*TM 1-1520-238-MTF

Technical Manual

MAINTENANCE TEST FLIGHT MANUAL

HELICOPTER, ATTACK, AH-64A APACHE

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

**HEADQUARTERS,
DEPARTMENT OF THE ARMY
31 AUGUST 1994**

* This manual supersedes TM 55-1520-238-MTF, dated 16 September 1987, including all changes.

CHANGE NO. 5

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Maintenance Test Flight Manual
For
HELICOPTER, ATTACK, AH-64A APACHE

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A through C/(D blank)	A through C/(D blank)
i through iii/(iv blank)	i through iv
1-1 through 1-4	1-1 through 1-4
2-73 and 2-74	2-73 and 2-74
2-83 and 2-84	2-83 and 2-84
2-85 and 2-86	2-85 and 2-86
4-3 and 4-4	4-3 and 4-4
4-13 and 4-14	4-13 and 4-14
4-17 through 4-20	4-17 through 4-20

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

TM 1-1520-238-MTF
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Maintenance Test Flight Manual
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———	A through C/(D blank)
2–49 through 2–52	2–49 through 2–52
2–55 and 2–56	2–55 and 2–56
2–87 and 2–88	2–87 and 2–88
4–3 through 4–6	4–3 through 4–6
5–13 and 5–14	5–13 and 5–14

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Remove pages	Insert pages
i and ii	i and ii
————————	iii/(iv blank)
1-3 and 1-4	1-3 and 1-4
2-17 through 2-20	2-17 through 2-20
2-55 through 2-58	2-55 through 2-58
2-58.1 and 2-58.2	2-58.1 and 2-58.2
2-65 and 2-66	2-65 and 2-66
2-69 through 2-74	2-69 through 2-74
2-93 and 2-94	2-93 and 2-94
4-19 through 4-24	4-19 through 4-24
4-27 and 4-28	4-27 and 4-28

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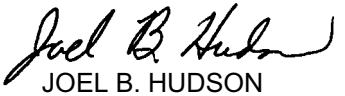

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HELICOPTER, ATTACK,
AH-64A APACHE

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Remove pages	Insert pages
2-83 thru 2-84.2	2-83 thru 2-84.2
2-85 and 2-86	2-85 and 2-86
2-93 and 2-94	2-93 and 2-94
4-9 and 4-10	4-9 and 4-10
4-21 and 4-22	4-21 and 4-22
4-31 and 4-32	4-31 and 4-32

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CHANGE NO. 1

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Maintenance Test Flight Manual

HELICOPTER, ATTACK, AH-64A APACHE

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2-15 through 2-18	2-15 through 2-18
2-43 and 2-44	2-43 and 2-44
2-57 and 2-58	2-57 and 2-58
– – – –	2-58.1 and 2-58.2
2-59 and 2-60	2-59 and 2-60
2-63 and 2-64	2-63 and 2-64
2-73 through 2-76	2-73 through 2-76
2-79 through 2-84	2-79 through 2-84
– – – –	2-84.1 through 2-84.3/(2-84.4 blank)
2-85 and 2-86	2-85 and 2-86
2-89 through 2-94	2-89 through 2-94
4-3 and 4-4	4-3 and 4-4
5-9 and 5-10	5-9 and 5-10

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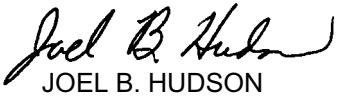

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WARNING

The maintenance test flight is an exceptionally demanding operation and requires a thorough flight readiness inspection (PRE-FLIGHT). The flight readiness inspection is prescribed in TM 1-1520-238-10 operators 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 should be used only by qualified maintenance test flight pilots as required in AR 95-1.

LIST OF EFFECTIVE PAGES

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Original . . . . . 0 . . . . . 31 August 1994
Change . . . . . 1 . . . . . 5 February 1996
Change . . . . . 2 . . . 20 September 1996
Change . . . . . 3 . . . . . 30 July 1997
Change . . . . . 4 . . . . . 18 January 2001
Change . . . . . 5 . . . . . 21 November 2001

TOTAL NUMBER OF PAGES IN THIS PUBLICATION IS 154, CONSISTING OF THE FOLLOWING:

Page No.	*Change No.
Cover	1
Blank	1
A – C	5
D Blank	5
a	0
b Blank	0
i – iv	5
1-1 – 1-3	5
1-4	3
2-1 – 2-4	0
2-5	1
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2-15 – 2-16	1
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2-21 – 2-49	0
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2-52 – 2-55	0
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2-57 – 2-58	3
2-58.1 – 2-58.2	3

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Page No.	*Change No.
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2-73	5
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2-75 – 2-76	1
2-77 – 2-78	0
2-79 – 2-83	1
2-84	5
2-84.1	1
2-84.2	2
2-84.3	1
2-84.4 Blank	1
2-85	5
2-86	2
2-87 – 2-88	4
2-89 – 2-90	1
2-91	0
2-92	1
2-93	3
2-94	1
2-95	0
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3-1 – 3-3	0
3-4 Blank	0
4-1 – 4-2	0
4-3	4
4-4	5
4-5	4
4-6 – 4-9	0
4-10	2
4-11 – 4-12	0

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4-13	5
4-14 – 4-16	0
4-17 – 4-19	5
4-20 – 4-23	3
4-24 – 4-26	0
4-27	3
4-28 – 4-30	0
4-31	2
5-1 – 5-13	0
5-14	4
5-15 – 5-16	0
Temp Conversion – Blank	0

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Technical Manual

No. 1-1520-238-MTF

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C.,
31 August 1994

HELICOPTER, ATTACK, AH-64A APACHE

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this publication. 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), or DA Form 2028-2 located in the back of the applicable Aircraft Operator's manual, (when using the 2028-2 from the Operators manual, ensure the publication number and title reflect this MTF) directly to: Commander, US Army Aviation and Missile Command, ATTN: AMSAM-MMC-MA-NP, Redstone Arsenal, AL 35898–5230. A reply will be furnished directly to you. You may also submit your recommended changes by E-mail directly to 2028@redstone.army.mil. Instructions for sending an electronic 2028 may be found at the end of TM 1-1520-238-10 immediately preceding the hard copy 2028.

OZONE DEPLETING CHEMICAL INFORMATION

This document has been reviewed for the presence of Class I Ozone Depleting chemicals. As of Change 3, dated 30 July 1997, all references to Class I Ozone Depleting chemicals have been removed from this document by substitution with chemicals that do not cause atmospheric Ozone depletion.

* This manual supersedes TM 55-1520-238-MTF, dated 16 September 1987, including all changes.

CHAPTER 1. INTRODUCTION

1-1. PURPOSE.

The purpose of this manual is to provide complete instructions for performing a maintenance test flight of the AH-64A helicopter. For the specific conditions which require a general or limited maintenance test flight, refer to TM 1-1500-328-23 and TM 1-1520-238-23.

1-2. DEFINITIONS.

a. **Maintenance Test Flight.** A flight for which the primary mission is to determine airworthiness, i.e., that the airframe, power plant accessories and items of equipment are functioning in accordance with predetermined requirements in the intended operational environment.

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

WARNING

An operating or maintenance procedure, practice, condition, or statement which, if not strictly observed, could result in injury to or death of the person who performs the action which follows the warning.

CAUTION

An operation procedure, practice, condition, or statement which, if not strictly observed, could result in damage to or destruction of equipment or loss of mission effectiveness or long term health hazard to personnel who perform the action which follows.

NOTE

An essential operating or maintenance procedure, condition, or statement which must be highlighted.

1-3. GENERAL INFORMATION.

a. This manual covers only maintenance test flight of the AH-64A helicopter and in no way supercedes any information contained in TM 1-1520-238-10 or -CL, but is to be used in conjunction with the -10 or -CL. For the purpose of maintenance test flights only, this manual satisfies all the requirements of the -CL from INTERIOR CHECK through ENGINE SHUTDOWN.

b. Crew requirements will be specified in TM 1-1500-328-23 and TM 1-1520-238-10.

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

1-4. SPECIAL INSTRUCTIONS.

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

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

c. **Configuration.** The configuration of the aircraft should be determined prior to each maintenance test flight in order to determine parameters.

d. **Post Test Flight Inspection.** A thorough visual inspection shall 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. **References.** When a maintenance test flight is required to assure proper operation of a specific system(s), refer to the applicable maintenance manual for the limits of that system.

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

A double asterisk (**) indicates a mandatory check for all test flights.

g. **Maintenance Test Flight Check Sheet.** A Check Sheet similar to the one contained in Chapter 5 shall be used for all test flights. When a test flight is performed to determine if specific equipment or systems are operating properly, completion of only that portion of the Maintenance Test Flight Check Sheet applicable to the specific equipment or systems being tested is required. 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 immediately after termination of the flight. The sheet shall be attached to the DA Form 2408-13 upon completion. After accumulation of two or more sheets, the data shall be reviewed to determine if trends are developing.

h. **Designator Symbol.** All AH-64A helicopters have BUCS equipment installed. In most helicopters, the system is deactivated; in some it is operable. The designator symbol B indicates text headings, text contents, and illustrations pertaining to helicopters with an operable BUCS.

Some helicopters have T700-GE-701C engines installed. Those helicopters will have components, instrumentation, performance parameters, and procedures different from helicopters with T700-GE-701 engines installed. The designator symbols 701 and 701C indicate material pertaining to those specific engines.

Some AH-64A helicopters have the 7-319200005-11 Fire Control Computer (FCC) with –51 software installed (EGI Mod); others have the 7-319200005-9A Fire Control Computer (FCC) with –49A software installed; others yet have the 7-319200005-5 FCC with –45 software. Because of differences in operation, displays, etc. designator symbols –45, –49A, and –51 will indicate material peculiar to that software installation.

CHAPTER 2. MAINTENANCE TEST FLIGHT CHECKLIST

2-1. GENERAL.

This chapter contains the maintenance test flight requirements peculiar to Army model AH-64A helicopter. 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 checklist (troubleshooting reference) is cross indexed to the troubleshooting guides contained in Chapter 3 or the troubleshooting chapter of the applicable maintenance manual or both. 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.

PROCEDURE	TROUBLESHOOTING REFERENCE

****PRIOR TO MAINTENANCE TEST FLIGHT**

1. Forms and records – Check.
2. A thorough flight readiness inspection in accordance with the requirements contained in TM 1-1520-238-10 – Performed.
3. Special equipment – Check installed as required.
4. Special pre-flight checks – Accomplished.
5. Crewmembers – Briefed.

****INTERIOR CHECK – PILOT**

1. Canopy door – As desired.
2. Glare shields – Check.
3. Loose equipment – Secure.
4. Vents – Check.
5. Seat – Check adjustment range and locking. Adjust to design eye position. Armor plate as required.
6. Restraint harness – Fasten and adjust.
7. Inertial reel lock – Check.
8. Pedals – Check adjustment range and locking. Set as required.

PROCEDURE	TROUBLESHOOTING REFERENCE

INTERIOR CHECK – PILOT (CONT)

9. **PARK BRAKE** – Check function, set.

10. **L CSL**, **R/CTR CSL** switches – As required.

11. Overhead circuit breakers – As required.

12. Collective stick switches – As required.

CAUTION

Physical confirm that engine chop collar is seated in its latched/centered position and safetied.

13. Auxiliary vent handle – Check operation, close.

14. Utility light – Off and stowed.

15. OAT gauge – Check.

16. **ANTI-ICE** panel switches – **OFF**.

17. **EXT LT**, **INTR LT** – As required.

18. **FUEL** panel switches – Set.

    a. **EXT TK** switch – **OFF**.

    b. **TRANS** switch – **OFF**.

    c. **CROSSFEED** switch – **NORM**.

PROCEDURE	TROUBLESHOOTING REFERENCE

INTERIOR CHECK – PILOT (CONT)

d. **ENG 1** switch – **ON**.

e. **ENG 2** switch – **ON**.

19. **PWR** Levers – **OFF**.

20. **ENG START** switches – **OFF**.

21. **MASTER IGN** switch – **ON**.

22. **RTR BK** – **OFF**.

23. **OVSP TEST** panel switches – Check centered.

24. **ELEC PWR** panel switches – **OFF**.

25. **STORES JETT** select switches – Guard covers down.

26. **ROCKETS** control panel – Check.

27. **MSL** control panel **LOAL** switch – **OFF.**

28. **ASE** panel switches – Check.

29. **ECS** control panel switches – Set.

a. **ENCU** – **ON**.

b. **FAN** – **NORM**.

c. **TEMP** control – As desired.

30. **TAIL WHEEL** switch – **LOCK**.

PROCEDURE	TROUBLESHOOTING REFERENCE

INTERIOR CHECK – PILOT (CONT)

31. **CANOPY JETTISON** pin – Remove and stow.

32. **FIRE CONTROL** panel – Set as follows:

    a. **SIGHT SEL** switch – **STBY**.

    b. **ACQ SEL** – **OFF**.

    c. **VID SEL** – **PLT**.

    d. **ACM** – **OFF**.

    e. **PNVS** – Off.

    f. **IHADSS BRSIT** – **OFF**.

    g. **RKT** select switch – **OFF**.

    h. **GUN** select switch – **OFF**.

    i. **MSL** select switch – **OFF**.

33. Magnetic compass – Check compass card, condition.

34. BRU – Check.

35. **FIRE BTL** select switch – Centered.

PROCEDURE	TROUBLESHOOTING REFERENCE

INTERIOR CHECK – PILOT (CONT)

36. **ENG FIRE PULL** handles – Check full in.

37. Engine instrument test panel switch – As desired.

38. Marconi instruments – Check.

39. Flight instruments – Check and set as follows:

    a. Airspeed indicator – Check static indication.

    b. Standby attitude indicator – Cage.

    c. VDU – **OFF**.

    d. Radar altimeter – **OFF**.

    e. Altimeter – Check.

    f. Turn and slip indicator – Check for condition.

    g. Vertical speed indicator – Check indication.

    h. HSI – Check **HDG** and **CRS** knobs for function.

40. Stabilator position indicator – Check.

41. Icing severity indicator – Check.

42. Clock – Check and set.

PROCEDURE	TROUBLESHOOTING REFERENCE

INTERIOR CHECK – PILOT (CONT)

43. Accelerometer – Reset.

44. **HARS** – **OFF**.

45. Hydraulic pressure indicator – Check.

46. **EMERG HYD** switch – **OFF**.

47. Remote transmit select panel – Check.

48. **CSC** panel switches – As required.

49. Right console avionics – **OFF**.

50. **FIRE APU PULL** handle – Check full in.

51. **FIRE BTL** select switch – Centered.

52. **APU** control switch – **OFF**.

53. Helmet – On.

NOTE

Routing the IHADSS HDU cable under the right arm may cause entanglement during emergency egress.

54. HDU – Check and adjust as required.

PROCEDURE	TROUBLESHOOTING REFERENCE

****INTERIOR CHECK – COPILOT/GUNNER (CPG)**

1. Canopy door – As desired.
2. Glare shields – Check.
3. Loose equipment – Secure.
4. Vents – Check.
5. Seat – Check adjustment range and locking. Adjust to design eye position. Armor plate as required.
6. Restraint harness – Fasten and adjust.
7. Inertial reel lock – Check.
8. Pedals – Check adjustment range and locking. Set as required.
9. Collective stick switches – As required.

CAUTION

Physically confirm that engine chop collar is seated in its latched/centered position and safetied.

10. Circuit breakers – As required.
11. Utility light – Off and stowed.
12. **INTR LT** – As required.

PROCEDURE	TROUBLESHOOTING REFERENCE

INTERIOR CHECK – CPG (CONT)

13. **FUEL** panel switches – Set as follows:
    a. **ORIDE** – **PLT**.
    b. **TRANS** – **OFF**.
    c. **BOOST** – **OFF**.
    d. **TK SEL** – **NORM**.
14. **PWR** levers – **OFF**.
15. **EMER HYD PWR** – **OFF**, guard down.
16. **BAT OVRD** – **NRML**, guard down.
17. **ANTI-ICE** panel switches – Set as follows:
    a. **TADS/PNVS GND** – **OFF**.
    b. **W WIPER** – **PLT**.
18. **AUX** panel switches – Set as follows:
    a. **STBY FAN** – **OFF**.
    b. **ADSS** – **OFF**.
19. **RECORDER** – Set as follows:
    a. **VIDEO** – As desired.
    b. **MODE** – **OFF**.

PROCEDURE	TROUBLESHOOTING REFERENCE

INTERIOR CHECK – CPG (CONT)

20. **MSL** panel – Set as follows:
    a. **TYPE** – **LASER**.
    b. **MODE** – **STBY**.
    c. **LOAL** – **OFF**.
21. **DATA ENTRY** keyboard – **OFF**.
22. Mirror – Check and adjust.
23. BRU – Check.
24. **CANOPY JETTISON** pin – Remove and stow.
25. **ENG FIRE PULL** handles – In.
26. **FIRE BTL** select switch – Centered.
27. **FIRE CONTROL** panel switches – Set as follows:
    a. **CPG ARM/SAFE** switch – **OFF**.
    b. Weapons select switches – **OFF**.
    c. **SIGHT SEL** switch – **STBY**.
    d. **ACQ SEL** – **FXD**.
    e. **MUX** – **PRI**.
    f. **FCC/MUX** – **ON**.
    g. **BRSIT** – **IHADSS** and **TADS** to **OFF**.

PROCEDURE	TROUBLESHOOTING REFERENCE

INTERIOR CHECK – CPG (CONT)

h. **LSR MSL CCM** – **OFF**.

i. **PLT/GND OVRD** – **OFF**.

j. **LRF/D CCM** – **OFF**.

k. **FC SYM GEN** – **OFF**.

l. **IHADSS** – **OFF**.

m. **TADS** – **OFF**.

28. ORT handles and switches – Set as follows:

    a. **LT** – **OFF**.

    b. **ACM** – **OFF**.

29. ORT HOD night filter – Check and stow.

30. Engine instrument test panel – **NORM**.

31. Marconi instruments – Check.

32. Flight instruments – Check and set as follows:

    a. Airspeed indicator – Check static indications.

    b. Attitude indicator – Check.

    c. RMI – Check.

PROCEDURE	TROUBLESHOOTING REFERENCE

INTERIOR CHECK – CPG (CONT)

d. Altimeter – Check.

e. Vertical velocity indicator – Check static indication.

33. Clock – Check and set.

34. Stabilator position indicator – Check.

35. **CSC** panel switches – As required.

36. Right console avionics – **OFF**.

37. **DPLR** mode select switch – **OFF**.

38. Cyclic – Check STOW and EXTEND lock function. Leave cyclic in required position for flight.

39. Helmet – On.

NOTE

Routing the IHADSS HDU cable under the right arm may cause entanglement during emergency egress.

40. HDU – Check and adjust as required.

****BEFORE STARTING APU – PILOT/CPG**

1. **BATT/EXT PWR** switch – **BATT** or **EXT** as required. A9

*2. ICS system – Check as follows: A9, B

a. Engine Out Audio – Verify audio present then reset.

PROCEDURE	TROUBLESHOOTING REFERENCE

BEFORE STARTING APU – PILOT/CPG (CONT)

b. **CSC** panel – Verify proper system function at all stations.

*3. Caution/warning panels – Check proper indications, test and reset. A9

*4. Fire detectors – Test. A12

*5. Instrument TEST panels – Test function, digits control, and photocell dimming. Check SDD function in all positions. A8

STARTING ENGINES – EXTERNAL PRESSURIZED AIR SOURCE

Refer to Chapter 4, paragraph A.

****STARTING APU – PILOT**

1. Fire guard – Posted if available. APU exhaust area clear.

2. Hydraulic accumulator – Verify 2600 psi minimum.

*3. **APU** – **START**. A15

PROCEDURE	TROUBLESHOOTING REFERENCE

STARTING APU – PILOT (CONT)

a. **APU** control switch – Set to run position. Verify **APU FAIL** C/W segment illuminates. Complete priming, initiate start, then to run.

CAUTION

The APU 95% cold start switch should not be used when the ambient temperature is above 0 °F (–18 °C) because this significantly increases component wear and may cause premature component failure.

b. **95%** switch – Hold to **95%** position as required.

c. Hydraulic system gages – Verify 3000 PSI indicated after PTO clutch engagement. — A7

d. Caution/warning panel – Verify **PRI HYD PSI, UTIL HYD PSI, OIL PSI ACC PUMP** and **APU FAIL** segments extinguished; **SHAFT DRIVEN COMP** and **APU ON** segments illuminated. — A7, A9 A15

AFTER STARTING APU

WARNING

To prevent injury to personnel, ensure pylons are clear prior to performing the generator system check.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

1. External power (if used) – Disconnect. Verify **EXT PWR** caution/warning segment extinguished.

*2. Generator system – Check as follows: A9

NOTE

B During the following checks the BUCS fail lamp will illuminate on BUCS equipped aircraft. This is normal and will be cleared during the BUCS self test or by cycling the ASE pitch, roll, or yaw switches.

a. **GEN 1** switch – **TEST**. Verify **GEN 1** caution/warning segment extinguished.

b. **GEN 1 switch – **GEN**. Verify **GEN 1**, **RECT 1**, **RECT 2** and SDC caution/warning segments extinguished, CPG **ELEC SYS FAIL** caution/warning segment extinguished.

NOTE

The **TADS**, **PNVS**, **ASE** and **ADS** caution/warning segments will illuminate and remain illuminated until the respective system switches are turned on.

c. **GEN 2** switch – **TEST**. Verify **GEN 2** caution/warning segment extinguished; **RECT 2** and **HOT BAT** caution/warning segments illuminated.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

d. **GEN 2 switch – **GEN 2**. Verify all electrical system caution/warning segments extinguished.

e. **GEN 1** switch – **OFF**. Verify **GEN 1** caution/warning segment illuminates and **RECT 1** caution/warning light is extinguished.

f. **GEN 1** switch – **TEST**. Verify **GEN 1** caution/warning segment extinguished; **RECT 1** and **MAN STAB** caution/warning segment illuminated, and stabilator fail audio present in headset. The **GUN** caution/warning segment may also be illuminated.

g. **GEN 1** switch – **GEN**. Verify all electrical system caution/warning segments extinguished.

*3. **EXT** and **INTR LT** – Check, set as required.

*4. **ECS** system – Test as follows:

a. Pilot **STBY FAN** switch – **STBY FAN**, verify increased fan speed, then **NORM**; verify return to normal fan speed.

b. CPG **STBY FAN** switch – **STBY**. Verify increased fan speed, then **OFF**; verify return to normal fan speed.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

c. **ENCU** – Verify air flow and proper temperature control through entire range.

5. Canopy doors – Secure, verify **CANOPY caution/warning segment extinguished.

6. **ECS caution/warning segment – Verify extinguished. B, A9

**7. Avionics – On (except doppler). Allow a two-minute warm-up before test or use.

8. **FC SYM GEN switch – **ON**.

9. **IHADSS switch – **ON** as required.

10. **TADS switch – As required. Verify **TADS** and **PNVS** caution/warning segment extinguished if on. C, H

11. **ADSS switch – On, verify **ADS** caution segment extinguishes. C

12. **PNVS – As required. Verify **TADS** and **PNVS** caution/warning segment extinguished. C, I

**13. VDU – On, test and set as required.

**14. FD/LS – Check status.

**14A. Aircraft data – Check and set as follows: C

NOTE

If erroneous magnetic variation data is entered, all heading indications will display erroneous readings.

For –49A and previous FCC software:

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

a. DEK – Set to **SP1**. Verify data.

For –51 FCC software:

b. CDU NAV/ADMIN page(s) – Verify data.

NOTE

If HARS fails alignment, perform HARS self test. Refer to Chapter 4, paragraph L.

15. **HARS control switch – **HARS** control switch – for –49A and previous FCC software select **NORM**. For emergency operations select **FAST.** For –51 FCC software select **NORM** for stationary starts, or **FAST** for airborne or moving starts. B, C

**16. Standby attitude indicator – Uncage, adjust as required.

**17. Altimeters – Set to field elevation.

**18. Radar altimeter – Check as follows: B

a. On – Verify **OFF** flag not present; altitude pointer and flight symbology indicate 0 + 5 feet and agree; digital readout indicates 0 + 3 feet; **LO** warning light and **LO** on flight symbology illuminated.

b. TEST – Verify altitude pointer, digital readout, and flight symbology indicate 1000 ± 100 feet and agree; **HI** warning light and **HI** on flight symbology illuminated.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

*19. Avionics – On, test, program as required. B

NOTE

Procedures for testing the AN/ARN-149 ADF are in paragraph b.

*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.

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

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

(d) Note HSI and 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 HSI and RMI bearing indicators 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.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

(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.

NOTE

If **TUNE** meter changes, impedance matching amplifier requires adjustment.

(f) Mode selector – **ANT**. Note **TUNE** meter indication.

(g) **ADF** – Set as required.

*b. AN/ARN-149 ADF Radio – Test as follows:

(1) **ANT** mode operation.

(a) Mode selector – **ANT**.

(b) HSI No. 2 bearing pointer is 90° from aircraft heading.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

(c) **MAN**-2182-500 switch – **MAN**.

(d) Frequency – Select and tune to a continuous wave station, if applicable.

(e) **TEST**-**TONE** switch – **TONE**. Note 1 kHz audio tone in headset.

(2) **ADF** operation.

(a) Mode selector – **ADF**.

(b) **MAN**-2182-500 switch – **MAN**.

(c) **AUDIO** control – As desired.

NOTE

If thunderstorms are in the area, the ADF will momentarily point in the direction of the storm. This is not an indication of failure in the system.

(d) Note position of HSI No. 2 pointer and RMI pointer.

(e) **TEST**-**TONE** switch – Momentarily **TEST**.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

(f) HSI No. 2 bearing pointer and RMI pointer rotate 90° from original position and then return to their original positions.

*c. 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.**

(7) Repeat steps (5) and (6) for **M-2**, **M-3/A**, and **M-C** switches.

NOTE

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

(8) **ANT** switch – **TOP**.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

(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. Computer not installed – **TEST MON NO-GO** indicator lights and KIT status lights.

(16) **MODE 4 TEST/ON/OUT** switch – **ON** with a computer, and **OUT** without a computer.

(17) **MASTER** rotary switch – **STBY**.

d. Communication radios – Test as required.

*e. Doppler Navigation Set – On. Test and set as required.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

*f. Fire control system – Verify boresight numbers. Complete programming as required.

g. Survivability equipment – Test as required.

*20. Anti-ice systems – Check as follows: A12

WARNING

Severe burns may result from touching a hot element. Check for radiated heat before touching ice detector probe, pitot tubes, nose gearbox fairings, and the air data sensor. A ground crewmember will have to touch the tip of the ice detector probe to generate a false signal. Release tip immediately when tip starts to heat up.

a. **ANTI-ICE** panel **BLADE** switch – **ON**.

b. Perform **FD/LS** test 03.

c. **ANTI-ICE** panel **BLADE** switch – Off.

d. DEK switch – **STBY**.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

*e. Ice-detector – Have crewmember touch tip. Verify ice severity meter needle movement, **ENG ICE** caution/warning segment illuminated, and detector heated. Release detector and verify **ENG ICE** caution/warning segment extinguished in approximately 90 seconds.

*f. **PITOT-AD SNSR** anti-ice system – Test as follows: A12

(1) **ANTI-ICE** panel **PITOT AD SNSR** and **ENG INLET** switches – **ON**. Verify **ENG 1 ANTI ICE** and **ENG 2 ANTI ICE** caution/warning segments illuminate.

(2) Have crewmember touch pitot tubes and nose gearbox fairings to verify heating.

(3) **ADSS** switch – **OFF**. Have crewmember touch sensor and verify heating.

(4) Ice detector unit – Have crew–member verify presence of PAS air and that the exterior housing is heated.

(5) Set pilot and CPG switches as desired.

PROCEDURE **TROUBLESHOOTING REFERENCE**

AFTER STARTING APU (CONT)

*g. **CANOPY DEFOG** switch – **ON.** Verify warm air coming from window diffusers. Then set as desired.

*21. IHADSS – Boresight as follows:

a. PILOT

WARNING

Offset boresight is not authorized.

(1) **SIGHT SEL** switch – **STBY** or **NVS**.

(2) **VID SEL** switch – **GRAY SC**. Adjust grayscale to optimize.

(3) **IHADSS VID BRT** and **CONTRAST** controls – Check through full range. Then set as desired.

(4) **VID SEL** switch – **PLT**.

(5) **IHADSS VID SYM BRT** control – Adjust.

(6) **IHADSS BRSIT** switch – **ON**.

(7) **INTR LT INST** control – On. Check reticle brightness corresponds to switch position through full range. Then set as required.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

(8) Align HMD reticle with BRU.

(9) **HMD BRSIT** switch – Actuate, then release.

(10) **IHADSS BRSIT** switch – **OFF**.

(11) **INTR LT INST** control – As desired.

(12) **SIGHT SEL** switch – As desired.

b. CPG

WARNING

Offset boresight is not authorized.

(1) **SIGHT SEL** switch – **HMD** or **HMD TADS**.

(2) **GS** switch – Actuate, Adjust grayscale to optimize.

(3) ORT **BRT** and **CONT** controls – Check through full range. Then set as desired.

(4) **VID SEL** switch – **TADS.**

(5) **SYM BRT** control – Adjust.

(6) **BRSIT IHADSS** switch – **ON**.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

(7) **INTR LT INST** control – On. Check reticle brightness corresponds to control position through full range. Then set as desired.

(8) Align HMD reticle with BRU.

(9) **HMD BRSIT** switch – Actuate then release.

(10) **BRSIT IHADSS** switch – **OFF**.

(11) **INTR LT INST** control – As desired.

(12) **SIGHT SEL** switch – As required.

*22. TADS – Complete operational checks and boresight as required.

a. Grayscale adjust check:

(1) **GS** switch – Actuate, Verify symbology replaced by grayscale on HOD.

(2) ORT **BRT** and **CONT** controls – Actuate through full range and adjust for optimum scaling.

(3) **HDD** switch – Actuate. Repeat steps (1) and (2) above. Return to HOD operations.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

b. **VID SEL** switch check:

(1) **PNVS** – Verify pilots display present.

(2) TADS – Verify TADS symbology displayed.

c. **SIGHT SEL** switch – **TADS**. Verify turret slews to fixed forward, **FORWARD** message displayed in HOD High Action Display.

d. Autodrift null check:

(1) **SLAVE** switch – Unslave. Observe turret for any uncommanded tendency to drift or drive. When it appears to decrease to a minimum or stop, depress **SLAVE** switch. Verify turret returns to fixed forward.

(2) **SLAVE** switch – Unslave. Slew turret to an easily observed target.

(3) FOV select switch – **N**. Note any remaining uncommanded drift.

NOTE

If turret drift is not minimized to an acceptable level during the autodrift null procedure, perform the manual drift null procedure. Refer to Chapter 4, paragraph B.

PROCEDURE **TROUBLESHOOTING REFERENCE**

AFTER STARTING APU (CONT)

e. Turret travel check:

(1) Sensor select switch – As desired. (FLIR tracks the fastest).

(2) Verify proper response to thumbforce commands and presence of **LIMITS** message in high action display when the turret is slewed to the azimuth and elevation limits.

CAUTION

Approach travel limits slowly to prevent driving the turret into the stops.

(3) **SLAVE** switch – **SLAVE**.

f. **TV** sensor operational check:

(1) Sensor select – **TV**. Evaluate image and symbology quality in each field of view.

(2) IAT/IAT offset check – Slew turret to a target of relatively high contrast differential:

(a) IAT polarity switch – Select appropriate polarity for image lock on.

(b) **IAT MAN** switch – Engage. Verify proper lockon of selected image.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

(c) **IAT OFS** switch – Actuate. Verify turret responds to thumbforce controller commands and allows movement about 20 percent of the available field of view.

(d) **IAT OFS** switch – Reactuate. Observe TADS crosshairs move smoothly towards IAT target, then jump suddenly onto the selected target.

(e) IAT polarity select switch – Verify tracking remains unchanged when appropriate polarity and/or **AUTO** polarity is selected, but break lock occurs when the opposite polarity is selected. Disengage IAT before excessive turret movement rates occur.

(3) Range focus adjustment – Check as follows:

(a) Select a target at least 500 meters distant.

(b) FOV select switch – **N**.

PROCEDURE **TROUBLESHOOTING REFERENCE**

AFTER STARTING APU (CONT)

(c) **RNG FOC** switch – Actuate through full range. Adjust as required to optimize image.

(4) Linear Motion Compensation Check as follows:

(a) Thumbforce controller – Actuate to initiate turret movement.

(b) **LMC** switch – Actuate. Verify turret continues movement at approximately the same rate.

(c) **LMC** switch – Reactuate. Verify turret stops.

(d) **LMC** switch – Reactuate. Verify turret remains stationary.

(e) **LMC** switch – Reactuate.

g. DVO sensor check:

(1) Sensor select switch – **DVO**. Verify TV imagery remains in HOD, **DVO** message displayed in HOD high action display, and DVO available in HDD.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

(2) **FLTR SEL** switch – Actuate to each available filter. Verify smooth switching of filters to selected mode.

(3) AND – Observe for appropriate data display. Verify range of adjustment of AND rheostat control.

(4) Optics check – Select each available FOV. Observe crosshair relationship to ‘‘Real World Image’’. Slew turret using thumbforce controller observing for any excessive crosshair rotation tendency.

NOTE

If display image is not reasonably upright, or if excessive crosshair rotation occurs during slewing, attempt to correct problem by performing the pechan alignment procedure. Refer to Chapter 4, paragraph C.

h. FLIR sensor check:

(1) Sensor select switch – **FLIR**.

(2) **LVL** and **GAIN** controls – Adjust through full range of authority noting effectiveness. Adjust as required for optimum imagery.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

(3) **ACM** switch – Engage. Note any adverse effects on image quality; reoptimize imagery as required.

(4) IAT/IAT OFS check – Slew turret to a target of relatively high contrast differential:

(a) IAT polarity switch – Select appropriate polarity for image lockon.

(b) **IAT MAN** switch – Engage. Verify proper lockon of selected image.

(c) **IAT OFS** switch – Actuate. Verify turret responds to thumbforce controller commands and allows movement about 20 percent of the available field of view.

(d) **IAT OFS** switch – Reactuate. Observe TADS crosshairs move smoothly towards IAT target, then jump suddenly onto the selected target.

(e) **FLIR PLRT** select switch – Verify tracking capability in both **WHT** and **BLK** positions.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

(f) **IAT** switch – Deactivated.

(5) Range focus adjustment – Check as follows:

(a) Select a target at least 500 meters distant.

(b) FOV switch – **N**.

(c) **RNG FOC** switch – Actuate through full range. Adjust as required to optimize image.

(6) **NT** filter select switch – Actuate. Verify proper function of night filter.

(7) **SLAVE** switch – Actuate to return turret to fixed forward stow.

i. Laser spot tracker – Check as follows:

(1) **LT** – **AUTO**.

(2) **SLAVE** switch – Actuate. Verify TADS turret enters a four bar search pattern.

(3) **LT** – **OFF**. Verify TADS turret stops.

(4) **SLAVE** switch – Actuate.

PROCEDURE **TROUBLESHOOTING REFERENCE**

AFTER STARTING APU (CONT)

j. TADS internal boresight:

WARNING

Ensure proper laser safety procedures are followed.

(1) TV

(a) **SIGHT SEL** control switch – **TADS**.

(b) Sensor select switch – **TV**.

(c) Field of view select switch – **N**.

(d) Tracker PLRT – W/B.

(e) **BRSIT** – **TADS**.

(f) **LSR SEL** – **ON**.

(g) **PLT/GND ORIDE** – **ORIDE**.

(h) **CPG ARM/SAFE** switch – **ARM**.

(i) Laser trigger – Press.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

(j) BRSIT ENABLE switch – UP position, observe tracking gates capture laser spot, continue to fire laser until tracking gates disappear. If automatic boresight does not appear to function properly, continue lasing for an additional fifteen seconds (0:15).

NOTE

If unable to capture laser spot, refer to manual boresight adjust procedure in Chapter 4, paragraph D.

(k) BRSIT ENABLE switch – CENTER.

(l) Laser trigger – Release.

(m) Field of view select switch – **Z**.

(n) Repeat steps (i) thru (l).

(2) FLIR

(a) Sensor select – **FLIR**.

(b) Field of view select switch – **N**.

(c) Adjust **FLIR LEVEL** fully counter clockwise.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

(d) Adjust **FLIR GAIN** to minimize video noise.

(e) Laser trigger – Press.

(f) BRSIT ENABLE switch – UP position, observe tracking gates capture laser spot, continue to fire laser until tracking gates disappear. If automatic boresight does not appear to function properly, continue lasing for an additional fifteen seconds (0:15).

NOTE

If unable to capture laser spot, refer to cue update procedure in Chapter 4, paragraph F.

(g) BRSIT ENABLE switch – CENTER.

(h) Field of view select switch – **Z**.

(i) Repeat steps (e) thru (g).

(j) **LSR SEL** – **OFF**.

(k) **CPG ARM/SAFE** switch– **SAFE**.

(l) **PLT/GND ORIDE** – **OFF**.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

(3) DVO

(a) Sensor select switch – **DVO**.

(b) Field of view select switch – **N**.

(c) Observe position of DVO crosshairs, if coincident with TV reticle go to step (g) below.

(d) BRSIT ENABLE switch – DOWN.

(e) DVO BRSIT – Adjust DVO crosshairs into coincidence with TV reticle.

(f) BRSIT ENABLE switch – CENTER.

(g) **BRSIT** – **OFF**.

(h) **ACQ SEL** – **FXD**.

(i) **SLAVE** switch – Press, TADS returns to the fixed forward position.

(j) Sensor select switch – As desired.

k. Video recorder – Check as required:

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

(1) **MODE** – As required.

(2) **PLAY** – As required.

(3) **VIDEO** – As required.

(4) **VID RCD** – Actuate. Verify tape counter increases/decreases as required for mode selected.

(5) **VID RCD** – Set as required for flight.

*23. PNVS – Evaluate operation as required.

a. **ACQ SEL** switch – **NVS FXD**.

b. **SIGHT SEL** switch – **NVS** (turret should slew to fixed forward).

c. **SYM BRT** control – Verify authority through full range of travel. Set as desired.

d. Symbology select switch – Actuate through each mode. Verify appropriate symbology display.

e. **LEVEL** and **GAIN** controls – Adjust for optimum imagery as cooldown progresses. Note any imagery anomalies.

f. Polarity select switch – Actuate to each polarity. Use as needed for personal preference.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

g. **ACM** switch – **ACM**. Verify no excessive change in image quality.

h. **ACQ SEL** switch – **OFF**. Verify proper turret response to head movement. No excessive blooming of picture.

i. Image registration – Check.

(1) Align crewmembers LOS forward to the 12 o'clock position ±5°.

(2) Select a reference object approximately 90 feet in front of helicopter.

NOTE

The allowable registration error is 1 foot at 90 feet. The center open position of the LOS reticle is equivalent to 1 foot at 90 feet.

(3) Check registration (alignment differential) between the thermal image and reference object in azimuth.

j. **ACM** switch – As desired.

k. **ACQ SEL** switch – As required.

24. Sensor changeover – Check as follows:

a. Pilots changeover check:

PROCEDURE **TROUBLESHOOTING REFERENCE**

AFTER STARTING APU (CONT)

(1) **SIGHT SEL** switch – **NVS**.

(2) Coll. **NVS** switch – **TADS**. Verify TADS WFOV FLIR is displayed on HMD and TADS follows pilots head movements.

(3) Coll. **NVS** switch – **PNVS**.

(4) **SIGHT SEL** switch – **HMD** or **NVS**.

b. CPGs changeover check:

(1) **SIGHT SEL** switch – **NVS**.

(2) **PLT/GND ORIDE** switch – **ORIDE**.

(3) Coll. **NVS** switch – **PNVS**. Verify PNVS video with flight symbology is displayed on HMD and PNVS follows CPG's head movements.

(4) Coll. **NVS** switch – **TADS**.

(5) **PLT/GND ORIDE** switch – **OFF**.

(6) **SIGHT SEL** switch – As desired.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

WARNING

Absolute verification of ordnance configuration and clearing/safing status is mandatory before attempting the following procedure.

*25. Weapon systems – Evaluate operation as required.

a. Master Arm switching check:

(1) **CPG ARM/SAFE** switch – **SAFE**, verify all weapons systems remain in OFF status in both crew stations.

(2) **PLT/GND ORIDE** switch – **ORIDE**, verify **CPG ARM/SAFE** status **SAFE**.

(3) Pilot **MASTER ARM/SAFE** switch:

(a) **SAFE**, verify all weapons systems indicate SAFE status in both crew stations.

(b) **ARM**, verify both crew station indicators remain SAFE.

(4) **CPG ARM/SAFE** switch – **ARM**, verify ARM status indicated in both crew stations.

PROCEDURE **TROUBLESHOOTING REFERENCE**

AFTER STARTING APU (CONT)

(5) **CPG ARM/SAFE** switch – **SAFE**, verify SAFE status in both crew stations.

(6) Pilot **MASTER ARM/SAFE** – **SAFE**.

b. Pilot select, actioning, and articulation checks – Complete as follows:

(1) **RKT** select switch – **GND STOW**. Verify pylons remain in GND STOW.

(2) WAS – **RKT**. Verify broken rocket cursor and pylons will not articulate.

(3) WAS – Deselect **RKT**.

(4) **RKT** select switch – **NORM**. Verify pylons articulate to FLT STOW.

(5) WAS – **RKT**. Verify solid rocket cursor and pylons will articulate with active LOS.

(6) WAS – Deselect **RKT**.

(7) **RKT** select switch – As required.

(8) **GUN** select switch – **FXD**.

(9) WAS – **GUN**. Verify gun articulates to fixed forward.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

(10) WAS – Deselect **GUN**.

(11) **GUN** select switch – **NORM**.

CAUTION

To prevent damage to gun, ground crewmember must be present to assure gun depression inhibit is operational.

(12) WAS – **GUN**. Verify gun articulates with active LOS.

(13) WAS – Deselect **GUN**.

(14) **GUN** select switch – **OFF**.

(15) Display AND on HOD. DEK switch – **SP1**. Key **R SHIFT** and **I**.

(16) **MSL** select switch – **ON**. Verify missile bit initiation and subsequent status.

(17) DEK switch – **STBY**.

(18) WAS – **MSL**. Verify appropriate symbology displayed.

(19) **CHAN SEL** switch – As desired. Verify symbology reflects appropriate coding and missile selection.

PROCEDURE **TROUBLESHOOTING REFERENCE**

AFTER STARTING APU (CONT)

(20) **LOAL** switch – Rotate to various positions. Verify appropriate symbology.

(21) **LOAL** switch – **OFF**.

(22) WAS – Deselect **MSL**.

(23) **MSL** select switch – As required.

c. CPG select, actioning, and articulating checks – Complete as follows:

(1) **RKT** select switch – **GND STOW**. Verify pylons articulate to ground stow position.

(2) ORT WAS – **RKT**. Verify broken rocket cursor. Pylons will not articulate.

(3) ORT WAS – Deselect **RKT**.

(4) **RKT** select switch – **NORM**. Verify pylons articulate to flight stow position.

(5) Cyclic WAS – **RKT**. Verify solid rocket cursor. Pylons will articulate with active LOS.

(6) Cyclic WAS – Deselect **RKT**.

(7) **RKT** select switch – **OFF**.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

(8) **GUN** select switch – **FXD**.

(9) ORT WAS – **GUN**. Verify gun articulates to fixed forward.

(10) ORT WAS – Deselect **GUN**.

(11) **GUN** Select – **NORM**.

CAUTION

Ground crewmember must be present to assure gun depression inhibit is operational.

(12) Cyclic WAS – **GUN**. Verify gun articulates with active LOS.

(13) Cyclic WAS – Deselect **GUN**.

(14) **GUN** select switch – **OFF**.

(15) **MSL** select switch – **ON**. Verify missile bit initiation and subsequent status.

(16) **MODE** select – **NORM**.

(17) **CHAN SEL** switch – As desired. Verify AND reflects appropriate coding and missile selection.

(18) ORT WAS – **MSL**. Verify appropriate symbology displayed.

PROCEDURE **TROUBLESHOOTING REFERENCE**

AFTER STARTING APU (CONT)

(19) ORT WAS – Deselect **MSL**.

(20) **MSL** select switch – **OFF**.

d. Pilot **MASTER** and **CPG ARM/SAFE** switches – **OFF**.

e. Weapons select switches – **OFF**.

f. **PLT/GND ORIDE** switch – **OFF**.

**26. Flight Controls – Check as follows:

CAUTION

B Ensure both pilot and CPG control locks are removed and that both pilot and CPG collective friction is off.

*a. Stabilator system – Check as follows:

(1) Perform FD/LS test 12. Verify **RTR BK** caution/warning segment illuminates. Leave **RTR BK** switch at **BRAKE**.

(2) CPG stabilator controls – Check operational, then reset.

*b. DASE system – Check as follows:

(1) Controls – Friction off, centered and cleared.

(2) **FORCE TRIM** – **OFF**.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

(3) Perform FD/LS test 02. Leave **RTR BK** switch at **BRAKE**.

(4) DEK – **STBY**.

(5) Verify normal trim and interrupt functions with trim switches on both pilot and CPG cyclics. Leave trim feel on.

*c. B BUCS Self Test.

CAUTION

Do not execute BUCS test or control sweep unless rotor is completely stopped.

(1) **RTR BK** switch – **BRAKE**.

(2) Controls – Friction off, centered and cleared.

NOTE

During both PLT and CPG BUCS test, the crew should be aware that the flight controls will move. If the **BUCS FAIL** warning light illuminates during either test, do not fly the helicopter.

(3) **BUCS TST** switch – **PLT** and hold. **BUCS ON** caution light should go out in approximately 20 seconds. Release switch and wait for 15 seconds to see if the **BUCS FAIL** warning light illuminates. If not, proceed to step (4).

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

(4) **BUCS TST** switch – **CPG** and hold. **BUCS ON** caution light should go out in approximately 20 seconds. Release switch and wait 15 seconds to see if the **BUCS FAIL** warning light illuminates, if not proceed to step (5).

(5) BUCS select trigger switch (CPG) – Press. Verify illumination of **BUCS FAIL** warning light in both crew stations.

(6) Collective – full down.

(7) **RTR BK** switch – As desired.

d. Collective friction – Check as follows:

(1) Pilot and CPG friction – Set at zero.

(2) With spring scale at head of pilots collective, check for breakaway of 4 to 6 pounds.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

(3) Collective – Move through full range of travel. Check for smoothness.

NOTE

With the collective in the full up position, verify and note maximum travel. This maximum travel should not be reached during the inflight V_H check.

(4) Pilots collective friction – Full on. Verify collective can be moved through full range of travel.

(5) Pilots collective friction – Set at zero.

(6) CPG collective friction – Full on. Verify collective can be moved through full range of travel.

(7) Collective friction – Set at zero.

27. **PWR levers – Check as follows:

NOTE

Verify power available spindle index indications as required during the following procedure.

a. **PWR** levers – Note nearly matched positioning at **OFF** position.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

b. Advance **PWR** levers to **IDLE**. Verify nearly matched **PWR** lever positioniong at **IDLE** position and neither will advance past idle stop position.

c. **RTR BK** switch – **OFF**. Verify **RTR BK** caution/warning segment extinguishes.

d. Advance **PWR** levers to **FLY** – Verify nearly matched **PWR** lever positioning at the **FLY** position.

e. **RTR BK** switch – **BRAKE**. Verify **RTR BK** caution/warning segment does not illuminate.

f. **PWR** levers – Retard to **IDLE** one at a time verifying that rotor brake will not engage with either **PWR** lever above **IDLE**, but will lock when both **PWR** levers are at **IDLE**.

g. **RTR BK** switch – **OFF**. Verify **RTR BK** caution/warning segment extinguishes.

h. Advance **PWR** levers to **FLY**, then to **LOCKOUT**. Verify normal operation of detent releases and nearly matched **PWR** lever positioning at the **LOCKOUT** position.

i. Retard **PWR** levers to **FLY**. Verify normal operation of detents.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

j. **PWR** levers friction – On. Retard **PWR** levers half way. Check for normal friction control effects and smooth travel.

k. **PWR** levers friction – Off. One at a time, retard **PWR** levers to **IDLE**. Verify HMU reset at **IDLE**.

l. Retard **PWR** levers to **OFF.** Verify normal function of detent release levers.

m. CPGs **PWR** levers – Check **IDLE** and **FLY** detents and releases.

*28. **ENG FIRE PULL** handles – Check as follows:

a. Ground crewmember – Briefed and positioned.

b. Fuel **CROSSFEED** switch – **AFT TK**.

c. Fuel **BOOST** switch – **ON**.

d. **ENG 1** and **ENG 2** Fuel switches – Verify **ON**.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

e. **NO. 1 PWR** lever – **LOCKOUT**. Verify fuel flows from overboard drain.

CAUTION

To prevent FIRE BTL activation, verify FIRE BTL Select switches are centered.

f. Pilots **ENG 1 FIRE PULL** handle – Pull. ENCU shuts down, cooling louvers close, fuel flow stops, and respective engine **FUEL PSI** caution/warning illuminates.

g. Pilots **ENG 1 FIRE PULL** handle – In. Verify ENCU returns, cooling louvers open, fuel flow returns, and respective engine **FUEL PSI** caution/warning extinguishes.

h. CPGs **ENG 1 FIRE PULL** handle – Pull. Verify same function as step f.

i. CPGs **ENG 1 FIRE PULL** handle – In. Verify same function as step g.

j. **NO. 1 PWR** lever – **OFF**. Verify fuel flow stops.

k. Repeat steps e through j using **NO. 2 PWR** lever and **ENG 2 FIRE PULL** handles.

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER STARTING APU (CONT)

l. Fuel **CROSSFEED** switch – **NORM**. Verify fuel **BOOST** switch disengages and **BOOST PUMP ON** caution/warning light extinguishes.

*29. Engine reinstallation/replacement checks – As required. Refer to Chapter 4, paragraph G.

****STARTING ENGINES – PILOT**

NOTE

- Verify HARS aligned and correlates to magnetic compass.
- Compute time to idle using chart in Chapter 5 prior to starting engines.
- –51 Verify HARS aligned and correlates to magnetic compass. Verify **NAV STATUS PAGE** on CDU; **INS GO**, **GPS GO**, **DNS GO**, and **HARS GO**.

1. **SHAFT DRIVEN COMP** caution/warning segment – Verify Off.

WARNING

701C **Aborted engine starts may cause fuel to collect in the engine nacelle. Subsequent engine starts may be attempted only after the nacelle door/work platform is opened and the nacelle inspected for fuel. If during the initial start an abnormal TGT rise was evident, or fuel is evident in the nacelle, the ignition system shall be checked IAW standard maintenance procedures.**

PROCEDURE **TROUBLESHOOTING REFERENCE**

STARTING ENGINES – PILOT (CONT)

CAUTION

The T700–GE–701C engine exhibits inconsistent starting capability above 6000 feet density altitude. Starts above this density altitude may be unsuccessful and require "over temperature" abort by the pilot.

2. Area – Clear.

3. Fire guard – Posted, if available.

4. **ENG 1** and **ENG 2 FUEL** switches – Verify **ON**.

WARNING

Main rotor brake could fail. Maintenance personnel will remain clear of all drive train components until completion of ground run.

5. **RTR BK** switch – As desired.

6. **ANTI-ICE** panel **ENG INLET** switch – Verify **OFF**.

7. **EXT LT** – As required.

8. **ANTI COL** light – As required.

*9. First engine – Start as follows: A4, G

   a. Verify **ENG 1** and **ENG 2** inlet advisory lights are illuminated.

PROCEDURE **TROUBLESHOOTING REFERENCE**

STARTING ENGINES – PILOT (CONT)

NOTE

Use the procedures in steps 9.a. thru 9.i. for COLD and WARM 701 engine starts and for COLD 701C engine starts (more than 4 hours since last shutdown) and all IN-FLIGHT 701 and 701C engine starts. Use the procedures in steps 9.j. thru 9.(4) for WARM 701C engine starts on the GROUND.

b. **START** switch – **START**.

NOTE

During engine start the amber **X FEED** caution/warning lights will illuminate if the **CROSSFEED** switch is not in the **AFT TK** position (modified caution/warning panels).

c. Instruments – Monitor.

d. **PWR** lever – **IDLE** after N_G speed increases and **TGT** is below 150 °C 701.

e. Clock – Start.

f. Engine oil pressure – Verify increasing within 45 seconds after moving **PWR** lever to **IDLE**.

PROCEDURE **TROUBLESHOOTING REFERENCE**

STARTING ENGINES – PILOT (CONT)

NOTE

Return of ECS airflow is positive indication of starter dropout and should occur between 52 to 58% N_G speed. The engine start light must remain illuminated until 52% N_G and will normally extinguish prior to reaching 60% N_G (but not necessarily simultaneously with the return of ECS airflow).

g. Starter dropout – Verify engine start light extinguished.

*h. Idle speed check – Verify time to idle is within limits of figure 5-1. upon completion of engine starting.

i. Engine instruments – Check.

j. 701C WARM ENGINE START. Less than 4 hours since last shutdown. Do not use this procedure for inflight restarts. Start procedures are as follows:

(1) **START** switch – **IGN OVRD** until N_G reaches 18 - 20%.

(2) **START** switch – **OFF**. Allow N_G to spool down below 5%.

(3) **START** switch – **START**.

(4) **PWR** lever – **IDLE** after N_G speed increases and TGT is below 80 °C.

PROCEDURE	TROUBLESHOOTING REFERENCE

STARTING ENGINES – PILOT (CONT)

k. Caution/warning lights – Check.

*l. Record engine idle speed.

10. **ENG INLET** anti-ice switch – As required.

NOTE

The second engine may be started with the **RTR BK** switch at **LOCK** or **OFF** as desired or required.

11. **RTR BK** switch – **OFF** (if required).

*12. Second engine start (as required) – Repeat step 9 above.

*13. Record **ENG OIL PSI** and **TGT**.

14. Idle speed torque check – Note that torque is between 5 – 7% on both engines for input clutch engagement.

15. **PWR** levers – Advance to **FLY**.

*16. N_p governing check – Verify N_p and N_r at 100%. A4, G

17. Torque matching check – With both engines at **FLY**, torque matching should be within 5%. A4, G

PROCEDURE	TROUBLESHOOTING REFERENCE

ENGINE RUNUP PILOT

*1. 1 ‘‘G’’ Spring – Check as follows: A11

a. With minimum friction applied to both collectives note any tendency of collective to move up of its own accord.

b. Increase collective to approximately 25% torque. Note any tendency of collective to move in either direction of its own accord.

c. Adjust collective friction to stop uncommanded collective motion.

*d. Decrease collective to full down stop. Record flat pitch torque indications.

*2. Engine chop circuit – Check as follows:

WARNING

To prevent inadvertent chop collar activation, chop collar shall be re-safetied prior to flight.

PROCEDURE	TROUBLESHOOTING REFERENCE

ENGINE RUNUP – PILOT (CONT)

NOTE

Engine chop circuit check should be performed at phased maintenance checks as required.

a. Slide collar on collective forward, rotate clockwise, and release.

b. N_p and N_G – Check at idle.

c. **ENGINE CHOP** warning light – Check illuminated.

d. **MASTER CAUTION** panel – Reset.

e. **PWR** levers – **IDLE**.

f. Slide collar on collective forward, rotate counterclockwise, and release. **ENGINE CHOP** warning light should extinguish.

g. **PWR** levers – **FLY**.

h. N_p and N_r – 100%.

i. Repeat steps a. thru h. using CPG controls.

*3. Engine overspeed test – Check as follows: A4

NOTE

Failure for the engine to automatically relight and flameout when both **OVSP TEST A** and **B** are pressed simultaneously is acceptable.

PROCEDURE	TROUBLESHOOTING REFERENCE

ENGINE RUNUP – PILOT (CONT)

CAUTION

If N_p drops below 86% and/or TGT rises above 852 °C, immediately retard test engine PWR lever to OFF. Place ENG START switch to IGN OVRD until TGT is below 540 °C.

a. ENG 1

CAUTION

If engine OVSP TST switches are not released immediately, engine overtemp may occur.

(1) **CKT A** switch – **ENG 1**. N_G should remain stable. Release switch.

(2) **CKT B** switch – **ENG 1**. **EMERG PWR** advisory light illuminates, N_G remains stable. Release switch.

(3) **CKT A** and **CKT B** switches – **ENG 1**. N_G should decrease. **EMERG PWR** advisory light illuminates. Release switches.

b. ENG 2 – Repeat procedure in step a. above for ENG 2.

*4. ECU lockout system – Check as follows: A4

PROCEDURE	TROUBLESHOOTING REFERENCE

ENGINE RUNUP – PILOT (CONT)

CAUTION

Delaying decrease of PWR lever may result in an engine/rotor overspeed.

a. **ENG 1 PWR** lever – **LOCKOUT**. Note $N_p/N_r/N_G$ increase. Then immediately retard **ENG 1 PWR** lever to a position midway between **FLY** and **IDLE**.

CAUTION

To avoid engine damage, do not operate engine steady-state between 24% – 38% N_p or in the 57% – 72% N_p range.

b. **NO. 1 PWR** lever – Advance to a position where both engine torques are matched at 100% N_p. Continue advancing until ENG 1 torque is approximately 10% greater than ENG 2 and an increase in ENG 1 N_p is noted.

c. **NO. 1 PWR** lever – Slowly advance above 100% N_p until **HIGH RPM** warning light illuminates.

d. **NO. 1 PWR** lever – **IDLE**. Verify N_G is at idle speed.

e. **NO. 1 PWR** lever – **FLY**. Verify ECU is reset.

PROCEDURE	TROUBLESHOOTING REFERENCE

ENGINE RUNUP – PILOT (CONT)

f. **NO. 2 PWR** lever – Repeat steps a. thru e. above.

*5. SDC/PAS – Check as follows: A7

a. **FUEL BST** circuit breaker – Pull. Verify **SHAFT DRIVEN COMP** caution/warning segment illuminates, ENCU output reduces, and No. 1 engine **TGT** rises approximately 10 °C.

b. **FUEL BST** circuit breaker – Reset. Verify **SHAFT DRIVEN COMP** caution/warning segment extinguishes, ENCU output returns to normal, and No. 1 engine **TGT** returns to normal.

*6. Fuel system – Check as required:

NOTE

For modified caution/warning panels, verify proper illumination of transfer and crossfeed annunciator lights.

a. CPG **FUEL** panel – Check as follows:

WARNING

Do not set CROSSFEED switch between FWD TK and AFT TK without pausing for at least 15 seconds in the NORM position to ensure both crossfeed valves have sequenced to their proper positions. Failure to follow this procedure may result in a dual engine flameout if one of the crossfeed valves fails to properly position.

PROCEDURE	TROUBLESHOOTING REFERENCE

ENGINE RUNUP – PILOT (CONT)

(1) **ORIDE** switch – **CPG**.

(2) **TK SEL** switch – **FROM AFT**.

(3) **BOOST** switch – **ON**. Verify **BOOST PMP ON** caution/warning segment illuminates and SDD shows AFT quantity decreasing with no change in FWD quantity.

(4) **TK SEL** switch – **FROM FWD**. Verify **BOOST PMP ON** caution/warning segment extinguishes and **BOOST** switch returns to **OFF** position. SDD shows FWD quantity decreasing with no change in AFT quantity.

(5) **TK SEL** switch – **NORM**.

(6) **TRANS** switch – **TO FWD**. Verify SDD FWD quantity increases, AFT quantity decreases and **FUEL XFR** advisory segments illuminates.

(7) **TRANS** switch – **TO AFT**. Verify SDD AFT quantity increases, FWD quantity decreases and **FUEL XFR** advisory segment illuminates.

(8) **TRANS** switch – **OFF**. Verify **FUEL XFR** advisory segment extinguishes.

PROCEDURE	TROUBLESHOOTING REFERENCE

ENGINE RUNUP – PILOT (CONT)

(9) **ORIDE** switch – **PLT**.

b. Pilot **FUEL** panel – Check as follows:

WARNING

Do not set CROSSFEED switch between FWD TK and AFT TK without pausing for at least 15 seconds in the NORM position to ensure both crossfeed valves have sequenced to their proper positions. Failure to follow this procedure may result in a dual engine flameout if one of the crossfeed valves fails to properly position.

(1) **CROSSFEED** switch – **AFT TK**.

(2) **BOOST** switch – **ON**. Verify **BOOST PMP ON** caution/warning segment illuminates and SDD shows AFT quantity decreasing with no decrease in FWD quantity.

(3) **CROSSFEED** switch – **FWD TK.** Verify **BOOST PMP ON** caution/warning segment extinguishes and **BOOST** switch returns to **OFF** position. SDD shows FWD quantity decreasing with no decrease in AFT quantity.

PROCEDURE	TROUBLESHOOTING REFERENCE

ENGINE RUNUP – PILOT (CONT)

(4) **CROSSFEED** switch – **NORM**.

(5) **TRANS** switch – **TO FWD**. Verify SDD FWD quantity increases and AFT quantity decreases, **FUEL XFR** advisory segment illuminates.

(6) **TRANS** switch – **TO AFT**. Verify SDD AFT quantity increases and FWD quantity decreases, **FUEL XFR** advisory segment illuminates.

(7) **TRANS** switch – **OFF**. Verify **FUEL XFR** advisory segment extinguishes.

(8) **EXT TK** switch – **ON** (if system is installed). Verify SDD FWD and AFT quantities increase, then **OFF**.

****BEFORE TAXI CHECK**

*1. **FD/LS** – Check.

a. Verify remaining systems **NO-GO** indications as required.

*b. Perform on command FD/LS Test 19. Record displayed transmission and nose gearbox indications.

*2. Engine instruments – Check correlations between crew stations and record.

PROCEDURE	TROUBLESHOOTING REFERENCE

BEFORE TAXI CHECK (CONT)

3. Flight instruments – Check static indications and set for flight.

4. **HARS** control switch – **OPR**.

5. DASE – Check.

   a. Engage all channels.

   b. Cyclic – Disengage switches. Check function (Both crew stations).

   c. DASE engage.

6. TADS/PNVS – Optimize as required.

7. Safety pins, chocks and ICS cords – Removed.

8. **APU** control switch – **OFF**, verify **APU ON** caution/warning segment extinguished.

CAUTION

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

*9. Engine Health Indicator Test (HIT) and anti-ice check. Check each engine individually. Refer to Chapter 4, paragraph H.

PROCEDURE	TROUBLESHOOTING REFERENCE

BEFORE TAXI CHECK (CONT)

10. **PARK BRAKE** – Release. A3

11. **TAIL WHEEL** switch – **UNLOCK**. Verify that green advisory light illuminates. A7

12. **EXT LT** – As required.

13. **ANTI COL** light – As required.

****TAXI CHECK**

*1. Wheel brakes – Check pilot and CPG braking operation. Note any tendency of aircraft to perform uncommanded swerving due to brake or wheel malfunction. A3

*2. Instruments and symbology – Verify normal function. A8

****BEFORE HOVER CHECKS**

1. **TAIL WHEEL** switch – **LOCK**.

2. Wheel brakes – Set as required.

*3. HIT and anti-ice check – If not already accomplished, perform at this time. Refer to Chapter 4, paragraph H.

PROCEDURE **TROUBLESHOOTING REFERENCE**

BEFORE HOVER CHECKS (CONT)

4. Systems – Check.

   a. **FUEL** panel switches – Set as required.

   b. Fuel quantity – Sufficient for flight.

   c. Engine instruments – Normal indications.

   d. Caution/warning panels – Proper indications.

5. **MASTER/CPG ARM/SAFE** – As required.

6. Weapons select switches – As required.

7. Active **FLY–TO** or **TGT** – Check. If the DTC overwrites the active fly-to or target, it is necessary to de-select and re-select the active fly-to or target.

8. Avionics – As desired.

HOVER CHECKS

**1. Initial hover check – Takeoff to a stabilized 5 foot hover. Verify normal controllability and stability, and note apparent c.g. Pylons should articulate properly for existing configuration. Note existing vibration levels and stabilator effect on vibrations through full range of stabilator travel.

PROCEDURE	TROUBLESHOOTING REFERENCE

HOVER CHECKS (CONT)

*2. Instrument checks – Verify proper function and PPC data correlation.

*3. Nav System – Initialize.

*4. Hover maneuvering checks:

a. Perform 90° pedal turns – Verify aircraft controllability, response, instrument and symbology functioning.

b. Perform forward, lateral and rearward hovering flight – Verify aircraft controllability, response, instrument and symbology functioning.

*5. DASE/HAS system checks:

a. Note aircraft stability for reference.

b. **TRIM FEEL** – Adjust as required.

c. **ATTD/HOVER HOLD** switch – On. Relax control pressures and note any tendency of aircraft attitude to change from trimmed condition. Without retrimming, perform smooth 90° pedal turns. Relax control pressures and verify HAS holds newly selected heading and attitude.

d. Without moving pedals, increase collective slightly. Observe that helicopter maintains original heading ±5°. Return to stabilized hover.

PROCEDURE	TROUBLESHOOTING REFERENCE

HOVER CHECKS (CONT)

e. **TRIM** release switch – Down momentarily, then **ON**. Note **ATTD/HOVER HOLD** switch disengages.

6. Torque repeatability check – As required. Refer to Chapter 4, paragraph O.

*7. Visionic system – Check as follows:

a. Maneuver the helicopter as required to be in azimuth alignment with a target at least 500 meters away.

b. TADS – Slew to target. Select **N** FOV, **TV** or **FLIR**. Observe display during remainder of check but do not attempt to recenter target.

NOTE

The TADS inertial stabilization system should compensate for azimuth changes of aircraft displacement but will not compensate for lateral aircraft displacement.

c. Perform 90° left and right pedal turns.

d. Note target remains within narrow field of view during entire check.

PROCEDURE	TROUBLESHOOTING REFERENCE

HOVER CHECKS (CONT)

*8. –45 / –49A Doppler drift – Check.

NOTE

Rates as high as 21 feet per minute may occur with a properly functioning Doppler system. Causes may be related to HARS, FCC, or interface problems.

a. **SYM SEL** switch – Actuate to select **BOB-UP** mode. Minimize velocity vector and acceleration cue to the extent possible.

b. Hover aircraft for one minute. Note amount of Doppler drift from original position. If drift is excessive perform HBCM.

*9. –51 HAS/Hover Position Box Drift. The Hover Position Box drift varies according to whether the EGI or HARS is in use as the inertial sensor, and if using the EGI, whether or not the GPS is operating in PPS (keyed) or SPS (not keyed) mode or operating at all. Using the EGI with the GPS keyed produces optimal HAS/Hover Position Box drift performance. The amount of drift may be up to 6 feet the first minute, and as much as 23 feet after 5 minutes. All other modes of operation (EGI or HARS) may produce Hover Position Box drift that is random and unpredictable. In these modes of operation, the HAS/Hover Position Box drift performance may be similar to that of the non–integrated navigation system (up to 21 feet per minute).

PROCEDURE	TROUBLESHOOTING REFERENCE

****BEFORE TAKEOFF CHECKS**

1. Weapons **ARM/SAFE** switches – **SAFE**.
2. **TAIL WHEEL** – **LOCK**.
3. Wheel brakes – Set as required.
4. Systems – Check.
   a. **FUEL** panel switches
   b. Fuel quantity
   c. Engine instruments
   d. Caution/warning panel.
   e. PPC data correlation.
5. Avionics – As desired.

FLIGHT CHECKS

*1. Initial takeoff checks – Perform normal takeoff and climb out to initial test altitude. Note the following:

   a. HAS – Engage, note automatic disengage as aircraft accelerates through 15 GS or 50 KTAS.
   b. Correct stabilator programming.
   c. Normal control positions and aircraft response.
   d. Vibration levels and entry conditions if encountered. A5
   e. Proper instrument indications, and sensor operation.
   f. Engine torque matching (within 5%). A4, G

PROCEDURE	TROUBLESHOOTING REFERENCE

FLIGHT CHECKS (CONT)

*2. Cruise checks:

a. Perform straight and level flight (110 KIAS) and note any unusual vibrations, noises or instrument indications, and sensor operation. A5

*b. Instrument correlation – Compare between crew stations.

**c. Fuel consumption – Complete as required.

*3. Autorotation – Perform as required.

NOTE

- The autorotation check following main rotor maintenance, should be conducted over a hard surface area preferably with crash/rescue personnel available.
- The autorotation check should be conducted at an altitude that will allow a power recovery to be completed before reaching 500 feet AGL.

a. Determine required N_r from autorotation RPM chart in Chapter 5.

b. Select a suitable autorotational landing area.

*c. At test altitude record the following:

(1) Pressure altitude.

(2) FAT.

(3) Target N_r as determined from figure 5-5.

d. Climb approximately 1000 feet above test altitude.

PROCEDURE **TROUBLESHOOTING REFERENCE**

FLIGHT CHECKS (CONT)

CAUTION

Do not exceed single engine torque of 110% or computed maximum torque available.

e. Reduce collective to achieve less than 54% dual engine torque at 80 knots.

f. Retard either engine **PWR** lever to **IDLE**. Verify that engine remains operational at **IDLE**.

g. Reduce collective to full down stop. Stabilize rotor within allowable limits.

WARNING

If it becomes apparent that N_r will decay below 94% or exceed 110%, terminate the test flight, return to base and trouble-shoot.

h. Retard other engine **PWR** lever to **IDLE**.

i. Maintain stabilized autorotation to test altitude. Note any abnormal vibrations encountered and verify that aircraft remains controllable.

*j. Upon reaching test altitude record the following:

PROCEDURE	TROUBLESHOOTING REFERENCE

FLIGHT CHECKS (CONT)

(1) N_r.

(2) Fuel quantity remaining.

k. Initiate power recovery by advancing both **PWR** levers to **FLY**.

l. Complete power recovery to normal flight mode.

*4. Attitude hold check. A11

a. **TRIM FEEL** – Verify engaged.

b. **ASE** switches – Verify all switches engaged.

c. Airspeed – Establish 110 KIAS. Note TAS correlation.

d. **ATTD/HOVER HOLD** switch – Engage.

e. Relax control pressures and verify aircraft attitude is reasonably maintained.

f. Turn coordination – Perform 20° angle of bank turns without retrimming, sideslips should not exceed 1/2 trim ball displacement. Return to normal flight.

g. Cyclic **ASE** release switch – Actuate. Verify all **ASE** switches unlatch; aircraft becomes less stable but remains controllable.

PROCEDURE	TROUBLESHOOTING REFERENCE

FLIGHT CHECKS (CONT)

h. **ASE** switches – Reengage as required.

*5. Maneuvering flight – Check as follows: A5, A6 A11

a. Cruise check – Establish 110 KIAS straight and level flight. Note vibration levels and control positions.

b. Descent check – Lower collective to 20% torque. Note any rotor instability or unusual control positioning.

c. Climb check – Increase torque to maximum continuous value. Note any rotor instability or unusual control positioning.

d. Reestablish normal cruise.

e. Turning flight check – Perform 30°, 45°, and 60° bank angle turns at 110 KIAS. Note any rotor instability or unusual control positioning.

PROCEDURE	TROUBLESHOOTING REFERENCE

FLIGHT CHECKS (CONT)

*6. Stabilator system – Check as follows:

a. **NOE/APRCH** switch – Engage.

b. Airspeed – Slow to less than 80 KTAS. Verify stabilator repositions to 25° trailing edge down.

c. Airspeed – Increase above 80 KTAS. Verify stabilator programs automatically.

d. **RESET** button – Press. Verify **NOE/APPR** switch returns to **OFF**.

*7. V_H check.

a. Smoothly increase collective while maintaining a level flight attitude until reaching a maximum torque, TGT, N_G, or airspeed limit.

b. Note any abnormal vibrations or control responses. — A5

c. Verify collective does not reach maximum travel before reaching allowable limit of engine performance.

d. Return to normal flight.

PROCEDURE	TROUBLESHOOTING REFERENCE

FLIGHT CHECKS (CONT)

*8. Maximum power check – Perform as follows:

WARNING

A safe AGL altitude must be maintained to allow sufficient reaction time if the engine being tested fails, or if other emergency situations occur.

CAUTION

To avoid torque oscillations when making performance checks, a torque split of at least 10% will be held between engines.

a. Establish a climb at 100% dual engine torque. Periodic collective control increase will be required throughout the climb to maintain 100% torque. Continue climb at 100% torque until one of the three following conditions occur:

PROCEDURE	TROUBLESHOOTING REFERENCE

FLIGHT CHECKS (CONT)

NOTE

- One engine may reach the normal engine TGT limiter or N_G limiting setting before the other engine. The climb should continue until the test engine reaches the TGT limiter or N_G limiting at 100% torque. This does not effect the maximum power check on the other engine.

- Do not exceed 10,000 ft pressure altitude.

(1) The test engine reaches the normal engine TGT limiter setting and is identified by power limiting at the TGT limit.

(2) The test engine reaches a fuel flow limit as a result of N_G limiting and it is identified by power limiting at TGTs below the TGT limit. N_G limiting is a MACH number limitation in the compressor and it occurs at colder ambient temperatures.

PROCEDURE	TROUBLESHOOTING REFERENCE

FLIGHT CHECKS (CONT)

(3) If ambient conditions prevent flight to altitudes where the power limiting conditions will occur, then go to step 8.1.

b. Stop the climb at the power limiting altitude (step a.) and establish level cruise flight with **ENG-RTR** at 100% 701 or 101% 701C.

c. Set torque at approximately 80 – 85%.

d. Retard the **PWR** lever on the non-test engine until:

(1) The non-test engine reaches 60% torque.

(2) The test engine reaches 100% torque.

(3) TGT on the test engine reaches the normal engine TGT limiter setting or N_G limiting.

PROCEDURE **TROUBLESHOOTING REFERENCE**

FLIGHT CHECKS (CONT)

CAUTION

- **Do not exceed 100% torque.**
- **To avoid torque oscillations when making performance checks, a minimum torque split of 10% must be held between engines.**
- **Do not reduce the PWR lever to a position which will allow less than 60% torque on the non-test engine. Contingency power is enabled below 51% torque and will prevent the test engine from limiting power at the normal dual engine TGT limiter setting.**

e. Establish an **ENG-RTR** RPM droop of approximately 2% using either a small increase in collective pitch or a small reduction of the **PWR** lever on the non-test engine. Either procedure may be used, but the **ENG-RTR** RPM droop confirms that the test engine is limiting power at the normal dual engine TGT limiter setting or due to N_G limiting.

PROCEDURE	TROUBLESHOOTING REFERENCE

FLIGHT CHECKS (CONT)

f. If a 2% droop is not achieved, do the following:

(1) Increase collective pitch while maintaining approximately 60% torque on the non-test engine until a reduction of 2% **ENG-RTR** RPM is observed.

(2) Maintain a constant pressure altitude by adjusting forward airspeed as necessary.

g. If a 2% droop is still not achieved, go to step 8.1.

NOTE

When the engine is TGT limited, the TGT may momentarily exceed the normal dual engine TGT limiter setting.

h. Observe TGT on the test engine. If TGT does not stabilize at the normal dual engine TGT limit in 10 to 15 seconds after the last collective pitch or **PWR** lever input, discontinue the maximum power check.

i. Slowly reduce collective pitch or advance the **PWR** lever on the non-test engine to re-establish **ENG-RTR** RPM at 100% 701 or 101% 701C.

j. Wait 30 seconds and record airspeed (KIAS), N_G (%), TGT (°C), torque (%), OAT (°C), and pressure altitude (ft).

PROCEDURE	TROUBLESHOOTING REFERENCE

FLIGHT CHECKS (CONT)

NOTE

The Contingency Power portion (8.2.g.) of the TGT Limiter/Contingency Power check may be accomplished in conjunction with the Maximum Power check providing the last engine was TGT limited and not N_G limited.

k. **PWR** lever, non-test engine – **FLY**.

l. Repeat steps a. thru k. for opposite engine as required.

m. To establish the engine torque factor (ETF) and aircraft torque factor (ATF), refer to TM 55-2840-248-23.

8.1. Engine Performance Check, Maximum Power, Non-Limiting method.

WARNING

A safe AGL altitude must be maintained to allow sufficient reaction time if the engine being tested fails, or if other emergency situations occur.

CAUTION

To avoid torque oscillations when making performance checks, a torque split of at least 10% will be held between engines.

PROCEDURE **TROUBLESHOOTING REFERENCE**

FLIGHT CHECKS (CONT)

NOTE

Pressure altitude must be between 2000 and 10,000 ft to compute the Torque Speed Factor.

a. Establish level cruise flight at the highest altitude that will allow the test engine to develop 100% 701 engine or 101% 701C engine.

b. Adjust collective pitch at approximately 80 – 85% torque.

NOTE

The non-limiting method assumes a power setting of 100% torque on the engine being checked and is designed to allow a maximum power check to be performed at TGTs less than the normal dual engine TGT limiter setting. It is not necessary to droop the **ENG-RTR** RPM to perform this non-limiting procedure.

c. Retard the **PWR** lever on the non-test engine until the test engine being checked reaches 100% torque with **ENG-RTR** at 100% 701 or 101% 701C. Do not reduce the **PWR** lever on the non-test engine to a position that will result in less than 60% torque.

PROCEDURE **TROUBLESHOOTING REFERENCE**

FLIGHT CHECKS (CONT)

CAUTION

Do not exceed 100% torque.

d. If 100% torque is not achieved, do the following:

(1) Increase collective pitch while maintaining approximately 60% torque on non-test engine until 100% torque is observed on the test engine.

(2) Maintain a constant pressure altitude by adjusting forward airspeed as necessary.

e. Wait 30 seconds and record airspeed (KIAS), N_G (%), TGT (°C), torque (%), OAT (°C), and pressure altitude (ft).

f. **PWR** lever, non-test engine – **FLY**.

g. If required, repeat steps a. thru f. for the other engine.

h. To establish the engine torque factor (ETF) and aircraft torque factor (ATF), refer to TM 55-2840-248-23.

PROCEDURE **TROUBLESHOOTING REFERENCE**

FLIGHT CHECKS (CONT)

*8.2. TGT Limiter/Contingency Power Check – Perform as follows:

a. Airspeed – 110 KIAS.

CAUTION

At higher TGT values placing the ENG INLET switch ON could cause excessive N_r/N_p droop.

b. If required **ANTI ICE** panel/**ENG INLET** switch – **ON**. Verify TGT increase, **ENG 1** and **ENG 2** advisory lights illuminate and **ENG 1** and **ENG 2 ANTI ICE** caution/warning lights extinguish after 90 seconds.

c. Collective – Increase approximately 80-85% torque on both engines, ambient conditions permitting.

CAUTION

Do not exceed 110% single engine or 200% combined engine torques.

d. **PWR** lever, non test engine – Retard as required to establish a torque split of at least 10% between engines, but not less than 60% on the non-test engine.

PROCEDURE	TROUBLESHOOTING REFERENCE

FLIGHT CHECKS (CONT)

e. While maintaining no greater than 75% torque on the non-test engine increase collective as required to reach a TGT Limiter Setting and a 2% N_r/N_p droop, or a single engine torque limit, whichever comes first.

f. Record TGT and torque (allow 10 seconds for indications to stabilize).

NOTE

Indicated TGT must be between 851° - 869 °C 701, 857° - 875 °C 701C.

g. Collective – Reduce until the combined torques of both engines is less than the torque of the test engine when TGT limiting was established.

CAUTION

Failure to reduce collective to less than the value noted in step g. could cause N_r/N_p droop when step h. is completed.

h. **PWR** lever, non test engine – Retard to **IDLE**.

i. Collective – Increase as required to reach a TGT indication of approximately 10 °C above the TGT limiter setting determined in step f.

PROCEDURE	TROUBLESHOOTING REFERENCE

FLIGHT CHECKS (CONT)

j. Collective – Reduce.

k. **PWR** lever, non test engine – **FLY**.

l. Repeat steps a. thru k. for opposite engine as required.

m. **ANTI–ICE** panel/**ENG INLET** switch – As required.

*9. Navigation and communication equipment checks – As required. B

a. ADF system check – Verify proper lock on to selected station, steady needle response, proper tracking and station passage indications.

b. EGI system check – Verify proper fly to indications, system update, and target store functioning.

c. Doppler system check – Verify proper fly to indications, system update, and target store functioning.

d. Transponder – Verify proper functioning with ATC or Tactical Radar site.

e. Communications radios – Check as required. If possible, verify acceptable transmission and reception capability at extended ranges.

PROCEDURE	TROUBLESHOOTING REFERENCE

FLIGHT CHECKS (CONT)

*10. PNVS system check – Verify function. A16, I

*11. TADS system check – Verify function. A16, H

*12. Weapon system checks – As required.

a. Airspeed – Less than 100 KTAS.

b. **MASTER/CPG ARM/SAFE** switches – **SAFE**.

c. Weapons select switches – **NORM/ON** positions.

d. WAS switch – **G**. Verify normal gun articulation without inducing abnormal vibrations.

e. WAS switch – Deselect **G**.

f. WAS switch – **R**. Verify normal pylon articulation without inducing abnormal vibrations. Solid rocket cursor is displayed.

g. –45 / –49A Airspeed – Increase above 100 KTAS. Verify pylons articulate to flight stow and do not respond to head movement. Open rocket cursor is displayed.

h. –45 / –49A Rocket select switch – **GND STOW**. Verify pylons remain in flight stow.

i. –45 / –49A Airspeed – Reduce below 100 KTAS. Verify pylons articulate to ground stow.

PROCEDURE	TROUBLESHOOTING REFERENCE

FLIGHT CHECKS (CONT)

j. Weapons select switches – As required.

k. **MASTER/CPG ARM/SAFE** switches – As required.

****BEFORE LANDING CHECK**

1. **TAIL WHEEL** switch – **LOCK**.
2. **ATTD/HOVER HOLD** switch **OFF**.
3. **PARK BRAKE** – As required.
4. Weapons systems – **OFF**.
5. **PLT/GND ORIDE** switch – As required.

****AFTER LANDING CHECK**

1. **TAIL WHEEL** switch – As desired.
2. **EXT LT** control/switches – As required.
3. Avionics – As required.
4. **ANTI-ICE** Panel **TADS/PNVS** switch – **OFF**.
5. **ASE** – As required.

PROCEDURE	TROUBLESHOOTING REFERENCE

ENGINE SHUTDOWN

1. **TAIL WHEEL switch – **LOCK**.

2. **PARK BRAKE – Set.

3. **APU – Start as required A15

4. **HARS switch – **NORM.** Verify **ASE** switches disengage.

5. BBC check – Check as required.

   a. Manual switchover.

      (1) **MUX** switch – **SEC**.

      (2) Note system operation.

      (3) **MUX** switch – **PRI**.

      (4) Note system operation.

   b. **FCC DC** circuit breaker open.

      (1) Note system operation.

      (2) Note **PRI MUX** caution/warning segment illuminates.

      (3) **MUX** switch – **SEC.**

      (4) Note **PRI MUX** caution/warning segment extinguish.

PROCEDURE	TROUBLESHOOTING REFERENCE

ENGINE SHUTDOWN (CONT)

c. **FCC DC** circuit breaker – Closed.

d. **MUX** switch – **PRI**.

**6. Weapons systems – Secure as follows:

a. PILOT.

(1) **SIGHT SEL** – **STBY**.

(2) **ACQ SEL** – **OFF**.

(3) **VID SEL** – **PLT**.

(4) **ACM** – **OFF**.

(5) **PNVS** – **OFF** (announce to CPG).

(6) **SHAFT DRIVEN COMP** caution/warning segment – verify off.

(7) Engine **PWR** levers – **IDLE** for 2 minutes cool down.

(8) Weapons select switches – **OFF**.

(9) **MASTER ARM/SAFE** – **OFF**.

PROCEDURE	TROUBLESHOOTING REFERENCE

ENGINE SHUTDOWN (CONT)

b. CPG.

(1) **INTR LT** switch – **OFF**.

(2) **SIGHT SEL** switch – **STBY**.

NOTE

- For TADS OI aircraft, monitor HOD CRT as **TADS/FLIR** switch is placed in **OFF**. After approximately 15 seconds, HOD should flash and loss of SYM BRT control should be experienced. When symbol brightness is no longer adjustable, the system is in independent HOD mode and power-down can be continued.

- Prior to turning TADS off, ensure PNVS is turned off to allow proper data transfer into the TADS non-volatile memory.

(3) **ACM** switch – **OFF**.

(4) **TADS** switch – **OFF** (verify PNVS off).

(5) ORT **SYM BRT** switch – Inoperative.

NOTE

Prior to turning IHADSS off, confirm TADS power down sequence is complete by waiting 30 - 45 seconds after TADS is turned off and verifying ORT **SYM BRT** switch is inoperative.

PROCEDURE	TROUBLESHOOTING REFERENCE

ENGINE SHUTDOWN (CONT)

(6) **IHADSS** switch – **OFF**.

(7) Verify AND is blank.

(8) **FC SYM GEN** switch – **OFF**.

(9) Weapons select switches – **OFF**.

(10) **CPG ARM/SAFE** switch – **OFF**.

(11) **PLT/GND ORIDE** switch – **OFF**.

(12) DEK switch – **OFF**.

(13) **ADSS** switch – **OFF**.

**7. Standby attitude indicator – Cage.

8. VDU switch – **OFF.

9. Radar altimeter – **OFF.

10. **HARS switch – **OFF**.

*11. Audio warning system operational check – As required. Refer to Chapter 4, paragraph N.

12. **NO. 1 PWR lever – **OFF**.

13. **NO. 2 PWR lever – **OFF**.

PROCEDURE	TROUBLESHOOTING REFERENCE

ENGINE SHUTDOWN (CONT)

14. **RTR BK switch – **BRAKE** when N_r is under 50%.

**15. Avionics – Off.

**16. Light switches – Off.

17. **RTR BK switch – **OFF**. Verify **RTR BK** C/W segment extinguishes.

18. Stabilator – Set to **0° (zero).

19. **GEN 2 and **GEN 1** switches – **OFF**.

*20. **APU FIRE PULL** handle – Test as follows: A12

a. **FIRE BTL** select switch – Verify centered.

b. **APU FIRE PULL** handle – Pull.

c. Verify APU shuts down (approximately 15-20 seconds) and **APU FAIL** caution/warning segment illuminated.

d. **APU FIRE PULL** handle – Full in.

21. **APU control switch – **OFF**.

PROCEDURE	TROUBLESHOOTING REFERENCE

ENGINE SHUTDOWN (CONT)

*22. Emergency hydraulics – Check as required. A7

*a. **UTIL ACC** pressure – Note.

b. CPG **EMER HYD PWR** switch – **ON**. Verify one full up and one full down stroke of collective travel available; then **OFF**. No movement of rotor system possible.

c. Pilot **EMERG HYD PWR** switch – **ON**. Verify one full up and one full down stroke of collective travel available. Verify cyclic and pedals have some hydraulic assistance remaining until **UTIL ACC** pressure is zero.

d. Pilot **EMERG HYD PWR** switch – **OFF**.

NOTE

On postflight, note nitrogen charge on accumulator at GSE panel is approximately 1650 PSI.

23. **CANOPY JETTISON pins – Installed.

24. **BATT switch – **OFF**.

25. **MASTER IGN – **OFF**, key removed.

PROCEDURE	TROUBLESHOOTING REFERENCE

****BEFORE LEAVING THE HELICOPTER**

1. Armament and pylon pins – Installed.
2. Chocks – Installed.
3. Post-flight inspection – Performed.
4. Checksheet – Signed.
5. All entries from REMARKS column of Checksheet – Transcribed to DA Form 2408-13.
6. Maintenance Personnel – De-briefed as necessary.
7. Helicopter – Secured.

CHAPTER 3. TROUBLESHOOTING PROCEDURES

3-1. GENERAL.

This chapter contains troubleshooting information cited in Chapter 2 checklists. This chapter lists possible abnormal conditions and indications and probable causes. The information is to be used only as a quick reference and may not be all encompassing.

The troubleshooting procedures manual and those maintenance manuals listed in this section have data for troubleshooting the helicopter systems. Operational checkout procedures and logic-type troubleshooting charts give detailed step-by-step instructions to identify malfunctioning components/ parts/systems. Component location diagrams and schematics are also included in these manuals. Specific troubleshooting procedures for various malfunctions are referenced throughout the Chapter 2 checklist. This information is to be used only as a quick reference and may not be all encompassing.

REFERENCES	TROUBLESHOOTING PROCEDURES REFERENCE SYMBOLS
AVIATION UNIT AND INTERMEDIATE TROUBLESHOOTING MANUAL	
TM 1-1520-238-T	A
AIRFRAME	2
LANDING GEAR SYSTEM	3
POWERPLANT	4
ROTORS	5
DRIVE	6
HYDRAULIC AND PNEUMATIC SYSTEMS	7
INSTRUMENTS	8
ELECTRICAL SYSTEM	9
FUEL SYSTEM	10
FLIGHT CONTROLS	11
UTILITY SYSTEM	12
ENVIRONMENTAL CONTROL SYSTEM	13
HOISTS AND WINCHES (NOT APPLICABLE)	14(N/A)
AUXILIARY POWER UNIT	15
MISSION EQUIPMENT	16
EMERGENCY EQUIPMENT	17

REFERENCES **TROUBLESHOOTING PROCEDURES REFERENCE SYMBOLS**

AVIATION UNIT AND INTERMEDIATE TROUBLESHOOTING MANUAL (cont)

TM 11-1520-238-23 AVIONICS CONFIGURATION	B
TM 9-1230-476-23 FIRE CONTROL SYSTEM	C
TM 9-1427-475-23 HELLFIRE MISSILE EQUIPMENT	D
TM 9-1270-221-23 INTEGRATED HELMET AND DISPLAY SIGHT SYSTEM	E
TM 9-1090-208-23 AREA WEAPON AND ROCKET SUBSYSTEM	F
TM 55-2840-248-23 ENGINE, AIRCRAFT, TURBOSHAFT	G
TM 9-1270-476-20 TARGET ACQUISITION DESIGNATION SIGHT (TADS) ASSEMBLY	H
TM 11-5855-265-20-1 PILOT NIGHT VISION SENSOR (PNVS) ASSEMBLY	I

CHAPTER 4. SPECIAL PROCEDURES

4-1. GENERAL.

This chapter contains special/detailed procedures which were referenced in Chapter 2.

A. STARTING ENGINES – EXTERNAL PRESSURIZED AIR SOURCE.

1. External air source – Connected.
2. Pressurized air – Verify available.
3. Engines – Start.
4. **GEN 1** and **GEN 2** switches – **TEST** then **GEN 1** and **2**.
5. **EXT PWR/BATT** switch – **BATT**.
6. External power – Disconnect.
7. External air source – Disconnect.
8. Continue with AFTER STARTING APU – Pilot and CPG (Refer to Chapter 2).

B. MANUAL SERVO DRIFT NULL.

1. **SLAVE** switch – Press and verify dotted crosshair is present on selected display (HOD or HDD).
2. **SIGHT SEL** switch – **TADS.**
3. Verify TADS turret slews to fixed forward position by observing solid crosshair coming to center of display and cueing LOS centering on cueing dot.

4. **SLAVE** switch – Press.

5. Sensor select switch – **TV** or **FLIR**.

6. Field of view select switch – **N**.

7. Aim reticle at an easily observed object.

8. BRSIT ENABLE switch – UP. Wait 5 seconds, then adjust left and right thumb-wheel controls for drift null.

9. BRSIT ENABLE switch – CENTER.

C. PECHAN ALIGNMENT.

NOTE

Pechan alignment procedures can affect manual drift null. This procedure aligns the voltages used to erect the Pechan (DVO) lens. It should be used in order to establish a “Real World” relationship when viewing through the DVO. Should alignment be unsuccessful, refer to TM 9-1270-476-20.

1. Sensor select switch – **DVO**.

2. Field of view select switch – **N**.

3. TADS turret – Manual control.

4. BRSIT ENABLE switch – UP.

5. Left thumbwheel control – Adjust as required to correct for 1/2 the necessary alignment.

6. BRSIT ENABLE switch – CENTER.

7. Field of view select switch – **W**.

8. Right thumbwheel control – Recheck alignment of crosshair and horizon.
   a. If satisfactorily aligned, procedure is complete. Select desired operating mode.
   b. If not satisfactorily aligned:
      (1) BRSIT ENABLE switch – UP.
      (2) Adjust right thumbwheel control as required to align horizontal crosshair with horizon.
      (3) BRSIT ENABLE switch – CENTER.
      (4) Field of view select switch – **N**.
      (5) Reverify alignment of NFOV. If satisfactory, procedure is complete. If unsatisfactory, repeat steps 4 thru 8 above as required. If still unsatisfactory, see note above.
9. Repeat steps 5 thru 8 as necessary to erect the pechan (DVO) lens.
10. Recheck manual drift null.

D. MANUAL BORESIGHT ADJUST.

NOTE

- The manual boresight procedure is used only to recapture or center the laser spot. It is not an acceptable boresight procedure for normal flight operations.
- TADS internal boresight shall be performed after performing TADS manual boresight adjustment.

1. **LSR** select switch – **ON**.
2. Sensor select switch – **FLIR**.

3. **IAT** polarity – **WHT**.

4. **FLIR PLRT** – Press to select white hot.

5. Field of view select switch – **N**.

6. **GAIN** – Midrange.

7. **LVL** – Fully counterclockwise.

WARNING

Ensure proper laser safety procedures are followed.

8. LASER TRIG – Press to second detent and hold. Verify the laser spot is visible. Adjust **GAIN** and **LVL** for brightest laser spot with the least background noise.

NOTE

If the laser spot is too weak or not visible, perform Q-update.

9. BRSIT ENABLE switch – UP then back to CENTER. Continue firing laser. After five seconds, the left and right thumbwheel controls will be active and the laser spot can be adjusted in elevation and azimuth.

10. LASER TRIG – Release.

11. **LSR** switch – **OFF**.

E. TADS OUTFRONT BORESIGHT.

1. Position helicopter, on the ground, over identified location for this procedure.

2. Enter, manually, the range from helicopter to the outfront boresight target.

3. Observe the outfront boresight target in NFOV FLIR, adjust gain and level for optimum autotracker image. Engage **IAT**.

4. Sensor select switch – **TV**, observe light source.

5. If not precisely centered on the TADS reticle execute the following:

   a. **BRSIT TADS** switch – **TADS**.

   b. BRSIT ENABLE switch – UP.

   c. Adjust AZ and EL pots to center the light source on the reticle.

   d. BRSIT ENABLE switch – CENTER.

   e. **BRSIT TADS** – **OFF**.

   f. **IAT** – **OFF**.

   g. Procedure complete, continue as desired.

F. CUE UPDATE PROCEDURE.

NOTE

- The CUE update procedure should be accomplished whenever the TADS FLIR is reported as being unable to be internally boresighted. Once the CUE update procedure has been accomplished and the TADS FLIR still cannot be boresighted, continue with troubleshooting as specified in TM 9-1270-476-20.

- TADS internal boresight shall be performed after a cue update procedure.

1. **SIGHT SEL** switch – **TADS.**

2. Sensor select switch – **TV**.

3. Field of view select switch – **W**.

4. **BRSIT TADS** switch – **ON**.

5. **SLAVE** switch – Actuate. Verify internal boresight message replaced by cue update message.

6. If reticle does not appear centered on the black cross (use WFOV if necessary) execute the following:

    a. BRSIT ENABLE switch – UP.

    b. Use **MAN TKR** control to position **TV** reticle in proximity to the black cross.

    c. BRSIT ENABLE switch – CENTER.

    d. **SLAVE** switch – Actuate. Verify cue update message replaced by internal boresight message.

    e. **BRSIT TADS** switch – **OFF**. Procedure complete. Continue as desired.

G. ENGINE REINSTALLATION/REPLACEMENT CHECKS.

NOTE

Perform all checks in sequence. Refer to TM 55-2840-248-23 for detailed instructions.

1. Engine fuel system – Prime.

    a. Engine priming is required for the following conditions:

(1) When troubleshooting.

(2) After disconnecting engine or fuel lines.

(3) After replacing fuel boost pump, fuel filter, fuel filter element, oil cooler, ODV or HMU.

b. With aircraft fuel system pressurized, advance **PWR** lever to – **LOCKOUT** until a steady stream of fuel, free of air and preserving oil, is draining from engine overboard drain. Return **PWR** lever to – **OFF**.

NOTE

- After initial installation of a new engine, a pinkish-colored fuel may drain during vapor vent or shutdown. This is due to the presence of residual dye used during factory fuel system leakage checks. This fuel coloring is normal under these circumstances; it is not harmful to the engine fuel system and will not cause operational difficulties; it will disappear as the engine is operated.

- After engine has been depreserved, or ODV, oil cooler, or HMU have been replaced, the first engine start may be delayed (delayed lightoff). It may also take longer than normal to reach idle speed (ground idle). Smoke may be noticed, but visible smoke should disappear after preservation oil is burned off.

- When depreserving engine after installing in aircraft, motor engine with starter for 30 seconds.

2. Engine – Motor with starter for 30 seconds.

   a. **PWR** levers – **OFF**.

   b. Collective – Full down.

   c. **MASTER IGN** switch – Verify **ON**.

   d. **NO. 1 ENG START** switch – **IGN OVRD** for 30 seconds, then – **OFF**. Verify minimum 22% N_G available.

   e. **NO. 2 ENG START** switch – **IGN OVRD** for 30 seconds, then – **OFF**. Verify minimum 22% N_G available.

3. Idle speed check – Perform.

NOTE

This may be done using one or both engines.

   a. With collective in full down position, start engine.

   b. Set **PWR** lever to – **IDLE**.

   c. Ground idle speed must be 63% N_G or higher.

4. Idle speed leakage check – Perform.

NOTE

This check will be made to be sure there is no fuel, air, or oil leaks present after replacing engine fuel system, air system, or oil system components. This check will also be made to be sure that leakage is not coming from weephole of oil cooler PN 6044T95P01 or PN 6044T95P02.

a. Operate engine at ground idle speed for 5 minutes and look for oil, air, and/or fuel leaks. Abort run if oil, air, or fuel leakage is noted. Check overboard drain for excessive oil or fuel leakage.

b. Correct all leaks by repeating installation steps of appropriate procedures.

5. N_p governing check – Perform.

a. Set **PWR** lever to – **IDLE**.

b. Set collective to full down position.

c. Slowly advance **PWR** lever to – **FLY**.

NOTE

The engine control system maintains a constant N_p speed, usually 100%. If N_p stabilizes below 96% or above 101%, the N_p governing system is not operating.

6. Torque matching check – Perform.

a. Set both **PWR** levers to – **FLY**.

b. Set collective to full down position.

c. Set minimum N_p/N_r speed. Refer to TM 1-1520-238-23.

d. If torque of both engines are within 5% of each other, torque matching is operating properly.

7. Engine overspeed check – Perform.

8. ECU lockout system check – Perform.

9. Anti-ice bleed and start valve check.

NOTE

During engine start, **ANTI-ICE** panel **ENG 1/ENG 2** advisory lights must be on and must remain on as **PWR** lever is advanced to – **IDLE**.

a. Advance **PWR** lever to – **FLY.**

b. Slowly increase collective until **ANTI-ICE** panel **ENG 1/ENG 2** advisory lights go off.

c. On **ANTI-ICE** panel, set **ENG INLET** switch to – **ON**. If **ANTI-ICE** panel **ENG 1/ENG 2** advisory lights come on, the anti-icing system is working.

10. Torque repeatability check – Perform.

11. Maximum power check – Perform.

12. TGT limiter setting check – Perform.

13. Contingency power check – Perform.

H. HEALTH INDICATOR TEST (HIT) AND ANTI-ICE CHECK.

Check each engine individually as follows:

1. Position helicopter into prevailing wind.

2. Set **ANTI-ICE ENG INLET** and **HTR** switches to **OFF**.

3. Set both engine N_p/N_r to 100%.

4. Retard **PWR** lever on engine not being checked to idle.

5. Increase collective pitch to 60% torque and hold for at least 30 seconds.

NOTE

If helicopter is equipped with two FAT gages and the readings are different, the higher reading must be used.

6. Record date, A/C hours, FAT, pressure altitude, and TGT on HIT log sheet in helicopter logbook.

NOTE

Steps 7 thru 9 contain instructions for performing the anti-ice Check.

7. If N_G is less than 90% and FAT is 15 °C or below, then increase collective to 90%. If N_G is less than 90% and FAT is above 15 °C, then increase collective to 94%.

8. For engine being checked, set **ANTI-ICE** switch to **ON** and note the following:

   a. Increase in TGT of at least 30 °C.

   b. **ANTI-ICE** advisory light comes on.

   c. 701C **ANTI-ICE** panel **ENG INLET** advisory light remains on after 90 seconds.

NOTE

- Do not cycle anti-ice bleed and start valve more than once to determine proper operation.
- Anti-ice valve malfunction can cause engine flameout at low power settings or during rapid collective movements.
- If any part of the anti-ice check fails, do not fly helicopter.

9. Set **ANTI-ICE** panel switch to **OFF** and note the following:

   a. Decrease in TGT to approximate value in step 6.

   b. **ANTI-ICE** panel **ENG INLET** advisory light goes off.

   c. 701C **ANTI-ICE** panel **ENG INLET** advisory light goes off with a delay of approximately 90 seconds.

10. **PWR** lever, non-test engine – **FLY**. Verify torque matching.

11. Repeat steps 3 thru 10 for other engine.

NOTE

When using TGT reference table, FAT must be rounded up and pressure altitude must be rounded off to the nearest value.

12. Check indicated TGT reference table 701 (fig 5-3) or 701C (fig 5-4) for TGT corresponding to the recorded FAT and pressure altitude. Record in 2 HIT logsheet in helicopter logbook. Compare indicated TGT 1 with table TGT 2 and record the TGT margin in HIT 1 logsheet in helicopter logbook. TGT margin is indicated TGT 1 minus table TGT 2.

13. Repeat step 12 for other engine.

14. If TGT margin is within acceptance limits (refer to HIT logbook), engine performance is satisfactory. If margin is 5 °C or less from the limit, make appropriate entry in remarks section of DA form 2408-13.

15. If TGT margin is out of limits, repeat check. Be sure all procedures are followed.

16. If TGT margin is still out of limits, do not fly the helicopter. Make appropriate entry in remarks section of DA form 2408-13.

I. HIT BASELINE CHECK AND ENGINE PERFORMANCE DATA CHECKS.

CAUTION

If icing conditions exist, do not keep anti-icing off for longer than is necessary to do HIT check.

1. Prior to completing maximum power check, a new HIT baseline is established by the maintenance test pilot and used if engine performance is satisfactory on the maximum power check. During initial HIT check, the maintenance pilot compensates for the particular engine characteristic and establishes the TGT limits to be used in the operational HIT check. The operational pilot will compare engine performance to this baseline to check engine performance.
2. Position helicopter into the wind to minimize hot gas ingestion.
3. Set **ENG INLET ANTI-ICE** and **HTR** switches to **OFF**. Set altimeter to 29.92 in. Hg.
4. Set both engines N_p/N_r at 100%.
5. Retard engine **PWR** lever of engine not being checked until a 0% torque at 92 – 98% N_p is reached.
6. Increase collective pitch to 60% torque and hold it there for at least 30 seconds.

NOTE

If helicopter is equipped with two FAT gages and the readings are different, the higher reading must be used.

7. Note FAT and pressure altitude.

8. Record A/C hours, FAT, pressure altitude and indicated TGT on HIT baseline worksheet (fig 5-2, Chapter 5).

9. If N_G is less than 90% and FAT is 15 °C or below, then increase collective to 90%. If N_G is less than 90% and FAT is above 15 °C, then increase collective to 94%.

10. For engine being checked, set **ENG INLET** switch to **ON** and note the following:

    a. Increase in TGT of at least 30 °C.

    b. **ANTI-ICE** advisory light comes on.

    c. 701C **ANTI-ICE** panel **ENG INLET** advisory light remains on after 90 seconds.

NOTE

- Do not cycle anti-ice bleed and start valve more than once to determine proper operation.
- Anti-ice valve malfunction can cause engine flameout at low power settings or during rapid collective movements.
- If any part of the anti-ice check fails, do not fly aircraft.

11. Set **ANTI-ICE** panel switch to **OFF** and note the following:

    a. Decrease in TGT to approximate value in step 8.

    b. **ANTI-ICE** panel **ENG INLET** advisory light goes off.

c. 701C **ANTI-ICE** panel **ENG INLET** advisory light goes off with a delay of approximately 90 seconds.

12. Repeat steps 3 thru 11 twice. This completes logging of data. Remaining steps can be done after engine is shut down.

13. Using HIT baseline worksheet (fig 5-2, Chapter 5), calculate average indicated TGT for above three readings.

NOTE

When using TGT reference table, FAT must be rounded up, the pressure altitude must be rounded off to the nearest value, if applicable.

EXAMPLE

a. If FAT is 14 °C, use 15 °C. Or, if FAT is 46 °C, use 50 °C.

b. If pressure altitude is between -249 feet and 249 feet, use 0 feet. Or, if pressure alitude is between 250 feet and 749 feet, use 500 feet.

14. Find indicated TGT in 701 (fig 5-3, Chapter 5) or 701C (fig 5-4, Chapter 5) to determine actual TGT for recorded FAT and pressure altitude.

15. Subtract table TGT on HIT baseline worksheet (fig 5-2, Chapter 5) from average indicated TGT 701 (fig 5-3, Chapter 5) or 701C (fig 5-4, Chapter 5).

16. Establish TGT upper and lower limits by adding 20 °C (68 °F) to answer in step 15 and by subtracting 20 °C (68 °F) from answer in step 15. Record TGT upper and lower limits on HIT logsheet in helicopter logbook.

17. During operation checks, the HIT TGT margin will fall within the upper and lower limits.

18. The following is an example of a HIT baseline calculation:

    a. FAT = 15 °C

    b. PRESS ALT = 500 FT

    c. TGT = 665° 668° 667°

    d. Average
    $$\text{TGT} = \frac{665° + 668° + 667°}{3} = 667°\text{C}$$

    e. Table value of TGT (for 15° C FAT + 500 FT altitude) = 669° C

    f. Average TGT minus table TGT = 667° C – 669° C = -2° C

    g. TGT acceptance limit
    -2° C + 20° C = + 18° C
    -2° C – (20° C) = -22° C

    h. Therefore an operational HIT check (TGT margin) that is less than + 18 °C and greater than -22 °C is acceptable.

J. ROTOR SMOOTHING PROCEDURES.

1. General.

    a. Main rotor pitch link adjustments approximate one inch tip travel per one flat adjustment. Use pitch link to correct track variances of greater than one half inch where tip path relationships are constant between flat pitch and hover tracks.

b. Main rotor reflex tab adjustments approximate one inch tip travel per one degree change. Use the appropriate tab pocket(s) to correct track variances when tip path relationships change more than 2 inches between flat pitch and hover tracks. If track variance is less than 2 inches, use pitch links to correct hover track. A combination of reflex tab and pitch link adjustments is used to correct track changes at all other airspeeds.

c. Adjust blade weights (main and/or tail rotor) per values determined from Vibrex chart.

d. Adjust blade phase only if tracking indicates phase change or per Vibrex chart.

e. Apply rotor smoothing procedure as necessary to attain least possible vibration level. A value of 0.3 IPS in either vertical or lateral vibrations straight and level should be considered the maximum acceptable level not requiring correction. A value of 0.76 IPS should be considered the maximum acceptable level during turning flight.

f. Upon attaining acceptable levels of vibration, record peak values and clock angles, tab pocket settings, and scan for peak IPS values through range of Vibrex monitor. Retain this record for use in troubleshooting vibrations as necessary.

2. Tail Rotor Balance Check.

Refer to TM 1-1520-238-T-4.

3. Main Rotor Track and Balance.

Refer to TM 1-1520-238-T-4.

K. AUTOMATIC TADS GYRO ALIGNMENT.

NOTE

This procedure is used for automatically aligning the gyros. The TADS inertial axis is aligned with the optical axis to eliminate potential pitch and yaw disturbances. This task is to be performed after replacement of the TEU, DSA roll/pitch/yaw gyros and the TADS turret.

1. FOV – **N**.
2. TADS – **TV**.
3. **SLAVE** switch – **SLAVE** to bring TADS turret out of fixed forward position. **–49** Set DEK-FD/LS then press mid shift key and enter B32. **–51** CDU FAD-FDLS then type B32 in the scratchpad.
4. **SLAVE** switch – Unslave.

NOTE

- Shortly after **ALIGNMENT IN PROGRESS** message appears, the TADS turret will begin vertical and lateral motions, then stop. System will enter manual track mode when bite target appears on display. The bite target is displayed by a white rectangle above the letters PR of the **ALIGNMENT IN PROGRESS** message. The presence of the white rectangle indicates the system is waiting for the next portion of the alignment procedure.
- Pitch and yaw gyro alignment is normally performed airborne, but may be performed on the ground if a suitable target is available. The target is required to be at an up or down elevation greater than 25 degrees from zero.

5. Trackable target – Acquire.

6. **IAT/MAN** switch– Engage and track target. If tracker enters stop mode, press **IAT/MAN** switch to select **MAN**. Repeat step.

NOTE

The TADS turret will begin oscillating (rolling) around the target; when the boresight menu appears, the alignment is complete.

7. **IAT** – OFF.
8. FOV – As required.
9. TADS – As required.

L. HARS SELF TEST.

CAUTION

The helicopter must not move during HARS self test. Any movement will result in an invalid self test.

NOTE

- The HARS self test can be used only with HARS units having part numbers 86-9415-5 and above.
- The HARS self test should be performed on the ground with APU power only.

1. **FCC/MUX** switch – **ON**.
2. **MUX** switch – **PRI**.
3. **SYSTEM FC SYM GEN** switch – **FC SYM GEN**.

NOTE

–45 and –49A If the DEK is in the FD/LS position when the HARS alignment is initiated, the heading tape will not appear; set DEK switch to **STBY**.

4. **VDU** mode switch – **CPG**. View heading tape on VDU.

5. For –45 and –49A software. DEK – Enter **SP1 PPOS**, **ALT**, **MV** and spheroid data for present location as required. For –51 software, use CDU **ADMIN** and **NAV** pages to enter PPOS/Datum and altitude.

6. HSI compass card – Note helicopter heading.

NOTE

For –45 and –49A software, complete steps 7 through 13 below. For –51 software, steps 7 through 13 may be completed or perform the automated HARS Extended Alignment test via the CDU **FD/LS** page.

7. **HARS** switch – **NORM** for 5 seconds, then to **FAST**.

8. Wait for second rotation of HSI compass card (approximately 3 – 5 minutes after setting **HARS** switch to **FAST**). **HARS** switch – **NORM** during second rotation of the HSI compass card when HSI compass card is 180° from helicopter heading.

9. HSI **HDG** flag – Goes out of view within 3 minutes of setting **HARS** switch to **NORM**.

10. VDU – Heading tape remains in view.

11. If the **HDG** flag remains in view, or if the heading tape is no longer visible, the self test has failed. Set **HARS** switch to **OFF** and repeat steps 5. thru 10. above.

12. If the HARS passes the second test, the first failure was because of invalid data in the mission data memory. Set **HARS** switch to **OFF** and complete a normal alignment prior to moving helicopter.

13. If the HARS fails the second test, the HARS unit is faulty.

M. NAVIGATION SYSTEMS CHECK.

NOTE

- The navigation course used during this check must consist of three waypoints, each at least 20 kilometers from the other two. A triangular course will minimize flight time required to complete flight data recording portion of this check. Accurate waypoint coordinates and magnetic variation data is required.
- Some aircraft have a fully integrated navigation system (EGI) installed; others will have a non-integrated navigation system. If EGI is installed, perform step 1.a. If EGI is not installed, perform step 1.b.

1. Before Flight Checks.

   a. EGI – Program Navigation course data.

   b. Doppler – Program navigation course data.

NOTE

Waypoint 1 – The departure and termination point should be stored in memory locations **H**, **PP**, **3**, and **6**.

Waypoint 2 – The first **FLY-TO** destination should be programmed in memory location **1** and **5**.

Waypoint 3 – The second **FLY-TO** destination should be programmed in memory locations **2** and **4.**

   c. **HARS** mode switch – **NORM**.

NOTE

A NORMAL HARS alignment must be completed immediately prior to performing the flight portion of the check.

c. **HARS** mode switch – **OPR**.

2. Flight Checks.

a. At Departure waypoint:

(1) Nav system – Initialize.

(2) **FCC PPOS** display (Non–EGI)– Verify agrees with doppler **PP** display coordinates.

(3) Select next waypoint: record navigation system distance to waypoint.

(4) Navigation system steering – Fly to next waypoint by tracking steering indicator.

NOTE

Following Navigation system steering data ensures the most direct route to the waypoint will be flown. Climb to enroute altitude should be performed at best rate of climb. Enroute altitude must comply with local regulations, and provide adequate terrain clearance. Enroute airspeed should be 120 KIAS. Maneuvering should be limited to the minimum possible; pitch and bank angles should be limited to ± 5 degrees whenever possible.

b. At EACH waypoint:

(1) Complete landing approach to hovering altitude of 10 to 20 feet over the physical landmark.

(2) Navigation system:

*(a) Present position freeze – Record actual coordinates.

NOTE

In EGI equipped aircraft, if NAV STAT 1 is displayed, bypass step (b).

(b) Update – Complete; verify distance to go display resets to zero (0).

(c) Select next waypoint; record Navigation system computed distance to waypoint.

(d) Navigation system steering – Fly to next waypoint by tracking steering indicator.

NOTE

The altitudes, airspeeds and maneuvering limitations observed on the first navigation leg apply to all navigation legs. Upon reaching the initial departure waypoint, reverse the order in which the waypoints were flown. This will result in a total of six (6) sets of data recorded upon return to home station.

3. Post Flight Check.

   a. Shutdown checklist – Complete.

   b. Analysis calculations – Complete.

4. Analysis Calculations.

Perform the following calculations for each leg flown.

NOTE

The example calculations use coordinates 32460360 and 22222830. Substitute actual data for each of the six legs and perform the required calculations using the methods shown.

a. Calculate actual track angles:

Formula:

$$\text{Angle } \emptyset 1 = \frac{\Delta/E/^{n}}{\Delta/N/^{n}} = \text{Tan}^{-1}$$

NOTE

The calculation determines the actual course that should have been flown. (n) represents the number of the leg flown.

Example Calculation:

	Easting	Northing	
WPT (H)	3246	0360	
WPT (1)	–2222	–2830	
ΔE =	1024	–2470	= ΔN

$$\text{Angle } \emptyset 1 = \frac{1024}{-2470}\text{Tan}^{-1} = -23.518°$$

b. Calculate Flown Track Angles:

Formula:

$$\text{Angle } \emptyset 2 = \frac{\Delta E^{n}}{\Delta N^{n}} = \text{Tan}^{-1}$$

NOTE

This calculation determines the course that was flown:

Example Calculation:

	Easting	Northing	
(Actual WPT (H) Data	3246	0360	
(Indicated WPT (1) Data	–2189	–2832	
ΔE^{n} =	1057	–2472	= ΔN^{n}

$$\text{Angle } \emptyset 2 = \frac{1057}{-2472} = \text{Tan}^{-1} = -23.151^\circ$$

c. Track Error Calculation:

Formula: TE = 02 – 01

NOTE

This calculation determines the error between actual course and the course flown.

TE = (-23.151°) – (22.518°) = -0.633°

d. Calculate Actual Distance Between Waypoints.

Formula:

$$\text{Distance} = \frac{\sqrt{(\Delta E)^2 + (\Delta N)^2}}{100}$$

Example Calculation:

$$\text{Distance} = \frac{\sqrt{(1024)^2 + (2470)^2}}{100}$$

Actual Distance =26.738 Km

e. Calculate Distance that was flown:

Formula:

$$\text{Distance} = \frac{\sqrt{(\Delta E^2) + (\Delta N^2)}}{100}$$

Example Calculation:

$$\text{Distance} = \frac{\sqrt{(1057)^2 + (2472)^2}}{100}$$

Distance Flown = 26.875 Km

f. Calculate Leg Crosstrack Error:

Formula:

$$XTK = \frac{\text{SIN OTE X Flown Distance X 100}}{\text{Actual Distance}}$$

NOTE

This calculation determines leg crosstrack error expressed in percent of distance traveled.

Example Calculation:

$$XTK = \frac{(\text{SIN} - 0.633°) \times (26.885\text{Km}) \times 100}{26.738\ \text{Km}}$$

XTK Error = 1.11% Distance Travelled

g. Calculate Leg Alongtrack Error:

Formula:

$$ATK = \frac{\text{COS TE} \times (\text{Flown Dist} - \text{Actual Dist} \times 100)}{\text{Actual Distance}}$$

NOTE

This calculation determines leg alongtrack error expressed in percent of distance traveled.

Example Calculation:

$$ATK = \frac{(\text{COS} - 0.633) \times (26.885 - 26.738\text{Km}) \times 100}{26.738\text{Km}}$$

ATK Error = 0.54% Distance Travelled

NOTE

This represents value (a) for use in Steps h and i. Each leg would be calculated in the same manner and become the next letter for use in steps h and i.

h. Calculate Root Mean Square of the six (6) Crosstrack Errors:

Formula:

$$XTK = \sqrt{\frac{(a)^2 + (b)^2 + (c)^2 + (d)^2 + (e)^2 + (f)^2}{6}}$$

NOTE

- This note is only applicable for use in the non–integrated navigation mode.
- If this result exceeds 1.40%, HARS input heading data to the Doppler is faulty.

i. Calculate the root mean square of the six (6) Alongtrack Errors:

Formula:

$$ATK = \sqrt{\frac{(a)^2 + (b)^2 + (c)^2 + (d)^2 + (e)^2 + (f)^2}{6}}$$

NOTE

- This note is only applicable for use in the non–integrated navigation mode.
- If this result exceeds 0.95%, Doppler velocity is faulty.

j. If the results of calculations performed in steps h and i are acceptable, navigation system performance is within tolerance.

N. AUDIO WARNING SYSTEM OPERATIONAL CHECK.

NOTE

All or part of this check may be required. The actual check may be broken into several parts and completed when convenient. However, the applicable portions of the check will be completed prior to flight.

1. Engine out audio warning – Check as follows:

   Before starting APU – Pilot/CPG.

   a. **BATT/EXT PWR** switch – **BATT** or **EXT PWR** as required.

   b. Engine out audio – Verify present in both headsets, then reset.

2. Stabilator fail audio warning – Check as follows:

   After starting APU – Pilot/CPG.

   a. **STAB AUTO AC** circuit breaker – Pull. Verify stabilator fail audio is present in both headsets. Reset using pilots stabilator **RESET** button.

   b. **STAB AUTO AC** circuit breaker – Reset. Then pull. Verify same as step a. Reset using CPGs stabilator **RESET** button.

3. **HIGH RPM ROTOR** warning light – Check as follows:

   After starting engines – Pilot/CPG.

CAUTION

Delaying decrease of PWR lever may result in an engine/rotor overspeed.

a. **NO. 1 PWR** lever – **LOCKOUT**. Note $N_p/N_G/N_r$ increase. Then immediately retard **NO. 1 PWR** lever to below ENG 2 torque.

b. **NO. 1 PWR** lever – Slowly advance above 100% N_p until **HIGH RPM ROTOR** warning light illuminates.

c. **NO. 1 PWR** lever – **IDLE**. Verify N_G is at idle speed.

d. **NO. 1 PWR** lever – **FLY**. Note that ECU has been reset from **LOCKOUT**.

4. Low $N_p/N_G/N_r$ audio warning – Check as follows:

After starting engines – Pilot/CPG.

a. **ENG 1 FUEL** switch – **OFF**. Verify **ENG 1 OUT** warning light illuminates and audio warning is present in both headsets as N_p goes below 94%. Reset audio using pilots **ENG 1 OUT** light.

b. **NO. 1 PWR** lever – **OFF**.

CAUTION

Avoid prolonged operation at 94% – 96% N_r with APU running. The APU clutch will oscillate from engaged to disengaged. This creates high loads on the clutch and shall be avoided.

c. **NO. 2 PWR** lever – Retard. Note **LOW RPM ROTOR** warning light illuminates and audio is present in both headsets when rotor goes below 94% N_r. Continue retarding **PWR** lever to **IDLE**. Reset audio using pilots **ENG 2 OUT** warning light.

d. **NO. 2 PWR** lever – **OFF**. Note **ENG 2 OUT** warning light illuminates and audio is present in both headsets as N_G goes below 63%. Reset audio.

5. Engine 1 fuel system – Prime as follows:

   a. **FUEL CROSSFEED** switch – **AFT TK**.

   b. **FUEL BOOST** switch – **ON**.

   c. **ENG 1 FUEL** switch – **ON**.

   d. **NO. 1 PWR** lever – **LOCKOUT**. Verify fuel flows from overboard drain.

   e. **NO. 1 PWR** lever – **OFF**.

   f. **FUEL CROSSFEED** switch – **NORM**.

6. Perform normal start and runup on No. 1 and No. 2 engines.

7. **ENG 2 FUEL** switch – **OFF**. Verify **ENG 2 OUT** warning light illuminates and audio warning is present in both headsets as N_p goes below 94%**.** Reset audio using CPGs **ENG 2 OUT** warning light.

8. **NO. 2 PWR** lever – **OFF**.

9. **NO. 1 PWR** lever – **IDLE**. Reset audio using CPGs **ENG 1 OUT** warning light.

10. **NO. 1 PWR** lever – **OFF**. Note **ENG 1 OUT** warning light illuminates and audio is present in both headsets as N_G goes below 63%. Reset audio.

11. Engine 2 fuel system – Prime in accordance with step 5, using **ENG 2 FUEL** switch and **PWR** lever.

O. TORQUE REPEATABILITY CHECK.

NOTE

- This check may be done on the ground or at altitude. If it is done on the ground, the helicopter should be headed into the wind to reduce the effects of exhaust gas ingestion. If it is done at altitude, all steps will be done at the same altitude. In either case, all steps will be done at the same FAT and N_p.

- The procedures in TM 1-1520-238-10 should be referred to when starting engines.

1. Start the engine and slowly increase engine power until TGT reaches 650 °C. If temperature exceeds 650 °C, reduce power until TGT is below 600 °C. Then slowly approach 650 °C again by slowly increasing engine power.

2. Stabilize TGT at 650 °C for one minute. Record torque, N_G, and TGT.

3. Increase power until TGT is 700 – 750 °C.

4. Slowly reduce power until TGT is 650 °C. If temperature is below 650 °C, increase power until TGT is 700 – 750 °C. Then slowly reduce power until TGT is 650 °C.

5. Stabilize TGT at 650 °C for one minute. Record torque, N_G and TGT.

6. With helicopter on the ground, reduce power quickly to ground idle speed. Record torque, N_G and TGT with engine stabilized at ground idle speed.

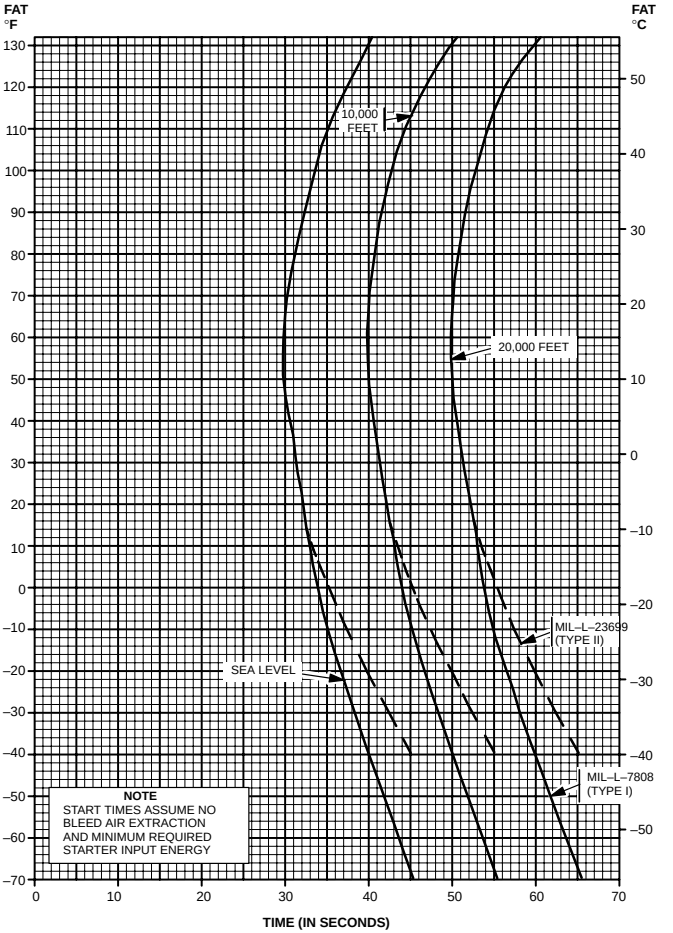
7. Compare the torque value recorded in step 2 with that recorded in step 5. The difference between the two values is the torque repeatability error. If this error is more than 10%, refer to troubleshooting procedures.

CHAPTER 5. CHARTS AND FORMS

5-1. GENERAL.

This chapter 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 maintenance test flight.

LIST OF CHARTS



M01−191

Figure 5-1. Time-to-Idle-Limits

HIT BASELINE WORKSHEET

A/C S/N _____ ENGINE S/N _____

A/C HOURS _____ ENGINE HOURS _____

FAT _____ POSITON _____

PA _____

NOTE

SET 60% TORQUE ON ENGINE BEING CHECKED

INDICATED TGT:

1. _____
2. _____
3. _____

TOTAL _____ ÷ 3 = _____ AVERAGE INDICATED TGT

– _____ TABLE TGT

= _____ TGT MARGIN

TGT ACCEPTABLE LIMITS: TGT MARGIN + 20°C = _____

TGT MARGIN – 20°C = _____

RECORD LIMITS IN A/C ENGINE HEALTH INDICATOR TEST LOG.

X8811103-1

Figure 5-2. HIT Baseline Worksheet

T701
ENGINE HEALTH INDICATOR TEST (HIT)
INDICATED TGT REFERENCE TABLE
(TRQ = 60% – % RPM R = 100%)
TGT = °C

FAT °C	PRESSURE ALTITUDE ~ FT					
	–1000	–500	0	500	1000	1500
55	765	768	772	776	780	785
53	760	763	767	771	775	779
51	755	758	762	766	770	774
50	752	755	759	763	767	771
49	749	752	756	760	764	768
47	744	747	751	755	759	763
45	739	742	746	749	753	757
43	734	737	741	744	748	752
41	728	732	735	739	743	747
39	723	726	730	734	737	741
37	717	721	725	728	732	736
35	712	716	719	723	727	730
33	707	710	714	717	721	725
31	701	705	708	712	716	719
29	696	700	703	707	710	714
27	691	694	698	701	705	709
25	685	689	692	696	699	703
23	680	684	687	690	694	698
21	675	678	681	685	689	692
19	669	673	676	679	683	687
17	664	667	671	674	678	681
15	659	662	665	669	672	676
13	654	657	660	663	667	670
11	649	652	655	658	662	665
9	644	647	650	653	659	660
7	639	642	645	648	651	655
5	634	637	640	643	646	649
3	629	632	635	658	641	644
1	624	627	630	633	636	639
–1	619	622	625	628	631	634
–3	614	617	620	623	626	629
–5	609	612	615	618	621	624
–7	604	607	610	613	616	619
–9	598	602	605	608	611	614
–11	593	596	600	603	606	609
–13	588	591	594	597	601	604
–15	583	586	589	592	595	598
–17	577	580	583	587	590	593
–19	572	575	578	581	585	588
–21	567	570	573	576	579	582
–25	557	560	563	566	569	572
–30	544	547	550	553	556	559
–35	532	534	537	540	543	546
–40	519	522	525	528	531	533
–45	507	509	512	515	518	521
–50	494	497	499	502	505	508
–55	481	484	487	490	493	495

Figure 5-3. HIT Check TGT Reference Table 701
(Sheet 1 of 3)

T701
ENGINE HEALTH INDICATOR TEST (HIT)
INDICATED TGT REFERENCE TABLE
(TRQ = 60% – % RPM R = 100%)
TGT = °C

FAT °C	PRESSURE ALTITUDE ~ FT					
	2000	2500	3000	3500	4000	4500
55	789	793	798	804	809	814
53	783	787	792	798	803	808
51	778	782	787	793	798	803
50	775	779	784	790	795	800
49	772	776	781	787	792	797
47	767	771	776	782	787	792
45	762	766	771	776	781	786
43	757	761	766	770	775	781
41	751	755	760	764	769	775
39	745	749	754	759	764	769
37	740	744	748	753	758	763
35	734	738	743	748	753	758
33	729	733	738	742	747	752
31	723	727	732	737	741	746
29	718	722	726	731	736	741
27	712	716	721	726	730	735
25	707	711	715	720	724	729
23	701	705	710	714	719	724
21	696	700	704	709	713	718
19	691	694	699	703	708	712
17	685	689	693	698	702	707
15	679	683	688	692	696	701
13	674	678	682	687	691	695
11	668	672	677	681	685	689
9	663	667	671	675	679	684
7	658	662	666	670	674	678
5	653	656	661	665	669	673
3	648	651	655	659	663	667
1	643	646	650	654	658	662
–1	637	641	645	649	653	657
–3	633	636	640	644	647	651
–5	628	631	635	638	642	646
–7	623	626	630	633	637	641
–9	617	621	625	628	632	636
–11	612	616	620	623	627	631
–13	607	611	614	618	622	626
–15	602	605	609	613	616	620
–17	596	600	604	607	611	615
–19	591	595	598	602	606	609
–21	586	589	593	597	600	604
–25	575	579	582	586	589	593
–30	562	566	569	573	576	580
–35	549	552	556	559	563	566
–40	536	539	543	546	549	553
–45	524	527	530	533	537	540
–50	511	514	517	520	524	527
–55	498	501	504	508	511	514

Figure 5-3. HIT Check TGT Reference Table 701
(Sheet 2 of 3)

T701
ENGINE HEALTH INDICATOR TEST (HIT)
INDICATED TGT REFERENCE TABLE
(TRQ = 60% – % RPM R = 100%)
TGT = °C

FAT °C	PRESSURE ALTITUDE ~ FT					
	5000	6000	7000	8000	9000	10000
55	820	831				
53	820	831				
51	809	820				
50	806	817	828	840		
49	803	814	825	837		
47	797	808	819	831		
45	791	802	813	825	837	851
43	786	796	807	819	831	845
41	780	790	801	813	825	838
39	774	784	795	807	819	832
37	768	778	789	801	813	826
35	762	772	783	795	807	819
33	757	767	777	789	801	813
31	751	761	772	783	794	807
29	745	755	766	777	788	800
27	740	749	760	771	782	794
25	734	744	754	765	776	788
23	728	738	748	759	770	782
21	722	732	742	753	764	776
19	717	726	736	747	758	769
17	711	720	730	741	752	763
15	705	715	724	735	746	757
13	700	709	718	729	739	751
11	694	703	712	723	733	745
9	688	697	707	717	727	738
7	682	691	701	711	721	732
5	677	685	695	705	715	726
3	671	680	689	699	709	720
1	666	674	683	693	703	713
–1	661	669	677	687	697	707
–3	655	663	672	681	691	701
–5	650	658	666	676	685	695
–7	645	653	661	670	679	689
–9	640	647	655	664	674	683
–11	634	642	650	659	668	677
–13	629	637	645	654	662	671
–15	624	632	640	648	657	666
–17	619	626	634	643	652	660
–19	613	621	629	637	646	655
–21	608	615	624	632	640	649
–25	597	604	612	621	629	638
–30	583	591	598	606	615	623
–35	570	577	585	593	600	609
–40	557	564	571	579	586	594
–45	544	551	558	565	572	580
–50	530	537	545	552	559	566
–55	517	524	531	538	545	553

Figure 5-3. HIT Check TGT Reference Table 701
(Sheet 3 of 3)

T701C
ENGINE HEALTH INDICATOR TEST (HIT)
INDICATED TGT REFERENCE TABLE
(TRQ = 60% – % RPM R = 100%)
TGT = °C

FAT °C	PRESSURE ALTITUDE ~ FT					
	–1000	–500	0	500	1000	1500
55	736	740	744	748	753	758
53	730	734	738	742	747	752
51	724	727	731	736	740	745
50	721	724	728	733	737	742
49	718	721	725	730	734	739
47	712	715	719	723	727	732
45	706	709	713	717	721	725
43	701	703	707	711	715	719
41	695	698	702	706	710	713
39	690	692	696	700	704	707
37	684	687	690	694	698	702
35	679	681	685	689	692	696
33	673	676	679	683	687	690
31	668	670	674	677	681	685
29	662	665	668	671	675	679
27	657	659	662	666	670	673
25	651	654	657	660	664	667
23	645	648	651	655	658	662
21	639	642	645	649	652	656
19	634	636	640	643	647	650
17	628	631	634	638	641	644
15	623	625	629	632	635	638
13	617	620	623	626	630	633
11	612	614	618	621	624	627
9	606	609	612	616	619	622
7	600	603	607	610	613	616
5	595	598	601	605	608	611
3	589	592	595	599	602	605
1	584	586	590	593	597	600
–1	577	579	583	586	590	593
–3	571	574	577	581	584	587
–5	566	568	572	575	578	581
–7	560	563	566	569	573	576
–9	554	557	560	564	567	570
–11	549	552	555	558	561	564
–13	543	546	549	553	556	559
–15	538	540	544	547	550	553
–17	532	535	538	541	544	547
–19	526	529	532	536	539	542
–21	521	523	527	530	533	536
–23	515	518	521	524	527	530
–25	510	512	515	519	522	524
–27	504	507	510	513	516	519
–29	498	501	504	507	510	513
–31	492	495	498	501	504	507
–33	487	490	493	496	499	501
–35	482	484	487	490	493	496
–37	476	478	481	484	487	490
–39	470	473	476	479	482	484
–45	453	456	459	462	465	467
–50	439	441	444	447	450	453
–55	425	427	430	433	436	438

Figure 5-4. HIT Check TGT Reference Table 701C (Sheet 1 of 3)

T701C
ENGINE HEALTH INDICATOR TEST (HIT)
INDICATED TGT REFERENCE TABLE
(TRQ = 60% – % RPM R = 100%)
TGT = °C

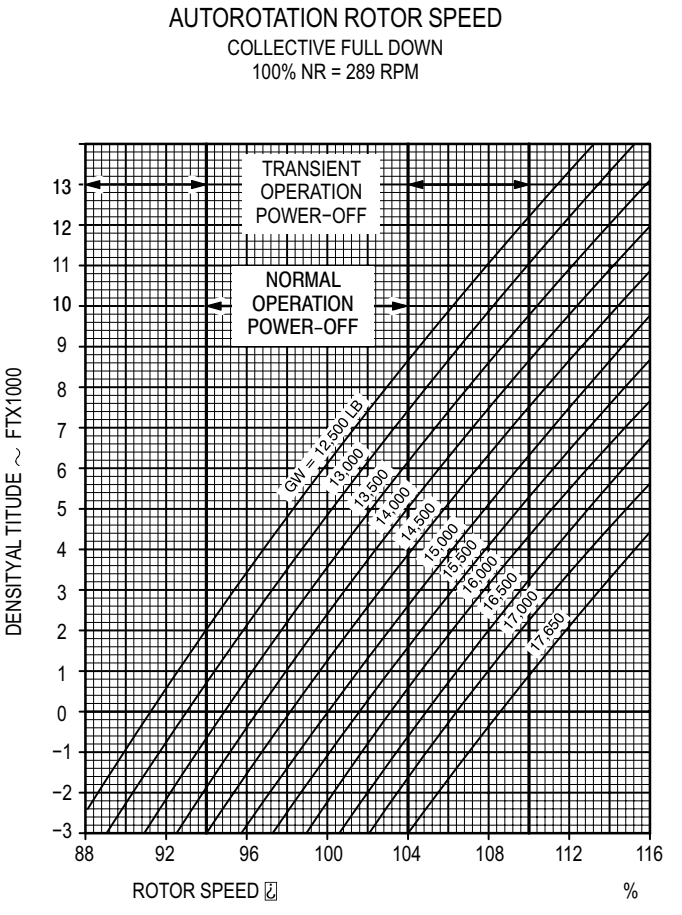
FAT °C	PRESSURE ALTITUDE ~ FT					
	2000	2500	3000	3500	4000	4500
55	763	769	775	781	787	792
53	757	762	768	774	780	786
51	750	755	761	767	773	779
50	747	752	758	764	770	776
49	744	749	755	761	767	773
47	737	742	748	754	760	766
45	731	736	741	747	753	759
43	725	729	734	740	746	752
41	718	723	728	733	739	745
39	712	716	721	726	732	738
37	706	710	714	720	725	731
35	700	704	709	713	719	724
33	694	698	703	707	712	717
31	689	692	697	702	707	711
29	683	687	691	696	701	705
27	677	681	685	690	695	700
25	671	675	680	684	689	694
23	666	669	674	678	683	688
21	660	664	668	672	677	682
19	654	658	662	667	671	676
17	648	652	656	661	665	670
15	642	646	650	655	659	664
13	636	640	644	649	654	658
11	631	634	638	643	647	652
9	625	629	633	637	641	646
7	620	623	627	631	635	640
5	614	618	621	625	630	634
3	609	612	616	620	624	628
1	603	607	610	614	618	622
–1	596	600	603	607	611	615
–3	591	594	598	602	606	609
–5	585	589	592	596	600	604
–7	579	583	587	590	594	598
–9	574	577	581	585	589	592
–11	568	571	575	579	583	586
–13	562	566	569	573	577	581
–15	556	560	564	567	571	575
–17	551	555	558	562	565	569
–19	545	549	552	556	559	563
–21	539	543	546	550	554	557
–23	534	537	540	544	548	551
–25	528	531	535	538	542	545
–27	522	526	529	532	536	539
–29	516	520	523	526	530	534
–31	511	514	517	521	524	528
–33	505	508	511	515	518	522
–35	499	502	506	509	512	516
–37	493	497	500	503	506	510
–39	487	491	494	497	500	504
–45	470	473	476	479	483	486
–50	456	459	462	465	468	471
–55	441	444	447	450	454	457

Figure 5-4. HIT Check TGT Reference Table 701C
(Sheet 2 of 3)

T701C
ENGINE HEALTH INDICATOR TEST (HIT)
INDICATED TGT REFERENCE TABLE
(TRQ = 60% – % RPM R = 100%)
TGT = °C

FAT °C	PRESSURE ALTITUDE ~ FT						
	5000	5500	6000	7000	8000	9000	10000
55	796	801	805	814	825	835	846
53	790	796	800	809	819	830	840
51	785	791	795	804	814	825	835
50	782	788	792	802	811	822	832
49	778	785	789	799	808	819	829
47	771	778	782	794	803	814	824
45	764	771	776	788	798	808	818
43	757	764	769	781	792	803	813
41	751	757	762	775	786	797	807
39	744	750	755	768	780	792	802
37	737	743	748	761	773	787	796
35	730	736	741	754	766	779	791
33	723	729	735	746	759	772	786
31	716	722	727	739	752	765	779
29	710	715	720	732	745	758	771
27	704	709	714	725	737	750	764
25	698	703	707	718	730	743	756
23	692	697	701	711	723	736	749
21	686	691	695	705	715	728	742
19	680	685	689	699	709	721	734
17	674	679	683	693	703	714	727
15	668	673	677	686	697	708	719
13	662	666	671	680	690	701	712
11	656	660	665	674	684	695	706
9	650	654	659	668	678	689	699
7	644	648	652	662	671	682	693
5	637	642	646	656	665	676	687
3	631	636	640	649	659	669	680
1	626	629	634	643	653	663	674
–1	618	622	626	635	645	655	666
–3	613	617	620	629	639	649	659
–5	607	611	615	623	632	642	652
–7	601	605	609	617	626	636	646
–9	596	599	603	611	620	630	639
–11	590	594	597	606	614	623	633
–13	584	588	591	600	608	617	627
–15	578	582	586	594	602	611	620
–17	572	576	580	588	596	605	614
–19	566	570	574	582	591	599	608
–21	560	564	568	577	585	593	602
–23	555	558	562	571	579	587	596
–25	549	552	556	565	573	581	589
–27	543	547	550	559	567	575	583
–29	537	541	545	553	561	569	577
–31	531	535	539	547	554	563	571
–33	525	529	533	541	548	556	565
–35	519	523	527	535	542	550	558
–37	513	517	521	529	536	544	552
–39	507	511	515	523	530	538	546
–45	489	493	497	505	512	519	527
–50	475	478	482	490	497	504	512
–55	460	464	467	475	481	489	496

Figure 5-4. HIT Check TGT Reference Table 701C
(Sheet 3 of 3)



GW − SUBTRACT FUEL CONSUMED FROM TAKEOFF GROSS WEIGHT.
DA − COMPUTE USING FIGURE 5−6.
Nr − MUST BE WITHIN A RANGE OF −0 TO +3.
EXAMPLE: DA=0, GW=15000 LBS, RPM=100%.
ALLOWABLE RANGE WOULD BE 100% TO 103% RPM.

M01−135A

Figure 5-5. Autorotation RPM Chart

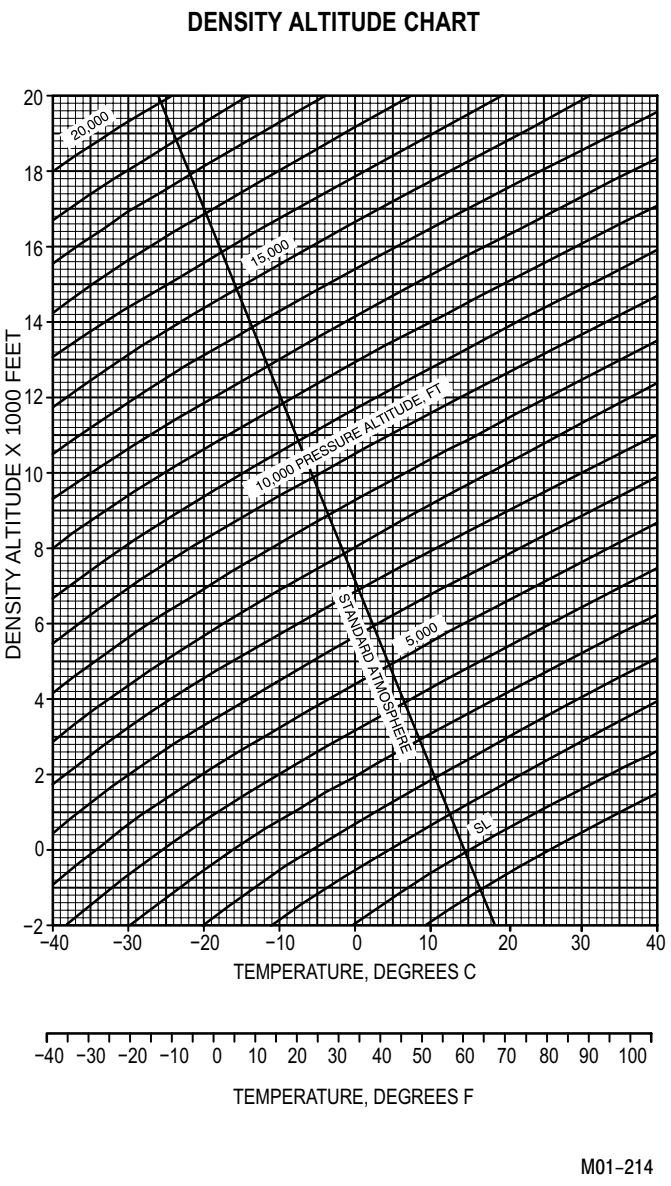


Figure 5-6. Density Altitude Chart

ROTATING COMPONENT	RPM
Main rotor 1 per rev	289
Main transmission sun gear	1,581
Main rotor 4 per rev	1,156
Tail rotor 1 per rev	1,403
Tail rotor 2 per rev	2,806
Tail rotor 4 per rev	5,612
Tail rotor drive shaft (main gearbox to intermediate)	4,815
Tail rotor drive shaft (intermediate to 90° gearbox)	3,636
Engine output shaft	20,952
Main transmission input shafts	9,841
Main transmission output ring gear	39,882
Tail rotor gearbox gear mesh rate	79,992
Engine N1	42,000
Engine N2	21,000

Figure 5-7. Rotating Component RPM Table

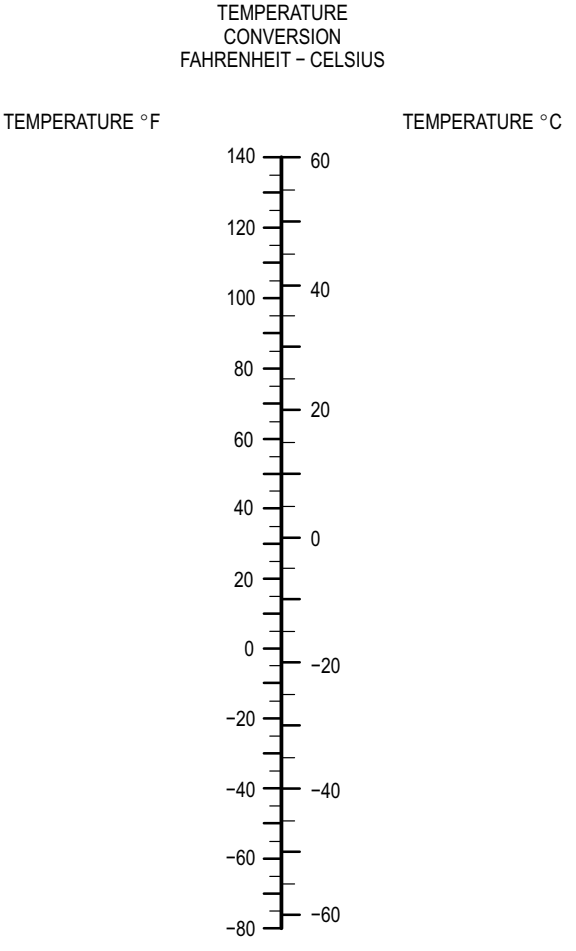


Figure 5-8. Temperature Conversions

AH-64A MAINTENANCE TEST FLIGHT CHECK SHEET

A/C NO	PURPOSE OF TEST FLIGHT			DATE
PILOT AND UNIT				TIME
GROSSWEIGHT	C.G.	FAT °C	PRESS ALT	DENSITYAL T

SYMBOLS: ✓ = SATISFACTORY ✕ = UNSATISFACTORY

	PRIOR TO MTF CHECKS		9. IHADSS
	INTERIOR CHECK–CPG		10. TADS SYSTEM CHECKS
	INTERIOR CHECK–PILOT		11 PNVS
BEFORE STARTING APU PILOT/CPG			12. WEAPONS SYSTEMS
	1. ICS SYSTEM		13. FLIGHT CONTROLS CHECK
	2. CAUTION/WARNING PANELS		a. STABILATOR
	3. FIRE DETECTORS		b. DASE
	4. INSTRUMENT TEST PANELS		c. BUCS
STARTING APU–PILOT			14. POWER LEVERS
	APU START		15. ENGINE FIRE PULL HANDLES
AFTER STARTING APU			16. ENGINEREINST/REPLCHECKS
	1. GENERATOR SYSTEM	STARTING ENGINES–PILOT	
	a. GEN 1		1. ENG 1 START
	b. GEN 2		a. TIME TO IDLE SEC
	2. EXT & INTR LIGHTS		b. IDLE SPEED $\%N_G$
	3. ECS SYSTEM		c. OIL PRESSURE PSI
	4. DEK		d. TGT °C
	5. HARS		2. ENG 2 START
	5.1. INS		a. TIME TO IDLE SEC
	6. RADAR ALTIMETER		b. IDLE SPEED $\%N_G$
	7. AVIONICS		c. OIL PRESSURE PSI
	a. ADF RADIO		d. TGT °C
	b. TRANSPONDER		3. N_P AND N_R 100%
	c. DOPPLER	ENGINES RUNUP – PILOT	
	d. FIRE CONTROL SYSTEM		1. 1 "G" SPRING
	e. GPS		TORQUE % %
	8. ANTI–ICE SYSTEM		2. ENGINE CHOP CIRCUIT
	a. ICE DET		3. ENGINE OVERSPEED TEST
	b. PITOT–AD SENSOR		a. ENG1
	c. CANOPY DEFOG		b. ENG2

Figure 5-9. Maintenance Test Flight Checksheet (Sheet 1 of 3)

AH-64A MAINTENANCE TEST FLIGHT CHECK SHEET (cont)

	4. ECU LOCKOUT				4. AUTOROTATION		
	a. ENG1				a. PRESS ALT		FT
	b. ENG2				b. FAT		°C
	5. SDC/PAS				c. N_R		%
	6. FUEL SYSTEM				d. FUEL		LBS
BEFORE TAXI CHECK					5. ATTITUDE HOLD		
	1. DEK−FD/LS				6. MANEUVERING FLIGHT		
	a. XMSN1	PSI	°C		7. STABILATOR SYSTEM		
	b. XMSN2	PSI	°C		8. V_H CHECK		
	c. NGB1	PSI	°C	ENGINE PERFORMANCE			
	d. NGB2	PSI	°C		1. MAXIMUM POWER CHECK		
	2. ENG	1	2		a. PRESS ALT		FT
	a. N_G	%	%		b. FAT		°C
	b. N_P	%	%		ENG	1	2
	c. N_R	%			c. TGT	°C	°C
	d. TGT	°C	°C		d. TORQUE	%	%
	e. OIL PRESS	PSI	PSI		e. N_G	%	%
	f. TORQUE	%	%				
	3. HIT CHECK				2. TGT LIM/CONTGCY PWR CK		
TAXI CHECK					a. TORQUE	%	%
	1. WHEEL BRAKES				c. TGT	°C	°C
	2. INSTRUMENT&SYMBOLOGY			MISSION EQUIPT CHECKS			
HOVER CHECKS					1. NAV COM EQUIPT CKS		
	1. INITIAL HOVER CHECK				2. PNVS SYSTEM CHECK		
	2. INSTRUMENT CHECKS				3. TADS SYSTEM CHECK		
	3. HOVERMANEUVERINGCHECK				4. WEAPON SYSTEM CHECKS		
	4. DASE/HARS CHECK				BEFORE LANDING		
	5. VISIONIC SYSTEM CHECK				AFTER LANDING		
	6. DOPPLER DRIFT			ENGINE SHUTDOWN			
FLIGHT CHECKS					1. PILOT		
	1. TAKEOFF				2. CPG		
	2. CRUISE				BBC		
	3. FUEL CONSUMPTION CHECK				3. APU FIRE PULL		
	START		STOP		4. EMERGENCY HYDRAULICS		
	LBS PER HOUR				5. UTIL ACC PRESSURE		PSI
				BEFORE LEAVING HELICOPTER			

Figure 5-9. Maintenance Test Flight Checksheet (Sheet 2 of 3)

REMARKS:

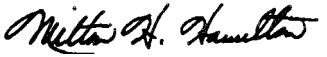
SIGNATURE:

Figure 5-9. Maintenance Test Flight Checksheet (Sheet 3 of 3)

By Order of the Secretary of the Army:

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

Official:



MILTON H. HAMILTON
Administrative Assistant to the
Secretary of the Army
07450

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigrams = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Temperature (Exact)

° F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	° C

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