TM 1-1510-225-MTF

TECHNICAL MANUAL

MAINTENANCE TEST FLIGHT MANUAL

ARMY MODEL C-12R AIRCRAFT

HEADQUARTERS,

DEPARTMENT OF THE ARMY

10 JUNE 1998

URGENT

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MAINTENANCE TEST FLIGHT MANUAL

ARMY MODEL
C-12R
AIRCRAFT

NSN 1510-01-425-1355

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Remove pages	**Insert pages**
3-25 and 3-26	3-25 and 3-26
4-9 through 4-12	4-9 through 4-12
5-13/(5-14 blank)	5-13/(5-14 blank)

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

TM 1-1510-225-MTF
C1

By Order of the Secretary of the Army:

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WARNING

A maintenance test flight is an exceptionally demanding operation and requires a thorough flight readiness inspection (PREFLIGHT). The flight readiness inspection is prescribed in TM 1-1510-225-10 (operator's manual) and must be completed prior to each maintenance test flight. Emergency procedures are found in the applicable operator's manual (-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.

TECHNICAL MANUAL
NO. 1-1510-225-MTF

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 10 JUNE 1998

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NSN 1510-01-425-1355

REPORTING OF ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of any way to improve the procedures. please let us know Mail your letter or DA form 2028-2 direct to Commander. U.S. Army Aviation and Missile Command, ATTN AMSAM-MMC-LS-LP, Redstone Arsenal. AL 35898-5230. A reply will he furnished to you. You may also send in your comments electronically to our e-mad address: ls-lp@redstone.army.mil or by fax 205-842-6546/DSN 788-6546. Instructions for sending an electronic 2028 may be found at the hack of the -10.

CHAPTER 1. INTRODUCTION

NOTE

A maintenance test flight is an exceptionally demanding operation and requires a thorough flight readiness inspection (PREFLIGHT). The flight readiness inspection is prescribed in TM 1-1510-225-10 (operator's manual) and must be completed prior to each maintenance test flight. Emergency procedures are found in the applicable operator's manual (-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.

l-l. PURPOSE. The purpose of this manual is to provide complete instructions for performing a maintenance test flight of C-12R aircraft. For the specific conditions which require a general or limited maintenance test flight or functional acceptance flight, refer to AR 95-1 and TM 1-1500-328-23, the applicable maintenance manual, and the aircraft support contract.

1-2. DEFINITIONS.

a. Maintenance Test Flight. A flight for which the primary mission is to determine airworthiness, i.e., that the airframe, powerplant, 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 or death of the person who performs the action which follows the warning.

CAUTION

An operating or maintenance 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 C-12R aircraft and in no way supersedes any information contained in TM 1-1510-225-10 or -CL, but is to be used in conjunction with the -10 or -CL. Normal preflight and test procedures which are contained in the -10 or -CL may not be included. 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 are as specified in TM 1-1500-328-23, AR 95-1, and TM 1-1510-225-10.

c. The duration of a general or limited test flight shall be in accordance with the requirements of AR 95-1 and 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 will 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 performance parameters.

d. Post Test Flight Inspection. A thorough visual inspection will be performed to the extent necessary to assure that deficiencies or short comings 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 l 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.

g. An O prior to a check indicates a requirement if the equipment is installed.

h. 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 2408-13-1 immediately after termination of the flight. The sheet shall be attached to the DA Form 2408-13-1 upon completion. After accumulation of two or more sheets, the data should be reviewed to determine if trends are developing.

i. Free Air Temperature (FAT) and Outside Air Temperature (OAT). For the purposes of this manual, free air temperature (FAT) is considered to be the same as outside air temperature (OAT).

CHAPTER 2. MAINTENANCE TEST FLIGHT CHECKLIST -

2-1. GENERAL. This chapter contains the maintenance test flight requirements peculiar to Army Model C-12R aircraft. Conditions requiring accomplishment of test flights shall be in accordance with AR 95-1 and 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"; and 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. Weight and balance - Maintenance test flight shall be conducted with full oil, full main tanks, full auxiliary tanks, two pilots, optional equipment, and ballast if required to remain within center of gravity limits. The average takeoff weight shall be 12,200 ±200 pounds with center of gravity between 184.7 to 187.0 inches aft of datum for the maximum cruise power and speed check. Test weight shall be 11,300 ±200 pounds with center of gravity at 184.7 to 187.0 inches aft of datum for stall tests. All other tests shall be conducted within normal weight limits.	
* 3. Thorough flight readiness inspection in accordance with the requirements	

PROCEDURE	TROUBLESHOOTING REFERENCE

PRIOR TO MAINTENANCE TEST FLIGHT (CONT)

contained in TM 1-1510-225-10 - Performed.

* 4. Oxygen system - Check as follows:

(a) Passenger manual drop-out - Push off.

(b) Oxygen system ready - Pull on.

(c) Crew masks - 100%; check operation and stow.

5. Seats, pedals, belts, harnesses - Check and adjust.

6. PARKING BRAKE - Check. Confirm that brakes are set by applying additional toe pressure.

CAUTION

Do not force the elevator trim system past the limits which are shown on the PITCH TRIM indicator scale.

7. Elevator trim - Set to 0 (neutral).

8. EFIS auxiliary power - Check as follows:

(a) EFIS AUX POWER TEST switch - Depress for a maximum of 5 seconds.

(b) Momentary illumination of the green TEST annunciator indicates a satisfactory test.

9. Ground communication power switch - Check as follows:

PROCEDURE	TROUBLESHOOTING REFERENCE

(a) GND COMM PWR switch - Depress on.

(b) Comm 1 transceiver - Check operation from pilot's and copilot's position.

(c) GND COMM PWR switch - Depress off.

CAUTION

Do not cycle LDG GEAR CONTR handle on the ground.

10. Gear - DN.

11. Weather radar - OFF.

* 12. Fuel control panel - Check the firewall valves as follows to ensure that they are powered through the hot battery bus:

(a) BATT switch - OFF.

(b) LEFT and RIGHT FIREWALL VALVE circuit breakers - Pull.

(c) LEFT and RIGHT FIREWALL SHUTOFF VALVE switches - CLOSED. Listen for operation.

(d) BATT switch - ON. C7-11

(e) LEFT and RIGHT STANDBY PUMP switches - ON. C41

(f) LEFT and RIGHT FIREWALL SHUTOFF VALVE switches - OPEN. Check L and R FUEL PRESS annunciators extinguished.

PROCEDURE	TROUBLESHOOTING REFERENCE
PRIOR TO MAINTENANCE TEST FLIGHT (CONT)	
(g) LEFT and RIGHT STANDBY PUMP switches - OFF.	
(h) LEFT and RIGHT FIREWALL VALVE circuit breakers - Reset.	
(i) CROSSFEED VALVE - Open. Check FUEL CROSSFEED annunciator illuminated and L and R FUEL PRESS annunciators extinguished.	
(j) CROSSFEED valve switch - OFF.	C40
(k) NO TRANSFER lights - PRESS TO TEST.	
*13. Fuel quantity indicators - Check as follows:	B6-8
(a) Fuel quantity indicator selector switch - MAIN.	
(b) Fuel quantity indicators - Compare indication. With full fuel tanks, left and right fuel quantity indicators must indicate within 82 pounds of each other with fuel quantity indicator selector switch set to MAIN.	
(c) Fuel quantity indicator selector switch - AUXILIARY.	
(d) Fuel quantity indicators - Compare indication. With full fuel tanks, left and right fuel quantity indicators must indicate within 35 pounds of each other with fuel quantity indicator selector switch set to AUXILIARY.	

PROCEDURE	TROUBLESHOOTING REFERENCE

* 14. Pitot tubes (2), stall warning vane, and heated fuel vents (2) - Check as follows:

WARNING

Use caution when checking pitot tubes, stall warning vane, and heated fuel vents for heat by feel. The heating elements in these items can produce enough heat to cause burns to personnel who touch them.

(a) STALL WARN heat switch - ON. C55

(b) PITOT heat switches (2) - ON.

(c) FUEL VENT heat switches (2) - C56

(d) Left wing heated fuel vent - Check by feel for heat and condition.

(e) Stall warning vane - Check by feel for heat and condition.

(f) Left pitot tube - Check by feel for heat, condition, and free of obstructions. C33

(g) Right pitot tube - Check by feel for heat, condition, and free of obstructions. C33

(h) Right wing heated fuel vent - Check by feel for heat and condition.

(i) STALL WARN heat switch - Off.

(i) PITOT heat switches (2) - Off.

(k) FURL VENT heat switches (2) - Off.

PROCEDURE	TROUBLESHOOTING REFERENCE

PRIOR TO MAINTENANCE TEST FLIGHT (CONT)

CAUTION

Extend the ice vanes during ground operation to minimize foreign object damage (FOD) to the engine.

15. ENGINE ANTI-ICE switches - ON.

*16. Lighting systems - Check. Include position lights, recognition lights, landing/taxi light, wing ice lights, beacons, and interior lights, then off. C39

*17. HYD FLUID SENSOR TEST switch - Depress and hold. Check HYD FLUID LOW annunciator light illuminates after approximately 2 seconds, and extinguishes after approximately 6 seconds.

*18. Engine fire detection system - Check as follows: C43-47

(a) ENG FIRE SYS TEST SWITCH - Rotate and hold to DET L position. Verify that L ENG FIRE warning annunciator illuminates and that the MASTER WARNING annunciators illuminate.

(b) ENG FIRE SYS TEST SWITCH - Rotate and hold to DET R position. Verify that R ENG FIRE warning annunciator illuminates and that the MASTER WARNING annunciators illuminate.

PROCEDURE	TROUBLESHOOTING REFERENCE
NOTE If MASTER WARNING is cancelled between tests, it may not re-illuminate.	
*19. Engine fire extinguisher system - Check as follows:	
(a) ENG FIRE SYS TEST SWITCH - Rotate and hold to EXT L position. Verify that the amber D annunciator and the green OK annunciator on each fire extinguisher activation switch illuminates.	
(b) ENG FIRE SYS TEST SWITCH - Rotate and hold to EXT R position. Verify that the amber D annunciator and the green OK annunciator on each fire extinguisher activation switch illuminates.	
*20. Stall and gear warning system - Check as follows:	C34,35
(a) STALL WARN TEST switch - TEST. Check that warning horn sounds, verify stall vane movement.	
(b) LDG GEAR WARN TEST switch - TEST. Check that warning horn sounds and that the LDG GEAR CONTR handle warning lights illuminate.	C30
*21. Flaps - Check in full down and full up positions.	C31,C32
22. BATT switch - As required.	
*23. Seat belts - Check for security and proper connections.	

PROCEDURE	TROUBLESHOOTING REFERENCE

PRIOR TO MAINTENANCE TEST FLIGHT (CONT)

*24. Toilet - Check condition.

*25. Emergency equipment - Check that all required emergency equipment is available and that fire extinguishers and first-aid kits have current inspection dates.

*26. Check all interior and exterior placards and markings.

*27. Trim tab travel and direction - Check. Operate trim tabs through the full range of travel, noting any excessive looseness, friction, or binding. Check tab direction and neutral position at the control and the surface.

*28. Right controls - Check operation and direction. Check movement of control surfaces for direction with movement of cockpit controls. Check for any abnormal friction or obstructions through full range of travel.

29. GPU - Connect as required C12

30. BATT switch - As required.

INTERIOR CHECK

1. Loose equipment - Check secured.

NOTE

The procedures below check both cargo and cabin door security provisions.

*2. Cabin/cargo doors - Test and lock:

(a) Cabin door - Check closed and latched by the following:

PROCEDURE	TROUBLESHOOTING REFERENCE
(1) Safety arm and diaphragm plunger - Check position (lift door step).	
(2) Index marks on rotary cam locks (6) - Check aligned with indicator windows.	
(b) Cargo door - Check closed and latched by the following:	
(1) Upper handle - Check closed and latched. (Observe through cargo door latch handle access cover window.)	
(2) Index marks on rotary cam locks (4) - Check aligned with indicator windows.	
(3) Lower pin latch handle - Check closed and latched. (Observe through cargo door lower latch handle access cover window.)	
(4) Carrier rod - Check orange indicator aligned with orange stripe carrier rod. (Observe through window, aft lower comer.)	
(c) BATT switch - As required	
(d) Cargo door - Check closed and latched.	
(e) Cabin door - Close but leave unlatched. Check CABIN DOOR annunciator light illuminated.	
(f) Cabin door - Open. Check CABIN DOOR annunciator light extinguished.	

PROCEDURE	TROUBLESHOOTING REFERENCE

INTERIOR CHECK (CONT)

(g) BATT switch - ON. Check CABIN DOOR annunciator light illuminated.

(h) Cabin door - Close and latch. Check CABIN DOOR annunciator light extinguished.

*3. Emergency exit - Check secure and key removed

BEFORE STARTING ENGINES

NOTE

GPU engine starts are the preferred starting method.

1. PARKING BRAKE - Check. Confirm that brakes are set by applying additional toe pressure.
2. Oxygen system - Pull on CREW READY.
3. Pilot's instrument panel - Check.
   (a) Compass control - SLV.
   (b) Standby horizon AUX POWER - Check.
      (1) Test switch - Hold to TEST for 5 seconds (green TEST annunciator will illuminate for 5 seconds).
      (2) Test switch - Release.

PROCEDURE	TROUBLESHOOTING REFERENCE
*(c) Flight instruments - Check instruments for protective glass, warning flags, and static readings.	
(d) PROP SYN switch - ON.	
*(e) Engine instruments - Check instruments for protective glass and static readings.	
4. Pilot's clock - Check and set.	
5. Pilot's subpanel - Check.	
(a) MIC selector switch - NORMAL.	
(b) Engine anti-ice - ON.	

NOTE

The engine anti-ice system should be ON for all ground operations to minimize ingestion of ground debris. Turn OFF engine anti-ice to maintain oil temperatures within limits.

(c) PILOT AIR control - As required.	
(d) DEFROST AIR control - As required.	
(e) LDG GEAR CONTROL - DN.	
(f) LANDING GEAR RELAY circuit breaker - In.	
(g) TAS probe heat - On.	
(h) All other switches - Off.	
6. Avionics switches - As required.	

PROCEDURE	TROUBLESHOOTING REFERENCE

BEFORE STARTING ENGINES (CONT)

NOTE

Refer to operator's manual or aircraft placarding to determine conditions affecting standby compass headings.

*7. Magnetic compass - Check for fluid, heading, and current correction card

*8. Free air temperature gage - Check. Note current reading.

9. Pedestal controls - Check.

(a) POWER levers - IDLE.

(b) PROP levers - HIGH RPM.

(c) CONDITION levers - Fuel cut-off.

(d) Trim tabs - Set.

(e) Landing gear alternate extension handle - Stowed

10. Pedestal - Check.

(a) EFIS POWER switches - OFF.

(b) AP/TRIM POWER switch - OFF.

(c) CABIN PRESS switch - PRESS.

(d) RUDDER BOOST switch - On.

(e) Elevator trim switch - On.

(f) Pressurization controller - Set.

11. Copilot's instrument panel - Set.

(a) Compass control - SLV.

PROCEDURE	TROUBLESHOOTING REFERENCE

*(b) Flight instruments - Check instruments for protective glass, warning flags, and static readings.

12. Copilot's clock - Check and set.

13. Copilot's subpanel - Check.

    (a) CABIN signs - As required.

    (b) VENT BLOWER switch - As required.

    (c) AFT BLOWER - OFF.

    (d) BLEED AIR VALVES switches - ENVIR OFF.

    (e) CABIN TEMP MODE control - OFF.

    (f) CABIN/COCKPIT AIR control - OFF.

    (g) COPILOT AIR control - As required.

    (h) MIC selector switch - NORMAL.

    (i) Oxygen pressure - Check.

14. Right sidewall circuit breaker panel - Check.

15. Static air source - Normal.

16. BATT - ON, (23 volts minimum for battery start).

17. Overhead panel lights - As required.

18. Exterior lights - As required.

PROCEDURE **TROUBLESHOOTING REFERENCE**

BEFORE STARTING ENGINES (CONT)

CAUTION

Never connect an external power source to the aircraft unless a battery indicating a charge of at least 20 volts is in the aircraft. If the battery voltage is less than 20 volts, the battery must be recharged, or replaced with a battery indicating at least 20 volts before connecting external power. Use only an external power source fitted with an AN-type plug.

19. GPU - As required.

20. External power advisory light - As required.

*21. DC volt/loadmeters - Check loads, voltage, and current limiters.

When an external power source is used, it must be set as follows:

(a) 28.0 to 28.4 volts

(b) 1000 amps capacity

(c) 300 amps maximum continuous

NOTE

BATT switch should be ON to absorb transients present in some auxiliary power units. Au EXT PWR annunciator alerts the crew when an external power plug is connected to the aircraft.

PROCEDURE	TROUBLESHOOTING REFERENCE
If the battery is partially discharged, the BATT CHG annunciator will illuminate approximately 6 seconds after external power is on line. If the annunciator does not extinguish within 5 minutes, refer to emergency procedures in TM 1-1510-225-10.	
*22. Annunciator panels - Test as follows:	D1-4
(a) Annunciator TEST switch - Hold depressed. Check that all annunciator panels, engine fire extinguisher/detector switch-indicators, MASTER CAUTION, and MASTER WARNING annunciators are illuminated, then release.	
(b) MASTER CAUTION and MASTER WARNING annunciators - Depress and release. Both annunciators should extinguish.	

FIRST ENGINE START (BATTERY START)

Starting procedures are identical for both engines except the second engine generator is kept off line after the second engine start to allow performing the current limiters check. When making a battery start, the right engine should be started first. When making a ground power unit (GPU) start, the left engine should be started first due to the GPU receptacle being located adjacent to the right engine. Normally, only one engine is started utilizing the GPU, reverting to a battery start procedure for the second engine start. A crewmember should monitor the outside observer throughout the engine start.

1. Propeller area - Clear.	
2. IGNITION AND ENGINE START switch - ON. IGN ON annunciator should illuminate and associated	A1-7

PROCEDURE	TROUBLESHOOTING REFERENCE

FIRST ENGINE START (BATTERY START) (CONT)

FUEL PRESS annunciator should extinguish.

CAUTION

If ignition does not occur within 10 seconds after moving the CONDITION lever to LOW IDLE, initiate ENGINE CLEARING procedure. If for any reason the starting attempt is discontinued, the entire starting sequence must be repeated after allowing the engine to come to a complete stop (1 minute minimum).

3. CONDITION lever (after N_1 stabilizes at or above 12% for 5 seconds minimum) - LOW IDLE. E1,J1

CAUTION

Monitor ITT to avoid a hot start. If there is a rapid rise in ITT, be prepared to abort the start before limits are exceeded During starting, the maximum allowable ITT is 1000°C for 5 seconds. If this limit is exceeded, use ABORT START procedure and discontinue start. Record the peak temperature and duration on DA Form 2408-13-1.

4. ITT and N_1 - Monitor. ITT 1000°C maximum. N_1 minimum 61%.
5. Oil pressure - Check (60 PSI minimum). E7-9
6. IGNITION AND ENGINE START switch - OFF after 50% N_1

PROCEDURE	TROUBLESHOOTING REFERENCE
7. CONDITION lever - HIGH IDLE. Monitor ITT as the condition lever is advanced	E2

NOTE

Ensure N, is at high idle before turning on generator.

8. GEN switch - RESET, then ON.	C1

SECOND ENGINE START (BATTERY START)

1. First engine generator load - 50% or less.	
2. First engine GEN switch - Remains ON, continue with start	
3. Propeller area - Clear.	
4. IGNITION AND ENGINE START switch - ON. IGN ON light should illuminate and FUEL PRESS light should extinguish.	A1-7

CAUTION

If ignition does not occur within 10 seconds after moving the CONDITION lever to LOW IDLE, initiate ENGINE CLEARING procedure. If for any reason the starting attempt is discontinued, the entire starting sequence must be repeated after allowing the engine to come to a complete stop (1 minute minimum).

5. CONDITION lever (after N_1 stabilizes at or above 12% for 5 seconds minimum) - LOW IDLE.	E1,J1

PROCEDURE	TROUBLESHOOTING REFERENCE

SECOND ENGINE START (BATTERY START) (CONT)

CAUTION

Monitor ITT to avoid a hot start. If there is a rapid rise in ITT, be prepared to abort the start before limits are exceeded During starting, the maximum allowable ITT is 1000°C for 5 seconds. If this limit is exceeded, use ABORT START procedure and discontinue start. Enter the peak temperature and duration on DA Form 2408-13-1.

6. ITT and N_1 - Monitor. ITT 1000°C maximum. N_1 minimum 61%.
7. Oil pressure - Check (60 PSI minimum). E7-9
8. IGNITION AND ENGINE START switch - OFF after 50% N_1 E2
9. BATTERY CHG annunciator - Check. C38
10. DC volt/loadmeters - Check loads, voltage, and current limiters.
11. Second engine GEN switch - RESET, then ON.
12. CONDITION levers - As required.
13. Red anti-collision light - RESET.

NOTE

To reset, turn off approximately 5 seconds, then on. When voltage drops below approximately 20 volts, the red anti-collision light may become inoperative.

14. Inverters - Check and ON. C36,37

PROCEDURE	TROUBLESHOOTING REFERENCE
*15. AC/DC power - Check	C1-6
(a) AC frequency 380 to 420 Hz.	
(b) AC voltage - 105 to 120 VAC.	
(c) DC voltage - 27.5 to 29.0 VDC.	
(d) DC loads: Parallel within 10%.	
(1) 75% maximum - Low Idle.	
(2) 85% maximum - High Idle.	
(3) 85% maximum - Ground Operations.	
16. AVIONICS MASTER PWR - On.	
17. EFIS power switches (3) - ON.	
18. Engine instruments - Check.	

ABORT START

1. CONDITION lever - FUEL CUTOFF.
2. IGNITION AND ENGINE START switch - STARTER ONLY.
3. ITT - Monitor for drop in temperature.
4. IGNITION AND ENGINE START switch - OFF.

ENGINE CLEARING

1. CONDITION lever - FUEL CUTOFF.
2. IGNITION AND ENGINE START switch - OFF (1 minute minimum).

PROCEDURE	TROUBLESHOOTING REFERENCE

ENGINE CLEARING (CONT)

CAUTION

Do not exceed starter limitation of 40 seconds on and 60 seconds off for two starting attempts and engine clearing procedure. Allow 30 minutes off before additional starter operation.

3. IGNITION AND ENGINE START switch - STARTER ONLY (15 seconds minimum, 40 seconds maximum).
4. IGNITION AND ENGINE START switch - OFF.

FIRST ENGINE START (CPU START)

1. Propeller area - Clear.
2. IGNITION AND ENGINE START switch - ON. IGN ON light illuminated and associated FUEL PRESS light extinguished — A1-7

CAUTION

If ignition does not occur within 10 seconds after moving the CONDITION lever to LOW IDLE, initiate ENGINE CLEARING procedure. If for any reason the starting attempt is discontinued, the entire starting sequence must be repeated after allowing the engine to come to a complete stop (1 minute minimum).

3. CONDITION lever (after N_1 stabilizes at or above 12% for 5 seconds) - LOW IDLE. — E1,J

PROCEDURE	TROUBLESHOOTING REFERENCE

CAUTION

Monitor ITT to avoid a hot start. If there is a rapid rise in ITT, be prepared to abort the start before limits are exceeded During engine start, the maximum allowable ITT is 1000°C for 5 seconds. If this limit is exceeded, use ABORT START procedure and discontinue start. Record the peak temperature and duration on DA Form 2408-13-1.

4. ITT and N_1 - Monitor. ITT 1000°C maximum. N_1 - Monitor. ITT 1000°C maximum. N_1 minimum 61%.
5. Oil pressure - Check (60 PSI minimum). E7-9
6. IGNITION AND ENGINE START switch - OFF after 50% N_1.
7. CONDITION lever - HIGH IDLE. Monitor ITT as the condition lever is advanced E2
8. GPU disconnect.

CAUTION

Do not turn on generators with GPU connected.

9. GEN switch (after GPU disconnected) - RESET, then ON. C1

PROCEDURE	TROUBLESHOOTING REFERENCE

FIRST ENGINE START (CPU START) (CONT)

NOTE

After starting the first engine with a GPU, the second engine is normally started utilizing a battery start. If a GPU start is required or desired for the second engine start, then utilize the SECOND ENGINE START (GPU START) procedure. Otherwise, utilize SECOND ENGINE START (BATTERY START) procedure.

SECOND ENGINE START (CPU START)

1. Propeller area - Clear.
2. IGNITION AND ENGINE START switch - ON. IGN ON light illuminated and the associated FUEL PRESS light extinguished. A1-7

If ignition does not occur within 10 seconds after moving CONDITION lever to low idle, initiate ENGINE CLEARING procedure. If for any reason a starting attempt is discontinued, the entire starting sequence must be repeated after allowing the engine to come to a complete stop (1 minute minimum).

3. CONDITION lever (after N_1 RPM stabilizes at or above 12% for 5 seconds) - LOW IDLE. E2

PROCEDURE	TROUBLESHOOTING REFERENCE

CAUTION

Monitor ITT to avoid a hot start. If there is a rapid rise in ITT, be prepared to abort the start before limits are exceeded. During engine start, the maximum allowable ITT is 1000°C for 5 seconds. If this limit is exceeded, use ABORT START procedure and discontinue start. Record the peak temperature and duration on DA Form 2408-13-1.

4. ITT and N_1 - Monitor. ITT 1000°C maximum. N_1 minimum 61%.
5. Oil pressure - Check (60 PSI minimum). E7-9
6. IGNITION AND ENGINE START switch - OFF after 50% N_1.
7. Right PROP lever - FEATHER.
8. GPU - Disconnect.
9. Right PROP lever - HIGH RPM.
10. GEN switch - RESET, then ON. C1
11. DC volt/loadmeters - Check loads, voltage, and current limiters.
12. CONDITION levers - As required.
13. Red anti-collision light - RESET.

NOTE

To reset, turn off approximately 5 seconds, then on. When voltage drops below approximately 20 volts, the red anti-collision light may become inoperative.

14. Inverters - Check.

PROCEDURE	TROUBLESHOOTING REFERENCE

SECOND ENGINE START (GPU START) (CONT)

*15. AC/DC power - Check

(a) AC frequency 380 to 420 Hz.

(b) AC voltage - 105 to 120 VAC.

(c) DC voltage - 27.5 to 29.0 VDC.

(d) DC loads: Parallel within 10%.

(1) 75% maximum - Low Idle.

(2) 85% maximum - High Idle.

(3) 85% maximum - Ground Operations.

16. AVIONICS MASTER PWR - ON.

17. EFIS POWER switches - ON.

18. AP/TRIM POWER switch - ON.

19. Autopilot self-test - Monitor.

(a) Allow 3-4 minutes for gyros to erect, HDG and ATTITUDE flags clear.

(b) AP FAIL and AP TRIM FAIL - Annunciators illuminate upon initial application of AP/TRIM POWER and then extinguish (followed by an audio test tone) after successful completion of the self-test. Allow 60 seconds after gyros are valid.

CAUTION

Taxi with caution. The autopilot temporarily engages the servos during the automatic self-test. Be prepared to overpower the autopilot as required.

PROCEDURE	TROUBLESHOOTING REFERENCE

NOTE

Illumination of the AP FAIL annunciator other than during initial power-up indicates a failure. This failure annunciation will result in power being removed from the roll, pitch, yaw, pitch trim, and rudder trim servos. The flight director may remain functional depending upon the nature of the failure. The continuous self-test feature may also inhibit flight director, autopilot, and electric trim use without illumination of the AP FAIL annunciator.

20. Engine instruments - Check.

BEFORE TAXIING

1. CABIN signs - As required.
2. BLEED AIR VALVES - As required.
3. CABIN TEMP MODE - Set.
4. AFT BLOWER - As required.
5. Avionics - Check and set.
6. HSI failure warning system - Check.
7. Cockpit voice recorder - Check (Chapter 4).
8. Radar - As required
9. Standby horizon - TEST, ON, and uncaged.
10. Altimeters - Set and check.
11. ADI warning flags - Check, all flags masked
12. Flaps - Check.
13. EFIS brightness - Set.

PROCEDURE	TROUBLESHOOTING REFERENCE

BEFORE TAXIING (CONT)

CAUTION

Do not leave brake deice on longer than required to check function of annunciators when ambient temperatures are above 15°C.

14. Brake deice - Check, use as required
    (a) BLEED AIR VALVES - OPEN.
    (b) BRAKE DEICE - On, annunciator illuminated
    (c) CONDITION levers - HIGH IDLE if brake deice is to be used
    (d) BRAKE DEICE - OFF, annunciator extinguished.
    (e) CONDITION levers - LOW IDLE.

NOTE

Brake deice control valves may become inoperative if valves are not cycled periodically. One cycle of the valves is required daily regardless of the weather conditions.

15. Exterior lights - As required
16. Taxi area - Clear.

PROCEDURE	TROUBLESHOOTING REFERENCE

TAXIING

CAUTION

Never taxi with a flat tire or a flat shock strut. During taxi operations, particular attention should be given to propeller tip clearance. Extreme caution is required when operating on unimproved or irregular surfaces or when high winds exist. If operations produce a propeller RPM over 1600, retard propeller levers to the detent to limit RPM to 1600 to help reduce the possibility of ingestion of ground debris.

*1. Brakes-Check. G1-4,6-8

NOTE

If brakes have been overhauled, “burn in” the brakes by applying near maximum braking (short of locking) for one or two landings or high speed taxi runs. After this, check brakes for any tendency to drag.

*2. Plight instruments - Check for normal operation.

*3. Nosewheel steering - Check for no turning tendency while taxiing straight ahead with the same RPM on both engines, with no braking and no rudder applied to either side. (This check must be performed with minimum cross wind.) Check freedom of movement and ability to turn aircraft using rudder pedals, engines, and brakes. Note any indication of nosewheel vibration or shimmy during takeoff or landing.

PROCEDURE	TROUBLESHOOTING REFERENCE

TAXIING (CONT)

*4. Magnetic compass - Check for freedom of movement.	B4

ENGINE RUNUP

1. Nose wheel - Center.

*2. PARKING BRAKE - Set. The parking brake must lock without undue pressure on the brake pedals and release cleanly when PARKING BRAKE handle is reset.	G5
*3. Engine low idle speed - Check 61 to 63% N_1 and propeller at 1100 RPM minimum.	E1
*4. Manual propeller feathering - Check as follows:	F14,15

CAUTION

During ground operation with propellers in FEATHER, monitor oil temperature closely, due to lack of air flow over oil cooler. If necessary move propeller control out of FEATHER to keep oil temperature within limits.

(a) CONDITION lever - LOW IDLE.

(b) Left PROP lever - FEATHER. Check that propeller feathers with no hesitation.

(c) Check for proper pedestal control detent position.

(d) Left PROP lever - HIGH RPM.

(e) Repeat procedure for right propeller.

PROCEDURE	TROUBLESHOOTING REFERENCE
*5. Engine acceleration from LOW to HIGH IDLE - Check approximately 4 seconds.	E5,15-20
*6. Engine HIGH IDLE speed - Check 69 to 71% N_1.	E2
*7. N_1 speed switch (air conditioning) - Check as follows:	
(a) Right engine CONDITION lever - LOW IDLE.	
(b) Right engine PROP lever - FEATHER.	
(c) CABIN TEMP MODE switch - MANUAL COOL.	
(d) AIR COND N_1 LOW annunciator light - Verify illuminated.	
(e) Right engine CONDITION lever - Advance to increase N_1 to between 57 and 63%.	
(f) AIR COND N_1 LOW annunciator light - Verify extinguished, and that air conditioning compressor begins operating in 8 to 12 seconds, as evidenced by a sustained increase in ITT on the right engine.	
(g) CABIN TEMP MODE switch - AUTO.	
*8. Pneumatics/vacuum/pressurization - Check as follows:	
(a) PNEUMATIC PRESSURE gage/ GYRO SUCTION gage - Check in green arcs.	
(b) Cabin controller - Set 500 feet lower than field pressure altitude.	

PROCEDURE	TROUBLESHOOTING REFERENCE

ENGINE RUNUP (CONT)

(c) Cabin pressurization RATE control - Set to maximum.

(d) BLEED AIR VALVES switches (2) - INSTR & ENVIR OFF.

(e) PNEUMATIC PRESSURE gage/ GYRO SUCTION gage - Check. Pressure should drop to zero.

(f) BL AIR OFF annunciators (2) - Check illuminated

(g) BL AIR FAIL annunciators (2) - Check illuminated.

(h) CABIN PRESS switch - TEST (hold).

(i) LEFT BLEED AIR VALVES switch - OPEN.

(j) L BL AIR OFF annunciator - Check extinguished.

(k) BL AIR FAIL annunciators (2) - Check extinguished

(1) PNEUMATIC PRESSURE gage/ GYRO SUCTION gage - Check in green arc.

(m) CABIN CLIMB indicator - Check for descent indication within 10 to 15 seconds, then release test switch.

(n) LEFT BLEED AND VALVES switch - INSTR & ENVIR OFF.

(o) Repeat steps (e) through (m) using the right bleed air valve.

(p) CABIN PRESS switch - Set to PRESS position (center).

PROCEDURE	TROUBLESHOOTING REFERENCE
(q) Cabin controller - Reset as required.	
(r) Cabin pressurization RATE control - Reset as required.	
(s) BLEED AIR VALVES switches (2) - As required.	
*9. Rudder boost - Check as follows:	
(a) RUDDER BOOST switch - On.	
(b) CONDITION levers - LOW IDLE.	
(c) Left POWER lever - Idle.	
(d) Right POWER lever - Advance until rudder boost is actuated on the right side. Rudder boost will actuate at the following values of N_1 and FAT: Above 35°C - 93 to 96%. 10 to 35°C - 90 to 95%, below 10°C - 87 to 92%.	
(e) Repeat procedure for right engine.	
*10. Autofeather/auto ignition - Check as follows:	F4-15
(a) AUTO IGNITION switches - ARM.	
(b) POWER levers - Approximately 22% torque.	
(c) AUTOFEATHER switch - Hold to TEST (both AUTOFEATHER annunciators illuminated).	
(d) POWER levers - Retard individually.	
(1) At 16% to 21% torque - Opposite AUTOFEATHER annunciator extinguished,	

PROCEDURE	TROUBLESHOOTING REFERENCE

ENGINE RUNUP (CONT)

IGNITION ON annunciator illuminated.

(2) At 9% to 14% torque - Both AUTOFEATHER annunciators extinguished (propeller starts to feather).

NOTE

The POWER lever may have to be lifted and pulled towards the ground fine gate in order to attain the 9% to 14% torque.

AUTOFEATHER annunciators will illuminate and extinguish with each fluctuation of torque as the propeller feathers.

(3) Return POWER lever to approximately 22% torque.

(e) Repeat steps c and d for other engine.

(f) AUTOFEATHER switch - ARM.

(g) AUTO IGNITION switches -

*11. Propeller overspeed governors - Check as follows: F1-3

(a) PROP levers - HIGH RPM.

(b) PROP GOV test switch - Hold in TEST position.

(c) Left engine POWER lever - Advance until overspeed governor governs propeller (1830 to 1910 RPM). Do not exceed temperature and torque limits.

PROCEDURE	TROUBLESHOOTING REFERENCE
(d) PROP GOVERNOR teat switch - Release. Verify that propeller RPM increases.	
(e) Left engine POWER lever - IDLE.	
(f) Repeat steps b through e for right engine.	
*12. Primary governors - Check as follows:	F1-3
(a) POWER levers - Set 1800 RPM.	
(b) PROP levers - Move aft to detent.	
(c) Propeller RPM - Check 1600 to 1640 RPM.	
(d) PROP levers - HIGH RPM.	
*13. Propeller low pitch stop - Check one engine at a time as follows:	E3
(a) Aircraft - Position crosswind.	
(b) Read the corrected propeller torque in % at 1800 RPM from figure 1.	
(c) PROP lever - HIGH RPM (full forward).	
(d) POWER lever - Set 1800 RPM.	
(e) Torquemeter - Read and record torque.	
(f) POWER lever - IDLE.	
(g) Torque reading taken in step (e) must equal the corrected torque in step (b), within ±2%.	
(h) Repeat steps (c) through (g) for other engine. Observe that the difference in torque readings	

PROCEDURE	TROUBLESHOOTING REFERENCE

ENGINE RUNUP (CONT)

between left and right engines is not greater than 2%.

*14. Engine anti-ice - Check as follows:

(a) POWER levers - Idle.

(b) ENGINE ANTI-ICE ACTUATOR switches (2) - STANDBY.

(c) ENGINE ANTI-ICE switches (2) - ON. Verify L and R ENG ANTI-ICE annunciators illuminated.

(d) ENGINE ANTI-ICE switches (2) - OFF. Verify L and R ENG ANTI-ICE annunciators extinguished

(e) ENGINE ANTI-ICE ACTUATOR switches (2) - MAIN.

(f) ENGINE ANTI-ICE - As required.

WARNING

Do not operate the weather radar set while personnel or combustible materials are within 18 feet of the antenna reflector. When the weather radar set is operating, high-Rower radio frequency energy which can have harmful effects on the human body and can ignite combustible materials, is emitted from the antenna reflector. Do not operate radar in congested areas.

PROCEDURE	TROUBLESHOOTING REFERENCE

CAUTION

Do not operate the weather radar system where the nearest metal wall is within 50 feet of the antenna reflector. Scanning such surfaces within 50 feet of the antenna reflector may damage receiver crystals.

NOTE

Teat the weather radar system before each flight on which the system is to be. used.

*15. Weather radar - Test and set as required.

(a) Radar mode selector switch - TST.

(b) TILT/stabilization control - UP 7 degrees (as shown on tilt indicator on display). Check for correct test pattern.

(c) Radar mode selector switch - TST or STBY. Taxi to a clear area where there are no people, aircraft, vehicles, or metallic buildings within approximately 100 yards.

(d) Radar mode selector switch - ON. Wx mode will be displayed in the 80 mile range. Any targets (weather or ground) will be displayed in green, yellow, red, or magenta.

(e) Range switches (EFIS control panel) - Select 40 miles as maximum range.

PROCEDURE	TROUBLESHOOTING REFERENCE

ENGINE RUNUP (CONT)

(f) WxA pushbutton mode selector switch - Depress and observe that the magenta areas (if any) are flashing.

(g) TILT control - Vary manually between UP 15 degrees and DN 15 degrees and observe that close-in ground clutter appears at lower settings and that any local rain appears at higher setting.

(h) Radar mode selector switch - TST or STBY before taxi.

*16. Flight control/autopilot system - Check.

(a) AP XFER switch - Select pilot's side.

(b) AP mode selector button (AP) - Press to engage autopilot.

WARNING

If unable to overpower the autopilot in any axis, do not use.

(c) Flight controls - Overpower autopilot in pitch, roll and yaw axis.

(d) Auto trim - Check.

(1) Apply nose up force on control wheel - Note nose down trim motion after approximately 3 seconds.

(2) Apply nose down force on control wheel - Note nose up

PROCEDURE	TROUBLESHOOTING REFERENCE

trim motion after approximately 3 seconds.

(3) Press right rudder - Note left rudder trim motion after approximately 3 seconds.

(4) Press left rudder - Note right rudder trim motion after approximately 3 seconds.

(5) Select HDG mode - Observe FD commands and control wheel motion correspond to movement of the heading selector knob.

(6) AP DISC & TRIM INTRPT- Press and release. Note autopilot disconnection, flashing AP annunciation, and aural disconnect tone.

(e) Manual electric trim - Check.

(1) Pilot and copilot control wheel trim switches - Check

WARNING

Operation of the electric trim switch system should occur only by movement of pairs of switches. Any movement of the elevator trim wheel while depressing only one switch element denotes a trim system malfunction. The AP/TRIM POWER switch must be turned OFF and flight conducted only by manual operation of the trim wheel. Do not use autopilot.

(2) Pilot and copilot trim switches - Check individual element for no movement of trim, then

PROCEDURE	TROUBLESHOOTING REFERENCE

ENGINE RUNUP (CONT)

check proper operation of both elements.

(3) Pilot trim switches - Check that pilot switches override copilot switches while trimming in opposite directions, and trim moves in direction commanded by pilot.

(4) Pilot and copilot trim switches - Check trim disconnects while activating pilot of copilot trim disconnect switches.

(f) AP XFER switch - Select copilot's side and repeat steps b thru e.

(g) Autopilot - Verify autopilot disconnects with each of the following actions:

(1) Depressing control wheel autopilot disconnect switch.

(2) Depressing pilot's or copilot's pitch trim switch.

(3) Depressing go-around switch on power lever or copilot's control wheel.

(4) Depressing autopilot engage/ disengage switch.

*17. EFIS system - Check as follows:

PROCEDURE	TROUBLESHOOTING REFERENCE

NOTE

Performing the EFIS self test is not required at any time. If a failure exists, the small red SG in a red box will be displayed. The self test is intended to familiarize the pilot with the display flags, and for checking proper display color.

(a) BRT control - Set desired brightness.

(b) TST/REF pushbutton switch - Depress for three seconds. A SELF TEST PASS or SELF TEST FAIL message will be annunciated.

NOTE

A white color on the compass scale indicates that all three colors are operational in the display unit.

* 18. Ground proximity altitude advisory system - Check as follows:

(a) GPAAS voice advisory VOL control - Full clockwise.

(b) VOICE OFF switch-indicator - Extinguished.

(c) Audio control panel - Set listening audio level.

(d) VA FAIL annunciator light - Extinguished.

(e) DH set knob - Set decision height to 200 feet on EADI.

(f) RALT TEST switch - Depress. “Minimum, minimum” will be annunciated once followed by the illumination of the VA FAIL light.

PROCEDURE	TROUBLESHOOTING REFERENCE

ENGINE RUNUP (CONT)

19. Pressurization - Check and set.

    (a) BLEED AIR VALVES - Both OPEN.

    (b) Cabin altitude - Set 500 feet lower than field pressure altitude.

    (c) CABIN PRESS switch - TEST. Cabin climb indicator indicates a descent.

    (d) CABIN PRESS switch - Release. Cabin climb indicator indicates a climb, then stabilizes at zero climb.

    (e) Altitude selector - Set airport elevation plus 500 feet or cruise altitude plus 1000 feet, whichever is higher.

* 20. Anti-ice/deice systems - Check as follows:

    (a) CONDITION levers - LOW IDLE.

    (b) Prop deice - Check. When MANUAL mode is selected, note rise on DC loadmeter. When AUTO mode is selected, monitor prop ammeter for 90 seconds and ensure the indicator remains in the normal operating range the entire time.

    (c) FUEL VENT heat - Check. Note slight rise on loadmeter.

    (d) Windshield heat - Check. Note increases on the loadmeter as cycle heats through both normal and high settings.

PROCEDURE	TROUBLESHOOTING REFERENCE

NOTE

If windshield heat is needed prior to takeoff, use NORMAL setting for a minimum of 15 minutes prior to selecting HIGH to provide adequate pre-heating and minimize the effects of thermal shock. The windshield heat thermostat will invalidate the check in OAT above 20 to 30 degrees C.

(e) Note slight rise on loadmeter on following checks.

(1) Pitot heat - ON.

(2) Stall warning heat - ON.

(f) All anti-ice/deice switches - OFF.

(g) Generator - RESET then ON.

(h) Red anti-collision light - ON.

(i) Surface deice system - Check.

21. CONDITION levers - As required.

BEFORE TAKEOFF

1. Fuel panel - Check fuel quantity and switch positions.
2. Autofeather - Armed.
3. Flight and engine instruments - Check.
4. Cabin controller - Set.
5. Avionics - Set.
6. Altitude alerter - Set.
7. Propellers - HIGH RPM.
8. Flaps - As required.
9. Trim - Set.
10. Autopilot/yaw damper - OFF.
11. Bleed air valves - As required

PROCEDURE	TROUBLESHOOTING REFERENCE
BEFORE TAKEOFF (CONT)	
12. Annunciator lights - Check.	
13. Plight controls - Check.	
14. Departure briefing - Complete.	
LINEUP	
1. Transponder - ON. Proper code and ALT.	
2. LANDING, TAXI, RECOG, and white STROBE lights - ON.	
3. Anti-ice/deice - As required.	
4. Engine anti-ice/deice vanes - As required.	
5. AUTO IGNITION - ARM.	
6. Radar - As required	
7. Power stabilized - 25% torque minimum.	
DURING TAKEOFF	
* 1. Propeller tachometers - Check. During takeoff verify that propeller tachometers indicate 2000 RPM. With propellers synchronized, minimum indicated RPM is 2000 RPM. The maximum difference between the indicators is 20 RPM.	E28
2. Engine instruments - Check the following instrument indications:	
*(a) Torque	E24
*(b) ITT	B9,E26,
*(c) N_1,	E27
*(d) Oil pressure	E7-9

PROCEDURE	TROUBLESHOOTING REFERENCE
* (e) Oil temperature	E10
3. Flight instruments - Check.	B1,3

AFTER TAKEOFF

WARNING

Immediately after takeoff, the pilot flying the aircraft should avoid adjusting controls located on the aft portion of the extended pedestal to preclude inducing spatial disorientation.

1. GEAR-UP.

NOTE

Listen for unusual noises during landing gear retraction.

2. FLAPS-UP.

3. LANDING/TAXI lights - OFF.

CAUTION

Turn windshield anti-ice on to NORMAL when passing 10,000 feet AGL or prior to entering the freezing level (whichever occurs first). Leave on until no longer required during descent for landing. Select HIGH temperature, as required, after a minimum warm-up period of 15 minutes.

4. Windshield anti-ice - As required

CLIMB

1. Climb power - Set.

PROCEDURE	TROUBLESHOOTING REFERENCE
CLIMB (CONT)	
2. Propeller synchronization - As required	
3. Yaw damper - ENGAGE (required above 17,000 feet).	
4. Brake deice - As required.	
5. ENGINE ANTI-ICE switches - As required	
6. STANDBY PUMP switches - As required.	
7. Cabin pressurization - Check. Adjust rate control knob so that cabin rate-of-climb equals one third of aircraft rate-of-climb.	
*8. Wings and center section - Check for security and no fuel fuel/oil leaks.	E29
*9. Engine and flight instruments - Monitor. All instruments must give proper indication with minimum fluctuation.	E6
*10. Engine control levers - Check for alignment.	E5
*11. Vertical speed indicators - Check normal operation against altimeter as follows:	B2
(a) Aircraft rate of climb - Fly an indicated 1000 feet per minute.	
(b) Read altimeter at beginning of timing, and time for one minute.	
(c) Read altimeter at end of one minute. Second reading must be 1000 ±200 feet more than first reading.	
*12. Surface deice system - Check as follows:	C42

PROCEDURE	TROUBLESHOOTING REFERENCE
(a) DEICE CYCLE switch - SINGLE. Verify that surface boots inflate and automatically deflate for one cycle, and that wing boots stay inflated for 6 seconds, then tail boots stay inflated for 4 seconds.	
(b) DEICE CYCLE switch - Hold to MANUAL position. Verify that boots stay inflated until switch is released.	
(c) DEICE CYCLE switch - Release. Check boots visually to see that they are sucked down flat after use.	
*13. Propeller deice system - Check as follows:	C54
(a) PROP AUTO deice switch - On.	
(b) PROP deice ammeter - Monitor for 26 to 30 amperes and for a slight needle deflection every 90 seconds.	
(c) PROP MANUAL deice switch- Hold to on position. Note a 5% increase in each loadmeter indication.	
*14. Windshield anti-ice system - Check operation as follows:	
(a) PILOT WSHLD ANTI-ICE switch - OFF.	
(b) PILOT WSHLD ANTI-ICE switch - NORMAL. Check for loadmeter rise.	

PROCEDURE	TROUBLESHOOTING REFERENCE
CLIMB (CONT)	
(c) PILOT WSHLD ANTI-ICE switch - HI, check for an increased loadmeter indication, then OFF.	
(d) COPILOT WSHLD ANTI-ICE switch - Check by repeating steps (a) through (c).	
(e) Windshield anti-ice system - Set as required	
*15. Cabin and cockpit ventilation system - Check the following items for flow of air, binding controls, and the capability of being shut off by appropriate control:	
(a) Eye-ball cold air vents.	
(b) Pilot's and copilot's air vents.	
(c) Windshield defroster ducts.	
(d) Main cabin air ducts.	
*16. Air conditioning and heating system - Check as follows:	C48-53
(a) CABIN TEMP MODE select switch - MAN COOL or MAN HEAT.	
(b) MANUAL TEMP control switch - Hold to INCR position for one minute. Observe an increase in cabin temperature.	
(c) MANUAL TEMP control switch - Hold to DECR position for one minute. Observe a decrease in cabin temperature.	
(d) CABIN TEMP MODE select switch - AUTO.	

PROCEDURE	TROUBLESHOOTING REFERENCE
(e) CABIN TEMP rheostat - Rotate to full INCR position. Observe an increase in cabin temperature.	
(f) CABIN TEMF rheostat - Rotate fully counterclockwise. Observe a decrease in cabin temperature.	

NOTE

Air conditioning will come on if cabin temperature is above 60 to 65°F.

Ensure that the temperature control rheostat is set to the mid position (approximately 75°F cabin temperature).

17. Pressurization system - Check as required (Chapter 4).

CRUISE

1. Power - Set.
2. ICE PROTECTION switches - As required
3. AUTOFEATHER - As required.
4. Volt-loadmeters - Check.
5. Auxiliary fuel gages - Monitor. Ensure that fuel is being transferred from auxiliary tanks
6. Altimeters - Check.

*7. Engine instrument indications - Check all engine instruments for normal indications. E21-28

8. RECOG lights - As required.

*9. Wings and nacelles - Check for fuel and oil leaks. E29

*10. Cabin noise level - Check for undue

PROCEDURE	TROUBLESHOOTING REFERENCE
CRUISE (CONT)	
air noise in the cabin from around the perimeter of doors and windows. Check for undue noise in the cabin due to vibrating and rattling articles or oil canning of skins.	
*11. Pilot's alternate static air source - Check as follows:	
(a) Maintain level flight and note airspeed and altitude.	
(b) Pilot's alternate static air source switch - ALTERNATE. Verify that airspeed indicator, altimeter, and vertical speed indicator readings increase.	
(c) Pilot's alternate static air source switch - NORMAL. Airspeed indicator, altimeter, and vertical speed indicator indications should return to their original readings.	
*12. Propeller synchrophaser - Check capturing ability of the synchrophaser by establishing a small out of synchronization condition, then turning the synchrophaser on. Verify that synchronization is established and held within a few seconds.	
13. Maximum ITT/N, availability - Perform as required (Chapter 4).	
14. Speed performance at maximum cruise power - Perform as required (Chapter 4).	
15. Engine performance at maximum continuous power - Perform as required (Chapter 4).	

PROCEDURE	TROUBLESHOOTING REFERENCE

16. Engine performance at maximum cruise power - Perform as required (Chapter 4).

*17. Engine ice vanes - Check operation as follows:

(a) LEFT and RIGHT ACTUATOR switches - MAIN.

(b) LEFT and RIGHT ENG ANTI-ICE switches - ON. Check L and R ENG ANTI-ICE annunciators illuminated.

(c) Torquemeters - Monitor for approximately a 10% drop in torque with ice vanes extended.

(d) LEFT and RIGHT ENGINE ANTI-ICE switches - OFF.

(e) Torquemeters - Monitor for an increase in torque.

(f) MN ENG ANTI-ICE circuit breakers - Pull. Check that L and R ENG ICE FAIL annunciator lights illuminate.

(g) LEFT and RIGHT ACTUATOR switches - STANDBY. Check that LEFT and RIGHT ENG ICE FAIL annunciator lights extinguish.

(h) LEFT and RIGHT ENGINE ANTI-ICE switches - ON. Check that LEFT and RIGHT ENG ICE FAIL annunciators illuminate.

(i) LEFT and RIGHT ENG ANTI-ICE switches - OFF.

(j) L and R MN ENG ANTI-ICE circuit breakers - Reset.

PROCEDURE	TROUBLESHOOTING REFERENCE
CRUISE (CONT)	
(k) LEFT and RIGHT STBY ENG ANTI-ICE circuit breakers - Pull. Check that LEFT and RIGHT ENG ICE FAIL annunciator lights illuminate.	
(l) LEFT and RIGHT ACTUATOR switches - MAIN. Check that L and R ENG ICE FAIL annunciators extinguish.	
(m) LEFT and RIGHT STBY ENG ANTI-ICE circuit breakers - Reset.	
18. Trim and rigging - Check as required (Chapter 4).	
*19. Turn and bank indicators - Check as follows:	B5
(a) Bank - Establish a coordinated standard rate turn.	
(b) Timing - Maintain turn for 1 minute. Heading change shall be 180 ±25°.	
(c) In straight and level flight, the turn needle will be centered to within ±1/16 inch.	
(d) Repeat procedure for opposite turn direction.	
20. Avionics - Check in flight as required (Chapter 4).	
LOW SPEED SYSTEMS CHECK	
*1. Flap operation - Check as follows:	
(a) Airspeed - Reduce to 200 KIAS or below.	

PROCEDURE	TROUBLESHOOTING REFERENCE
(b) Flaps - APPROACH. Check flaps for freedom and smoothness of operation and for excessive aircraft roll.	
(c) Airspeed - Reduce to 157 KIAS.	
(d) Flaps - 100%. Check flaps for freedom and smoothness of operation and for excessive aircraft roll.	
* (e) Flap extension and retraction time - Check as follows:	
(1) Airspeed - 157 KIAS.	
* (2) Flaps - UP, check and record retraction time. Full down to full up maximum time - 9 seconds.	
(3) Airspeed - 157 KIAS.	
*(4) Flaps - Down, check and record extension time. Full up to full down maximum time - 13 seconds.	
NOTE	
Ensure that stall warning horn sounds within the speed range specified in the Warning Speed column of figure 2.	
*2. Stall speed, stall warning, and stall characteristics (clean, power off) - Check as follows:	C34-35
(a) Gear - UP.	
(b) Flaps - UP.	
(c) Power - IDLE.	
(d) Trim aircraft to trim speed as shown in figure 2.	

PROCEDURE	TROUBLESHOOTING REFERENCE

LOW SPEED SYSTEMS CHECK (CONT)

(e) Airspeed - Reduce by one knot/ second until aircraft stalls.

* (f) Airspeed (at warning and at stall) - Record (KIAS).

*(g) Roll - Controllable within 15 degrees left or right.

*3. Stall speed, stall warning, and stall characteristics (clean, power on) - Check as follows:

(a) Gear - UP.

(b) Flaps - UP.

(c) Propellers - Set 2000 RPM.

(d) POWER levers - Set 75% torque.

(e) Trim aircraft to trim speed as shown in figure 2.

(f) Airspeed - Reduce by one knot/ second until aircraft stalls.

*(g) Airspeed (at warning and at stall) - Record (KIAS).

*(h) Roll - Controllable within 15 degrees left or right.

*4. Stall speed, stall warning, and stall characteristics (gear down and flaps full down, power off) - Check as follows:

(a) Flaps - APPROACH (40%), below 200 KIAS.

(b) Gear - DN, below 181 KIAS.

(c) Flaps - DOWN (100%), below

(d) Power - IDLE.

PROCEDURE	TROUBLESHOOTING REFERENCE
(e) Trim aircraft to trim speed as shown in figure 2.	
(f) Airspeed - Reduce by one knot/ second until aircraft stalls.	
*(g) Airspeed (at warning and at stall) - Record (KIAS).	
*(h) Roll - Controllable within 15 degrees left or right.	
*5. Stall speed, stall warning, and stall characteristics (gear down and flaps full down, power on) - Check as follows:	
(a) Flaps - APPROACH (40%). below 200 KIAS.	
(b) Gear - DN, below 181 KIAS.	
(c) Flaps - DOWN (100%), below 157 KIAS.	
(d) PROP levers - Set 2000 RPM.	
(e) POWER levers - Set 75% torque.	
(f) Trim aircraft to trim speed as shown in figure 2.	
(g) Airspeed - Reduce by one knot/ second until aircraft stalls.	
*(h) Airspeed (at warning and at stall) - Record (KIAS).	
*(i) Roll - Controllable within 15 degrees left or right.	
6. Flaps - UP.	C31,32
7. Gear - UP.	
*8. Autoignition - Check as follows:	
(a) AUTO IGNITION switches - ARM.	

PROCEDURE	TROUBLESHOOTING REFERENCE
LOW SPEED SYSTEMS CHECK (CONT)	
(b) Slowly retard each POWER lever individually.	
(c) Respective IGNITION ON annunciator light - Illuminates at 13 to 19% torque.	
(d) Power - Establish cruise power with autoignition armed.	
(e) CONDITION lever (engine to be tested) - Rapidly retard to IDLE CUTOFF for 3 seconds, then return to LOW IDLE. Observe that engine relight occurs within 3 to 5 seconds. Monitor engine acceleration and ITT rise. If relight does not occur within limits, or acceleration or ITT do not appear normal, abort the start. Restart engine using Normal Procedures.	
(f) Repeat substep e for opposite engine if required.	
*9. Propeller feathering - Check each engine as follows:	F14,15
(a) Airspeed - 120 KIAS.	
(b) POWER lever (engine to be feathered) - IDLE.	
(c) PROP lever (engine to be feathered) - HIGH RPM.	
(d) CONDITION lever (engine to be feathered) - IDLE CUTOFF. Allow N1, RPM to decay below 20%.	

PROCEDURE	TROUBLESHOOTING REFERENCE

(e) PROP lever (engine to be feathered) - FEATHER. Time to feather must not exceed 10 seconds from windmilling at 2000 RPM to no rotation in the feathered position.

(f) Engine cleanup.

(1) CONDITION lever - FUEL CUTOFF.

(2) AUTO IGNITION switch - Off.

(3) AUTOFEATHER switch - OFF.

(4) GEN switch - OFF.

(5) PROP SYN switch - OFF.

(g) Engine restart.

WARNING

Airstarts using the starter assist procedures will momentarily cause the loss of all electronic flight instrument system (EFIS) data. The engine restart during flight (no starter assist procedure), or turning EFIS power off prior to a starter assisted restart, should normally be performed

PROCEDURE	TROUBLESHOOTING REFERENCE

LOW SPEED SYSTEMS CHECK (CONT)

CAUTION

Do not attempt engine airstarts above 25,000 feet. During engine acceleration to idle speed, it may become necessary to move the CONDITION lever into FUEL CUTOFF in order to avoid an over-temperature condition.

(1) CABIN TEMP MODE SELECT switch - OFF.

(2) VENT BLOWER switch - AUTO.

(3) AP/TRIM POWER switch - Off.

(4) EFIS POWER switches (3) - OFF (if conditions permit).

NOTE

If EFIS power is turned off, aircraft attitude should be maintained by using outside visual references or the standby attitude indicator and turn-and-slip indicator.

(5) Radar - STBY or OFF.

(6) POWER lever - IDLE.

(7) PROP lever - Low RPM.

(8) CONDITION lever - FUEL CUTOFF.

PROCEDURE	TROUBLESHOOTING REFERENCE

NOTE

If conditions permit, reduce power on the operative engine to obtain an ITT of 700°C or less to reduce the possibility of exceeding ITT limit. Reduce electrical load to minimum consistent with flight conditions.

False fuel flow indications may be observed with the starter engaged and the CONDITION lever in FUEL CUTOFF.

(9) IGNITION and ENGINE START switch - ON. Check IGNITION ON annunciator illuminated.

(10) CONDITION lever - LOW IDLE.

(11) IGNITION and ENGINE START switch - OFF, after ITT peaks.

(12) CONDITION lever - LOW IDLE.

(13) PROP lever - As required

(14) POWER lever - As required

(15) GEN switch - RESET, then ON.

(16) Engine AUTO IGNITION - As required.

(17) PROP SYN switch - As required.

(18) Electrical equipment - As required.

(h) Repeat step (g) for opposite engine if required

*10. Propeller autofeathering system and F4,14-15

PROCEDURE	TROUBLESHOOTING REFERENCE

LOW SPEED SYSTEMS CHECK (CONT)

propeller unfeathering - Check as follows:

(a) AUTOFEATHER switch - ARM.

(b) Airspeed - 120 KIAS.

(c) PROP levers - Set 2000 RPM.

(d) POWER levers - Set as required to arm autofeather system.

(e) CONDITION lever (engine to be feathered) - IDLE CUTOFF.

* (f) Record the time from fuel cutoff until propeller is feathered. (Propeller is considered to be feathered when the blades are individually visible to the human eye, but the propeller is still rotating.) Time to feather shall not exceed 10 seconds.

NOTE

For proper autofeather operation, propeller must stop completely.

(g) Engine cleanup.

(1) CONDITION lever - FUEL CUTOFF.

(2) AUTO IGNITION switch - OFF.

(3) AUTOFEATHER switch - OFF.

(4) GEN switch - OFF.

PROCEDURE **TROUBLESHOOTING REFERENCE**

WARNING

Airstarts using the starter assist procedures will momentarily cause the loss of all electronic flight instrument system (EFIS) data. The engine restart during flight (no starter assist procedure), or turning EFIS power off prior to a starter assisted restart, should normally be performed

CAUTION

Do not attempt engine airstarts above 25,000 feet. During engine acceleration to idle speed, it may become necessary to move the CONDITION lever into FUEL CUTOFF in order to avoid an overtemperature condition.

(h) Engine restart,

(1) CABIN TEMP MODE SELECT switch - OFF.

(2) VENT BLOWER switch - AUTO.

(3) AP/TRIM POWER switch - OFF.

(4) EFIS POWER switches (3) - OFF (if conditions permit).

NOTE

If EFIS power is turned off, aircraft attitude should be maintained by using outside visual references or the standby attitude indicator and turn-and-slip indicator.

(5) Radar - STBY or OFF.

PROCEDURE	TROUBLESHOOTING REFERENCE

LOW SPEED SYSTEMS CHECK (CONT)

(6) POWER lever - IDLE.

(7) PROP lever - Low RPM.

(8) CONDITION lever - FUEL CUTOFF.

NOTE

If conditions permit, reduce power on the operative engine to obtain an ITT of 700°C or less to reduce the possibility of exceeding ITT limit. Reduce electrical load to minimum consistent with flight conditions.

False fuel flow indications may be observed with the starter engaged and the CONDITION lever in FUEL CUTOFF.

(9) IGNITION AND ENGINE START switch - ON. Check IGNITION ON annunciator illuminated.

(10) CONDITION lever - LOW IDLE.

(11) IGNITION AND ENGINE START switch - OFF after ITT peaks.

(12) CONDITION lever - LOW IDLE.

(13) PROP lever - As required

(14) POWER lever - As required

(15) GEN switch - RESET, then ON.

(16) ENG AUTO IGNITION - As required.

PROCEDURE	TROUBLESHOOTING REFERENCE
(17) PROP SYN switch - As required.	
(18) Electrical equipment - As required.	
*(19) Propeller unfeathering - Check as follows with propeller in the feathered position with the gas generator running in LOW IDLE:	
a POWER lever - IDLE. PROP lever - Move out of FEATHER detent to full forward. Propeller RPM must reach 1000 RPM in 30 seconds or less.	
(i) Repeat step h for other engine if required	
*11. Landing gear warning horn - Check as follows:	C24-26
(a) POWER levers - Retard slowly, individually, until landing gear warning horn first sounds.	
* (b) Turbine tachometers - Read N1, tachometers on first hearing landing gear warning horn. Verify that the landing gear warning horn sounds when POWER levers are retarded to 79 to 82% N1.	
(c) Flaps - Extend beyond APPROACH position. Verify that the landing gear warning horn sounds regardless of POWER lever position.	

PROCEDURE	TROUBLESHOOTING REFERENCE
LOW SPEED SYSTEMS CHECK (CONT)	
(d) POWER levers - Advance past 79 to 82% N_1. Check that landing gear warning horn is armed again.	
*12. Landing gear normal operation - Check as follows:	C13-30
(a) Airspeed - 181 KIAS.	
(b) LDG GEAR CONTROL switch - DN.	
*(c) Landing gear extension time - Record (8 seconds maximum).	
(d) Landing gear handle lights (red) - Check illuminated while gear is in transit.	
(e) GEAR DOWN indicator lights (3, green) - Check illuminated.	
(f) Airspeed - 160 KIAS.	
(g) LDG GEAR CONTROL switch - UP.	
*(h) Landing gear retraction time - Record (7 seconds maximum).	
(i) Landing gear handle lights (red) - Check illuminated while gear is in transit.	
(j) GEAR DOWN indicator lights (3, green) - Check all extinguished.	
*13. Emergency landing gear extension system - Check operation and condition as follows:	
(a) Airspeed - 181 KIAS.	
(b) LANDING GEAR RELAY circuit breaker - Out (pulled).	

PROCEDURE	TROUBLESHOOTING REFERENCE

(c) LDG GEAR CONTROL switch - DN.

(d) LANDING GEAR ALTERNATE EXTENSION pump handle - Unstow.

(e) LANDING GEAR ALTERNATE EXTENSION pump handle - Pump.

(f) GEAR DOWN indicator lights (3) - Monitor. Stop pumping lever when GEAR DOWN indicator lights are illuminated or resistance is felt.

NOTE

Eighty or more strokes of the handle could be required to fully extend the landing gear.

(g) LANDING GEAR ALTERNATE EXTENSION pump handle - Stow.

(h) LANDING GEAR RELAY circuit breaker - In.

(i) LDG GEAR CONTROL switch - UP.

DESCENT AND LOW LEVEL CRUISE

*1. Maximum rate (Vmo) descent. If the test pilot is satisfied that the entire aircraft is functioning properly, perform the maximum rate descent check as follows:

(a) Cruise altitude - Establish in accordance with figure 3.

(b) POWER levers - IDLE.

(c) PROP levers - Set 2000 RPM.

PROCEDURE	TROUBLESHOOTING REFERENCE

DESCENT AND LOW LEVEL CRUISE (CONT)

(d) Gear - UP.

(e) Flaps - UP.

(f) Airspeed - In accordance with figure 3.

WARNING

Immediately reduce airspeed if any flutter, oscillation or vibration is encountered

*(g) Plight controls - Check for any indication of flutter, oscillation, vibration, or malfunction.

* (h) Windows and doors - Check for wind noise indicating air leaks.

(i) Aircraft - Level off at 10,000 feet.

*2. Elevator trim - Nose down trim stops will be set as follows:

(a) POWER levers - Set maximum continuous power. Do not exceed N1, or ITT limits.

(b) PROP levers - Set 2000 RPM.

(c) Airspeed - 250 KIAS. Verify that excess nose down trim is at least 0.9, but does not exceed 1.4 trim wheel indicator units.

DESCENT-ARRIVAL

Perform the following checks prior to the final descent for landing:

PROCEDURE **TROUBLESHOOTING REFERENCE**

WARNING

M_{mo}, may be easily exceeded when descending from high altitude. The pilot should frequently cross check the airspeed and Mach limit indicators to avoid exceeding M_{mo}. Exceeding M_{mo}, could result in structural failure and loss of airframe integrity.

1. Cabin controller - Set.
2. ICE PROTECTION switches - As required.

CAUTION

Set windshield anti-ice to NORMAL or HIGH as required well before descent into icing conditions or into warm moist air to aid in defogging. Turn off windshield anti-ice when descent is completed to lower altitudes and when heating is no longer required. This will preclude possible wind screen distortions.

3. Windshield anti-ice - As required.
4. RECOG lights - On.
5. Altimeters - Set to current altimeter setting (QNH) when passing through transition altitude.
6. Avionics and EFIS control panel - Set and check. Ensure EFIS displays match procedure to be flown.
7. Arrival briefing - Complete.

PROCEDURE	TROUBLESHOOTING REFERENCE

BEFORE LANDING

1. PROP SYN switch - OFF.
2. AUTOFEATHER switch - ARM.
3. ENGINE ANTI-ICE switches - As required.
4. PROP levers - As required.
5. Flaps (below 200 KIAS) - APPROACH.
6. Gear (below 181 KIAS) - DN.
7. Landing lights - As required.
8. BRAKE deice - As required.

LANDING

CAUTION

The maximum demonstrated crosswind component is 25 knots at 90°. Landing the aircraft in a crab will impose side loads on the landing gear. Record landing the aircraft in a crab on DA Form 2408-13-1.

When landing is assured:

1. Autopilot and yaw damper - Disengage.
2. GEAR DOWN annunciators - Check.
3. PROP levers - HIGH RPM.

After touchdown:

4. POWER levers - Lift and retard to GROUND FINE.

PROCEDURE	TROUBLESHOOTING REFERENCE
*5. Brake operation - Check during landing roll for any tendency IO bleed down, drag after release, or indicate assymmetrical braking power.	
*6. Propeller reversing - Check as follows:	E4
(a) During landing utilize maximum reverse power.	
(b) Check for smoothness of operation and equal thrust from engines.	
*(c) Turbine tachometers - Maximum reverse N_1, is 82 to 88%. Observe that maximum difference between engines is 2% N_1.	
*7. Oil temperature - Monitor. Ground idle limits are 0 to 104°C.	
*8. Oil pressure - Monitor. Ground idle limits are 60 PSI minimum.	

GO-AROUND

1. Power - Maximum allowable.
2. Flaps - As required.
3. Gear - UP.
4. Flaps-UP.
5. Landing lights - OFF.
6. Climb power - Set.
7. BRAKE deice - Off.

AFTER LANDING

Complete the following procedures after the aircraft has cleared the runway:

PROCEDURE	TROUBLESHOOTING REFERENCE

AFTER LANDING (CONT)

1. PROP levers - Retard to FEATHER detent.
2. ENGINE ANTI-ICE switches - ON.
3. Engine AUTO IGNITION switches - Off.
4. ICE PROTECTION switches - OFF.
5. Flaps-UP.
6. Radar/transponder - As required.
7. Lights - As required.

ENGINE SHUTDOWN

NOTE

To prevent sustained loads on rudder shock links, park the aircraft with the nose gear centered

1. PARKING BRAKE - Set.
2. LANDING and TAXI light switches - OFF.
3. CABIN TEMP MODE switch - OFF.
4. VENT BLOWER switch - AUTO.
5. AFT BLOWER switch - OFF.
6. AUTOFEATHER switch - OFF.
7. INVERTER switch - Off.
8. AP/TRIM POWER switch - Off.
9. EFIS power switches (3) - Off.
10. BRAKE deice - Off.

*11. Battery condition - Check.

12. ITT - Check stabilized for 1 minute prior to shutdown.

PROCEDURE **TROUBLESHOOTING REFERENCE**

13. POWER levers - IDLE.
14. PROP levers - FEATHER.

CAUTION

Monitor ITT during shutdown. If sustained combustion is observed, proceed immediately to Abort Start procedure.

15. CONDITION levers - FUEL CUT-OFF.
16. Oxygen system - Off.

WARNING

Do not turn exterior lights off until propeller rotation has stopped

17. Exterior lights switches - Off.
18. MASTER PANEL LIGHTS switch - OFF.
19. AVIONICS MASTER PWR switch - OFF.
20. MASTER SWITCH - OFF.

BEFORE LEAVING AIRCRAFT

NOTE

Release brakes after chocks are in place (ramp conditions permitting).

1. Wheels - Chocked.
2. PARKING BRAKE - As required.

PROCEDURE	TROUBLESHOOTING REFERENCE
BEFORE LEAVING AIRCRAFT (CONT)	
3. Flight controls - Locked.	
4. STANDBY PUMP switches - Off.	
5. Windows - As required	
6. Emergency exit lock - As required.	
7. Aft cabin lights - OFF.	
8. Door light - OFF.	
*9. Walk-around inspection - Complete. Conduct a thorough walk-around inspection, checking for damage, fluid leaks, and fluid levels. Check that covers, tiedowns, restraints, and chocks are installed as required.	E11-13
NOTE A cold oil check is unreliable. Check oil within 10 minutes after stopping engine.	
*10. Aircraft forms - Complete. In addition to established requirement for reporting any system defects, unusual and excessive operation such as hard landings, etc., the flight crew will also make entries on DA Form 2408-13-1 to indicate when limits in the operator's manual have been exceeded.	
11. Aircraft - Check secured Lock cabin door as required	

CHAPTER 3. TROUBLESHOOTING

3-1. GENERAL. This chapter contains troubleshooting information that has been referenced in Chapter 2. This chapter lists possible conditions, abnormal conditions and indications and probable causes. The information is to be used only as a quick reference and may not be all-encompassing

TROUBLESHOOTING GUIDE A - STARTING

CONDITION
PROBABLE CAUSE

A1. Both starter-generators inoperative.

a. Low battery.

b. Loose connection or open circuit between battery relay and power cabinet.

A2. One starter-generator inoperative.

a. Starter relay inoperative.

b. Poor ground at starter-generator.

c. Open circuit.

d. Defective starter-generator.

e. Defective switch.

f. Defective wiring.

g. Defective generator control unit.

h. Current transformer miswired.

A3. Engine slow to start or does not start.

a. Low battery.

b. High resistance starter circuit.

c. Defective starter-generator.

d. Turbine dragging.

e. Defective generator control unit.

f. Current transformer miswired.

A4. Engine fails to light up.

a. Improper engine starting procedure.

b. Ignition system.

(1) No power to ignition exciter.

(2) Defective wiring or components.

c. Fuel system.

(1) Debris or ice in fuel system.

(2) Air lock in fuel control unit.

(3) Engine driven primary high pressure pump failure.

AS. Engine fails or is slow to accelerate to idle N_1, speed.

a. Improper engine starting procedure.

b. Leaks or restrictions in fuel control unit pneumatic system.

c. Leaks in pneumatic line of propeller governor.

d. Fuel control unit contaminated with water or ice, or corroded

A6. Hot start or delayed light up.

a. Improper engine starting procedure.

b. Insufficient power from battery or ground power unit.

c. Poor connections on power input lines or starter-generator.

d. Low power to ignition exciter.

e. Defective ignition cable.

f. Defective igniters.

g. Defective ignition exciter.

h. Bleed air leaking or system in aircraft using bleed air is on.

i. Engine control linkage improperly rigged

j. Fuel nozzle restrictions.

A7. Engine fails to or is slow to accelerate propeller to idle speed.

a. Propeller oil transfer sleeve binding.

TROUBLESHOOTING GUIDE B - INSTRUMENTS

CONDITION
PROBABLE CAUSE

B1. Airspeed indicator reading remains fixed.

a. Pitot pressure line clogged with ice or debris.

b. Defective indicator.

B2. Vertical speed indicator inaccurate or Inoperative.

a. Static line clogged.

b. Leak in line or instrument case or loose fittings.

c. Defective indicator.

B3. Airspeed Indicator reads incorrectly or fluctuates excessively.

a. Pitot tube or pressure line partially restricted or leaking.

b. Static port or line clogged or static line leaking.

c. Defective indicator.

B4. Magnetic compass inaccurate, sluggish, or erratic.

a. Insufficient liquid.

b. External magnetic interference.

c. Defective compass.

d. Windshield heat on.

e. Air conditioner on.

f. Sun visors not stowed outboard.

g. EFIS power switches on.

B5. Turn-and-slip indicator inoperative or erratic.

a. No electrical power.

b. Defective turn-and-slip indicator.

B6. Fuel quantity indicator fluctuates or reads low.

a. Defective pins in connector on harness that mates with gage.

b. Compensator immersed in water.

c. Circuit out of calibration.

d. Tank unit(s) out of circuit.

e. Defective pins in connector on fuel probes and wing harness used to connect fuel probes.

f. Defective indicator.

B7. Fuel quantity Indicator pegs down scale against stop.

a. Defective probe.

b. Defective pins on connectors on both gage and probes.

c. Nacelle probe body is making contact with metal braided hose inside of nacelle tank.

d. Defective indicator.

e. No power to fuel quantity indicator system.

B8. Fuel quantity Indicator needle pegs up scale against stop.

a. Defective indicator.

B9. Interstage turbine temperature indicator inoperative or indicates inaccurately.

a. Defective or out of adjustment balance resistor.

b. Defective interstage turbine temperature harness.

c. Defective indicator.

TROUBLESHOOTING GUIDE C - ELECTRICAL

CONDITION
PROBABLE CAUSE

C1. Zero or low voltage indicated.

a. Circuit breaker tripped.

b. Loose connection.

c. Open or shorted field circuit in generator or defective armature.

d. Brushes not contacting commutator.

e. Brushes worn out.

f. Dirty commutator.

g. Defective generator control unit.

h. Starter-generator switch on.

i. Defective indicator.

C2. No generator output.

a. Improper connections.

b. Circuit breaker tripped.

c. Open or short circuit.

d. Loss of residual magnetism.

e. Generator control switch not ON or RESET.

f. Defective generator control switch.

g. Starter-generator switch on.

h. Generator control unit over-voltage circuit defective.

i. Paralleling circuit open.

j. Defective generator control unit.

k. High resistance field circuit.

l. Shorted field.

m. Generator feeder fault.

n. Defective indicator.

C3. Low generator output.

a. Generators not paralleled.

b. Defective generator control unit.

C4. Low voltage.

a. Malfunctioning generator control unit.

C5. Volt-loadmeter reads off scale in wrong direction.

a. Generator field magnetized in wrong direction.

C6. Volt-loadmeter does not indicate.

a. Tripped circuit breaker.

b. Open volt-loadmeter lead

c. Defective volt-loadmeter.

C7. No power indicated with BATT master switch ON.

a. Battery discharged or defective.

b. Open circuit between battery and BATT master switch.

c. Master switch defective.

d. Defective relay.

e. Keylock switch OFF.

C8. Power on with BATT master switch in OFF position.

a. Master switch defective.

b. Relay contacts stuck.

C9. Apparent loss of battery capacity.

a. Cells unbalanced.

b. Electrolyte level too low.

c. Charging rate too low in aircraft.

d. Too little usage or shallow discharges.

C10. Complete failure of battery to operate.

a. Loose or broken lead.

b. Loose or disengaged terminals in battery.

c. Battery not charged.

d. Cell open internally.

e. Battery feeder fault.

C11. Below normal battery output.

a. BATT switch left ON.

b. Generator control unit set too low.

c. Internal connection links loose.

d. External connector burned or pitted.

e. Defective or reversed cells.

f. Cell case current leakage.

C12. External power fails to energize aircraft.

a. Defective or incorrectly polarized external power source.

b. Defective external power receptacle.

c. Defective external power relay.

d. Loose or wrong connection in external power circuit.

e. Defective external power overvoltage monitor.

f. APU voltage too high.

g. APU defective.

h. Defective switch.

i. Circuit breaker tripped.

j. External power feeder fault.

k. Battery feeder fault.

C13. Landing gear will not retract or extend.

a. LANDING GEAR RELAY circuit breaker (pilot's subpanel) tripped.

b. LANDING GEAR POWER circuit breaker (under floor in cabin) tripped.

c. Landing gear power safety control circuit breaker (under floor in cabin) tripped.

d. Landing gear power sense circuit breaker (under floor in cabin) tripped.

e. Landing gear safety power circuit breaker (under floor in cabin) tripped

f. Faulty power pack motor.

g. Faulty power relay.

h. Faulty remote-controlled circuit breaker (RCCB), (under floor in cabin).

i. Defective landing gear control switch.

j. Defective wiring.

C14. Landing gear fails to retract.

a. Safety switch not closing.

b. Pressure switch not closing.

c. Gear selector valve stuck.

d. Circuit is open between the selector valve and the power relay.

e. Time delay circuit opening prematurely.

f. Hand pump handle improperly stowed.

g. Service valve in up position.

h. Defective landing gear control switch.

i. Defective wiring.

C15. Landing gear fails to extend.

a. Service valve switches faulty.

b. Landing gear selector valve stuck in up position.

c. Control switch not providing power to the extend side of selector valve.

d. Defective limit switch.

e. Defective landing gear control switch.

C16. Landing gear pump motor continues to run after the gear is retracted, causing landing gear pump motor circuit breaker to trip.

a. Pressure switch not opening on high pressure.

b. Low accumulator charge.

c. Excessive fluid leakage past the piston seals in the actuators.

d. Defective valve in the power pack.

C17. Landing gear pump motor continues to run after the gear are extended, causing landing gear pump motor circuit breaker to trip.

a. Downlock switches are not opening.

b. Power relay points stuck.

c. Defective limit switch.

C18. Landing gear pump motor continues to run when the gear is extended or retracted, causing the circult breaker to trip.

a. Weak power pack motor.

b. Low voltage to the motor.

c. Low fluid level.

d. Blockage in the hydraulic system.

C19. Landing par pump motor operating longer than 14 seconds in both the extention and retraction modes The 2-ampere circuit breaker does not trip.

a. Low voltage.

C20. Landing gear pump motor operating longer than 14 seconds in the retract mode, but the 2-ampere circuit breaker does not trip.

a. Faulty time delay PCB and pressure switch.

C21. Landing gear pump motor operating longer than 14 seconds in the extend mode, but the 2-ampere circuit breaker does not trip.

a. Downlock switches failing to open and/or the time delay PCB is faulty.

C22. Landing gear HYD FLUID LOW light not functioning.

a. Defective lamp.

b. Defective fluid indicator circuit.

C23. Landing gear circuit breaker trips.

a. Shorted circuit.

C24. Landing gear warning horn inoperative when LDG GEAR CONTROL switch is in the up position and weight of aircraft is on struts, but operates when a POWER lever is closed and the gear is retracted.

a. Poor ground at landing gear control switch.

b. Defective wiring between LDG GEAR CONTROL switch and landing gear safety switch.

c. Defective stall/landing gear warning module.

d. Defective speaker.

C25. Landing gear warning horn inoperative when POWER lever is closed and landing gear is up.

a. Defective or out of adjustment POWER lever switch.

b. Defective wiring between POWER lever switches and pedestal terminal board, and between LDG GEAR CONTROL switch and stall/landing gear warning horn module.

c. Defective speaker.

C26. Landing gear warning horn fails to shut off when landing gear is extended.

a. Defective or out of adjustment down-lock switches.

C27. Landing GEAR DOWN position indicator lights are illuminated with landing gear retracted.

a. Defective or out of adjustment down lock switch.

b. Wrong connection in light test circuit.

c. Ground between light and down lock switch.

C28. Landing GEAR DOWN position indicator light inoperative.

a. Defective light bulb.

b. Defective or out of adjustment down lock switch.

C29. Landing gear handle light is illuminated with gear up and locked.

a. Defective or out of adjustment up-lock switch.

C30. Landing gear handle light inoperative.

a. Defective or out of adjustment up-lock or down-lock switch.

b. Defective landing gear control switch.

c. Defective bulbs in handle.

C31. Flaps fail to extend or retract.

a. Tripped circuit breaker.

b. Defective flap motor.

c. Defective flap control switch.

d. Defective mechanical component in actuator system.

e. Defective wiring.

f. Defective split flap switch.

g. Split flap condition.

C32. Flap position indicator Inoperative.

a. Tripped circuit breaker.

b. Defective position indicator.

c. Defective position transmitter.

d. Defective wiring.

C33. Pitot tube heater fails to operate.

a. Tripped circuit breaker.

b. Defective heater.

c. Defective wiring.

d. Defective switch.

C34. Stall warning system inoperative.

a. Defective stall warning transducer.

b. Defective stall warning computer.

c. Defective wiring.

d. Defective stall/landing gear warning module.

e. Defective speaker.

C35. Stall warning horn sounds continuously.

a. Defective stall warning transducer.

b. Defective stall warning test system.

c. Defective wiring.

d. Defective stall warning computer.

C36. Both inverters inoperative.

a. Defective wiring in inverter system.

C37. One inverter inoperative.

a. Tripped inverter circuit breaker (on DC power distribution panel beneath floor).

b. Loose or corroded ground connection.

c. Defective wiring to inverter.

d. Defective inverter switch.

C38. BATTERY CHARGE annunciator light inoperative.

a. Defective light bulb.

b. Connections on battery shunt loose or corroded

c. Defective battery charge monitor module.

C39. One portion of interior lighting or lighting control system inoperative.

a. Defective light circuit board.

b. Defective light bulbs.

c. Defective components in overhead control panel.

d. Defective power supply.

C40. Fuel crossfeed valve inoperative or FUEL PRESS annunciator light remains illuminated.

a. Defective standby fuel pump.

b. Defective crossfeed valve.

C41. Standby fuel pump inoperative.

a. Defective standby pump.

b. Defective switch in fuel management panel.

C42. Pneumatic surface deice system inoperative.

a. Defective surface deice time delay module.

b. Defective deice distributor valve.

c. Defective plumbing.

d. Defective boot.

C43. Right and left FIRE warning **lights do not illuminate in test position of fire protection test switch.**

a. Tripped fire detector circuit breaker.

b. Defective fire protection test switch.

c. Defective wiring.

C44. Engine fire detection system wholly or partially inoperative.

a. Defective sensing tube.

b. Defective fire detector.

c. Defective ENG FIRE SYS TEST SWITCH.

C45. FIRE DET circuit breaker trips.

a. Short circuit in wiring or components.

C46. Left FIRE warning light illuminates in test position but right FIRE warning light does not-

a. Defective right fire detector.

b. Defective wiring between fire warning power circuit breaker and right fire detector.

C47. Right FIRE warning light illuminates in test position but left FIRE warning light does not.

a. Defective left fire detector.

b. Defective wiring between fire warning power circuit breaker and left fire detector.

C48. Ventilation blower will not run.

a. Tripped vent blower circuit breaker.

b. Defective motor brushes.

c. Defective wiring.

d. Defective motor.

e. Defective switch.

C49. Ventilation blower draws excessive current.

a. Misaligned or preloaded bearings.

b. Defective bearings.

C50. Ventilation blower runs at reduced speed.

a. Brushes not seated properly.

C51. Ventilation blower draws excessive current and runs at high speed.

a. Shorted turns in field windings.

C52. Ventilation blower draws excessive current and speed surges.

a. Shorted turns in armature.

C53. Ventilation blower has excessive vibration.

a. Armature out of balance.

b. Fan damaged

c. Fan out of balance.

d. Defective bearings.

C54. Propeller deice inoperative.

a. Circuit breaker tripped.

b. Propeller &ice switch defective.

c. Ammeter defective.

d Defective propeller deice timer.

C55. Stall warning deice inoperative.

a. STALL WARN circuit breaker tripped

b. STALL WARN circuit breaker defective.

c. STALL WARN deice switch defective.

d Stall warning deice heating element defective.

C56. Left or right fuel vent deice Inoperative.

a. FUEL VENT circuit breaker tripped.

b. FUEL VENT circuit breaker defective.

c. FUEL VENT deice switch defective.

d. Fuel vent deice heating element defective.

TROUBLESHOOTING GUIDE D - CAUTION PANEL

CONDITION
PROBABLE CAUSE

D1. Placard light (annunciator Panel) will not illuminate when press-to-test button is pressed.

a. Defective placard light.

b. Defective lamps.

c. Defective fault detection module.

D2. MASTER WARNING or MASTER CAUTION annunciator light will not illuminate for any red or yellow faults.

a. Defective fault warning light.

b. Defective fault detection module.

c. Defective annunciator control module.

D3. Depressing the press-to-test switch has no effect on fault warning system operation.

a. Defective switch.

b. Defective circuit breaker.

c. Defective wiring.

D4. Dim control does not function properly.

a. Defective rheostat switch.

b. Defective annunciator control module.

TROUBLESHOOTING GUIDE E - POWERPLANT

CONDITION
PROBABLE CAUSE

E1. LOW IDLE speed is either high or low.

a. LOW IDLE speed improperly adjusted.

E2. HIGH IDLE speed is either high or low.

a. HIGH IDLE speed improperly adjusted.

E3. Low or high torque is observed during torque check.

a. Barrel adjustable stop is improperly adjusted.

E4. Reverse torque, N1, and propeller RPM is too high or low.

a. Reverse adjusting screw is improperly adjusted.

E5. Newly rigged engine accelerates faster or slower than opposite engine.

a. Engine rigging, components, or engine is mismatched

E6. POWER levers are not aligned.

a. Fuel control rod improperly adjusted.

E7. High engine oil pressure.

a. Defective oil pressure indicating system.

b. Defective pressure relief valve.

E8. Low engine oil pressure.

a. Insufficient oil.

b. Defective oil pressure indicating system.

c. Dirty oil filter.

d. Leak in oil lines or oil cooler.

e. Defective pressure relief valve.

E9. Fluctuating engine oil pressure.

a. Insufficient or excess oil.

b. Defective oil pressure indicator.

c. Dirty oil filter.

d. Defective pressure relief valve.

E10. High oil temperature.

a. Insufficient oil supply.

b. Defective oil temperature indicator.

c. Excessive idling in feather.

d. Restriction in oil cooler.

e. Cooling air flow blocked.

E11. Oil leak from compressor inlet.

a. Defective preformed packing and plastic ring on oil filter housing.

b. Defective preformed packings on accessory gearbox.

E12. Excessive oil discharge from overboard breather.

a. Excess oil in tank.

b. Defective preformed packing and plastic ring on oil filter.

c. Excessive back pressure in scavenge system due to restrictions in oil scavenge tubes, pump screen or oil-to-fuel heater tubes.

E13. Excessive engine oil consumption.

a. Excess oil in tank.

b. Leak or restriction in pressure scavenge oil tubes.

c. Defective preformed packing and plastic ring on oil filter housing.

d. Leakage in oil to fuel heat exchanger.

e. Defective centrifugal breather carbon seal.

f. Defective air seals.

E14. Failure of engine to decelerate.

a. Fuel control unit defective.

b. Disconnected or improperly adjusted linkage.

El5. Gas generator overspeed.

a. Defective turbine tachometer system.

b. Sheared or worn fuel control unit splined coupling or drive spline.

c. Defective fuel control unit.

E16. Gas generator uncontrolled acceleration.

a. Sheared or worn fuel control unit splined coupling or drive spline.

b. Defective fuel control unit.

E17. Surge during acceleration.

a. Defective or incorrect compressor bleed valve.

b. Defective fuel control unit.

c. Compressor damaged.

E18. Slow to accelerate.

a. Leak or restriction in P_y, air bleed tube or P3 air delivery tube.

b. P3 air filter contaminated

c. Improper acceleration adjustment on fuel control unit.

d. Propeller governor out of adjustment.

e. Defective fuel control unit.

f. Defective propeller governor.

E19. Flame out.

a. Fuel supply contaminated with ice, water, or debris.

b. Engine driven high pressure fuel pump defective.

c. Fuel control unit contaminated or corroded.

d Manifold adapter or fuel nozzles restricted.

E20. Low power output.

a. Defective indicator.

b. Operating procedures incorrect.

c. Control Linkages incorrectly adjusted or disconnected.

d. Propeller governor defective.

e. Leaks or restrictions in fuel control unit pneumatic system.

f. Fuel nozzles restricted.

E21. High fuel flow at altitude.

a. Defective indicator.

b. Defective or incorrect compressor bleed valve.

E22. Maximum operating ITT has been exceeded.

a. Faulty instrumentation, thermocouples, or wiring.

b. Excessive accessory power being pulled due to failure or overload.

c. Torquemeter system reading low.

E23. ITT limited (turbine temperature is at maximum limit before target torque is reached).

a. Defective instruments, thermocouple, or wiring.

b. Improper operating procedure.

c. Dirty compressor.

d. Excessive accessory power being pulled due to failure or overload

e. Defective or incorrect compressor bleed valve.

f. Damaged compressor.

g. Air leaks in engine flanges or fittings.

h. Hot section distress.

i. Torquemeter system reading low.

E24. Fluctuating torque indication.

a. Faulty instrumentation system.

b. Defective power turbine governor.

c. Engine driven high pressure pump shaft seal leakage.

d. Defective or out of adjustment propeller overspeed governor.

e. Defective propeller primary governor.

f. Sticking beta mechanism.

E25. Fluctuating fuel flow.

a. Faulty instrumentation system.

b. Defective power turbine governor.

c. Engine driven high-pressure fuel pump shaft seal leaking.

d. Defective propeller overspeed governor.

e. Sticking beta mechanism.

E26. Fluctuating ITT.

a. Faulty instrumentation system.

b. Defective power turbine governor.

c. Defective engine driven high pressure fuel pump shaft seal.

d. Defective or out of adjustment propeller overspeed governor.

e. Defective propeller primary governor.

f. Sticking beta mechanism.

E27. Fluctuating gas generator speed.

a. Faulty instrumentation system.

b. Defective power turbine governor.

c. Defective engine driven primary high pressure fuel pump shaft seal.

d. Defective or out of adjustment propeller overspeed governor.

e. Defective propeller primary governor.

f. Sticking beta mechanism.

E28. Fluctuating torque and propeller RPM.

a. Defective or out of adjustment propeller overspeed governor.

b. Defective propeller primary governor.

c. Sticking beta mechanism.

E29. Fuel leaking overboard.

a. Fuel cap not seated and anti-siphon valve defective.

b. Filler cap or preformed packing defective and anti-siphon valve defective.

c. Fuel transfer module defective.

d Fuel level transmitter defective.

TROUBLESHOOTING GUIDE F - PROPELLERS

CONDITION
PROBABLE CAUSE

F1. Propeller governor system partially or completely iuoperative.

a. Defective propeller governor test switch.

F2. Propeller governor test system inoperative.

a. Tripped propeller governor test circuit breaker.

b. Defective wiring.

c. Defective switch.

d. Defective propeller governor reset solenoid.

F3. Propeller governor test system inoperative on one engine.

a. Defective PROP GOV test switch.

b. Defective propeller governor reset solenoid.

F4. Propeller autofeather system inoperative (propeller AUTOFEATHER switch in ARM or TEST position).

a. Tripped circuit breaker.

b. Defective arming light out relay or feathering relay.

c. Defective arc suppression diode on relays or feather dump valve.

d. Defective ground blocking diode.

F5. AUTOFEATHER circuit breaker trips (AUTOFEATHER switch in ARM or TEST position).

a. Defective ARM-TEST switch.

b. Defective wiring.

F6. One AUTOFEATHER arm light illuminates when power setting is less than 90 percent N, (AUTOFEATHER switch in ARM position).

a. Defective or out of adjustment power lever switch.

F7. Neither AUTOFEATHER arm light illuminates when POWER levers are advanced (AUTOFEATHER stitch in ARM position).

a. Defective AUTOFEATHER switch.

F8. One arm light does not illuminate when POWER levers are advanced (AUTOFEATHER switch in ARM position).

a. Defective or out of adjustment power lever switch.

b. Defective No. 1 (4.7 PSI) torque pressure switch.

F9. Both arm lights remain illuminated when one POWER lever is retarded (AUTOFEATHER switch in ARM position). Defective or out of adjustment power lever switch.

F10. Propeller does not start to feather after engine torque fails below 7% (AUTOFEATHER switch in ARM position).

a. Defective No. 2 (3.1 PSI) torque pressure switch on retarded engine.

b. Defective autofeather dump valve.

F11. One autofeather arm light does not illuminate when POWER levers are advanced to 90 percent N„ (AUTOFEATHER ARM - TEST switch in TEST position).

a. Defective No. 1 (4.7 PSI) torque pressure switch.

F12. Both autofeather arm lights extinguish when one POWER lever is retarded (engine torque 7 to 12% on retarded engine, AUTOFEATHER ARM-TEST switch in TEST position).

a. Defective No. 2 (3.1 PSI) torque pressure switch on retarded engine.

F13. One autofeather arm light remains illuminated after torque of one engine falls below 7% on retarded engine, AUTOFEATHER ARM-TEST switch in TEST position).

a. Defective No. 2 (3.1 PSI) torque pressure switch on retarded engine.

b. Defective autofeather dump valve.

F14. Propeller slow to feather.

a. Preformed packing leak at transfer tube or transfer housing.

b. Defective propeller governor.

F15. Propeller slow to unfeather.

a. Defective propeller governor.

TROUBLESHOOTING GUIDE G - HYDRAULIC

CONDITION	PROBABLE CAUSE
G1.	**Solid pedal, no brakes.**
	a. Brake linings worn beyond allowable limits.
G2.	**Spongy brakes.**
	a. Air in brake hydraulic system.
	b. Low hydraulic fluid.
G3.	**Unable to hold brake pressure.**
	a. Leak in brake hydraulic system.
	b. Brake cylinder seal leaking.
	c. Master cylinder seal leaking.
G4.	**Brake pedals bottom, no brakes.**
	a. Broken or leaking hydraulic lines.
	b. Brake cylinder seal failure.
	C. Master cylinder seal leaking.
G5.	**Parking brake will not hold.**
	a. Air in brake hydraulic system.
	b. Defective parking brake valve.
	c. PARKING BRAKE control out of adjustment.
G6.	**Brakes grab.**
	a. Stones or foreign matter locking brake disc.
	b. Warped or bent disc.
G7.	**Brakes drag.**
	a. Packing nut or threaded bushing too loose.
G8.	**Brakes weak.**
	a. Packing nut or threaded bushing too light.

TROUBLESHOOTING GUIDE H - FLIGHT CONTROLS

CONDITION
PROBABLE CAUSE

For complete troubleshooting of autopilot system, refer to Allied Signal autopilot maintenance manual.

TROUBLESHOOTING GUIDE I - NOT APPLICABLE

TROUBLESHOOTING GUIDE J - VIBRATIONS

CONDITION
PROBABLE CAUSE

J1. Engine vibration.

a. Propeller damaged or blade angle slipped.

b. Loose engine mounting bracket bolts.

c. Compressor damaged.

d. Turbine damaged.

TROUBLESHOOTING GUIDE K - COMMUNICATION/NAVIGATION EQUIPMENT

CONDITION
PROBABLE CAUSE

K1. Interphone system: No audio signals heard in headset.

a. No power to audio system.

b. Defective microphone.

c. Defective control wheel microphone switch.

d. Defective foot microphone switch.

e. Defective headset-microphone cord or jack.

f. Defective microphone jack.

g. Defective audio control panel.

h. Headset-oxygen mask switch set in wrong position.

K2. **Interphone system: Audio signals can be heard at other headset stations when transmitter selector switches at audio control panels are at different positions and receiver monitor switches are pulled out.**

a. Defective audio control panel.

b. Defective wiring.

K3. Deleted.

K4. Deleted.

K5. Deleted.

K6. Deleted.

K7. **Cannot establish AM/FM (VHF/UHF) two-way communications.**

a. Defective audio distribution channels.

b. Defective antenna or antenna cabling.

c. Defective VHF/UHF transceiver set.

K8. **Cannot establish VHF two-way communications.**

a. Defective audio distribution channels.

b. Defective antenna or cabling.

c. Defective VHF command set.

K9. **VHF volume control does not affect received audio level.**

a. Defective VHF control panel.

b. Defective antenna or antenna cabling.

K10. HF transmitted or received signal or sidetone not clear.

a. Defective HF receiver-transmitter.

b. Defective antenna cabling.

c. Defective HF control panel.

d. Defective audio control panel.

K11. No VOR audio tone heard in headset.

a. Defective VOR receiver.

b. Defective VOR control panel.

c. Defective audio control panel.

K12. VOR receiver inoperative.

a. No power to equipment.

b. Defective VOR control panel.

c. Defective VOR receiver.

K13. Marker beacon signals not heard in headset.

a. Defective audio control panel.

b. Defective marker beacon volume control or sensitivity switch on pedestal extension.

c. Defective VOR receiver.

K14. ADF radio set inoperative.

a. No power to ADF radio set.

K15. No ADF audio heard in headsets.

a. No Rower to equipment.

b. Defective ADF receiver.

c. Defective ADF control panel.

d. Defective ADF antenna.

K16. Quality of ADF reception is poor.

a. Defective ADF control panel.

b. Defective audio control panel.

c. Defective ADF receiver.

d. Defective antenna.

K17. Radar inoperative.

a. System circuit breaker tripped.

b. Defective radar receiver-transmitter.

c. Defective wiring.

Kl8. Radar antenna does not scan.

a. No power to radar antenna.

b. Defective radar antenna.

K19. No radar display on EHSI.

a. Defective radar receiver-transmitter.

b. Defective wiring.

K20. No radar targets on EHSI or targets do not move with TILT control.

a. Defective radar receiver-transmitter.

b. Radar TILT control inoperative.

K21. Transponder cannot be interrogated or provides unsatisfactory response.

a. Mode C not set or defective.

b. Air data computer defective.

c. Defective transponder.

d. Defective antenna.

e. Defective coax.

f. Defective wiring.

TROUBLESHOOTING GUIDE L - STABILITY AND CONTROL - NOT APPLICABLE

CHAPTER 4. SPECIAL PROCEDURES

4-1. GENERAL. I-his chapter contains the special procedures that were referenced in Chapter 2.

‘ PRESSURIZATION

1. Before takeoff:
   (a) Cabin controller - Set for a 5000 foot cabin altitude.
   (b) Cabin controller RATE knob - Set to mid position.
   (c) BLEED AIR VALVES switches (2) - OPEN.
   (d) CABIN PRESS DUMP switch - PRESS.
2. After takeoff - Initiate a climb to 10,000 to 12,000 feet pressure altitude.
3. Cabin rate-of-climb indicator - Monitor for a smooth transition from an unpressurized to a pressurized cabin.
4. Cabin controller RATE knob - Set to maximum. Monitor the cabin rate of climb for a rate of between 1500 and 2500 feet per minute.
5. Cabin controller RATE knob - Set to mid position. Monitor the cabin rate of climb for a rate of 350 to 650 feet per minute.
6. Cabin controller RATE knob - Set to minimum. Monitor the cabin rate of climb for a rate of 50 to 300 feet per minute.
7. Cabin altimeter - Check that the cabin altimeter needle stabilizes at 4600 to 5400 feet while the cabin differential pressure needle continues to increase.
8. CABIN CONTROLLER - Set to 10,000 feet. Cabin altitude should reach 9600 to 10,400 feet.
9. CABIN PRESS switch - DUMP, when cabin altitude approaches aircraft altitude.

10. Climb - Continue. At between 12,000 and 12,500 feet ALT WARN annunciator light will illuminate, oxygen masks should drop, and cabin lights and no smoking sign should illuminate.
11. CABIN PRESS switch - PRESS.
12. CABIN CONTROLLER - Set to 0 feet.
13. Climb - Continue to between 15,000 and 16,000 feet.
14. Cabin controller RATE knob - Set to 0 feet.
15. Cabin controller RATE knob - Set to maximum. Monitor the cabin rate of climb for a descent rate of less than 1500 to 2500 feet per minute.
16. Cabin controller RATE knob - Set to mid position. Monitor the cabin rate of climb for a descent rate of 350 to 650 feet per minute.
17. Cabin controller RATE knob - Set to minimum. Monitor the cabin rate of climb for a descent rate of 50 to 300 feet per minute.
18. Cabin altimeter - Check that the cabin altimeter needle stabilizes and remains at -250 to +250 feet until the maximum differential pressure of 6.5 ±.1 PSI is reached. At this point (approximately 15,300 feet pressure altitude), verify that cabin altitude increases and differential presure remains constant.
19. With the cabin at maximum differential pressure, place both BLEED AIR VALVES switches to ENVIR OFF. As the cabin differential pressure decreases from 6.1 to 5.7 PSI, the cabin rate of climb shall not exceed 2200 feet per minute.
20. BLEED AIR VALVES switches - OPEN and re-establish maximum differential pressure.
21. Left BLEED AIR VALVES switch - ENVIR OFF.
22. Slowly retard the right POWER lever to flight idle and determine the minimum N_1 required to maintain cabin pressure. Verify that cabin pressurization is maintained down to flight idle N_1.
23. Left BLEED AIR VALVES switch - OPEN.
24. Right BLEED AIR VALVES switch - ENVIR OFF.

25. Slowly retard the left POWER lever to flight idle and determine the minimum N_1 required to maintain cabin pressure. Verify that cabin pressurization is maintained down to flight idle N_1.
26. Right BLEED AIR VALVES switch - OPEN.
27. Cabin pressurization controller - Set to 500 feet above field elevation.

***TRIM AND RIGGING**

Check as follows:

In smooth air, at cruise power, the aircraft will fly hands off, straight and level with the ailerons symmetrically aligned at the trailing edge and the aileron adjustable tab set to zero.

***! MAXIMUM ITT/N_1 AVAILABILITY**

Ensure that sufficient POWER lever travel is available at 16,000 feet to produce a ITT of 800°C or an N_1 of 101.5%. Check the that maximum ITT or N_1 is available at the maximum POWER lever position as follows:

NOTE

The only requirement of the maximum ITT/N, is to verify that it is possible to obtain maximum allowable gas generator RPM (N,) or reach the ITT limit with the POWER levers in the full forward position. If during the test the ITT temperature limit or N_1 limit is obtained prior to reaching maximum N_1. the check is completed.

1. Altitude - 16,000 feet pressure altitude.
2. PROP levers - Set 2000 RPM.
3. Ice vanes - Retracted.
4. BLEED AIR VALVES switches (2) - OPEN.
5. Airspeed - As required
6. POWER levers - Full forward (do not exceed ITT and/or N_1. Maximum N_1 is 101.5%. Maximum ITT is 780°C.

***SPEED PERFORMANCE AT MAXIMUM CRUISE POWER**

NOTE

A new or rebuilt engine operated at the torque value presented in the Maximum Cruise Speed and Power chart (figure 4) will show a ITT margin below the maximum cruise limit for the torque value presented in the table. Cruise torque settings shown on the Maximum Cruise Speed and Power chart (figure 4) shall be obtained without exceeding ITT limit (780°C).

Speed-power runs shall be made in smooth air with engine anti-ice off at 16,000 and 25,000 feet to determine conformity with performance figures. Determine torque settings, fuel flow, and airspeed to be achieved by referencing Maximum Cruise Speed and Power Chart (figure 4).

1. Altitude - 16,000 feet pressure altitude.
2. Record the following:
   - (a) Engine serial number.
   - (b) Engine hours since new.
   - (c) Engine hours since overhaul.
3. Propeller RPM - 1800 RPM.
4. Engine anti-ice - OFF.
5. FAT - Determine and note.
6. Power setting - Read torque for the noted FAT from figure 4.
7. Set torque on left and right engines to the torque from figure 4.
8. Verify that pilot's and copilot's airspeed indicators agree within 4 KIAS, and that neither indicator reads more than 3 KIAS less than the chart value.
9. Allow conditions to stabilize for one minute, then record the following for each engine being tested.
   - (a) Pressure altitude

*(b) Propeller RPM.

*(c) FAT.

*(d) Torque.

*(e) Fuel flow.

*(f) KIAS.

*(g) ITT.

*(h) N_1.

10. Indicated fuel flow must be within +10 and -25 lb/hr of chart value for Jet-A fuel.

11. If observed ITT exceeds chart value, conduct the Engine Performance at Maximum Cruise Power **check.**

12. Repeat steps 2 through 11 for opposite engine if required.

***ENGINE PERFORMANCE AT MAXIMUM CONTINUOUS POWER**

1. Record the following:

*(a) Engine serial number.

*(b) Engine hours since new.

*(c) Engine hours since overhaul.

2. Altitude - Establish level flight at 16,000 feet pressure altitude.

3. PROP levers - Set 2000 RPM.

4. Adjust the opposite engine to maintain 160 KIAS.

5. Engine anti-ice - OFF.

6. FAT - Determine and note.

7. Power setting - Read torque for the noted FAT from figure 5.

8. Set torque on engine being tested to the torque from figure 5.

9. Adjust opposite engine to maintain 160 KIAS.

10. Allow conditions to stabilize for one minute, then

record the following for each engine or being tested.

* (a) Pressure altitude.
* (b) Propeller RPM.
* (c) FAT.
* (d) Torque.
* (e) Fuel flow.
* (f) KIAS.
* (g) ITT.
* (h) N_1.

11. If observed ITT exceeds chart value, conduct the Maximum Cruise Power check.
12. Repeat steps 3 through 11 for the other engine if required.
13. Repeat procedure at 25,000 feet pressure altutude.

***ENGINE PERFORMANCE AT MAXIMUM CRUISE POWER**

NOTE

The Engine Performance at Maximum Cruise Power check needs to be performed only if the ITT observed during the Speed Performance at Maximum Cruise Power check exceeds chart value.

1. Record the following:
   * (a) Engine serial number.
   * (b) Engine hours since new.
   * (c) Engine hours since overhaul.
2. Altitude - Establish level flight at 25,000 feet pressure altitude.
3. PROP levers - Set 1900 RPM.
4. Adjust the opposite engine to maintain 160 KIAS.
5. FAT - Determine and note.

6. Power setting - Read torque for the noted FAT from figure 6.
7. Set torque on engine being tested to the torque from figure 6.
8. Adjust opposite engine to maintain 175 KIAS.
9. Allow conditions to stabilize for one minute, then record the following for engine being tested.
   - (a) Pressure altitude.
   - (b) Propeller RPM.
   - (c) FAT.
   - (d) Torque.
   - (e) Fuel flow.
   - (f) KIAS.
   - (g) ITT.
   - (h) N_1.
10. Observed ITT should not exceed 780°C.
11. Repeat steps 3 through 10 for the other engine if required.

AVIONICS FLIGHT CHECKS

PROCEDURE	TROUBLESHOOTING REFERENCE
1. Autopilot - Check as follows:	
Observe that all channels operate positively and smoothly with no oscillation of any flight control.	
(a) Trim aircraft for straight and level flight.	
(b) AP/TRIM POWER switch - ON.	
(c) TURN control - Place in center (detent) position.	
(d) AP ENGAGE switch - Press to engage.	

PROCEDURE	TROUBLESHOOTING REFERENCE

AVIONICS FLIGHT CHECKS (CONT)

(e) Check autopilot heading preselection as follows:

(1) Autopilot HEADING selector knob (on pedestal extension) - Set test heading.

(2) HDG switch-indicator (flight director mode selector) - Press on.

(3) Aircraft should automatically turn and roll out on preselected heading.

(f) Check altitude control and selection as follows:

(1) Pitch thumbwheel (autopilot controller) - Move UP and DN while observing that aircraft and pitch trim indicator respond properly.

(g) Check autopilot VOR/ILS operation as follows:

(1) VOR receiver - Set.

(2) NAV pushbutton selector switch (EFIS control panel) - Depress to select VOR 1 or 2.

(3) NAV switch-indicator (flight director mode selector) - Depress on.

(4) When the aircraft is within 10 degrees of the selected radial, observe that the aircraft begins a gradual interception of the radial or glideslope signal.

PROCEDCURE	TROUBLESHOOTING REFERENCE

(h) Check autopilot altitude hold function as follows:

(1) Fly Aircraft to test altitude.

(2) ALT switch-indicator (flight director mode selector) - Press on.

(3) Verify that the aircraft maintains the altitude being flown at the time the ALT hold switch was pressed.

(i) Check autopilot indicated airspeed hold function as follows.

(1) Fly aircraft to test airspeed.

(2) IAS switch-indicator (flight director mode selector) - Press on.

(3) Aircraft should maintain airspeed that was being flown at the time IAS hold switch was pressed.

(j) Check roll command function of autopilot as follows:

(1) TURN control knob (autopilot controller) - Turn to L and R and verify that autopilot turns aircraft left or right respectively.

* 2. Slaved compass systems - Check that systems agree with known magnetic headings within ±2° and within 3° of each other.

* 3. Audio control panel and interphone system - Check as follows: **K1-2**

(a) Interphone functional check:

PROCEDURE	TROUBLESHOOTING REFERENCE

AVIONICS FLIGHT CHECKS (CONT)

(1) PILOT and COPILOT AUDIO monitor switches - OFF.

(2) AUDIO SPKR switch - On.

(3) HOT INTPH switch - On. This will allow checking operation of microphones by speaking into them.

(4) Microphones - Check operation by speaking into them. Speech should be heard over speaker and in other headset.

(5) Audio control panel VOL controls - Check for function and adjust.

(6) PILOT and COPILOT AUDIO monitor switches - Turn on one at a time and increase volume on appropriate receiver, listening for either radio reception or background noise then turn OFF.

(b) Transmitter selector switches (2) - Check as follows:

(1) Transmit and receive on each radio using all microphone switches one at a time.

* 4. AM/FM (VHF/UHF) transceiver - Check as follows: K-7

(a) On/off switch - Depress. Self test page will appear. When self test is complete the control display alpha page or the last display page shown before system shutdown will appear.

PROCEDURE	TROUBLESHOOTING REFERENCE
(b) MENU key - Depress.	
(c) Upper and lower soft keys - Depress as required to adjust display brightness.	
(d) CLR key - Depress.	
(e) Cursor movement control knob and cursor field value knob - Set required test frequencies.	
(f) Transmitter selector switch (audio control panel) - UHF.	
(g) Altitude - 1200 feet above ground level (AGL).	
(h) Fly aircraft to a point 35 nautical miles away from test station.	
(i) Communicate with test station when 20 miles away and again at 35 miles.	
(j) At 35 nautical miles, maintain communication with test station each 10” while flying a 360° flat turn (not to exceed 5° bank). Verify that communication is uniformly loud and clear through these tests.	
(k) Repeat procedure for frequencies in low, middle, and high ranges on both FM and AM.	
* 5. VHF radio set - Check as follows:	K8-9
(a) Altitude - 1000 feet AGL.	
(b) Transmitter selector switch (audio control panel) - VHF 1 or 2.	
(c) Frequency selector - Set desired frequency.	

PROCEDURE	TROUBLESHOOTING REFERENCE
AVIONICS FLIGHT CHECKS (CONT)	
(d) Fly aircraft to a point 40 nautical miles away from test station.	
(e) At 40 nautical miles, maintain communication with test station each 10° while flying a 360° flat turn (not to exceed 5° bank). Verify that communication is uniformly loud and clear through these tests.	
(f) Repeat procedure for frequencies in low, middle, and high ranges.	
* 6. HF radio set - Check as follows.	K10
(a) Transmitter selector switch (audio control panel) - HF.	
(b) Microphone switch - Press momentarily and wait for antenna coupler to tune. A 1000 Hz tone will be heard in the headphones until tuning is complete. Verify that tuning time does not exceed 30 seconds.	
(c) Establish communications with a ground station at least 150 miles distant on at least three frequencies (one each from the lower, middle, and upper frequency ranges). Establish two-way communications on AM and, when possible, on USB. Obtain signal quality reports from the other station and note received signal quality.	

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PROCEDURE	TROUBLESHOOTING REFERENCE

NOTE

The intelligibility of SSB voice operations becomes degraded when the receiver and transmitter differ in frequency by a small amount (approximately 50 Hz). The voice pitch will sound either too high or too low. The cause may be either the receiver or transmitter.

(d) Frequency accuracy - Check as follows:

(1) Station WWV - Select the frequency that provides the best signal. The station broadcasts on 2.5000, 5.0000, 10.0000, 15.0000, and 20.0000 MHz. The higher the frequency selected, the more accurate the frequency check will be.

NOTE

Do not key transmitter when set to WWV.

(2) Mode selector - USB.

(3) Listen to the time tick, tone, or voice announcements. The tone is preferable.

*7. Cockpit voice recorder - Check as follows:

(a) ERASE pushbutton - Depress for 4 seconds minimum.

(b) Headset - Listen for erasure tone. Erase function shah not work in flight.

***8.** ADF radio set - Check as follows: K14-16

(a) Power and mode switch - ADF.

PROCEDURE	TROUBLESHOOTING REFERENCE
AVIONICS FLIGHT CHECKS (CONT)	
(b) Tuning knobs - Set test frequency. Tune the ADF receiver to at least three frequencies as nearly equally spaced as possible throughout the frequency range of 200 to 1750 KHZ.	
(c) Single or double bearing pointer source selector switch (EFIS control panel) - ADF. Both single and double needle pointers on both the pilot's and copilot's EHSI should be functionally checked	
(d) Verify accuracy of ADF indications on pilot's and copilot's EFIS displays over a known ground reference point appoximately every 90° throughout 360°.	
* 9. Navigation receivers (VOR/localizer/ glideslope/marker beacon) - Check as follows:	K11-13,
(a) VOR receivers - Check each VOR receiver as follows:	
(1) NAV 1 AUDIO MONITOR control - On.	
(2) Power, volume, and squelch test control (VHF navigation receiver control unit) - On, adjust volume as required.	
(3) Tuning knobs - Set test frequency .	
(4) NAV pushbutton selector switch (EFIS control panel) - Depress to select VOR 1 or	

PROCEDURE	TROUBLESHOOTING REFERENCE

VOR 2 navigation source annunciator on respective HSI.

(5) Check the operational status and accuracy of the VOR receivers by one of the following methods:

a A VOT (VOR test facility). Maximum permissible bearing error is ±4°.

b A radiated test signal from an appropriately rated repair station. Maximum permissible bearing error is ±4°.

c A certified airborne check point. Maximum permissible bearing error is ±6°.

d Certified check points on an airport surface. Maximum permissible error is ±40°.

e Comparison of indications of dual aircraft VOR systems. The maximum permissible variation between the two indicated bearings is 4°.

(b) Localizer/glideslope/marker beacon - Check as follows:

(1) MKR BCN VOL control (audio control panel) - Rotate fully clockwise.

(2) NAV 1 or 2 AUDIO monitor switch - On. Verify that clear audio signals are available.

PROCEDURE	TROUBLESHOOTING REFERENCE

AVIONICS FLIGHT CHECKS (CONT)

(3) Tuning knobs (VOR control panel) - Select localizer frequency .

(4) NAV pushbutton selector switch (EFIS control panel) - Depress to select LOC 1 or LOC 2 navigation source annunciator on respective EHSI.

(5) Glideslope indicator (EADI and EHSI) - Read glideslope indications.

(6) Fly an ILS approach monitoring localizer and glideslope indications and marker beacon indicator lights and audio tone for proper function.

(7) Each localizer and glideslope receiver shall provide positive indications with no glideslope or localizer display oscillations occurring from the outer marker to the approach end of the runway.

(8) Verify that marker beacon can be received for a distance of not less than one mile, when in horizontal flight over the ground station cone of silence marker at 10,000 feet above ground level.

(9) Check marker beacon sensitivity switch function as follows:

PROCEDURE	TROUBLESHOOTING REFERENCE

a MKR BCN sensitivity switch (audio control panel) - HI.

b Fly toward marker beacon station. When marker beacon indicator light illuminates and audio tone sounds, set sensitivity switch to LO. Observe that marker beacon indicator light and audio tone cease.

c Continue to fly toward station. Verify that marker beacon indicator light again illuminates and audio tone sounds.

10. TACAN - Check as follows:

(a) NAV 2 AUDIO monitor switch (audio control panel) - On.

(b) Frequency selectors (TACAN control panel) - Set test frequency.

(c) Volume control (NAV/TAC control panel) - As required.

(1) NAV pushbutton selector switch (EFIS control panel) - Depress to select TCN navigation source annunciator on respective EHSI .

(d) Fly directly toward a TACAN station of known direction and near enough to provide a reliable signal.

(e) Set direction to station on course indicator (EHSI) using remote course knob (pedestal extension).

PROCEDURE	TROUBLESHOOTING REFERENCE
AVIONICS FLIGHT CHECKS (CONT)	
Verify that course deviation bar is nearly centered and the lo/from indicator reads to.	
(f) Set reciprocal of direction to station on course indicator (EHSI) using remote course knob (pedestal extension). Observe that course deviation bar is nearly centered and the to/from indicator reads from.	
(g) Set direction to station again on course indicator (EHSI) using remote course knob (pedestal extension). Observe that course deviation bar is nearly centered and the to/from indicator reads to.	
(h) Fly a 90° right turn such that the flight path is at a 90° angle to the direction to the station. Observe that the course deviation indicator needle deflects noticeably to the left after one or two miles of flight (assuming the station is 25 to 50 miles from the aircraft).	
(i) TACAN range test - Achieve adequate usable reception at 45 miles at 1,250 feet above station antenna altitude.	
(j) TACAN ground-track accuracy test - Fly aircraft over a predetermined ground check point. The maximum error is ±3%.	
* (k) TACAN distance measuring equipment - Check against known distances (on the ground if possible) using known check-	

PROCEDURE	TROUBLESHOOTING REFERENCE
points. Verify that TACAN distance accuracy is within 2% of known distances.	
11. Flight management system - Check as follows:	
* 12. Flight management system - Check as follows: system using the GPS sensor by positioning aircraft on or over a known check point and comparing indicated location with known location.	
(a) Flight management system - Set up and operate in accordance with TM 1-1510-225-10 using the GPS sensor.	
(b) Coordinates or identifier of checkpoint - Insert into FMS.	
(c) Position aircraft on a ground check point if possible or fly over checkpoint.	
(d) Record the distance from the location provided by the FMS to the location of the known checkpoint. Maximum permissible error is 0.124 nautical miles (750 feet).	
* 13. Transponder set - Check as follows:	K21
(a) MASTER control - STBY (allow 2 minute warm up).	
(b) MASTER control - NORM.	
(c) Mode switches - Set test mode.	
(d) Code selectors - Set test code.	
(e) Fly aircraft within line of sight of interrogating stations.	

PROCEDURE	TROUBLESHOOTING REFERENCE

AVIONICS FLIGHT CHECKS (CONT)

(f) Contact the facility by radio and request that the aircraft be interrogated and that the reply be checked for satisfactory response.

*14. Encoding altimeter - Check as follows:

(a) Mode C switch (transponder control panel) - ON.

(b) Contact ground radar facility and request facility altitude readout. Observe that ground facility altitude readout agrees with aircraft altitude within ±200 feet.

*15. Radar set - Check while airborne as follows: K17-20

NOTE

Critical functions in the receiver/transmitter/antenna are continuously monitored.

(a) Radar system mode selector switch - ON.

(b) Radar receiver GAIN control - Preset (pushed in) position.

(c) Wx pushbutton mode selector switch - Depress.

(d) Range switches - Select 40 or 80 nautical mile range.

(e) TILT control - Adjust down until entire display is filled with ground returns.

(f) TILT control - Slowly raise antenna so that ground returns are pointed on about the outer one third of the indicator area.

PROCEDURE	TROUBLESHOOTING REFERENCE

(g) Range switches - As required. Satisfactory operation of the weather radar shall be verified using all sweep ranges.

(h) TILT control - Move up or down to observe targets above or below aircraft. Verify that echo displays change in shape and location only and that weather targets do not not change shape or location. Ground targets will not change shape or location. Ground targets are selected as a function of tilt.

(i) Antenna stabilization check:

(1) Fly to an altitude above 10,000 feet AGL.

(2) GND MAP pushbutton selector switch - Depress to select MAP mode.

(3) Range switches - Select 20 miles.

(4) GAIN control - Maximum.

(5) TILT control - Pull out to disable stabilization. STAR OFF should appear in upper left comer of display.

(6) While flying level (0” pitch, 0° roll), adjust TILT control to obtain a video pattern throughout the upper range marks. Note TILT control setting. If the inner ring of video is not parallel to the range mark, the error is caused by mechanical displacement of the antenna about the roll axis of the aircraft. Use TILT con-

PROCEDURE	TROUBLESHOOTING REFERENCE

AVIONICS FLIGHT CHECKS (CONT)

trol to determine exact error. Correct on ground, if necessary, before further in-flight calibration.

(7) TILT control - Push in to restore stabilization.

(8) Verify that pattern does not change. If the pattern shifts either left or right, ground check leveling of the gyro and accuracy of the horizon indicator. Use TILT control to find exact error.

(9) Roll the aircraft 20° right. For perfect stabilization, the pattern should not shift.

(10) If the terrain band shifts to the right around the second range marks, increase tilt angle using TILT control until pattern is displayed throughout the third range marks. Note new position of TILT control. Verify that tilt is no more than two degrees above that noted in step (5).

(11) If the terrain band shifts (in step 8) to the left around the second range marks, decrease tilt angle using TILT control until pattern is displayed throughout the third range marks. Note new position of TILT control. Verify that tilt is no more than two degrees below that noted in step (5).

PROCEDURE	TROUBLESHOOTING REFERENCE
(12) If the differences between steps (10) and (5) or steps (9) and (5) are greater than two degrees, recalibrate roll stabilization circuitry to the gyro using the following procedure:	

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

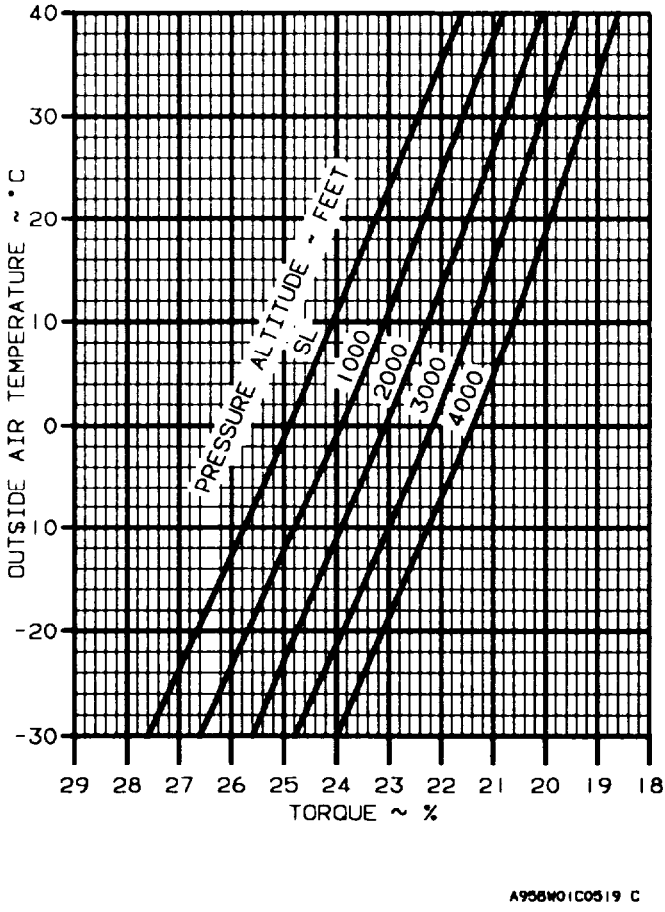

Figure 1. Propeller Low Pitch Stop

CONFIGURATION	POWER	TRIM SPEED	STALL SPEED	WARNING SPEED
Gear & Flaps Down	Idle	114 KIAS	65-73 KIAS	81-75 KIAS
Gear & Flaps Down	On	114 KIAS	----	71-65 KIAS
Gear & Flaps Up	Idle	145 KIAS	90-98 KIAS	114-108 KIAS
Gear & Flaps Up	On	145 KIAS	----	103-97 KIAS

NOTE

These speeds are based on an aircraft weight of 11,300 lbs. In all stalls, the stall warning horn shall sound at no more than twelve and no less than four knots above the initial stall buffet.

BT05568

Figure 2. Stall Speeds

PRESSURE ALTITUDE	KIAS
18,000	247
17,000	251
16,000	257
15,000 and Below	260

BT05569

Figure 3. Airspeeds for Vmo Dive

PT6A-42 MODEL C-12R			
MAXIMUM CRUISE SPEED AND POWER 12,200 LB - 16,000 FT - 1800 RPM			
IFAT °C	TORQUE %	FUEL PPH	KIAS
16	86	361	205
14	87	365	207
12	89	369	208
10	90	372	210
8	91	376	211
6	92	380	212
4	94	386	214
2	95	389	216
0	96	393	217
-2	97	397	218
-4	98	400	220
-6	99	404	221
-8	100	407	222
-10	100	407	222
-12	100	407	223
-14	100	407	223
-16	100	407	224
-18	100	407	224
-20	100	407	224
-22	100	407	224
-24	100	407	225
-26	100	407	225
-28	100	406	226
-30	100	406	226
-32	100	406	227
-34	100	405	227
-36	100	405	227
-38	100	405	228
-40	100	405	228
NO TESTING ALLOWED ABOVE 780°C ITT			

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Figure 4. Maximum Cruise Speed and Power {Sheet 1 of 2)

PT6A-42 MODEL C-12R			
MAXIMUM CRUISE SPEED AND POWER 12,200 LB - 25,000 FT - 1800 RPM			
IFAT °C	TORQUE %	FUEL PPH	KIAS
16	--	--	--
14	--	--	--
12	--	--	--
10	--	--	--
8	--	--	--
6	--	--	--
4	68	278	173
2	68	280	174
0	69	283	175
-2	70	285	176
-4	71	289	178
-6	72	291	179
- 8	72	294	180
-10	73	296	181
-12	74	298	182
-14	74	300	183
-16	75	302	184
-18	75	305	185
-20	76	307	187
-22	77	310	188
-24	78	312	189
-26	78	315	190
-28	79	317	191
-30	80	320	193
-32	81	323	194
-34	82	326	195
-36	83	328	196
-38	83	331	197
-40	84	333	198
NO TESTING ALLOWED ABOVE 780°C ITT			

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Figure 4. Maximum Cruise Speed and Power (Sheet 2 of 2)

PT6A-42 MODEL C-12R		
MAXIMUM CONTINUOUS POWER 16,000 FT - 2000 RPM - 160 KIAS		
IFAT °C	TORQUE %	FUEL PPH
16	72	347
14	73	351
12	74	354
10	75	358
8	76	361
6	77	365
4	78	368
2	78	371
0	79	374
-2	80	378
-4	81	381
-6	82	383
-8	82	386
-10	83	389
-12	84	392
-14	84	395
-16	85	398
-18	86	401
-20	87	404
-22	87	407
-24	88	410
-26	89	414
-28	90	417
-30	90	420
-32	91	424
-34	92	427
-36	93	430
-38	94	433
-40	95	437
* NO TESTING ALLOWED ABOVE 780°C ITT		

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Figure 5. Maximum Continuous Power

PT6A-42 MODEL C-12R		
MAXIMUM CRUISE POWER 25,000 FT - 1900 RPM - 175 KIAS		
IFAT °C	TORQUE %	FUEL PPH
16	61	266
14	62	268
12	62	270
10	63	272
8	63	274
6	64	276
4	65	278
2	65	280
0	66	283
-2	66	285
-4	67	287
-6	67	289
-8	68	291
-10	68	293
-12	69	294
-14	69	296
-16	70	298
-18	70	299
-20	70	301
-22	71	303
-24	71	305
-26	72	307
-28	73	309
-30	73	311
-32	74	313
-34	74	316
-36	75	318
-38	75	320
-40	76	322
NO TESTING ALLOWED ABOVE 780°C ITT		

Figure 6. Maximum Cruise Power

C-12R MAINTENANCE TEST FLIGHT CHECK SHEET		
PURPOSE OF MTF	FAT	DATE
PILOT	UNIT	
SYMBOLS: √ = SATISFACTORY, X = DEFICIENCY		

	PRIOR TO MTF		a. AC frequency _____ Hz
	1. Forms and records		b. AC voltage _____
	2. Weight and balance		c. DC voltage _____
	3. Flight readiness inspection		DURING TAXIING
	4. Oxygen		1. Brakes
	5. Standby pumps and firewall valves		2. Flight instruments
	6. Fuel quantity indicators		3. Nosewheel steering
	7. Pitot tubes (2), stall warning vane, heated fuel vents (2), TAS temperature probe		4. Magnetic compass
			ENGINE RUNUP
	8. Lights		1. Parking brake
	9. Hydraulic fluid level sensor		2. Low idle speed
	10. Engine fire detection		3. Propeller feathering
	11. Engine fire extinguisher		4. Engine acceleration to high idle
	12. Stall and gear warning		5. High idle speed
	13. Flaps		6. N_1 speed switch
	14. Seat belts		7. Pneumatics/vacuum/pressurization
	15. Toilet		8. Rudder boost
	16. Emergency equipment		9. Autofeather/auto ignition
	17. Placards and markings		10. Overspeed governors
	18. Trim tabs		11. Primary governors
	19. Flight controls		12. Low pitch stop
	INTERIOR CHECK		13. Engine Anti-Ice
	1. Cabin/cargo doors		14. Weather radar
	2. Emergency exit		15. Flight control system
	BEFORE STARTING ENGINES		16. EFIS
	1. Pilot's flight instruments		17. GPAAS
	2. Engine instruments		18. Anti-ice/deice
	3. Magnetic compass		DURING TAKEOFF
	4. Free air temperature gage		1. Propeller tachometers L _____ RPM, R _____ RPM
	5. Copilot's flight instruments		2. Torque L _____%, R _____ %
	6. DC power, _____ VDC		3. ITT, L _____ °C, R _____ °C
	7. Annunciator panels		4. N_1 L _____ %, R _____ %
	SECOND ENGINE START		5. Oil pressure, L _____ PSI, R _____ PSI
	1. AC/DC power		6. Oil temperature, L _____°C, R _____ °C

Figure 7. Maintenance Test Flight Checksheet (Sheet 1 of 3)

	CLIMB
	1. Wings and center section
	2. Engine and flight instruments
	3. Engine control levers
	4. Vertical speed indicators
	5. Surface deice
	6. Propeller deice
	7. Windshield anti-ice
	8. Cabin and cockpit ventilation
	9. Air conditioning and heating
	CRUISE
	1. Engine instrument indications
	2. Wings and nacelles
	3. Cabin noise level
	4. Pilot's alternate static air source
	5. Propeller synchrophaser
	6. Ice vanes
	7. Turn and bank indicators
	LOW SPEED SYSTEMS
	1. Flap operation
	a. Flap retraction time _____ seconds
	b. Flap extension time _____ seconds
	2. Stall speed, stall warning, and stall characteristics (clean, power off), KIAS at warning _____, KIAS at stall _____, roll _____ °L or R
	3. Stall speed, stall warning, and stall characteristics (clean, power on), KIAS at warning _____, KIAS at stall _____, roll _____ °L or R
	4. Stall speed, stall warning, and stall characteristics (gear down, flaps down, power off), KIAS at warning _____, KIAS at stall _____, roll _____ °L or R
	5. Stall speed, stall warning, and stall characteristics (gear down, flaps down, power on), KIAS at warning _____, KIAS at stall_____, roll _____ °L or R
	6. Autoignition
	7. Propeller feathering
	8. Propeller autofeathering time from fuel cutoff to rotation stop L _____ seconds, R _____ seconds
	9. Propeller unfeathering time from propeller lever full forward to 1000 RPM L _____ seconds, R _____ seconds
	10. Landing gear warning horn, N_1 on first hearing horn L _____ %, R _____ %
	13. Landing gear normal operation
	a. Landing gear extension time _____ seconds
	b. Landing gear retraction time _____ seconds
	11. Emergency landing gear extension
	DESCENT AND LOW LEVEL CRUISE
	1. Maximum rate (V_{mo}) descent
	a. Flight controls
	b. Windows and doors
	2. Excess nose down trim
	LANDING
	1. Brake operation
	2. Propeller reversing, L _____ % N_1, R _____ % N_1
	3. Oil temperature, L _____ °C, R _____ °C
	4. Oil pressure, L _____ PSI, R _____ PSI
	ENGINE SHUTDOWN
	1. Battery condition
	BEFORE LEAVING AIRCRAFT
	1. Walkaround inspection
	2. Aircraft forms
	SPECIAL PROCEDURES
	1. Pressurization
	2. Trim and rigging
	3. Maximum ITT/N_1 availability
	4. Speed performance at maximum cruise power
	a. Engine serial number, L _____, R _____
	b. Engine hours since new, L _____, R _____
	c. Engine hours since overhaul, L _____, R _____
	d. Pressure altitude, _____ feet
	e. Propeller RPM, L _____, R _____
	f. FAT _____ °C
	g. Torque, L _____ %, R _____ %

Figure 7. Maintenance Test Flight Checksheet (Sheet 2 of 3)

	h. Fuel flow, L ______ PPH, R ______ PPH
	i. KIAS ______
	j, ITT, L ______ °C, R ______ °C
	k. N_1, L ______ %, R ______ %
5.	Engine performance at maximum continuous power
	a. Engine serial number, L ______, R ______
	b. Engine hours since new, L ______, R ______
	c. Engine hours since overhaul, L ______, R ______
	d. Pressure altitude, ______ feet
	e. Propeller RPM, L ______ R ______
	f. FAT ______ °C
	g. Torque, L ______ %, R ______ %
	h. Fuel flow, L ______ PPH, R ______ PPH
	j. KIAS ______
	j. ITT, L ______ °C, R ______ °C
	k. N_1, L ______ %, R ______ %
6.	Engine performance at maximum cruise power
	a. Engine serial number, L ______, R ______
	b. Engine hours since new, L ______, R ______
	c. Engine hours since overhaul, L ______, R ______
	d. Pressure altitude, ______ feet
	e. Propeller RPM, L ______, R ______
	f. FAT ______ °C
	g. Torque, L ______ %, R ______ %
	h. Fuel flow, L ______ PPH, R ______ PPH
	i. KIAS ______
	j. ITT, L ______ °C, R ______ °C
	k. N_1, L ______ %, R ______ %
7.	Autopilot
8.	Slaved compass
9.	Audio control panel and interphone

	10. AM/FM (VHF/UHF)
	11. VHF
	12. HF
	13. Cockpit voice recorder
	14. ADF
	15. VOR/Localizer/glideslope/marker beacon
	16. TACAN
	17. TACAN distance measuring equipment
	18. Flight Management System
	19. Transponder
	20. Encoding altimeter
	21. Radar
	REMARKS

BT0558

Figure 7. Maintenance Test Flight Checksheet (Sheet 3 of 3)

By Order of the Secretary of the Army:

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

Official:

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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 = 3280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain

1 decigram = 10 centigrams = 1.54 grains

1 gram = 10 decigrams = .035 ounce

1 dekagram = 10 grams = .35 ounce

1 hectogram = 10 dekagrams = 3.52 ounces

1 kilogram = 10 hectograms=2.2 pounds

1 quintal = 100 kilograms = 220.46 pounds

1 metric ton = 10 quintals: 1.1 short tons

Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounces

1 deciliter = 10 centiliters = 3.38 fl. ounces

1 liter = 10 deciliters = 33.81 fl. ounces

1 dekalfter = 10 liters = 2.64 gallons

1 hectoliter = 10 dekaltters = 28.42 gallons

1 kiloliter = 10 hectoliters = 264.18 gallons

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