

TM 55-1520-242-MTF

MAINTENANCE TEST  
FLIGHT MANUAL

ARMY MODEL  
UH-1, EH-1 HELICOPTER

TM 55-1520-242-mtf is published for the use of all concerned.

\*This manual supersedes TM 55-1500-219-MTF, 28 February 1979, including all changes.

HEADQUARTERS  
DEPARTMENT OF THE ARMY

20 December 1985



**WARNING**

A maintenance test flight is an exceptionally demanding operation and requires a thorough flight readiness inspection (pre-flight). The flight readiness inspection is prescribed in TM 55-1520-210-10 and TM 55-1520-220-10 Operator's Manual and must be completed prior to the maintenance test flight. Emergency procedures are found in the applicable -10 or checklist and are not duplicated in this publication. Prior to each maintenance test flight, the pilot will contact maintenance/quality control personnel to determine the maintenance that has been performed. This manual should be used only by qualified maintenance test flight pilots as required in AR 95-1.

**NOTE**

A copilot or observer is required for the checks listed below:

- (1) Hydraulic system check (pg. 2-15)
- (2) Power cylinder check (pg. 2-34)
- (3) Hydraulics off check (pg. 2-41)



**TM 55-1520-242-MTF  
C5**

CHANGE  
NO. 5



HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D.C., 18 July 2005

Maintenance Test  
Flight Manual

Army Model  
UH-1, EH-1 HELICOPTER

TM 55-1520-242-MTF, 20 December 1985 is changed as follows:

1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove Pages

i and ii  
1-1 and 1-2  
2-1 and 2-2  
2-9 and 2-10  
2-13 and 2-14  
2-15 and 2-16  
2-29 and 2-30  
2-39 and 2-40

Insert pages

i and ii  
1-1 and 1-2  
2-1 and 2-2  
2-9 and 2-10  
2-13 and 2-14  
2-15 and 2-16  
2-29 and 2-30  
2-39 and 2-40

2. Retain this sheet in front of manual for reference purposes.

**TM 55-1520-242-MTF**  
**C5**

**By Order of the Secretary of the Army:**

**Official:**

A handwritten signature in black ink that reads "Sandra R. Riley". The signature is written in a cursive style with a large, flowing "S" and "R".

**SANDRA R. RILEY**

*Administrative Assistant to the  
Secretary of the Army*

0516005

**PETER J. SCHOOMAKER**  
*General, United States Army*  
*Chief of Staff*

**DISTRIBUTION:**

To be distributed in accordance with DA Form 12-31-E, block no. 0800, requirements for TM 55-1520-242-MTF.

CHANGE }  
NO. 4 }

HEADQUARTERS  
DEPARTMENT OF THE ARMY  
WASHINGTON, D.C., 28 June 1996

Maintenance Test  
Flight Manual

Army Model  
UH-1, EH-1 HELICOPTER

TM 55-1520-242-MTF, 20 December 1985 is changed as follows:

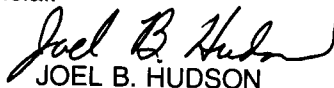
1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove Pages	Insert pages
2-3 and 2-4	2-3 and 2-4
2-7 and 2-8	2-7 and 2-8
2-13 and 2-14	2-13 and 2-14
2-33 through 2-36	2-33 through 2-36
2-39 and 2-40	2-39 and 2-40
4-13 and 4-14	4-13 and 4-14

2. Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

Official:



Handwritten signature of Joel B. Hudson in black ink.

JOEL B. HUDSON

*Administrative Assistant to the  
Secretary of the Army*

01973

DENNIS J. REIMER  
*General, United States Army  
Chief of Staff*

**DISTRIBUTION:**

**To be distributed in accordance with DA Form 12-31-E,  
block no. 0800, requirements for TM 55-1520-242-MTF.**



CHANGE } HEADQUARTERS  
NO. 3 } DEPARTMENT OF THE ARMY  
WASHINGTON, D.C., 15 November 1991

Maintenance Test  
Flight Manual

Army Model  
UH-1, EH-1 HELICOPTER

TM 55-1520-242-MTF, 20 December 1985, is  
changed as follows:

1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

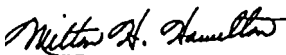
Remove pages	Insert pages
a/b	a/b
2-1 and 2-2	2-1 and 2-2
2-33 and 2-34	2-33 and 2-34
2-43 through 2-46	2-43 through 2-46
3-71 and 3-72	3-71 and 3-72
4-1 and 4-2	4-1 and 4-2
4-11 and 4-12	4-11 and 4-12

2. Retain this sheet in front of manual for reference purposes.

By Order of the Secretary of the Army:

GORDON R. SULLIVAN  
*General, United States Army*  
*Chief of Staff*

Official:



MILTON H. HAMILTON  
*Administrative Assistant to the*  
*Secretary of the Army*

00213

DISTRIBUTION:

To be distributed in accordance with  
DA Form 12-31-E, block no. 0800, MTF  
maintenance requirements for  
TM 55-1520-242-MTF.

CHANGE }  
 NO. 2 }

HEADQUARTERS  
 DEPARTMENT OF THE ARMY  
 WASHINGTON, D.C., 14 May 1990

Maintenance Test  
 Flight Manual

Army Model  
 UH-1, EH-1 HELICOPTER

TM 55-1520-242-MTF, 20 December 1985, is changed as follows:

1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages

Insert pages

a/b

a/b

2-3 and 2-4

2-3 and 2-4

2-15 and 2-16

2-15 and 2-16

2-23 and 2-24

2-23 and 2-24

2-25 and 2-26

2-25 and 2-26

4-11 and 4-12

4-11 and 4-12

2. Retain this sheet in front of manual for reference purposes.

**By Order of the Secretary of the Army:**

**CARL E. VUONO**  
*General, United States Army*  
*Chief of Staff*

**Official:**

**WILLIAM J. MEEHAN II**  
*Brigadier General, United States Army*  
*The Adjutant General*

**DISTRIBUTION:**

To be distributed in accordance with DA Form 12-31, MTF Maintenance requirements for all UH-1 series Aircraft, EH-1H Helicopter, Electronic Countermeasure & EH-1X Helicopter, Electronic Countermeasure & Intercept.

CHANGE } HEADQUARTERS  
 NO. 1 } DEPARTMENT OF THE ARMY  
 WASHINGTON, D.C., 19 December 1986

Maintenance Test  
 Flight Manual

Army Model  
 UH-1, EH-1 HELICOPTER

TM 55-1520-242-MTF, 20 December 1985, is changed as follows:

1. Remove and insert pages as indicated below. New or changed text material is indicated by a vertical bar in the margin. An illustration change is indicated by a miniature pointing hand.

Remove pages	Insert pages
2-5 and 2-6	2-5 and 2-6
2-29 and 2-30	2-29 and 2-30
2-39 and 2-40	2-39 and 2-40
5-3 and 5-4	5-3 and 5-4
5-9 and 5-10	5-9 and 5-10
5-11 and 5-12	5-11 and 5-12
5-13 and 5-14	5-13 and 5-14

2. Retain these sheets in front of manual for reference purposes.

**By Order of the Secretary of the Army:**

**JOHN A. WICKHAM, JR.**  
*General, United States Army*  
*Chief of Staff*

**Official:**

**R. L. DILWORTH**  
*Brigadier General, United States Army*  
*The Adjutant General*

**DISTRIBUTION:**

To be distributed in accordance with DA Form 12-31, MTF Maintenance requirements for all UH-1 series aircraft and EH-1H/X Helicopter, Electronic Countermeasure & Intercept aircraft.

TABLE OF CONTENTS

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 these procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms) located in the back of the applicable Operator's Manual (when using the 2028 from the Operator's Manual, make sure the publication number and title are changed to reflect this MTF), directly to: Commander, U.S. Army Aviation and Missile Command, ATTN: AMSAM-MMC-MA-NP, Redstone Arsenal, AL 35898-5000. A reply will be furnish to you. You may also provide DA Form 2028 information to AMCOM via e-mail, fax, or the World Wide Web. Our fax number is DSN 788-6546 or Commercial 256-842-6546. Our e-mail address is: 2028@redstone.army.mil. Instructions for sending an electronic 2028 may be found at the back of the Operator's Manual immediately preceding the hard copy 2028. For the World Wide Web use: <https://amcom2028.redstone.army.mil>.

<b>SECTION</b>	<b>PAGE</b>
I Introduction . . . . .	1-1
II Maintenance Test Flight Checklist . . . . .	2-1
Prior to Maintenance Test Flight . . . . .	2-1
Before Starting Engine . . . . .	2-2
Starting Engine . . . . .	2-9
Engine Runup . . . . .	2-15
Before Takeoff . . . . .	2-29
Hover Checks . . . . .	2-30
Takeoff and Climb Checks.. . . . .	2-37
Level Off Checks . . . . .	2-38
In-Flight Checks . . . . .	2-39
Before Landing Checks. . . . .	2-47
After Landing and Engine Shutdown Checks . . . . .	2-48

TABLE OF CONTENTS (CONT)

SECTION	PAGE
III	Troubleshooting . . . . . 3-1
	Troubleshooting Guide A -
	Starting . . . . . 3-2
	Troubleshooting Guide B -
	Instruments . . . . . 3-7
	Troubleshooting Guide C -
	Electrical . . . . . 3-16
	Troubleshooting Guide D -
	Caution Panel . . . . . 3-38
	Troubleshooting Guide E -
	PowerPlant . . . . . 3-48
	Troubleshooting Guide F -
	Power Train . . . . . 3-57
	Troubleshooting Guide G -
	Hydraulic . . . . . 3-60
	Troubleshooting Guide H -
	Flight Controls . . . . . 3-63
	Troubleshooting Guide I -
	Nonapplicable . . . . . 3-74
	Troubleshooting Guide J -
	Vibrations . . . . . 3-75
	Troubleshooting Guide K -
	Communications/Navigation
	Equipment . . . . . 3-79
IV	Special Procedures . . . . . 4-1
	a. Radar Altimeter Self-Test . . . . . 4-1
	b. Electronic Altimeter Self-Test . . . . . 4-2
	c. Radar Warning Receiver Self-Test . . . . . 4-3
	d. Tail Rotor Tracking . . . . . 4-5
	e. Main Rotor Tracking . . . . . 4-9
	f. Health Indicator Test(HIT) . . . . . 4-13
	g. Engine Topping . . . . . 4-15
	h. Fuel Control Flight Check . . . . . 4-21
V	Charts and Forms . . . . . 5-1



## SECTION I. - INTRODUCTION

**1. PURPOSE.** The purpose of this manual is to provide complete instructions for performing a maintenance test flight of UH-1, C/M, H/V and EH-1H/X aircraft. For the specific conditions which require a general or limited maintenance test flight refer to TM 55-1500-328-25 and the applicable aviation unit and intermediate maintenance manual.

### **2. DEFINITIONS.**

*a. Maintenance Test Flight.* A functional test flight for which the primary purpose is to determine whether the airframe, power plant, accessories and other equipment are functioning in accordance with predetermined requirements while subjected to the intended environment.

*b. Warnings, Cautions and Notes.* Warnings, Cautions and Notes are used to emphasize important and critical instructions and are used for the following conditions:



**WARNING**

An operation procedure, practice, etc., which, if not correctly followed, will result in personnel injury or loss of life.



**CAUTION**

An operating procedure, practice, etc., which, if not strictly observed, will result in damage to or destruction of equipment.

## TM 55-1520-242-MTF

### NOTE

An operating procedure, condition, ect., which is essential to highlight.

### 3. GENERAL INFORMATION .

a. This manual covers only maintenance test flight of UH-1, C, H, M, V and EH/1H/X aircraft and in no way supercedes any information contained in TM 55-1520-210-10, TM 55-1520-220-10, TM 55-1520-247-10 or -CL, but is to be used in conjunction with the -10 or -CL. This manual covers all the requirements of the appropriate -10 and -CL from "Before Starting Engine" through "Engine Shutdown".

b. Crew requirements will be as specified in AR 95-1, TM 1-1500-328-23 and TM 55-1520-210-10, TM 55-1520-220-10 and TM 55-1520-247-10.

c. The duration of the general or limited test flight will be in accordance with the requirements of TM 1-1500-328-23.

### 4. SPECIAL INSTRUCTIONS .

a. **Cargo and Passengers.** Cargo and passengers are prohibited on maintenance test flights.

b. **Forms and Records.** Forms and records will be checked prior to the maintenance test flight to determine maintenance performed and the type of maintenance test flight required (i.e., general or limited).

c. **Configuration.** The configuration of the aircraft should be determined prior to the maintenance test flight in order to determine performance parameters. Prior to the actual test flight, the pilot will compute weight and balance as required.

**d. Post Test Flight Inspection.** A thorough visual inspection will be performed to the extent necessary to assure that deficiencies or shortcomings developed as a result of the maintenance test flight are detected.

**e. References.** When a maintenance test flight is required to assure proper operation of a specific system(s), refer to the applicable maintenance manual for the limits of that system.

**f. Asterisked Checks.** An asterisk (\*) prior to a check requires that the Test Flight Check Sheet be annotated with a specific reading, a check ( ✓ ) for satisfactory performance, or an (X) for problem detected will be recorded and a short statement entered in the "remarks" block of the check sheet.

**g. Maintenance Test Flight Check Sheet.** The sample check sheet contained in section V will (refer to figure 5-12) be used for all test flights. When a test flight is performed for the purpose of determining if specific equipment or systems are operating properly, completion of only that portion of the maintenance test flight check sheet applicable to the specific equipment or systems being tested is required. The aircraft test flight check sheets may be locally reproduced. Continuation sheets may be used when necessary. Items that, during maintenance test flights prove to be unsatisfactory and require corrective action, should be listed in the remarks block during flight and transferred to DA Form 2408-13 immediately after termination of the flight. The sheet will be attached to DA Form 2408-13 upon completion. After accrual of two or more sheets, the data should be reviewed to determine if trends are developing.

**h. Crew Briefings.** Prior to accomplishment of the test flight the aircraft crew (co-pilot/technical observer/inspector, etc) will be briefed by the Maintenance Test Pilot on the maneuvers to be performed and any special requirements/inspections requiring assistance by these personnel.



## SECTION II. MAINTENANCE TEST FLIGHT CHECKLIST

**General.** This section contains the maintenance test flight requirements peculiar to Army Model UH-1, C, H, M, V and EH/1H/X aircraft. Conditions requiring accomplishment of test flights shall be in accordance with TM 1-1500-328-23. The requirements contained herein are established to assure a thorough inspection of the aircraft before flight, during flight, and upon completion of the maintenance test flight. The right side of the check list (Troubleshooting Reference) is cross-indexed to the troubleshooting guides contained in Section III. A dash between the references means "through"; a comma means "and". The references list the possible abnormal conditions, indications or malfunctions which could be encountered while performing the procedure.

### PROCEDURE

### TROUBLESHOOTING REFERENCE

#### PRIOR TO MAINTENANCE TEST FLIGHT

- \* 1. Forms and records - Check.
- \* 2. Through flight readiness inspection in accordance with the requirements contained in TM 55-1520-210-10, TM 55-1520-247-10 Performed.
- 3. Special pre-flight checks -
  - a. Landing/Searchlight - Check Operation and Limit Switches. C11

## TM 55-1520-242-MTF

### PROCEDURE

### TROUBLESHOOTING

### REFERENCE

### PRIOR TO MAINTENANCE TEST FLIGHT (CONT)

- b. Cockpit/Cargo Compartment Lights - Condition/Operation (Includes all NVG Lighting Systems). C9, 53-54
- c. Special Equipment - Check (MTF Equipment).

### BEFORE STARTING ENGINE

1. Ignition lock switch - On. Check condition and security.
2. Doors - As desired.



Kicking pedal adjuster with the heel to adjust pedals can break the shaft. Adjust pedals by hand only.

3. Seat and pedals - Adjust. Freedom of adjustment. H1
4. Seat belts and shoulder harness - Fasten. Inertia reel functions properly.
5. Pedals - Freedom of movement through range of travel, neutral. H2
6. Cyclic and collective friction - OFF.

## TM 55-1520-242-MTF

PROCEDURE	TROUBLESHOOTING REFERENCE
7. Cyclic and collective (except UH-1 C/M) - Freedom of movement through range of travel. Check blade movement corresponds to control movement, ensure pilots cyclic does not contact the instrument panel when full forward, cyclic centered. Place collective full down.	H3;4
8. AC circuit breakers - In.	
9. Heater outlets, fresh air ducts (front and rear) - Condition, no foreign matter.	
10. Overhead checks - (Pilot and co pilot).	
a. Greenhouse - Condition and security.	
b. Windshield wiper motor, motor guards, cannon plugs, wires - Condition and security.	
c. Windshield - Condition and security.	
d. Spare lamp kit - Complete.	
11. Collective and cyclic control head and switches - Check, set as required. (pilot and co-pilot).	

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

**BEFORE STARTING ENGINE (CONT)**

12. Radios - Check, set as required.
13. GOV switch - AUTO.
14. DE-ICE switch - OFF.
15. INT AUX FUEL/transfer pump switches - OFF.
16. LOW RPM AUDIO - Check springloaded AUDIO.
17. MAIN and START FUEL switches - OFF, main fuel switch guard installed.
18. HYD CONT switch - ON or spring-loaded BOTH (C/M).
19. FORCE TRIM switch - ON.
20. HOIST CUT switch - OFF, Cover down; if installed.
21. CHIP DET switch - Spring-loaded to BOTH.
22. COMPASS slaving switch - IN or MAG.
23. EMERGENCY COLLECTIVE ACCUMULATOR switch - OFF (UH-1C/M).



**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

24. Instruments - Check condition, security, position, range markings, slippage marks and static indications. Check both pilots and co pilots when applicable.
- a. Turn and Slip indicator - Full of fluid, no bubbles, needle centered. Marked four minute turn.
  - b. Omni indicator - Course selector free.
  - c. Marker beacon rheostat - OFF.
  - d. Clock - Set and running. B1
  - e. Standby compass - Full of fluid, no bubbles, no discoloration, compensated within last 12 months. Compensation card posted with Cardinal Headings and each 45°.
  - f. VSI's - needle zero. B3
  - g. Gyro-Compass - ADF position.
  - h. Altimeter's - Set to field elevation (not with AIMS altimeter.).

**NOTE**

The altimeter will give a slightly different reading after the rotor commences turning.

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

**BEFORE STARTING ENGINE (CONT)**

- i. Attitude indicators-check.
- j. Airspeed indicators-Check. B4
- k. Radar altimeter - Check.
- l. Dual tachometer - Check.
- m. Torquemeter - Check.

**NOTE**

Redline (except UH-1C) should be calibrated to the engine Data Plate Torques.

<u>Data Plate Torque</u>	<u>Gage Redline</u>
58	47
59	48
60	49
61	50
62	51
63	51.5
64	52

- n. Gas producer tach - Check.
- o. EGT gage - Check, (may indicate FAT).
- p. Voltmeters - Check.
- q. Loadmeters - Check.
- r. XMSN oil pressure gage - Check.

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

- s. XMSN oil temperature gage - Check.
- t. Radar warning display (AN/APR-39) - Check.
- u. Engine oil pressure gage - Check.
- v. Engine oil temperature gage - Check.
- w. Fuel pressure gage - Check.
- x. Fuel quantity gage - Check.
- y. Gyro-Compass correction card - Installed, compensated within last 12 months, with cardinal headings and every 45°.

**25. Overhead Console Checks:**

- a. CABIN HEATING control panel switches - OFF.
- b. CARGO REL switch - OFF.
- c. WIPERS - OFF, do not recycle.
- d. ANTI-COLL light switch - ON.
- e. POSITION/NAVIGATION light switch - OFF.
- f. PITOT HTR switch - OFF.

## TM 55-1520-242-MTF

### PROCEDURE

### TROUBLESHOOTING REFERENCE

### BEFORE STARTING ENGINE (CONT)

- g. NVG switch - OFF.
- h. FWD DOME LT switch - OFF  
(if installed).
- i. DC circuit breakers - ALL IN. **I**
- j. INST LTG rheostats - OFF
- k. INVTR switch - OFF.
- l. AC voltmeter selector AC  
phase
- m. DC voltmeter selector -- BAT. **C1**  
A minimum of 24 volts should  
be indicated on the DC volt-  
meter before attempting start.  
Battery, starts can be made when  
voltage is less than 24 volts. pro-  
vided the voltage is at/or above  
14 volts when cranking thru 10  
percent N1 speed.
- n. MAIN GEN switch -- ON. EH-  
IH Phase 1B/EH-IX GEN  
switch ON
- o. NON - ESS BUS switch  
NORMAL ON.
- p. START/GEN switch - START  
position. EH-IH Phase 1B/EH-  
IX, Start/Converter Switch -  
START position.

## TM 55-1520-242-MTF

PROCEDURE	TROUBLESHOOTING REFERENCE
-----------	------------------------------

### BEFORE START ENGINE (CONT)

- |  |          |
|--|----------|
| q. BAT switch - On.                                  | C2-4, 52 |
| * r. Free-air temperature gage -<br>Check, condition |          |

### STARTING ENGINE

- |   |    |
|---|----|
| 1. Ground power unit - Connect for GPU start. The external power caution light should be illuminated.   |    |
| 2. Inverter - Spare on GPU start) CAUTION panel light out. Note the copilot Attitude Indicator OFF flag disappears, after 15 seconds pull out and then release the Pull To Cage knob. The gyro should settle to a proper display. The Pilots attitude indicator OFF flag should disappear within two minutes. |    |
| 3. Low RPM audio - OFF.   | C6 |
| * 4. All press to test lights - Test, Check cat-eyes. The CARGO RELEASE ARMED light and IFF light should also be tested utilizing their respective switches.  | C5 |
| 5. MASTER CAUTION light - ON.   | D1 |
| 6. RPM WARNING light - ON.  | C6 |

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

**STARTING ENGINE (CONT)**

- \*7. FIRE detector light - Test Light should come on within 10 seconds after depressing button. Do not leave light on for more than 15 seconds. C7,8
  
- \*8. CAUTION Panel Lights - Check proper lights illuminated. D2-4  
26-28  
30-32
  - a. CAUTION Panel TEST - All lights should illuminate.
  - b. BRIGHT/DIM switch - DIM; lights should remain bright.
  - c. PILOT lighting rheostat - ON.
  - d. BRIGHT/DIM switch - DIM; lights should dim.
  - e. BRIGHT/DIM switch - BRIGHT; lights should return to full bright.
  - f. BRIGHT/DIM switch - DIM.
  - g. PILOT lighting rheostat - OFF; lights should return to bright.
  - h. MASTER CAUTION - RESET.

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

**NOTE**

The governor switch caution panel light is wired through the governor control switch. It is possible for the fuel control to be in the emergency mode and the caution light out under some circumstances.

- |      |   |       |
|------|---|-------|
| 9.   | Engine and transmission temperature gages - Check indications.  | B2    |
| 10.  | Altimeter(s) (AIMS) - Set field elevation (insure DC power has been applied for one minute prior to setting). |       |
| 11.  | MAIN FUEL switch - ON; Check BOOST pump light(s) out.   | D5, 6 |
| 12.  | START FUEL switch - ON (if installed).  |       |
| 13.  | GOV RPM INCR-DECR switch - DECR for 10 seconds.   |       |
| *14. | Throttle System - Check:  | E1-3  |



Use of excessive force may cause damage to the throttle linkage or bellcranks.

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

**STARTING ENGINE (CONT)**

- a. Friction Check - Ensure friction can be overridden, then off.
- b. Full Open Check - Record cushion at full open position.
- c. Idle Stop Check - Note presence of mechanical stop and proper operation.
- d. Full Closed Check - Record cushion at full closed position.
- e. Freedom of Travel Check - Note freedom of travel through entire range; Set throttle for start.

**NOTE**

Ridge to ridge on the knurled throttle friction knob represents  $10^{\circ}$  travel on the fuel control arm. By aligning a pencil with any ridge, the degrees of cushion can be measured by opening and closing the throttle to the point where resistance is met until the throttle stop is hit. Cushion should be  $5^{\circ} \pm 2^{\circ}$ .

15. Rotor blades (main and tail) - Clear and untied.
16. Fire guard - Briefed and posted.
17. Starting Engine - Proceed as follows:



**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

- |   |        |
|---|--------|
| a. Starter switch - Energize; start clock.  | A1-3   |
| b. DC Voltmeter - check minimum 14VDC passing through 10% N1 speed, voltage increases as N1 gains speed.        |        |
| c. EGT - Rising normally.   | A4, 6  |
| d. N1- Normal acceleration.   | A4, 5  |
| e. Main Rotor Blades - Turning by 15% N1.   |        |
| f. Engine oil press light - out as N1 gains speed (27±1 PSI).   | D7     |
| g. START FUEL - Off (if installed) 400°c L-11, 40% N1L13.   |        |
| h. Starter switch - Release at 40% N1, or after 40 seconds, whichever occurs first. Note increase in voltmeter. | A7-9   |
| i. Transmission oil press light - out as N1 gains speed. (35± 2 PSI).   | D15    |
| j. Fire Warning light - OUT.  | C8     |
| k. Rotor - Turning normally.  | A9, 10 |
| l. Throttle - Engine Idle.  |        |

STARTING ENGINE (CONT)



The copilot attitude indicator should be caged and held momentarily as inverter power is applied.

- |   |        |
|---|--------|
| 18. INVTR switch - SPARE ON<br>caution panel light out. Note<br>copilot attitude indicator off flag<br>disappears. The gyro should<br>settle to a proper display. The<br>pilot's attitude indicator off flag<br>should disappear within two<br>minutes. | C12-14 |
|---|--------|



If no engine or transmission oil pressure is evident, shut down engine immediately and investigate cause.

- |  |             |
|--|-------------|
| 19. Engine oil pressure - Check 25<br>PSI minimum.               | B23, E4-8   |
| 20. Engine oil temp - Check for<br>rising indication.            | B2, E9      |
| 21. XMSN oil pressure - Check 30<br>PSI minimum.                 | B23, F1-5   |
| 22. XMSN oil temp - Check for rising<br>indication.              | B2, F6      |
| 23. Fuel pressure - Check 5 PSI<br>minimum.                      | B5          |
| 24. CAUTION panel lights - All out;<br>MASTER CAUTION light out. | D3, 5, 7-24 |
| 25. Torquemeter - Some indication.                               | B9-11, 23   |

## TM 55-1520-242-MTF

PROCEDURE	TROUBLESHOOTING
<b>STARTING ENGINE (CONT)</b>	<b>REFERENCE</b>



To properly check N1 speed at engine idle throttle must be rolled slightly into the cushion to ensure contact with the engine idle stop. Use of excessive force may cause damage to the throttle linkage or bellcranks.

- |   |                               |
|---|-------------------------------|
| * 26. Engine idle speed - Check N1 at engine idle, L13 68-72%, L-11 55-59%.   | E10, 11                       |
| * 27. GOV switch - EMER; let N1 decrease 2 to 5%. Note caution light on, then switch back to auto within 5 seconds; note increase to initial reading and caution light out. | E10, 11<br>D12, 25<br>E12, 13 |
| 28. Ground power unit (GPU Start) - Disconnect. The external power caution light should be out.   |                               |
| 29. DELETED.  |                               |

### ENGINE RUNUP

- |   |                          |
|---|--------------------------|
| 1. Radios - All ON (monitor loadmeter).             | K1                       |
| * 2. HYDRAULIC SYSTEM (UH-1, H/V, EH-1H/X) - Check. | C15, D1,<br>16, 26<br>G1 |

## PROCEDURE

TROUBLESHOOTING  
REFERENCE

## ENGINE RUNUP (CONT)



Full movement of the cyclic at low RPM may result in damage to the main driveshaft.

Brief copilot/observer not to remove his hand from hydraulic control switch unless instructed to do so. Be prepared for possible cyclic and collective hard-overs. If forces are excessive, return switch to ON position. This condition must be corrected before continuing.

- a. FORCE TRIM switch - OFF.
- b. HYD CONT switch - OFF, caution light on reset master caution.
- c. Flight controls - Check within one inch of cyclic center.
  - (1) No excessive forces or feedback.
  - (2) Collective can be increased to mid travel and pushed down.
- d. HYD CONT switch - ON, caution light out.
- e. FORCE TRIM switch - ON, Proceed to step #4.

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

- \*3. Hydraulic system (UH-1C/M) - C46, D1,  
Check. 16,26,  
G1
- a. FORCE TRIM switch - OFF.
  - b. HYD CONT switch - System 1;  
note system 2 caution light on.
  - c. Flight Controls - Check within  
one inch of cyclic center.
    - (1) No excessive forces or  
feedback.
    - (2) Collective can be increased to  
mid travel and pushed down.
  - d. HYD CONT switch - BOTH, then  
to system 2; note system 1 caution  
light on.
  - e. Flight controls - Check.
    - (1) No excessive forces or  
feedback. Pedals will be stiffer.
    - (2) Collective can be increased to  
mid travel and pushed down.
  - f. HYD CONT switch - BOTH; note  
caution light out.
  - g. FORCE TRIM switch - ON.

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

**ENGINE RUNUP (CONT)**

**NOTE**

The tail rotor servo is powered by SYSTEM 1 (except on earlier models without the emergency collective hydraulic accumulator). With the control switch in the SYSTEM 1 ON POSITION the caution light for SYSTEM 2 should be ON and vice versa.

- \*4. Fuel Tank Sump Pump - Check. B6, D5,  
24, 27,29
- a. BLEED AIR and DE-ICE switches - OFF.
  - b. Fuel Tank Sump Pump Circuit Breaker OUT, record pressure (5-35 PSI), note caution light on.
  - c. BLEED AIR and DE-ICE switches - ON, note increase in EGT, some fuel pressure remaining, Left caution light out.
  - d. Fuel Tank Sump Pump Circuit Breaker - IN, record pressure (8-25 PSI), caution light out.
  - e. BLEED AIR and DE-ICE switches - OFF, note decrease in EGT, possible increase in fuel pressure.

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

- \*5. Bleed Band Operation - Check. E14
- a. BLEED AIR and DE-ICE switches - OFF.
  - b. Very slowly increase throttle, watching EGT gage until sudden decrease of 5 to 10 degrees (indicates bleed band is closed); note N1, FAT.
  - c. Very slowly decrease throttle, watching EGT gage until sudden increase of 5 to 10 degrees (indicates bleed band is open); note N1.
  - d. Opening and closing (L-11), and closing (L-13) N1 readings should be within limits as indicated on bleed band charts (section V).

**NOTE**

The bleed band is temperature sensitive and opening and closing points will vary at different temperatures. A more exacting method, if required, is to station an observer alongside the engine compartment to determine exactly when the bleed band has opened and closed. If aircraft is operated in dusty areas, it is recommended that the bleed check be performed twice to detect possible modulation.

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

**ENGINE RUNUP (CONT)**

- \*6. Variable inlet guide vanes-Check  
begin to open point
  - a. BLEED AIR and DE-ICE  
switches - OFF.
  - b. Station observer alongside engine  
compartment.
  - c. Slowly increase N1 until VIGV  
Actuator Rod begins to move,  
note N1 speed and FAT.

**NOTE**

The begin to open check is a recommend-  
ed starting point for adjustment of the  
VIGV'S. If the begin to open point, as  
plotted on the VIGV opening chart, is  
not within the chart limits, perform a  
full open check IAW TM 55-2840-229-23  
before making any adjustments.

- 7. Throttle full open - Slowly increase; E15, 16  
note N2 RPM 6000± 50.
- \*8. Fuel quantity gage - Check to zero B7, 8,22  
and returns to initial reading.
- 9. Gyro Compass - Nulled if the K2, 3  
heading indicator is 180° out of  
phase the annunciator may in-  
dicate alignment.
- \*10. PITOT HTR switch - ON; check C17  
loadmeter for rise then OFF.



**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

- |      |   |                     |
|------|---|---------------------|
| *11. | AC voltmeter (INVTR SPARE) -<br>Check each phase for 115V ± 3V.   | C18-22              |
| *12. | INVTR switch - OFF, note caution<br>lights on; MAIN ON, note caution<br>lights out; check voltage indication<br>to ensure MAIN INVTR is<br>operating. | C12, 13,<br>D20, 28 |
| *13. | DC voltage system - Check:  | C1, 23-31,<br>55    |
| a.   | DC voltmeter selector - Check all<br>positions, leave in NON-ESS<br>BUS. STBY GEN should be 1V<br>lower then MAIN GEN.                                |                     |

**NOTE**

Main generator voltage will be dependent upon the average ambient temperature.

- 27.0 volts 80°F (26°C) and above
- 28.0 volts 32 to 80°F (0 to 26°C)
- 28.5 volts 32°F (0 °C) and below

- |    |   |        |
|----|---|--------|
| b. | STARTER GEN switch - STBY<br>GEN position.  |        |
| c. | MAIN GEN switch - OFF, note<br>caution light on; loadmeter goes to<br>zero ± 0.1 and standby loadmeter<br>registers the load. | C32-36 |

PROCEDURE

TROUBLESHOOTING  
REFERENCE

ENGINE RUNUP (CONT)

NOTE

The loadmeters indicate percentage of total generator output being used. On aircraft equipped with 200 ampere starter generator shunts, the standby generator loadmeter will indicate a higher value than main generator loadmeter with the same load.

- |      |   |                           |
|------|---|---------------------------|
| d.   | DC Voltmeter - Check voltage zero with NON-ESS BUS switch NORMAL ON.  | C37                       |
| e.   | NON-ESS BUS switch - MANUAL ON, note standby generator voltage on voltmeter.  |                           |
| f.   | NON-ESS BUS switch - NORMAL ON.   |                           |
| g.   | DC voltmeter selector - ESS BUS.  | C42                       |
| h.   | MAIN GEN switch - ON, note main loadmeter registers load, standby zero $\pm$ 0.1. Caution light out.  | C28,<br>38-40,<br>56, D19 |
| *14. | AC voltmeter (INVTR MAIN Check each phase for 115 $\pm$ 3V.   | C18-22                    |
| *15. | BLEED AIR heater - ON, note EGT rise, Check operation, thermostat set (if installed), defrost, and aft outlets. The heater should not be noisy. Heater OFF or as desired. | C44, 45                   |

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

- \*16. DE-ICE switch - ON; note EGT rise. Then off; note EGT drop. C42-43

**NOTE**

If no change in EGT is observed, the hot air valve may be open at all times. Under these circumstances the turbine engine analysis check (TEAC) and/or health indicator check (HIT), baseline EGT values will be inaccurate.

- \* 17. LOW RPM AUDIO warning switch - ON, check level, no bleed-over on rear ICS. C6, 63
- \*18. N2 Systems - Check: C47-51, 57, 58, E15, 16



A steady state N2 RPM of 6900 is permissible and is not considered an engine overspeed provided 15 PSI torque (L-13) or 85% N1, (L-11) is not exceeded. Collective pitch must be in full down position at all times.

- a. GOV RPM INCR/DECR switch - carefully increase to maximum RPM (6700 ± 50). Note warning light and audio off by 6200 ± 100.

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

**ENGINE RUNUP (CONT)**

- b. At full increase check high RPM warning light on at  $6800 \pm 100$ , ( $334 \pm 5$  Rotor RPM).
- c. GOV RPM INCR/DECR switch - Full decrease. Note travel time (5-10 seconds), RPM warning light and audio on at  $6200 \pm 100$  RPM. Actuator should operate smoothly.

**NOTE**

If high RPM warning light came on during step 18b proceed to step 20.

- \*19. High RPM warning light - Check: C6, D25, E12



Throttle must be at engine idle prior to switching governor to emergency.

- a. Throttle - Engine idle.
- b. GOV switch - EMER.
- c. Throttle - slowly increase N1, note high RPM warning light on at  $6800 \pm 100$  ( $334 \pm 5$  rotor) RPM.
- d. Throttle - Engine idle, GOV switch to AUTO, carefully increase throttle to full open, check N2  $6000 \pm 50$  RPM. D12

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

\*20. Cyclic and Pedal Systems - Check:

- a. FORCE TRIM switch - OFF,      C15, H2,  
Check cyclic friction, then OFF.      5-11
  
- b. Controls - without input, controls should not creep. Check for motoring by lightly tapping the controls, movement should stop when input stops. Controls should operate smoothly; no binding, chattering, feedback or excessive friction within 1 inch of center.
  
- c. FORCE TRIM switch - ON, check C15, H12,  
cyclic gradient forces nearly the      13  
same in all directions, no play.  
Recheck within one inch of center.  
Insure mag brakes release using  
cyclic buttons. Check pedals  
similarly.

\*21. Collective lever - Check Frictions:

- a. Apply collective friction - Insure      H15  
collective friction can be over-  
ridden, friction off.
  
- b. Collective system friction - Check      G3, 4  
built in friction. Forces should be      H14  
8-10 lbs up and down.

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

**ENGINE RUNUP (CONT)**

**NOTE**

Up and down force should be equal within one pound. It is recommended that a calibrated spring scale be used to make this check with greater accuracy. (Attach the spring scale to center of twist grip  $\pm 1/2$  inch.) Friction may be noticeably less on abnormally damp days. Friction adjusted on damp days may be too heavy on dry days.

- 22. Deleted.
- 23. GOV INCR/DEC switch - INCR to 6600 RPM. C47
- \*24. Engine oil pressure - Record. B23, E4-8
- \*25. Engine oil temp - Record. B2, E9
- \*26. XMSN oil pressure - Record. B23, F1-5
- \*27. XMSN oil temp - Record. F6
- \*28. Fuel pressure - Record. B5, 12, 13
- \*29. Torquemeter - Flat Pitch record: B9, 11, 14, 15, 23
  - L-11 10 to 15 PSI
  - L-13 8 to 15 PSI

**NOTE**

Ensure pedal position is neutral. Left pedal forward of neutral will result in a higher torque indication.

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

- |  |        |
|--|--------|
| *30. EGT-Record.                                 | E17-19 |
| 31. Dual tachometer - Needles joined and steady. | B16-18 |

**NOTE**

A small amount of N2 fluctuation (25 RPM) is not abnormal. If the N1, torque, and EGT gages are also fluctuating, it could indicate a serious problem with the overspeed governor, fuel control, engine deterioration, etc.

- |  |                  |
|--|------------------|
| *32. Dual Electric Boost Pumps - Check:  | B5, 19<br>D5, 27 |
| a. Fuel Boost Circuit Breakers - Pull individually and record pressure 8-25 PSI on one pump. Allow engine to run 60 seconds, minimum, with zero fuel pressure. Note caution lights on. |                  |
| b. Fuel Boost Circuit Breakers - IN (use same order as pulled out) record pressure on opposite pump, caution lights out.   |                  |
| 33. Rotors - Observe main rotor track. Track tail rotors if necessary, (See Section IV).   |                  |

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

**ENGINE RUNUP (CONT)**

**NOTE**

This is simply a visual check of the main rotor track and does not call for moving the tip path plane with the cyclic. If the blades appear to be 2 to 4 inches out of track, this condition must be corrected before flight. (See Section IV).

34. Listen for any abnormal noises.

**NOTE**

Listen for a low pitched roar, which could indicate engine trouble, or any grinding noises, etc. Some normal noises are tape popping when working a lateral vibration, window vibration, and inverters.

35. Doors - Secured for flight.
36. Attitude indicators - Set.
37. Radios - Check; obtain altimeter setting.
- \*38. Altimeters - Check tower setting against setting for field elevation. Unreliable for flight if more than 70-foot error exists from field elevation. If more than 50-foot error exists, corrective action should be initiated.



## TM 55-1520-242-MTF

<b>PROCEDURE</b>	<b>TROUBLESHOOTING</b>
	<b>REFERENCE</b>

### ENGINE RUNUP (CONT)

- a. Altimeter Set, Electronic  
AN/APN-171A(V)1 - Check  
(See Section IV).
- b. Altimeter Radar, AN/APN-209  
- Check (See Section IV).

### NOTE

Note the decrease in altimeter reading induced by rotor downwash effect. This decrease will be approximately 20 feet with collective pitch setting calling for 15 pounds torque.

39. Radar Warning Receiver,  
AN/APR-39 - Check (See  
Section IV).
40. FORCE TRIM switch - Off.

### BEFORE TAKEOFF

1. RPM - 6600.

### NOTE

Setting N2 RPM precisely at 6600 will produce a much more accurate steady state droop check.

2. Warning lights - Checked.
3. Fuel quantity - Checked.
4. Instruments - Checked.

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

**BEFORE TAKEOFF (CONT)**

5. Caution lights - Checked.
6. Transponder - Standby.
7. Crew and mission equipment - Check.
- \* 8. HIT check - Complete. (See Section IV.)

**NOTE**

HIT check may be deferred until arrival in test flight hover area if conditions in runup area preclude accurate and/or safe completion of check. HIT check must be completed before takeoff.

9. Accomplished main rotor tracking as required.

**HOVER CHECKS**

**WARNING**

Do not operate aircraft below 6600 RPM except during low RPM Hover, Hover in emergency, Engine vibration analysis and Turbine Engine Analysis Check (TEAC).

**WARNING**

Binding or lack of proper control response is cause to terminate flight and determine cause.

## PROCEDURE

TROUBLESHOOTING  
REFERENCE

\*1. Takeoff to Hover:

G1, H5,  
6, 16-23,  
J1-3

**CAUTION**

Any excessive control displacement requires a static rigging check.

- a. Control Response - Carefully bring aircraft light on skids insuring all control responses are normal.
- b. Hover - Closely monitor control response and CG hang as aircraft departs the ground. Note smooth power increase.
- c. Droop Cam - Check rigging, note N2 RPM constant within  $\pm 40$  RPM.
- d. Controls - note position, cyclic nearly centered, normal pedal position.

**NOTE**

The wind must be taken into consideration, as well as fore and aft and lateral center of gravity loading (fuel, tools, personnel, etc.).

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

**HOVER CHECKS (CONT)**

- e. Move off hover pad and check ground for oil spots which could indicate oil leakage.
2. Hover slowly to test area.

**NOTE**

If HIT check has been deferred, performance of the check is required at this time.



An abnormal torquemeter reading will be investigated before continuing flight.

- \*3. Torquemeter/Power Check - B11, 14,  
Compare with PPC. 15,23
- \*4. Control Response Checks:
  - a. Hovering Turns - Check 90° in H11.  
each direction. 21,24
  - b. Sideward Flight - Check cyclic H22, 25  
response and rigging in both  
directions.

## TM 55-1520-242-MTF

### PROCEDURE

### TROUBLESHOOTING REFERENCE

#### NOTE

Hover speed should be consistent with autorotation requirements, yet sufficient to determine control reaction.

- |     |  |               |
|-----|--|---------------|
| c.  | Forward flight - Check control response and rigging.   | H22,<br>25,26 |
| *5. | Pylon mounts check - Move cyclic to induce pylon rock. Bumping should dampen out after 4 or 5 cycles. No abnormal vibrations or engine surges should occur. The hydraulic caution light must not illuminate. | F7,8,J6       |
| *6. | Engine response check - Make positive application of up collective; engine should respond both smoothly and rapidly; then back down before excessive altitude is gained.                                     | E20,<br>21,26 |

#### NOTE

Be alert for any evidence of compressor stall or lag in engine response. During this check some transient droop may be evident.

PROCEDURE

TROUBLESHOOTING  
REFERENCE

HOVER CHECKS (CONT)

**WARNING**

Ensure co-pilot/observer understands instructions contained in this paragraph before proceeding with check. If cyclic movement is too rapid, or if the irreversible valve(s) fails, a control lockup may occur. Therefore the co-pilots hand will be kept on the hydraulic control switch. In the event of a control lockup the co-pilot will, on the pilots command, rapidly recycle (OFF, then ON) the hydraulic control switch. Simultaneously the pilot will be attempting to land the aircraft. Recycling the HYD CONT switch should only be attempted twice, If possible. If control is not regained, the HYD CONT switch will be turned OFF and a hydraulics OFF landing accomplished.

In checking the UH-1C/M, it is necessary to move the control switch to the opposite system and then back to both if the controls should jam.

- \*7. Power cylinder check - Hover air- G1, 2  
craft at 10 feet minimum. Isolate each power cylinder using a 6 to 8 inch stroke. No restrictions to movement or feedback should be felt. The hydraulic boost system should function adequately with faster than normal control input. The hydraulic caution light must not illuminate.

- \*8. Low RPM hover - Check: C47,H21  
**C4 2-34**

## TM 55-1520-242-MTF

### PROCEDURE

### TROUBLESHOOTING REFERENCE

- a. Reduce N2 RPM - 6000.
- b. Note controllability at low RPM, control positions, and check anti-torque controllability by performing 45° turns.



If aircraft controllability or control responses become abnormal during RPM reduction, the maneuver will be terminated and static control rigging will be checked.

- c. Note any lateral vibrations.
- d. Increase N2 RPM - 6600.

### NOTE

Generally, a lateral vibration will become more pronounced at low RPM and may be determined at this time. A lateral vibration of noticeable intensity should be corrected before continuing flight since it can manifest itself as a vertical in flight. (See Section IV).

9. Land aircraft.
- \*10. Hover in emergency: E22

PROCEDURE

TROUBLESHOOTING  
REFERENCE

HOVER CHECKS (CONT)



Throttle movements must be smooth and well coordinated. Too rapid movements can cause engine overspeed, compressor stall, flameout, and/or excessive EGT.

- a. Throttle - Engine idle, GOV switch to EMER.
- b. RPM - INCR to 6400 RPM with throttle.
- c. Hover - Maintaining 6400 RPM. Aircraft should hover normally in EMER.
- d. LAND - Throttle to engine idle, GOV to AUTO.
- e. Throttle - Increase to full open (6600 RPM).

**NOTE**

A fluctuation of the torquemeter may occur between 6300 and 6500 RPM as a result of transient opening and closing of the bleed band and is not abnormal. N2 may have to be beeped down to eliminate bleed band cycling.

- \*11. Torquemeter indication - Check at a 2 foot hover into the wind, for use in airspeed indicator check.



**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

**TAKEOFF AND CLIMB CHECKS**

1. RPM-6600.



Ensure throttle is in the full open position. Under reduced rotor loading conditions, and indication of normal operating RPM (6600) may be obtained while the throttle is not in the full open position. Upon application of collective pitch, a decrease in RPM may result.

2. Warning lights - Checked.
3. Fuel quantity - Checked.
4. Instruments - Checked.
5. Caution lights - Checked.
6. Transponder - As required.
7. Crew and mission equipment - Check.
- \*8. Power Check - if not performed previously in direction of takeoff. B11, 14,  
15,23
9. Make normal takeoff and climb at 60(N)/70(R) KTS. Note control positions normal, engine and transmission instruments for normal indication and check for abnormal vibrations.

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

**TAKEOFF AND CLIMB CHECKS (CONT**

**NOTE**

A normal takeoff is used because it is the safest type. In the event of an engine failure the nose will drop, possibly to a point from which recovery could not be made during a nose low takeoff. From any point in a normal takeoff and climb, a successful autorotation can normally be made. This possibility must be considered on all flights, maintenance flights in particular.

**LEVEL OFF CHECKS**

1. Climb to predetermined altitude.  
Allow engine to stabilize for minimum of one minute.
- \*2. Engine oil pressure - Record. B23,  
E4-8
- \*3. Engine oil temperature - Record. B2, E9
- \*4. Transmission oil pressure - Record. B23,  
F1-5
- \*5. Transmission oil temperature - Record. B2, F6
- \*6. EGT - Record. E17-19

## TM 55-1520-242-MTF

PROCEDURE	TROUBLESHOOTING	REFERENCE
-----------	-----------------	-----------

### LEVEL OFF CHECK (CONT)

- |  |                   |
|--|-------------------|
| * 7. Airspeed indicators - Check using 2' hover torque for straight and level flight at 90(N)/(100(R). Indicators should be nearly the same ( $\pm 5$ KTS), no excessive fluctuation ( $\pm 3$ KTS). | H26, 27<br>34, 35 |
| * 8. Fuel consumption check - Initiate.  |                   |

### IN-FLIGHT CHECKS

- |   |                         |
|---|-------------------------|
| * 1. Control rigging - Check:   | G3<br>B4, 11, 21<br>C16 |
| a. FORCE TRIM - ON  |                         |
| b. Increase airspeed - 90 (Nose mounted), 100 (Roof mounted) using 30 PSI torque, needle ball centered. |                         |

## WARNING

Lack of proper pedal position is cause to terminate flight. Adjustments are to be made prior to proceeding with the test flight.

- c. Note cyclic nearly center; force trim holds controls in position.
  - d. Right pedal should be 1.0 to 2.0" forward of left.
  - e. The collective should not creep up or down.
  - f. FORCE TRIM - OFF.
- \* 2. Autorotation RPM - Check:

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

**IN-FLIGHT CHECKS (CONT)**



The autorotation should be entered at an altitude that will allow a power recovery to be completed at or above 500 feet above ground level (AGL). A maladjusted or malfunctioning engine idle stop can allow the throttle to be retarded to the cutoff position.

a. Airspeed - adjust to 60 knots (roof mounted).

adjust to 50 knots (nose mounted).

b. Collective - full down.

c. Throttle - engine idle.

(1) N1 Speed - check.

(2) N2 and Rotor tach needles - split.

(3) Torquemeter - zero indication.

d. Rotor RPM - approximately:

UH-1, H/V, EH-1H/X 310-315 rpm (approximately, 7,000 lbs gross weight).

UH-C/M 320-325 rpm (approximately, 7,000 lbs gross weight).

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

**NOTE**

Autorotational RPM will vary significantly with gross weight and ambient conditions. In no event will RPM be set to exceed 339 at maximum gross weight nor be less than 294 at minimum gross weight.

- e. Vibration Level - Note. C59
- f. Right Pedal - Sufficient remaining.



Ensure throttle is in the full open position. Under reduced rotor loading conditions, an indication of normal operating RPM (6600) may be obtained while the throttle is not in the full open position. Upon application of collective pitch, a decrease in RPM may result.

- g. Make power recovery - Prior to 500 ft AGL. H21, 28,  
J3,5,6
- \*3. Hydraulics Off Check (except UH-1C/M) - Accomplish: C46, D16  
26, G1,  
H29, 30

## PROCEDURE

TROUBLESHOOTING  
REFERENCE

## IN-FLIGHT CHECKS (CONT)

**WARNING**

Brief copilot/observer not to remove his hand from hydraulic control switch unless instructed to do so. Be prepared for possible cyclic and collective hardovers. If control hardover occurs proceed IAW the operators manual.

- a. HYD CONT switch - OFF.
- b. Caution lights - Caution panel lights and Master Caution light illuminated, RESET.
- c. Check that aircraft is easily controllable, no excessive forces to the cyclic and pedals. Collective should go down to 13 PSI torque and up to 33 PSI with approximately equal force.
- d. HYD Cont Switch - ON, power restored.

**NOTE**

It will take slightly more force to move the cyclic right and forward than to the left and forward. A common cause for excessive pressure being required to the right and forward is a maladjusted or missing swashplate balance spring.

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

- \*4. Turbine Engine Analysis Check—  
Perform Baseline or Normal as applicable. (See Section IV).

**NOTE**

For baseline TEAC:

Under certain climatic conditions, the “topping” portion of TEAC procedure may not be possible. When such conditions exist, the test pilot will verify engine power by climbing to highest obtainable altitude and confirm that maximum torque is available without exceeding any engine or airframe limits. Maximum torque will be determined from appropriate -10 operators manual based on actual pressure altitude and temperature for that flight level. Engine must provide at least maximum torque without N2 bleed or exceeding engine or airframe limitations. Refer to TM 55-2840-229-23-1 for additional requirements and instructions.

For normal TEAC:

If during the conduct of a general test flight, engine topping cannot be performed due to adverse environmental conditions the TEAC may be deferred until conditions improve. An entry on DA Form 2408-13 will be made and a red diagonal status symbol will be entered in Block 16. Block 17 will state: Normal TEAC deferred until environmental conditions improve.

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

**IN-FLIGHT CHECKS (CONT)**

5. Deleted.

\*6. Stabilizer Bar Dampner-Check following time for  $5 \pm 1$  seconds in each direction. C15,16,  
H 31

a. Airspeed-Adjust to  $80 \pm 10$  knots.

b. FORCE TRIM switch-ON.

c. Turns-Left or Right to 10 to 20 degree bank.

d. FORCE TRIM switch-OFF.

\*7. Vibration Analysis-Check

NOTE

For aircraft equipped with composite blades, vibration analysis check may be accomplished at 6400 N2 RPM.



**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

- a. Starting at 70 kias slowly increase airspeed to a point where a 1:1 vertical vibration becomes noticeable. Establish a 10 psi torque descent at that airspeed and note any changes in vibration level from straight and level flight.

**NOTE**

Generally, 1:1 vibrations felt predominantly in a low power descent are caused by a basic difference in blade lift and can be corrected by rolling a blade grip. Note also any excessive 2:1 vibration.

- b. Level off and slowly increase airspeed from 70 Knots up to VNE (unless vibrations get uncomfortably severe). Note any increase in 1:1 vibrations and airspeed at which it became evident. Note any excessive 2:1 vibration or higher frequency vibrations. Aircraft should fly smoothly through entire speed range. J4, 5

**NOTE**

Vertical 1:1 vibrations felt mostly in forward flight, that get worse as airspeed is increased, are usually due to one blade developing more lift as airspeed increases. This can most often be corrected by adjustment of trim tabs.

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

**IN-FLIGHT CHECKS (CONT)**



Minimize or eliminate all abnormal vibrations and compute VNE for aircraft configuration and ambient conditions prior to performing this check. Roof or nose mounted pitot tube changes VNE significantly.

- \*8. Cyclic Rigging - Check: H26,32,33

Increase airspeed to VNE or maximum attainable in level flight (if less than VNE). With normal aircraft configuration and CG about neutral, observe the pilots cyclic stick has a minimum of 2 inches clearance from the instrument panel, a slight spring cushion may or may not be felt.

- \*9. Flight Instruments - Check:

- |   |     |
|---|-----|
| a. Altimeters - Proper indication, nearly the same as before take-off, no large fluctuations. | B20 |
| b. Attitude indicators - Correct indications, no excessive precession or vibrations.          | B24 |
| c. Standby compass - Nearly correct heading, no excessive fluctuation.                        | B25 |

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

- |  |      |
|--|------|
| d. Vertical speed indicators (VSI) - Proper indication, nearly the same, no excessive fluctuations.                | B3   |
| e. Gyro compass - Correct heading, operates smoothly, no fluctuations, co-pilots same as pilots within 2°.         | K3-5 |
| f. Clock - Still indicating correct time.  | B1   |
| g. Turn and slip indicator - Proper indication, needle movement.   | B21  |
| h. Instrument panel - No excessive vibration. Note any looseness or cracks at pedestal mounts.                     | B26  |
| *10. Communication and navigation equipment - Check operation of all equipment as indicated in the appropriate TM. | K6   |
| *11. Fuel consumption check - Complete.  |      |

**BEFORE LANDING CHECK**

1. RPM -6600.
2. Warning lights - Checked.

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

**BEFORE LANDING CHECK (CONT)**

3. Fuel quantity - Checked.
4. Instruments - Checked.
5. Caution lights - Checked.
6. Crew and mission equipment - Check.
7. Landing light - As required.

**AFTER LANDING AND ENGINE  
SHUTDOWN CHECKS**

1. Landing light - As required.
2. Transponder - OFF.
3. Controls - collective full down, cyclic centered, pedals neutral, FORCE TRIM ON. Apply cyclic friction. C16
- \*4. EGT - Record. E17-19
- \*5. Engine oil pressure - Record. B23, E3-8
- \*6. Engine oil temp - Record. B2, E9
- \*7. XMSN oil pressure - Record. B23, F1-5

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

- \*8. XMSN oil temp - Record. B2, F6, E1
- 9. Throttle - Engine idle, start clock.
- 10. LOW RPM AUDIO switch-OFF.
- 11. START/GEN switch - START position.
- \*12. Engine idle speed - Check N1, Record. E10, 11
- 13. Special equipment - Check operation of cargo hook, rescue hoist, and other special equipment if installed.
- \*14. Battery check. BAT switch OFF. If drop in loadmeter is 0.02 or less, this indicates a charge rate of six amperes and the battery is considered fully charged. BAT switch ON. C60, 61

**NOTE**

Ensure engine has idled for 2 minutes to allow internal engine components to stabilize before shutdown.

- \*15. Engine Shutdown:
  - a. Throttle - Full off, check N1 coastdown time (25 seconds rein). E23, 24

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

**AFTER LANDING AND ENGINE  
SHUTDOWN CHECKS (CONT)**

- |      |   |     |
|------|---|-----|
| b.   | EGT - Monitor, listen for any abnormal noises.  | E25 |
| c.   | ENG oil press light - On by 25 PSI.   | D31 |
| d.   | XMSN oil press light - On between 28-32 PSI.  | D31 |
| e.   | MAIN FUEL switch - OFF.   |     |
| 16.  | AVIONICS - OFF.   |     |
| 17.  | INVTR switch - OFF.   |     |
| 18.  | ANTI-COLLISION light switch - OFF (after rotor stops).  |     |
| 19.  | BAT switch - OFF (except UH-1C/M).  | C62 |
| *20. | Emergency collective hydraulic system (UH- 1C/M) - Check immediately after rotor stops:   |     |
| a.   | With the EMER COLL HYD switch OFF, attempt to raise the collective pitch, If the collective pitch cannot be raised, the accumulator switch is functioning properly. | G5  |

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

- |  |    |
|--|----|
| b. EMER COLL HYD switch - ON.<br>Move the collective pitch up one full stroke and down one full stroke.  | G6 |
| c. BAT switch - OFF. Move the collective pitch up one full stroke and down one full stroke. This indicates that the collective accumulator will function without electrical power. | G7 |
| d. EMER COLL HYD switch - OFF.   |    |

**NOTE**

Movement of collective should be made slowly to preclude premature bleeding of accumulator.

21. Ignition lock switch - OFF. Remove key as required.
22. Bleed Collective accumulator and check gage in the GREEN, (UH-1 C/M).
- \*23. Post Flight Inspection - Performed.
24. Check sheet - Completed and signed.
25. Maintenance Personnel - Debriefed as necessary.

**PROCEDURE**

**TROUBLESHOOTING  
REFERENCE**

**AFTER LANDING AND ENGINE  
SHUTDOWN CHECKS (CONT)**

- \*26. All entries from remarks column of check sheet - Transcribe to DA Form 2408-13.
- 27. HIT Worksheet and Log - Update to latest baseline HIT EGT.
- 28. Engine Historical Records - update DA Form 2408-15 Turbine Engine Analysis Checks.



### SECTION III. TROUBLESHOOTING

**General.** This section contains troubleshooting information that has been referenced in Section II checklists. This section shall list possible conditions, abnormal conditions and indications and probable causes. The information is to be used only as a quick reference and may not be all encompassing.

**TROUBLESHOOTING GUIDE A - STARTING  
CONDITION**

**PROBABLE CAUSE**

**A1. No starter action.**

- a. Starter-generator switch in the wrong position, or malfunction.
- b. Circuit breaker out.
- c. Starter switch inoperative.
- d. Starter failure.
- e. Faulty wiring.
- f. Internal seizing of compressor.

**A2. No N1 indication, but starter turns.**

- a. Faulty N1 tach generator or gage.
- b. Faulty wiring.
- c. Starter drive failed.
- d. N1 gearbox internal failure.

**A3. Failure to start.**

- a. Weak battery.
- b. GPU (if used) underrated.
- c. Faulty igniter plugs.

**CONDITION**

**PROBABLE CAUSE**

- d. Faulty ignition unit (exciter box or leads).
- e. Ignition key not on.
- f. Throttle not open.
- g. Faulty fuel control.
- h. Internal failure.
- i. Fuel switch not on.

**A4. N1 hangs at about 15%, EGT holds at about 100°C.**

- a. Fuel control malfunction.
- b. Flow divider malfunction.
- c. Main fuel line restricted.

**A5. N1 hangs, will not increase, EGT holds high.**

- a. Hanging start due to air in fuel control.
- b. Starter switch released too soon.
- c. Weak battery.
- d. GPU (if used) underrated.
- e. Fuel control malfunction.
- f. In-line filters clogged.

**CONDITION**

**PROBABLE CAUSE**

**A6. Normal start except EGT rises too rapidly.**

- a. Hot start due to starting in high tail wind, starting engine shutdown short time previous, or starting in extremely hot weather.
- b. Governor changeover solenoid in emergency position.
- c. Weak battery.
- d. Start fuel valve fails to close.
- e. Throttle improperly rigged.
- f. Wrong type fuel.
- g. Air intake obstructed.
- h. Dirty compressor.
- i. GPU (if used) underrated.
- j. Faulty fuel control.
- k. Combustion chamber dump valve sticking.
- l. T1 sensor dirty or clogged.

**A7. Starter continues to motor, and/or igniters continue to fire when start switch is released.**

- a. Faulty start switch (pilot or copilot).
- b. Faulty starter relay.

**CONDITION**

**PROBABLE CAUSE**

**A8. Start quits, N1 falls.**

- a. Starter switch released too soon.
- b. Main fuel valve shut off.
- c. Main fuel line quick disconnect not connected tightly.
- d. Air in fuel control.
- e. Circuit breaker out (starter or ignition).
- f. Starter failure (electrical or mechanical).
- g. Ignition system failure (exciter or igniter).
- h. Faulty fuel control.

**A9. N1, EGT, indication but main rotor does not turn as soon as normal. No N2 indication.**

- a. Rotor still tied down, either main or tail.
- b. Foreign object(s) binding rotating components.
- c. Transmission or gearbox failure.
- d. N2 turbine failed or locked.
- e. Engine reduction gearing failure.

**CONDITION**

**PROBABLE CAUSE**

A10. N1, EGT indication but main rotor does not turn with N2 tachometer engine indication.

- a. Engine drive shaft failed.
- b. Free-wheeling unit failure.
- c. Transmission failure.

**TROUBLESHOOTING GUIDE B -  
INSTRUMENTS**

**CONDITION**

**PROBABLE CAUSE**

**B1. Clock not accurate.**

- a. Not wound.
- b. Wound too tightly.
- c. Defective clock.

**B2. No indication on engine and/or transmission  
temperature gages.**

- a. Faulty wiring.
- b. Faulty gage(s).
- c. Faulty temperature bulb.

**B3. Vertical velocity indicator inaccurate, not  
zeroed, or fluctuates excessively.**

- a. Mechanism shifted (adjustment off).
- b. Loose connections.
- c. Static port or line clogged.
- d. Leak in line.
- e. Faulty indicator.

**CONDITION**

**PROBABLE CAUSE**

**B4. Airspeed indicator reads incorrectly or fluctuates excessively.**

- a. Pitot tube restricted.
- b. Line not completely connected.
- c. Static port or line clogged by water or dirt.
- d. Leak in line.
- e. Faulty indicator.

**B5. Fuel pressure too low.**

- a. Electric pump(s) circuit breaker out.
- b. Faulty bleed air pump (H/V models).
- c. Bleed air line leakage (H/V models).
- d. Faulty pressure transmitter and/or gage.
- e. Faulty fuel check valve manifold.
- f. Restriction in lines.

**B6. No fuel pressure indicated from bleed air boost pump (H/V models).**

- a. Bleed air line leakage.
- b. Restricted lines.



**CONDITION**

**PROBABLE CAUSE**

- c. Faulty transmitter and/or gage.
- d. Faulty boost pump.

**B7. Fuel quantity indicator reads low or remains at one point.**

- a. Improper gage.
- b. Out of adjustment.
- c. Faulty fuel probe(s).
- d. Faulty wiring.
- e. Faulty test switch.
- f. Faulty indicator.

**138. Fuel quantity indicator reads high.**

- a. Improper gage.
- b. Faulty fuel probe(s).
- c. Faulty wiring.
- d. Faulty test switch.

**B9. No torquemeter indication.**

- a. Faulty wiring.
- b. Clogged pressure line.
- c. Disconnected or broken pressure line.

**CONDITION**

**PROBABLE CAUSE**

- d. No oil in system.
- e. Faulty gage or transmitter.
- f. Torquemeter internal system malfunction.
- g. Faulty torquemeter boost pump.
- h. N2 gearbox internal failure.

**B10. Torquemeter indication rises rapidly after start, or pegged.**

Faulty transmitter.

**B11. Torquemeter fluctuates - no other instruments fluctuating.**

Faulty transmitter.

**B12. Fuel pressure erratic.**

- a. Air in system.
- b. Faulty pump.
- c. Fuel leak.
- d. Faulty transmitter or gage.
- e. Faulty wiring.
- f. Pump inlet restricted.
- g. Faulty fuel check valve manifold.

**CONDITION**

**PROBABLE CAUSE**

**B13. Fuel pressure too high.**

- a. Faulty transmitter or gage.
- b. Faulty wiring.
- c. Restricted lines.

**B14. Low torquemeter indication.**

- a. Faulty transmitter or gage.
- b. Low torquemeter boost pressure (adjustment or malfunction).
- c. Clogged boost pump screen.
- d. Damaged torquemeter seal ring.
- e. Main rotor blades pitch angle set too low (6600 RPM, flat pitch).
- f. Gross weight lower than computed.
- g. Abnormal density altitude.
- h. PPC calculation incorrect.

**B15. High torquemeter indication.**

- a. Faulty transmitter or gage.
- b. Torquemeter valve fails to close.

**CONDITION**

**PROBABLE CAUSE**

- c. Vent hose plugged.
- d. Faulty internal torquemeter system.
- e. Main rotor blade pitch angle set to high (6600 RPM, flat pitch).
- f. Gross weight higher than computed.
- g. Abnormal density altitude.

**B16. N2 needles not joined.**

- a. Faulty instrument.
- b. Faulty tachometer generator.

**B17. N2 tachometer fluctuates. No other engine instruments fluctuating.**

- a. Faulty wiring.
- b. Faulty instrument.
- c. Faulty tachometer generator.

**B18. Excessive tachometer error high or low.**

- a. Faulty instrument.
- b. Faulty tachometer generator.
- c. Faulty wiring, leads connected to wrong terminals at indicator.

**CONDITION**

**PROBABLE CAUSE**

**B19. Engine fails to run with both electric boost pumps disabled.**

- a. Air leak between fuel control and fuel tanks.
- b. Restriction in lines.

**B20. Altimeter reads incorrectly or fluctuates excessively.**

- a. Leak in static line.
- b. Clogged port or line.
- c. Faulty instrument.
- d. Water in static system.

**B21. Turn and slip indicator needle erratic or inoperative.**

- a. Sticking gyro.
- b. No electric power.

**B22. Fuel quantity gage will not decrease when press-to-test button pressed.**

- a. Faulty inverter.
- b. Faulty press-to-test button.
- c. Fuel gage stuck.

**CONDITION**

**PROBABLE CAUSE**

- d. Faulty wiring.
- e. Loose connections.

**B23. Pressure instruments inoperative, inverters on.**

- a. Faulty transformer.
- b. Transformer circuit breaker out.
- c. Inverter voltage excessively high or low.
- d. Faulty wiring.

**B24. Attitude indicator does not work properly.**

- a. AC power failure, one or all phases.
- b. Circuit breaker out.
- c. Loose connections.
- d. Faulty components.

**B25. Standby compass inaccurate, sluggish or erratic.**

- a. Improper compensation.
- b. Mounting bracket loose.
- c. External magnetic interference.

**CONDITION**

**PROBABLE CAUSE**

- d. Insufficient liquid.
- e. Faulty instrument.
- f. Improper hardware used on instrument panel or windshields.

**B26. Excessive instrument panel vibration.**

Mounts loose.

**TROUBLESHOOTING GUIDE C - ELECTRICAL  
CONDITION**

**PROBABLE CAUSE**

**C1. No voltage indicated when DC voltmeter turned to BAT position.**

- a. Battery circuit breaker out.
- b. Faulty wiring at battery relay.
- c. Battery circuit diode faulty or incorrectly installed.
- d. Internal failure of battery.
- e. Wiring at meter or VM selector faulty.

**C2. Battery does not come on.**

- a. Switch or switch wiring faulty.
- b. Battery relay faulty or incorrectly wired.
- c. Battery voltage low.
- d. Internal failure of battery or faulty connection.
- e. Feeder relay faulty or incorrectly wired on H/V models.



**CONDITION**

**PROBABLE CAUSE**

**C3. Battery relay chatters when battery is turned on.**

- a. Battery voltage low.
- b. Internal failure of battery.
- c. Faulty wiring at battery relay.

**C4. GPU does not provide current to aircraft.**

- a. External power relay or wiring faulty.
- b. Polarity of GPU reversed.
- c. GPU voltage low.
- d. Diode incorrectly installed or faulty.
- e. External power plug faulty or wiring faulty.

**C5. Press-to-test light fails to illuminate.**

- a. Bulbs burned out or missing, cat-eye closed.
- b. Faulty wiring.
- c. Faulty cargo release armed switch.

**CONDITION**

**PROBABLE CAUSE**

**C6. RPM WARNING light and/or audio inoperative.**

- a. Bulbs burned out or missing.
- b. Break in circuit wiring or cannon plugs disconnected.
- c. RPM warning box faulty, disconnected or not installed.
- d. RPM warning box not adjusted properly (did not follow published procedures).
- e. Tachometer generator faulty.

**C7. FIRE WARNING light inoperative.**

- a. Bulbs burned out or missing.
- b. Break in circuit wiring or cannon plug disconnected.
- c. Fire detector relay faulty, not installed or incorrectly wired.
- d. Faulty test button.

**CONDITION**

**PROBABLE CAUSE**

- C8. FIRE WARNING light on (no actual fire).**
- a. Moisture or foreign matter in cannon plug.
  - b. Wiring frayed, chaffed, shorted, or grounded out.
  - c. Fire detector relay faulty.
  - d. Fire sensing wire damaged or has sharp bends or is kinked.
  - e. Faulty test button.
- C9. Interior lights fail to illuminate or brighten.**
- a. Faulty switch or rheostat.
  - b. Faulty or broken wiring.
  - c. Bulb(s) burned out.
- C10. Navigation lights fail to illuminate, dim, or flash.**
- a. Bulbs burned out.
  - b. Faulty switch.
  - c. Faulty wiring.
  - d. Faulty or incorrect flasher.
  - e. Faulty dimmer resistor.

**CONDITION**

**PROBABLE CAUSE**

- C11. Searchlight/landing light fails to illuminate, extend, or retract.**
- a. Faulty switch.
  - b. Bulb burned out.
  - c. Faulty wiring.
  - d. Faulty motor/gears.
  - e. Faulty relay switch.
- C12. Main or spare inverter fails to operate.**
- a. Switch or switch wiring faulty.
  - b. Inverter power relay faulty or wiring incorrect.
  - c. Faulty inverter.
  - d. Faulty wiring.
- C13. Inverter comes on but no AC voltage applied to the instruments.**
- a. Faulty wiring.
  - b. Faulty inverter relay.
  - c. Faulty switch.

**CONDITION**

**PROBABLE CAUSE**

**C14. Instrument inverter caution panel light on, inverter on.**

- a. Fail relay circuit breaker out or faulty.
- b. Faulty wiring.
- c. "C" Phase out or inoperative in the inverter.

**C15. Force trim holds in all or some positions with switch OFF.**

- a. Magnetic brakes not completely releasing.
- b. Rough spots in brake travel.
- c. Residual magnetism in magnetic brake.
- d. Improperly rigged.
- e. Electrical Failure.

**C 16. Force trim inoperative.**

- a. Faulty switch(s).
- b. Faulty wiring.
- c. Faulty magnetic brake(s).
- d. Arm disconnected.
- e. Electrical failure.

**CONDITION**

**PROBABLE CAUSE**

**C17. No loadmeter indication when pitot heater is turned on.**

- a. Heater inoperative.
- b. Faulty switch.
- c. Loadmeter malfunction (see C40).

**C18. AC voltage high or low.**

- a. Generator voltage excessively high or low.
- b. Faulty inverter.
- c. AC voltmeter improperly adjusted.
- d. One phase inoperative.
- e. Faulty VM selector.
- f. Faulty wiring.

**C19. Excessive difference between AC phases.**

- a. Faulty inverter.
- b. Power factor correction network faulty or circuit breakers out.
- c. Faulty wiring at VM selector.

**CONDITION**

**PROBABLE CAUSE**

**C20. AC voltage indication varies or fluctuates.**

- a. Faulty meter wiring.
- b. Faulty wiring.
- c. Faulty VM selector.
- d. Faulty inverter.
- e. Faulty inverter relay.
- f. Faulty power factor correction circuit or circuit breaker.
- g. Fail relay or fuel quantity circuit breaker wiring faulty.

**C21. AC voltmeter inoperative, inverters on and current applied to instruments.**

- a. Faulty wiring.
- b. Faulty VM selector.
- c. Faulty voltmeter.
- d. Fail relay or fuel quantity circuit breakers out or faulty.

**C22. AC voltmeter indicates low voltage in the AC position, and either 0 or 115 volts in the AB or BC position, with current applied to the instruments and inverter on.**

- a. Faulty wiring.

**CONDITION**

**PROBABLE CAUSE**

- b. Fail relay or fuel quantity circuit breaker out .
- c. Faulty VM selector.

**C23. Main generator ON but no DC voltage indicated for main generator position of VM selector.**

- a. Faulty wiring at reverse current relay.
- b. Main generator VM circuit breaker out or faulty.
- c. Faulty VM selector switch or faulty wiring at switch.
- d. Faulty wiring at the generator.

**C24. Generator voltage high.**

- a. Voltage regulator faulty or out of adjustment.
- b. Voltage regulator wiring faulty, loose or incorrect.
- c. Regulator base plate faulty, contacts corroded, loose or damaged.
- d. Faulty field relay wiring.
- e. Field circuit breaker wiring incorrect.
- f. Voltmeter out of adjustment.



**CONDITION**

**PROBABLE CAUSE**

- g. Faulty overvoltage relay (main) (see C26).

**C25. Generator voltage low.**

- a. Field circuit breaker out or faulty.
- b. Faulty generator or wiring.
- c. Faulty voltage regulator or out of adjustment.
- d. Voltage regulator wiring faulty, loose or incorrect.
- e. Regulator base plate corroded, loose or damaged.
- f. Faulty field relay or wiring incorrect.
- g. Faulty overvoltage relay (see C26).
- h. Voltmeter out of adjustment.

**C26. Overvoltage relay does not function properly.**

- a. Faulty relay.
- b. Faulty wiring.
- c. Faulty field relay.
- d. Generator and bus reset circuit breaker out or faulty.

**CONDITION**

**PROBABLE CAUSE**

**C27. Generator voltage fluctuates.**

- a. Faulty field circuit breaker.
- b. Faulty field relay.
- c. Faulty voltmeter.
- d. Faulty generator.
- e. Faulty voltage regulator.
- f. Voltage regulator base plate loose, corroded or damaged.
- g. Faulty wiring.

**C28. Main generator does not come on with switch in the ON position.**

- a. Faulty wiring at reverse current relay.
- b. Switch or switch wiring faulty.
- c. Generator voltage excessively low.
- d. Field relay wiring or field relay faulty.
- e. Overvoltage relay wiring faulty or relay faulty.
- f. Generator field circuit breaker out or faulty.
- g. Faulty generator, residual magnetic field gone.

**CONDITION**

**PROBABLE CAUSE**

- h. Faulty reverse current relay or wiring.
- i. Generator drive shaft sheared or improperly installed.

**C29. Standby generator operating but no DC voltage indicated for STANDBY GENERATOR position of VM selector.**

- a. Faulty standby generator.
- b. Standby generator VM circuit breaker out or faulty.
- c. Faulty VM selector switch or faulty wiring at switch.

**C30. No reading when VM selector is placed in the ESS BUS position.**

- a. Faulty wiring at the VM selector switch or faulty VM selector.
- b. GEN and BUS reset circuit breaker out or faulty.

**C31. Non-essential bus VM selector position does not indicate voltage with main generator ON, and switch in NORMAL ON.**

- a. Faulty non-essential bus relay.
- b. Faulty bus control relay.

**CONDITION**

**PROBABLE CAUSE**

- c. Faulty switch.
- d. Generator and bus reset circuit breaker out or faulty.
- e. VM selector faulty.
- f. Faulty voltmeter.
- g. Faulty wiring.

**C32. Main generator will not go off when switch is placed in the OFF position.**

- a. Reverse current relay faulty or wiring at relay faulty.
- b. Faulty switch or switch wiring.

**C33. Standby generator will not come on with switch in STBY position, main generator OFF.**

- a. Reverse current relay faulty.
- b. Faulty bus control relay.
- c. Faulty switch.
- d. Generator voltage excessively low.
- e. Standby generator's field relay faulty.
- f. Field circuit breaker out or faulty.

**CONDITION**

**PROBABLE CAUSE**

- g. Starter switch faulty activating field relay.
- h. Faulty wiring.

**C34. Standby generator ON, no indication on loadmeter.**

- a. Circuit breaker out.
- b. Faulty meter.
- c. Faulty wiring at shunt.

**C35. Standby generator will not come on, voltmeter indicates negative in STBY position.**

Faulty wiring at reverse current relay.

**C36. Standby generator ON, loadmeter indicated negative (below zero) when VM selector is placed in STBY GEN position.**

- a. Circuit breaker out.
- b. Faulty meter or wiring.
- c. Faulty wiring at shunt.

**C37. Non-essential bus indicates voltage with switch in NORMAL ON and main generator OFF.**

- a. Faulty non-essential bus relay or faulty wiring at relay.

**CONDITION**

**PROBABLE CAUSE**

- b. Main generator reverse current relay wiring faulty.
- c. Faulty bus control relay.
- d. Faulty switch.
- e. Faulty wiring.

**C38. DC GEN caution panel light OFF when main generator is off, comes on when main generator comes on.**

- a. Faulty wiring.
- b. Faulty bus control relay.

**C39. Main generator ON, but no indication on loadmeter.**

- a. Wiring at loadmeter faulty.
- b. Wiring at shunt faulty.

**C40. Main generator goes off, switch is in the ON position.**

- a. Faulty wiring at the reverse current relay or faulty relay.
- b. Faulty switch.
- c. Generator voltage excessively high, activating overvoltage relay.

**CONDITION**

**PROBABLE CAUSE**

- d. Generator voltage excessively low.
- e. Faulty field relay,
- f. Faulty overvoltage relay.
- g. Field circuit breaker out or faulty.
- h. Faulty generator.
- i. Faulty voltage regulator and/or baseplate.
- j. Faulty wiring.

**C41. Main generator will not reset when switch is placed in the RESET position.**

- a. Faulty switch.
- b. Faulty field relay.
- c. Faulty overvoltage relay.
- d. Field circuit breaker out or faulty.
- e. Faulty generator.
- f. Faulty wiring.

**C42. No increase in EGT when DE-ICE switch is turned on.**

- a. Faulty switch.
- b. Bleed air valve stuck open.

**CONDITION**

**PROBABLE CAUSE**

- c. Bleed air leakage.
- d. Electrical failure to valve solenoid.
- e. Faulty de-ice valve.

**C43. No decrease in EGT when DE-ICE switch is turned off.**

- a. De-ice valve stuck open.
- b. Faulty switch.
- c. Electrical failure to valve solenoid.

**C44. Insufficient or no heat from outlets.**

- a. Obstructed, disconnected or leaking ducting.
- b. Faulty air control switch.
- c. Faulty bleed air valve.
- d. Faulty air mixing valve.
- e. Faulty wiring.
- f. Faulty overtemp switch.
- g. Faulty thermostat.
- h. Faulty defrost circuit.



**CONDITION**

**PROBABLE CAUSE**

**C45. Excessive hot air.**

- a. Faulty thermostat.
- b. Faulty overtemp switch.

**C46. HYDRAULIC CONTROL switch ineffective.**

- a. Hydraulic system circuit breaker out.
- b. Faulty switch.
- c. Faulty wiring.
- d. Faulty solenoid valve.
- e. Electrical failure.

**C47. No change in governor RPM when INCR/DECR switch is activated.**

- a. Governor control circuit breaker out.
- b. Faulty overspeed governor.
- c. Faulty or binding actuator.
- d. Faulty wiring.
- e. Faulty switch.

**C48. Governor RPM increase when beep decreased or vice versa.**

- a. Faulty wiring.
- b. Connections crossed.

**CONDITION**

**PROBABLE CAUSE**

**C49. Excessive time for actuator to complete travel.**

- a. Actuator binding.
- b. Faulty actuator.
- c. Overspeed governor binding.
- d. Faulty wiring.

**C50. Governor RPM too low or too high at full open throttle and increased beep.**

- a. N2 system improperly rigged.
- b. Faulty overspeed governor.
- c. Air in fuel control.
- d. Droop compensator shear pin sheared.

**C51. RPM warning light and/or audio on, dual tachometer indicating normal.**

- a. Faulty wiring.
- b. Faulty warning box or improperly adjusted.
- c. Water or moisture in warning box or components.

**C52. Main generator motors with battery on.**

- a. Faulty wiring at reverse current relay.
- b. Faulty reverse current relay.

**CONDITION**

**PROBABLE CAUSE**

- C53. Transmission sump inspection light inoperative.**
- a. Battery circuit breaker out.
  - b. Bulb burned out.
  - c. Faulty light socket or wiring.
  - d. Faulty switch.
  - e. Battery circuit diode faulty or incorrectly installed.
- C54. Battery comes on when transmission sump inspection switch is pushed.**
- Faulty wiring at battery relay.
- C55. DC voltmeter does not indicate in some positions.**
- a. Faulty wiring.
  - b. Faulty switch.
- C56. When main generator turned back on, standby loadmeter maintains indication.**
- a. Voltage improperly set, standby should be 1 volt lower than main generator.
  - b. Faulty relay.
  - c. Faulty main generator or circuit.

**CONDITION**

**PROBABLE CAUSE**

**C57. RPM WARNING light and audio on, rotor or N2 needle on dual tachometer fluctuating or indicating zero.**

- a. Faulty wiring.
- b. Cannon plug disconnected.
- c. Faulty tachometer generator(s).

**C58. RPM warning system activates at various settings.**

- a. Faulty wiring.
- b. Faulty warning box.
- c. Faulty tachometer generator(s).
- d. Water or moisture in components.

**C59. RPM WARNING light and audio do not come on during autorotation, or come on excessively low.**

- a. Faulty warning box.
- b. Warning box out of adjustment, did not follow published procedures.

**C60. Battery will not hold charge, or will not charge.**

- a. Incorrect servicing/maintenance.
- b. Generator voltage low.
- c. Internal failure of battery,

**CONDITION**

**PROBABLE CAUSE**

**C61. Battery spewing electrolyte, gasing and/or overheating.**

- a. Generator voltage too high for ambient conditions.
- b. Internal battery failure.
- c. Incorrect servicing/maintenance.

**C62. Battery will not turn off.**

- a. Faulty switch.
- b. Faulty battery relay.
- c. Faulty wiring.

**C63. Low RPM audio too weak.**

- a. Audio level adjusted too low.
- b. Faulty warning system.
- c. High resistance wiring.
- d. Faulty interphone control box.

**TROUBLESHOOTING GUIDE D -  
CAUTION PANEL**

**CONDITION**

**PROBABLE CAUSE**

**D1. MASTER CAUTION light fails to illuminate.**

- a. Faulty wiring.
- b. Faulty caution panel box.
- c. Bulbs burned out or missing.

**D2. Caution panel lights do not illuminate when test switch is depressed.**

- a. Faulty test switch.
- b. Faulty caution panel box.
- c. Faulty wiring.
- d. Bulbs burned out.

**D3. All or many caution panel lights illuminated dimly.**

- a. Moisture in cannon plug or internally.
- b. Defective caution panel box.

**D4. Caution panel lights dim, pilot instrument light rheostat off or caution panel lights do not dim pilot instrument light rheostat on.**

- a. Faulty pilot instrument light rheostat.

**CONDITION**

**PROBABLE CAUSE**

- b. Faulty wiring.
  - c. Faulty caution panel box.
- D5. RIGHT FUEL, LEFT FUEL BOOST pump (electric) caution panel light illuminated.**
- a. Circuit breaker(s) out.
  - b. Boost pump inoperative.
  - c. Ejector pump (H/V) clogged.
  - d. Pump inlet screen restricted.
  - e. Flow switch inoperative (H/V).
  - f. Pressure switch inoperative (C/M).
  - g. Main fuel switch faulty.
  - h. Faulty caution panel.
  - i. Fuel line clogged.
- D6. LEFT FUEL BOOST (bleed air) caution panel light goes out when main fuel is turned on.**
- a. Faulty fuel check valve manifold.
  - b. Faulty caution panel.

**CONDITION**

**PROBABLE CAUSE**

- D7. ENGINE OIL PRESSure caution panel light illuminated.**
- Check gage, if pressure is up and pressure changes with power changes, trouble is faulty caution panel, or pressure switch.
  - If pressure not correct, see E5.
- D8. SPARE caution panel light illuminated.**
- Faulty wiring.
  - Segmented title in wrong location.
  - Faulty caution panel.
- D9. ENG CHIP DET and/or CHIP DETECTOR caution panel light(s) illuminated.**
- Metal chips on detector plugs.
  - Faulty wiring or plug.
  - Faulty caution panel.
- D10. ENGINE FUEL PUMP caution panel light illuminated.**
- One or both elements of dual pump failed.
  - Loose or clogged lines between pressure switch and fuel control.
  - Faulty pressure switch.



**CONDITION**

**PROBABLE CAUSE**

**D11. 20 MINUTE FUEL caution panel light illuminated.**

- a. Low fuel supply.
- b. Faulty float switch.
- c. Flapper valve installed wrong (H/V).
- d. Faulty wiring.
- e. Faulty caution panel.

**D12. GOVernor EMERgency caution panel light illuminated.**

- a. Governor switch in the emergency position.
- b. Faulty caution panel.
- c. Faulty switch or wiring.

**D13. FUEL FILTER caution panel light illuminated.**

- a. Fuel filter impending bypass or bypassing.
- b. Filter iced.
- c. Faulty fuel filter pressure switch.
- d. Faulty caution panel.
- e. Faulty wiring.

**CONDITION**

**PROBABLE CAUSE**

**D14. AUXiliary FUEL LOW caution light illuminated.**

- a. Faulty wiring (with no auxiliary system installed).
- b. Faulty fuel transfer relay.
- c. Faulty caution panel.

**D15. XMSN OIL PRESSure caution panel light illuminated.**

- a. Check gage. If pressure up and pressure changes slightly with RPM changes trouble is faulty caution panel, faulty pressure switch, or faulty wiring.
- b. If pressure not correct, see F2.

**D16. HYDraulic PRESSURE caution panel light illuminated (No. 1 or No. 2 C/M).**

- a. Switch in off position or faulty.
- b. Faulty solenoid.
- c. Leak in system.
- d. Faulty pressure relief valve.
- e. Oil level low.
- f. Faulty pump.

**CONDITION**

**PROBABLE CAUSE**

- g. Check valve in pump pressure line installed backwards.
- h. Faulty pressure switch or wiring.
- i. Faulty system module (C/M).
- j. Faulty caution panel.

**D17. ENGINE INLET AIR caution panel light illuminated.**

- a. Faulty wiring.
- b. Faulty pressure switch,
- c. Clogged inlet screens.

**D18. XMSN OIL HOT caution panel light illuminated.**

- a. Check gage. If it indicates normal, trouble is faulty caution panel, thermostwitch or wiring.
- b. If gage is indicating high, see F6.

**D19. DC GENERATOR caution panel light illuminated.**

- a. Main generator inoperative, see C28.
- b. Faulty bus control relay.
- c. Faulty caution panel.

**CONDITION**

**PROBABLE CAUSE**

- d. Faulty reverse current relay (main gen) IND terminal.
- e. Faulty wiring.

**D20. Instrument INVERTER caution panel light illuminated.**

- a. Faulty inverter, see C12.
- b. Faulty caution panel.

**D21. EXTERNAL POWER caution panel light illuminated.**

- a. External power door open, faulty or incorrectly adjusted micro-switch.
- b. Faulty caution panel.

**D22. APX-68 IFF caution panel light illuminated.**

- a. Faulty wiring.
- b. Faulty caution panel.

**D23. MASTER CAUTION light illuminated only.**

- a. Small resistance in a chip detector plug.
- b. Faulty caution panel.

**CONDITION**

**PROBABLE CAUSE**

- D24. LEFT FUEL BOOST pump (bleed air) caution light illuminated (H).**
- a. Faulty boost pump.
  - b. Boost pump outlet screen restricted.
  - c. Ejector pump restricted.
  - d. Boost pump inlet restricted.
  - e. Leak or obstruction in bleed airline.
  - f. Faulty flow switch.
  - g. Faulty wiring.
  - h. Line clogged.
- D25. GOVERNOR EMERGENCY caution panel light does not illuminate when placing governor switch in the EMERGENCY position.**
- a. Faulty switch.
  - b. Faulty wiring.
  - c. Faulty governor control circuit breaker.
  - d. Faulty caution panel.
- D26. HYDRAULIC PRESSURE caution panel light does not illuminate.**
- a. Faulty pressure switch.
  - b. Faulty wiring.

**CONDITION**

**PROBABLE CAUSE**

- c. Faulty caution panel.
- d. Faulty hydraulic module (C/M).
- e. Bulbs burned out or missing.

**D27. RIGHT FUEL, LEFT FUEL BOOST (electric) pump caution panel light does not illuminate.**

- a. Faulty wiring.
- b. Faulty caution panel.
- c. Faulty pressure switch (C/M).
- d. Faulty fuel check valve manifold.
- e. Bulbs burned out or missing.

**D28. Instrument INVERTER caution panel light remains out, inverter off.**

- a. Faulty fail relay.
- b. Faulty caution panel.
- c. Faulty wiring.

**D29. LEFT FUEL BOOST pump (bleed air) caution panel light comes on above 40° N1.**

- a. Faulty boost pump.
- b. Bleed air leakage.
- c. Faulty flow switch.

**CONDITION**

**PROBABLE CAUSE**

- D30. LEFT FUEL BOOST pump (bleed air) caution panel light does not illuminate.**
- a. Faulty caution panel.
  - b. Faulty flow switch.
  - c. Faulty fuel check valve manifold.
  - d. Faulty wiring.
  - e. Bulbs burned out or missing.
- D31. ENGINE OIL and/or XMSN OIL PRESSure caution panel light not illuminated.**
- a. Faulty wiring.
  - b. Faulty caution panel.
  - c. Bulbs burned out or missing.
  - d. Faulty pressure switch.
- D32. DC GENERATOR caution panel light does not illuminate.**
- a. Faulty bus control relay.
  - b. Faulty wiring.
  - c. Faulty caution panel.
  - d. Bulbs burned out or missing.

**TROUBLESHOOTING GUIDE E - POWER PLANT  
CONDITION**

**PROBABLE CAUSE**

**E1. Throttle stiff or binding.**

- a. Fuel control power lever binding.
- b. Throttle friction on or bound up.
- c. Deck firewall boot rubbing control tube.
- d. Engine idle stop misaligned or rough.
- e. Segment gears (base of collective) worn, broken or dirty.
- f. Throttle linkage rod end bearings worn or dirty.

**E2. Incorrect throttle cushion.**

- a. Incorrect throttle rigging.
- b. Throttle linkage, bell cranks or supports damaged or improperly installed.

**E3. Unable to go to idle cutoff.**

- a. Idle stop solenoid improperly adjusted.
- b. Electrical failure.
- c. Faulty solenoid.



**CONDITION**

**PROBABLE CAUSE**

**E4. No engine oil pressure indication. Caution panel light out.**

- a. Faulty transmitter or gage.
- b. Faulty wiring.
- c. Faulty caution panel combine with actual oil system problem.
- d. No AC power, either 115V or 28V (will also have no transmission oil pressure indication).

**E5. No engine oil pressure indication. Caution panel light on.**

- a. Loose hose connection(s).
- b. No oil in system.
- c. Restriction in lines.
- d. Pressure relief valve malfunction.
- e. Oil pump failure.
- f. Oil leak.

**E6. Low engine oil pressure.**

- a. Low oil level.
- b. Torque pressure line connected to engine oil pressure transmitter.

**CONDITION**

**PROBABLE CAUSE**

- c. Faulty indicating system.
- d. Oil pump inlet restricted.
- e. Oil pump relief valve setting wrong.
- f. Oil leak.

**E7. Fluctuating engine oil pressure.**

- a. Low oil level.
- b. Sticking pump relief valve.
- c. Pump inlet restricted.
- d. Faulty transmitter or gage.
- e. Air in oil system.

**E8. High engine oil pressure.**

- a. Cold ambient conditions.
- b. Faulty transmitter or gage.
- c. Oil pump relief valve setting wrong.

**E9. High engine oil temperature.**

- a. Low oil supply.
- b. Oil cooler blower inoperative.
- c. Faulty or obstructed oil cooler.

**CONDITION**

**PROBABLE CAUSE**

- d. Faulty thermal valve.
  - e. Restriction in oil system; clogged jets.
  - f. Scavenge pump inoperative.
  - g. Faulty indicating system.
- E10. N1 above 59% (L-11) or 72% (L-13) with throttle at engine idle.**
- a. Throttle positioned above engine idle.
  - b. Engine idle stop improperly rigged.
  - c. Faulty fuel control.
  - d. Wrong idle trim setting on fuel control.
  - e. Tachometer system failure.
- E11. N1 below 55% (L-11) or 68% (L-13) with throttle at engine idle.**
- a. Engine idle stop improperly rigged.
  - b. Fuel control in emergency.
  - c. Wrong idle trim setting on fuel control.
  - d. Faulty fuel control.
  - e. Overspeed governor malfunction.
  - f. Throttle linkage bell crank or support loose or broken.

**CONDITION**

**PROBABLE CAUSE**

- g. Fuel flow restricted.
- h. Wrong fuel.
- i. Tachometer system faulty.

**E12. N1 does not decrease when placing governor switch in the EMERgency position.**

- a. Faulty switch.
- b. Faulty wiring.
- c. Faulty changeover solenoid.
- d. Faulty fuel control.
- e. Faulty governor control circuit breaker.

**E13. N1 does not increase when placing governor switch in the AUTOmatic position.**

- a. Faulty switch.
- b. Faulty changeover solenoid.
- c. Faulty wiring.
- d. Faulty fuel control.
- e. Faulty governor control circuit breaker.

**CONDITION**

**PROBABLE CAUSE**

**E14. Bleed band opening/closing abnormal.**

- a. Adjustment incorrect.
- b. Clogged strainer or actuator valve.
- c. Actuator sensing hoses obstructed or not connected (L-11).
- d. Teflon seal binding.
- e. Sticky actuator valve.
- f. Fuel control sensing hose obstructed.
- g. Faulty fuel control.
- h. Faulty airbleed actuator.
- i. P-3 air lines disconnected or loose.

**E 15. N2 exceeds 6050 RPM at full open throttle and decreased beep.**

- a. Sticking or dirty actuator.
- b. Faulty wiring.
- c. Faulty overspeed governor.
- d. Improper N2 rigging.

**CONDITION**

**PROBABLE CAUSE**

**E16. N2 below 5950 RPM at full open throttle and decreased beep.**

- a. Improper N2 rigging.
- b. Air in fuel control.
- c. Faulty overspeed governor.

**E17. EGT fluctuating, no other engine instruments fluctuating.**

- a. Faulty indicating system.
- b. Loose connections.
- c. Faulty resistance box wiring.

**E18. Low EGT.**

Faulty indicating system.

**E19. EGT abnormally high.**

- a. Engine inlet dirty, filters clogged.
- b. De-ice valve open.
- c. Faulty inlet guide vanes,
- d. Faulty bleed band.
- e. Combustion chamber drain open.

**CONDITION**

**PROBABLE CAUSE**

- f. Dirty or damaged compressor.
- g. Bleed air heater on.
- h. Faulty indicating system.
- i. Faulty fuel control.
- j. Damaged internal components.

**E20. Engine surge (compressor stall), fluctuating engine instruments.**

- a. Engine deterioration or dirty air inlet.
- b. Dirty compressor.
- c. Faulty fuel control.
- d. Faulty bleed band actuator.
- e. Faulty inlet guide vanes.

**E21. Excessive overshooting of RPM or hunting by engine during collective applications.**

Faulty overspeed governor.

**E22. Unable to attain hover power in EMERGENCY position.**

- a. Improper throttle rigging.
- b. Faulty fuel control.
- c. Faulty inlet guide vanes.

**CONDITION**

**PROBABLE CAUSE**

- E23. Unable to move throttle below engine idle.**
- a. Solenoid stuck or improperly rigged.
  - b. Electrical failure to solenoid.
  - c. Throttle binding.
  - d. Faulty fuel control.
- E24. Engine fails to shut off, with throttle below engine idle.**
- a. Throttle improperly rigged.
  - b. Fuel control improperly rigged.
  - c. Faulty fuel control.
- E25. Coastdown time of N1 too short.**
- Internal binding of engine.
- E26. Engine response slow, RPM does not recover.**
- a. Faulty overspeed governor.
  - b. Faulty droop compensator.
  - c. Shear pin sheared or shearing.



**TROUBLESHOOTING GUIDE F -  
POWER TRAIN**

**CONDITION**

**PROBABLE CAUSE**

**F1. No transmission oil pressure indication.  
Caution light out.**

- a. Faulty transmitter or gage.
- b. No AC power, either 115V or 28V (will also have no engine oil pressure indication).
- c. Faulty wiring.
- d. Faulty caution panel combine with actual oil system problem.

**F2. No transmission oil pressure indication.  
Caution light on.**

- a. Loose hose connection(s).
- b. No oil in system.
- c. Restriction in lines.
- d. Quick disconnect loose (closed).
- e. Pressure relief valve faulty.
- f. Clogged pump inlet screen.
- g. Oil pump failure.
- h. Oil leak.

**CONDITION**

**PROBABLE CAUSE**

**F3. Low transmission oil pressure.**

- a. Pressure relief valve faulty.
- b. Clogged inlet screen.
- c. Faulty oil pump.
- d. Faulty indicating system.
- e. Leakage or restriction between pressure relief valve and transmitter.

**F4. Fluctuating transmission oil pressure.**

- a. Faulty transmitter or gage.
- b. Instrument clamped too tight in panel.
- c. Faulty relief valve.
- d. Clogged pump inlet screen.
- e. Low oil level.
- f. Air in transmitter lines.

**F5. High transmission oil pressure.**

- a. Faulty indicating system.
- b. Pressure relief valve malfunction or improperly set.
- c. Clogged jets.

**CONDITION**

**PROBABLE CAUSE**

**F6. High transmission oil temperature.**

- a. Faulty pressure relief valve.
- b. Clogged oil jets.
- c. Seized bearing or other internal transmission failure.
- d. Oil cooler clogged or obstructed.
- e. Faulty bypass valve.
- f. Faulty oil cooler blower.
- g. Faulty indicating system or wiring.

**F7. Pylon rocking continues abnormally long or present in normal flight.**

- a. Faulty transmission mount dampers.
- b. Wrong dampers installed.
- c. Pylon mounts worn.
- d. Faulty fifth mount.
- e. Mount bolts bottomed, loose or stripped.

**F8. Abnormal vibrations or engine surges during pylon mounts check.**

Engine to transmission alignment incorrect.

**TROUBLESHOOTING GUIDE G -  
HYDRAULIC**

**CONDITION**

**PROBABLE CAUSE**

**G1. Excessive feedback in controls.**

- a. Air in hydraulic system.
- b. Servo control head bolts too tight.
- c. Internal leakage in irreversible valve.
- d. Power cylinder assembly faulty.
- e. Hydraulic pump faulty.

**G2. Cyclic gets hard to move along 45° line with feedback.**

- a. Faulty hydraulic servo pilot valve.
- b. Faulty irreversible valve.
- c. Faulty hydraulic pump.
- d. Low hydraulic pressure.
- e. Faulty check valve.
- f. Restriction at pump outlet.
- g. Low fluid level.

**CONDITION**

**PROBABLE CAUSE**

- G3. Collective motors up or down, boost on.**
- a. Collective servo balance spring out of adjustment.
  - b. Faulty irreversible valve.
  - c. Faulty servo valve.
- G4. Collective comes up easier than it goes down or vice versa (boost on).**
- a. Collective servo balance spring out of adjustment.
  - b. Faulty servo valve.
- G5. Collective moves freely with emergency accumulator switch off and battery on (C/M).**
- a. Faulty switch.
  - b. Faulty emergency solenoid.
  - c. Check valve installed backwards.
- G6. Collective does not move freely with emergency accumulator switch and battery switch on.**
- a. Hydraulic fluid level low.
  - b. Faulty switch.
  - c. Faulty emergency solenoid.

**CONDITION**

**PROBABLE CAUSE**

- d. Faulty collective lockout valve.
- e. Collective lockout valve closing at too high a pressure.

**G7. Accumulator gage reads above or below green arc and less than four strokes are available on collective pitch.**

- a. Low or high nitrogen charge.
- b. Check valve installed backwards.
- c. Faulty collective lockout valve.
- d. Friction collect too high.

## **TROUBLESHOOTING GUIDE H - FLIGHT CONTROLS**

### **CONDITION**

#### **PROBABLE CAUSE**

#### **H1. T/R pedal adjustment binding or hard to adjust.**

- a. Dirt in adjustment assembly.
- b. Worn assembly.
- c. Pedals at limits.

#### **H2. Stiff or binding T/R pedals.**

- a. Worn or frayed T/R cables.
- b. Mag brake/force gradient assembly binding or sticking.
- c. Worn pitch change mechanism.
- d. Faulty T/R servo.

#### **H3. Binding or limited travel of cyclic control.**

- a. Misrigged.
- b. Wiring bundle at base or cyclic improperly rigged.
- c. Mag brake/force gradient assembly binding or sticking.
- d. Adjustable friction not completely off.

**CONDITION**

**PROBABLE CAUSE**

- e. Foreign matter at base of cyclic stick.
- f. Bearings worn or dirty.

**H4. Binding or limited travel of collective control.**

- a. Bearings worn or dirty.
- b. Adjustable friction not completely off.
- c. Improperly rigged.
- d. N2 improperly rigged.

**H5. Controls do not operate smoothly.**

- a. Servo valve sticking.
- b. Bearing worn or dirty.
- c. Servo valve improperly set.
- d. Servo control head bolts too tight.
- e. Faulty hydraulic pump.
- f. Relief valve malfunction.
- g. Bent or binding control tubes.

**H6. Cyclic chatters when being moved.**

- a. Air in hydraulic system.



**CONDITION**

**PROBABLE CAUSE**

- b. Power cylinder mounting bearings loose.
- c. Power cylinder mount uniball loose.

**H7. Cyclic binding in certain areas with force trim off.**

- a. Adjustable friction not completely off.
- b. Wiring harness binding in base of cyclic.
- c. Foreign matter in base of stick.
- d. Bearings worn or dirty.
- e. Cyclic jackshaft too tight (improperly shimmed).

**H8. With force trim off, cyclic continues moving after a small force is applied or moves without force application.**

- a. Power cylinder control head bolts binding.
- b. Collective pilot valve spring inadvertently installed on cyclic cylinders(s).
- c. Faulty hydraulic cylinder.
- d. Faulty irreversible valve.

**CONDITION**

**PROBABLE CAUSE**

**H9. Pedals chatter when being moved.**

- a. Air in hydraulic system.
- b. Power cylinder mounting bearings loose.
- c. Misalignment of T/R power cylinder.

**H10. With force trim off, left or right pedal creeps forward.**

- a. Hydraulic cylinder lines putting force on cylinder.
- b. Faulty hydraulic cylinder.
- c. Servo balance spring missing or improperly adjusted.

**H11. Excessive play in pedals.**

- a. Worn pitch change mechanism.
- b. Worn tube rod ends or pedal adjuster.
- c. Cable tension low.

**H12. Force trim weak or allows play in cyclic.**

- a. Maladjusted spring tension.
- b. Improperly rigged.
- c. Faulty magnetic brake.

**CONDITION**

**PROBABLE CAUSE**

- H13. Force trim excessively stiff.**
- a. Improperly rigged.
  - b. Maladjusted spring tension.
- H14. Collective built-in friction too light or too heavy.**
- a. Improperly adjusted at base or stick.
  - b. Bearings worn or dirty.
  - c. Collective jackshaft improperly shimmed.
- H15. Unable to increase collective friction using pilot adjustable friction device.**
- a. Friction knob jammed.
  - b. Threads need cleaning.
  - c. Friction pads excessively worn.
  - d. Malfunction in base of collective stick.
- H16. Aircraft tries to turn in wrong direction with pedal input.**
- Improperly rigged.

**CONDITION**

**PROBABLE CAUSE**

**H17. Unable to get collective up sufficiently (boost on).**

- a. Faulty hydraulic cylinder.
- b. Improper rigging.
- c. Fouled controls.

**H18. Collective stick binds, sticks or has breakaway force.**

- a. Friction device worn, rough or adjusted tighter on one side than the other.
- b. Fouled electric harness at base of stick.
- c. Droop compensator sticking or pin shearing.
- d. Faulty hydraulic cylinder.

**H19. N2 increases more than 40 RPM when collective raised.**

- a. Faulty droop compensator.
- b. Wrong droop cam installed.
- c. N2 system improperly rigged.
- d. Improper collective control rigging.

**CONDITION**

**PROBABLE CAUSE**

**H20. N2 droops off more than 40 RPM when collective is raised. (Not to be confused with normal transient droop caused by rapid collective movement.)**

- a. Improperly rigged droop compensator.
- b. Maladjusted droop compensator.
- c. Excessive play in linkage.
- d. Throttle not fully open.
- e. Wrong droop cam installed.
- f. Faulty overspeed governor.
- g. Droop compensator pin sheared.

**H21. Insufficient pedal travel, or pedal position.**

- a. Improper tail rotor rigging.
- b. Fouled control tubes or control components.
- c. Wrong tail rotor installed.

**H22. Unable to get normal cyclic travel.**

- a. Improper rigging of cyclic.
- b. Improperly installed control components,

**CONDITION**

**PROBABLE CAUSE**

- c. Fouled controls.
- d. Force trim improperly rigged.
- e. Jackshaft counterweight installed backward (C/M).

**H23. Cyclic stick not centered in stable hover.**

- a. Fore and aft CG off center.
- b. Lateral CG off center.
- c. Improper rigging at swashplate.
- d. Improper rigging in cockpit.

**H24. Aircraft responds faster in one direction than the other with equal pedal inputs.**

- a. Improper tail rotor rigging.
- b. Wrong tail rotor installed.
- c. Gusty wind conditions.

**H25. Rotor response to cyclic inputs slow, or inconsistent.**

- a. Improper rigging.
- b. Leaking hydraulic cylinder.

**CONDITION**

**PROBABLE CAUSE**

- c. Faulty stabilizer bar dampers, see H31.
- d. Faulty hydraulic pump.
- e. Faulty relief valve.

**H26. Cyclic position abnormal for flight conditions.**

- a. Improper swashplate or elevator rigging.
- b. CG not as computed.
- c. Faulty airspeed indicator.

**H27. T/R pedals improperly positioned with 30 PSI torque and 90 (N)/100(R) KTS airspeed.**

- a. Improper tail rotor rigging.
- b. Incorrect component installed.

**H28. Autorotation RPM too high or low.**

- a. Gross weight different than computed.
- b. Abnormal density altitude.
- c. Improper main rotor blade pitch angle set.

**H29. With boost off it is harder to move cyclic right and forward than to left.**

- a. Normal, unless excessively hard.
- b. Balance spring on right cyclic swashplate horn missing, or improperly set.

**CONDITION**

**PROBABLE CAUSE**

**H30. Collective comes up too easy and goes down too hard or vice versa (boost off).**

**NOTE**

Collective becomes more negative as density altitude increases.

- a. Deleted.
- b. Blade tabs either too high or low in both blades.
- c. T/T bundle improperly adjusted.

**H31. Bank response abnormal. Ship unusually sensitive or unusually stable.**

- a. Faulty stabilizer bar dampers.
- b. Incorrect damper rod adjustment.
- c. Wrong stabilizer bar weights installed.
- d. Wrong damper lever arms.
- e. Rod end to damper lever arms connection incorrect.
- f. Dampers low on fluid.
- g. Wrong type fluid on damper.



**CONDITION**

**PROBABLE CAUSE**

**H32. Too much or too little spring cushion on forward cyclic travel.**

- a. Maladjusted force gradient spring.
- b. Magnetic brake sticking.

**H33. Unable to get normal cyclic travel.**

- a. Improper cyclic rigging.
- b. Control components installed wrong,
- c. Fouled controls.
- d. Force trim improperly rigged.
- e. Jackshaft counterweight installed backward (C/M).

**H34. Normal flight, tail boom intermittently kicks right or left.**

Tail rotor pitch change rod end bearings excessively worn or crosshead improperly shimmed.

**H35. Rail rotor pedals not rigged properly.**

Adjust pitch change links.

**TROUBLESHOOTING GUIDE I -  
NOT APPLICABLE**

**TROUBLESHOOTING GUIDE J -  
VIBRATIONS**

**CONDITION**

**PROBABLE CAUSE**

- J1. 1/REV vibration at a hover.**
- a. Blade balance (lateral felt as a vertical) spanwise or chordwise unbalance.
  - b. Severe out of track.
  - c. Stabilizer bar out of balance.
  - d. Excessively worn dynamic components.
  - e. Grip bearings binding.
  - f. Incorrect grip spacing.
  - g. Internal leak in blade grip (H/V and EH-1H/X).
- J2. 1/REV vibration, intermittent (C/M).**
- a. Collective friction (mast) loose.
  - b. Collective sleeve bearings worn.
  - c. Collective lever pivot bearing worn.
  - d. Swashplate uniball torque incorrect.
  - e. Grip bearings worn or sticking.
  - f. Excessive tab differential.

**CONDITION**

**PROBABLE CAUSE**

- J3. Excessive high frequency vibration.**
- a. Tail rotor out of balance.
  - b. Tail rotor out of track.
  - c. Loose tail rotor pitch change link bearings.
  - d. Hanger bearings worn, bearing assembly loose, or dry of lubricant.
  - e. Worn or loose crosshead.
  - f. Faulty engine.
  - g. Faulty generator bearings.
  - h. Tail rotor drive shaft balance.
  - i. Tail rotor drive shaft bent.
  - j. Tail rotor drive shaft out of alignment.
  - k. Worn or loose tail rotor trunnion.
  - l. Start-generator cooling fan worn (H/V).
  - m. Oil cooler fan or mount.
  - n. Faulty hydraulic pump.
  - o. Hydraulic modules (C/M).
  - p. Loose tail rotor grip bearing.
  - q. Loose tail rotor retaining nut.

**CONDITION**

**PROBABLE CAUSE**

- r. Bent tail rotor pitch change link.
- s. Engine alignment or mounts.
- t. Main drive shaft clamps not matched properly.
- u. Main drive shaft clamps not installed at 90°.
- v. Faulty inverters.
- w. Bad bearings in any quill assembly.

**J4. 1/REV vertical vibration in forward flight.**

- a. Blade out of track.
- b. T/T straps not set equally or not holding setting (H/V).
- c. Pitch change rod end bearings worn.
- d. Grip bearings sticking.
- e. Radius rings worn (C/M).
- f. Carbon insert missing (C/M).
- g. Worn stabilizer bar pivot bearings.
- h. Worn mixer lever bearings.

**CONDITION**

**PROBABLE CAUSE**

- i. Swashplate unbail torque incorrect (C/M).
- j. Scissors bearings or bushings worn.
- k. Worn trunnion bearings.
- l. Undertorqued pillow block bolts.
- m. Loose power cylinder mountings.

**J5. Excessive 2/REV vibration.**

- a. Transmission mounts deteriorated.
- b. Loose, worn or improperly shimmed drag brace bolts.
- c. Worn rod end bearings.
- d. Excessive play in swashplate assembly.

**J6. Medium frequency vibration felt in airframe.**

- a. Loose skids.
- b. Loose radio or electronic equipment.
- c. Loose equipment in cabin.
- d. Excessive elevator play.
- e. Loose airframe components.

**TROUBLESHOOTING GUIDE K -  
COMMUNICATIONS/NAVIGATION  
EQUIPMENT**

**CONDITION**

**PROBABLE CAUSE**

**K1. High loadmeter indication when turning radio on, or radio inoperative.**

- a. Faulty wiring.
- b. Internal failure.
- c. Improperly tuned.
- d. Improper radio switch position.
- e. Faulty ICS panel.
- f. Headset not plugged in completely.

**K2. Gyro compass will not null.**

- a. Compass slaving switch in wrong position.
- b. Internal failure.
- c. Faulty flux valve.
- d. Faulty wiring.

**K3. Gyro operated instruments processing excessively.**

- a. Inverter frequency output incorrect.
- b. Faulty inverter.

**CONDITION**

**PROBABLE CAUSE**

- c. Faulty power correction network or circuit breakers out.

**K4. Copilot RMI card inoperative, inverters on.**

- a. Faulty transformer.
- b. Transformer circuit breaker out.
- c. Inverter voltage excessively high or low.
- d. Faulty wiring.

**K5. Gyrocompass inaccurate or erratic.**

- a. Improper position of compass slaving switch.
- b. Improper adjustment of transmitting unit.
- c. External magnetic interference.
- d. Faulty components.
- e. Faulty indicating system.

**K6. Communication and/or navigation equipment does not operate properly.**

- a. Faulty wiring.
- b. Faulty interphone control box.
- c. Internal failure of radio.
- d. Faulty antenna or connection.



## SECTION IV-SPECIAL PROCEDURES

**General.** This section contains special procedures which were referenced in Section II.

### A. Altimeter, Radar-AN/APN-209-Self-Test

1. Set LO SET index to 0 feet and observe:
  - a. Indicator pointer is driven behind no track mask above 1500 feet.
  - b. OFF flag is displayed.
  - c. Digital display and warning lamps illuminated (may flash momentarily when power is first applied).
2. Set LO SET index to 100 feet, set HI SET index to 800 feet, (allow two minutes warmup) observe:
  - a. OFF flag disappears.
  - b. Indicator pointer indicated  $0 \pm 3$  feet.
  - c. Digital display indicated 0 (-0) to 3 feet.
  - d. LO warning lamp illuminated.
  - e. HI warning lamp out.
3. Press and hold the push-to-test (HI SET) knob and observe:
  - a. Indicator pointer indicates  $1000 \pm 100$  feet.
  - b. Digital display indicates  $1000 \pm 100$  feet.
  - c. LO warning lamp out.
  - d. HI warning lamp illuminated.
4. Release push-to-test (HI SET) knob and observe indication shown in item b.

**B. Altimeter Set, Electronic AN/APN-171 A(V)1 - Self-Test**

<u>Test Step</u>	<u>Test Instructions</u>	<u>Normal Indications</u>
1.	PUSH-TO-TEST, OFF, SET control-ON Allow 3 minutes for system warm up.	The NO TRACK flag should remain visible and the dial pointer should remain behind the NO TRACK mask for 2 to 3 minutes after power is turned on. The pointer will then rotate to the $0\pm 5$ foot graduation on the dial and the flag will disappear.
2.	Low Warning Index - Set to 50 Feet	Low warning light should illuminate.
3.	PUSH-TO-TEST Switch - PUSH	The height indicator pointer should indicate $100\pm 50$ feet. The LOW warning light should go out.
4.	PUSH-TO-TEST Switch - Release	The pointer should return to zero and the LOW warning light illuminate.
5.	End of Test	

**C. Self-Test, Radar Warning Receiver, AN/APR-39  
- Self-Test**

<u>Test Step</u>	<u>Test Instructions</u>	<u>Normal indications</u>
1.	Apply power to AN/APR 39. Wait one minute for warm up.	Control unit panel lamps illuminate.
2.	Set control unit DSCRM-OFF. Monitor CRT and audio and press and hold SELF TEST.	<p>a. Fwd and aft strobes appear, extending to approx. the third circle on the CRT. A 2.5 kHz PRF audio should be heard immediately.</p> <p>b. Within 6 seconds alarm audio present and MA lamp starts flashing.</p>
3.	Rotate indicator BRIL control CW and CCW.	Indicator strobes should brighten and dim.
4.	Rotate control unit AUDIO CW and CCW.	Audio not audible at max CCW and clearly audible at max CW.
5.	Release SELF TEST.	All indications cease.

## TM 55-1520-242-MTF

<u>Test Step</u>	<u>Test Instructions</u>	<u>Normal Indications</u>
6.	Set DSCRM to ON. Press and hold SELF TEST.	<ol style="list-style-type: none"><li>a. Within 4 seconds a fwd or aft strobes (either may appear first) and 1.2 kHz PRF audio present.</li><li>b. Within 6 seconds the other strobe will appear and PRF audio frequency will double.</li><li>c. Several seconds later alarm audio present and MA lamp starts flashing.</li></ol>
7.	Release SELF TEST	All indications cease.
8.	END OF TEST	

**D. Tail Rotor Tracking and Balance**

**NOTE**

This section has instructions for only the strobe-type tracking device. If manual methods are to be used consult the appropriate airframe maintenance manual.

**1. Tail Rotor Tracking**

- a. Install the tracking and balancing hardware on the aircraft as prescribed in the strobex instruction manual.
- b. Set Balancer as Follows:
  - (1) "Function" switch to "B"
  - (2) "RPM Range" to "X10"
  - (3) "RPM Tune" to "165"
- c. Set strobex as follows:
  - (1) (135 M-11) mode switch to "D"
  - (2) "RPM dial to 662"
- d. Run helicopter to 6600 RPM, with flat pitch and centered pedals. Head aircraft into the wind, on-the-ground.
- e. Stand to the side of the tail rotor and observe the four images of the single grip target. Fine tune the "RPM" dial so the four targets are stopped.

- f. Reposition, with Balancer and Strobex, to aft left portion of fuselage. Look aft at edge of tail rotor disc to view the super-imposed Tip Targets and judge track (left to right relation). Adjustment of "RPM" knob will position and stop targets as desired.

**NOTE**

If the horizontal bar appears above or below the vertical it indicates the targets were not placed an equal distance aft of the leading edge of the blade. This is not important if the difference is only an inch or two; the important observation is the left-to-right relation of the vertical to horizontal bars.

- g. Shut down and adjust track if required.

**2. Tail Rotor Balance.**

**NOTE**

The rotor must be in track at the time balance readings are taken.

- a. Set Strobex mode switch to "A"
- b. Set Balancer to Channel "B" and RPM to 1650.

**NOTE**

The Phazor section of the balancer is not operable when working the tail rotor, so ignore the Phazor lights when working the tail rotor.

- c. Standing alongside the tailrotor view the "Clock Angle" of the single grip target. Push the "verify Tune" button and, while the button is depressed, adjust the "RPM Tune" dial to return the target to the "Clock Angle" observed BEFORE the button was pushed. Release button, observe angle, push and adjust again to match new "unpushed" angle. Repeat until there is no change whether button is pushed or released.
- d. Record in Balance Chart (Section V) the "Clock Angle" and "IPS" (Read "IPS" without strobex flashing).
- e. Shut the aircraft down. Plot point at the intersection of the "Clock Angle" and "IPS" circle. Determine the required changes. Run the aircraft and check results. Continue until balance is 0.1 "IPS" or less.

**NOTE**

It is important that only the larger of the two indicated weights be changed on the tail rotor for the first move. The "move line" should be parallel to the fine lines extending perpendicular from the unchanged axis.

If the "move Line" is not in the correct direction, use "Clock Angle Corrector" #3597, and assign new numbers to clock.

Both weights can be changed if the tail rotor is fitted with Balance Arms so the axes on the Balance Chart are at 90° to each other.

**NOTE**

If the rotor does not respond in an orderly fashion after a few moves, the weights should be restored to original and the first reading should be repeated. If the first reading cannot be repeated, look for faulty bearings, shafts, etc.



**E. Main Rotor Tracking and Balance**

**NOTE**

If Manual tracking procedures are to be used, follow the instructions in the appropriate airframe maintenance manual.

**NOTE**

This section has instruction for only the strobe-type tracking device.

**1. Balancing the Main Rotor.**

- a. Install the associated accelerometers, magnetic pick-ups, targets, and interrupters as prescribed in the instructions included with the device.
- b. Insure both trim tabs are at zero degrees before starting tracking procedures.
- c. Set Balancer (177M-6A or 7A) as follows:
  - (1) "Magnetic Pickup" to "Common"
  - (2) "Interrupter Logic" to "Double"
  - (3) "Function switch to "Track"
  - (4) "RPM Range" to "X1"
  - (5) "RPM Tune" to "324"

d. Set strobex (135M-11) as follows:

- (1) "Mode switch" to "B"
- (2) "RPM" to "129"

Setting the "Mode Switch" to "B" puts the strobe light in the high intensity mode.

- e. Hover the aircraft and search the tip path to find the Tip Targets. Fine tuning the Strobex RPM may bring the targets into better view. Record track on Track and Balance Sheet (Section V).
- f. Correct main rotor track, as required, using pitch-links.
- g. When hover track is set, switch Balancer "Function" Switch to "A".
  - (1) While hovering, push "test" button and check for 12:00 and 6:00 o'clock lights in phazor.
  - (2) Release "Test" button and observe "Clock Angle".
  - (3) Push "Verify Tune" button, and adjust "RPM Tune" dial while button is depressed, to return light to angle observed before button was pushed. Release, observe angle, push and adjust again to match new "Unpushed" angle. Repeat until there is no change whether button is pushed or released.
  - (4) After tuning, read, and record on the Track and Balance Chart (Section V) "Clock Angle" and "IPS".

(5) Land aircraft and plot the point on the Track and Balance Chart (Section V) at the intersection of "clock angle" line and "IPS" circle. Determine changes required in blade bolt weight and sweep, and record in data section.

h. Make the changes, hover again, repeat steps g, 1, 2, 3, 4 and 5 until balance reading is 0.1 "IPS" or less.

## 2. In-Flight Tracking Main Rotor

a. Switch Balancer "Function" Switch to Track, (everything else remains the same).

b. Set strobe as stated in 1, d, (1) and (2).

### **CAUTION**

Minimize or eliminate all abnormal vibrations and compute VNE for aircraft configuration and ambient conditions prior to performing this check. Roof or nose mounted pilot tube changes VNE significantly.

c. Fly the aircraft and sketch the track observed at 60, 90 and 110 knots on the in-flight tracking sheet (section V).

d. While still flying, switch Balance "Function" Switch to "B".

(1) Press "Test" button and look for 12:00 o'clock lights.

(2) Release "Test" button and observe "Clock Angle".

## TM 55-1520-242-MTF

- e. Isolate vibration "Clock Angle" and "IPS" as stated in 2, d, (1), (2) and record on the In-flight tracking Sheet for 60, 90 and 110 knots.
- f. Land aircraft. Plot the 110 knot (or highest speed attained) reading on the Tracking Sheet at the intersection of the "Clock Angle" line and "IPS" circle.
- g. If the blades are seen to spread as airspeed is increased use trim tab. If the blades are out-of-track about the same amount at all airspeeds, use pitchlink.

### NOTE

Use as little trim tab as possible. Excessive tab tends to wash out, and may deteriorate the ride.

- h. Fly the aircraft again to check the results. Repeat if required to reduce "B" readings (vertical 1:1) to 0.2 "IPS" or less.

### **WARNING**

After in-flight tracking, check the autorotation RPM, and correct as necessary by adjusting both pitch change links equally.

- i. After in-flight tracking, check the "A" (balance) reading in hover. "Fine Tune" if required.

## TM 55-1520-242-MTF

- F. Health Indicator Test (HIT). Establish the HIT baseline EGT values as follows:**
1. Perform normal engine runup and cockpit procedures in accordance with the applicable -10 manual.
  2. Maintain N2 at 6600 RPM.
  3. Turn off all bleed air, de-ice.
  4. Turn aircraft into the wind and read free air temperature on cockpit FAT gage.
  5. Utilizing a blank HIT baseline EGT worksheet locate OAT in first column nearest to the free air temperature reading on the cockpit FAT gage. Circle this OAT. If OAT falls between two temperatures listed on the worksheet, use the higher reading.
  6. Set N1% at the value indicated in column 2 opposite this FAT. Allow EGT to stabilize.
  7. Read EGT from indicator. Record EGT beside the circled FAT.
  8. Apply the  $\Delta$  EGT A Correction Factor in column 3 adjacent to the circled FAT to indicate EGT and record the results in the open space in column 4.

### NOTE

The blank form in Section V will only take you to this point. To proceed further will require an actual HIT EGT worksheet.

**C4 4-13**

9. Apply  $\Delta$  EGT B Correction Factor in column 5 to the EGT in column 4. Record results for each of the FAT/N1 combinations shown in column 8.
10. Enter baseline information in the respective columns of the HIT EGT log.

G. Engine Topping.

1. Prior to topping the engine, perform all required inspections IAW TM 55-2840-229-23.

**NOTE**

In cold weather it may be impossible to achieve topping without exceeding 10,000 feet pressure altitude. Flight above 10,000 feet pressure altitude is not recommended. During periods of cold temperatures, precise trimming of the fuel control is less critical since considerable reserve power exists due to the low ambient temperature. If engine topping cannot be accomplished the following conditions will apply:

FOR BASELINE TEACS: If ambient temperature is below  $-15^{\circ}$  C at TEST ALTITUDE the engine topping portion of the Baseline TEAC may be deferred until temperature conditions improve. An entry on DA Form 2408-13 will be made and a red diagonal status symbol will be entered in block 16. Block 17 will state; Engine topping deferred until temperature conditions improve. (Temperature is the only reason to defer engine topping. All other Baseline TEAC checks will be accomplished IAW TM 55-2840-229-23 and the aircraft will be flown to 10,000'PA to insure the fuel control has not been inadvertently trimmed down).

2. Predetermine Topping Altitude:

- a. Set one altimeter at 29.92.
- b. Insure de-ice is off.
- c. Insure bleed-air is off.
- d. Increase collective to 40 psi torque.
- e. Read N1 at any whole thousands altitude at 40 psi and altimeter 29.92.
- f. Subtract actual N1 reading from maximum N1, minus 2%.
- g. For every 1% of N1 difference you will need to climb another 2000 feet pressure altitude to attain your predetermined topping altitude.

EXAMPLE:

Max N1 . . . . .	101.5
Subtract	- 2.0
Adjusted N1 . . . . .	<u>99.5</u>
N1 at 40 psi at 2000' PA . . . . .	<u>-96.0</u>
Difference	3.5
Multiply by . . . . .	<u>x2000</u>
Product . . . . .	7000
Add altitude used . . . . .	<u>+2000</u>
Predetermined Topping Altitude	9000

3. Top the engine as follows:

- a. At a moderate rate, climb to 500 feet below predetermined altitude.





Do not exceed maximum N1, Torque, or EGT limits.

As altitude increases, VNE decreases. At high power settings and low rotor RPM, retreating blade stall can occur below computed VNE.

- b. Increase collective to maximum torque available.



Certain T53-L-13 engines may experience a torque oscillation at the time of N2 droop. This may be caused by transient opening and closing of the bleedband. Adjustment of the bleedband to a lower closing position within the closing range and/or using a higher topping altitude may reduce or eliminate this torque oscillation. If torque oscillation cannot be reduced to 4 PSI or below, the fuel control may be replaced. If torque oscillation is noted, record the nominal indication. If during torque oscillation the maximum torque limit is exceeded, refer to the appropriate manual for over-torque inspections.

- c. Maintain maximum torque until N2 droops to 6400 RPM. Record N1, TQ, EGT, FAT, PA.

**NOTE**

If N2 droops prior to reaching predetermined altitude, maintain 6400 RPM until reaching the next whole altitude, then record N1, Torque, EGT, FAT, PA. If N2 does not droop prior to or at your predetermined altitude, maintain maximum torque until N2 droops or 10,000 feet pressure altitude is exceeded. If N2 droops prior to 10,000 feet pressure altitude, record N1, Torque, EGT, FAT, and PA, at the next whole thousands altitude. If 10,000 feet pressure altitude is reached prior to N2 droops, note the torque at 10,000 feet pressure altitude and temperature to insure that the fuel control is not over trimmed. If necessary, adjust IAW TM 55-2840-229-23. If fuel control is not over trimmed (in excess of 3 PSI required torque) engine topping must be deferred until temperature conditions improve.

- d. Further droop N2 to 6200 RPM insuring N1 does not increase.

**NOTE**

If N1 increases as N2 droops from 6600 to 6500 RPM, the droop cam is probably worn or out of adjustment and the engine is not "topping" out at 6600 RPM and should be corrected. If N1 changes as N2 droops from 6400 to 6200 RPM, the engine is probably not at maximum power and the droop cam must be adjusted before an accurate topping check can be accomplished.

- e. Reduce collective smoothly and slowly. Rapid reduction of collective could cause engine surge, compressor stall, and/or complete unloading of the main rotor system.
- f. Reset altimeter to current setting.
- g. Analyze topping data IAW TM 55-2840-229-23.
- h. Record topping data on DA Form 2408-15 over-print IAW DA PAM 738-751.

**NOTE**

ALL engine troubleshooting and fuel control adjustments will be IAW TM 55-2840-229-23.

**NOTE**

The format in Section V may be used to assist the MTP recording topping data and computation of predetermining topping altitude and does not delete the requirement to record topping data on the Maintenance Test Flight Check Sheet.

**H. Flight Check - Model TA-2S Fuel Control P/N 84200A Series.**

1. Using the appropriate aircraft - 10 find MAX TQ available for ambient conditions.
2. Stabilize at an altitude of 1000 feet or higher.
3. Verify N2 at 6600 RPM.
4. Adjust airspeed to MAX rate of climb airspeed.
5. Increase collective to obtain MAX AVAIL TQ. (Use the same pitch pull as that for Engine Response Check).



Do not exceed torque, EGT, or N1, Limits.

6. Climb at this rate for 500 feet.
7. Check N2 for decay.
8. If decay is evident, troubleshoot the following systems:
  - a. Check bleed band for proper adjustment/closure range.
  - b. Check droop compensator rigging.
  - c. Check N2 rigging for play in linkage.

- d. Check N1 rigging.
- e. Insure proper droop cam is installed.
- f. Insure shear pin in N2 linkage is not sheared.
- g. Check for faulty overspeed governor.
- h. Insure fuel control is trimmed properly.
- i. Replace fuel control if the above items are found to be corrected.

**SECTION V. CHARTS AND FORMS**

**General.** This section contains the necessary charts and forms required to ascertain that the aircraft is performing to established standards and to record readings, pressures, RPM, etc., obtained during the maintenance test flight.

**LIST OF CHARTS**

<b>FIGURE NUMBER</b>	<b>TITLE</b>	<b>PAGE</b>
5-1	Bleed Band Closure Chart, Model TA-2S, P/N 84200-A7 Fuel Control	5-3
5-2	Bleed Band Closure Chart, Model TA-7 P/N 100770-A4 Fuel Control	5-4
5-3	Variable Inlet Guide Vane Opening Chart	5-5
5-4	Power Adjustment Chart T53-L-13B Engine	5-6
5-5	UH-1H/M HIT EGT Worksheet	5-7
5-6	Main Rotor Track and Balance Chart (UH-1H/V, EH-1H/X)	5-8
5-6.1	Main Rotor Track and Balance Chart (UH-1C/M)	5-9

**LIST OF CHARTS (CONT)**

<b>FIGURE NUMBER</b>	<b>TITLE</b>	<b>PAGE</b>
5-7	In-Flight Main Rotor Tracking Record Sheet	5-10
5-8	In-Flight Main Rotor Tracking Chart	5-11
5-9	Tail Rotor Balance Chart (Old-Style)	5-12
5-10	Tail Rotor Balance Chart (New-Style)	5-13
5-11	Suggested TEAC DATA Format	5-14
5-12	Maintenance Test Flight Check Sheet	5-15



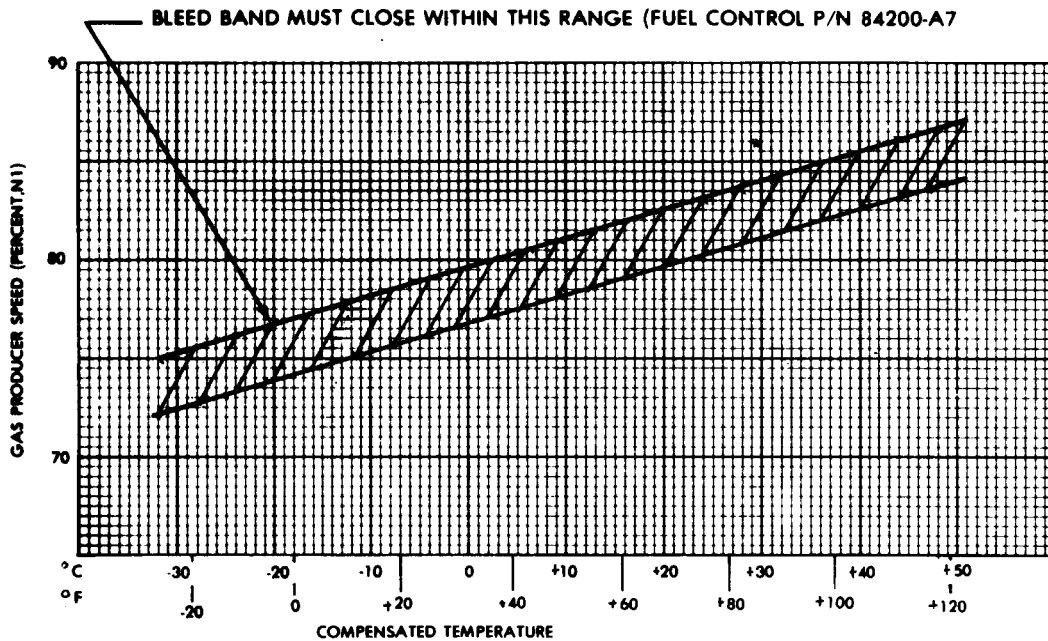


Figure 5-1. Bleed Band Closure Chart Model TA-2S Fuel Control

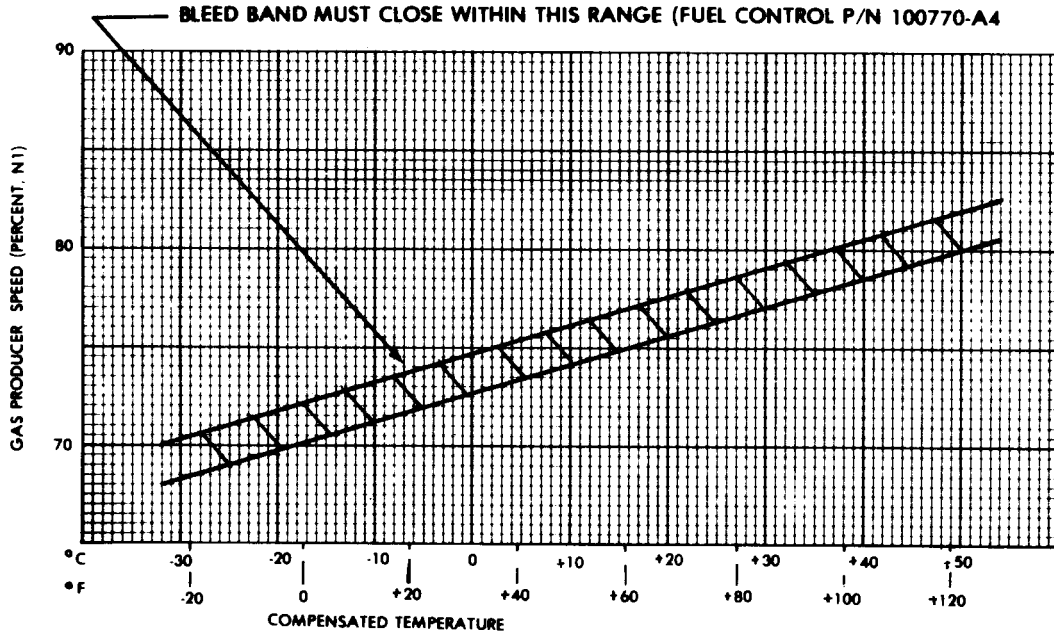


Figure 5-2. Bleed Band Closure Chart Model TA-7 Fuel Control

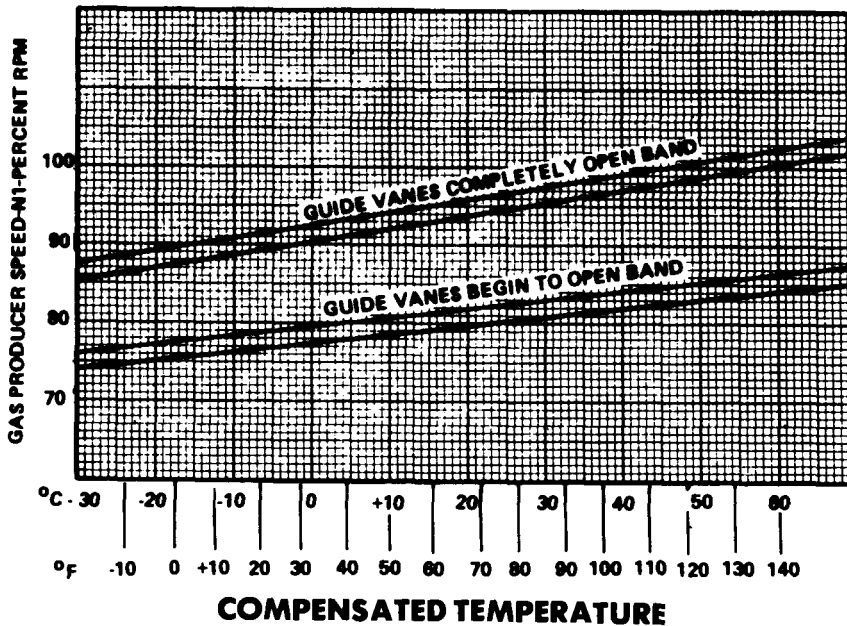


Figure 5-3. VIGV Opening Chart

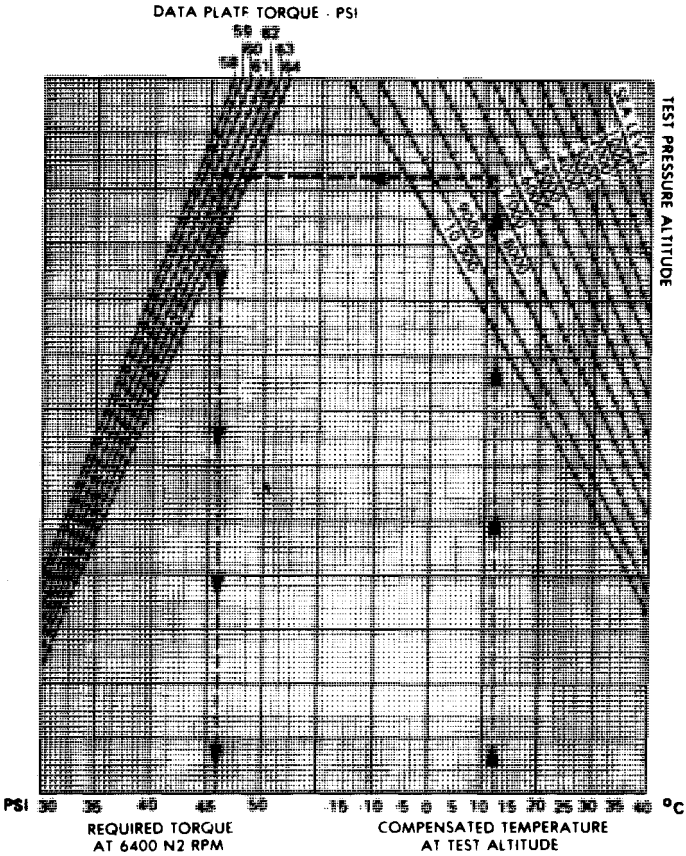


Figure 5-4. Power Adjustment Chart T-53-L13B Engine

$\Delta$ EST B	EST	$\Delta$ EST A	N 1 %	OAT °C	$\Delta$ EST B	EST	$\Delta$ EST A	N 1 %	OAT °C
-40		+40	87.7	0	-201		+201	77.4	-60
-35		+35	88.0	2	-196		+196	77.8	-58
-30		+30	88.3	4	-191		+191	78.1	-56
-24		+24	88.7	6	-185		+185	75.5	-54
-19		+19	89.0	8	-180		+180	78.8	-52
-14		+14	89.3	10	-175		+175	79.2	-50
- 8		+ 8	89.6	12	-169		+169	79.5	-48
- 3		+ 3	89.9	14	-164		+164	79.9	-46
					-158		+158	80.3	-44
					-153		+153	80.6	-42
+ 3		- 3	90.1	16	-148		+148	80.9	-40
+ 8		- 8	90.4	18	-142		+142	81.3	-38
+13		-13	90.7	20	-137		+137	81.6	-36
+18		-18	91.0	22	-132		+132	82.0	-34
+24		-24	91.4	24	-126		+126	82.3	-32
+29		-29	91.7	26	-121		+121	82.7	-30
+35		-35	92.1	28	-115		+115	83.0	-28
+40		-40	92.4	30	-110		+110	83.3	-26
+45		-45	92.7	32	-105		+105	83.7	-24
+51		-51	93.0	34	- 99		+ 99	84.0	-22
+ 56		- 56	93.3	36	- 94		+ 94	84.4	-20
+ 62		- 62	93.6	38	- 89		+ 89	84.7	-18
+67		-67	93.9	40	- 83		+ 83	85.0	-16
+72		-72	94.2	42	- 78		+ 78	85.3	-14
+77		-77	94.5	44	- 73		+ 73	85.7	-12
+83		-83	94.9	46	- 68		+ 68	86.0	-10
+88		-88	95.2	48	- 62		+ 62	86.3	- 8
+93		-93	95.5	50	- 57		+ 57	86.7	- 6
					- 51		+ 51	87.0	- 4
					- 46		+ 46	87.4	- 2

Figure 5-5. UH-1 H/M Hit EGT Worksheet

**BALANCE DATA**

MEASURED ONLY IN CASES OF SEVERE SWEEP CHANNEL "A" (LATERAL) ACCELEROMETER.

	1st Run	2nd Run	3rd Run	4th Run	5th Run	6th Run
Check BEARING of one each balance screw						
Check angle						
MANUALLY "19"						

SEVERE	CRANK TO TARGET Blade Bolt					
	CRANK TO BLANK Blade Bolt					
	SWEEP TARGET Blade Aft					
	SWEEP BLANK Blade Aft					

Mount empty blade  
forward of "crank"  
or "sweep" position.

The amount of weight or sweep required may be somewhat different for the various models of Army.

**DO NOT ATTEMPT TO BALANCE UNLESS SWEEP IS IN GOOD SEVERE TRACK.**

Set Balancer to 324 RPM.

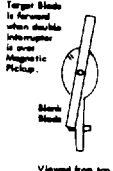
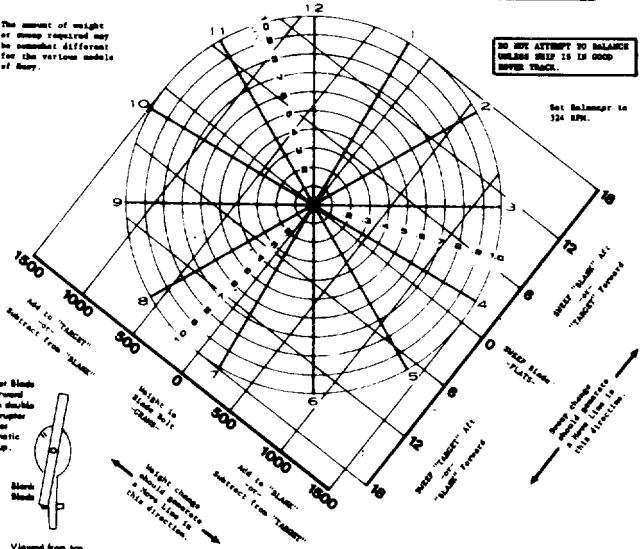


Figure 5-6. Main Rotor Track and Balance Chart (UH-1H/V, EH-1H/X)

Figure 5-6.1. DELETED

**Change 1 5-9**

IN-FLIGHT TRACKING DATA

FLIGHT NUMBER		ROTOR BALANCE BEARING (CHANNEL A)	TRACK (CHANNEL B) AT AIRSPEED			CHANGE BEFORE NEXT FLIGHT
			60	90	110	
1	TRACK					
	CLOCK ANGLE					
	"IPS"					
2	TRACK					
	CLOCK ANGLE					
	"IPS"					
3	TRACK					
	CLOCK ANGLE					
	"IPS"					
4	TRACK					
	CLOCK ANGLE					
	"IPS"					
5	TRACK					
	CLOCK ANGLE					
	"IPS"					
6	TRACK					
	CLOCK ANGLE					
	"IPS"					

Figure 5-7. In-Flight Main Rotor Tracking Recording Sheet.



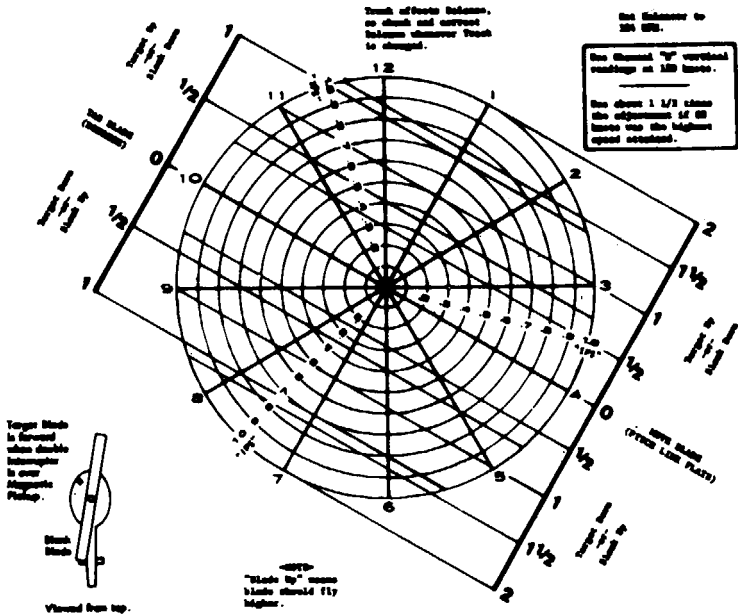


Figure 5-8. In-Flight Main Rotor Tracking Chart.

# TM 55-1520-242-MTF

		1st Run	2nd Run	3rd Run	4th Run	5th Run
<b>A</b>	TRACE					
	Clock Angle					
	"IPS"					
<b>C</b>	TARGET					
	<b>A</b>					
	<b>B</b>					
	<b>C</b>					

- NOTES:**
- 1) Track tail rotor. Viewing tail rotor disc from side, adjust Strobe oscillator so the single grip target appears as a STOPPED image of 4. Then view rotor edge-on, from cabin door, and observe track of tip targets.
  - 2) Set Balance to 1600 RPM (RPM Tune dial to 165, and RPM Range to 1 10), switch to "ACC B", and Strobe oscillator "OFF". View "Clock Angle" of grip target from side of tail rotor disc.
  - 3) Now press "Verify Tune" button and adjust "RPM Tune" dial, WHILE BUTTON IS PUSHED, to return target to angle observed BEFORE BUTTON WAS PUSHED. Release, observe angle, depress and adjust again to match new "unpushed" angle. Repeat until there is NO CHANGE WHETHER BUTTON IS PUSHED OR RELEASED. TUNE ONLY WITH BUTTON PUSHED.
  - 4) Read "Clock Angle" with button released, and "IPS" WITHOUT STROBE FLASHING, and record in section A of chart.
  - 5) Repeat readings, plot in Section B (label it point #1), and note required changes in C. Make indicated changes on rotor.
  - 6) If it is, proceed to balance to .2 "IPS" or less. If not, use "Clock Angle Corrector" #3597 to correct clocks, and then proceed.

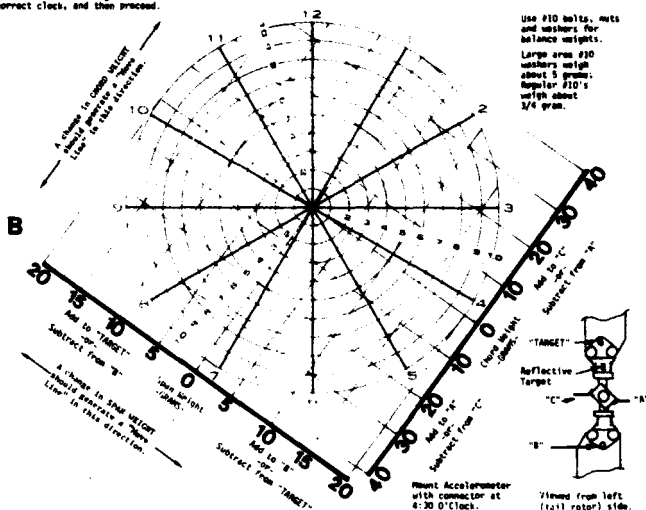


Figure 5-9. Tail Rotor Balance Chart

Figure 5-10. DELETED

# TM 55-1520-242-MTF

SUGGESTED FORMAT FOR TEAC DATA

MTP NAME _____	TYPE TEAC _____	DATE _____
ACFT / _____	<b>INC SER #</b> _____	CAL FACTOR _____
Predetermine Topping Altitude:		
a. MAX M1 .....	_____	
b. Subtract 2% .....	_____	- 2
c. Adjusted M1 .....	_____	
d. M1 at 40 psi at selected altitude .....	_____	
e. Difference between "d" and "c" .....	_____	
f. Multiply "e" by 2000' .....	_____	x 2 0 0 0
g. Product of "e" and "f" .....	_____	
h. Add altitude used in step "d" .....	_____	
i. Predetermined Tapping Altitude .....	_____	

TEAC <b>Computation</b>	<b>M1</b>	<b>TQ</b>	<b>NOT</b>
BASELINE DATA	_____	_____	_____
ADJ FACTOR (Temp/Alt)	_____	NONE	_____
REQUIRED DATA	_____	_____	_____
ACTUAL INDICATIONS	_____	_____	_____
DIFFERENCE	_____	_____	_____

Figure 5-11. TEAC Data Format.

Change 1 5-14

UH-1 B, H, M, V & EH-1H/v		DATE
PURPOSE OF FLT	FAT	ADVT MODEL 1-34
PILOT		UNIT
SYMBOLS: P = TATIC/STAC/DEY M = DEFICIENCY		
Prior to Test Flight		2. Power Check
1. Forms and Records		3. Control Responses Checks
2. Flight Readiness Insp.		4. Pylon Mounts Checks
3. Weight and Balance		5. Engine Response
4. Engine Baseline Data		6. Power Cylinder
TO NI EGT		7. Low RPM Hover
Starting Engine		8. Hover in Emergency
1. Press to Test Lights		9. Torque Meter PSI
2. Fire Warning Light		LEVEL OFF CHECKS
3. Caution Panel Lights		1. Eng Oil Press Temp
4. Throttle System Cushion		2. XMSN Oil Press Temp
OPEN CLOSED		3. EGT °C
ENGINE RUNUP		4. Airspeed Indicators
1. Engine Idle % NI		INFLIGHT CHECK
2. Emerg Gov Switch		1. Control Rigging
3. Hydraulic System		2. Autorotation RPM
4. Fuel Boost Pumps		3. Hydraulics Off
Right PSI Left PSI		4. TEAC: PA
5. Bleed Band Operation		FAT TQ
OPEN CLOSE % NI/FAT		NI EGT
6. Variable Inlet Guide Vanes		5. Stabilizer Bar
BEGIN TO OPEN % NI/FAT		6. Vibration Analysis
7. Fuel Quantity Gage		7. Cyclic Rigging
8. Pitot Heater		8. Fuel Consumption Initiate
9. Spare Inverter		TIME FUEL
AB AC BC		9. Instruments
10. Main GEN VDC		Altimeters Att. Ind.
11. STBY GEN VDC		VSI Stby Comp
12. Main Inverter		RMI Clock
AB AC BC		Turn & Slip
13. Bleed Air Heater		10. Comm/NAV Radios
14. Deice Operation		UHF VHF FM1 FM2
15. Low RPM Warning		VOR ADF LOC/GS
Off On		MB XPONDER
16. GOV INCR/DECR		MODE C
Full Incr DECR		11. Fuel Consump. Complete
Travel Time SEC		Time Fuel
17. High RPM Warning		AFTER LANDING/ENGINE SHUTDOWN
OFF ON		1. EGT
18. Force Trim System		2. Eng Oil Press Temp
19. Collective Friction		3. XMSN Oil Press Temp
UP DOWN		4. Eng Idle % NI
20. Eng Oil Press Temp		5. Battery
21. XMSN Oil Press Temp		6. Eng Oil Press Lite
22. Fuel Press PSI		7. XMSN Oil Press Lite
23. Torque Press PSI		8. NI Coastdown Time Sec
24. EGT °C		9. Emerg. Collective Accum.
25. Altimeters P CP		10. Post Flight
BEFORE TAKEOFF		11. Forms & Records Complete
1. HIT Check		SPECIAL REQUIREMENT (LIST)
HOVER CHECK		1.
1. Takeoff to hover		2.

Figure 5-12. Suggested Maintenance Test Flight Check Sheet (Sheet 1 of 2)

ROTOR SMOOTHING RECORD

RED BLADE SERIAL NUMBER					WHITE BLADE SERIAL NUMBER				
ADJUSTMENT NUMBER	TAB	ROLL	BALANCE	EFFECT	ADJUSTMENT NUMBER	TAB	ROLL	BALANCE	EFFECT
1					1				
2					2				
3					3				
4					4				
5					5				

REMARKS

\_\_\_\_\_  
PILOTS SIGNATURE

Figure 5-12. Aft Side of Maintenance Test Flight Check Sheet  
(Sheet 2 of 2)

**TM 55-1520-242-MTF**

**By Order of the Secretary of the Army:**

**Official:**

**JOHN A. WICKHAM, JR.**  
*General, United States Army*  
*Chief of Staff*

**MILDRED E. HEDBERG**  
*Brigadier General, United States Army*  
*The Adjutant General*

**DISTRIBUTION:**

To be distributed in accordance with DA Form 12-31, MTF Maintenance requirements for All UH-1 series aircraft and EH-1H/X Helicopter, Electronic Countermeasure & Intercept aircraft.

