

*M. Sullivan*

# TROUBLE SHOOTING GUIDE C118



Prepared By:

**SIMULATOR TRAINING BRANCH**



This trouble shooting guide is a supplemental reference which you may retain permanently. The trouble shooting techniques suggested are not directive in nature but have been proven effective through years of study and experience.

Remember that technical orders and other official directives supercede the data in this guide when the information contained herein conflicts.

AFLC-WPAFB-FEB 74 300

I N D E X

	Page
Introduction.....	1
Index.....	2
Chapter 1. Electrical.....	3 - 5
2. Instruments.....	6 - 7
3. Communications.....	8 - 10
4. Engines.....	11 - 14
5. Propellers.....	15 - 17
6. ADI.....	18 - 19
7. Hydraulics.....	20 - 21
8. Heating and Venilation.....	22 - 24
9. Pressurization.....	25 - 26
10. Anti-Icing.....	27 - 28
11. Fuel System.....	29

## ELECTRICAL

1. CIRCUIT BREAKERS: Most of the circuit breakers on the airplane are the "TRIP-FREE" type. That is, they will open the circuit if a fault exists, even though the circuit breaker switch handle is held in the "ON" position. Certain circuit breakers, however, are "NON TRIP-FREE", and permit the circuit to be held closed (regardless of the overload), when the switch handle is held in the "ON" position. On some aircraft the "NON TRIP-FREE" circuit breaker switch handles are painted red for identification. The "TRIP-FREE" circuit breakers have three positions: "ON", "TRIPPED", and "OFF" or "RESET". To reset this type, after tripping, the switch handle must first be positioned to "OFF" or "RESET" before returning "ON" position.

NOTE: Anytime an electrically operated circuit does not function, check and/or reset the circuit protection.

### 2. D.C. AMMETER SHOWS NO AMPS - VOLTAGE OK.:

a. Turn bad generator switch OFF and note if amperage increases on good generators. If so, trouble is in ammeter circuit.

(1) Check ammeter fuses in the main electrical junction box.

(2) Check connections on ammeter circuit wiring in main electrical junction box.

b. In making the foregoing check, if amperage did not increase on good generator ammeters:

(1) Turn off one or more of the operating generators. If bad generators then show charge, wait several minutes, then turn all generators on and check amperage paralleling.

(2) If generators fail to parallel within limits, turn high generator OFF. If electrical load requires use of all operating generators, the voltage regulators may be adjusted in flight. Paralleling in flight, however, seldom can be accomplished successfully due to inaccuracy of the voltmeter. It should be attempted only if electrical load makes it essential.

c. If foregoing checks do not restore generator operation:

(1) Turn generator switch - OFF.

(2) Trip generator field circuit breaker.

(3) Limit DC electrical load, as necessary.

3. "0" AMPS "0" VOLTS:

NOTE: This problem is usually associated with a "Sheared" Shaft of the generator. However, the following checks can be made to ascertain condition of circuit.

a. Make checks (1) and (2) of preceding trouble shooting procedure.

b. Turn faulty generator switch "OFF". If the other ammeters pick up the load the indicating circuit is malfunctioning. If the ammeter does not pick up the load, turn off the generator per paragraph 2(c).

4. GENERATORS OUT OF PARALLEL:

a. If D.C. load requirement permits, turn generator with highest amps - OFF.

b. Adjust voltage regulator to 28 volts.

5. AMPERAGE TOO HIGH ON ALL GENERATORS:

a. Check batteries by turning master switch OFF and check amperage drop. If excessive, leave switch OFF and replace batteries upon landing.

b. Turn off all unnecessary electrical equipment.

6. VOLTAGE HIGH ON ALL GENERATORS:

a. Check voltage regulator for overheat.

b. Drop the voltage regulator compartment door. Down to latch position.

c. Check air flow from cooling turbine. If little or no air flow, leave compartment door all the way down.

7. CIRCUIT BREAKER TRIPPED - EMERGENCY OPERATION OF CIRCUIT NECESSARY:

a. If circuit is not required, do not reset.

b. If circuit is absolutely required:

(1) Reset circuit breaker.

(2) If C.B. trips immediately thereafter hold C.B. in for short periods of time (5 seconds MAX) and operate equipment during this period. Allow one (1) minute cooling period and hold C.B. in again for 5 seconds maximum.

NOTE: The above procedure is for emergency conditions only using non TRIP-FREE circuit breakers - such as changing prop RPM, etc. This procedure may lead to extensive damage of the equipment.

#### 8. INVERTER CIRCUIT:

a. Inverter warning light "ON" - If conditions permit, check inverter voltage. If "0" volts on both "A" and "C" phase, check Inverter Control and input C/B. (Note: Inverter Control C/B tripped will also render Standby Inverter inoperative.

b. If voltage check indicates "0" volts on either "A" or "C" phase and 115 volts on ~~inverter~~ <sup>inverter</sup> phase. The phase output C/B behind the pilot has probably tripped. Reset as necessary.

NOTE: Anytime an inverter C.B trips, serious consideration should be given to operating without that inverter, if feasible. If Standby circuit provides requirements, use it.

#### 9. FAILURE OF 500A CURRENT LIMITER CONNECTING PRIMARY AND SECONDARY BUSS:

a. Under "Lighted Conditions". This would be indicated by all D.C. operated instruments going to "off scale" cold and auto pilot going off.

b. Under "Night Conditions". Turn Emergency Inverter - ON. (for lighting only). Note: D.C. operated instruments will be "off scale" cold; Auto pilot - inoperative.

c. Turn D.C. generators and battery switch - off, before changing current limiter.

## INSTRUMENT SYSTEMS

1. ANY INSTRUMENT MALFUNCTION: As a rule, first determine whether a faulty instrument operates with 28 volts D.C., inverter A.C. voltage, or is self-energized. Self-energized, direct reading instruments such as manifold pressure and supercharger airflow instruments cannot be investigated in flight. 28 volt D.C. and 26V-115V A.C. instruments should be checked by circuit breaker, fuses, voltmeter, ammeter switch position, or system operation.

2. PILOT'S OR CO-PILOT'S GYRO HORIZON:

a. Check inverter voltage on 115 volt - 400 cycles A.C. positions.

b. Check small pip in flight instrument for operation.

c. Check flight instrument fuses. (RT. hand annex.)

3. TURN AND BANK:

a. Check bus voltage - 28 volts D.C.

b. Check circuit breakers.

c. Check if instrument works using emergency inverter.

4. AIRSPPEED - ALTIMETER - RATE OF CLIMB: (ERRATIC INDICATIONS: OR PILOT'S INSTRUMENTS READ LOWER THAN CO-PILOT'S, OR VICE VERSA:)

a. Maintain constant attitude by reference to gyro horizon.

b. Turn auto-pilot altitude control switch OFF.

c. Check pitot heat switch-on and check amperage.

d. Attempt to determine whether error is in pilot's or co-pilot's system.

e. Turn static selector switch to alternate source on side where error is suspected. Do not switch both sides to alternate at the same time. (Insure auto pilot altitude hold is off.)

f. If condition not corrected on alternate static source, vary cabin pressure. If instrument readings vary with change in cabin pressure, there is a leak in the static lines (increase in cabin pressure will cause airspeed and altimeter to read lower than normal). Operating unpressurized will minimize the effects of such a leak.

5. ENGINE INSTRUMENT GROUP (A.C.):

- a. Check engine instrument transformer voltage. (26V)
- b. Check respective circuit fuse. One fuse for each engine covers oil pressure, fuel pressure, fuel flow, BMEP, ADI pressure, and cabin supercharger oil pressure. (RT. Hand Annex.)

6. TEMPERATURE GAUGES: (Carburetor air, Engine oil, Cabin supercharger oil.)

- a. Check bus voltage 28 volts D.C.
- b. Check respective circuit breaker.

7. HYDRAULIC - ALCOHOL AND ADI QUANTITY GAUGES:

- a. Check bus voltage - 28 volts D.C.
- b. Check respective circuit breaker.

8. HEATER TEMPERATURE GAUGES: No corrective action possible in flight.

9. MANIFOLD PRESSURE GAUGE ERRATIC: Retard throttle to reduce manifold pressure below cabin pressure, and operate manifold pressure purge valve for several seconds.

## COMMUNICATIONS

### 1. NO RECEPTION ON ANY CIRCUIT - ALL CREW POSITIONS:

- a. Check DC voltage.
- b. Check master radio circuit breakers - ON.
- c. Check circuit breakers on main and rear radio racks - ON.

NOTE: In 53 series aircraft, there are two separate interphone circuit breakers on the main radio rack; one for pilot and navigator station and one for the co-pilot and auxiliary stations.

In 51 series aircraft, there are three interphone circuit breakers on the radio rack. Insure that the AM-300 switch located on the forward cargo door is ON. (Normally safetied - ON.)

### 2. NO RECEPTION ON ANY CIRCUIT - ONE CREW POSITION:

- a. Check headset and connection.
- b. "Normal - Aux listen" switch on "Aux Listen". Toggle switch for desired receiver ON. All other OFF.

NOTE: On 53 series aircraft, microphone will be inoperative with switch in Aux Listen position.

### 3. NO VHF TRANSMISSION OR RECEPTION: Check circuit breaker - main radio rack.

### 4. NO VHF TRANSMISSION, RECEPTION NORMAL:

- a. Check microphone selector switch on jackbox - in proper detent.
- b. Check UHF - VHF selector switch on pedestal - 51 series only.
- c. Check dynamotor operation while the microphone is keyed. On 51 series the VHF dynamotors are on the radio rack. On 53 series they are in a box at floor level forward of the crew entrance door. The larger of the two dynamotors is for the transmitter.
- d. Check  $\frac{1}{2}$  amp fuse next to dynamotor. The fuse is in the output circuit and the dynamotor will run even with the fuse blown.

5. NO VHF RECEPTION, TRANSMITTER NORMAL:

a. Jackbox VHF toggle switch ON. (On 53 series reception is obtained regardless of toggle switch if the microphone selector switch is positioned to the facility desired. On 51 series, the respective listen switch must be ON.)

b. Check reception on a different frequency.

c. If 5b above indicated set is not working, check that the receiver dynamotor is running. This is located next to the transmitter dynamotor. (See 4c above.)

d. Check  $\frac{1}{2}$  amp fuse next to dynamotor (blown fuse does not prevent dynamotor from running).

e. If b above indicates only one channel is giving trouble, check reading on indicator wheel on front of receiver unit. If it does not read within  $\pm 3$  mhz of the desired frequency, the thumbwheel for the bank being used is not properly set. Turn thumbwheel higher or lower as appropriate. (Set may channel to end of scale when thumbwheel is moved.) Reselect channel and check indicator wheel.

f. Use VOR receiver if necessary.

6. HF TRANSMITTER - RECEIVER:

a. Check circuit breaker on main radio rack.

b. Check fuse on box on radio rack.

7. UHF TRANSMITTER - RECEIVER: (Note: ALLOW A ONE-MINUTE WARM-UP PERIOD BEFORE ATTEMPTING TO TRANSMIT.)

a. 51 series.

(1) Check UHF selector switch on pedestal.

(2) Check circuit breaker - aux radio rack.

(3) See that frequencies change in window as new channels are selected from pilot's position. If not, change "Local - remote" switch to "Local" and attempt frequency selection at the transmitter/receiver.

b. 53 series.

(1) Check circuit breaker - aux radio rack.

(2) Select manual position and set in desired frequency. If this works, reset frequency in appropriate channel.

8. TACAN:

- a. Check radar inverter voltage and frequency.
- b. Check switch on transmit-receive position.
- c. Check ARN-21 circuit breaker on main radio circuit breaker panel.
- d. Check fuse in radio fuse box.

NOTE: Warmup period for TACAN is approximately 90 seconds. No indications will be received during this time. ARN-21 A, B, C, or D models must be warmed up in the "Receive " position. All later sets may be warmed up in either "Receive " or T/R".

9. VOR RECEIVER:

- a. Check audio reception on various frequencies.
- b. If no results, check VHF-NAV circuit breaker on aux radio rack.
- c. If audio signal is heard check VOR-TACAN selector switch.

NOTE: If ACFT is modified this part does not apply.

- d. If Course Indicator needle sticks in full deflection, tap instrument lightly.

10. GLIDE SLOPE RECEIVER:

- a. Check glide slope circuit breaker on radio circuit breaker panel.
- b. Check glide slope circuit breaker fuse on radio fuse panel.
- c. If needle sticks in full deflection, tap instrument lightly.

NOTE: When receiver is tuned from a VOR or an ILS frequency, a warmup period of a few seconds is required before a glide path indication is received.

11. PA SYSTEM (TOO HIGH OR SQUEALING): Adjust the right - or forward - adjusting crew on the amplifier (lower shelf of radio rack).

## ENGINES

### 1. ENGINE WILL NOT TURN:

a. Check and reselect engine selector switch and check DC voltage.

b. Check for voltmeter deflection when depressing starter switch, listen for vibrator operation when depressing boost switch. If vibrator noise is not heard, check "start-prime induction vibrator" circuit breaker.

c. Check 200 Amp starter current limiter with prop deicer manual switch and ammeter. If 200 Amp current limiter does not check out, check 500 Amp current limiter by momentarily depressing feathering button and check for generator amperage drop, check prop deicer ammeter for amperage load.

d. If the "start-prime induction vibrator" circuit breaker, the 200 and 500 Amp current limiters are operational, this is indicative of a malfunctioning engine starter or starter relay.

### 2. ENGINE TURNS BUT WILL NOT START:

a. Check ignition switch and listen for vibrator operation when depressing boost switch.

b. Check fuel boost pump and boost pump control circuit breakers - check for fuel pressure.

c. Check fuel pressure fluctuation when primer is operated.

d. Move mixture momentarily out of idle cut-off with prop turning and check for fuel flow through blower drain.

### 3. ENGINE STOPS ABRUPTLY DURING CRANKING:

a. Stop cranking immediately - hydraulic<sup>locking</sup> indicated - check ignition OFF.

b. Have maintenance personnel remove spark plugs from lower cylinders and drain fluid.

### 4. LOW OR NO OIL PRESSURE AFTER STARTING:

a. Turn of ADI pump and check for ADI light and pressure. (25 PSI oil pressure required to complete circuit to ADI pump.) If oil pressure is less than 25 PSI, shut down engine and have cause investigated.

- b. Check instrument switch and transformer voltage (26V A.C.).
- c. Check firewall selector valve handle full in.
- d. Turn off all fuel and oil isolation light switches except for engine in question. If oil pressure warning light is not illuminated, this indicates that engine oil pressure is 45 to 55 PSI.
- e. If the aforementioned procedures fail to indicate that it is definitely a lack of engine oil pressure rather than instrument failure, secure engine.

5. OIL PRESSURE LOW OR ZERO IN FLIGHT:

- a. Check oil temperature.
- b. Check warning light bulb and circuit breaker.
- c. If oil pressure warning light is on, shut down engine immediately.
- d. If warning light is off, shift engine blower to opposite position - if blower does not shift, shut down engine immediately. If blower shifts, oil pressure is at least 40 PSI - check engine visually.
- e. Check engine instrument voltage (AC) and fuse (with blown fuse fuel pressure, fuel flow and BMEP gauges for the same engine will be inoperative).
- f. If no correction, recommend engine be shut down. If continued operation is required, operate at reduced power - monitor oil temperature and quantity.

6. EXCESSIVE OIL CONSUMPTION:

- a. Check engine, nacelle and exhaust. If heavy smoke and/or excessive oil is evident, shut down engine immediately.
- b. If engine appears normal, operation may be continued until oil quantity drops to 35 pounds. Monitor oil pressure, temperature and quantity. (NOTE: Oil consumption during the first hour of engine operation following oil dilution will ~~appear~~ to be abnormally high because of evaporation of fuel from the oil.)
- c. Check quantity gauge operation by transferring for a short period and checking rise in gauge reading.
- d. Reduce RPM as soon as possible.

7. LOW MANIFOLD PRESSURE:

a. On Ground:

(1) Purge manifold lines (below barometric manifold pressure).

(2) Set throttles of 3 normal engines to 30" HG - align throttle of faulty engine with other throttles, then compare RPM, manifold pressure and BMEP with other engines.

(3) Shift all engine blowers to opposite position.

(4) If all readings are then approximately equal, engine has slipping blower clutch - check with Maintenance.

b. In-Flight:

(1) Make analyzer check for "no combustion" pattern caused by an induction leak. This could indicate an intake pipe disconnected.

(2) If manifold pressure goes to approximately atmospheric pressure, BMEP is normal, pressure line to gauge is probably broken or disconnected. Reading will not change when throttle is retarded. If BMEP is low, shift to opposite blower position. If this corrects trouble, engine blower was slipping in the opposite blower position. Do not shift back. (If in Hi-Blower position, observe limits.)

8. ENGINE ROUGH OR BACKFIRING:

a. On Ground:

(1) Check analyzer for fouled plugs.

(2) Use spark plug defouling procedures. (In section seven of Dash One.)

b. Take-Off:

(1) Engine rough or backfiring, power loss or failure of two or more engines.

(2) Turn ADI switches OFF and reduce to dry power. ADI may be contaminated.

c. In-Flight:

(1) Mixture - AUTO RICH.

(2) Reduce power to approximately 80 BMEP (for severe roughness).

(3) Check temperatures, fuel pressure, fuel flow.

(4) Make engine analyzer check - scan engine.

(5) If possible, operate engine at reduced power - AUTO RICH and apply carburetor preheat for several minutes. Extremely low OAT may necessitate continued use of carburetor heat for fuel vaporization.

(6) If trouble cannot be corrected, or engine operated improperly at reduced power, shut down engine.

9. HIGH OIL TEMPERATURE:

a. Check oil pressure for normal limits.

b. Check oil cooler control circuit breaker.

c. Open oil cooler door manually. If this restores oil temperature to normal, operate oil cooler door manually for remainder of flight.

d. If OAT is very low, congealed oil in the oil radiator is preventing proper flow. Close oil cooler door manually and allow oil in the radiator to warm up. If oil temperature decreases, continue manual control, returning to automatic when OAT permits.

e. If condition still exists, reduce engine power to hold oil pressure and temperature within operating limits. If unable to do so, shut down engine.

10. LOW OIL TEMPERATURE:

a. Check oil pressure for normal limits.

b. Check oil cooler control circuit breaker.

c. Close oil cooler door manually. If this restores oil temperature to normal, operate oil cooler door manually for remainder of flight.

## PROPELLERS

### 1. TOGGLE SWITCHES INOPERATIVE:

- a. Check propeller "MANUAL" circuit breaker.
- b. No further action possible in flight. (Use Master Control Lever to change RPM.)

### 2. MASTER LEVER, RESYNCHRONIZE BUTTON AND LIMIT LIGHTS INOPERATIVE:

- a. Check propeller "SYNC" circuit breaker.
- b. Use toggle switches.

3. RPM ON ONE ENGINE CHANGES IN DIRECTION OPPOSITE TO THAT SELECTED WITH MASTER LEVER: Try toggle operation. If successful place master engine selector switch in "MANUAL" and use toggle switches. (If toggle operation is erratic, follow "TROUBLE SHOOTING - TOGGLE SWITCHES".)

### 4. RPM LIMIT LIGHT INOPERATIVE WHEN UNFEATHERING IN FLIGHT:

- a. Check bulb - push to test. Replace if necessary. If light is still inoperative, hold toggle in decrease RPM for 20 seconds.
- b. Unfeather engine in normal manner but be alert to feather engine again if RPM is not controllable.

### 5. ONE RPM LIMIT LIGHT INOPERATIVE WHEN MASTER LEVER IS IN CALIBRATE POSITION:

- a. Check bulb - push to test.
- b. Check Tach Isolation Switch - normal.

### 6. PROPELLER WILL NOT FEATHER:

- a. Check "Feather Control" circuit breaker.
- b. Check prop deicer for amperage draw.
- c. If no load on deicer ammeter, check 500 amp current limiter located in Main J box.

7. PROPELLER WILL NOT UNFEATHER: Follow procedure for PROP WILL NOT FEATHER.

8. SYMETRICAL PROPELLERS WILL NOT REVERSE: Check reverse control circuit breaker.

9. PROPELLER REVERSES SLOWLY - (SLUGGISH):

a. Check prop deicer for amperage draw.

b. If no load on prop deicer ammeter, check auxiliary oil pump current limiter.

c. If current limiter is OK, trouble is probably due to failure of auxiliary oil pump motor.

10. SYMETRICAL REVERSING LIGHTS REMAINS ON IN FLIGHT: Trip reverse indicator lights circuit breaker. (Blade switch malfunction.)

11. PROPELLER WILL NOT COME OUT OF REVERSE:

a. If one or more reverse indicator lights remain on after throttles are returned to forward ~~throust~~ thrust position, check propeller deicing ammeter for load. ~~Thrust~~

b. If load is indicated, trip Reverse Control circuit breakers.

c. Momentarily depress feathering button to position blades to forward thrust position.

d. If no load is indicated on ammeter, momentarily depress feathering button.

e. If above procedures fail to accomplish unreversing, secure the engine as follows: Throttle - Reverse range; Mixture - IDLE CUTOFF; Prop reverse control CB - Tripped; Engine - Secure. Write up discrepancy in AFTO-781.

12. PROPELLER COMES OUT OF REVERSE AND THEN FEATHERS:

a. Trip required Feather or Reverse Control circuit breakers immediately.

b. Shut down engine.

13. AUXILIARY PUMP WILL NOT SHUT OFF:

a. Trip required Feather or Reverse Control circuit breakers.

b. If pump continues to operate, shut down engine - turn off master battery generator gangbar and remove respective current limiter in main electrical junction box.

NOTE: If condition occurs inflight, operate flight instruments on emergency inverter while battery generator gangbar is off.

c. After removing current limiter, turn battery and generator switches on for operative engines.

## A.D.I. SYSTEM

### Problem

### Recommended Action

1. A.D.I. warning lights (4) will not press to test. (Preflight cockpit check.)

Check #1 A.D.I. pump C/B.

2. A.D.I. System completely inoperative. (No warning light, low A.D.I. pressure, and no derichment.)

Check individual A.D.I. pump C/B.

NOTE: If C/B is set, oil pressure switch may be malfunctioning or leaking. Malfunction should be identified before making a decision to continue.

3. A.D.I. pressure low (light on) and no derichment.

Check A.D.I. quantity gage.

NOTE: If quantity gage indicates sufficient quantity, the A.D.I. pump may be inoperative or a fuel or A.D.I. leak may exist. Malfunction should be identified before making a decision to continue.

4. Warning light fails to function properly (A.D.I. pressure and derichment normal).

Check light bulb.  
If bulb is o.k., malfunction is probably in the warning light pressure switch or adjacent circuitry (fluid leak is unlikely).

5. A.D.I. pressure and/or derichment fail to occur (warning light functioning properly).

Check fuse for appropriate engine pressure instruments. Problem may be with the instrument or adjacent circuitry.

Problem

Recommended Action

6. A.D.I. pressure fails to indicate "in flow" pressure drop above approximately 38-42 hg.

Unmetered fuel pressure plug may have been left in bottom of carburetor.

NOTE: This condition may also be caused by a fuel leak. Malfunction should be identified before making a decision to continue.

## HYDRAULICS

### 1. NO hydraulic pressure.

#### a. If not accompanied by fluid loss:

(1) Check position of bypass handle.

(2) If bypass is down, engine driven pumps are likely to be inoperative. Check this by placing Emergency Hydraulic Pump Selector in General Systems and check pressure rise using aux pump. (This will also show if pressure gauge is functioning.)

(3) If engine driven pumps are inoperative, operate hydraulic components with aux pump as outlined in the flight manual.

### 2. Loss of hydraulic fluid. (As indicated on pressure gauge.)

a. Bypass - up.

b. Landing gear lever - neutral.

c. Wing flap lever - 5 degrees down (valve closed position.)

NOTE: Any position except up on the wing flap handle is off.

d. Windshield wipers - off.

e. With the bypass lever down, build up system pressure. If the pressure falls from 3100 to 2650 psi in less than 1 minute, the drop is excessive. If drop in pressure is not excessive, move landing gear lever to UP position and check for excessive drop in pressure. If drop in pressure is not excessive move flap lever to full UP position and again check for excessive drop in pressure.

f. If the trouble has not been isolated, extend landing gear only when in landing area; then, check for excessive drop in pressure. Hold brakes on and check for adequate pedal back pressure or excessive drop in pressure. If failure is in gear downline, immediately return landing gear control level to NEUTRAL to prevent loss of hydraulic fluid. Extend flaps for the approach and landing before placing landing gear lever in DOWN position.

### 3. Hydraulic pressure too high (pressure above 3100 psi) or system overheating.

a. Hydraulic bypass - open (system off).

b. Lower bypass ("on") when it is necessary to operate a hydraulic component.

c. If pressure or temperature is excessively high, consideration may be given to operating the hydraulic components with the aux pump and lowering the bypass only for landing.

4. Nosewheel steering failure.

a. Check bypass down.

b. Taxi slowly.

(1) Use differential engine power.

(2) Use wheel brakes as necessary. If brakes are also inoperative, there may be no pressure in gear down line. Stop, shut down and insert ground locks. (Aux pump may provide enough pressure to stop the aircraft. If not, Emergency Air may be necessary.)

5. Landing gear handle cannot be moved up after takeoff.

a. After manually releasing locking solenoid, check gear warning horn C/B.

6. Gear indicates unsafe with handle down.

a. Check handle for full down and latched.

b. Check system hydraulic pressure.

c. Refer to unsafe landing gear procedures in flight manual.

7. Aux pump fails to operate (quantity o.k.) - check aux pump C/B.

#### FIRE PROTECTION

1. Warning Lights fail to operate on test.

a. Check appropriate light bulbs.

b. Check C/B.

2. Airfoil heater, GTPU, and cabin heater CO<sub>2</sub> fails to discharge - check "Heater Fire Extinguisher" C/B.

## HEATING AND VENTILATION

### 1. SUPERCHARGERS:

a. No oil pressure when engine is started (within 30 seconds).

(1) Check engine instrument transformer voltage.

(2) Check respective A/C engine instruments for indication of blown fuse.

(3) Declutch supercharger.

b. Sluggish airflow and low oil temperature: Idle engine until supercharger oil temperature is normal.

c. No airflow (within 2 minutes after engine start).

(1) Shut down engines.

(2) Have maintenance determine/correct discrepancy before proceeding.

d. Low airflow (RPM above 1400), or high airflow indicated:

(1) Cooling turbine switch OFF and/or mixing valve out of "A" port.

(2) Increase and decrease engine RPM.

(3) Decrease cabin differential pressure. If no correction:

(4) Declutch supercharger (provided flight profile allows).

(5) Monitor temperature and pressure during continued operation.

e. Airflow fluctuates (Supercharger stall):

(1) Engine RPM 1400 or above.

(2) Cooling turbine OFF.

(3) Increase and decrease engine RPM.

(4) Decrease cabin differential pressure. If no improvement:

(5) Disengage supercharger.

f. Decreasing oil pressure and/or increasing oil temperature:

(1) Cooling turbine OFF. If no improvement:

(2) Disengage supercharger if temperature or pressure continues to approach maximum or minimum operating limits.

g. Supercharger duct pressure low (reference chart Section 4 of Dash 1) and/or superchargers stall when turbine switch is used.

(1) Cooling turbine switch - OFF.

(2) Reduce cabin pressure.

(3) Operate unpressurized at lower altitude.

## 2. CABIN HEATER:

a. No fuel pressure - normal temperature rise:

(1) Check 26V instrument transformer voltage.

(2) Check "Heater Fuel Pressure Indicator" fuse.  
(Same fuse as for cabin air mixing valve position indicator.)

(3) If heater operation is normal, gauge circuit is probably inoperative.

b. No fuel pressure - no temperature rise:

(1) Check circuit protection.

(2) Check #2 and #3 generators. On the ground failure of either generator or operation below cut-in speed prevents heater operations. \*

NOTE: It can have the same result in flight if the safety switch on the left main gear is stuck. Trip the landing gear ground control circuit breaker to restore normal operation in flight. (Reset prior to landing.)

\* If GTPU or ground power is not connected to D.C. Buss.

(a) Switch to system #2 fuel control. (See note below.)

(b) Heater fuel crossfeed switch ON.

(c) Check all cockpit heater switching - try various settings of windshield and cockpit heat controls.

(4) If above steps do not correct trouble, turn cabin heater master switch OFF for duration of flight, as heater fuel line may be broken. Also, do not use heater fuel crossfeed to airfoil heaters for duration of flight.

NOTE: If heater operation was restored by switching to #2 fuel control system and then later failed on system #2 - system drop-out fuses have probably blown. No further action is possible in flight.

c. Low fuel pressure - temperature normal or low:

(1) Cabin heater fuel control switch to system #2.

(2) Heater fuel system switch to crossfeed.

d. Fuel pressure normal - temperature low:

(1) Turn off cabin heater master switch and allow heater to clear out for 30 seconds, then:

(2) Switch to #2 fuel system.

(3) Check "Cabin heater power control" circuit breakers.

(4) Check all cockpit heater switching. Try various settings of windshield and cockpit heat controls.

### 3. CABIN AND COCKPIT TEMPERATURE:

a. Cabin is too hot.

(1) Check all cockpit heater switching.

(2) Operate cabin temperature control in MANUAL.

b. When flying with both superchargers declutched, both cabin cooling and cabin heater output can be improved by opening the emergency cabin altitude control. Leave turbine switch- OFF. Open cabin pressure control valve using the manning switch.

c. When cabin heater is inoperative, maintain maximum cabin pressure for maximum heating effect.

## PRESSURIZATION

### 1. AUTOMATIC PRESSURE CONTROLS INOPERATIVE AFTER TAKE-OFF:

- a. Check Emergency Cabin Altitude Control - CLOSED.
- b. Cabin pressure manual control door - OPEN and RECLOSE.

(Listen for "CLICK" of transfer switch as this door closes, if no "CLICK", transfer switch has failed. Use Manual Control.)

- c. Check start marker. If ratio control is being used, set Change Limit control hands to 500-600 feet/min UP. (Rate only operation.)
- d. Check circuit breakers.
- e. Check Radio Electric Inverter voltage and cycles.
- f. Check cabin airflow for normal - (Green ARC). If superchargers are stalling, turn cooling turbine off.
- g. If condition not corrected, operate pressurization manually.

### 2. MANUAL AND AUTOMATIC CONTROL INOPERATIVE:

- a. Use Emergency Cabin Altitude Control valve.
- b. Check circuit breakers.
- c. If condition not corrected, have maintenance check cabin pressure control disconnect (Mouse Trap) after landing.

### 3. CABIN PRESSURIZES RAPIDLY ON GROUND WHEN COCKPIT WINDOW IS CLOSED:

- a. Open cockpit direct view windows immediately.
- b. Open Emergency Cabin Altitude Control valve.
- c. Check pressure warning light adjacent to flight compartment door:

(1) If light is not illuminated, check circuit breaker.

(2) If light is illuminated, hold manual control switch to "CABIN CLIMB" position for 20 seconds.

d. If trouble not corrected, main cabin pressure control valve is probably inoperative.

WARNING: It is possible to partially pressurize cabin with all exits closed and the ground blowers on (without engines running). Do not operate ground blowers without a pilot's window or door fully open. Do not attempt to close a door unless a cockpit window or the window in the crew entrance door is open.

4. CABIN WILL NOT DEPRESSURIZE IN DESCENT:

a. Check circuit breakers.

b. Operate system in rate (both hands of change limit control 300-400 feet down).

c. Cabin pressure control switch to "Rate Only" position.

d. Operate system manually.

e. Depressurize with Emergency Cabin Altitude Control.

NOTE: Because of system condition, some aircraft operate at a slower rate. Therefore, it is necessary to allow sufficient time for automatic controls to function.

## ANTI-ICING EQUIPMENT

### 1. WING AND TAIL ANTI-ICING:

a. Indicated cycling temperature exceeds maximum limit (Red Line):

(1) Turn master switch OFF immediately, allow temperature to drop before taking further action.

(2) Switch respective heater fuel control switch to opposite system.

(3) Turn on airfoil anti-icing master switch and observe cycling temperature to see that it does not overheat. (Check chart section 4 of Dash 1.)

(4) If temperature overheats and continuous operation of heaters is necessary, cycle heaters manually with anti-icing master switch.

b. Heater indicated temperature is normal, but no fuel pressure showing: Probable failure of fuel pressure gauge system - no action possible. If condition exists on all heaters - check "Heater Fuel Pressure Indicator" fuse (same fuse as for cabin air mixing valve position indicator).

c. Heater fuel pressure normal, but no heat output:

(1) Turn master switch OFF for 30 seconds, then back ON. If heater does not operate:

(2) Again turn heaters OFF - switch to opposite ignition system - then turn back ON again - if no results:

(3) Again turn heater OFF for 30 seconds, switch to opposite fuel control system - then back ON again. If no results:

(4) Try change of airspeed and/or altitude and repeat above procedure.

d. No fuel pressure or temperature rise on any airfoil heater:

(1) Check #2 and #4 generators. On the ground failure of either or operation below cut-in speed prevents heater operation. It can have the same result in-flight if the safety switch on the left main gear is stuck. Trip the landing gear ground control circuit breaker to restore normal operation in flight. (Caution: Reset circuit breaker before landing.)

- (2) Check heater fuel pump circuit breakers.
- (3) Heater fuel crossfeed switch ON.
- (4) If no results above, a fuel line may be broken.

Turn crossfeed and airfoil master switches OFF.

2. PROPELLER DE-ICING:

a. Amperage reads low on one propeller:

(1) One of more blade elements are inoperative.  
Isolate propeller from Automatic System.

(2) Propeller may be de-iced by changing R.P.M. 200-300  
(after allowing ice build up).

b. No amperage on all propellers:

(1) Check "Prop De-Icer Circuit Breaker".

(2) Check "Cycling Load" on generator ammeters.  
(De-icer ammeter may be inoperative.)

(3) Check system on "Manual Control".

## FUEL SYSTEM

### 1. LOW OR NO FUEL PRESSURE INDICATED - WARNING LIGHT ON:

#### a. On Ground:

- (1) Check fuel booster pump and circuit breaker.
- (2) Check instrument transformer switch and voltage.
- (3) Check position of fuel selector valves.
- (4) Insure that the engine fire extinguisher selector valve handle is full in.
- (5) Check fuel quantity in tanks.
- (6) If low or no fuel pressure condition still exists, shut down engine (possible fuel leak in nacelle).

#### b. In-Flight (Fuel pressure drops to 12-18 PSI):

- (1) Guard respective throttle. If booster pump is on, turn off. If fuel pressure drops to "0", this indicates a probable engine driven pump failure. Close throttle, place boost pump to "low" then to "high". Operation of engine can then be continued normally. However, it must be remembered that any interruption of power to the main DC Bus will result in the loss of the engine.
- (2) (Reference paragraph 1.) If fuel pressure does not drop or booster pump was "off" when fuel pressure drop occurred, a leak is indicated. Secure engine per flight manual.
- (3) If fuel tank has been run dry, close throttle and select another source of fuel.

### 2. LOW OR NO FUEL PRESSURE INDICATED - WARNING LIGHT OFF:

- a. Check warning light bulb and circuit breaker.
- b. Check engine instruments transformer voltage.
- c. Check respective fuel pressure isolation switch on (fuel pressure gauge failure indicated).
- d. Check A.C. fuses if all instruments for that engine are affected.

TROUBLESHOOTING LIST  
G-2/S-2 COMPASS SYSTEMS  
PROBABLE CAUSES

MALFUNCTION

CORRECTION

Compass inop

Pilot's system:

- a. Fuses #17 and 18
- b. Radio electric inverter inop
- c. Circuit breaker out
- d. Fuse in amplifier blown

- a. Replace fuses
- b. Use standby inverter
- c. Turn on circuit breaker
- d. Replace fuse

Co-pilot's system:

- a. Fuses #28 and 29
- b. Radio radar inverter
- c. Circuit breaker out
- d. Fuse in amplifier blown (Protects transformer)

- a. Replace fuses
- b. Use standby inverter
- c. Turn on circuit breaker
- d. Replace fuse

Heading error

- a. Bad gyro
- b. Bad tubes in S-2 Amplifier
- c. Loose instrument panel
- d. Loose cannon plugs

- a. Replace gyro
- b. Replace tubes
- c. Tighten panel
- d. Check cannon plugs

Pilot's system:

- a. Bad indicator (Pilot's)
- b. Bad indicator (Navigator's)
- c. Both malfunctions

- a. Replace indicator
- b. Replace indicator
- c. Replace both indicators

Co-pilot's system:

- a. Co-pilot's indicator only
- b. Bad tubes in amplifier (rear)
- c. Bad gyro
- d. Loose instrument panel
- e. Loose cannon plugs

- a. Replace single indicator
- b. Replace tubes
- c. Replace gyro
- d. Tighten panel
- e. Tighten plugs

RMI SYSTEM  
PROBABLE CAUSES

MALFUNCTION

CORRECTION

RMI cards inop Autopilot OK	a. Fuse #24 blown b. Bad tubes in C-1 (ME-1) Amplifier c. Bad autosyn unit in C-1 amplifier (ME-1)	a. Replace fuse b. Replace tubes in C-1 Amplifier (ME-1) c. Replace C-1 amplifier (ME-1)
RMI pointers inop Cards OK Autopilot OK	a. Radio system inop (ADF, VOR, TACAN)	a. Have radio checked
RMI/ADF pointers and cards inop	a. Fuse #24 blown b. Bad tubes in C-1 (ME-1) Amplifier (ME-1) c. Bad C-1 amplifier d. Cannon plugs	a. Replace fuse b. Replace tubes c. Replace amplifier d. Check plugs
Sticking Indicators	a. One bad indicator will create new vector and affect the other four indicators b. Bad autosyn unit in C-1 amplifier (ME-1) c. Bad Directional Gyro for the Auto- pilot system	a. Isolate bad indicator and replace b. Replace C-1 amplifier (ME-1) c. Replace Directional Gyro
RMI cards inop RMI pointers OK	a. Fuse #19 blown b. Autopilot filia- ment CB tripped	a. Replace fuse b. Reset CB

C-118A AUTOPILOT  
PROBABLE CAUSES

MALFUNCTION

CORRECTION

Heading Selector  
Inop

- |    |                           |    |                     |
|----|---------------------------|----|---------------------|
| a. | Blown fuse in B7A         | a. | Replace 1½ amp fuse |
| b. | Bad rectifier tube in B7A | b. | Replace tube 25Z6   |
| c. | Directional gyro inop     | c. | Replace gyro        |
| d. | Indicator inop            | d. | Replace indicator   |
| e. | Loose instrument panel    | e. | Tighten panel       |

Autopilot inop  
unable to turn  
pilot's switch  
on

- |    |   |    |                          |
|----|---|----|--------------------------|
| a. | No AC-Fuse #19 blown                          | a. | Replace fuse, 5 amps     |
| b. | No DC-4 circuit breakers off                  | b. | Turn on circuit breakers |
| c. | Turn knob out of detent                       | c. | Reposition turn knob     |
| d. | Approach controller out of autopilot position | d. | Reposition switch        |
| e. | Servo control disconnected                    | e. | Connect servo control    |

Autopilot inop  
after turning on  
pilot's switch

- |    |                             |    |                        |
|----|-----------------------------|----|------------------------|
| a. | Blown fuse in B-6 amplifier | a. | Replace fuse, 1/16 amp |
| b. | Bad rectifier in B-6        | b. | Replace 6x5 in B-6     |
| c. | Servo control inop          | c. | Replace servo control  |

Autopilot control  
erratic on rudder,  
aileron, elevator

- |    |                           |    |   |
|----|---------------------------|----|---|
| a. | Microphonic tubes in B-6  | a. | In flight, disengage control surface involved and enter in forms            |
| b. | For ground maintenance    | b. | For ground maintenance replace bad tubes                                    |
| c. | Servo control brushes bad | c. | Bench check servo control and replace the brusher in the generator involved |
| d. | Vertical gyro bad         | d. | Replace vertical gyro   |

Erratic control on  
localizer, approach,  
or range; system OK  
on autopilot position

- |    |                     |    |                       |
|----|---------------------|----|-----------------------|
| a. | Bad B-9 amplifier   | a. | Replace B-9 amplifier |
| b. | Bad radio equipment | b. | Have radio checked    |