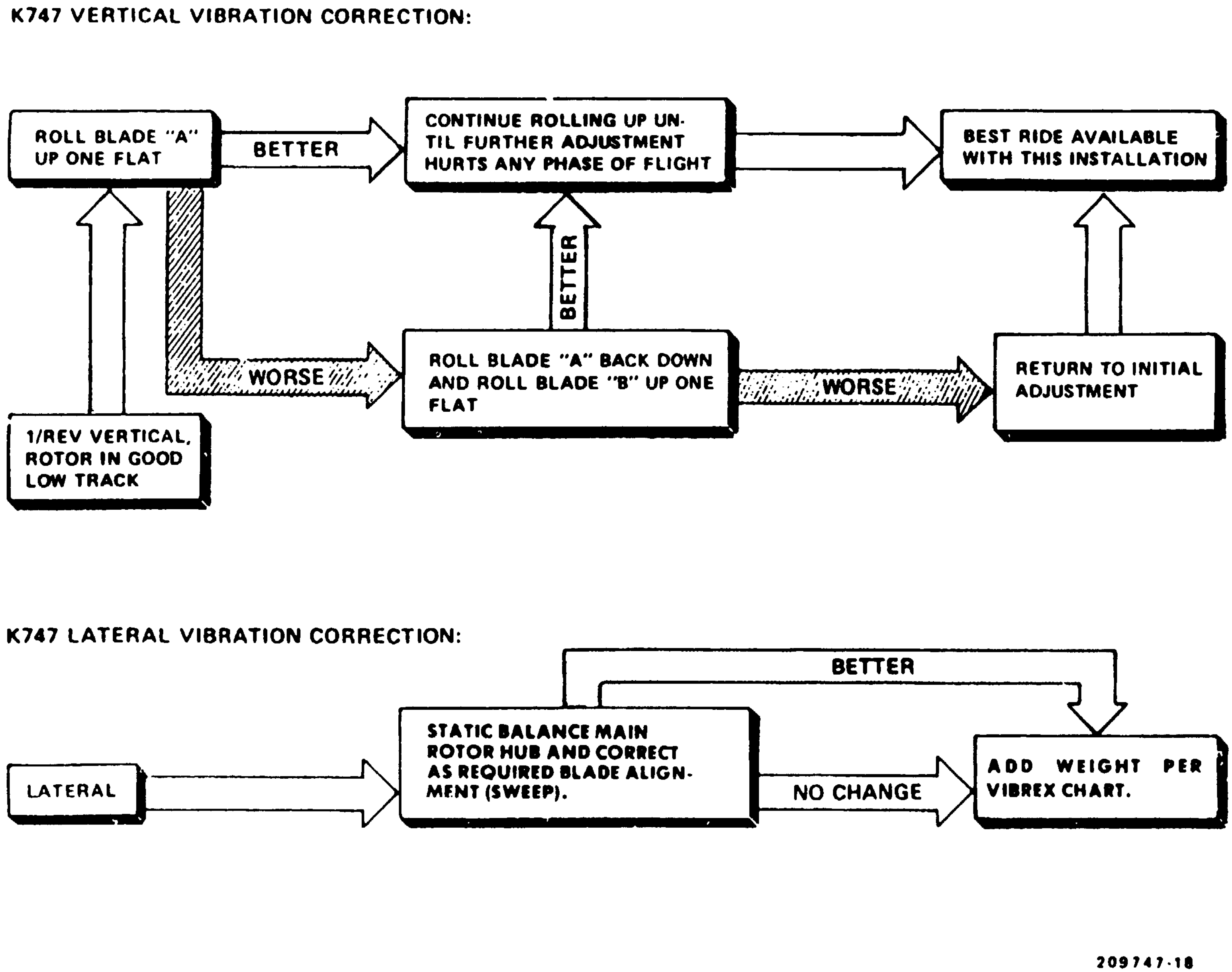

Figure 5-95. Vertical and Lateral Vibration Chart for K747 Rotor Blades

(d) After each adjustment, test fly helicoptar to observe effect. Continue until vertical vibration is reduced to acceptable level.

(6) Test fly helicopter through full airspeed range to check for lateral vibrations. if lateral vibration is severe enough to require correction, follow the sequence below and as shown in figure 5-96.

(a) Use two-inch wide masking tape (C123) and apply to blade near the tip. When satisfactory operation is obtained, remove the tape and count number of wraps as the tape is removed. Remove hexhead plug from top of blade retaining bolt assembly (25, figure 5-2) on taped blade. For each full wrap of tape, add 2.4 ounces of lead in bolt. Reinstall plug.

(b) Sweep blade (step (5) (c) above).

(c) Check and adjust grip spacing as required (paragraphs 5-43).

(d) Align blades (paragraph 5-13).

(7) Prior to incorporation of MWO 55-1520-244-50-9, check rotor rpm in autorotation. If rotor overspends, shorten both pitch link assemblies equally. If rotor underspends, lengthen troth pitch link assemblies equally. One turn of barrels will change rotor rpm approximately 3 percent. Lockwire (C138) upper jamnut to barrel. Lockwire (C138) barrel and lower jamnut to pitch link assembly tube. Repeat flight check and adjust as necessary.

(7.1) After incorporation of MWO 55-1520-244-50-9, check rotor rpm in autorotation. If rotor overspends, shorten both pitch link assemblies equally. If rotor underspeeds, lengthen both pitch link assemblies equally. One-half turn of tube assembly will change rotor rpm approximately 3 percent. Lockwire upper and lower jamnuts to pitch link assembly tube. Repeat flight check and adjust as necessary.

c. K747 perform following procedures as required for acceptable smooth operation of main rotor. Recommended sequence of procedures is also provided in charts (figures 5-93, 5-94, and 5-95).

WARNING

Runup of helicopter shall be performed only by personnel authorized by AR95-1.

K747 main rotor blades have a tendency to attain a higher percent RPM during autorotation, then B540 main rotor blades. DO NOT RIG (adjust length of pitch link assemblies) beyond the limits established in paragraph 5-14, step q to obtain a lower main rotor percent RPM.

NOTE

K747 blades, new and repaired, may have tip weights (P/N 747-063-11) added or removed to obtain proper tracking and balancing. A maximum of 32 weights may be used.

(1) Adjust pitch link assembly (figure 5-9) to accomplish main rotor tracking for K747 blades. Refer to paragraph 5-116 for VIBREX 4591 system tracking procedures.

(2) Perform a low speed blade track at 91 percent rpm. If track is satisfactory, omit step (3) and proceed to step (4).

(3) Prior to incorporation of MWO 55-1520-244-50-9, correct a low speed out-of-track condition by shortening pitch link attached to the low blade to roll the blade up (figure 5-9). Loosen jamnuts and turn barrel to shorten tube. Turning barrel three turns will change blade track approximately 0.375 inch. Tighten and lockwire (C138) nuts. Repeat checks and adjustment until satisfactory.

NOTE

After application of lockwire, apply a thin cost of sealant (C105) around the lock nut and threads of the rod end to prevent water intrusion.

(3.1) After incorporation of MWO 55-1520-244-50-9, correct a low speed out-of-track condition by shortening pitch link assembly attached to the low blade to roil the blade up (figure 5-9). Loosen jamnuts and turn tube assembly to shorten tube. Turning tube one and one-half turns will change blade track approximately 0.375 inch. Tighten and lockwire (C138) nuts. Repeat checks and adjustments until satisfactory.

(4) Perform a high speed track at 100 percent rpm. If out-of-track record which blade is low but make no adjustments.

(5) Test fly helicopter. If vertical vibration is not evident proceed to step (6). If vertical vibration requires correction, begin sequence of adjustments indicated in figure 5-95 as applicable according to airspeed where vibration occurs.

(a) To roll a blade, adjust pitch link as in step (3) above.

(b) To sweep a blade, loosen jamnuts on blade drag brace (12, figure 5-2) enough to turn barrel one full turn as shown by decal arrows. Torque jamnuts 150 TO 200 foot-pounds without moving barrel. Record all such adjustments, and do not exceed TWO full turns total adjustments.

NOTE

The blade sweep adjustments Is also used to correct lateral vibration. Refer to step (6).

If maximum blade sweep adjustment falls to correct rotor vibrations remove main rotor hub and blade assembly and align blades (paragraphs 5-12 and 5-13).

(c) After each adjustment, test fly helicopter to observe effect. Continue until vertical vibration is reduced to acceptable level.

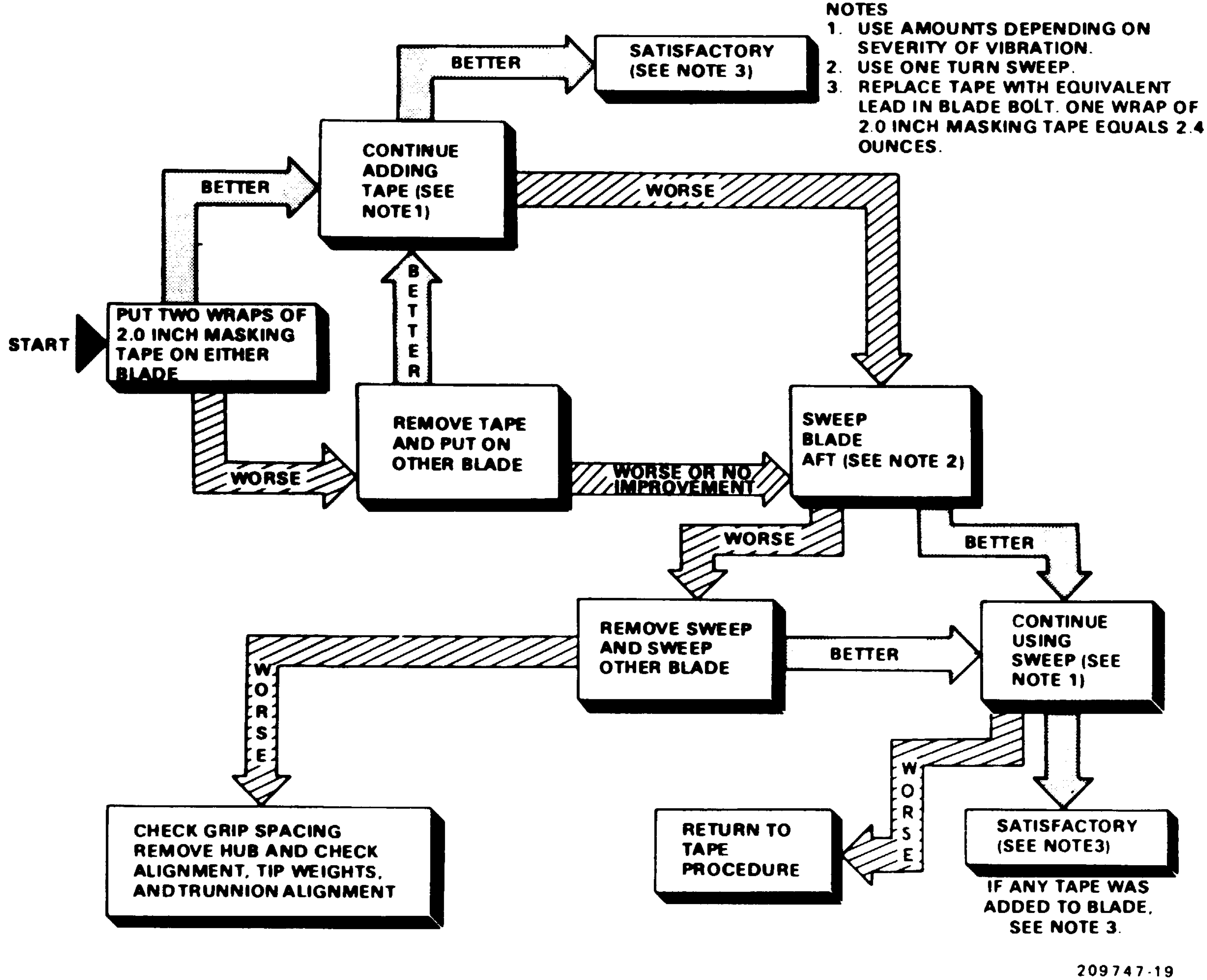

Figure 5-96. Lateral Vibration Correction Chart for B-540 Rotor Blades

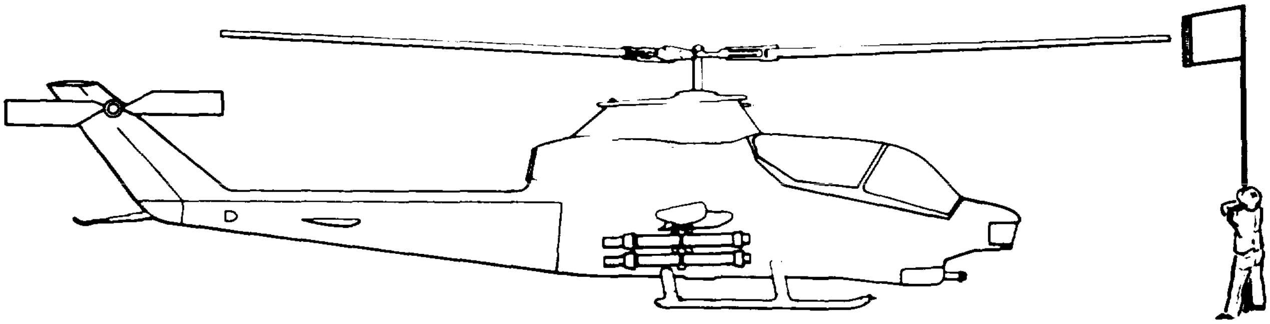

Figure 5-97. Tracking Main Rotor

(6) Test fly helicopter through full airspeed range to check for lateral vibrations. If lateral vibration is severe enough to require correction, request AVIM assistance to check alignment of installed blades (sweep).

WARNING

K747 main rotor blades have a tendency to attain a higher percent RPM during autorotation than B540 main rotor blades. DO NOT RIG (adjust length of pitch link assemblies) beyond the limits established in paragraph 5-14, step q to obtain a lower main rotor percent RPM.

(7) Prior to incorporation of MWO 55-1520-244-50-9, check rotor rpm in autorotation. If rotor overspeeds, shorten both pitch link assemblies equally. If rotor underspeeds, lengthen both pitch link assemblies equally. One turn of barrels will change rotor rpm approximately 3 percent. Lockwire (C138) jamnuts. Repeat flight check and adjustment as necessary.

(7.1) After incorporation of MWO 55-1520-244-50-9, check rotor rpm in autorotation. If rotor overspeeds, shorten both pitch link assemblies equally. If rotor underspeeds, lengthen both pitch link assemblies equally. One-half turn of tube assembly will change rotor rpm approximately 3 percent. Lockwire upper and lower jamnuts to pitch link assembly tube. repeat flight check and adjust as necessary.

5-115. TRACKING – TAIL ROTOR BLADES.

Premaintenance Requirements For Tracking of Tail Rotor System

Condition	Requirements
Model	AH-1E, F, & P
Part No. or Serial No.	All
Special Tools	NA
Test Equipment	Tracking stick
Support Equipment	NA
Minimum Personnel Required	Two
Consumable Materials	(C92)
Special Environmental Conditions	None

NOTE

The VIBREX 4591 system is the preferred method of tracking tail rotor blades. (Refer to paragraph 5-142.)

a. After replacement of installation of tail rotor hub blades or pitch change systems, check tail rotor rigging and set pitch links to 2.74 ± .010 inches between the jam nuts. Note this jam nut to jam nut dimension does correspond to the dimension of 6.115 ± .010 inches between the centers of the pitch link bearings. Tail rotor tip clearance shall be checked and both pitch link adjusted if necessary. This procedure may be used instead of tracking the tail rotor blades using a strobe light.

NOTE

The strobe-type tracking device may be used if available (paragraph 5-116).

b. Make a tracking stick by attaching a small piece of sponge rubber 1/8 TO 1/4 inch thick to end of a 1/2 X 1/2 inch pin stick, approximately 4 feet long or any other flexible device. Coat sponge rubber with Prussian blue (C92) or similar type of coloring thinned with oil.

WARNING

The runup shall be performed by personnel authorized in accordance with AR 95-1.

WARNING

Do not approach the tail rotor area for the purpose of tracking until 100 percent rpm has been established and it is certain that the helicopter is not going to yaw left or right due to rigging error or slippery parking surface. injury or death could result from being struck by the tail rotor blades

c. Start engine. Run at 100 percent rpm with pedals in neutral position. Rest tracking stick on underside of tail fin assembly as shown in figure 5-98. Slowly move tracking stick toward disc of tail rotor just far enough to lightly contact a blade approximately one inch from tip. Pull stick back immediately.

d After contact is made, stop engine and allow rotor to stop. Shorten pitch link assembly on unmarked blade 1/2 turn of rod end. Reinstall pitch link assembly bolt, washers and rotter pin.

Figure 5-98. Tracking Tail Rotor

e. Recheck track of blades. Proceed with adjustments, if required, by adjusting pitch links equally in opposite directions.

f. Make operational test flight and check that normal right and left turn can be made in autorotational and powered flight.

g. Check tail rotor forces as follows:

(1) Start engine and run at 100% with pedals in neutral position.

(2) Turn force trim-OFF. Place HYDR control switch to SYS 2-ON, so tail rotor hydraulic cylinder is not powered. Observe pedals remaining at neutral when foot pressure is removed.

(3) If left pedal creeps forward, less weight is needed on tail rotor counterweight.

(4) If right pedal creeps forward, more weight is needed on tail rotor counterweight.

(5) Move HYDR switch to ON position and shut down engine.

CAUTION

Identical weight must be maintained at all four positions on bellcrank. Use maximum of two weights and one washer, or minimum of one weight and five washers.

h. Adjust tail rotor forces as follows:

(1) Remove nut (19, figure 5-76) and washer (18) from bolt (16).

(2) Add or remove weight es determined in steps g(3) or g(4). Remove only one weight at each position. Replace with AN960 or AN970 washers, or a combination of both types.

(3) Install washer and nut on bolt. Torque nut 50 TO 70 inch-pounds.

(4) Repeat check and adjustment steps until forces are satisfactory.

(5) Track tail rotor blades.

5-116. TRACKING AND BALANCING ROTOR BLADES AND TROUBLESHOOTING OTHER ROTATING ELEMENTS USING THE VIBREX 4591 SYSTEM.

5-117. DESCRIPTION-VIBREX 4591 SYSTEM.

a. The Vibrex 4591 System may be used to electronically track and balance main and tail rotor blades and troubleshoot other rotating elements. See figure 5-99 for view of Vibrex System components.

b. Description and specifications of the Vibrex 4591 System are presented in FO3 (foldout 3). Using the synchronized Strobex, track is visually displayed by rotor Tip Targets. One-per-revolution vibration is measured from an Accelerometer mounted laterally on the airframe to indicate the condition of main rotor balance. Another Accelerometer, mounted vertically in the front cockpit, reads vertical vibration from out-of-track. The Balancer meter indicates amount, and the Phazor shows location of the required correction, when interpreted by the Track and Balance Charts. Tail rotor balancing is done by mounting an Accelerometer on the fin near the tail rotor gear box. Amplitude of vibration is read from the Balancer meter to indicate the amount of weight change required, and the Strobex, triggered by the Balancer, shows “Clock Angle” that tells where to put the weight. Tail rotor Balance Charts interpret these readings. To locate sources of vibration other than the rotors, the Accelerometer is relocated and the Balancer's filter is tuned to the peak vibration levels. The RPM rate of these vibrations is related to known component RPM to identify the offending element.

c. Track and Balance Charts, Checklist and “Clock Angle” Corrector. Charts tell what to do to rotor, in response to reading from Balancer, to correct track or balance.

d. Magnetic Pickup, Bracket, and Cable. Mounted on stationary swashplate of main rotor, the Magnetic Pickup delivers an electrical pulse that seines as a trigger for the Strobex for main rotor tracking, and as a phase reference for the phase meter in the Balancer.

e. Accelerometers, Accelerometer Bracket, and Cable. Accelerometers sense the vibration induced by rotors, shafts, fans, bearings, gears, etc.

f. Tip Targets. One is mounted on each main rotor blade tip. Used for viewing main rotor track.

g. VIBREX Tester. For functional test of the VIBREX 4591 System.

h. Strobex Blade Tracker. Used for tracking both main and tail rotors, and for measuring “Clock Angle” when balancing tail rotors.

i. Gram Scale. For weighing balance weights.

j. Carrying Case. For all the equipment.

k. Interrupters. Two Interrupters are mounted on the rotating swashplate of the main rotor, 180° apart. Each time an Interrupter passes the Magnetic Pickup, an electrical pulse is generated in the Pickup. These pulses cause the Strobex to flash twice-per-revolution to illuminate reflective Targets on the blade tips for visual tracking.

One of the Interrupters is double, delivering a double pulse from the Magnetic Pickup, once-per-revolution.

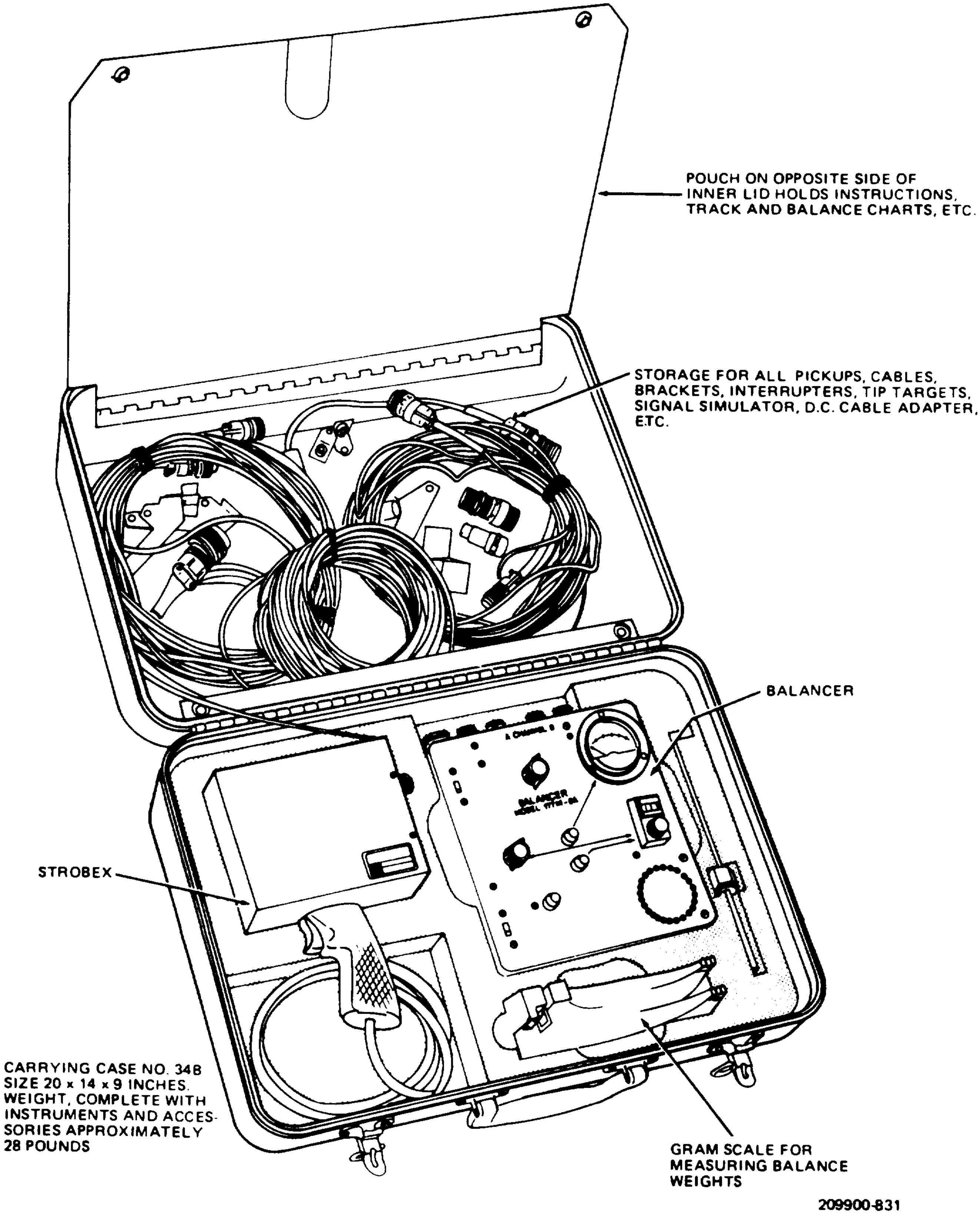

Figure 5-99. Vibrex 4591 System Components and Carrying Case

This serves as the needed one-per-revolution phase reference signal for the Phazor section of the Balancer.

1. Balancer/Phazor Unit. Measures amplitude and phase, or "Clock Angle, " of the vibration induced by rotors and other components that are out-of-balance or track.

5-118. GENERAL NOTES.

CAUTION

Do not plug the VIBREX into 110 volt power. The instruments may be damaged. Do not set Balancer "RPM Tune" dial below 100. The circuits are unstable and the readings useless.

a. There are two basics which MUST be understood and mastered to utilize the System effectively.

One is the tuning of the Balancer band-pass filter. This procedure is spelled out in detail and takes but little practice. Follow the instructions carefully!

The other requirement is a good grasp of the Charts. It is important to know the direction in which the "Move Line" SHOULD go in response to a certain change on the rotor. (The "Move Line" is the line connecting the data points before and after a change on the rotor.) Only then can it be determined whether the Chart is "matched" to the helicopter being worked. Chart examples are given, with explanations.

b. It is normal operation for the "Clock Angle" to become uncertain and erratic as balance is improved. A "jittery" "Clock Angle" is generally an indication of a good balance.

c. When the Balancer is first plugged in (or power applied), the meter will deflect to full scale for a few seconds. This is normal, and the meter is protected so no damage results.

d. Do not change the connector on the Balancer DC Cable. Use DC Adapter #3140-9 which is a foot-long Cable with a connector at one end to mate with the Balancer's connector, and a connector at the other end to mate to the helicopter.

e. When tracking rotor blades, look directly over top of Strobex when viewing retro-reflective Targets. Those who are sitting or standing to the side of the user will see the Targets very dimly, or not at all, because the reflected light returns to the source and not to the observer to the side.

f. A RULE-OF-THUMB: As long as a good "Clock Angle" can be measured in the Phazor, or with the Strobex, the balance or track can, and should, be made better. When balance is perfected to the point where the "Clock Angle" becomes too unsteady or erratic, it can no longer be determined where to put the weight, and the job must be considered complete.

g. It may not be possible to achieve a satisfactory ride over a wide speed and load range due to differences in rotor blade characteristics. These differences in flight characteristics are usually revealed when working track with the vertical Accelerometer.

h. FOCUS OF THE FLASH TUBE IN ITS PARABOLIC REFLECTOR IS ESSENTIAL! Periodically shine the light on a wall 10 to 20 feet distant and check for a bright spot 1 to 2 feet in diameter. If this is not seen, FOCUS IN ACCORDANCE WITH INSTRUCTIONS IN TM 55-4920-402-13&P.

(1) "IPS" (inches-per-second) or maximum velocity as the object passes through the center of its vibratory motion. Knowing frequency, or RPM, this can be related to displacement (roils) or G force (G) as follows.

$$D \text{ (mils, peak-to-peak)} = \frac{\text{“IPS”} \times 19{,}000}{\text{RPM}}$$

$$G \text{ (peak)} = \frac{\text{“IPS”} \times \text{RPM}}{3686}$$

(2) When the filter is properly tuned, there should be no change in either "'Clock Angle" or "IPS" when the "Verify Tune" button is pushed. The Accelerometer is sensitive only along its cylindrical axis. If shaken radially, it will have little or no output.

5-119. TRACK AND BALANCE CHARTS.

a. The Charts are the “computers” that are used to plot the measurement of vibration (“Clock Angle” and amplitude) obtained from the Balancer/Phazor. (The Strobex is used to measure “Clock Angle” in the case of tail rotors.) The main rotor Charts tell the weight or sweep required to balance the main rotor, pitch-link, or tab required to track it. Tail rotor Charts show amount and location of weight needed to balance.

A different Chart is provided for each rotor of each helicopter type, A Chart (Figure 5-100) consists of:

(1) A clock face (12 radial lines) representing “Clock Angle, ” or location of the vibration;

(2) A set of 10 concentric circles representing “IPS,” or amplitude of vibration, drawn over the clock face, with zero at the center and 1.0 “IPS” at the outside; and

(3) A graph over the clock face and “IPS” circles, whose axes are geometrically related to the points at which rotor changes (weight, sweep, pitch-link, or tab) can be made.

b. The intersection of “IPS” circle and “Clock Angle” line defines a point on the Charts. From this point, lines to the axes of the graph show amount and location of change or adjustment to accomplish track or balance. The objective is to reduce the vibration to the lowest possible level, or the center of the Chart, “Clock Angle” is not important, except as a means of getting there (it tells where to make the change). Low “IPS” (vibration) level is the only important consideration.

5-120. MAIN ROTOR CHART EXAMPLES AND CORRECTIONS.

NOTE

Take balance readings only when blades are in-track.

5-121. READING A MAIN ROTOR BALANCE CHART. (Figure 5-101).

a. Assume a reading of 10:00 o’clock and 0.6 “IPS.”

b. Plot this on the Chart, labeling it point #1. Sketch lines to the two axes of the Chart,

c. The Chart calls for about 180 grams in the “blank” blade bolt, and for sweeping the “blank” blade aft about 6 flats.

d. The first “move” should involve only one change. Sweep should be selected, because it is further from the zero line and calls for the greater change.

e. If the “move” were perfect, the next reading should be at 11:45 o’clock and about 0.4 “IPS,” Label this point #2.

f. Now, addition of 180 grams to the blank blade should reduce the lateral vibration to near zero, Label it #3.

NOTE

Observe that when weight is added to a blade, the “Move Line” should be parallel to the weight arrow along the edge of the Chart. If sweep is changed, the “Move Line” should be parallel to the sweep axis arrows.

NOTE

It can be seen that if weight were subtracted from the “target” blade, it would have exactly the same effect as weight addition to the “blank.” The blade bolts should always be checked, and weight subtracted whenever possible.

5-122. WORKING WITH A HELICOPTER THAT DOES NOT “MATCH” THE CHART (INCORRECT “CLOCK ANGLE”), (Figure 5-102).

It is very seldom that a Chart needs to be corrected, but an explanation of its simplicity is important. The dynamic response (vibration characteristics) of one helicopter of a given type may not be exactly the same as another. This can cause the vibration of the airframe to occur at a different time (or different phase) in response to a given pitch-link or weight change. Thus, the helicopter does not “match” the Chart. It is easy to correct the Chart. The process is described here:

a. Assume the same reading of 10.00 o’clock and 0.6 “IPS.” Label it point #1.

b. Make the same 6 flat sweep change to the “blank” blade, as indicated.

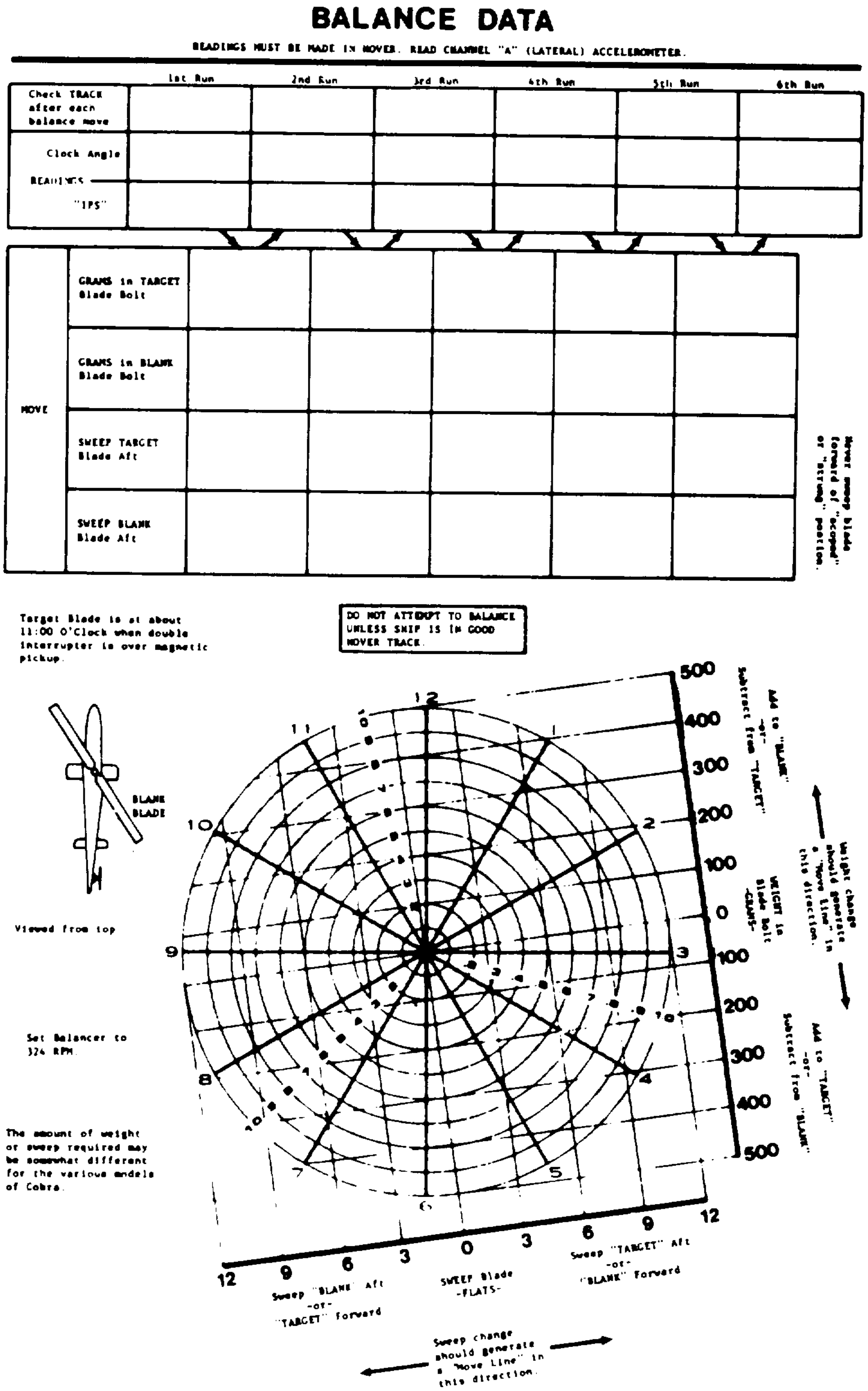

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Figure 5-100. A Main Rotor Balance Chart

BALANCE DATA

READINGS MUST BE MADE IN HOVER. READ CHANNEL "A" (LATERAL) ACCELEROMETER.

	1st Run	2nd Run	3rd Run	4th Run	5th Run	6th Run
Check TRACK after each balance move						
READINGS Clock Angle	10:00	11:45	12:00			
READINGS "IPS"	0.6	0.4	0.02			

MOVE						
GRAMS in TARGET Blade Bolt						
GRAMS in BLANK Blade Bolt		180 gms				
SWEEP TARGET Blade Aft						
SWEEP BLANK Blade Aft	6 flats					

Never sweep blade forward of "Scoped" or "Strong" position.

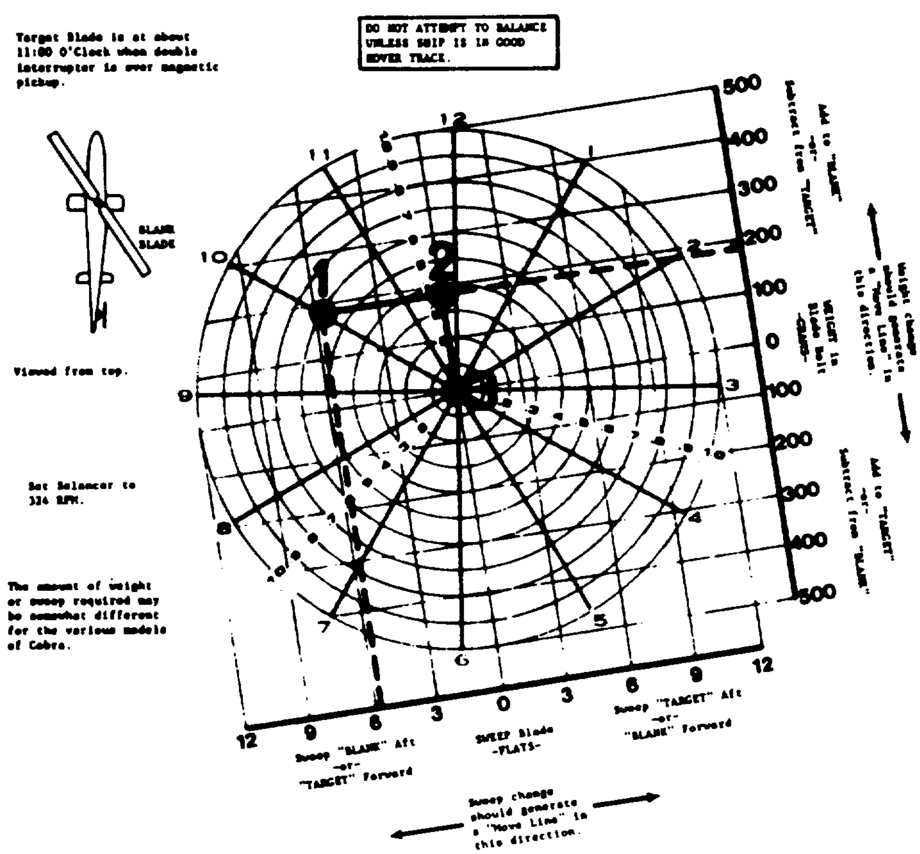

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Figure 5-101. Reading a Main Rotor Balance Chart

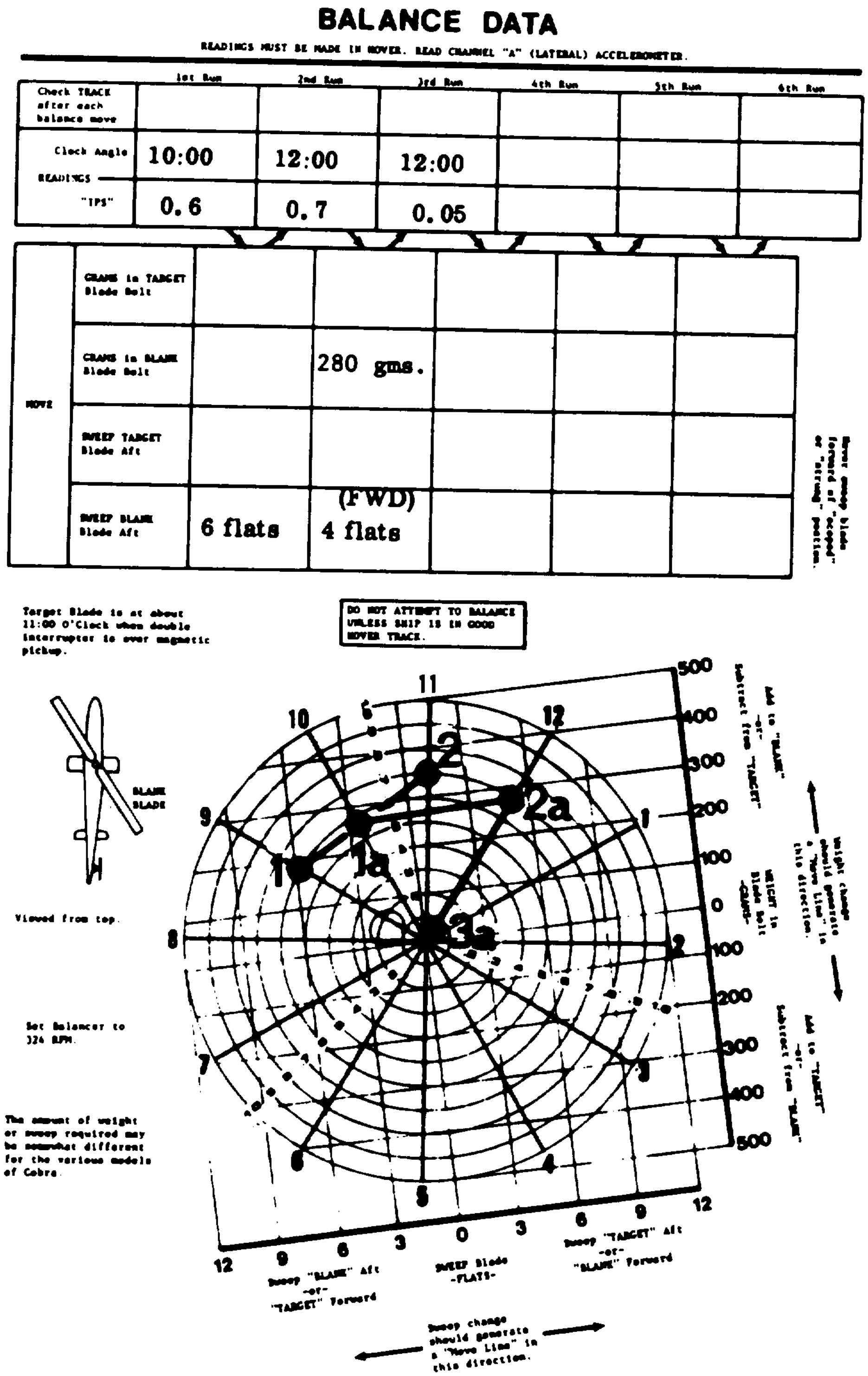

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Figure 5-102. Reading a Main Rotor Balance Chart With an Incorrect “Clock Angle”

c. This time, however, assume the next reading is 12:00 o'clock and 0.7 "IPS." Label it #2.

NOTE

The "Move Line" between points #1 and #2 correctly shows a change in sweep (although the amount is not correct). The problem, though, is that if the points are traced back to the weight axis, a change is indicated there, too. THIS CANNOT BE CORRECT, BECAUSE NO WEIGHT CHANGE WAS MADE.

d. Thus, "Clock Angle Corrector" #3597 must be used to make the Chart "match" the helicopter as follows:

NOTE

It is not necessary to be concerned about the length of the "Move Line" because it is quite obvious that too great a change will cause too long a "Move Line", etc. DIRECTION OF THE "MOVE LINE" IS THE BIG CONCERN.

(1) Place eyelet "A" of "Clock Angle Corrector" on the first reading.

(2) Rotate the body of "Corrector" so line "A-O" lies in the direction "Move Line" SHOULD HAVE GONE (parallel to the sweep arrow along the edge of the Chart).

(3) Swing index "A-B" in the direction the "Move Line" DID GO.

(4) Read the required correction to the "Clock Angle" on the Chart, and assign new numbers to the clock. In this case, it says to subtract one hour.

(5) Replot points #1 and #2, on the renumbered clock. Label the new points #1a and #2a.

NOTE

Observe that the new "Move Line" #1a and #2a, is now parallel to the arrow associated with sweep change.

(6) It can be seen that the blade should have been swept only 2 flats, and that 280 grams of weight will be required, instead of the 180 originally called for.

(7) Try both changes at once and see if point #3a is about right.

NOTE

Make all subsequent plots on the "corrected" clock. If there l re questions about the validity of the corrected clock, make a substantial change to one blade only. Then, verify that the "Move line, " as a result of that change, is correct (parallel to the arrow associated with the blade change).

If subsequent "moves" are erratic and inconsistent (appearing to require a different "Clock Angle" correction each time), the trouble is probably due to faulty rotor bearings, linkages, dampers, etc. LOOK FOR THE PROBLEM !

5-123. READING THE TAIL ROTOR CHART (FIGURE 5-103).

The tail rotor Chart is used in the same manner as the main rotor Charts. Assume a first reading of 3:00 o'clock and 0.75 "IPS". This calls for addition of about 30 grams to "Blank" B and 15 grams to "target" A. Since the 30 gram point "B" IS farther from the zero axis, that weight is added there first. The next reading should be 11:30 o'clock and 1.1 "IPS". Then, addition of 15 gram to "target" A should reduce the vibration to a satisfactory level.

NOTE

Tail rotor vibration amplitude is mad from the Balancer meter, but since there is no Magnetic Pickup on the tail rotor to deliver the needed Phazor input, "Clock Angle" is determined with the Strobex instead of the Phazor. The Phazor lights will light, but they are meaningless and should be ignored, since there is no Magnetic Pickup input.

Weight addition to one point only. for the first "move", is good practice to be sure the Chart and helicopter are matched. With experience, both weights can be changed at once.

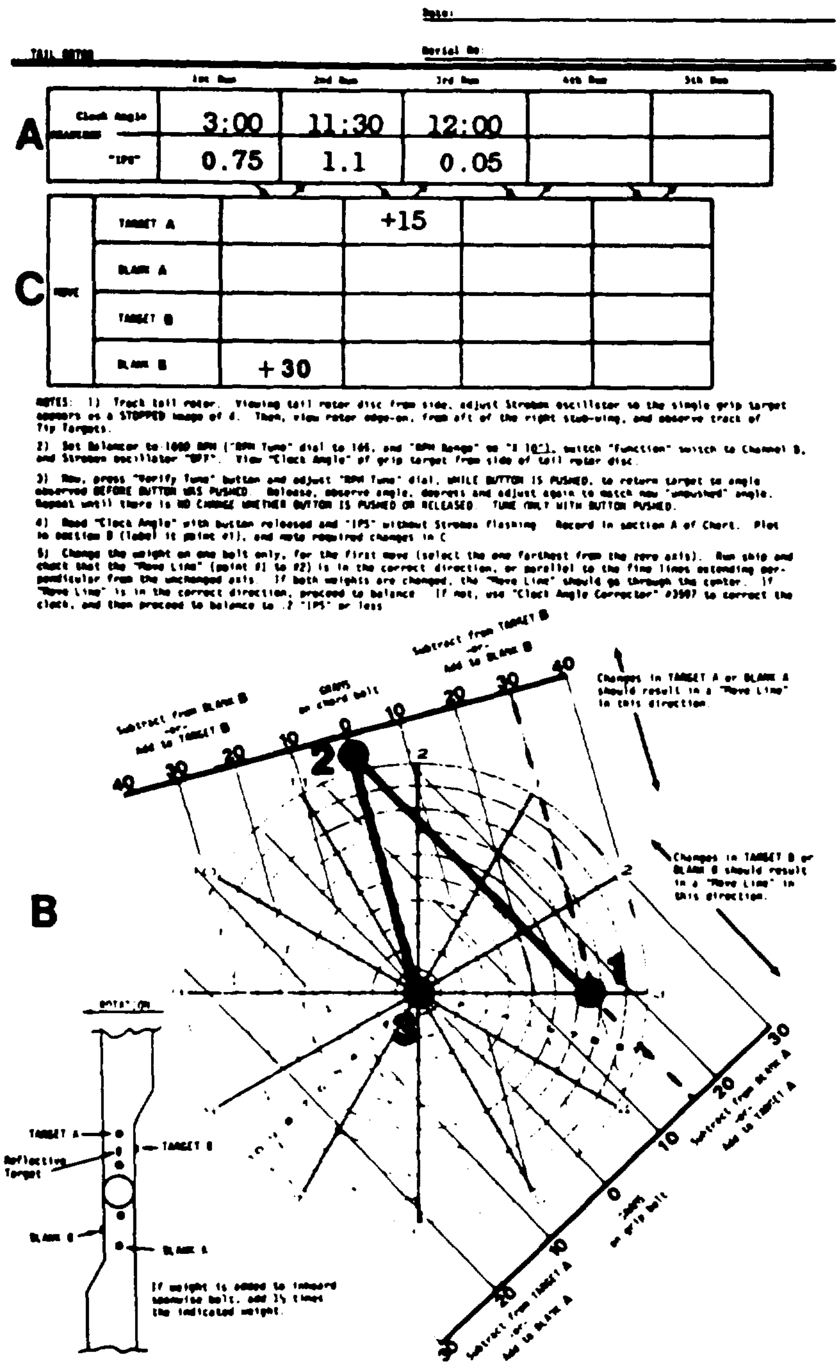

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Figure 5-103. Reading the Tail Rotor Charts

5-124. USING THE VIBREX.

NOTE

Perform operational checkout outlined In Section II, Chapter 3, TM 55-4920-402-13 & P prior to us. of Vibrex.

In order to use the VIBREX, the helicopter must be fitted as follows:

5-126. MAIN ROTOR.

5-126. NECESSARY EQUIPMENT.

QUANTITY	EQUIPMENT NEEDED	MODEL NUMBER
1	Balancer/Phazor	177M-6A
1	Strobex Tracker	135M-11
1	Gram Scale	47
*1	Magnetic Pickup Cable	3319-2
*1	Magnetic Pickup	3030
*1	Magnetic Pickup Bracket	4559
*2	Interrupters	3251-1 3251-2
*2	Accelerometers	4177B
*2	Accelerometer Cables	4296-2
*2	Accelerometer Brackets	3382
*1	Set of Tip Targets	3387
*1	DC Adapter Cable	3140-9
1	M/R Track and Balance Chart	4273

* Denotes equipment physically mounted to the aircraft. Installation and removal should be double checked.

NOTE

This list should be checked prior to and after balancing to ensure that the proper equipment is or hand before proceeding and that all equipment is removed upon completion.

5-127. ATTACH MAGNETIC PICKUP (FIGURES 5-104 AND 5-105).

Attach Magnetic Pickup Bracket #4559 to the left-front pitch-horn of the fixed swashplate.

a. Remove cotter pin, nut, and washer from bolt through left lateral pitch-horn of fixed swashplate.

NOTE

The half inch bolt must be installed with its head to the front-right (toward center line of ship) and the nut to the left-rear (outboard).

b. Place Magnetic Pickup Bracket #4559 on me bolt. The two plastic coated “fingers” must straddle the pitch-horn, to prevent the Bracket from rotating. The flange with the 0.625 inch diameter hole will be pointing up.

c. Replace the nut (do not use the washer), torque, and replace the cotter pin.

d. Place Magnetic Pickup #3030 in 0.625 inch hole with connector away from mast. Use thin jamnut on each side of Bracket, leaving them loose, with the tip of the Pickup extending as little as possible. Adjust and tighten nuts later.

5-128. Attach Interrupters (Figures 5-104 and 5-105). Mount Interrupters #3251-1 and -2 on the rotating swashplate.

a. Remove nuts and washers from four studs indicated by “X” (figure 5-105) on the outer ring of the rotating swashplate.

b. Turn the head so the red blade is at 11:00 o’clock and place the double Interrupter, with pointed flanges down, at the left-front of the swashplate, This becomes the “target” blade, (Later, you will put the horizontal Target on the red blade tip — so RED = target = horizontal.)

c. Place single Interrupter on the opposite pair of studs (at right-rear).

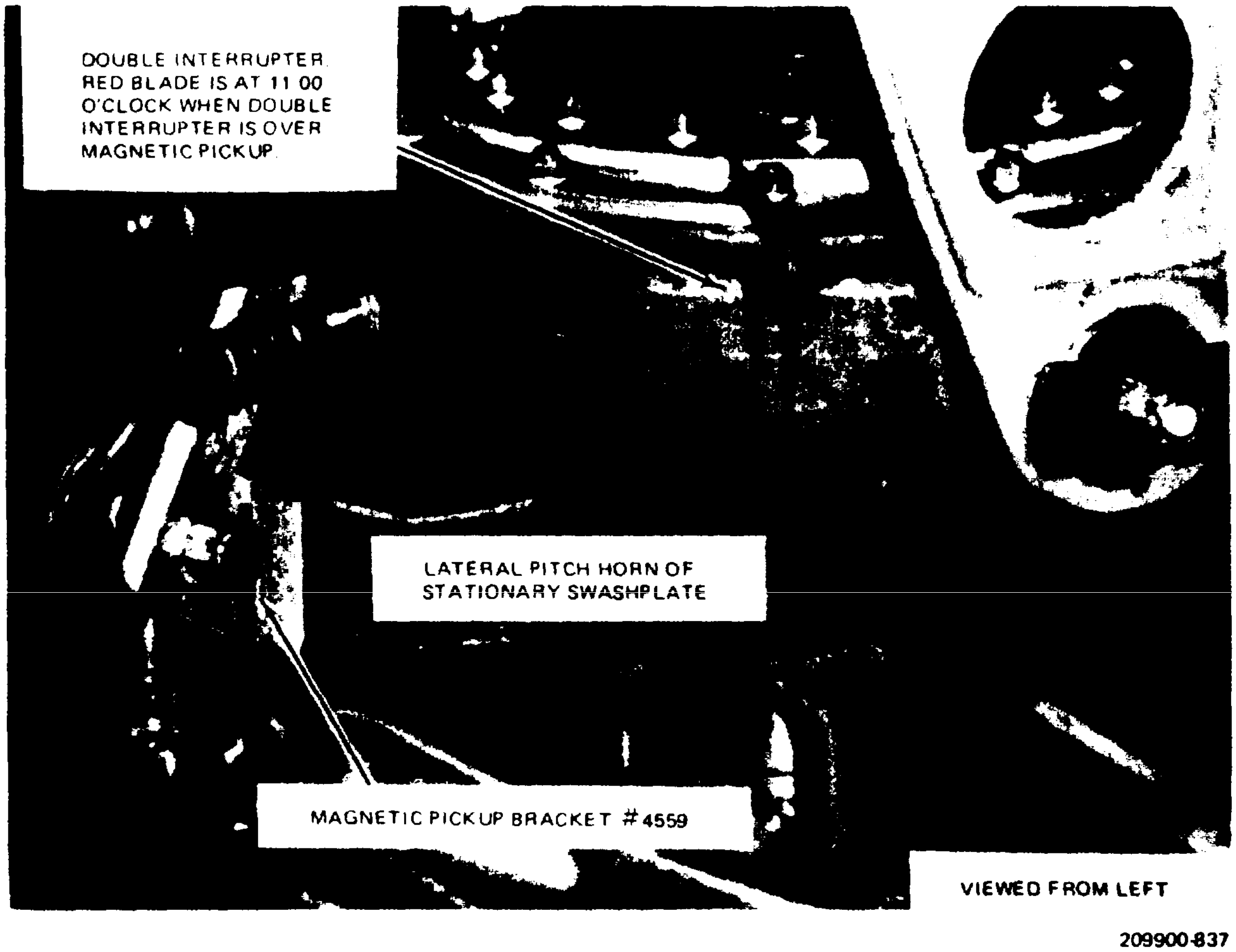


Figure 5-104. Magnetic Pickup and Double Interrupter Installation.

d. Replace nuts, (do not reinstall washers at this time, save washers for reinstallation after removing interrupters), torque nuts.

NOTE

When installing interrupters, push them in toward mast as the nuts are tightened so they will both "seat" the same.

5-129. Adjust Magnetic Pickup Gap. Carefully -- BY HAND -- pull the rotor head through to line up an Interrupter with the Magnetic Pickup.

a. Adjust the Pickup for a 0.060 +/-0.010 inch clearance. HINT: A coin can be used as a feeler gauge. A penny is about 0.060 inch thick. A nickel is about 0.075 inch thick, A dime is about 0.050 inch thick and a quarter is about 0.070 inch thick.

b. Tighten and safety jamnuts on Pickup.

c. Pull head to other Interrupter. Check for proper clearance. (Clearances need not be precisely the same; 0.010 or 0.020 inch difference is acceptable.)

d. If difference is too great, loosen nuts on Interrupter and adjust as required.

5-130. Connect Magnetic Pickup Cable (Figure 5-106). Connect Cable #3319-2 to Magnetic Pickup.

a Move cyclic stick of helicopter to its farthest right-rear position, so left-front control rod is in its farthest up position (left-front corner of swashplate farthest up).

b. Plug Cable #3319-2 into Magnetic Pickup. Tape or tie Cable to control rod, just below rivets in swaged end, with only an inch or so of slack.

c. Bring Cable out the swashplate access door. Secure it with enough slack to allow complete and free movement of controls, but not enough so Cable can foul in any moving parts. Pinch Cable in door.

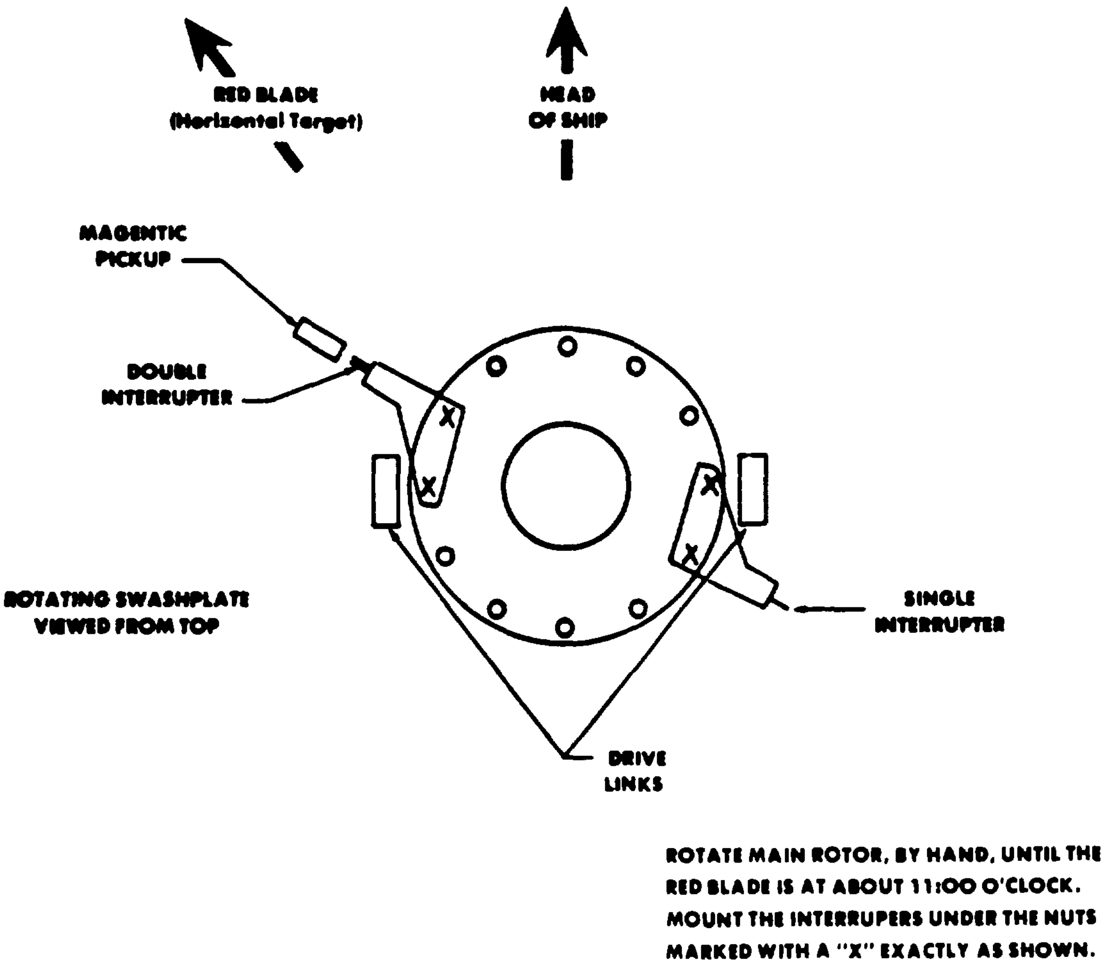


Figure 5-105. Magnetlc Pickup/Interrupter Installation.

d. Open hydraulics access door and pinch Cable in door (in top and out bottom). Then, dress forward under left side of pilot's canopy, taping about twice. Pass Cable into gunner's cockpit, behind headrest, and coil excess Cable between armor at gunner's right shoulder and canopy.

e. Remove gunner's elbow pads. Place Balancer on the right side and the Strobex on the left.. Leave enough Cable slack so Balancer may be used in observer's lap.

f. Alternate method for routing Cable Run Cable through the E.C.U. blower hole on forward wall of transmission area Add enough slack to allow complete and free movement of controls, but not enough so Cable can foul in any moving parts. Run Cable through hydraulic compartment on left side to grommeted hole at top of compartment just to the left of E.C.U., pass Cable through hole. Pass Cable into gunner cockpit, coil excess and stow in pilot left side storage pouch.

CAUTION

Avoid using tape in front of the engine air intake where it could F.O.D. the engine. Be sure instruments cannot jam controls. Check for free movement of cyclic, collective, and pedals.

5.131. Connect Balancer to DC Power (Figure 5-107). Plug Balancer into helicopter DC power. Use DC Adapter Cable #3140-9 and plug into map light at gunner seat. Remove retaining clip from front glass. Remove glass and bulb. Plug Cable #3140-9 into lamp socket. Be sure to turn lamp intensity to full brightness (CW).

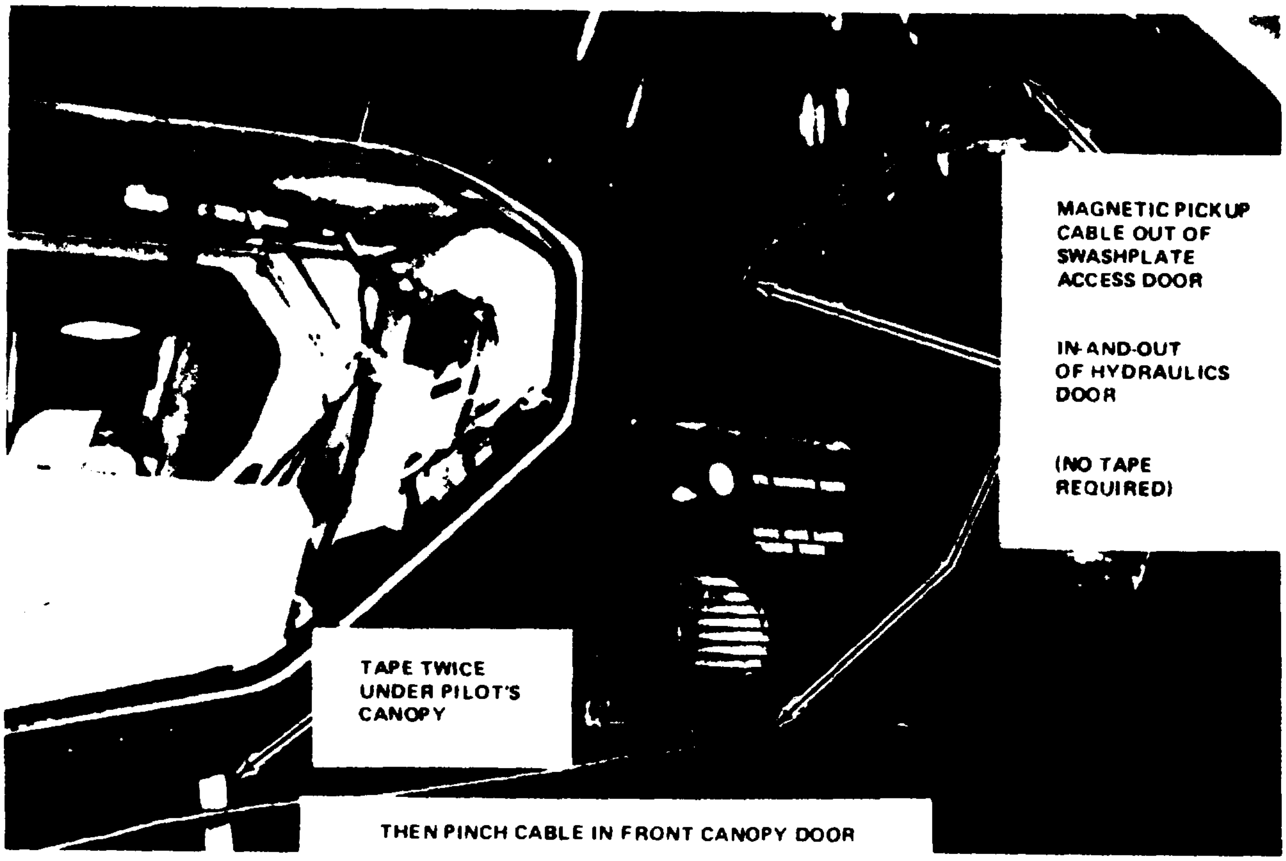


Figure 5-106. Magnetic Pickup Cable Installation

NOTE

In the older map lights, the lamp is removed from the side of the fixture, with its receptacle. When Cable #3140-9 is plugged into the receptacle, it cannot be replaced in the fixture; therefore, there is no ground connection. Use alligator clip on ground lead and clip onto a convenient screw or protrusion for the ground connection.

5-132. Mount Accelerometers and Connect Cables. (Figures 5-108 and 5-109.)

a. Using the 3382 bracket (2, figure 5-108), install one accelerometer (1) on the pilots compartment aft bulkhead with the connector pointing to the right side of the helicopter. Connect accelerometer to the A input on Balancer with one of the accelerometer cables.

b. Mount another accelerometer (figure 5-109) using another bracket #3382, to the right side of the front cockpit. Mount it with the lower forward screw of the copilot canopy removal system, arm and fire mechanism mount bracket. The accelerometer should be vertical with the CONNECTOR DOWN. Any other convenient screw may be used in the same area, Accelerometers are both inside the canopy. Connect this to Channel B using another cable #4296-1.

5-133. Attach Tip Targets.

Attach Tip Targets #3387 to blade tips (figure 5-111). Use 1/4-28 inch bolts and self-locking nuts and bolt them through the tie-down holes in the tips. The Retro-reflective bar on the target must face

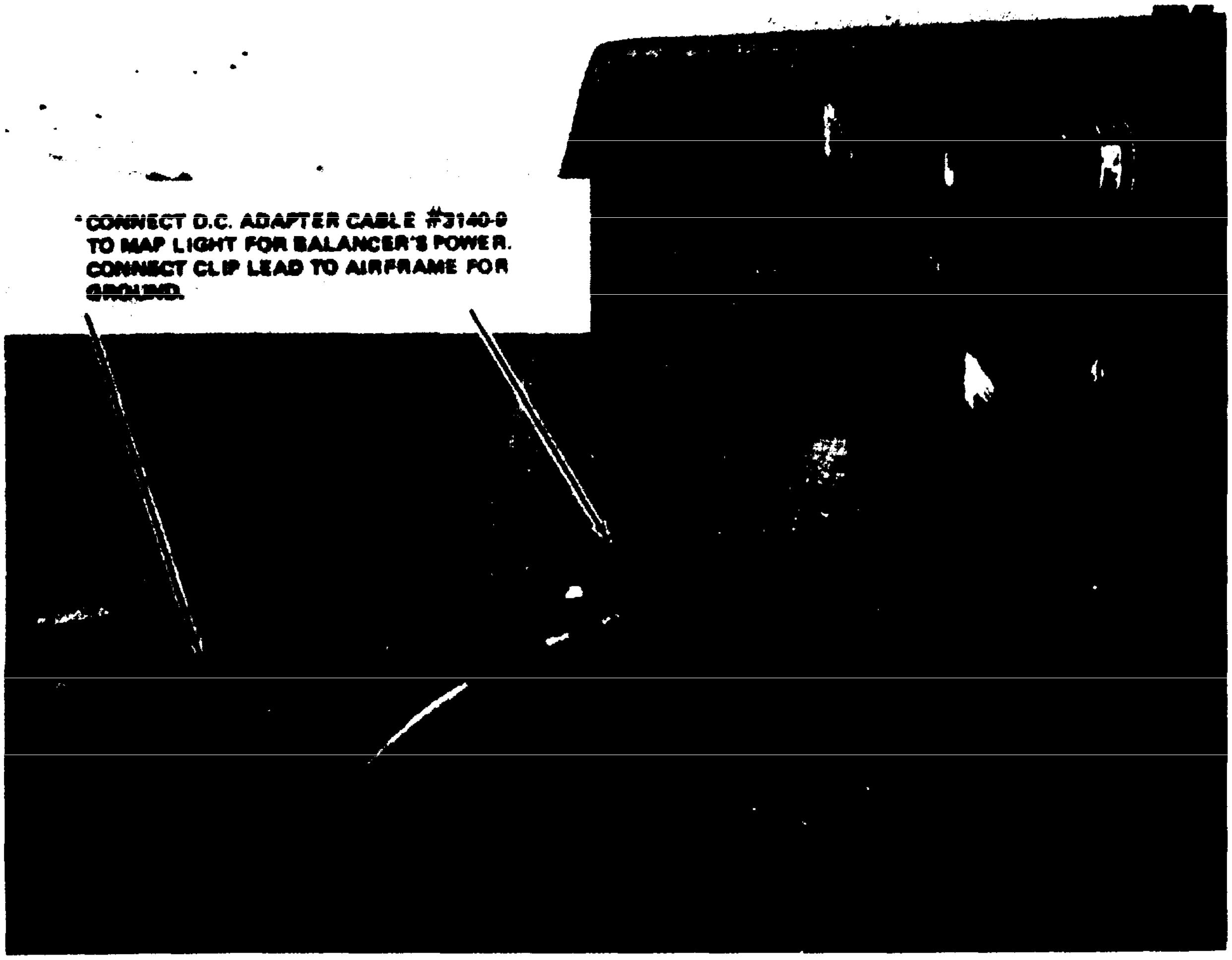


Figure 5-107. Balancer Installation

inboard (to be viewed from the cockpit). Put the HORIZONTAL bar on the RED blade tip, and the vertical bar on the opposite.

CAUTION

Tip Targets MUST BE TANGENT to tip path (parallel to blade tip).

NOTE

As an alternate method of tracking, use reflective strips #4270 and stick them on underside of blade tip as illustrated (figure 5-112). Clean the area where the targets are to be applied. Don't use fuel because it is too oily.

5-134. SET CONTROLS.

5-135. SET BALANCER 177M-6A AS FOLLOWS:

a. "Magnetic Pickup" to "Common. "

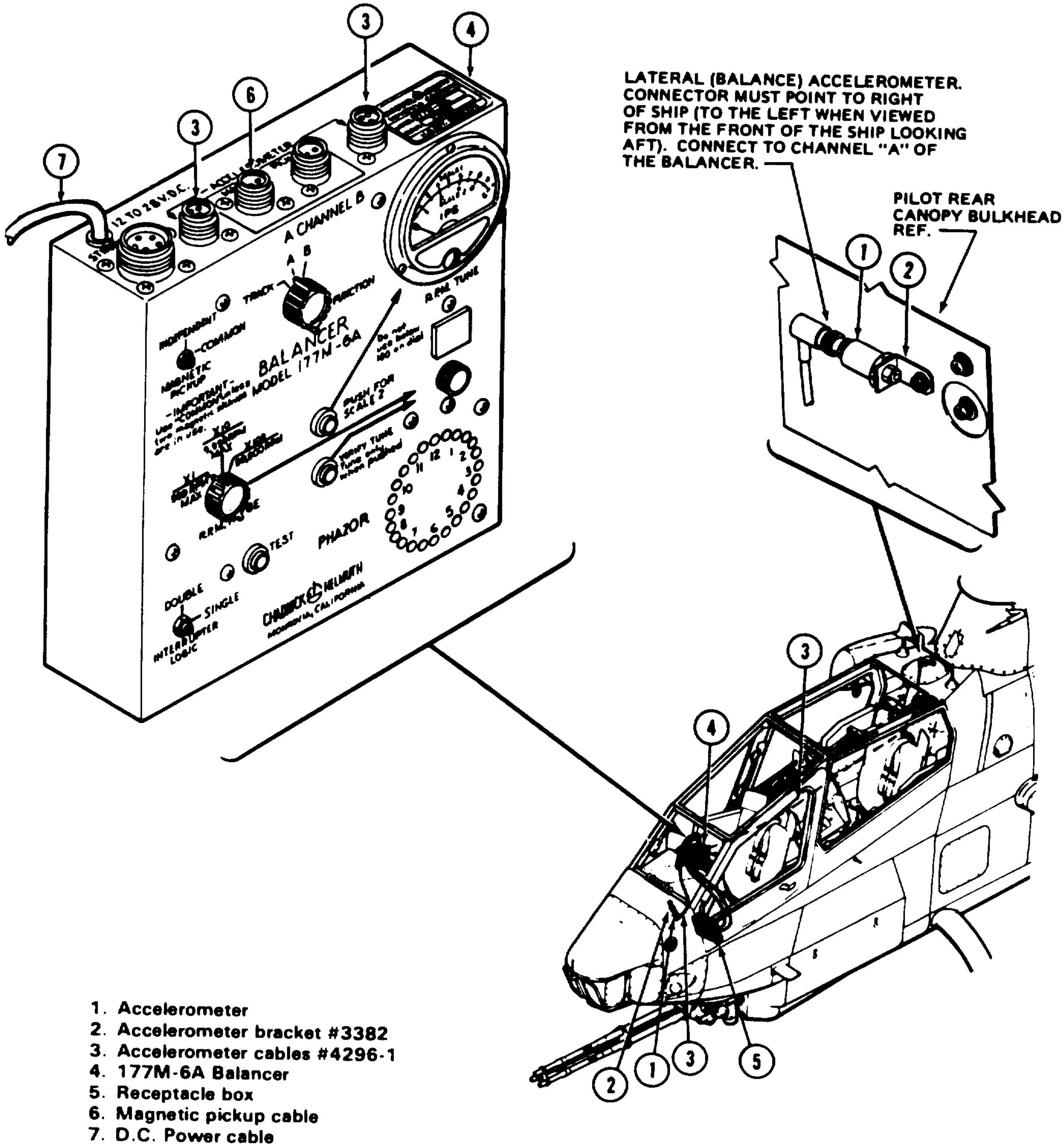
b. "Interrupter Logic" to "Double."

c. "Function" switch to "Track."

d. "RPM Range" to "X 1."

e. "RPM Tune" to "324."

(d. and e.) Main rotor RPM.



1. Accelerometer
2. Accelerometer bracket #3382
3. Accelerometer cables #4296-1
4. 177M-6A Balancer
5. Receptacle box
6. Magnetic pickup cable
7. D.C. Power cable

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Figure 5-108. Lateral Accelerometer Installation

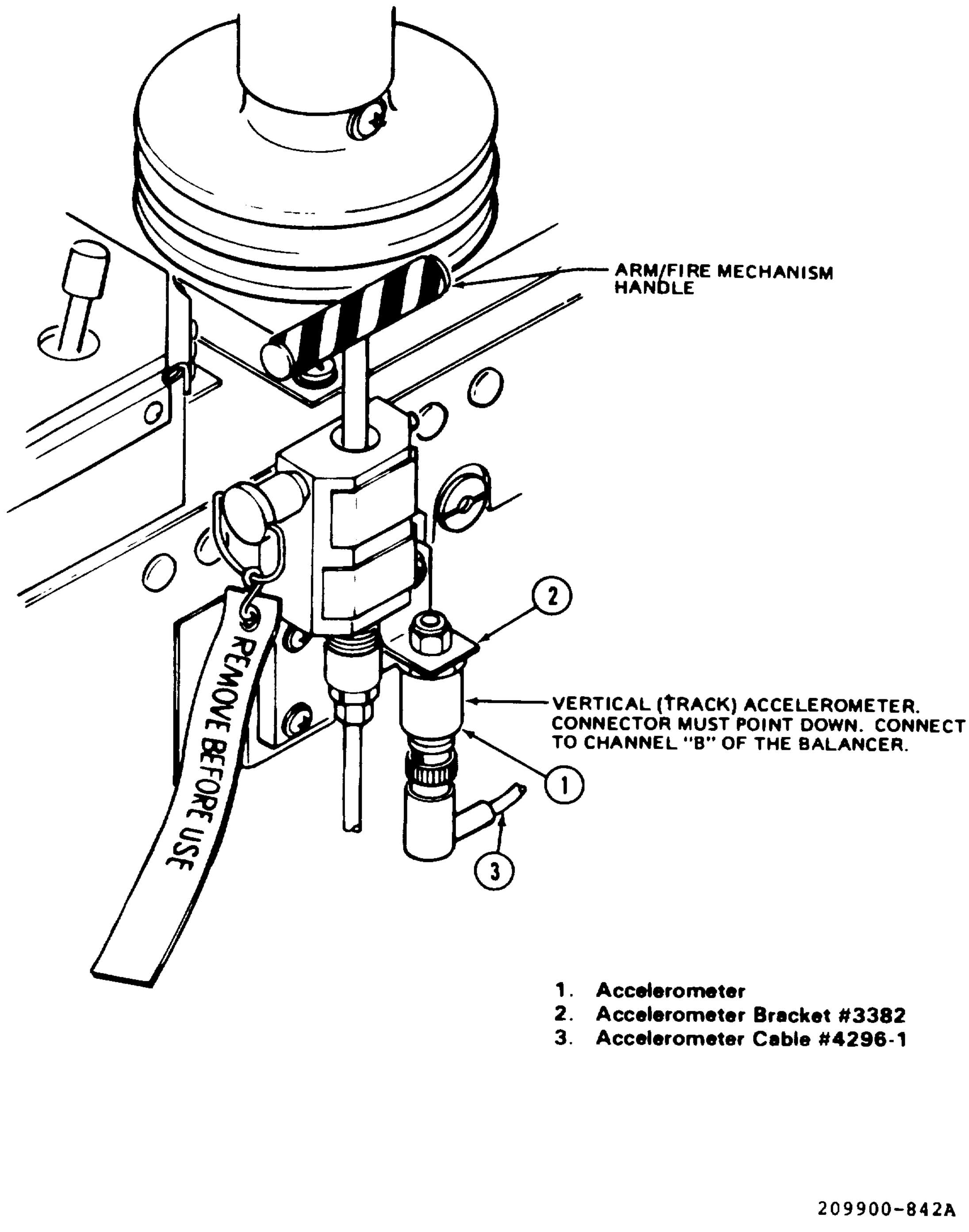

Figure 5-109. Vertical Accelerometer Installation
(Page 5-206, Figure 5-110 Deleted)

5-136. SET STROBEX 135M-11 AS FOLLOWS:

a. "Mode" switch to "A" in which case oscillator is inoperative and setting of the "RPM" dial has no effect and is unimportant. Targets will be seen at about 1:00 o'clock.

Light is in low intensity mode.

b. "Mode" switch to "B" and "RPM" dial to about 240 or less. See formula on back of Strobex. This allows viewing the Targets at the front of the ship. Setting the "RPM" dial to about 500 or less allows viewing the Targets at 11:00 o'clock, and about 2:00 and 8:00 o'clock as well (for advancing and retreating blades).

Light is in high intensity mode.

CAUTION

Oscillator MUST BE SET IN MODE "A" or "B" except for tail rotor track.

5-137. BALANCE MAIN ROTOR.

a. Zero tabs and hover helicopter. Use Strobex and search tip path in a "W" pattern to find the Tip Targets at about 11:00 o'clock. Observe track and correct as required, using pitch-link adjustment.

b. When hover track is set, switch Balancer "Function" switch to "A". (Lateral Accelerometer for balance.) Balancer is set to 324 RPM. While hovering, push "Test" button and check for 12:00 and 6:00 o'clock lights in Phazor. If you do not have 12:00 and 6:00 o'clock lights in Phazor with test button pushed, shut down aircraft and check out system for proper installation or failure.

Release "Test" button and observe "Clock Angle" of lighted light in the ring-of-lights.

c. Push "Verify Tune" button, and adjust "RPM Tune" dial WHILE BUTTON IS PUSHED, to return light to angle observed BEFORE button was pushed. Release, observe angle, push and adjust again to match new "unpushed" angle. Repeat until there is NO CHANGE whether button is pushed or released.

d. After tuning, read "Clock Angle" and "IPS" and record on the Balance Chart.

NOTE

The "Clock Angle" readings (the lighted light in the Phazor) will seldom be perfectly steady. It will become much less steady (more jittery) as balance is improved ("IPS" reading is lowered). When the "verify Tune" button is pushed, the "Clock Angle" should be less jittery than with the button released. Tuning must be adjusted so the "pushed" pattern lies in the center of the "unrushed',' pattern. Simply judge the center of the "jittery range" of the lights.

e. Land helicopter and plot a point on the Balance Chart at the intersection of "Clock Angle" line and "IPS" circle. Lable it point #1. Determine changes required in blade bolt weight and sweep, and record in Data Section. Change either blade bolt weight, or sweep, whichever is farthest from the zero line.

NOTE

Make only one change far the first "move." This makes it easier to check the correctness of the Chart.

f. Hover helicopter and check results (label second point #2). If "Move Line" (point #1 to #2) is in correct direction, proceed to balance until reading is 0.1 "IPS" or less, If "Move Line" is not in correct direction, use "Clock Corrector" #3597 and assign new numbers to clock. Then, proceed to balance using relabeled clock.

NOTE

Good balance is essential for goad results! As long as you can get a reasonably usable "Clock Angle" you can make the balance better, and should.

5-138. READING THE MAIN ROTOR CHART (FIGURE 5-113).

The main rotor chart is used in the following manner. Assume a first reading of 10:00 o'clock and 0.65 "IPS", sketching lines to the edges of the charts, this reading calls for a sweep change of 6 flats aft to the "blank" blade and addition of 200 grams to the "blank" blade. Since the sweep change is farther from the zero axis, that adjustment is made first. The next reading should be 11:45 o'clock at 0.4 "IPS". Then addition of 200 grams to the "blank"' blade should reduce the vibration to a satisfactory level.

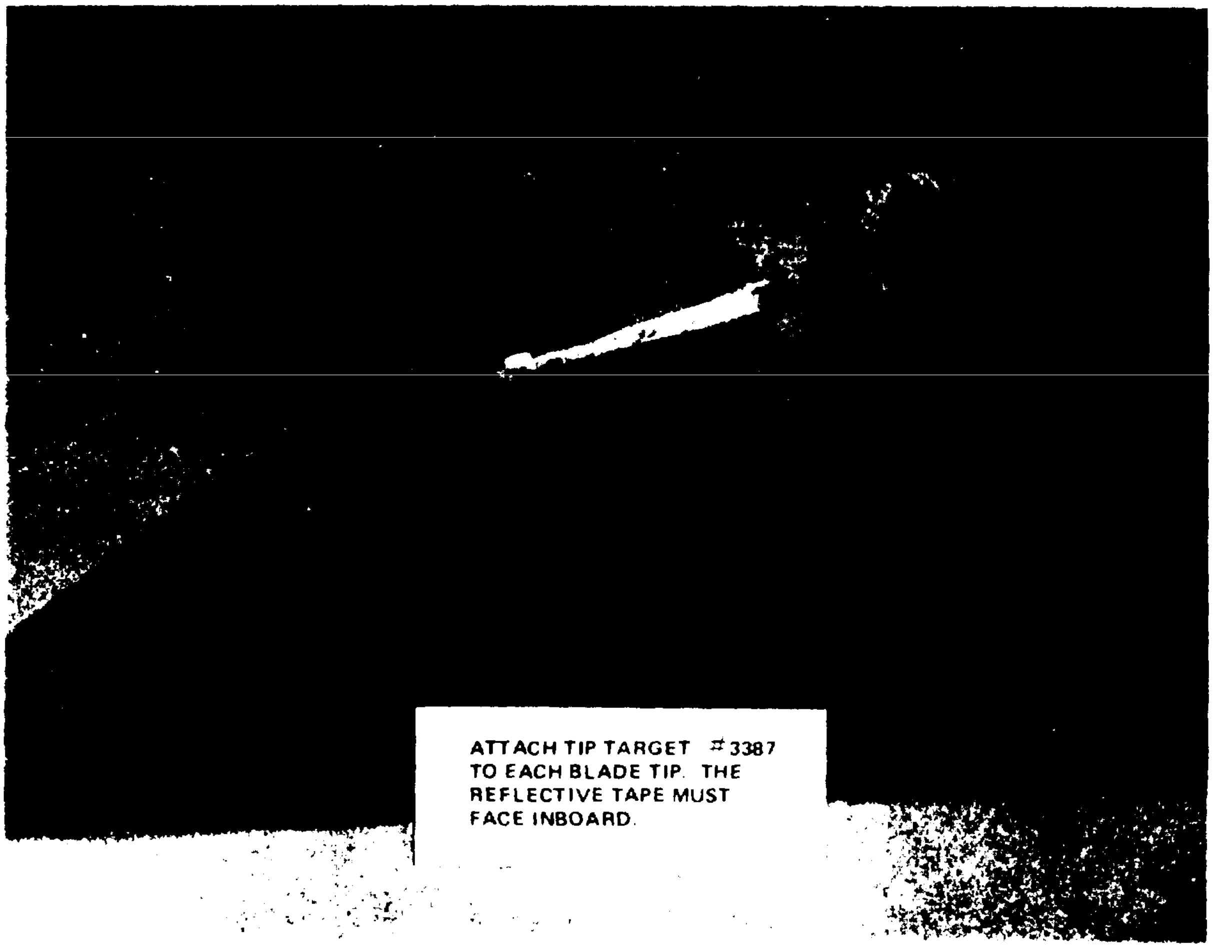

Figure 5-111. Tip Targets Installation

5-139. IN-FLIGHT TRACK MAIN ROTOR.

a. Switch Balancer "Function" switch to "track." (Everything else is the same.)

Strobex maybe used in position "A" or "B", see "Set Controls" Section.

b. Fly the helicopter and sketch, in the spaces provided on Tracking Chart, the track observed at 90 and 140 knots. Do not exceed a reasonable airspeed for the conditions of track, density, altitude, load, etc. at each airspeed above, switch Balancer "Function" switch to "B" (vertical Accelerometer). Press "Test" button and look for 12:00 and 6:00 o'clock lights.

c. Release "Test" button and observe "Clock Angle" of lighted light in ring-of-lights.

d. Push "Verify Tune" button, and adjust "RPM Tune" dial WHILE BUTTON IS PUSHED, to return light to angle observed BEFORE button was pushed. Release, observe angle, push and adjust again to match new "unpushed" angle, Repeat until there is NO CHANGE whether button is pushed or released. After tuning, record "Clock Angle" and "IPS" at 90 and 140 knots, in the spaces provided.

NOTE

Tuning is exactly the same as when taking balance readings.

e. Land the helicopter, Plot the 140 knot (or highest speed reached) readings on the Tracking Chart, at the intersection of "Clock Angle" line and "IPS" circle, (USE "B" VERTICAL ACCELEROMETER FOR IN-FLIGHT TRACK).

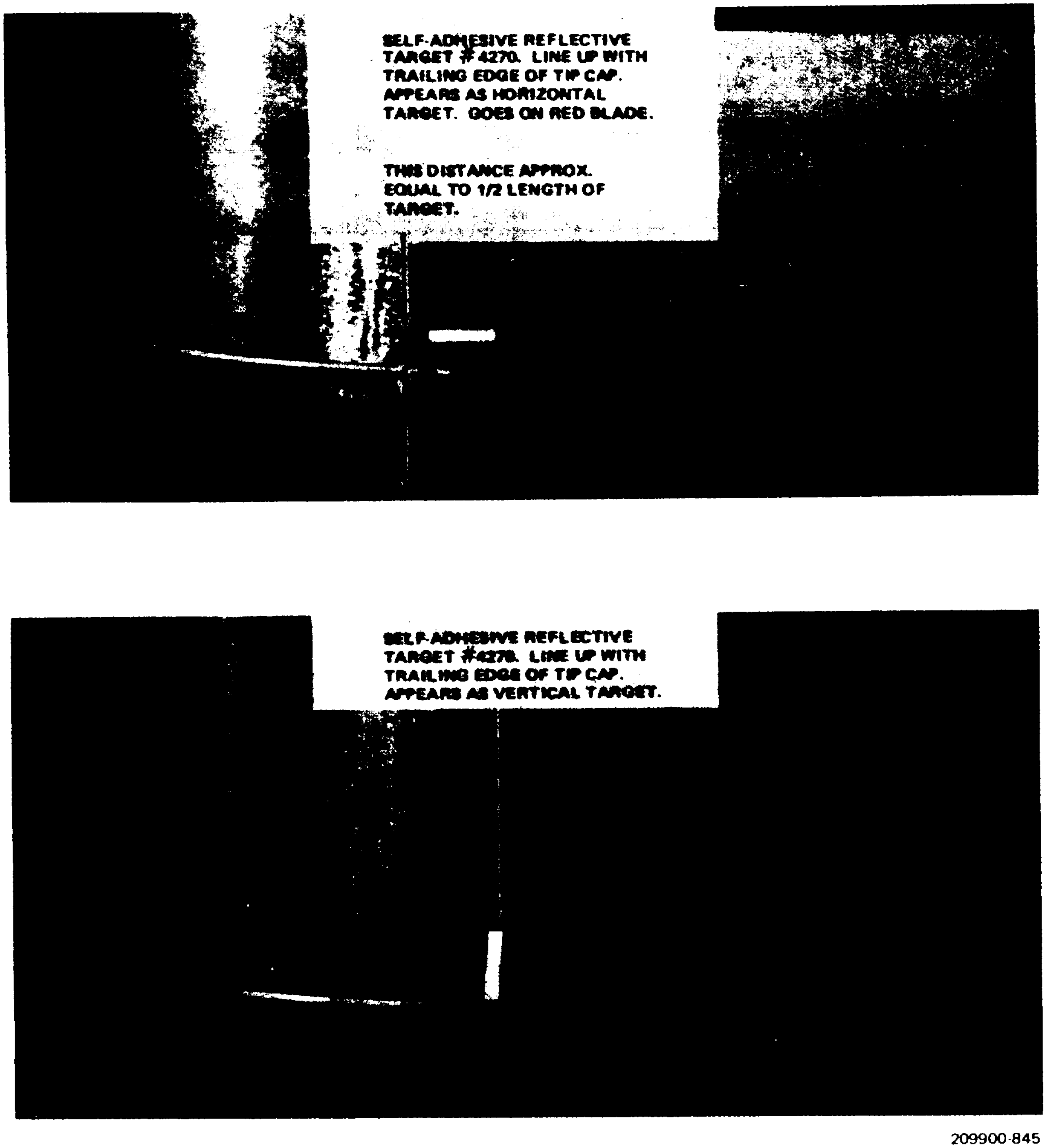

Figure 5-112. Reflective Target Installation

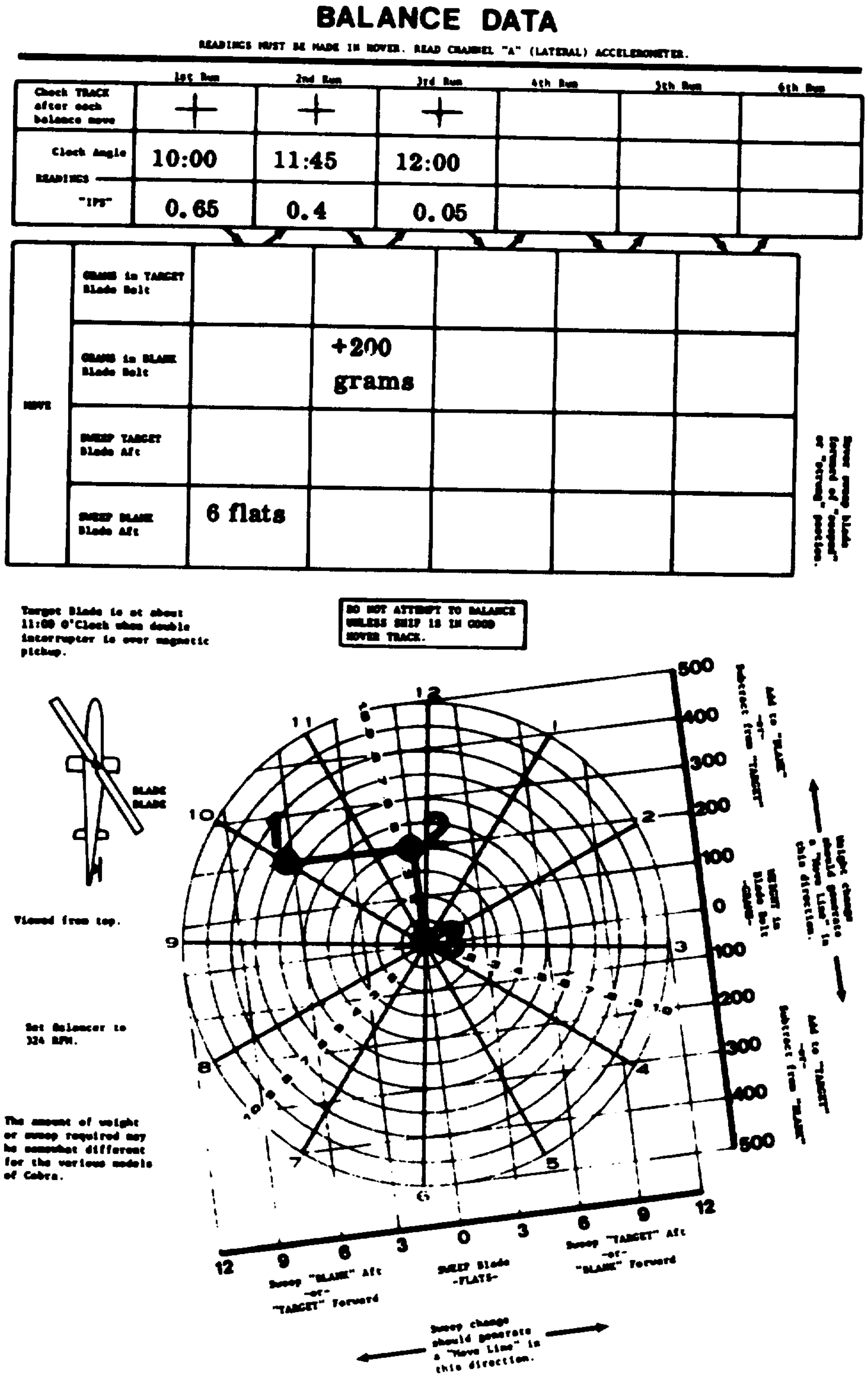

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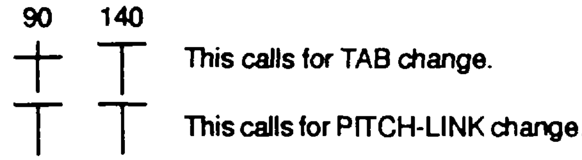
Figure 5-113. Reading the Main Rotor Chart

5-140. READING THE MAIN ROTOR TRACKING CHART (FIGURE 5-114).

The main rotor Tracking Chart is read in the same manner as the main rotor Balance Chart. Assume a first reading of 9:00 o'clock and 0.4 "IPS" at 140 knots. The visual track can be seen to spread with airspeed and the vibration level increase with airspeed indicating a tab change is necessary. Sketching a line to the edge of the chart, this reading indicates an adjustment of about 3 degrees up to the "blank" blade. The next reading, 9:00 o'clock and 0.05 "IPS" indicates a satisfactory vibration level.

5-141. CORRECT TRACK.

a. If the blades are seen to spread an airspeed is increased (the Tip Targets show substantially more vertical separation at 140 knots than at 90) use trim-tab. If the blades are out-of-track about the same amount at all airspeeds, use pitch-link.



Use the vertical one-per-revolution reading for final pitch-link adjustment.

CAUTION

Use as little tab as possible. Excessive tab tends to wash out and may deteriorate the ride In let-down or other conditions of loading (gross weight), etc.

b. Fly the helicopter again and check results. Repeat if required to reduce “B” readings (vertical one-per-revolution) to 0.2 "IPS" or less. Check all airspeeds.

NOTE

The “Move Line”, In response to EITHER tab or pitch-link, should fall roughly along the 3:00 through 9:00 o’clock line. If the “Move Line” is approximately parallel to this, BUT DOES NOT GO THROUGH THE CENTER OF THE CHART, it is likely that due to variations In the blade flight characteristics that THEY CANNOT BE MADE TO FLY TOGETHER without some degree of vibration since there is no control available to cause a “Move Line” in the 12:00 to 6:00 o’clock direction, the point where the “Move Line” is tangent to the "IPS" circles is the best ride attainable with that pair of blades.

Conditions of rod-ends and linkages may have some effect, but with everything tight it is probably blades.

After In-flight tracking, check autorotation RPM, and correct as required. Track changes will have some effect on balance readings. Therefore, balance should be checked In hover after each track change, before the check flight.

5-142. TAIL ROTOR TRACK AND BALANCE.

NOTE

For Aviation Vibration Analyzer (AVA) refer to TM 1-6625-724-13&P.

5-143. NECESSARY EQUIPMENT.

QUANTITY	EQUIPMENT NEEDED	MODEL NUMBER
1	Balancer/Phazor	177M-6A
1	Strobex Tracker	135M-11
1	Gram Scale	47
*1	Accelerometer	4177B
*1	Accelerometer Bracket	3382
*1	Accelerometer Cable	4296-2
*1	DC Adapter Cable	3140-9
*1	DC Extension Cable	3529
3	Reflective Targets	3300
1	T/R Balance Chart	4471

*Denotes equipment physically mounted to the aircraft. Installation and removal should be double checked.

a. Check the above list prior toad after balancing to ensure that the proper equipment is on hand before proceeding, and that all equipment is removed upon completion.

b. Static balance the tail rotor in accordance with paragraph 5-86 prior to installation.

5-144. CONNECT ACCELEROMETER, CABLES, TARGETS, AND INSTRUMENTS (FIGURE 5-115).

a. Attach Accelerometer, on Bracket #3382, under the bottom screwhead that secures gearbox

INSTRUCTIONS
-IN-FLIGHT TRACK-

1) After balancing, switch Balancer "Function" Switch to "Track" and sketch the track observed with the Strobex at 90 and 140 knots STRAIGHT and LEVEL. Switch Balancer to "B" (vertical) and take "Clock Angle" and "IPS" readings at the same airspeeds. (DON'T EXCEED A COMFORTABLE AIRSPEED.) Tune Balancer as described in 2) and 3) on previous page. Land ship, plot point on "Tracking Chart" (label it #1), and record changes to tab or pitch link in "Data" Section. Plot 140 knot, or fastest airspeed.

-IMPORTANT-

	90	140
Use tab if blade "spread" increases greatly with airspeed		
Use pitch link if "spread" is fairly uniform with airspeed		

-CAUTION-

Use the minimum possible tab to do the job. Excessive tab tends to "wash out" and may deteriorate the ride in some flight regimes.

2) Make the indicated changes and fly again to check result. Repeat as required to reduce vertical one-per-rev to .2 or less.

-NOTE-

With some rotors, you will find that the plotted points, ("Move Line") as track is changed, will not go thru the center, but rather will be tangent to some "IPS" circle. This point of tangency is the best track attainable, for tab and pitch link both generate a "Move Line" in generally the same direction. There is no known control to move perpendicular to this.

This may indicate a mis-match of blades and/or loose control linkages. You must be satisfied with this ride. . . .or change blades, and this can be determined in two or three flights.

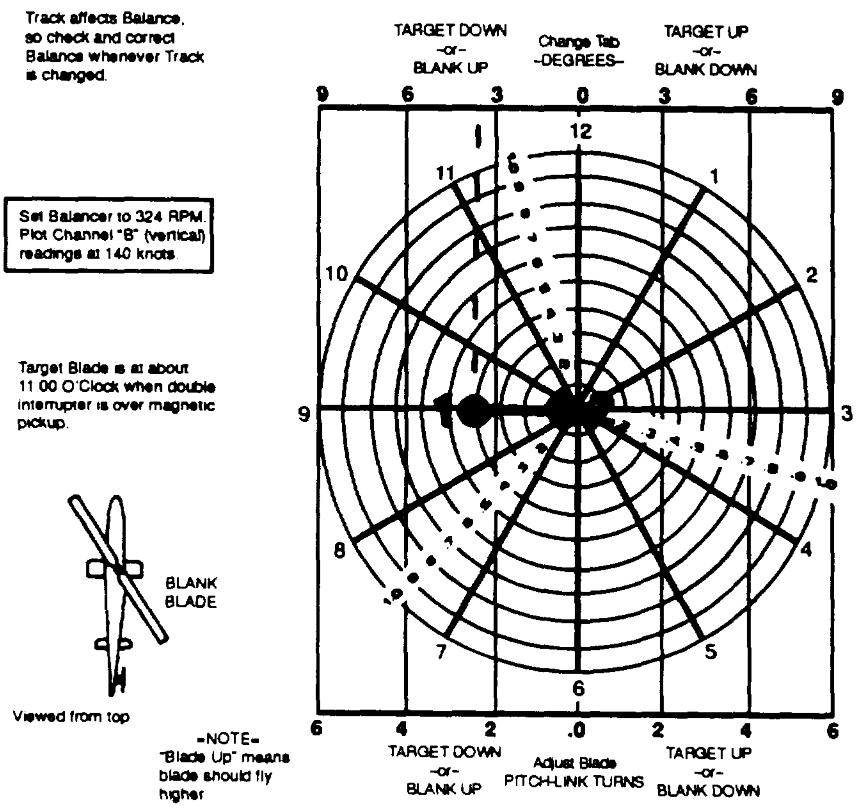


Figure 5-114. Reading the Main Rotor Tracldng Chart (Sheet 1 of 2)

IN-FLIGHT TRACKING DATA

FLIGHT NUMBER		HOVER BALANCE READING (CHANNEL A)	TRACK (CHANNEL "B") AT AIRSPEED 90	140	CHANGE BEFORE NEXT FLIGHT
1	TRACK	+	+	⊤	Blank blade tab up 3 degrees
	CLOCK ANGLE	9:00	9:00	9:00	
	"IPS"	0.05	0.2	0.4	
2	TRACK	+	+	+	
	CLOCK ANGLE	9:00	9:00	9:00	
	"IPS"	0.05	0.05	0.05	
3	TRACK				
	CLOCK ANGLE				
	"IPS"				
4	TRACK				
	CLOCK ANGLE				
	"IPS"				
5	TRACK				
	CLOCK ANGLE				
	"IPS"				
6	TRACK				
	CLOCK ANGLE				
	"IPS"				

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Figure 5-114. Reading the Main Rotor Tracking Chart (Sheet 2 of 2)

Figure 5-115. Accelerometer Cable Installation (Typical)

cover on fin opposite tail rotor. Connector must point to lower-right (4:30). Connect Accelerometer Cable #4292-2 to Accelerometer. Dress Cable down "back" of fin, loop around tail stinger, then forward along tailboom and over left elevator, and under tailboom to right-rear of helicopter, about 20 feet to the side of the tail rotor.

b. Using DC Extension Cable #3529 and DC Adapter Cable #3140-9, plug Balancer into map light for DC power. Place Balancer at the right-rear of the helicopter (where the Cable was left from step (1) Plug Accelerometer Cable into Channel "B" Accelerometer receptacle. Plug Strobex into Balancer.

CAUTION

Tie DC power and Accelerometer Cables together about the mid-point of their run, so Accelerometer Cable cannot foul in tail rotor. Take slack out of cables when tying so there is nothing loose to get into tail rotor.

c. Apply a Retro-reflective "target patch, " part #3300 or #4270, to grip plate area of one blade. This becomes the "target" blade, Apply another target to one blade tip along the chord (to be viewed edge-on), and on the opposite tip across the chord. They must be centered, and about the same distance back from leading edge.

5-145. SET CONTROLS.

a. Set Balancer as Follows:

(1) "Function" switch to "B".

(2) "RPM Range" to "X 10"

(3) "RPM Tune" to "166" for AH-1S

1661 RPM (tail rotor rate for AH-1S)

b. Set Strobex as Follows:

(1) 135M-11 "Mode" switch to "D".

(2) "RPM" dial to "664" for AH-1S.

6644 RPM, which is 4-per-revolution of tail rotor for AH-1S

NOTE

Switching the Strobex as described activates its internal oscillator and disconnects any external commands (as from the Balancer. Accelerometer, etc.).

5-146. TRACK TAIL ROTOR (FIGURE 5-116).

a. Run helicopter at 100% AH-1S flat pitch, center pedals, head into wind, on-the-ground.

(1) Stand at the side of the tail rotor and observe the four images of the single grip target. Fine tune "RPM" dial so the four Targets are STOPPED.

(2) Move, dragging the Cables with Balancer and Strobex to stub wing (on tail rotor side) Look aft at edge of rotor disc to view the superimposed TIP Targets and judge track (left-to-right relatlon).

NOTE

If the horizontal bar appears above or below the vertical, it indicates that the Targets were not placed an equal distance aft of the leading edge of the blade. This is not important, if the difference is only an inch or two; the important observation is the left-to-right relation of the vertical to horizontal bars.

NOTE

FINE adjustment of "RPM" knob will position and stop Targets as desired.

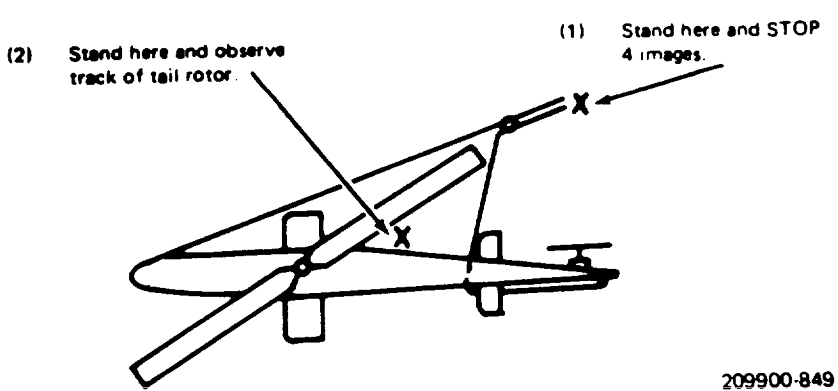


Figure 5-116. Tracking Tall Rotor

b. Shut down and adjust track if required. If track looks good, keep running and proceed to balance.

NOTE

The finest adjustment available is one. half turn of rod end, so track can probably not be made perfect.

5-147. BALANCE TAIL ROTOR (FIGURE 5-117),

NOTE

Tail rotor must be in tracker pitch links sat to 2.74 ± .010 inches between Jam nuts before balancing.

a. Return, with Balancer and Strobex, to position at side of tail rotor. Set Strobex “Mode” switch to “A”. (Tl is turns off the Strobex oscillator and makes it respond ONLY to commands from the Balancer). Check that Balancer is set to Channel "B" (Into which tail rotor Accelerometer is plugged) and 1650 RPM.

NOTE

The Phazor section of the Balancer is used only for main rotor balancing (it needs reference signal from Magnetic Pickup). It is NOT operable when working the tail rotor, so IGNORE THE PHAZOR LIGHTS WHEN WORKING THE TAIL ROTOR.

b. With the Strobex, view “Clock Angle” of the single grip target. Push the "Verify Tune” button. WHILE THE BUTTON IS PUSHED, adjust the “RPM Tune” dial to return the Target to the “Clock Angle” observed BEFORE THE BUTTON WAS PUSHED Release button, observe angle, push and adjust again to match “unpushed” angle. Repeat until there IS NO CHANGE whether button is pushed or released.

c. Record “Clock Angle” and “IPS” on Balance Chart #4471, (Read "IPS" without Strobex flashing.)

d. If the “Move Line” is in the correct direction, proceed to balance to 0.2 “IPS” or less, Both span and chord weights can be changed at once for subsequent moves.

e. If the “Move Line” IS not in the correct direction, use “Clock Angle Corrector” #3597, and assign new numbers to clock.

NOTE

If the rotor does not respond in an orderly fashion after a few moves, the weights should be restored to original and the first reading be repeated. If the first reading cannot be repeated, look for faulty bearings, shafts, etc.

5-148. TROUBLESHOOTING.

a. The Balancer is used to measure the frequency, or RPM, of unknown vibrations in order to try to locate their source. The Accelerometer IS mounted, or held, in the area where the vibration is felt. If there is no reading on the “IPS” meter, it means there is no vibration at the RPM at which the Balancer electronic filter is set. If the meter reads, it is because there is vibration at the RPM at which the filter is set. In use, the Balancer filter is tuned, or adjusted, across the RPM range of interest and the meter is watched for response. Then the “Verify Tune” button is pushed, sharpening the filter, while the “RPM Tune” dial is adjusted to peak the meter. When the meter reading is maximized, the RPM is read directly from the “RPM Tune” dial, and “RPM Range” switch. After the vibration rate is measured, it can usually be related to known rotor or component rates. It IS important, too, to consider multiples, or harmonics, of these rates.

Transmission mounts and loose skid gear can cause excessive six-per-revolution (1944 per minute) that may feel like tail rotor (1661 for AH-1S).

The source of other vibrations may be determined by securing an Accelerometer in the area of the noticed disturbance. The measured vibration rate IS generally the same as, or harmonically related to, the source (forcing function) of the vibration. The Accelerometer can often be hand-held at various points on a structure, while “searching” with the “RPM Tune” dial. When hand-holding the Accelerometer, take care to select “hard points” where the vibration will not be damped (suppressed). Avoid sheet metal panels, etc.

b. To facilitate determination of the offending component, the following operating RPM’s are printed. Components of the different models may turn at a different RPM than those shown here. Refer to the helicopter manual for your particular model.

NOTES: 1) Track tail rotor. Viewing tail rotor disc from side, adjust Strobex oscillator so the single grip target appears as a STOPPED image of 4. Then, view rotor edge-on, from aft of the right stub-wing, and observe track of Tip Targets.

2) Set Balancer to 1650 RPM ("RPM Tune" dial to 165, and "RPM Range" to "X 10"), switch "Function" switch to Channel B, and Strobex oscillator "OFF". View "Clock Angle" of grip target from side of tail rotor disc.

3) Now, press "Verify Tune" button and adjust "RPM Tune" dial, WHILE BUTTON IS PUSHED, to return target to angle observed BEFORE BUTTON WAS PUSHED. Release, observe angle, depress and adjust again to match new "unpushed" angle. Repeat until there is NO CHANGE WHETHER BUTTON IS PUSHED OR RELEASED. TUNE ONLY WITH BUTTON PUSHED.

4) Read "Clock Angle" with button released and "IPS" without Strobex flashing. Record in section A of Chart. Plot in section B (label it point #1), and note required changes in C.

5) Change the weight on one bolt only, for the first move (select the one farthest from the zero axis). Run ship and check that the "Move Line" (point #1 to #2) is in the correct direction, or parallel to the fine lines extending perpendicular from the unchanged axis. If both weights are changed, the "Move Line" should go through the center. If "Move Line" is in the correct direction, proceed to balance. If not, use "Clock Angle Corrector" #3597 to correct the clock, and then proceed to balance to .2 "IPS" or less.

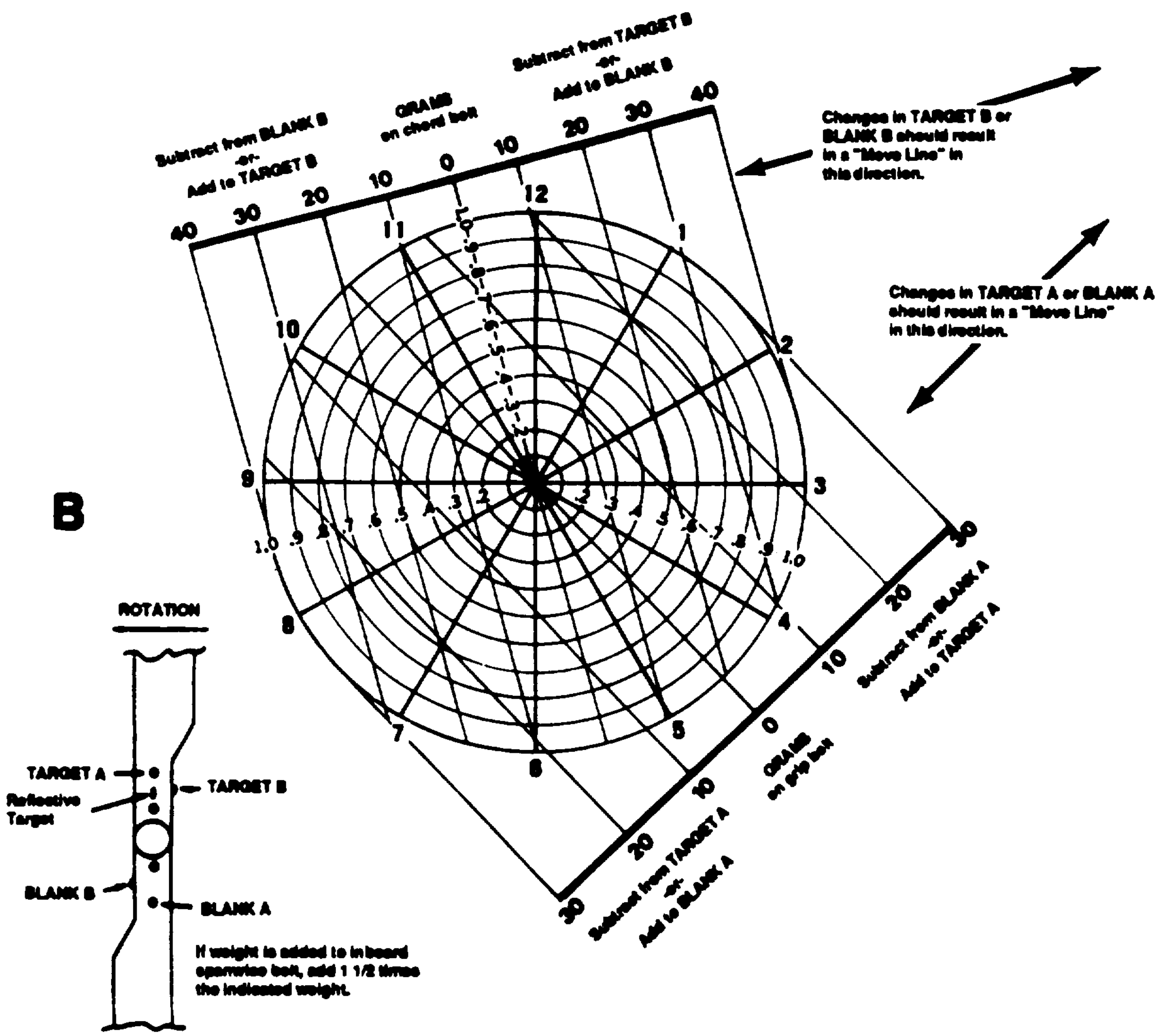


Figure. 5-117. Balancing Tail Rotor

ROTORS	OPERATING RPM
Main rotor (1/rev)	324
Main rotor (2/rev)	648
Main rotor (4/rev)	1296
Main rotor (6/rev)	1944
Tail rotor	1661

DRIVE TRAIN AND ACCESSORIES	
Oil pump (transmission)	4498
Hydraulic pump	4300
Ecu quill	6600
Tail rotor drive-shaft	4300
Main drive-shaft	6600
Hanger assemblies	4300
Intermediate gearbox	4300
Tail Rotor Drive Gearbox Input Quill	4300
Tail Rotor Drive Gearbox Output Quill	1661

c. The VIBREX Tester, model 11, provides a complete and simple functional test and calibration of the entire VIBREX 4591 System. Use of the Tester will identify moat problems that are likely to occur with the VIBREX (Table 5-4).

Table 5-4. Troubleshooting the VIBREX 4591 System with the VIBREX Tester, Model 11

SYMPTOMS	PROBABLE CAUSES	CURES
No lights in Balancer/Phazor.	DC polarity wrong.	Check polarity (Pin B is hot +, Pin A is ground).
	Breaker, to circuit in use, is not turned on.	Turn breaker on.
Unsteady tail rotor image when balancing.	Oscillator not in position “A”.	Strobex must be in “A”, when balancing tail rotor.
	Vibration level is very low.	When vibration level is low, “Clock Angle” is uncertain. Jittery image is indicator of good balance.
Can’t see Targets.	Strobex out of focus.	Remove rear panel and adjust focus.
	Reflective Targets worn or dirty.	Replace, and avoid handling reflective surface. Replace as necessary.
	Flash Tube cracked (weak blue flash).	Replace Flash Tube.
	Not aiming Strobex correctly and/or not in-line with light source.	Look directly over top of Strobex, and search in a “W” pattern along the tip path.
	Strobex and/or balancer switched to wrong position.	Check settings.
	Protective varnish or coating over reflector material.	Coating kills reflective properties of exposed bead material. DO NOT COAT!

Table 5-4. Troubleshooting the VIBREX 4691 System with the VIBREX Tester, Model 11 (Cont)

SYMPTOMS	PROBABLE CAUSES	CURES
Targets appear “scattered” when tracking main rotor.	Strobex oscillator "ON."	Check oscillator switch, MUST be in “A” or “B”
	Interrupter assembly bent.	Straighten or replace Interrupter.
Don’t get “’Test” pattern in Phazor when “Test” button is pushed.	Magnetic Pickup gap too large.	Close gap between Magnetic Pickup and Interrupter.
	Faulty Magnetic Pickup Cable or Magnetic Pickup.	Check and repair or replace as required. Magnetic Pickup should read about 1000 ohms.
	“Interrupter Logic” switch set incorrectly.	Must be set to “double”
	Polarity of Magnetic Pickup incorret.	Pulse should first go negative, then sharply positive where Phazor triggers, then go negative to zero.
	Magnetic Pickup Cable plugged into Magnetic Pickup “backwards” (wrong polarity),	Check that indexing key is correctly lined up. It is not easy, but connector can be plugged in backwards.
	“RPM Range” switch set to wrong range	Set “RPM Range” to “X1”
Meaningless Phazor light pattern when working tail rotors.	NORMAL.	Phazor is NOT used for all tail rotor workm so don’t worry about it.
“IPS” and “Clock Angle” readings not repeatable, i.e., restoring weights to original condition does not give same readings.	Mechanical components on rotor are faulty. Bearings, dampers, rod-ends, etc., should all be rechecked.	Correct or replace faulty components.
False reading on on Balancer’s “IPS” meter.	When the Balancer’s “RPM Tune” dial is set below 100 (on any “RPM Range”) the circuitry is unstable and causes false readings on the “IPS” meter.	DO NOT USE BALANCER WITH “RPM TUNE” DIAL SET BELOW 100.

CHAPTER 6

DRIVE TRAIN SYSTEM

SECTION I. DRIVE TRAIN

6-1. DRIVE TRAIN SYSTEM.

6-2. DESCRIPTION - DRIVE TRAIN SYSTEM.

The drive train is a system of shafts and gearboxes through which the engine drives the main rotor, tail rotor, and such accessories as rotor tachometer generator and hydraulic pump (figure 6-1). The system consists of the main driveshaft, transmission, main rotor mast, tail rotor driveshafts, intermediate gearbox, and tail rotor drive gearbox.

6-2.1 AIRCRAFT WITH OIL DEBRIS DETECTION SYSTEM (ODDS) MWO 1-1520-236-50-30.

a. The primary benefit of the ODDS System is improved filtration of the engine and main transmission lubrication system. The ODDS System is designed to provide early identification of potential component failures. Fine filtration (3 micron) increases system lie by removing oil-borne particles which cause wear in the component. Analysis shows that catastrophic failure modes that are detected through spectrometric oil analysis (SOA)/AOAP will be detected by the ODDS System chip detectors. The ODDS equipped engine and main transmission do not require routine oil sampling. Spectrometric oil analysis measures concentrations of wear metal debris in the three to ten micron range. Not enough of significant size particles exist to allow an accurate indication of wear metal concentration by spectometric analysis. Therefore routine oil sampling is not required or authorized.

b. Although routine oil sampling of the engine and main transmission of ODDS equipped aircraft is not required or authorized, samples may be taken in the event of a chip light, and provided along with chip detector debris to an AOAP Lab for analysis using ferrography or similar techniques. The results of this analysis will be used with Oil Debris Classification Chart guidelines to determine the serviceability of the component.

c. Replacement of the ODDS equipped engine and main transmission external oil filters are performed “ON CONDITION” as required by maintenance actions (such as bypass buttons, major component change etc...). Since operation of fine filtration deans the lubricant in the component, do not replace lubricant when replacing fitter. Flushing and filtering the lubricant of the ODDS System is not required or authorized. Flushing and filtering of the lubricant is only done during replacement of engine and/or main transmission.

d. During the modification of aircraft I.A.W. MWO 1-1520-236-50-30 (ODDS) chip detectors in the 42- and 90-degree gearboxes were changed, they are not part of the ODDS filtering oil system and still require SOA/AOAP samples and inspections.

6-3. TROUBLESHOOTING - DRIVE TRAIN SYSTEM.

The troubleshooting chart (table 6-1) is a brief summary of drive train troubles which maybe encountered in aviation unit and intermedite maintenance. Conditions and possible causes listed have been limited to those reasonably probable (through not necessarily frequent in normal service) which could become known through pilot reports or by inspection methods applicable in aviation unit and intermediate maintenance and which would be subject to some evacuation by aviation unit and intermediate maintenance personnel. Final corrective action by a higher level of maintenance might be required in some instances. Conditions involving obvious major damage are omitted as are those caused by accident or an unusual chain of events which would require evaluation by a competent authority.

NOTE

Before you use this table, be sure you have performed all normal operational checks. If you have a malfunction which is not listed in this table, notify the next higher level of maintenance.

Table 6-1. Troubleshooting Drive Train System

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

1. Metal chips found on magnetic sump plug or pump screen, (paragraphs 6-176 and 6-169).

STEP 1. Internal transmission failure of gears or bearings.

Replace transmission (paragraphs 6-24 and 6-33).

Replace oil cooler and flush lines, Drain and refill with oil (paragraphs 6-143 and 6-146).

2. Excessive pylon motion (Approximately one-half revolution).

STEP 1. Pylon mounts worn or installed wrong.

Repair or replace mounts (paragraph 2-225).

STEP 2. Leaking pylon mount dampers.

Replace or repair dampers (paragraph 2-239).

3. Water in transmission.

STEP 1. Water in drain lines.

Clear obstructions from lines Disconnect lines and purge with compressed air.

MAIN DRIVESHAFT:

1. Grease leakage.

STEP 1. Cut or tom packing or boot.

Replace packing or boot assembly with care (paragraph 6-12).

2. Abnormal coupling wear.

STEP 1. Faulty lubrication or wrong lubricant (paragraph 6-12).

Clean and lubricate coupling or replace driveshaft (paragraphs 6-12 and 6-13).

3. Lubricant breakdown in forward coupling.

STEP 1. Misalignment or wrong lubricant (paragraphs 6-7 and 6-12).

Align engine and transmission; replace driveshaft and associated parts as required (pars graphs 6-7 and 6-13).

4. Suspected vibration.

STEP 1. Coupling damps loose, improperly installed, or not matched.

Install clamp sets by instructions (paragraph 6-13).

STEP 2. Loose engine adapter.

Replace adapter and any worn associated parts (paragraph 6-19).

Table 6-1. Troubleshooting Drive Train System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

STEP 3. Main driveshaft improperly assembled or missing spring.

Disassemble, inspect, and assemble properly (paragraphs 6-8, 6-10, and 6-12).

TAIL ROTOR DRIVE SYSTEM:

1. Suspected vibration.

STEP 1. Worn hanger bearings or couplings (paragraph 6-85)

Replace hanger assembly (paragraph 6-84 and 6-88).

STEP 2. Shaft balance weights lost or shaft bent (paragraph 6-79).

Replace shaft section (paragraphs 6-77 and 6-81).

STEP 3. Misaligned driveshaft clamps (paragraph 6-81).

Align clamps properly (paragraph 6-81).

2. Binding or roughness when manually checked (paragraph 6-85).

STEP 1. Dry or faulty bearing (paragraph 6-85).

Isolate faulty hanger by disconnecting shafts (paragraph 6-85).

Replace hanger assembly (paragraph 6-84 and 6-88).

STEP 2. Defective gearbox.

Check gearboxes, replace defective unit (paragraphs 6-96 and 6-113).

STEP 3. Faulty lubrication of couplings (paragraph 6-87).

Replace hanger, gearbox, or gear quills (paragraphs 6-84, 6-88, 6-100, 6-105, 6-117, 6-121, 6-124, and 6-128).

3. Metal chips on gearbox chip detector (figure 6-2) or debris monitor (Table 6-1.1).

STEP 1. Internal failure of gears or bearings.

Replace gearbox (paragraphs 6-100, 6-105, 6-117, and 6-121).

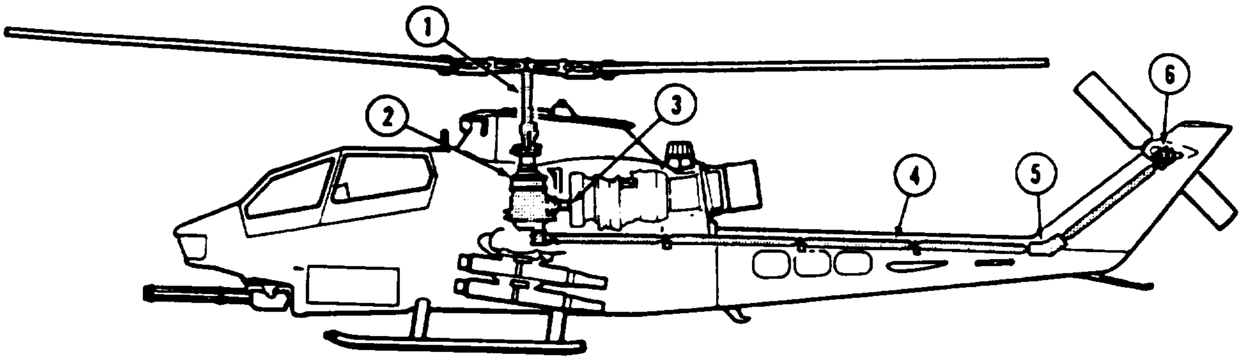


Figure 6-1. Drive Train (Typical)

a. For main driveshaft troubleshooting, apply the following:

(1) Trouble conditions of main driveshaft can seldom be detected in operation, since there are no reliable indications except possibly in art extreme condition. "Suspected vibration" is only partially accurate as a term for renditions such as dynamic out-of-balance or faulty coupling action. Vibration would result from these conditions, as well as abnormal stresses and wear, but would be absorbed in structure and pylon mounts or effectively masked by normal vibrations of the helicop ter, providing no distinct indication to pilot.

(2) Driveshaft trouble indications are usually those revealed by careful inspection.

(3) The principal causes of driveshaft trouble are faulty installation procedures and inadequate or improper lubrication of spherical tooth couplings.

b. For tail rotor drive system troubleshooting, apply same principles as for main driveshaft.

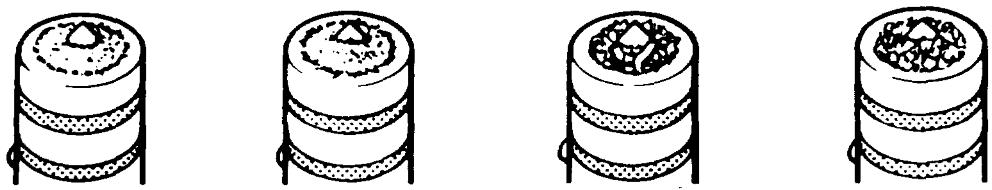
c. Indication of trouble, probable causes, and corrective action are shown on table 6-1.

6-4. METAL PARTICLES IDENTIFICATION - GEARBOXES. (Aircraft without ODDS.)

Metal particles found on gearbox oil strainer screens, oil filters, or chip detectors may indicate failure of an internal part of the gearbox. The presence of metal particles, however, is not necessarily an indication that the gearbox is no longer serviceable. The quantity, source, form, and type of metal found, together with the service history of the particular gearbox, must be taken into consideration. The time accumulated since the gearbox was new or overhauled, previous failures, and the type of operation are important factors in determining the further serviceability of the unit. The particles found may be steel, cadmium, aluminum, magnesium, copper (bronze), silver, or phenolic in various shapes and quantities. Refer to figure 6-2 for a detailed explanation of the action made necessary by the presence of various types of particles in the gearbox. For helicopters with ODDS (MWO 1-1520-236-50-30), refer to table 6-1.2 for necessary actions and refer to paragraph 6-4.1.

WARNING

When any particles found are readily identifiable as fragments of gearbox parts, such as gears, nuts, bearings, oil slingers, thrust washers, snaprings, safety wire, or other component, re place gearbox.



METAL PARTICLES CONTAMINATION-GEARBOX OIL

KIND OF METAL	QUANTITY AND/OR SIZE	ACTION REQUIRED	NOTES
Steel	Fuzz, fine hair-like particles (detail A.)	None	Result of normal wear. May have exaggerated appearance because of oil
	Particles in splinter or granular form (details B and C).	Drain and flush.	Usually indicates failure.
		Take oil sample from sump drain for spectrograph oil analysis.	
		Examine oil filter and determine if chips are excessive.	
		If chips are not excessive, flush gearbox oil system and refill with new oil.	
		Accomplish aircraft ground run, take oil sample, check chip detector and oil filter for metal.	
		If no particles are found, hover aircraft for 30 minutes, take oil sample, check chip detector and oil filter for metal. If no metal is present, release helicopter for flight. If metal is present, replace gearbox.	
	Thin flakes or splinters not exceeding 1/1 6 (0.060) inch in thickness and 1/16 (0.060) inch in length. Quantity not to exceed 10 flakes (detail D).	Drain and flush.	Small quantity may not indicate bearing failure.

Figure 6-2. Gearbox Oil Contamination-Description and Corrective Action (Sheet 1 of 2)
(Helicopters w/o MWO 1-1520-236-50-30)

METAL PARTICLES CONTAMINATION - GEARBOX OIL

KIND OF METAL	QUANTITY AND/OR SIZE	ACTION REQUIRED	NOTES
	More than 10 flakes not exceeding 1/64 (0.015) inch in diameter and 1/1 6 (0.060) inch in length; and quantity of flakes exceeding the above dimensions.	Replace gearbox.	Usually indicates failure. May be bearing in one of accessory quills.
Aluminum or Magnesium	Particles in granular form, or like miniature lathe turnings.	Replace gearbox.	May be result of use of these materials as mallets or drifts during assembly. May indicate wear of oil pump interior surfaces or abnormal interference.
Bronze	Particles in granular form	Replace gearbox.	May indicate excessive wear of bearing cages as result of bearing failure.
Phenolic		None	Result of the use of mallets and drifts during assembly or same as Copper (Bronze) above.
Silver	Particles, flakes or chips form	None	Result of flaking from lower planetary roller bearing retainers.

Figure 6-2. Gearbox Oil Contamination-Description and Corrective Action (Sheet 2 of 2) (Helicopters w/o MWO 1-1520-236-50-30)

a. A visual inspection of color and hardness will occasionally suffice to identify metal particles found on gearbox oil strainer screens, oil filters, or chip detectors. When visual inspection does not positively identify the particle, the kind of particle present may be determined by a few simple tests. Equipment to perform tests includes a permanent magnet, an electric soldering iron, hydrochloric (muriatic) acid (C4), and nitric acid (C5). Proceed as follows: (figure 6-2).

(1) Steel. Isolate steel particles with permanent magnet.

(2) Aluminum. Determine aluminum particles by their reaction to hydrochloric acid. When a particle of aluminum is dropped into hydrochloric acid (C4), it will fizz with a rapid emission of bubbles. The particles will gradually disintegrate and form a black residue.

NOTE

Since magnesium and aluminum react similarly in hydrochloric acid, when in doubt drop particle Into nitric acid. Aluminum does not react noticeably in nitric acid.

(3) Bronze or Magnesium. Differentiate bronze or magnesium by their respective reactions to nitric add. When a particle of bronze is dropped into nitric acid, it forms a bright green cloud in the acid. When a particle of magnesium is dropped into nitric acid, it fizzes with a rapid emission of bubbles. Phenolic and aluminum do not react noticeably to nitric acid.

(4) Silver. Dissolve particles in nitric add. Add a few drops of distilled water and small amount of table salt or hydrochloric add (C4). Check for appearance of white (milky) cloud in the solution.

b. When the Army Oil Analysis Program is being utilized, check for particles at three places: the transmission, intermediate gearbox, and tail rotor drive gearbox. Instructions for taking oil sample and descripton of probable source of particles are as follows:

(1) Transmission. Take a sample from sump drain immediately after engine shutdown. Allow one-half to three-fourths pint of oil to drain through the line before taking sample.

(a) Any of the gear trains, bearings, or a loose or worn shim under the mast bearing will give a high count of iron, copper, aluminum, and magnesium.

(b) A loose fitting on the sump may also show the same trace elements, with the rate of increase suspected to be slightly above normal.

(c) A high iron, copper, and aluminum count could be caused by one or both of the planetary systems with the rate of increase suspected to be above that for normal wear rate.

(d) High iron, copper, and aluminum content could be from the input quill triplex bearing or the mast bearing. This will increase rapidly and will probably progress to failure.

(2) Intermediate and Tail Rotor Drive Gearboxes. Take sample from gearbox immediately after shut down. Use a plastic syringe or take from drain. Clean area before removing drain plug.

(a) High iron count, suspect gear scuffling, or bearing inner races fretting, suspected rate of increase slightly above normal.

(b) High iron and cooper count could be roller bearings and cage or duplex bearings in quills.

6-4.1. DECISION CRITERIA FOR REPLACEMENT OF TRANSMISSION, FOLLOWING CHIP CAUTION LIGHT. (Helicopters without MWO 1-1520-236-50-30.)

a. Collection and Analysis of Debris Samples - When XMSN CHIP caution light for transmission has come on, proceed as follows:

(1) Remove debris monitor from transmission or remove chip detector. Remove and retain debris from the debris monitor or chip detection. In addition, remove and retain debris from oil filters and screens for the lubrication system.

(2) Clean debris monitor and screen with solvent (C112) and dean cloth and install it.

(3) Identify debris using the information in table 6-1.1 and figure 6-2.1. Subparagraph b. also contains useful information. Pay particular attention to debris classified as significant.

(4) Perform maintenance actons on referenced Oil Debris Classification Chart, table 6-1.1 for transmission.

b. Decision Aids- Use following information in reaching a decision to replace a component or continue it in service.

(1) Debris m oil system does not necessarily mean that component is no longer serviceable. Quality of debris as well as size, type, and composition must be considered. Component time, gage indications, and noise and vibration levels must also be considered.

(2) Metallic debris can be result of earlier maintenance activity or of wear. Maintenance records should be examined and considered first for history and possible cause. Debris from earlier chip events should be examined tor comparison.

(3) Debris from significant failure modes is usually a single type. When several types are present, pay particular attention to identifying significant types.

(4) It is likely that a maintenance-generated chip light will occur during first 25-50 hours of operation following replacement of a component. It is also likely that several maintenance-generated chip lights will occur in first 100 hours of operation following installation of ODDS (MWO 1-1520-236-50-30).

(5) A single clip is rarely significant.

6-4.2. DECISION CRITERIA FOR REPLACEMENT OF TRANSMISSION, FOLLOWING CHIP CAUTION LIGHT. (Helicopters with MWO 1-1520-236-50-30).

a. Collection and Analysis of Debris Samples - In the event of main transmission chip light illumination, proceed as follows:

NOTE

It is very difficult to provide procedures for all types of chip light occurrences. Units should take full advantage of all information available, such as DA Form 2408 History, Oil Debris Classification Chart, Supporting Oil Labs, CCAD Service Center, etc.

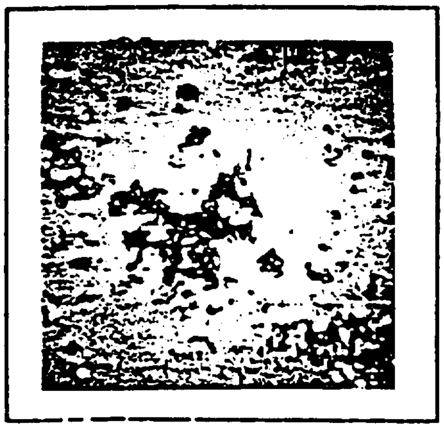
Table 6-1.1 Oil Debris Classification Chart (Aircraft wihout ODDS)

DEBRIS TYPE	DESCRIPTION	QUANTITY/SIZE	CAUSE/ACTION REQUIRED
A. Flake (steel) [significant]	Thin, flat, oblong particles with rounded or scalloped sides. Like corn flakes.	SIZE: Up to 0.040 long and very thin. QUANTITY: Generally more than 10 particles per chip event.	Typically result from spalling of bearings. Usually idicates bearing wear and, sometimes, gear wear. (Note 1.)
B. Chunk/Fragment (steel) [significant]	Sometimes identifiable as fragment from specific component in engine or transmission. Shape varies widely. Sometimes shows distinct fracture surface.	SIZE: Varies greatly. QUANTITY: Usually 1 to 5 per chip event.	Indicates possibility of major failure of part; e.g. gears, bearings or other dynamic elements. Can sometimes be maintenance/induced or residual debris from previous failure. (Note 1.)
C. Granule (steel) [significant]	Fine powder–like clumps, irregular shaped debris. Like coffee grounds.	SIZE: Length and width are similar and generally 0.010. Thickness varies, but is generally one–half length–width. QUANTITY: Usually more than 50 per chip event.	Usually bearing or gear wear, scoring. Generally associated with fretting or components spinning in housings or on shafts. May be mixed with flakes or fragments. (Note 1.)
D. Bronze [significant]	Granular, chunks, fragments, or powder–like golden particles.	To be significant, 25 particles, any size, per chip event.	Bearing cage wear or failure and usually preceded by chip light event with small quantities of magnetic debris (Note 1.)
E. Wire/Hair/ Splinter/Sliver [possible significant]	Long, thin wire or hair–like particles. May have jagged edges and exhibit fracture planes. Like steel wool or wood splinters.	SIZE: Length generally does not exceed 0.080, width and thickness 0.010 to 0.012. QUANTITY: Generally 1 to 20 particles per chip event.	Generally not a significant wear mode. Often associated with maintenance–induced debris. In T–53 engine, may come from torquemeter cylinder. (Note 1.)
F. Cutting/Turning [possible significant]	Curled, twisted debris of varying length and thickness. Like lathe turnings.	SIZE: Length to 0.08, width 0.10 to 0.08. Thickness varies greatly. QUANTITY: 5 to 20 particles per chip event.	Usually maintenance–induced and not significant. However, recurrence or large quantity usually indicates abrasive wear by bearings or seals rotating in housing. (Note 1.)
G. Chrome/Silver [possible significant]	Large flat particles. Like shavings, peelings).	To be significant, must be greater than 3 particles which are more than 0.08 long.	Platings or coatings separating from parts; e.g. bearings. (Note 1.)
H. Aluminum/ Magnesium [possible significant]	Granular, powder–like chunks or turning particles. Can be bright silver–white to gray if very fine.	To be significant, 20 to 30 large pieces.	Not usually significant. Wear of housing or failure of shims, spacers, cases. (Note 1.)
I. Carbon [possible significant]	Black, usually granular, powder, may include chunks or slivers.	Usually requires large quantity to be significant.	Engine only. Generally due to wear of carbon seal. Look for other symptons; increased oil use, smoking, leaking.
J . Epoxy/Phenolic [possibly significant]	Varies in color and can be fibers or peelings or plating–like particles.	Variable	Manufacturing debris or coating peeling. (Note 1.)

AIRCRAFT WITHOUT ODDS

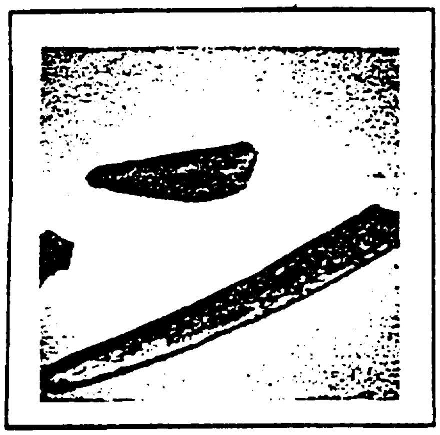
NOTES

1. Refer to oil contamination troubleshooting for the system.
2. Use this table in conjunction with figure 6-2.1.
3. Dimensions are in inches.

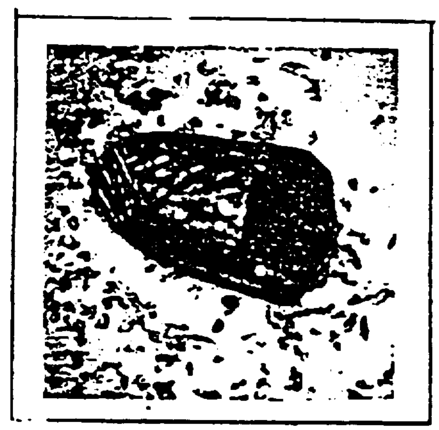


STEEL FLAKES
(SIGNIFICANT)

STEEL GRANULES
(SIGNIFICANT)



STEEL CHUNKS
(SIGNIFICANT)



BRONZE FRAGMENTS
(SIGNIFICANT)

CHUNKS, TURNINGS
(SIGNIFICANT)

Figure 6-2.1. Typical Oil System Debris at 6X Magnification. Aircraft without ODDS.

NOTE
Figure 6-2.2 has been replaced by Table 6-1.2.

Table 6-1.2. Oil Debris Classification Chart (Aircraft with ODDS)

Debris Type	Debris Description	Debris Source	Allowable Quantity & Size
A. Flakes-Magnetic	Thin, flat oblong particles with rounded or scalloped sides (like corn flakes).	Typically results from bearing spalling or other bearing or gear wear.	No more than 10 particles, none greater than 0.040 inch long. Very thin.
B. Granule-Magnetic	Fine powder like clumps and/or irregular shaped debris (like coffee grounds).	Usually bearing/gear wear or scoring. Generally associated with fretting or components spinning in housings or shafts. May be mixed with flakes or fragments.	No more than 50 particles. Length and width under 0.010 inch. Thickness varies but generally one-half of width.
C. Chunk/ Fragment-Magnetic	Sometimes identifiable as fragment from specific component. Shape varies widely. Sometimes shows distinct fracture surface.	Indicates possible major failure of internal component- gear, bearing, etc. Can be maintenance induced or residual debris from a previous failure.	None of any size allowed.
D. Bronze-Non-magnetic	Granular, chunks, fragments or powder like golden particles.	Bearing cage wear or failure. Usually proceeded by a chip light with small quantities of metallic (magnetic) debris. Usually 1-5 particles are present each event.	No more than five particles of any size.
E. Wire/Hair/ Splinter/Silver	Long, thin wire or hair-like particles (like steel wool or wool splinters). May have jagged edges and exhibit fracture planes.	Generally not a significant wear mode. Often associated with maintenance-induced debris. Usually 1-20 particles per event, of length 0.080 inch and thickness 0.010 to 0.012 inch.	No more than 40 particles of any size.
F. Cutting/ Turning	Curled, twisted debris of varying length and thickness (like lathe turnings).	Usually maintenance-induced and not significant. However, recurrence of large quantities usually indicates abrasive wear by bearings or seals rotating in housings. Usually 5-20 particles per event, of length 0.080 inch and width 0.08 to 0.10 inch.	No more than 40 particles of any size.
G. Chrome/Silver	Large flat particles (like shavings, peelings).	Platings or coatings separating from parts such as bearings.	No more than 3 particles, none more than 0.08 inch long.
H. Aluminum/ Magnesium	Granular, powder-like chunks or turning particles. Can be bright silver-white to gray if very fine	Not usually significant. Wear of housings or damage to shims, spacers, cases etc.	No more than 30 particles of any size.
I. Carbon	Black usually granular or powder, may include chunks or slivers.	Usually due to wear of carbon seals. Other symptoms should be evident first, such as increased oil consumption, smoking, filter bypass or leaking.	No maximum quantity/size. If more than 20 particles of any size is present, check seals and take appropriate maint. action.
J. Epoxy/Phenolic	Varies in color. Can be fibers, peelings, or plating like particles.	Manufacturing debris of coating peeling.	No maximum quantity/size.
K. Sand/Dirt	Light or dark granular particles.	External contamination.	No maximum quantity/size.
L. Fibers/Lint	Color and types variable.	External contamination.	No maximum quantity/size.

AIRCRAFT WITH ODDS

NOTE

Determine the different types of debris on the chip detector, since it is possible to have more than one type of debris on the chip detector. An example would be the presence of both flakes and granules on the chip detector. More than 10 flakes or more than 50 granule particles would be cause for component replacement Any combination of less than 10 flakes and 50 granules would be acceptable.

NOTE

Replacement of external oil filter on ODDS equipped aircraft is “ON CONDITION” and only when associated impending bypass indicator button is extended (second reset) or main transmission change. The affected chip detector should also be removed and inspected whenever the impending bypass indicator button is extended. Since fine filtration deans the lubricant in the component, do not replace lubricant when replacing filter. Flushing and filtering of system (unless there is a component replacement) is not required or authorized as this may mask problems and prevents trending of data.

(1) Remove and inspect debris monitor. Classify debris I.A.W. Oil Debris Classification Chart (table 6-1.2). Document findings on DA Form 2408-20, block 7.

NOTE

More frequent chip lights maybe encountered In the first 50 hours of operation of a component which has undergone an overhaul or major repair, as well as break-in wear debris, being present in lube system. This type of debris is normal and not indicative of a problem with the ODDS System.

(2) Clean debris monitor, and screen with solvent (C112) and dean cloth and reinstall.

(3) Retain or replace component I.A.W. Oil Debris Classification chart (table 6-1.2).

(4) If evaluation of debris requires component replacement, remove component and forward to overhaul.

(5) If evaluation of debris does not require replacement of component, operate aircraft for one hour, (30 minutes flat pitch ground run and 30 minutes hover m ground effect). Re-check chip detector. Classify debris I.A.W. Oil Debris Classification Chart (table 6-12).

(6) If number or size of debris has increased, remove defective component and forward to overhaul.

(7) If number or size of debris decreases or remains the same, return aircraft to service.

SECTION II. MAIN DRIVESHAFT

6-5. MAIN DRIVESHAFT.

6-6. DESCRIPTION - MAIN DRIVESHAFT.

A main driveshaft with crowned tooth couplings is installed between an adapter on engine output shaft and the freewheel coupling of the transmission input drive quill (figure 6-3). Two damp sets, of split V-band type, hold the mating curvic splined faces of couplings in secure contact. Flexibility of couplings is provided by sliding an inner coupling in splines of an outer coupling to accommodate movement of transmission on pylon mountings. A spring in each coupling assists centering of shaft during operation and tends to hold shaft assembly in place if damps are removed during maintenance.

6-7. ALIGNMENT-MAIN DRIVESHAFT.

a. Check alignment for main driveshaft installation between transmission input drive quill coupling and engine output shaft adapter when any of the following conditions apply:

(1) Main driveshaft inspection reveals excessive wear of coupling splines.

(2) Main driveshaft has multi-color appearance indicating excessive heating.

(3) Driveshaft misalignment is suspected for any reason.

(4) Engine tripod mount, engine biped mount, or engine forward support tube mount is replaced.

(5) Any engine mount to service deck fitting is changed.

(6) Shim stack-up under any engine mount to service deck fitting is changed.

(7) Major repair to the center fuselage section and tailboom in area 9, figure 1-12.

(8) Driveshaft couplings have multi-colored or straw colored appearance, indicating overheating.

NOTE

When engine is replaced, driveshaft alignment check is not required, provided engine mount components, deck fittings, or shim stack-up is not changed.

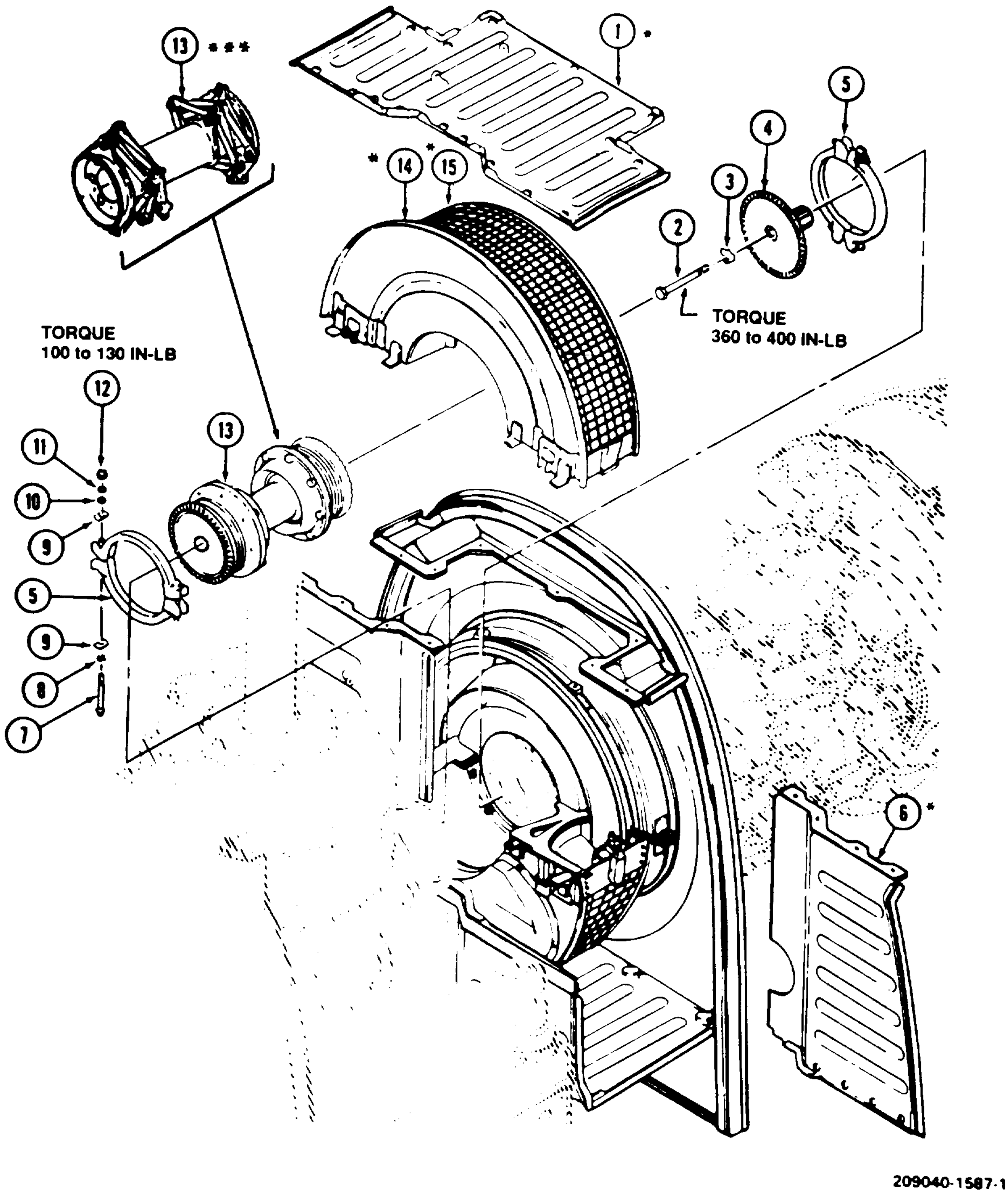
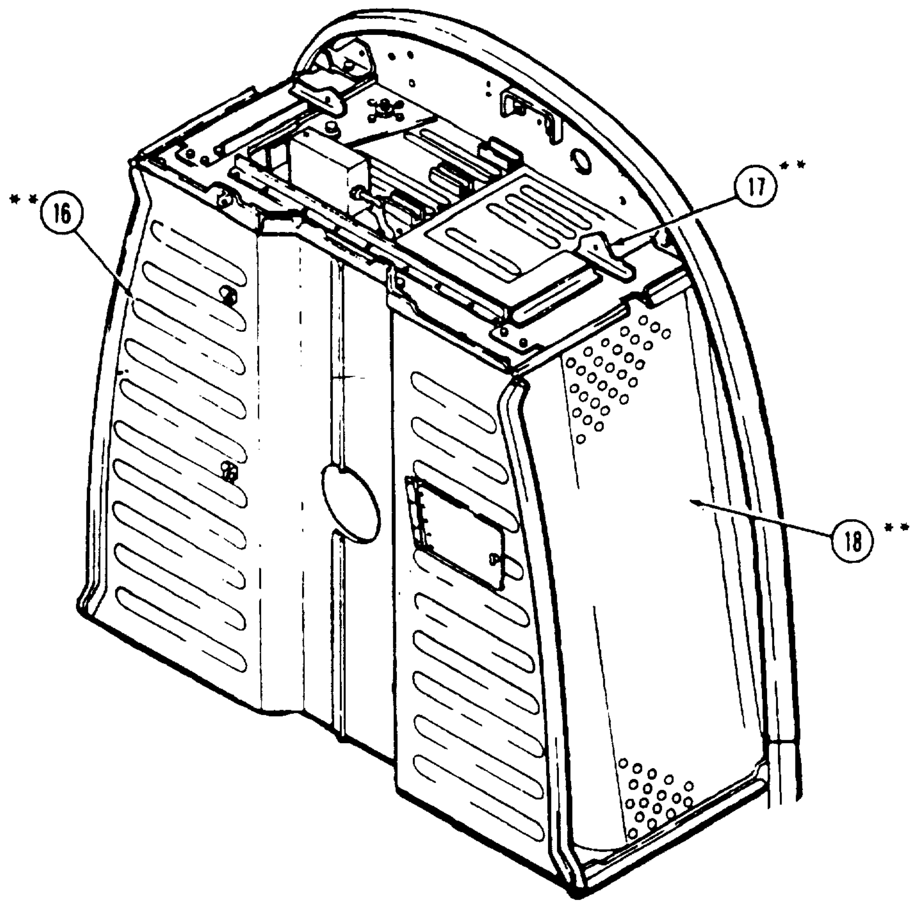


Figure 6-3. Main Driveshaft Installation (Sheet 1 of 2)



1.	Baffle panel	7.	Bolt	13.	Main driveshaft assembly
2.	Bolt	8.	Chamfered washer	14.	Particle separator upper half
3.	Locking washer	9.	Pivots	15.	FOD screen upper half
4.	Adapter	10.	Steel washer	16.	Forward baffle
5.	Clamp sets	11.	Thin steel washer (if reqd)	17.	Top baffle
6.	Baffle panel	12.	Nut	18.	Centrisep particle separator

* E M P Prior to incorporation of MWO 55-1520-236-50-12.
** E M After incorporation of MWO 55-1520-236-50-12.
*** After incorporation of MWO 55-1520-244-50-04

Figure 6-3. Main Driveshaft Installation (Sheet 2 of 2)

Premaintenance Requirements for Main Driveshaft Alignments

Conditions	Requirements
Model	AH-1E, F, & P
Part Number or Serial Number	All
Special Tools	(T45) (T32) (T35)
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	None
Special Environmental Conditions	None

b. Remove main driveshaft (paragraph 6-8). Leave adapter (4, figure 6-3) installed in end of engine output shaft.

CAUTION

Do not attempt to raise transmission with jacks only. Hoist must be used in conjunction with jacks while lifting.

c. Attach hoist (T45) or other suitable hoist to main rotor retaining nut at top of mast. Install four jacks (T35), two at each side between transmission support case and top of pylon supports (figure 6-4).

d. Remove nut and washer from lower bolt of lift link, and operate hoist to raise transmission until bolt can be freely moved with fingers or wrench. Adjust jacks to hold pylon at this position with hoist stack. Replace bolt if binding occurs due to corrosion or galling.

e. Check that transmission support points are parallel symmetrically with pylon support structure. Measure at each mount with a micrometer depth gage as shown in figure 6-4.

(1) Measure dimension from top surface of sup port case mounting plate to top of pylon support. All four dimensions should now be equal within 0.020 inch.

(2) When all four points cannot be adjusted to same dimension, take average of two front points and adjust two rear points accordingly.

f. Install target plate of alignment tool set, (T32) on transmission input quill coupling (figure 6-5). Index arrow of center at 3.5 on inner scale. Secure by tightening two washer-head screws at back of plate, Position plate on coupling with 1.75 index of outer scale at top of vertical centerline (figure 6-5). Secure with coupling damp set.

g. Install alignment gage of tool set on engine output shaft adapter, Secure with coupling damp set (figure 6-5).

h. Check horizontal and vertical alignment by extending plunger of gage toward target plate hole. Push plunger forward against tension of retracting spring.

(1) Largest diameter of plunger must enter target hole to indicate correct alignment.

(2) If misalignment is indicated, observe amount and direction.

NOTE

No correction should be attempted before completing angularity check in following step. Shim requirements can be determined best on basis of both checks.

i. Perform angularity check with a dial indicator mounted on end of alignment gage housing as follows:

(1) Position indicator for contact at 2.5 inch radius (just inside outer scale numerals) on target plate (part of T32).

(2) Rotate gage through a full turn to find area of plate nearest to engine, This should occur at left side of plate between 8 and 10 o'clock position. Zero indicator in this area.

(3) Check run-out through a full turn of gage to be within 0.016 inch maximum total indicator reading. If runout is greater than 0.016 inch, make correction of engine alignment by use of shims under engine mount deck fitting as required (figure 6-5).

CAUTION

Do not exceed 0.312 inch shim thickness under any fitting.

j. Repeat alignment and angularity check after any change of shims.

k. When alignment is complete, reinstall washer and nut on lift link lower bolt. Torque nut 30 TO 50 foot-pounds. Remove jacks (T35) and hoist (figure 6-4).

l. Install driveshaft (paragraph 6-13).

NOTE

After alignment and angularity adjustments, perform the following.

- Power lever control rigging
- Power turbine governor rigging
- Droop cam rigging
- Vibration analysis

6-8. REMOVAL — MAIN DRIVESHAFT.

a. Open cowling on left and right side of pylon. Remove baffle panel (6, figure 6-3).

b. Prior to incorporation of MWO 55-1520-236-50-12, remove particle separator as follows:

(1) Remove baffle panels (1 and 6) (paragraph 2-125).

(2) Remove top half of FOD screen (15) (paragraph 4-35).

(3) Remove particle separator (14). Cover open ends of lower air filter assembly to keep out dirt and foreign objects.

c. After incorporation of MWO 55-1520-236-50-12, remove centrisep particle separator as follows:

(1) Remove top baffle (17) and left and right sections of forward baffle (16) (paragraph 2-125.1).

(2) Remove centrisep particle separator (18) (paragraph 4-28.1).

d. Remove clamp sets (5) from each end of shaft, with attaching parts (7) through (12). Keep serialized clamps and attaching parts in sets.

e. Push shaft assembly (13) toward either end to shift one coupling inward and disengage coupling at opposite end. Remove shaft assembly. Apply enough force to compress springs in couplings.

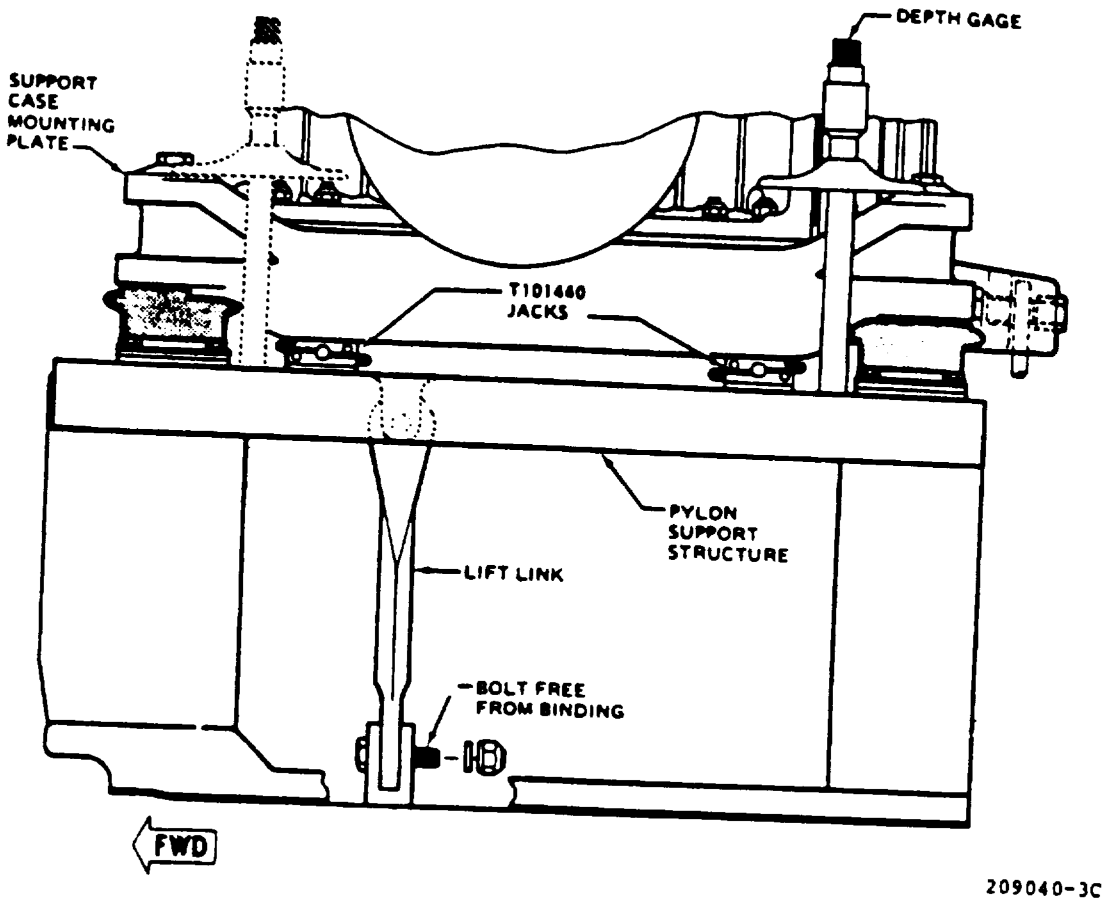


Figure 6-4. Tool Application - Transmission Positioning Jacks P/N T101440 (135)

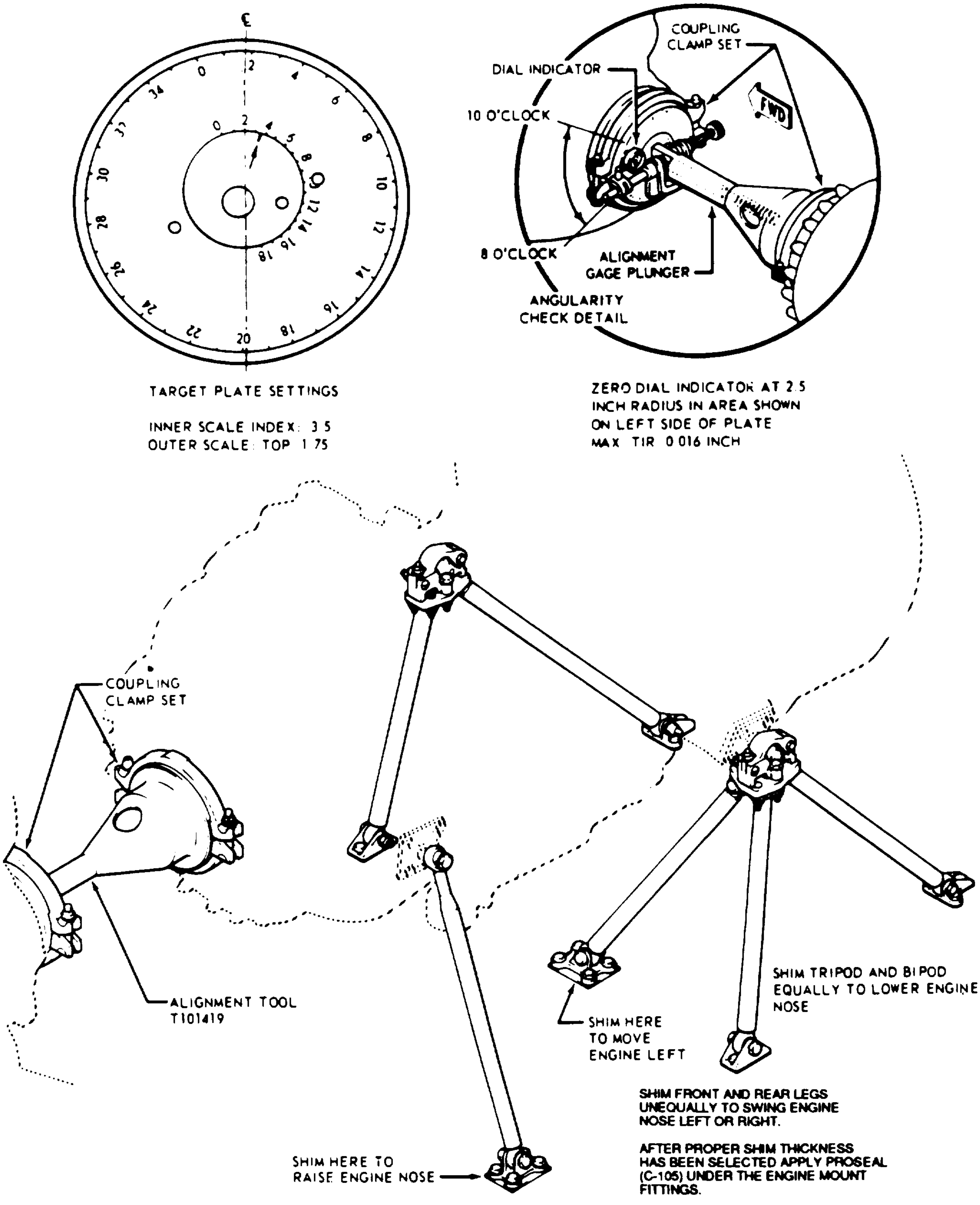


Figure 6-5. Tool Application — Engine to Transmission Driveshaft Alignment P/N T101419 (T32)

6-9. DISASSEMBLY – MAIN DRIVE SHAFT.

Premaintenance Requirements for Main Driveshaft Disassembly

Conditions	Requirements
Model	AH-IS
Part Number or Serial Number	All
Special Tools	(T25) (T33)
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C19) (C31) (C37) (C88 or C91) (C103) (C112) (C116)
Special Environmental Conditions	None

a. Place shaft assembly on a suitable work table. Remove retaining ring (1, figure 6-6), Use care in removing ring, which must be replaced if bent or damaged. See details A and B in figure 6-7 for removal technique.

b. Push down on outer coupling (13, figure 6-6) just enough to force out retainer (3). Remove retainer pecking (2), spring (4), and locking spring (5). See details C and D, figure 6-7 for removal technique.

c. Repeat steps a. and b. at opposite end of shaft.

d. Attaching holding fixture (T33) with a clamp set on one coupling of shaft with retainer reinstalled as a spacer to keep inner coupling in place. Secure fixture in a vise (detail E).

e. Use transmission wrench (T25) to loosen nut (6, figure 6-6). Do not remove nut. Remove shaft from holding fixture.

f. Repeat steps d. and e. to loosen nut in opposite end of shaft.

g. Remove nut (6) and spring retainer (7) from one end of shaft. See details G and H, figure 6-7, for removal technique.

h. Remove couplings from end of shaft (detail I).

i. Carefully remove inner coupling (14, figure 6-6) from outer coupling (13). See detail J, figure 6-7, for removal technique.

CAUTION

Inner coupling may be tight in boot ring, Use extreme care not to damage boot.

NOTE

If the driveshaft has been dynamically balanced, the outer couplings, inner couplings and the driveshaft will be indexed as shown on figure 6-6. Also, one or more lamination weights (15) will be installed.

i.1. If driveshaft has been dynamically balanced (at CCAD), use marking ink to temporarily index relative positions of laminated balance weights (15), boots, and outer couplings. Mark each end of shaft with different colors or marks.

j. Remove bolts (9, figure 6-6) and washers (10) to separate boot (11) from outer coupling (13) and remove packing (12).

k. Record serial numbers of mating inner and outer couplings.

l. Repeat steps g. through k. to remove parts from opposite end of shaft.

m. Clean main driveshaft as follows:

WARNING

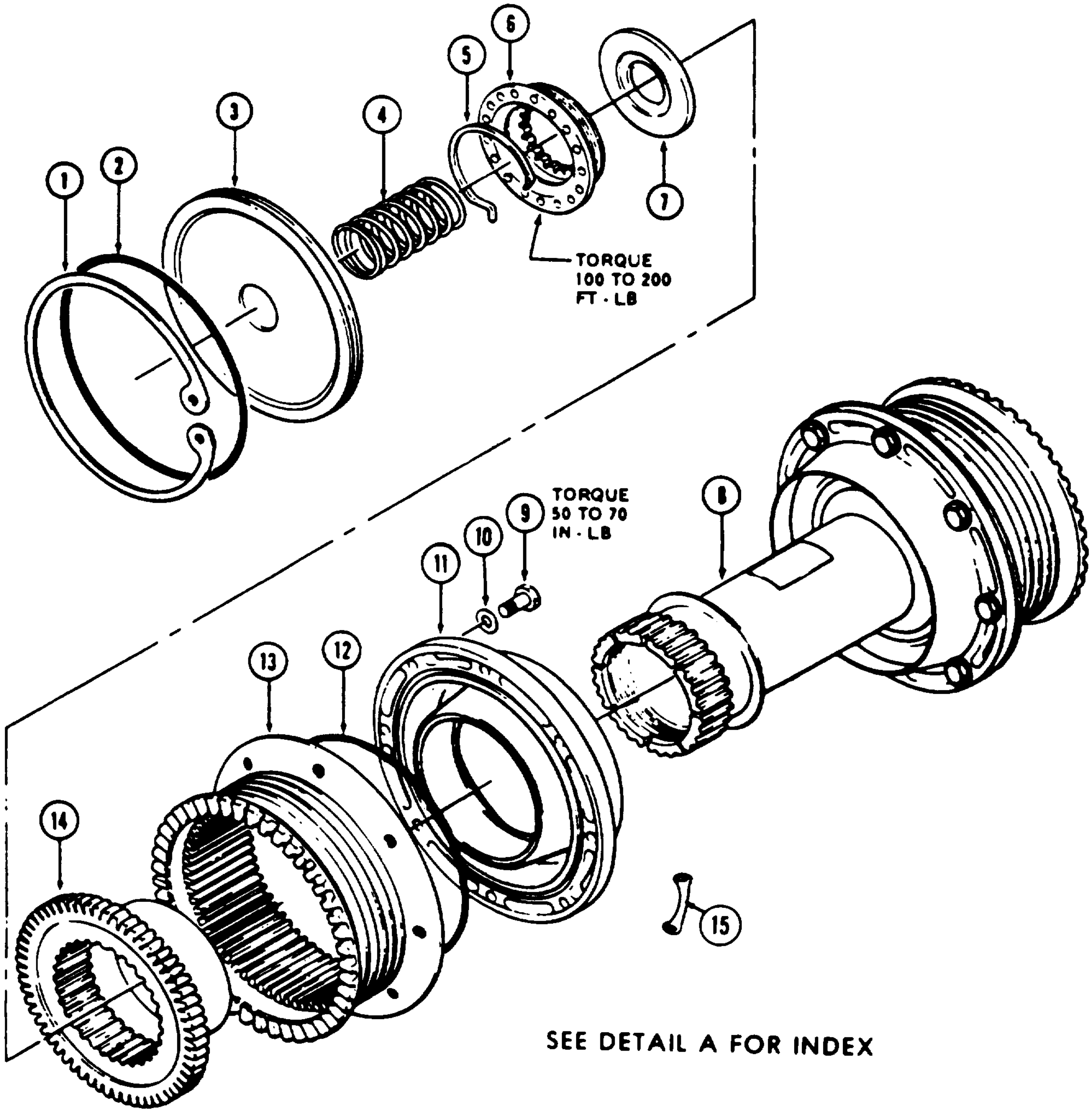
Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

CAUTION

Do not use solvent to clean assembled driveshaft. Residue may remain in assembly and prevent proper lubrication. Do not clean boot (11) with cleaning solvent.

(1) Clean shaft assembly, adapter and attaching parts by wiping with clean cloth. Solvent (C112) may be used if driveshaft is completely disassembled.

(2) Remove all grease from inner and outer couplings.



1. Retaining ring
2. Packing
3. Retainer
4. Spring
5. Locking spring
6. Nut
7. Spring retainer
8. Shaft
9. Bolts
10. Washer
11. Boot
12. Packing
13. Outer coupling
14. Inner coupling
15. Balance weight

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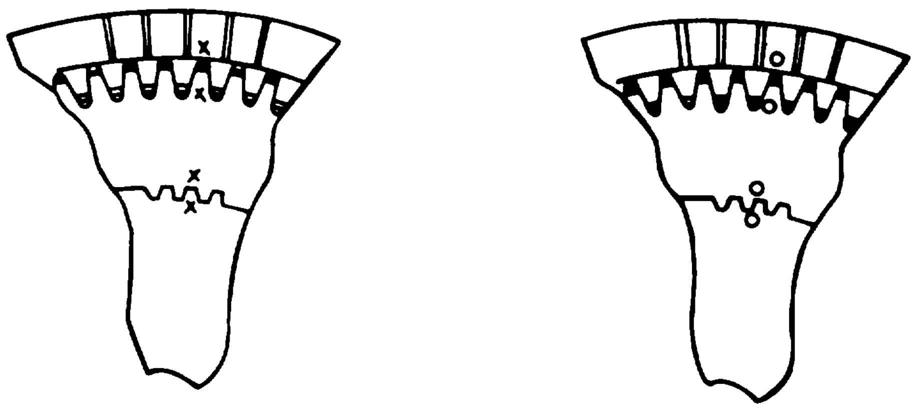
Figure 6-6. Main Driveshaft Assembly (Sheet 1 of 2)



DETAIL VIEW ILLUSTRATING INDEXING OF MAIN DRIVE SHAFT PARTS

DETAIL A

Figure 6-6. Main Driveshaft Assembly (Sheet 2 of 2)

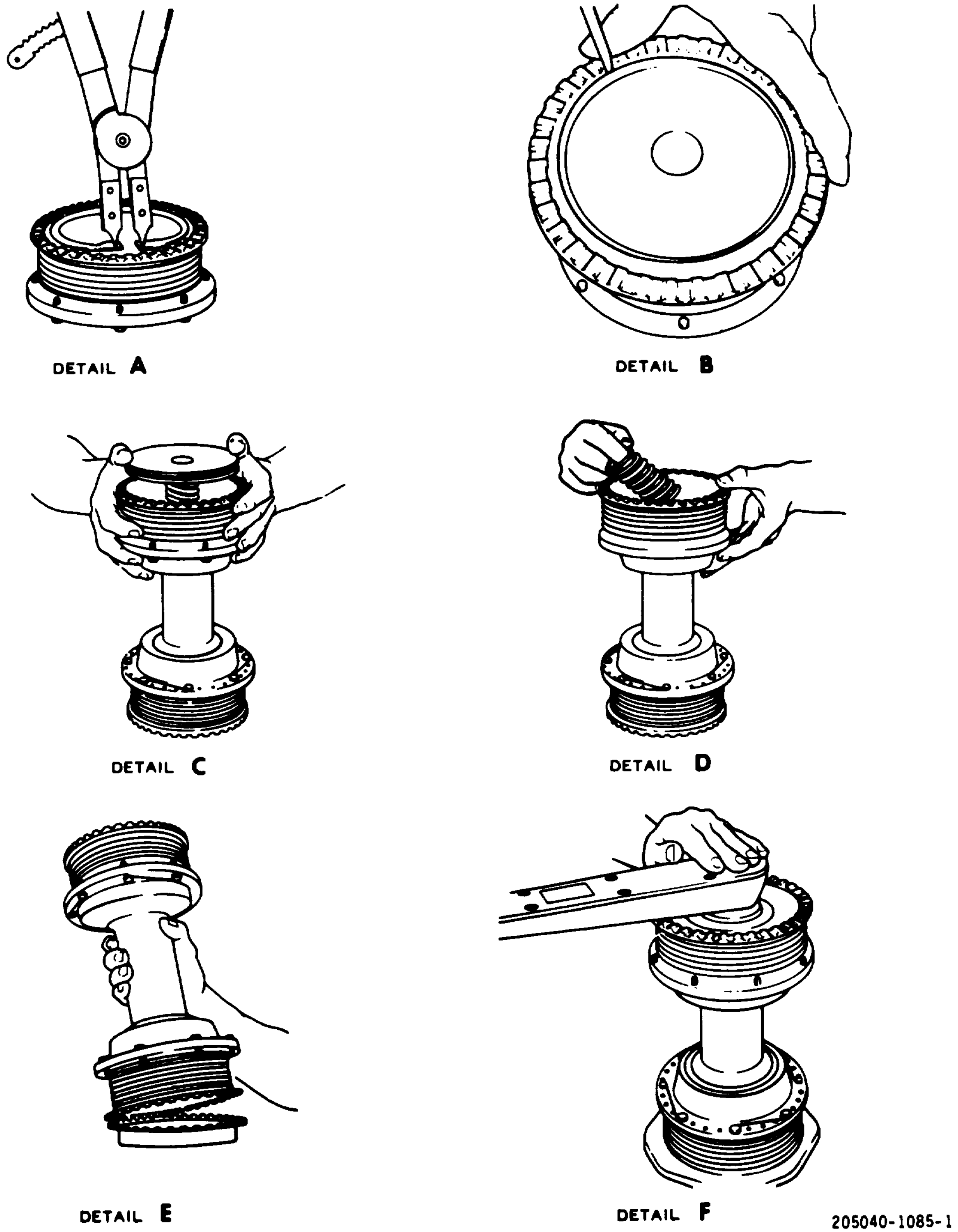


Figure 6-7. Inspection and Lubrication of Main Driveshaft (Sheet 1 of 3)

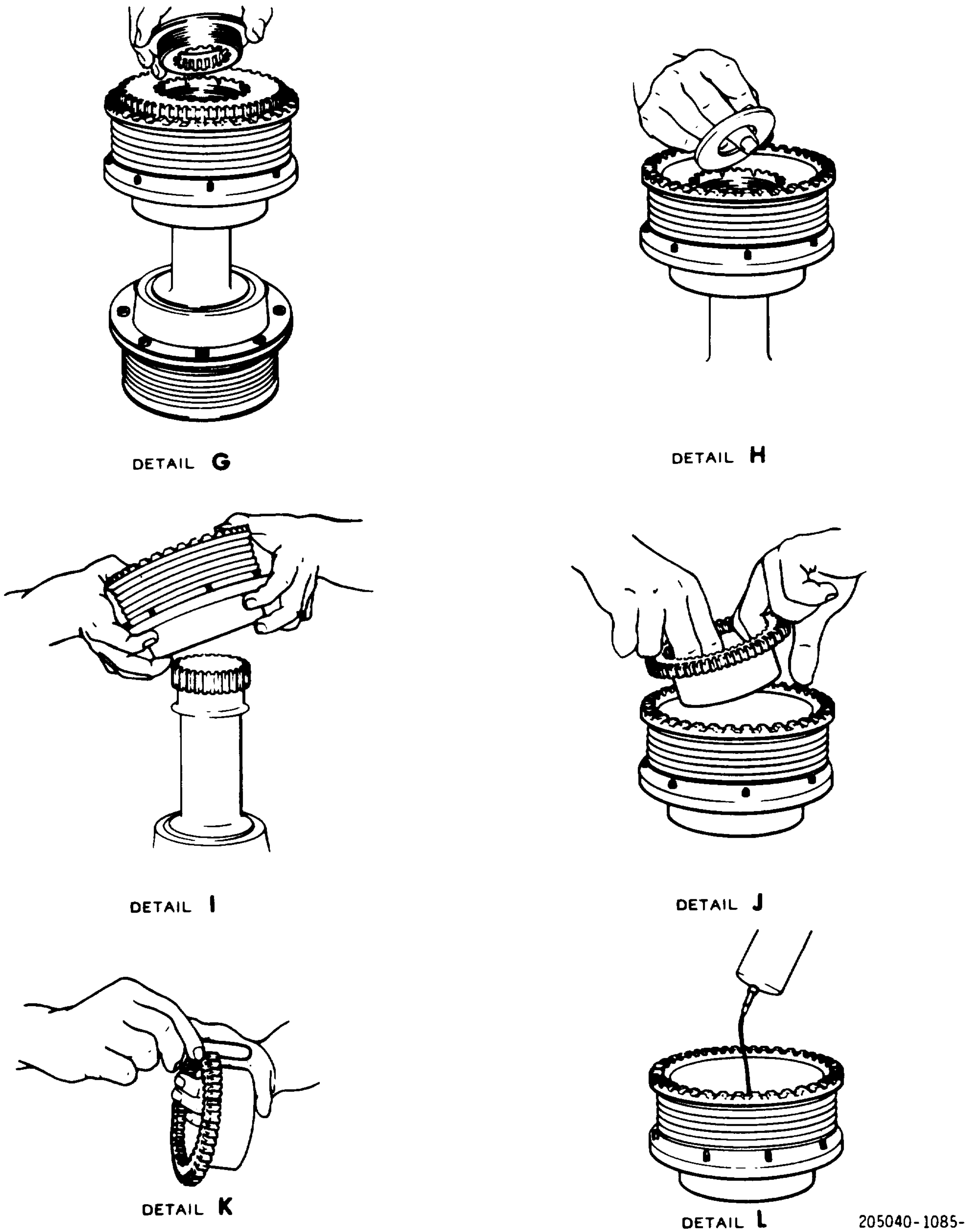
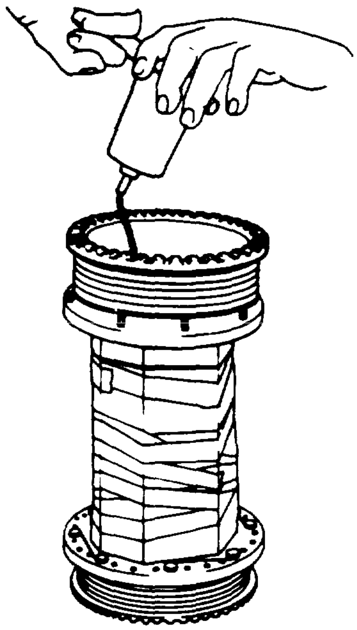
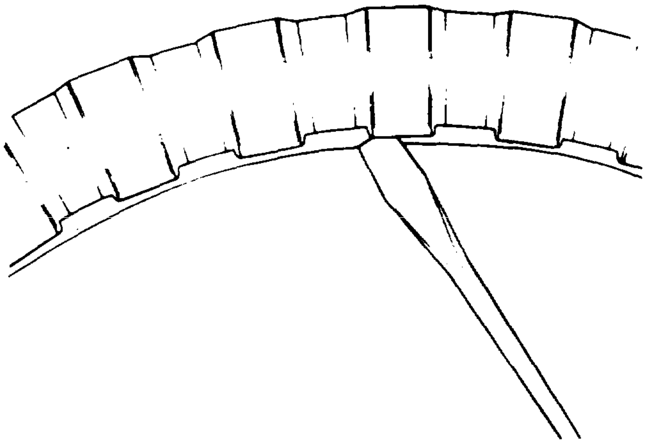


Figure 6-7. Inspection and Lubrication of Main Driveshaft (Sheet 2 of 3)



DETAIL M



DETAIL N

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Figure 6-7. Inspection and Lubrication of Main Driveshaft (Sheet 3 of 3)

CAUTION

Do not use alcoholic phsophoric solution on couplings (12) and (13).

(3) If necessary, clean corrosion from parts using wire brush or Scotch-brite (C103). If necessary to remove all corrosion, wipe pitted area with cotton swab dipped in alcoholic phosphoric (C19) diluted three parts water to one part (C19). Wash area clean with water and dry with hot air.

6-10. INSPECTION – MAIN DRIVESHAFT.

a. Inspect installed driveshaft for security, grease leakage, and evidence of damage.

b. Inspect main driveshaft after disassembly as follows:

(1) Outer surface of shaft (8, figure 6-6) for nicks, scratches or pits to the following limits:

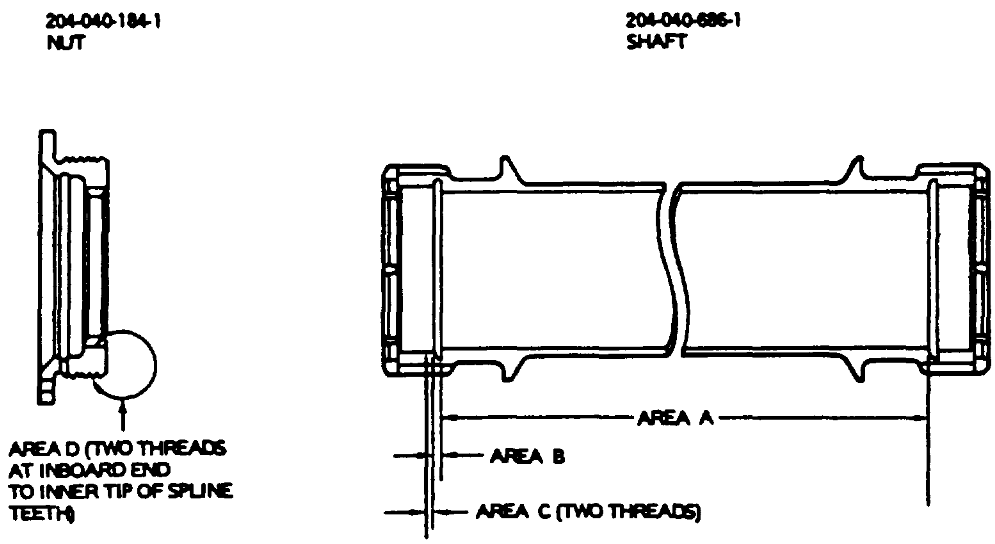
(a) Nicks and scratchs, running within 15 degrees of shaft axis, which are not in excess of 0.005 inch in depth are permissible without polishing out.

(b) Nicks and scratches, running within 15 degrees of shaft axis, which are not in excess of 0.010 inch depth are permissible if polished out. Total polished area must not exceed 20 percent of circumference of shaft at any point.

(c) Nicks and scratches not running within 15 degrees of shaft axis must be polished out. A maximum depth of 0.005 inch may be polished out on 100 percent of shaft circumference. A maximum depth of 0.010 inch maybe polished out, provided the total polished area does not exceed 20 percent of shaft circumference at any point.

(2) Inner surface of shaft (8) for corrosion pits to the following limits:

(a) In area A, figure 6-7.1, pits to a maximum depth of 0.005 inch are acceptable without polishing out. Pits greater than 0.005 inch in depth must be polished out. Maximum acceptable depth of rework to completely polish out pits is 0.015 inch, or to a maximum inside diameter of 2.430 inch provided rework is done by honing or other suitable means



1. Area A, inside diameter of shaft. That portion in the middle with constant bore, extending from chamfer at thread relief at one end, to the similar chamfer at the other end.
2. Area B, thread relief, including all surfaces from Area A to the inner end of the threads.
3. Area C, includes two threads at the inner end.
4. Area D, on nut, includes two threads at the inboard end, and extends around the end face to the inner tip of spline teeth.

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Figure 6-7.1 Main Driveshaft Internal Corrosion Areas

such that material removal is uniform around the full inside diameter. Minimum acceptable radius in reworked area is 0.50 inch, and surface finish must be 63 microinches or better.

(b) in Area B, figure 6-7.1, pits to a maximum depth of 0.010 inch are acceptable without polishing out. Pits greater than 0.010 inch in depth must be polished out. Maximum acceptable depth of rework to completely polish out pits is 0.025 inch. Minimum acceptable wail thickness after rework is 0.060 inch. Minimum acceptable radius in reworked area is 0.09 inch, and surface finish must be 63 microinches or better.

(c) In Area C, figure 6-7.1, pits to a maximum depth of 0.030 inch are acceptable.

c. Inspect couplings as follows:

(1) Inspect packing groove in each retainer (3, figure 6-6) and areas of outer couplings (13), where packing and retaining ring will seat, for burrs or sharp edges. Remove any such defects with a fine India stone (C116) or crocus cloth (C42). Carefully remove any foreign material.

(2) inspect splines of couplings for wear conditions (figure 6-8). Use a white card or a tongue depressor at root of each tooth to reflect light on spline surfaces. See detail K, figure 6-7 for inspection technique.

(3) Inspect exterior of outer couplings for discoloration of cadmium plating as evidence of overheating. Extensive discoloration or blistering of cadmium plating is cause for return to depot maintenance level for repair.

(4) Inspect shaft (8, figure 6-6) inner coupling (14) and outer coupling(13) for chipped teeth, cracks, and damage.

c.1. Coupling overheat detector paint strip. A 1.0 by 1.1 inch strip of zinc-chromate primer is painted on each side (180° apart) of every flexible driveshaft coupling. The green zinc-chromate primer (TT-P-1757) will turn brown at 375± 5°F, indicating:

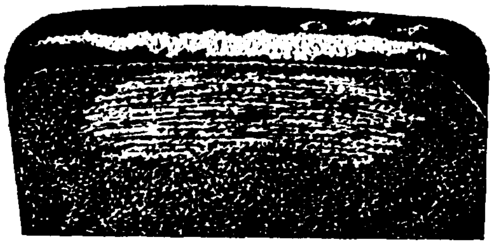
(1) Loss of lubricant due to seal failure.

(2) Contaminated or improper lubricant.

(3) incorrect cleaning and lubricating procedures.

(4) Drive train misalignment.

d. Inspect boot (11) for breaks or tears.



DETAIL A

DETAIL B

Details A and B show typical acceptable patterns of wear on spherical teeth of male coupling. Patterns will vary due to differences in time in service, alignment, and extent of operation at high power.

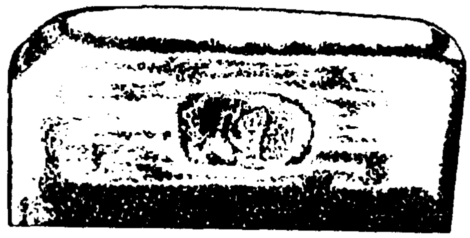
DETAIL C

Small defects as shown in detail C can occur in either Detail A or B. This type of defect is not detrimental to the coupling.

DETAIL D

Grooves, as shown in detail D, of any length are acceptable on not more than twelve consecutive teeth or twenty four teeth total.

DETAIL E



DETAIL F

Condition as shown in detail E or F are acceptable on not more than five consecutive teeth or twelve teeth total.

Note

When male coupling is replaced for defects like detail E or F, female coupling may require honing to remove any buildup of transferred metal.

DETAIL G

Defects as in detail G which cover over 1/2 the tooth length and 1/2 the tooth depth are to be rejected. Care should be taken in inspection of the female. If metal buildup is not excessive it may be honed down.

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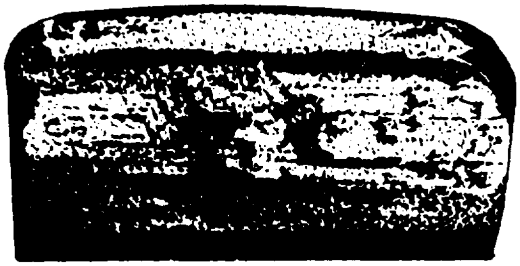
Figure 6-8. Coupling Wear Criteria for Driveshaft (Sheet 1 of 2)



DETAIL H

DETAIL I

Conditions shown in Detail H or I are not acceptable. This type of failure has only been found when an improper lubricant had been used. These photos show that the entire tooth surface has been spalled.

All or at least 30 of the 60 teeth will exhibit this failure. Check for the proper kind of lubricant, and be sure the proper amount of lubricant is installed.

Normally if the male coupling is as shown in Details H, I, or J the surface of the female will be damaged and should be scrapped.

DETAIL J

Detail J shows a group of teeth from a coupling which was run with an improper lubricant. The type of failure as shown in Details H and I.

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Figure 6-8. Coupling Wear Criteria for Driveshaft (Sheet 2 of 2)

e. Inspect spring retainer (7) for corrosion damage. Pits to a maximum depth of 0.030 inch are acceptable.

f. Inspect nut (6) for damaged threads or for corrosion damage. In Area D, figure 6-7.1, pits to a maximum depth of 0.030 inch are acceptable.

g. inspect spring (4, figure 6-6) for corrosion damage. Corrosion pits are unacceptable.

h. Inspect clamp set (5, figure 6-3) for cracks, distortion, and damage.

i. Inspect driveshaft assembly for wear in accordance with figure 6-9.

6-11. REPAIR – MAIN DRIVESHAFT.

a. Return to depot level of maintenance for repair if damage or wear to inner coupling (14, figure 6-6) or outer coupling (13) exceeds allowable inspection limits.

b. Replace all packings at reassembly.

c. Replace retaining ring (1) if broken or damaged.

d. Replace retainer (3) if broken or cracked.

e. Replace spring (4) if broken, damaged, or pitted. Remove superficial corrosion with Scotch-brite (C103)

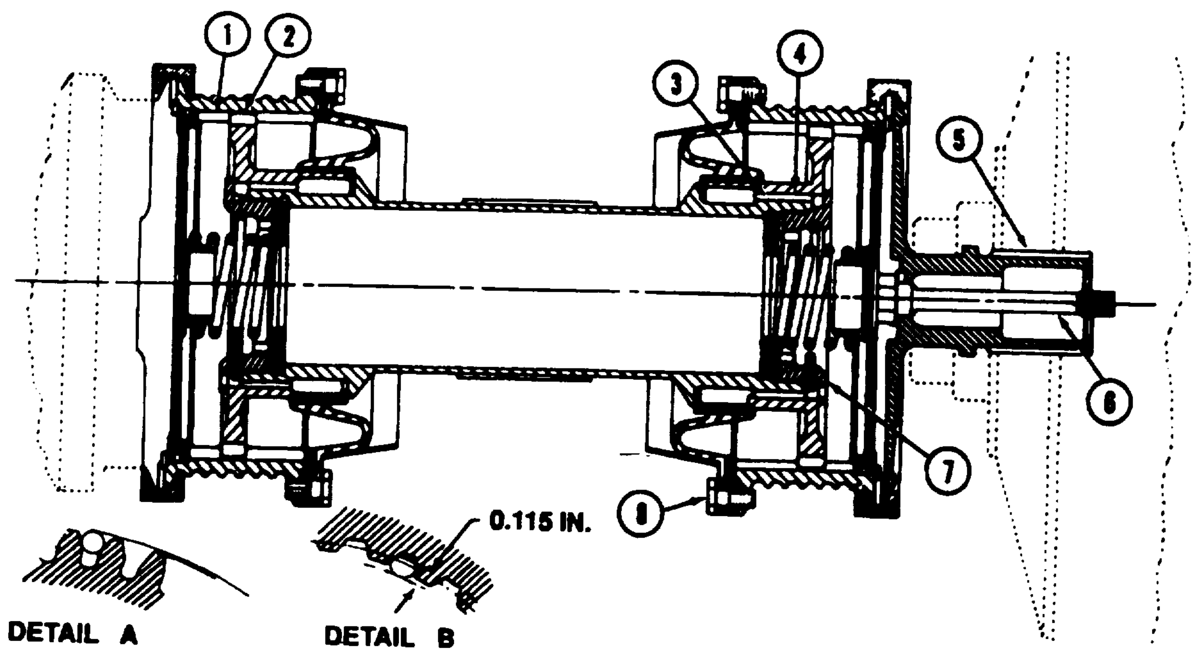
f. Treat with brush Alodlne (C31) after corrosion removal

g. Replace clamp set (5, figure 6-3) if cracked, damaged, distorted, or if not a numbered matched set.

h. Replace boot (11, figure 6-6) if broken or torn.

i. Replace locking spring (5) if broken or damaged.

j. Replace spring retainer (7) If worn, damaged, or if corrosion pits exceed allowable limits.



ITEM	NOMENCLATURE	DIMENSIONS (Inches) MIN	MAX	REPLACE
	Cracks	None		
1	Outer coupling — Internal spline (dim between pins) (use 0.1440 dia pins) (detail B)	4.8812	4.8852	*
2	Inner coupling — spherical teeth (dim over pins) (use 0.1440 dia pins) (detail A)	5.1800	5.1841	5.1549
3	Inner coupling — Internal spline (dim between pins) (use 0.1440 dia pins) (detail B)	2.8427	2.8445	**2.8464
4	Shaft — spline (use 0.1920 dia pins) (dim over pins)	3.2928	3.2952	3.2909
5	Adapter — spline (use 0.1200 dia pins) (dim over pins)	1.8067	1.8088	1.8017
		TORQUE		
6	Bolts — adapter retaining	360	400	in-lb.
7	Nuts — coupling retaining	100	200	ft-lb.
8	Bolts — seal housing retaining	50	70	in-lb.

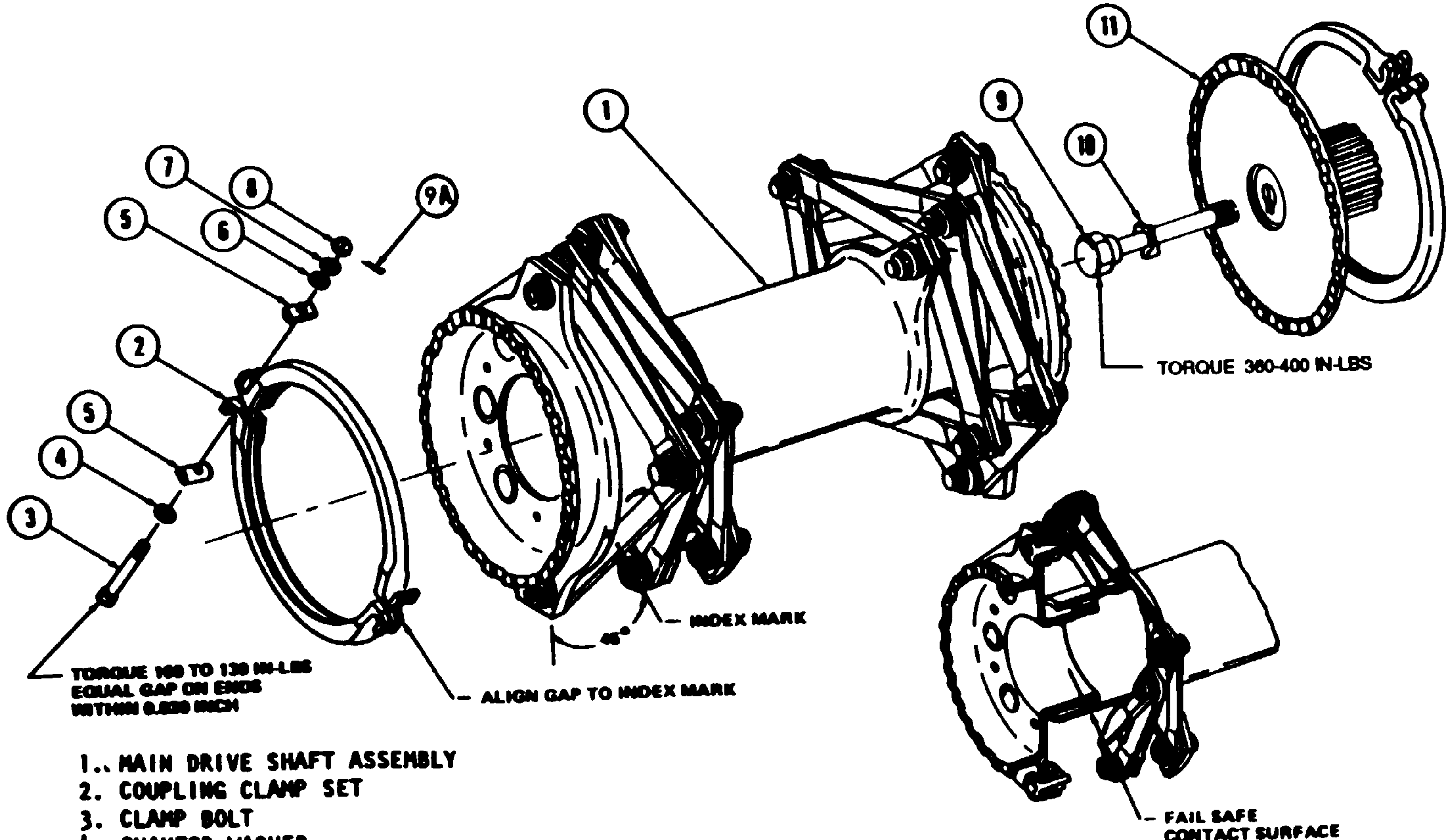
NOTE

*Maximum allowable depth of wear 0.0055 (measure from unworn face of tooth). (Dimension between pins is mfg. dimension for new parts.)

NOTE

**Use pins with one side ground flat to provide clearance between pins and root of spline teeth.

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.



1.. MAIN DRIVE SHAFT ASSEMBLY
2. COUPLING CLAMP SET
3. CLAMP BOLT
4. CHAMFER WASHER
5. PIVOTS
6. STEEL WASHER
7. STEEL WASHER (IF REQD)
8. NUT
9. RETAINING BOLT
9A. COTTER PIN
10. KEY WASHER
11. ADAPTER

Figure 6-9.1 Main Driveshaft

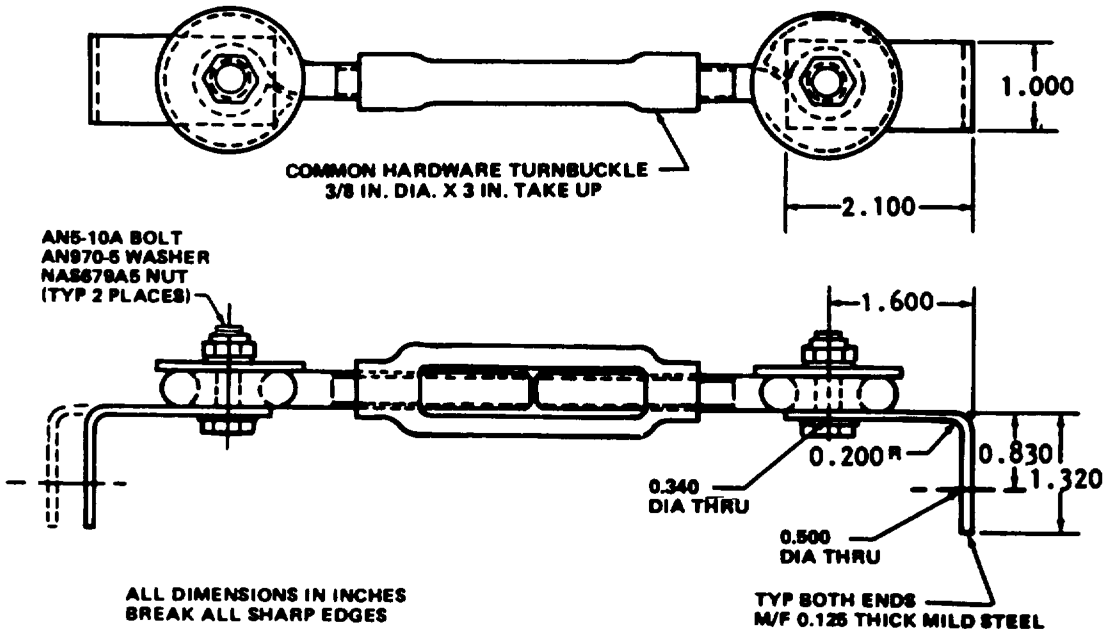


Figure 6-9.2 Main Driveshaft Installation & Removal Tool

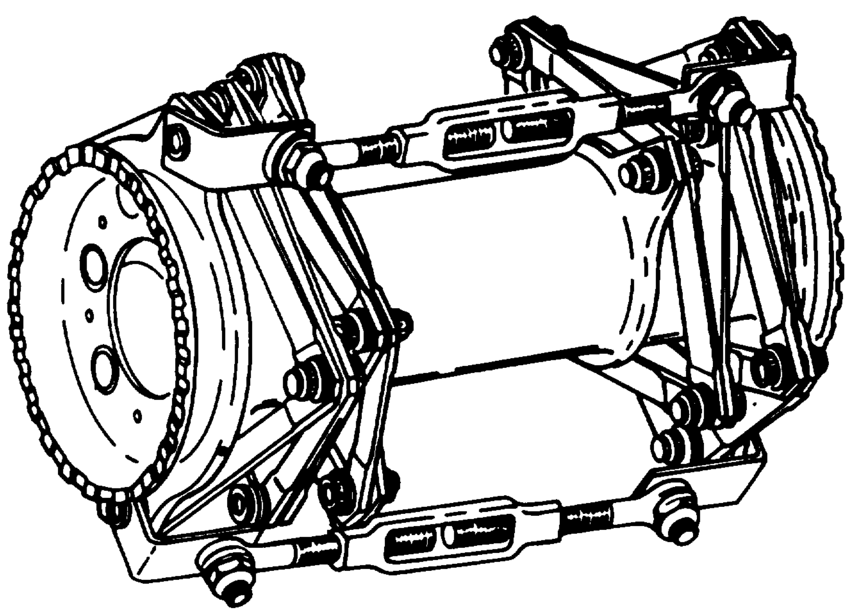
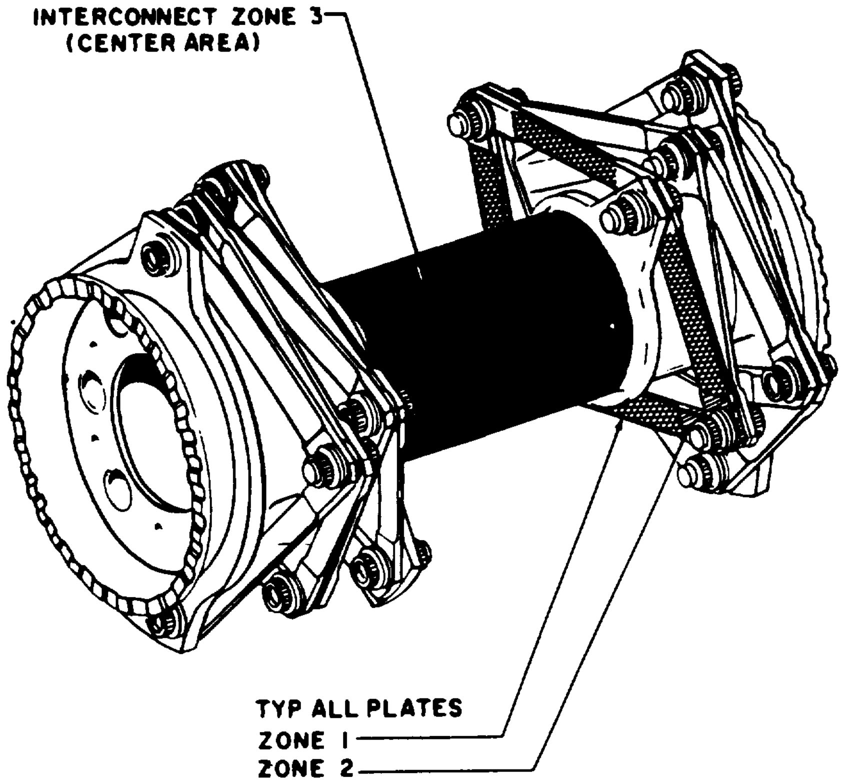


Figure 6-9.3 Work Aid Tool installed on Main Driveshaft



TYPE OF DAMAGE	ZONE 1	ZONE 2	ZONE 3	ZONE 4
NICKS, SCRATCHES, CORROSION	0.002	0.005	0.010	0.040
EDGE DENTS, NICKS	0.005	0.010	N/A	0.060
MAX AREA FOR FULL DEPTH REPAIRS	0.05 sq in.	0.10 sq in.	-not critical- (local area only)	
NUMBER OF REPAIRS	2 max	- not critical (not to overlap)		

Figure 6-9.4 Main Driveshaft Damage Limits

k. Polish out nicks, scratches, or pits on shaft (8) using fine India stone (C116) or crocus cloth (C37).

NOTE

Minimum acceptable radius in reworked areas is 0.50 inch, except in Area B, figure 6-7.1,0.09 inch minimum radius is acceptable. Surface finish in reworked areas must be 63 microinches or better. Polished areas, or cleaned areas with pita within allowable limits must be refinished with two coats of primer (C91).

(1) Nicks and scratches on the outside of shaft running within 15 degrees of shaft axis may be in excess of 0.010 inch depth. Polished area must not exceed 20 percent of circumference of shaft at any point.

(2) Nicks and scratches on outside of shaft not running within 15 degrees of shaft axis, which are not polished out. A maximum depth of 0.005 inch maybe polished out on 100 percent of shaft circumference. A maximum depth of 0.010 inch maybe polished out, provided the total polished area does not exceed 20 percent of shaft circumference at any point.

(3) Corrosion pitting on inside of shaft must be reworked or polished out in accordance with limits stated in paragraph 6-10.

(4) Replace shaft if cracked, dented or if damage exceeds acceptable limits.

1. Remove any defects such as burrs or sharp edges in packing groove in retainer (3, figure 6-6) and areas of outer coupling (13) where packing and retaining ring will seat. Use a fine India stone (C116) or crocus cloth (C37). Carefully remove any foreign material.

m. Replace couplings (13) and (14) if teeth are chipped, pitted, corrosion pitted, discolored or blistered plating indicating overheating or if patterns are not within acceptable limits.

n. Replace nut (6) if corrosion damage exceeds acceptable limits, or if threads are galled. Repair minor nicks or dents on threads using a fine India stone (C116).

o. Replace any parts that are cracked or exceed acceptable dimensional limits.

6-12. ASSEMBLY – MAIN DRIVESHAFT.

Premaintenance Requirements for Assembly of Main Driveshaft

Conditions	Requirements
Model	AH-IP/E/F
Part Number or Serial Number	All
Special Tools	(T25) (T33)
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C81) (C56) (C91) (C116) (C137) (C103)
Special Environmental Conditions	None

a. Lubricate and assemble driveshaft as follows:

(1) Install boot (11, figure 6-6) and packing (12) on outer coupling (13), making sure large holes in boot mote with the topped holes in the outer coupling. Install bolts (9), washer (10) and if installed, balance weight (15). Torque baits 50 TO 70 inch-pounds and install lockwire (C137).

(2) Position each coupling and boot assembly with boot down. Squeeze one-fourth of a tube of lubricant (C56) into boot of one coupling, keeping remainder of tube for later use. Apply lubricant from a second tube in other coupling booth in same manner. See detail L, figure 6-7. Coat inner diameter of shaft (8, figure 6-6) with a light film of coupling lubricant (C56). Coat threads and thread relief in shaft, threads and flange on nut (6) and mating surface on coupling (13) and spring retainer (7) with coupling lubricant (C56).

NOTE

If shaft has boon dynamically balanced, assure that Index parts "X" and "O" are indexed correctly per detail "A", figure 6-6 to maintain a dynamically balanced shaft.

If main driveshaft has not boon dynamically balanced, or If driveshaft or couplings were replaced, disregard use of laminated balance weights and indexing of parts.

(3) Carefully place inner couplings (14) into outer couplings (13). See detail J, figure 6-7. Be sure that couplings ore correctly mated according to serial numbers recorded at disassembly No special indexing of splines is necessary if driveshaft has not been dynamically balanced.

(4) Place a coupling assembly on end of shaft. See detail l. Install spring retainer (7, figure 6-6) and nut (6) finger-tight to bald parts in place. Repeat procedure at opposite end of shaft.

(5) Secure shaft assembly on holding fixture (T33) in a vise.

CAUTION

Before applying torque on nuts, be sure splines of inner and outer couplings are fully engaged, to avoid wrinkling and damaging boots.

(6) Torque nut (6) 100 TO 200 foot-pounds, using splined wrench (T25). See detail F, figure 6-7. Install locking spring (5, figure 6-6) with tang inserted through a hole in nut (6) and slot in end of shaft (8).

(7) Repeat steps (4) and (5) on opposite end of shaft. Remove tools.

(8) Cut a piece of corrugated cardboard approximately 7.25 by 16 inches. Fully extend couplings outward on shaft and wrap cardboard around shaft to hold in position.

(9) Apply remaining three-fourths tube of lubricant (C56) evenly inside one outer coupling with care to keep grease out of shaft, See detail M, figure 6-7.

NOTE

Six-ounce tube of grease provides correct amount of grease for one end of shaft.

(10) Install anew packing (2, figure 6-6) coated with grease (C56) in groove around retainer (8). Place spring (4) in center of spring retainer (7). Place retainer (3) on spring, and carefully press retainer inward to normal position. Check that retaining ring groove is clean and that there are no rubber slivers to indicate packing damage, See detail N, figure 6-7.

(11) Install retaining ring (1, figure 6-6). Ensure that ring is seated securely in groove of outer coupling, See details A and B, figure 6-7.

(12) Turn shaft assembly over, with incomplete coupling up.

(13) Repeat step (8), (9), and (10) to lubricate and complete assembly of other coupling. Remove cardboard from shaft.

b. Clean all traces of grease from exterior of driveshaft assembly with clean dry cloth.

c. Inspect coupling boots (11, figure 6-6) for any damage that may have occurred during assembly, Wrinkles and tears could be caused if inner and outer coupling splines were not engaged before retaining nut was tightened and couplings were then twisted to align and engage splines.

6-13. INSTALLATION – MAIN DRIVESHAFT.

NOTE

Before installing driveshaft, carefully wipe clean the area surrounding the driveshaft, especially the particle separator, fifth mount support fitting, and collective tube.

a. If removed, coat adapter (4, figure 6-3) with lubricant (C56) and install into engine shaft (paragraph 6-19). Install bolt (2) and locking washer (3), with short tab of washer in slot of adapter. Torque bolt 360 TO 400 inch-pounds and secure head to tab on washer (3), using lockwire (C 137).

b. Place driveshaft assembly (13) between engine adapter and transmission input drive quill.

c. Install clamp sets (5) to secure each end of shaft.

(1) Wipe inside grooves of clamp (5) clean of grease, Fit clamp halves around coupling joint, checking that serial numbers on both halves are alike and on same side. Clamp halves should fit snugly and hold themselves in place without bolts.

(2) Install two bolts (7) as follows:

(a) Place chamfered washer (8) on each bolt (7) with chamfered side next to bolt head. Install pivots (9) on each bolt (7) with curved side toward clamp set (5) with heads in direction of rotation.

(b) Install steel washer (10) and thin steel washers (11) on bolts (7) as required to obtain proper thread engagement with nuts (12). Use equal number of washers on opposite bolts to maintain balance.

(c) Install nuts (12) on bolts (7). Tighten nuts evenly and keep gap between ends of clamps equal within 0.030 inch. Torque nuts 100 TO 130 inch-pounds. Tap on clamp set (5) with fiber mallet to ensure good seating.

(d) Recheck torque on nuts (12) and install cotter pins.

(3) *Install* opposite end clamp set, positioned 90 degrees around shaft in relation to previously installed clamp set in same manner as outlined in step (2). Wipe any grease from shaft exterior. Install upper air filter assembly (paragraph 4-24). Install top half of FOD screen (figure 4-7)

d. Prior to incorporation of MWO 55-1520-236-50-12, install particle separator as follows:

(1) Install particle separator upper half (14) (paragraph 4-32) and FOD screen upper half (15) (paragraph 4-38).

(2) Install baffle panels (1 and 6) (paragraph 2-125). Close cowling.

e. After incorporation of MWO 55-1520-236-50-12, install centrisep particle separator as follows:

(1) Install centrisep particle separator (18) (paragraph 4-32.1).

(2) Install forward and top baffle panels (16 and 17) (paragraph 2-125.1). Close cowling.

f. After first ground runup, inspect areas around both main driveshaft couplings, in line with coupling clamps, for evidence of grease slinging. If grease leakage is indicated:

(1) Remove clamp sets to check for grease in grooves. If grease is found in clamp grooves, remove shaft and inspect couplings for lubrication and proper installation of packings.

(2) If no grease is found, reinstall clamps. Watch for further evidence of leakage in next runup.

6-14. ADAPTER-MAIN DRIVESHAFT.

6-15. DESCRIPTION-ADAPTER-MAIN DRIVESHAFT.

The main driveshaft adapter is installed between the engine output shaft and the main driveshaft. The adapter attaches to the outer coupling of the main driveshaft with a clamp set.

6-16. REMOVAL—ADAPTER—MAIN DRIVESHAFT.

a. Remove main driveshaft (paragraph 6-8).

b. Remove lockwire, bolt (2, figure 6-3), and locking washer (3). Pull adapter (4) out of engine output shaft.

6-17. INSPECTION—ADAPTER—MAIN DRIVESHAFT.

a. Inspect adapter splines visually for wear. If there is any evidence of wear, inspect dimensionally in accordance with figure 6-9.

b. Inspect splines for chipped or worn teeth. Replace if local damage exceeds 0.002 inch depth and/or 10 percent of the total effective spline surface.

c. Inspect for nicks, burrs, and scratches. Minor nicks, burrs, and scratches are acceptable if polished out and maximum area of damage after polishing out is less than 5 percent of the plated area.

d. Inspect adapter for cracks. No cracks are acceptable.

6-18. REPAIR — ADAPTER — MAIN DRIVESHAFT.

Replace adapter if damaged in excess of acceptable limits noted in paragraph 6-17.

b. Polish out scratches, nicks, and burrs that are within limits noted in paragraph 6-17. Use fine India stone (C116). Touch-up repair area with primer (C88 or C91).

c. Remove superficial corrosion with Scotch-brite (C103),

6-19. INSTALLATION — ADAPTER — MAIN DRIVESHAFT.

Refer to paragraph 6-13a.

6-19.1 MAIN DRIVESHAFT (FLEXIBLE PLATE).

6-19.2. DESCRIPTION — MAIN DRIVESHAFT.

a. A main driveshaft (see figure 6-9.1) with flexible plate couplings is installed between an adapter on engine output and the freewheel unit on transmission input drive quill. Two coupling clamp sets of split v-band type, hold mating curvic-splined faces of end fittings in secure contact.

b. Flexibility of shaft is provided by rectangular plates four in each coupling. Each plate flexes providing both angular misalignment and length changes to accommodate movement of transmission on pylon mounts. Each coupling can be considered a truss-work, in which torque loads are carried as axial loads in straight members of each plate.

c. A fail-safe feature exists which enables uninterrupted drive of the shaft after a failure has occurred in one of the duel load paths provided by the plate couplings. In normal operation a radial clearance exists between center shaft internal diameter and the internal protruding hub of the end filling (see figure 6-9.1). Upon the unlikely event of a plate failure the center shaft shifts contacting the hub surface which restores the load balance, contains the whirling parts and restores stable operation. The off center operation of center shaft is sufficient to cause a noticeable unbalance which signals that a partial failure has occurred and fail-safe mode is in operation with lost remaining load path.

d. The shaft is dynamically balanced of time of manufacture by the use of washer(s) and screw(s) which are used as balance weights. These weights maybe found inside the shaft end fittings. To assure screws are securely fastened a high grade of adhesive is used on the threads. Do not attempt to turn screws as breakage may result due to high lockage force of the adhesive.

6-19.3. REMOVAL — MAIN DRIVESHAFT.

a. Open cowling on left and right side of pylon.

b. Prior to incorporation of MWO 55-1520-238-50-12, remove particle separator as follows:

(1) Remove baffle panels (1 and 6, figure 6-3) (paragraph 2-125).

(2) Remove FOD amen upper half (15).

(3) Remove particle separator upper half (14). Cover open ends of lower air filter assembly to keep dirt and foreign objects.

c. After incorporation of MWO 55-1520-236-50-12, remove centrisep part separator as follows:

(1) Remove top baffle (17) and left and right sections of forward baffle (16) (paragraph 2-125.1).

(2) Remove centrisep particle separator (16) (paragraph 4-28.1).

d. Remove coupling damps at each end of main driveshaft, keep damps together as matched sets after removal.

WARNING

Compression of shaft is usually necessary to clear the engine adapter and transmission freewheeling unit.

DO NOT APPLY ANY TOOLS OR CLAMPS TO COUPLING PLATES.

To prevent critical damage to plates and/or shaft, focally obtain and make two installation clamp aids. Refer to figure 6-9-2.

e. Position two installation clamp aids over bolt heads located on the arms of the end fittings. (See figure 6-9.3.) Tighten damps to allow removal of shaft. Remove shaft assembly, remove damp aids.

f. To remove engine shaft adapter, remove lockwire, retaining bolt and key washer. Pull adapter out of engine output shaft.

6-19.4. CLEANING — MAIN DRIVESHAFT.

a. Clean shaft assembly, adapter, and attaching parts with dry cleaning solvent (C112) or Methyl-Ethyl-Ketone (C74).

b. Dry with filtered compressed air or dean cloth.

6-19.5. INSPECTION AND REPAIR — MAIN DRIVESHAFT.

CAUTION

Do not attempt to loosen or tighten any hardware. Any reason for necessary part removal is cause for shaft replacement.

a. Visually inspect shaft for cracks.

b. Visually inspect shaft for nicks, dents, scratches and corrosion. Refer to figure 6-9.4 for limits.

(1) Superficial scratches not exceeding 0.002 inch in depth or well rounded dents on port edges not exceeding 0.005 inch in depth do not require repair.

(2) Scratches in the metal deeper than 0.002 inch or with sharp notches shall be smoothly blended into surrounding area so that no shaft indentations or edges remain. Repair must be within the limits specified in figure 6-9.4, Accomplish repair by careful hand filing or stoning, using fine emery cloth for final polishing. Minimize removal of protective coating during repair.

(3) Damage to the protective coating (removal to base metal) which exceeds 0.25 inch in width may be touched-up with aluminum colored paint for appearance and minimal protection from corrosion. Smaller areas left bare will not corrode due to sacrificial properties of the original protective coating.

NOTE

Black residue developing around flex plates is not reason for rejection of driveshaft.

(4) Check for legibility of stenciled serial number, and/or existence of data plate on main driveshaft. If discrepancy exists, stencil number on shaft.

6-19.6. INSTALLATION — MAIN DRIVESHAFT.

a. If removed, insert adapter (11, figure 6-9.1) into engine shaft. Install retaining bolt (9), P/N 204-040-813-101, and key washers (10) with short tab of washer to adapter slot. Torque bolt with 360 to 400 inch-pounds. Lockwire (C137) bolt head to outer tab of key washer.

b. Position two installation clamp aids over bolt heads located on arms of the end fittings. Tighten damps to allow installation of shaft between engine adapter and transmission freewheel unit, Install main driveshaft in either direction. Remove both damps from shaft after installation.

c. Install coupling damps (2, figure 6-9.1) to secure both ends of shaft as follows:

(1) Check the serial numbers on each clamp set ensuring both halves are alike and on the same side for installation.

(2) Position clamp set so that gap is in line with index mark (circular indentation) on the shaft end fitting (see figure 6-9.1).

(3) Clamp halves should fit snugly and hold themselves in place without bolts.

(4) Place washer (4, figure 6-9.1) on bolt (3) with chamfer against head. Install bolt, with head in direction of shaft rotation, through pivots (5) and clamp ends. Install washers (6, 7) and nut (8).

NOTE

Thick or thin steel washers maybe added if required under nut; and using like quantity on opposite bolt to maintain balance.

(5) Torque nut 100-130 inch-pounds, keeping equal gaps between ends of clamp set within 0-030 inch. Tap around outside of clamp set to ensure good seating, and recheck torque. Install cotter pin.

(6) Install opposite end clamp set, in the same manner, positioned 90° around shaft in relation to previously installed damp set.

d. Prior to incorporation of MWO 55-1520-236-50-12, install particle separator as follows:

(1) Install particle separator upper half (14, figure 6-3) (paragraph 4-32) and FOD screen upper half (15) (paragraph 4-38).

(2) Install baffle panels (1 and 6) (paragraph 2-128). Close cowling.

e. After incorporation of MWO 55-1520-236-50-12, install centrisep particle separator as follows:

(1) Install centrisep particle separator (18) (paragraph 4-32.1).

(2) Install forward and top baffle panels (16 and 17) (paragraph 2-128.1). Close cowling.

6-19.7. ALIGNMENT — MAIN DRIVESHAFT.

See paragraph 6-7 for alignment instruction.

SECTION III. MAIN TRANSMISSION

6-20. TRANSMISSION ASSEMBLY.

6-21. DESCRIPTION — TRANSMISSION ASSEMBLY.

a. The transmission is located directly ahead of engine. It is supported in the helicopter pylon structure by four main mounts and the fifth mount. The engine furnishes power to the transmission through the main driveshaft. The transmission drives the main rotor mast through a spiral bevel gear set and two planetary reduction stages. A freewheeling unit in the input quill coupling disengages to allow main rotor and gear train to turn freely when engine is stopped or is idling below rotor-driving speed, as in autorotational descent. Secondary gear trains drive tail rotor shaft, rotor tachometer generator, hydraulic pumps, transmission oil pump, and alternator. See figure 6-10 for view of quills which drive these components.

b. **E** **M** An input bevel gear also drives alternator drive quill (5, figure 6-10) on the left side of transmission main case (11).

6-22. SERVICING — TRANSMISSION ASSEMBLY.

Refer to paragraph. 1-5

6-23. ALIGNMENT — TRANSMISSION ASSEMBLY.

Refer to paragraph 6-7.

6-24. REMOVAL — TRANSMISSION ASSEMBLY

Premaintenance Requirements for Transmission

Conditions	Requirements
Model	AH-1 P/E/F
Part Number or Serial Number	All
Special Tools	(T45) (T49) (T66) (T72)
Test Equipment	None
Support Equipment	(S4)
Minimum Personnel Required	Two
Consumable Materials	(C25) (C26) (C41) (C46) (C52) (C53) (C57) (C66) (C79) (C79C) (C80) (C88 or C91) (C114) (C121) (C127)
Special Environmental Conditions	None

CAUTION

If the transmission is being removed prior to normal overhaul, for internal failure or metal particles, clean all oil lines, replace cockpit air blower drive quill, hydraulic pump and tachometer drive quill, alternator drive quill oil cooler, mast assembly, and transmission external oil filter.

a. When the transmission is to be replaced, unless conditions prevent operation, perform a ten minute ground runup and drain operating oil. If runup is not practical, remove mast assembly and spray the interior of the transmission through the top opening with approximately one gallon lubricating oil (C79) (C79A) or (C80) of the type that has been used in the transmission. While spraying, manually rotate internal gears and bearings by turning the input drive quill (3, figure 6-10) clockwise. Drain oil from transmission. Attach tag to the transmission stating: TRANSMISSION PRESERVED WITH LUBRICATING OIL, MIL-L-7808, MIL-L-23699, or DOD-L-85734 as applicable.

NOTE

Transmission and mast maybe removed with swashplate and support, collective lever, and pitch links attached

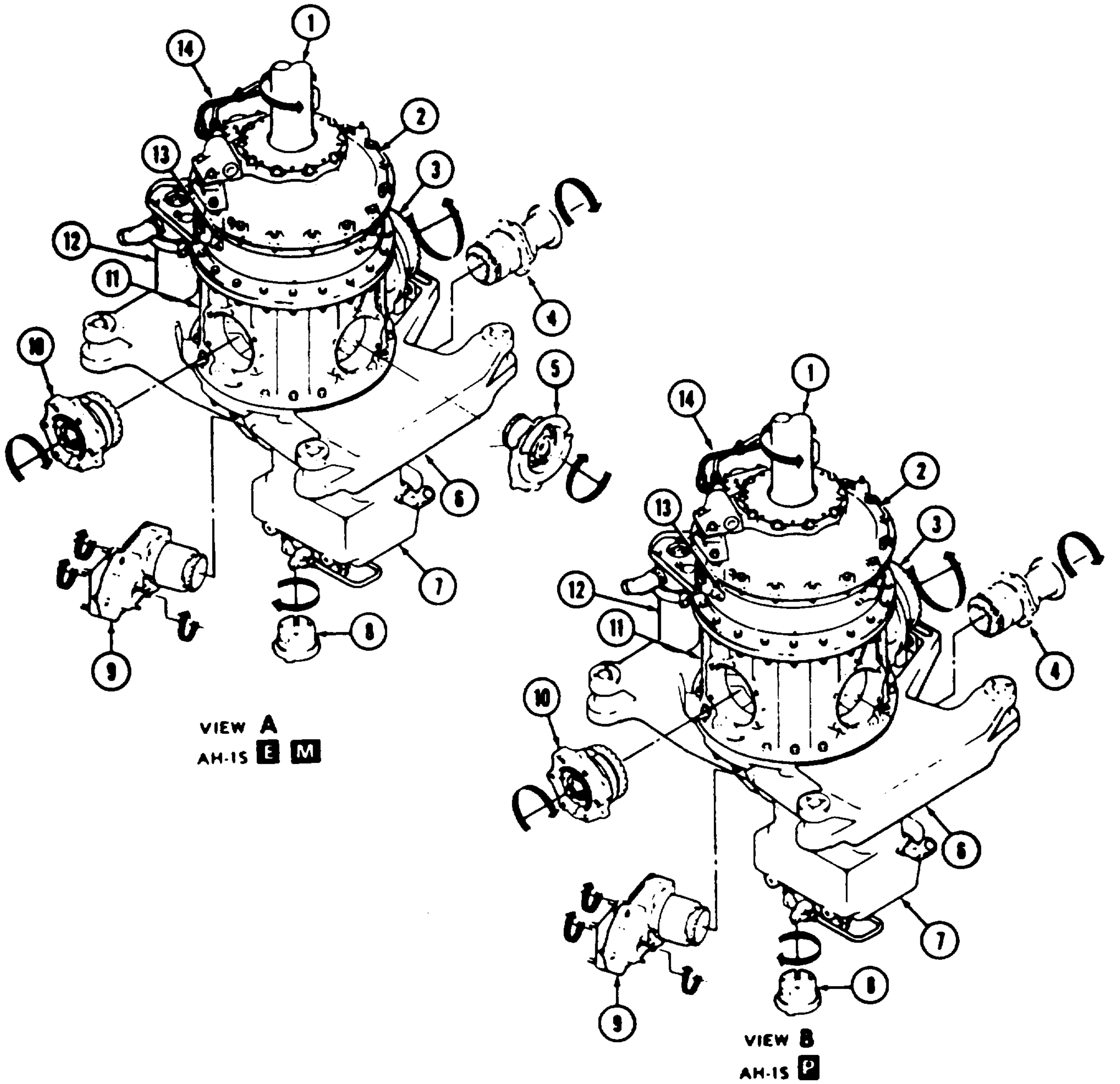
b. Open cowl doors on both sides of engine compartment Detach both forward doors from helicopter by removing nuts, washers, and bolts in hinges. Disconnect electrical harness at door.

c. Remove both upper fairing side panels.

d. Disconnect battery and electrical connections.

e. Remove main driveshaft (paragraph 6-8).

f. Remove tail rotor forward driveshaft (paragraph 6-77).



1. Mast
2. Top case
3. Input drive quill
4. Tail rotor drive quill
5. Alternator drive quill
6. Support case
7. Accessory drive and sump case
8. Transmission oil pump
9. Hydraulic pump and tachometer drive quill
10. Fan drive quill
11. Main case
12. Oil filter
13. Ring gear case
14. Mast bearing oil hose

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Figure 6-10. Transmission Quills

g. Without disconnecting hydraulic lines, remove the two hydraulic pumps from drive pad on right side of transmission sump case and set back dew of transmission. Remove oil tube from sump case (14, figure 6-11).

h. Disconnect two oil hoses from oil cooler bypass valve (23, figure 6-12). Disconnect sump drain coupling (24).

i. Detach ducting from blower at front of transmission.

j. **E** **M** Disconnect electrical wires and electrical connectors from altemator. Identify location of wires for use on installation. Protect wires, receptacles, and plugs with caps or electrical tape (C121).

k. **P** Remove transducer at fifth mount (paragraph 11-129).

l. Disconnect transmission instrumentation wiring electrical connector at right side of transmission compartment.

m. Remove main rotor (paragraph 5-12). If mast controls are to be removed, refer to paragraph 5-49.

n. Install mast nut (1, figure 6-11) on mast (2). Attach hoist (T45) and take up cable slack.

o. Disconnect cyclic control tubes and elevator control tube from swashplate control horns. Disconnect collective control tube from collective lever.

p. Remove bolt assembly (10). If bolt is binding, apply slight tension on hoist to lift transmission slightly.

q. Remove bolt assembly (30). Move lift link (17) out of lift beam (29) and reinstall bolt assembly (30), washer (31), and nut (32) in lift link.

r. Remove four bolts (22), washers (23), and retaining washers (24).

CAUTION

Extreme care must be taken when removing transmission to prevent damage to lines, hoses, and airframe components.

s. Carefully hoist mast and transmission assembly dear of fuselage structure.

t. If transmission is not to be reinstalled, remove bolt assembly (21). Remove lift link from transmission and reinstall bolt assembly (21), washer (20), and nut (19) in lift link (1 7).

u. Place transmission on stand (T72) equipped with adapter (T49). Secure with bolts through transmission support case.

v. If transmission is being replaced, transfer the following components to the new transmission.

(1) Electrical harness.

(2) All accessories.

(3) Cockpit air blower (paragraph 13-51).

(4) **E** **M** Alternator.

(5) For helicopters with MWO 1-1520-236-50-30, transfer bracket (73, figure 6-12), external filter (9.1), hose (7), hose (10), and debris monitor (74).

6-25. REMOVAL - TRANSMISSION RELATED PARTS.

CAUTION

If the transmission was removed due to internal failure and/or metal particles on oil filters or magnetic chip detector, replace oil coder, mast assembly, hydraulic pump drive quill and alternator drive quill, E/M. Attach a tag to each of these parts and to the transmission, showing that the parts are suspected of being metal particle contaminated. Clean all metal particles from all oil hoses and tubes prior to installing the hoses and tubes on a replacement transmission.

a. Remove number 8 oil jet hose (6, figure 6-12) and damp.

b. Remove mast assembly (paragraph 6-69).

c. Remove oil cooler (paragraph 6-143).

d. **P** Remove two nuts (6, figure 6–13) aluminum washer (7) and transducer mounting bracket from tail rotor driveshaft quill.

6-26. INSPECTION - TRANSMISSION RELATED PART.

a. Inspect all threaded fittings for damaged threads and cracks.

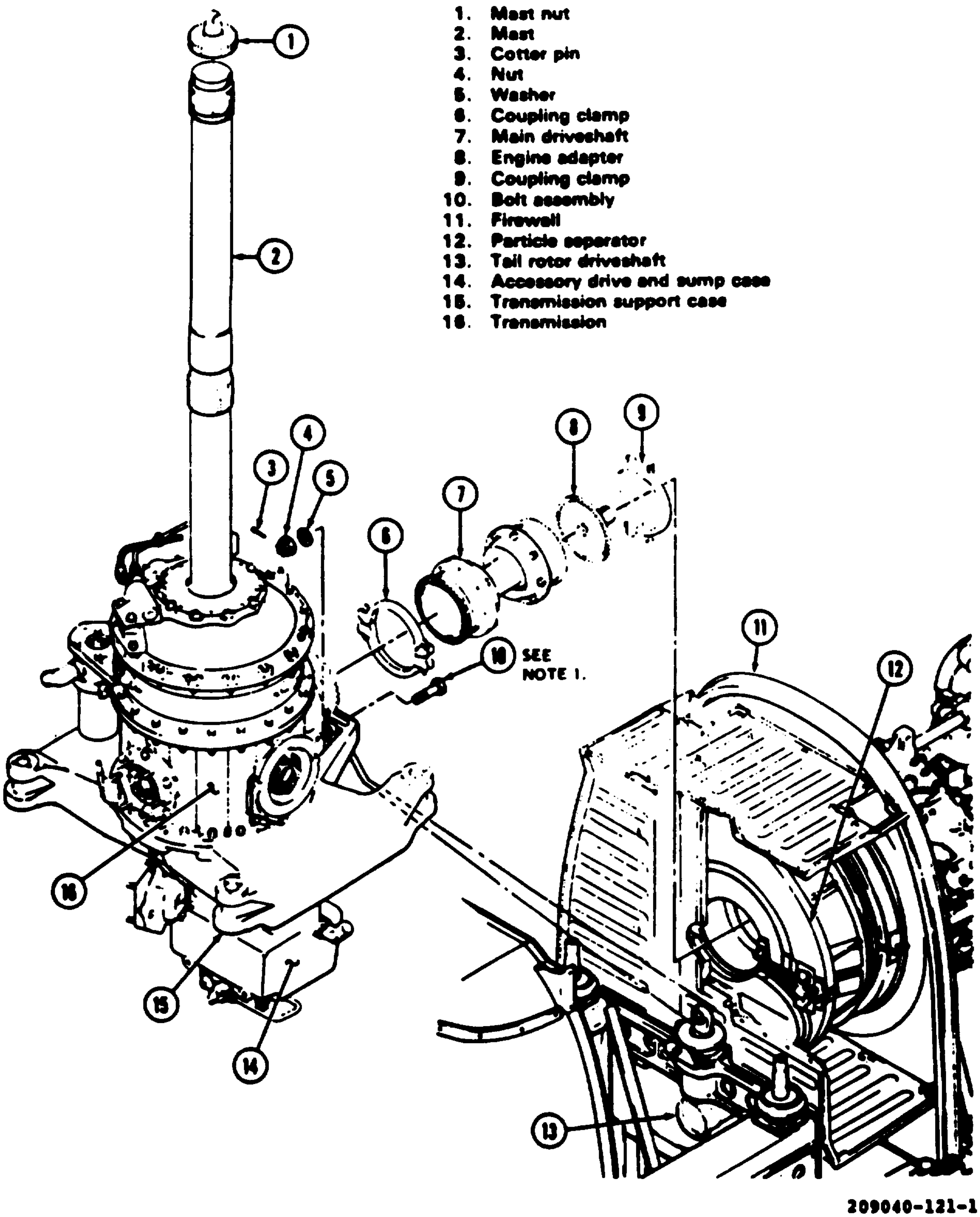
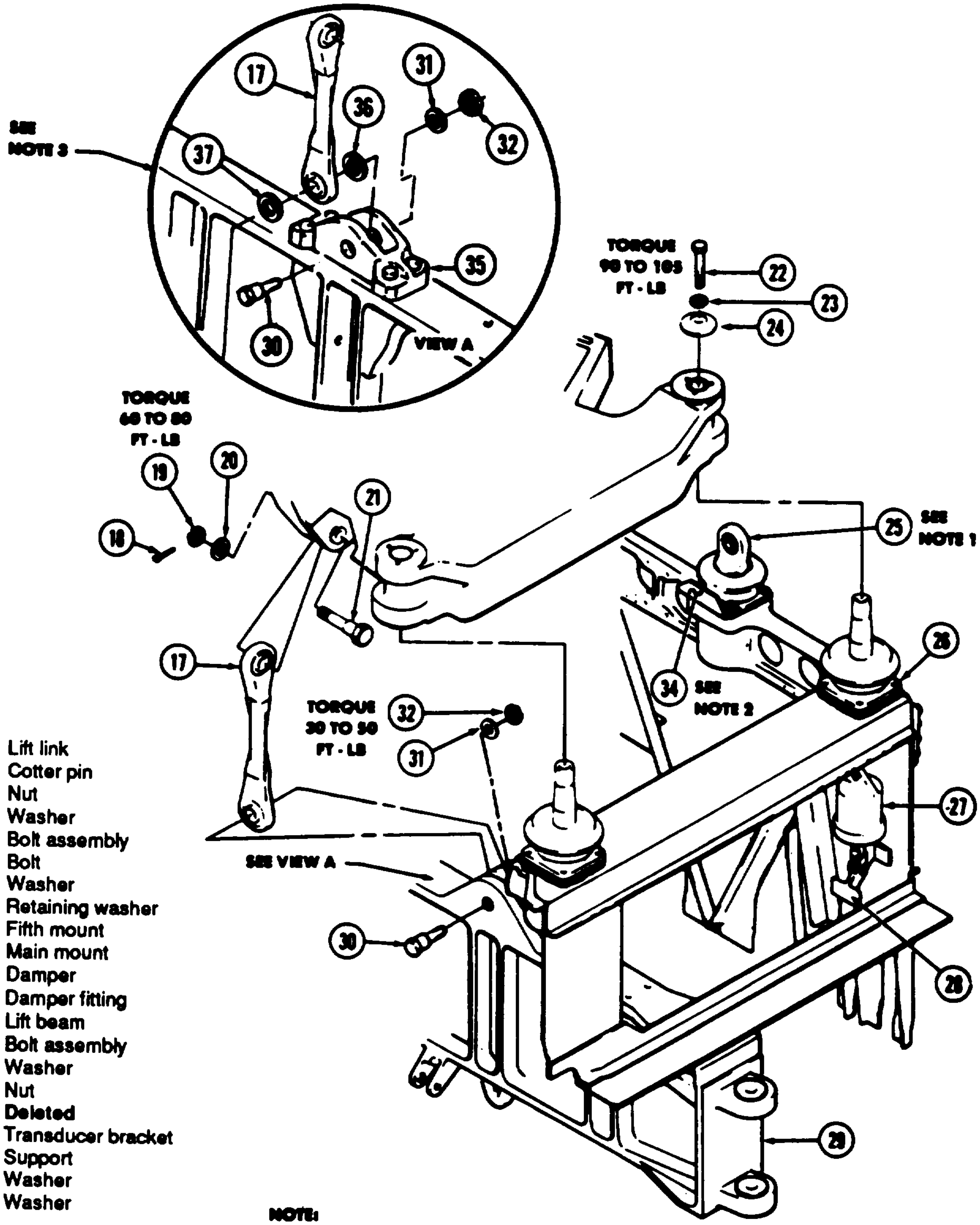


Figure 6-11. Transmission Installation (Sheet 1 of 2)



17. Lift link
18. Cotter pin
19. Nut
20. Washer
21. Bolt assembly
22. Bolt
23. Washer
24. Retaining washer
25. Fifth mount
26. Main mount
27. Damper
28. Damper fitting
29. Lift beam
30. Bolt assembly
31. Washer
32. Nut
33. Deleted
34. Transducer bracket
35. Support
36. Washer
37. Washer

NOTE:

1. Refer to chapter 2 for instructions to install fifth mount to transmission attachment bolt or bolt assembly as applicable.

2. Transducer attachment bracket is not used on [illegible] or [illegible] coded helicopters.

3. [illegible] coded helicopters-prior to serial no. 76-22367

Figure 6-11. Transmission Installation (Sheet 2 of 2)

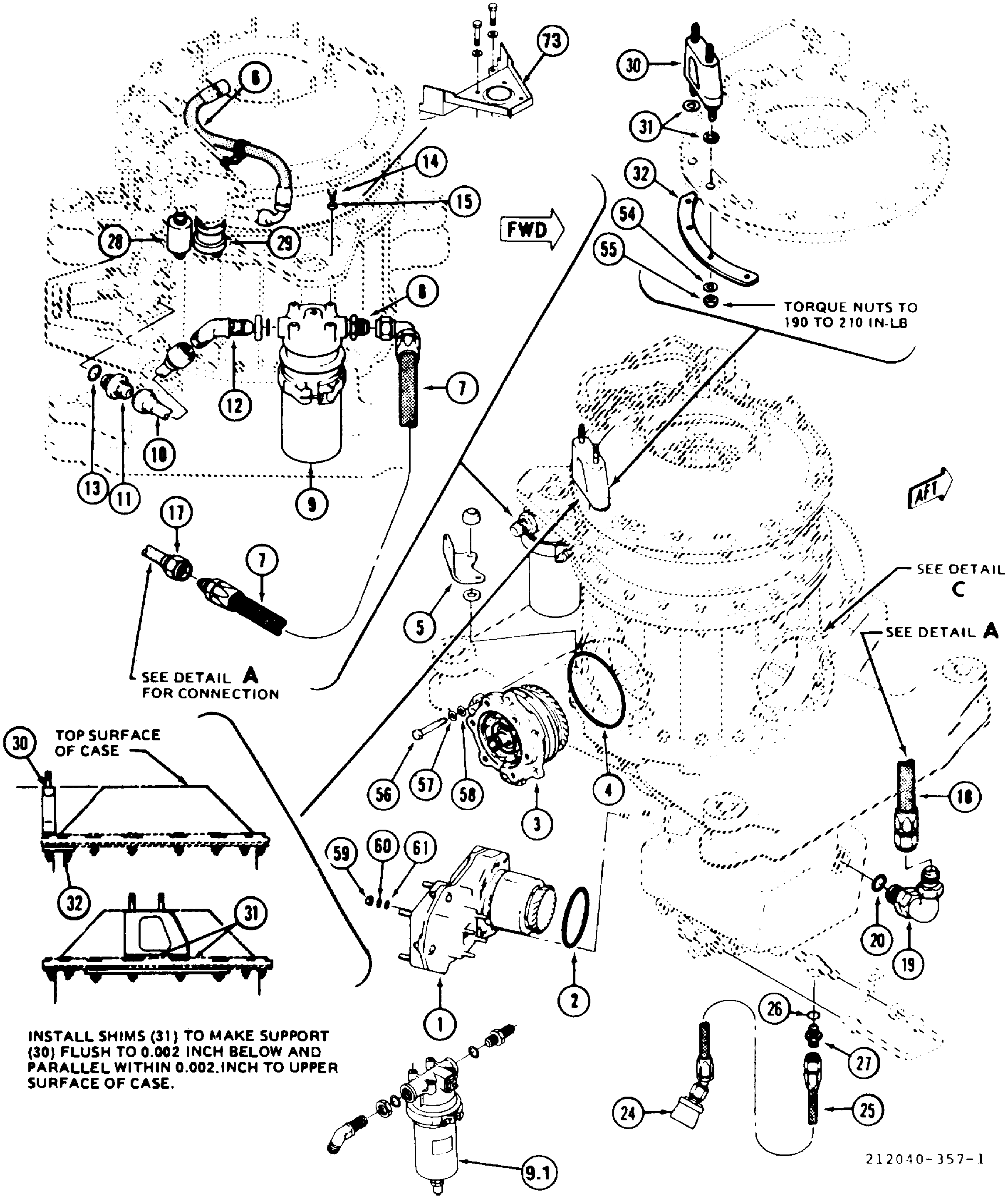


Figure 6-12. Transmission Buildup (Sheet 1 of 3)

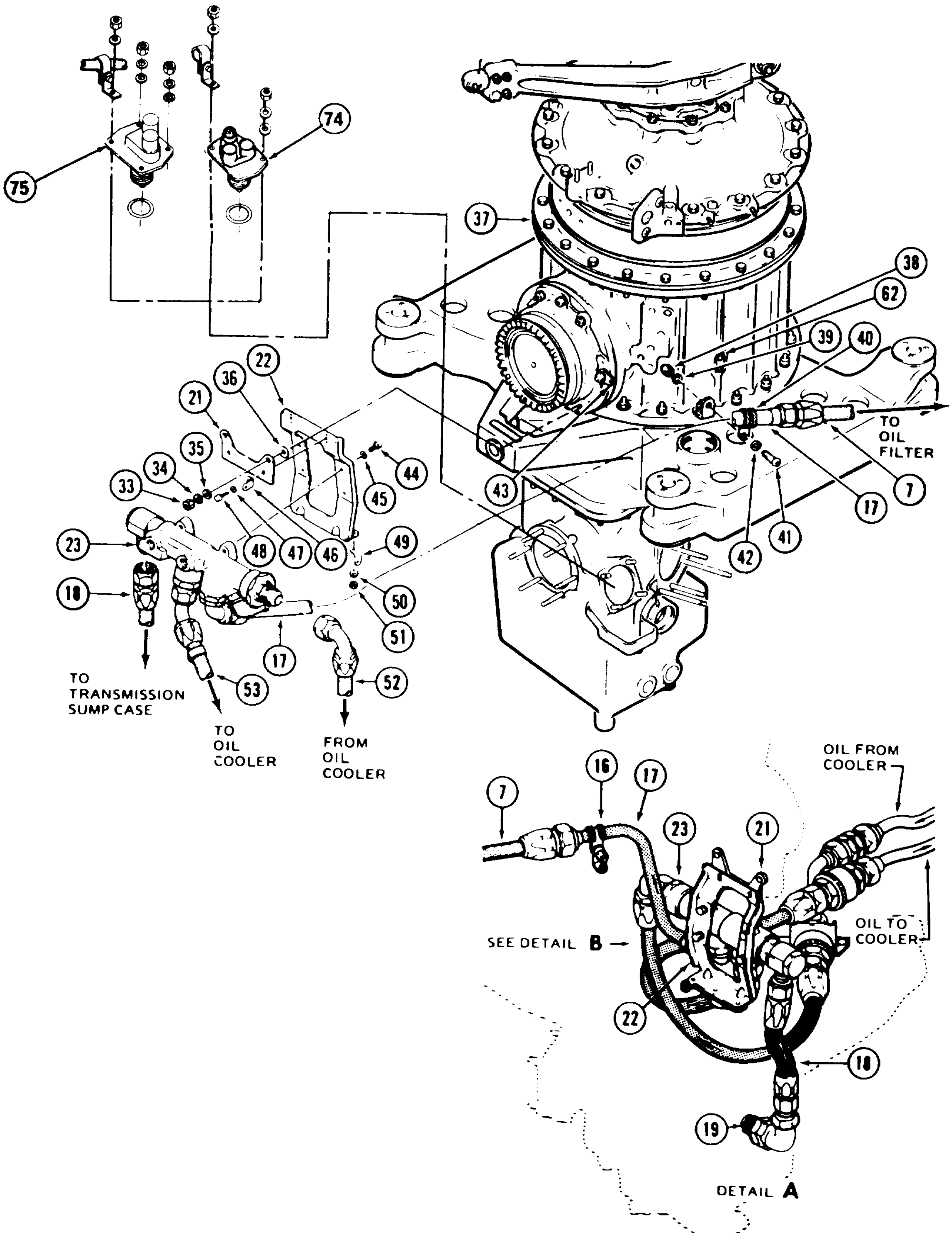
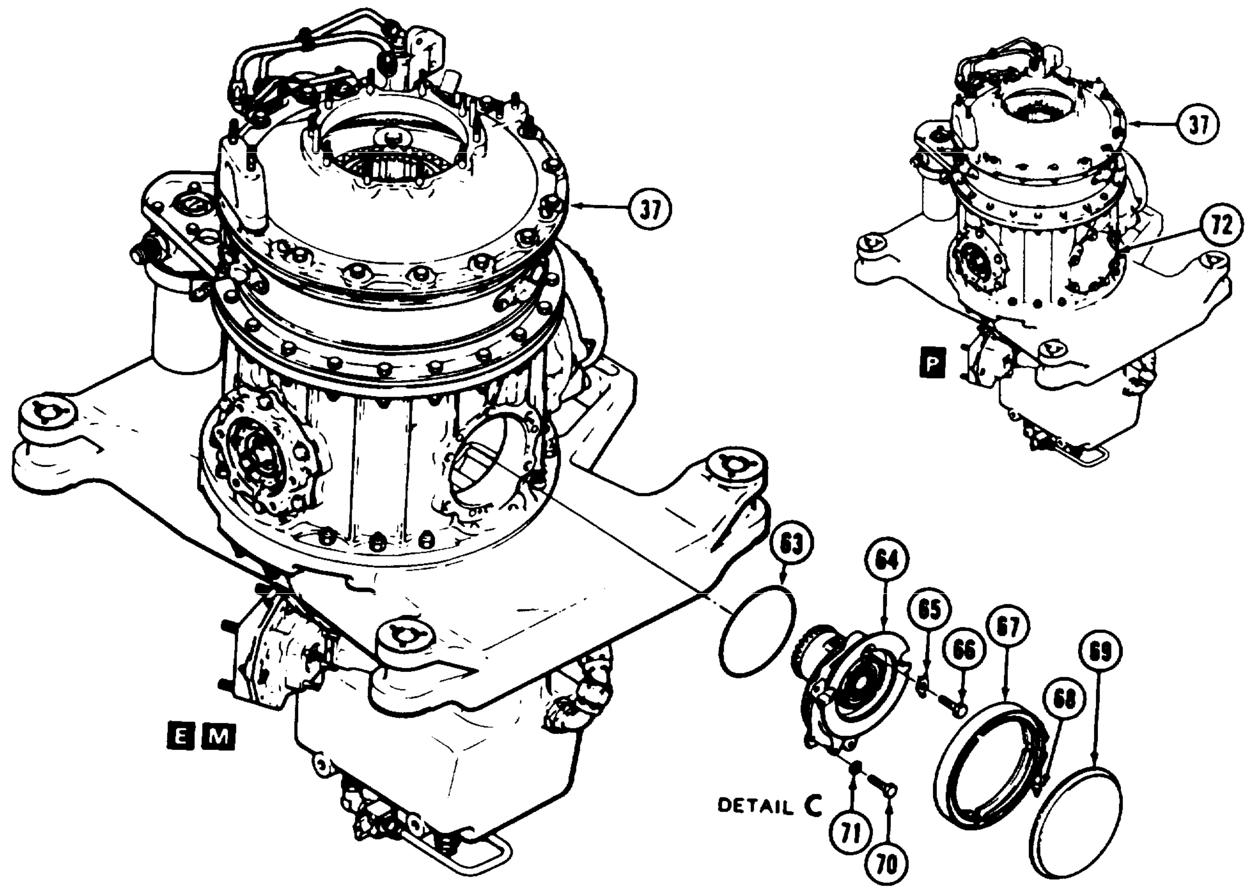
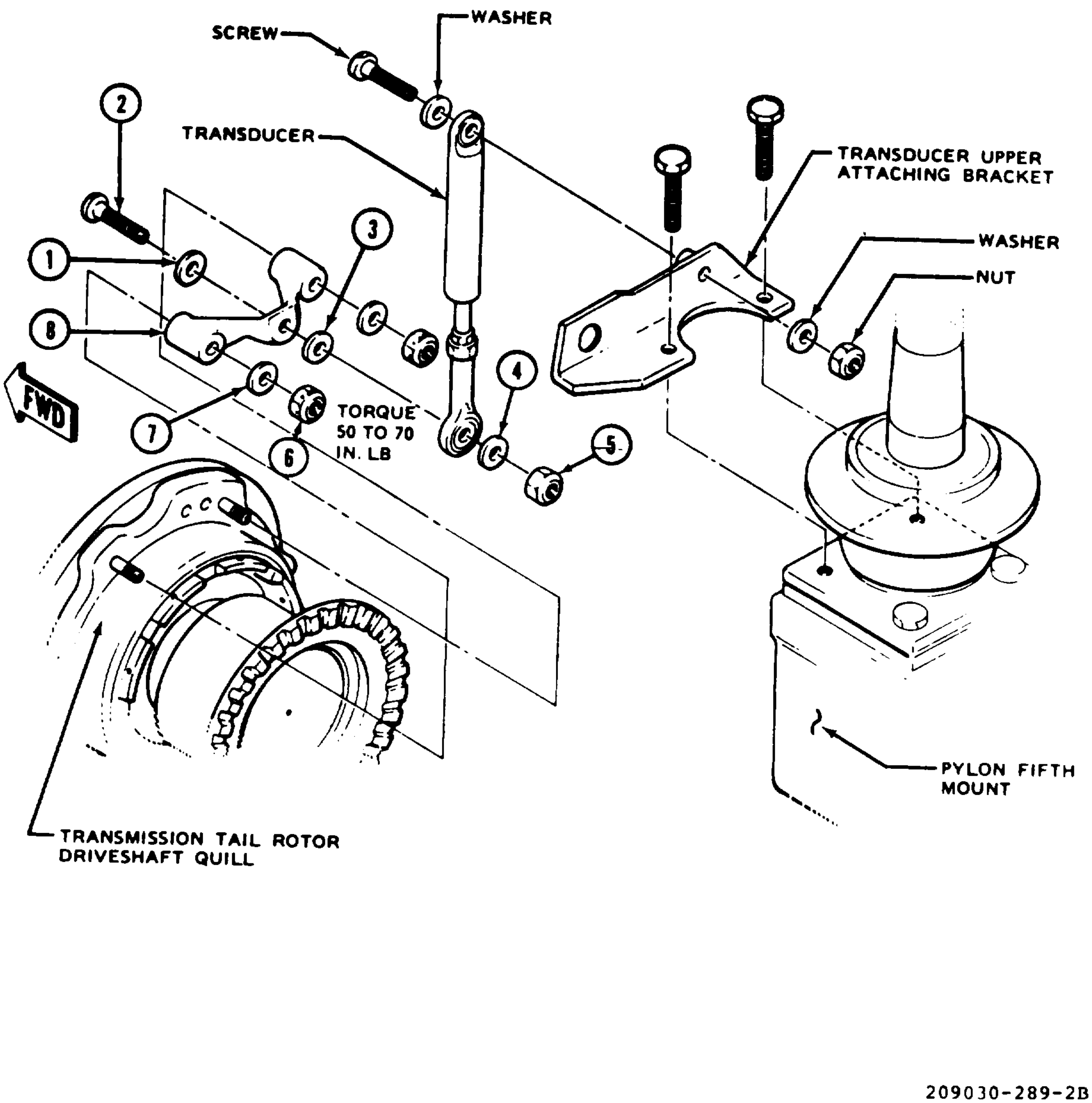


Figure 6-12. Transmission Buildup (Sheet 2 of 3)



1. Hydraulic pump and tachometer drive quill
2. Packing
3. Fan drive quill
4. Packing
5. Bracket
6. Hose assembly
7. Hose
8. Union
9. External oil filter
9.1. External oil filter (ODDS)
10. Tube
11. Union
12. Elbow
13. Packing
14. Bolt
15. Aluminum washer
16. Clamp
17. Hose assembly
18. Hose assembly
19. Elbow adapter
20. Packing
21. Bracket
22. Bracket
23. Bypass valve
24. Coupling half
25. Hose assembly
26. Packing
27. Union
28. Oil pressure switch
29. Oil pressure transmitter
30. Support
31. Shim
32. Support plate
33. Self-locking nut
34. Thin steel washer
35. Aluminum washer
36. Aluminum washer
37. Transmission
38. Nut
39. Thin aluminum washer
40. Clamp
41. Screw
42. Thin aluminum washer
43. Clip
44. Bolt
45. Thin steel washer
46. Bracket
47. Steel washer
48. Bolt
49. Bracket
50. Thin aluminum washer
51. Nut
52. Hose
53. Hose
54. Thin steel washer
55. Self-locking nut
56. Bolt
57. Steel washer
58. Aluminum washer
59. Self-locking nut
60. Thin steel washer
61. Aluminum washer
62. No. 6 oil jet
63. Packing
64. Alternator drive quill
65. Lock (tab) washer
66. Bolt
67. Rim clenching clamp
68. Nut
69. Alternator drive quill cap
70. Bolt
71. Steel washer
72. Alternator drive quill pad cover
73. Bracket (ODDS)
74. Debris monitor (ODDS)
75. Integral filter

Figure 6-12. Transmission Buildup (Sheet 3 of 3)



1. Aluminum washer
2. Screw
3. Aluminum washer
4. Aluminum washer
5. Nut
6. Nut
7. Aluminum washer
8. Transducer mounting bracket

Figure 6-13. P Transducer Bracket Installation

b. Inspect all brackets and clamps for distortion and cracks.

c. Inspect all hose assemblies for deterioration and damaged fittings.

d. Inspect all tubes for distortion and damaged fittings.

6-27. REPAIR – TRANSMISSION RELATED PARTS.

a. Replace all transmission related parts that failed to pass inspection requirements.

b. Clean hoses and tubes thoroughly.

6-28. INSPECTION – INSTALLED TRANSMISSION AND MAST ASSEMBLY.

a. Inspect the following oil strainers and magnetic chip detector for metal particles. If any particles are found, refer to paragraph 6-4 for required corrective action.

(1) Magnetic chip detector (paragraph 6-176).

(2) External oil filter (paragraph 6-158).

(3) Internal oil filter (transmission sump primary) (paragraph 6-161).

b. Inspect transmission for loose, missing, and damaged bolts and studs.

c. Inspect transmission for damage in accordance with figure 6-14.

d. Inspect transmission for oil leakage. If any defects are noted, refer to appropriate paragraph in Section VII.

e. Inspect transmission for corrosion and mechanical damage.

f. Inspect main rotor mast (paragraph 6-71).

6-29. REPAIR OR REPLACEMENT – TRANSMISSION ASSEMBLY.

a. Replace transmission if damaged in excess of reparable limits.

b. Replace any loose or damaged standard type studs as follows:

NOTE

These instructions are for studs of standard type; threaded directly into transmission case and for studs and thread inserts which have a serrated locking ring, with inner teeth engaged on a serrated collar of stud or insert and outer teeth broached into material of transmission case. Tools for installation and removal are made by manufacturer of these parts. When such tools are not available, replacement can be accomplished with other tools, provided careful workmanship is applied.

(1) Measure stud height, if possible, before removal. Use suitable tool to grip stud and turn out slowly and evenly to avoid seizure and breakage. If broken off, drill hole in stud on center to use any easy-out type extractor.

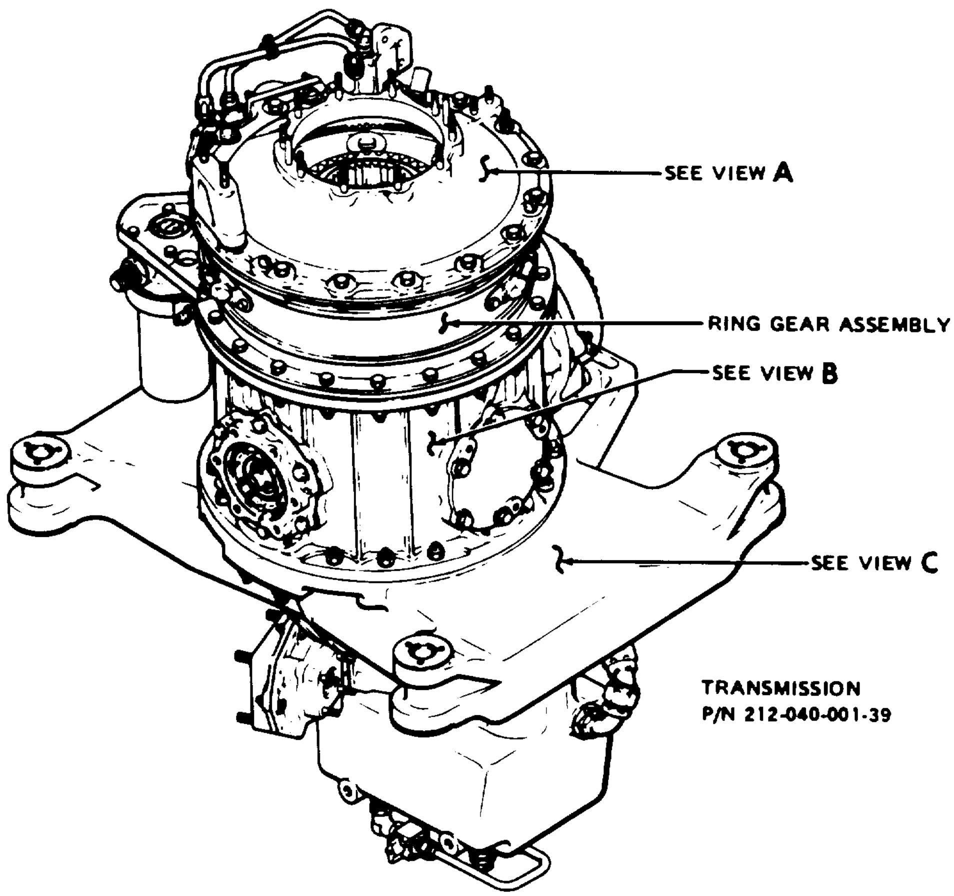
(2) If tapped hole in case has a small vent hole at the bottom of the tapped hole, ensure that the vent hole is open prior to installing the new stud.

(3) Select replacement stud by reference to Repair Parts Appendix, which provides an undersize and four oversizes (by 0.003 inch increments) to each standard stud. Generally, next larger oversize will be required for proper installation torque. Start new stud into tapped hole with fingers. If it turns freely beyond two turns, select next oversize which will engage in one or two turns with fingers.

(4) Remove replacement stud, and coat end with primer (C88 or C91) to prevent contact of dissimilar metals. Start stud into tapped hole.

(6) Use a suitable tool to turn stud slowly and evenly into hole. Check stud for squareness with machined surface of case. As stud is installed to proper depth, check that torque is within limits of following table:

Stud Size	Inch-Pounds Torque
1/4	50 TO 95
5/16	100 TO 225
3/8	175 TO 375



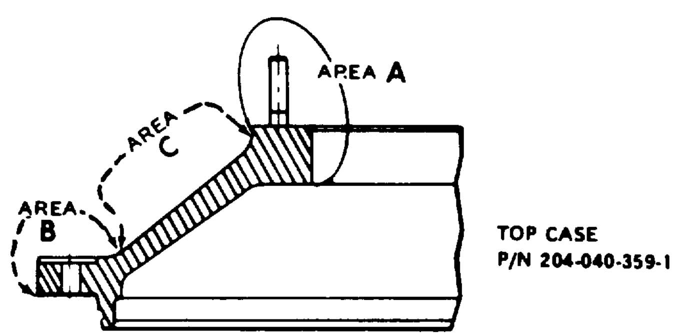


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Figure 6-14. Damage Limits — Transmission (Sheet 1 of 6)

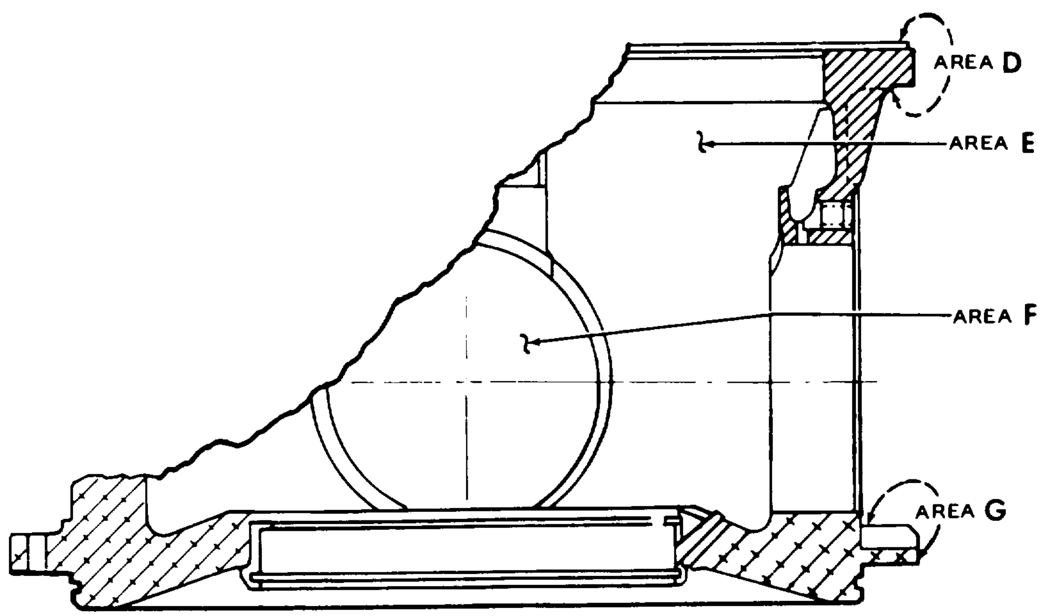


Figure 6-14. Damage Limits — Transmission (Sheet 2 of 6)

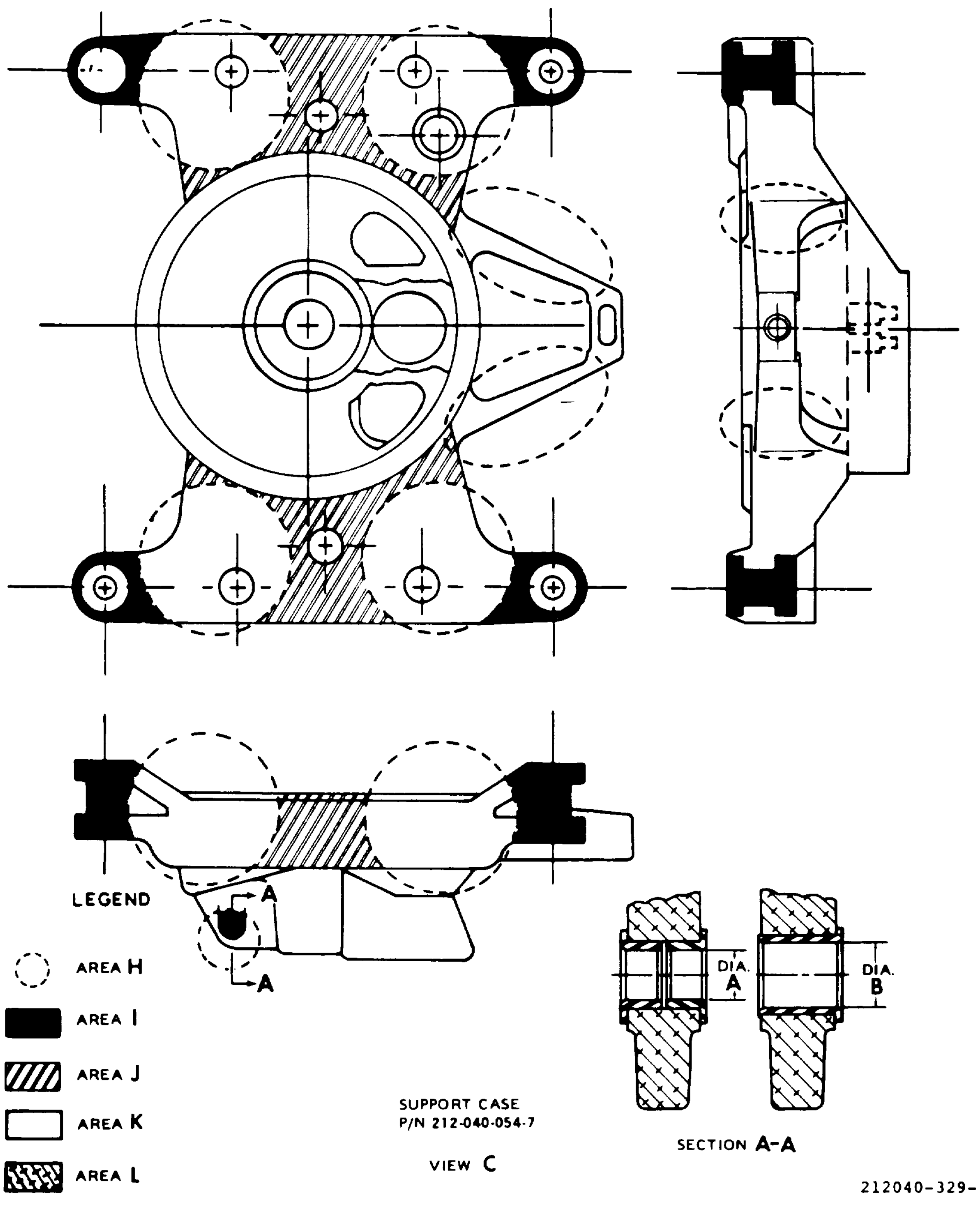


Figure 6-14. Damage Limits — Transmission (Sheet 3 of 6)

AREA	LIMITS
All	No cracks allowed.
A and B	Corrosion in Area "A" at mast mounting port or in Area “B” where top case to ring gear assembly attaching bolts are installed is cause to replace transmission.
C	Mechanical or corrosion damage on top case outside areas noted in preceding paragraph IS acceptable if following conditions are met: 1. Maximum depth after polishing out damage is 0.020 inch. 2. Maximum area of damage is 25 percent of the total area, 3. Damaged area is treated for corrosion protection in accordance with general instructions.
D	Corrosion in Area “D” where main case to ring gear attaching bolts are installed is cause to replace transmission.
E	Mechanical and corrosion damage limits on exterior surface of main ease and outside Area “D” and “G” are the same as stated for Area “C”.
F	A loose bearing liner for the bearing that supports the forward end of the input drive quill and/or corrosion between the bearing liner and the case is cause to replace the transmission.
D and G	Corrosion in Area “D” where main case to ring gear attaching bolts are installed is cause to replace transmission. Corrosion in Area “G” where main case to support case attaching studs are installed is cause to replace transmission. Mechanical or corrosion damage in Area "D" and Area “G” that does not extend under nuts and washers is acceptable if following conditions are met 1. Maximum depth after polishing out damage is 0.020 inch. 2. Maximum area of damage within any one square inch is 20 percent. 3. Maximum area of damage in total area IS 10 percent. 4. Damaged area is treated for corrosion protection in accordance with general instructions.
H	Mechanical or corrosion damage in Area “H” is acceptable if following conditions are met: 1. Maximum depth alter polishing out damage on flat surfaces is 0.010 inch, and maximum length is 1.0 inch. 2. Maximum depth after polishing out damage on radii is 0.030 inch, and maximum length is two inches.

Figure 6-14. Damage Limits — Transmission (Sheet 4 of 6)

AREA	LIMITS
H	3. Damage is polished out and blended smoothly into surrounding surface.
	4. Damaged area is treated for corrosion protection in accordance with general instructions.
I	Mechanical or corrosion damage in Area “1” is acceptable if following conditions are met:
	1. Maximum depth after polishing out damage on flat surfaces is 0.040 inch.
	2. Maximum depth after polishing out damage on radii is 0.060 inch.
	3. Damaged area is treated for corrosion protection in accordance with general instructions.
J	Mechanical or corrosion damage in Area “J” is acceptable if following conditions are met.
	1. Maximum depth after polishing out damage on flat surfaces and radii is 0.060 inch
	2. Damaged area is treated for corrosion protection in accordance with general instructions.
K	Mechanical or corrosion damage in Area "K", which consists of all areas not covered by Areas "H", “I”, and “J”, is acceptable if following conditions are met:
	1. Maximum depth after polishing out damage is 0.010 inch.
	2. Damage area is treated for corrosion protection in accordance with general instructions.
L	Wear and damage to lift link bushings installed in Area “L” is acceptable if following conditions are met:
	1. Diameter “A” must not be greater than 0.7505 inch.
	2. Diameter “B” must not be greater than 1.0005 inch.
	3. Surface finish inside bushings must be 40 RHS (roughness height ratio) or better.
	4. Bushings must be securely mounted in case. Loose bushings, signs of yielding, and/or cracks in lift link bushing support lugs is cause to replace transmission.

GENERAL INSTRUCTIONS

1. Evidence of corrosion under shim plates at quill mounting ports is cause to replace the transmission and/or affected quill.

2. Loose or damaged studs it Area “A” and loose studs or inserts at any of the quill mounting ports are cause to replace the transmission.

Figure 6-14. Damage Limits — Transmission (Sheet 5 of 6)

GENERAL INSTRUCTIONS (Continued)

3. Polish out corrosion damage to twice the depth of the corrosion. Finish polishing out with 400 grit abrasive paper (C102) to blend repairs smoothly into surrounding surface. Ensure that depth and /or repair does not exceed acceptable limits specified for the areas designated above. Treat reworked areas for corrosion protection with MIL-M-3171C, Type VI treatment. This is commercial designation Dow No. 19. Refer to TM 43-0105 for application procedures. Prime all rework areas that were painted prior to repair. Use polyamide epoxy primer (C88). Paint to match existing finish.

4. Polish out mechanical damage to depth to remove all traces of the damage. Finish polishing out with 400 grit abrasive paper (C102) to blend repair smoothly into surrounding surface. Ensure that damage does not exceed acceptable limits. Apply corrosion protection, prime, and paint in same manner prescribed in preceding step.

5. Chafed areas of the sump case assembly that are smooth and do not exceed 0.070 inch depth shall be filled with DEVCON F or equivalent and blended to surrounding surfaces. Mechanical damage that does not exceed 0.070 inch depth shall be N.D.T. to assure no cracks exist. The area shall then be blended and filled as a chafed area.

Figure 6-14. Damage Limits—Transmission (Sheet 6 of 6)

c. Replace loose or damaged lock-in studs as follows:

(1) To remove a threaded insert, select a drill equal in diameter to that of serrations between locking ring and insert. Drill to depth equal to ring thickness. Remove insert with a square-type extracting tool. If lockring fails to come out, collapse remaining portion of with punch.

(2) To remove a stud, use a hollow mill with outside diameter 1/64 inch less than mot diameter of outer serrations of locking. Mill to depth equal to ring thickness. Remove stud and any remaining portion of ring. If hollow mill is not available, saw stud off, use drill as in step (1), and remove stud with an easy-out extractor.

(3) Check condition of tapped hole and counterbore. Holes are tapped with standard Class 3 tap. Counterbore has 90 degree shoulder and can be cleaned up as necessary. Avoid enlargement of holes, since this would require oversize parts.

(4) If tapped hole in case has a small vent hole at the bottom of the tapped hole, ensure that the vent hole is open prior to installing the new stud.

(5) Coat threads of new stud or insert with unreduced primer (C91). Install the new stud or insert into tapped hole with suitable tool until top surface of serrated collar is 0.010 TO 0.020 inch below surface of parent material.

(6) Place locking ring over stud or insert end line up teeth of ring with teeth of serrated collar. Drive ring into material flush with top of insert or stud collar.

d. Replace transmission oil system components that fail to pass inspection requirements. Refer to appropriate paragraph in chapter 6, section VII.

e. Repair transmission oil system components that have damage within repairable limits. Refer to appropriate paragraph in chapter 6, section VII.

6-30. INSPECTION-TRANSMISSION MOUNT COMPONENTS.

a. Inspect pylon structure and lift beam (29, figure 6-11) for damage.

b. Inspect lift. link (17) for damage.

c. Inspect four main mounts (26) (paragraph 2-224).

d. Inspect two dampers (27) for damage and leakage (paragraph 2-236). Inspect dampers for secure installation in pylon structure.

e. Inspect damper fitting (28) for damage and for secure installation in pylon structure.

f. Inspect fifth mount (25) (paragraph 2-230).

6-31. REPAIR - TRANSMISSION MOUNT COMPONENTS.

a. Replace transmission mount components that fail to pass inspection requirements. Refer to appropriate paragraph in chapter 2 for main mounts

(26, figure 6-11), fifth mount (26), dampers (27), and damper fittings (28).

b. Repair dampers (27) that have damage within reparable limits (paragraph 2-236).

c. Replace damper fitting (28) if loose or damaged (paragraph 2-241).

6-32. INSTALLATION – TRANSMISSION RELATED PARTS.

a. Place serviceable transmission on a suitable stand.

b. Remove pad covers, caps, and plugs from serviceable transmission. See figure 6-15.

c. Install pad covers, caps, and plugs that were removed in preceding step on unserviceable transmission.

d. Clean all sealant from serviceable transmission where quill pad covers ware removed. Use a sharp plastic scraper.

e. Install electrical harness using clamps and hardware. Attach harness to electrical components.

f. Install main rotor mast (paragraph 6-73).

g. Connect number 8 oil jet hose (6) and secure with clamp.

h. P Install transducer mounting bracket (8, figure 6-13).

6-33. INSTALLATION – TRANSMISSION ASSEMBLY.

a. Install main mast if not previously accomplished (paragraph 6-73).

b. Install air distribution blower (fan). Refer to paragraph 13-59.

c. Ensure that transmission mount components have been inspected in l ccomlance with paragraph 6-30.

d. Install mast nut (1, figure 6-11). Attach hoist (T45) to mast nut, using clevis (S4).

e. Position lift link (17) on transmission and install bolt assembly (21), washer (20), and nut (19). Torque nut 60 TO 80 foot-pounds. Install cotter pin (18).

f. Carefully hoist transmission into position above helicopter with input quill facing aft. Lower the transmission onto mounts (26) and guide lift link (17) into clevis on lift beam (29).

g. Position height of transmission with hoist to align holes in lift link (17) and lift beam (29). Install bit assembly (30), washer (31) and nut (32). Torque nut 30 TO 50 foot-pounds. Install cotter pin (33).

NOTE

The minimum breakaway torque is the minimum torque required to start removal of bolt (22) from the completely installed untorqued position. The purpose of determining breakaway torque in the following step is to ensure that the self-locking feature of the nylon insert bolt (22) is serviceable.

h. Install four bolts (22), washers (23), and retaining washers (24). Thread bolts into mounts to obtain full thread engagement but do not torque. Check breakaway torque of each bolt (22). Minimum acceptable breakaway torque is 24 inch-pounds. Replace bolts which have less than acceptable breakaway torque. Torque four bolts (22) 90 TO 105 foot-pounds.

i. Install fifth mount to transmission attaching bolt assembly (10) (paragraph 2-232).

j. Install hydraulic cylinder extension tubes on swash - plate and on collective lever (paragraph 11-152).

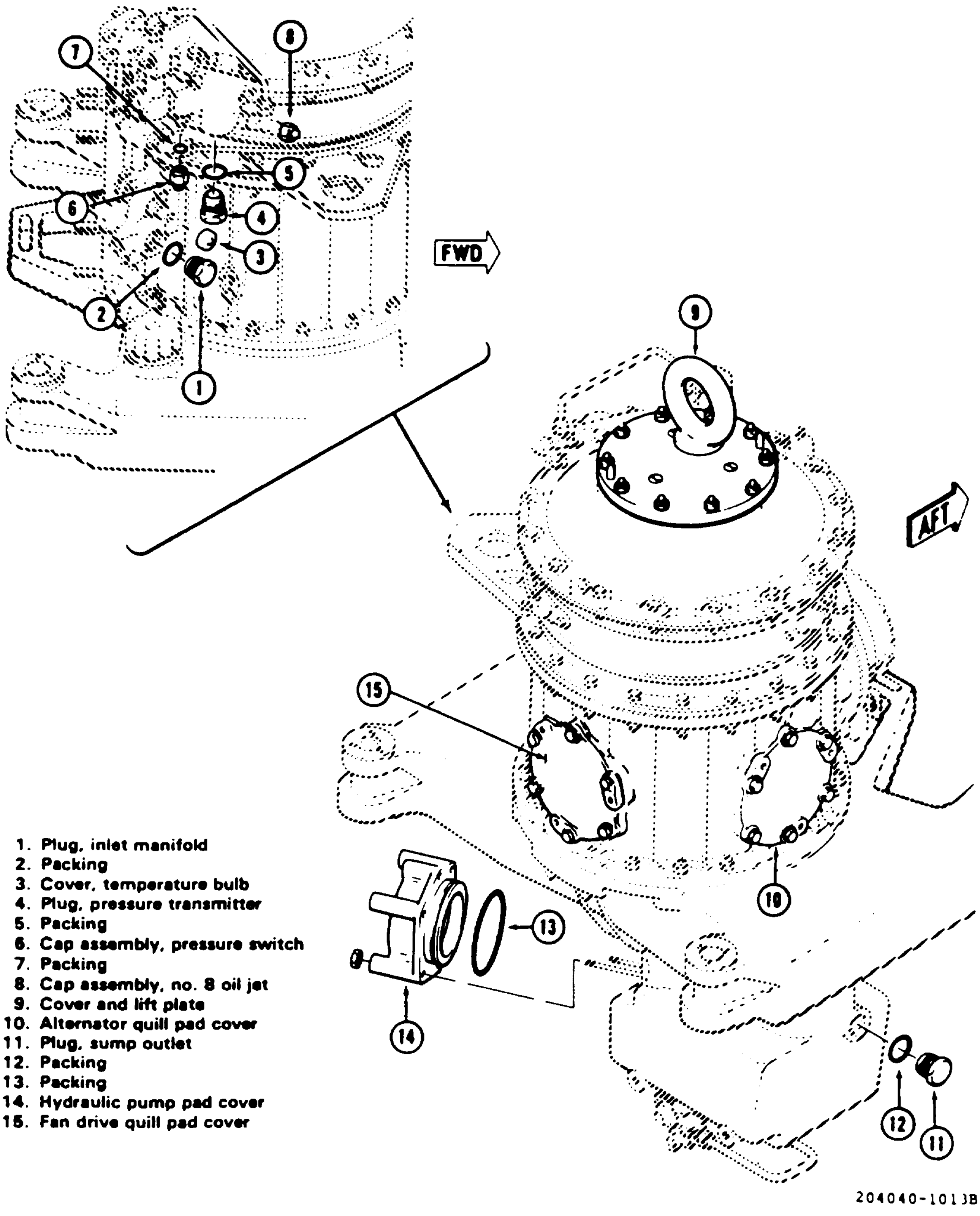
k. Install main rotor hub and blade assembly (paragraph 5-14).

WARNING

Ensure that crowned tooth coupling is properly lubricated prior to installation of driveshaft.

l. Install tail rotor driveshaft (paragraph 6-81).

m. If required, make engine to transmission alignment check (paragraph 6-7).



1. Plug, inlet manifold
2. Packing
3. Cover, temperature bulb
4. Plug, pressure transmitter
5. Packing
6. Cap assembly, pressure switch
7. Packing
8. Cap assembly, no. 8 oil jet
9. Cover and lift plate
10. Alternator quill pad cover
11. Plug, sump outlet
12. Packing
13. Packing
14. Hydraulic pump pad cover
15. Fan drive quill pad cover

Figure 6-15. Transmission Shipping Covers, Caps, and Plugs

n. Install main driveshaft (paragraph 6-13).

o. Connect two oil hoses from oil cooler to oil cooler automatic emergency bypass valve (13, figure 6-47). Ensure that oil filter (2) and external oil lines are properly installed on transmission.

CAUTION

Ensure that items (38, 39) or (41, 42) of figure 6-7 are installed correctly to ensure proper oil cooler bypass valve operation and oil flow direction through the coder.

p. Connect sump drain coupling (6, figure 647).

q. Attaching ducting to blower at front of transmission.

r. E M Install alternator (paragraph 9-165) and connect electrical wires and electrical connectors to alternator.

s. P Install transducer (figure 6-13) at fifth mount (TM 11-1520-236-20).

t. Connect transmission instrumentation electrical wiring connector at right side of transmission compartment.

t.1 For helicopters with MWO 1-1520-236-50-30, check that ODDS components - bracket (73, figure 6-1 2) external filter (9.1) and debris monitor (74) - are installed. Check that cable plug is connected to receptacle on debris monitor.

Service transmission with oil (C79), (79A) or (C80).

v. Close transmission cowling.

w. Perform maintenance test flight (TM 55-1520-236-MTF).

6-34. PREPARATION FOR SHIPMENT — TRANSMISSION ASSEMBLY.

a. Remove main rotor mast assembly if not previously accomplished (paragraph 6-69).

b. Preserve transmission by spraying the interior of the transmission through the top opening with a one gallon mixture of one part oil (C79 or C80) and one part corrosion prevention (C44.1). While spraying, manually rotate the transmission input drive quill to insure gears and bearings are completely saturated. Attach tag to transmission stating: PRESERVED WITH CORROSION PREVENTIVE, NSN 6850-00-142-9582.

c. Install cover and lift plate (9, figure 6-15) immediatety after the mast has been removed and the interior preservation has been completed.

d Cap or plug all lines, as applicable, see figure 6-15. Cover breather hole and ail other openings with barrier material (C23) or protective cap (C26) and secure with tape (C127). Secure ail loose wires and lines to assembly with tape (C127) to prevent damage during shipment.

WARNING

Cleaning advent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

CAUTION

Keep rubber portions of container transmission pyton mounts free of any oil, grease, and advents to prevent deterioration and weakening of bonds between rubber and metal.

e. Clean the exterior of the transmission to include splines and the threaded areas with solvent (C112). Air dry or wipe with a clean lint-free cloth.

CAUTION

Do not allow corrosion preventive compound to contact rubber parts.

f. Apply corrosion preventive compound (C41) to all exterior bare metal surfaces to include splines, studs, and threaded areas.

g. Cover the couplings on the input and tail rotor drive quills and all open accessory mounting pads with barrier material (C23) and secure with tape (C127).

h. Attach a tag to the transmission stating: TRANSMISSION PRESERVED WITH LUBRICATING OIL, MIL-L-7806 or MIL-L-23699, or DOD-L-85734.

i. Fill out a DD Form 1577-2 (Unserviceable/ Repairable tag) and attach it directly to the transmission.

J. Fill out a DD form 1577-3 (tag or label) and attach it to the exterior of the transmission container in such a manner that will afford maximum protection from handling and weather. Refer to DA PAM 738-751.

k. Fill out a DA form 2410, component removal and repair/overhaul record, in accordance with DA PAM 738-751.

l. Install the transmission in a metal storage and shipping container as follows:

NOTE

If the container noted is not available, proceed to step m.

(1) Inspect the shipping container and be sure it is clean and satisfactory for use. Repair and/or clean the container if necessary.

(2) Carefully lower the transmission into the shipping container and align with shock mounts in the container. Install four mounting bolts, washers, and nuts. Torque nuts 700 TO 900 inch-pounds.

CAUTION

Desiccant bags must be secured in the transmission container in a manner to prevent contact with the transmission or corrosion damage will result. Do not use desiccant bags if an airtight container is not available.

(3) Place 56 units of dry desiccant (C49) into the transrnission container in such a manner that the desiccant cannot touch the transmission during shipment.

(4) Position top of container over transmission and install bolts, washers, and nuts; torque nuts 265 TO 285 inch-pounds.

(5) Paint over old markings that do not apply to transmission in container. Mark container in accordance with MIL-STD-129.

m. If a metal storage and shipping container is not available, prepare the transmission for shipment as follows:

NOTE

This procedure is based on the assumption that the provisions of paragraph j cannot be complied with, that the work will be done under less than ideal conditions with limited equipment and that on some occasions by personnel who are not experts in the field of perservation. Use this procedure only at locations where facilities for the application of normal preservation procedures do not exist.

(1) Comply with steps a through k.

(2) If caps, plugs, and barrier materials specified in steps d. and g. are not available, use barrier material and tape as substitutes.

(3) If corrosion preventive compound specified in step f is not available, substitute other grease-type corrosion preventive compound or bearing grease (C57).

(4) Cover the transmission with barrier material (C22) and secure with tape. Do not use desiccant.

(5) Install the transmission in the beat available container or stand. Cushion, block, and brace the transmission as necessary to prevent damage.

(6) Mark the container as follows: Point over old markings that do not apply to transmission in container. Mark the container in accordance with MIL-STD-129 and also include the following: THIS TRANSMISSION IS NOT PRESERVED FOR STORAGE. OVERHAUL OR PRESERVE FOR STORAGE AS SOON AS PRACTICABLE.

6-34.10 PYLON LIFT LINK TRANSMISSION.

6-34.2. DESCRIPTION - PYLON LIFT LINK.

A pylon lift link is used to attach transmission to helicopter fuselage. The lift link transmits rotor lift to fuselage structure. The lift link is forged steel with self -aligning end bearings and is connected between transmission support case and a lift link support beam, which is attached to the fuselage.

6-34.3. REMOVAL - PYLON LIFT LINK.

Premaintenance Requirements for Pylon Lift Link — Transmission

Conditions	Requirements
Model	AH-1S
Part Number or Serial Number	All

Conditions	Requirements
Special Tools	(T45)
Support Equipment	None
Minimum Personnel Required	Two
Consumable Materials	(C31), (C33), (C74), (C91), (C96)
Special Environmental Conditions	None
Test Equipment	None

a. Open and secure transmisson cowl door on left side.

b. Attach hoist (T45), or other suitable lifting device, to main rotor retaining nut.

c. Remove cotter pine (18 and 33, figure 6-11), nuts (19 and 32), and washers (20 and 31), from bolts (21 and 30).

d. M coded helicopters prior to serial no. 76-2256. Remove cotter pins (18 and 33, figure 6-11), nuts (19 and 32) and washers (20, 31, 36 and 37).

e. Using hoist, raise transmission until bolts (21 and 30) can be removed. Remove both bolts and lift link.

6-34.4. INSPECTION - PYLON LIFT LINK.

a. Inspect upper and lower lift link ends in bearing area, using 10X magnifying glass.

b. Suspected cracks should be inspected by the magnetic particle method (refer to TM 43-0103). Scrap lift link if any cracks are found.

WARNING

Paint remover (C96) is toxic and contains ingredients harmful to skin and eyes. Observe safety precautions printed on the container.

(1) Remove paint from lug areas, using paint remover (C96).

(2) Perform nondestructive inspection.

(3) After inspection thoroughly clean and dry the areas using cleaning compound (C33) and MEK (C74).

(4) Apply two cross-coats of primer (C91) to stripped areas.

c. Corrosion or mechanical damage, not exceeding 0.005 inch is permissiible after cleanup, except in outboard 2.50 inches. No damage is permitted in outboard 2.50 inches, on either end of lift link.

d. Inspect bearings for a maximum allowable play of 0.008 inch radial and/or 0.016 inch axial.

6-34.5. REPAIR OR REPLACEMENT-PYLON LIFT LINK.

a. Replace lift link if cracked, damaged beyond allowable limits. Bearing in lift link P/N 212-030-104-5 may be replaced in accordance with TM 55-1500-322-24 after installing bearings, link is to be fluorescent penetrant inspected.

b. Polish out corrosion or mechanical damage that is within allowable limits (refer to TM 43-0105).

c. Refinish polished area with primer (C91).

6-34.6. INSTALLATION - PYLON LIFT LINK

a. Position lift link in transmission case recess and install shouldered bolt (21, figure 6-11), washers (20), and nut (19). Torque nut 60 TO 80 foot-pounds and install cotter pin (18).

b. Align lower end of lift link and install bolt (30), washer (31), and nut (32). Torque nut 30 TO 50 foot-pounds and install cotter pin (33).

c. M coded helicopters prior to serial no. 76-22567. Align lower end of lift link and install bolt (30), washers (36) and/or (37), as required; washer (31) and nut (32). Torque nut 30 to 50 foot-pounds. SEE NOTE 3 (Fig. 6-11).

d. Disconnect and remove hoist.

e. Close and secure transmission cowl.

6-34.7. LIFT LINK ATTACHING POINT.

6-34.8. DESCRIPTION – LIFT LINK ATTACHING POINT.

The lift link attaching point is an integral part of the lift beam (29, figure 6-11) and provides a means of attaching the transmission to the fuselage by the lift link (17).

6-34.9. INSPECTION – LIFT LINK ATTACHING POINT.

NOTE

Refer to paragraph 6-34.3. if removal of lift link is required.

a. Nicks and scratches on any lug surface within the enclosed 120 degree area as shown in figure 6-15.1 may be smoothed and polished out by removing material enclosed within a 0.75 inch diameter to a maximum depth of 0.025 inch below 0.813 inch lug minimum thickness. No repair allowed within 0.75 inch radius of bolt hole center.

b. Nicks and scratches on any surface below the 120 degree area and outside the 0.75 inch radius around the bolt hole center may be smoothed and polished out by removing material enclosed in a 1.00 inch diameter to a depth of 0.050 inch below 0.813 inch lug minimum thickness.

c. Corrosion limits are half the depth of mechanical damage limits, because clean-up requires material removal to twice the depth of corrosion damage.

d. No looseness of bushings allowed.

e. No cracks allowed.

f. Inspect bushings for wear (View A-A, figure 6-15.1).

6-34.10. REPAIR – LIFT LINK ATTACHING POINT.

a. Polish out corrosion and mechanical damage within limits of previous paragraph.

b. Replace loose or worn bushings.

c. Treat repaired area with chemical film treatment (C31).

d. Paint repaired area with primer (C91).

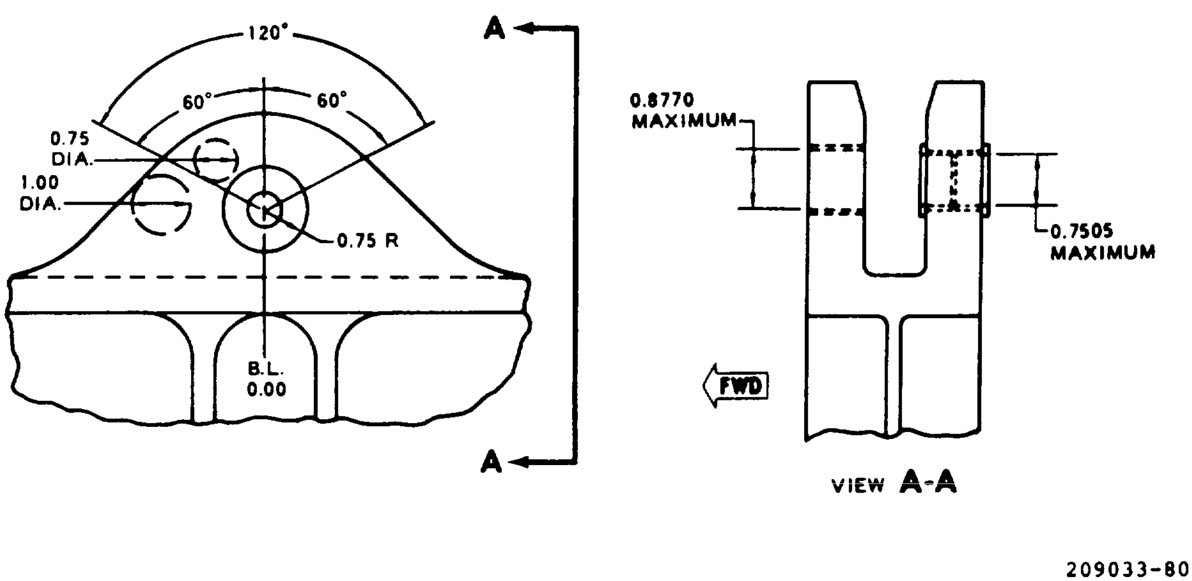


Figure 6-15.1. Lift Link Attaching Point

6-35. TRANSMISSION QUILLS.

6-36. DESCRIPTION - TRANSMISSION QUILLS.

The transmission contains a varied assortment of quills. The quills may be replaced individually without shimming.

6-37. MAIN INPUT QUILL.

6-38. DESCRIPTION – MAIN INPUT QUILL.

The main input quill (3, figure 6-10) is located on the aft side of the transmission. The engine transmits power to the transmission through the main driveshaft and the main input quill. A freewheel (one-way) clutch located in the main input quill operates automatically, engaging to allow engine to drive rotor or disengaging the idling engine during autorotational descent.

6-39. REMOVAL – MAIN INPUT QUILL.

Premaintenance Requirements for Input Quill

Conditions	Requirements
Modal	AH-1P/E/F
Part Number or Serial Number	All
Special Tools	(T27) (T43)
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	Two
Consumable Materials	(C79) (C80) (C74) (C111) (C105) (C137)
Special Environmental Conditions	None

a. Open cowling on both sides of transmission. Remove baffling and panicle separator from intake section.

b. Remove driveshaft (paragraph 6-8).

c. Disconnect drain tube (18, figure 6-16) from union (17).

d. Remove bolts, nuts, and washers that secure bracket (21, figure 6-12) to bracket (22) and to input quill. Remove bracket (21) and bracket (46).

e. Remove clip (43).

f. Remove four remaining nuts (33) that secure main input quill in transmission.

g. Use sharp plastic scraper and cut sealant around periphery of quill. Also remove sealant, or lockwire, plugs and gasket from jackscrew holes.

CAUTION

Do not apply uneven pressure to input quill with jackscrews during removal procedure. Do not pry behind input quill flange during removal procedure.

CAUTION

Do not use open flame to host transmission case during input quill removal procedure.

h. Install three jackscrews (T27) in holes provided in input quill. Tighten jackscrews evenly to remove quill. If the quill is difficult to remove, apply heat to the transmission case with a heat lamp and then remove the quill with the jackscrews.

i. Remove drain tube (10, figure 6-16).

j. Cover mounting port for main input quill to prevent accidental entry of foreign objects into transmission.

k. Do not remove shims from main input quill sleeve or from transmission case.

6-40. INSPECTION – MAIN INPUT QUILL.

NOTE

External leakage around seals is not acceptable; however, a small amount of seepage is acceptable and does not indicate an unsatisfactory seal condition. Continuous flow (droplets) is excessive and requires seal replacement.

a. Inspect main input quill for evidence of oil leakage. See note above.

b. Inspect main input quill for mechanical and corrosion damage. Any evidence of corrosion where the shim is attached to sleeve assembly (11, figure 6-16) is cause to replace the quill.

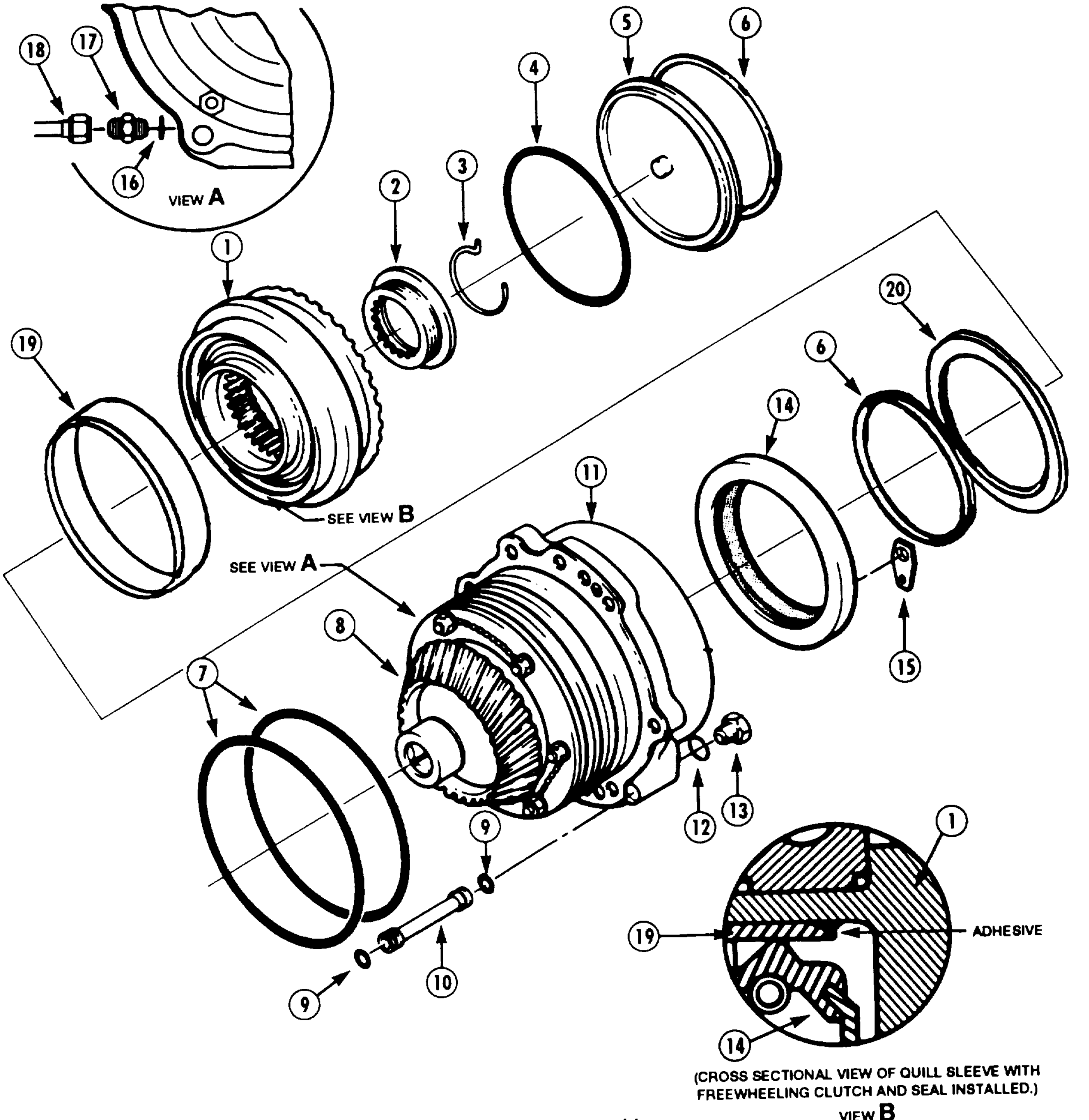
c. Inspect teeth on pinion gear (8) for evidence of abnormal wear and for chipped teeth.

d. Inspect freewheeling clutch assembly (1, figure 6-16) surface that contacts main driveshaft for nicks, dents, and cracks.

6-41. REPAIR-MAIN INPUT QUILL (AVIM).

CAUTION

Do not allow clutch flange to move axially in relation to inner race when handling freewheeling clutch assembly (1, figure 6-16). Axial movement is possible with grease cap (5) removed.



1. Freewheeling clutch assembly
2. Nut
3. Locking spring
4. Packing
5. Grease cap
6. Retaining ring
7. Packing (2)
8. Pinion gear
9. Packing (2)
10. Drain tube
11. Sleeve assembly
12. Packing
13. Plug
14. Seal
15. Clip
16. Packing
17. Union
18. Tube assembly
19. Wear sleeve
20. Shield

Figure 6-16. Main Input Quill Assembly

a. Fabricate a work aid (figure 6-16.1, sheet 1). Secure work aid to clutch assembly (figure 6-16.1, sheet 2), using tape or other suitable material.

a.1. Remove retaining ring (6, figure 6-16) and grease cap (5) from input drive quill. Remove packing (4) from grease cap.

b. Secure quill and remove locking spring (3). Insert wrench (T43) into the quill; match the spline teeth on the tool with splines of nut (2). Insert a 3/4 inch square drive extension through wrench and engage inner end of pinion gear (8). Remove nut (2).

b.1. Reinstall grease cap (5, figure 6-16) (without packing (4)) and retaining ring (6). Remove work aid (figure 6-16.1, sheet 2).

CAUTION

Handle clutch assembly carefully and do not disassemble clutch when replacing input drive seal.

c. Replacement of Wear Sleeve.

(1) Remove freewheeling unit from quill (use tool 25, Table 1-4, P/N T101306, NSN 4920-00-797-3672).

(2) Discard preformed packing (Item 4, Figure 6-16).

(3) Remove Seal (Item 14, Figure 6-16) from Sleeve Assembly (Item 11, Figure 6-10).

(4) Remove RR511 retaining ring (Item 6, Figure 6-16) and shield (Item 20, Figure 6-16).

CAUTION

After removal of RR511 retaining ring (Item 6, Figure 6-16) do not allow freewheeling coupling outer race to move axially relative to the coupling inner race.

(5) Drive pins from wear sleeve with a punch.

(6) Remove old wear sleeve from outer race.

(7) Prepare surfaces for bonding as follows:

CAUTION

Replace grease cap (Item 5, Figure 6-16) prior to surface preparation and make every effort to ensure bearings remain clean and free of contaminates during sleeve replacement.

(a) Initially remove old adhesive using plastic scraper.

(b) Lightly abrade faying surfaces with 400 grit abrasive paper or scotchbrite (C103) and then clean with MEK (C74).

(8) After thoroughly mixing adhesive (C14) per manufactured instructions apply to wear sleeve ID per illustration (Figure 6-16.3)3 to 8 mile thick.

(9) Press new sleeve (Item 19, Figure 6-16) onto outer race (ensure wear sleeve is pressed onto the race with the internal radius first). Also, the outer edge of wear sleeve (see Figure 6-16.3) shall be recessed flush to 0.020 inch from outer races edge.

(10) After installation, ensure a 0.06R fillet of adhesive is provided on the inside diameter chamfer of wear sleeve as shown in Figure 6-16.3.

(11) Clean up any excess adhesive that may have seeped through the holes where pins were previously installed.

(12) Cure adhesive at mom temperature for 24 hours, at 70-95 degrees F.

CAUTION

If heat is used to accelerate cure time do not exceed 250 degrees F.

(13) Reinstall shield (Item 20, Figure 6-16) and RR511 retaining ring (Item 6, Figure 6-16).

(14) Mask off all surfaces except O.D. of wear sleeve. Spray O.D. of wear sleeve. Spray O.D. of installed wear sleeve with teflon-flouroglide (NSN 6810-00-184-4800). Allow five minutes for drying then buff with a clean dry lint free cloth.

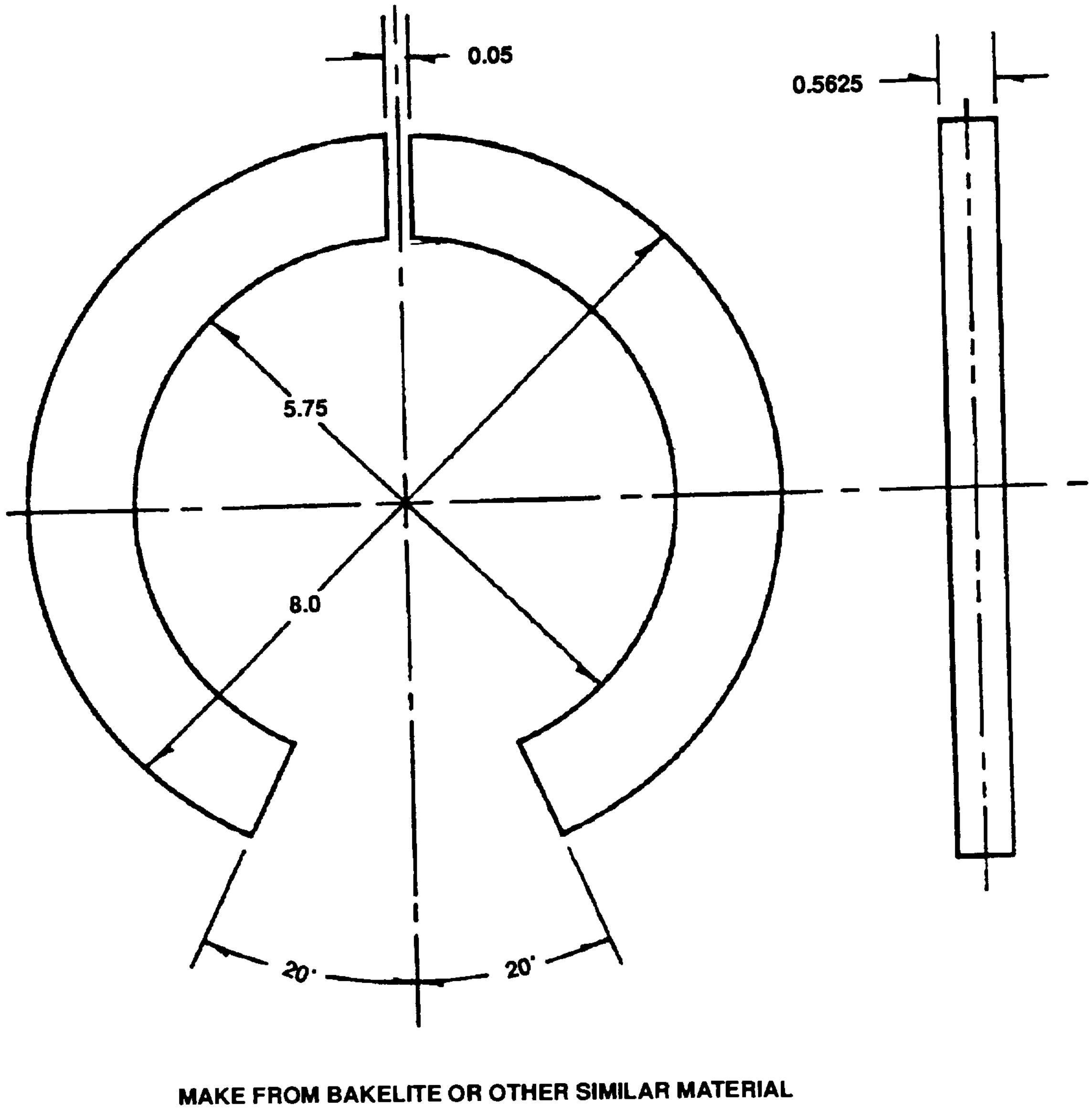


Figure 6-16.1. Transmission Input Quill Work Aid (Sheet 1 of 2)

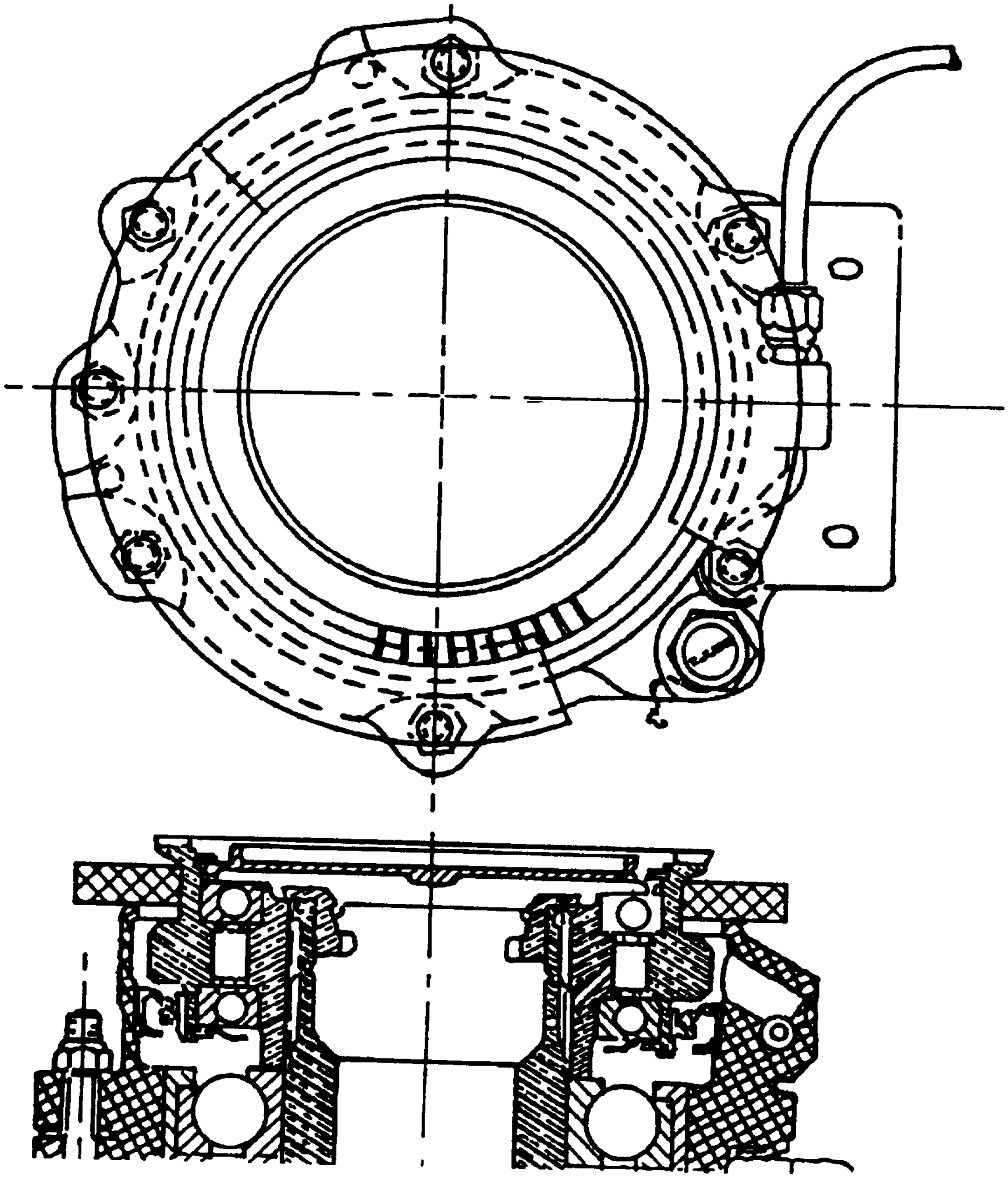


Figure 6-16.2. Transmission Input Quill Work Aid (Sheet 2 of 2)

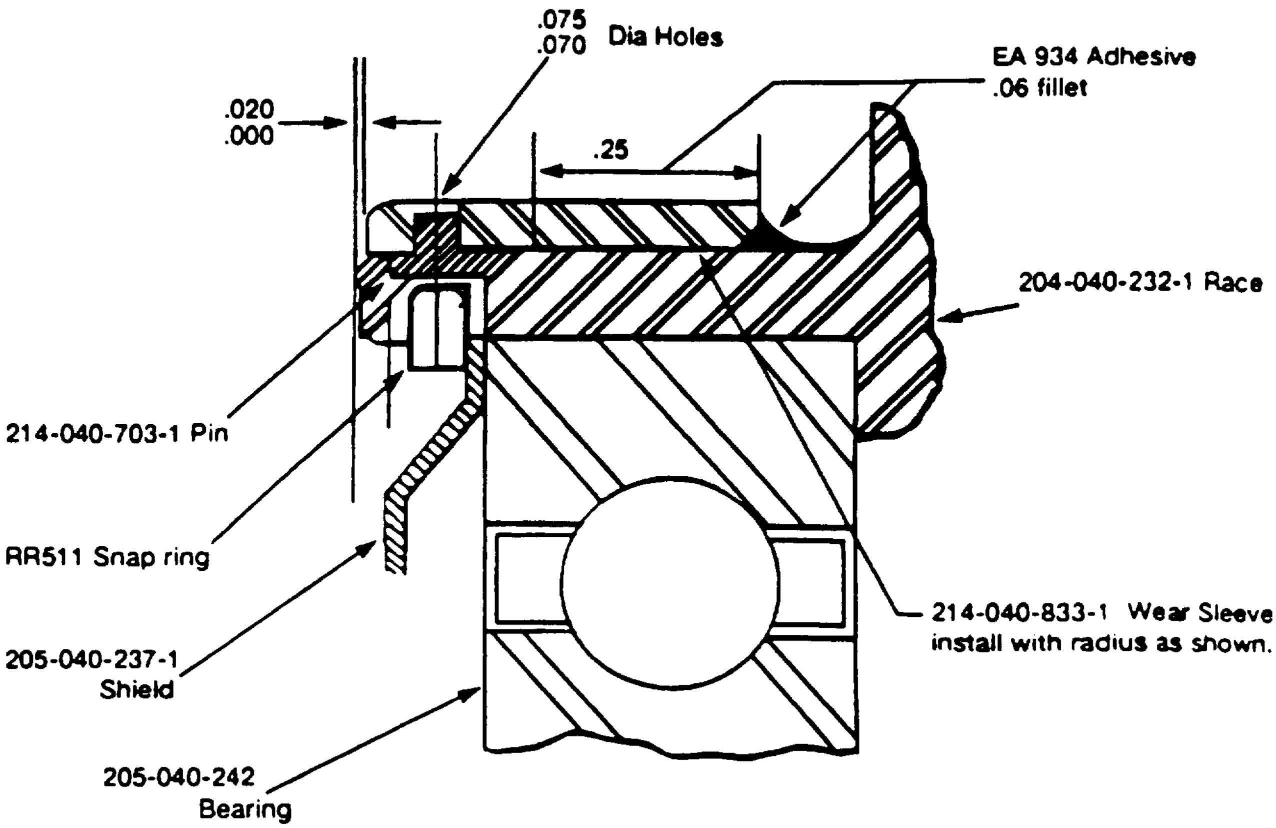


Figure 6-16.3 Input Drive Quill Wear Sleeve Replacement

(15) Install new seal (Item 14, Figure 6-16) in Sleeve Assembly (paragraph 6-41.f). Coat the seal lip (Item 14, Figure 6-16) and wear sleeve (Item 19, Figure 6-16) with a light film of grease (C58).

(16) Install freewheeling unit. Inspect for proper direction of freewheeling (outer race of clutch drives clockwise).

NOTE

When installing nut (Item 2, Figure 6-16) torque to 350-400 ft-lbs (use tool 25, Table 1-4, P/N T101306, NSN 4920-00-797-3672).

(17) Install new packing (Item 4, Figure 6-16) and reinstall the grease cap (Item 5, Figure 6-16) and secure with RR511 retaining ring (Item 6, Figure 6-16).

d. Deleted.

e. Deleted.

f. Install a new seal (14) in sleeve assembly (11) as follows.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(1) Clean sleeve assembly in area where seal is to be installed using MEK (C74).

(2) Apply 0.025 inch band of sealant (C107) to O.D. of the seal (14).

(3) Press seal (14) into sleeve assembly (11). Wipe excess adhesive.

(4) Cure at 70 TO 80 degrees F (21 TO 27 degrees C) for 24 hours.

NOTE

If seal replacement does not stop leakage, forward quill to next higher maintenance level.

f.1. Install work aid (figure 6-16.1, sheet 2) and secure with tape or other suitable material. Remove retaining ring (6) and grease cap (5).

g. Lubricate seal (14) with transmission oil (C79) or (C80) and position clutch assembly (1) in sleeve (11). Install nut (2) and torque 350 TO 400 foot-pounds with tools described in step b.

h. Install locking spring (3). Ensure that spring tang engages nut and pinion properly to perform locking function,

i. Inspect groove in grease cap (5) provided for packing (4). Remove any burrs which might damage packing. Install new packing (4) on cap (5), Lubricate packing with transmission oil (C79) (C79A) or (C80) and install retainer in sleeve (11). Install retaining ring (6).

j. Remove work aid (figure 6-16.1, sheet 2).

6-42. INSTALLATION — MAIN INPUT QUILL.

a. Remove cover from main input quill mounting pad on transmission case. Check that mating surfaces of case and quill are dean. Inspect grooves provided for packings (4 and 7, figure 6-16). Remove any burrs which might damage packing.

b. P Remove cover (10, figure 6-15).

c. E M Remove alternator drive quill (paragraph 6-63).

d. Remove number 6 oil jet (62, figure 6-12) from right side of main transmission case.

CAUTION

Rubber plug installation procedure must be followed to prevent damage to bearings.

e. Fabricate rubber plug as follows:

(1) Cut a rubber plug (figure 6-17) Slightly larger than the diameter of the roller bearing liner race on the inboard end of the input pinion.

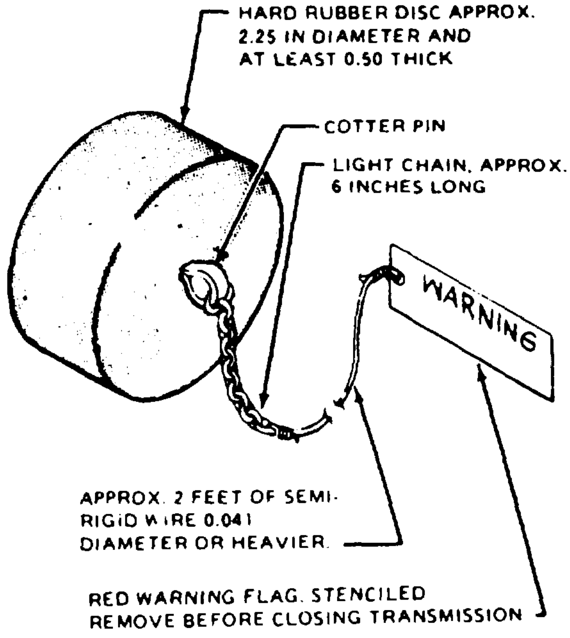


Figure 6-17. Work Aid — Main Input Drive Quill Installation

(2) Insert a 3/32 inch cotter pin through center of rubber plug and through a washer.

(3) Bend ends of colter pin back against washer and plug.

(4) Attach a piece of light chain or 1/8 inch nylon cord approximately two feet long, to the eye of the rotter pin. See figure 6-17 for view of rubber plug.

f. Using quill port in side of transmission, position the rubber plug in the forward side of the main input quill support bearing in such a manner that the rollers are held against the bearing outer race. Ensure that chain or cord extends outside alternator drive quill port.

g. Install two new packings (9, figure 6-16) on drain tube (10). Lubricate packings with transmission oil (C79) (C79A) or (C80) and install tube (10) in hole provided in transmission case.

CAUTION

Do not use open flame to heat transmission case during main input quill installation procedure.

h. Install a new packing (7) in each of the two outside grooves of drive quill (11), leaving the middle groove open for oil flow. Lubricate packings (7) with transmission oil (C79) (C79A) or (C80) and position quill in transmission. Exercise care to engage gear teeth by rotating the input pinion until engagement is felt. Align nose of pinion into roller bearings as quill is installed. Be sure tube (10) is properly installed. Do not tap on freewheeling clutch. if quill is difficult to install, heat transmission case with heat lamp.

i. Position two aluminum washers (36, figure 6-12) and bracket (21) on two lower stud. Install two aluminum washers (35), two thin steel washers (34), and two self-locking nuts (33). Do not torque nuts (33) at this time.

j. Install clip (43, figure 6-12), thin steel washer, and self-locking nut at position illustrated. Do not torque nut at this time

k. Position one aluminum washer on remaining four studs and install remaining four self-locking nuts. Tighten seven nuts (33) evenly and torque 160 TO 190 inchpounds

l. Install brackets (22) and (46), using bolts, nuts, and washers removed in paragraph 6-39d.

m. Ensure that roller bearing separator plug, installed in step e. is removed when the input pinion has sufficiently engaged the roller alignment bearing. This will prevent jamming the plug against the vertical shaft. Remove rubber plug installed in step d.

n. **P** Install cover (10, figure 6-15).

o. **E** **M** Install alternator drive quill (paragraph 6-66).

p. Install number 6 oil jet (62, figure 6-12).

q. Install union (17, figure 6-16) with new packing (16). Install tube assembly (18).

r. Install plug (13) and new packing (12) at lower right side of quill. Lockwire plug with lockwire (C137).

s. Apply sealant (C105) to quill case joint and around drain tube (10). Install plugs (MS24391D2L), Gasket (MS28777-2), and lockwire (C137).

6-43. TAIL ROTOR DRIVE QUILL

6-44. DESCRIPTION-TAIL ROTOR DRIVE QUILL.

The tail rotor drive quill is located in the aft side of the transmission sump case. The forward tail rotor drive-shaft is attached to a splined coupling which is part of the tail rotor drive quill.

6-45. REMOVAL-TAIL ROTOR DRIVE QUILL.

Premaintenance Requirements for Removal and Repair of Tail Rotor Drive Quill

Conditions	Requirements
Model	AH 1P/E/F
Part Number or Serial Number	All
Special Tools	(T28) (T55) (T26) (T35.1)
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	Two
Consumable Materials	(C56) (C 105) (C137)
Special Environmental Conditions	None

a Open cowling at either side of transmission.

b. Remove forward section of tail rotor driveshaft paragraph 6-77).

c. **P** Remove transducer (figure 6-13). Refer to paragraph 11-148.

d. Remove six nuts (6, figure 6-13) and washers (7).

e. **P** Remove transducer mounting bracket (8).

f. Use sharp plastic scraper and cut sealant around periphery of quill. Also remove sealant, or lockwire, plugs, and gaskets from jackscrew holes.

CAUTION

Do not heat case with open flame.

g. Install three jackscrews (T28) in tapped holes in quill flange. Turn jackscrews evenly to pull quill from case. If quill is difficult to remove, heat case with heat lamp.

h. Install cover on open port on transmission case.

6-46. INSPECTION — TAIL ROTOR DRIVE QUILL.

a. Inspect tail rotor drive quill for damage in accordance with figure 6-18.

b. Inspect grease seal, (6, figure 6-19) for cracks and deterioration.

NOTE

External leakage around seats Is not acceptable; however, a small amount of seepage Is acceptable and does not indicate an unsatisfactory seal condition. Continuous flow (droplets) is excessive and requires seal replacement.

c. Inspect inner coupling (16) and outer coupling (7) while disassembled (paragraph 6-47).

6-47. REPAIR — TAIL ROTOR DRIVE QUILL.

a. Replace tail rotor drive quill if damage exceeds acceptable limits (paragraph 6-46).

NOTE

Remove seal plate (9, figure 6-19) slowly so centering spring (10) will not fly out.

b. Polish out corrosion and mechanical damage in accordance with figure 6-18.

c. Secure quill, then remove retaining ring (8), seal plate (9), and centering spring (10).

d. Remove lock-spring (11) and retainer plug (12).

e. Remove bolt (14) using a 1/2 inch square drive extension and holding wrench (T26). Remove washer (15).

f. Remove inner coupling (16) with outer coupling (7), and spacer (5).

CAUTION

Do not use solvent to clean interior of coupling.

g. Clean grease from inner coupling (16, figure 6-19) and outer coupling (7) with clean cloth (C30) and insert per paragraph 6-128.1.

h. Cut and remove lockwire from nut (20) figure 6-19.

i. Remove nut (2) with wrench (T55) and holding fixture (T35.1).

j. Positon tail rotor quill in holding fixture (T35.1); then press oil seal (3) from nut (2) and install new seal, applying sealant (C107) to O.D. of seal (9) and I.D. on nut (2). Remove packing (1) from nut and install new packing.

k. Install nut (2) with wrench (T55); torque to 1200 TO 1800 inch-pounds and lockwire (C137).

l. Replace grease seal (6) by installing new seal in small end of outer coupling (7) with seal lip toward flange end of coupling.

m. Press seal, using tongue depressor, into slot between end of coupling teeth and flange. Hand pack grease to 0.12 inch deep over top of internal spline teeth. Use grease (C56).

n. Install packing (4), spacer (5), outer coupling (7), with inner coupling (16) on pinion shaft and splines.

o. install washer (15) and coupling bolt (14) on pinion shaft; torque coupling bolt 960 TO 1200 inch-pounds.

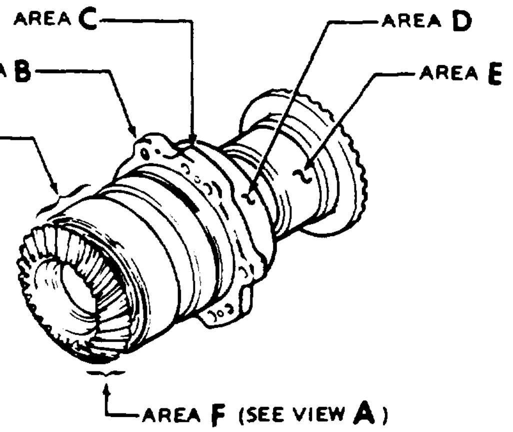
p. Install new packing (13) on retainer plug (12). Install retainer plug (12) and secure with lockspring (11) through grooves in the outboard end of inner coupling (16).

WARNING

Ensure that crowned tooth coupling is lubricated prior to installation of tail rotor drive quill (paragraph 1-29).

q. Coat internal splines of outer coupling (7) with grease (C56) to 0.12 inch depth over top of spline teeth.

r. Install centering spring (10), seal plate (9), and retaining ring (8).



AREA	LIMITS
All	No cracks allowed.
A	Scratches, nicks, and dents up to 0.030 inch in depth are acceptable provided that the following conditions are complied with: 1. Raised material around damage must be polished off to original surface. 2. Small burrs that oculd damage packing must be polished off, Repair area must not affect sealing of packing. Extensive damage and rework around packing groove is prohibited. 3. Sleeve diameter must not be leas than 3.6247 inches at any location after damage is polished out. 4. Blend radius must be 0.026 inch or better. Surface finish must be 63 RMS or batter. 6. Repair area must be treated for corrosion protection in accordance with general instructions.
A	Corrosion damage up to 0.015 inch in depth is acceptable if polished out to remove all traces of corrosion and the requirements for mechanical damage are complied with.
B	Scratches, nicks, and dents up to 0.040 inch in depth are acceptable provided the following conditions are complied with: 1. Damage must be polished out to a surface finish of 63 RMS or bettor with a blend radius of 0.250 inch or more. 2. Damage must not extend into holes for studs or into spotface for stud washers in a manner that would cause studs to bend when holddown nuts are tightened. 3. Repair area must not exceed forty percent of total flange area. 4. Repair area must be treated for corrosion protection in accordance with general instructions.

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Figure 6-18. Damage Limits — Tail Rotor Drive Quill (Sheet 1 of 3)

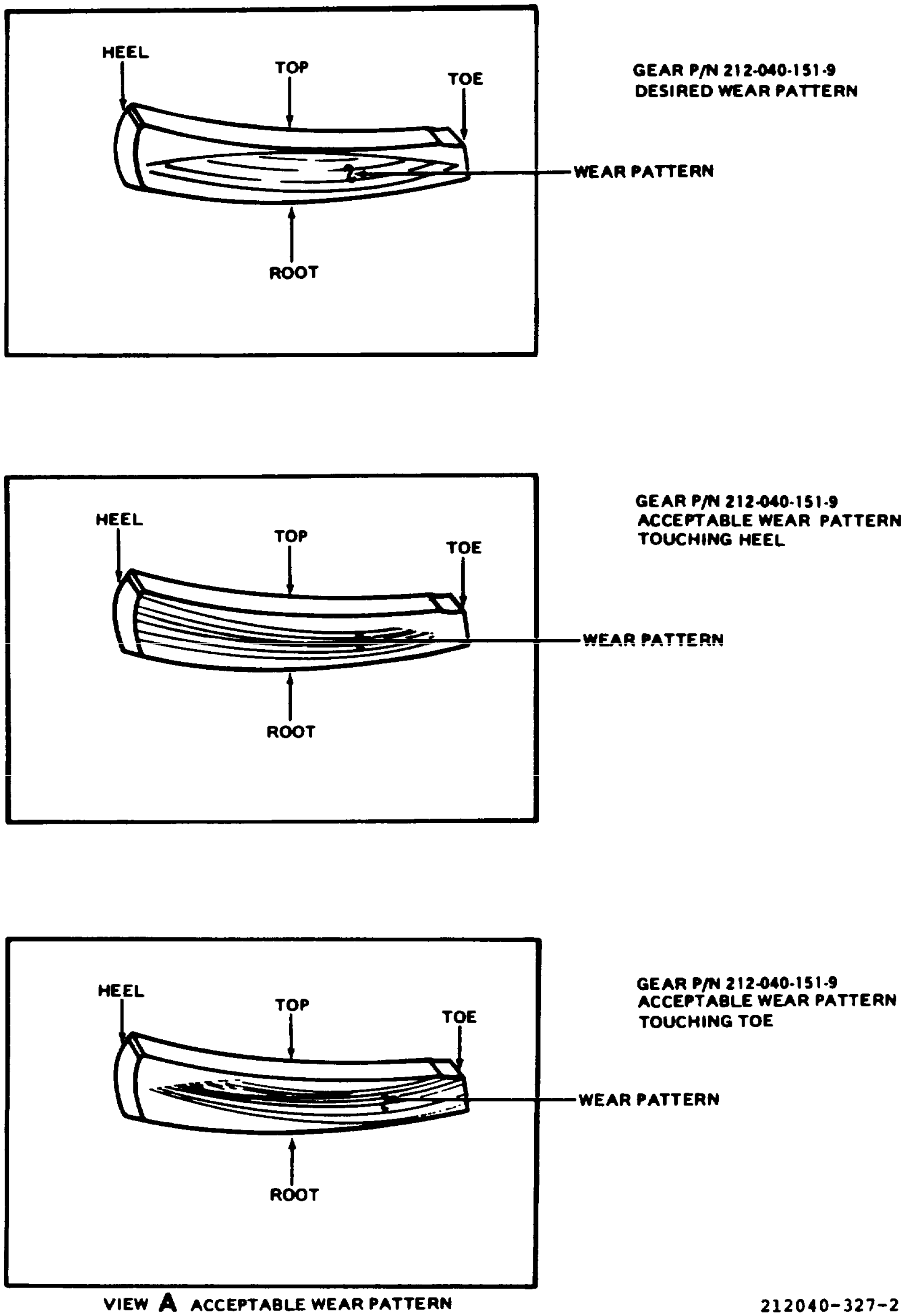

Figure 6-18. Damage Limits - Tail Rotor Drive Quill (Sheet 2 of 3)

AREA	LIMITS
B	Corrosion damage up to 0.020 inch in depth is acceptable if polished out to remove all traces of corrosion and the requirements specified for mechanical damage are complied with.
C	Evidence of corrosion under shim in area C is cause to replace the quill.
D	Evidence of corrosion on sleeve adjacent to externally threaded ring (nut) that retains bearings in sleeve is cause to replace quill.
D	Scratches. nicks, dents, and gouges on external surface up to 0.040 inch in depth are acceptable providing the following conditions are complied with: 1. The repaired area must be blended in smoothly. 2. The repair area bottom radius must be 0.500 inch or more. 3. The finish must be 63 RMS or better. 4. Reworked area must be treated for corrosion protection in accordance with general instructions.
D	Corrosion damage on external surface up to 0.020 inch in depth is acceptable if polished out to remove all traces of corrosion and the requirements specified for mechanical damage are complied with.
E	Minor scratches and burrs on external surface of coupling are acceptable if polished out with India stone (C116). Indication of overheating of coupling, such as multi-color appearance, is cause to remove the outer coupling and inspect splines and teeth. Inspection procedure is furnished in text.
F	Damage and wear on pinion teeth must be within limits shown on view A. Wear patterns outside acceptable patterns illustrated and/or roughness, scoring chips and other evidence of damage is cause to replace the tail rotor drive quill and to perform detailed inspection of mating quill inside the transmission sump.
General	1. Treat all rework areas on interior and external surfaces with Alodine for corrosion protection. Refer to TM 43-0105 for additional corrosion protection procedures. 2. Apply zinc chromate (C91) or polyemide epoxy prima (C88) to rework areas on surfacesthat were painted originally, then paint to match surrounding surface.

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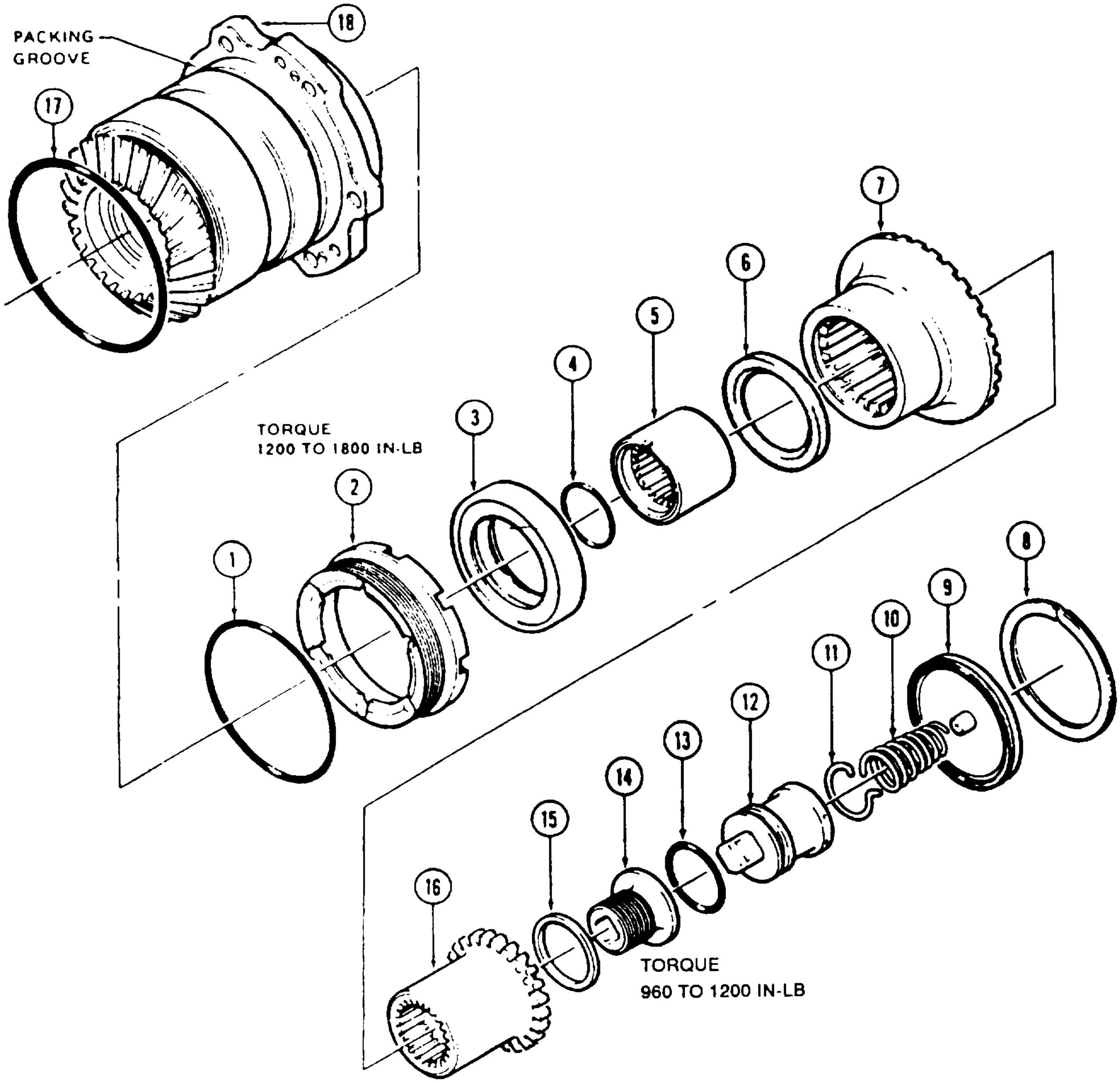
Figure 6-18. Damage Limits - Tail Rotor Drive Quill (Sheet 3 of 3)



1. Packing
2. Nut
3. Oil seal
4. Packing
5. Spacer
6. Grease seal
7. Outer coupling
8. Retaining ring
9. Seal plate
10. Centering spring
11. Lock-spring
12. Retainer plug
13. Packing
14. Bolt
15. Washer
16. Inner coupling
17. Packing
18. Quill sleeve

Figure 6-19. Tail Rotor Drive Quill Assembly

6-48. INSTALLATION — TAIL ROTOR DRIVE QUILL.

CAUTION

Do not use torch or open flame to heat quill and/or cases during installation of transmission quills.

a. Remove cover from mounting port on aft side of transmission sump case.

b. Install new packing (17, figure 6-19) in groove around quill sleeve (18). Lubricate packing and mating surfaces of sleeve and case port with lubricating oil (C79, C79A or C80).

CAUTION

When inserting tail rotor drive quill, exercise care to engage gear teeth properly to avoid damage.

NOTE

The quill flange has a staggered mounting hole pattern to ensure correct location during installation. Locate the two studs and quill flange holes that are 2.0 inches between centers and align these during installation.

c. Heat sump case at tail rotor drive quill mounting port with a heat lamp until drive quill can be installed. Insert tail rotor drive quill into case and engage studs through mounting flange.

d. **P** Position transducer mounting bracket (8, figure 6-13) on tail rotor drive quill studs. Install aluminum washers (7) and nuts (6) to secure transducer mounting bracket (8). Install aluminum washers next to quill on remaining four studs. Torque nuts evenly 50 TO 70 inch-pounds.

e. **P** Install transducer. Refer to TM 11-1520-236-20.

f. **E** **M** Install aluminum washer next to quill on six studs. Install thin steel washer and nut on each stand. Torque nuts evenly 50 TO 70 inch-pounds.

g. Check for backlash between mating gear teeth by slight back and forth movement of quill coupling to feel metal-to-metal contact. Backlash must be evident. Allowances must be made for backlash in couplings.

h. Seal flange of quill sleeve and transmission mating points with sealant (C105). Install set screw (P/N 120-152-5-6) with sealant (C11813) in jackscrew holes of quill sleeve.

i. Fill transmission to proper level with lubricating oil (C79) or (C80).

WARNING

Ensure that crowned tooth coupling is properly lubricated prior to installation of drive shaft (paragraph 1-29).

j. Install forward section of tail rotor driveshaft (paragraph 6-81).

k. Close cowling.

6-49. HYDRAULIC PUMP AND TACHOMETER DRIVE QUILL.

6-50. DESCRIPTION — HYDRAULIC PUMP AND TACHOMETER DRIVE QUILL.

The hydraulic pump and tachometer drive quill (9, figure 6-10) is located on the right side of the transmission sump case. The quill has pads for two hydraulic pumps and the rotor tachometer generator.

6-51. REMOVAL — HYDRAULIC PUMP AND TACHOMETER DRIVE QUILL.

Premaintenance Requirements for Hydraulic Pump and Tachometer Drive Quill

Conditions	Requirements
Model	AH-1P/E/F
Part Number or Serial Number	All
Special Tools	(T27)
Test Equipment	None
Support Equipment	None

Conditions	Requirements
Minimum Personnel Required	One
Consumable Materials	(C105) (C137)
Special Environmental Conditions	None

a. Open cowling at right side of transmission.

b. Cut sealant at mating flanges of tachometer generator and quill, hydraulic pumps and quill, transmission sump case, and quill. Use a sharp plastic scraper to cut sealant. Also, remove sealant, or lockwire plug and gasket from jackscrew holes.

c. Remove rotor tachometer generator by disconnecting electrical connector and removing nuts and washers from four mounting studs

CAUTION

Do not kink hoses. Refer to TM 1-1500-204-23 (series) for hose limitations.

d. Detach hydraulic pump or pumps (paragraph 7-25). Leave hoses connected except seal drain hose at lower side next to mounting flange. Stow pumps on service deck.

e. Remove nuts and washers from two remaining studs through flange of drive quill.

CAUTION

Apply even pressure to hydraulic pump and tachometer drive quill with jackscrews during removal procedure.

Do not pry behind quill flange during removal procedure.

Do not use open flame to heat transmission case during removal procedure.

f. Install three jackscrews (T27) in holes provided in quill (figure 6-20). Tighten jackscrews evenly to remove quill. If the quill is difficult to remove, apply heat to the transmission case with a heat lamp and then remove quill with jackscrews. Cover the quill mounting port to prevent accidental entry of foreign objects into the transmission.

6-52. INSPECTION — HYDRAULIC PUMP AND TACHOMETER DRIVE QUILL.

a. Visually inspect all accessible parts for damage.

b. Inspect outer quill sleeve for wear and corrosion.

c. Inspect bearings for smoothness, binding, and freedom of operation.

d. Inspect gear teeth for cracks, chipping, scoring, and excessive wear.

e. Inspect seals in cover for evidence of leakage.

NOTE

External leakage around seals is not acceptable; however, a small amount of seepage is acceptable and does not indicate an unsatisfactory seal condition. Continuous flow (drop lets) is excessive and requires seal replace ment.

6-53. REPAIR — HYDRAULIC PUMP AND TACHOMETER DRIVE QUILL.

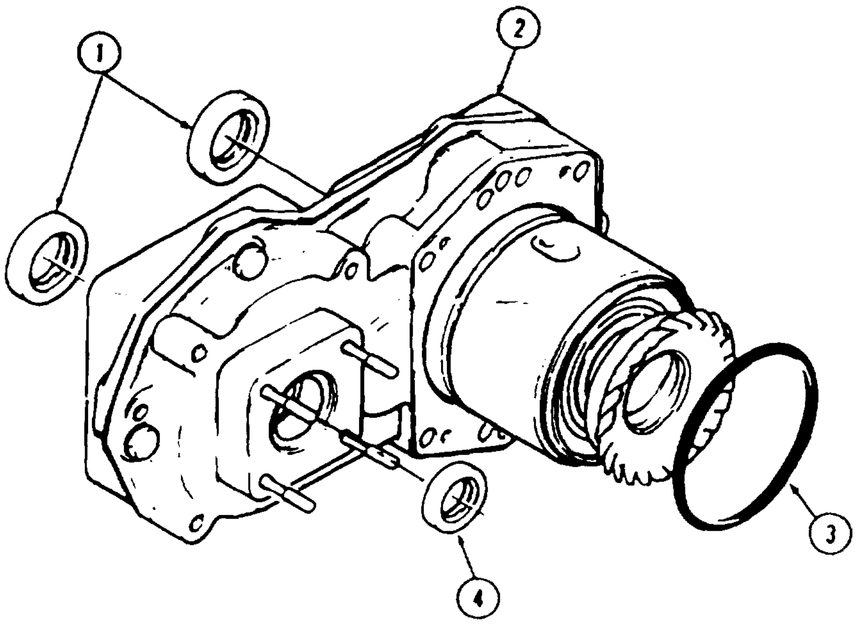
a. Replace quill as a complete assembly when quill does not meet inspection requirements, abnormal gear pattern is evident, or there is evidence of bearing failure.

b. Replace seals in cover assembly as follows:

(1) Remove seals (1 and 4, figure 6-20). Avoid damage to seal housing when removing seal.

(2) Clean seal housing using a solvent (C112) dampened cloth.

(3) Press in replacement seals. Ensure that seal is fully seated in cover.



1. Seals
2. Hydraulic pump and tachometer drive quill
3. Packing
4. Seal

Figure 6-20. Hydraulic Pump and Tachometer Drive Quill Assembly

6-54. INSTALLATION — HYDRAULIC PUMP AND TACHOMETER DRIVE QUILL.

a. Install packing (2, Figure 6-12) in groove around quill sleeve, and lubricate with oil (C79) (C79A) or (C80).

CAUTION

When inserting drive quill, exercise care to engage gear teeth properly to avoid damage.

b. Uncover mounting pad at right side of transmission sump case. Heat sump case at drive quill mounting pad with a heat lamp until drive quill can be installed. Insert drive quill, engaging studs through mounting flange. Rotate main input quill clockwise to ensure proper engagement of quill gear teeth with sump drive during installation.

c. Install washers and nuts on two shortest studs, at top and bottom of drive quill flange. Use thin aluminum washer next to flange and standard steel washer next to each nut.

NOTE

Check backlash between mating teeth by slight back and forth movement of tail rotor drive quill coupling (4, figure 6-10) until metal-to-metal contact is felt and heard between hydraulic pump quill and sump drive pinion end gear teeth, Backlash must be evident.

d. Install hydraulic pump, or pumps (paragraph 7-169), engaging pump shaft in drive quill.

e. Install rotor tachometer generator with electrical connector 180 degrees down. Secure with nuts and washers on four studs. Connect and lockwire (C137) electrical cable connector.

f. Seal areas around mating flanges of quill and transmission sump case, quill hydraulic pumps, and quill and tachometer generator with sealant (C105). Also install plugs (MS24391D2L), gasket (MS28777-2) in jackscrew hole, and lockwire (C137),

6-55. FAN DRIVE QUILL.

6-56. DESCRIPTION – FAN DRIVE QUILL.

The fan drive quill (10, figure 6-10) is located on the forward side of the transmission. This quill transmits power from the transmission input bevel gear to drive the air distribution blower (fan).

6-57. REMOVAL – FAN DRIVE QUILL.

Premaintenance Requirements for Fan Drive Quill

Conditions	Requirements
Model	AH-1P/E/F
Pert Number or Serial Number	All
Special Tools	(T60) (T36) (T35.1)
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C105)
Special Environmental Conditions	None

a. Open cowling at left side of transmission.

b. Remove ambient air blower (fan) (paragraph 13-53).

c. Remove lockwire and remove six bolts and washers that secure fan drive quill (10, figure 6-10).

d. Cut sealant at mating flange of fan drive quill and transmission case with sharp plastic scraper. Also remove sealant, or lockwire, plug, and gasket.

CAUTION

Apply even pressure to quill with jackscrews during removal procedure. Do not pry behind quill flange during removal procedure. Do not use open flame to heat transmission case during quill removal procedure.

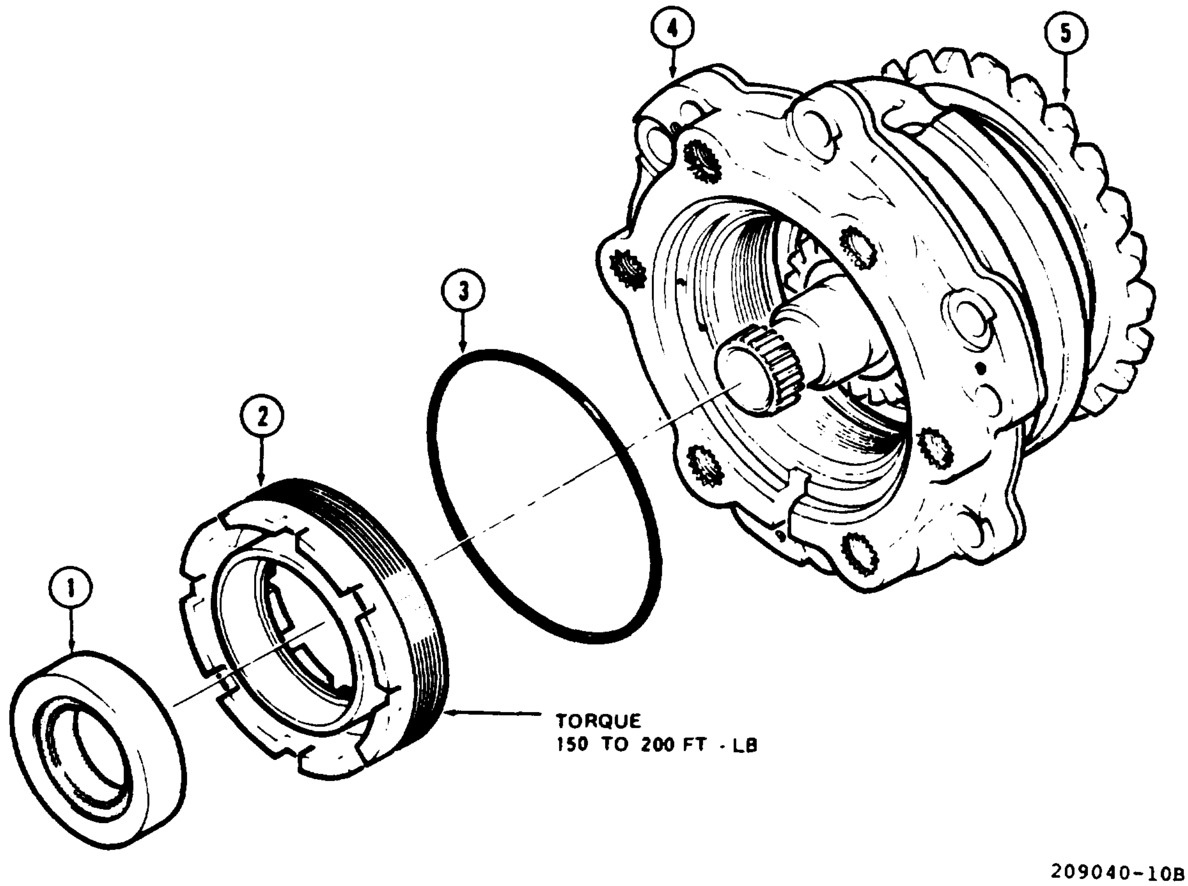
e. Install three jackscrews (T60) in threaded holes provided in quill. Tighten jackscrews evenly to remove quill. If the quill is difficult to remove, apply heat to the transmission case with a heat lamp and then remove the quill with the jackscrews.

f. Cover the quill mounting port to prevent accidental entry of foreign objects into transmission.

6-58. INSPECTION – FAN DRIVE QUILL.

a. Visually inspect all accessible parts for damage.

b. Inspect outer quill sleeve (4, figure 6-21) for wear and corrosion.



1. Seal
2. Nut
3. Packing
4. Sleeve
5. Gear

Figure 6-21. Fan Drive Quill Assembly

c. Inspect for bearing smoothness, binding, and freedom of operation.

d. Inspect gear teeth (5) for cracks, chipping, scoring, and wear.

e. Inspect seal (1) for leakage.

NOTE

External leakage around seals is not acceptable; however, a small amount of seepage is acceptable and does not indicate an unsatisfactory seal condition. Continuous flow (droplets) is excessive and requires seal replacement.

6-69. REPAIR – FAN DRIVE QUILL.

Mount quill flange over pins in holding fixture (T35.1).

b. Remove lockwire from nut (2, figure 6-21) and quill sleeve (4). Use care so as not to remove material from lockwire hole in sleeve (4).

c. Remove nut (2, figure 6-21) from front side of sleeve (4) using wrench (T36).

d. Press seal (1) from nut (2).

e. Press new seal (1) into nut (2) with open side of lip positioned toward inboard side of nut.

f. Lubricate and install new packing (3) on outside of nut and thread nut (2) into sleeve (4), Torque nut 150 TO 200 foot-pounds, lockwire (C137).

6-60. INSTALLATION – FAN DRIVE QUILL.

a. Install lubricated packing (3, figure 6-21) in groove around quill sleeve.

CAUTION

When inserting fen drive quill, exercise care to engage gear teeth properly to avoid damage.

b. Uncover mounting port at forward side of transmission case. Heat main case at mounting port for fan drive quill (10, figure 6-10) with a heat lamp until drive quill can be installed.

c. Use three studs and three pushers as shown on figure 6-22 to push quill into transmission. Install three studs into case threads at equally spaced intervals.

d. Start the quill into the case port.

e. Install a steel washer on the top of the quill sleeve flange, then thread the pusher onto the stud.

CAUTION

Be sure gears of quill and driving gear are properly meshed before seating the quill. Rotate fan drive quill gearshaft while drawing quill into main case and feel for engagement of gear teeth.

f. Tighten pushers evenly until the quill is seated.

g. Remove pushers and studs. Install six bolts through sleeve flange into threaded inserts of case.

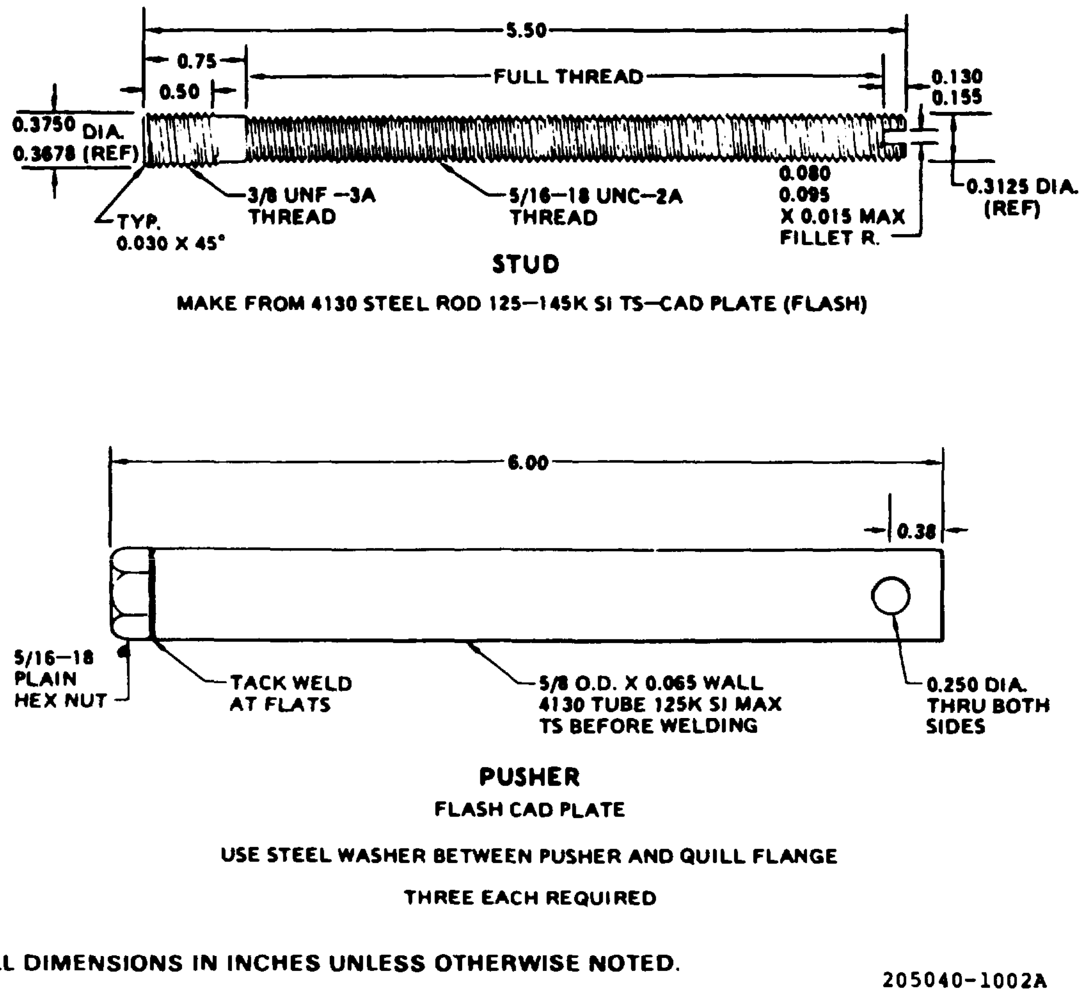


Figure 6-22. Work Aid — Quill Installation

h. Install thin aluminum washer next to quill flange and standard steel washer next to each bolt head. Torque bolts evenly and lockwire (C137).

i. Check for backlash between mating teeth by slight back and forth movement of quill coupling until metal-to-metal contact is felt end heard. Backlash must be evident.

j. Also install plug (MS24391D2L) and gasket (MS28777-2) in jackscrew hole and lockwire (C137).

k. Install air distribution blower fan (paragraph 13-59).

6-61. I M ALTERNATOR DRIVE QUILL.

6-62. I M DESCRIPTION — ALTERNATOR DRIVE QUILL.

The alternator drive quill (5, figure 6-10) is located on the left side of the transmission. The purpose of this quill is to take power from the input bevel gear of the transmission to drive the alternator.

6-63. I M REMOVAL — ALTERNATOR DRIVE QUILL.

Premaintenance Requirements for Alternator Drive Quill

Conditions	Requirements
Model	AH-1P/E/F
Part Number or Serial Number	S/N 77-22763 and Sub.
Special Tools	(T56) (T57) (T58) (T60)
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C79) (C80) (C105) (C121) (C137)
Special Environmental Conditions	None

a. Open cowling at left side of main transmission

b. If alternator is installed, identify wires attached to alternator for reinstallation in same location. Disconnect wires and electrical connector from alternator. Remove alternator (paragraph 9-163).

c. If alternator drive quill cap (69, figure 6-12) is installed instead of alternator, loosen nut (68) and remove rim clenching clamp (67) and cap (69.

d. Straighten tang on lock washer (65). Remove bolt (66). Remove five bolts (70) and washers (71).

e. Cut sealant at mating flange of alternator drive quill and transmission case with a sharp plastic scraper. Remove set screws from jackscrew holes.

CAUTION

Apply even pressure to quill with jackscrews during removal procedure. Do not pry behind quill flange during removal procedure. Do not use open flame to heat transmission case during quill removal procedure.

f. Install three jackscrews (160) in threaded holes provided in quill. Tighten jackscrews evenly to remove quill. if the quill is difficult to remove, apply heat to the transmission case with a heat lamp and then remove the quill with the jackscrews.

g. Cover the quill mounting port to prevent accidental entry of foreign objects into transmission.

6-64. I M INSPECTION — ALTERNATOR DRIVE QUILL,

a. Visually inspect all accessible parts for damage.

b. Inspect outer quill sleeve for wear and corrosion.

c. Inspect for bearing smoothness, binding, and freedom of operation.

d. Inspect gear teeth for cracks, chipping, scoring, end wear.

e. Inspect seal for leakage.

NOTE

External leakage around seals is not acceptable; however, a small amount of see page is acceptable and does not indicate an unsatisfactory seal condition. Continuous flow (droplets) is excessive and requires seal replacement.

6-65. E M REPAIR – ALTERNATOR DRIVE QUILL.

a. Mount quill over pins in holding fixture (T57).

b. Remove Iockwire from nut (2, figure 6-23) and quill wear sleeve (4), using caution during removal to avoid damage to Iockwire tab.

c. Remove nut (2) from front side of sleeve of quill (6) using wrench (T58).

d. Press seal (1) from nut (2).

e. Apply sealant (C105) to seal (1) on surface, mating with nut (2).

f. Press new seal (1) into nut (2) with open side of lip positioned toward inboard side of nut.

g. Lubricate new packing (3) with oil (C79 (C79A) or C80). Install packing on nut (2), Install nut (2) in quill sleeve. Torque nut 150 TO 200 foot-pounds.

h. Lockwire (C137) nut (2) to quill assembly (6).

6-66. E M INSTALLATION – ALTERNATOR DRIVE QUILL.

a. Lubricate new packing (63, figure 6-12) with oil (C79 (C79A) or C80) install packing in groove in alternator drive quill sleeve.

b. Uncover mounting port at left side of transmission main case.

c. Install quill using three studs and three pushers (figure 6-22) as follows:

CAUTION

When inserting alternator drive quill, exercise care to engage gear teeth properly to avoid damage.

(1) Start the quill into the case port.

(2) Install three work aid studs (figure 6-22) at equally spaced intervals. Ensure that work aid studs have full thread engagement with transmission.

(3) Install a steel washer on the top of the quill sleeve flange on each work aid stud. Install work aid pusher (figure. 6-22) on each stud.

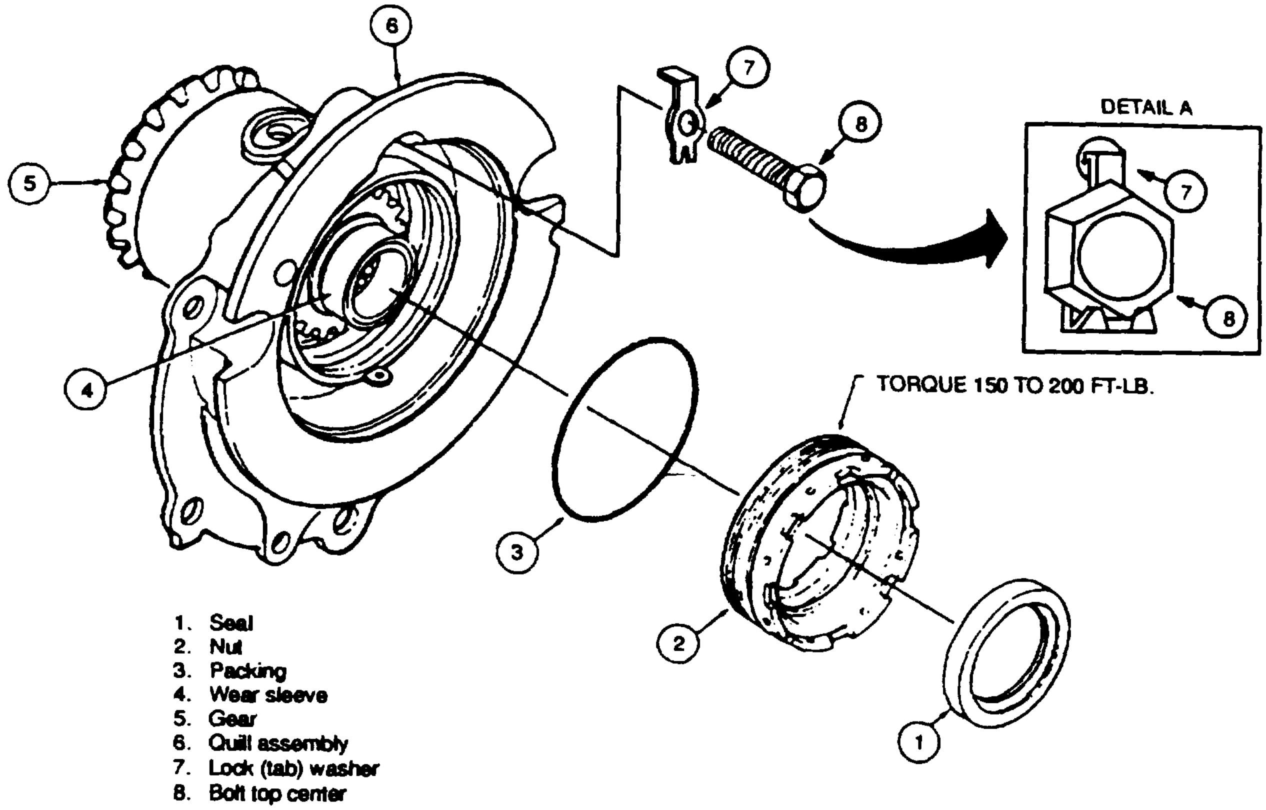


Figure 6-23. E M Alternator Drive Quill Assembly

CAUTION

Rotate alternator drive quill generator while drawing quill into transmission and feel for engagement of gear teeth.

NOTE

If quill is difficult to install, heat main case at mounting port for alternator drive quill with a heat lamp.

(4) Tighten work aid pushers evenly until the quill is seated.

(5) Remove work aid pushers, washers and studs.

d. Position lock (tab) washer (65, figure 6-12) on bolt (66) and install bolt in top center hole. Position one steel washer (71) on each of five bolts (70) and install bolts. Torque bolts (66 and 70) evenly 160 TO 190 inch-pounds. Bend locking tabs on lock (tab) washer (65) as in figure 6-23, detail A.

e. Check for backlash by slight back and forth movement of quill gear shaft until metal-to-metal contact is felt. Backlash must be evident. As alternate procedure, use backlash measurement tool (T56). Backlash must be 0.005 TO 0.013 inch.

f. Seal area around flange of alternator drive quill and transmission with sealant (C105). Install set screws, P/N 120-151-5-4, with (C106) in jackscrew holes.

g. Install alternator (paragraph 9-165), or position alternator drive quill cap (69) and rim clenching damp (67) on quill. Tighten nut (68) to secure clamp.

h. Close cowling at left side of main transmission.

6-67. MAIN ROTOR MAST ASSEMBLY.

6-68. DESCRIPTION – MAIN ROTOR MAST ASSEMBLY.

The main rotor mast assembly is a tubular steel shaft fitted with two bearings, which support it vertically in the transmission. Mast driving splines are engaged with transmission upper stage planetary gear providing counterclockwise rotation as viewed from above. Splines on upper portion of mast provide mounting for main rotor and control assemblies.

6-69. REMOVAL – MAIN ROTOR MAST ASSEMBLY.

Premaintanence Requirements for Removal — Main Rotor Mast

Conditions	Requirements
Model	AH-IS
Part Number or Serial Number	All
Special Tools	(T45)
Test Equipment	None
Support Equipment	(S4)
Minimum Personnel Required	Two
Consumable Materials	(C22) (C36) (C41) (C46) (C47) (C70) (C74) (C91) (C105) (C107) (C112) (C116) (C123)
Special Environmental Conditions	None

NOTE

This procedure is for removal of mast from a transmission that has previously been removed from helicopter.

a. Install mast nut (1, figure 6-24) on top of mast. Attach clevis (S4) to nut (1). Attach hoist (T45) to clevis (S4) and take up cable slack.

b. Disconnect oil hose (6, figure 6-12) from jet assembly (19, figure 6-24).

c. Remove two nuts (21), washers (22), and washers (23).

d. Remove eight nuts (13), washers (11), and washers (12).

e. Carefully lift mast assembly out of transmission.

6-70. CLEANING – MAIN ROTOR MAST ASSEMBLY.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

a. Clean mast with solvent (C112) and dry with filtered compressed air. Keep solvent off seal (16, figure 6-24).

6-71. INSPECTION – MAIN ROTOR MAST ASSEMBLY.

WARNING

Inspect mast for the word "REWORKED" on flange in area I, figure 6-25. If the word "REWORKED" is on the flange and there is corrosion damage that will require polishing out (figure 6-26), reject the mast; rework is permitted one time only.

a. Inspect friction sleeve (3, figure 6-24) as follows:

NOTE

Friction sleeve may be inspected for wear and for bonding failure with mast installed on helicopter.

(1) If friction sleeve is to be inspected with mast installed on helicopter, remove collet set and attaching parts to gain access to friction sleeve. Refer to paragraph 5-47.

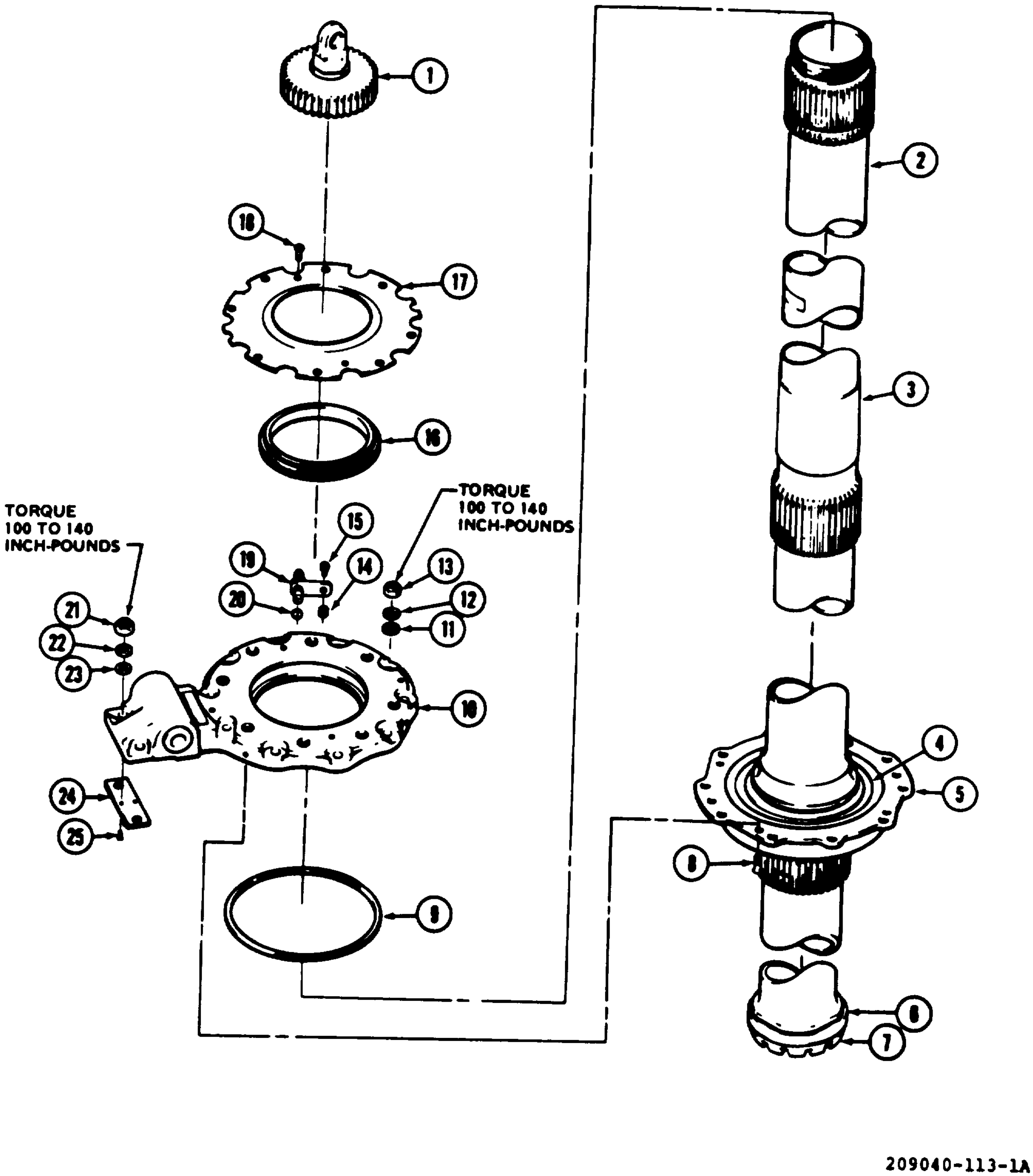


Figure 6-24. Main Rotor Mast Assembly (Sheet 1 of 2)

1. Mast nut
2. Mast
3. Friction sleeve
4. Bearing
5. Mast liner
6. Roller alignment being inner race.
7. Nut
8. Screw
9. Shim
10. Retainer plate
11. Aluminum washer
12. Thin steel washer
13. Nut
14. Insert
15. Screw
16. Seal
17. Plate
18. Screw
19. No. 8 oil jet assembly
20. Packing
21. Nut
22. Thin steel washer
23. Aluminum washer
24. Shim
25. Screw

Figure 6-24. Main Rotor Mast Assembly (Sheet 2 of 2)

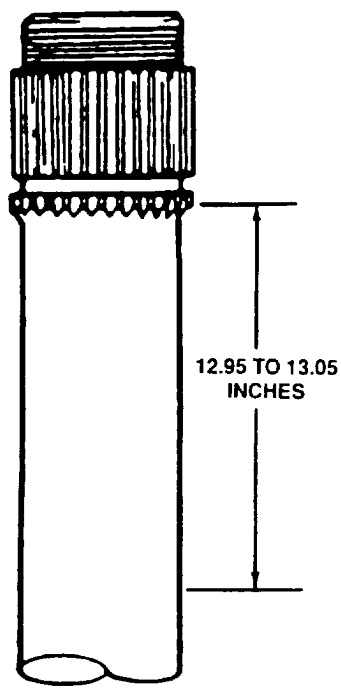


Figure 6-24.1. Installation of Buffers and Plates (Sheet 1 of 3)

(2) Using a soft carbon pencil lay out four reference marks, 90 degrees apart, along entire length of friction sleeve (figure 6-25).

(3) Using standard 3 to 4 inch micrometer, check friction sleeve diameter over full length at reference marks made in step (2). Record dimensions as they are measured. See figure 6-25, sheet 2, for taper limits and out-of-round limits.

(4) Inspect fiction sleeve for bond voids. Use a 0.002 inch feeler gage to determine void dimensions. See figure 6-25 for bond void limits.

b. Inspect mast for mechanical and corrosion damage. See figure 6-25 for damage limits.

c. Inspect mast for damage in area of main rotor hub flapping stop contact. See figure 6-26 for deformation damage limits.

d. Inspect meet bearing and mast bearing retaining plate as follows:

(1) Inspect mast bearing for roughness and damage in accordance with instruction on figure 6-27.

(2) Inspect mast bearing retaining Plate for mechanical and corrosion damage. See figure 6-27 for damage limits.

e. Remove screw (15, figure 6-24). Remove no. 8 oil jet assembly (19). Inspect jet assembly for damage and obstructions. Inspect insert (14) for damaged threads and for secure installation in retainer plate (10). If insert (14) and jet assembly (19) are satisfactory for further service, install jet assembly with new packing (20).

f. Inspect for evidence of oil leakage in area of seal (16, figure 6-24). If there is evidence of oil leakage, replace seal (paragraph 6-72). Inspect mast for mechanical and corrosion damage in area contacted by seal. See figure 6-25 for damage limits. Inspect mast bearing retainer for mechanical and corrosion damage while seal is removed. See figure 6-27 for damage limits.

6-72. REPAIR-MAIN ROTOR MAST ASSEMBLY.

WARNING

Rework on mast is permitted one time only. Do not polish out mechanical and/or corrosion damage if mast has the word "REWORKED" on the flange in area I, figure 6-25.

a. Replace mast assembly if damaged in excess of acceptable limits (paragraph 6-71).

b. Replace seal (16, figure 6-24) if there is evidence of leakage.

(1) If not previously accomplished, remove mast from helicopter (paragraph 6-69).

(2) Support mast assembly in a suitable stand. Keep mast nut (1) installed to protect threads.

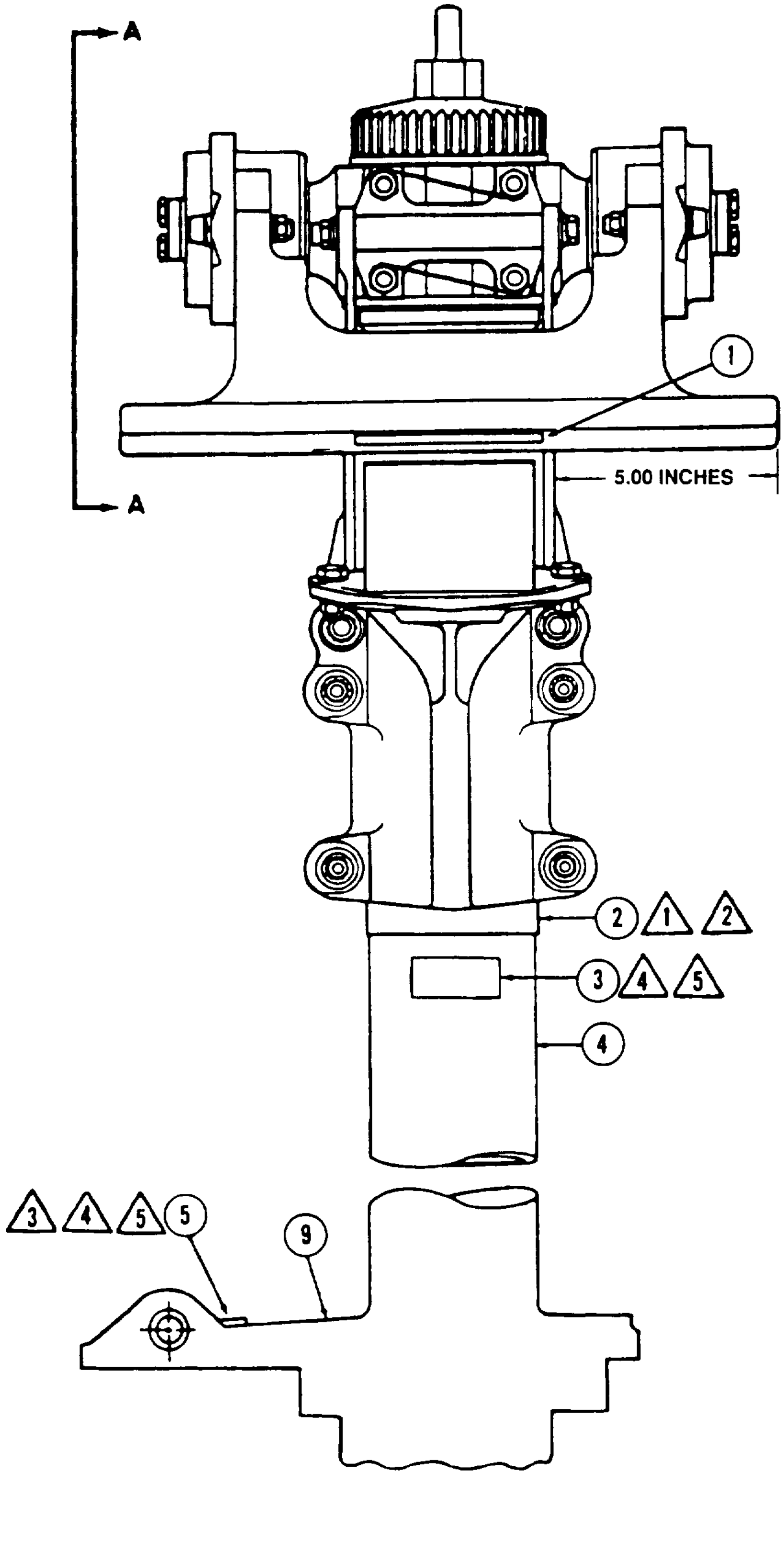
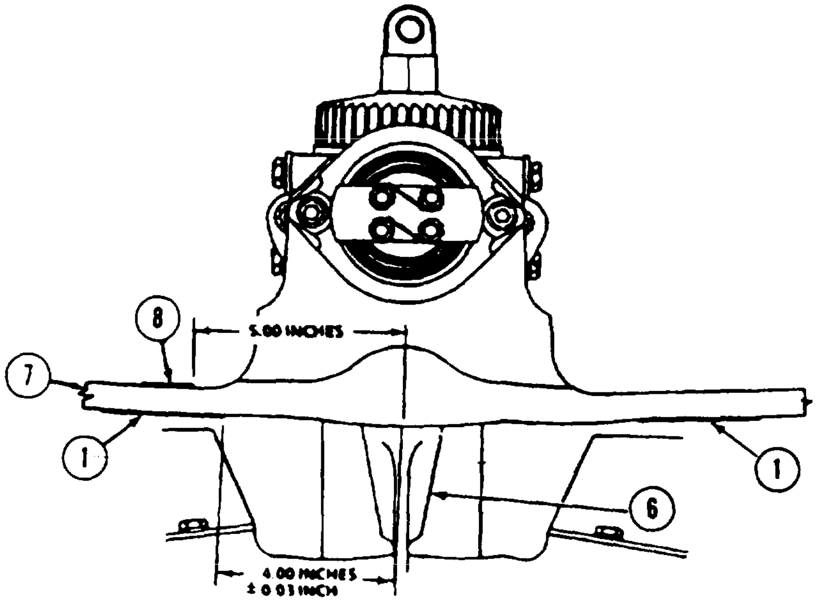


Figure 6-24.1. Installation of Buffers and Plates (Sheet 2 of 3)



VIEW A - A

1. Buffer, 209-011-203-101
2. Buffer, 209-010-450-107
3. Plate, 100-135-1
4. Mast, (ref)
5. Plate, 100-136-1
6. Strap assembly (ref)
7. Yoke (ref)
8. Plate, MS27253-1
9. Plate assembly (ref)

NOTES

1 Bond buffer to mast using adhesive EA956A/B.

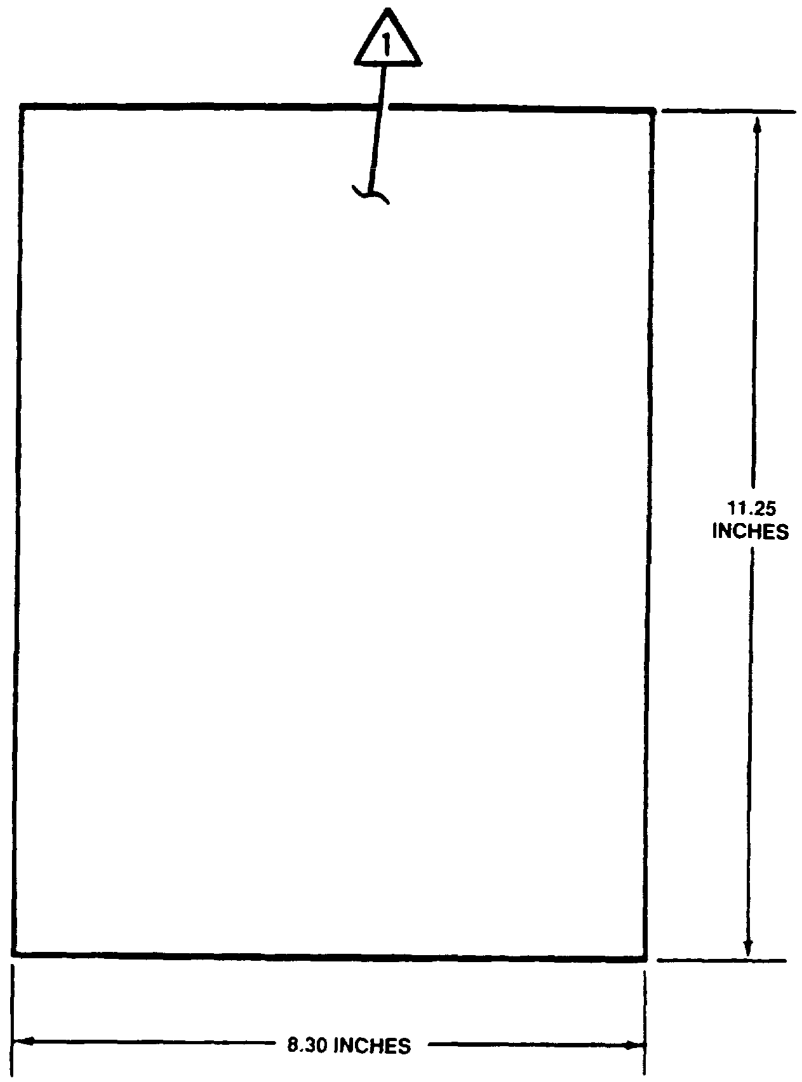
2 Do not remove cadmium plate from mast.

3 Swashplate and support assembly removed for clarity.

4 Metal stamp plate before bonding to surface.

5 Bond plate to surface using adhesive EC2216.

Figure 6-24.1. Installation of Buffers and Plates (Sheet 3 of 3)



MATERIAL: 0.010 X 8.50 X 11.50 INCHES, 2024-T3,AL.ALY.

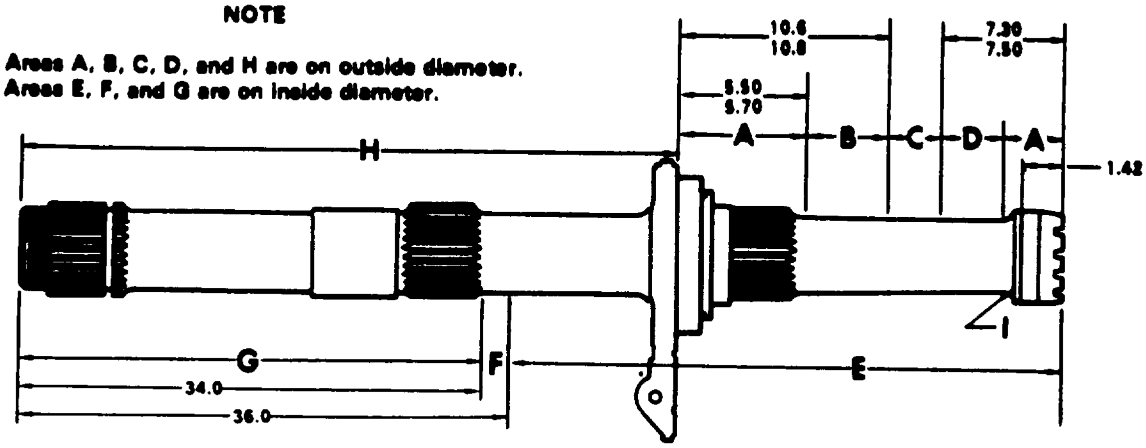
NOTE

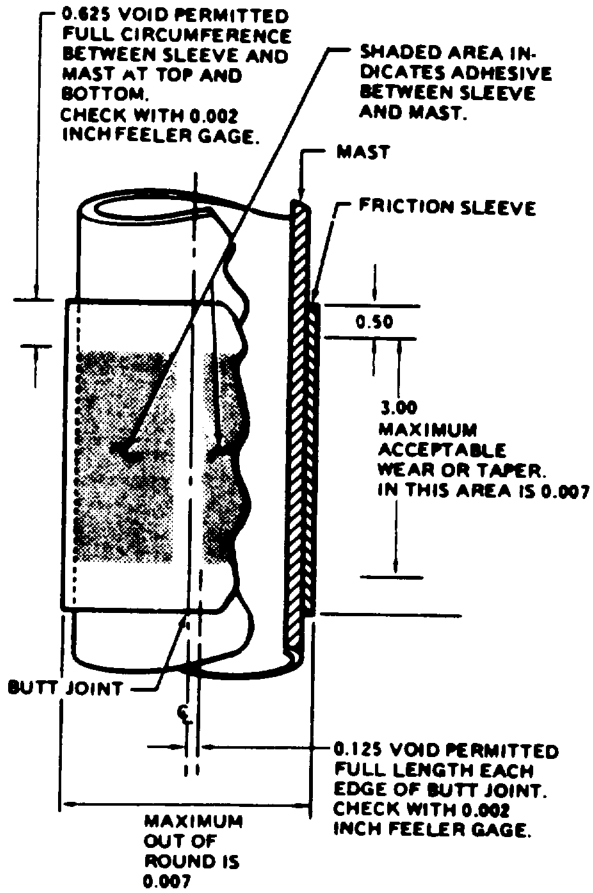
1 Coat one surface of workaid with teflon tape Scotch 5490.

Figure 6-24.2. Workaid for Mast Buffer

NOTE

Areas A, B, C, D, and H are on outside diameter.
Areas E, F, and G are on inside diameter.





NOTE

Do not touch mast in areas B, C, D. If touched, remove fingerprints within two hours with fingerprint remover (C44.2). Cotton gloves (C54) should be worn when handling the mast in these areas.

COLLECTIVE PITCH FRICTION SLEEVE

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

209010-118-1

Figure 6-25. Damage Limits – Main Rotor Mast Assembly (Sheet 1 of 2)

MAXIMUM ALLOWABLE DEPTH OF CLEANUP TO REMOVE CORROSION AND MECHANICAL DAMAGE

AREA A—Surface Corrosion. Only that which can be removed by wire brush or steel wool.
AREA B—0.002 Inch
AREA C—0.015 Inch
AREA D—0.020 Inch

NOTE

Cleanup on the inner diameter is allowable within the following limits provided cleanup is accomplished by honing or similar method so that material removal is uniform around the diameter. This must be accomplished at depot level.

AREA E—0.005 Inch — Or to a maximum I.D. of 2.980 inches.
AREA F—2.970 Inch Maximum I.D.
AREA G—See table below:

NOTE

Table for AREA G, indicates maximum allowable I.D. for various O.D.'s at stations measured in inches from top of mast.

O.D.⟶	3.545	3.550	3.555
Max. I.D. Sta. 0-10	2.980	2.986	2.993
Max. I.D. Sta. 10-20	2.976	2.982	2.989
Max. I.D. Sta. 20-34	2.970	2.976	2.983

AREA H — 0.010 Inch Local Cleanup.
AREA I — After cleanup; mark "REWORKED" on flange, using vibration stylus. This does not apply if rework is limited to removal of surface corrosion that can be removed by wire brush or steel wool.

Note: Pitting must be completely removed within allowable cleanup depth for mast to be acceptable. Finish reworked areas to 32 RMS.

NO CRACKS ALLOWED

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

209010-118-2

Figure 6-25. Damage Limits — Main Rotor Mast Assembly (Sheet 2 of 2)

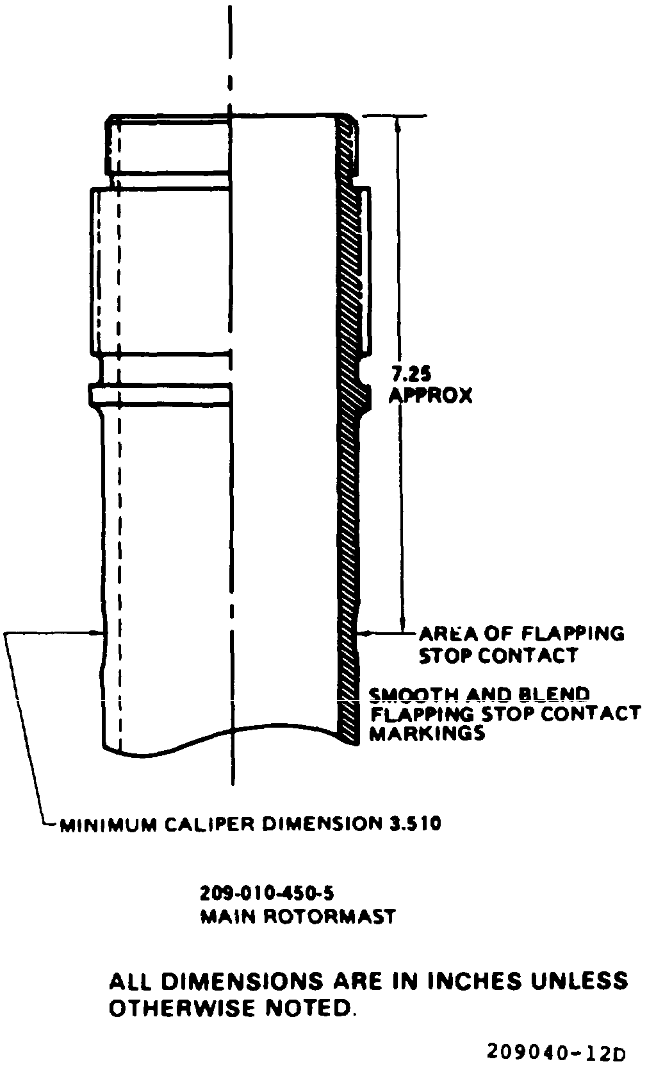


Figure 6-26. Deformation Limits — Main Rotor Mast

(3) Remove two screws (18) and remove plate (17).

CAUTION

Ensure that shim (9) is indexed and re-installed in the same location. If shim (9) is lost or intermixed with similar shims, send mast assembly to next higher maintenance level.

(4) Remove four screws (8). Carefully remove retainer plate (10). Remove shim (9) and index for reinstallation in the same location. Do not remove shim (24).

(5) Press seal (16) out of retainer plate. Clean old sealant out of retainer plate with a sharp plastic scraper.

(6) Apply a thin coat of sealant (C105) on retainer plate (10) surfaces where seal will be installed. Press new seal (16) onto retainer plate with lip of seal up. Remove excess sealant with clean cloth. Ensure that four drain holes are not plugged with sealant.

CAUTION

Shim (9) that was removed in step (4) must be reinstalled. If shim (9) is defective or there is any doubt that shim has been intermixed with similar shims, send mast assembly to next higher level of maintenance.

(7) Ensure that shim (24) was not removed from retainer plate (10). Position shim (9) of correct thickness in mast liner (5). Install retainer plate (10) on mast carefully to avoid damage to seal (16). Install four screws (8). Ensure that heads of countersunk screws are below surface of mast liner (5). Position plate (17) on retainer plate (10) and install two screws (18).

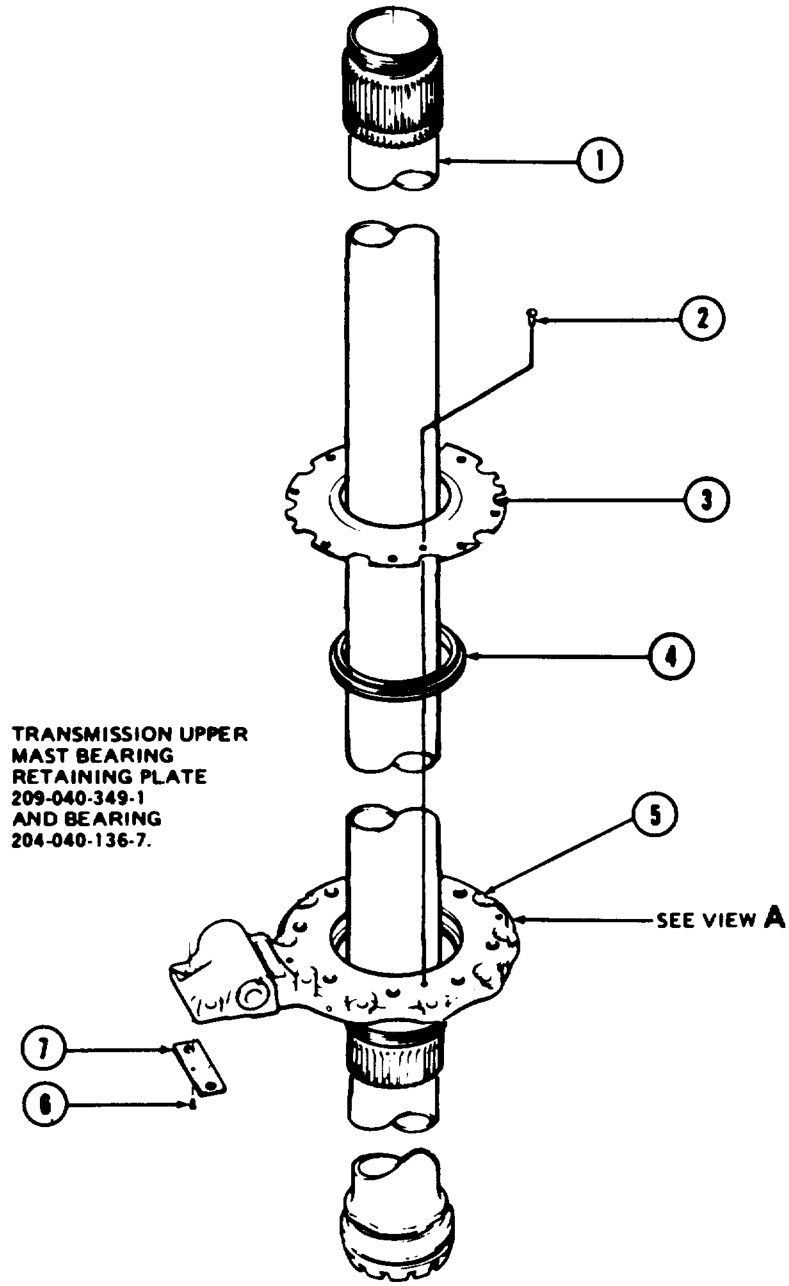
c. Remove nicks and scratches that are within acceptable limits of paragraph 6-71 from mast splines with fine India stone (C116).

d. Polish out nick, scratch, and corrosion damage that is within acceptable limits noted in paragraph 6-71, b. Use abrasive cloth (C36), and polish to a surface finish of 32 RMS or better. If acceptable limits are exceeded after complete clean-up of damage, forward mast assembly to next higher maintenance level.

CAUTION

Ensure compliance with following step e prior to returning mast assembly to service.

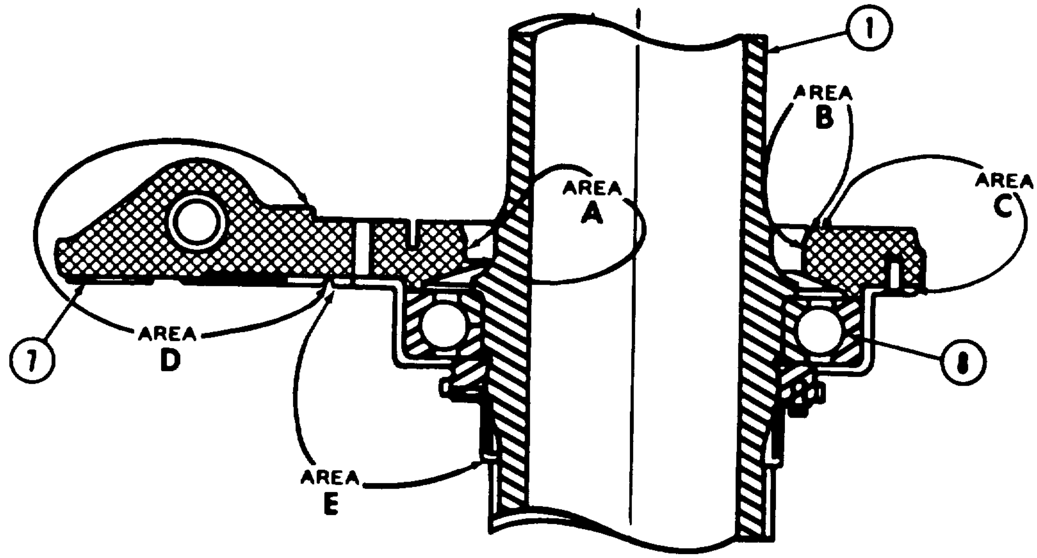
e. If any polishing out work was accomplished on mast, mark the word "REWORKED" on flange in area I as described on figure 6-25.



1. Mast assembly shaft
2. Screw
3. Seal retaining plate
4. Seal
5. Bearing retaining plate
6. Screw
7. Shim
8. Bearing

209040-118-1

Figure 6-27. Damage Limits - Main Rotor Mast Bearing and Main Bearing Retaining Plate (Sheet 1 of 4)



SECTIONAL VIEW WITH SEAL RETAINING PLATE (3) AND SEAL (4) REMOVED.

VIEW A

209040-118-2

Figure 6-27. Damage Limits - Main Rotor Mast Bearing and Main Bearing Retaining Plate (Sheet 2 of 4)

AREA	LIMITS
All	No cracks acceptable.
A - - -	Mechanical and corrosion damage on the plate assembly in area A is acceptable provided the damage is polished out and the rework to completely remove the damage is within the following limits: 1. Rework is no more than 0.010 inch deep. 2. No more than twenty percent of the total surface area and no more than thirty percent of any one inch square is affected. 3. Damage will not prevent sealing of outside diameter of seal in plate. 4. Minimum blend radius in rework areas is 0.5 inch. 5. Surface finish in rework areas must be 63 RMS or better. 6. Damage must be polished out and the area treated for corrosion protection in accordance with general instructions.
B - - -	Mechanical and corrosion damage on the plate assembly in area B is acceptable provided the damage is polished out and the rework to completely remove the damage is within the following limits: 1. Rework is no more than 0.020 inch deep. 2. No more than twenty percent of the total surface area and no more than forty percent of any one inch square is affected. 3. Minimum blend radius in rework areas is 0.5 inch. 4. Surface finish in rework areas must be 63 RMS or better. 5. Damage must be polished out and the area treated for corrosion protection in accordance with general instructions.
C - - -	Mechanical and corrosion damage on the plate assembly in area C is acceptable provided the damage is polished out and the rework to completely remove the damage is within the following limits: 1. Rework is no more than 0.020 inch deep. 2. No more than forty percent of the total surface area and no more than fifty percent of any one inch square is affected. No more than twenty percent of any washer mating surface or hole is affected. 3. Minimum blend radius in rework areas is 0.5 inch. 4. Surface finish in rework area must be 63 RMS or better. 5. Damage must be polished out and the area treated for corrosion protection in accordance with general instructions.

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Figure 6-27. Damage Limits - Main Rotor Mast Bearing and Main Bearing Retaining Plate (Sheet 3 of 4)

D - - - Mechanical and corrosion damage on the plate assembly in area D is acceptable provided the damage is polished out and the rework to completely remove the damage is within the following limits:

CAUTION

Do not remove shim (7). If there is evidence of corrosion under shim (7), send mast assembly to next higher maintenance level.

1. Rework is no more than 0.005 inch deep.
2. No more than 10 percent of each surface is affected.
3. Minimum blend radius in rework areas is 0.5 inch.
4. Surface finish in rework area must be 63 RMS or better.
5. Damage must be polished out and the area treated for corrosion protection in accordance with general instructions.

E - - - Any corrosion damage and/or mechanical damage in excess of superficial marks in area E is not acceptable. Forward mast assembly to next higher maintenance level.

Any damage to bearing (8) that can be detected visually or by feel is not acceptable. Support mast assembly vertically with a hoist or place mast in suitable padded stand. Press bearing retaining plate (5) toward lower end of mast to load bearing (8) and simultaneously turn retaining plate. If bearing roughness is detected, forward mast assembly to next higher maintenance level.

Threaded Inserts Thirteen threaded inserts are installed in bearing retaining plate (5). Loose, missing, or damaged threaded inserts are not acceptable. Replace unacceptable inserts or forward mast assembly to next higher maintenance level.

GENERAL INSTRUCTIONS.

Repair mechanical and corrosion damage on the plate assembly as follows:

1. Polish out mechanical and corrosion damage in areas A, B, and C with varying grades of aluminum oxide paper. Use 400 grit paper on final clean up to obtain a finish of 63 RMS or better. Ensure that all traces of damage are removed.
2. Polish out mechanical and corrosion damage in area D with fine emery cloth or fine India Stone to obtain a finish of 63 RMS or better. Ensure that all traces of damage area removed.
3. Treat rework areas on the aluminum plate with alodine chemical film. Refer to TM TM 43-0105 for application procedures.
4. Treat rework areas on bushings in area D with brush cadmium plate. Refer to TM TM 43-0105t for application procedures.
5. Prime all rework areas that were painted prior to repair. Use polyamide epoxy primer. Paint to match existing finish.

209040-118-4

Figure 6-27. Damage Limits - Main Rotor Mast Bearing and Main Bearing Retaining Plate (Sheet 4 of 4)

f. Touch up repair areas on mast above retainer plate (10) with a spray coat of primer (C88 or C91), then spray on a coat of aluminum lacquer (C70).

g. Install buffer (2, figure 6-24.1) to mast (4) as follows:

(1) Measure down 12.95 to 13.05 inches from bottom of upper mast spline and mark a line using a penal for buffer (2) as shown in figure 1. Apply a layer of teflon tape around mast below the marked reference line and secure with masking tape. Measure up 8.50 inches. Mark a line using a pencil for the area to be cleaned for buffer (2) and apply a layer of teflon tape around the mast above the marked reference line and secure with masking tape.

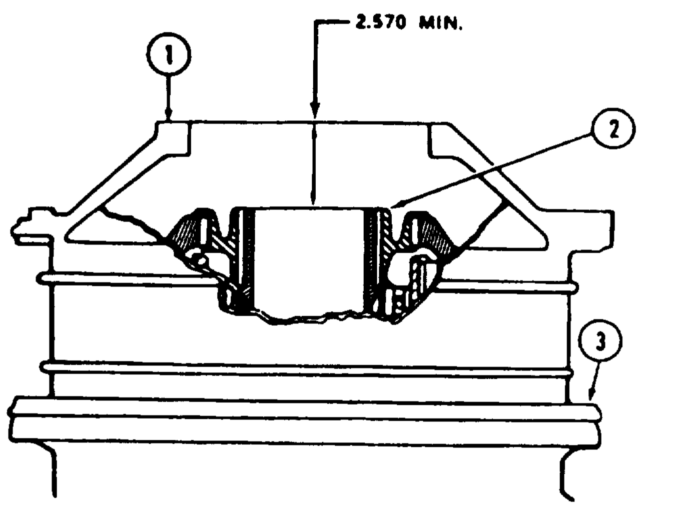
WARNING

MEK is flammable; do not use near open flames, welding areas, or on hot surfaces. Do not smoke when using MEK, and do not use it where others are smoking. Contact with liquid or vapor can cause skin and eye irritation and drowsiness. If there is any prolonged skin contact, wash contacted area with soap and water. Remove solvent-saturated clothing. If vapors cause drowsiness, go to fresh air. In all cases get immediate medical attention. When handling liquid at air-exhausted workbench, wear approved gloves, goggles, and long sleeves. When handling liquid or liquid-soaked cloth in open unexhausted area, wear approved respirator, gloves, and goggles. Dispose of liquid-soaked rags in approved metal container. Metal containers of solution must be grounded to maintain electrical continuity.

NOTE

Do not remove cadmium plate from mast.

(2) Clean area for buffer (2) with a dean lint free cloth dampened with methyl-ethyl-ketone (MEK). Dry with a dean lint free cloth.



ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

204040-1059A

1. Top case
2. Planetary adapter
3. Transmission

Figure 6-28. Transmission Top Case — Dimension Check

WARNING

Adhesion promoter is flammable; keep away from sparks, flames, and non-explosion proof devices. Inhalation may cause nose and throat Irritation, headache, drowsiness, weakness, or exhaustion. Prolonged or repeated skin contact may cause irritation. Vapor and liquid may cause eye irritation. Ingestion may cause intoxication and gaatro-intestinal irritation. Prolonged overexposure to ethanol can have adverse effects on liver. If inhaled, remove to fresh sir, if not breathing give artificial respire tion. If breathing is difficult, give oxygen. Remove contaminated clothing and wash with soap and water. Flush eyes with plenty of water for 15 minutes while holding eyelids open. If ingested, dilute with one to two glasses of water or milk. Induce vomiting by sticking finger down throat. In all cases, get immediate medical attention. When working with adhesion promoter, wear approved respirator, goggles, and rubber gloves. Work in well-ventilated area.

(3) Apply a light coat of adhesion promoter A934BX to cleaned area, use only enough to wet surface. Let dry for a minimum of 30 minutes.

(4) Fabricate a workaid from 0.010 inch 2024-T3 aluminum alloy (figure 6-24.2). Workaid needs to be flexible enough to mold to the shape of the mast to ensure proper bonding of the buffer. Cover one side of workaid with teflon tape.

(5) Lightly hand abrade side of buffer (2, figure 6-24.1) to be bonded to mast (4) with 400 grit abrasive cloth. Remove sanding residue with a clean dry lint free cloth.

WARNING

Adhesive may cause irritation to skin, eyes, and respiratory system. Thoroughly wash skin area with soap and water and immediately flush eyes with water for 15 minutes. In all cases get immediate medical attention. When working with adhesive, wear approved protective gloves, goggles, or faceshield, and respirator approved for organic solvents. Use in a well-ventilated area away from open flame, spark sources, and heat.

(6) Mix adhesive EA956A/B in accordance with instructions on container, and apply to mating surface of buffer (2) and surface of mast (4) at location shown.

(7) Position buffer (2) on mast (4) at location shown in (figure 6-24.1). Twist buffer (2) around mast (4) to smooth out adhesive. Position buffer (2) with split aligned with master spline of mast (4). Wipe off excess adhesive with a clean cloth dampened with MEK.

(8) Apply worked (figure 2) over buffer (2, figure 1) with teflon tape toward buffer (2) per dimensions shown. Wrap two full wraps of hoot shrink tape around workaid (figure 2) and heat shrink.

(9) Cure adhesive, EA956A/B for 24 hours at 75 degrees F or for one hour at 175 to 190 degrees F.

(10) Remove heat shrink tape, workaid, masking tape and teflon tape. Lightly hand abrade buffer (2) with 180 grit abrasive paper followed by lightly scuffing with abrasive pad, until a uniform moleskin surface is obtained.

6-73. INSTALLATION — MAIN ROTOR MAST ASSEMBLY.

a. Ensure that proper shim (24, figure 6-24) is installed.

b. Uncover opening in top of transmission.

c. Perform dimensional check between upper surface of transmission case and upper surface of planetary adapter as follows:

(1) Measure distance from planetary adapter (2, figure 6-28) to top of top case (1). Minimum acceptable dimension is 2.570 inches.

WARNING

Exercise caution during reindexing of parts to prevent injury to fingertips.

(2) If minimum measurement is not obtained, examine upper and lower sun gear in planetary assemblies to determine if tangs of planetary support liner are engaged with mating slots of lower planetary liner. This can be determined by use of fingertips. If tangs are disengaged, a gap of approximately 0.250 inch will be felt between the two liners.

(3) If gap exists, reindex two liners by inserting the hands into the adapter and liner, palms outboard, lifting adapter slightly and rotating until the liners are correctly aligned.

d. Seal mating surface of the transmission and the mast liner prior to the installation of the mast. Use the following procedure:

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(1) Clean the mating surfaces of the transmission top case and the mast liner with MEK (C74). Wipe dry with a clean cloth before solvent evaporates.

(2) Mix two-part sealant (C107) in accordance with directions on the container. Use the sealant before the put life times expires.

(3) Run a small bead of sealant on both mating surfaces and smooth with wooden spatula. The correct amount of sealant application will result in a small amount of squeeze-out when the mast is installed.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(4) If the sealant cures before the mast can be installed, dean the sealant from both surfaces with a sharp plastic scraper and repeat cleaning procedure with MEK (C74). Reapply sealant as outlined in steps (2) and (3).

e. Lift mast assembly to position directly over transmission opening. Carefully lower the mast assembly into the transmission opening. Guide inner rats (6, figure 6-24) into bearing.

f. Install two aluminum washers (23), two thin steel washers (22), and two nuts (21). Do not torque nuts at this time.

g. Install ten aluminum washers (11), ten thin steel washers (12), and ten nuts (13). Torque nuts (13) and (21) evenly, **100 TO 140** inch-pounds.

h. Seal area where flange of retainer plate (10) joins transmission as follows:

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(1) Clean the sealant area with MEK (C74) and wipe dry with a clean cloth before solvent evaporates.

(2) Prepare two-part sealant (C107) in accordance with instructions on the container.

(3) Run a small bead of sealant (C107) around the mating flanges and fill jackscrew holes with plastic caps or sealant (C107). Use an extrusion gun if available. If necessary, smooth the sealant before it cures, using a wooden spatula wetted with MEK (C74), or finger wetted with water.

(4) Connect oil hose from tee fitting on left rear side of transmission top case to No. 8 oil jet assembly (19).

6-74. PREPARATION FOR SHIPMENT — MAIN ROTOR MAST ASSEMBLY.

a. Clean main rotor mast assembly (paragraph 6-70).

NOTE

Do not coat bearings with oil. Refer to subparagraph (C) below.

b. Remove corrosion from the mast (paragraph 6-72).

c. Coat the entire mast assembly, including bearings, with corrosion preventive compound (C41).

d. Attach an unserviceable reparable tag, DD Form 1577-2, which has been properly filled out, to the mast assembly.

e. Prepare DA Form 2410 (Component Removal and Repair/Overhaul Record) in accordance with TM 38-750.

f. Place copies of the DA Form 2410 in a greaseproof envelope and stow them with the mast in the container after completion of step h. or i. as applicable.

g. Wrap entire mast assembly with barrier material (C22) and securely wrap with pressure-sensitive tape (C127) to protect mast from cushioning material and prevent preservative from rubbing off.

h. Reusable Metal Container (Preferred Method). If a reusable metal container, P/N 204-040-366 MUSC-A19, NSN 8115-00-083-8335, complete with molded heir pads is available, insert the wrapped mast in the container. If hair pads are not available, follow procedures as closely as possible, center the wrapped mast assembly in container with adequate cushioning material (C46) surrounding assembly. Be certain the mast assembly is held firmly in the container and that all open spaces are filled with cushioning material.

i. Plywood Container (Alternete Method). If a plywood shipping container is available, place the preserved mast assembly in the plywood container between the molded hair pads and secure lid.

j. Obliterate old markings from the container that do not coincide with the item to be returned. Mark container in accordance with MIL-STD-129. Stencil DA Form 2410 control number on exterior of container.

SECTION IV. TAIL ROTOR DRIVESHAFT

6-75. TAIL ROTOR DRIVESHAFT.

6-76. DESCRIPTION - TAIL ROTOR DRIVESHAFT.

Five driveshaft sections transmit power from the transmission to the tail rotor through two gearboxes. The shaft sections are identical and are supported by three hanger assemblies on the tailboom and engine deck.

6-77. REMOVAL – TAIL ROTOR DRIVESHAFT.

Premaintenance Requirements for Tail Rotor Driveshaft

Conditions	Requirements
Model	AH-IS
Part Number or Serial Number	All
Special Tools	None
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C37) (C112)
Special Environmental Conditions	None

a. Open hinged access doors along top of tailboom and vertical fin by realeasing fasteners on left side. Also remove tailpipe fairing, transmission cowling, and intermediate gearbox cover, as necessary to gain access.

CAUTION

Clamp set must he removed from both ends of shaft before removing either end of shaft from its mating curvic coupling to avoid coupling tooth or bearing damage.

NOTE

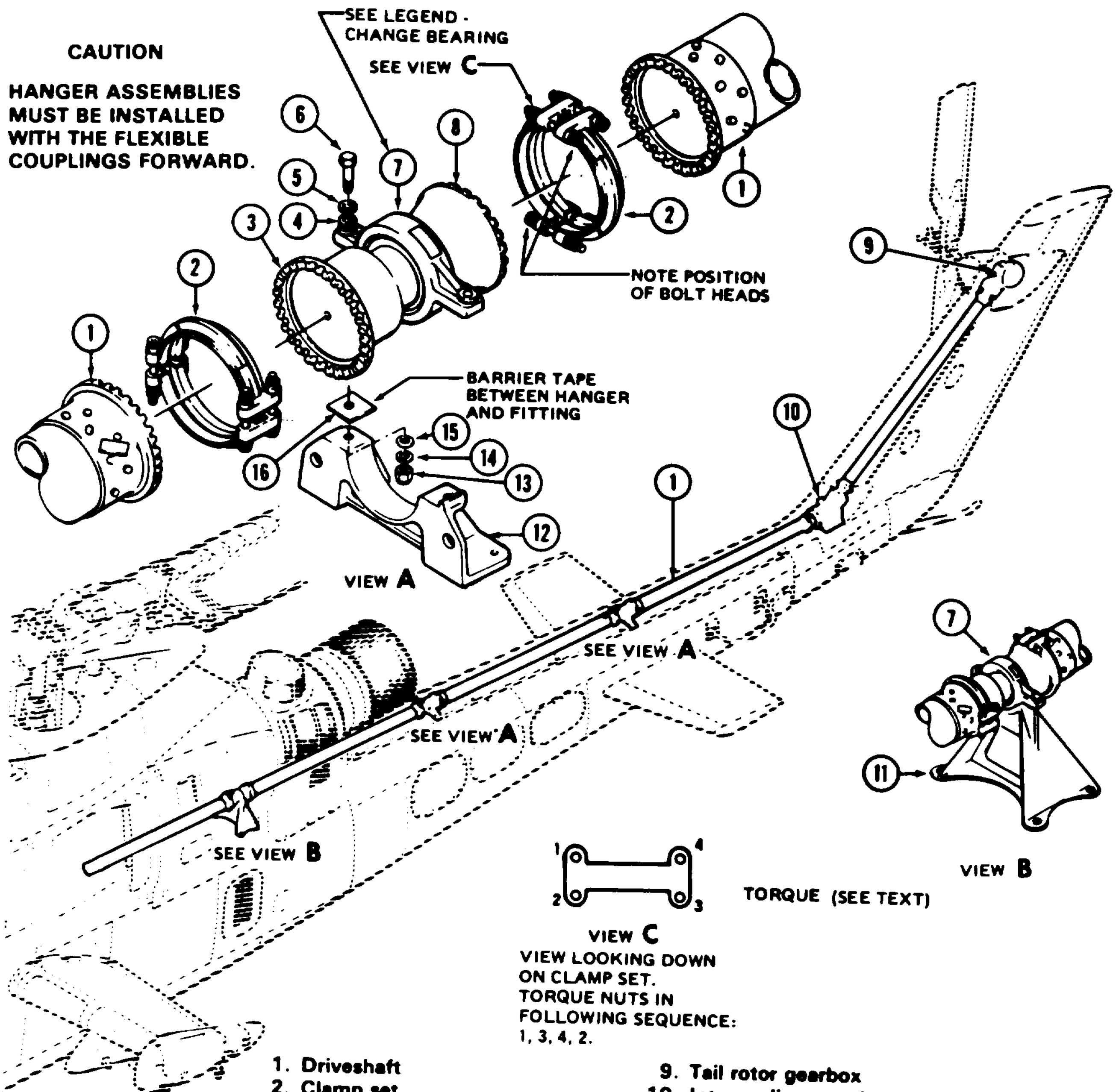
Retain clamp set as a unit when removed to preclude intermix of set halves.

b. If chafing strips come loose, replace with new chafing strips.

WARNING

Secure the tail rotor blades to prevent personnel injury and equipment damage any time a segment of the tail rotor drive system is disconnected. The tail rotor blades may cause uncontrolled system rotation should there be a sudden gust of wind when they are not secured.

c. Remove clamp set (2, figure 6-29) from coupling at each end of driveshaft (1). Push shaft against flexible coupling to disengage opposite end.



1. Driveshaft
2. Clamp set
3. Coupling (outer flexible)
4. Aluminum washer (Note 1)
5. Thin steel washer
6. Bolt
7. Hanger assembly
8. Coupling (non-flexible)
9. Tail rotor gearbox
10. Intermediate gearbox
11. Bearing hanger support fitting
12. Bearing hanger support fitting
13. Nut (extended base)
14. Thin steel washer
15. Aluminum washer
16. Barrier tape

NOTE: OMIT WASHER (4) FROM UNDER BOLT HEAD WHEN BEARING HANGER MATERIAL IS STEEL OR STAINLESS STEEL.

204040-1174

Figure 6-29. Tail Rotor Driveshaft Installation and lift out shaft. Remove remaining shafts aft of forward bearing hanger in same manner.

d. To remove forward shaft, remove damp set from tail rotor drive quill coupling. With shaft disconnected from hanger coupling, move shaft against flexible coupling to disengage and remove shaft carefully rearward and to right through firewall tunnel.

e. Remove second shaft section.

6-78. CLEANING — TAIL ROTOR DRIVESHAFT.

WARNING

Cleaning solvent is flammable and toxic Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

Clean all shaft surfaces using dean cloth moistened with dry cleaning solvent (C112) with care to avoid marring anodized surfaces. Dry with filtered compressed air.

6-79. INSPECTION — TAIL ROTOR DRIVESHAFT.

a. Inspect shaft for cracks.

b. Inspect shaft for rivet failures. No loose, cracked, or missing rivets are acceptable.

c. Inspect tail rotor driveshaft sections for trueness. Mount driveshaft section on V-blocks or support on centers. Measure runout with dial indicator. Maximum acceptable runout is 0.050 inch TIR (total indicator reading) at any point on the shaft.

d. Check for loss or partial detachment of balance strips which are bonded on tube near center.

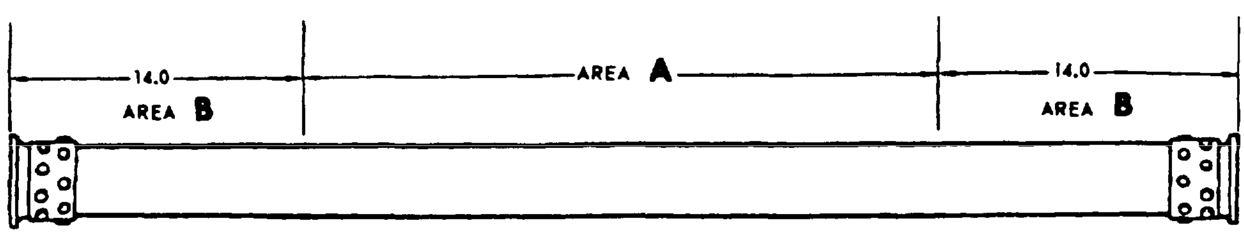
NOTE

Do not mistake empty imprints in bonding material on ends of balance weight groups as an indication of a missing weight coupon. This imprint results from removal of a test coupon to inspect for bonding voids and is indicated by a raised outer corner of bonding material. If a tail rotor driveshaft has any empty bonding imprint without a raised corner on any weight group, shaft should be removed for overhaul. (if more than one group of weights are on shaft, test imprints will be located at the end of each group toward center of shaft.)

e. Inspect driveshafts which have more than a single empty bonding inprint for the following configurations:

(1) -3 shaft with one balance weight group in center of shaft, statically balance. (Being overhauled at depot, dynamically balanced and updated to -7).

(2) CCAD overhauled -3 shaft, identified by CCAD overhaul decal on aft end. Has two (2) staggered (not in line) weight groups, no test coupons, dynamically balanced.



ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

Figure 6-30. Tail Rotor Driveshaft Inspection Diagram

(3) -7 shaft has two (2) weight groups (in line) dynamically balanced. (Factory -7 shafts have teat coupon with each group and CCAD overhauled -7 shafts have no test coupons).

(4) -5 shafts same type as (1) and (2), being dynamically balanced and updated to -9 shafts.

(5) CCAD decals are removed at depot and no longer used.

(6) Cured epoxy paint at time of rework is optional on driveshafts.

(7) Driveshafts identified by all the preceeding steps are serviceable. Any shafts having more than one (1) empty imprint in bonding material per weight group and are not identified by preceding steps will be removed from service as overhaul candidates.

f. Inspect for damaged or excessivety worn curvic coupling teeth. There should be no radial play or backlash between mating teeth when fully meshed with V-band damp (2, figure 6-29) removed.

g. Inspect shaft for grooves worn by V-band clamp on shaft coupling to extent that such wear prevents proper clamping.

h. Inspect shaft for surface damage of shaft tube in excess of limits in (i) below.

i. Classify surface damage on shaft tube as acceptable, reparable, or excessive by following limits. Define "Area A" as central portion of shaft and "Area B" as portions within 14 inches of ends (figure 6-30).

(1) Any damage to anodized finish or grey epoxy paint requires anti-corrosion treatment in accordance with TM 43-0105.

(2) Nicks or scratches alighned within 15 degrees of spanwise axis are acceptable without repair to maximum depth of 0.002 inch in "Area A" or 0.004 inch in "Area B".

(3) Other nicks or scratches must be polished out with crocus cloth (C42) provided depth of material removed does not exceed 0.008 inch in "Area A" or 0.012 inch in "Area B".

NOTE

If total reworked area on one side of shaft is 8 square inches greater than the total reworked area on opposite side, shaft may be out of balance and should be replaced.

(4) Sharp dents are permissible to maximum depth of 0.010 inch in "Area A" and 0.015 inch in “Area B".

(5) Nonsharp dents are permissible to maximum depth of 0.020 inch m "Area A" and 0.030 inch in "Area B".

NOTE

All dents should be carefully inspected for cracks, nicks, and scratches. No cracks permitted. Nicks or scratches shall be within limits. When nicks or scratches are present in a dent, total depth of a dent and nick or scratch combined may not exceed the limits for dent above.

(6) Corrosion must be polished out with crocus cloth (C37), provided depth of material removal does not exceed 0.012 inch in "Area B". Deeper corrosion is cause for rejection.

NOTE

If total reworked surface on one side exceeds the reworked surface on the opposite side by eight square inches, the shaft may be out of balance and should be replaced.

j. Inspection — Driveshaft Clamps.

(1) Check bolt holes for wear, nicks, and scratches.

(2) Inspect spot face, lug fillets, and internal V-groove for nicks and scratches in excess of 0.008 inch, and gouges or wear pattern extending into the fillet radius at bottom of internal V.

(3) Inspect all remaining surfaces for nicks and gouges exceeding 0.010 inch.

6-80. REPAIR — TAIL ROTOR DRIVESHAFT.

a. Replace driveshaft sections that are damaged in excess of acceptable limits (paragraph 6-79).

b. Send tail rotor driveshaft sections that require painting to next higher maintenance level for painting and balancing.

6-81. INSTALLATION — TAIL ROTOR DRIVESHAFT.

WARNING

Ensure that crowned tooth coupling is properly lubricated prior to installation of driveshaft (paragraph 1-29).

NOTE

if driveshaft misalignment is suspected, refer to paragraph 6-79.

NOTE

Leave the hanger bearing assembly loose until driveshaft is properly seated.

a. Engage shaft couplings with mating couplings. Install damp sets (2, figure 6-29) at each end with nuts in trailing direction of rotation and bolted joints indexed within 1/8 inch of 90 degrees measured at perimeter of damps for balance in operation.

NOTE

Clamp halves are matched by identical vendor and forging lot number, or by weight. Every effort should be made to retain clamp halves se matched sets. All nuts on any one clomp set must be identical part numbers. Random clamp halves of some part numbers may be paired if they meet either of the following criteria: (1) Weight differential of the two halves does not exceed one gram, or (2) No excessive high frequency vibrations are introduced during e maintenance test flight when matched with unknown weight difference.

CAUTION

Use new nuts each time clamps are installed.

b. Install tail rotor damp set (2, figure 6-29) bolts and nuts as follows:

(1) Start four nuts onto damp bolts by hand.

(2) Thread nuts on bolts to obtain complete thread engagement.

(3) Measure and record tare torque for each nut.

(4) Torque each nut in sequence illustrated in figure 6-29 30 to 35 inch-pounds above tare torque recorded in preceding step. Keep gaps in ends of clamp set (2) equal within 0.020 inch.

(5) Tap very lightly around outer surface of damp with fiber mallet and re-check torque.

c. Install tailpipe fairing or gearbox cover as required. Close access doors and cowling.

6-82. TAIL ROTOR DRIVESHAFT HANGER ASSEMBLY.

6-83. DESCRIPTION — TAIL ROTOR DRIVESHAFT HANGER ASSEMBLY.

Three hanger assemblies connect and support tail rotor driveshaft along top of tailboom and above the engine deck. Each assembly consists of couplings on a short, splined shaft, mounted through a single-row sealed ball bearing in a ring-shaped hanger equipped with two mounting lugs for attachment on a support fitting (figure 6-29).

6-84. REMOVAL— TAIL ROTOR DRIVESHAFT HANGER ASSEMBLY.

Premaintenence Requirements for Driveshaft Hanger Assembly

Conditions	Requirements
Model	AH-1P, E, & F
Part Number or Serial Number	All
Special Tools	None
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C56) (C116) (C120)
Special Environmental Conditions	None

a. Open hinged access doors along top of tailboom by releasing fasteners on left side. Open engine access doors.

CAUTION

Use caution when removing driveshaft. Damage to shaft or coupling may result from improper handling.

b. Remove tall rotor driveshafts from each side of hangar (paragraph 6-77).

c. Remove bolt (6, figure 6-29) with nut (13) and washers (4, 5, 14, and 15) at each side to detach hanger assembly from its bearing hanger support fitting (11 or 12).

6-85. INSPECTION — TAIL ROTOR DRIVESHAFT HANGER ASSEMBLY.

a. inspect three driveshaft hanger assemblies for metal particles and/or rust-colored fretting debris adjacent to bearing in bearing and shaft assembly (10, figure 6-31). If particles are found, replace affected park

b. Inspect three bearing and shaft assemblies (10) for overheating.

(1) Deleted.

(2) Indications of overheating such as discoloration of bearing (blue to blue/black in color) or multicolor appearance of hanger that darkens adjacent to bearing is cause for replacement.

(3) Brown coloring of bearing shield is normal and is not an indication of overheating.

b.1. Coupling overheat detector paint strip. A 1.0 by 1.1 inch strip of zing-chromate primer is painted on each side (180° apart) of every flexible driveshaft coupling. The zinc-chromate primer (TT-P-1757) will turn brown at 375 ± 5°F, indicating:

(1) Loss of lubricant due to seal failure.

(2) Contaminated or improper lubricant.

(3) Incorrect cleaning and lubricating procedures.

(4) Drive train misalignment.

Also paint a 0.5 X 0.5 inch zinc-chromate primer strip on the top of the bearing and shaft assembly (reference item 10, figure 6-31) 0.06 inches away from the identification plate (reference item 17, figure 6-31).

c. Inspect three bearing and shaft assemblies (10) and outer flexible couplings (8) for grease leakage. Wetting of adjacent areas by grease is cause for replacement of affected parts with the following exception: A small amount of grease expelled from around lip of seal in bearing and shaft assembly (10) indicates slight over-lubrication and is not cause for hanger replacement. Perform an evaluation of bearing and shaft assembly (10) as follows:

CAUTION

Do not clean or spray bearing or hanger assembly With any type of advent during inspection. Use only dean cloths without solvent to dean exterior of hanger.

(1) Wipe grease from shaft of inner (spherical) coupling (11), bearing and shaft assembly (10) with clean, lint-free cloth.

(2) Record on DA Form 2408-13, indicating bearing by location and check again after one flight of the aircraft.

(3) If amount of grease expelled from seal of hanger bearing does not decrease after this period of time, replace bearing and shaft assembly (10).

d Inspect three bearing and shaft assemblies (10) for cracks, elongated bolt holes, and corrosion.

e. Inspect three bearing and shaft assemblies (10) for excessive bearing wear, roughness, or binding. If condition of bearing is in doubt, check as follows:

(1) Remove driveshaft from each end of hanger assembly (pargraph 6-77).

(2) Rotate bearing while pressing in axially on end of hanger. Obvious roughness, catching, or binding when turned by hand is cause for replacement.

(3) If ratcheting noise is detected when coupling assembly is spun, while attached to airframe, replace bearing.

f. Inspect three non-flexible couplings (11) for scratches, nicks, dents, and cracks. Minor damage that can be polished out with fine India stone (C116) is acceptable.

g. Inspect three outer flexible coupling (8) for discoloration due to overheating. If the coupling has a multicolor appearance, disassemblethe coupling and inspect splines and teeth.

h. Inspect three outer flexible coupling (8) for scratches, nick, dents, and cracks. Minor damage that can be polished out with fine India stone (C116) is acceptable.

i. Inspect three seals (9) for protrusion, leakage, cuts, tears and deterioration. Replace unserviceable seals.

j. Disassemble three outer flexible couplings (8) from inner flexible couplings (7) and inspect as follows:

(1) Remove retaining ring (1). At the same time hold seal plate (2) against spring pressure.

(2) Remove seal plate (2) and spring (3).

(2A) Inspect retaining ring (1), and seal plate (2), for serviceability. Inspect center spring (3) by applying a test Ioad of 5.0 ± 0.5 pounds to compress spring to 1.50 ± 0.10 inches.

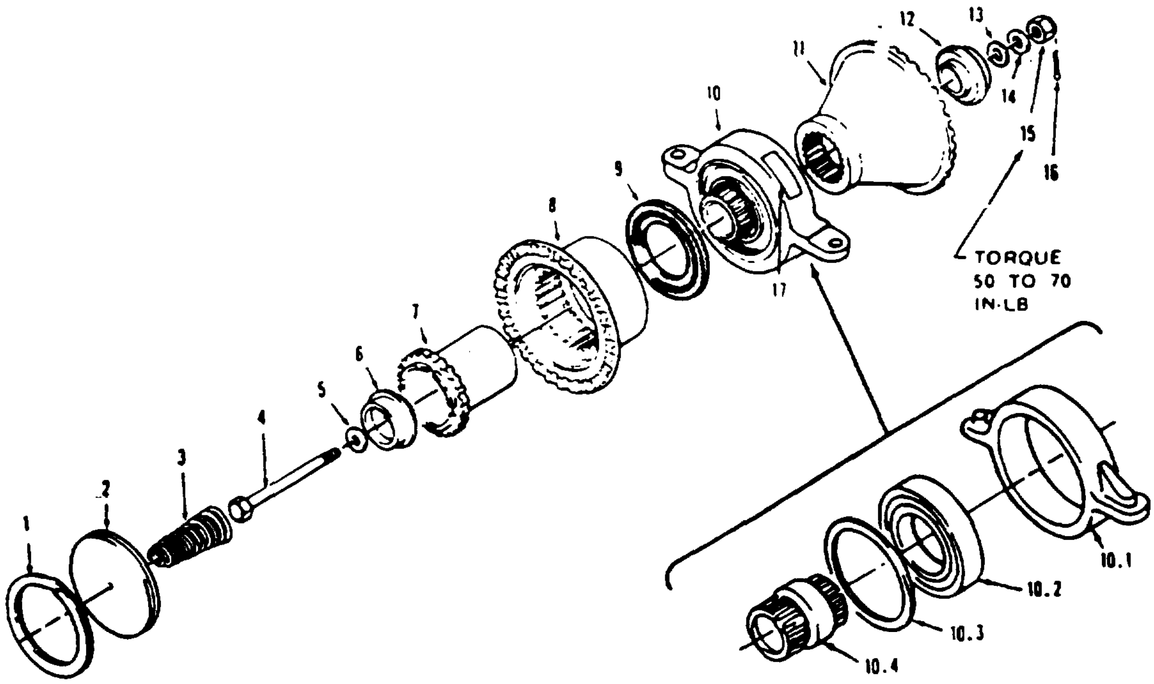
CAUTION

Do not use solvent to dean assembled driveshaft hanger assembly. Residue may remain in assembly and prevent proper lubrication. Do not dean seal (9) with cleaning solvent.

(3) Hold outer flexible coupling (8) at full outward pisition and use a dean lint-free cloth to remove all old grease. Clean coupling splines thoroughly. Solvent (C112), may be used if driveshaft hanger assembly is completely disassembled.

NOTE

Leave the hanger bearing assembly loose until driveshaft is property seated.



1. Retaining ring	6. Plate	10.1 Hanger	12. Plate
2. Seal plate	7. Inner (spherical) coupling	10.2 Hanger bearing	13. Washer (aluminum)
3. Spring	8. Forward coupling	10.3 Retaining ring	14. Washer (steel)
4. Retaining bolt	9. Seal	10.4 Coupling shaft	15. Nut
5. Washer (Aluminum)	10. Bearing and shaft assembly	11. Rear coupling	16. Cotter pin
			17. Identification plate

Figure 6-31. Tall Rotor Driveshaft Hanger Assembly

(4) Inspect inner coupling (7) and outer coupling (8) per paragraph 6-128.1.

(5) Assemble outer flexible coupling (8) on inner flexible coupling (7). Move outer flexible coupling (8) forward and aft with clockwise and counter-clockwise preload and feel for roughness. If any roughness or resistance is felt, reinspect internal splines of outer flexible coupling (8) and teeth on inner flexible coupling (7). Refer to step (4).

(6) Lubricate and assemble three inner and outer flexible couplings (7 and 8) (paragraph 6-86.c. and 6-87).

k. Install tail rotor driveshaft sections that were removed at step e (paragraph 6-81).

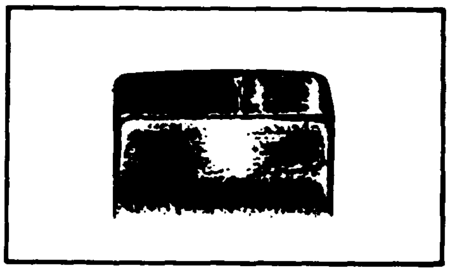
6-86. REPAIR — TAIL ROTOR DRIVESHAFT HANGER ASSEMBLY.

a. Replace parts of driveshaft hanger assemblies that are damaged in excess of acceptable limits (paragraph 6-85).

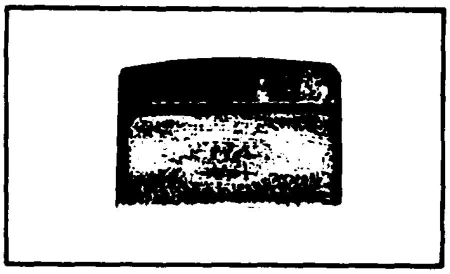
b. Disassemble hanger assembly as follows:

(1) Remove spiral retaining ring (1, figure 6-31), seal plate (2) and spring (3) from outer flexible coupling (8).

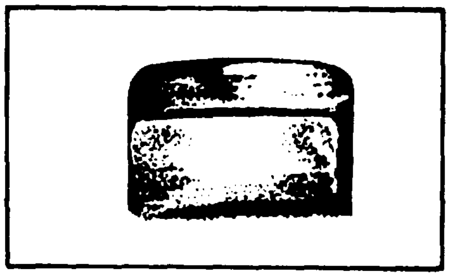
(2) Remove cotter pin (16), nut (15), and retaining bolt (4). Remove aluminum washer (5 and



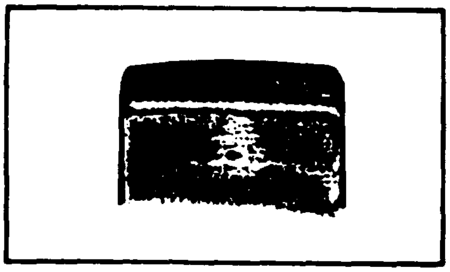
A Acceptable pattern typical of low operating time.



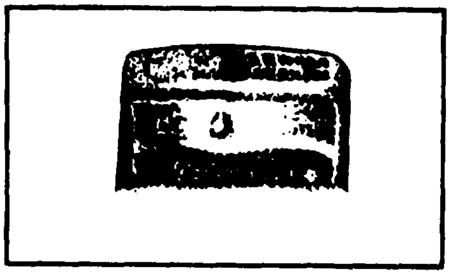
B Acceptable pattern typical of couplings which have operated with normal misalignment for a longer period of time than that shown in A.



C Acceptable pattern denoting operation at higher torque than that shown in A and B.



D Acceptable pattern showing a pitted tooth. This condition is acceptable on all teeth.



E Pattern shows a more severe condition of tooth pitting than that shown in D. There is no metal projecting above the normal face of the tooth, indicating that the pitted area is polishing over. This condition may exist on all teeth. Couplings with pits larger than 1/32 inch diameter should be replaced.

Figure 6-32. Coupling Teeth Wear Patterns

13) and steel washer (14). Remove inner flexible coupling (7), outer flexible coupling (8) and nonflexible coupling (11) from bearing and shaft assembly (10). Remove seat (9) from outer flexible coupling (8).

(3) If bearing replacement is necessary, proceed as follows.

(a) Press shaft (10.4) from tearing and shaft assembly (10).

(b) Remove retaining ring (10.3) from bearing and hanger (10.1).

(c) Press bearing (10.2) out of hanger (10.1) through retaining ring end.

(4) Assemble bearing and shaft assembly as follows:

(a) Press new bearing (10.2) into hanger (10.1) through retaining ring end. Press on bearing outer race only.

(b) Support inner race of bearing (10.2) and press shaft (10.4) into bearing. Bearing journal of shaft must center within 0.003 to 0.016 inch.

(c) Install retaining ring (10.3) in hanger and shaft assembly (10).

c. Assemble banger assembly as follows:

CAUTION

It is possible to erroneously intermix outer coupling (8, figure 6-31) inner coupling (7) and bearing on bearing and shaft assembly (10) with similar parts manufactured for other helicopters. Confirm that oil driveshaft hanger assembly parts are correct part number (TM 55-1520-236-23P).

(1) Install seal (9, figure 6-31) into groove at small end of outer flexible coupling (8) with seal lip toward flange and of coupling. Use a burnishing tool to seat seal between gear tooth and end of coupling.

(2) Apply lubricant (C56) to splines of inner flexible coupling (7) and insert into outer flexible coupling (8).

(3) Install nonflexible coupling (11). Install inner flexible coupling (7) and outer flexible coupling (8) to the (forward) retaining ring side of bearing and shaft assembly (10).

(4) Install aluminum washer (5) and plate (6) against head of retaining bolt (4) and insert bolt through previously assembled parts.

(5) Install plate (12), aluminum washer (13), steel washer (14), and nut (15) on retaining bolt (4). Torque nut (15) 50 TO 70 inch-pounds. Install cotter pin (16).

(6) Hold outer flexible coupling (8) at full outward position. Hand-pack lubricant (C56) to 0.12 inch depth over top of internal spline teeth.

(7) Install spring (3), seal plate (2), and retaining ring (1).

6-87. LUBRICATION—TAIL ROTOR DRIVESHAFT HANGER ASSEMBLY.

NOTE

Tail rotor driveshaft hanger assemblies can be lubricated while installed on tailboom.

a. Hold seal plate (2, figure 6-31) against spring (3) and remove retaining ring (l).

b. Remove seal plate (2) and spring (3).

CAUTION

Do not use cleaning solvent inside flexible coupling. Solvent leaves residue.

c. Hold outer flexible coupling (8) full outboard and clean old grease from coupling with clean cloths.

d. Hand pack grease (C56) to 0.12 inch depth over top of spline teeth on outer flexible coupling (8)

CAUTION

Ensure seal plate vent hole is not clogged.

e. Keep outer flexible coupling (8) at full outboard position. Install spring (3), seal plate (2), and retaining ring (1)

f. Gently push and pull flex coupling to full limits to evenly distribute grease full length of spline teeth.

6-88. INSTALLATION — TAIL ROTOR DRIVESHAFT HANGER ASSEMBLY.

NOTE

If driveshaft misalignment is suspected, refer to paragraph 6-95.

a. Place dissimilar metals tape (C120) (16, figure 6-29) on bearing hanger support fittings (11) and (12).

b. Position hanger assembly (7) on bearing hanger support fitting (12) with outer flexible coupling (3) forward.

NOTE

Use additional washers if required to obtain proper thread engagement on bolts (6).

Omit washer (4) under bolt head when bearing hanger material is steel or stainless steel.

c. Install bolts (6), steel washers (5), aluminum washers (4) if required, aluminum washers (15), steel washers (14), and nuts (13). Ensure that aluminum washers (15) are installed next to the support fitting.

d. Install tail rotor driveshaft sections (paragraph 6-81).

e. Torque nuts (13) evenly 50 TO 70 inch-pounds.

6-89. TAIL ROTOR DRIVESHAFT BEARING HANGER SUPPORT FITTING.

6-90. DESCRIPTION — TAIL ROTOR DRIVESHAFT BEARING HANGER SUPPORT FITTING.

Two bearing hanger support fittings (12, figure 6-29) are located on the tailboom. One bearing hanger support fitting (11) is located on the engine service deck. The bearing hanger support fittings support the three bearing hanger assemblies (7) and the tail rotor driveshaft.

6-91. REMOVAL — TAIL ROTOR DRIVESHAFT BEARING HANGER SUPPORT FITTINGS.

a. Remove tail rotor driveshaft sections as required (paragraph 6-77).

b. Remove tail rotor driveshaft hangers as required (paragraph 6-64.)

CAUTION

Identify shims under bearing hanger support fittings (11 and 12, figure 6-29) for reinstallation in same position. Do not attempt to remove or change shims.

c. Remove bearing hanger support fitting (11) by removing four screws and washers securing support to engine deck.

6-92. INSPECTION — TAIL ROTOR DRIVESHAFT BEARING HANGER SUPPORT FITTINGS.

Inspect bearing hanger support fittings (11 and 12, figure 6-29) for scratches, nicks, dents, cracks, and corrosion. Superficial scratches and nicks are acceptable.

6-93. REPAIR — TAIL ROTOR DRIVESHAFT BEARING HANGER SUPPORT FITTINGS.

a. Replace tail rotor driveshaft bearing hanger support fittings that are damaged in excess of acceptable limits (paragraph 6-92).

b. Touch up paint on tail rotor driveshaft bearing hanger support fittings to match existing finish.

6-94. INSTALLATION — TAIL ROTOR DRIVESHAFT BEARING HANGER SUPPORT FITTING.

CAUTION

Identify shims under bearing hanger support fittings (11 and 12, figure 6-29) for reinstallation in same position. Do not attempt to remove or change shims.

a. Place dissimilar metals tape (C120) on shims prior to installing bearing hanger support fittings (11 and 12).

b. Position bearing hanger support fitting (12, figure 6-29) with tab on left side on tailboom and shims in position. Secure to tailboom with screws and washers.

c. Position bearing hanger support fitting (11) with tab on left side on engine deck and shims in position. Secure with screws and washers.

d. Install tail rotor driveshaft hanger (paragraph 6-88).

WARNING

Ensure that flexible couplings are properly lubricated prior to installation of driveshaft (paragraph 1-29).

e. Install tail rotor driveshaft sections (paragraph 6-81).

6-95. ALIGNMENT – TAIL ROTOR DRIVESHAFT BEARING HANGER SUPPORT FITTING.

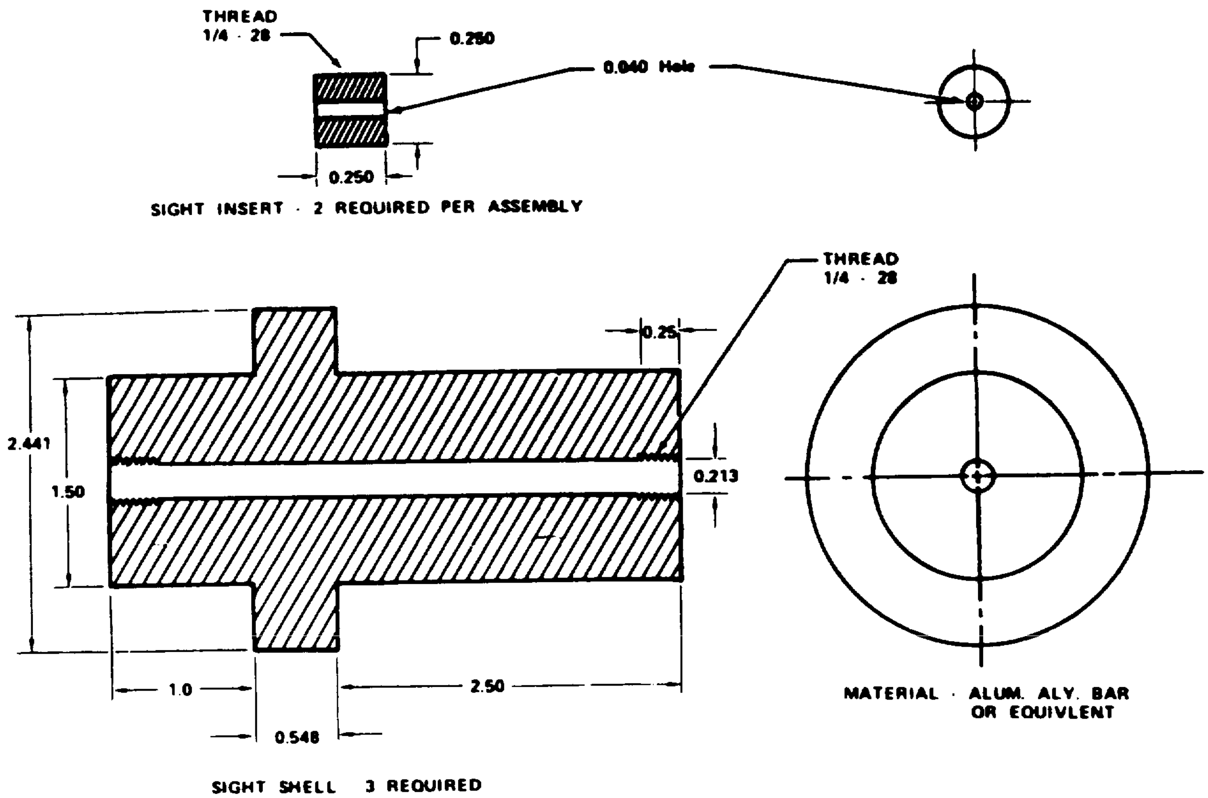
CAUTION

Procedures herein are for aligning the fitting on engine deck with fittings on tailboom. Alignment of fittings on tailboom is a depot function.

a. Remove four driveshaft sections (1, figure 6-29) between transmission and intermediate gearbox (10) (paragraph 6-77).

b. Remove three hanger assemblies (7) paragraph 6-84).

c. Attach an alignment workaid (figure 6-33) to each of the three bearing hanger support fittings (11 and 12, figure 29). Bolts (6) with nuts and washers may be used to attach workaids to fittings.



ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

MATERIALS

Aluminum Alloy Bar Stock 2.5 x 12.5	1 each
Bolts, AN-4	6 each
Hanger, Driveshaft (obtained from stock)	3 each
Ring, Lock P/N R244C or Equivalent	3 each

1. Fabricate three alignment sight shells from aluminum bar stock to dimensions shown.
2. Fabricate six sight inserts from AN-4 bolts. Install bolts in threaded ends of sight shells and cut off flush with face of shell. Center drill bolts to 0.040 inch diameter, using a No. 60 drill.
3. Press each of the sight assemblies into a tail rotor driveshaft hanger (obtained from stock) and secure with a lock ring P/N R244C or equivalent.

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Figure 6-33. Work Aid — Driveshaft Hanger Support Alignment

d. Place flashlight or suitable light against forward end of work aid attached to bearing hanger support fining (11) on engine deck.

e. Look through aft end of work aid attached to the most aft bearing hanger support fitting (12) at the light. If light is not visible, bearing hanger support fitting (11) on engine deck is misaligned.

f. If necessary, shim bearing hanger support fitting as follows:

(1) Remove bearing hanger support fitting (11) (paragraph 6-91).

(2) Remove or add shims until light is visible through all three work aids. Bond shims to engine deck with adhesive (C14).

(3) Install bearing hanger support fitting (11) (paragraph 6-94).

g. Remove all three work aids from fittings.

h. Install three hanger assemblies (7) (paragraph 6-88).

WARNING

Ensure that crowned tooth coupling is properly lubricated prior to installation of driveshaft (paragraph 1-29).

i. Install four driveshaft sections (1) (paragraph 6-81).

SECTION V. INTERMEDIATE GEARBOX

6-96. INTERMEDIATE GEARBOX.

6-97. DESCRIPTION - INTERMEDIATE GEARBOX.

The intermediate gearbox (15, figure 6-34) is located on the tailboom at the base of the vertical fin. The gearbox provides a forty-two degree change in direction of tail rotor driveshaft. It consists of a case with a gear quill in each end. The case is fitted with a breather-type oil filler cap, an oil level sight gage and a drain plug equipped with a chip detector which activates warning lights on the pilot and gunner caution panels and the miscellaneous controls panel when excessive metal particle contamination occurs. On helicopters without MWO 1-1520-236-50-30, the chip detector is straight and includes a threaded-stud electrical termination. On helicopters with MWO 1-1520-236-50-30, the chip detector is right-angled and includes an electrical receptacle. Chip detector is connected electrically to 42° CHIP light on caution panel. The input and output quills have flexible couplings for attachment of drive-shafts. Access is provided by a cover with quick-release fasteners.

6-98. LUBRICATION - INTERMEDIATE GEARBOX.

a. Service gearbox with oil to proper level (paragraph 1-7).

b. Lubricate gearbox flexible couplings as follows:

NOTE

Couplings can be lubricated with gearbox installed on tailboom and driveshafts disconnected.

(1) Remove retaining ring (1, figure 6-35) while holding seal plate (2) against pressure of centering spring (3).

(2) Remove seal plate (2), centering spring (3), and spacer (5).

CAUTION

Do not use cleaning solvent inside coupling. Solvent leaves residue.

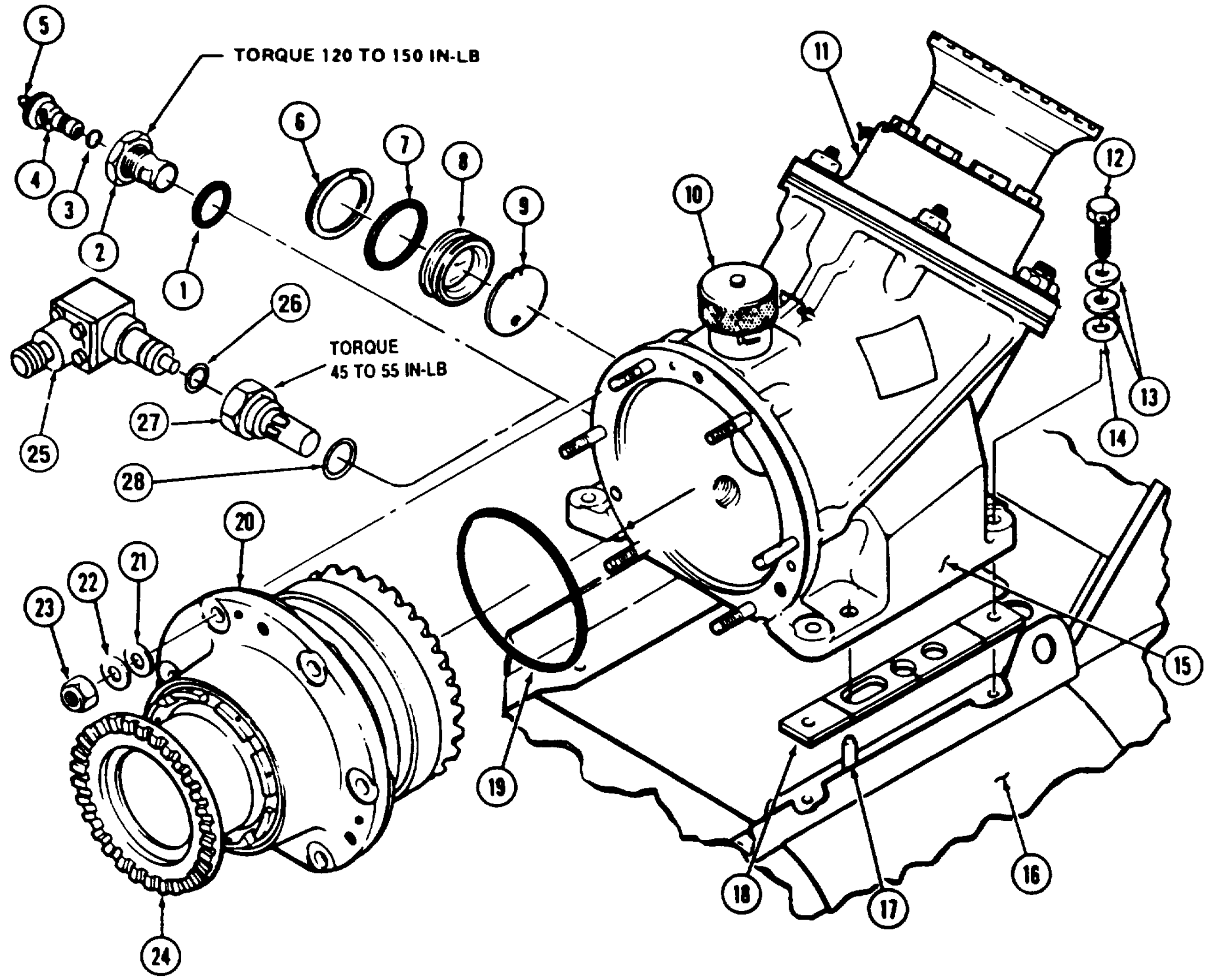
NOTE

Care must be taken to ensure that the retainer plug does not become unsealed from inner coupling.

(3) Hold couplings at full outward position. Remove old grease as thoroughly as possible.

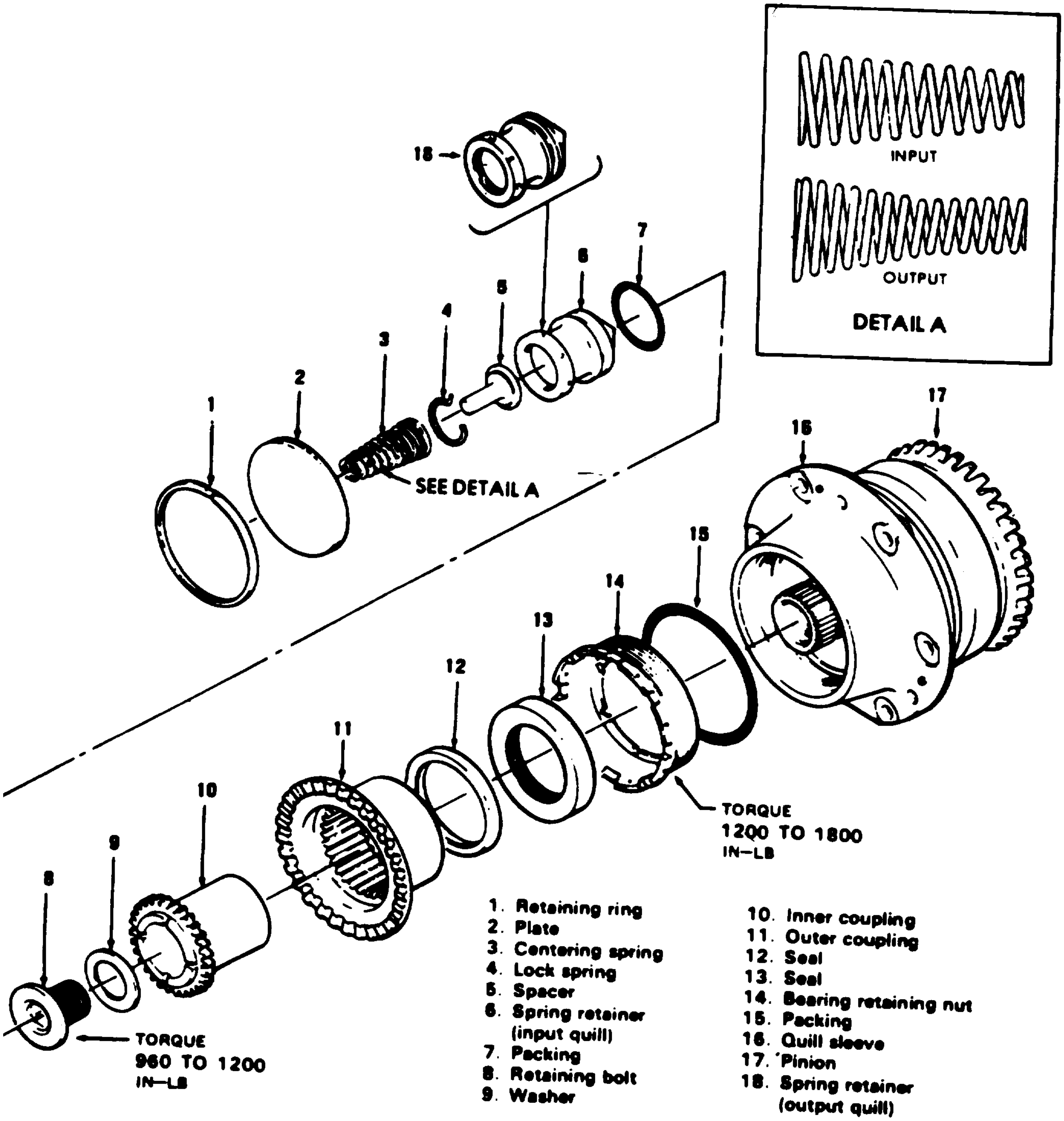
(4) Hand pack grease (C56) to 0.12 inch depth over top of internal spline teeth.

(5) Keep coupling at full outward position. Ensure retainer (6) and lock spring (4) are properly seated Reinstall spacer (5), centering spring (3), seal plate (2), and spiral retaining ring (1).



1. Gasket
2. Chip detector self-closing valve
3. Packing
4. Chip detector
5. Nut
6. Retaining ring
7. Packing
8. Sight glass
9. Sight gage
10. Filler cap
11. Output quill
12. Bolt
13. Steel washer
14. Aluminum washer
15. Gearbox
16. Tailboom
17. Alignment pin
18. Shim
19. Packing
20. Input quill
21. Aluminum washer
22. Steel washer
23. Nut
24. Flexible coupling
25. Chip detector probe (ODDS)
26. Packing (ODDS)
27. Valve
28. Packing

Figure 6-34. Intermediate Gearbox Installation



CAUTION

Input quill spring retainer (6) P/N 204-040-607-7 and output quill spring retainer (18) P/N 204-040-607-5 are not interchangeable.

Input centering spring is not interchangeable with output centering spring.

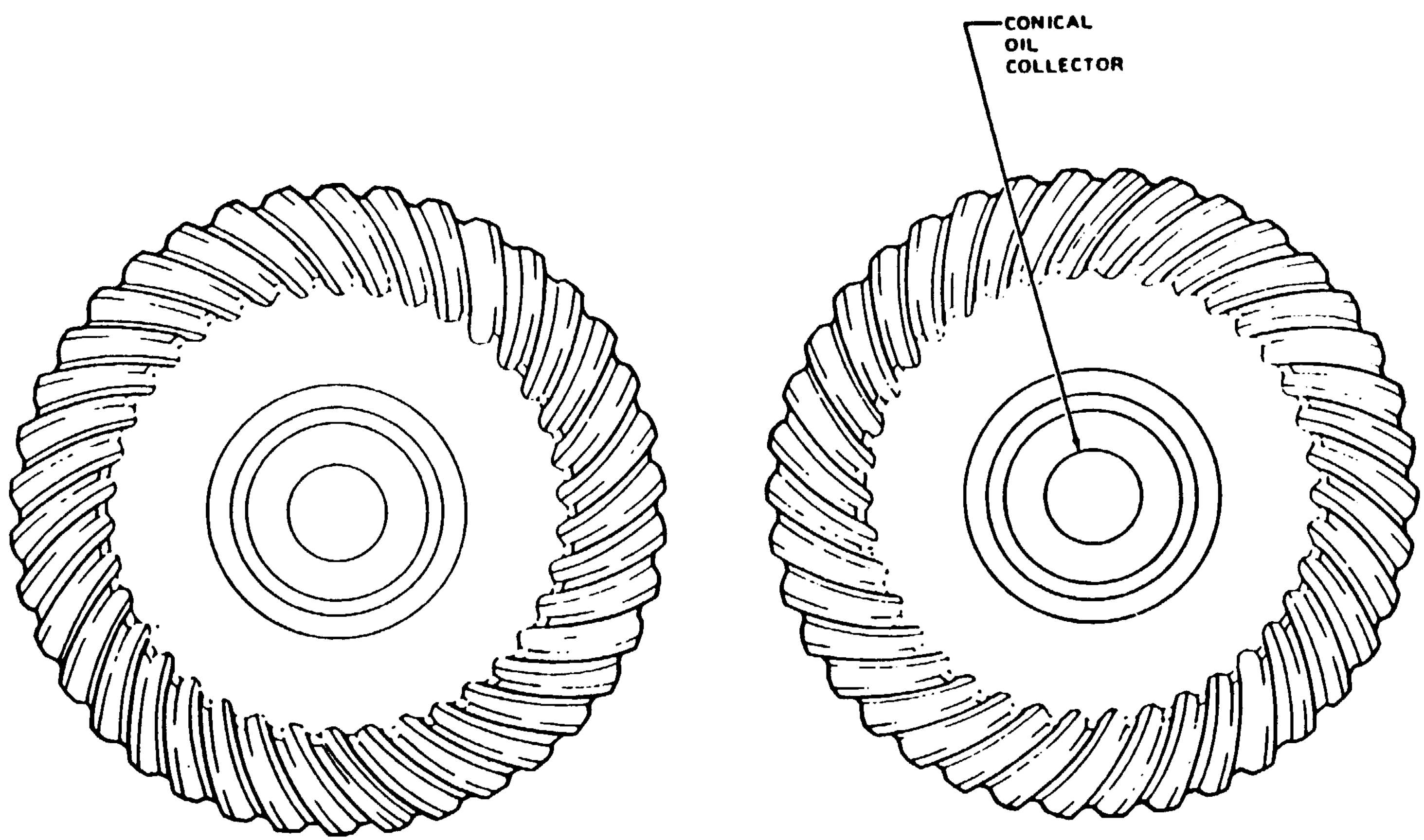
Input quill pinion (17) P/N 212-040-500-7 and output quill gear (not illustrated) P/N 212-040-500-6 are not interchangeable.

Be sure correct part number is installed in each quill.

NOTE

Physical difference in coupling springs.

Figure 6-35. Intermediate Gearbox Quill, Seals, and Couplings (Typical) (Sheet 1 of 2)



Note:
Conical oil collector must be
installed in output gear
P/N 212-040-500-6 as illustrated

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Figure 6-35. Intermediate Gearbox Quill, Seals, and Couplings (Typical) (Sheet 2 of 2)

6-98.1 COLLECTION OF DEBRIS SAMPLE.

a. Remove debris from chip detector probe. Retain debris.

b. Clean chip detector with advent (C261) and dean cloth. Install chip detector.

c. Identify particles using information in figure 6-2.1 and table 6-2. Pay particular attention to debris classified as significant.

d. See figure 6-35.1 for maintenance action dictated by debris.

6-99. INSPECTION - INSTALLED INTERMEDIATE GEARBOX.

NOTE

External leakage is not permitted around seal; however, a small amount of seepage is permissible and does not indicate an unsatisfactory seal condition. Continuous flow (droplets) is considered excessive and requires seal replacement.

a. Remove intermediate gearbox cover (fairing).

b. Inspect installed intermediate gearbox (15, figure 6-34) as follows:

(1) Obvious mechanical and corosion damage. Refer to paragraph 6-102 for acceptable limits.

(2) Oil sight glass for correct oil level.

(3) Oil leakage.

(4) Lubrication leakage at flexible couplings (24) on input quill and output quill.

(5) Secure installation of four bolts (12) that secure gearbox to tailboom. If Iockwire and/or torque lacquer on bolts indicates that bolts have moved, remove all four bolts, inspect, and reinstall (paragraph 6-105).

(6) Shake gearbox and check for looseness on tailboom. No looseness is acceptable.

(7) Cheek for evidence of fretting corrosion at mating surface between gearbox and tailboom that could be caused by movement of the gearbox on the tailboom.

(8) Magnetic chip detector (4) and wiring for secure installation and for damage.

(9) Inspect oil filler cap (10) for security of installation.

(10) inspect tail rotor driveshaft damp set (four bolts) for security of installation.

(11) Check for overheating of two flexible couplings (24) evidenced by multi-color appearance. Refer to paragraph 6-110 if overheating is suspected.

(12) Insure number 5 driveshaft is not bottomed out. If number 5 driveshaft is bottomed out, replace output coupling spring. Refer to paragraph 6-111 for repair procedures.

CAUTION

Do not manually bottom out number 5 driveshaft. This procedure may cause displacement of the coupling lubricant.

c. install tail rotor gearbox covers (fairings) and dose vertical fin driveshaft door.

6-100. REMOVAL - INTERMEDIATE GEARBOX.

a. When the intermediate gearbox is to be replaced, unless conditions prevent operation, perform a ten minute ground runup and drain operation oil. If runup is not practical, remove intermediate gearbox and flush with its own operating oil. Attach tag to intermediate gearbox stating: "PRESERVED WITH OPERATING LUBRICANT".

b. Remove gearbox cover and open tail rotor driveshaft access doors.

c. Disconnect tail rotor driveshafts from gearbox input and output couplings (paragraph 6-77).

CAUTION

To avoid damage to driveshaft hanger bearing or coupling, either remove clamp set from both ends of driveshaft before removing either end of shaft from its mating curvic coupling, or support unattached end of shaft to hold shaft aligned on normal operating axis while gearbox is removed.

d. Disconnect electrical lead from chip detector (4, figure 6-34).

d.1. On helicopter with MWO 1-1520-236-50-30, if gearbox is to be replaced, remove chip detector from gearbox as follows:

(1) Push in on magnetic chip detector (25) as far as possible and turn counterclockwise to disengage from self-closing valve (27) and pull out. Discard packing (26).

(2) Remove valve (27). Discard packing (28)

(3) Install gasket (1), valve (2), and probe (4) with two packings (3).

NOTE

Ensure shims are not stuck to bottom of gearbox.

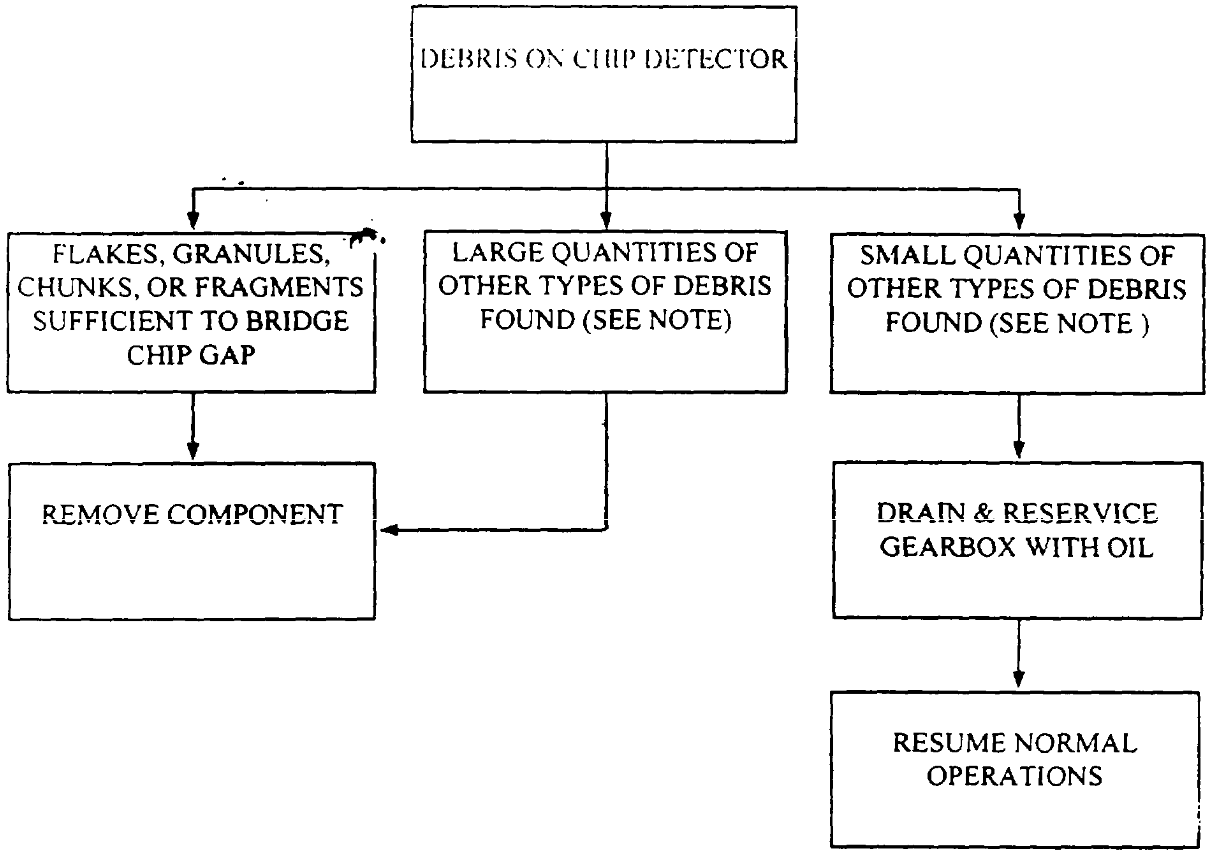
e. Remove lockwire, four bolts (12), and washers (13 and 14). Remove gearbox (15) from tailboom. Do not remove shims (18).

Table 6-2. Gearbox Oil Debris Classification

DEBRIS TYPE	DESCRIPTION	QUANTITY/SIZE	CAUSE/ACTION REQUIRED
A. Flake (steel) [significant]	Thin, flat, oblong particles with rounded or scalloped sides. Like corn flakes.	SIZE: Up to 0.040 long and very thin. QUANTITY: Generally more than 10 paticles per chip event.	Usually associated with bearing wear/spalling. (Note 1.)
B. Chunk/ Fragment (steel) [Significant]	Sometimes identifiable as fragment from specific component. Shape varies widely. Sometimes shows distinct fracture surface.	SIZE: Varies greatly. QUANTITY: Usually 1 to 5 per chip event.	Indicates possibility of major failure (Note 1.)
C. Granule (steel) [significant]	Fine, powder-like clumps, irregular shaped debris. Like coffee grounds.	SIZE: Length and width are similar an generally 0.010. Thickness varies, but is generally one-half length-width. QUANTITY: Usually more than 50 per chip event.	Usually bearing or gear wear, scoring. (Note 1.)
D. Bronze [significant]	Granular, chunks, fragments, or powder-like golden particles.	To be significant, 25 particles, any size, per chip event.	Bearing cage wear or failure and usually preceded by chip light event with small quantities of magnetic debris (Note 1.)
E. Other [possible significant]	Splinters, slivers, cutting, turnings, wire- or hair-like particles, chrome or silver foil, aluminum, magnesium, corrosion products, and dirt.	Oil is dark, clowdy, feels gritty.	Indicates possible wear or corrosion of gearbox. (Note 1.)

NOTES

1. Refer to figure 6-34.1 for gearbox oil contamination troubleshooting.
2. Dimensions are in inches.



NOTE

OTHER TYPES OF DEBRIS CAN INCLUDE: SPLINTERS; SLIVERS; WIRE – OR HAIR-LIKE PARTICLES, CUTTINGS, TURNINGS, CHROME OR SILVER FOIL, ALUMINUM, MAGNESIUM, CORROSIONS PRODUCTS, AND DIRT.

WARNING

IF FRAGMENT CAN BE IDENTIFIED AS PIECE FROM SPECIFIC INTERNAL PART, REPLACE GEARBOX.

Figure 6-35.1. Intermediate and Tail-Rotor Gearbox Troubleshooting Chart

6-101. CLEANING - INTERMEDIATE GEARBOX.

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

CAUTION

Do not force dirt or solvent into bearings or flexible couplings by use of compressed air.

Clean removed parts and exterior of gearbox assembly with solvent (C112).

6-102. INSPECTION — INTERMEDIATE GEARBOX (GEARBOX REMOVED FROM HELICOPTER).

a. Inspect gearbox and historical records for evidence gearbox has been involved in an accident or

incident that requires special inspection (paragraph 6-103).

b. Inspect gearbox for oil leakage.

c. Inspect both gearbox flexible couplings for lubricant leakage.

NOTE

To remove chip detector (4 or 25, figure 6-34) push body of detector in and turn left to disengage bayonet pins, then withdraw from chip detector self-closing valve (2 or 27).

d. Inspect chip detector (4 or 25) for metal particles (paragraph 6-4).

e. Inspect gearbox for elongated mounting bolt holes. See figure 6-36 for maximum acceptable elongation.

f. Inspect gearbox for mechanical and corrosion damage. See figure 6-36 for acceptable damage limits and instructions to rework damaged gearbox cases.

g. Inspect oil filler cap (10, figure 6-34) for damage that would affect function.

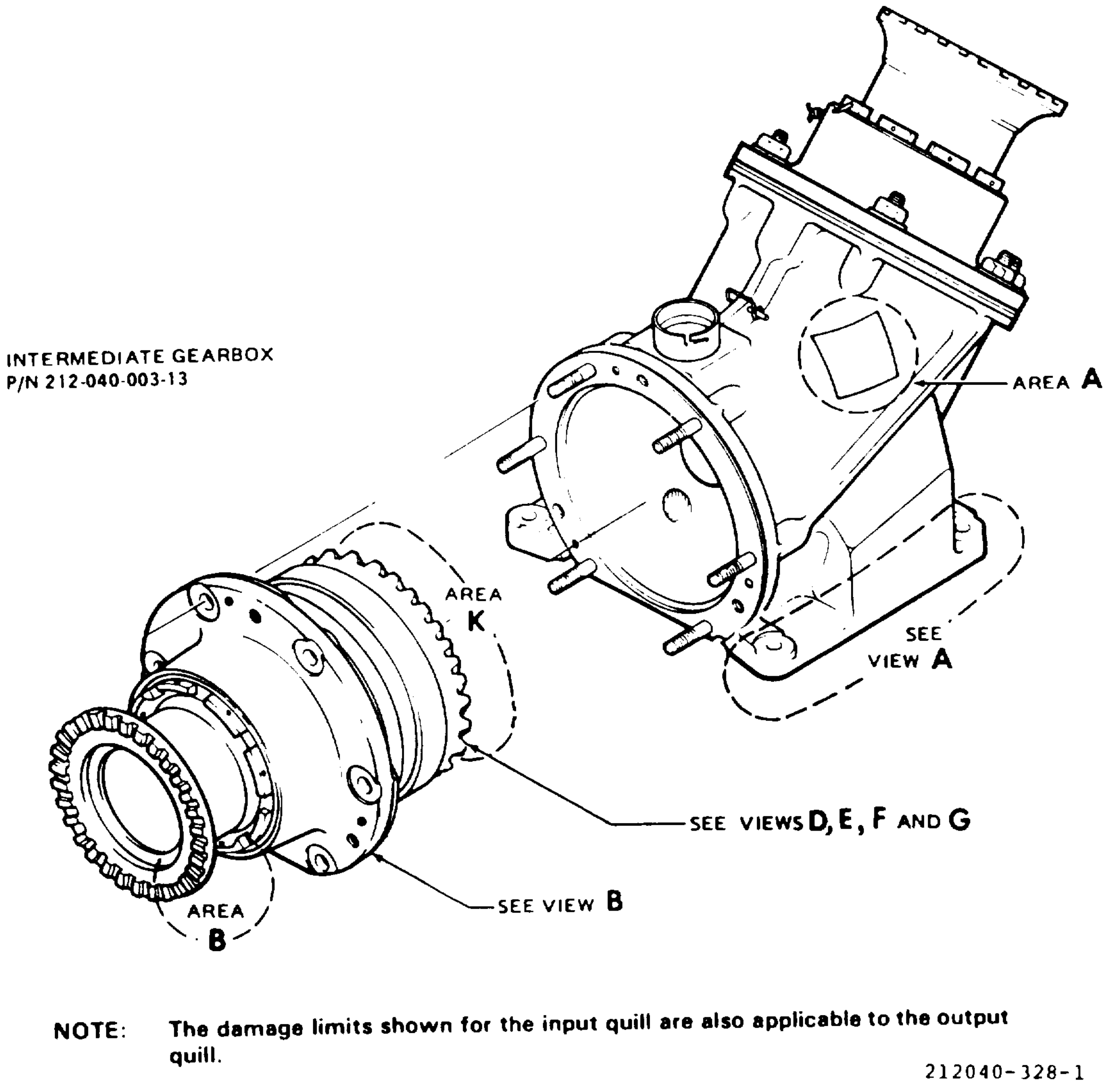


Figure 6-36. Damage Limits-Intermediate Gearbox (Sheet 1 of 7)

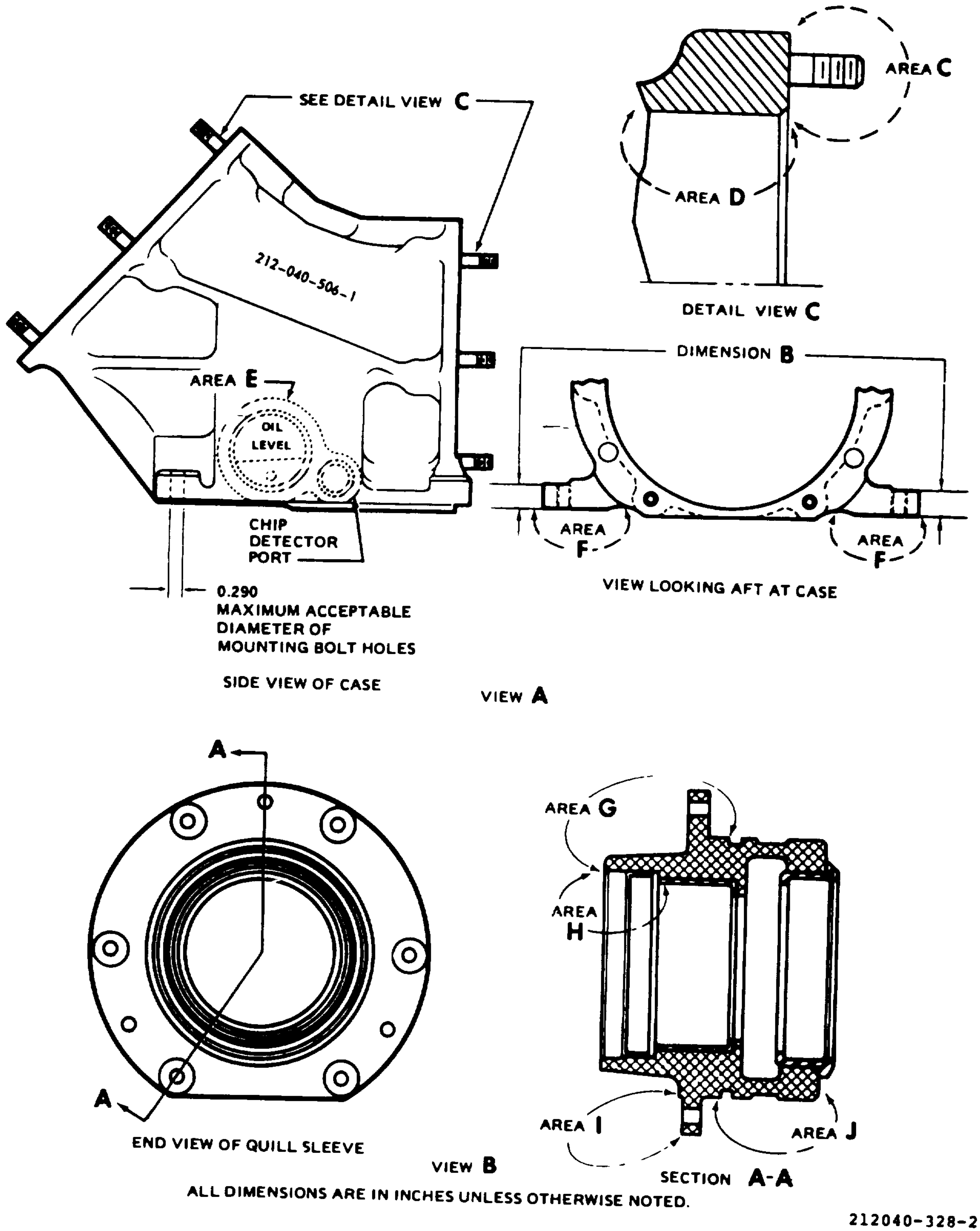
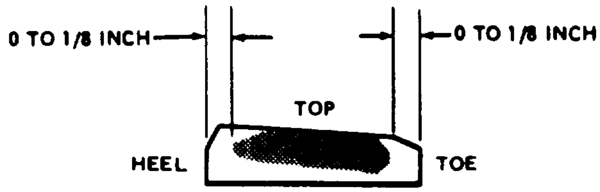


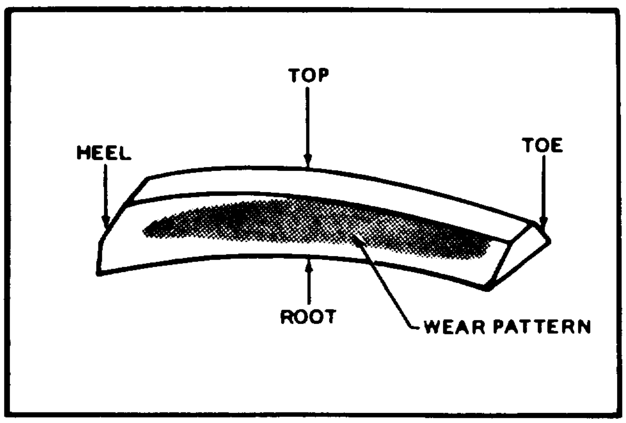
Figure 6-36. Damage Limits — Intermediate Gearbox (Sheet 2 of 7)



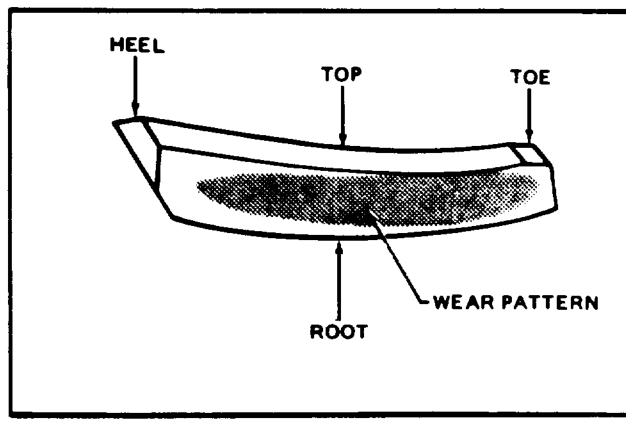
ROOT (CONVEX SIDE)

GEAR P/N 212-040-500-6

VIEW D PATTERN TOLERANCES AT TOE AND HEEL

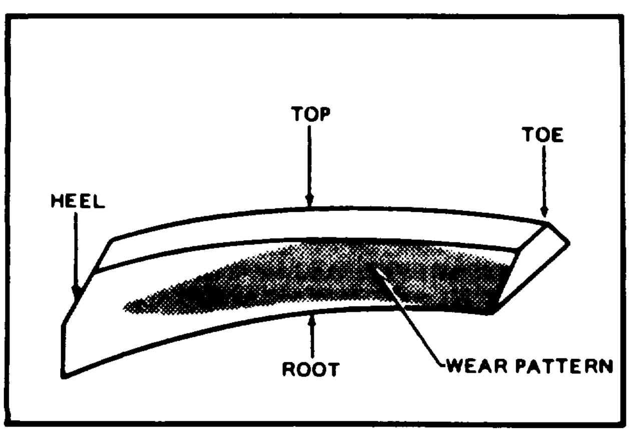


PINION P/N 212-040-500-7

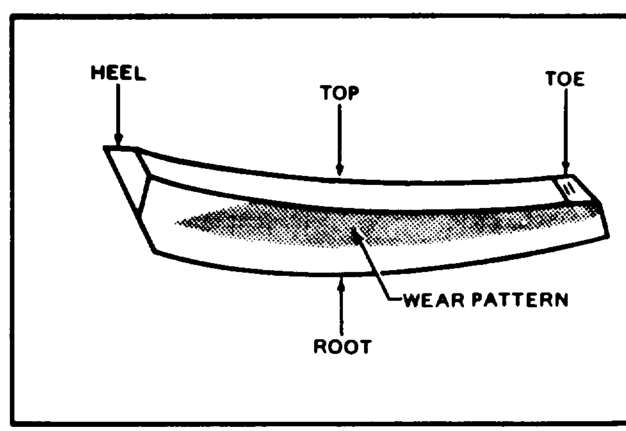


GEAR P/N 212-040-500-6

VIEW E DESIRED WEAR PATTERN



PINION P/N 212-040-500-7



GEAR P/N 212-040-500-6

VIEW F ACCEPTABLE WEAR PATTERN TOUCHING TOE

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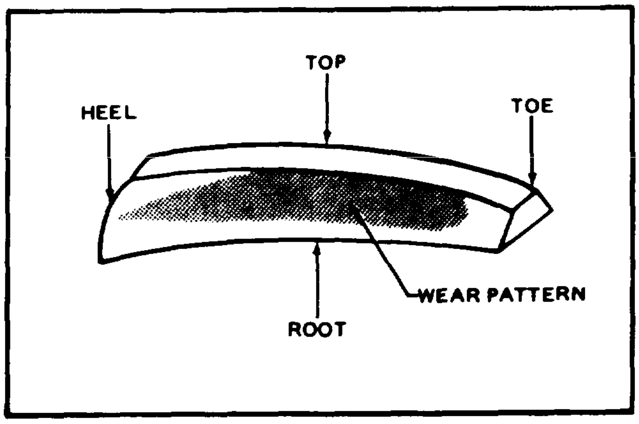
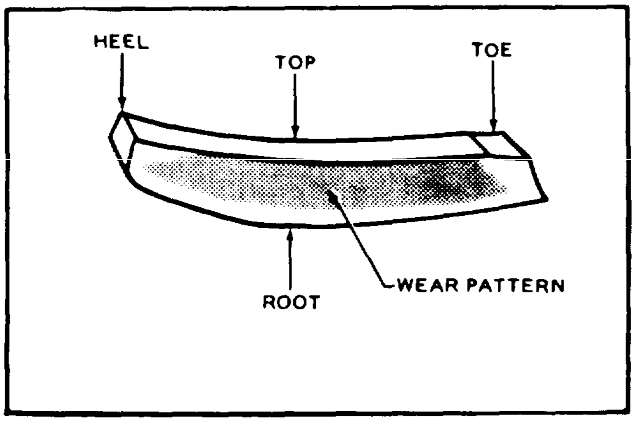
Figure 6-36. Damage Limits — Intermediate Gearbox (Sheet 3 of 7)



PINION P/N 212-040-500-7



GEAR P/N 212-040-500-6

VIEW G ACCEPTABLE WEAR PATTERN

AREA	LIMITS
All ------	No cracks acceptable
Case Assembly Undesignated areas	Mechanical damage and/or corrosion pitting on the case outside "designated" areas is acceptable provided the damage is polished out and the rework to completely remove the damage is within the following limits: 1. Rework is no more than 0.020 inch deep. 2. No more than forty percent of the area within one square inch or more than twenty percent of the total area is damaged. 3. Damaged area must be treated for corrosion protection in accordance with general instructions
A ······	Identification plate legible and securely bonded to case.
B ······	Minor scratches and burrs on external surface of coupling are acceptable if polished out with India stone. Indication of overheating of coupling, such as multi-color appearance, is cause to remove the outer coupling and inspect splines and teeth. Inspection procedure is furnished in text. These limits are also applicable to the coupling on the output quill.
C ······	Corrosion damage in area C may be reparable at higher level of maintenance. If there is evidence of corrosion under shims or around base of studs, send gear box to higher level of maintenance.

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Figure 6-36. Damage Limits — Intermediate Gearbox (Sheet 4 of 7)

AREA	LIMITS
D - - - - - -	Mechanical damage and/or corrosion pitting on case in area D is acceptable provided the damage is polished out and the rework to completely remove the damage is within the following limits: 1. Rework is no more than 0.010 inch deep. 2. No more then twenty percent of the total surface area and no more than ten percent of any one inch square is damaged. 3. Damaged area must be treated for corrosion protection in accordance with general instructions.
E - - - - - -	Mechanical and corrosion damage limits for area E are the same as limits for area D.
F - - - - - -	Mechanical damage and/or corrosion fittings in area F on the lower surface of the case is-acceptable provided the damage is polished out and the rework to completely remove the damage is within the following limits: 1. Rework is no more than 0.030 inch deep. 2. No more than forty percent of area within any one inch square or more than twenty percent of the total surface is damaged. Mechanical damage and/or corrosion pitting on upper machined surface at four mounting bolt holes is acceptable provided the damage is polished out and the rework to completely remove the damage is within the following limits: 1. Rework is no more than 0.020 inch deep. 2. No more than twenty percent of total area is damaged. 3. No more than ten percent of the area contacted by the washer is damaged. 4. Minimum thickness of flange in damaged area is no less than 0.430 inch. S. Damaged area must be treated for corrosion protection in accordance with general instructions. **NOTE** Damage on area F that is in excess of limits noted above maybe reparable at higher level of maintenance. Elongation of four mounting bolt holes is acceptable up to maximum diameter of 0.290 inch.
G - - - - - -	Mechanical damage and/or corrosion pitting on quill sleeves in area G (exclusive of area I and under shim) is acceptable provided the damage is polished out and the rework to completely remove the damage is within the following limits: 1. Rework is no more than 0.030 inch deep.

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Figure 6-36. Damage Limits — Intermediate Gearbox (Sheet 5 of 7)

AREA	LIMITS
	2. No more than forty percent of the area within any one inch square or more then twenty percent of the total area of any surface or diameter is damaged.
	NOTE
	Corrosion damage under shim may be reparable at higher level of maintenance. If there is evidence of corrosion under shim. send gearbox to higher level of maintenance.
H	Mechanical damage and/or corrosion pitting in area H is acceptable provided the damage is polished out l nd the rework to completely remove the damage is within the following limits:
	1. Rework is no more than 0.010 inch deep.
	2. No more than twenty percent of the total area and no more than thirty percent of l ny one inch square is damaged.
	3. No sharp corners that could damage packings are acceptable.
	4. Damaged area must be treated for corrosion protection in accordance with general instructions.
I	Mechanical damage and/or corrosion pitting on the spot faced surface at holes for quill attaching studs is acceptable provided the damage is polished out and the rework to completely remove the damage is within the following limits:
	1. Rework is no more than 0.020 inch deep.
	2. No more than twenty percent of the spot faced area of any hole is pined.
	3. No more then twenty percent of the total area normally contacted by the washer is pitted.
	4. No more than fifty percent of the width of the area normally contacted by the washer may be pitted at any point around the hole.
J - - - - - -	Mechanical and corrosion damage limits for area J are the same as limits for area H.
K	The wear pattern information in this section is applicable to input quill pinions P/N 212-040-600-7 and output quill gear P/N 212-040-500-6. The wear pattern appears on the concave side of the pinion teeth and on the convex side of the gear teeth. Wear patterns on any tooth of the pinion or gear that are defined as unacceptable are cause to replace the intermediate gearbox.
	1. Desired Wear Pattern: The desired wear pattem is shown in view C. A speckled or mottled appearance in the flank of the pinion or top of the gear due to dulite removal is permissible. The wide and not too well defined toe pattern is characteristic of this gear set. The area of the wear pattern in the flank of the gear is very faint and proper lighting must be used in order to see it.

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Figure 6-36. Damage Limits - Intermediate Gearbox (Sheet 6 of 7)

AREA	LIMITS

2. Acceptable Wear Patterns: Examples of acceptable wear patterns are shown in views F and G. These figures show various pattern toe and heel locations.

3. Pattern Limits at Toe: The pattern may touch the toe or be a maximum of 1/8 inch from toe on gear number, see view D. Usually, the pattern will touch the toe in the flank of the pinion and at the top of the gear as shown on view F. If the pattern touches the toe, but is more than 1/8 inch from heel on gear member, then the pattern is off the toe and is unacceptable. This method of inspection must be used, due to the wide toe pattern, to determine whether the pattern is just touching the toe or is running off the toe. If pattern variation at the toe exceeds 1/32 inch, it is unacceptable.

4. Pattern Limits at Heel: The pattern may touch the heel or be maximum of 1/8 inch from heel on gear member, see view D. If pattern variation of the heel exceeds 1/32 inch it is unacceptable.

5. Pattern Profile: The pattern in the profile direction must touch or extend over the top of the pinion as shown by views E, F, and G. On the gear, the pattern may be 1/32 inch from the top or may extend over the top. Most of the gear patterns will extend over the top as shown by views E, F, and G. A bright line occurring at the top of pinion or in the flank of the gear is unacceptable.

6. In addition to pattern size and location, examine the drive face of all gear teeth for the following unacceptable defects: non-dean up, grinding scratches, pitting, corrosion, cuts, nicks, dents, grinding flats or barber poling (evidenced by diagonal streaks in the wear pattern), scuffing, scoring, or inclusions. If any of these defects can be felt with a scribe having a 0.002 inch radius spherical point, the affected part is unacceptable.

GENERAL INSTRUCTIONS.

Repair mechanical and corrosion damage to ease and quill sleeve as follows:

1. Polish out corrosion damage to completely dean up surface. Use sandpaper (C102) or crocus cloth (C37). Blend repair in with surrounding surface and make minimum radius 0.250 inch. Use 400 grit abrasive paper (C102) to make repair area surface 63 microinches or better. Ensure that depth and/or area of repair does not exceed acceptable limits specified for the areas designated above. Treat reworked areas for corrosion protection with MIL-M-3171 C, Type VI treatment (commercial designation Dow No. 19) (C42). Refer to TM 43-0105 for application procedures. Prime all rework areas that were painted prior to repair. Use polyamide epoxy primer (C88). Paint to match existing finish.

2. Polish out mechanical damage to depth to remove all traces of the damage. Finish polishing out with 400 grit abrasive paper (C102) to blend repair smoothly into surrounding surface. Ensure that damage does not exceed acceptable limits. Apply corrosion protection, prime, and paint in the same manner as described in preceding step.

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Figure 6-36. Damage Limits — Intermediate Gearbox (Sheet 7 of 7)

h. Inspect sight glass (8) for damage that could cause leakage and for staining that would prevent seeing oil level.

i. Inspect shims (18) for secure installation on tail boom,

j. If quill or quills are removed, refer to paragraph 6-110 for inspection procedure for gear wear patterns.

k. Inspect couplings for mechanical damage and for evidence of overheating. Refer to paragraph 6-110 if overheating is suspected.

6-103. SPECIAL INSPECTION — INTERMEDIATE GEARBOX.

NOTE

Special inspections of intermediate gearbox are required after tail rotor drive system overtorque, sudden stoppage, compressor stall, etc. Refer to paragraph 1-55, Special Inspection.

Remove output quill from intermediate gearbox (paragraph 6-108).

b. Inspect output quill gear teeth for scoring. See figure 6-36 for procedure to check teeth for roughness with a scribe having a 0.002 inch spherical point.

c. Inspect output quill gear teeth for wear patterns outside acceptable limits. See figure 6-36 for instructions to evaluate gear patterns.

d. If scoring, abnormal wear patterns, or other discrepancies are detected, send gearbox to next higher maintenance level.

6-104. REPAIR — INTERMEDIATE GEARBOX.

Replace gearbox if damaged in excess of acceptable limits (paragraphs 6-102 and 6-103).

b. Repair leaking quills by replacing seals or packings (paragraph 6-111).

c. Replace oil filler cap and packing if damaged or unserviceable. If filler cap contains an insufficient amount of aluminum wool, replace as follows:

(1) Remove pin (1, figure 6-37) from cap (10).

(2) Remove ring (11), cap (10), and spring assembly (9) from plug (7).

(3) Remove packing (8) from plug (7). Discard packing.

(4) Remove ring spiralox (4), washer (5), and packing (6) from plug (7). Discard packing (6).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(5) Clean parts with solvent (C112).

(6) Fill plug (7) with new aluminum wool packing (6) (C20) and place washer (5) in plug. Check to determine whether correct amount of aluminum wool is installed. Push washer (5) inward 0.06 inch. If washer springs back to its original position, the correct amount of aluminum wool is installed. Add or remove aluminum wool as required. Secure washer (5) in plats with ring spiralox (4).

(7) Coat packing (8) with oil (C79 (C79A) or C80) and position packing on plug (7).

(8) Install spring assembly (9), cap (10), and ring (11) on plug (7). Insert pin (1) through cap (10) and bend end of pin to secure.

d. Replace sight glass (8, figure 6-34) if damaged or leaking.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(1) Remove retaining ring (6, figure 6-34), packing (7), sight glass (8), and sight gage (9). Clean sight gage (9) with solvent (C112).

(2) Position sight gage (9) in gearbox. Place new packing (7) on sight glass (8). Install sight glass with flat side out. Install retaining ring (6).

e. Polish out mechanical and corrosion damage on gearbox case that is within limits shown on figure 6-36. Comply with "General Instructions" on figure 6-36.

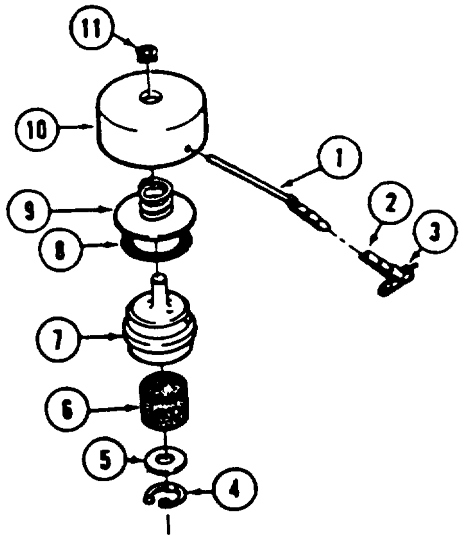
f. Replace gasket (1, figure 6-34) if leaking. Torque self-closing valve (2) 120 TO 150 inch-pounds and secure with lockwire (C137).

g. For helicopters with MWO 1-1520-236-50-30, replace packing (28), if leaking. Torque self closing valve to 45 to 50 inch-pounds and secure with lockwire (C137).

6-105. INSTALLATION - INTERMEDIATE GEARBOX.

CAUTION

Do not remove or change shims installed on tailboom under gearbox, as any resulting misalignment could cause excessive stresses, vibration, wear, and possible eventual failure of components in tail rotor drive train.



1. Pin
2. Chain
3. Pin (safety)
4. Ring spiralox
5. Washer
6. Packing (aluminum wool)
7. plug
8. Packing
9. Spring assembly
10. Cap
11. Ring

214040-12C

Figure 6-37. Oil Filler Cap Assembly

a. If gearbox is replacement for helicopter with MWO 1-1520-236-50-30, replace the chip detector. (See figure 6-34).

(1) Remove chip detector (4), packing (3), valve (2), and gasket (1).

CAUTION

Do not overtorque valve (2). Overtorque can distort or crush light metal housing.

(2) Install new packing (28) on self-dosing valve (27) and install in gearbox. Torque valve to 45-55 inch-pounds and lockwire (C137).

(3) Install new packing (26) on chip detector probe (25) and install chip detector probe.

b. Apply primer (C88 or C91) to mating surfaces of gearbox (15, figure 6-34, shims (18) and tailboom (16).

c. Position intermediate gearbox, with oil sight gage and chip detector at right side, on tailboom. Ensure that hole in gearbox ease is positioned over alignment pin (17).

NOTE

Steel washers (13) may be removed or added to ensure proper thread engagement. Minimum acceptable washers is one steel and one aluminum with steel washer under bolt head.

d. Install four bolts (12) with steel washers (13) next to bolt heads and aluminum washers (14) next to gearbox. Torque bolts evenly 50-70 inch-pounds. Secure bolts with lockwire (C137). Lockwire left rear bolt to left forward bolt. Lockwire right rear bolt to drain plug, then lockwire right forward bolt to drain plug. Cover the four-mounting bolt heads with Proseal (C105) to prevent moisture from standing on or entering bolt holes.

WARNING

Ensure that flexible coupling is properly lubricated prior to installation of drive-shaft (paragraph 1-29).

e. Install driveshafts (paragraph 6-81).

f. Connect electrical wire to chip detector (4) with nut (5). Do not over torque nut (5). Aircraft with ODDS: connect electrical wire to chip detector (25).

6-106. INTERMEDIATE GEARBOX QUILLS.

6-107. DESCRIPTION - INTERMEDIATE GEARBOX QUILLS.

The intermediate gearbox input and output quills consist of a pinion gear bearing mounted in a sleeve. Each quill has a flexible coupling for attachment of driveshafts. The output quill has an oil collector cone installed on the inboard end of the pinion gear.

6-108. REMOVAL - INTERMEDIATE GEARBOX QUILLS.

Premaintenance Requirements for Removal of Intermediate Gearbox Quills

Conditions	Requirements
Model	AH-1P/E/F
Part No. or Serial No.	All
Special Tools	(T26) (T27) (T37) (T55)
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	One
Consumable Materials	(C56) (C106) (C112) (C116) (C137)
Special Environmental Conditions	None

a. Remove gearbox and drain oil (paragraph 6-99).

NOTE

Either quill can be removed using the following procedures.

b. Remove nuts (23, figure 6-34) and aluminum and steel washers (21 and 22).

c. Cut sealant around quill sleeve and gearbox case with a sharp plastic scraper. Remove sealant, or lockwire, plugs, and gasket from jackscrew holes.

d. Install three jackscrews (T27) in jackscrew holes in quill sleeve, Tighten jackscrews evenly to pull quill from case.

NOTE

Do not remove shims from quill sleeve or from gearbox case.

e. Cover opening in gear case port to prevent entry of foreign material.

6-109. CLEANING — INTERMEDIATE GEARBOX QUILLS.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contacts with skin or eyes.

CAUTION

Do not force dirt or solvent into bearings or flexible couplings by use of compressed air.

a. Prior to cleaning inspect quills for evidence of oil and/or grease leakage (paragraph 6-110).

b. Clean exterior of quill with solvent (C112).

c. Clean sealant from quill sleeve and gearbox case with a plastic scraper.

NOTE

The following cleaning pertains to a disassembled quill. Do not use cleaning solvent inside couplings. Solvent leaves residue .

d. Use a clean dry cloth to clean lubricant from inner and outer coupling.

e. Clean old sealant from bearing retaining nut and reside of quill sleeve with a plastic scraper. Ensure that sealant does not contaminate quill bearings.

6-110. INSPECTION - INTERMEDIATE GEARBOX QUILLS.

a. Inspect quills for evidence of oil leakage at seal (13, figure 6-35).

b. Inspect quills for evidence of grease leakage at seal (12).

c. Inspect inner couplings (10) on both quills for wear and damage on surface contacted by seal (13) during operation. Wear is allowable to minimum diameter of 1.587 inches, provided groove is uniform and smooth.

d. Inspect outer coupling (11) on input and output quills for discoloration due to overheating. If the coupling has a multi-color appearance, disassemble the coupling and inspect splines and teeth as outlined in step g.

e. Inspect outer couplings (11) on input and output quills for scratches, nicks, dents, and cracks. Minor damage that can be polished out with fine India stone (C116) is acceptable.

f. Inspect seals (12) on input and output quills for protrusion, leakage, cuts, tears, and deterioration.

g. Disassemble outer couplings (11) from inner couplings (10) and inspect as follows:

(1) Remove retaining ring (1). At the same time, hold seal plate (2) against spring pressure.

(2) Remove seal plate (2) and centering spring (3). Inspect input coupling centering spring (3) by applying a test load of 5.0 ± 0.5 pounds to compress spring to 1.50 ± 0.03 inches, release test load; spring should return to free length of 2.00 ± 0.03 inches. Inspect output coupling centering spring (3) by applying a test load of 15.0 ± 2.0 pounds to compress spring to 1.17 ± 0.03 inches, release test load, spring should return to free length of 2.00 ± 0.03 inches. Replace springs that do not meet above test.

CAUTION

Do not use cleaning solvent Inside coupling. Solvent leaves residue.

(3) Hold outer coupling (11) at full outboard position, and use clean, lint-free cloth to remove all old grease. Clean coupling splines thoroughly.

(4) Inspect inner coupling (10) and outer coupling (11) per paragraph 6-128.1.

(5) Lubricate and assemble outer coupling (11) and inner coupling (10) (paragraph 6-111).

h. inspect teeth on input quill pinion and output quill gear for abnormal wear patterns, roughness, and cracks. See figure 6-36 for instructions to perform this inspection.

i. Inspect quill sleeves for mechanical and corrosion damage. See figure 6-36 for damage limits and instructions to rework damaged quills.

6-111. REPAIR — INTERMEDIATE GEARBOX QUILLS.

a. Replace quills (or intermediate gearbox if required) that have damage in excess of limits noted in paragraph 6-110.

b. Polish out mechanical and corrosion damage that is within limits shown on figure 6-36. Comply with “General Instructions” on figure 6-36.

c. Disassemble quill as follows:

(1) Remove retaining ring (1, figure 6-35), plate (2), centering spring (3), lock spring (4), and spacer (5).

(2) Remove retainer (6) with packing (7). If retainer is difficult to remove, install a 1/4-20 threaded bolt in center of retainer and pull on bolt to withdraw retainer. Remove packing.

(3) Install wrench assembly (T26) on outer coupling (11). Insert a square-drive tool through wrench and remove retaining bolt (8) and washer (9).

(4) Remove and separate inner and outer couplings (10 and 11). Remove seal (12) from outer coupling.

(5) Position holding plate (T37) on quill sleeve (16) with pins engaged in bolt holes. Remove lockwire and use wrench (T55) to remove bearing retaining nut (14). Remove packing (15) and press seal (13) from nut.

(6) Clean disassembled quill (paragraph 6-109).

(7) Inspect disassembled quill (paragraph 6-110).

d. Assemble quill as follows:

(1) Apply sealant (C107) to outside diameter of seal (13). Press seal into bearing retaining nut (14) from outboard side, with lip of seal facing inboard. Place new packing (15) on nut.

(2) Position holding plate (T37) on quill sleeve (16) with pins engaged in bolt holes. Coat threads of bearing retaining nut (14) with oil used in gearbox and start into sleeve. Use wrench (T55) to torque nut 1200 TO 1800 inch-pounds. Remove tools. Secure nut to sleeve with lockwire (C137).

(3) Examine inner coupling (10) for damage or wear on surface contacted by seal (12). Polish out any minor nicks. dents, burrs or scratches. Wear is allowable to minimum diameter of 1.587 inches, if groove is uniform and smooth.

(4) Install new seal (12) onto outer coupling (11) with lip of seal facing outboard. Place a small amount of grease (C56) on internal splines of coupling Insert inner coupling (10) into outer coupling (11).

(5) Position coupling assembly on splined shaft of gear (17). Place washer (9) on retaining bolt (8), coat bolt threads with oil and start into end of gear shaft. Hold outer coupling (11) with wrench T26) and use a square-drive extension to torque retaining bolt (8) 960 TO 1200 inch-pounds.

(6) Coal internal splines of outer coupling with grease (C56) to 0.12 inch depth over top of spline teeth.

CAUTION

Input quill spring retainer (6) (204-040-607-7) and output quill spring retainer (18) (204-040-607-5) are not interchangeable.

Input quill pinion (17) (212-040-500-7) and output quill gear (not Illustrated) (212-040-500-6) are not interchangeable.

Be sure correct part number is installed in each quill.

(7) Place packing (7) on retainer (6). Insert retainer into retaining bolt (8). Check for alignment of one hole in rim of retainer with a notch in each of inner coupling (10). If necessary, reposition retainer by one-fourth turn increments to obtain alignment.

(8) Place spacer (5) into retainer (6). Install lock spring (4) with tang through aligned hole and notch. Place small end of centering spring (3) on boss of plate (2). and insert large end of spring into retainer. Compress plate into coupling and secure with retaining ring (1).

(9) Hold quill sleeve and manually turn coupling. Check for smooth rotation of gear with only a very light drag caused by preload of bearings.

6-112. INSTALLATION - INTERMEDIATE GEARBOX QUILLS.

a. Remove gearbox port cover.

NOTE

Output drive quill has conical oil collector projecting from center of gear.

b. Ensure that input drive quill is installed in forward port of gear case and output drive quill is installed in aft port of gear case.

c. Install new pecking (19, figure 6-34) on quill (20). Carefully align holes in mounting flange of sleeve with studs on gearbox and position flange.

d. Install aluminum washer (21), steel washer (22) and nut (23) on each stud. Manually check meshing of gears while tightening nuts evenly to seat quill sleeve flange on gear case. Torque nuts 50 TO 70 inch-pounds.

e. Check backlash between mating teeth by slight beck l nd forth rotary movement of quill coupling until metal-to-metal contact is felt and heard. Backlash must be evident.

NOTE

Backlash has been permanently set with shims during manufacture. Measurement is not required. Do not change shims on gearbox quill case.

f. Apply a bead of sealant (C105) around joint of quill flange gearbox, and install plugs (MS24391D2L) and gaskets (MS28777-2) in jackscrew holes and lockwire (C137).

g. Install and service gearbox. Refer to paragraph 6-105.

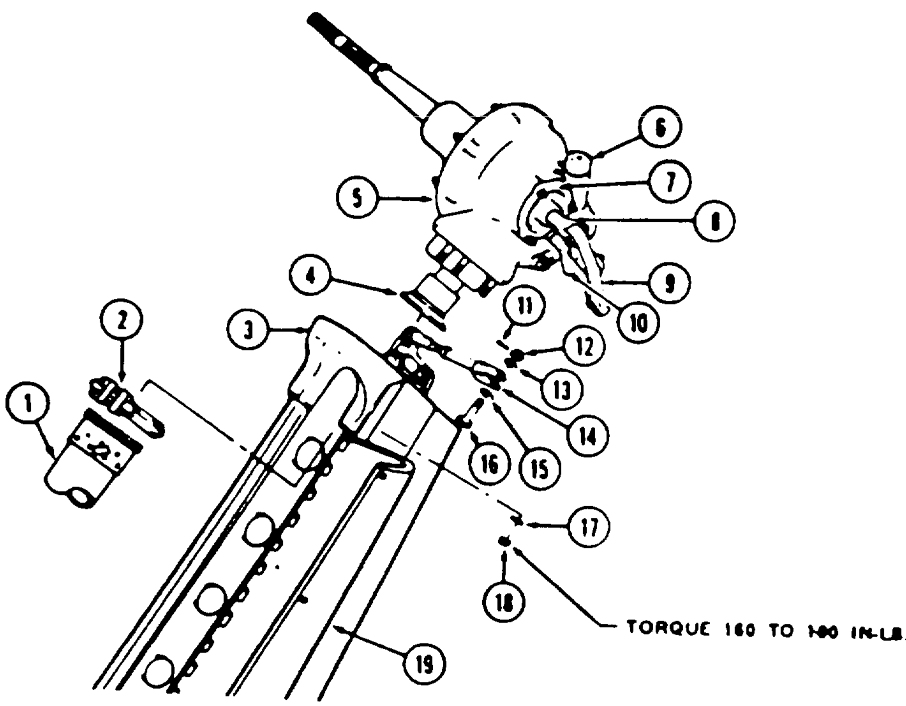
SECTION VI. TAIL ROTOR DRIVE GEARBOX

6-113. TAIL ROTOR DRIVE GEARBOX.

6-114. DESCRIPTION - TAIL ROTOR DRIVE GEARBOX .

A gearbox at top of tailboom vertical fin provides ninety-degree change in direction of drive and speed reduction between the input driveshaft and the output shaft on which the tail rotor is mounted. The gearbox consists of mating input and output gear quill assemblies set into gear case provided with a breather-type oil filler cap, oil level sight gage, and a drain plug with a chip detector. The input quill has a flexible coupling for attachment of driveshaft. Control linkage is attached on the left side, with a control rod extending through the rotor shaft.

On helicopters without MWO 1-1520-236-50-30, the chip detector is straight and includes a threaded-stud electrical termination. On helicopters with MWO 1-1520-236-50-30, the chip detector is right-angled and includes an electrical receptacle. Chip detector is connected electrically to 90° CHIP light on the caution panel.



1. Driveshaft
2. Clamp
3. Tail rotor gearbox support fitting
4. Coupling rotor
5. Tail rotor gearbox
6. Filler cap
7. Tail rotor control housing
8. Control lube
9. Lever
10. Idler
11. Cotter pin
12. Nut
13. Steel washer
14. Link
15. Steel washer
16. Bolt
17. Thin steel washer
18. Nut
19. Vertical fin cover

Figure 6-38. Tail Rotor Drive Gearbox Installation

6-115. INSPECTION - INSTALLED TAIL ROTOR DRIVE GEARBOX.

NOTE

External leakage is not permitted around seal; however, a small amount of seepage is permissable and does not indicate an unsatisfactory seal condition. Condition flow (droplets) is considered excessive and requires seal replacement.

a. Open vertical fin cover (19, figure 6-38) and remove tail rotor gearbox covers (fairings).

b. Shake gearbox and check for looseness on tail rotor gearbox support fitting (3).

c. Inspect for evidence of fretting corrosion at mating surface between tail rotor gearbox (5) and tail rotor gearbox support fitting (3) that could be caused by movement of the gearbox on the support. A gray residue is an indication of fretting. Remove gearbox if residue is present (paragraph 6-117).

d. Inspect six nuts (18) for secure installation, correct torque, and correct thread engagement (paragraph 6-121).

e. Inspect clamp set (2) for secure installation.

f. Inspect control tube (8) and lever (9) for secure installation.

g. Inspect flexible coupling (4) for grease leakage and for overheating evidenced by multi-color appearance.

h. Inspect tail rotor gearbox (5) for scratches, nicks, dents. cracks. corrosion, and oil leakage.

i. Disconnect electrical wire or cable plug from chip detector.

j. Press in and turn counterclockwise to remove chip detector probe (11 or 23, figure 6-39).

k. Inspect for magnetic particle buildup. Retain debris. Clean, install, and connect the probe.

1. If chip detector is being inspected following chip light, collect debris for classification (paragraph 6-98.1).

m. Inspect oil filler cap (4) for damage and correct amount of aluminum wool (paragraph 6-104).

n. Inspect oil sight glass (8) for correct oil level.

NOTE

Before installing tail rotor gearbox fairings, ensure that the isolation pad Is securely attached (Figure 2-93). Ensure fairing attachment hard-ware are installed in the proper locations; use of incorrect length screws can damage gearbox casing.

o. Install tail rotor gearbox fairings and close vertical fin cover (19, figure 6-38).

6-115.1. DISASSEMBLY - TAIL ROTOR GEARBOX INPUT QUILL (SEAL REPLACEMENT WITH GEARBOX INSTALLED ON HELICOPTER).

a. Drain oil from tail rotor gearbox. (Refer to paragraph 1-7.)

b. Open access cover on front of vertical fin.

WARNING

Secure the tail rotor blades to prevent prevent personal injury and equipment damage any time a segment of the tail rotor drive system is disconnected. The tail rotor blades may cause uncontrolled system rotation should there be a sudden gust of wind when they are not secured.

CAUTION

Clamp set must be removed from both ends of shaft before removing either end of shaft from its mating curvic coupling to avoid coupling tooth or bearing damage.

NOTE

Retain clamp set as a unit when removed to preclude intermix of set halves.

c. Remove clampset from curvic couplings (both ends of shaft).

d. Push shaft against coupling to disengage opposite end and remove driveshaft.

e. Remove curvic coupling as follows (figure 6-40).

(1) Remove retaining ring (18), plate (17), centering spring (16) and spacer (14). Thread a 1/4-20 bolt into center of retainer plug (13) and pull retainer with lockspring (15) and packing (12) from inner coupling. Remove lockspring and packing from retainer.

(2) Hold outer coupling (1) with wrench, (T26) and use square adapter through wrench to remove coupling retaining bolt (11) and washer (10).

(3) Remove inner coupling (9) and outer coupling (1) from pinion splines.

(4) Remove inner coupling (9) from outer coupling (1). Remove seal (2) from outer coupling (1).

f. Remove sealer and lockwire from retaining nut (4). Remove nut (4) using special socket (68SPL-12757-0136) or tool, (T36). Remove spacer assembly (21) on pinion splines.

g. Remove packing (5) from nut (4).

h. Press seal (3) from retaining nut (4).

6-115.2. ASSEMBLY - TAIL ROTOR DRIVE GEARBOX INPUT QUILL.

NOTE

Replace all removed seals and packings with new items

a. Install spacer assembly (21) on pinion splines.

NOTE

Large end of spacer assembly goes Inboard (toward gearbox).

b. Press seal (3) into retainer nut (4) with lip of seal facing inboard (toward gearbox). Apply sealant (C105) to outside diameter of seal (3). Install packing (5) an nut (4).

c. Using special socket 68SPL-12757-0136, install nut (4). Torque nut 100 TO 150 foot-pounds. Lockwire (C137) nut (4) to sleeve. Apply a bead of sealer (C104) around mating joint of nut and sleeve.

d. Lubricate O.D. of seal (2) with grease (C56) and press into outer coupling (1) with lip of seal facing toward coupling splines.

e. Place a small amount of grease (C56) in internal splines of coupling (1), on lip of seal (2) and mating surface of coupling (9). Insert coupling (9) into coupling (1).

f. install couplings (9) and (1) on splines of pinion shaft (6).

g. Place washer (10) on bolt (11) and thread bolt into pinion shaft (6).

h. Hold outer coupling (1) with wrench, T101307. Position square adapter through wrench and torque bolt (11) 80 TO 100 foot-pounds.

i. Place packing (12) on retainer (13). Insert retainer into bolt (11). If one hole in rim of retainer does not align with notch of inner coupling (9), pull out retainer, rotate it ninety degrees and reinstall. Repeat if necessary to obtain alignment. Install lock spring (15).

j. Extend outer coupling (1) so that seal (2) is against the teeth of inner coupling (9). Coat internal splines of outer coupling with grease (C56) to 0.12 inch depth overtop of spline teeth.

k. Place small end of centering spring (16) on boss of plate (17). Install spacer (14), spring (16) and plate (17) into coupling and install retaining ring (18).

l. Install drive shaft by pushing shaft against one coupling while mating shaft couplings with gearbox couplings.

m. Install damp set at each end of shaft as follows:

CAUTION

Use new nuts each time clamps are installed.

NOTE

Insure damp halves are matched. All bolts and nuts on anyone clamp must be Identical parts to maintain balance.

(1) Position damps with bolted joints indexed 90 degrees to those of adjacent damps for balance in operation.

(2) Install four bolts with heads in direction of rotation of tail rotor driveshaft. Start four new nuts on damp bolts to obtain complete thread engagement in nut.

(3) Measure and record tare torque for each nut.

(4) Torque each nut in sequence illustrated (Figure 6-29, View C) 30 TO 35 inch-pounds above tare torque recorded in proceeding step. Keep end gaps of damp set equal within 0.020 inch.

(5) Tap lightly around outer surface of damp with fiber mallet and recheck torque.

n. Service tail rotor gearbox with oil to proper level. (Refer to paragraph 1-7.)

o. Close access cover on vertical fin.

6-116. LUBRICATION — TAIL ROTOR DRIVE GEARBOX.

a. Service gearbox with oil to proper level (paragraph 1-6).

b. Remove driveshaft (paragraph 6-77).

c. Lubricate gearbox flexible coupling as follows:

(1) Remove retaining ring (18, figure 6-40) while holding seal plate (17) against spring pressure.

(2) Remove seal plate (17), spring (16), and spacer (14).

CAUTION

Do not use cleaning solvent inside coupling. Solvent leaves residue.

(3) Hold couplings at full outward position. Remove old grease as thoroughly as possible using dean cloths.

(4) Inspect inner coupling (9, figure 6-40) and outer coupling (1) per paragraph 6-128.1.

(5) Hand pack grease (C56) to 0.12 inch depth over top of internal spline teeth.

(6) Ensure that retainer plug (13) and lock spring (15) are properly installed. Keep outer coupling (1) at full outboard position. Install spacer (14), spring (16), plate (17) and retaining ring (18).

6-117. REMOVAL — TAIL ROTOR DRIVE GEARBOX.

a. Remove tail rotor (paragraph 5-81).

b. Disconnect control link (14, figure 6-38) from lever (9).

c. Disconnect electrical lead or connector from chip detector (11 or 23, figure 6-39).

d. Open rover on front of vertical fin driveshaft (paragraph 6-77).

e. Remove six nuts (18, figure 6-38) and thin steel washers (17). Remove gearbox from tail rotor gearbox support fitting (3).

f. Install spacers, thin steel washers (17) and nuts (18) on gearbox studs to hold input quill in gearbox while the gearbox is removed from the helicopter.

g. If the gearbox is not to be reinstalled, remove lever (9), idler (10), control tube (8), and tail rotor control housing (7). If gearbox is removed from helicopter with MWO 1-1520-236-50-30, remove chip detector probe (23, figure 6-39), packing (24), valve (25), and packing (26). Install gasket (14) on valve (13) and install valve (13) in gearbox. Install packing (12) on chip detector (11) and install in valve. Install a cover fabricated from plywood or similar material to cover port where control housing was removed.

6-118. CLEANING — TAIL ROTOR DRIVE GEARBOX.

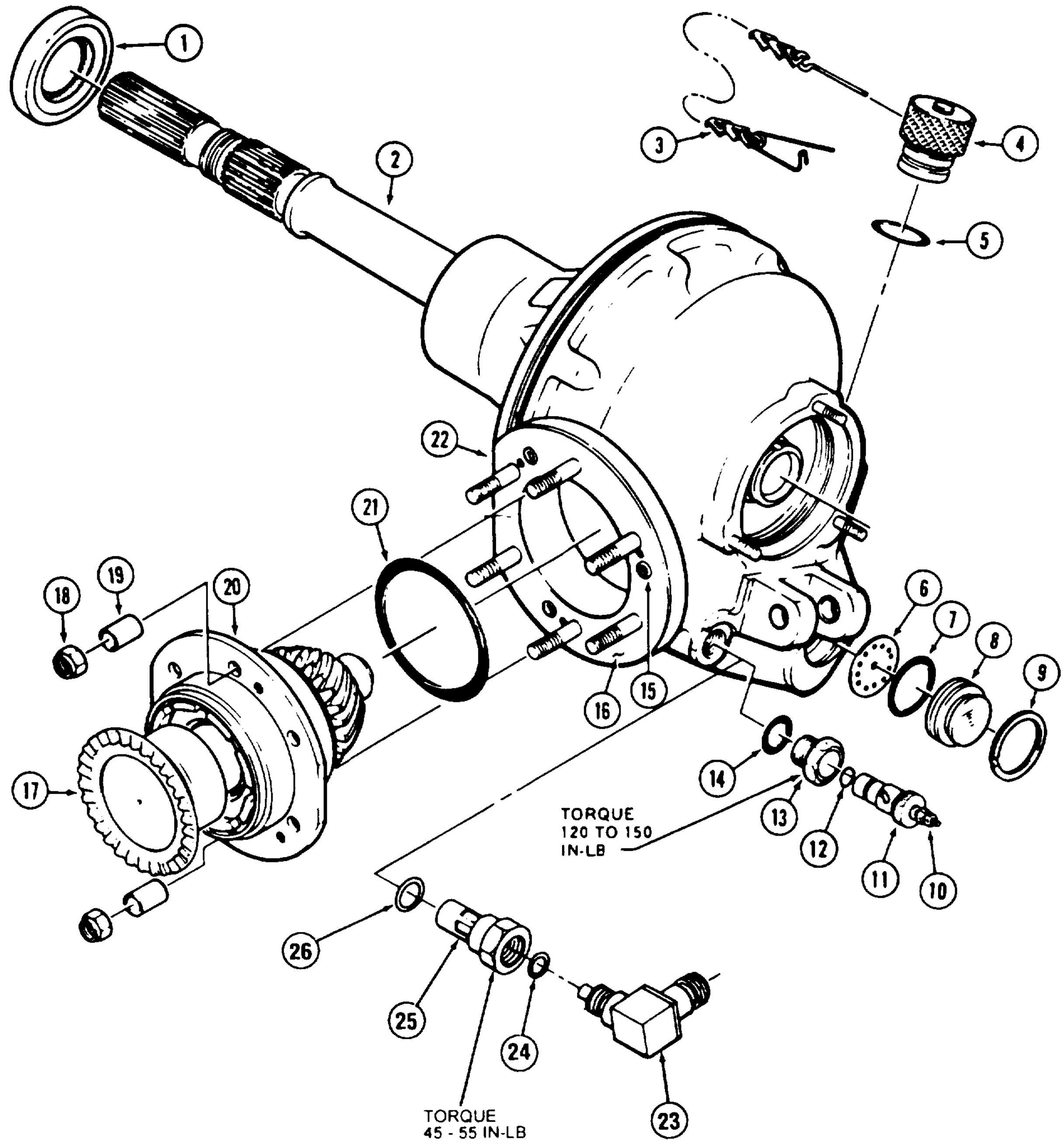
WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

CAUTION

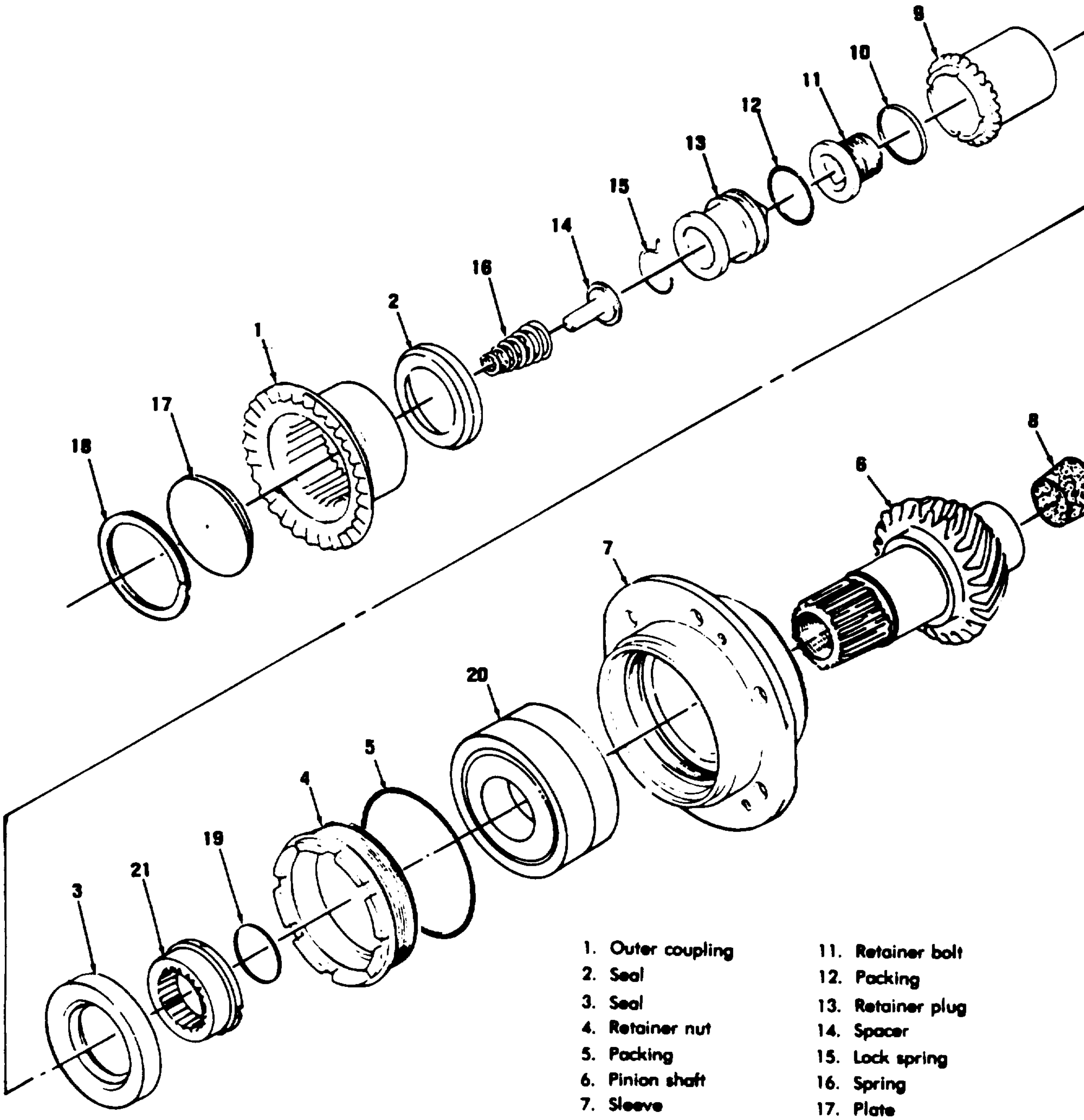
Do not permit solvent or dirt to be forced into flexible coupling when using compressed air.

Clean exterior of gearbox and removed parts with solvent (C112).



1. Seal
2. Output shaft
3. Chain and pin
4. Cap
5. Packing
6. Oil level indicator
7. Packing
8. Sight glass
9. Retaining ring
10. Nut
11. Chip detector
12. Packing
13. Chip detector self-closing valve
14. Gasket
15. Screw
16. Shim
17. Flexible coupling
18. Nut
19. Shipping spacer
20. Input quill
21. Packing
22. Case
23. Chip detector probe (ODDS)
24. Packing (ODDS)
25. Valve (ODDS)
26. Packing (ODDS)

Figure 6-39. Tail Rotor Drive Gearbox Assembly



1. Outer coupling
2. Seal
3. Seal
4. Retainer nut
5. Packing
6. Pinion shaft
7. Sleeve
8. Cork
9. Inner coupling
10. Washer

11. Retainer bolt
12. Packing
13. Retainer plug
14. Spacer
15. Lock spring
16. Spring
17. Plate
18. Retaining ring
19. Packing
20. Bearing
21. Spacer assy.

Figure 6-40. Tall Rotor Drive Gearbox Input Quill

6-119. INSPECTION - TAIL ROTOR DRIVE GEARBOX (GEARBOX REMOVED FROM HELICOPTER).

a. Inspect chip detector (11 or 23, figure 6-39) for metal particles. If particles are found, refer to paragraph 6-4 to determine required action.

b. Inspect oil filler cap (4) for damage and correct amount of aluminum wool (paragraph 6-104).

c. Inspect gearbox for damage in accordance with figure 6-41.

6-120. REPAIR - TAIL ROTOR DRIVE GEARBOX.

a. Forward gearbox to next higher maintenance level if damage in excess of acceptable limits is detected during inspection.

b. Polish out mechanical and corrosion damage that is within acceptable limits shown on figure 6-41. Treat rework areas for corrosion protection and touch-up as outlined on figure 6-41.

c. Replace leaking seals and/or packings (paragraph 6-127).

d. Replace oil filler cap (4, figure 6-39) and packing (5) if damaged or unserviceable. If filler cap contains an insufficient amount of aluminum wool, replace wool. Refer to paragraph 6-104.

e. Replace sight glass (8) if damaged, discolored or leaking.

(1) Remove retaining ring (9), sight glass (8). packing (7) and oil level indicator (6). Clean parts.

(2) Position oil level indicator (6) in gearbox port. Place packing (7) in groove around sight glass (8). Install glass with fiat side out and secure with retaining ring (9).

6-121. INSTALLATION - TAIL ROTOR DRIVE GEARBOX.

CAUTION

Prior to installation of tail rotor gearbox ensure that splined coupling has been properly lubricated in accordance with paragraph 6-116.

CAUTION

Prior to installation of tail rotor drive gearbox ensure that lubricating oil or preservative oil has been drained. Service gearbox with new lubricating oil after installation.

a. If gearbox is replacement on helicopter with MWO 1-1520-236-50-30, replace the chip detector. (See figure 6-39.)

(1) Remove chip detector (11), packing (12), valve (13), and gasket (14).

CAUTION

Do not overtorque valve (40). Overtorque can distort or crush light metal housing.

(2) Install new packing (26) and self-closing valve (25) in gearbox housing. Torque valve to 45 to 55 inch-pounds and lockwire (C137)

(3) Install new packing (24) on chip detector probe (23) and install probe in valve.

b. Remove sealant from mating surfaces of gearbox and tail rotor gearbox support fitting (3, figure 6-38) using plastic scraper.

NOTE

Spacers removed in following step are used to hold input quill in gearbox when the gearbox is removed from the helicopter. The spacers are not used on an installed gearbox.

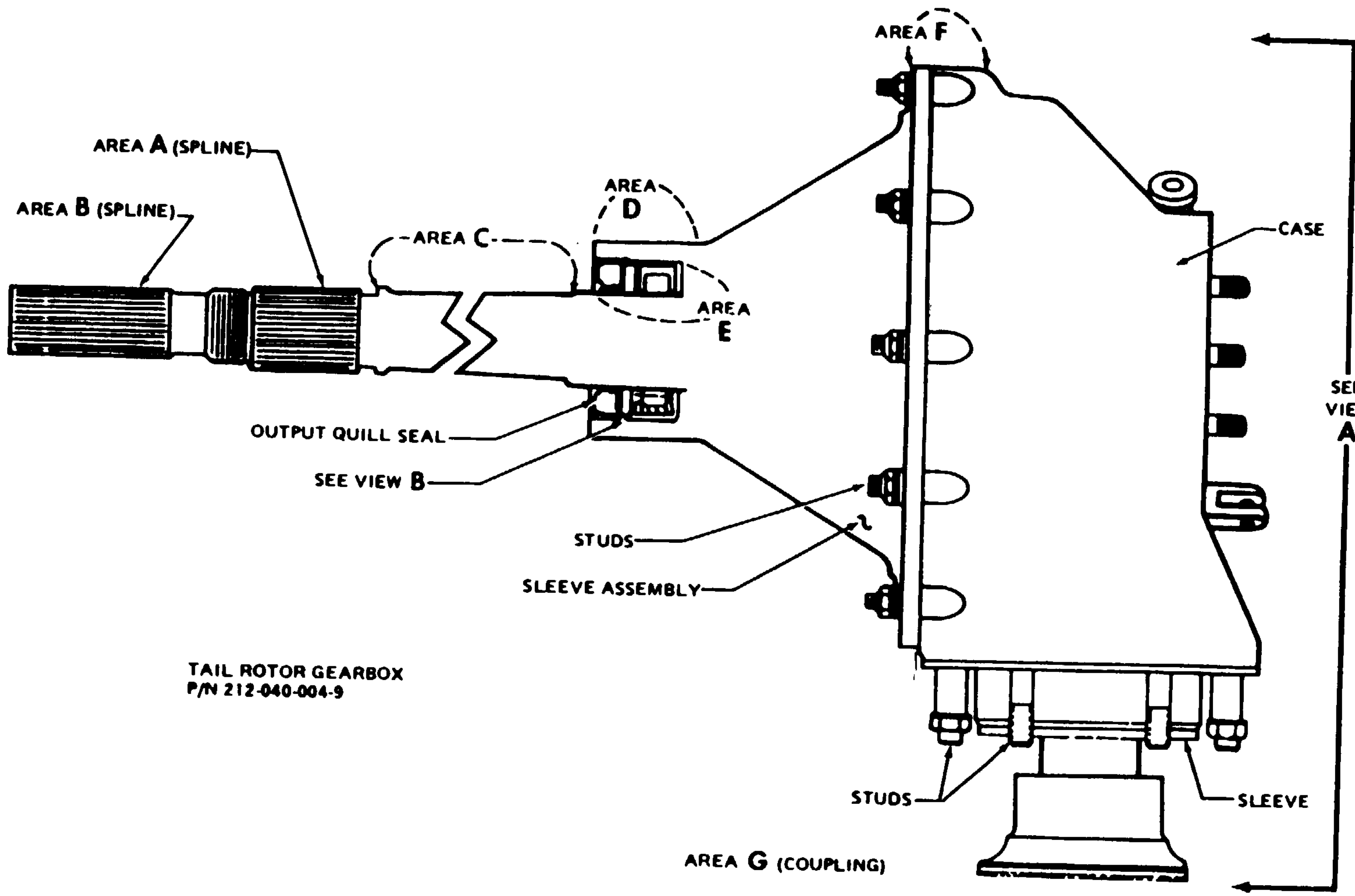
c. Remove nuts (18), thin steel washers (17), and spacers (not illustrated) from studs a round input drive quill. Apply primer (C88 or C91) to mating surfaces of tail rotor drive gearbox (5) and to tail rotor drive gearbox support fitting (3).

d. Position tail rotor drive (5) on tail rotor gearbox drive support fitting (3) with coupling (4) and mounting studs through holes in support fitting. Install one thin steel washer (17) and nut (18) on each stud. Torque nuts evenly in a star pattern to 160 TO 190 inch-pounds. Repeat the torque pattern until all nuts retain the torque that was initially applied to the first nut in the pattern. The torque valve of the first nut will decrease as the other nuts are torqued. Ensure that a minimum of two thread pitches, including the chamfer, extend through nuts (18). Ensure that the nuts do not bottom on the grip portion of the studs. Use additional thin steel washers (17) or standard steel washers if required. Apply sealant (C105) around edges of mating surfaces of gearbox and support fitting to prevent corrosion .

WARNING

Ensure that flexible coupling is properly lubricated prior to installation of driveshaft (paragraph 1-29).

e. Install driveshaft (paragraph 6-81).



ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

AREA	LIMITS
A	Small nicks, burrs, and scratches on splines are acceptable if they are blended out with fine India stone (C116).
B	Same as Area A.

212040-321-1A

Figure 6-41. Damage Limits — Tail Rotor Drive Gearbox (Sheet 1 of 5)

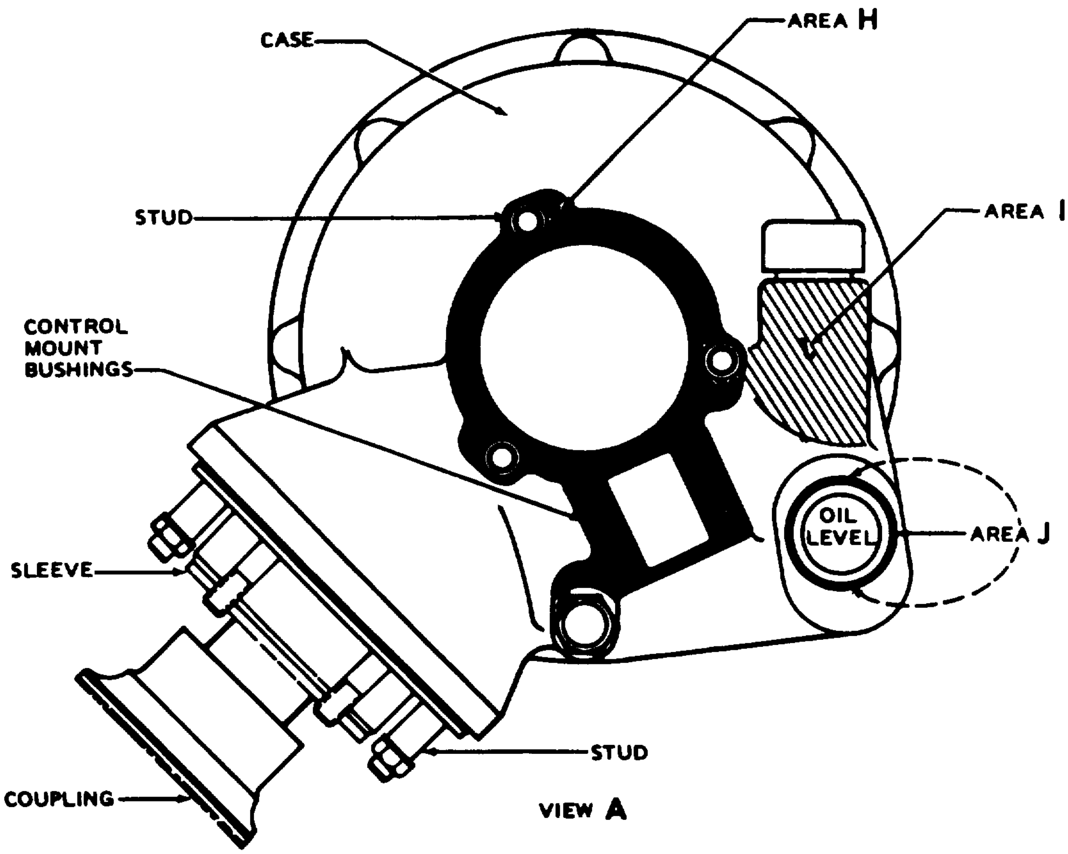
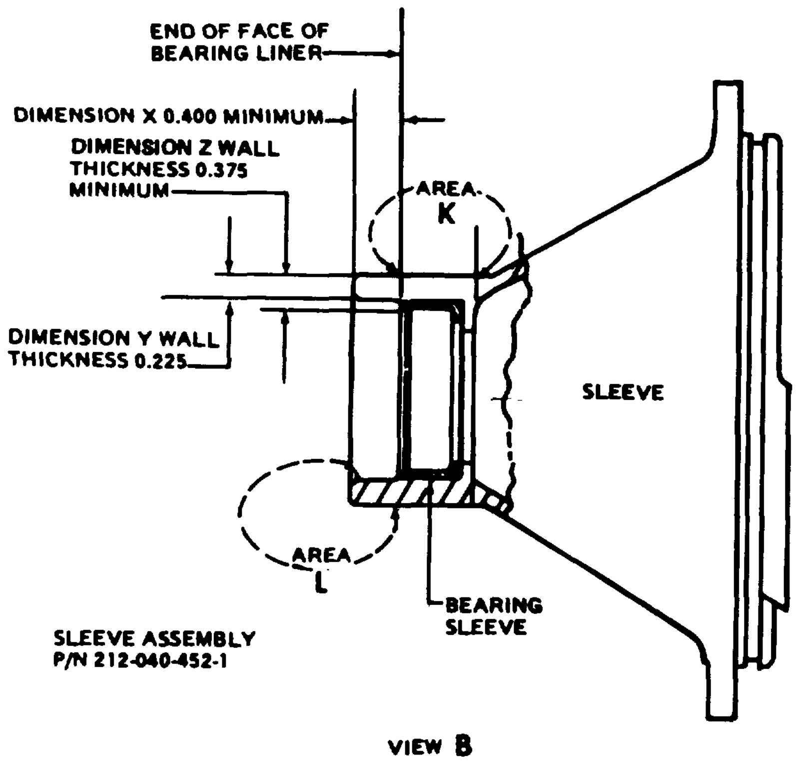


Figure 6-41. Damage Limits - Tail Rotor Drive Gearbox (Sheet 2 of 5)



ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

NOTES:

1. Minimum acceptable wall thickness (dimension Y) in area L is 0.225 at any location after rework is complete.

2. Minimum acceptable wall thickness (dimension Z) in area K is 0.375 at any location after rework is complete.

3. Minimum acceptable dimension X is 0.400 at any location after rework is complete.

212040-321-3A

Figure 6-41. Damage Limits – Tail Rotor Drive Gearbox (Sheet 3 of 5)

AREA	LIMITS
ALL	No cracks allowed.
C	Nicks, dents, scratches, and corrosion up to 0.005 inch deep are acceptable if polished out with 400 grit emery cloth to blend with surrounding area and have a bottom radius of 0.50 inch. Area C is the outer diameter of the portion of the shaft outside the gearbox between the diameter of the oil seal and the shoulder adjacent to the splines.
D	Nicks, dents, and scratches up to 0.030 inch deep are acceptable if polished out and treated in accordance with general instructions. Corrosion damage up to 0.030 inch deep after clean-up, is acceptable. Treat in accordance with general instructions. Mechanical and corrosion damage maximum area after polishing out is forty percent of the area within one square inch and/or twenty percent of the total area. Also, minimum wall thickness and dimension X specified in notes 1, 2, and 3 in view B must be maintained.
E	Wear limit on the shaft in the area contacted by the output quill seal is 0.002 inch or a minimum shaft diameter of 1.430 inch. Check prior to installing a new output quill seal. Corrosion damage up to 0.005 inch deep is acceptable on the case in the area contacted by the output quill seal if polished out to twice the depth of the corrosion and treated in accordance with general instructions. Mechanical damage up to 0.010 inch deep is acceptable on the case in the area contacted by the output quill seal if polished out and treated in accordance with general instructions. Also lubricating oil must not leak past the seal after installation. Mechanical and corrosion damage maximum area after polishing out is twenty percent of the total area contacted by the output quill seal. Also, minimum wall thickness and dimension X specified in notes 1, 2, and 3 in view B must be maintained. When output quill seal is removed, bearing sleeve shown in view B may be inspected. Evidence of corrosion between bearing sleeve and the sleeve and/or a loose bearing sleeve is cause for replacement of the gearbox.
F	Mechanical and corrosion damage limits are the same as the limits for Area D except that evidence of corrosion under shims and around base of studs is cause to replace gearbox.
G	Small nicks, burrs, and scratches on couplings are acceptable if they are blended out with fine India stone (C116).
H	Mechanical and corrosion damage limits are the same as limits for area D with the exception that no damage is permissible in the following areas: 1. Adjacent to studs. 2. Adjacent to control mount bushings. 3. Inside case bore where pitch change control shaft seal housing pilots.
I	Nicks, dents, and scratches up to 0.040 inch deep are acceptable if polished out and treated in accordance with general instructions.

212040-321-4A

Figure 6-41. Damage Limits — Tail Rotor Drive Gearbox (Sheet 4 of 5)

AREA	LIMITS
I	Corrosion damage up to 0.040 inch deep, after clean-up, is acceptable. Treat in accordance with general instructions.
	Mechanical and corrosion damage maximum area after polishing out is thirty percent of the total area.
J	Mechanical damage in machined area of case, where oil level sight gage is installed, up to 0.010 inch deep is acceptable if polished out to form a smooth contour and treated in accordance with general instructions. Also, lubricating oil must not leak past sight gage.
	Corrosion damage limits in area J are 0.010 inch after clean-up. Corrosion prevention treatment and lubricating oil leakage requirements are the same as noted for mechanical damage limits.
All areas of the case and sleeve except areas previously designated D, E, etc.	Nicks, dents, and scratches up to 0.010 inch deep are acceptable if polished out and treated in accordance with general instructions.
	Corrosion damage up to 0.010 inch deep, after clean-up, is acceptable. Treat in accordance with general instructions.
	Mechanical and corrosion damage maximum area after polishing out is forty percent of the area within one square inch and/or twenty percent of the total area.

GENERAL INSTRUCTIONS

1. Repair mechanical snd corrosion damage to case and sleeve as follows:

   a. Polish to remove corrosion damage. Use sandpaper and/or crocus cloth (C102). Blend repair in with surrounding surface and make minimum radius 0.250 inch. Use 400 grit crocus cloth (C102) to make repair area surface 63 microinches or better. Inspect to ensure that depth and/or area of repair does not exceed acceptable limits specified for the various areas above. Treat reworked areas for corrosion protection with MIL-M-3171C, type VI treatment (C1). Refer to TM 43-0105 for additional procedures. Prime with polyamide epoxy primer (C88) and paint all areas that were painted prior to repair to match existing finish.

   b. Polish out mechanical damage to remove all traces of the damage. Complete repair in same manner prescribed for corrosion damage in step a.

2. Evidence of corrosion damage around base of studs is cause to replace the gearbox. Structural damage to threads in case is not acceptable.

3. Evidence of corrosion damage under the shims where quills are attached to case is cause to replace the gearbox.

212040-321-5A

Figure 6-41. Damage Limits — Tail Rotor Drive Gearbox (Sheet 5 of 5)

f. If not previously accomplished, install control linkage on gearbox as follows:

(1) Remove cover at port for tail rotor drive control housing (7).

(2) Install control tube (8) and tail rotor drive control housing (7). Refer to paragraph 5-105.c.

(3) Install idler (10).

(4) Install lever (9) on idler (10) and control tube (8).

g. Connect electrical lead to magnetic chip detector (11, figure 6-39).

h. Service gearbox with oil (paragraph 1-6).

i. Close vertical fin (19, figure 6-38),

j. Install and rig tail rotor (paragraph 5-105).

6-122. QUILLS, TAIL ROTOR DRIVE GEAR, BOX.

6-123. DESCRIPTION — QUILLS, TAIL ROTOR DRIVE GEARBOX.

The tail rotor drive gearbox has an input and output quill. The input quill consists of a pinion gear and bearing mounted in a sleeve. The input quill has a flexible coupling for attachment of driveshaft. The output quill has an output shaft for mounting the tail rotor assembly. A gear mounted on the inboard end of the output shaft meshes with the pinion gear of the input quill.

6-124. REMOVAL — TAIL ROTOR DRIVE GEARBOX INPUT QUILL.

Premaintenance Requirements for Removal of Tail Rotor Gearbox Quills

Conditions	Requirements
Model	AH-1P/E/F
Part No, or Serial No,	All
Special Tools	(T26) (T37) (T55) (C27)
Test Equipment	None
Support Equipment	None
Minimum Personnel Required	Two
Consumable Materials	(C37) (C56) (C78) (C79) (C79A) (C80) (C104) (C105) (C112) (C116) (C137)
Special Environmental Conditions	None

NOTE

Removal procedure only covers the input quill since the output quill is not normally removed in the field.

Remove gearbox from helicopter and drain oil (pargraph 6-117).

b. Remove nuts (18, figure 6-39) and shipping spacers (19). The spacers are used to hold the input quill in position during shipment. They may not be present on all gearboxes received for repair.

c. Remove sealant, or plugs and gaskets from three threaded holes provided for jackscrews in the input quill sleeve and from the groove at the point where the input quill (20) and the case (22) join.

d. Install three jackscrews (T27) in threaded holes in input quill (20). Tighten jackscrews evenly to remove input quill. Use heat lamp on case (22), if quill is very hard to remove, but do not use open flame. Remove input quill (20) and locally dispose of packing (21).

CAUTION

Do not remove screws (15) and shim plate (16) or the matching shim plate and screws installed on input quill. The correct thickness for these shim plates is determined at time of manufacture, and they must not be removed except at a depot level maintenance facility.

e. Immediately after quill removal, inspect for evidence of corrosion around edges of the two shim plates described in the caution above, but do not remove the shim plates. If there is any evidence of corrosion, preserve and reassemble the gearbox and forward it to next higher maintenance level.

f. Cover opening in case (22) and also cover the open end of the quill to prevent contamination by dust or other foreign material until the gearbox can be inspected.

6-125. CLEANING — TAIL ROTOR DRIVE GEARBOX INPUT QUILL.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

CAUTION

Do not permit dirt or solvent to be forced into bearing of input quill flexible coupling by use of compressed air.

NOTE

Do not use cleaning solvent inside coupling. Solvent leaves residue.

a. Clean exterior of quill with solvent (C112).

b. Clean oil sealant from quill sleeve and gearbox case with a plastic scraper.

NOTE

The following cleaning pertains to a disassembled input quill. Do not use cleaning solvent inside coupling. Solvent leaves residue.

c. Clean lubricant from inner and outer coupling using a clean dry cloth.

d. Clean old sealant from bearing, retaining nut, and inside of quill sleeve with a plastic scraper. Ensure that sealant does not contaminate quill bearings.

6-126. INSPECTION — TAIL ROTOR DRIVE GEARBOX INPUT QUILL.

a. Inspect bearing inside tail rotor drive gearbox that supports forward end of input quill pinion. Inspect the bearing for spalling, scoring, pitting, brinnelling, flaking, corrosion, cracked or broken retainers, discoloration due to overheating, and for roughness when the bearing is rolled by hand. See figure 6-42 for views of acceptable and unacceptable roller bearings.

b. inspect teeth on input quill pinion for abnormal wear and chipped teeth. See figure 6-43 for acceptable and unacceptable wear patterns.

c. If inspections in steps a. and b. reveal unacceptable wear or damage, do not disassemble quill for repair. Reinstall quill, preserve gearbox, and forward gearbox to higher level of maintenance.

d. Inspect quill for evidence of oil leakage at seal (3, figure 6-40).

e. Inspect quill for grease leakage at seal (2).

f. Inspect outer coupling (1) for discoloration due to overheating. If the coupling has a multi-colored appearance, disassemble the coupling and inspect splines and teeth.

g. Inspect outer coupling (1) for scratches, nicks, dents, and cracks. Minor damage that can be polished out with a fine India stone (C116) is acceptable.

h. Inspect seal (2) for protrusion, leakage, cuts, tears, and deterioration.

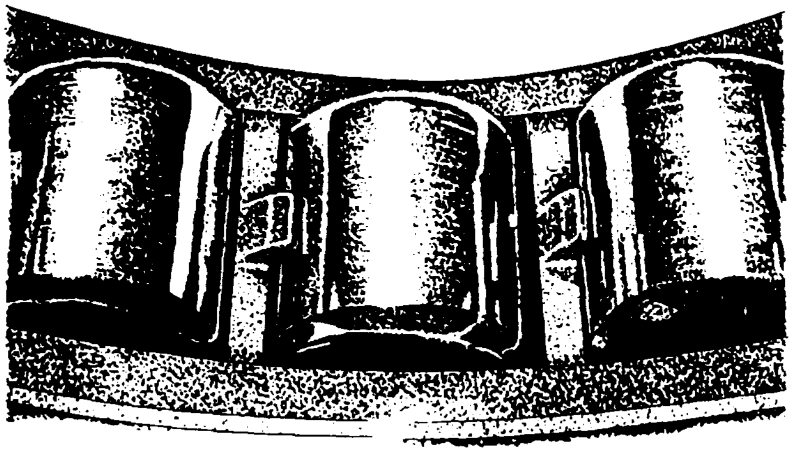
i. Disassemble outer coupling (1) from inner coupling (9) and inspect as follows:

(1) Remove retaining ring (18). At the same time hold seal plate (17) against spring pressure. Remove seat plate (17) and spring (16).

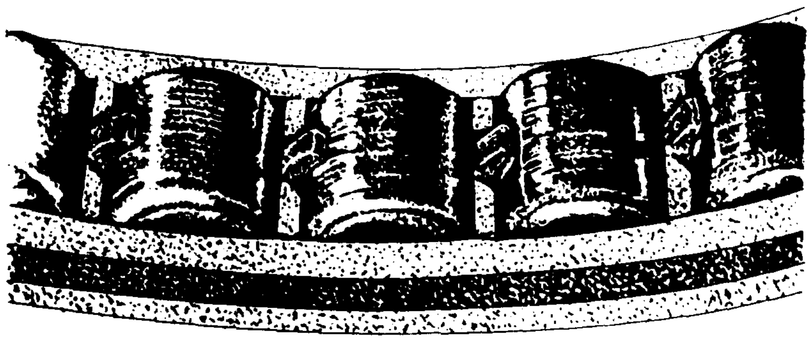
CAUTION

Do not use cleaning solvent inside coupling. Solvent leaves residue.

(2) Hold outer coupling (1) at full outboard position, and use dean, lint-free cloth to remove all old grease. Clean coupling splines thoroughly.



ACCEPTABLE



UNACCEPTABLE

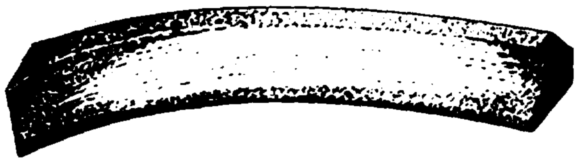
Figure 6-42. Roller Bearing Wear Patterns

(3) Inspect inner coupling (9, figure 6-40) and outer coupling (1) per paragraph 6-128.1.

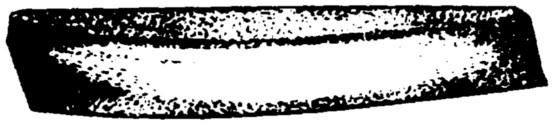
(4) Assemble outer coupling (1, figure 6-40) on inner coupling (9). Move outer coupling (1) forward and aft with clockwise and counterclockwise preload and feel for roughness. If any roughness or resistance is felt, reinspect splines on outer coupling (1) and teeth on inner coupling (9). Refer to step (3).

(5) Inspect inner coupling (9) for wear in the area contacted by seal (3). Measure the diameter of the coupling in the worn area and in the adjacent unworn area. A maximum of 0.002 inch of wear is allowable if the diameter in the worn area is not less than 1.587 inch. The worn area must be free of nicks and dents that would affect function of seal (3).

(6) Inspect seal plate (17) for scratches, nicks, dents, and corrosion. Minor damage is acceptable if polished out, but any damage within 0.030 inch of the seal area is cause to replace the seal plate.



Desired wear pattern on pinion
View A



Desired wear pattern on gear
View B

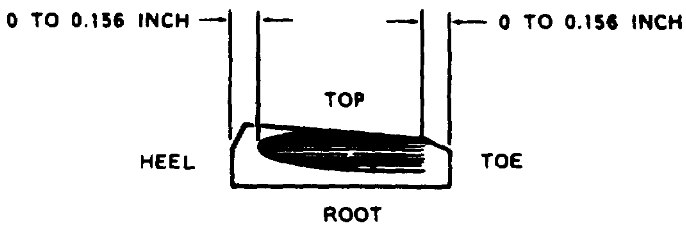
ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

NOTES

1. Wear Pattern Inspection: Observe the visible gear contact wear pattern on the concave side of the pinion teeth and on the convex side of the gear teeth.

2. The desired wear pattern is shown in views A and B. A alight bright line at top of pattern on gear and in flank of pinion is permissible.

90° Gearbox



Pattern tolerances at toe and heel on gear and pinion
View C

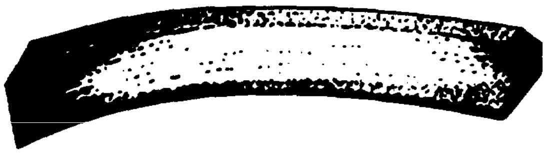
NOTES

3. Acceptable wear patterns are shown in views D, E, F, G, H and I. View C is furnished to further define wear limits.

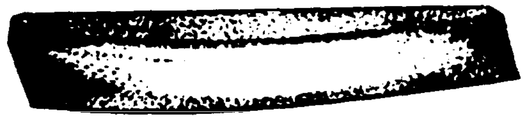
4. Pattern Limits at Toe: The wear pattern may touch the toe or may be a maximum of 0.166 from the toe (see views C, D, G and I). Pattern variation at the toe must not exceed 0.156. Normally, the pattern will touch the toe on the pinion but will not touch the toe on the gear (view's D and E). It is permissible for the pattern to touch the toe on the gear if the pattern does not go off the toe of the pinion.

5. Pattern Limits at Heel: The wear pattern may touch the heel or may be a maximum of 0.156 from the heel. Pattern variation at the heel must not exceed 0.031. The heel positions shown in views A, B, C, E, F, G, H and I are within these limits.

Figure 6-43. Tall Rotor Drive Gearbox Gear Patterns (Sheet 1 of 2)



Acceptable wear pattern on pinion
(touching toe)
View D



Acceptable wear pattern on gear

View E

NOTES

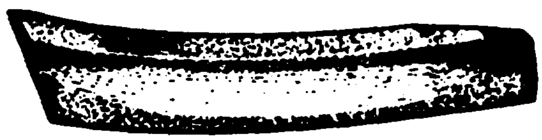
6. Pattern Profile: The pattern must be positioned on the tooth in a profile direction such that the pattern extends over the top of the pinion and is 0.031 to 0.063 inch from the top of the gear (views A, B, D, E, F, G, H and I). A pattern which does not extend over the top of the pinion or touches the top of the gear shall be rejected. A bright line occurring at the top of the pinion or in the flank of the gear is also cause for rejection.

7. Unacceptable Defects: In addition to pattern size and location, examine the drive face of all gear teeth for the following defects which are not acceptable if they can be felt with a scribe having a 0.002 spherical point:

a. non-clean up
b. grinding scratches
c. pitting
d. corrosion
e. cuts
f. nicks
g. dents
h. grinding flats or barber poling (evidenced by diagonal streaks in the wear pattern)
i. scuffing
j. scoring
k. inclusions

Acceptable wear pattern on pinion

View F



Acceptable wear pattern on gear
(0.156 inch from toe)
View G

Acceptable wear pattern on pinion

View H

Acceptable wear pattern on gear
(touching heel and 0.156 from toe)
View I

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Figure 6-43 Tail Rotor Drive Gearbox Gear Patterns (Sheet 2 of 2)

(7) Lubricate end assemble outer coupling (1) and inner coupling (9) (paragraph 6-127).

j. Inspect retainer nut (4) for damaged threads and corrosion.

k. Inspect seal (1, figure 6-39) for protrusion, leakage, cuts, tsars, and deterioration.

1. Inspect area adjacent to shim (16) end area on input quill (20) adjacent to similar shim for corrosion. If any corrosion is detected send gearbox to higher level of maintenance. Do not remove shim (16) or similar shim on input quill.

6-127. REPAIR-TAIL ROTOR DRIVE GEAR BOX QUILLS.

NOTE

Repair of gearbox input quill is limited to replacement of components of the flexible coupling, seals (2 and 3, figure 6-40), and packing (19) and packing (21, figure 6-39). Repair of the output quill is limited to replacement of seal (1).

a Disassemble input quills as follows:

(1) Remove retaining ring (18, figure 6-40), plate (17), spring (16) and spacer (14).

(2) Remove lockspring (15), retainer plug (13), and packing (12).

(3) Place holding plate (T53.1) in a vise. Secure quill in holding plate. Secure wrench (T26) to quill as shown on figure 6-44.

(4) Install square drive extension in retainer bolt (11, figure 6-40), hold wrench, (T26), and loosen retainer bolt. Remove retainer bolt (11) and washer (10).

(5) Remove outer coupling (1), and inner coupling (9). Remove seal (2) from outer coupling.

(6) Cut lockwire on retainer nut (4). Install wrench (T55) as shown in figure 6-45. Remove retainer nut (4, figure 6-40).

(7) Press seal (3) from retainer nut (4) and remove packing (5).

(8) Remove spacer assembly (21) from pinion shaft (6). Inspect spacer assembly for wear of the wear sleeve. Wear limit on the wear sleeve on the spacer assembly (21) in the area contacted by seal (3) is 0.002 inch or a minimum shaft diameter of 1.430 inches. Check prior to installing a new seal (3). Corrosion damage up to 0.005 inch deep is acceptable in the area contacted by the seal if polished out to twice the depth of the corrosion and treated in accordance with general instructions. Lubricating oil must not leak past the seal after installation. Inspect packing (19) for damage. Replace packing (19) if damage is found.

b. Clean disassembled quill. Refer to paragraph 6-125.

c. Polish out raised metal on teeth on outer coupling (1, figure 6-40) when the raised metal is caused by dents, nicks, or scratches. Use crocus cloth (C37) to remove the raised metal. Do not rework the internal teeth in the coupling.

d. Assemble input quill as follows:

(1) Install new packing (19) on pinion shaft (6), if necessary, and reinstall spacer assembly (21). Press seal (3) in retainer nut (4) with lip of seal facing inboard. Apply sealant (C105) to outside diameter of seal (3). Position packing (5) on retainer nut (4). Lubricate packing, seal, and threads of nut with the type oil used in the gearbox.

(2) Place holding plate (T53.1) in a vise and secure quill sleeve in holding plate as-shown in figure 6-45.

(3) Install retainer nut (4, figure 6-40) in quill with wrench (T55) as shown in figure 6-45. Torque nut 100 TO 150 fret-pounds. Lockwire (C137) nut to sleeve. Apply a bead of sealer (C104) around mating joint of nut and sleeve. Remove wrench (T55).

(4) Use clean lint-free cloths to remove any film of grease or cleaning solvent from outer coupling (1, figure 6-40) and inner coupling (9).

(5) Lubricate new seal (2) with grease (C56) and press into outer coupling (1) with lip of seal facing toward curvic coupling teeth on coupling. Coat teeth of inner coupling (9) with grease (C56) and install inner coupling in outer coupling.

(6) Install the couplings on pinion shaft (6). Place washer (10) on retainer bolt (11) and thread nut into pinion shaft (6), Install special tools as shown on figure 6-44. Torque retaining bolt 80 TO 100 foot-pounds.

(7) Position packing (12, figure 6-40) on retainer plug (13) and lubricate with small amount of grease from coupling. Install retainer plug and lock spring (15). Ensure that tang of lock spring (15) is fully seated.

(8) Hold outer coupling (1) full outboard. Lubricate splines of outer coupling (1) with grease (C58) to cover splines to a depth of 0.12 inch.

(9) Install spacer (14), spring (16), plate (17), and retaining ring (16).

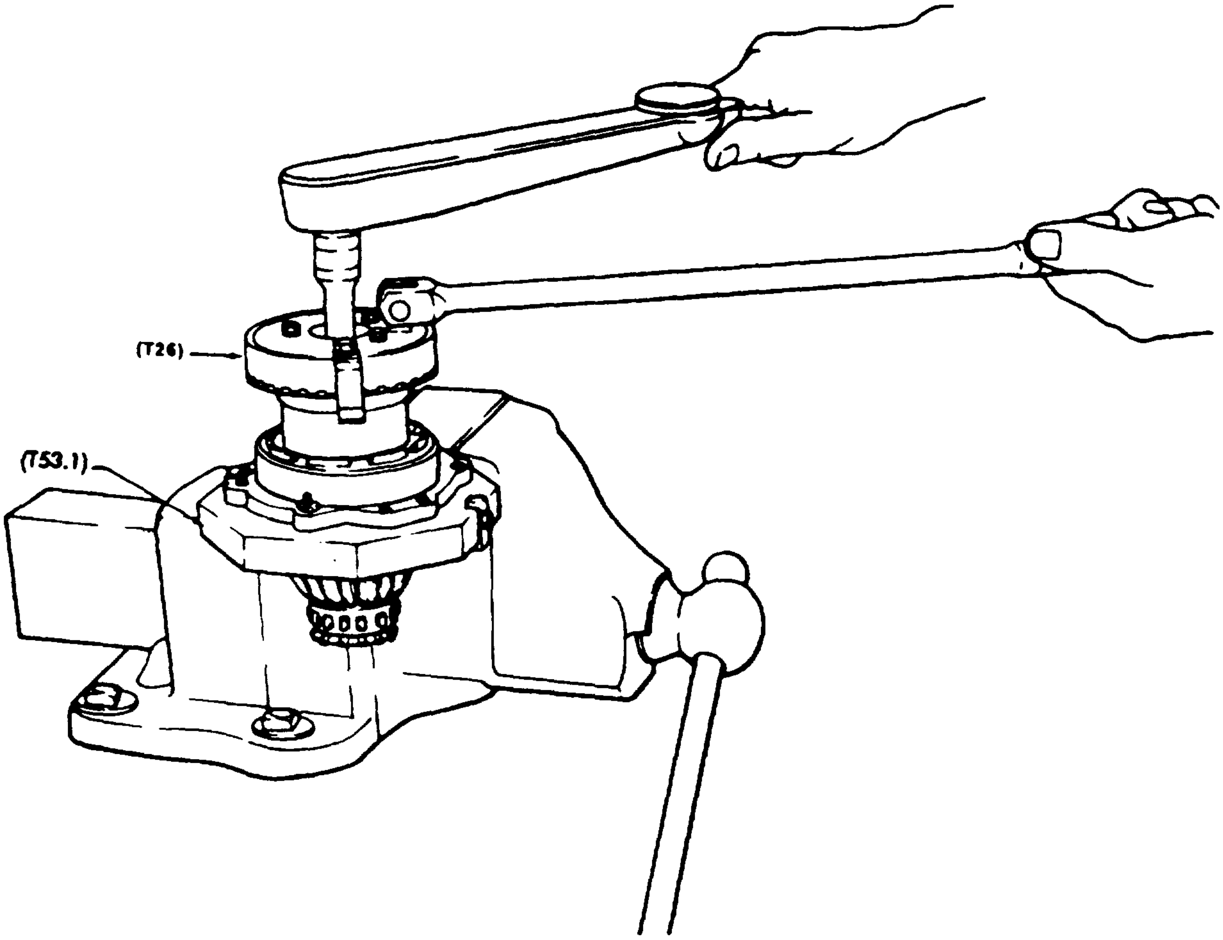


Figure 6-44. Tool Application — Removal/Installation of Tail Rotor Drive Gearbox Input Quill Retainer Bolt

e. Replace output quill seal (1, figure 6-39) as follows:

(1) Remove tail rotor assembly (paragraph 5-91).

(2) Using a suitable tool, pry seal (1) from quill sleeve. Use a wooden block between quill sleeve and tool to prevent damage to sleeve.

(3) Coat lip of new seal with grease (C58) and press into piece.

(4) Install tail rotor assembly (paragraph 5-77).

6-128. INSTALLATION — TAIL ROTOR DRIVE GEARBOX INPUT QUILL.

WARNING

Ensure that crowned tooth coupling is properly lubricated prior to installation of driveshaft (paragraph 1-29).

CAUTION

Exercise care during installation of quill to engage gear teeth and to keep quill aligned so that nose of pinion enters the roller bearing property to avoid damage.

NOTE

Installation procedures only cover the input quill since the output quill is not normally removed in the field.

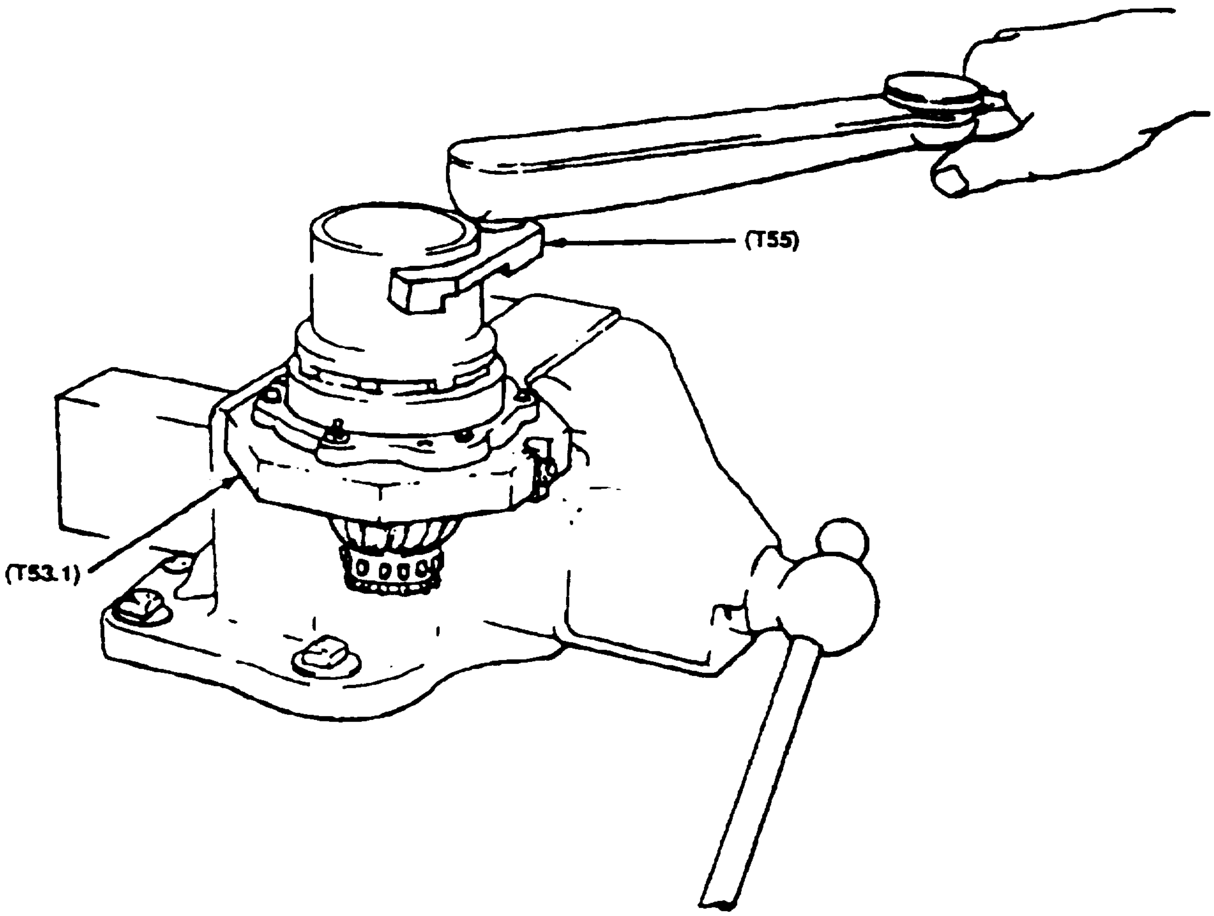


Figure 6-45. Tool Application - Removal/Installation of Tall Rotor Drive Gearbox Input Quill Retainer Nut

a. Ensure that shim (16, figure 6-39) and similar shim on input quill are installed.

b. Heat gear case with a heat lamp. Lubricate new packing (21) and mating surfaces of quill and case with oil (C79 (C79A) or C80). Install packing on quill and install quill into case. Use care to engage bearing and gear teeth properly. Install shipping spacers (19) and nuts (18). Torque nuts 100 TO 140 inch-pounds to hold input quill in place.

c. Rotate quill by hand and check for free rotation and for a small amount of backlash clearance.

d. Apply a bead of sealant (C105) around mating joint of quill and case, also fill three jackscrew holes.

6-128.1 INSPECTION – TAIL ROTOR DRIVESHAFT COUPLING AND SPHERICAL COUPLING.

NOTE

Couplings must be disassembled from the tell rotor drive quill, hanger assembly, 42 degree gearbox or the tall rotor gearbox before proceeding with inspection of the couplings.

a. Inspect coupling teeth for pitting and unusual wear patterns (figure 6-32).

b. Inspect coupling teeth for overheating. Refer to paragraph 6-110 if overheating is suspected.

NOTE

Blackening of splines teeth and grease often occurs and is NOT a result of overheating. Overheating will be evidenced by heavy spline wear, the presence of many steel particles in the grease, and/or very heavy corrosion formation In the splines.

c. Inspect couplings for evidence of corrosion. Superficial corrosion (removable with abrasive pads (C01) is the only corrosion repair allowed).

d. Inspect external splines of spherical coupling for wear.

(1) Secure spherical coupling (1, figure 6-45.1) in vise or other suitable fixture being careful not to damage the coupling. The seal (2) may remain installed on the coupling to aid in alignment of the coupling during inspection.

(2) Using the driveshaft coupling (3) as an inspection aid, slide the driveshaft coupling onto the spherical coupling and position as shown in figure 6-45.2.

(3) Rotate the driveshaft coupling as shown in figure 6-45.2 to take out all of the play between the splines being careful to keep the couplings in line (avoid cocking the driveshaft coupling).

(4) Insert wire gage (table 1-4, item 107) between the back side of the spherical coupling splines and the driveshaft coupling splines, approximately half was between the root and the top of the splines as shown in figure 6-45.2. Record the size of the largest wire which can be inserted. Repeat this procedure in three locations, approximately 120 degrees apart.

(5) If the largest wire that can be inserted is greater than .027 inch, the spherical coupling is worn beyond limits and must be replaced.

e. Inspect internal splines of driveshaft coupling for wear.

NOTE

Inspection of the driveshaft coupling requires the use of a spherical coupling which has bean Inspected for wear per paragraph 6-128.1.a. To reduce inspection time, the use of one spherical coupling to inspect several driveshaft couplings is recommended.

f. Retain the spherical coupling (1) in a fixture as directed in paragraph 6-128.1.d(1).

g. Slide the driveshaft coupling onto the spherical coupling so that the splines align in the most severe wear area as shown in figure 6-45.2.

h. To determine the appropriate wire size to use for inspection of the driveshaft coupling, add .005 inches to the diameter of the largest wire identified in paragraph 6-128.1.d(5). As an example, if the largest wire diameter was .025 inches, adding .005 inches would result in .030 inches.

i. Rotate the driveshaft coupling in the drive direction being careful not to cock the coupling. Attempt to insert the appropriate wire gage (table 1-4, item 107) between the back side of the spherical coupling splines and the driveshaft coupling splines approximately halfway between the root and the top of the splines (figure 54.3). Repeat this procedure at three locations approximately 120 degrees apart.

j. if the wire can be inserted at any one of the three locations, the driveshaft coupling is worn beyond limits and should be replaced.

SECTION VII. TRANSMISSION OIL SYSTEM

6-129. TRANSMISSION OIL SYSTEM.

6-130. DESCRIPTION — TRANSMISSION OIL SYSTEM.

The transmission oil system is entirely separate from that of the engine. It includes a pump, an external and an internal fitter, a pressure relief valve, an automatic emergency by-pass valve, an oil cooler with an

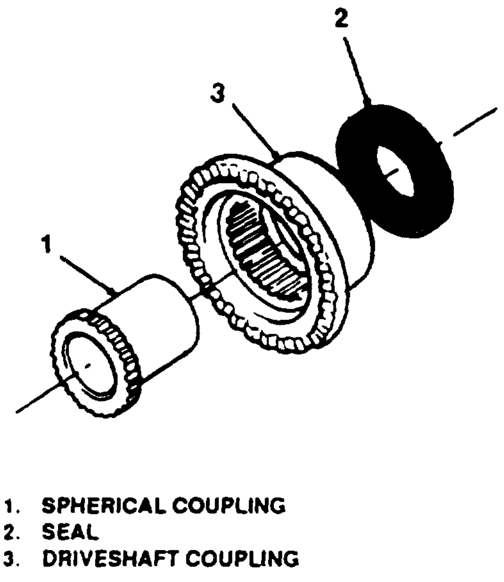


Figure 6-45.1 Driveshaft/Spherical Couplings

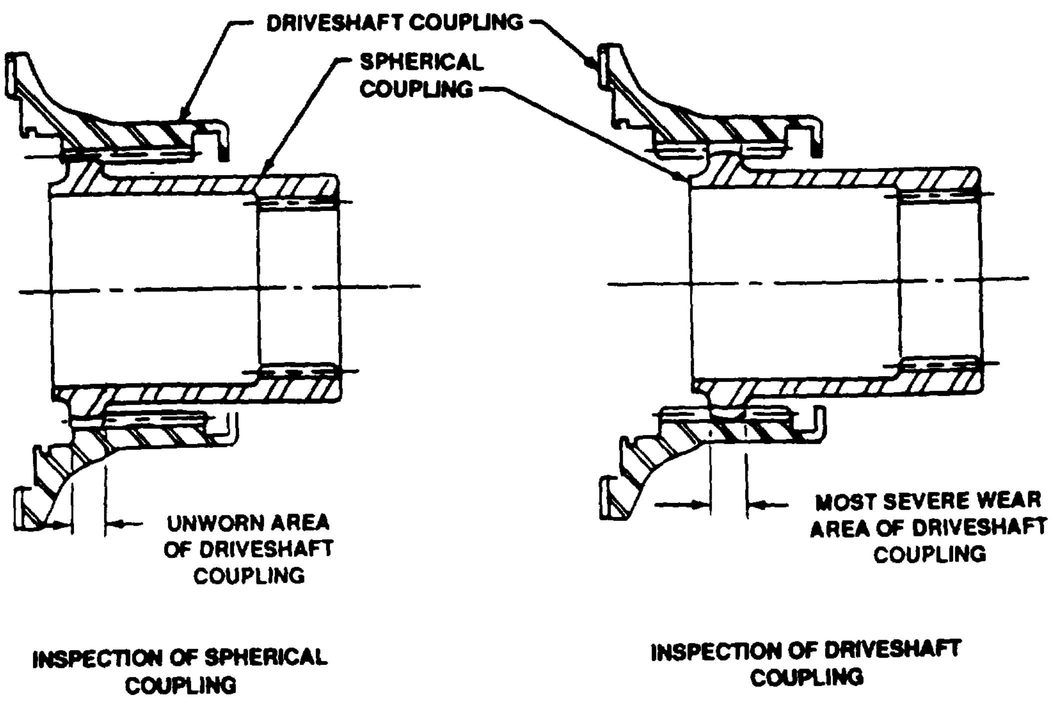


Figure 6-45.2 Coupling Inspection (Sheet 1 of 2)

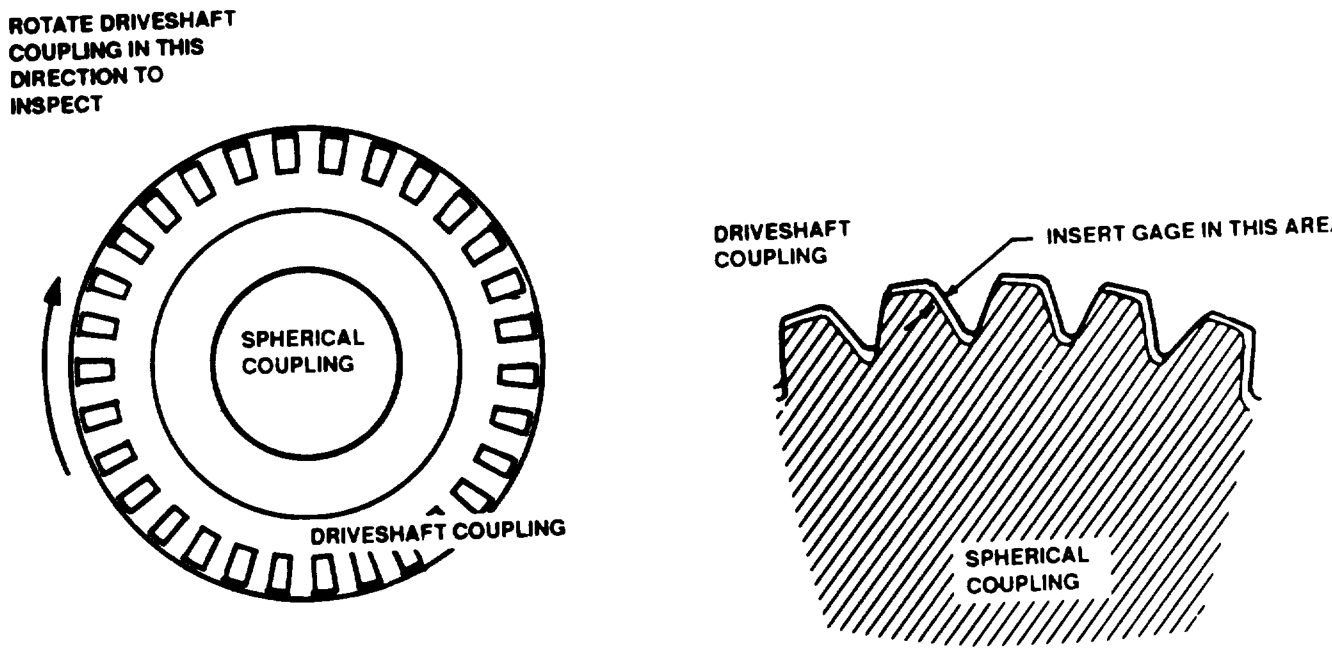


Figure 6-45.2 Coupling Inspection (Sheet 2 of 2)

integral temperature regulating valve, and connecting lines. See figures 6-46 and 6-47. Oil is distributed within the transmission by a series of jets and internal passages. Oil pressure and temperature indications are provided by a thermocouple and a pressure transmitter. A thermo-switch and a pressure switch illuminate caution panels lettered **P** (pilot) XMSN OIL HOT, (gunner) XMSN OIL TEMP and XMSN OIL PRESS and **E** **M** TRANS OIL HOT and TRANS OIL PRESS to warn of abnormal conditions. Servicing and drain provisions are located on the right side of the transmission. Oil level sight gages on the sump case can be viewed through a window in the right-hand cowl door. Access through this same door is provided to the oil filter on the main case and to the oil filter screen and chip detector on the sump case. A manual valve, located beneath the sump, drains oil overboard through an outlet in the bottom of the fuselage. Access to this valve is through the access panel under the right wing.

a. (See figure 6-46.) In helicopters without MWO 1-1520-236-50-30, oil from the transmission pump flows through the transmission primary fitter and is circulated under pressure to the thermal (bypass) valve and oil cooler. The thermal valve allows oil to bypass the cooler until normal operating oil temperatures are reached. Return oil from the thermal valve and cooler is returned to the transmission through a 30-micron external oil filter to the transmission-mounted inlet manifold.

b. (See figure 646.) In helicopters with MWO 1-1520-236-50-30, oil from pump flows through debris monitor end is circulated under pressure to thermal (bypass) valve and oil cooler. The thermal valve allows oil to bypass cooler until operating temperature is normal. Oil from thermal valve and cooler is returned to transmission mounted inlet manifold through a 3-micron external filter.

c. A manual valve, located beneath the sump, drains oil overboard through an outlet in the bottom of the fuselage. Access to this valve is through the access panel under the right wing.

6-131. TROUBLESHOOTING - TRANSMISSION OIL SYSTEM.

Refer to table 6-3 for troubleshooting transmission oil system. Observe the following during system troubleshooting.

a. Low oil level will not cause a low oil pressure indication, provided sump contains enough oil to cover pump inlet. Oil temperature might rise, however.

b. Effects of an oil leak will depend on its location in system and rate of leakage. An external leak can eventually allow sump to be pumped dry, causing internal failure of transmission. While oil remains to supply the pump, the pressure relief valve will tend to maintain normal system pressure, compensating for leakage. This applies especially to leaks located between the pump and the relief valve. Leaks occurring beyond the relief valve could cause indication of low oil pressure. Leakage to interior of transmission; while not affecting oil level, could starve lubrication areas beyond the leak and might affect indicated oil pressure and temperature. Leakage in the oil cooler circuit, unless very minor, causes the oil cooler automatic emergency bypass valve to shift and direct oil directly to the transmission manifold instead of directing it through the oil cooler. Leaks in the oil cooler and connecting lines may cause above normal oil temperatures.

c. Cumulative clogging of oil fitter screens will not be shown by a gradual drop of indicated oil pressure. Pressure relief valve will maintain normal system pressure even if filter screens become so dogged as to force oil flow through fitter bypass valve.

d. “Use of wrong oil’ is omitted from troubleshooting chart because such a case would require special investigation as to damage and corrective action. As to detecting such a condition, little can be said except that most oils which might be available to use by error would tend to cause high oil pressure and high oil temperature indications, or excessive seal leakage.

e. When troubleshooting transmission case halves, external or internal fluid loss is undesirable; however, the design of sealing mechanisms will not always ensure that a joint will be completely free of fluid loss. The terminology for leakage is defined as follows:

(1) Weep. Slight loss of fluid beyond a sealing mechanism which causes staining or discoloration of painted surfaces, usually dry to the touch.

(2) Seep. Slight loss of fluid beyond the sealing mechanism which does not form droplets but is moist to the touch.

NOTE

Fluid loss from a joint defined as weep or seep is acceptable although efforts shall be taken to keep the fluid loss to a minimum.

(3) Leak. Loss of fluid beyond a sealing mechanism which form a droplets.

(4) Drip. Loss of fluid beyond a sealing mechanism which forms drops that roll or drop away from the point of leakage.

NOTE

Leaks and drips are not acceptable and the source of the fluid loss must definitely be established by observing the component suspected of leakage, after prior residue of leakage evidence has bean removed. If leaks or drips apply to your transmission, remove item from service and return to depot through normal supply channels for overhaul.

Table 6-3. Troubleshooting - Transmission Oil System

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

NOTE

Before you use this table, be sure you have performed all normal operational checks. If you have a malfunction which is not listed in this table, notify the next higher maintenance level.

1. Low oil pressure on caution panel or pressure gauge, but not on both.

STEP 1. Check for faulty caution panel (paragraph 9-276).

Replace faulty caution panel. Return faulty panel to next higher maintenance level.

STEP 2. Check for faulty pressure gauge (paragraph 8-233 and 8-234).

Replace faulty pressure gage (paragraphs 8-235 and 8-237).

STEP 3. Check electrical circuit for faulty wiring (paragraph 9-11).

Repair faulty electrical wiring (paragraph 9-12).

2. Low oil pressure on both caution panel and pressure gage.

STEP 1. Check pressure relief valve for adjustment or malfunction (paragraph 6-184.c).

Repair pressure relief valve (paragraph 6-184.c).

Replace pressure relief valve (paragraph 6-184.c).

STEP 2. Check for leakage and for restriction between pressure relief valve and transmitter.

Repair oil line or clean oil line to remove restriction as required.

STEP 3. Check for faulty oil pump (paragraph 6-135).

Replace faulty oil pump (paragraph 6-140).

Table 6-3. Troubleshooting - Transmission Oil System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

3. No oil pressure with normal oil level in sump.

STEP 1. Check for faulty gage or transducer (paragraphs 8-243, 8-244, 8-251, and 8-252).

Replace faulty gage or transducer (paragraphs 8-245, 8-247, 8-253, and 8-255).

STEP 2. Check electrical circuits for faulty wiring (paragraph 9-11).

Repair faulty electrical wiring (paragraph 9-12).

STEP 3. Check for faulty oil pump (paragraph 6-135).

Replace transmission or replace oil pump only if not damaged internally and oil system not contaminated with metal particles.

4. No oil pressure - check reveals no oil supply in transmission sump.

STEP 1. Check system to determine cause of oil loss.

Replace transmission and oil cooler (paragraphs 6-33 and 6-146).

Flush oil lines and repair as needed.

Table 6-3. Troubleshooting - Transmission Oil System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

5. High oil pressure.

STEP 1. Check for faulty gage or faulty transducer (paragraph 8-234, 8-235, 8-241, and 8-242).

STEP 2. Check for electrical circuit for faulty wiring (paragraph 9-11).

Repair faulty electrical wiring (paragraph 9-12).

STEP 3. Check pressure relief valve for adjustment or malfunction paragraph 6-184.c).

Adjust pressure relief valve (paragaph 6-185.m).

Repair pressure relief valve (paragraph 6-184.c).

Repair pressure relief valve (paragraph 6-184.c).

6. High oil temperature on caution panel or gage but not both.

STEP 1. Check for faulty caution panel or gage (paragraphs 8-233 and 9-279).

Replace caution panel. Return faulty panel to next higher level of maintenance.

Replace faulty temperature gage (paragraphs 8-235 and 8-237).

STEP 2. Check electrical circuits for faulty wiring (paragraph 9-11).

Repair faulty wiring (paragraph 9-12).

7. High oil temperature on both caution panel and gage.

STEP 1. Check area around transmission for obstructed air flow.

Clean cowl opening and sump area.

STEP 2. Check oil coder for obstructed air passage.

Clean coder cure air passage.

STEP 3. Check oil coder for dogged internal oil passage (paragraph 6-144).

Replace cooler if internally dogged flush oil lines

Check transmission filters, pump screen magnetic plug (paragraph 6-158).

Table 6-3. Troubleshooting - Transmission Oil System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

STEP 4. Check oil cooler for thermostatic valve malfunction.

Replace thermostatic valve (paragraph 6-144).

STEP 5. Check for dogged transmission oil jets (paragraph 6-196).

Clean or replace jets.

Replace transmission if internally damaged (paragraph 6-33).

STEP 6. Check transmission magnetic plug and filters for evidence of seized bearings or other internal failure.

Replace transmission and oil cooler. Flush external oil lines (paragraphs 6-33 and 6-146).

STEP 7. Check for oil leaks in cooler or oil line which could cause the emergency bypass valve to operate and bypass cooler.

Repair leaks as necessary (paragraph 6-145).

STEP 8. Test emergency bypass valve for malfunction.

Repair or replace emergency bypass valve (paragraph 6-151).

8. Oil bypass caution light on.

STEP 1. Check caution light circuit for short or faulty wiring (paragraph 9-11).

Repair electrical circuit as necessary (paragraph 9-12).

STEP 2. Check for low oil level in sump.

Service transmission with oil (paragraph 1-5).

STEP 3. Check oil coder and lines for leaks.

Repair leaks as necessary.

STEP 4. Test emergency bypass valve for malfunction (paragraph 6-152).

Repair or replace emergency bypass valve (paragraph 5-151).

9. Oil leak at internal primary oil filter.

STEP 1. Check cooler line couplings (9 and 10, figure 647) for proper seating and/or connection.

Reconnect coder line couplings.

Ensure indicators on quick disconnects are locked.

Table 6-3. Troubleshooting - Transmission Oil System (Cont)

CONDITION

TEST OR INSPECTION

CORRECTIVE ACTION

STEP 2. Check disconnects for wear and damage.

Replace defective cooler line couplings.

Replace packing (19, figure 6-47).

6-132. OIL PUMP.

6-133. DESCRIPTION - OIL PUMP.

The oil pump is mounted into the underside of the transmission sump case and is driven by a splined shaft from the accessory and tail rotor drive gear.

6-134. REMOVAL - OIL PUMP.

a. Open access panel under wing on right side of helicopter.

b. Place a container under oil drain outlet beneath fuselage. Open valve beneath sump and drain oil.

c. Disconnect drain tubes from valve and tee. Provide a container to collect trapped oil as pump is removed.

d. Remove pump retaining nuts and drain tee bracket from three mounting studs.

CAUTION

Tapped hole m pump body base is for attaching puller only. Do not attempt to use for a jackscrew.

e. Pull pump from sump. When necessary, use threaded puller in 1/4 UNF tapped hole in base at center of pump body.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

f. Wash assembled pump in solvent (C112) prior to disassembly. Drain thoroughly and dry with filtered compressed air.

6-135. INSPECTION - OIL PUMP.

a. Inspect assembled pump as follows:

(1) Rotate pump shaft and check for binding.

(2) Visually inspect pump for evidence of wear or damage.

(3) If evidence of binding, wear, or damage is found, do not disassemble pump but forward to next higher level of maintenance.

NOTE

The following inspection for wear pertains to a disassembled pump.

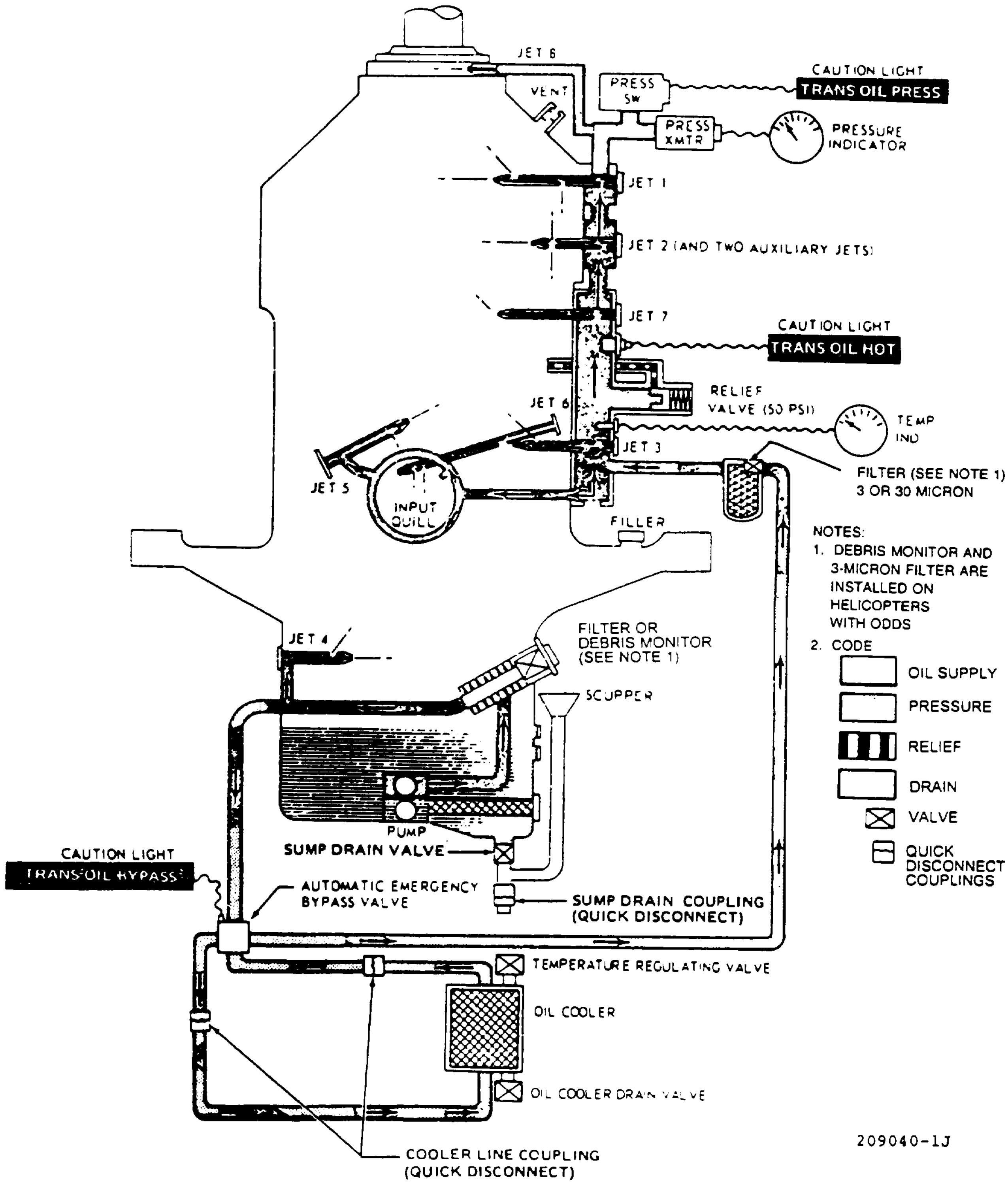


Figure 6-46. Transmission Oil System Schematic (Typical)

1. Vent
2. External oil filter
3. Pressure transmitter
4. Pressure switch
5. Filler cap
6. Sump drain coupling
7. Cooler drain valve
8. Transmission oil cooler
9. Cooler line coupling
10. Cooler line coupling
11. Transmission sump
12. Sump outlet fitting
13. Oil cooler automatic emergency bypass valve
14. Oil manifold assembly

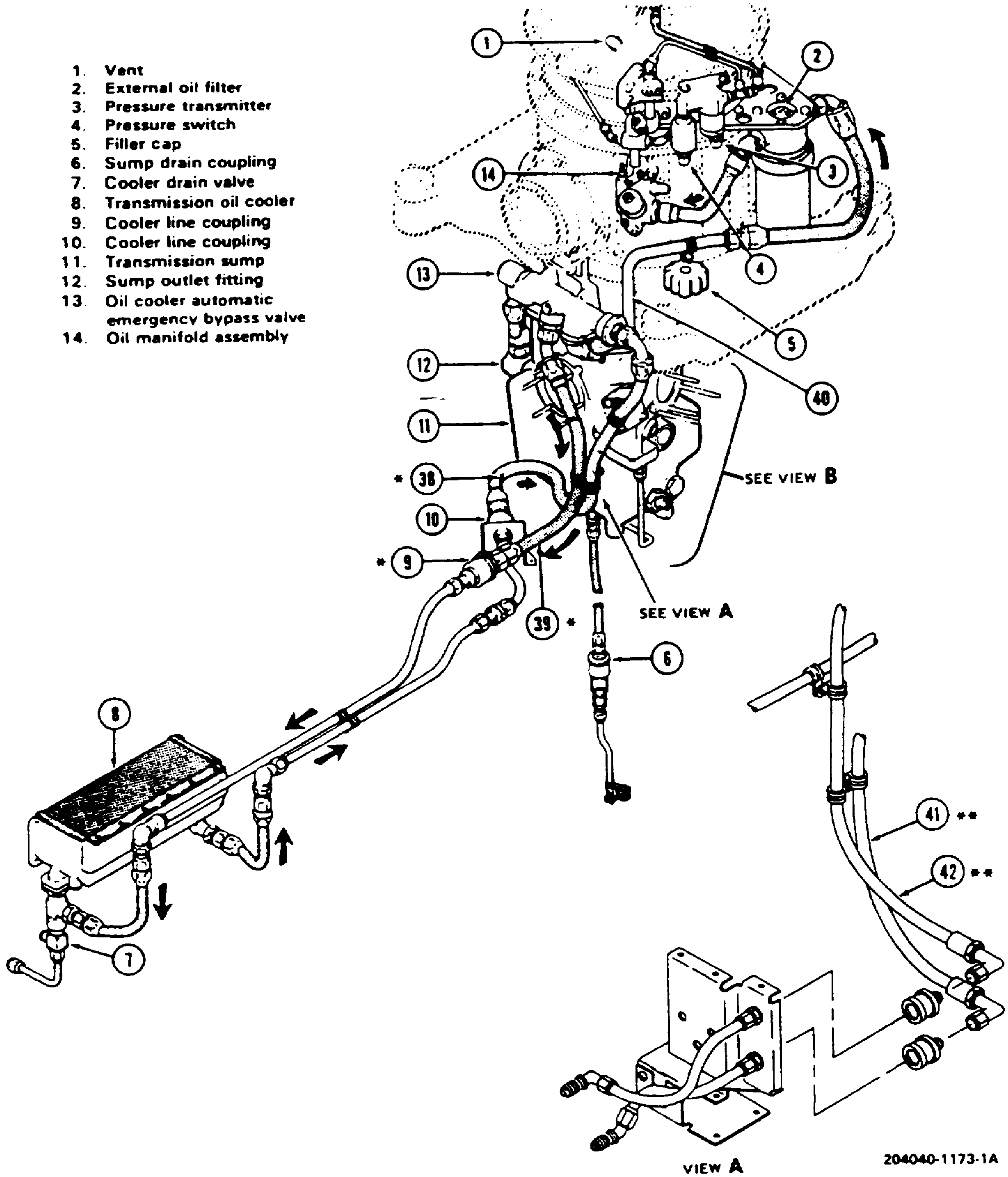
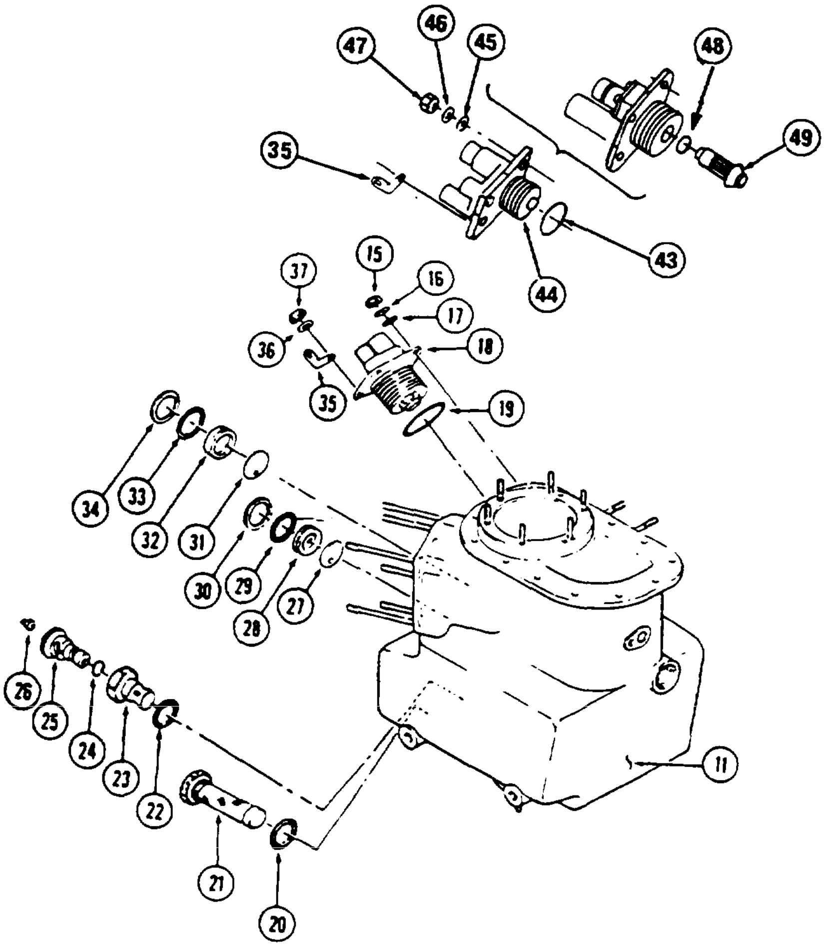


Figure 6-47. Transmission Oil System Installation (Sheet 1 of 2)

15. Nut
16. Thin steel washer
17. Thin aluminum washer
18. Oil filter (sump)
19. Packing
20. Gasket
21. Oil screen
22. Gasket
23. Chip detector self closing valve
24. Packing
25. Chip detector
26. Nut
27. Indicator (Low)
28. Sight glass
29. Packing
30. Retaining ring
31. Indicator (full)
32. Sight glass
33. Packing
34. Retaining ring
35. Bracket
36. Thin steel washer
37. Nut
38. Hose assemblv
39. Hose assembly
40. Outlet tube
41. Hose assembly
42. Hose assemblv
43. Packing (ODDS)
44. Debris Monitor (ODDS)
45. Washer (ODDS)
46. Washer (ODDS)
47. Nut (ODDS)
48. Packing
49. Cup and Screen



VIEW B

* E M P Prior to incorporation of MWO 55-1520-236-50-12.
** E M After incorporation of MWO 55-1520-236-50-12.

Figure 6-47. Transmission Oil System Installation (Sheet 2 of 2)

b. Inspect disassembled pump as follows:

(1) Check corners, grooves, and oil passageways for sludge.

(2) Inspect parts for damage and excessive wear. Use following table showing dimensions of new parts in parentheses and allowable clearances after wear in last column.

Outer Gerotor Body	Width (0.7080/0.7085)
Chamber	Width (0.7100/0.7105)
Allowable Chamber Face Clearance	0.0015/0.0025
Outer Gerotor OD	(2.1220/2.225)
Body ID	(2.1220/21255)
Allowable Clearance	0.0025/0.0040
Driveshaft OD	(0.4985/0.4990)
Bearings ID	(0.5000/0.5005)
Allowable Clearance	0.0010/0.0025

6-136. DISASSEMBLY - OIL PUMP. (AVIM)

NOTE

Do not remove any part of pump by forcing or prying. Loose parts by tapping lighthly with a fiber hammer. Do not disassemble pump in a damp or dusty room.

a. Remove retainer ring (1, figure 6-48) from body (10).

b. Remove retainer plate (2). Do not remove bearing from plate.

CAUTION

Inner and outer gerotors area matched eat. Do not intermix.

Remove retaining ring (3), inner gerotor (5), outer gerotor (4), and woodruff key (6) from shaft (7).

d. Remove retaining ring (8).

e. Do not remove bearing from body (10).

f. Clean disassembled pump as follows:

WARNING

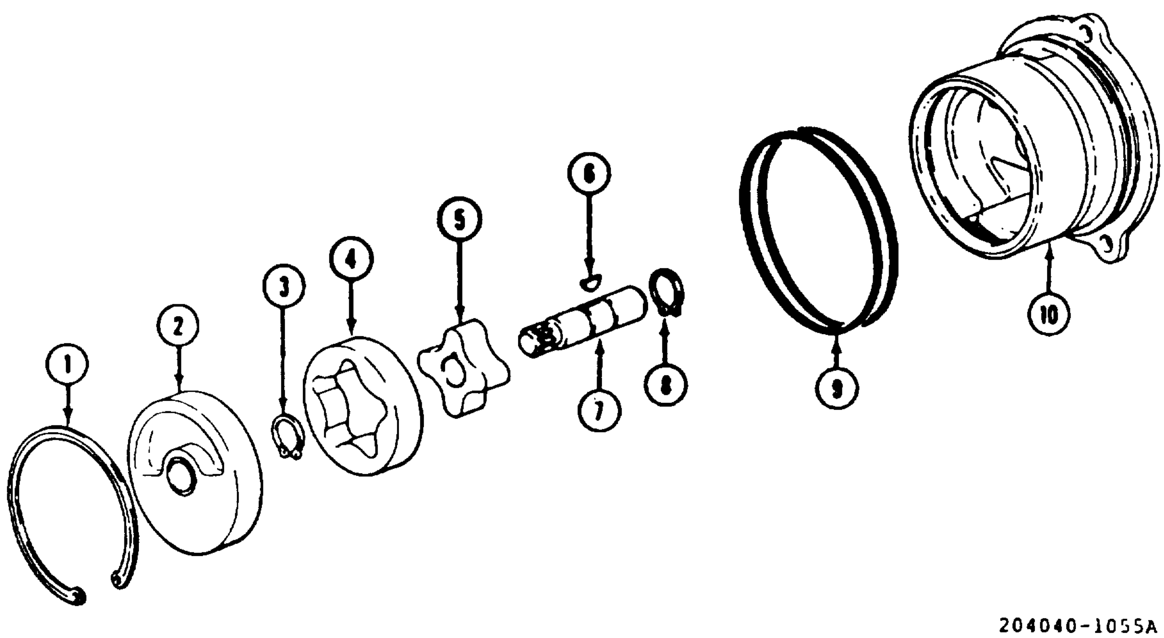
Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(1) Wash all metal parts with solvent (Ch 2) and dry with dean, filtered, compressed air.

(2) Clean corners, grooves, and threads with a short-bristled brush such as a toothbrush.

6-137. REPAIR — OIL PUMP (AVIM).

Repair is limited to inspection of pump for wear or damage and testing pump output in accordance with paragraph 6-139. If wear limits, defined in paragraph



1. Retaining Ring
2. Retainer Plate
3. Retaining Ring
4. Outer gerotor
5. Inner geroter
6. Woodruff key
7. Shaft
8. Retaining ring
9. Packing (2)
10. Body

Figure 6-48. Transmission Oil Pump

6-135. are exceeded or if pump fails to meet test requirements, forward pump to depot maintenance.

6-138. ASSEMBLY-OIL PUMP (AVIM)

a Lubricate parts with oil (C79 (C79A) or C80) for ease in assembly.

b. Install retaining ring (8, figure 6-48) on shaft (7) inboard groove.

c. Insert woodruff key (6) in shaft (7) and install inner gerotor (5) so that keyway engages key. Install retaining ring (3) on outboard end of shaft.

d. Install shaft (7) in body (10). Install outer gerotor (4) over inner gerotor (5).

e. Install retainer plate (2) in body (10). Make sure locating pin is properly seated. Install retainer ring (1) in body (10) with beveled side of ring facing up. Make sure ring is firmly seated in body groove.

f. Check that shaft (7) will rotate without binding.

6-139. TEST PROCEDURES-OIL PUMP (AVIM).

a. Use lubricating oil (C79 (C79A) or C80). Oil must be clean and free from foreign matter.

b. Oil must be 110 TO 130 degrees F (43 TO 54 degrees C) for duration of rest.

c. Check pump shaft rotation in both directions. Shaft must rotate freely; replace the pump if any binding is noted.

d. Place pressure and vacuum gages as close to the pump as possible. See figure 6-49. Use piping that will cause no appreciable pressure changes between the gages and the pumps. Use gages which are accurate within 0.5 percent full scale.

CAUTION

Be sure shutoff valves are open before starting pump.

e. Make flow measurements with a meter that is accurate within plus or minus 1.0 percent

f. Measure pump speed with a tachometer directly coupled to the pump shaft. The tachometer must be accurate within plus or minus 1.0 percent or 20 RPM, whichever is greater.

g. Observe the following:

(1) Operate pump at 3575 RPM.

(2) Oil temperature of 110 TO 130 degrees F (43 TO 54 degrees C).

(3) Inlet pressure Of 24 TO 30 inches of mercury.

(4) Discharge pressure shall be 50 psig.

h. Minimum pump flow shall be 10.5 gpm.

6-140. INSTALLATION-OIL PUMP.

a. Install new packings (9, figure 6-48) in two grooves around pump housing. Lubricate packing with transmission oil.

CAUTION

b. Insert pump into mounting port, while main rotor is slowly rotated until pump shaft is positively engaged to splined driveshaft in transmission sump. Install washers and nuts on studs, with drain tee bracket on forward stud. Torque nuts 50 TO 70 inch-pounds.

c. Apply a bead of sealant (C 105) around mating joint of oil pump and transmission.

d Connect drain line tubes to valve and tee.

e. Fill sump with oil (C79 (C79A) or C80) to normal level on sight gages. Close access openings and cowling.

6-141. OIL COOLER

6-142. DESCRIPTION-OIL COOLER.

A radiator type oil cooler (1, figure 6-50) with an internal temperature and bypass control valve is connected into the transmission oil pressure external lines. The cooler is mounted beside the engine oil system cooler, under an opening in the engine

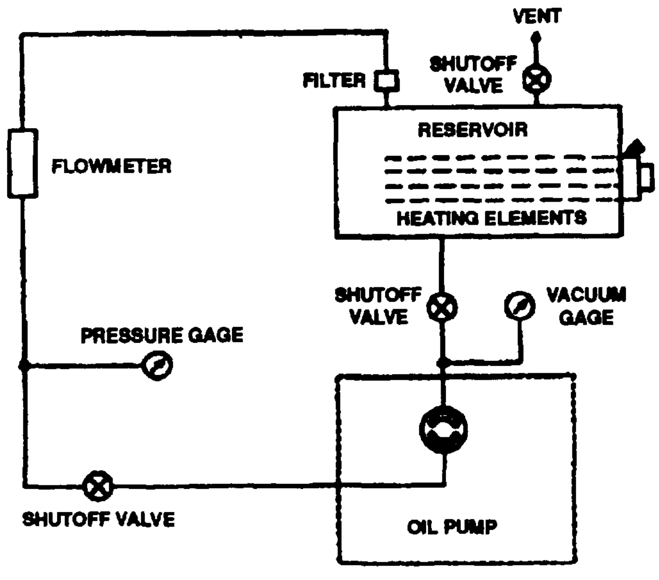


Figure 6-49. Transmission Oil Pump-Test Setup

compartment deck. The two coolers are bolted together and share the same cooling air flow, but have no oil circulation between them. 'The inlet fitting is equipped with a manual drain valve and overboard drain line.

6-143. REMOVAL-OIL COOLER

CAUTION

Use back-up wrenches when removing and installing oil cooler drain fittings, valves, and lines.

a. Remove oil cooler duct on left side of fuselage below engine combustion section.

b, Drain oil from both coolers (paragraph 4-78).

c. Remove bleed air-driven turbine and fan duct (paragraph 4-78).

d. Disconnect engine oil cooler hoses (paragraph 4-78), hoses (2 and 17, figure 6-50), and drain tube (18). Cover open fittings and hose ends.

e. Remove bolts (4) and washers (3). Lower cooler assembly (1) out of compartment.

f. separate engine oil cooler (paragraph 4-78) from transmission oil cooler by removing bolts (11), washers (6) and nuts (5).

g. If cooler is being replaced, remove fittings for use on replacement assembly.

(1) Loosen nut (16) and remove elbow (14) with packings (16 and 13) and union (12). Remove nut (16).

(2) Remove nuts (10) and washers (9); then remove adapter (8), gasket (7).

(3) Loosen nut (20); then remove packing (21) drain valve and tee assembly (19). Remove nut (20).

(4) Remove nuts (22) and washers (23); then remove adapter (25) and gasket (24).

6-144. INSPECTION-OIL COOLER

a. Inspect fittings for damage.

b. Inspect cooler core and body for evidence of leakage.

c. Inspect cooler core for clogged air passages and cleanliness.

d. Inspect temperature regulating valve (26, Figure 6-50) and valve housing for stripped threads and distortion, scoring, or wear of the seal surfaces. Check functioning of bypass control valve as follows:

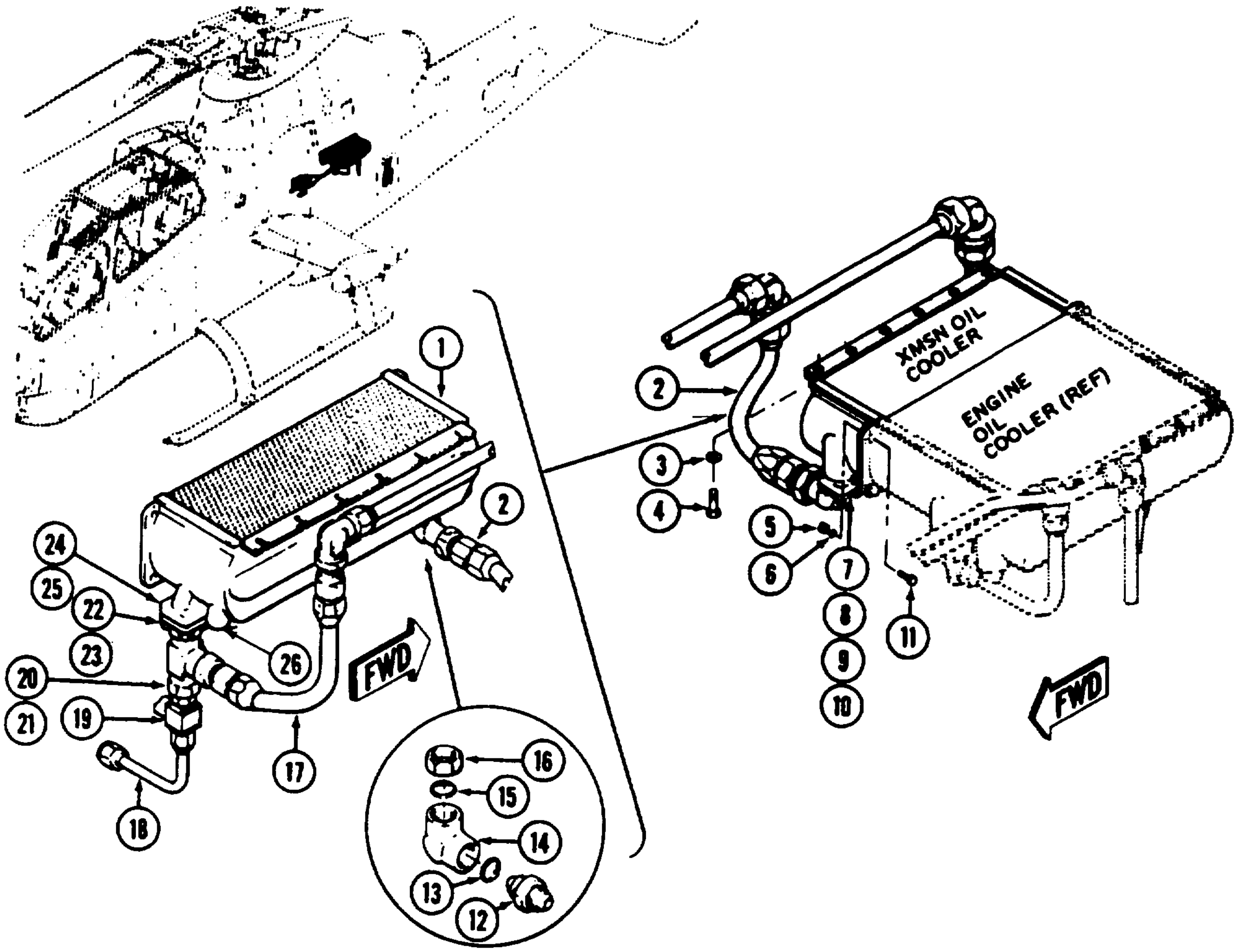
(1) Submerge valve in water heated to 150 to 155 degrees F (66 to 68 degrees C) for five minutes. Valve should open.

(2) Remove valve ii-em water and measure length and record.

(3) Submerge valve in water heated to 176 to 180 degrees F (80 to 82 degrees C) for five minutes. Valve should open.

(4) Remove valve from water and measure length. Minimum acceptable increase in valve length from dimension recorded in step (2) is 0.090 inch.

(5) If valve fails check, replace valve.



1. Cooler assembly
2. Hose assembly
3. Washer
4. Bolt
5. Nut
6. Washer
7. Gasket
8. Adapter
9. Washer
10. Nut
11. Bolt
12. Union
13. Packing
14. Elbow
15. Packing
16. Nut
17. Hose assembly
18. Flared tube
19. Valve and tee assembly
20. Nut
21. Packing
22. Nut
23. Washer
24. Gasket
25. Adapter
26. Valve thermostatic

204040-1172

Figure 6-50. Transmission Oil Cooler Installation

6-144.1. CLEANING-OIL COOLER (AVIM).

CAUTION

When using steam and compressed air, be careful not to damage air fins by high pressures.

a. Steam clean the exterior surfaces and corrugated sir fins of each core. Remove obstructions from air fins with a pick and compressed air.

b. Prepare oil cooler for internal cleaning as follows:

(1) Remove lockwire end unscrew oil cooler bypass valve body (26, figure 6-50) from valve housing in cooler.

(2) Press a rubber plug into the bypass opening in the valve housing.

(3) Reinstall temperature regulating valve (26) into valve housing so valve body bears up against the rubber plug.

c. Connect oil cooler in line with cleaning equipment in reverse of normal flow for first flush (figure 6-50.1).

NOTE

Centrifugal pump in cleaning equipment must be capable of supplying fluid at approximately 40 gpm while maintaining pressure of 76 psi.

d. To remove oil end loose sludge and to reduce contamination of cleaning solutions during following operations, pre-clean cooler interior as follows:

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(1) Flush core in reverse direction, with solvent (C 112) for 30 minutes or until solvent appears clean.

(2) Reverse lines to cooler and flush core in direction of normal flow for approximately 15 minutes.

(3) Remove oil cooler from cleaning equipment and drain all fluid from cooler.

e. Remove dirt, carbon deposits, oil gum, lead deposits, and other contaminants by connecting oil cooler to cleaning equipment (figure 422). Use cleaning compound (C35).

(1) Flush core 30 TO 60 minutes in direction opposite to normal flow.

(2) Reverse lines and flush core in normal direction for 15 minutes.

(9) Remove plug installed in bypass opening of valve housing and insert plug in cooling section opening. Reinstall temperature regulating valve (26, figure 6-50).

(4) Flush oil cooler in normal direction for 15 minutes to clean bypass passage.

(6) Remove plug from cooling section opening in valve housing and install into bypass opening. Reinstall temperature regulating valve (26, figure 6-50).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

f. Connect oil cooler to cleaning equipment containing cleaning compound (C35). Install 100-mesh screen at inlet and outlet ports of oil cooler.

(1) Flush core for 10 minutes in each direction.

‘2) Check 100-mesh screens between each flush.

(3) If screens are not clear, reflush core for 5 minutes in each direction, repeat until screens are clear.

g. Remove rubber plug from bypass valve housing in oil cooler.

6-145. REPAIR-OIL COOLER

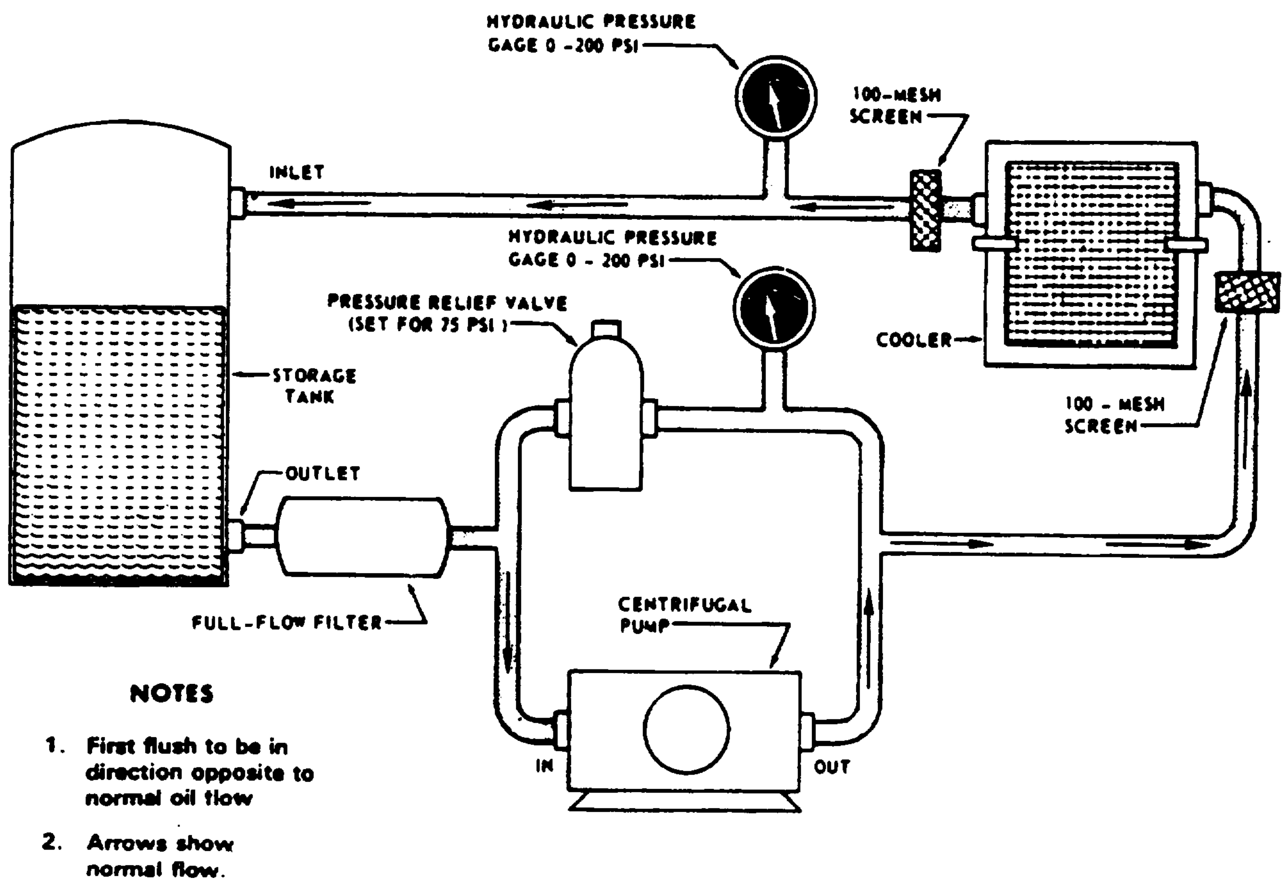


Figure 6-50.1. Oil Cooler Cleaning Schematic

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

If transmission internal failure has occurred, replace cooler and thoroughly flush all connecting lines and fittings with solvent (C112). Dry with filtered compressed air.

a. If cooler core shows evidence of external clogging, clean core using solvent (C112) and compressed air.

b. If cooling fins on core are bent enough to disrupt air flow, straighten using flat nose pliers. Use care to prevent damage to cooler core.

c. Replace cooler if damaged or leaking.

d. Replace damaged fittings.

6-146. INSTALLATION — OIL COOLER.

If replacing cooler, install fittings from removed cooler assembly (1, figure 6-50).

(1) Install adapter (25) and gasket (24), using nuts (22) and washers (23).

(2) Install nut (20); then install packing (21) and valve and tee assembly (19). Tighten nut (20).

(3) Install adapter (8) and gasket (7), using nuts (10) and washers (9).

(4) install nut (16); then install packings (15 and 13), elbow (14), and union (12). Tighten nut (1 6).

b. Connect engine and transmission oil coolers, using bolts (11), washers (6) and nuts (5).

c. Place coolers in position in helicopter and secure, using bolts (4) and washers (3). Hold coolers in place with suitable clamps while installing bolts.

d. Install turbine fan and duct (paragraph 4-91).

CAUTION

Check proper fit of flared ends of tubing to valves and fittings. Do not allow preloading or stresses due to misalignment or improper fit.

e. Connect hoses (17 and 2) and flared drain line (18) to transmission oil cooler and hoses to engine oil cooler (paragraph 4-82).

f. Install oil cooling duct on left side of fuselage compartment.

g. During first run-up after installing cooler, carefully observe transmission and engine instruments. Check oil cooler installation for leaks. After a brief period of running, add oil (C79 (C79A) or 80) to transmission and engine oil tank, as oil level will have lowered by the filling of empty lines and cooler.

6-147. AUTOMATIC EMERGENCY BYPASS VALVE.

6-148. DESCRIPTION — AUTOMATIC EMERGENCY BYPASS VALVE.

The bypass valve (13, figure 6-47) is located on the aft side of the transmission below the power input quill. The valve protects the transmission against total loss of oil if a leak occurs in the oil cooler and its connecting lines, by isolating the cooler circuit from the oil system proper. It consists of a body enclosing nozzles, piston assemblies, a compensating spring, and a warning switch. Passageways within the valve provide for normal and bypass flow of transmission oil. The warning switch illuminates a light on the pilot caution panel when the valve shifts into the by-pass position

6-149. REMOVAL — AUTOMATIC EMERGENCY BYPASS VALVE.

a. Disconnect electrical lead from terminal at right lower side of valve (13, figure 6-47).

CAUTION

When disconnecting hose from right end of valve, do not allow nut on fitting to turn while loosening flare nut of hose elbow. Any turning of valve fitting nut will destroy calibration of valve.

b. Disconnect outlet tube (12) and three oil hoses (38, 39, 40) or (40, 41, 42) from fittings on valve. Cap fittings and open ends of tube and hoses.

NOTE

In step c. and d. two electrical cable brackets will be detached but remain on wiring.

c. Remove two nuts which secure bottom of valve mounting bracket on transmission case studs.

d. Remove two bolts to detach top valve bracket from upper bracket, which remains attached on input drive quill studs.

e. Remove valve and bracket assembly.

f. Detach valve from bracket by removing lockwire, four bolts, and washers.

6-150. INSPECTION — AUTOMATIC EMERGENCY BYPASS VALVE.

a. Inspect valve and fitting for leakage.

b. Inspect fittings and valve mounting holes for damaged threads.

6-151. REPAIR — AUTOMATIC EMERGENCY BYPASS VALVE. (AVIM)

Premaintenance Requirements for Repair of Automatic Emergency Bypass Valve

Conditions	Requirements
Model	AH-IS
Part No. or Serial No.	All
Special Tools	(T49) (T50) (T51) (T52)
Test Equipment	Test Stand
Support Equipment	None
Minimum Personnel Required	Two
Consumable Materials	(C74) (C78) (C79) (C79A) (C80) (C88)(C91) (C102) (C105) (C112) (C116) (C137)
Special Environmental Conditions	Dust Free

a. Disassemble valve as follows:

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(1) Soak "return end" of cooler bypass valve assembly (figure 6-51) in MEK (C74) for one hour, then remove sealant.

NOTE

Be careful not to damage valve components while removing sealant.

(2) Clamp fixture (T49) in vise, with drilled surface in horizontal position. Attach oil cooler valve assembly to the tool with four bolts (AN4-5A) or equivalent.

(3) Cut and remove lockwire from fitting (28, figure 8-51), nut and switch (11).

(4) Remove union (3) and packing (14).

(5) Loosen checknut on elbow fitting (1). Loosen adapter (13) and remove fitting.

(6) Remove switch (11) and packing (12).

(7) Remove bolt (32) and elbow (30).

WARNING

Use extreme care in disassembly of remaining valve parts to avoid nicking or scratching. Package each part individually to avoid damage while handling.

(8) Remove fitting (28).

NOTE

Nozzle (21) will come out with the fitting; therefore, hold threaded end of fitting upward after removal to prevent dropping nozzle.

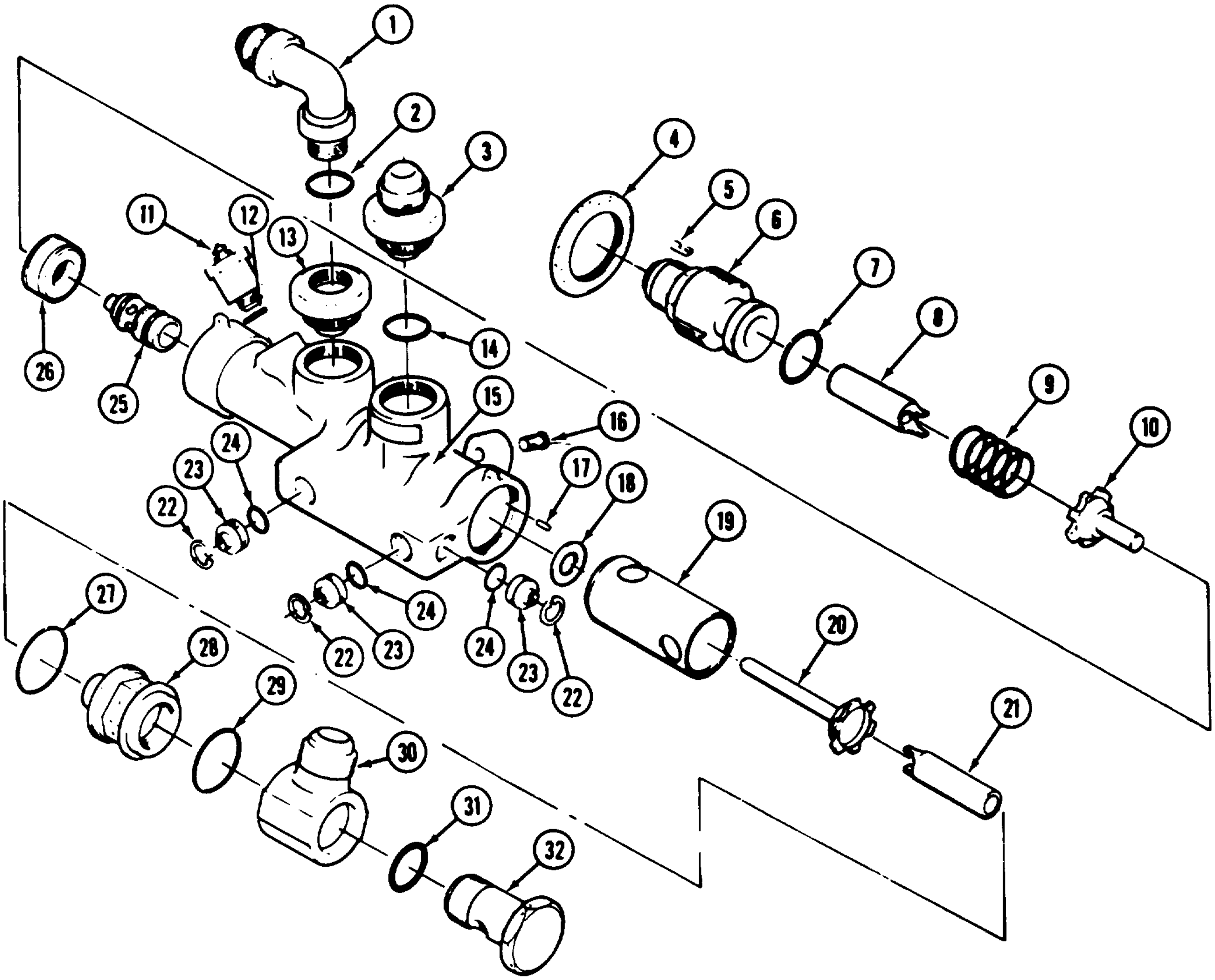
(9) Remove nozzle (21) from fitting (28),

(10) Insert end of finger into open end of valve assembly and gently remove sleeve (19) and piston (20) from valve housing.

(11) Remove piston (20) from sleeve (19), being very careful not to bend or scratch the piston stem.

(12) Remove and discard washer (18) from sleeve (19).

(13) Loosen nut (4) and remove nut and key (5) from fitting (6). Remove fitting (6) and nozzle (8) from



1. Fitting and check nut
2. Packing
3. Union
4. Nut
5. Key
6. Fitting
7. Packing
8. Nozzle
9. Spring
10. Piston
11. Switch
12. Packing
13. Adapter
14. Packing
15. Valve housing
16. Rosan insert
17. Pin
18. Washer
19. Sleeve
20. Piston
21. Nozzle
22. Retaining ring
23. Plug
24. Packing
25. Plunger and retaining ring
26. Seat
27. Packing
28. Inlet fitting
29. Packing
30. Elbow
31. Packing
32. Bolt

209040-24E

Figure 6-51. Oil Cooler Automatic Emergency Bypass Valve Assembly valve housing (15). Be careful not to drop nozzle when removing fitting because nozzle comes out with the fitting.

(14) Remove nozzle (8) from fitting (6).

(15) Remove spring (9) from valve housing (l5).

(16) Remove piston (10) from valve housing (15) as follows:

(a) Insert finger into end of valve housing (15) from which fitting (6) was removed. Push piston (20) seat (26), and plunger (25) as far as possible toward opposite end of housing.

(b) Remove three. retaining rings (22). Pull three plugs (23) and packings (24) from valve housing (15) with puller (T51).

(c) Insert tool (T50) into transfeed port and separate plunger (25) and piston (20).

(d) Remove piston (20) from valve housing (1 5).

NOTE

Plunger (25) and housing (16) are match fitted and are either discarded or reused as a unit.

(17) Remove temporary cloth plug from end of valve housing (15) and remove plunger by inserting finger into open end of plunger (25) and slowly pulling plunger from valve housing.

(18) Remove and discard all packings from valve components.

b. Clean disassembled bypass valve as follows:

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(1) Clean detail parts (6, 8, 9, 10, 19, 20, and 21, figure 6-51) individually with solvent (C112).

CAUTION

Wash and clean each of the below items carefully and individually to prevent nicking, scratching, or other damage to the parts.

(2) Plug all ports and holes in oil cooler bypass housing (15) to prevent entrance of any liquid into internal areas of valve housing.

(3) Remove paint from exterior portion of oil cooler bypass housing (15) by use of MEK (C74)anda suitable brush.

(4) Dry detail parts of oil cooler bypass valve assembly by use of low pressure, filtered air, or by placing parts on dry clean cloth in such manner that no part will contact any other part of the assembly.

c. Inspect parts of disassembled bypass valve as follows:

(1) Inspect all threaded parts of oil cooler bypass valve for torn, crossed, or otherwise damaged threads.

(2) Inspect all metal detail parts of oil cooler bypass valve assembly for nicks, scratches, surface finishes, and all other limits as shown and designated in figure 6-52 through 6-61.

(3) Inspect Rosan inserts (16, figure 6-51) for secure installation and for damaged threads.

NOTE

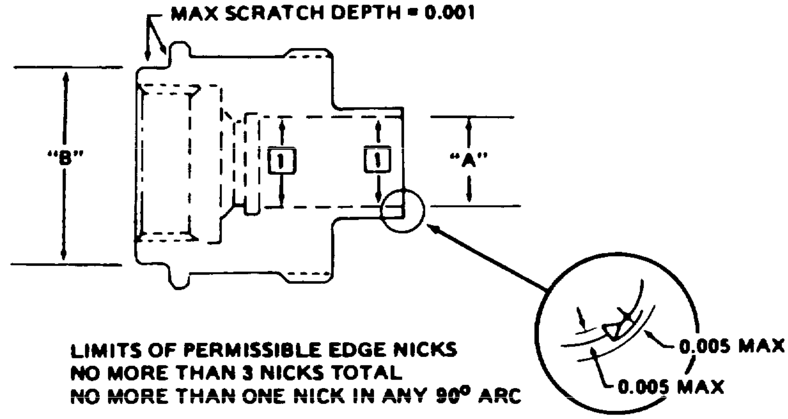
Housing assembly and plunger (15 and 25. figure 6-51) are mated parts and are used or discarded as a unit.

d. Repair parts of bypass valve as follows:

(1) Do not repair the following parts (1, 3, 4, 5, 9, 10, 11, 13, 17, 18, 19, 20, 22, 23, 26, and 30, figure 6-51). Do not rework nicks or scratches within tolerance as indicated in figure 6-52 through 6-60. Replace any of the parts listed above that have damage in excess of limits shown on illustrations.

(2) Replace fittings (6 or 28, figure 6-51) if threads are damaged.

209-040-819 FITTING



DIA "A"

[1] MEASURE DIA WHERE INDICATED

MIN	MAX	REPLACE
0.6255	0.6260	0.6267
SURFACE FINISH		
	16	REPLACE AT 20
NICKS, SCRATCHES, CORROSION		
REPLACE FITTING IF SCRATCHES, NICKS, CORROSION VISIBLE		

DIA "B"

MIN	MAX	REPLACE
1.313	1.315	1.312
SURFACE FINISH		
	32	45

NO CRACKS ALLOWED

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

209040-25B

Figure 6-52. Damage Limts — Inlet Fitting

(3) Repair fittings (6 or 28) with a fine round India stone (C116). Break sharp edges, and remove other damage, to the tolerances shown in figure 6-62. Replace fittings if damage exceeds the allowable limits shown on figure 6-52 and 6-53.

(4) Repair nozzies (8 and 21, figure 6-51) as follows:

(a) Use a fine, round india stone (C116) and break the outside sharp edge within 0.002 TO 0.005 inch iimit as shown in figure 6-63.

(b) Remove nicks and scratches on nozzles (8 and 21, figure 6-51) to depth and width illustrated on figure 6-63).

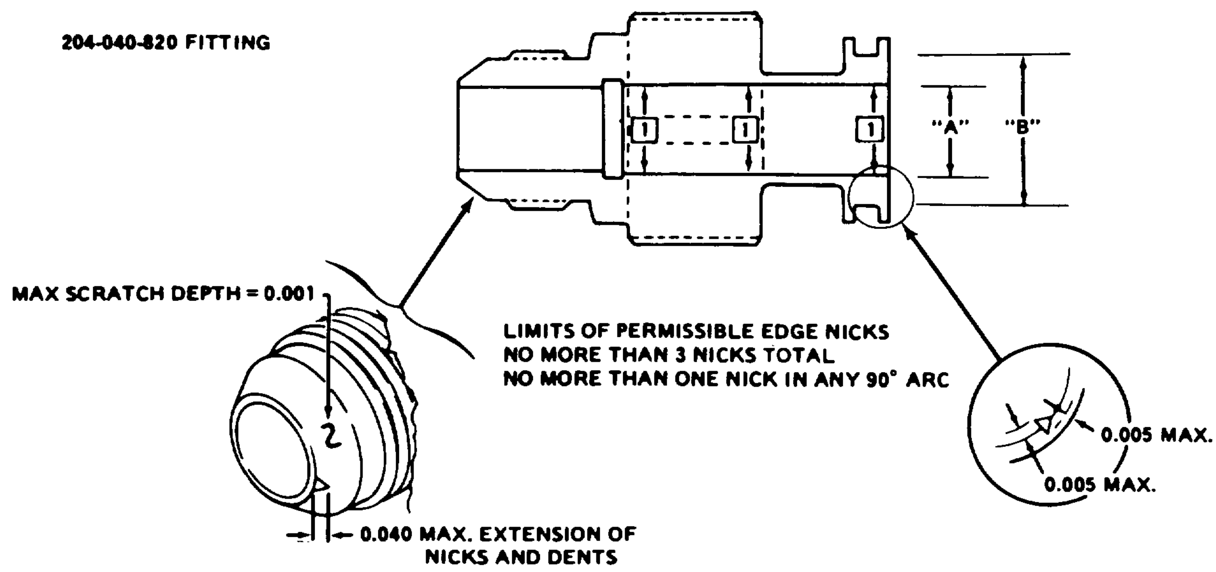
(c) Replace nozzies if inspection limits of figure 6-56 are exceeded.

(5) Rework plunger (25, figure 6-51) as foliows:

CAUTION

Uae extreme care when mounting piunger in coliet, to prevent damage to the piunger.

(a) Chuck or mount plunger (3, figure 6-64) in a suitable resilient chuck with O.D. of piunger true



DIA. "A"

[1] MEASURE DIA WHERE INDICATED

MIN.	MAX.	REPLACE
0.6255	0.6260	0.6267
SURFACE FINISH		
	16	20
NICKS, SCRATCHES, CORROSION		
		REPLACE FITTING IF SCRATCHES, NICKS, CORROSION VISIBLE

DIA. "B"

MIN.	MAX.	REPLACE
1.020	1.024	1.0195
SURFACE FINISH		
	32	45
NICKS AND SCRATCHES		
		REPLACE FITTING IF GREATER THAN 0.001 DEEP

NO CRACKS ALLOWED

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

209040-26D

Figure 6-53. Damage Limits — Return Bypass Fitting

within 0.0005 inch. Machine retention ring (1) to 0.648 TO 0.650 inch diameter for width of 0.166 TO 0.278 inch.

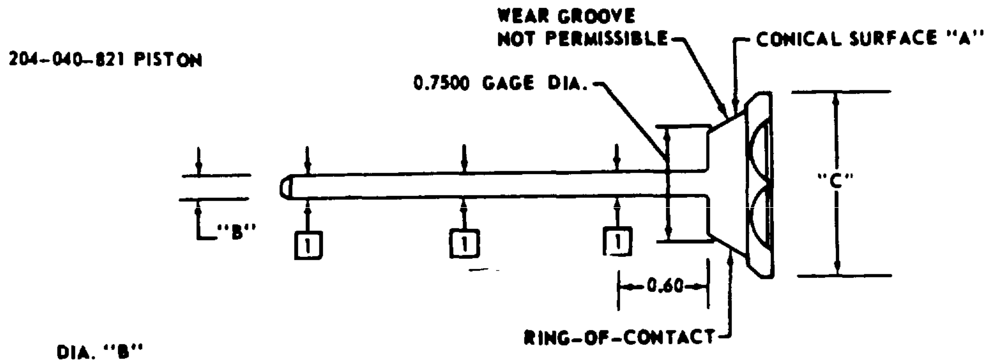
(b) Split and remove the remainder of retention ring (1) from plunger with suitable sharp pointed tool; use care not to nick or scratch the plunger.

(c) Remove and discard packing (2).

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

(d) Clean plunger (3) with solvent (C112) and coat with oil (C79).



DIA. "B"

1 MEASURE DIA. WHERE INDICATED

MIN.	MAX.	REPLACE
0.1245	0.1249	0.1244
SURFACE FINISH		
	8√	12√
NICKS, SCRATCHES & CORROSION		
		REPLACE FITTING IF SCRATCHES, NICKS, CORROSION VISIBLE

CONICAL SURFACE "A"

REPLACE IF:

1. SCRATCHES, NICKS, ETC. AT RING-OF-CONTACT
2. ECCENTRICITY AT GAGE DIA. EXCEEDS 0.001 T.I.R. RELATIVE TO AXIS OF DIA. "B"
3. SURFACE FINISH EXCEEDS 12√

DIA. "C"

MIN.	MAX.	REPLACE
1.2470	1.2480	1.2466
SURFACE FINISH		
	16√	25√
		REPLACE IF ECCENTRICITY IS GREATER THAN 0.001 T.I.R. RELATIVE TO DIA. "B"

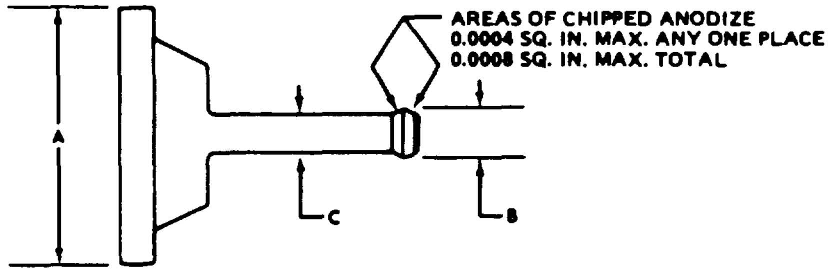
209040-27C

NO CRACKS ALLOWED

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

Figure 6-54. Damage Limits — Inlet Bypass Piston

204-040-822 PISTON



DIA. B

MIN.	MAX.	REPLACE
0.2140	0.2155	0.2132

DIA. A

MIN.	MAX.	REPLACE
1.2470	1.2480	1.2467
SURFACE FINISH		
	16	25

DIA. C

MIN.	MAX.	REPLACE
0.190	0.192	0.189

NO CRACKS ALLOWED.
ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.

209040-28B

Figure 6-55. Damage Limits - Piston

(e) Lubricate new packing (2) with oil (C79) and install in groove of plunger,

(f) Heat new retention ring (1) 140 TO 170 degrees F (60 TO 77 degrees C) and lubricate retention I.D. with oil (C78).

(9) position plunger (3) into holding fixture (T52) and press new retention ring (1) into place using tool (752).

(h) Break sharp edges 0.002 TO 0.006 inch as illustrated.

(i) Replace plunger if it foils to meet inspection requirements of figure 6-60.

(6) Repair housing (15, figure 6-51) as follows:

(a) Replace any broken thread inserts in housing mount pads, to depth of 0.000 TO 0.010 inch after coating the external insert threads with unreduced primer (C88 or C91).

(b) Remove nicks and scratches from exterior of housing (15) by filing, then polish with 320 grit sandpaper (C102).

CAUTION

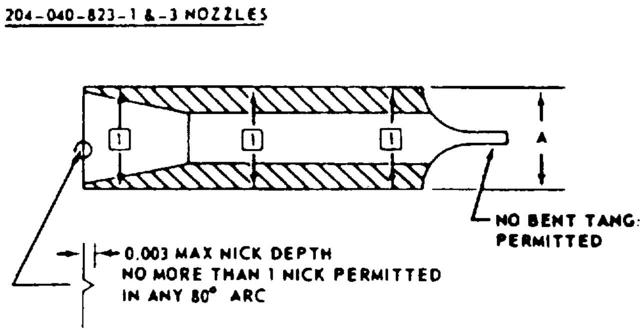
Make certain that thickness of housing wall is at least 0.090 inch after rework.

(c) Do not attempt to remove all traces of nicks or scratches on ports or bosses on valve housing. Remove only the raised, disturbed metal.

(d) Replace housing and mating plunger if housing fails inspection requirements of figure 6-59.

e. Assemble bypass valve as follows:

(1) Position holding fixture (T49) in vise Attach valve housing to fixture in horizontal position with four bolts and nuts.



MIN.	MAX.	REPLACE
0.6247	0.6250	0.6240
SURF. FINISH		
	16	20
REPLACE FOR ANY VISIBLE-EVIDENCE OF NICKS, SCRATCHES OR CORROSION.		

NO CRACKS ALLOWED

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

209040-34A

Figure 8-56. Damage Limits — Nozzles

(2) Lubricate internal ports and passages of housing (15, figure 6-51) with oil (C79) (C79A).

NOTE

Make certain that plunger (25) and housing (15) have the same serial number. They are mated pairs and are to be used or discarded as a unit.

(3) Lubricate plunger (25) with oil (C79) (C79A). Place plunger on end of finger and insert plunger in housing (15).

(4) Attach plunger (25) to piston (10 by exerting pressure on outboard ends of wooden dowel pins held in contact with outboard ends of plunger and piston. See figure 6-65.

(5) Rotate housing (15, figure 6-51) end-for-end several times to check freedom of movement of plunger and piston,

NOTE

Plunger (25) and piston (10)assembly should slide the full length of their travel with no applied force other than their own weight. If plunger binds in its housing, check serial numbers of plunger and housing for mating. Also inspect for nicks, scratches, and foreign particles.

(6) Lubricate a new washer (18) with oil (C78) and install in groove at end of sleeve (19).

(7) Install sleeve (19) in inlet end of housing (15) with pin (17) at end of sleeve inserted into index hole in bottom of housing bore.

(8) Install piston (20) in sleeve (19) after first lubricating piston stem with oil (C79) (C79A).

(9) Lubricate packing (27) with oil (C79) (C79A) and install in housing (15) around end of sleeve (19).

(10) Lubricate nozzle (21) with oil (C79) (C79A) and insert nozzle in end of fitting (28).

NOTE

Nozzle should slide freely under its own weight. If drag exists, again inspect for burrs on nozzle edges, on fitting (28) and/or dirt on components.

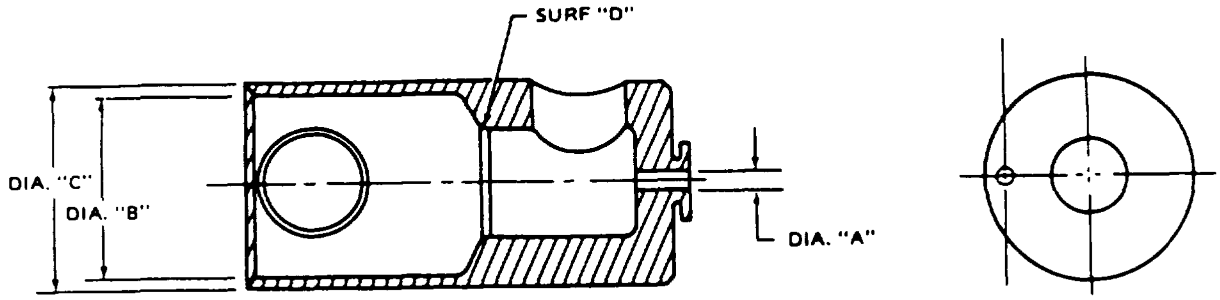
(11) Install fitting (28) and nozzle (21) in the inlet port of housing (15). Torque fitting (28) 250 TO 300 inch-pounds, Lockwire (Cl17) fitting to hole in housing (15).

(12) Install spring (9) in return port of housing (15).

(13) Lubricate packing (7) with oil (C79) (C79A) and install on fitting (6).

(14) Lubricate nozzle (8) with oil (C79) (C79A) and insert in fitting (6).

NOTE



DIA. A

MIN.	MAX.	REPLACE
0.1252	0.1255	0.1256
SURFACE FINISH		
	16	REPLACE IF 20
ECCENTRICITY		

DIA. B

MIN.	MAX.	REPLACE
1.2475	1.2500	—1.2502
SURFACE FINISH		
	16	REPLACE IF 20

DIA. C

MIN.	MAX.	REPLACE
1.3742	1.3747	1.3741

REPLACE IF ECCENTRICITY
EXCEEDS 0.001 T.I.R.
RELATIVE TO DIA. B

SURF "D"

CONICAL SEAT MUST SE
FREE OF ALL NICKS, SCRATCHES,
AND CORROSION

REPLACE IF ANY VISIBLE
EVIDENCE OF NICKS,
SCRATCHES, OR CORROSION.

209040-35C

NO CRACKS ALLOWED

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

Figure 6-57. Damage Limits-Sleeve

NOTE

Nozzle should slide freely under its own weight.

(15) Install fitting (6) and nozzle (8) in return end of valve housing (15) approximately three and one-half turns.

(16) Install nut (4) and key (5) on bypass valve and snug up against housing (15).

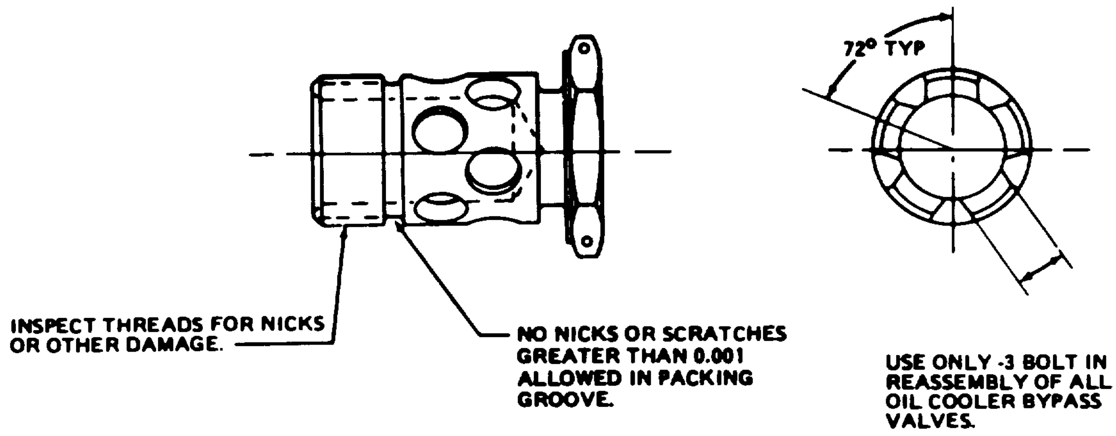
(17) Lubricate packing (31) with oil (C79) (C79A) and install against head of bolt. (32).

(18) Lubricate packing (29) and install on end of fitting (28).

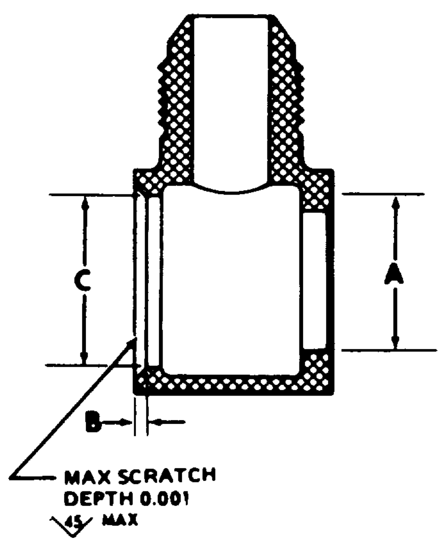
(19) Install elbow (30) on fitting (28) with counter sunk end of elbow (30) against packing (29) on end of fitting (28).

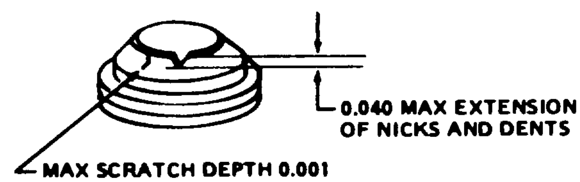
(20) Insert bolt (32) through elbow (30) thread into fitting (28) and snug up bolt.

(21) Lubricate packings (2 and 14) with oil (C79) (C79A). Install one packing on adapter end of elbow fitting (1) and one packing on union (3).



209-040-807-1 FITTING





DIA. A

MIN.	MAX.	REPLACE
1.062	1.064	1.065
SURFACE FINISH		
	32	REPLACE AT 45

DIA. C

MIN.	MAX.	REPLACE
1.316	1.317	1.318

DIM. B

MIN.	MAX.	REPLACE
0.092	0.097	0.098

NO CRACKS ALLOWED

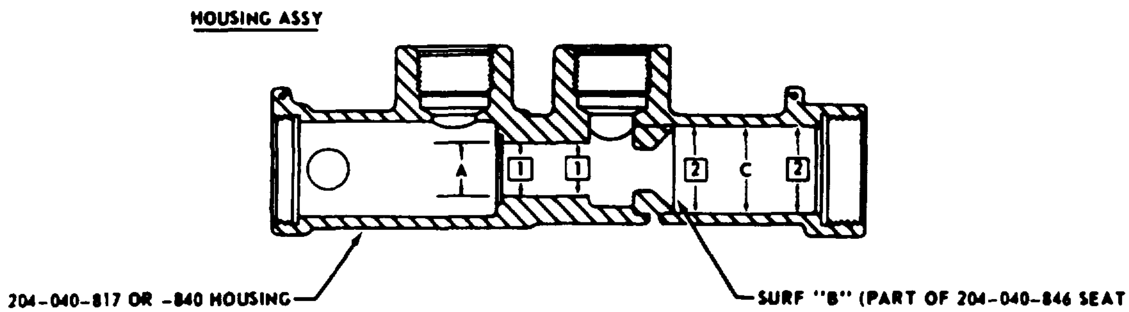
ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

209040-29D

Figure 6-58. Damage Limits - Universal Fitting Bolt l nd Elbow

NOTE

Housing and mating -832 plunger are selectively fitted. Replacement of either housing or plunger necessitates replacement of the mating part.



INSPECT HOUSING BY FLUORESCENT PENETRANT INSPECTION IN ACCORDANCE WITH TM 43-0103.

DIA. A

[1] MEASURE DIA. WHERE INDICATED

MIN.	MAX.	REPLACE
CLEARANCE BETWEEN THIS DIA. & DIA. "A" OF MATING 204-040-832 PLUNGER IS AS FOLLOWS		
0.00030	0.00045	0.00050
SCRATCHES, NICKS, & CORROSION		
REPLACE IF ANY VISIBLE EVIDENCE OF SCRATCHES, NICKS, OR CORROSION		
SURFACE FINISH (-840)		
	MAX. 4	REPLACE IF 6
SURFACE FINISH (-817 HOUSING)		
	MAX 50	REPLACE IF 60

DIA. C

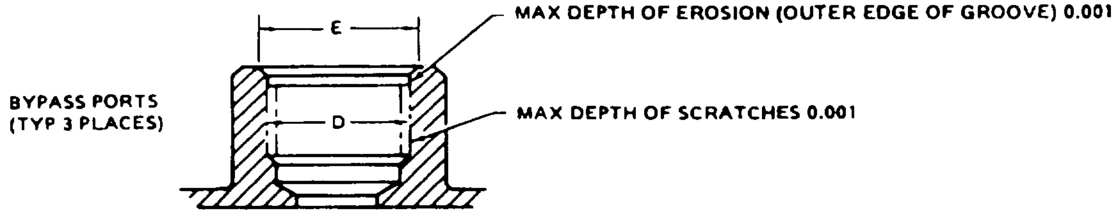
[2] MEASURE DIA. WHERE INDICATED

MIN.	MAX.	REPLACE
1.2495	1.2500	1.2503
SCRATCHES, NICKS, & CORROSION		
REPLACE FOR ANY SIGN OF CORROSION. MAXIMUM DEPTH OF NICK OR SCRATCH - 0.0005.		
SURFACE FINISH (-840)		
	MAX. 16	REPLACE IF 25
SURFACE FINISH (-817)		
	MAX. 80	REPLACE IF 100

NO CRACKS ALLOWED
ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

209040-30D

Figure 6-59. Damage Limits - Housing Assembly (Sheet 1 of 2)



DIA "E"

MIN	MAX	REPLACE
0.663	0.667	0.669

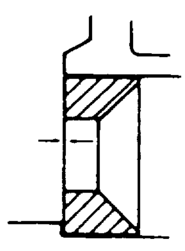
DIA "D"

MIN	MAX	REPLACE
0.625	0.630	0.631

SURFACE "B"

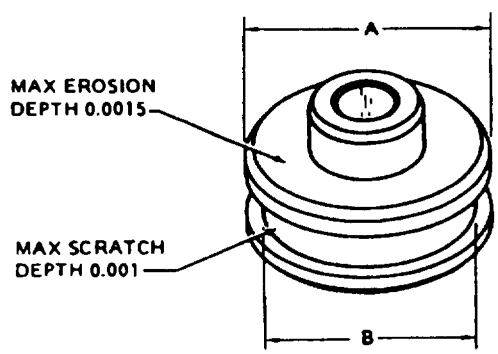
REPLACE HOUSING ASSEMBLY IF

(1) VISIBLE EVIDENCE OF NICKS, SCRATCHES OR CORROSION IN PLUNGER-CONTACT AREA.



(2) SEAT WEAR AT PLUNGER-CONTACT AREA IS 0.0015 OR GREATER

(3) SURF (AT PLUNGER CONTACT AREA) IS OUT OF SQUARE MORE THAN 0.001 RELATIVE TO AXIS OF DIA "A"



DIA "A"

MIN	MAX	REPLACE
0.621	0.623	0.620

DIA "B"

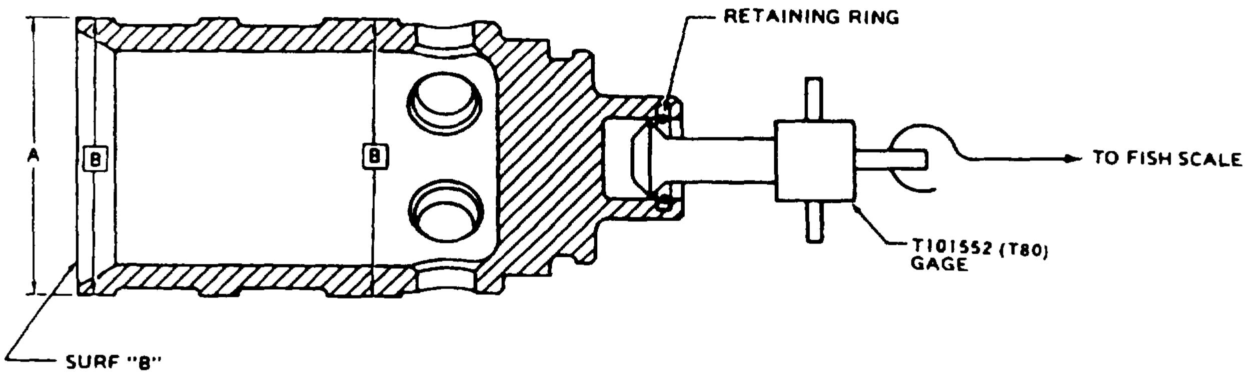
MIN	MAX	REPLACE
0.514	0.525	0.513

NO CRACKS ALLOWED

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

209040-31C

Figure 6-59. Damage Limits — Housing Assembly (Sheet 2 of 2)



DIA A

[B] MEASURE DIA. WHERE INDICATED

MIN.	MAX.	REPLACE
CLEARANCE BETWEEN THIS DIA. & DIA. "B" OF MATING VALVE HOUSING IS AS FOLLOWS:		
0.00030	0.00045	0.00050
NICKS, SCRATCHES, & CORROSION		
REPLACE FOR ANY VISIBLE EVIDENCE OF NICKS, CRACKS, OR CORROSION.		

SURF B

REPLACE IF
(1) ANY NICKS OR SCRATCHES GREATER THAN 0.001 DEEP
(2) OUT OF SQUARE RELATIVE TO AXIS OF DIA. "A" MORE THAN 0.001 T. I. R.

REPLACE RING IF
(1) IF BROKEN (2) IF FORCE REQUIRED TO PULL T101552 FROM PLUNGER IS LESS THAN 7 OZ. (3) IF EXCESSIVE BURRS ARE PRESENT AT RING GAP (CHECK NOSE OF MATING 204-040-822 PISTON FOR EXCESSIVE ANODIZE CHIPPING).

NO CRACKS ALLOWED

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED

Figure 6-60. Damage Limits — Plunger

(22) Install adapter (13) in transmission feed port of housing (15) and torque 500 TO 550 inch-pounds. Install fitting and checknut (1) into adapter (13). Install union (3) into cooler feed port and torque 500 TO 550 inch-pounds,

(23) Lubricate packing (12) with oil (C79) (C79A) and install packing on switch (11). Install switch (11) in valve housing (15) and torque 40 TO 60 inch-pounds.

(24) Lubricate three packings (24) with oil (C79) (C79A) and install one packing (24) on plug (23) and one retaining ring (22) in each of bypass ports.

5-152. TEST PROCEDURES — AUTOMATIC EMERGENCY BYPASS VALVE. (AVIM)

a. Install the bypass valve in a test stand. See figure 6-66 for schematic of test stand. The accuracy of the test equipment must be certified within following tolerances: pressure gages: 1 percent, temperature gages: 2 percent.

b. Perform seal bond test as follows:

(1) Tighten checknut in fitting and checknut (1, figure 6-51) not to exceed 200 inch-pounds torque.

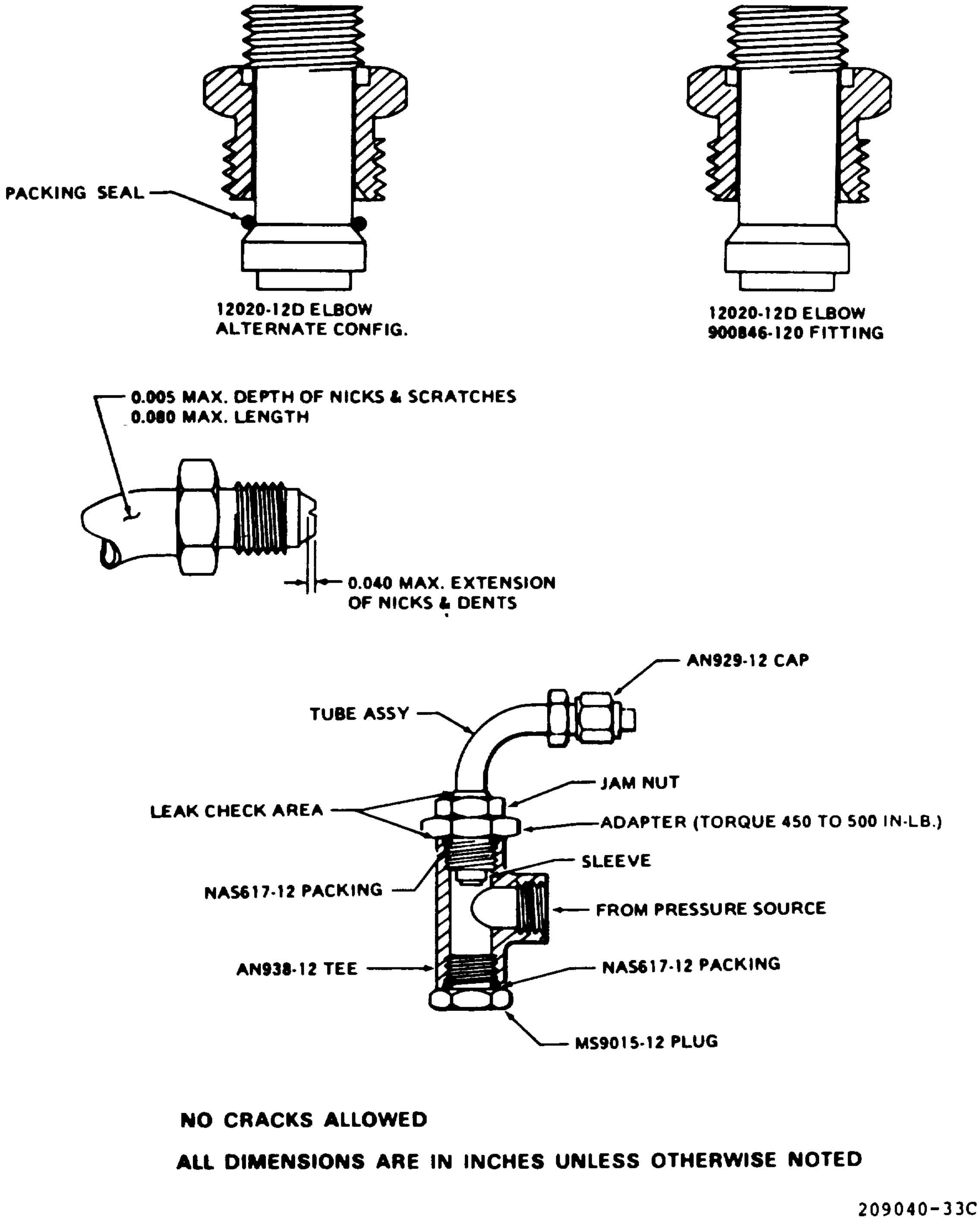


Figure 6-61. Damage Limits — Elbow Fitting

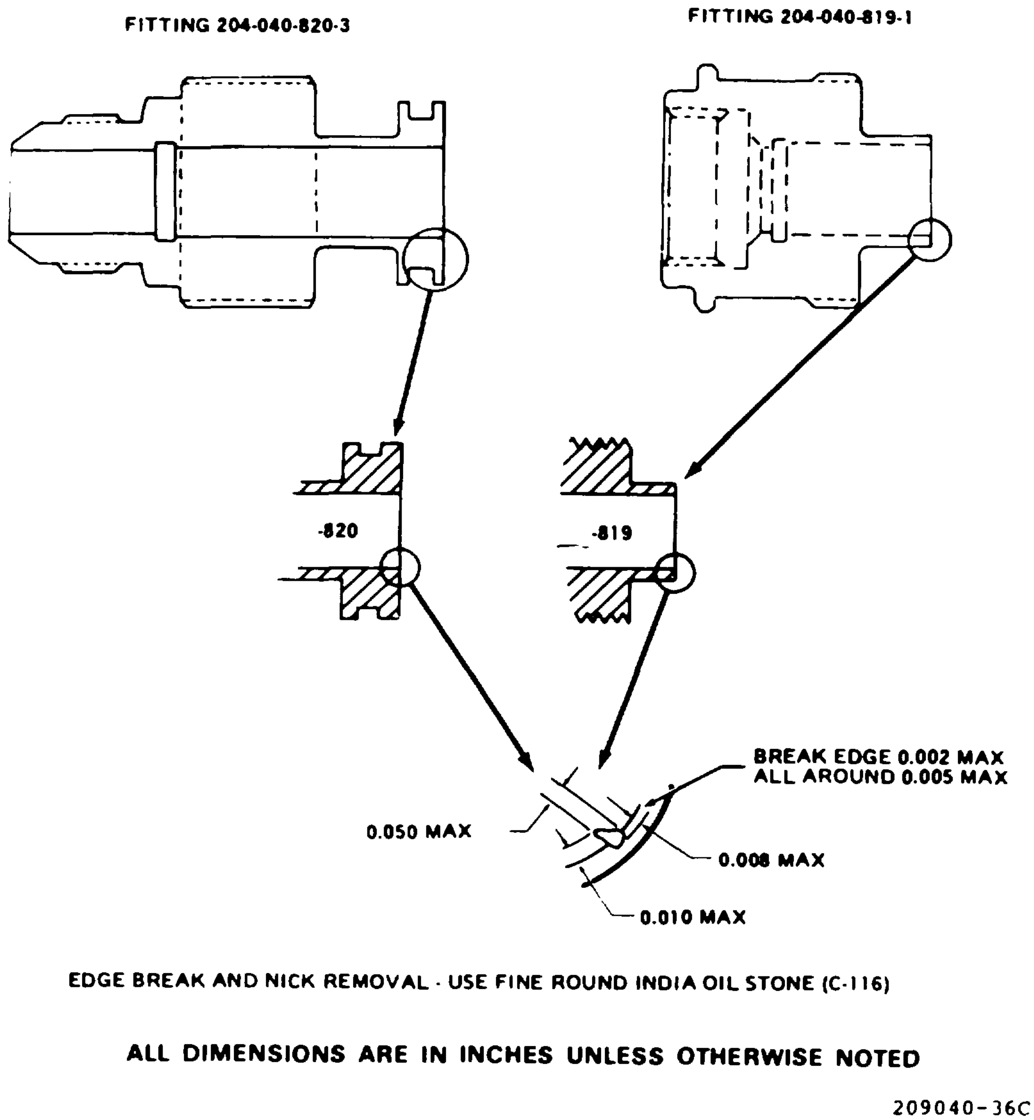


Figure 6-62. Fittings — Repair

(2) Remove compensator spring (9, figure 6-51) in order to ensure proper placement of other shifting elements of valve.

(3) Position valves: V1-closed; V2-open; and V3-closed (figure 6-66).

(4) Monitor fluid discharged by means of V2 by flowmeter No. 2 and P1, at pressures of 13±5 and 210±10 pounds per square inch. Leakage at the higher pressure must be no more than 5cc/min greater than the flow at the lower pressure,

c. Perform valve sensitivity test as follows:

(1) Install compensator spring (9, figure 6-51) in the oil cooler bypass valve and complete assembly of valve.

(2) Set pressures as follows (figure 6-66):

Pl = 115 ±2 PSlG

P2 = 95 ±2 PSIG

P3 = 84 ±2 PSIG

P4 = 64 ±2 PSIG

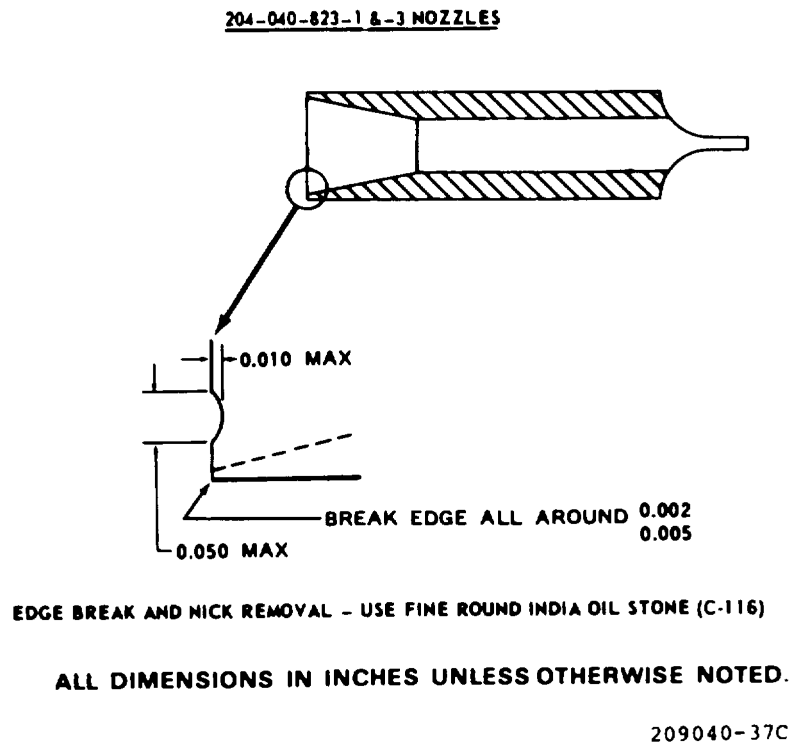
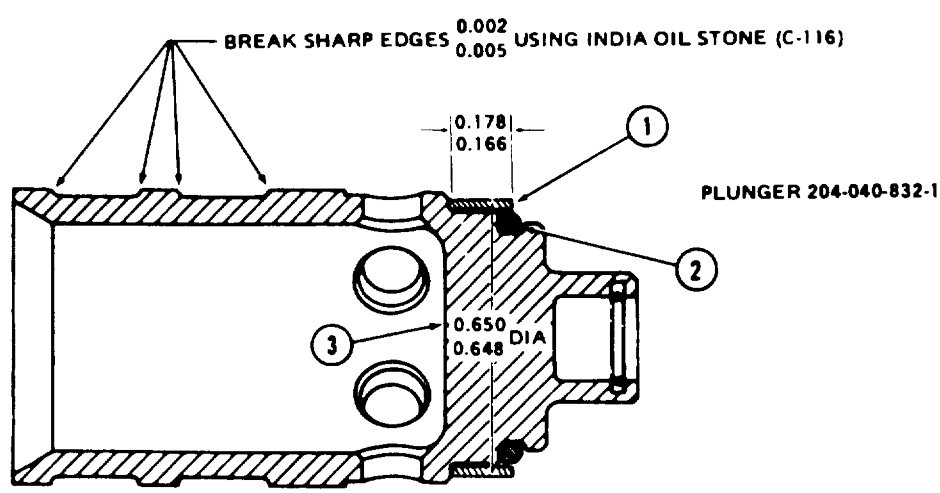


Figure 6-63. Nozzles — Repair



1. Retention ring
2. Packing
3. Plunger

ALL DIMENSIONS IN INCHES UNLESS OTHERWISE NOTED.

209040-38F

Figure 6-64. Plunger — Repair

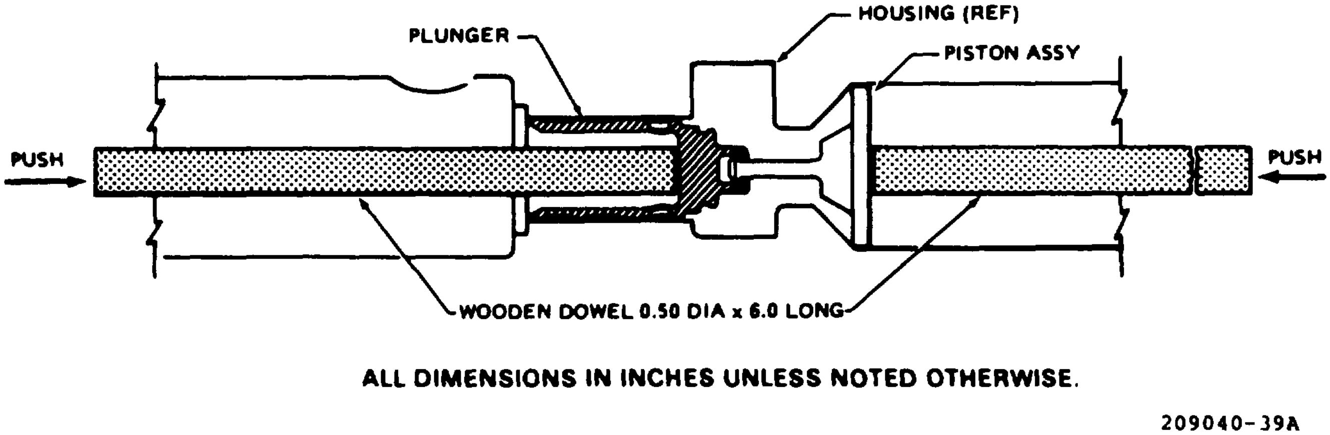


Figure 6-65. Work Aid Application — Plunger and Piston

(3) Set valves in position as follows (figure 6-66):

V1 = Open

V2 = Open at controlled rate to measure valve sensitivity.

V3 = Open

(4) Adjust oil temperature so that it reads 100 degrees ± 5 degrees F on circuit temperature gage.

(5) Adjust input flow rate, which is regulated by pump, to read 11.8 gal per minute on flow meter No. 1.

(6) Adjust the valve sensitivity to sense and shift oil flow to bypass the cooler as follows (figure 6-66):

NOTE

The bypass valve must sense and shift at a cooler leakage rata of 1.12 TO 1.37 gallons per minute.

(a) Regulate leakage flow with valve V2 and measure by flowmeter number 2 (figure 6-66). Adjust the valve shift to open oil bypass at leakage rate of 1.12 TO 1.37 gallons per minute.

(b) Adjust bypass valve sensitivity by threading fitting (A), in or out of valve housing. Decrease sensitivity by turning the fitting clockwise (figure 6-66).

(c) Torque nut (4, figure 6-51) on fitting (6) 260 TO 300 inch-pounds. Lockwire (C137) nut (4) and key (5) to hole in valve housing (15).

(d) After completion of step (c), the valve must reset when input flow rate is reduced to zero gallons per minute and input pressure is zero PSIG. Operate valve through at least six consecutive cycles. Make certain that valve resets at completion of each cycle.

NOTE

Pump run-up time, which is time lapse between start of pump and attainment of required system pressure and flow rote, must not be less than 10 seconds or more than 16 seconds.

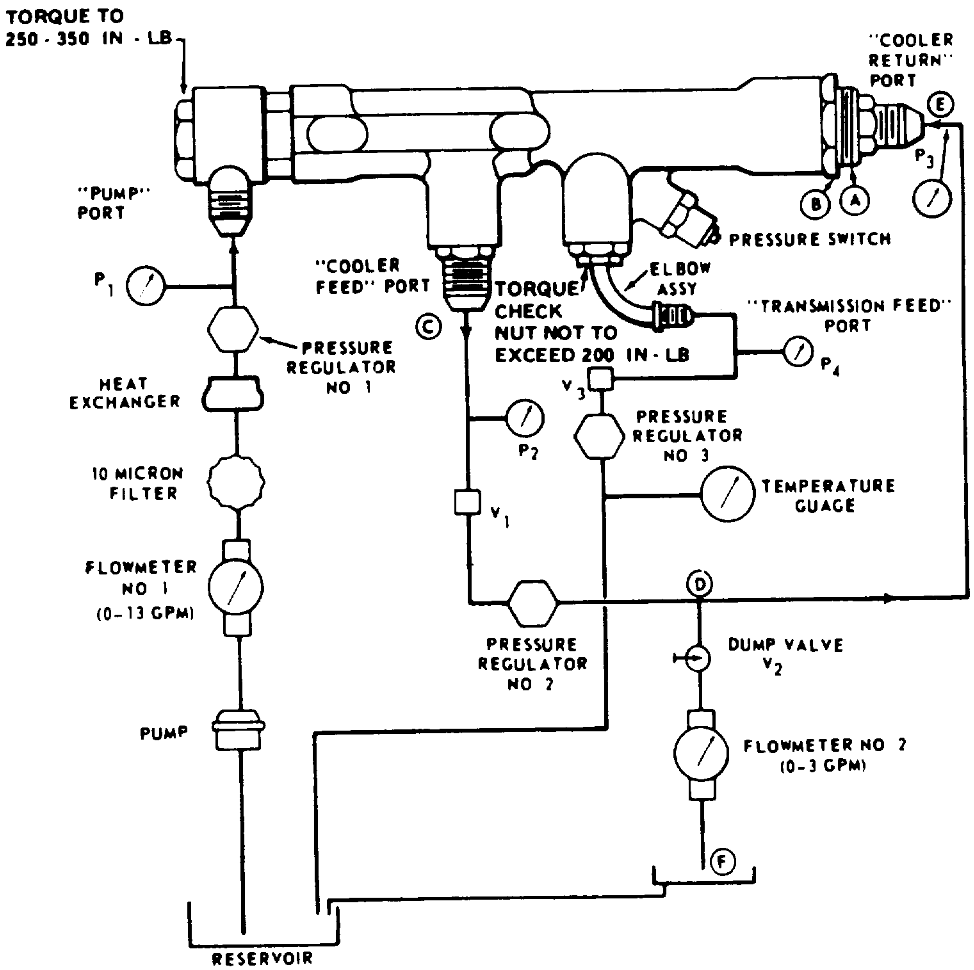
d. Apply sealant (Cl 05) as a fairing to fill open key slots in nut (4) and around fitting (6) next to nut.

e. Loosen bolt (32) and checknut on checknut and fitting (1) after completion of test.

6-153. INSTALLATION – AUTOMATIC EMERGENCY BYPASS VALVE.

a. Attach valve (13, figure 6-47) to mounting bracket with four bolts and washers. Lockwire (Cl37) bolt heads in pairs.

b. Position valve bracket on transmission, with lower flange on two sump case mounting studs and upper and aligned on inner side of upper bracket



NOTE

10 micron filter and flowmeter may be placed in any convenient sequence between pump and P1 gage. Heat exchanger may be located at any convenient point between reservoir and valve under test.

No point in circuits C-D-F or E-D-F may be more than 22 inches higher or lower than point "C".

204-040-816-1 and -3 BENCH TEST SCHEMATIC.

209040-40D

Figure 6-66. Oil Cooler Automatic Emergency Bypass Valve — Bench Test Schematic (which is attached on input drive quill mounting studs).

c. Attach valve bracket to upper bracket with two bolts, using a washer on left bolt and attaching electrical cable bracket on right bolt.

d. Attach lower end of bracket with nuts on studs. using a washer on left stud and attaching electrical cable bracket on right stud.

e. Position elbow (30, figure 6-51) to align with hose from transmission sump. Torque bolt (32) 250 TO 350 inch-pounds. Lockwire (C137) bolt (32) to elbow (30). Connect hose to elbow (30).

CAUTION

Ensure that items (38, 39) or (41, 42) of figure 6-47 are installed correctly to ensure proper oil cooler bypass valve operation and oil flow direction through the cooler.

f. Connect valve-to-coder hose on union (3).

g. Position fitting (1) to align with valve-to-filter tube. Connect tube to fittings.

CAUTION

Do not allow nut on valve fitting to turn when tightening flarenut of hose elbow. Any turning of this nut will destroy calibration of valve.

h. Connect cooler-to-valve hose on fitting (6) at right end of valve.

L Connect electrical lead of caution panel circuit to terminal at right underside of valve (11). Cover terminal with rubber nipple.

j. At next ground run check for leaks and proper operation of oil system.

6-154. OIL FILTER (EXTERNAL). (Helicopters without MWO 1-1520-236-50-30).

6-155. DESCRIPTION - OIL FILTER (EXTERNAL).

An external oil filter (2, figure 6-47) for the transmission oil system is bracket mounted on the right side of the transmission main case and is connected to the external oil line between cooler and pressure relief valve manifold. The unit contains a pleated paper type filter element, and incorporates a bypass valve set to open at 18 to 22 psi to assure oil flow if filter element should become clogged. A visual indicator at top of filter will pop out when bypass occurs, but has a temperature lock-out device to prevent actuation below 50 degrees F. If visual indicator button pops out, push button in and run up helicopter. If button pops out again, replace filter element assembly.

6-156. REMOVAL - OIL FILTER (EXTERNAL).

a. Open cowl door at right side of transmission.

b. Remove filter element (11, figure 6-67) for inspection or replacement.

(1) Place suitable container below filter to catch trapped oil.

(2) Open V-band clamp (8).

(3) Remove filter (body) (13) downward.

(4) Remove fitter element (11) and packings (9) and (10).

c. Remove filter (head) (4) and bracket (3) as follows:

(1) Disconnect hose assemblies (7 and 17) from filter (head) (4). Drain oil from hoses into a container. Cap or plug open hoses.

(2) Remove lockvire and four bolts (1) with washers (2) to detach filter (head) (4) from bracket (3).

(3) If filter (head) (4) is being replaced, remove union (6), elbow (16), nut (15), and packings (5 and 14).

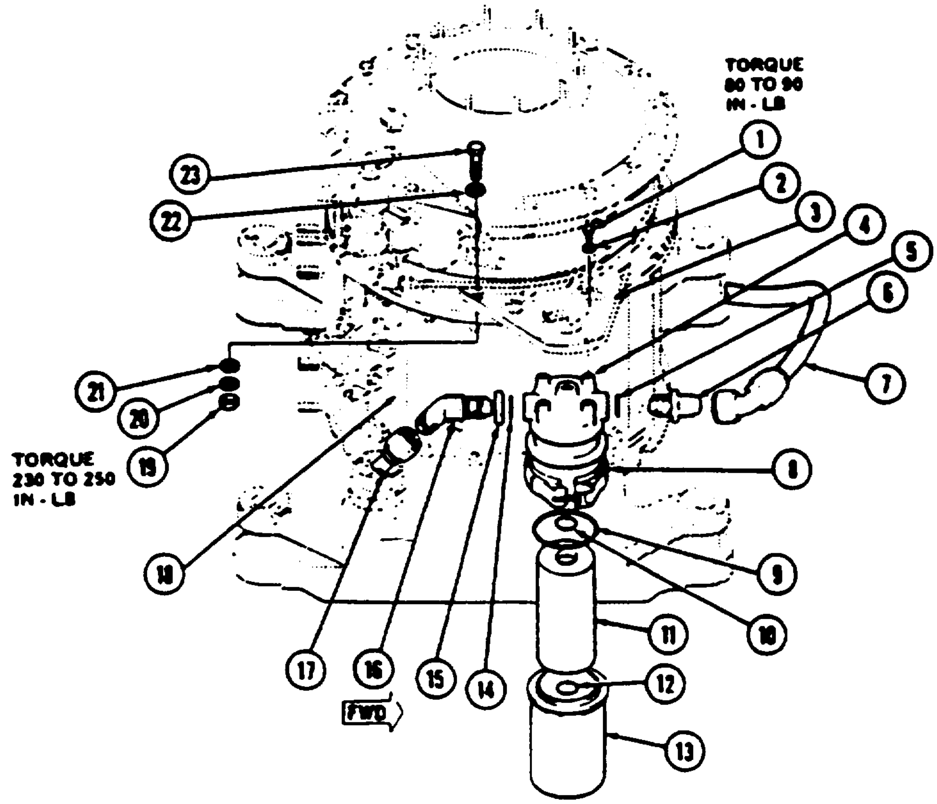
(4) Remove four bolts (23), washers (20, 21, 22) and nuts (19), Remove bracket (3).

6-l57. CLEANING — OIL FILTER (EXTERNAL).

WARNING

Cleaning advent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with akin or eyes.

Clean filter (head) (4, Figure 6-67), filter (body) (13) and bracket (3) with solvent (C112). Dry thoroughly *filtered compressed air.



1. Bolt
2. Aluminum washer
3. Bracket
4. Filter (head)
5. Packing
6. Union
7. Hose assembly
8. V-band clamp
9. Packing
10. Packing
11. Filter element
12. Packing
13. Filter (body)
14. Packing
15. Nut
16. Elbow
17. Hose assembly
18. Transmission case
19. Nut
20. Thin steel washer
21. Special washer P/N 212-040-199-1
22. Thin aluminum washer
23. Bolt

209040-111

Figure 6-67. Transmission External Oil Filter Installation (Typical)

6.158. INSPECTION - OIL FILTER (EXTERNAL).

a. Inspect bracket (3, figure 6-67). filter (head) (4) and filter (body) (13) for scratches, nicks, dents, cracks, and corrosion. Minor machanical damage and superficial corrosion that will not l ffect function is acceptable. No cracks are acceptable.

b. Inspect filter element (11) for metal particles. If any particles are found, refer to paragraph 6-4.

6-159. REPAIR – OIL FILTER (EXTERNAL).

a. Replace bracket (3, figure 6-67), filter (head) (4) and/or filter (body) (13) if damaged in excess of acceptable limits (paragraph 6-158).

b. Replace filter element (11) and ail packings that were removed.

6-160. INSTALLATION - OIL FILTER (EXTERNAL).

a. Position bracket (3, figure 6-67) on top of lower flange of transmission ring gear as illustrated. Install four bolts (23) with thin aluminum washers (22) under bolt heads. Install special washers (21) next to transmission ease (18). Install thin steel washers (20) next to nuts. Install nuts (19). Torque nuts (19) evenly 230 -260 inch-pounds

b. Position filter (head) (4) under bracket (3) with outlet aft. Install four bolts (1) with aluminum washers (2) under bolt heads. Torque bolts evenly 80-90 inch-pounds. Lockwire (C137) bolt heads in pairs.

c. Install union (6) and packing (5).

d. install hose assembly (7) on union (6).

e. Install elbow (16), packing (14), and nut (15).

f. Install hose assembly (17) on elbow (16).

g. Manually reset bypass indicator on filter (head) (4).

h. Install filter element (11) and filter (body) (13) as follows:

(1) Install packing (1O) on boss in filter (head) (4).

(2) Install packing (9) on filter (head) (4).

(3) Install packing(12) on boss filter (body) (13).

(4) Place filter element (11) in fitter (body) (13) and seat firmly on boss.

(5) Position filter (body) (13) and filter element (11) on filter (head) (4) and install V-band damp (8) around flanges of filter (head) and filter (body). Torque damp nut 50 inch-pounds.

6-160.1. EXTERNAL OIL FILTER. (Helicopters with MWO 1-1520-236-50-30).

6-160.2. DESCRIPTION - EXTERNAL OIL FILTER.

a. An external oil filter (4, figure 6-67.1) is bracket mounted on the tight side of the transmission main case. It is connected in the oil line between cooler and pressure relief valve manifold.

b. Filter contains disposable 3-micron pleated-paper element and includes bypass valve. Valve is set to open at 20 to 24 psi and reseat at 18 psi pressure. A differential pressure indicator pops out to indicate bypass. Filter design prevents re-entry of trapped debris into system during bypass.

c. Filter is accessed by opening right side of transmission cowling.

d Drain valve on bottom of filter can be used to drain the filter for removal. Filter head is marked TRANSMISSION.

6-160.3. Cleaning - External Oil Filter. Clean filter bowl and head with cleaning solvent (C112). Dry with compressed air.

CAUTION

Do not attempt to dean filter element for reuse. Oil system performance can be seriously degraded.

6-160.4. INSPECTION - EXTERNAL OIL FILTER.

a. Make sure filter head (2, figure 6-67.2) is marked TRANSMISSION.

b. Check bypass indicator. Reset if edtended. If reset, check for proper operation at next runup.

c. Inspect filter head and bowl (6) for corrosion, cracks, and evidence of leaks.

d. Replace cracked or corroded parts. Correct leeks.

6-160.5. REPLACEMENT OF ELEMENT OR BOWL - EXTERNAL OIL FILTER. Proceed as follows: (figure 6-67.2).

NOTE

Replacement of main transmission external oil filter is “ON CONDITION” change only when associated impeding bypass indicator button is extended (second reset) or when main transmission is replaced. Since fine filtration deans lubricant in the component, do not change lubricant when replacing fitter. Flushing and filtering system lubricant (unless the transmission is being replaced) is not required or authorized, as it may mask problems and prevents trending data.

a. Place container below filter to catch oil. Remove lockwire from cap of drain valve (8). Remove cap to drain oil.

b. Remove lockwire and coupling damp (4).

c. Remove filter bowl (6) and element (5) downward.

d. Remove packing (1) from filter head (2).

e. Clean head (2) and bowl (6). Use cloths and cleaning solvent (C112). Inspect bowl for cracks and serviceability.

f. Install new packing (1) in head (2).

g. Install new or serviceable element (5) in filter bowl (6).

h. Position bowl in head.

i. Install and tighten coupling damp (4). Torque coupling nut (10) to 40-50 inch-pounds Lockwire (C137) damp.

j. Install packing (9) and cap of drain valve (8) and torque cap to 20-25 inch-pounds. Lockwire (C137).

k. Service system with oil (paragraph 1-5).

6-160.6. REPLACEMENT OF DRAIN VALVE-EXTERNAL OIL FILTER. Proceed as follows: (figure 6-67.2).

a. Place container below filter to catch oil. Drain oil using drain valve (8).

b. Remove body of drain valve (8) and packings (7 and 9) from bowl (6).

c. install body of drain valve (8) and new packing (7) in bowl. Torque body to 16-20 inch-pounds. Lockwire (C137).

d. Install new packing (9) on body.

e. Install capon drain valve. Torque cap to 20-25 inch-pounds. Lockwire (C137) cap.

f. Service the system with oil (paragraph 1-5).

6-160.7. REMOVAL - EXTERNAL OIL FILTER. Proceed as follows:

l . Place container below fitter to catch oil. Remove lockwire from cap of drain valve (8, figure 6-67.2). Remove cap to drain oil.

b. Disconnect outlet oil hose (7, figure 6-67.1) from filter outlet nipple (6). Disconnect transmission inlet hose (9) from elbow (8). Cover openings.

c. Remove four bolts (1), and washers (2), and remove filter. Inspect filter head and bowl for serviceability.

d. If filter or head will be replaced, remove fittings and packings. (6, 8, and 5) from IN and OUT ports. Discard packings.

6-160.8. REPLACEMENT OF FILTER HEAD - EXTERNAL OIL FILTER. (See figure 6-67.2).

a. Remove filter (paragraph 6-160.7).

b. Remove lockwire and coupling damp (4).

c. Remove filter bowl (6) and element (5) downward. Remove and discard packing (1) from head. Inspect element.

CAUTION

Make sure replacement filter head is marked TRANSMISSION. Otherwise, oil system performance will be degraded and pressure bypass mechanism will not function as required.

d. Install new packing (1) on replacement head (2).

e. Install serviceable element and bowl.

f. Install and tighten coupling damp (4). Torque coupling nut (10) to 40-50 inch-pounds Lockwire (C137) clamp.

g. Install filter (paragraph 6-160.9).

6-160.9. INSTALLATION - EXTERNAL OIL FILTER. Proceed as follows: (figure 6-67.1).

a. If filter or head is a replacement, install fittings as follows:

(1) Install packing (5) and nipple (6) in OUT port.

(2) Install packing (5) and elbow (8) in IN port.

b. Position oil filter below bracked (3), OUT port forward.

CAUTION

Make sure filter head is marked TRANSMISSION and that filter is installed with OUT port forward. Otherwise, oil system performance will be degraded and pressure bypass mechanism will not function as required.

c. install four bolts (4), and washers (2). Torque bolts to 87-93 inch-pounds.

d. Connect hose (7) to nipple (6).

e. Connect hose (9) to elbow (8).

f. Install packings (7 and 9, figure 6-67.2) on body of drain valve (8).

g. Install cap on drain plug. Torque cap to 20-25 inch-pounds. Lockwire (C137) cap.

h. Service system with oil (paragraph 1-5) and perform maintenance operational check for leaks and proper operation at first runup (TM 55-1520-236-10).

6-161. OIL FILTER (PRIMARY). (Helicopters without MWO 1-1520-236-50-30).

6-162. DESCRIPTION - OIL FILTER (PRIMARY).

The oil filter (primary is located in the upper right aft corner of the transmission sump case. The filter assembly consists of a stack of wafer-disc screens assembled with spacers on a perforated tube, attached on a body which incorporates two bypass valves to allow continued oil flow in the event screens become clogged. The filter is mounted into a sump case chamber with inlet and outlet through internal passages. A cast scupper on the sump case IS located below the filter mounting pad and connected to the overboard oil drain line to dispose of any oil spilled when servicing filter.

6-163. REMOVAL - OIL FILTER (PRIMARY).

a. Remove two nuts (15, figure 6-47) and washers (16 and 17). Remove two nuts (37), washers (36) and bracket (35).

b. Remove oil filter (18) from sump case. Allow excess oil to drain through scupper into suitable container placed under overboard drain outlet at left underside of fuselage.

6-164. CLEANING - OIL FILTER (PRIMARY).

a. Visually inspect filter screens (3, figure 6-68) for metal particles, other contamination and damaged screens. If any metal particles are found refer to paragraph 6-4.

WARNING

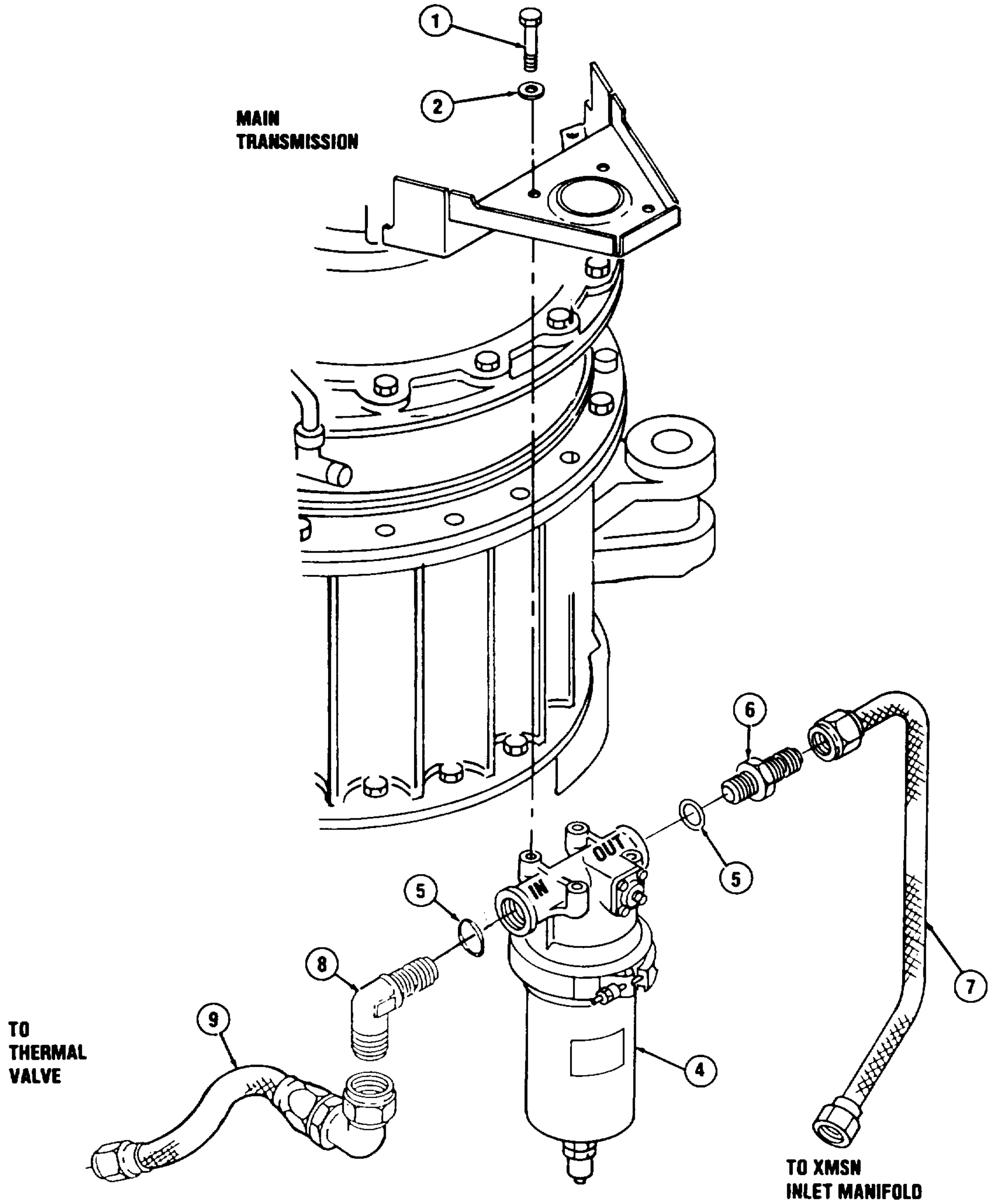
Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

b. Plug or cap end of tube, wash filter in solvent (C112), and dry thoroughly with filtered compressed air. A small soft bristle brush may be used to assist cleaning. Remove plug or cap from end of tube prior to installation

NOTE

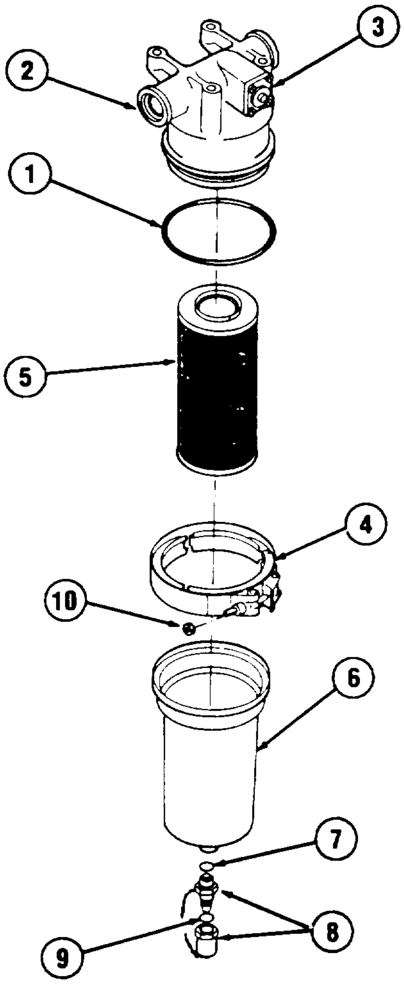
Remove used tang from lockwasher (4) while disassembled for inspection.

c. Filter maybe disassembled for cleaning necessary but should be done only if impossible to clean while assembled. If necessary, disassemble screens (3) and spacers (2) from filter tube on valve body (1) by removing retaining nut (5) and lockwasher (4). Make sure inner surfaces of screens do not become contaminated before reassembling measur wafer disc screens with micrometer, minimum acceptable thickness, 0.115 inch. Replace screens that do not meet minimum thickness, are damaged, or are unable to be cleaned, Reassemble.



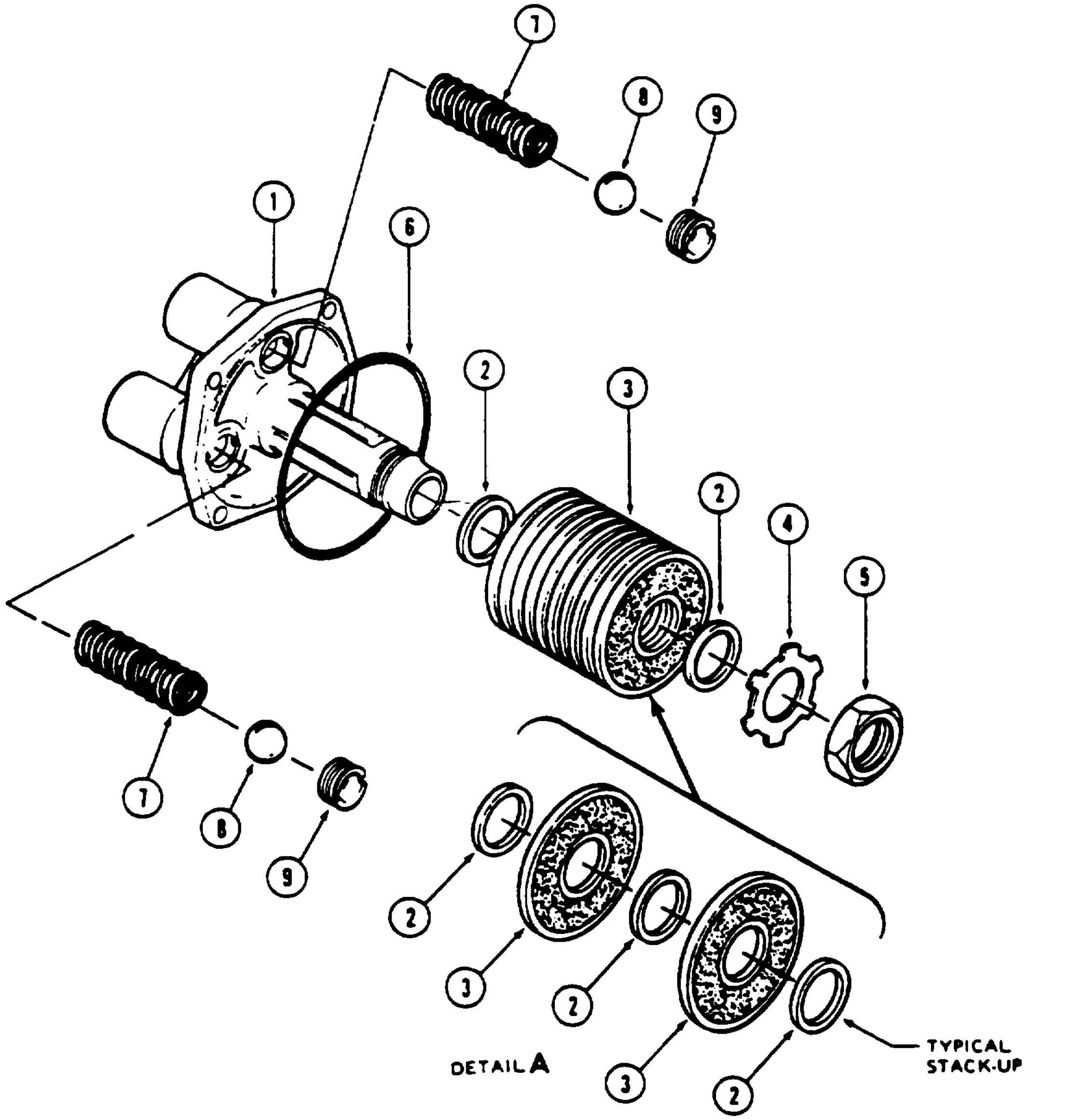
1. Bolt
2. Washer
3. Bracket
4. Filter
5. Packing
6. Nipple
7. Hose
8. Elbow
9. Hose

Figure 6-67.1. Transmission External Oil Filter Installation
(Helicopters With MWO 1-1520-236-50-30)



1. Packing
2. Filter head
3. Bypass indicator
4. Coupling clamp
5. Element
6. Filter bowl
7. Packing
8. Drain valve
9. Packing
10. Nut

Figure 6-67.2. Transmission External Oil Filter (Helicopters With MWO 1-1520-236-50-30)



1. Valve body, oil filter
2. Spacer, (11) each
3. Screen, (10) each
4. Lockwasher
5. Nut
6. Gasket
7. Spring
8. Ball
9. Seat valve

Table 6-68. Transmission Oil Filter (Primary) Assembly
(Aircraft without ODDS)

filter by alternately installing spacers (2), then screens (3). Eleven spacers and ten screens are required. Install lockwasher (4) and nut (5). Tighten until spacers and screens cannot be rotated individually, then tighten additional one-quarter turn. Bend lockwasher (4) tab against flat of nut (5).

6-165. INSTALLATION - OIL FILTER (PRIMARY).

a. Install new packing (19, figure 6-47) on oil filter (18).

b. Install oil filter (18) in transmission sump (11) with one bypass valve at the top and one bypass at the 3:00 position for proper bypass of oil in case of filter failure.

c. Place one bracket (35) on each of the two lower studs. Install one thin steel washer (36) on each bracket. Install two nuts (37). Do not tighten nuts at this time

d. Place one thin aluminum washer (17) on each of the two upper studs. Install one thin steel washer (16) on each of the two upper studs. Install two nuts (15). Torque two nuts (15) and two nuts (37) evenly 50 to 70 inch-pounds Wait a minimum of fifteen minutes and retorque nuts to same torque noted above.

e. Fill transmission to proper level with oil (paragraph 1-5).

6-165.1. DEBRIS MONITOR (Helicopters with MWO 1-1520-236-50-30).

6-185.2. DESCRIPTION - A full-flow debris monitor (44, figure 6-47) is installed on threaded studs on aft right comer of transmission sump. Inlet and outlet connections are internal. Ferrous (iron or steel) debris is collected on a magnetic surface with two chip gaps. Non-ferrous debris is collected in removable scavenge cup/screen, screen begin rated at 70 microns. Debris monitor also includes two valves for cold start bypass or for bypass when differential pressure exceeds 40@. Design prevents re-entry of trapped debris into system during bypass. Chip detector is connected through receptacle to XMSN CHIP capsule on caution panel. Access to debris monitor is through right transmission cowling.

6-165.3. REMOVAL - DEBRIS MONITOR. Proceed as follows: (figure 6-47).

a. Position suitable container under overboard drain.

b. Disconnect cable plug from chip detector receptacle.

c. Remove four nuts (47), washers (45 and 46), and bracket (35) from threaded studs.

d. Remove monitor (44) and packing (43). Let oil drain into scupper.

6-165.4. CLEANING/inspection - DEBRIS MONITOR.

NOTE

Debris monitor is inspected when CHIP XMSN caution fight comes on.

a. Remove debris monitor (44, figure 6-47). (*paragraphs* 6-1 65.3)

b. Inspect chip gaps for chips. Remove material for analysis if chips are present.

c. Using a wrench on flats of tube, remove scavenge cup and screen (49).

d. Inspect cup and screen for contamination. Remove material for analysis if there is contamination. (Refer to paragraph 6-165.5)

e. Clean chip gaps and cup and screen. Use a brush and solvent (Ch 2). Dry parts with compressed air.

f. Inspect screen for damage.

g. Install scavenge cup and screen with new packing (46). Torque tube to 22 to 30 inch-pounds

h. Install debris monitor (paragraph 6-165.6).

6-165.5. TRANSMISSION OIL CONTAMINATION TROUBLE-SHOOTING (Helicopters with MWO 1-1520-236-50-30). Following a chip light event, the particles from the debris monitor (paragraph 6-165.4), screen, and external filter shall be examined and classified to determine maintenance action. Identify particles using information in paragraph 6-4.1. Refer to table 6-1.2 for maintenance action dictated by debris.

WARNING

If fragment can be identified as piece from specific part, replace transmission.

6-165.6. INSTALLATION - DEBRIS MONITOR

a. Install packing (43, figure 6-47) in groove on debris monitor (44).

b. Position monitor on threaded studs, receptacle up/inboard.

c. Position bracket (35) on stud.

d. Install four washers AN960PD416L (45, next to monitor), four washers AN960XC416L (46, under nut), and four nuts (47). Torque nuts as follows:

(1) Hold monitor firmly against sump.

(2) Torque nuts in increments, in sequence - upper fwd, lower aft, lower fwd, upper aft - until a torque of 70 inch-pounds is obtained.

e. Connect and safety wire (C137) cable plug.

f. Close cowling.

6-166. OIL SCREEN.

6-167. DESCRIPTION - OIL SCREEN.

The oil screen (21, figure 6-47) is located in the transmission sump. It prevents any particles, larger than the oil screen mesh, from entering the oil pump.

6-168. REMOVAL - OIL SCREEN.

a. Drain oil from transmission oil system at cooler drain valve (7, figure 6-47). Alternate procedure is to drain oil at sump drain valve on bottom of transmission.

b. Remove lockwire and remove screen (21) and gasket (20).

6-169. INSPECTION - OIL SCREEN.

a. Inspect screen (21, figure 6-47) for metal particles and other foreign objects. If any particles are found, refer to paragraph 6-4.

b. Inspect screen for damaged threads, distortion. and holes.

6-170. REPAIR - OIL SCREEN.

Replace screen (21, figure 6-47) if damaged in excess of limits noted in paragraph 6-169.

6-171. CLEANING - OIL SCREEN.

WARNING

Cleaning advent Is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

Clean oil screen with solvent (Ch 2).

6-172. INSTALLATION - OIL SCREEN.

a. Position gasket (20, figure 6-47) on oil screen (21). Install oil screen in transmission sump (11) and torque 300 TO 400 inch-pounds.

b. Lockwire (C137) oil screen to chip detector.

c. Fill transmission to correct level with lubricating oil (paragraph 1-5).

6-173. CHIP DETECTOR.

6-174. DESCRIPTION - CHIP DETECTOR.

The transmission is equipped with a chip detector (25, figure 6-47) located in the right side of the sump. It is wired to lights on the pilot and gunner caution panels. The lights are illuminated when metal particles are present in sufficient quantity on the detector element.

The element is held in the self-closing valve (23) plug by a bayonet type connector. Removal without loss of oil is made possible by the self-closing valve which seats when the chip detector is removed.

6-175. REMOVAL - CHIP DETECTOR.

a. Remove nut (26, figure 6-47) and remove electrical wire.

b. Press chip detector (25) in, turn counterclockwise and withdraw chip detector from self-closing valve (23).

c. If self-closing valve (23) is to be removed, drain oil from transmission at drain valve (7). Remove lockwire and remove self-closing valve from transmission sump.

6-176. INSPECTION – CHIP DETECTOR.

a. Inspect chip detector (25, figure 6-47) for metal particles. If any metal particles are found, refer to paragraph 6-4.

b. Inspect chip detector (25) for distortion and damaged threads.

c. Inspect self-closing valve (23) for damaged threads and proper operation of self-closing valve.

d. Inspect nut (26) for damaged threads.

e. Inspect gasket (22) and packing (24) for nicks. cuts, and deterioration.

6-177. CLEANING – CHIP DETECTOR,

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with akin or eyes.

Clean chip detector (25, figure 6-47) and self-closing valve (23) with solvent (C112).

6-178. REPAIR – CHIP DETECTOR,

Replace chip detector (25, figure 6-47), self-closing valve (23), nut (26), packing (24), and/or gasket (22) if damaged.

6-179. INSTALLATION – CHIP DETECTOR.

NOTE

Deleted

a . Position gasket (22, figure 6-47) on self-closing valve (23). Install self-closing valve in transmission sump. Torque 300 TO 400 inch-pounds. Lockwire (CI 37) self-closing valve to screen (21) and to sump drain plug.

b. Fill transmission to proper level with lubricating oil (paragraph 1-6). Inspect self-closing valve (23) for oil leakage.

c. Install pocking (24) on chip detector (25) or self-closing valve (23).

d. Push chip detector (25) into self-closing valve (23) and turn clockwise. Ensure that chip detector locks in self-closing valve.

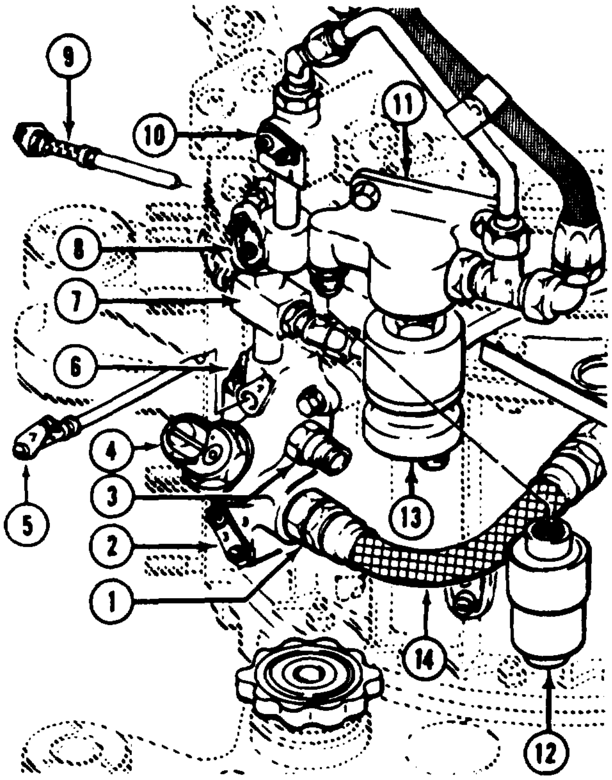
e. Place electrical wire on chip detector and install nut (26).

6-180. OIL MANIFOLD.

6-181. DESCRIPTION – OIL MANIFOLD.

The oil manifold (14, figure 6-47) is installed on the right side of transmission case. The manifold provides mounting points for the pressure relief valve temperature bulb, thermoswitch, and No. 3 and No. 7 oil jets.

6-182. DELETED.



1. Manifold inlet
2. Jet No. 3
3. Temperature bulb
4. Pressure relief valve
5. Jet No. 7
6. Thermoswitch
7. Fitting assembly
8. Jet No. 2
9. Jet No. 5
10. Jet No. 1
11. Pressure tap manifold
12. Pressure switch
13. Pressure transmitter
14. Hose assembly

Figure 6-69. Transmission Oil Manifold Installation

6-183. INSPECTION – OIL MANIFOLD.

a. Inspect manifold for damage or leakage.

b. Inspect components installed on manifold for damage, leakage, or malfunction.

6-184. REPAIR – OIL MANIFOLD.

NOTE

Components can b. replaced with manifold installed on transmission,

a. Replacement — Temperature Bulb (3, figure 6-69).

(1) Remove lockwire and remove temperature bulb (3).

(2) Install new bulb with new gasket.

(3) Lockwire (C137) temperature bulb to pressure relief valve.

b. Replacement - Thermoswitch (6, figure 6-69).

(1) Remove lockwire and remove thermoswitch (6).

(2) install new thermoswitch with new gasket. Torque thermoswitch 12 inch-pounds and lockwire (C137).

Replacement and Repair — Pressure Relief Valve (4, figure 6-69).

(1) Remove lockwire and remove pressure relief valve.

NOTE

If pressure relief valve is repaired or replaced, transmission oil pressure must be checked and adjusted. Refer to step (4).

(2) Repair pressure relief valve as follows:

(a) Depress piston (4, figure 6-70) and remove retaining ring (5) from valve body (3).

(b) Remove piston (4) and spring (6) from valve body. If there has been leakage at top of valve, also remove nut (7) and screw (1), replace packing (2), and reinstall screw and nut.

(c) Check valve body (3) and piston (4) for damage or obstructions.

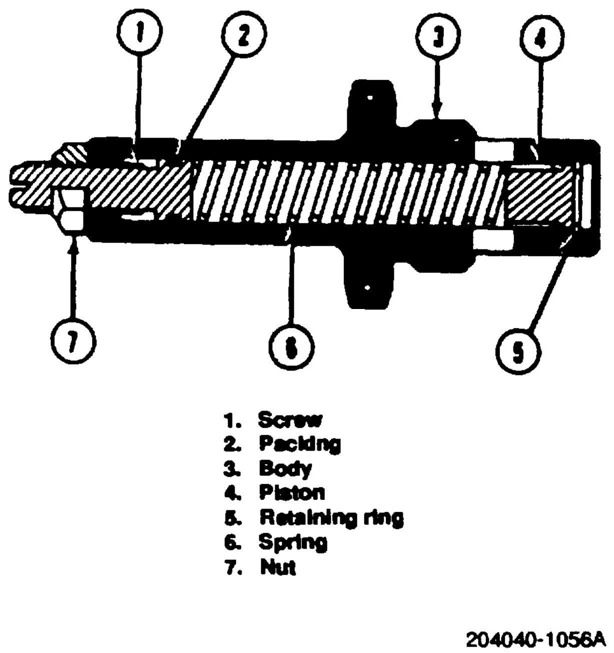


Figure 6-70. Transmission Oil Pressure Relief Valve Assembly

(d) Install serviceable spring (6) and piston (4) in valve.

(e) Install retaining ring (5).

(3) Install pressure relief valve (4, figure 6-69) with new packing. Lockwire (C137) valve to temperature bulb and thermoswitch. Check and adjust relief valve. Refer to step (4).

(4) If pressure relief valve was replaced or repaired adjust as follows:

WARNING

Adjustment of pressure relief valve while aircraft is operating could result in serious injury or loss of life. Adjustment should be made after shutdown.

(a) Check transmission oil pressure on runup. Comet oil pressure is 50 ± 5 psi.

(b) Loosen nut (7, figure 6-70) while holding screw (1) at top of body (3).-

(c) Turn screw (1) in to increase or out to decrease indicated oil pressure.

(d) Tighten nut (7).

(e) Recheck oil pressure in operation.

6-185. DELETED.

6-186. SIGHT GAGES.

6-187. DESCRIPTION – SIGHT GAGES.

Visual indication of oil level in transmission is provided by two transparent sight gages (28 and 32 figure 6-47) set into right side of sump case, backed by indicator discs with FULL and LOW markings.

6-188. REMOVAL – SIGHT GAGES.

a. Drain oil below gage level.

b. Remove retaining ring (34, figure 6-47), packing (33), sight glass (32), and indicator (31).

c. Remove retaining ring (30), pecking (29), sight glass (28), and indicator (27).

6-189. INSPECTION SIGHT GAGES.

a. Inspect sight glasses (28 and 32, figure 6-47) for cracks, excessive scratches, and stains, Cracked and/or damaged glasses that obstruct view of indicators are not acceptable.

b. inspect indicators (27) and (31) for stains. If words “full” and “low” as applicable are not legible, the indicators are not acceptable.

c. Inspect retaining rings (30 and 34) for distortion.

6-190. REPAIR – SIGHT GAGES.

a. Replace sight glasses (28 and 32, figure 6-47), indicators (27 and 31), and retainers (30 and 34) if damage is excess of acceptable limits (paragraph 6-189).

6-191. INSTALLATION – SIGHT GAGES.

a. Position new packing (29, figure 6-47) on sight glass (28).

b. Position indicator “LOW”’ (27) in lower sight gage port in transmission sump.

c. Install sight glass (28) with flat side out.

d. Install retaining ring (30).

l. Position new packing (33) on sight glass (32).

f. Position indicator “FULL’” (31) in upper sight gage port in transmission sump.

g. Install sight glass (32} with flat side out.

h. Install retaining ring (34),

i. Fill transmission to full level with lubricating oil (paragraph 1-5). Check for oil leaks at sight gages.

6-192. OIL JETS.

6-193. DESCRIPTION – OIL JETS.

Eight jet assemblies are used in the transmission oil system to deliver aimed sprays of oil to gears and bearings. Each jet is identified to its mounting port by matching stamped numerals on the jet and on the transmission case. Locations and functions of the jets are as follows: See figure 6-46.

No. 1- Top right aft section of top case. Sprays upper mast bearing, mast driving spline, and upper stage planetary pinion bearings.

No. 2- On housing at right aft on ring gear case. with two auxiliary jets fed by external tubes and located 120 degrees apart on ring gear case. Sprays pinion bearings and gears of both planetary stages.

No. 3- On bottom of oil manifold at right aft on main case. Sprays input bevel gears (leaving mesh) and delivers oil to No. 6 jet inside case.

No. 4- On left side of sump case. Lubricates accessory and tail rotor drive quills.

No. 5- Left aft main case, beside input drive quill. Lubricates input quill gears entering mesh.

No. 6- Right side on main case, near oil manifold. Receives oil from No. 3 jet inside case. Sprays inboard bearing of input drive quill, and through end of gear to lubricate freewheeling clutch.

No. 7- Top of oil manifold at right aft on main case. Lubricates upper bearings of input drive quill.

No. 8- Located on the mast bearing retaining plate. Lubricates the upper mast bearing.

6-194. REMOVAL – OIL JETS.

a. Remove any jet, except auxiliary No. 2 jets, as follows:

NOTE

Before removing No. 7 jet, remove oil pressure relief valve.

(1) Cut lockwire between two screw heads on jet and loosen both screws. Remove screw that secures plate of jet to case.

(2) Pull jet, with packings, from case. Exercise care not to bend jet during removal. Cover open port to prevent contamination.

b. Remove No. 2 auxiliary jets as follows:

CAUTION

Do not attempt to remove the housing of number 2 auxiliary oil jets. This housing is attached by two bolts, nuts and cotter pins inside the transmission case. Tampering with bolts may cause leaks.

(1) Disconnect oil tube from jet. Cap open end of tube.

(2) Remove lockwire and screw from jet mounting plate.

(3) Pull jet and packing from housing. Cover open port.

6-195. CLEANING – OIL JETS.

a. Remove packing. Also remove screw, with seal, from outer end of jet (except auxiliary No. 2 jets) to permit thorough cleaning, drainage, and inspection.

WARNING

Cleaning solvent is flammable and toxic. Provide adequate ventilation. Avoid prolonged breathing of solvent vapors and contact with skin or eyes.

b. Wash in solvent (Cl 12). A suitable brush can be used, if needed. Drain and dry with filtered compressed air. Be sure all jet openings are clear.

c. Install screw, with new seal, in outer end of tube.

6-196. INSPECTION – OIL JETS.

a. inspect jet openings for foreign material not removed during cleaning.

b. Inspect jets for bending or other damage which would render them unserviceable.

6-197. REPAIR – OIL JETS.

Repair of oil jets is limited to replacement of jets which cannot be cleaned or jets which are bent or otherwise damaged. Replace all pecking during installation.

6-198. INSTALLATION – OIL JETS.

a. Uncover mounting port. Check matching numerals beside port and on jet.

b. Install packings on jet tube in grooves at each side of inlet slot.

c. Coat packings with oil (C80). Insert jet, align lug, and secure to case with screw. Tighten both screws and lockwire (C137) heads together.

(1) For number 3 jet, use manifold attachment bolt for attachment. Install electrical harness clamp under bolt head when oil jet is installed.

(2) Connect oil tube to auxiliary number 2 jets. Lockwire (C137) attaching screw to elbow fitting next to tube connector nut.

(3) After installing number 7 jet, install oil pressure relief valve.

(4) Check for oil leaks at next runup.

6-199. INSPECTION – TRANSMISSION VENT VALVE.

a. Inspect vent valve for clogged condition (1, figure 6-47).

b. Clean with dry compressed air.

c. Install vent valve using new gasket. Torque 60 TO 100 inch-pounds. Lockwire (C137) to drilled hole in case.

By Order of the Secretary of the Army:

DENNIS J. REIMER
General, United States Army
Chief of Staff

Official:

JOEL B. HUDSON
Administrative Assistant to the
Secretary of the Army
01933

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8. Pub no: 55-2840-229-23
9. Pub Title: TM
10. Publication Date: 04-JUL-85
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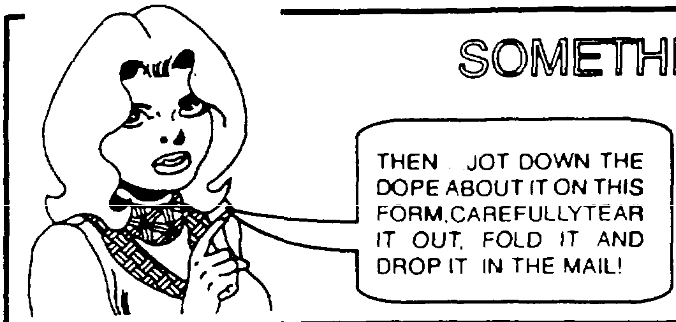

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81		4-3		Callout 16 on figure 4-3 is pointed at a bolt. In key to figure 4-3, item 16 is calle a shim. Please correct one or the other

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

PIN : 032465-000