* TM 1-1520-228-MTF

TECHNICAL MANUAL

MAINTENANCE TEST FLIGHT MANUAL FOR

FOR ARMY MODEL OH-58A/C HELICOPTER

* This manual supersedes TM 1-1520-228-MTF, dated 28 February 2003, including all changes.

HEADQUARTERS
DEPARTMENT OF THE ARMY
15 MAY 2007

WARNING

A maintenance test flight is an exceptionally demanding operation and requires a thorough flight readiness inspection (PREFLIGHT). The flightreadiness inspection is prescribed in TM 1-1520-240-10 Operator's Manual and must be completed prior to each maintenance test flight. Emergency procedures are found in the applicable -10 or checklist (CL) 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 shall be used only by qualified maintenance test flight pilots as required in AR 95-1.

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 or DA Form 2028 (Recommended Changes to Publications and Blank Forms) located in the back of the maintenance manual, directly to: Commander, U.S. Army Aviation and Missile Command, ATTN: AMSAM-MMC-MA-NP, Redstone Arsenal, AL 35898-5000. A reply will be furnished to you. You may also provide DA Form 2028 information to AMCOM via e-mail, fax, or the Wide World 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 maintenance manual immediately preceding the hard copy 2028. For the World Wide Web use: https://amcom2028.redstone.army.mil.

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SECTION I. INTRODUCTION

1. PURPOSE. The purpose of this manual is to provide complete instructions for performing a maintenance test flight of OH-58A/C Helicopters. For the specific conditions which require a general or limited maintenance test flight, refer to TM 1-1500-328-23, TM 11-1520-228-20 (OH-58A), TM 11-1520-228-20-1 (OH-58C) and TM 11-1520-228-23P.

2. DEFINITION.

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

Highlights an essential operating or maintenance procedure, practice, condition, statement, etc. which if not strictly observed, could result in injury to, or death of, personnel or long term health hazards.

CAUTION

Highlights an essential operating or maintenance procedure, practice, condition, statement, etc., which if not strictly observed, could result in damage to, or destruction of, equipment or loss of mission effectiveness.

NOTE

Highlights an essential operating or maintenance procedure, condition or statement.

3. GENERAL INFORMATION.

a. This manual covers only maintenance test flight of OH-58A/C helicopters and in no way supersedes any information contained in TM 55-1520-228-10 or TM 1-1520-228-CL, but is to be used in conjunction with the -10 and -CL. For the purpose of maintenance test flights only, this manual satisfies all the requirements of the -CL from "Before Starting Engine Checks" through "Engine Shutdown Checks."

b. Crew requirements will be as specified in TM 1-1500-328-23 and TM 55-1520-228-10.

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 test flight required (i.e., general or limited).

c. Configuration. The configuration of the helicopter should be determined prior to the maintenance test flight in order to determine performance parameters.

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

e. Reference. 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. Symbol(s) Preceding Numbered Steps.

1. Asterisked Checks. An asterisk (*) prior to a check requires that the Test Flight Check sheet be annotated. Record a check (√) for satisfactory performance, or an (X) for a problem detected, with a short statement entered in the remarks block of the check sheet.
2. If installed. The symbol (O) prior to a step indicates that this step shall be performed if the associated equipment is installed on the aircraft.

g. Maintenance Test Flight Check Sheet. The sample check sheet contained in will be used on all Maintenance Test Flights. When a test flight is performed for the purpose of determining if specific equipment or systems are operating of only that portion of the Maintenance Test Flight (MTF) Check Sheet applicable to the specific equipment or systems being tested is needed. The helicopter test flight Check Sheets may be locally reproduced. Continuation sheets may be used when necessary. Items that prove to be unsatisfactory during the test flight, and require corrective action, shall be listed in the remarks block during flight and transferred to DA Form 2408-13-1 immediately after termination of the flight. The sheet will be attached to DA Form 2408-13-1 upon completion. After accumulation of two or more sheets, the data should be reviewed to determine if trends are developing.

h. Series and Effectivity Codes.

NOTE

All OH-58A and OH-58C model aircraft are now equipped with the T63-A-720 Engine.

Procedural requirements peculiar to individual series and configurations are indicated by the following codes:

A – OH-58A

C – OH-58C

SECTION II. MAINTENANCE TEST FLIGHT CHECKLIST

GENERAL. This section contains the maintenance test flight requirements peculiar to Army model OH-58A/C helicopters. 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 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.

PRIOR TO MAINTENANCE TEST FLIGHT

* 1. Forms and records — Check.

* 2. Preflight — Perform IAW TM 55-1520-228-10.

3. Special preflight checks — Complete as applicable.

BEFORE STARTING ENGINE CHECKS

1. Pedals — Adjust as required.
2. Seat belts and shoulder harness — Fasten and adjust.
3. Shoulder harness, inertia reel and lock — Check operation and leave unlocked.
4. Cyclic control — Friction off, check freedom of movement through full range of travel (note main rotor pitch change).
5. Collective control — Friction off, check freedom of movement through full range of travel (note main rotor pitch change and coupling effect).
6. Pedals — Check pedals through full range of travel, and no binding.

BEFORE STARTING ENGINE CHECKS (CONT.)

7. Throttle — Full Open, close to idle stop, check for positive stops. Check idle release, close throttle.
8. Avionics — Off. Set as required.
9. System Instruments — Check gage security, static indications, and range marking in accordance with TM 55-1520-228-10.

NOTE

Any round instrument which has a range marking on glass face must also have a white slippage mark from the glass to frame.

a. **A** MODEL
   1. ENG OIL PRESsure.
   2. ENG OIL TEMPerature.
   3. AMPS meter.
   4. FUEL QTY.
   5. TORQUE meter.
   6. TOT gage.
   7. Gas Producer Tachometer.
   8. Dual Tachometer.
      a. ENGINE.
      b. ROTOR.

b. **C** MODEL
   1. Gas producer tachometer.
   2. TOT gage.
   3. ENG OIL Temperature.
   4. ENG OIL Pressure.
   5. XMSN OIL pressure.
   6. AMPS meter.
   7. FUEL QTY.
   8. TORQUE meter.
   9. Dual Tachometer.
      a. ENGINE.
      b. ROTOR.

10. Clock — Set time, check wound and running.

BEFORE STARTING ENGINE CHECKS (CONT.)

NOTE

Any round instrument which has a range marking on glass face must also have a white slippage mark from the glass to frame.

11. Flight Instruments — Check instrument security, static indications, and range markings in accordance with TM 55-1520-228-10.

    a. AIRSPEED indicator.

    b. C Attitude indicator:

       C — Warning flag visible. Rate of turn pointer out of view. Ball centered, full of fluid.

       A — OFF flag visible.

    c. RBI — OFF flag visible, deviation card calibrated within the last 12 months.

    d. C Omni bearing selector — OFF flag visible, needles centered.

    O e. Radar Altimeter — OFF, and set.

    * f. Altimeter — Set field elevation, except AIMES.

    g. IVSI — Check indication.

    h. A Turn and Slip indicator — Needle ball centered, full of fluid.

    i. Magnetic compass — Check fluid level discoloration, approximate correct heading, deviation card calibrated with the last 12 months.

BEFORE STARTING ENGINE CHECKS (CONT.)

12. Misc Control Panels and Switches.
    a. **A MODEL**
        (1) DIR GYRO switch — MAG.
        (2) IFF CODE switch — OFF.
        (3) FORCE TRIM switch — FORCE TRIM.
        (4) HYD BOOST switch — HYD BOOST.
        (5) FUEL BOOST switch — OFF.
    b. **C MODEL**
        (1) IFF CODE switch — OFF.
        (2) RMI BRG PNTR switch — As required.
        (3) DIR GYRO switch — MAG.
        (4) FORCE TRIM switch — FORCE TRIM.
        (5) HYD BOOST switch — HYD BOOST.
        (6) FUEL BOOST switch — OFF.
13. Cockpit Utility light(s) — OFF.
14. HEATer Rheostat — Check smooth operation and contact of both stops. Turn off (counterclockwise).
15. Overhead Circuit Breakers and Switches:
    a. Circuit breakers — All in.
    b. CONSOLE LTS and INST LTS rheostats — As required.
    c. ANTI-COLLISION LTS switch — ANTI-COLLISION LTS.
    d. NVG POS LTS switch — As required.
    e. POS LTS switch — As required.
    f. **C** CSL LT switch — As required.
    g. AUTO ENG OIL switch — OFF.
    h. HTR switch — OFF.
    i. DEFOG & VENT switch — OFF.
    j. PITOT HTR switch — OFF.
    k. ENG DEICE switch — OFF.

BEFORE STARTING ENGINE CHECKS (CONT.)

l. INV switch — OFF.

m. NON-ESS BUS switch — As required.

n. GEN switch — OFF.

o. BAT switch — OFF.

p. AUX RECP switch — OFF.

16. Fuel Valve Handle — Check for smooth operation and positive on/off position, threads in witness hole, cotter keys present, cracks, and excessive grooves on lever arm. Leave in forward (on) position and lock into detent.

* 17. FAT Gage — Check condition and security. Read OAT and determine N1 and maximum starter engine engage time.

18. BAT switch — BAT (OFF for GPU start); Ground Power Unit Connected for GPU start. Check for appropriate electrical indications.

19. Light System Checks:

a. Cockpit light — Check condition and smoothness of operation of rheostat, blue-green lens, and power cord. Leave in the off position.

b. Interior lights — Check operation of console and instrument light.

* 20. Warning Lights:

a. ROTOR RPM light — On.

b. ENGINE OUT light — On.

c. XMSN OIL PRESS light — On.

d. XMSN OIL HOT light — Off.

e. Warning lights — Press-to-test.

f. XMSN OIL HOT light — On when switch is depressed.

* 21. CAUTION Panel — Check.

BEFORE STARTING ENGINE CHECKS (CONT.)

* 22. MASTER CAUTION light A Flashing, C On — Hold test/reset switch to test and check all caution lights on.

a. Check dim capability with INST LTS rheostat offset from DIM position.

b. Reset caution lights. All caution lights should be off except INST INVERTER, DC GENERATOR, and HYD PRESS.

23. Misc Caution Lights:

IFF CODE MODE light — On when pressed.

24. Misc Instruments:

a. A ENG OIL TEMP and TOT GAGES, C ENG OIL TEMP — Check against Fat gage for approximately correct indication.

b. FUEL QTY — Check.

c. AIMES altimeter — Set (if installed).

25. Engine Out/Low Rotor Audio — Check by raising collective. Audio should be heard when collective is raised approximately one inch.

26. GOV RPM — DECR for seven seconds.

27. Throttle — Check closed.

28. Starter/ignition lock switch — On.

STARTING ENGINE CHECKS

1. Fireguard — Posted.

2. Rotor Blades — Check clear and untied.

WARNING

Do not have battery on and APU system charging simultaneously for more than 2 minutes. This will prevent an unmonitored battery from overhearing and possibly exploding.

STARTING ENGINE CHECKS (CONT.)

CAUTION

Refer to TM 55-1520-228-10 for engine starting limits. Abort start if abnormal conditions are noted.

CAUTION

In the event of a GPU failure during starting, the starter will cease to function and a hot start could occur. Immediately close the throttle, place the BAT switch to BAT and complete abort start procedures. Note peak TOT and record on DA Form 2408-13-1, if TOT limits are exceeded.

3. Engine Start:
   a. FUEL BOOST switch — FUEL BOOST, note momentary illumination of FUEL BOOST caution light, then out.
   b. STARTER switch — Press and hold. Start time.
   c. TOT — Check below 200° C.
   d. THROTTLE — Open to engine idle when the minimum N1 provided below is reached:

FAT	MINIMUM
Above 7°C	15%
–18°C to 7°C	13%
Below –18°C	12%

   e. ENG OIL PRESS — Check for increase by 20% N1 RPM or abort start.
   f. Main Rotor — Check turning by 30% N1 RPM or abort start.

STARTING ENGINE CHECKS (CONT.)

* g. TOT — Monitor for overtemperature conditions and record both peak indications, ensure TOT stabilizes.

h. ENGINE OUT light — Check at 55 ± 3% N1 RPM.

* i. STARTER switch — Release at 58-62% N1 RPM and record duration of start time.

j. ENG OIL PRESS — Check indication.

k. **C** XMSN OIL indicator — Check indication.

l. XMSN OIL PRESS — Check out.

m. TORQUEmeter — Check indication by 62% N1 RPM.

n. GAS PRODUCER tachometer — Approximately 62 - 64% RPM.

o. **A** Dual Tachometer — Check stabilized within one needle width. **C** Needles joined.

p. CAUTION lights — All out except DC GEN and INST INV.

4. GPU — Disconnect (if used).

CAUTION

Check GPU disconnected prior to turning the BAT switch to BAT.

5. BATtery switch — BAT (GPU start).
6. GEN switch — GEN, check CAUTION panel lights out, check AMPS (meter), N1, and TOT, Monitor AMPS (meter) for gradual decrease in amps.
7. CAUTION panel and MASTER CAUTION lights — Out, except for INST INV.
8. Check for leaks.

STARTING ENGINE CHECKS (CONT.)

9. Circuit breakers — All in.
10. ENG OIL TEMP — Check for indication and rising.

ENGINE RUNUP CHECKS

* 1. Cyclic Check:

CAUTION

Limit cyclic to two inches maximum displacement from center.

a. FORCE TRIM switch — FORCE TRIM, check for positive feeling of force gradient springs. No loose play allowed, check for approximately equal forces needed to offset cyclic into lateral and fore and aft positions. Check operation of both cyclic force trim interrupter switches. Note both cyclic sticks, equally aligned.

b. FORCE TRIM switch — Off. Check for creep and motoring. Check for freedom of movement. No binding or restriction allowed.

c. Use spring scale to check all quadrants for equal force of one pound ± 0.5 pound. FORCE TRIM ON after check.

d. Cyclic friction Check. — Cyclic friction full on.

e. Force Trim — OFF. Ensure cyclic can be moved without excessive force. Check that both cyclic sticks are equally aligned.

f. Force Trim — ON. Friction off.

* 2. Collective Check:

a. Raise collective a maximum of 1/2 inch. Use spring scale to check built-in friction of 4 to 6 pounds. Collective down.

ENGINE RUNUP CHECKS (CONT.)

b. Raise collective to mid-travel while checking for binding and hard spots. Collective down and observe control reaction and that HYD BOOST light remains out. Collective down.

c. Collective friction on. An acceptable increased force should be required to move the collective. Collective down, friction off.

CAUTION

Limit cyclic to two inches maximum displacement from center.

CAUTION

Before any movement of controls with the hydraulic system off, both hands must be on the controls.

CAUTION

If a copilot/observer is used, brief not to remove his hand from hydraulic control switch unless instructed to do so. Be prepared for possible up forces on collective. If up forces are excessive, return switch to on. This condition must be corrected before continuing.

* 3. Hydraulic System Check

a. FORCE TRIM OFF, HYD BOOST switch OFF, RESET caution panel. Check for unusual forces or feedback while moving cyclic.

ENGINE RUNUP CHECKS (CONT.)

NOTE

Feedback forces will be encountered when moving the cyclic stick. If hydraulic servos are functioning properly, negligible forces will be required to maintain a given stick position once the stick is stopped.

b. Check that collective can be moved up to about mid-travel and moved full down.

c. Pull HYD BOOST SOL circuit breaker to check fail safe system. Check hydraulic POWER RESTORED and HYD PRESS caution light out. HYD BOOST switch ON, circuit breaker in. FORCE TRIM on.

CAUTION

Observe engine overspeed limitations during steps 4 and 5.

4. Throttle — Slowly increase to full open, 95% N2 RPM. Check all instrument and lights are normal. Check for high frequency vibrations.

* 5. GOV RPM Switch — Carefully increase to 101% to 103%. Check for approximately 7% spread. Decrease to 95% and note travel time of 5 to 10 seconds. Actuator should operate smoothly. Increase to 100% N2.

* 6. Compressor Bleed Valve Check:

NOTE

Ensure aircraft and engine are properly prepared for this check. Refer to TM 55-2840-241-23. Ensure all bleed air is off.

a. Have observer monitor bleed valve. For communication between pilot and observer, use helmets and extension cord to passenger communication box.

ENGINE RUNUP CHECKS (CONT.)

b. If bleed valve is not in the closed position, apply collective until valve is fully closed, unless aircraft becomes light on the skids.

NOTE

If FAT is 17°C or higher, it will be necessary to increase helicopter gross weight, not to exceed max gross weight. Due to environmental conditions, it may not be possible to check the valve in the fully closed position.

c. With bleed valve closed, friction collective and reduce throttle to engine idle. Let N2 stabilize. Observer should check that bleed valve is fully open.

* d. Slowly increase throttle until observer indicates bleed valve starts to close. Record N1.

* e. Continue to increase throttle until observer indicates bleed valve is fully closed. Record N1.

f. Collective — Down, friction off, N2 100%.

CAUTION

Ensure aircraft and engine are prepared for flight after below check.

g. Check compressor bleed valve chart for correct operating range of the bleed valve. Refer to TM 55-2840-241-23.

CAUTION

If torsional oscillation does not dampen by 10 cycles, the throttle will be immediately retarded to eliminate the effect of an unstable N2 governor. If torsional oscillation is not corrected and exceeds 10 cycles, damage to the aircraft may occur.

ENGINE RUNUP CHECKS (CONT.)

CAUTION

Brief copilot/observer to guard pedals by placing his feet approximately 2 inches from the pedals to ensure pilot does not exceed pedal travel limits.

NOTE

Torsional oscillation check must be performed after an engine change, phase inspection, or a change of or adjustment of the engine fuel control, N2 governor, double check valve, accumulators or fuel control air lines.

* 7. Torsional Oscillation Check. — Induce oscillation by making short, quick inputs on the anti-torque pedals. Limit pedal travel to 1 inch. Oscillations should dampen out prior to a maximum of 10 cycles. Monitor N2 tach and torque for excessive oscillation.

* 8. Fuel Boost Pump Check:

a. FUEL BOOST PUMP circuit breaker — Out. Check FUEL BOOST caution light on, reset CAUTION panel lights, MASTER CAUTION light out, stabilize 30 seconds.

b. Throttle — To engine idle, stabilize 15 seconds, check for stable N1.

c. FUEL BOOST PUMP circuit breaker — In. Note no more than 5 amp increase in AMPS (meter) and FUEL BOOST caution light out.

ENGINE RUNUP CHECKS (CONT.)

* 9. Engine Idle Speed:

NOTE

Dual control installation requires an idle speed check from the copilot's side also. Idle speed may be approximately one-half percent higher on copilot's twist grip, but not lower.

a. DC GEN switch — OFF. Check idle speed 62 - 64% N1.

b. Pilot Throttle — Increase approximately 5% N1, then return to idle. N1 should stabilize at 62 - 64%. Note N1% and repeat step verifying N1 returns to same stabilized N1%.

c. Copilot Throttle — Increase approximately 5% N1, then return to idle. Note N1 percent. Repeat step verifying N1 returns and remains stable.

CAUTION

If throttle is inadvertently rolled to the off position, do not attempt to roll it back on. Perform a hot start emergency shutdown if it appears that TOT limits will be exceeded.

* 10. Idle Cutoff Check:

NOTE

Allow TOT to stabilize for two minutes before performing idle cutoff check.

a. N1 Speed — Check and rotate throttle 1/16 inch below engine idle stop.

b. N1 Speed — Stabilize for 15 seconds. N1 must remain stable and engine must not quit.

c. Throttle — Increase to idle position.

11. Gas Producer Fuel Control Deceleration Check — Complete (if required) as follows:

ENGINE RUNUP CHECKS (CONT.)

a. Collective — Down.

b. Deceleration Check — Perform with generator off.

c. Throttle — Full open, N2 RPM 100%. Stabilize at least 15 seconds.

d. Throttle — Idle. Simultaneously start time.

e. As N1 passes through 65%, note time.

NOTE

Practice and/or retakes may be required before proficiency is obtained in timing the deceleration.

f. Check deceleration time. Minimum allowable time is 2 seconds. If deceleration is less than 2 seconds, make two more checks to confirm the time.

g. If deceleration time is less than 2 seconds, the aircraft will not be flown until corrective action is accomplished. Refer to TM 55-2840-241-23.

12. Generator switch — GEN. Generator light out.
13. AMPS — Check indication. AMPS must indicate 60 or less before the inverter is turned on.
14. INVERTER switch — ON/OFF flags on RBI and/or attitude indicator should not be visible after 3 minute max. Check INST INVERTER caution light out.
15. AVIONICS — On. Note no more than 5 amps fluctuation of ammeter while turning avionics on.
16. Throttle — Increase smoothly to full open, increase N2 RPM to 100% with governor control.

ENGINE RUNUP CHECKS (CONT.)

* 17. Engine Deice Check.
    a. ENG DEICE switch — ENG DIECE, note approximately 20°C TOT rise.
    b. ENG DEICE switch — OFF, note TOT decrease to normal. Set switch as required for conditions.
  18. Pitot Heater Check.
    a. PITOT HTR switch — PITOT HTR, note rise in AMPS.
    b. PITOT HTR switch — OFF, note decrease in AMPS. Set switch as required.
  19. DEFOG & VENT Check.
    a. DEFOG & VENT switch — DEFOG & VENT. Note rise in AMPS and swing in mag compass.
    b. Note both blower motors operate properly and check for excessive noise in headset, caused by blower motors or failure of noise suppressors. Check proper operation of defog and vent pull levers.
  20. Heater Check.
    a. HTR switch — HTR, check no TOT increase or warming air from outlets. Rotate HEAT rheostat on, check approximately 20°C TOT rise and warming air from DEFOG and VENT outlets.
    b. DEFOG & VENT switch — OFF, and check for warming air at the heater outlets.
    c. HTR switch — OFF. Check for decrease in TOT and AMPS. Set HTR switch as required.
* 21. Record following instrument indications:
    a. N1 — Stabilized.
    b. TOT — Note stabilized and normal for ambient condition.

ENGINE RUNUP CHECKS (CONT.)

c. ENG OIL TEMP — Note stabilized and normal for ambient condition.

d. ENG OIL PRESS — Note stabilized and as required for N1 speed.

e. C XMSN OIL pressure — Note stabilized and between 40 to 60 psi.

f. TORQUE meter — Note stabilized and reading between 23 and 29%.

22. A Auto Engine Oil Bypass Check.

a. ENG OIL bypass switch — AUTO. Hold caution panel TEST / RESET switch in TEST. Note approximately 15°C rise in engine oil temp. Release TEST / RESET switch.

b. ENG OIL bypass switch — OFF. Note decrease in engine oil temp.

23. Dual Tach — Note needles joined and steady.

24. Avionics — Test program as required.

* a. AN/ARN-89 ADF Radio — Test as follows:

(1) ANT mode operation:

(a) Mode selector — ANT.

(b) Frequency — Select and tune.

(c) CW-VOICE-TEST switch — CW. Note detectable BFO tone in headset.

(d) Tune around selected station frequency and check that BFO tone does vary. Set to null.

(e) CW-VOICE-TEST switch — As desired.

(f) Mode selector — As desired.

(2) COMP mode operation:

(a) Mode selector — COMP.

(b) CW-VOICE-TEST switch — CW or VOICE as appropriate for the received signal.

ENGINE RUNUP CHECKS (CONT.)

(c) AUDIO control — Verify range of control. Set as desired.

(d) Note whether RMI bearing indications are within ± 5° of station bearing (if known).

NOTE

Direction of rotation during TEST and with switch released is indicative of signal strength and shortest distance to rotate, respectively.

(e) CW-VOICE-TEST switch — TEST. Note RMI bearing indicator, rotate 180° ± 5°.

(f) CW-VOICE-TEST switch — CW or VOICE as appropriate. Note bearing pointers return to previously noted bearing ± 5°.

(3) LOOP mode operation:

(a) Mode selector — LOOP.

NOTE

Audio tone should increase and decrease approximately each 90° from originally noted bearing.

(b) LOOP L-R control — Adjust to obtain null. Adjust to obtain the opposite null approximately 180° from original bearing.

(c) LOOP L-R control — Adjust to obtain a maximum deflection on TUNE meter. This should be 90° from the station.

(d) AUDIO control — Adjust for a reading that is below 3 divisions on the TUNE meter.

(e) Repeat steps (c) and (d) until a sharp peak in reading is obtained.

ENGINE RUNUP CHECKS (CONT.)

NOTE

If TUNE meter changes, impedance matching amplifier requires adjustment.

(f) Mode selector — ANT. Note TUNE meter indication.

(g) ADF — Set as required.

b. Radar altimeter — Check. Refer to Section IV Special Procedures.

* c. Transponder — Test. Refer to Section IV Special Procedures.

25. ASE-APR-39 Check — Refer to Section IV Special Procedures.
26. RBI — Check nulled and proper indication.
27. Flight instruments — Check normal, set altimeter to current barometric pressure and compare with field elevation. Altimeter indications should be within 70 feet of field elevation below 5000 feet pressure altitude.
28. Cyclic and collective friction — As desired (recommended OFF for test flight).
29. FORCE TRIM — As desired (recommended OFF for test flight).

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 prior to takeoff.

* 30. HIT Check — Complete.

BEFORE HOVER CHECK

1. N2 — 100%.
2. Warning Lights — Out.
3. Systems — Check engine, transmission, electrical and fuel systems indications.

BEFORE HOVER CHECK (CONT.)

4. Caution Lights — Out.
5. Crew, Mission equipment and Seat belts (inside helicopter) — Check.
6. Avionics — as required.
7. Doors — Secure.

AIRCRAFT HOVER CHECKS

1. Takeoff to Hover — Carefully bring helicopter to a 3-foot hover. Closely monitor control response and predicted C.G. hang as aircraft departs ground. Observe copilot controls are positioned approximately the same as pilot controls, ensure droop compensation maintains constant N2 speed of 100%, and check all instruments normal. Turn helicopter into the wind and check cyclic, collective, and pedals are positioned normally for conditions and power required.

NOTE

During hover checks, check operation of flight instruments as necessary.

* 2. Hover Power Check — While at a stabilized 2-foot hover into the wind, record torque, TOT and N1. Readings should be normal for conditions. Ensure adequate power margin exists IAW ATM requirements.

3. Check parking area for indication of leaks.
4. Slowly hover to test flight area.

NOTE

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

5. Flight Control Rigging Checks.
   a. With aircraft into the wind, check controllability of tail rotor by making pedal turns 90° left and right.

AIRCRAFT HOVER CHECKS (CONT.)

b. With aircraft headed into the wind, perform sideward flight in both directions to check cyclic response and rigging. Limit ground speed to 5 kts.

c. While maintaining 5 feet AGL, fly forward into the wind until effective translational lift is reached, Check cyclic response and rigging, abnormal vibrations, and/or flight control displacement.

* 6. Pylon Isolation Mount Check:

NOTE

The hydraulic caution light may illuminate during this check. This is normal as long as neither the cyclic nor the collective control has any feedback.

While maintaining a 3-foot hover, move the cyclic fore and aft (about 2 to 3 inches) fairly rapidly along a straight line to induce an extremely low frequency vibration. Stop the cyclic in the neutral position and check that the vibrations dampen out prior to 5 cycles. No abnormal vibrations or engine surges are allowed.

7. Land aircraft.

AIRCRAFT HOVER CHECKS (CONT.)

* 8. Power Cylinder Check.

CAUTION

Brief copilot/observer to hold HYD BOOST switch throughout the following check. Should cyclic jam or become hard to move, instruct copilot/observer to turn the HYD BOOST switch off, then on. If cycling the switch does not release controls, turn HYD BOOST switch off and accomplish a hydraulics off landing.

a. Climb and maintain a 10-foot hover, smoothly move the cyclic along a straight line from left rear to right forward. The length of cyclic movement should be approximately 6 inches either side of the center position. No restriction to movement should be felt and the HYD PRESS caution light should not illuminate. This check is primarily a flow capacity check of the hydraulic pump.

b. Repeat the procedure moving the cyclic from right rear to left forward.

c. Return to normal hover altitude upon completion of the check.

* 9. Engine Response Check:

CAUTION

Do not exceed helicopter limits during power application.

CAUTION

N2 may temporarily overspeed or underspeed the RPM selected for a period of approximately 2 to 5 seconds if the collective is moved abruptly.

AIRCRAFT HOVER CHECKS (CONT.)

While maintaining all instruments within normal ranges, make a positive increase in collective and check for nearly instantaneous increase in N1 speed (less than one second). Ensure N2 recovers to 100% within 5 seconds prior to reducing collective. Stop ascent before excessive altitude is gained and descend to normal hover altitude. Engine should respond smoothly and rapidly.

BEFORE TAKE OFF CHECKS

1. N2 — 100%.
2. Warning Lights — Out.
3. Engine Instruments — Normal range.
4. Fuel — Check quantity.
5. Caution Lights — Out.

CAUTION

Seat belts and shoulder harnesses must also be properly fastened and tightened when seats are not occupied.

6. Crew, Mission equipment and Seat belt (inside aircraft) — Check.
7. Transponder — As required.
8. Doors — secure.

INFLIGHT CHECKS

CAUTION

If excessive vibrations are felt or other indications exist that preclude further safe flight, land and/or return to maintenance area and correct before continuing.

1. Takeoff — Perform normal takeoff (500 FPM - 60 KIAS). Check that control position and instrument indications are normal for conditions.
2. Fuel Consumption Check — Initiate.

NOTE

Perform checks 3 through 7 into the wind.

* 3. Control Rigging Check:

a. While maintaining aircraft in trim, increase airspeed to 100 KIAS using 65% torque. Force trim on. Check that cyclic remains in place when hand pressure is relaxed. Force trim off.

b. Check pedal position. One-half inch of forward right pedal is normal after compliance with MWO 55-1520-228-50-25. Relax pedal pressure. Pedals should not creep.

NOTE

Inflight pedal position is an approximate indicator. Primary check for tail rotor rigging will be accomplished before aircraft is released for test flight.

* 4. Autorotation RPM:

WARNING

If autorotation RPM cannot be maintained in the green, terminate the test flight.

INFLIGHT CHECKS (CONT.)

CAUTION

Autorotation will be entered at an altitude that will allow power recovery to be completed prior to 500 feet AGL.

NOTE

Ensure engine deice and/or bleed air is off prior to next check.

a. While keeping a suitable landing area within reach at all time, autorotate at 55 KIAS into the wind. Do not allow rotor RPM to exceed limits. Stabilize autorotation, note N1%, and record rotor RPM. Check adequate pedal to maintain trim and no unusual cyclic position required to maintain desired attitude. Note vibration level or a marked decrease in vibration level. Note torque at/or near zero and no warning or caution lights on. Initiate power recovery for the autorotation.

b. After power recovery, compare autorotation RPM against figure below, and adjust as necessary. In no event should rotor RPM be set to exceed 110% at max gross weight or 93% at min gross weight.

NOTE

MTF MISSION GROSS WEIGHT - 2700 pounds. ROTOR RPM shall be stabilized at 100% ± 1.4% at the selected baseline DA for your operating area. A DA baseline median for the operating area would be, for example: DA summer average is 4000 feet; DA winter average is 2000 feet; median is 3000 feet. This would be the baseline DA for ROTOR RPM autorotational computation.

INFLIGHT CHECKS (CONT.)

NOTE

ROTOR RPM will increase/decrease approximately 1.4% for every 1000 feet increase/decrease in density altitude or 100 pounds increase/decrease in gross weight.

Approx. Mission Gross Weight	Approx. RPM @ 55 KIAS
2700 lbs	100% ± 1.4%

* 5. Engine Performance Check:

NOTE

Under certain climatic conditions, performing an EPC at an altitude at which the maximum power available is less than 100%, may not be possible. When such conditions exist, the test pilot will verify engine power by climbing to the highest obtainable altitude and confirm that the maximum predicted torque is available without exceeding any engine or airframe limits. Maximum torque will be determined from the -10 operator's manual based on the actual pressure altitude and temperature for that flight level. Engine must provide at least the maximum torque without an N2 bleed or exceeding engine or airframe limits. An entry on DA Form 2408-13-1 will be made and a red diagonal status symbol will be entered in Block 16. Block 17 will state: Normal EPC deferred until environmental conditions improve. When environmental conditions improve the test pilot will complete an EPC at an altitude at which the maximum power available is less than 100%.

a. An engine performance check (EPC) is required after any of the following maintenance actions are completed:

INFLIGHT CHECKS (CONT.)

NOTE

Fuel control air lines between the fuel control and the governor, i.e., Pr, Pg, Py and Pc from the "TEE" fitting the fuel control. Pc lines forward of the governor "TEE" fitting are exempt from requiring an EPC, but require a MOC, to include checking fittings with soap spry solution.

(1) Removal/installation/reinstallation of the engine.

(2) Anytime poor performance is noted.

(3) Removal/reinstallation/installation of gas producer fuel control (GPFC), adjustment of maximum speed stop, maximum flow stop, start acceleration, or rigging of the GPFC arm.

(4) Removal/reinstallation/installation of governor (GOV), or droop compensator.

(5) Removal/reinstallation/installation/repair of compressor, fifth stage bleed valve, double check valve, and accumulators.

(6) Calibration/replacement of torque or TOT indicating system.

(7) Anytime the fuel system control air lines are loosened/installed.

CAUTION

Transient droop may occur and N2 speed may droop below 100% N2. This droop must recover within 5 seconds.

CAUTION

Do not exceed any operating limitations.

INFLIGHT CHECKS (CONT.)

NOTE

Maximum power available is achieved when the limits of either TOT, torque, or N1 speed are reached at 100% N2.

NOTE

Ensure all bleed air systems are off prior to check.

NOTE

If weather permits, EPCs should be performed at an altitude that has a predicted maximum torque available of less than 100%.

NOTE

This maneuver will be accomplished so that when maximum power is achieved, the aircraft will be in position to reach a safe landing area.

b. Perform check as follows:

(1) Establish cruise flight at an altitude of 500 feet AGL or above.

(2) Set altimeter to 29.92.

(3) Select a test altitude at which the maximum available torque is less than 100%.

(4) Turn aircraft into the wind and initiate a climb at 70 KIAS.

(5) Climb power should be adjusted as required to avoid prolonged operation in the yellow range of TOT or torque.

(6) At approximately 300 feet prior to the test altitude, power should be increased slowly to reach the limit of TOT, torque, or N1 as the aircraft arrives at the test altitude.

INFLIGHT CHECKS (CONT.)

(7) Upon reaching the test altitude, record the following.

(a) Torque.

(b) N1.

(c) TOT.

(d) Test Altitude.

(8) Return to the test altitude, allow the FAT gage to stabilize and record the actual FAT.

(9) Refer to Chapter 7 of TM 55-1520-228-10 and select the appropriate Maximum Torque Available Chart (30 minute operation). Enter the chart at the elected test altitude, move right to the FAT and the down to the torque value required. Compare the actual torque recorded with the torque shown on the chart.

(10) If the actual torque recorded meets or exceeds the chart torque value, continue the test flight.

(11) If the actual torque recorded is less than the chart torque value or if the limit of either N1 speed or TOT is reached and/or N2 is below 100%, discontinue the test flight and refer to TM 55-2840-241-23 for troubleshooting procedures.

NOTE

Ensure the correct chart was used and the torque required was computed accurately.

(12) Rest the altimeter to the current setting.

INFLIGHT CHECKS (CONT.)

NOTE

If more than one engine performance check is performed, allow at least five minutes at cruise power setting between checks.

* 6. Hydraulic Off Check:

CAUTION

If a copilot/observer is used, brief not to remove hand from HYD BOOST switch until instructed to do so. If any control problems or abnormal forces are encountered, the copilot/observer should be instructed to place the HYD BOOST switch on.

a. While maintaining approximately 70 KIAS for easier controllability, turn HYD BOOST switch — OFF. Check that the cyclic is easily controlled in all quadrants and no abnormal forces are present. More force should be needed to move the cyclic right forward than left forward.

b. Decrease and increase collective and check that at least 17% down and 83% up can be reached without excessive pressure. Do not exceed any limitations during this check. HYD BOOST switch on. Record actual % reached.

* 7. Vibration Analysis — Complete. See Section IV for Detailed Procedures and Section III,Troubleshooting References.

* 8. Flight Instruments Check — Fly at different attitudes and airspeeds to check performance of flight instruments.

NOTE

Eliminate or minimize all main rotor vibrations prior to the following checks.

INFLIGHT CHECKS (CONT.)

a. Airspeed indicator — Check approximately 80 KIAS at hover torque setting and no excessive fluctuation.

b. IVSI — Proper indication for straight and level flight (± 50 FPM).

c. Attitude indicator — Correct indication, no excessive oscillation or precession.

d. Turn and slip indicator — Check proper indication, freedom of movement, no large fluctuations. Perform time turns.

e. Mag compass — Check flying over known heading, no excessive fluctuation.

f. RBI — Check flying over known heading, smooth operation during turns, no binding or fluctuation. No excessive oscillation or precession.

g. Clock — Check still operating and indicating correct time.

h. **C** Radar altimeter — Check for proper operation.

i. All instruments — No excessive vibrations or fluctuation of instruments, mounts or frames. Observe for looseness or cracks at pedestal mounts.

9. Complete fuel consumption check.

* 10. Communication and Navigation Equipment Check:

a. Transponder — Contact radar controller and request a transponder check to include EMER mode.

b. ADF — Fly over operational NDB station maintaining visual track. Check proper operation.

c. FM radios — Check reception and transmission capability on at least 2 frequencies. Check homing indication on one frequency.

INFLIGHT CHECKS (CONT.)

d. VHF radio — Check reception and transmission capability on at least 2 frequencies, and guard.

e. UHF radio — Check reception and transmission capability on at least 2 frequencies, and guard.

O f. KY-58 and T-SEC 1/A — Check.

g. C AN/ARN-123 — Fly ILS and VOR instrument approaches maintaining visual track. Check proper operation (if installed).

BEFORE LANDING CHECKS

1. N2 — 100%.
2. Systems — Check.
3. Crew — Check.
4. Landing Light — Check.

AFTER LANDING CHECKS

1. Landing Light — As required.
2. Transponder — As required.

ENGINE SHUTDOWN CHECKS

1. LDG LTS — OFF.
2. Collective — Full down.
3. FORCE TRIM — FORCE TRIM.
4. Cyclic and Collective Friction — On.

* 5. Battery Check — BAT switch — OFF. If drop in AMPS is less than 5 amps, the battery is fully charged. BAT switch — BAT.

* 6. Note and Record Following Instruments — N1, TOT, ENG OIL TEMP, ENG OIL PRESS (as required for N1 speed), C XMSN OIL PRESS, and TORQUE.

NOTE

Raise collective approximately one inch prior to the next check.

ENGINE SHUTDOWN CHECKS (CONT.)

7. ROTOR RPM light and audio check — Slowly reduce throttle. Check low rotor RPM audio activates and ROTOR RPM light is on at 95% ± 1.4% rotor RPM. When audio activates, lower collective and reduce throttle to engine idle stop.
8. Fuel Boost Pump Check:
   a. FUEL BOOST PUMP circuit breaker — Out. Check FUEL BOOST caution light on, reset CAUTION panel lights, MASTER CAUTION light out, stabilize 30 seconds.
   b. Throttle — To engine idle, stabilize 15 seconds, check for stable N1.
   c. FUEL BOOST PUMP circuit breaker — In. Note no more than 5 amp increase in AMPS (meter) and FUEL BOOST caution light out.
9. Avionics, Electrical switches — Off, except GEN, BAT, and ANTI-COLLISION LTS.
10. Special Equipment — Perform operational checks on all special equipment installed.

CAUTION

If throttle is inadvertently rolled to the off position, do not attempt to roll it back on. Perform a hot start emergency shutdown if it appears that TOT limits will be exceeded.

11. Engine Shutdown — Close throttle, check ENGINE OUT light on by 55 ± 3 N1. Listen for abnormal noises, monitor TOT.
12. FUEL BOOST switch — OFF.
13. GENerator switch — OFF.
14. Lights — OFF when rotor is stopped.
15. BATtery switch — OFF.
16. Starter/Ignition Lock Switch — Off, remove key.

ENGINE SHUTDOWN CHECKS (CONT.)

CAUTION

Do not drop seat belt against side of helicopter. Buckle and bracket will damage honeycomb panel under crewmember door frame.

17. Main Rotor Blade — Tie down.

* 18. Post Flight Inspection — Completed.

19. Engine Inlet Covers — Installed.

20. Checksheet — Signed.

21. All Entries from “Remarks” Column of Checksheet — Transcribed to DA Form 2408-13.

22. Aircraft — Secured.

23. Maintenance Personnel — Debriefed as necessary.

SECTION III. TROUBLESHOOTING

GENERAL. This section contains troubleshooting information that has been referenced in Section II checklists. This section shall list possible condition, 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 start action.

1. Circuit breaker out.
2. Battery power low.
3. Battery cable connector is not properly connected.
4. Starter switch inoperative.
5. Starter brushes excessively worn.
6. Faulty starter relay.
7. Faulty starter.
8. Wiring to starter shorted or broken.
9. Internal seizure of engine.
10. Starter/ignition lock switch not on.

A2. No N1 indication, but starter turns.

1. Faulty N1 tachometer transmitter or instrument.
2. Wiring open or shorted.
3. Starter drive failed.
4. Accessory gear box internal failure.

A3. Unable to get sufficient N1 RPM for start.

1. Weak battery output.
2. GPU underrated, (if used).
3. Too much electrical drain on battery.
4. Internal failure of engine.

A4. Engine fails to light off.

1. Air in fuel lines.
2. Faulty spark ignitor.
3. Faulty circuit to ignition unit.
4. Faulty ignition exciter.
5. Engine driven fuel pump inoperative (fuel vapor not observed leaving the exhaust).
6. Fuel nozzle flow obstructed.
7. Gas producer fuel control remains in cutoff.
8. Contaminated fuel.
9. Fuel line disconnected.
10. Insufficient fuel in tank.

A5. Engine lights off but will not accelerate to idle speed in 45 seconds.

1. Inadequate torque at starter pad.
2. Air in fuel control.
3. Pneumatic air leak.
4. Defective fuel control.
5. Defective power turbine governor.
6. Start derichment valve out of adjustment.
7. PC filter clogged.
8. Starter-generator improperly wired at the starter-generator's lead.

A6. Acceleration temperature too high during start.

1. Dirty particle separator or compressor.
2. Obstructed air inlet.
3. Battery weak.
4. Residual TOT in excess of 200°C prior to start.
5. Throttle improperly rigged.
6. Leaking engine anti-icing valve or lines.
7. Faulty gas producer fuel control or start derichment is set too rich.
8. Starter-generator improperly wired at the starter-generator's lead.
9. Faulty starter which is not capable of dry motoring gas producer N1 above 15%.
10. FOD or erosion to compressor.

A7. Normal start, rotor turns but no N2 indication.

1. Faulty tachometer instrument, transmitter, or wiring.
2. N2 gear box internal failure.

A8. Main rotor not turning by 30% N1, no N2 indication, but normal N1 and TOT indications.

1. Rotor still tied down, either main or tail.
2. Foreign object binding tail rotor drive.
3. Transmission or gear box failure.
4. N2 turbine failed or locked (Do not turn backwards).
5. Engine gearing failure.

A9. Unintentional start termination.

1. Starter switch released too soon.
2. Fuel valve shut off.
3. Circuit breaker pops (starter or ignition).
4. Starter failure (electrical or mechanical).
5. Ignition system failure.
6. Fuel control malfunction.

A10. Main rotor not turning by 30% N1 but normal N1, N2, and TOT indication.

1. Engine driveshaft failure.
2. Freewheeling unit failure.
3. Transmission failure.

A11. Engine continues to accelerate above 64% N1.

1. Throttle positioned above engine idle.
2. Engine idle improperly rigged.
3. Fuel control malfunction.

A12. Gas producer fuel control deceleration check time is less than allowable.

1. Generator on during check.
2. Perform rigging checks (N1 and N2).
3. Perform pneumatic leak check.
4. Fuel nozzle dirty or malfunctioning.
5. Replace fuel control.

A13. HIT check, high TOT.

1. Dirty compressor.
2. Bleed air leaks.
3. Restriction to air inlet.
4. Faulty TOT indicating system.
5. Compressor FOD.
6. Aircraft not turned into the wind.
7. Chart computation in error.
8. Faulty N1 gage.
9. Faulty FAT gage.

TROUBLESHOOTING GUIDE B — INSTRUMENTS

CONDITION

PROBABLE CAUSE

B1. ENGINE OUT light or low ROTOR RPM light inoperative.

1. Caution panel circuit breaker out.
2. Faulty warning system lights.
3. RPM sensors inoperative.

B2. Engine out or low rotor RPM audio inoperative.

1. Headset not plugged in completely.
2. Caution panel circuit breaker out.
3. Collective stick not raised the proper distance.
4. Faulty tone generator.
5. Faulty RPM sensor (N1 or rotor).
6. Engine out warning switch sticking.

B3. Fuel quantity indicator reads low.

1. System out of adjustment.
2. Tank unit has low capacitance.
3. Indicator defective.
4. Low fuel.
5. Low battery voltage.

B4. Fuel quantity indicator reads high.

1. System out of adjustment.
2. Indicator defective.
3. Tank unit shorted.

B5. Fuel indicator remains at one point.

1. No DC power.
2. Defective indicator.
3. Coaxial lead grounded.

B6. Fuel indicator remains at zero or below.

1. Open or broken wiring.
2. Reversed polarity.
3. Indicator failure.

B7. No torquemeter indication after start.

1. Faulty indicator.
2. Clogged, disconnected, or broken pressure line.
3. No oil in system.
4. Torquemeter internal system malfunction.

B8. Torquemeter fluctuates — no other instruments fluctuating.

1. Restriction in pressure line.
2. Faulty indicator.

3. Air in pressure line.

4. Engine oil pressure improperly adjusted.

B9. Low torquemeter indication.

1. Faulty indicator.

2. Low engine oil pressure.

3. Clogged pressure line.

4. Gross weight lower than computed.

5. Performance Planning Card incorrect.

B10. High torquemeter indication.

1. Faulty indicator.

2. Oil pressure and torquemeter lines switched.

3. Performance Planning Card incorrect.

4. Torquemeter internal system malfunction.

B11. Rotor and N2 needles not joined.

NOTE

Normal unless not joined at higher ranges. **A** 97%.

NOTE

All OH-58 **A** aircraft may have up to 2% split due to calibration tolerances.

1. Instrument or tachometer generator malfunction.

2. Wrong instrument installed.

B12. N2 tachometer fluctuates — no other engine instrument fluctuating.

1. Instrument or tachometer generator malfunctioning, wiring loose, moisture in connector plugs.
2. Faulty double check valve.
3. Faulty gas producer fuel valve.
4. Faulty N2 governor.

B13. N2 tachometer error.

1. Faulty instrument or tachometer generator.
2. Wrong instrument or generator installed.

B14. Attitude indicator does not work properly.

1. AC power failure.
2. Circuit breaker out.
3. Loose connections.
4. Improper inverter output, voltage, or cyclic rate.
5. Faulty inverter input voltage.
6. Faulty indicator.

B15. Altimeter reads incorrectly or fluctuates excessively.

1. Leak in static lines.
2. Clogged port or line.
3. Defective instrument.
4. Water in static system.

5. Faulty indicator.

6. **C** No electrical power to instrument.

B16. Airspeed indicator and/or IVSI reads incorrectly or fluctuates excessively.

1. Gusty winds.

2. Pitot tube restricted.

3. Static port or line clogged by water or dirt.

4. Leak in lines.

5. Defective indicator.

B17. Turn and slip indicator needle erratic or inoperative.

1. Sticking gyro.

2. Loose wire or connection.

3. No electrical power to indicator.

4. Defective instrument.

B18. Clock not accurate.

1. Not wound.

2. Defective clock.

B19. Magnetic (standby) compass inaccurate, sluggish or erratic.

1. Improper compensation.

2. Mounting bracket loose.

3. External magnetic interference.

4. Landing light on.

5. Defective instrument.

B20. GYRO — Syn inaccurate or erratic.

1. Compass slaving switch in MAG position or defective.

2. Improper adjustment of transmitter unit.

3. External magnetic interference.

4. Indicating system malfunction.

5. Gyro-Syn compass control malfunction.

6. AC voltage or cycles not correct.

B21. TOT fluctuating, no other engine instruments fluctuating.

1. Faulty indicating system.

2. Loose connections.

B22. TOT shows excessive temperature (incorrect reading).

1. Incorrect resistance spool.

2. Cracked or broken TOT wires.

3. Indicator in need of calibration.

B23. TOT shows no reading on indicator.

1. Loose connections on indicator lead spool resistor or terminal block.

2. Open circuit in indicator.

B24. TOT shows incorrect reading.

1. Harness not calibrated.
2. Defective gage.
3. Improper hardware installed.

B25. Warning lights press-to-test inoperative.

1. Faulty circuit or switch.
2. Bulbs burned out.
3. Dirty contacts.

B26. Excessive instrument vibration.

1. Main rotor severely out of track.
2. Mount of instrument loose or cracked.

B27. FAT gage reading incorrect for known actual ambient temperature.

1. Gage inoperative.
2. Gage probe damaged (overtorque mount nut).
3. Direct sun rays on probe (normal).

B28. Rotor RPM light and/or audio warning not on below 93% rotor RPM.

1. Rotor sensor inoperative.
2. Audio transmitter inoperative.
3. (Audio) Collective is not raised high enough or engine out warning switch sticking.
4. Rotor transmitter inoperative.
5. Rotor or audio connector plugs disconnected.

B29. No engine oil pressure indication.

1. Engine oil pump inoperative.
2. Engine oil pressure line broken prior to reaching indicator.
3. Defective engine oil pressure indicator.
4. Engine oil pump prime has been lost.

B30. Low engine oil pressure.

1. Restriction in oil line going to indicator.
2. Increase in oil pump internal clearance.
3. Oil contamination.
4. Defective engine oil pressure indicator.
5. Oil pressure regulator valve improperly adjusted.
6. Lack of oil in reservoir.

B31. Excessive oil pressure fluctuation.

1. Defective engine oil pressure indicator or regulator.
2. Air in pressure line.
3. Oil leaks.
4. Oil contamination and foaming.
5. Restriction in oil filter or pressure regulator.
6. Low oil supply.
7. Defective oil pump or pump inlet restricted.
8. Restriction in pressure line.

9. Internally kinked or twisted engine oil inlet line.

B32. High oil pressure.

1. Defective engine oil pressure indicator.
2. Pressure regulator valve improperly adjusted.
3. Contaminated or improper oil.

B33. High engine temperature with normal oil pressure.

1. Defective engine oil temperature gage.
2. Defective bypass valve or low level warning switch.
3. Defective engine oil temperature bulb.
4. Improper air flow to oil cooler area.
5. Contaminated or improper oil.

B34. ENG OIL BYPASS light illuminates with a rise in engine oil temp and auto engine oil bypass switch in off position.

1. Defective or improperly wired auto eng. oil switch.
2. Shorted wire from low level warning switch to master caution panel.
3. Engine oil leak or low oil.

B35. C XMSN pressure gage no reading, reads low, reads high, or erratic.

1. Defective transmitter.
2. Defective gage.
3. XMSN oil pressure regulator defective.

4. No XMSN oil pressure.
5. Defective wiring or circuit breaker open.
6. XMSN oil low.

B36. A No rise in engine oil temp when auto oil switch is in auto and caution panel test switch is in test position.

1. Defective or improperly wired auto eng. oil switch.
2. Broken wire from caution panel to oil tank.
3. Defective bypass switch at oil cooler.

TROUBLESHOOTING GUIDE C — ELECTRICAL

CONDITION

PROBABLE CAUSE

C1. Battery will not hold charge.

1. Charging rate too low.
2. Electrolyte level too low.
3. Impurities in electrolyte.
4. Broken cell partitions.
5. Electrolyte overfilled.
6. Shorted or grounded wire.
7. Unbalanced cells.
8. Dirty or loose wire connections.

C2. Short battery life.

1. Improperly adjusted or defective voltage regulator.

2. Same causes as above.

C3. Excessive loss of electrolyte.

1. Poor servicing.
2. Charging rate too high.
3. Defective battery.

C4. Battery terminals corroded.

1. Loose connections at battery terminal.
2. Battery case (leaking electrolyte).

C5. Actuation of battery switch fails to turn on power.

1. Battery relay defective.
2. Faulty wiring between relay and battery switch.
3. Faulty battery switch.

C6. Starter-generator produces voltage, but ammeter reads zero with gen switch in on position and N1 at engine idle speed.

1. Defective ammeter.
2. Defective circuit breakers in ammeter circuit.
3. Broken or disconnected wire in ammeter circuit.
4. Broken or defective generator shunt terminal.

C7. No generator voltage.

1. At generator terminal.
    a. Defective generator.
    b. Brushes excessively worn.

c. Brushes binding in holders.

2. On main DC bus.

a. Defective generator switch.

b. Defective line control relay.

c. Defective generator shunt.

d. Faulty voltage regulator.

e. Faulty wire connections.

f. Circuit breaker popped open.

3. On non-essential bus.

a. Defective NON-ESS BUS switch.

b. Defective generator fail relay.

c. Defective non-essential bus relay.

d. Defective or popped GEN & BUS RESET circuit breaker.

C8. Generator voltage varies excessively with changes in engine speed or electrical load.

1. Defective voltage regulator.

2. Defective generator.

C9. Ammeter fluctuates rapidly under steady load conditions.

1. Intermittent short or loose wire.

2. Defective ammeter.

3. One anti-condition light shorted, burned out, or drawing more amps than the other.

C10. Adjustment of voltage regulator does not move voltage within normal range.

1. Defective voltage regulator.
2. Incorrect or faulty wiring.
3. Defective generator.

C11. Ammeter not zero with generator switch in off position.

1. Defective GENerator switch, (generator not actually off).
2. Defective line control relay.
3. Defective ammeter.

C12. Inverter fails to produce voltage to AC bus, RBI and/or attitude indicator.

1. INV PWR circuit breaker out.
2. Defective inverter.
3. Faulty INV switch.
4. Faulty wiring or connection.
5. Improper DC voltage input.
6. Poor system grounding.

C13. Improper inverter output voltage or frequency rate (cycles).

1. Low input DC voltage.
2. High input DC voltage.
3. Defective inverter.

C14. No ammeter indication when pitot heater turned on.

1. Heater inoperative.
2. Defective PITOT HTR breaker switch.
3. Broken wire in system.

C15. Instrument or console lights fail to brighten or dim as INST LTS or CONSOLE LTS knob is rotated.

1. Defective rheostat.
2. Defective transistor dimmer element.

C16. Breaker switch or circuit breaker trips.

1. Short in switch/breaker or wiring.
2. Actual ampere overload on system.

C17. One caution or warning light is dimmer than the others.

1. Poor grounding.
2. Corroded lamp sockets or bulbs.

C18. Caution light(s) fail to burn with circuit energized normal or test position.

1. Broken lamp filament.
2. Corroded lamp socket or bulb.
3. Broken wire.

C19. Position lights malfunction when POSITION LTS switch is placed to BRIGHT position.

1. Defective circuit breaker.
2. Defective switch.
3. Shorted or defective wiring.
4. Lamp filament open (burned).

C20. Position lights fail to burn or fail to go dim with POSITION LTS switch in DIM position.

1. All of item above.
2. Defective dimming resistor.

C21. Landing lights fail to light.

1. Circuit breaker faulty or out.
2. Defective landing light switch.
3. Lamp filament broken or burned.
4. Broken or loose wires.
5. Defective landing light relays.

C22. LDG LT PWR circuit breaker out when switch placed to on position.

1. Defective switch.
2. Shorted wire in circuit.
3. Excessive ampere demand from lamp (due to incorrect lamp or loose wires).

C23. Blowers fail to operate when DEFOG & VENT switch is placed to the DEFOG & VENT position.

1. Defective switch.
2. Broken wire.
3. Loose connections.
4. Defective blower motors.

C24. DEFOG & VENT breaker switch trips to OFF.

1. Shorted wire.
2. Shorted or faulty blower motors.

C25. Lack of or no power when external power plug is connected.

1. Power supply voltage from external source too low (300-750 min/max amps).
2. External power relay inoperative.
3. Dirty or corroded pins or plug at external power receptacle.
4. Reversed polarity.

C26. External power relay is energized with reverse polarity voltage applied to external power receptacle.

1. Defective one-way diode.
2. Improper circuit wiring.

C27. Anti-collision light(s) burn constantly.

1. Flasher is not properly grounded.
2. Inoperative flasher.

C28. Anti-collision light(s) fail to illuminate.

1. Broken wire or improper grounding.
2. Dirty or corroded receptacle.
3. Defective switch.
4. Defective circuit breaker.
5. Incorrect light bulb.
6. Defective or improperly wired flasher unit.

C29. FUEL PUMP circuit breaker trips.

1. Wiring shorted/defective relay.
2. Shorted or defective pump.

C30. ENG DEICE circuit breaker trips to OFF.

1. Shorted wiring.
2. Faulty deice motor.
3. Improperly rigged actuator.

C31. Fuel boost pump fails to operate when FUEL PUMP circuit breaker is closed (in).

1. Defective breaker in pump circuit.
2. Faulty wiring or loose connections.
3. Defective pump.
4. FUEL BOOST switch in OFF position or defective.
5. System voltage low.

C32. Engine quits during fuel boost pump check.

1. Leak in fuel line causing cavitation.
2. Improperly torqued fuel line inside of fuel cell.
3. Internally collapsed fuel line.

TROUBLESHOOTING GUIDE D — CAUTION PANEL

CONDITION

PROBABLE CAUSE

D1. All or some caution lights dimly illuminated.

1. Moisture in connector plug.
2. Poor grounding of light.
3. Caution panel malfunction.
4. Low battery voltage.

D2. All caution lights out.

1. Connector plug disconnected.
2. Test switch defective.
3. Broken wires.

D3. MASTER CAUTION light on only.

1. Reset and check again.
2. Wire grounded out (short).
3. Small amount of ferrous resistance in one of the chip detector plugs.
4. Loose wire connection.
5. Caution panel malfunction.

D4. FUEL BOOST caution light on.

1. Wire grounded out (short).
2. See items and C31.

D5. 20 MIN FUEL caution light on.

1. Wire grounded out (short).
2. Low fuel supply.
3. Faulty caution panel.
4. Low level switch defective.
5. Defective wiring or connections.

D6. FUEL FILTER caution light on.

1. Wire grounded out (short).
2. Fuel filter is clogging and bypass is imminent.
3. Caution panel malfunction.
4. Faulty filter pressure switch (fuel).
5. Faulty caution light.

D7. ENG OIL BYPASS caution light on.

1. Wire grounded out (short).
2. Defective float switch.
3. Caution panel malfunction.
4. See item B34.

D8. XMSN CHIP DET caution light on.

1. Wire grounded out (short).
2. Faulty wiring or caution panel.

3. Internal failure of gears or bearings.

4. Ferrous chips on plug.

D9. ENG CHIP DET caution light on.

1. Wire grounded out (short).

2. Faulty caution panel.

3. Ferrous chips on plugs.

D10. T/R CHIP DET caution light on.

1. Wire grounded out (short).

2. See item F7.

3. Faulty caution panel.

D11. INST INVERTER caution light on.

1. Wire grounded out (short).

2. Inverter inoperative.

3. A/C fail relay inoperative.

4. Faulty caution panel.

5. See item C12.

D12. DC GENERATOR caution light on.

1. Wire grounded out (short).

2. Generator inoperative.

3. See items and D16.

4. Faulty caution panel.

D13. HYD PRESS caution light on.

1. Hydraulic system turned off.
2. Low hydraulic pressure because of low fluid.
3. Pressure relief valve inoperative.
4. Defective hydraulic pump.
5. Solenoid valve not operating properly (stuck closed).
6. Electrical wiring to warning light, solenoid valve, or pressure switch not correct.
7. Faulty caution panel.
8. Ruptured hydraulic line.

D14. DC GENERATOR caution light not on prior to engine start.

1. Defective bulbs.
2. Defective caution panel circuit.
3. Broken or disconnected wire from generator fail relay.
4. Faulty voltage regulator.

D15. All or any caution lights on dimly.

1. Moisture in connector plugs.
2. Shorted dimming circuit system.
3. One bulb burned out.

D16. DC GENERATOR caution light is on after engine start with GEN switch in GEN position and N1 at idle speed or above.

1. Ammeter indicates a load.
    a. Defective generator fail relay.
    b. Shorted wire.
2. Ammeter indicates zero.
    a. Defective generator switch or breaker.
    b. Defective voltage regulator.
    c. Defective generator (output is lower than battery).
    d. Defective ammeter.
    e. Defective line control relay.

D17. IFF caution light on.

1. Wire grounded out (short).
2. Faulty caution panel.
3. Unit not keyed or improper operation used.

D18. SPARE caution light on.

1. Wire grounded out (short).
2. Faulty caution panel.

TROUBLESHOOTING GUIDE E — POWER PLANT

CONDITION

PROBABLE CAUSE

E1. Throttle stiff.

1. Flexible cable defective.
2. Fuel control malfunction.
3. Control rod binding or chaffing.
4. Foreign object obstructing control movements.
5. Fuel control shaft binding.

E2. Little or no fuel flow to engine driven fuel pump.

1. No fuel in cell.
2. Disconnected fuel line.
3. Ruptured or broken fuel line.
4. Defective fuel shutoff valve.
5. Defective boost pump.
6. Air in fuel lines.

E3. N1 below 62% with throttle at engine idle.

1. Throttle linkage, bell crank, or support loose or broken.
2. Incorrect gas producer fuel control lever setting.
3. Gas producer fuel control idle adjustment incorrectly set.
4. Tachometer malfunction.
5. Air sensing lines leaking.

6. Defective governor.

7. Defective fuel control.

8. Gen. load (off for check).

E4. N1 above 64% with throttle at engine idle.

1. Incorrect gas producer fuel control level setting.

2. Gas producer fuel control idle adjustment incorrectly set.

3. Defective fuel control.

E5. Fuel dripping from drain and weep holes.

1. Fuel pump drive shaft seal leaking.

2. Gas producer fuel control failure.

3. Fuel nozzle stuck open.

E6. N2 instability above idle speed.

1. Faulty double check valve.

2. Air sensing tubes leaking.

3. Faulty N2 governor.

4. Faulty fuel control.

E7. Linear actuator fails to respond when GOV RPM switch is placed to INCR or DECR position.

1. Defective or open circuit breaker in overhead console.

2. Faulty wiring or loose connection.

3. Switch contacts corroded or burned.

4. Defective linear actuator.

5. Leads connected to wrong terminals on actuator or switch.

6. Governor shaft binding.

E8. Linear actuator moves in opposite direction to increase or decrease selection.

1. Leads connected to wrong terminals on actuator or switch.

E9. Fluctuating TOT, N1, N2, and torque gage.

1. Faulty overspeed governor.

2. Faulty fuel control.

3. Engine deterioration.

4. Pneumatic air leak.

5. Faulty or dirty double check valve.

6. Contaminated fuel.

E10. At full open throttle and full governor increase, N2 RPM not correct (not getting a 7% spread).

1. Actuator need adjustment.

2. Governor stops being contacted.

3. N1 or N2 fuel control malfunction.

4. Droop compensator shear tube or control tubes bent.

5. Engine not developing sufficient power.

E11. Governor RPM too high or low at full open throttle and decrease beep (must have 94%).

1. Governor stops being contacted.
2. Governor faulty or improperly rigged.
3. Droop compensator improperly rigged.
4. Shear tube weak.

E12. Excessive time for linear actuator to complete travel.

1. Defective actuator.
2. N2 governor binding.
3. Control tubes restriction.

E13. No change in TOT when ENG DEICE switch is turned ENG DEICE or OFF (increase of 20 degrees will insure proper operation).

1. ENG DEICE circuit breaker out or faulty.
2. Faulty switch or wiring.
3. Defective deice unit.
4. Deice valve not properly rigged.

E14. Bleed valve is not opening or closing at proper N1 speed.

1. Bleed air leaks.
2. Calculation error.
3. Clogged filter.
4. Faulty bleed valve unit.
5. Faulty N1 gage.

E15. Compressor stall, fluctuating engine instrument, during start.

1. Fifth stage bleed valve stuck closed.
2. Dirty compressor.

E16. Compressor stall, fluctuating engine instruments, during acceleration.

1. Compressor erosion.
2. Bleed valve stuck closed.
3. Defective gas producer fuel control.
4. Faulty deice valve assembly.
5. Dirty compressor.

E17. Engine slow to accelerate from engine idle to power.

1. Loose pneumatic fittings.
2. Dirty or eroded compressor.
3. Defective fuel control or governor.
4. Excessive compressor air leakage.

E18. Low torque with high TOT.

1. Faulty TOT indicator or system.
2. Faulty torquemeter indicating system.
3. Faulty FAT gage.
4. Bleed air leaks.
5. Restriction to compressor air inlet.
6. Dirty compressor.

7. Heater control valve leaking.

8. Anti-icing valve leaking.

9. Compressor FOD.

10. Fifth stage bleed control valve has failed to close.

11. Eroded compressor.

E19. Low TOT normal or high power.

1. Faulty TOT indicator.

2. Improperly adjusted resistor spot spool (8 ohms).

3. Loose thermocouple wire assembly.

4. Faulty TOT thermocouple assembly.

5. Not actually developing power indicated (N1 or torque system inoperative).

6. Improper hardware installed.

E20. Low TOT, low torque, N2 bleed-off (does not recover).

1. Fuel control rigging.

2. N2 governor rigging.

3. Fuel control air line leakage.

4. Pc filter.

5. Fuel control max speed stop screw adjustment.

6. Obstructed fuel flow, i.e. clogged filters, nozzle, or lines.

7. Contaminated fuel.

8. Faulty fuel control.

9. Faulty governor.

10. Improperly installed copilot collective.

E21. TOT normal, torque normal, N2 bleed-off 1-2% and stabilize.

1. Excessive bearing play in N2 governor linkage.

2. Excessive bearing play in collective flight controls.

E22. Engine N1 overspeed above maximum limits.

1. Faulty N1 tachometer.

2. Faulty gas producer fuel control.

3. Pilot induced.

4. Auto acceleration (Engine warmup time not complied with).

E23. Engine N2 overspeeds.

1. Faulty gas producer fuel control or power turbine governor.

2. Faulty N2 tachometer or tachgenerator.

E24. Continuous exhaust smoking.

1. Oil leakage in turbine section.

2. Oil bellows seal faulty.

3. Internal turbine seals faulty.

4. Compressor front support bearing oil seal.

E25. Exhaust smoking on shut down or engine start.

1. Turbine rear bearing seal.

E26. Static oil leakage from drain valve.

1. External oil check valve faculty or not installed properly.

2. Turbine rear bearing sump nut.

E27. Number two engine bearing labyrinth seal venting oil vapor.

1. Diffuser vent orifice loose.

2. Diffuser vent orifice too large.

3. Defective seal.

E28. Exhaust duct emitting sparks.

1. FOD in engine.

2. Turbine or compressor blade, vane, or seal damage.

E29. Excessive engine vibration.

1. Bearing or accessories section, internal failure.

2. Compressor or turbine damage.

3. Loose engine mounts.

E30. Static oil leakage from power and accessory gear box breather.

1. External oil check valve.

2. Internal check valve failure under the oil filter housing.

E31. Excessive overshooting of RPM or hunting during collective application.

1. N1 or N2 governors inoperative or faulty.
2. Improper rigging (droop).
3. Faulty double-check valve.

E32. No heated air from registers or abnormally loose switch (no stops).

1. Heater switch defective.
2. Temperature selection switch set at lower position.
3. Bleed air line not connected.
4. Defective solenoid on mixing valve or electrical wire not connected.
5. Remote sensor inoperative or control cable not connected.
6. Defective mixing valve.

E33. Restricted warm air supply.

1. Leaks or obstruction in ducts.
2. Mixing valve malfunction.
3. Heater outlet valve incorrectly set.

E34. Outlet temperature too high or too low.

1. Temperature selection incorrectly set.
2. Defective remote sensor or mixing valve.
3. Overtemp switch defective.

E35. Torquemeter too high or too low at flat pitch 100% N2 RPM.

1. Improper initial pitch change links setting.
2. Torquemeter gage inoperative.
3. Same causes as B9 and B10.

E36. Engine oil consumption exceeds 6-1/2 ounces per hour.

1. Leakage at a loose fitting or connection.
2. Restricted vent lines.
3. Defective internal engine oil seals.

E37. Unable to move throttle to below engine idle.

1. Idle release button malfunction.
2. Throttle controls binding.
3. Throttle improperly rigged.
4. N1 fuel control malfunction.
5. Copilot's collective stick not properly installed.

TROUBLESHOOTING GUIDE F — TRANSMISSION

CONDITION

PROBABLE CAUSE

F1. XMSN OIL PRESS light on, with engine at operational RPM (62% N1).

1. Wire or XMSN transmitter is grounded out between transmitter and warning light.
2. Low oil level.

3. Faulty oil pump.

4. Leakage or restriction between pressure relief valve and transmitter.

5. Pressure relief valve malfunction.

6. Defective transmitter.

F2. XMSN OIL PRESS light is not illuminated prior to engine start.

1. Disconnected connector plug or broken wire from transmitter.

2. Faulty light bulbs.

3. Light bulbs not properly seated in socket.

4. Corroded terminals.

F3. XMSN OIL HOT warning light on.

1. Wires grounded out from transmitter to warning light.

2. Shorted transmitter or indicator.

3. Obstructed air flow into transmission oil cooler.

4. Oil cooler clogged or obstructed.

5. Oil cooler bypass valve malfunction.

6. Clogged oil jets.

7. Seized bearing or other internal transmission failure.

8. Low oil quantity.

F4. Excessive pylon motion.

1. Loose bearing on isolation mount fitting.
2. Internal deterioration of isolation mount.
3. Worn or loose pylon support link bearings.

F5. Oil leakage around freewheeling unit.

1. Faulty seals or preformed packing.
2. Faulty valve assembly.
3. Hose leaking.
4. Orifice fitting allowing excessive oil pressure to get to freewheeling assembly.

F6. Excessive loss of grease from hanger bearings.

1. Improper assembly.
2. Bearing misaligned within hanger clamp.
3. Bearing overlubricated.

F7. Metal chips in tail rotor gear box, T/R CHIP DET caution light is on.

1. Internal failure of gears or bearings.
2. Submit oil sample.

F8. Autorotation RPM too high or too low.

1. Blade angle set incorrectly.
2. Gross weight different than computed.

TROUBLESHOOTING GUIDE G — HYDRAULIC

CONDITION

PROBABLE CAUSE

G1. Excessive feedback in flight or during power cylinder check, hydraulic boost on.

1. Feedback in collective and cyclic.
   a. Air in system.
   b. Excessive out-of-track or out-of-balance rotor system.
   c. Low pump pressure.
   d. Main pressure relief valve inoperative.
2. Feed back felt in one flight control.
   a. Loose servo assembly or attaching bolts.
   b. Excessively worn rod end bearings.
   c. Defective servo.

G2. HYD BOOST switch ineffective.

1. HYD BOOST SOL circuit breaker popped or faulty.
2. Faulty switch.
3. Faulty connections or wiring.
4. Faulty solenoid valve.
5. No hydraulic pressure.
6. Electrical failure.

G3. Flight controls do not operate smoothly.

1. Sticking servo control valve.
2. Pivot bolts in input lever are sticking or over torqued.
3. Low pump pressure.
4. Air in system.
5. Pump one-way check valve improperly installed.

G4. Servo actuators chatter when moving controls.

1. Air in servo actuators.
2. Low hydraulic pressure.
3. Loose servo assembly or attaching bolts.
4. Excessively worn rod end bearings.

G5. Excessive feedback with HYD BOOST switch OFF.

1. Excessive out-of-track or out-of-balance of rotor system.
2. Irreversible valve malfunction.
3. Air in irreversible chamber.
4. Pilot valve malfunction.

G6. During power cylinder check, feedback is felt in cyclic stick.

1. Servo pilot valve malfunction.
2. Defective servo.
3. Pump malfunction.

G7. Cyclic jams during rapid movement.

1. Defective servo.
2. Low hydraulic pressure or fluid level.
3. FOD in flight controls, flight controls binding.

G8. Collective motors up or down (HYD BOOST switch ON).

1. Pilot valve bolts too tight.
2. Defective servo.

G9. Hydraulic system too hot (the HYD PRESS caution light may illuminate).

1. Relief valve inoperative, cracking pressure starts too low.
2. Low fluid level.
3. Hydraulic filters are clogged or starting to clog.
4. One-way check valve installed wrong.

G10. Unable to get collective up sufficiently (boost on).

1. Defective servo.
2. Improper rigging or controls jammed.

TROUBLESHOOTING GUIDE H — FLIGHT CONTROLS

CONDITION

PROBABLE CAUSE

H1. Cyclic binding in certain areas with force trim off.

1. Wiring harness binding at base of cyclic stick.
2. Foreign matter in base of stick.
3. Foreign matter under deck.
4. Rough spot in friction device.
5. Rod end bearings worn or dirty.
6. Binding in intermixing bellcrank.

H2. With FORCE TRIM switch OFF, cyclic continues moving after small forces applied or moves without cyclic input.

1. Moves forward or aft only.
   a. Cyclic centering spring improperly adjusted.
   b. Improperly rigged force trim.
2. Moves mostly in a 45 degree angle.
   a. Servo cylinder control head bolts too tight.
   b. Defective servo.
3. Moves with less than 0.5 pounds of force - friction improperly adjusted.

H3. Pedals binding.

1. Foreign matter binding forward controls under center console.
2. Rod end bearing malfunction.
3. Control tube binding on phenolic block in tail-boom.
4. Excessive friction applied on T/R pedal friction device.

H4. Excessive play in pedals.

1. Worn pitch change mechanism.
2. Worn tube rod end bearings or pedal adjustor assembly.

H5. Unable to increase collective friction using pilot adjustable friction device.

1. Friction knob jammed.
2. Threads need cleaning.
3. Malfunction in jackshaft friction.

H6. Collective built-in friction too light or too heavy.

1. Friction nut or clamp at jackshaft not adjusted properly.
2. Binding of N2 system.

H7. Collective stick binds and sticks or has breakaway force.

1. Friction device worn, rough, or improperly adjusted.
2. Electrical wire harness at base of collective fouling.

3. Obstruction of push-pull tubes from collective to swashplate.

4. N2 governor or control binding.

5. N2, droop compensator, or shear shaft tube binding. Check rod ends.

6. Defective servo.

H8. Any magnetic brake fails to energize with FORCE TRIM switch in the FORCE TRIM position.

1. Defective magnetic brake.

2. Copilot's cyclic stick connector plug must be connected even with stick in stored position.

H9. Magnetic brake fails to deenergize when force trim switches are depressed.

1. Defective switch.

2. Wiring is shorted out, grounded.

H10. Force trim weak or allows play in cyclic.

1. Improper built-in spring tension adjustment.

2. Improper rigging.

3. Magnetic brake inoperative.

4. Wrong gradient spring assembly installed.

5. CAP NUT with double safety wire is not properly adjusted.

H11. Force trim stiff.

1. Wrong gradient spring installed.

2. Spring tension out of adjustment.

H12. Excessive friction on cyclic with force trim released.

1. Adjustable friction not completely off.
2. Foreign matter in base of stick.
3. Magnetic brake unit stiff (dragging).

H13. Force trim holds in same position with FORCE TRIM switch in the OFF position.

1. Faulty magnetic brake binding.
2. Faulty wiring at switches.
3. Improperly rigged.

H14. Force trim inoperative.

1. Faulty switches.
2. Open circuit breaker.
3. Open or shorted wire.
4. Faulty magnetic brake.
5. No electrical power going to magnetic brake (ensure copilot cyclic connector plug is connected).

H15. Unable to get normal cyclic travel.

1. Improper rigging of cyclic or collective.
2. Control components improperly installed.
3. Force trim rigged improperly.
4. FOD.
5. Cyclic stick bent.

H16. Cyclic position abnormal for flight condition.

1. Cyclic rigged improperly.
2. C.G. not as computed.

H17. Rotor response to cyclic inputs slow or inconsistent.

1. Cyclic rigged improperly.
2. Servo leaking.
3. Faulty hydraulic pump.
4. Faulty pressure relief valve.

H18. Cyclic stick not centered in stable hover.

1. Fore and aft C.G. not within limits.
2. Lateral C.G. not within limits.
3. Cyclic rigged improperly.
4. Swashplate rigged improperly.
5. Cyclic stick bent.

H19. Pedal creep.

1. Dynamic balance.
2. Washer stackup incorrect (see TM 55-1520-228-23).
3. Aircraft not into wind.

H20. Unable to obtain a minimum of 83% up and/or 17% down during collective check (HYD BOOST switch OFF).

1. Defective tension torsion straps.
2. Collective binding.
3. Faulty torque system.
4. Maximum power reached prior to 83% up.

TROUBLESHOOTING GUIDE I — VIBRATIONS

CONDITION

PROBABLE CAUSE

NOTE

See Section IV, paragraph C for detailed information on vibrations.

I1. Extreme low frequency vibration (approximately 2 to 3 beats per second).

1. Loose or faulty isolation mount or bearing.
2. Severe maneuvers, i.e. relatively long ground runs with collective up during practice autorotations.
3. Extreme asymmetric (lateral) loading.
4. Low g maneuvers.
5. Low rotor RPM.

I2. Low frequency vibrations.

NOTE

Low frequency vibrations are divided into two groups, laterals and verticals.

1. Laterals.

   a. Spanwise.
      1. Blades of unequal weight.
      2. Blades of unequal flight time.
      3. Blades from different environments.
      4. Moisture in blades.
      5. Improper filing or repair techniques.
      6. Improper balancing techniques.
      7. Trunnion not centered.

   b. Chordwise.
      1. Blades of unequal flight time.
      2. Improper balancing techniques.
      3. Improper alignment (sweep).
      4. Excessive movement (2 flats) on pitch change control tubes.

2. Verticals.

   a. 1/REV (5 to 6 cycles per second, e.g. 354 rpm/60 sec = 5.9 CPS).
      1. Excessively worn parts.
      2. Climbing (weak) blade.
      3. Weak trim tabs.
      4. Improper smoothing procedures.
      5. Damaged blades.

   b. 2/REV (10 to 12 cycles per second).
      1. Insufficient friction on swashplate uniball.
      2. Excessively loose control linkage or swashplate parts.
      3. Deteriorated or separated pylon isolation mount; worn transmission to isolation mount attachment bolt or bearing.
      4. Excessive degrees of trim tab on one

or both blades.

5. Loose blade latch bolt or nut.

I3. Medium frequency vibration felt in airframe (20 to 25 cycles per second).

1. Skids or crosstube loose.
2. Unstowed equipment.
3. Horizontal stabilizer attachment bolts loose.
4. Vertical fin attachment bolts loose.
5. Any loose airframe components.
6. Airframe skin is oil canning.

I4. High frequency vibration.

1. Tail rotor hub assembly unbalanced.
2. Worn or loose blade bearing.
3. Loose or shifted trunnion.
4. Loose or worn pitch change link bearing.
5. Bent pitch change link.
6. Loose retaining nut.
7. Loose or worn pitch change slider.
8. Worn tail rotor bumper.
9. Tail rotor gear box alignment or failure.
10. Retaining bolts of tail rotor gear box loose.
11. Loose bolts in flexible couplings.
12. Worn splined adapters.
13. Tail rotor driveshaft bent.

14. Shaft hanger bearing rough or failed.
15. Loose hanger bearing housing.
16. Oil cooler fan unbalance or failure.
17. Engine malfunction.
18. Generator bearing failure.
19. Freewheeling unit failure.
20. Engine oil pump failure.
21. Loose engine mounts.
22. Main drive shaft failure.
23. Main transmission malfunction.
24. Hydraulic pump failure.
25. Transmission oil pump failure.
26. Attitude indicator or turn and slip indicator's gyroscope malfunction.

I5. Excessive torsional oscillation.

1. Double check valve dirty or inoperative.
2. Air leak in system.
3. Faulty power turbine governor.
4. Faulty fuel control.

TROUBLESHOOTING GUIDE J — COMMUNICATION/NAVIGATION EQUIPMENT

CONDITION

PROBABLE CAUSE

J1. Radios inoperative.

1. Circuit breaker out.
2. Headset not plugged in completely.
3. Radios improperly tuned.
4. ICS panel malfunction.
5. Connector plug disconnected or broken.
6. Radio malfunction.
7. Antenna wire disconnected or crossed.
8. Fuse blown.

J2. ICS panel malfunction.

1. ICS panel inoperative.
2. ICS panel disconnected.
3. Headset not plugged in completely.
4. Circuit breaker out.

J3. 1 FM radio inoperative.

1. KY-58 dummy plugs not installed.
2. KY-58 not turned on.

J4. ADF malfunction.

1. ADF inoperative.
2. NDB station inoperative.
3. Loop antenna inoperative.
4. ADF set not connected.
5. Antennas disconnected.

J5. KY-28 and T/SEC 1/A malfunction.

1. Sets are zeroized.
2. Codes not set correctly.
3. Mode position switch incorrectly set.
4. ARC-114 slave cards are old series.
5. Sets not connected properly.
6. Circuit breaker out.

SECTION IV. SPECIAL PROCEDURES

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

A. C ALTIMETER, RADAR, AN/APN-209, SELF–TEST.

NOTE

Refer to TM 1-1520-228-10 and TM 11-5841-284-23&P for additional test instructions. Self-test operations steps differ between Radar Altimeter (without MWO 1-1520-228-50-52) and Radar Altimeter (with MWO 1-1520-228-50-52).

Test Step	Test Instruction	Normal Indication
1.	Set low altitude warning bug to 50 feet, and the high altitude warning bug to 800 feet.	a. OFF flag-not in view. b. Altitude pointer -0 ± 5 feet c. Digital readout -0 to 3 feet. d. LO warning light ON. e. HI warning light OFF.
2.	HI SET knob — Press and Hold.	a. Altitude pointer -1000 ± 100 feet. b. Digital readout 1000 ± 100 feet. c. LO warning light OFF. d. Hi warning light ON.
3.	HI SET knob - Release.	Indications should return to those noted in step 1.

B. RADAR WARNING RECEIVER, AN/APR-39, SELF-TEST.

Test Step	Test Instruction	Normal Indication
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, press and hold SELF TEST.	a. Fwd and aft (12:00-6:00) strobes appear, extending to approx. the third circle on the CRT.A 2.5 kHz PRF audio should be heard immediately. b. Within 6 seconds alarm audio present and MA lamp starts flashing.
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.
6.	Set DSCRM to ON. Press and hold SELF TEST.	a. Within 4 seconds a fwd or aft strobe (either may appear first) and 1.2 kHz PRF audio present. b. Within 6 seconds the other strobe will appear and PRF audio frequency will double. c. Several seconds later missile alarm audio present and

Test Step	Test Instruction	Normal Indication
		MA lamp starts flashing.
7.	Release SELF TEST.	All indications cease.

C. VIBRATION ANALYSIS.

NOTE

Troubleshooting is shown in Section III.

NOTE

Vibrations as a whole may be identified by category based on their magnitude.

1. EXTREME LOW FREQUENCY VIBRATIONS. The extreme low frequency vibration occurs at 2 to 3 beats per second and is confined to the pylon area of the helicopter. When severe enough, this vibration is known as spike knock. The vibration may be induced by a test pilot using a slight fore and aft movement of the cyclic (2" to 3"). Once the movement is made, the cyclic should be centered. At this time the test pilot can count the number of cycles it takes for the vibration to dampen out. Dampening should be completed in 3 to 5 cycles. Even though fore and aft movement is made on the cyclic, the pylon will rock laterally.

2. LOW FREQUENCY VIBRATION.

NOTE

Low frequency vibrations are divided into two groups: laterals and verticals. All lateral vibrations must be eliminated before a vertical vibration can be eliminated because a lateral will manifest itself as a vertical in forward flight. Lateral vibrations are “RPM” sensitive.

a. Lateral. Lateral vibrations are caused by an out of balance condition, either spanwise or chordwise.

1. Spanwise. A spanwise imbalance is due to a weight difference in the spanwise axis of the blades.

2. Chordwise. A chordwise imbalance condition is caused by the center of gravity of one blade not being compatible with the other blade.

NOTE

Vertical vibrations are divided into two categories: 1/rev (5 to 6 cycles per second) and 2/rev (10 to 12 cycles per second), e.g., 1/rev = 354/60 = 5.9 CPS 2/rev = 5.9 x 2 = 11.8 CPS).

b. Vertical. Vertical vibrations are caused by one blade developing more lift at a given pitch setting than the other blade develops at the same point.

1. 1/rev vibration.

2. 2/rev vibration. The OH-58A/C, as any other two-bladed rotor system, has a certain amount of 2/rev vibrations that is inherent in the aircraft; thus, we are interested in removing that amount which would be considered excessive. Not only is an excessive amount uncomfortable, but it increases the wear on the components thereby causing them to fail prematurely. Since this vibration occurs at 10-12 CPS, it would be unrealistic to think that you could count the cycles per second.

3. MEDIUM FREQUENCY VIBRATION. A medium frequency vibration occurs at 20-25 cycles per second and is another inherent vibration associated with most helicopters. An increase in the level of these vibrations is caused by a change in the capability of the fuselage to absorb vibrations or a loose airframe component, such as skids vibrating at that frequency. Changes in the fuselage vibration absorption can be caused by such things are fuel level, external stores, structural damage and repairs, internal loading, or gross weight. Abnormal vibration levels of this range are almost always caused by something loose, either a part of the helicopter, a part of the cargo, or external stores.

4. HIGH FREQUENCY VIBRATION. Since a high frequency vibration can be caused by any thing that rotates or vibrates at tail rotor speed or faster, this includes many unusual situations such as hydraulic lines buzzing or starter relay buzzing, to the most common and obvious cause - tail rotor out of balance.

D. TRACK AND BALANCE PROCEDURES.

Refer to TM 1-6625-724-13&P.

E. FUEL CONTROL MAX SPEED STOP.

Refer to TM 55-2840-241-23.

F. BASELINE HIT.

NOTE

Prior to establishing new HIT baseline values, clean compressor and check the accuracy of the following instrument systems: TOT, OAT, N1, and FAT.

1. Establish new HIT baseline TOT values. New baseline values for HIT will be established when an engine has been replaced or when the airflow of an engine has been affected by any maintenance performed. Examples include.

a. Replacement or repair of the compressor.
b. Discharge tube/seals replacement.
c. Installation of a new particle separator or re- placement of swirl tubes.
d. Replacement or repair of components in the combustion section to include liner and fuel nozzle.

2. Follow instructions found on OH-58A/C HIT TOT Worksheet. Refer to TM 55-2840-241-23.

G. TRANSPONDER.

Test as follows:

1. MASTER rotary switch — Verify in STBY. Note NO- GO lamp is illuminated.
2. Operate the press-to-test feature of the indicator lamps.
3. ANT switch — BOT.
4. MASTER rotary switch — NORM.
5. M-1 switch — TEST. TEST- GO indicator should illuminate.
6. M-1 switch — ON.

NOTE

If altitude encoding is not connected, testing MODE C will result in a failed indication.

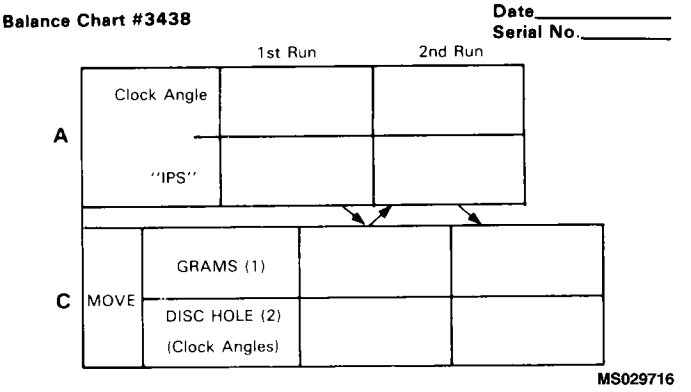
7. Repeat steps (5) and (6) for M-2, M-3/A, and M-C switches.
8. ANT switch — TOP.
9. Repeat steps (5), (6), and (7) above.
10. ANT switch — DIV.
11. Repeat steps (5), (6), and (7) above.
12. MODE 4 rotary switch — A. If an external computer is used, set a code in it.

13. MODE 4 AUDIO/LIGHT/ OUT switch — OUT.
14. MODE 4 TEST/ON/OUT switch — Hold in TEST position.
15. Computer installed — TEST-GO indicator lights.
16. Computer not installed — TEST MON NO-GO indicator lights and KIT status lights.
17. MODE 4 TEST/ON/OUT switch — ON with a computer, and OUT without a computer.
18. MASTER rotary switch — STBY.

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



1. Read around circular lines plotted IPS and clock to GRAMS scale, and enter grams.
2. Enter clock angle from A.

NOTE

Run ship at 100%, flat pitch, on the ground.

3. Set Balancer at 2550 RPM. Direct Strobex at tail rotor hub and observe clock angle of target.
4. The depress "Verify Tune" button and adjust "RPM Tune" dial to return target to clock angle observed before button was pushed. Release button, observe angle, press and adjust again until clock angle remains the same whether button is released or pushed. ADJUST ONLY WITH BUTTON PUSHED.
5. Read clock angle without button pushed, and "IPS" from Balancer meter WITHOUT STROBEX FLASHING and record in Section A of chart. Plot in B (label it point #1), and note indicated weight changes in C.
6. Make indicated changes, run ship to check result and repeat if required to reduce "IPS" to .2 or less.
7. Look along the "move" line on the chart (from reading #1 to #2, chart rotated to bring #1 nearest to eye). If it goes directly toward or through the center of the chart the weight was placed in the correct hole. If it misses to the left, move the weight to the next hole counter-clockwise from the one chosen. If it misses to the right, move weight to the next hole clockwise. If the error is about 1/2 hour the angle formed between lines from point #1 and #2 and point #1 and center of chart = about 1/2 hour, divide the required weight between the hole chosen and the next hole as determined above.
   If the move line is too short or too long, use more or less weight.
8. It is normal that the "Clock Angle" display and "IPS" will "jitter" or become uncertain and erratic as good balance is approached. Judge a center value.

Figure 5-1. Tail Rotor Balance Chart (Sheet 1 of 2)

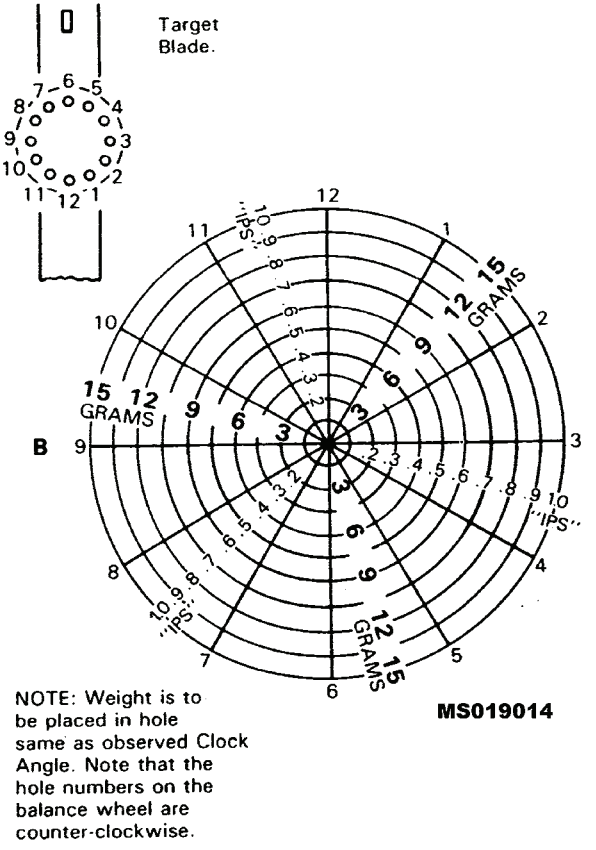
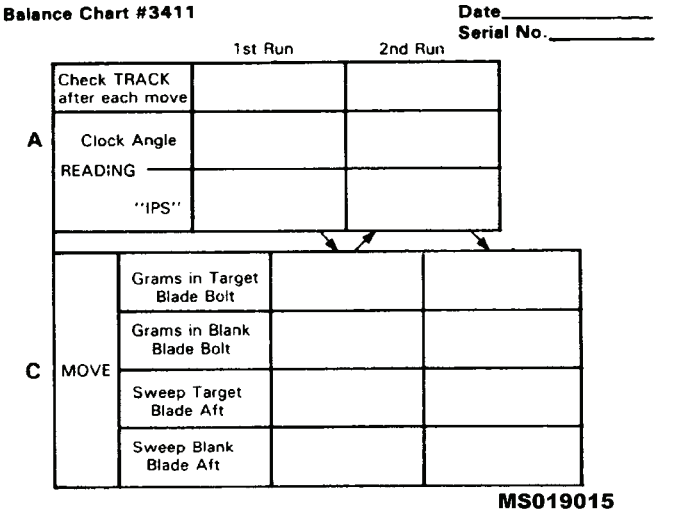


Figure 5-1. Tail Rotor Balance Chart (Sheet 2 of 2)



1. Set tabs at trail. Adjust for good track at 100%, flat pitch, on the ground, using pitch link only.

2. Set BALANCER to 354 RPM. Push “TEST” button and check that the 12:00 and 6:00 o’clock lights are illuminated. Release button.

3. Observe Clock Angle of illuminated light, then press “VERIFY TUNE” button. Adjust “RPM TUNE” dial WHILE BUTTON IS PUSHED to return light to angle observed BEFORE BUTTON WAS PUSHED. Release button, observe angle, press and adjust again to match new “unpushed” angle. Repeat until there is no change WHETHER BUTTON IS PUSHED OR RELEASED.

4. Record Clock Angle and “IPS” in section A of chart. Plot in B (label it #1). Note indicated changes in C.

5. Make changes indicated. Run ship to check result (label it point #2). Repeat as required to reduce “IPS” to .2 or less.

6. If move line (point #1 to #2) is not in the correct direction use “Clock Angle Corrector” #3597, and assign new numbers to clock. SEE MANUAL FOR DETAILS.

Figure 5-2. Main Rotor Track and Balance Chart (Sheet 1 of 2)

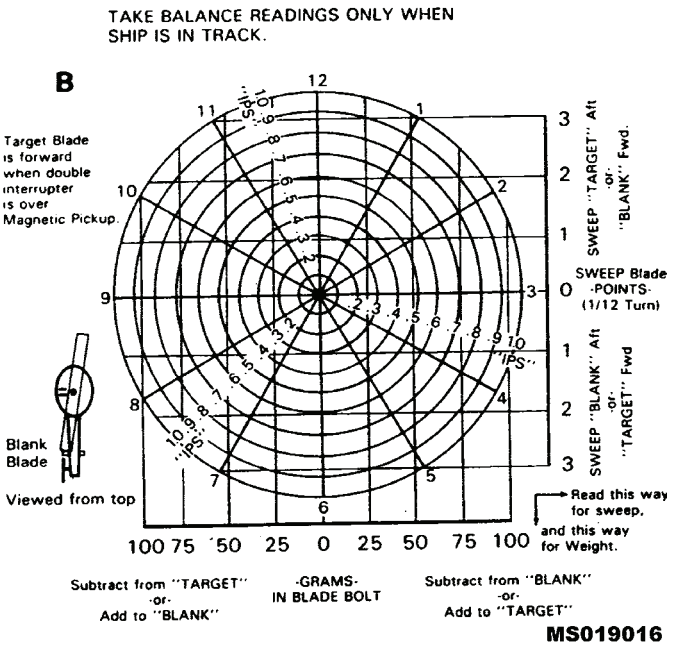
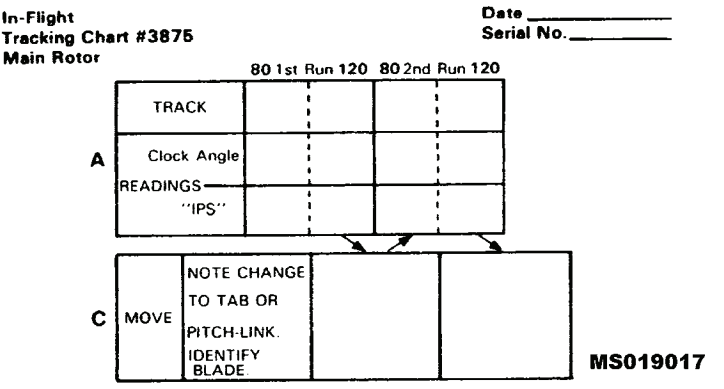


Figure 5-2. Main Rotor Track and Balance Chart (Sheet 2 of 2)



1. Ship must be in good ground track, as from balancing operation (5-2).

2. Fly ship at 80 MPH. Sketch observed track. Set Balancer to 354 RPM. Place “Function” switch to channel “B”. Press “Test” button and check that the 12:00 and 6:00 o’clock lights are lighted. Release button.

3. Observe Clock Angle of illuminated light, then press “VERIFY TUNE” button. Adjust “RPM TUNE” dial WHILE BUTTON IS PUSHED to return light to angle observed BEFORE BUTTON WAS PUSHED. Release button, observe angle, press and adjust again to match new UNPUSHED angle. Repeat until there is NO CHANGE WHETHER BUTTON IS PUSHED OR RELEASED.

4. Record Clock Angle and “IPS” in section A of chart.

5. Increase speed to 120 MPH (or high speed) and repeat “Track” and Channel “B” readings as above. Plot 120 MPH readings in section B of chart.

6. Make indicated changes. Run ship to check result, (label it point #2). Repeat as required to require “IPS” to .2 or less.

Figure 5-3. In-Flight Main Rotor Tracking Chart (Sheet 1 of 2)

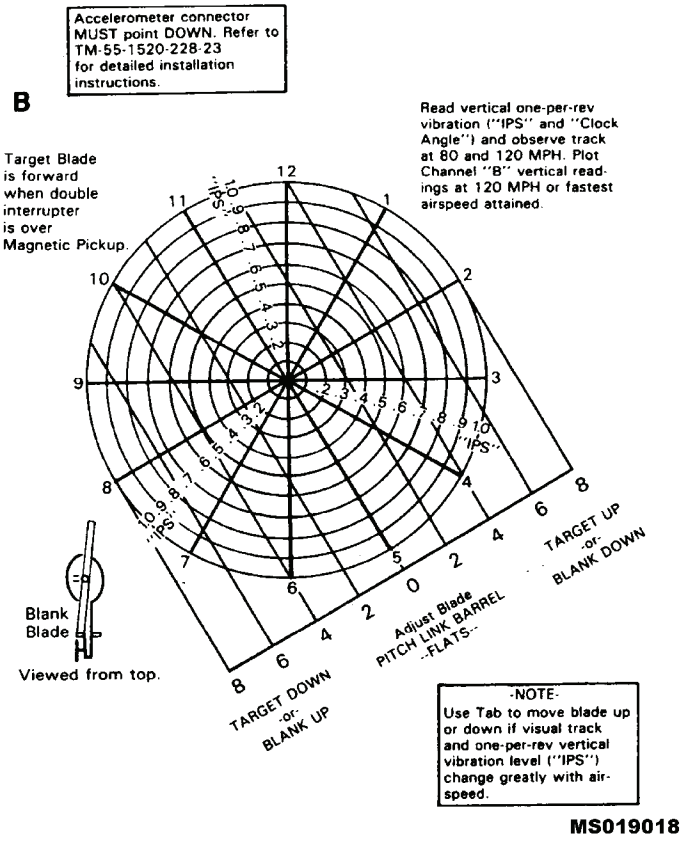


Figure 5-3. In-Flight Main Rotor Tracking Chart (Sheet 2 of 2)

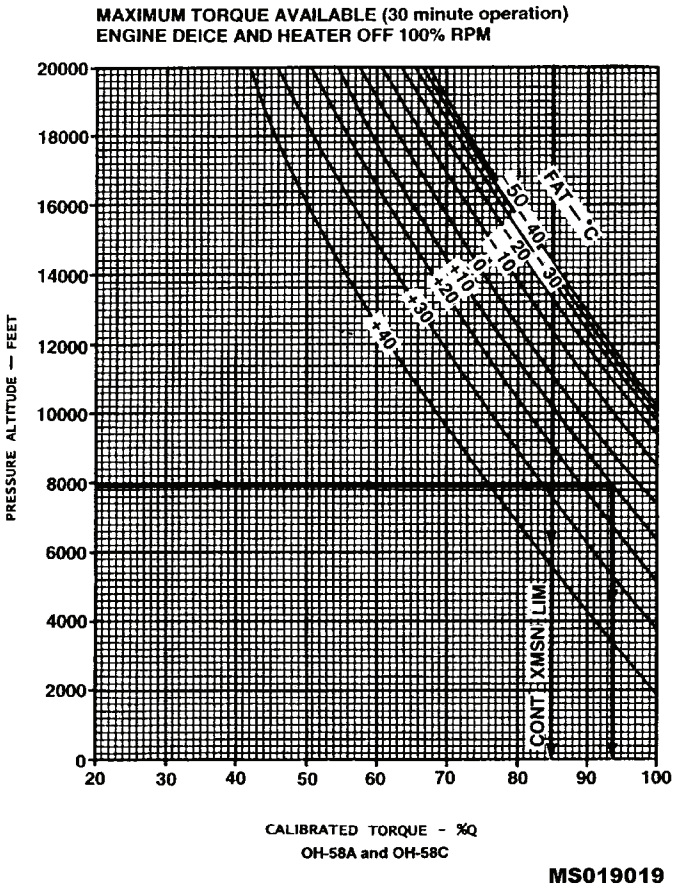


Figure 5-4. OH-58A/C Maximum Torque Available Chart (Sheet 1 of 2)

MAXIMUM TORQUE AVAILABLE (30 minute operation)
ENGINE DEICE AND HEATER OFF AND REVERSE FLOW INLET INSTALLED 100% RPM

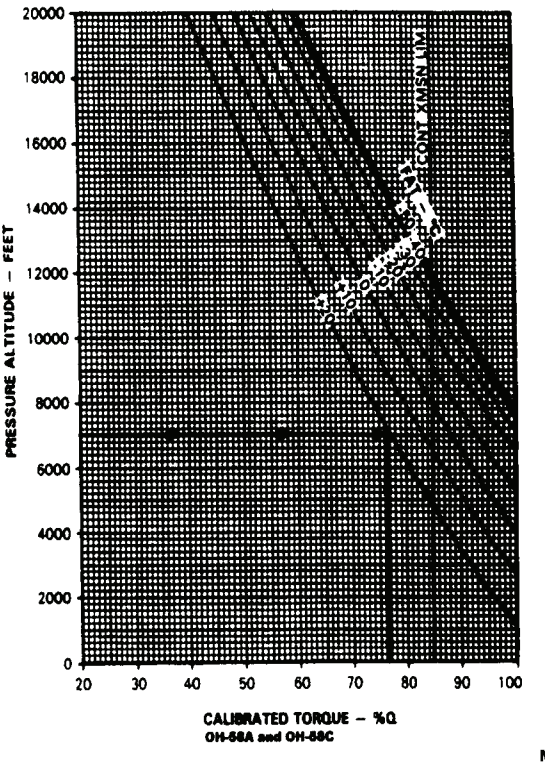


Figure 5-4. OH-58A/C Maximum Torque Available Chart (Sheet 2 of 2)

ITEM NO	NOMENCLATURE	NSN	WEIGHT
1.	AN3-3A BOLT	5306-00-150-9221	2.96 GRAMS
2.	AN3-4A BOLT	5306-00-722-0393	3.41 GRAMS
3.	AN3-5A BOLT	5306-00-274-2119	3.86 GRAMS
4.	NAS679A3 NUT	5310-00-807-1474	1.27 GRAMS
5.	AN960-10 WASHER	5310-00-167-0818	0.90 GRAMS
6.	AN970-3 WASHER	5310-00-167-0765	5.00 GRAMS

Figure 5-5. Balance Weight Conversion

ASSEMBLY	RPM
Main Rotor	354
Main Rotor Two-per-rev	708
Main Rotor Six-per-rev	2124
Tail Rotor	2623
Tail Rotor Two-per-rev	5246
Tail Rotor Drive Shaft	6173
Oil Cooler Fan (XMSN)	6173
Engine to XMSN shaft	6173
Oil Pump Transmission	4344
Hydraulic Pump	4344
Tachometer Generator (XMSN)	4344
Sungear (XMSN)	1648
Planetary (XMSN)	1001
N2 Turbine Wheel	34158
Torque Meter Shaft Pad	10288
Power Turbine Governor Pad	4309
N2 Turbine Pinion	6173
N2 Tachometer Generator	4309

Figure 5-6. Component Operations RPM Chart

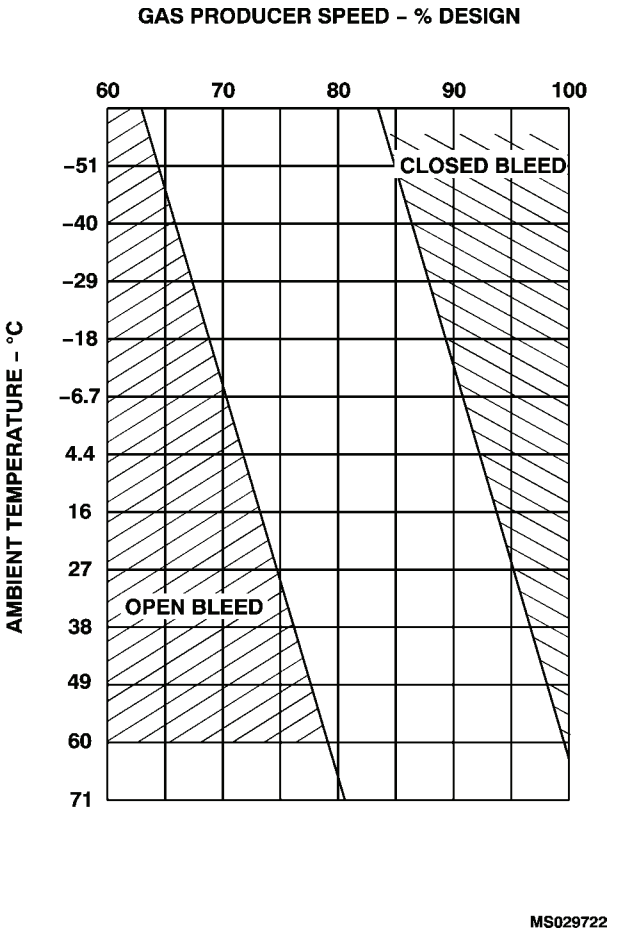


Figure 5-7. OH-58A-720 and OH-58C Bleed Valve Closure Chart

PURPOSE OF TEST FLIGHT:

ACFT S/N: DATE:

PILOT: UNIT:

SYMBOLS: ✓ = SATISFACTORY X = DEFICIENCY

PRIOR TO MAINTENANCE TEST

FLIGHT

1. FORMS AND RECORDS
2. FLIGHT READINESS INSP

BEFORE STARTING ENGINE

CHECKS

1. FAT
2. ALTIMETER
3. WARNING LIGHTS
4. CAUTION PANEL

STARTING ENGINE AND RUNUP

CHECKS

1. START
   - 1ST PEAK TOT _____ °C
   - 2ND PEAK TOT _____ °C
   - START TIME _____
2. CYCLIC
3. COLLECTIVE
4. HYDRAULIC SYSTEM
5. GOV RPM SWITCH
6. COMPRESSOR BLEED VALVE
   - START TO CLOSE _____ % N1
   - FULL CLOSE _____ % N1
7. TORSIONAL OSCILLATION
8. FUEL PUMP
9. ENGINE IDLE SPEED CHECK
10. ENGINE DEICE
11. INSTRUMENTS
    - N1 _____ %
    - TOT _____ °C
    - TORQUE _____ PSI
    - ENG OIL TEMP _____ °C
    - ENG OIL PRESS _____ PSI
    - XMSN OIL PRESS _____ PSI
12. HIT

AIRCRAFT HOVER CHECKS

1. HOVER POWER
   - TORQUE _____ PSI
   - TOT _____ °C
   - N1 _____ %
2. FLIGHT CONTROLS
3. (C) PRIMARY DIR. CONTROL
4. PYLON ISOLATION MOUNT
5. POWER CYLINDER
6. ENGINE RESPONSE

INFLIGHT CHECKS

1. CONTROL RIGGING
2. AUTOROTATION
   - ROTOR _____ RPM
   - AIRCRAFT WEIGHT _____
3. ENGINE PERFORMANCE
   - CHECK
   - PA _____ FAT _____
   - TORQUE _____ N1 _____
   - TOT _____
   - N2 _____
4. HYDRAULIC OFF
   - UP _____ PSI
   - DOWN _____ PSI
5. VIBRATION ANALYSIS
6. FLIGHT INSTRUMENTS
   - AIRSPEED _____ MAG COMP _____
   - IVSI _____ RBI _____
   - ATT IND _____ CLOCK _____
   - TURN SLIP _____
7. AVIONICS
   - XPDR _____ VHF _____
   - ADF _____ UHF _____
   - FM#1 _____ KY-58 _____
   - FM#2 _____ T-SEC-1/A _____
8. MISSION EQUIPMENT

ENGINE SHUTDOWN CHECKS

1. BATTERY
2. INSTRUMENTS
   - N1 _____ %
   - TOT _____ °C
   - TORQUE _____ PSI
   - ENG OIL TEMP _____ °C
   - ENG OIL PRESS _____ PSI
   - XMSN OIL PRESS _____ PSI
3. ROTOR RPM LIGHT/AUDIO
4. POST FLIGHT INSP
5. COMPLETE UPDATE FORMS AND RECORDS
6. SPECIAL EQUIPMENT LIST
   1.
   2.
   3.
   4.

MS029723

Figure 5-8. 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

PILOT'S SIGNATURE

MS029717

Figure 5-8. Maintenance Test Flight Check Sheet (Sheet 2 of 2)

CAUTION

If a problem is encountered during any phase of vibration check, do not continue. Shut down helicopter and correct problem. Repeat each step until no malfunction is detected that cannot be corrected by the next check or adjustment.

NOTE

Refer to TM 55-1520-228-23 for proper dimensions and maintenance procedures.

NOTE

The ground track is a reference only and does not mean that the rotor is in the best flight configuration.

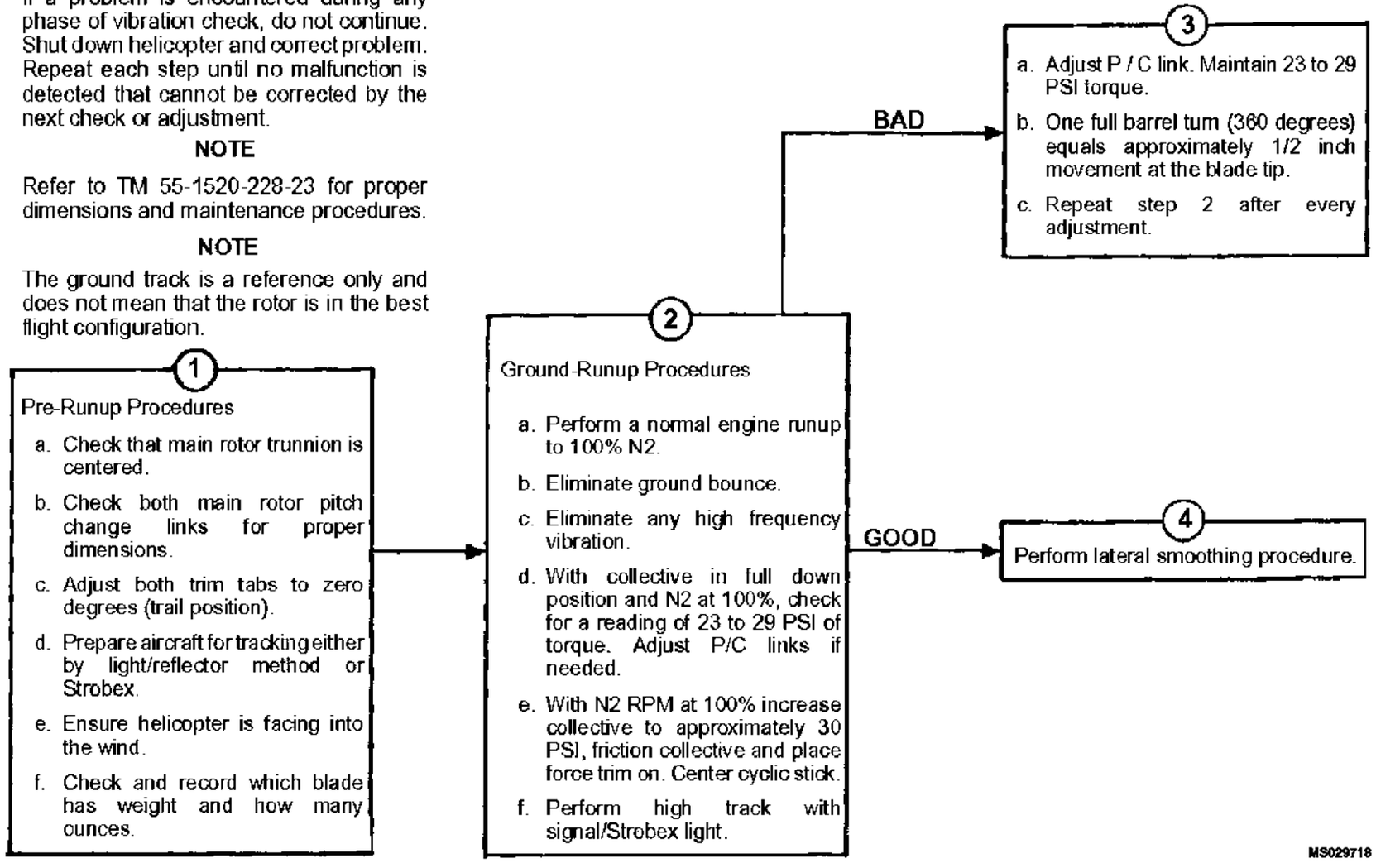


Figure FO-1. Alternate Ground Tracking Procedure

NOTE

All lateral vibrations must be eliminated before a vertical vibration can be eliminated. A lateral vibration will manifest itself as a vertical vibration in forward flight.

NOTE

The following procedures are to be used only if the vibrex balancing kit is not available. The vibrex is the recommended method and it should be utilized.

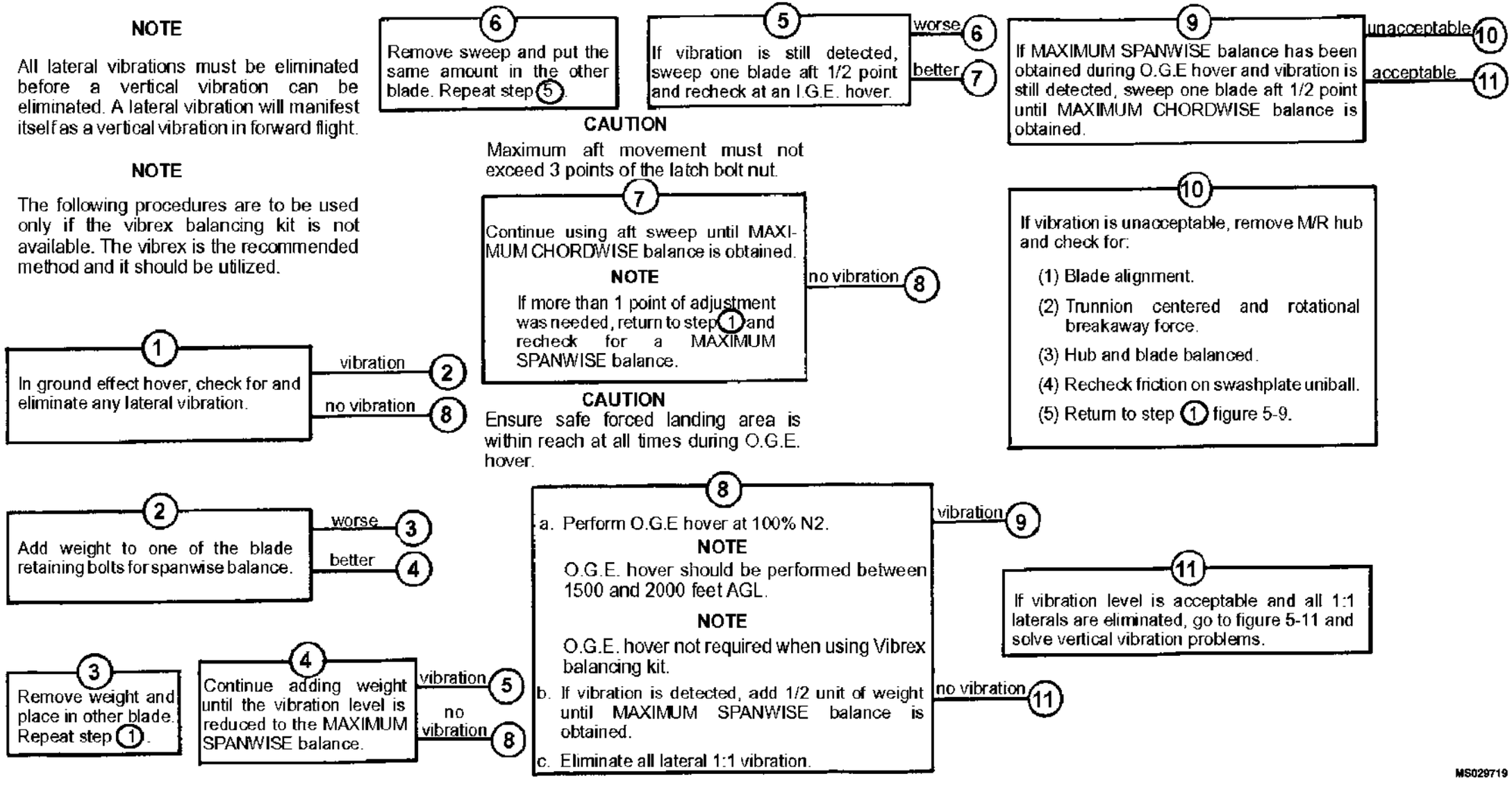


Figure FO-2. Alternate Lateral Smoothing Procedures

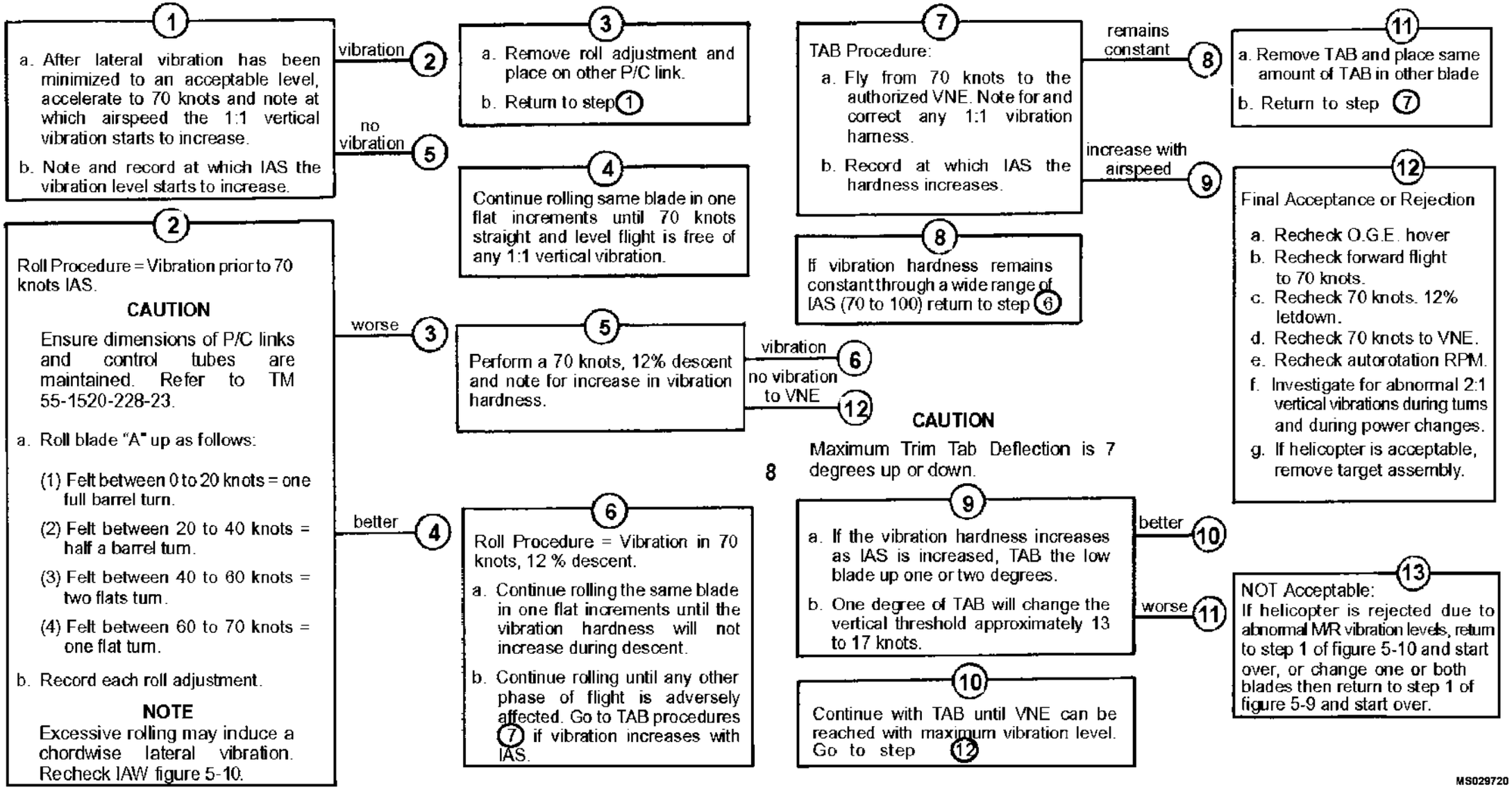
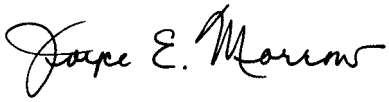


Figure FO-3. Alternate Vertical Smoothing Procedures

By Order of the Secretary of the Army:

GEORGE W. CASEY, JR.
General, United States Army
Chief of Staff

Official:



JOYCE E. MORROW
Administrative Assistant to the
Secretary of the Army
0709508

DISTRIBUTION:
To be distributed in accordance with Initial Distribution Number (IDN) 310231 requirements for TM 1-1520-228-MTF.

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch

1 decimeter = 10 centimeters = 3.94 inches

1 meter = 10 decimeters = 39.37 inches

1 dekameter = 10 meters = 32.8 feet

1 hectometer = 10 dekameters = 328.08 feet

1 kilometer = 10 hectometers = 3280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain

1 decigram = 10 centigrams = 1.54 grains

1 gram = 10 decigrams = .035 ounce

1 dekagram = 10 grams = .35 ounce

1 hectogram = 10 dekagrams = 3.52 ounces

1 kilogram = 10 hectograms = 2.2 pounds

1 quintal = 100 kilograms = 220.46 pounds

1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce

1 deciliter = 10 centiliters = 3.38 fl. ounces

1 liter = 10 deciliters = 33.81 fl. ounces

1 dekaliter = 10 liters = 2.64 gallons

1 hectoliter = 10 dekaliters = 26.42 gallons

1 kiloliter = 10 hectoliters = 264.18 gallons

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