

**DEPOT MAINTENANCE WORK REQUIREMENT  
FOR  
MAIN ROTOR MAST ASSEMBLY**

**PART NUMBERS**

**NSN**

|                       |                         |
|-----------------------|-------------------------|
| <b>204-040-386-7</b>  | <b>1615-00-075-3386</b> |
| <b>204-040-386-9</b>  | <b>1615-00-073-8203</b> |
| <b>204-040-386-11</b> | <b>1615-00-866-8032</b> |
| <b>204-040-386-15</b> | <b>1615-00-255-2896</b> |
| <b>209-040-386-1</b>  | <b>1615-00-919-4642</b> |
| <b>209-040-386-3</b>  | <b>1615-00-179-9165</b> |
| <b>209-040-386-5</b>  | <b>1680-00-454-0005</b> |

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**THIS PUBLICATION IS A REPRINT OF DMWR 55-1615-223,  
DATED 1 AUGUST 1979 INCLUDING CHANGES 1 THROUGH 6.**

**US ARMY AVIATION  
AND TROOP COMMAND  
1 August 1979**

**WARNING****PRECAUTIONARY DATA**

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

**CLEANING AREA**

When using cleaning solvents for cleaning operation, use area with adequate ventilation and no open flames or excessive high temperatures. Solvent flash point must not be less than 100°F.

**BREATHING TOXIC VAPORS**

Avoid prolonged or repeated breathing of solvent vapors.

**COMPRESSED AIR**

Do not direct compressed air against skin. Compressed air shall not be used for cleaning purposes except where reduced to less than 30 psi and only then with an effective chip guarding and personnel protection equipment.

**USING TOXIC/FLAMMABLE MATERIALS**

Due to the toxicity and flammability of the solvents and solutions used in the cleaning procedures, adequate ventilation shall be provided. Avoid prolonged contact with solutions and chemicals. Do not use drycleaning solvent or flammable cleaners near open flame or in areas where high temperatures prevail.

**FLIGHT SAFETY PARTS**

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

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Insert latest changed pages; dispose of superseded pages in accordance with applicable regulations.

NOTE: On a changed page, the portion of the text affected by the latest change is indicated by a vertical line, or other change symbol, in the outer margin of the page. Changes to illustrations are indicated by miniature pointing hands. Changes to wiring diagrams are indicated by shaded areas.

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| Page<br>No.           | *Change<br>No. | Page<br>No.               | *Change<br>No. |
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| a .....               | 6              | 3-8 through 3-10 .....    | 0              |
| b blank .....         | 0              | 3-11 .....                | 5              |
| A .....               | 6              | 3-12 .....                | 6              |
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| 1-4 blank .....       | 0              | 4-1 through 4-4 .....     | 6              |
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| 2-2.1 .....           | 6              | 5-2 blank .....           | 6              |
| 2-2.2 blank .....     | 6              | 5-3 and 5-4 deleted ..... | 6              |
| 3-1 through 3-3 ..... | 0              | A-1 .....                 | 6              |
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| 3-5 .....             | 0              | B-1 .....                 | 6              |
| 3-6 .....             | 5              | B-2 blank .....           | 6              |
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\*Zero in this column indicates an original page.

Depot Maintenance  
Work Requirement  
No. 55-1615-223

U.S. ARMY AVIATION  
AND TROOP COMMAND  
1 August 1979

DEPOT MAINTENANCE WORK REQUIREMENT  
FOR  
MAIN ROTOR MAST ASSEMBLY

| Part Numbers   | NSN              |
|----------------|------------------|
| 204-040-366-7  | 1615-00-075-3386 |
| 204-040-366-9  | 1615-00-073-8203 |
| 204-040-366-11 | 1615-00-886-6032 |
| 204-040-366-15 | 1615-00-255-2896 |
| 209-040-366-1  | 1615-00-919-4642 |
| 209-040-366-3  | 1615-00-179-9165 |
| 209-040-366-5  | 1680-00-454-0005 |

**REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS**

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 or 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, US Army Aviation and Troop Command, ATTN: AMSAT-1-MP, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. A reply will be furnished directly to you.

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# CHAPTER 1

## INTRODUCTION

### Section I. GENERAL

**1-1. Scope.** These instructions are for use by contractor/depot personnel. They apply to the main rotor mast assembly (fig. 1-1) manufactured by Bell Helicopter Company, FSMC 97499, P.O. Box 482, Fort Worth, Texas, used on model AH-1 and UH-1 series helicopters, and, in case of conflict, take precedence over all other documents pertinent to their overhaul and inspection.

**1-2. Deviations and Exceptions.** When any work segment as set forth in this DMWR cannot be accomplished, or can be accomplished only in a manner other than specified, the contractor shall submit a Request for Action form, AMSAT-I-M Form 1379, through the contracting officer to AMSAT-I-MP with a copy to AMSAT-I-MDO. If the problem is publications related or requires a change to a publication, a DA Form 2028 shall also accompany the Request for Action. The request for action shall state the problems, the reason for urgency, and the following specifics:

- a. Serial number (if applicable), part number, and NSN of affected equipment.
- b. Work elements which will not be completed or which will not be accomplished exactly as specified herein.
- c. Reason for nonaccomplishment or deviation.
- d. Action taken to correct condition causing nonaccomplishment or need for deviation.
- e. Data relative to availability of parts required, if applicable.
- f. Estimated man-hours.
- g. Instructions and inspection required to maintain the integrity of the end item because of such omission or deviation.

**1-3. Maintenance Forms and Records.** Maintenance forms, records and reports which are to be used by depot maintenance personnel are listed in and prescribed by DA PAM 738-751, Chapter 2.

**1-4. Reporting Equipment Improvement Recommendations (EIR).** EIRs can and must be submitted by anyone who is aware of an unsatisfactory condition with the equipment design or use. It is not necessary to show a new design or list a better way to perform a procedure, just simply tell why the design is unfavorable or why a procedure is difficult. EIRs may be submitted on SF 368 (Quality Deficiency Report). Instructions for preparing EIRs are provided in DA PAM 738-751, Functional Users Manual for The Army Maintenance Management System-Aviation. Mail 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 directly to you.

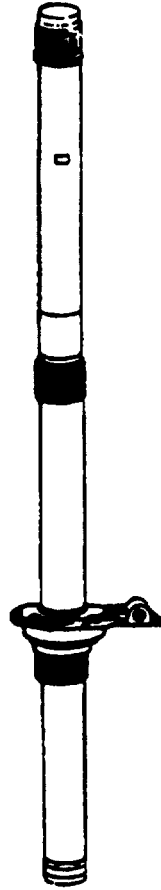
### Section II. DESCRIPTION, DATA PLATES, AND TABULATED DATA

**1-5. Description.** The purpose of this component is to provide a method of mounting and driving the main rotor by connecting the main rotor to the transmission.

**1-6. Data Plates.** Stamping and/or replacement of data plate when applicable, is necessary to provide a convenient record of overhaul or modification and operating time that will at all times accompany equipment (fig. 1-2).



204-040-366 SERIES  
ILLUSTRATED



209-040-366 SERIES  
ILLUSTRATED

TS 1615-223/1-1

*Figure 1-1. Mast Assembly*

| (Identification of Overhaul Facility) |                      |
|---------------------------------------|----------------------|
| DATE                                  | <input type="text"/> |
| PN                                    | <input type="text"/> |
| S/N                                   | <input type="text"/> |
| TIME                                  | <input type="text"/> |

TS 1615-223/1-2

*Figure 1-2. Stamping and/or Replacement of Data Plate*

Figure 1-2.1 and Figure 1-2.2 have been deleted.

|   |                          |                    |  |                        |
|---|--------------------------|--------------------|--|------------------------|
| <b>REQUEST FOR ACTION</b>   |                          | <b>CONTRACT NO</b> | <b>PRIORITY OF REQUEST</b><br><input type="checkbox"/> URGENT <input type="checkbox"/> ROUTINE | <b>DATE OF REQUEST</b> |
| <b>TO</b><br><br><b>THRU</b><br><br><b>COPIES</b>   | <b>FROM:</b>             |                    |  |                        |
|   | <b>POINT-OF-CONTACT:</b> |                    |  |                        |
| <b>PUBLICATION NO AND TITLE</b>   |                          |                    |  |                        |
| <b>STATEMENT OF THE PROBLEM</b> <input type="checkbox"/> <b>PUBLICATIONS PROCEDURES</b> <input type="checkbox"/> <b>OTHER</b> |                          |                    |  |                        |
| (USE CONTINUATION SHEET IF NECESSARY)   |                          |                    |  |                        |
| <b>REASONS FOR URGENCY</b>  |                          |                    |  |                        |
| <b>RECOMMENDED SOLUTIONS OR DISPOSITIONS</b><br><input type="checkbox"/> <b>DA FORM 2028 ATTACHED</b>                         |                          |                    |  |                        |
| (USE CONTINUATION SHEET IF NECESSARY)   |                          |                    |  |                        |
| <b>TITLE</b>  | <b>SIGNATURE</b>         |                    |  | <b>DATE</b>            |

AMSAV-M Form 1379  
1 Oct 87

FIGURE 1-2.1. AMSAV-M Form 1379



|  |          |            |           |  |           |   |      |
|--|----------|------------|-----------|--|-----------|---|------|
| <b>RECOMMENDED CHANGES TO PUBLICATIONS AND BLANK FORMS</b>                                       |          |            |           |  |           | Use Part II (reverse) for Repair Parts and Special Tool Lists (RPSTL) and Supply Catalogs/Supply Manuals (SC/SM). | DATE |
| For use of this form, see AR 310-1; the proponent agency is the US Army Adjutant General Center. |          |            |           |  |           |   |      |
| TO: (Forward to proponent of publication or form) (Include ZIP Code)                             |          |            |           | FROM: (Activity and location) (Include ZIP Code) |           |   |      |
| <b>PART I - ALL PUBLICATIONS (EXCEPT RPSTL AND SC/SM) AND BLANK FORMS</b>                        |          |            |           |  |           |   |      |
| PUBLICATION FORM NUMBER  |          |            |           | DATE   |           | TITLE   |      |
| ITEM NO.   | PAGE NO. | PARA-GRAPH | LINE NO * | FIGURE NO.                                       | TABLE NO. | RECOMMENDED CHANGES AND REASON<br>(Exact wording of recommended change must be given)                             |      |
|  |          |            |           |  |           |   |      |
| *Reference to line numbers within the paragraph or subparagraph.                                 |          |            |           |  |           |   |      |
| TYPED NAME, GRADE OR TITLE   |          |            |           | TELEPHONE EXCHANGE/AUTOVON, PLUS EXTENSION       |           | SIGNATURE   |      |
|  |          |            |           |  |           |   |      |

**DA FORM 2028**  
FEB 74

REPLACES DA FORM 2028, 1 DEC 68, WHICH WILL BE USED.

FIGURE 1-2.2. DA Form 2028

1-7. **Tabulated Data.** The models which this DMWR is applicable to are listed in table 1-1.

*Table 1-1. Leading Particulars*

| Model           | Part Number    | NSN              |
|-----------------|----------------|------------------|
| UH-1,B,F,N      | 204-040-366-7  | 1615-00-075-3386 |
| UH-1B           | 204-040-366-9  | 1615-00-073-8203 |
| UH-1B,H,V,EH-1H | 204-040-366-15 | 1615-00-255-2896 |
| AH-1G,TH-1G     | 209-040-366-1  | 1615-00-919-4642 |
| AH-1G,TH-1G     | 209-040-366-3  | 1615-00-179-9165 |
| AH-1S,AH-1SP    | 209-040-366-5  | 1680-00-454-0005 |
| AH-1J           |                |                  |

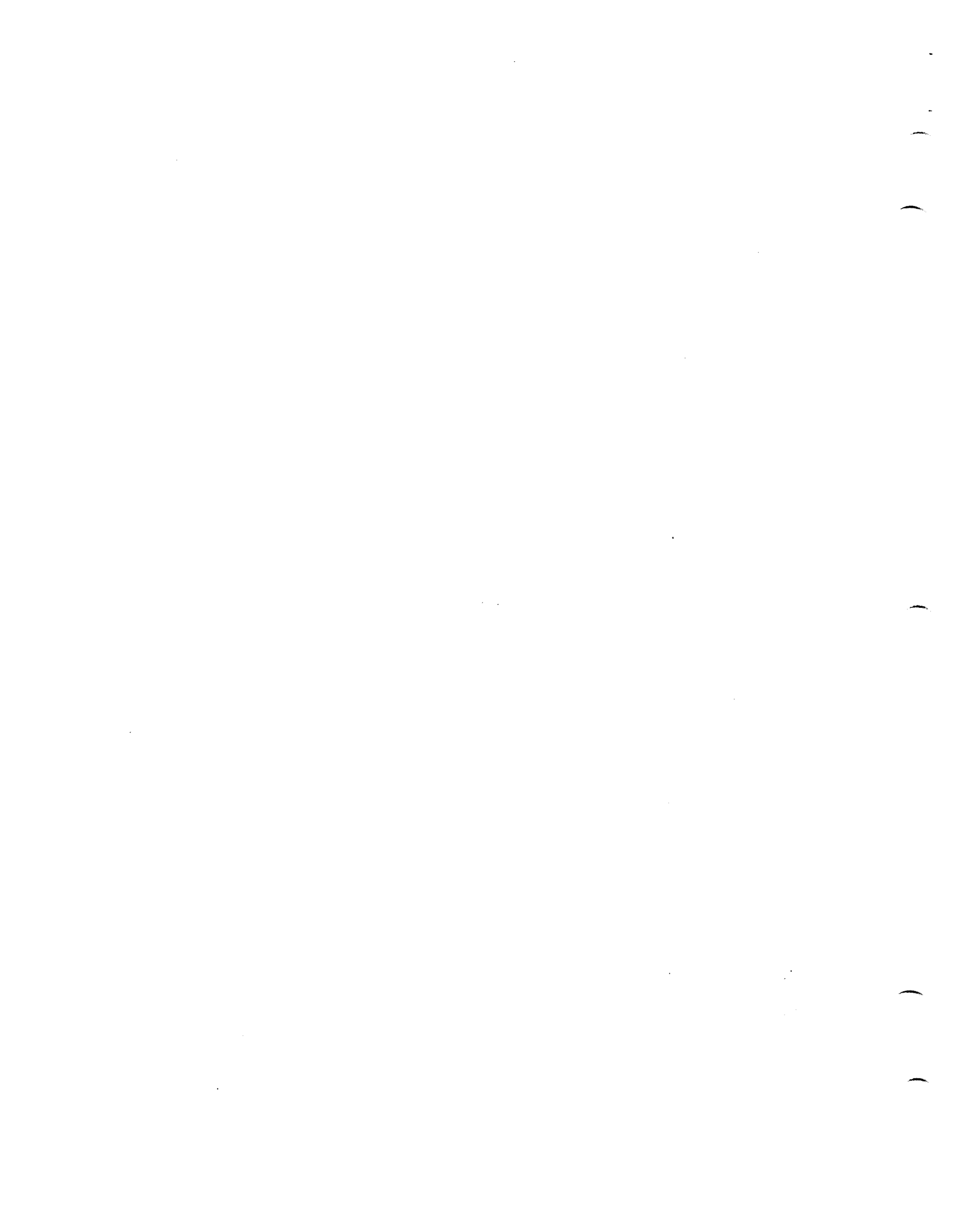
1-8. **Modification Criteria.** The main rotor mast assembly, Part No. 209-040-366-1, will be modified to a-3 configuration after disassembly, inspection and lubrication procedures. Modification will take place as follows:

- a. Refer to parts list, (fig. 3-1) Usable On Code column for parts application.
- b. Build up main rotor mast assembly using only component parts showing code E application.
- c. Re-identify main rotor mast assembly to Part No. 209-040-366-3.

### Section III. DEPOT MOBILIZATION REQUIREMENTS

1-9. "DEPOT MOBILIZATION REQUIREMENTS". Under a state of mobilization, the procuring activity may elect to:

1. Eliminate the minor repair stipulation in the Preshop Analysis Section of the DMWR. This will require all items to be overhauled, maximizing the longevity of such items but requiring full turnaround time during depot maintenance.
2. Extend the operating hour ceiling, which is currently stipulated in the Preshop Analysis Section, for accomplishing minor repair. This will assure a quicker turnaround during depot maintenance but will not maximize longevity."



## CHAPTER 2

### REQUIREMENTS

#### Section I. GENERAL

**2-1. Facilities.** The contractor's facilities shall be equipped to perform all phases of overhaul and retest as specified in this DMWR.

**2-2. Tools and Test Equipment.** Tools and test equipment which are required to disassemble, test assemble the main rotor mast assembly are listed in table 2-1. Miscellaneous common hard tools and measuring gauges are not listed.

*Table 2-1. Tools and Test Equipment*

| Item Number | Nomenclature      | Part Number                         |
|-------------|-------------------|-------------------------------------|
| 1           | Power Wrench      | SWE8100                             |
| 2           | Anchor Plate Assy | T100968 or SWE 124330               |
| 3           | Socket Assy       | T101903                             |
| 4           | Adapter           | T101904                             |
| 5           | Wrench            | T101456                             |
| 6           | Bonding Fixture   | 204-011-405-5AGF-1                  |
| 7           | Torque Wrench     | 1/2 in. drive (0-1200 in.-lb range) |
| 8           | Torque Wrench     | 3/4 in. drive (0-500 ft.-lb range)  |

**2-3. Expendable Supplies and Consumable Materials List.** The supplies and materials required to repair or overhaul the main rotor mast assembly are listed in table 2-2. The latest revision including amendments, changes to specifications that are in effect on date work is initiated on mast are applicable.

*Table 2-2. Expendable Supplies and Consumable Materials*

| Item Number | Nomenclature  | Specification                          |
|-------------|---|--|
| 1.          | Drycleaning Solvent (Type II)                       | P-D-680                                |
| 2.          | India Stone, Type II, Class A                       | SS-S-736C                              |
| 3.          | Abrasive Paper, Fine Grit                           | P-P-101E                               |
| 4.          | Abrasive Cloth                                      | P-C-451E                               |
| 5.          | Crocus Cloth  | P-C-458C                               |
| 6.          | Zinc Chromate Primer                                | TF-P-1757                              |
| 7.          | Glass Beads, Size 10                                | MIL-G-9954A                            |
| 8.          | Lubricating Oil                                     | MIL-L-23899B                           |
| 9.          | Corrosion Preventive Compound Class 3               | MIL-C-11796B                           |
| 10.         | Sealing Compound                                    | MIL-S-8784 or MIL-S-8802,<br>Class B-2 |
| 11.         | Corrosion Preventive Compound and Surface Sealer    | MIL-C-82594                            |
| 12.         | Adhesive  | AF163 (FSCM 76381)                     |
| 13.         | Trichloroethylene                                   | O-T-694B                               |
| 14.         | Primer, Adhesive                                    | EC3924 or EC3950                       |
| 15.         | Filler  | DEVCON F                               |
| 16.         | Zinc Chromate Primer                                | MIL-P-8585A                            |
| 17.         | Chemical Films & Film Mat'l for A1 & A1 A1, Class 2 | MIL-C-5541B                            |

**Table 2-3. Expendable Supplies and Consumable Materials (continued)**

| Item Number | Nomenclature   | Specification        |
|-------------|--|----------------------|
| 18.         | Primer Coating   | MIL-P-7962C          |
| 19.         | Lacquer, Aluminum Color No. 17178                                    | MIL-L-19537C         |
| 20.         | Primer Coating Color No. 84151                                       | TT-P-800A            |
| 21.         | Lacquer, Type II, Color No. 17178                                    | TT-L-50F             |
| 22.         | Corrosion Preventive Compound, Grade 3                               | MIL-C-16173D         |
| 23.         | Adhesive, Metalset A-4 (Smooth-on Inc.)                              |                      |
| 24.         | Abrasive, Type I   | MIL-A-21380          |
| 25.         | Sealing Compound, Corrosion Inhibitive                               | MIL-S-81733          |
| 26.         | Primer, Epoxy (NSN 8010-00-935-7080)                                 | MIL-P-23377, Type II |
| 27.         | Polyurethane, Aliphatic Flat Black (37038)<br>(NSN 8010-01-146-2646) | MIL-C-46168          |

## Section II. STANDARDS

**2-4. Repair Parts.** Repair parts and replacement parts as needed for overhaul appear in Chapter 3, Section II of this DMWR.

### NOTE

*The component parts will include a Usable on Code to indicate the items are used only on certain mast assemblies. The absence of a Usable on Code indicates the item is applicable to all mast assembly configurations.*

**2-5. Quality of Materials.** Parts and materials used for replacement, repair, or modification shall meet equipment drawings and specifications.

**2-6. Wear Limits, Fits and Tolerances.** Wear limits, fits and tolerances throughout this DMWR shall be complied with unless otherwise stated in the contract/work directive.

**2-7. Flight Safety Parts Program.** Parts, assemblies, or installation identified under the flight safety parts program require special handling during overhaul. Throughout the overhaul procedures, warnings appear emphasizing critical instructions to be followed. These warnings are identified and are inserted whenever and wherever necessary.

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

b. A critical characteristic is any dimension tolerance, finish, material, manufacturing, assembly or inspection process, or other feature which, if nonconforming or missing could cause failure or malfunction of the critical item.

c. The main rotor mast assembly, P/N 204-040-366-15, is considered a flight safety part.

d. Critical characteristics are listed in Table 2-3.

Table 2-3. Critical Characteristics

| <u>Item<br/>Figure No.</u> | <u>Part<br/>Number</u> | <u>Nomenclature</u> | <u>Critical<br/>Characteristic</u>  |
|----------------------------|------------------------|---------------------|---|
| 9, Fig. 3-1                | 204-040-349-9          | Retainer Plate      | a. Fluorescent penetrant inspection   |
| 18, Fig. 3-1               | 204-040-115-1          | Nut                 | a. Magnetic particle inspection<br>b. Maximum minor thread diameter 4.1908 and pitch diameter 4.2094-4.2151<br>c. No laps of cracks allowed. No unacceptable nonmetallic inclusions allowed.  |
| 21, Fig. 3-1               | 204-011-450-101/105    | Mast                | a. Magnetic particle inspection<br>b. Cadmium plate bake cycle at 375 + 10 degrees F for 23 hours minimum within 1 hour of plating<br>c. Minimum major diameter of 3 1/2 - 16 UN-3A thread be 3.4906, pitch diameter of 3.4551-3.4594<br>d. Minimum major diameter of 4 1/4 - 16 UN-3A thread be 4.2406, pitch diameter 4.2050-4.2094 |
| 3-1                        | 204-040-366-15         | M/R Mast Assy       | a. Torque of nut (18) be 2000-2500 ft. lbs.<br>b. Proper installation of lockwasher (14)<br>c. Proper installation and lockwiring of screw (13)<br>d. Proper installation of bearing (20), chamfer up   |

## CHAPTER 3

### MAINTENANCE, OVERHAUL AND REPAIR

#### Section I. PRESHOP ANALYSIS

**3-1. Purpose.** Preshop analysis instructions are provided as a guide to examination of the incoming main rotor mast assembly. Information obtained from this examination should be used by the overhaul facility preparing estimates needed to determine extent of repair, modification and replacement needed to perform overhaul of the main rotor mast assembly in order to make it a completely serviceable item. Detailed cleaning and corrosion treatment methods appear in this DMWR. Items pending performance of maintenance shall be preserved to prevent damage or deterioration.

**3-2. Unpacking.** Remove main rotor mast assembly from shipping container. Physically check all tags and forms to determine reason for removal from service. Also determine what modifications have not been accomplished.

#### NOTE

*Tags and forms received with the main rotor mast assembly should not be removed.*

**a. General Disassembly Procedures.** Disassembly and a physical check are required when the main rotor mast assembly to be overhauled was removed from service for any of the following reasons:

- (1) Internal failure.
- (2) Visible physical damage.

**b. Required Disassembly Procedures.** When it has been determined that the main rotor mast assembly will need disassembly, proceed as follows:

- (1) Refer to NOTES, CAUTIONS and WARNINGS in DMWR.
- (2) Parts of the main rotor mast assembly should be tagged and/or kept together so that wear condition of parts can be evaluated during inspection. Matched parts shall be tagged, handled and stored together to preclude damage and to ensure reassembly and installation in their matched position.
- (3) Record and tag parts that are defective with the reason for rejection.

#### NOTE

*Exclude parts which are normally replaced at every overhaul such as packing, gaskets and seals.*

- (4) To ensure replacement of parts in the main rotor mast assembly being overhauled, tag and identify all parts.
- (5) Used components and refinished parts recovered as products of disassembly will be examined 100% by the contractor to determine serviceability.

**c. Reference.** Refer to paragraph 3-5 for disassembly procedures.

#### Section II. DISASSEMBLY

**3-3. General.**

**a.** The following instructions are issued with the understanding that all lockwire will be removed when necessary, and parts such as bushings which are not normally removed at overhaul, but are removed on condition as deemed necessary by inspection, are classified as repairs and are covered under the repair and replacement section.

b. Figure 3-1 is an exploded view illustration with an associated group parts list used for disassembly of main rotor mast assembly.

3-4. **In-Process Inspection.** The inspection procedures are contained in paragraph 3-7.

3-5. **Disassembly.** When overhauling the main rotor mast assembly, complete disassembly is required. To disassemble the main rotor mast assembly, (fig. 3-1) proceed as follows:

a. Support mast assembly in a suitable work stand.

**NOTE**

*If mast (21, fig. 3-1) is marked REWORKED on lower bearing race flange, refer to paragraph 3-7 k.*

b. Remove protective caps (1) and (2) and plug (2A) only as necessary. Replace caps to protect threads.

c. Remove two screws (3) attaching shield plate (4), to upper bearing retainer plate (9) and remove shield plate from mast (21). Cut lockwire and remove screw (5) attaching oil jet assembly (6). Remove oil jet. Discard packing (7).

d. Remove four countersunk screws (8) and carefully lift bearing retainer plate (9) with shim (11) and seal (12) from mast.

**NOTE**

*Bushing (26) will not be removed from bearing retainer plate (9).*

e. Press seal (12) from bearing retainer plate.

f. Cut lockwire and remove two screws (13) and lockwasher (14) from upper bearing retainer nut (18).

g. Install adapter (item 4, table 2-1) over mast drive spline. Position socket assembly (item 3, table 2-1) on bearing retainer nut (18). Install power wrench (item 1, table 2-1) and anchor plate (item 2, table 2-1). (See fig. 3-2).

**CAUTION**

**Exercise care when performing the above step to prevent damage to lower bearing race (17).**

h. Remove cotter pins (15). Holding mast assembly with anchor plate (item 2, table 2-1) remove retaining nut (16) using wrench (Item 5, table 2-1).

i. Carefully tap inner race (17) of lower bearing from lower end of mast.

**CAUTION**

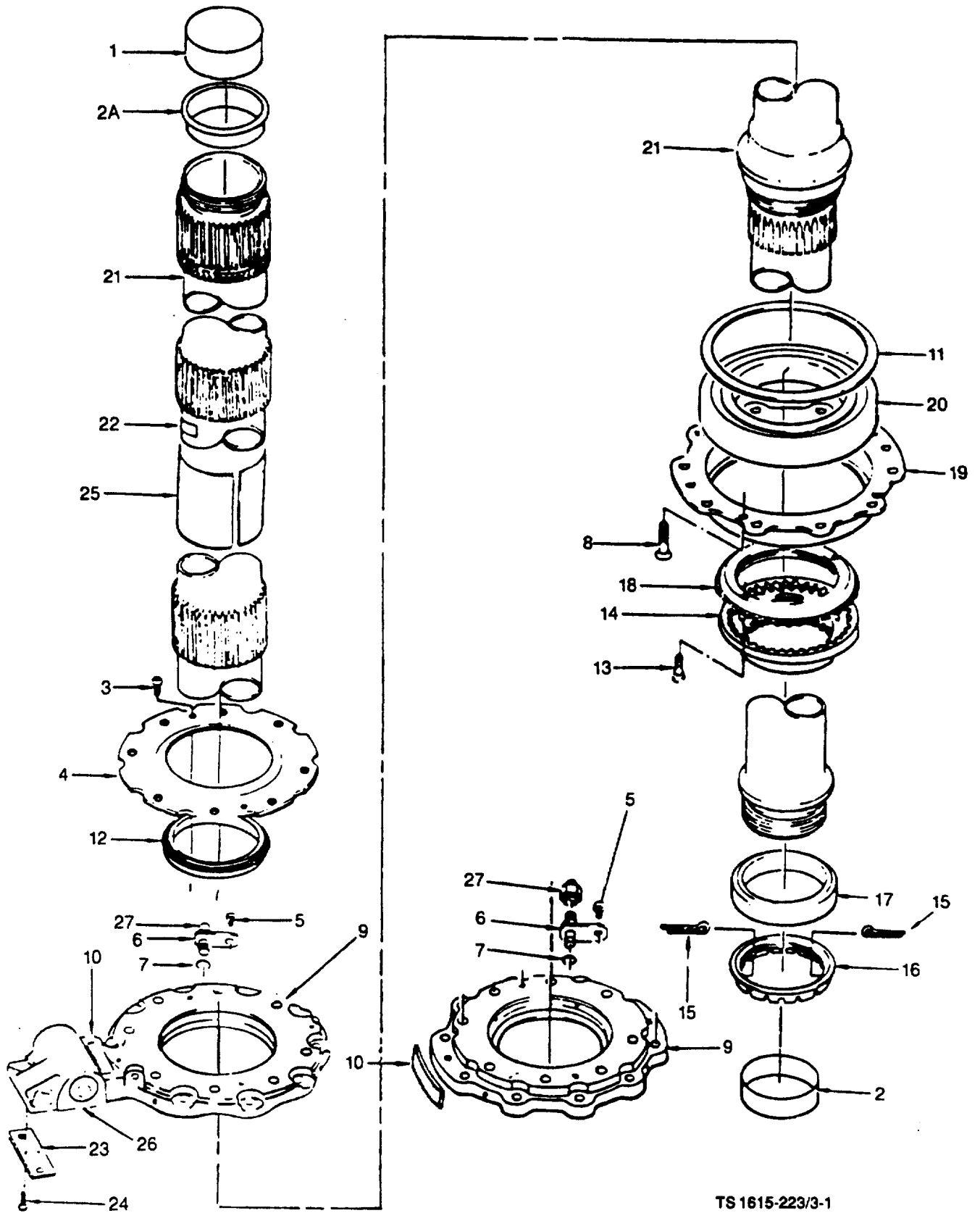
**Protect lower mast threads with cap to prevent damage during subsequent operations.**

j. Utilize tools installed in paragraph 3-5g. Break torque on bearing retainer nut (18) and remove tools and nut.

k. Using nonmetallic mallet, carefully tap liner (19) from upper bearing (20).

l. Using soft metallic drift (brass or aluminum), remove upper bearing (20) from mast (21) by tapping on inner race of bearing (20).





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Figure 3-1. Main Rotor Mast-Assembly, Exploded View

| FIGURE<br>& INDEX<br>NO | PARTNUMBER      | DESCRIPTION                                       | UNITS |   |   |   |   |   |    | USABLE<br>ON<br>CODE |
|-------------------------|-----------------|---|-------|---|---|---|---|---|----|----------------------|
|                         |                 |   | 1     | 2 | 3 | 4 | 5 | 6 | 7  |                      |
| 3-1                     | 204-040-366-7   | MAIN ROTOR MAST ASSEMBLY .....                    |       |   |   |   |   |   |    | A                    |
|                         | 204-040-366-9   | MAIN ROTOR MAST ASSEMBLY .....                    |       |   |   |   |   |   |    | B                    |
|                         | 204-040-366-11  | MAIN ROTOR MAST ASSEMBLY .....                    |       |   |   |   |   |   |    | C                    |
|                         | 204-040-366-15  | MAIN ROTOR MAST ASSEMBLY .....                    |       |   |   |   |   |   |    | D                    |
|                         | 209-040-366-1   | MAIN ROTOR MAST ASSEMBLY .....                    |       |   |   |   |   |   |    | E                    |
|                         | 209-040-366-3   | MAIN ROTOR MAST ASSEMBLY .....                    |       |   |   |   |   |   |    | F                    |
|                         | 209-040-366-5   | MAIN ROTOR MAST ASSEMBLY .....                    |       |   |   |   |   |   |    | G                    |
| -1                      | 650121          | • CAP, Protective (25205) .....                   |       |   |   |   |   |   | AR |                      |
| -2                      | 630125-3        | • PLUG, Protective (25205) .....                  |       |   |   |   |   |   | AR |                      |
| -2A                     | 55A             | • PLUG, Protective .....                          |       |   |   |   |   |   | AR | ABCD                 |
|                         | 53              | • PLUG, Protective .....                          |       |   |   |   |   |   | AR | EFG                  |
| -3                      | MS35206-215     | • SCREW .....                                     |       |   |   |   |   |   | 2  |                      |
| -4                      | 204-040-347-1   | • PLATE, Shield .....                             |       |   |   |   |   |   | 1  | ABF                  |
|                         | 540-040-011-1   | • PLATE, Shield .....                             |       |   |   |   |   |   | 1  | CDEG                 |
| -5                      | AN502-10-6      | • SCREW .....                                     |       |   |   |   |   |   | 1  | BCDE                 |
|                         | MS35276-261     | • SCREW (Alternate) .....                         |       |   |   |   |   |   | 1  | FG                   |
|                         |                 |   |       |   |   |   |   |   | 1  | BCDE                 |
| -6                      | 204-040-761-1   | • JET ASSEMBLY .....                              |       |   |   |   |   |   | 1  | FG                   |
| -7                      | MS29561-008     | • PACKING .....                                   |       |   |   |   |   |   | 1  | BCDE                 |
|                         |                 |   |       |   |   |   |   |   | 1  | FG                   |
| -8                      | MS24693S272     | • SCREW .....                                     |       |   |   |   |   |   | 4  |                      |
| -9                      | 204-070-349-5   | • PLATE, Bearing, Retainer .....                  |       |   |   |   |   |   | 1  | A                    |
|                         | 204-040-349-9   | • PLATE, Bearing, Retainer .....                  |       |   |   |   |   |   | 1  | BF                   |
|                         | 540-040-010-5   | • PLATE, Bearing, Retainer .....                  |       |   |   |   |   |   | 1  | C                    |
|                         | 209-040-349-1   | • PLATE, Bearing, Retainer .....                  |       |   |   |   |   |   | 1  | DEG                  |
| -10                     | 100-037-1M      | • PLATE, Identification .....                     |       |   |   |   |   |   | 1  |                      |
| -11                     | 120-006C213-198 | • SHIM .....                                      |       |   |   |   |   |   | 1  |                      |
| -12                     | 204-040-244-1   | • SEAL .....                                      |       |   |   |   |   |   | 1  |                      |
| -13                     | AN500A8-6       | • SCREW .....                                     |       |   |   |   |   |   | 2  |                      |
| -14                     | 205-040-236-1   | • LOCKWASHER .....                                |       |   |   |   |   |   | 1  |                      |
| -15                     | MS24665-151     | • COTTER PIN .....                                |       |   |   |   |   |   | 2  |                      |
| -16                     | 204-040-309-1   | • NUT, Retaining .....                            |       |   |   |   |   |   | 1  |                      |
| -17                     | 204-040-270-5   | • RACE, Bearing .....                             |       |   |   |   |   |   | 1  |                      |
| -18                     | 204-040-115-1   | • NUT, Bearing Retainer .....                     |       |   |   |   |   |   | 1  |                      |
| -19                     | 204-040-307-1   | • LINER .....                                     |       |   |   |   |   |   | 1  |                      |
| -20                     | 204-040-136-7   | • Bearing, upper Repl. by P/N 212-040-136-1 ..... |       |   |   |   |   |   | 1  | ABC                  |
|                         | 204-040-136-7   | • Bearing, upper Obs. by P/N 212-040-136-1 .....  |       |   |   |   |   |   | 1  | DE                   |
|                         | 204-040-136-9   | • Bearing, upper Repl. by P/N 212-040-136-1 ..... |       |   |   |   |   |   | 1  | FG                   |
|                         | 212-040-136-1   | • Bearing, upper .....                            |       |   |   |   |   |   | 1  |                      |
| -21                     | 204-011-450-1   | • MAST .....                                      |       |   |   |   |   |   | 1  | AB                   |
|                         | 204-011-450-5   | • MAST .....                                      |       |   |   |   |   |   | 1  | C                    |
|                         | 204-011-450-7   | • MAST .....                                      |       |   |   |   |   |   | 1  | F                    |
|                         | 209-010-450-1   | • MAST .....                                      |       |   |   |   |   |   | 1  | D                    |
|                         | 209-010-450-5   | • MAST .....                                      |       |   |   |   |   |   | 1  | EG                   |
| -22                     | 100-024-1       | • PLATE, Identification .....                     |       |   |   |   |   |   | 1  |                      |
| -23                     | 209-040-348-1   | • SHIM .....                                      |       |   |   |   |   |   | 1  | DEG                  |
| -24                     | MS24693-C2      | • SCREW .....                                     |       |   |   |   |   |   | 2  | DEG                  |
|                         | AN507C440R4     | • SCREW (Alternate) .....                         |       |   |   |   |   |   | 2  | DEG                  |
| -25                     | 540-001-477-3   | • SLEEVE .....                                    |       |   |   |   |   |   | 1  | CDEG                 |
| -26                     | 209-040-301-1   | • BUSHING .....                                   |       |   |   |   |   |   | 1  | DEG                  |
| -27                     | AN929-4S        | • CAP, Protective .....                           |       |   |   |   |   |   | 1  | BCDE                 |
|                         | MS20995C32      | • LOCKWIRE .....                                  |       |   |   |   |   |   | AR | FG                   |
| NOTE:                   | 204-040-136-9   | BEARING alternate for ABCDE, ONLY.                |       |   |   |   |   |   |    |                      |

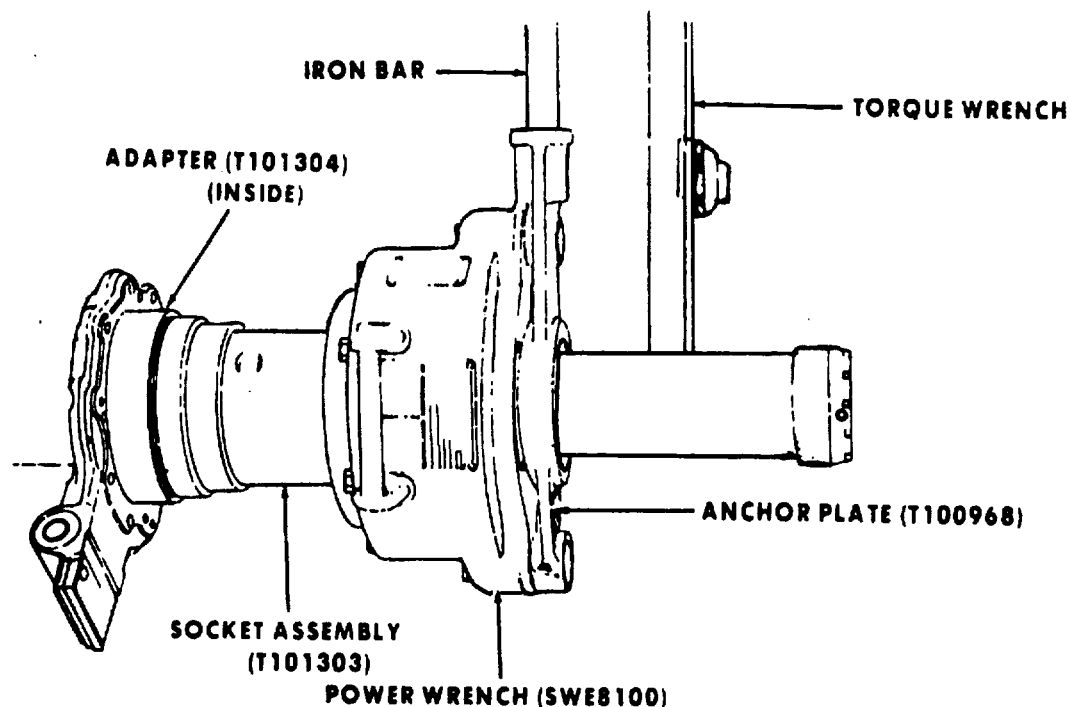


Figure 3-2. Nut Removal and Installation Tools

**CAUTION**

Keep bearings and both halves of inner race together as a serial-numbered, matched set.

- m. Remove screws (24) and shim (23) from bearing retainer plate (9) Codes D,E,G.
- n. Remove identification plates (10 and 22) as necessary.

## 3-6. Cleaning. Clean mast assembly as follows:

- a. Clean all parts of mast assembly with drycleaning solvent (item 1, table 2-2) and dry with filtered, compressed air.

**WARNING**

Drycleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Do not use near open flame or excessive heat. Flash point of solvent is 100 degrees F to 138 degrees F (38 degrees C to 59 degrees C).

- b. Use sharp-edged plastic tool to scrape sealant from bearing retainer plate (9, fig. 3-1). Do not scratch plate.

## 3-7. Inspection. Inspect the main rotor mast as follows:

**NOTE**

Paragraph 3-7a(1) thru (6) must be accomplished after reassembly.

a. Inspect upper mast bearing (20) for play as follows:

(1) Support mast on stand or bench so that it will remain steady during inspection procedure.

(2) Position two dial indicators 180 degrees apart on mounting hole circumference of bearing retainer plate (9) fig. 3-1) (figure 3-3).

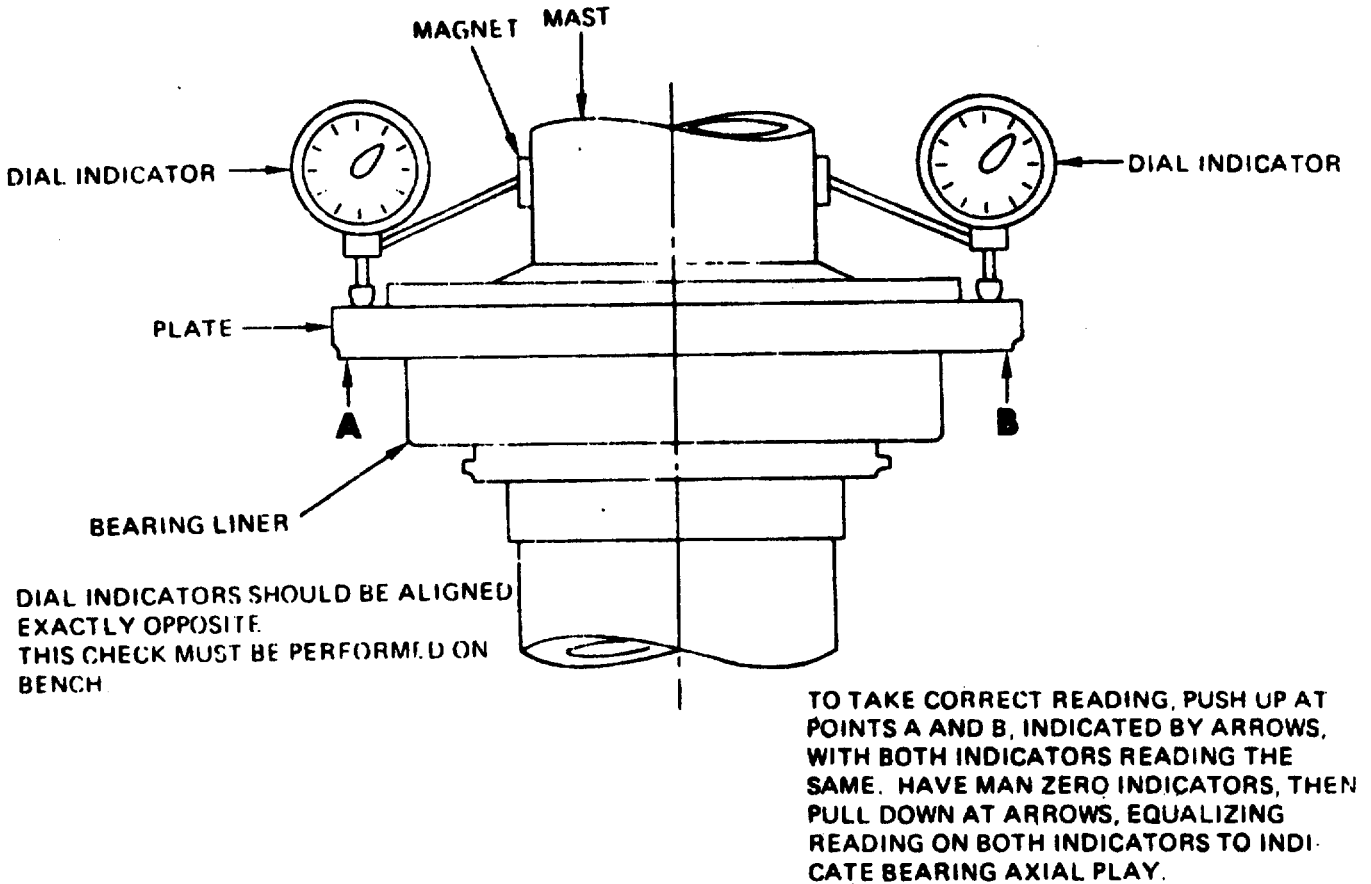


Figure 3-3. Mast Bearing Axial and Radial Play Check

(3) Apply pressure on retainer plate (9) parallel to mast at both indicator locations. Keep indicator readings the same, while maintaining equal pressure at both points zero indicators.

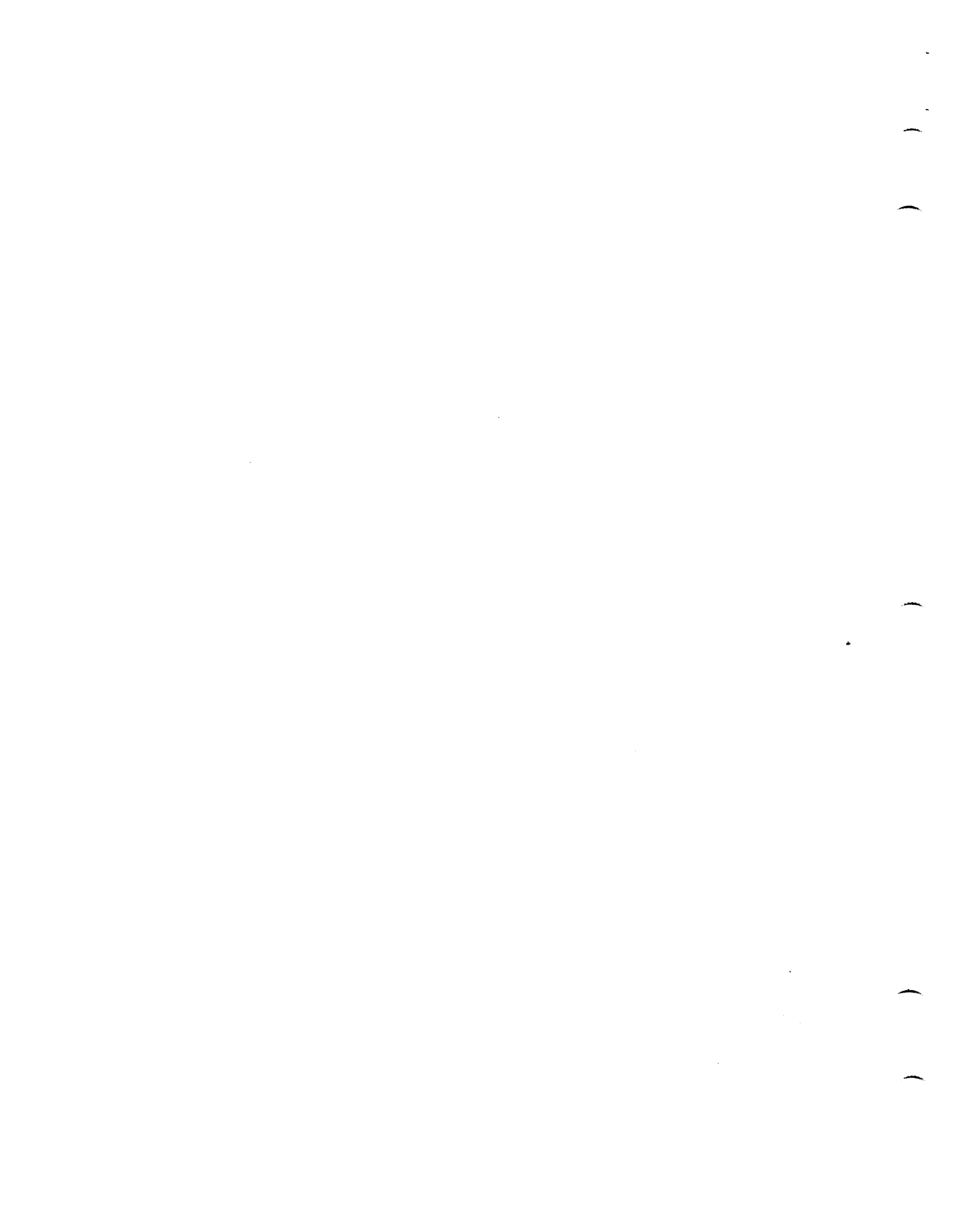
(4) Apply pressure equally to both points in opposite direction and record total indicator deflection. Deflection (axial play) shall not exceed 0.040 inch (1.02 mm).

(5) Measure radial play by using one dial indicator. Maximum allowable radial play is 0.012 inch (0.30 mm) for bearing 204-040-136 and 0.0123 inch (0.31mm) for bearing 212-040-136.

(6) All bearings not meeting the criteria in paragraphs (4) and (5) above will be discarded.

b. Inspect retainer plate (9) for pitting, especially in area of seal seat. Any evidence of pitting is cause for rejection.

c. Inspect liner (19) for deformation and corrosion damage. There shall be no evidence of coning of ID. Surface A & B shall be square with diameter C within 0.002 (0.05 mm) inch TIR (figure 3-4). Corrosion pitting not to exceed 0.005" in depth shall be cleaned up and the reworked surface treated with Magic Bluer (Birchwood Casey Company, Eden Prairie, MN) or equivalent.



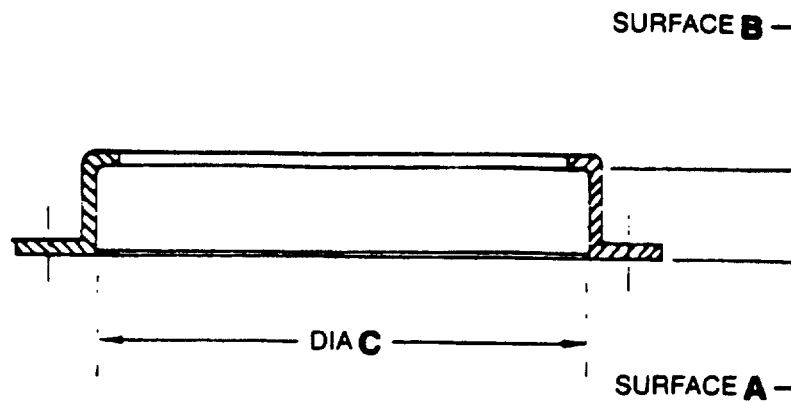


Figure 3-4. Squareness Check of Mast Bearing Liner

**WARNING**  
**FLIGHT SAFETY PART**

1. Flight Safety Part.

Magnetic particle inspection is the critical characteristic.

2. No lap or cracks allowed. Nonmetallic inclusions are acceptable provided the maximum length of individual indications is less than or equal to 1/8 inch, rateable indications are no closer than 1/4 or equal to 1/62 inch are rateable.

3. Flight Safety Part.

Fluorescent penetrant inspection is a critical characteristic.

**Table 3-1. Nondestructive Testing**  
**Magnetic Particle Inspection**

The following parts shall be inspected with the wet fluorescent magnetic particle process using the continuous method of magnetization in accordance with MIL-STD-1949. Refer to applicable figure and index number for procedures on individual parts. Inspect all surfaces. Mast acceptance criteria is in paragraph 3-7.d.

| Figure & Index No. | Nomenclature        | Method of Magnetization  |
|--------------------|---------------------|--|
| 3-1, 6             | Jet                 | Longitudinal, 10,000 ampere-turns, rotate 90°.   |
| 3-1, 14            | Lock Ring           | Circular, using 1 1/2" central conductor. Two (2) equally spaced shots (180° apart), 600 amperes.  |
| 3-1, 16            | Nut                 | Circular, using 1 1/2" central conductor. Two (2) equally spaced shots (180° apart), 800 amperes.  |
| 3-1, 17            | Race                | Circular, using 1 1/2" central conductor. Two (2) equally spaced shots (180° apart), 500 amperes.  |
| 3-1, 18            | Nut                 | Circular, using 2" central conductor. Three (3) equally spaced shots (120° apart), 800 amperes.  |
| 3-1, 19            | Liner               | Circular, using 2" central conductor. Three (3) equally spaced shots (120° apart), 1000 amperes.   |
| 3-1, 21            | Mast                | 1. Circular, using 90" X 2" central conductor. Two (2) equally spaced shots (180° apart), 1500 amperes.<br>2. Longitudinal, six (6) equally spaced shots 12" apart, 6000 ampere-turns. |
| 3-1, 18            | (See Notes 1 and 2) |  |
| 3-1, 21            | (See Note 1)        |  |
| 3-1, 9             | (See Note 3)        |  |

**PENETRANT INSPECTION**

Inspect the following part(s) with fluorescent penetrant inspection in accordance with MIL-I-6866, using a penetrant of high sensitivity equal to MIL-I-25135, Type I, Level 3 or 4, Method A or D. Inspect all surfaces.

| Figure & Index No. | Nomenclature |
|--------------------|--------------|
| 3-1, 9             | Plate        |

d. Inspect mast and components in accordance with table 3-1. Indications of cracks are cause for rejection. Mast acceptance criteria for surface and sub-surface indications of non-metallic inclusions, within the stated limits are as follows:

- (1) The indications lie parallel to the long axis of mast within 15 degrees of long axis.
- (2) The lower 23.5 inch (69.69 cm) section of mast, from seal area to lower end.

- (a) Maximum length of indication is 0.5 inch (12.70 mm).
  - (b) Not more than two 0.5 inch (12.70 mm) indications allowed for each 2 square inches of surface area.
  - (c) The maximum total additive length of all indications, that are longer than 0.06 inch (1.52 mm), shall not exceed 3 inches (76.20 mm).
- (3) Upper section of mast, above the seal area.
- (a) Maximum length of indication is 1.0 inch (25.40 mm).
  - (b) Not more than two 1.0 inch (25.40 mm) indications allowed for each 3 square inches of surface area.
  - (c) The maximum total additive length of all indications that are longer than 0.06 inch (1.52 mm), shall not exceed 6 inches (152.4 mm).
- (4) One (1) indication per spline crown is acceptable provided it does not exceed 0.25 inch (6.35 mm) in length.

**NOTE**

***An indication within limits and determined not to be a crack shall not be reworked in attempt to remove the defect.***

- (5) Indications, aside from cracks, that are cause for rejection are:
- (a) Surface discontinuities that break over corners or run into fillets.
  - (b) Indications in or that terminate within 0.12 inch (3.05 mm) of threads root or side wall of splines, slots, keyway, or ring grooves.
  - (c) Heavy concentrations of inclusions, or where considerable particle buildup is present indicating that the defect has considerable depth and/or cross section.
- e. Inspect mast for mechanical damage and corrosion to limits and areas shown in figures 3-5 and 3-6, with particular attention to radii in retainer grooves and in the thread relief below the upper bearing seat area.
- f. Visually inspect for damage, with particular attention given to the area below upper spline (8, fig. 3-7). There should be no yielding or deformation. Inspect mast parts for circumferential and transverse scratches with particular attention to mast radius just above upper bearing (20, fig. 3-1) and to tapered section between thrust bearing and lower bearing inner race (17).
- g. If crash damage, overtorque, overspeed or hard landing is recorded, suspected or evident, mount mast on centers and inspect as follows:
- (1) Use dial indicator with pointer on surfaces A, B and C as shown on figure 3-7. Runout shall not exceed values given in figure 3-7.
  - (2) Splines (8, 9 and 10, fig. 3-7) must be in line radially within 1/2 degree.
- h. Check sleeve (25, fig. 3-1, codes C, D, E, G) for bond void between the sleeve and mast (21) utilizing 0.002 in feeler gauge. Bond void is cause for sleeve replacement.
- i. Inspect sleeve (25, codes C, D, E, G) as follows for wear and taper (fig. 3-8).
- (1) Layout four reference marks, full length of sleeve, located 90 degrees apart, with a soft carbon pencil.
  - (2) Use a three to four inch (76.2 mm to 101.6 mm) micrometer and check sleeve for taper and for out-of-round along lines for entire length of sleeve, then check areas between the marks. If sleeve exceeds requirements it must be replaced.

**NOTE**

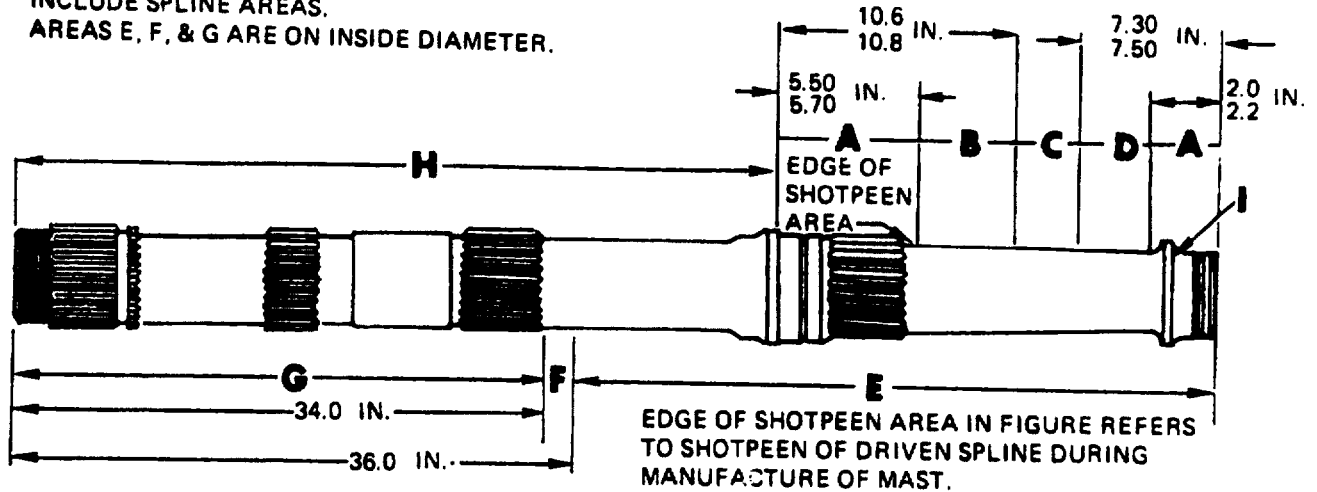
***The maximum out-of-round or taper allowance is 0.007 inch (0.18 mm) (fig. 3-8).***

- j. Inspect mast dimensionally (fig. 3-7). Failure to meet dimensional requirements will be cause for rejection.



NOTE

AREAS A, B, C, D & H ARE ON OUTSIDE DIAMETER. DO NOT INCLUDE SPLINE AREAS.  
AREAS E, F, & G ARE ON INSIDE DIAMETER.



**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 IN.  
 AREA C - 0.015 IN.  
 AREA D - 0.020 IN.

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.

AREA E - 0.005 IN. - OR TO A MAXIMUM I.D. OF 3.140 IN.  
 AREA F - 3.130 IN 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.<br>STA 0-10  | 3.140 | 3.146 | 3.153 |
| MAX I.D.<br>STA 10-20 | 3.136 | 3.142 | 3.149 |
| MAX I.D.<br>STA 20-34 | 3.130 | 3.136 | 3.143 |

AREA H - 0.010 IN. AFTER CLEANUP. SEAL AREA AND THREADS EXCLUDED. FLANGE SURFACE AND AREA I FLATS, USE SAME LIMITS AS AREA D.  
 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. SEE PARAGRAPH 3-8, E.

NOTE: PITTING MUST BE COMPLETELY REMOVED WITHIN ALLOWABLE CLEANUP DEPTH FOR MAST TO BE ACCEPTABLE. DEFINITE PITS REMAINING AFTER REWORK ARE NOT ACCEPTABLE. FINISH REWORKED AREAS PER PARAGRAPH 3-8, B.

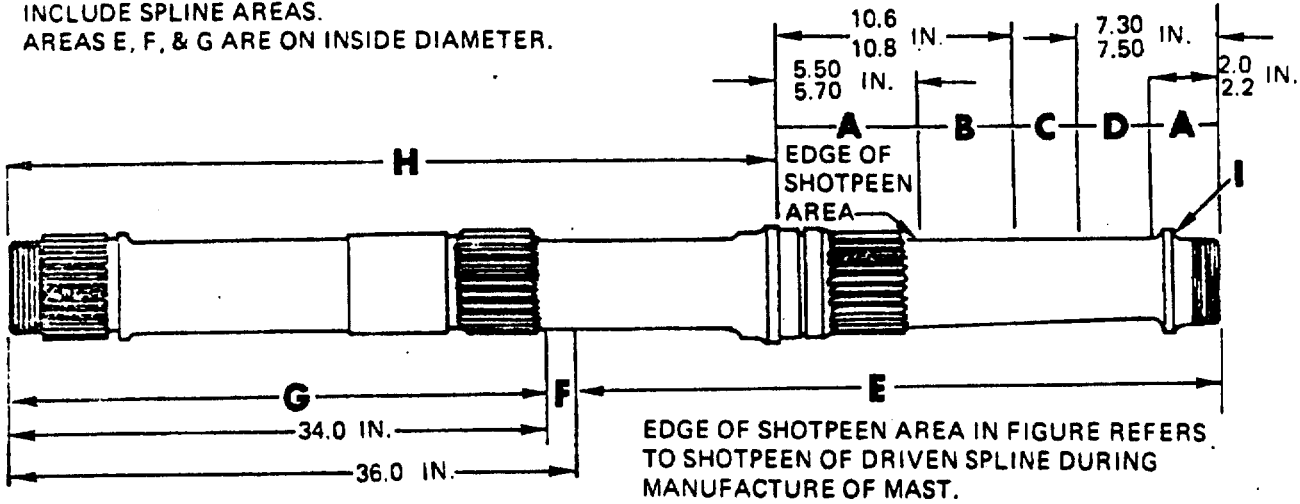
Figure 3-5. Wear Limits, Fits, and Tolerances for Rotor Mast (Codes A,B,C,D)

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Figure 3-5. Wear Limits, Fits and Tolerances for Rotor Mast (Codes A, B, C, D)

NOTE

AREAS A, B, C, D & H ARE ON OUTSIDE DIAMETER. DO NOT INCLUDE SPLINE AREAS.  
AREAS E, F, & G ARE ON INSIDE DIAMETER.



EDGE OF SHOTPEEN AREA IN FIGURE REFERS TO SHOTPEEN OF DRIVEN SPLINE DURING MANUFACTURE OF MAST.

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 IN.
- AREA C - 0.015 IN.
- AREA D - 0.020 IN.

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.

- AREA E - 0.005 IN. - OR TO A MAXIMUM I.D. OF 2.980 IN.
- AREA F - 2.970 IN. 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.

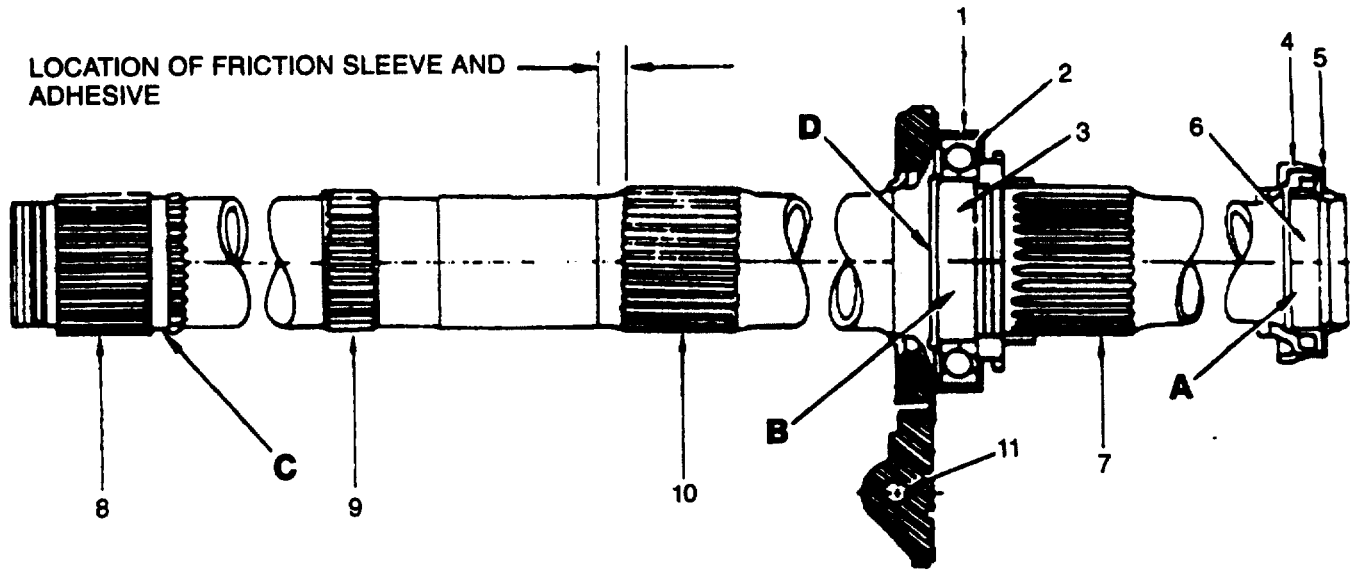
|                       |       |       |       |
|-----------------------|-------|-------|-------|
| O.D.                  | 3.545 | 3.550 | 3.555 |
| MAX I.D.<br>STA 0-10  | 2.980 | 2.986 | 2.993 |
| MAX I.D.<br>STA 10-20 | 2.976 | 2.982 | 2.989 |
| MAX I.D.<br>STA 20-34 | 2.970 | 2.976 | 2.983 |

- AREA H - 0.010 IN. AFTER CLEANUP. SEAL AREA AND THREADS EXCLUDED. FLANGE SURFACE AND AREA I FLATS, USE SAME LIMITS AS AREA D.
- 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. SEE PARAGRAPH 3-8, E.

NOTE PITTING MUST BE COMPLETELY REMOVED WITHIN ALLOWABLE CLEANUP DEPTH FOR MAST TO BE ACCEPTABLE. DEFINITE PITS REMAINING AFTER REWORK ARE NOT ACCEPTABLE. FINISH REWORKED AREAS PER PARAGRAPH 3-8, B.

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Figure 3-6. Wear Limits, Fits and Tolerances for Rotor Mast (Codes E, F, G)



| ITEM   | NOMENCLATURE                        | DIAMETER | MFG       | DIMENSION | REPLACE   |
|--|-------------------------------------|----------|-----------|-----------|-----------|
| 1  | LINER-THRUST BEARING                | ID       | 6.6919 IN | 6.6925 IN | 6.6929 IN |
| 2  | BEARING-THRUST                      | OD       | 6.6923    | 6.6929    | 6.6922 IN |
|  |                                     | ID       | 4.3302 IN | 4.3307 IN | 4.3308 IN |
| 3  | MAST-BEARING SEAT                   | OD       | 4.3310 IN | 4.3315 IN | 4.3307 IN |
| 4  | LINER-ROLLER BEARING                | ID       | 4.9987 IN | 4.9997 IN | 5.0003 IN |
| 5  | BEARING-ROLLER                      | OD       | 3.4995    | 4.9990 IN | 4.9984 IN |
|  |                                     | ID       | 3.4095 IN | 3.5000 IN | 3.5001 IN |
| 6  | MAST-BEARING SEAT                   | OD       | 3.5007 IN | 3.5012 IN | 3.5003 IN |
| 7  | SPLINES-DRIVE (USE 0.1920 DIA PINS) |          | 4.2938 IN | 4.2962 IN | 4.2913 IN |
| 8, 9, 10   | SPLINES-ROTOR (USE 0.1920 DIA PINS) |          | 4.0937 IN | 4.0961    | 4.0760 IN |
| 11   | BUSHING                             | ID       | 0.625 IN  | 0.626 IN  | 0.627 IN  |
|  |                                     |          | A         | B         | C         |
| RUN-OUT LIMITS, SUPPORTED ON CENTERS SURFACE MAX TIR |                                     |          | 0.0025 IN | 0.006 IN  | 0.0045 IN |

TS 1615-223/3-7

Figure 3-7. Inspection of Sleeve Wear Limits, Fits and Tolerances

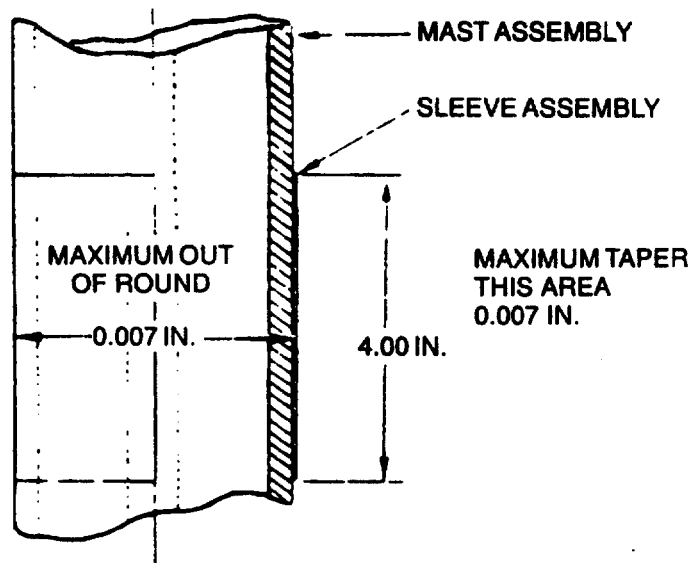


Figure 3-8. Inspection of Sleeve for Wear and Taper

k. Masts marked REWORKED shall be inspected and evaluated, visually and/or dimensionally, as applicable with special attention to areas showing defects.

(1) Rework limited to removal of superficial surface corrosion, burrs, etc., route for standard procedures (inspections, plating, etc.) and re-use.

(2) Defects in tapered section (areas B, C, D, fig. 3-5 and fig. 3-6).

(a) Determine if defects are workable within limits.

(b) Dimensionally check OD.

(c) Tapered section previously ground to minimum OD, no further rework permissible.

(d) OD dimensions are nominal per blueprint, (para 3-8b(5) below); rework by grinding procedure.

(3) Defects in upper splines.

(a) Pin check (fig. 3-7) to determine that rework can be accomplished, within limits.

(b) Minimum major diameter, 3.865 inches (98.17 mm) (maximum material removal per tooth to clean up 0.015 inch (0.38 mm)).

(c) Minimum minor diameter, 3.583 inches (91.01 mm) (maximum clean up per root, 0.010 inch (0.25 mm), maintaining 0.031 in (0.79 mm) R minimum).

**WARNING  
FLIGHT SAFETY PART**

The minimum major diameter and the pitch diameter are the critical characteristics.

(4) Inspect mast threads.

(a) Inspect 4 1/4 - 16 UN-3A threads, the pitch diameter must be 4.2050-4.2094 and the major diameter must be 4.2406 minimum.

(b) Inspect 3 1/2 - 16 UN-3A threads, the pitch diameter must be 3.4551-3.4594 and the major diameter must be 3.4906 minimum.

**WARNING  
FLIGHT SAFETY PART**

The maximum minor diameter and the pitch diameter are the critical characteristics.

3-7.1. Inspect mast bearing nut (18, Fig. 3-1) threads, the pitch diameter must be 4.2094-4.2151 and the minor diameter must be 4.1908 maximum.

**Section III. REPAIR**

**3-8. Component Replacement and Repair.**

a. Replace all parts that fail to meet inspection requirements (para 3-7). All upper mast bearings (20, fig. 3-1) will be replaced 100 percent.

**NOTE**

***If bushing (26, fig. 3-1) does not meet dimensional requirements in figure 3-7, replace bearing retainer plate (9, fig. 3-1) which includes bushing (26).***

**b.** Removal of corrosion, pitting and defects by mechanical means shall be accomplished in accordance with the following procedures and within the following limits:

**NOTE**

***Rework of nicks and scratches shall consist of blending and polishing defect to remove sharp edges and scratches. Use medium to fine abrasive cloth (item 4, table 2-2), or fine India stone, (item 2, table 2-2), followed by crocus cloth (item 5, table 2-2), to produce a scratch-free finish meeting the RMS limits noted below.***

**(1)** Inside diameters (Areas E, F, & G, figs. 3-5 and 3-6).

**(a)** Limits and method of clean-up per figures 3-5 and 3-6.

**(b)** Defects, a maximum depth of 0.005 inch (0.13 mm) are allowable without clean-up if ID is to be shotpeened. This is applicable both before ID is reworked and after reworking ID to maximum dimensions per figures 3-5 and 3-6.

**(c)** Surface finish of ID to be 63 RMS, except if shotpeened, finish to be 125 RMS.

**(2)** Outside surface and the upper splines (2 on Codes E, G and 3 on Codes A, B, C, D, F), except threads, bearing areas, and seal area.

**(a)** Dry glass bead blast, per MIL-STD-852, item 7, table 2-2), the entire mast to clean the surface and to remove fretting and surface corrosion. Minor localized defects on outside surface may be reworked, within limits, using fine grit paper (item 3, table 2-2).

**(b)** Areas with corrosion pitting and defects revealed or not removed by bead blasting may be followed by a sand or grit blasting operation (40 psi (2.81 kg/sq cm) maximum pressure measured at surface). The sand or grit blasted surface shall be followed by a dry bead blasting operation.

**(c)** After rework, surface finish on OD to be 32 RMS, grooves 63 RMS and splines 125 RMS. If mast is shotpeened, finish to be 125 RMS.

**(d)** Corrosion pits on top surface of a spline tooth may be removed by dressing the surface, a maximum of 0.015 inch (0.38 mm).

**(e)** Pitting on sides and in roots of spline teeth and in radii of retainer grooves may be worked by bead, sand or grit blasting (per para (2) (b) above) or by hand working using fine grit paper (item 3, table 2-2). Teeth shall be worked evenly in order to maintain the tooth profile.

**CAUTION**

**During rework, care shall be taken not to remove or distort the involute tooth form of the spline teeth.**

**(f)** Defects a maximum of 0.005 inch (0.13 mm) are allowable without clean-up if mast is to be shotpeened. This is applicable both before rework and after reworking to maximum limits per figures 3-5 and 3-6.

**(g)** A pin recheck shall be accomplished (fig. 3-7), after spline tooth rework or before reassembly of mast assembly.

**(3)** Corrosion pits in thread relief (area above threads for nut 18, fig. 3-1) may be removed by local hand working only with fine grit paper (item 3, table 2-2). Finish 32 RMS and 0.050 R corner radii. Refer to blueprint.

**(4)** Bearing seat areas and seal area.

(a) Bearing journal areas and seal area may be polished with fine grit paper (item 3, table 2-2), to remove surface corrosion, surface defects, burrs, raised metal, etc. that would interfere with installation and/or operation of bearings and seal.

(b) Minor seal groove in seal area (0.005 inch (0.13 mm) max. depth) shall be polished smooth. Complete removal not required.

(c) Seal area and upper bearing journal surface finish is 16 RMS.

(d) Lower bearing journal surface is acceptable with scratches or defects in an axial and/or circumferential direction with maximum depth of .005 inch (0.13 mm).

(5) Pitting in area B, C and D (figs. 3-5 and 3-6) may be reworked as follows:

(a) Regrind area maintaining all dimensions and finishes of figures 3-5 and 3-6. Use a Simmonds RA60-K5-V Bond Wheel or equivalent, wheel speed 6500 rpm, work speed, 300 surface ft/min.

(b) If I.D. of mast is still within blueprint dimensions (3.120/3.130 in. (7.92/7.95 cm), Code A, B, C, D, and 2.960/2.970 in. (7.52/7.54 cm), Code E, F, G), the outside diameter in Area B may be reduced to 3.426 in (8.7020 cm) minimum (beginning of taper) and the outside diameter in Area D may be reduced to 3.260 in. (8.2804 cm) minimum (end of taper), otherwise blueprint dimensions will prevail.

(c) After grinding, the Nital Etch process for grinding burn inspection of ground surfaces will be accomplished.

1. Personnel engaged in Nital Etch inspection work must be certified as inspectors and/or operators.

2. Unburned area will be a uniform light to medium gray color, with an essentially non-reflective surface. Any heavy burns (dark areas) or areas where original temper heat has been exceeded (white or light colored areas) is cause for rejection of part.

3. Inspect the part using magnetic particle inspection process per MIL-STD-1949.

4. Dimensionally check and record the diameters of the extreme ends of the reworked tapered section. All recorded information will become a part of the historical data on the final assembly serial number.

5. Place the part in an oven at 350 degrees F to 375 degrees F (177 degrees C to 190 degrees C) for 4 to 4.5 hours.

#### **CAUTION**

**Parts shall be baked within 4 hours of Nital Etch being performed.**

(d) Shotpeen mast per paragraph 3-8c.

c. In lieu of extensive local rework, or if after rework, indications still exist (within the 0.002 or 0.005 inch (0.05 or 0.13 mm) limits, corrosion and mechanical damage on surface not exceeding 0.005 inch (0.13 mm) in depth on ID, or in areas B, C, D, and H (excluding seal contact area and threads), or not exceeding 0.002 inch (0.05 mm) in depth in area A (figs. 3-5 and 3-6) (excluding threads, thread reliefs, and bearing areas) may be shotpeened in accordance with the following procedures:

(1) Clean the surfaces to be shotpeened and the surrounding area using a cloth moistened with solvent (Item 1, table 2-2 or equivalent).

(2) Shotpeen entire mast assembly ID and OD except for the following areas:

(a) Starting at a point at the top of the driven spline 21.395 to 21.415 inches (54.34 cm to 54.45 cm) up from bottom of the mast) up to the top edge of the seal area.

(b) Starting from lower end of mast for a distance of 1.420 to 1.380 inches (3.61 to 3.51 mm) (bottom threads and bearing area).

(c) Starting from top of mast for a distance of 0.865 to 0.885 inches (21.97 mm to 22.48 mm) (top threads).

All of the above areas shall be protected in accordance with the requirements of MIL-S-13165.

(3) Shotpeen in accordance with MIL-S-13165B and the following criteria:

- (a) Shot size: Nominal diameter 0.017 in. to 0.028 in.
- (b) Intensity: 0.010A +0.002 or -0.002.
- (c) Coverage: 100 percent

Using a test strip (Almen A-2) and a test gauge (Almen No. 2) prepare equipment in accordance with above parameters.

(4) Remove all shot and fragments. Visually inspect the shotpeened surfaces for uniform indentations and overlapped peened areas with no evidence of excessive surface distortion.

(5) Quality control requirements for shotpeening shall be as stated in MIL-S-13165B except for sampling and process control which will be in accordance with the following:

One intensity determination shall be made every four hours of continuous operation, and in all cases, regardless of the length of the run, at least one determination shall be made at the beginning and one at the end of each period of operation. The intensity values and shot sizes shall be within the limits provided above. A Process Card shall be established for each part processed. This card shall be kept where the operator and government inspector have it at their disposal at all times. It shall contain the following:

- (a) Intensity used.
- (b) Shot size.
- (c) Air pressure range.
- (d) Location, position and distance of nozzle to work.
- (e) Number of passes made by nozzle on part.
- (f) Nozzle size.
- (g) Identification of machine used for peening.
- (h) Volume of shot used.
- (i) Tool drawing number of holding fixture used to hold Almen test strips.
- (j) Speeds of rotation, traverse and linear motion, time of delay of motion (specify) or control by special design machine.
- (k) Any other controls that have been established for the process.

d. Rework of bearing plate (9, fig. 3-1, Code D, E, G) having corrosion in shim (23) mounting area:

- (1) Glass bead clean corroded areas maintaining following parameters.
  - (a) Glass beads (item 7, table 2-2).
  - (b) Direct pressure, 10-30 psi (0.70 to 2.11 kg/sq cm) maximum measured at the working surface.
- (2) Pitting after cleaning not to exceed 0.040 inch (1.02 mm) in depth.
- (3) Fill pitted areas with filler (Item 15, table 2-2) to prevent water entrapment.
- (4) Blend to existing surface, treat surfaces as reworked areas with chemical film, (item 17, table 2-2.)
- (5) DELETED
- (6) DELETED

#### NOTE

*Ensure sealant remains below shim surface.*

- e. Replace seal (12), shim (11), and bearing (20) at every overhaul.
- f. Replace all unserviceable parts.
- g. Replace upper bearing (20) if limits are exceeded. Refer to para 3-7a.

**NOTE**

*Parts of upper bearing (20) are in matched sets, numbered on outer race and both halves of inner race. Parts of different numbers may not be interchanged. Lower bearing race (17) is not matched and may be interchanged between mast assemblies.*

**h. Surface treatment of reworked aluminum parts:**

- (1) Less than 5 percent of total surface area requires treatment touch up with brush chemical film (item 17, table 2-2, Grade B).
- (2) More than 5 percent of total surface area requires treatment, treat by immersion method (item 17, table 2-2, Grade C).

**i. Surface of steel parts shall be treated as follows:**

- (1) Less than 5 percent of total surface area requires plating, touch up with brush cadmium plate per MIL-STD-865.

**WARNING  
FLIGHT SAFETY PART**

The cadmium plating bake cycle for mast (21) is the critical characteristic.

(2) More than 5 percent of total surface area requires replating. Strip and replate per QQ-P-416, Type II, Class 1. Bake plated parts at  $375 \pm 10^\circ\text{F}$  for 23 hours minimum within 1 hour of plating. The one hour period is defined as starting when part is removed from the plating bath and ending when part is subjected to the oven or furnace heat at the start of the baking cycle.

- (3) The areas of mast (21) to be cadmium plated are:

(a) The entire ID.

(b) The OD from the top down to upper edge of flange separating seal area and main bearing seat (point D, fig. 3-7) except the upper and lower rotor splines (splines 8 and 10, fig. 3-7, Codes A, B, C, D, F and two upper splines, Codes E, G). Flash cadmium on OD surface of flange is permissible.

(4) After plating procedures are completed, apply surface sealing, corrosion preventive compound (type II, item 11, table 2-2) to all surfaces of the mast. Method of application is optional. Permit sealing compound to air dry 10-15 minutes, then oven cure 10-15 minutes at 325 degrees F to 375 degrees F (163 degrees C to 191 degrees C).

**NOTE**

*If local rework is subsequently required, resealing may be accomplished by aerosol application (type I, item 11, table 2-2). Air dry 10-15 minutes.*

**j. Replace friction sleeve (25, fig. 3-1, Codes C, D, E, G) if found unserviceable, as follows:**

(1) Roughen bonding area on OD of Mast by dry grit Blasting with aluminum oxide abrasive, 180 grit or finer (Item 24, Table 2-2) to a uniform matte finish. The area from 0.72 inch (18.29 mm) above the upper point of root of tooth on spline and extending up for 3-1/2 inches (8.89 cm) (Code C). The area from 0.94 inch (23.88 mm) above the upper point of root of tooth on spline (10, fig. 3-7) and extending up for 3-1/2 inches (8.89 cm) (Codes D, E, G).

**NOTE**

*Full length of friction sleeve will be 4.00 inches (10.16 cm).*

- (2) Blast ID of sleeve with aluminum oxide abrasive, 180 grit or finer (ITEM 24, Table 2-2).
- (3) Round off sharp corners on sleeve 1/4 inch (6.35 mm) radius minimum.
- (4) Re-roll sleeve to 3-1/2 inch diameter (8.89 cm).
- (5) Thoroughly clean, with trichloroethylene (item 13, table 2-2) the bonding surfaces on OD of mast and ID of sleeve.

**NOTE**

*Care should be taken to avoid contaminating the cleaned surface.*

- (6) Permit adhesive and the primer to warm to ambient temperature before applying.



**NOTE****Moisture adversely affects the adhesive properties.**

- (7) Apply one coat of primer (item 14, table 2-2) to the bonding areas on OD of mast and ID of sleeve.
- (8) Primer dry cycle shall be one (1) hour at 75 degrees F (23.9 degrees C) (room temp).
- (9) Apply 4 inch (101.6 mm) wide strip of adhesive (item 12, table 2-2) to mast with lower edge of adhesive located 0.44 to 0.50 inch (11.18 mm to 12.7 mm) above spline (10, fig. 3-7) (Code C) or 0.65 to 0.71 inch (16.5 mm to 18.03 mm) above spline (10, fig. 3-7) (Code D, E, G).

**NOTE****Roll adhesive film onto mast being careful to prevent air entrapment.**

- (10) Place sleeve on mast locating the sleeve above spline (10, fig. 3-7).
- (11) Trim protruding adhesive film.
- (12) Install assembly in bonding fixture (Item 6, table 2-1).
- (13) Torque heat clamp nuts to 225 inch-pounds.
- (14) Wrap the mast with an asbestos blanket on both sides of the heat clamp.
- (15) Raise bond line temperature to 245 degrees F to 255 degrees F (118 degrees C to 124 degrees C) at a rate of 5 degrees F (-15.0 C) per minute.

**CAUTION****Rate of increase must be adhered to.**

- (16) Cure at 245 degrees F to 255 degrees F (118 degrees C to 124 degrees C) for 60 to 65 minutes.
- (17) Turn off heat and permit mast assembly to cool below 180 degrees F (82 degrees C) before loosening clamp and removing mast from fixture.
- (18) Seal and fair top and bottom edges of sleeve around mast with sealing compound (item 25, table 2-2).
- (19) Machine (with light cuts) or grind (60 grit stone) the sleeve to 3.600/3.595 inch (9.14/9.13 cm) diameter with a maximum taper of 0.004 inch (0.10 mm) and maximum out-of-round of 0.004 inch (0.10 mm). Dial indicate off mast surface just above sleeve. Surface finish to be 16 RMS (Codes D, E, G) and 32 RMS (Code C). Full cleanup of upper and lower 0.5 inch (12.7 mm) of sleeve not required.

k. Mast (21, fig. 3-1) shall be rejected if inspection and allowable rework limits are exceeded.

l. Identify mast by vibro-etching on lower bearing race flange flat (Area I, figs. 3-5 and 3-6) the word "REWORKED" after reworking as follows:

- (1) Splines and outside surface to maximum allowable. (Add S (for splines) or H (for upper OD) - after word REWORKED.)
- (2) Honing of ID. (Add ID after word REWORKED.)
- (3) Grinding of tapered section. (Add G after word REWORKED.)

m. Liner (19, fig. 3-1) may be phosphate coated per MIL-P-16232E, Type M (liner material 4130/alt 4340 or 4140, tensile 145-165 Kips), in lieu of black oxide coated. After coating, apply corrosion preventive compound (item 22, table 2-2).

n. Following listed parts shall not have black oxide coating reapplied at time of repair or overhaul.

| Noun          | P/N           | Fig. 3-1, Item No. |
|---------------|---------------|--------------------|
| Lockwasher    | 205-040-236-1 | 14                 |
| Retaining Nut | 204-040-309-1 | 16                 |
| Nut           | 204-040-115-1 | 18                 |

## Section IV. ASSEMBLY

**3-9. Lubrication.** Lubricate all bearings and surfaces of mating parts on reassembly with oil (item 8, table 2-2). Use corrosion preventive compound (item 9, table 2-2) on mating threads of dissimilar metals.

**3-10. Reassembly-Mast Assembly.** To reassemble main rotor mast (fig. 3-1) proceed as follows:

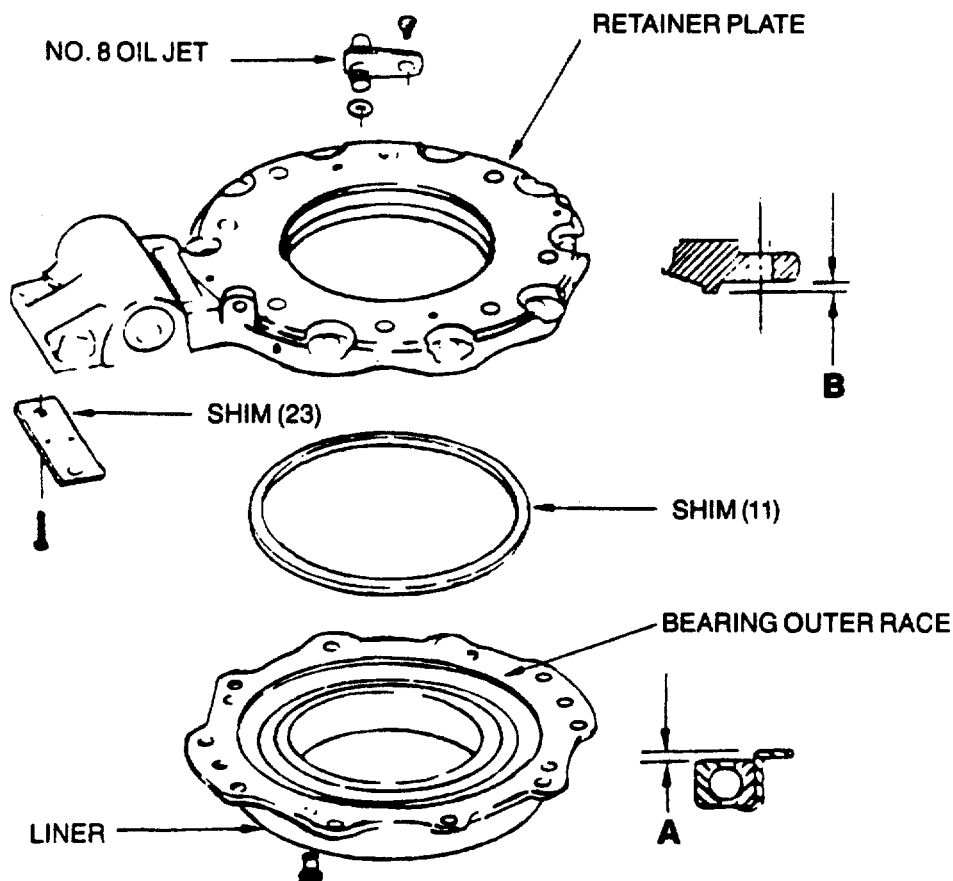
### WARNING FLIGHT SAFETY PART

Proper installation of lockwasher (14) and proper installation, lockwiring of screw (13) are the critical characteristics.

### CAUTION

Failure to obtain proper pinch fit in upper mast bearing will cause premature bearing and shim deterioration, which will result in transmission failure.

- a. Press outer race of new bearing (20) into liner (19).
- b. Determine thickness of shim (11) as follows (fig. 3-9).

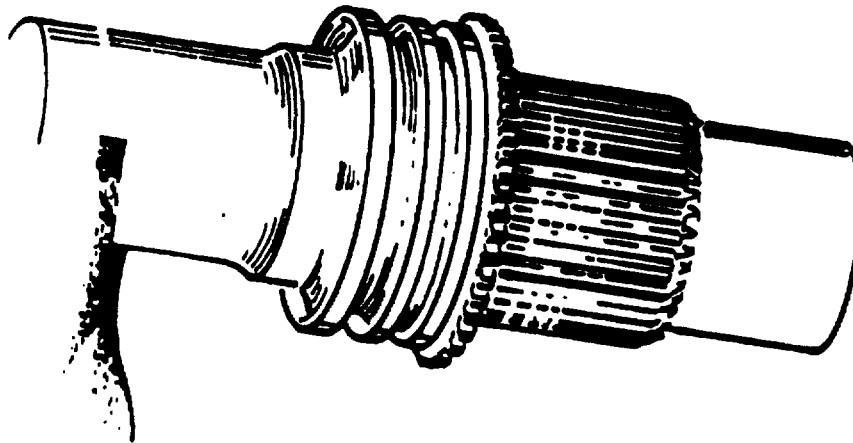


**Figure 3-9. Adjusting Shims-Upper Mast Bearings**

- (1) With a depth gauge measure dimension A.
- (2) Measure dimension B with a depth gauge.
- (3) Subtract dimension B from dimension A.

c. Peel a shim from 0.001 in. to 0.004 in. (0.03 mm to 0.10 mm) greater in thickness than the resulting dimension. This provides the proper pinch fit on the bearing. Set aside with liner assembly for later installation.

d. With mast suitably supported, start upper half of thrust bearing (20) inner race on mast bearing seat. Use retaining nut (18) to force race as far as threads allow and remove nut (see fig. 3-10). Using a soft faced drift, carefully tap race approximately 1/16 inch further onto mast to provide a positive pilot for starting lower half of race.



*Figure 3-10. Installing Upper Bearing Inner Race*

e. Place assembled liner and outer race on mast against upper half inner race. Start lower half of inner race on mast with match marks on race halves aligned.

f. Install bearing retainer nut (18) hand-tight, with splined flange down and threads lubricated with oil (item 8, table 2-2).

g. Position adapter (item 4, table 2-1) over mast drive splines, and position socket assembly, (item 3, table 2-1) on bearing retainer nut. Install power wrench (item 1, table 2-1) and anchor plate (item 2, table 2-1). Holding mast assembly with anchor plate and using wrench (item 5, table 2-1), tighten nut to push assembled bearing to position against mast shoulder. Continue tightening nut to low side of required 2000 to 2500 ft-lb torque, then remove tools.

**NOTE**

**During seating and torquing procedure, rotate bearing outer race to check for freedom of movement.**

h. Place lockwasher (14, fig. 3-1) over mast drive splines and engage with splines of bearing retainer nut (18). Secure to nut with screws (13) at opposite sides of mast. Lockwire screw heads together.

i. Apply sealing compound (Item 10, table 2-2) on surfaces where seal (12) will seat in bearing retainer plate (9). Press seal, with lip up, into place. Clean off any excess sealant. Be sure four drain holes in retainer plate above seal remain clear. Install packing (7) on jet (6) and secure jet assembly in plate with screws (5).

(1) Thickness of shim (23) must be 0.000 to 0.002 inch (0.00 to 0.05 mm) greater than thickness of liner (19) flange minus Dimension E, marked on plate (9).

(2) Install new shim (23) coated with zinc chromate primer (item 6, table 2-2) with screws (24) on codes D, E, & G. Apply bead of sealant (item 10, table 2-2) around periphery of shims.

j. Place shim (11) into liner (19) against outer race of upper bearing. Install bearing retainer plate (9) on mast, with care to avoid damaging seal on mast splines. Secure bearing liner to plate with four countersunk screws (8).

k. Install shield plate (4) secured to top of retainer plate with two screws (3).

l. Carefully drive lower bearing inner race (17) onto seat at lower end of mast. Install retaining nut (16) with wrench (5, table 2-1). Tighten nut to a torque of 250 to 300 ft-lb aligning two nut slots with holes at opposite sides of mast. Insert two cotter pins (15, fig. 3-1) with splits, horizontal, from inside mast. Bend both ends of each cotter pin down and against mast end, to lie below or flush with outer surface of nut.

m. Check upper mast bearing play in accordance with paragraph 3-7a.

n. Coat top threads of mast with corrosion preventive compound (item 22, table 2-2) and install plug (2A, fig. 3-1) and protective covers (1 and 2). Install cap (27) on jet assembly (6).

o. Install identification plates (10) and (22) at locations indicated in figure 3-1 with adhesive (item 23, table 2-2).

**3-11. Final Testing of Assembly.** Not applicable to the main rotor mast assembly.

**3-12. Painting Requirements.** Prime and paint bearing retainer plate (9) and jet assembly (6) (installed) as follows:

a. Mask off shim areas, bushing faces and plate ID. Cap oil jet housing.

b. Paint in accordance with TM55-1500-345-23 using one coat epoxy primer (26, Table 2-2) and 2 coats polyurethane (27, Table 2-2). After dry, stencil with letters "CARC-P."

## CHAPTER 4

### QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

#### Section I. GENERAL

**4-1. Responsibility.** The contractor/depot quality assurance activity is responsible for the performance of the inspections specified in the DMWR. The contractor/depot may utilize their own facilities or any commercial laboratory acceptable to the procuring activity/commodity manager (PA/CM). The PA/CM reserves the right to perform any of the inspections specified in the DMWR, when such inspections are necessary to assure that supplies or services conform to the prescribed requirements.

**4-2. Quality Assurance Terms and Definitions.** For quality assurance terms and definitions refer to MIL-STD-109 and the glossary in the DMWR.

**4-3. Inspection and Test Equipment.** The overhaul facility is responsible for acquisitions, maintenance, calibration, and disposition of all inspection and test equipment. Test equipment to be used by AMC (Army) elements will be acquired in accordance with AR 750-43 and AMC Supplement 1 to AR 750-43. All instrumentation and inspection equipment used in compliance with this DMWR shall be calibrated and controlled in accordance with MIL-I-45607B and MIL-STD-45662 (Commercial facility) or DESCOM-R 702-1, Depot Quality Systems (Army facility), with all standards traceable to the National Bureau of Standards. Descriptions of inspecting and measuring equipment are left to the discretion of the overhauling facility to be considered as good shop practice.

**4-4. Certification of Personnel, Materials, and Processes.** The contractor/depot QA activity shall be responsible for ascertaining and certifying personnel skills, equipment, and material meet the requirements of the work to be accomplished. Unless otherwise specified in the contract or by PA/CM representative, the contractor/depot QA activity shall provide the PA/CM with statements or other evidence that specifications for such special purposes as welding, nondestructive testing, plating, and the like, have been complied with. Personnel performing magnetic particle and penetrant tests shall be certified in accordance with MIL-STD-410.

#### Section II. INSPECTION REQUIREMENTS

##### 4-5. General.

**a.** Quality Inspectors (QI) are required to witness all tests and those inspections which are marked "QI" or otherwise designated by the PA/CM.

**b.** The Maintenance Technicians shall inspect, check, and determine the conditions of all other areas to insure compliance with the DMWR.

**4-6. Product Verification Audit.** A product verification audit may be performed in accordance with AVSCOM-R 702-1 on one of the first five items produced to verify compliance with the DMWR and contractual terms.

##### 4-7. In-Process and Acceptance Inspections.

**a.** Used components and refinished parts recovered as products of disassembly shall be examined 100% by the contractor/depot, to determine serviceability. A copy of this log shall be submitted to the PA/CM as part of the overhaul contract. The log shall contain the Maintenance Technician's comments for all parts, removed; such as, parts inspected, replaced, inspected by QI, tested by NDI, modified by MWO, or other notes or actions.

b. Diagnostic and nondestructive tests such as magnetic particle, penetrant, radiographic, and ultrasonic inspections as required by this DMWR shall be in accordance with referenced military specifications, AVSCOM AA-STD-1 and AA-STD-2 where not otherwise specified. A qualified QI shall either perform or witness these tests.

c. A list of inspection definitions, Table 4-1, are included at the end of this chapter. Accept and reject criteria for these inspections and unique repair methods are found in applicable areas of this DMWR.

4-8. **Test Check List.** A check list indicating each required test shall be included as part of this DMWR. The list shall show name of test and test set-up (per figure if applicable). List the input readings, such as position of valves, switches, etc. List the required readings, such as time, meter readings, etc. List the accept/reject criteria for each test as applicable.

**Table 4-1. Inspection Definitions**

| <b>TERM</b>  | <b>DEFINITION</b>   | <b>PROBABLE CAUSE</b>  |
|--|---|--|
| Abrasion   | Roughened surface, varying from light to severe   | Foreign material present between moving parts                            |
| Bend   | Any change in the intended configuration  | Application of severe or excessive force                                 |
| Break  | Separation of part  | Severe force, pressure or overload                                       |
| Burn   | Loss of metal   | Excessive heat   |
| Burnishing   | The smoothing of a metal surface by mechanical action, but without loss of material. Generally found on plain bearing surfaces. Surface discoloration is sometimes present around outer edges of burnished area | Excessive heat   |
| <p><b>NOTE</b><br/>                     Normal burnishing from operational service is not detrimental if coverage approximates the carrying load and if there is no evidence of burns.</p> |   |  |
| Burr   | A rough edge or sharp projection  | Impact from foreign object, or poor machining                            |
| Chipping   | Breaking away of small metallic particles   | Heavy impact of foreign object   |
| Corrosion  | Surface chemical action that results in surface discoloration, a layer of oxide, rust, and removal of surface metal   | Improper corrosion preventive procedures and excessive moisture          |
| Crack  | A break in material   | Severe stress from overloading or shock; possible extension of a scratch |

Table 4-1. Inspection Definitions (continued)

| <b>TERM</b>   | <b>DEFINITION</b>   | <b>PROBABLE CAUSE</b>  |
|---|---|--|
| Dent  | A small smoothly rounded depression   | A sharp blow or excessive pressure   |
| Distortion  | A change from original shape  | Application of severe heat or irregular forces   |
| Erosion   | Wearing away of metal   | Hot gases, corrosive liquids, or grit  |
| Fatigue failure                                     | Sharp indentions, cracks, toolmarks, and inclusions that result in progressive yielding of one or more local areas  | Cyclic stress. As stress is repeated, cracks develop, then spread, usually from surfaces (or near surface) of the particular section. Finally, so little sound material remains that normal stress on part exceeds strength of the remaining material. This type of failure is not caused by metal crystallization. This condition can easily be determined by visual inspection of part. Striations will be evidenced by several lines, more or less concentric. The center (or focus) of lines indicates origin of the failure |
| Flaking   | Loose particles of metal or evidence of surface covering removal  | Imperfect bond or severe load  |
| Fracture  | See break   |  |
| Gouging   | Removal of surface metal. Typified by rough and deep depressions  | Protruding objects, misalignment   |
| Heat oxidizing                                      | Characterized by a discoloring film. Color varies from yellow to brown and blue to purple   | High temperature operation   |
| Indenting   | Cavities with smooth bottoms and sides. Occurs on rolling contact surfaces of bearing components  | Loose or foreign particles rolling between rotating elements of a bearing  |
| Nick  | A sharp-bottomed depression that may have rough outer edges   | Dropping, banging  |
| Off-square or misalignment of Anti-Friction Bearing | Indicated by retainer deterioration, retainer bore erosion, and gouged retainer rolling element pockets of the inner and outer race. Two distinct rolling element paths may be seen on the race where off-square conditions exist | Caused by rolling element speed variation, which jams rolling elements into separator pockets  |

Table 4-1. Inspection Definitions (continued)

| TERM            | DEFINITION  | PROBABLE CAUSE   |
|-----------------|---|--|
| Pitting         | Small indentions in a surface   | Chemical pitting: Oxidation of surface or electrolytic action.<br>Mechanical pitting: Chipping of loaded surfaces caused by improper clearances and overloading, and by pressure of foreign material |
| Scoring         | Deep scratch following path of part travel  | Result of localized lubrication breakdown between sliding surfaces   |
| Scraping        | A furrow  | Rubbing with any hard, or rough pointed object   |
| Scratch         | A very shallow furrow or irregularity, usually longer than wide                   | Movement of a sharp object across the surface  |
| Seizure         | Fusion or binding of two adjacent surfaces preventing continued movement          | Improper lubrication or wear   |
| Stripped thread | Thread of a nut, stud, bolt, or screw damaged by tearing away part of thread      | Improper installation or thread pitch or size  |
| Tear            | Parting of parent material  | Excess tension, caused by an external force  |
| Wear            | Slow removal of parent material. Frequently, wear is not visible to the naked eye | Result of abrasive substances contacting rolling surfaces, and acting as a lapping compound  |



**CHAPTER 5**

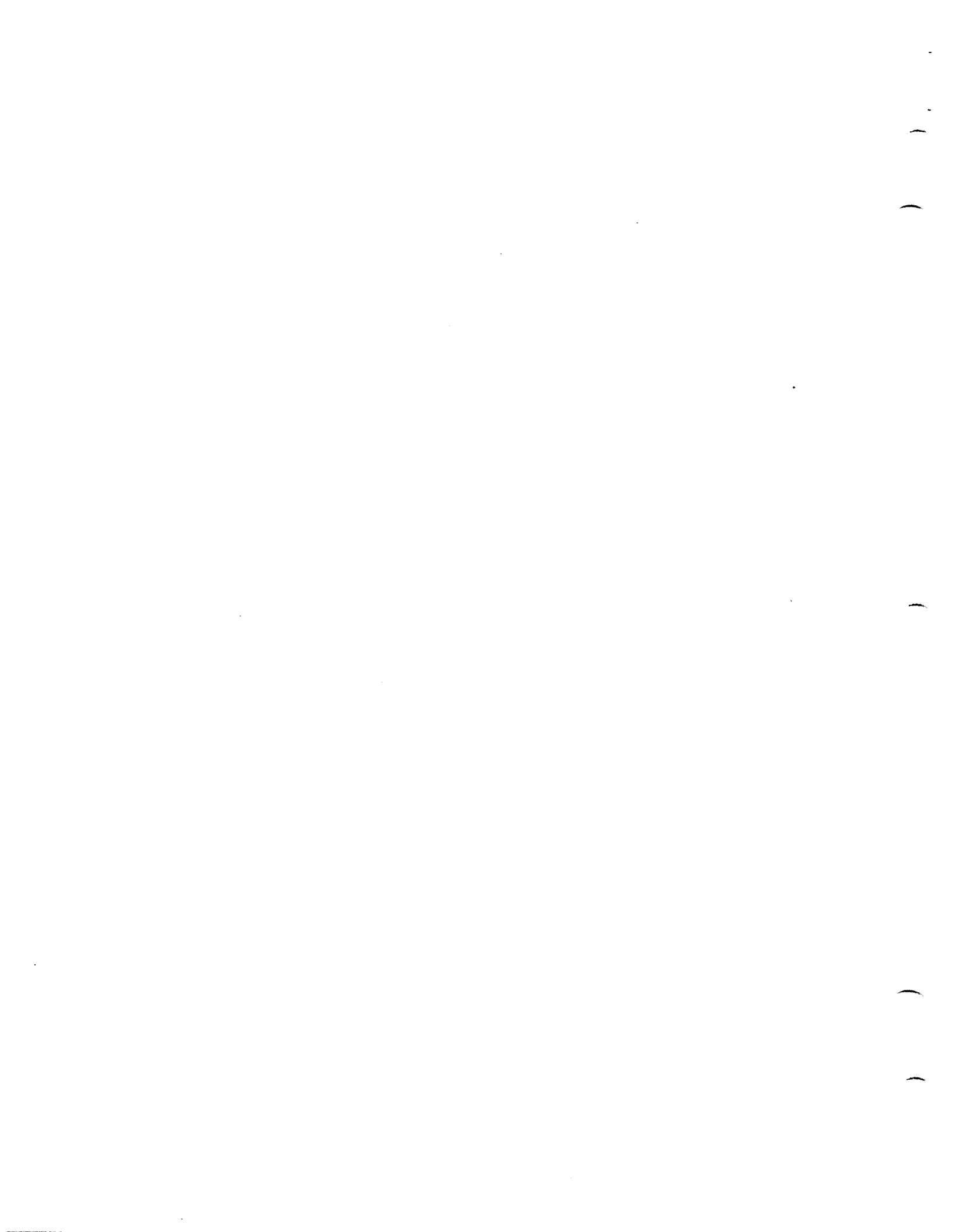
**PACKAGING**

**5-1.** Components will be preserved, packed, and marked in accordance with the Delivery Order/Contract, Depot Maintenance Interservice Support Agreement (DMISA), Statement of Work (SOW), Memorandum of Agreement or other authorized document, and the accompanying AMSAV Form 6525(J).

**5-2.** Organic Depots shall contact ATCOM Packaging and Transportability Branch, HQ ATCOM, AMSAT-I-SDP, 4300 Goodfellow Blvd., St. Louis, MO 63120 for preservation and packaging requirements.

**5-3.** For further information, contact ATCOM Packaging and Transportability Branch, HQ ATCOM, AMSAT-I-SDP, 4300 Goodfellow Blvd., St. Louis, MO 63120. All contracts or inquiries shall be through the Contracting Officer (KO).

Pages 5-2 through 5-4 have been deleted.



**APPENDIX A**  
**REFERENCES**

**A-1. Military Specifications.**

MIL-A-8625  
MIL-A-21380  
MIL-P-116  
MIL-I-45208A  
MIL-I-45607

MIL-C-45662  
MIL-P-16232E

MIL-S-13165B

Anodic Coating  
Abrasive Materials, for Blasting  
Preservation, Methods of  
Inspection System Requirements  
Inspection Equipment, Acquisition,  
Maintenance, and Disposition of  
Calibration Systems Requirements  
Phosphate Coating, Heavy, Manganese or  
Zinc (Base for Ferrous Metals)  
Shotpeening of Metal Parts

**A-2. Military Standards.**

MIL-STD-109  
MIL-STD-120  
MIL-STD-129  
MIL-STD-852  
MIL-STD-865  
MIL-STD-6866  
MIL-STD-1949

Quality Assurance Terms and Definitions  
Gauge Inspection  
Marking for Shipment and Storage  
Glass Bead Peening Procedures  
Brush Plating, Electro Deposition  
Penetrant Method of Inspection  
Magnetic Particle Process Inspection

**A-3. Technical Manuals.**

DA PAM 738-751

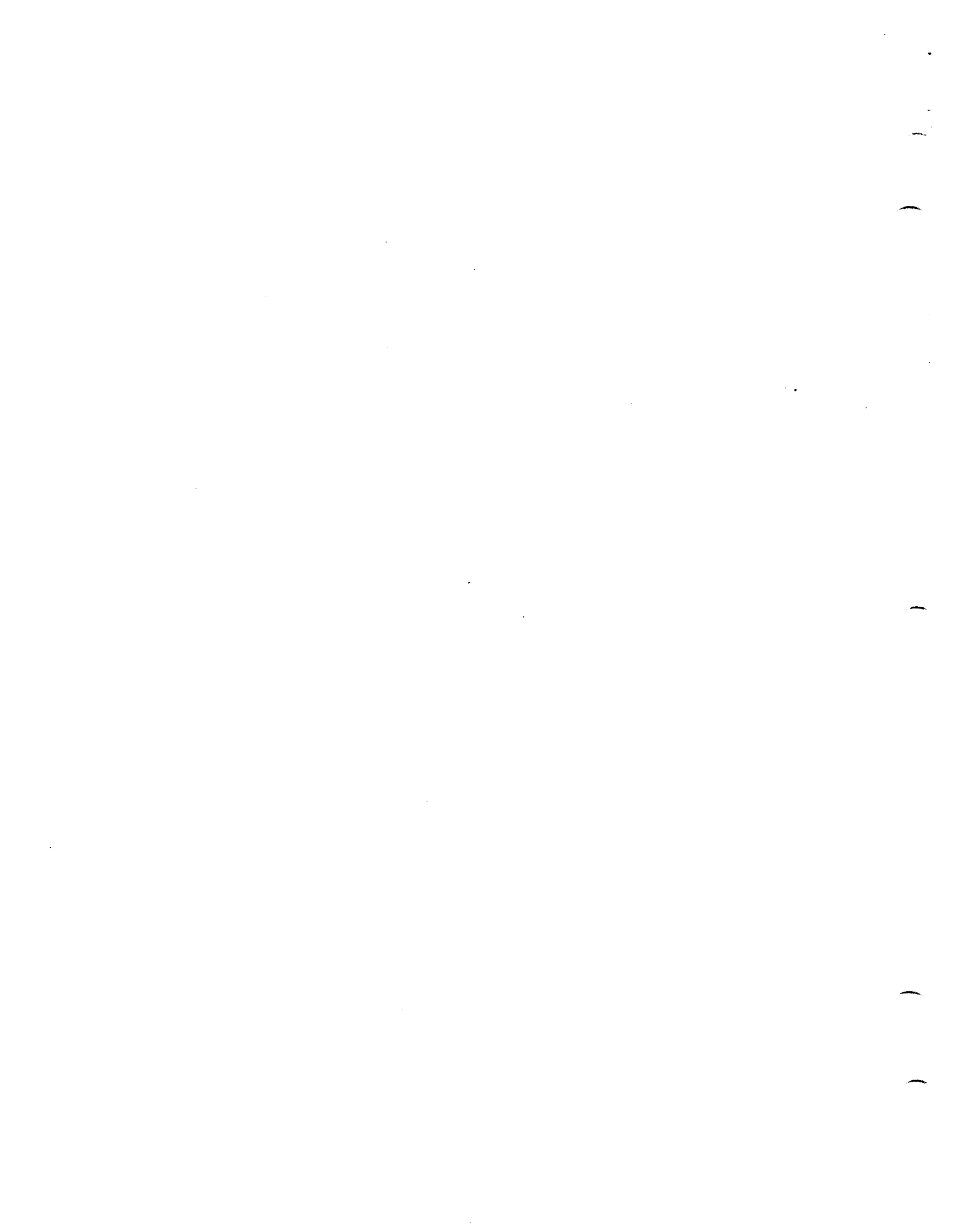
TM 43-0105  
TM 55-1500-345-23

Functional Users Manual for The Army  
Maintenance Management System-Aviation  
(TAMMS-A)  
Corrosion Control for Army Aircraft  
Revision, Painting and Marking Army  
Aircraft

**A-4. Federal Specifications.**

QQ-P-416

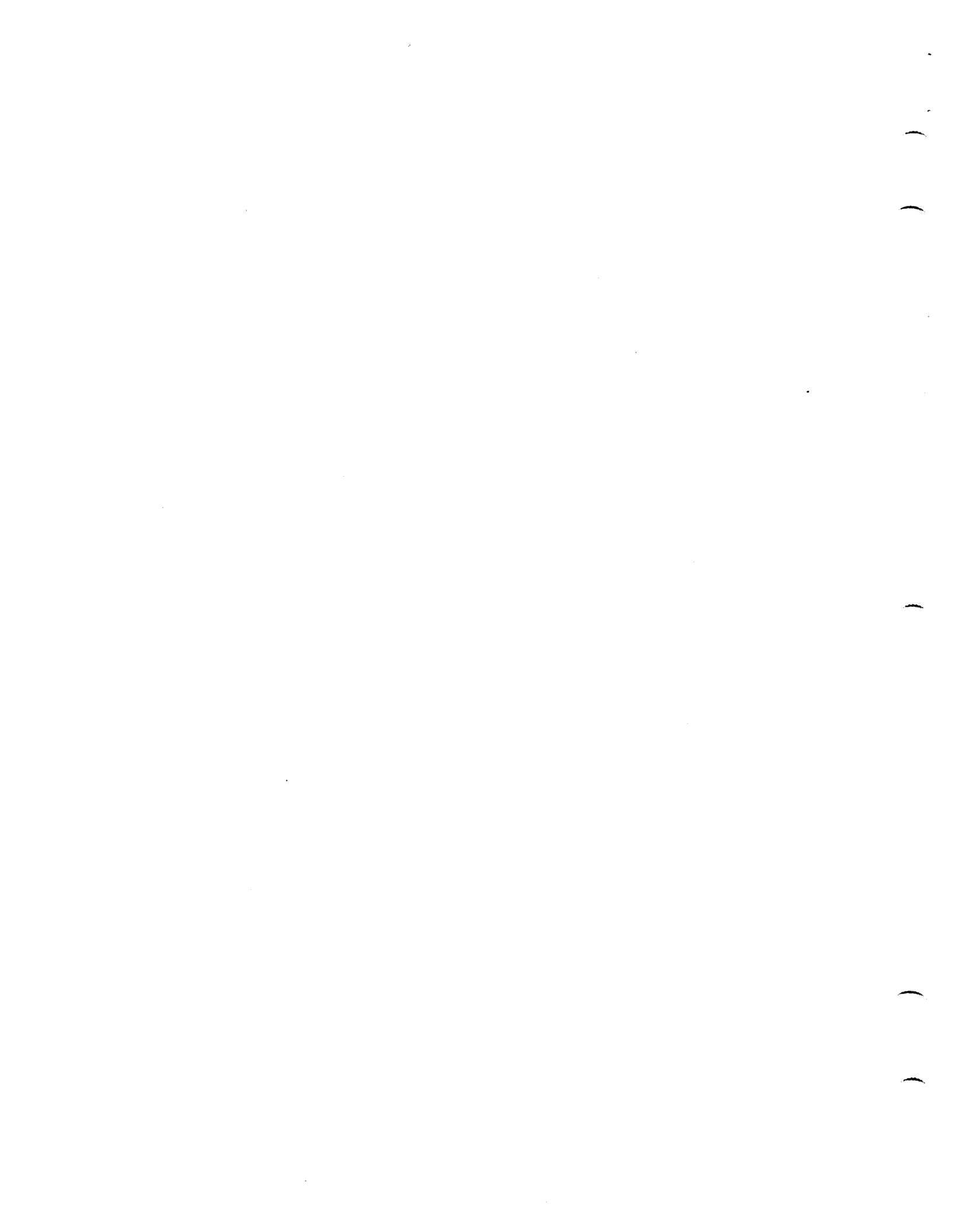
Plating, Cadmium



**APPENDIX B**

**DEPOT MOBILIZATIONS REQUIREMENTS**

**B-1.** This DMWR pertains to an on condition item and is used as a guide during depot maintenance to perform only those corrective maintenance tasks essential to achieving serviceability. The exception is when mandatory convenience maintenance tasks, necessary to assure the inherent reliability and/or longevity of the item are stipulated in the Pre-Shop Analysis Section of the DMWR. All of the above are essential even under a state of mobilization.

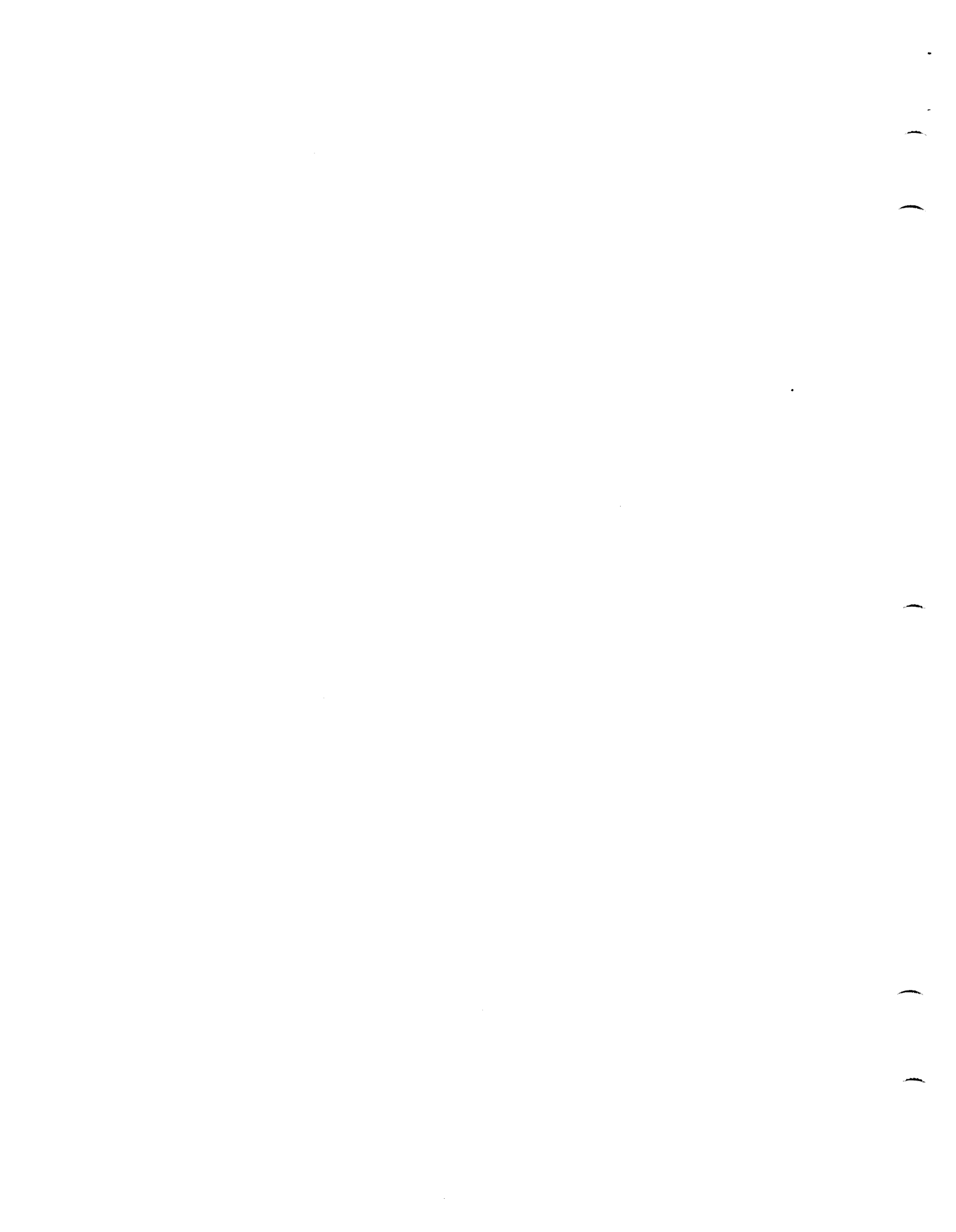


**For the Commander:**

**EUGENE J. DAVIS**  
*Colonel, GS*  
*Chief of Staff*

**Official:**

  
JOANNE M. MEYER  
*DA Publications Manager*





RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

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**PFC JOHN DOE**  
**COA, 3d ENGINEER BN**  
**FT. L. HANBROOK, MD 63108**  
 DATE SENT

PUBLICATION NUMBER: **DMWR 55-1615-223**      PUBLICATION DATE: **1 AUG 79**      PUBLICATION TITLE: **MAIN ROTOR MAST ASSEMBLY**

BE EXACT PIN-POINT WHERE IT IS

| PAGE NO    | PARA-GRAPH       | FIGURE NO  | TABLE NO |
|------------|------------------|------------|----------|
| <b>6</b>   | <b>2-1<br/>a</b> |            |          |
| <b>B1</b>  |                  | <b>4-3</b> |          |
| <b>125</b> | <b>line 20</b>   |            |          |

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

In line 6 of paragraph 2-1a the manual states the engine has 6 cylinders. The engine on my set only has 4 cylinders. Change the manual to show 4 cylinders.

Callout 16 on figure 4-3 is pointing at a bolt. In key to figure 4-3, item 16 is called a skin. Please correct one or the other.

I ordered a gasket, item 19 on figure B-16 by NSN 2 910-05-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered, so the NSN is wrong. Please give me a good NSN

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

**JOHN DOE, PFC (268) 317-7111**

SIGN HERE

**JOHN DOE**

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OFFICIAL BUSINESS

COMMANDER  
U S ARMY AVIATION SYSTEMS COMMAND  
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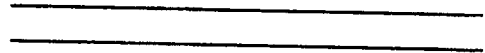


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# The Metric System and Equivalents

## 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 decigrams = .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 milliliters = .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 |
|----|------------------------|----------------------------|---------------------|----|