

- b. If the damaged tank is a nacelle tank, place the respective boost pump in HI and opposite boost pump to LO. This permits both engines to be supplied with fuel from the damaged tank and insures a continued supply of fuel when damaged tank is emptied.
- c. If the damaged tank is an external drop tank, place the respective air pump ON, place the boost pump of the related nacelle tank in LO, and turn OFF the opposite boost pump.
- d. After all available fuel from the damaged tank is used, set up a fuel flow pattern which permits fuel to be supplied to both engines from the remaining undamaged tank.

RECIPROCATING ENGINE BOOST PUMP FAILURE.

Should a nacelle tank boost pump fail, action will be necessary only when conditions require boost pump operation to maintain fuel pressure. It is possible to operate on engine-driven fuel pumps alone; however, under this condition vapor lock can occur. In this case the remaining boost pump will help maintain pressure, through the crossfeed system, to both engines. Note that under these conditions fuel for both engines will be used from the nacelle tank with the operating boost pump.

- a. Fuel crossfeed - ON.
- b. Remaining boost pump - LO.

NOTE

If jet engines are being used, the jet fuel crossfeed may be turned ON and the jet fuel boost pump to the corresponding nacelle tank supplying the operating reciprocating engine, may be turned OFF. This will assure to some degree, that a balanced fuel load can be maintained.

JET ENGINE BOOST PUMP FAILURE.

In the event of a jet engine fuel boost pump failure, it will be possible to operate both jet engines from one boost pump and the crossfeed system. Under these conditions fuel will be used from the nacelle tank containing the operating boost pump.

- a. Jet fuel crossfeed - ON.

NOTE

If the jet engines are to continue in operation, it is desirable that the reciprocating engines receive fuel from the opposite tank being used to supply fuel to the jet engines. This will assure, to some degree, that a balanced fuel load can be maintained.

RECIPROCATING ENGINE-DRIVEN FUEL PUMP FAILURE.

In the event of engine-driven pump failure, the engine may be inoperative and low fuel pressure will be noted. Refer to LOSS OF FUEL PRESSURE this section. If it is necessary to continue operation of the engine, close the throttle, place the mixture to RICH, boost pump to HI, and observe fuel pressure. Reset power as required if pressure is normal.

JET ENGINE-DRIVEN FUEL PUMP FAILURE.

In the event of jet engine-driven fuel pump failure, the engine will flame out and the engine should be shut down with normal shut down procedures.

NOTE

There probably will not be any indication of failure except engine flame out.

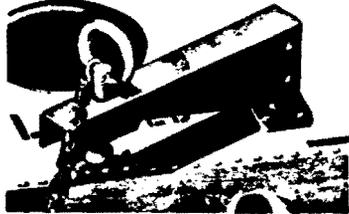
ASYMMETRICAL FUEL LOADING—FUEL TRANSFER FAILURE.

Asymmetrical fuel loading is a condition which may arise from failure of the external drop tank fuel transfer system. This may be the result of failure of external drop tank air pump, failure of the fuel transfer line valves, or other less likely malfunctions. In any case, the undesirable result is likely to be an unbalanced distribution of weight if one tank should fail to transfer properly. If this uneven distribution of weight is allowed to progress too far, the slow-speed flight and ground-handling characteristics of the aircraft can be dangerously affected. In general, it is considered hazardous to land, taxi, or take-off if the fuel quantity in one drop tank exceeds the other by more than 1350 pounds (approximately half a tank) when the nacelle tank loads are equal. For this reason it is essential that the transfer of fuel

EMERGENCY (in flight)

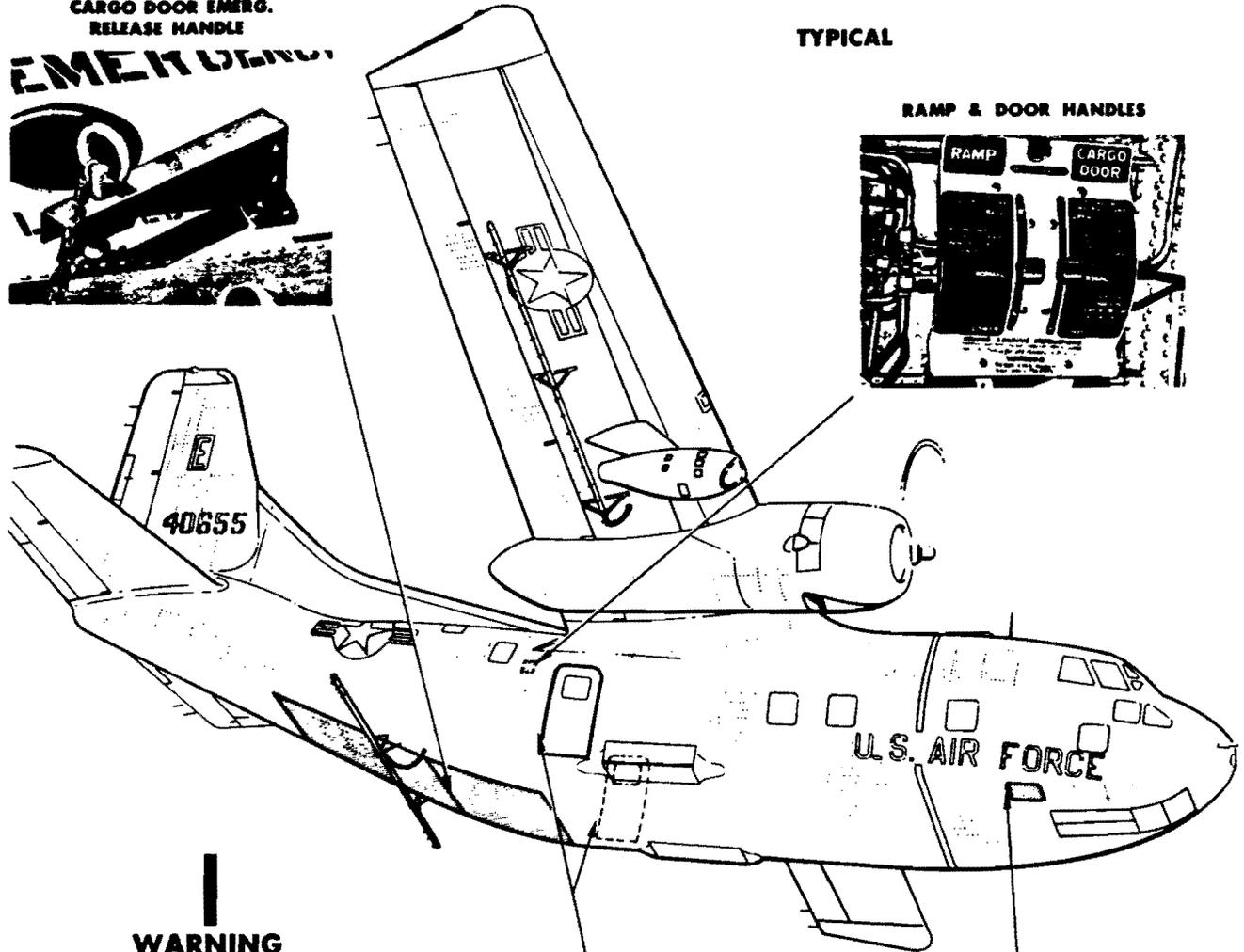
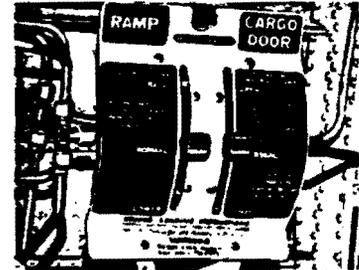
CARGO DOOR EMERG.
RELEASE HANDLE

EMERGENCY



TYPICAL

RAMP & DOOR HANDLES



WARNING

• ONLY THOSE EXITS INDICATED SHOULD BE USED FOR IN-FLIGHT EXIT FROM AIRPLANE. USE OF ANY OTHER EXIT COULD RESULT IN DEATH OR OTHER SERIOUS INJURY TO PERSONNEL.

• (AIRCRAFT WITH TAIL BOOM INSTALLED) BAIL-OUT SHOULD NOT BE ATTEMPTED FROM THE REAR TROOP DOORS. EXTREME CAUTION SHOULD BE EXERCISED WHEN BAILING OUT THE REAR CARGO DOOR TO AVOID CONTACT WITH THE TAIL BOOM.

AFT TROOP DOOR
JETTISON HANDLE
(RIGHT SIDE SHOWN)



BAIL-OUT CHUTE
RELEASE HANDLE

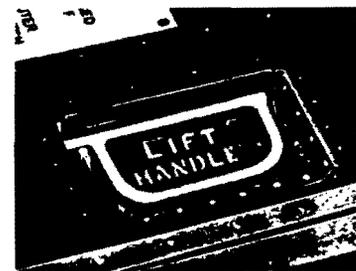


Figure 3-13 (Sheet 1 of 2)

EXITS (ground or ditching)

TYPICAL

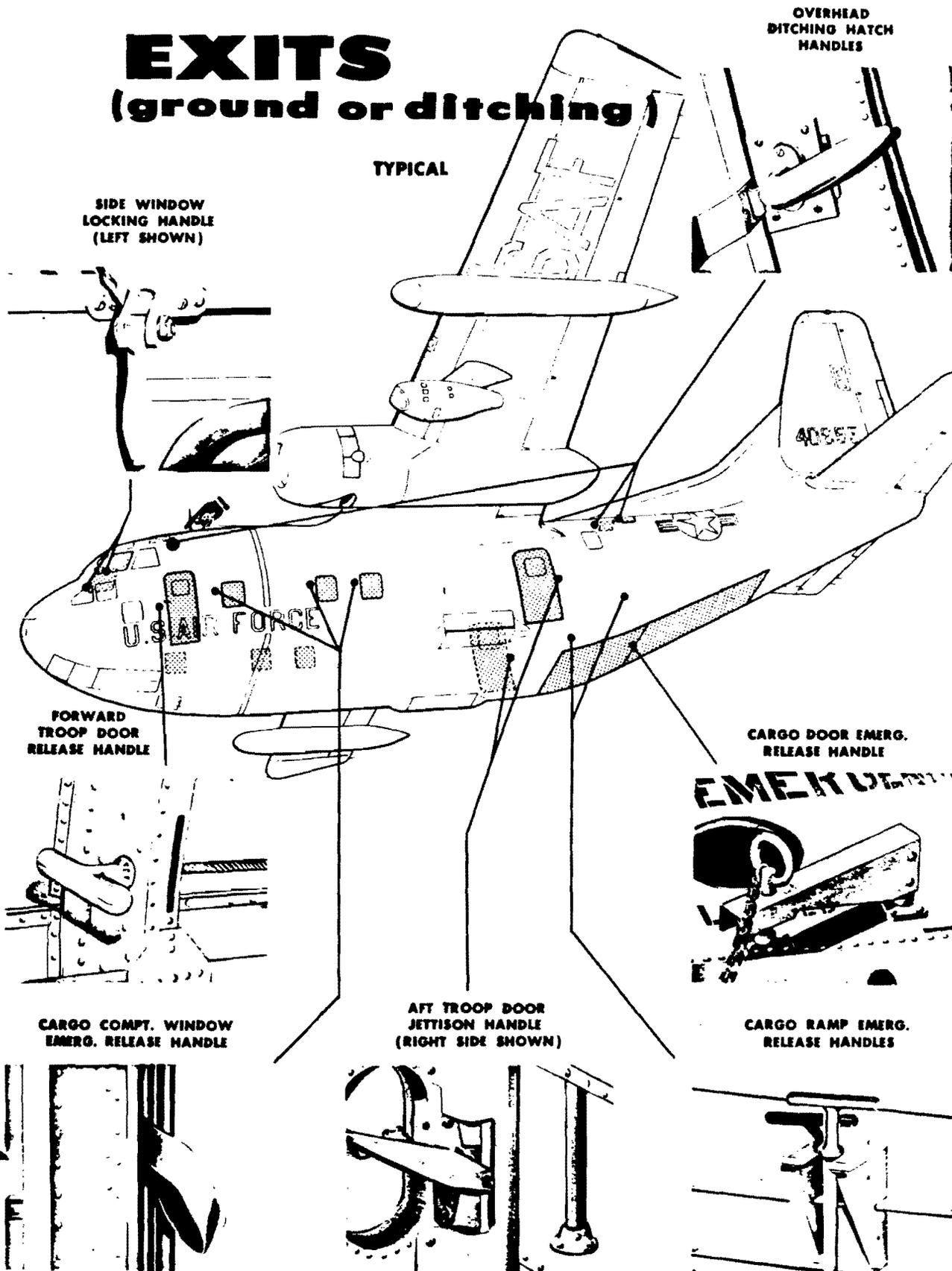


Figure 3-13 (Sheet 2 of 2)

from the external drop tanks be checked periodically. If a failure of the transfer system on one side is detected before an appreciable amount of fuel is transferred, both external drop tank air pump switches should be turned OFF to prevent further imbalance unless the external fuel is needed to complete the mission. In this case, the pilot, depending upon the urgency of the mission, may decide to return to base, land enroute, or continue the flight, using as much external drop tank fuel as possible and jettisoning the defective tank. If it is determined that jettisoning is not absolutely necessary, the slow-speed flight characteristics of the aircraft should be checked with the landing gear and wing flaps extended to ensure that adequate aileron trim is available for a safe approach and landing. An asymmetrical drop tank fuel load can be brought within an acceptable limit by providing a corresponding asymmetrical fuel load in the opposite side nacelle tank. One pound of fuel in the drop tank is equal to approximately 2.37 pounds in the nacelle tank. By determining the difference in fuel load between drop tanks and multiplying this difference by 2.37, then subtracting 3200, a minimum allowable difference between nacelle fuel loads will be provided.

Example: What is the minimum allowable difference between nacelle fuel loads if 2600 pounds of fuel are in the right drop tank and 500 pounds in the left tank?

$$2600-500 = 2100 \times 2.37 = 4977-3200 = 1777$$

The minimum allowable difference in fuel load between nacelle fuel tanks is 1777 pounds, i.e., the left nacelle tank should have at least 1777 pounds more than the right nacelle tank. Refer to JETTISONING OF FUEL TANKS, this section.

ELECTRICAL SYSTEM EMERGENCY OPERATION.

NOTE

Refer to figures 1-29 and 1-30 for primary and flight emergency bus equipment power requirements.

The aircraft has four reciprocating engine generators which power the primary bus, and two jet engine starter/generators which provide auxiliary power to the aircraft electrical system

through the flight emergency bus. Consequently, these aircraft are more versatile in encountering electrical power failure emergencies. However, due to the high fuel consumption of the jet engines, use of the jet engines to provide a source of auxiliary power will be dependent upon many factors; e.g., severity of the emergency, fuel supply, climatic conditions, etc. Use of the jet engines primarily to provide auxiliary power will, therefore, be at the discretion of the pilot.

APU EMERGENCY OPERATING PROCEDURES.

The following starting procedure should be employed whenever there is no electrical power available for starting the auxiliary power unit.

To Start The Auxiliary Power Unit Manually.

1. APU generator - OFF. FM
2. APU ignition - ON. FM
3. Governor - As required. FM

NOTE

Varying temperature conditions may require different governor lever settings.

4. APU field control relay - Manually reset. FM
5. Manual fuel bypass valve - Open. FM
6. Altitude compensator valve - Set. FM

Place valve at setting nearest the altitude which the aircraft is being operated. Do not set pointer between altitude positions.

7. APU rewind starting handle - Pulled. FM
8. Governor - IDLE for warmup, when APU has started. FM
9. Starter - On. FM
10. Governor - RUN, after warmup. FM
11. Generator - ON, after engine has stabilized in RUN. FM
12. Battery - ON. FM

13. Manual fuel bypass valve - Closed. FM

14. APU EMERGENCY OPERATING PROCEDURES Checklist - Completed. FM

PARTIAL POWER FAILURE.

Partial electrical power failures are emergency conditions in that they restrict the aircraft in some specific phases of its operation. Such failures seldom jeopardize safety of flight and, in most cases, prompt corrective action in utilizing the equipment provided to cope with a partial power

failure will offset the power loss. The dc voltmeter, as well as the loadmeters, will immediately confirm a suspected generator power failure. Likewise, the generator and inverter warning lights will indicate a malfunction in the electrical system. Loss of equipment powered by the secondary dc and ac busses similarly will provide evidence of a power failure. A malfunctioning flight emergency bus relay, however, can only be discovered prior to battery depletion by checking periodically. Discussed below are some specific partial electrical power failures and the remedial action to be undertaken should they occur.

FLIGHT EMERGENCY BUS RELAY FAILURE.

The 28-volt dc output of the reciprocating engine generators is directed to the primary bus. Normally, the flight emergency bus is connected to the primary bus by the flight emergency bus relay. In the event the flight emergency bus relay malfunctions and fails to connect the primary and flight emergency busses when the reciprocating engine generators are placed on the primary bus, the flight emergency bus equipment will be powered only by the battery. Unless detected as outlined in the CRUISE checklist, Section II, this malfunction will not be recognized until flight emergency bus voltage has dropped enough to cause intermittent flashing of the pilot's INSTRUMENT POWER FAILURE light and SPARE INVERTER ON light. At this point, the battery is nearly depleted, and the flight instruments (turn-and-slip, attitude, and heading indicators) may be expected to become sluggish and unreliable very shortly. Another indication of this condition may be dimming of the pilot's C-4 spotlight, if On. Under these conditions operation of the fire detection, fire emergency and propeller feathering systems is marginal depending on the condition of the battery. Eventually, the complete flight emergency bus will be lost. To preserve battery power for emergency needs which may arise, all loads on the battery should be removed, if possible. If VFR conditions prevail, or if IFR conditions prevail and the copilot's three-phase inverter is operable, the pilot's flight instruments may be turned off and flight continued by visual reference or by use of the copilot's flight instruments powered from the primary bus. The output of the APU and the jet engine generators is directed to the flight emergency bus; therefore, the APU may be started manually and used to offset the failure of the relay. At the first indication of flight emergency bus relay failure, immediately accomplish the following procedure:

CAUTION

In the event of Flight Emergency Bus failure do not attempt to start the jets on APU and Battery.

Relay Failure Procedure.

- a. Start APU manually to energize the flight

emergency bus. Refer to START THE AUXILIARY POWER UNIT MANUALLY, this section.

- b. Pilot's C-4 spotlight - OFF.
- c. Oil temperature switches - OFF.
- d. Cowl flaps - As previously set.
- e. Pilot's three-phase inverter - OFF.
- f. Pilot's B-1A attitude indicator - OFF.
- g. Pitot heaters - OFF, unless actually needed.
- h. APU generator - ON (after warm-up is complete).
- i. Return to operation any desired flight emergency bus equipment previously turned off.

FAILURE OF ONE OR TWO RECIPROCATING ENGINE GENERATORS.

The aircraft can operate under normal flight conditions with the loss of two reciprocating generators.

CAUTION

Prior to initiating a jet engine start with two engine generators failed, assure that the propeller de-icing and windshield heat are turned OFF to reduce electrical load.

When a generator warning light glows indicating a malfunction in its respective generator system, employ the following procedure:

NOTE

The glowing of an engine generator warning light indicates the output of the generator has been disconnected from the bus because of overvoltage, low voltage, or a mechanical failure of the generator. Illumination of the APU generator warning light indicates the output of the generator has been disconnected from the bus because of an overvoltage condition.

1. Engine generator - RESET, then OFF.

The RESET position of the generator switch will reset the field control relay. The warning light will go out when the switch is moved from ON. This does not indicate that the field control relay has reset.

2. DC voltmeter (select malfunctioning generator) - Check voltage.

3. If voltmeter reading is approximately 28 volts:

A voltmeter reading of 28 volts indicates that the field control relay has been reset.

a. Generator - ON.

Closing the switch guard will not necessarily position the switch from OFF to ON. Check that the warning light remains off.

b. Loadmeter - Check for output.

NOTE

If the voltage is normal but the reading of the loadmeter is zero, turn the corresponding generator switch OFF and note if the reading on the other loadmeter increases. An increase on the other generator loadmeter indicates that the generator voltage was reaching the bus, but the loadmeter has failed.

4. If voltmeter reading is more than 28 volts:

A voltmeter reading of 28 volts or more indicates that the field control relay has been reset.

a. Voltage regulator rheostat - Adjust for 28 volts.

A rheostat knob on its corresponding voltage regulator in the left electrical panel in the cargo compartment permits adjustment of voltage. Voltage is decreased by turning the rheostat counterclockwise.

CAUTION

If inflight adjustment of the voltage regulator is absolutely necessary, extreme caution should be exercised to avoid inadvertently raising the voltage. This could result in an overvoltage condition with resulting failure or electrical fire.

b. Accomplish step 3.

5. If the voltmeter reading is 0-5 volts:

A voltmeter reading of 3-5 volts indicates that the field control relay has not reset. A voltmeter reading of zero probably indicate a mechanical failure of the generator, however, to preclude the possibility of field control malfunction, it is advisable to repeat field control relay setting.

a. Field control relay - Reset manually.

The manual reset button is located on its corresponding field control relay in the right electrical panel in the cargo compartment.

b. DC voltmeter - Check for 28 volts.

c. Accomplish step 3.

6. If unable to recover engine generator output:

a. Generator - OFF.

The generator is turned OFF to avoid the danger of fire resulting from generator failure and to prevent excessive voltage of one generator from tripping the overvoltage relays of the other generators.

7. FAILURE OF ONE OR TWO RECIPROCATING ENGINE GENERATORS Checklist - Completed.

8. Maintain fire watch.

Periodically check the engine to ascertain that the failed generator does not cause an engine fire. At the first indication of smoke, shut down the engine and follow the procedure outlined in ENGINE FIRE DURING FLIGHT, this section.

CAUTION

Unnecessary hesitation in responding to first indications of fire may result in loss of the generator blast tube from overheating. This prevents the extinguishing agent from reaching the generator and interferes with effective fire extinguishing. Number 3 and 4 generators are not protected by the extinguishing agent.

FAILURE OF THREE RECIPROCATING ENGINE GENERATORS.**CAUTION**

Should the third engine generator fail, both the dc and ac secondary busses are deenergized; this cuts off power to the scoop ice guard, ground blowers, cargo compartment dome lights and the following radio equipment: VOR, TACAN, glide slope, liaison, and radar altimeter. Power may be restored to this equipment, if necessary, by turning the secondary bus switch to MONITOR. The loadmeter should be checked frequently to ascertain that the remaining generator is not being overloaded.

1. All unnecessary electrical equipment - Off.
2. Secondary bus - MONITOR, if required.
3. APU - Start and idle.

For starting procedure of the APU refer to Section IV.

NOTE

The APU is set at 27 volts and will not assume any of the electrical load as long as an engine generator is operating, regardless of the position of the APU generator switch. The switch is positioned to OFF to prevent a possible overvoltage condition of the remaining engine generator from tripping the APU field control relay or to prevent overloading of the battery and APU should the remaining engine generator fail.

4. Engine generator - RESET, then OFF.

Accomplish steps 1 through 8 in the previous procedure for FAILURE OF ONE OR TWO RECIPROCATING ENGINE GENERATORS. If it is impossible to recover engine generator output the generator is turned OFF to avoid the danger of fire resulting from generator failure.

5. Jet engines - As required.

APU - RUN, generator - ON, if jet engine is to be started.

No jet engine starts should be made with only one reciprocating engine generator operating unless an absolute emergency condition exists. Cooling time (in the air or on the ground) for reciprocating engine generators after starting jet engines must be no less than 15 minutes and should be 20 minutes if conditions permit.

6. Drop tank air pumps - ON.

Fuel from the drop tanks should be transferred to the nacelle tanks to make certain this fuel is available should a loss of primary dc bus power occur.

7. FAILURE OF THREE RECIPROCATING ENGINE GENERATORS Checklist - Completed.

8. Maintain fire watch.

FAILURE OF FOUR RECIPROCATING ENGINE GENERATORS.

Should four engine-driven generators fail in flight (and the APU is not operating) the primary dc bus is automatically disconnected from the flight emergency bus. Indication of the failure will be apparent immediately by the following conditions: generator warning lights will illuminate, all equipment except that on the flight emergency bus or connected directly to the battery will become inoperative, and the generator loadmeters will register a no-load condition. Since the battery will immediately assume the load, preservation of the battery requires that the APU be started as soon as possible. If used only to operate essential flight instruments, the battery may last several hours depending upon its condition at the time of generator failure. Operation of other equipment will materially shorten battery life. If absolutely necessary, interphone, VHF, UHF, and UHF/FM equipment may be powered directly from the battery by depressing the emergency communications switch.

Battery Endurance.

The failure of four reciprocating engine generators in flight (APU or jet generators not operating) results in an electrical power emergency wherein only the battery remains to supply electrical power

for the remainder of the flight. The need for battery power in such an emergency will depend primarily upon the weather conditions and the distance to the nearest suitable airfield. The availability of battery power will be contingent upon the condition of the battery at the time of generator failure, the temperature, and the conservation measures taken to preserve the battery as long as possible. Since both the need and the availability present highly variable factors, it is impossible to predict accurately how long the battery will last.

Procedure.

Should failure of four engine generators occur, the procedure to be employed is as follows:

NOTE

Make certain that the location of flashlights is known to all crew members. Should all generators fail during a night mission, several flashlights will be required to accomplish the emergency procedures.

1. Battery - ON.
2. All generators - OFF.
3. All unnecessary electrical equipment - Off.

NOTE

Attempt to stay clear of IFR conditions and land at the nearest suitable airfield.

4. APU - Manually start and idle.

Manual starting procedure of the APU is outlined in this section.

CAUTION

To conserve battery power do not attempt battery starting of the APU.

5. Field control relays - Reset manually.

The manual reset buttons are located on the field control relays in the right electrical panel in the cargo compartment.

6. DC voltmeter (select one generator) - Check voltage.

7. If voltmeter reading is approximately 28 volts:

- a. Generator - ON.

Closing the switch guard will not necessarily position the switch from OFF to ON. Check that the warning light remains off.

- b. Loadmeter - Check for output.

8. If voltmeter reading is more than 28 volts:

- a. Voltage regulator rheostat - Adjust for 28 volts.

A rheostat knob on the corresponding voltage regulator in the left electrical panel in the cargo compartment permits adjustment of voltage. Voltage is decreased by turning the rheostat counterclockwise.

CAUTION

If inflight adjustment of the voltage regulator is absolutely necessary, extreme caution should be exercised to avoid inadvertently raising the voltage. This could result in an overvoltage condition with resulting failure or electrical fire.

- b. Accomplish step 7, if applicable.

9. If voltmeter reading is 0-5 volts:

A voltmeter reading of 3-5 volts indicates that the field control relay has not reset. A voltmeter reading of zero probably indicates a mechanical failure of the generator; however, to preclude the possibility of field control malfunction, it is advisable to repeat field control relay resetting.

- a. Field control relay (of corresponding generator) - Reset manually.

- b. DC voltmeter - Check for 28 volts.

- c. Accomplish step 7, if applicable.
10. If the output of the generator has been recovered:
- APU - Start electrically, if manual starting has not been completed. Permit APU to warm up.
 - APU starter - ON.
 - APU governor - IDLE.
 - APU generator - RESET, then OFF.

The APU is permitted to idle in order to have its output available. It is connected to the bus only after all engine generator recovery attempts have failed since one malfunctioning generator may trip the field control relays of the other generators and result in loss of all generator power.

11. If the output of the generator cannot be recovered:

- a. Generator - OFF.

The generator is turned OFF in order to avoid the danger of fire resulting from generator failure and to prevent excessive voltage of one generator from tripping the field control relays of other generators.

12. Attempt to recover the output of the other engine generators by repeating steps 6 through 11.

13. If output of any of the other engine generators cannot be recovered:

- Engine generators - OFF.
- APU governor - RUN (when warm-up is completed).
- APU generator - ON.

CAUTION

When operating solely on the APU, propeller deicing may be used in an

extreme emergency provided all electrical systems are turned off except the pitot heat (if required), pilot's three-phase inverter and heaters (if required). Rated capacity of the APU will be exceeded under this condition.

NOTE

If it is not possible to start the APU and get its output on the flight emergency bus, the pilot's three-phase inverter switch may be placed in MANUAL OVERRIDE (on some aircraft). This will bypass the automatic changeover relay and its voltage failure circuits and will increase the length of time that three-phase inverter power is available for operation of the pilot's attitude and heading indicators. On aircraft without three-phase automatic changeover, this step is not necessary.

14. Jet engines - As required.

NOTE

Either or both jet engines may be shut down at the pilot's discretion, since no control of jet engine will be available if complete electrical failure occurs. APU should not be used to attempt to start jet engines.

15. Drop tank air pumps - ON.

If not previously accomplished.

16. Secondary bus - MONITOR, if required.

The secondary bus is automatically deenergized when three or all of the reciprocating engine generators fail. If operation of equipment on the secondary bus is required, power may be restored by the secondary bus switch but the loadmeter of the operating generator should be checked frequently to avoid overloading.

17. FAILURE OF FOUR RECIPROCATING ENGINE GENERATORS Checklist - Completed.

18. Maintain fire watch.

Periodically check the engines to ascertain that the failed generators do not cause an engine fire. At the first indication of smoke, shutdown the affected engine and follow the procedure outlined in ENGINE FIRE DURING FLIGHT.

CAUTION

Unnecessary hesitation in responding to first indication of fire may result in loss of the generator blast tube from overheating. This prevents the extinguishing agent from reaching the generator and interferes with effective fire extinguishing. Number 3 and 4 generators are not protected by the extinguishing agent.

FAILURE OF JET ENGINE GENERATOR.

When a jet engine generator warning light illuminates, indicating a malfunction in its respective generator system, employ the following procedure:

NOTE

The illumination of the jet engine generator warning light indicates the output of the generator has been disconnected from the flight emergency bus because of overvoltage, low voltage, or a mechanical failure of the generator.

1. Generator switch - RESET, then OFF.

The RESET position of the generator switch will reset the generator control unit. (GCU). The warning light will go out when the switch is moved from ON. This does not indicate that the GCU has reset.

2. DC voltmeter (select malfunctioning generator) - Check voltage.

3. If voltmeter reading is approximately 28 volts:

A voltmeter reading of 28 volts indicates that the GCU has been reset.

a. Generator switch - ON.

Closing the switch guard will not necessarily position the switch from OFF to ON. Check that the warning light remains off.

b. Loadmeter - Check for output.

NOTE

If the voltage is normal but the reading of the loadmeter is zero, turn the corresponding generator switch OFF and note if the reading on the other loadmeter increases. An increase on the other generator loadmeter indicates that the generator voltage was reaching the bus, but the loadmeter has failed.

4. If voltmeter reading is more than 28 volts:

A voltmeter reading of 28 volts or more indicates that the GCU has been reset.

a. GCU - Adjusted for 28 volts.

A rheostat on the GCU in the corresponding left and right side of the cargo compartment permits adjustment of voltage. Voltage is decreased by turning the rheostat counterclockwise.

CAUTION

If inflight adjustment of the GCU is absolutely necessary, extreme caution should be exercised to avoid inadvertently raising the voltage. This could result in an overvoltage condition with resulting failure or electrical fire.

b. Accomplish step 3.

5. If the voltmeter reading is 0-5 volts:

A voltmeter reading of 3-5 volts indicates that the GCU has not reset. A voltmeter reading of zero indicates probable mechanical failure of the generator.

- a. GCU - Reset manually at unit.
- b. DC voltmeter - Check for 28 volts.
- c. Accomplish step 3.

6. Generator - OFF.

If it is impossible to recover generator output, the generator is turned OFF to avoid the danger of fire resulting from generator failure and/or to prevent excessive voltage of one generator from tripping the overvoltage relays or GCU of the other generators.

7. FAILURE OF JET ENGINE GENERATOR
Checklist - Completed.

8. Maintain fire watch.

Periodically check the jet engine to ascertain that the failed generator does not cause a jet engine fire. At the first indication of fire, shut down the jet engine and follow the procedure outlined in JET ENGINE FIRE this section.

INVERTER FAILURE.**Single-phase Inverter Failure.**

Should failure of the main single-phase inverter occur while the single-phase inverter switch is positioned to MAIN, an amber warning light labeled MAIN, adjacent to the single-phase inverter switch on the copilot's instrument panel, will glow, and the spare single-phase inverter will be automatically energized to supply the aircraft single-phase power needs. Should the automatic changeover relay fail to operate, the spare inverter may be manually selected by positioning the single-phase inverter switch to SPARE. While the switch is in the SPARE position, the MAIN

inverter failure warning light will glow. The automatic changeover relay will not automatically energize the main single-phase inverter in the event the spare inverter fails while the single-phase inverter switch is positioned to SPARE. Should both single-phase inverters fail, a red warning light labeled BOTH, adjacent to the single-phase inverter switch on the copilot's instrument panel, will glow. In the event a failure of both single-phase inverters is indicated, the single-phase inverter switch should be positioned to SPARE, then MAIN, to assure that no single-phase inverter output is available. After single-phase inverter failure is confirmed, the switch should be positioned to OFF to avoid the danger of fire resulting from operation of a failed inverter. For equipment affected by failure of the single-phase ac power system, refer to Figure 3-14.

NOTE

The pilot's heading indicator, which normally is powered from the single-phase ac supply will remain operative in event of failure of both single-phase inverters by automatically switching to the "C" phase of the pilot's or spare three-phase inverter, whichever is operating, to supply the pilot's instruments. Should this automatic changeover fail to occur (as indicated by failure of the pilot's heading indicator), the changeover may be accomplished manually by positioning the remote compass switch in the cargo compartment to 3-PHASE EMERGENCY.

Three-phase Inverter Failure.*

Should either the pilot's or copilot's three-phase inverter fail as indicated by illumination of its respective warning light, the switch of the inverter which has failed should be positioned to SPARE. This action will energize the spare three-phase inverter and direct its output to the equipment normally powered by the inverter which has failed. Should SPARE three-phase inverter operation be selected by both the pilot's and copilot's three-phase inverter switches, the pilot's switch

*AF54-552 thru 54-706

overrides the copilot's switch and the spare three-phase inverter will supply power to the pilot's instruments only.

NOTE

On some aircraft, † the three-phase inverters require a 20-second warm-up period when first turned on. During the warm-up the warning lights will glow. The spare inverter is warmed up simultaneously with the pilot's, copilot's, or both and requires no additional time in event of switch-over.

Three-phase Inverter Failure.**

Should either the pilot's or copilot's three-phase inverter fail, the spare inverter will automatically be energized to replace the inverter which has failed and an amber indicator light labeled SPARE INVERTER ON will glow. Should both the pilot's and copilot's three-phase inverters fail, the spare inverter will automatically be energized to replace the pilot's inverter and both the SPARE INVERTER ON light and the copilot's red INSTRUMENT POWER FAILURE light will glow. The copilot's three-phase inverter switch should then be positioned to OFF to avoid the danger of fire resulting from operation of a failed inverter and to prevent continuous cycling of the copilot's automatic changeover relay. In event of failure of the pilot's automatic changeover relay, the spare three-phase inverter may be selected to supply power for the pilot's instruments by positioning the pilot's three-phase inverter switch to MANUAL OVERRIDE. Should all three-phase inverters fail, both the pilot's and copilot's red INSTRUMENT POWER FAILURE warning lights will glow. Both the pilot's and copilot's three-phase inverter switches should then be positioned to OFF to avoid the danger of fire resulting from operation of a failed inverter and to prevent continuous cycling of the automatic changeover relays. For equipment affected by failure of the pilot's or copilot's three-phase power systems, refer to Figure 3-14.

NOTE

The three-phase inverters require 60 seconds to warm up when first turned on. During the warm-up period the

†AF54-687 and subsequent
**AF54-707 and subsequent

corresponding INSTRUMENT POWER FAILURE warning light will glow. If the pilot's switch is positioned to MANUAL OVERRIDE only 20-seconds warmup period for the spare inverter is required.

LOSS OF ALL ELECTRICAL POWER.

In the event a loss of all electrical power should occur, the major factor influencing the pilot's course of action is the atmospheric conditions prevailing at the time. If the failure should occur during VFR conditions, continued operation is practical; however, every effort should be made to stay clear of instrument flight conditions and to land at the first suitable airfield. If such a failure should occur during IFR conditions, continued operation would be made at the discretion of the pilot. Under the above conditions, control of the aircraft is limited to the following:

- a. Flight controls and trim tabs.
- b. Control of reciprocating engines with throttles, propellers and mixture controls. Propeller feathering and reversing are inoperative. Super charger operation is limited to low blower operation.

WARNING

- Jet engines may continue to operate, but will be uncontrollable.
- If propeller reversing is attempted after a complete loss of electrical power the propeller will not reverse and normal engine power will be applied.
- c. Engine instruments: manifold pressure, rpm and exhaust gas temperature.
- d. Flight instruments: magnetic compass, altimeter, and vertical velocity indicator; also airspeed, depending upon atmospheric conditions.
- e. Landing gear: emergency extension only.
- f. Wing flaps: normal operation (indicator does not function).
- g. Brakes: hydraulic and emergency air.

OVERHEATED BATTERY.

If an overheated battery is suspected or detected, proceed as follows:

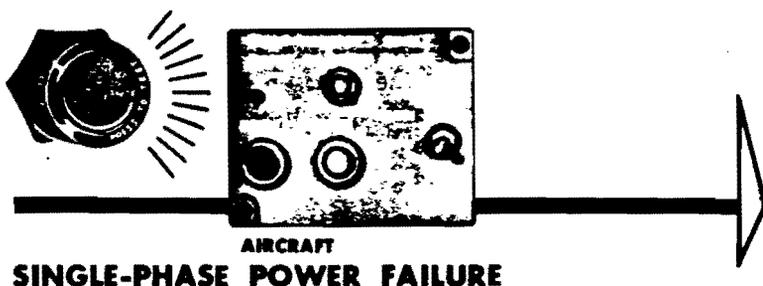
- a. Battery switch — OFF.
- b. Land if overheat condition continues. If overheat condition is corrected, flight may be continued with battery switch OFF.

WARNING

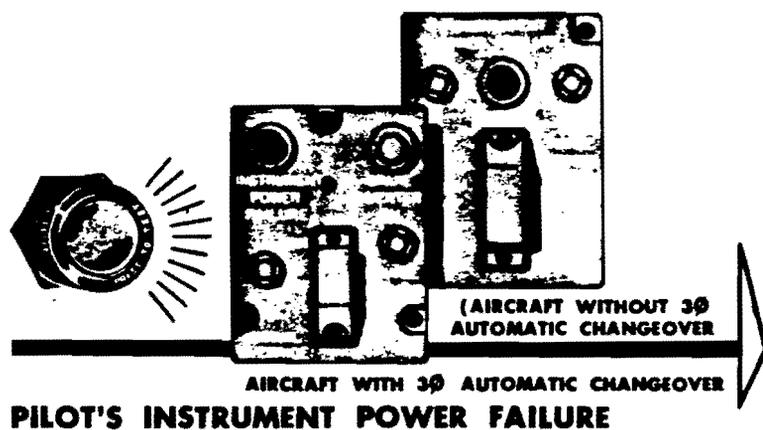
Do not open battery compartment and attempt to disconnect or remove overheated battery. Battery fluid will cause burns and overheated battery will cause thermal burns and may explode.

inverter FAILURE

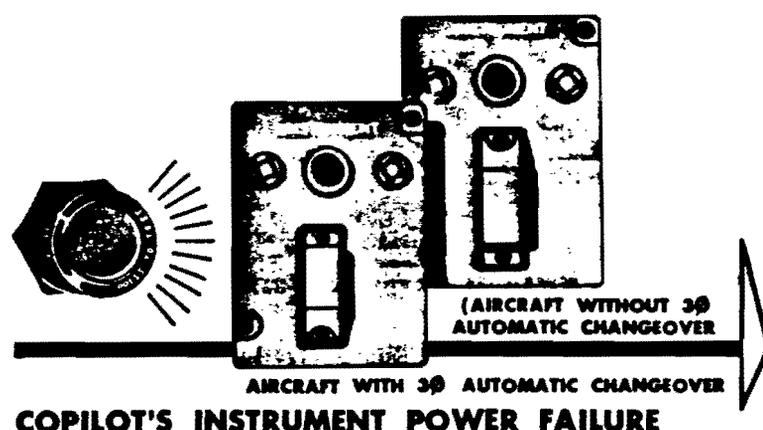
When illuminated, red inverter failure warning lights indicate the following equipment inoperative:



- 1∅
- RANGE INDICATOR
 - AILERON DEICING PRESSURE INDICATOR
 - HEADING POINTER AND GLIDE SLOPE INDICATOR OF ID-249
 - RADAR ALTIMETER
 - RADIO MAGNETIC INDICATORS
 - TORQUE PRESSURE INDICATORS
 - FUEL PRESSURE INDICATORS
 - OIL PRESSURE INDICATORS
 - FUEL QUANTITY INDICATORS
 - FUEL FLOW INDICATORS
 - TACAN
 - LIAISON RADIO
 - IFF/SIF
 - NAVIGATOR'S HEADING INDICATOR
 - IGNITION ANALYZER
 - AZIMUTH INDICATOR
 - BEARING CONVERTER



- 3∅
- PILOT'S ATTITUDE INDICATOR
 - PILOT'S HEADING INDICATOR
 - HEADING POINTER OF ID-249
 - RADIO MAGNETIC INDICATOR
 - COMPASS CARDS
 - NAVIGATOR'S HEADING INDICATOR
 - AZIMUTH INDICATOR
 - BEARING CONVERTER



- 3∅
- COPILOT'S ATTITUDE INDICATOR
 - COPILOT'S HEADING INDICATOR
 - DRIFTMETER

Figure 3-14

HYDRAULIC SYSTEM EMERGENCY OPERATION.

Should the output of either or both the engine-driven hydraulic pumps be lost, continue normal operation of the hydraulic system, using the auxiliary hydraulic pump to maintain pressure. See Section I, HYDRAULIC SYSTEM.

CAUTION

When using the auxiliary hydraulic pump with only one engine generator operating, check the loadmeter frequently to assure that the rated capacity of the remaining generator is not exceeded. Turn off all unnecessary electrical equipment.

LOSS OF HYDRAULIC PRESSURE.

In the event hydraulic pressure is lost because of a leaking or damaged supply system, the loss will be indicated by the hydraulic pressure gage on the instrument panel and the following components will become inoperative: nose wheel steering, wing flaps, cargo door, cargo ramp, elevator and rudder reverse locks. The landing gear, normally powered by hydraulic pressure, may be extended manually. If the leak occurs on the main system pressure side of the check valve at the brake accumulator, hydraulic pressure for limited braking action will be available. If a leak is observed in the nose steering this system can be isolated by pulling nose steering circuit breaker. If a leak is observed in either main gear well the use of the brake on that wheel should be kept to a minimum to reduce the possibility of fire.

WARNING

In the event of main hydraulic system failure prior to landing, turn the anti-skid switch OFF. This will insure positive braking action of at least one full application of the brakes.

HYDRAULIC BRAKE SYSTEM EMERGENCY OPERATION.

If a complete hydraulic system failure should occur, the brakes will be inoperative for any continuous use unless the anti-skid is turned off. However, the hydraulic brake system is so designed, with a brake accumulator, that at least one brake application will remain after a hydraulic system pressure supply failure. Should the hydraulic brake system fail, braking action to shorten the landing roll may be obtained by use of the emergency air brake system and propeller reversing. If brakes fail for no apparent reason, turn the anti-skid off and attempt braking.

NOTE

If the hydraulic pressure gage on the instrument panel indicates low pressure, a check of the pressure indicated on the brake accumulator air gage, located in the radio compartment, should be made to determine the pressure available in the brake system. Refer to INSTRUMENT RANGE MARKINGS, Figure 5-1, Section V, for minimum braking pressure.

LANDING GEAR EMERGENCY OPERATION.

CAUTION

In all cases of known or suspected gear malfunction or unsafe cockpit indications, appropriate emergency gear lowering procedures will be followed to ensure positive lowering of the gear. After landing gear is down, the gear locking pins should be inserted and should remain installed throughout the landing sequence.

HYDRAULIC FAILURE (LANDING GEAR FAILS TO EXTEND).

Refer to Figure 3-15 should the landing gear fail to extend because of a failure of the hydraulic system.

NOTE

If landing gear does not lower when the handle is placed in the down position, check hydraulic pressure gage and turn on aux hydraulic pump. If this fails, proceed with manual lowering of the gear as follows:

- ① Landing gear lever - DOWN. CP
2. Landing gear controllable check valve - EMERGENCY. FM (LM)
3. Main landing gear uplock release handles - Pulled. FM, (LM)
4. Main landing gear - Down and locked. FM, (LM)

Use hand crank as necessary to crank gear into position.

NOTE

Use the tapered end of the handcrank as a drift pin, if necessary, to lock down the main landing gear.

5. Main landing gear ground lock pins - Installed. FM, (LM)
6. Nose landing gear uplock release handle - Pulled. FM
7. Nose landing gear - Down and locked. FM

Pull nose landing gear emergency down - lock handle as necessary.

Airspeed may have to be reduced to as low as 110 knots to lock nose landing gear down.

8. Nose landing gear ground lock pin - Installed. FM
9. HYDRAULIC FAILURE (LANDING GEAR FAILS TO EXTEND) Checklist - Completed.FM

HYDRAULIC FAILURE (LANDING GEAR FAILS TO RETRACT).

There are no provisions for retraction of the

landing gear should the hydraulic system fail. The pilot should decide whether to continue flight or land.

ELECTRICAL FAILURE (LANDING GEAR FAILS TO EXTEND).

In the event a complete electrical power failure occurs, the landing gear lever becomes inoperative. For this reason, manual operation of the landing gear directional control valve is required. However, other types of electrical failure (short circuits, faulty switches, etc.) can also interfere with the normal operation of the system. Since the nature of the malfunction is generally not known and could be intermittent: it is recommended that the circuit be deenergized by pulling out the circuit breaker on the overhead circuit breaker panel. Furthermore, the landing gear lever should be placed in the appropriate position to avoid inadvertent landing gear operation when the circuit breaker is reset.

1. Landing gear control circuit breaker - Pulled. FM

NOTE

On some aircraft this circuit breaker is marked LANDING GEAR RETRACT.

- ② Landing gear lever - DOWN. CP
3. Landing gear directional control valve - Depress down (top) button until all three struts are down and locked. FM, (LM)

CAUTION

When ground lock pins are not installed and the accumulator is hydraulically charged, movement of the manual control button to the UP position will retract the landing gear.

4. Visually check that all struts are down and locked; then insert ground lock pins. FM, (LM)
5. ELECTRICAL FAILURE (LANDING GEAR FAILS TO EXTEND) Checklist - Completed. FM

ELECTRICAL FAILURE (LANDING GEAR FAILS TO RETRACT).

1. Landing gear control circuit breaker - Pulled. FM

NOTE

On some aircraft this circuit breaker is marked LANDING GEAR RETRACT.

2. Landing gear lever - UP. CP
3. Landing gear directional control valve - Depress up (bottom) button until all three struts are up and locked. FM, (LM)
4. ELECTRICAL FAILURE (LANDING GEAR FAILS TO RETRACT) Checklist - Completed. FM

REVERSE LOCK EMERGENCY RELEASE.

Should there be an indication of pressure restricting movement of the elevator and rudder surfaces (except during intentional locking), emergency release of hydraulic pressure in the reverse lock lines may be accomplished by pulling the release handle at the pilot's station or manually operating the reverse lock release valve in the cargo compartment.



When the reverse lock release valve is turned to EMERGENCY, the rudder and elevator reverse lock system is inoperative until the valve is repositioned to NORMAL. If landing with the valve in the EMERGENCY position, the pilot's should exercise caution in using reverse thrust and the copilot should attempt to restrain excessive movement of the surfaces.

SECTION IV

AUXILIARY EQUIPMENT

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HEATING, VENTILATING AND ANTI-ICING SYSTEM.

Hot air for heating the crew and cargo compartments and for anti-icing the flight surfaces can be supplied throughout the aircraft both on the ground and in flight. Two internal-combustion type heaters, employing what is termed the "whirling flame" design, are located overhead in the cargo compartment and furnish hot air for the system. The hot air plenum acts as a collecting chamber for the output of the two heater units. Ducts leading forward to the windshields and crew compartment, outboard into the wings, and aft into the cargo compartment and tail assembly convey the heated air to desired points depending upon the setting of valves located in the ducts. Facilities are provided for mixing heated air with fresh air. Mechanically-operated, variable-aperture anemostats and heat control valves in the crew and cargo compartments control temperature by controlling the amount of air released from the ducts into the compartments. Utilizing the same ducts as the heating system, but with the heater units inoperative, the ventilating system provides the crew and cargo compartments with fresh outside air. Power for operation of the system is obtained from the primary 28-volt dc bus.

HEATER FUEL AND AIR SUPPLY.

Fuel for the heaters is obtained from either nacelle fuel supply. Normally, fuel is drawn from the nacelle tanks by the recip engine-driven fuel pumps and supplied under pressure to the heater fuel pressure regulators; however, with the engines not running, fuel may be obtained for heater operation by using either or both nacelle tank boost pumps. On aircraft AF 54-552 through 54-666, check valves are installed in both heater fuel supply lines downstream of the master fuel solenoid valves; however, the check valve in the heater fuel supply from the left engine is drilled to provide for thermal expansion. If the left engine is shut down with the heaters operating, a small amount of fuel will feed back into the heater fuel supply line from the left engine. Refer to Figure 4-1. On aircraft AF 54-667 and subsequent, a check valve is installed upstream of the heater fuel solenoid valve in each fuel supply line as is a thermal relief valve to provide pressure relief. Air for the heating system is supplied in flight by a ram air scoop located on the top of the fuselage. During ground operation the airscoop flapper valve is closed and a blower in the cargo compartment supplies air to the heater air intake chamber. The blower normally receives air from the interior of the cargo compartment. If outside air is desired, the forward ditching hatch may be opened and an auxiliary duct leading back to the blower air intake may be installed. The changeover between ram air and ground blower operation is automatic as the aircraft lands and takes off.

Note

On some aircraft, a ground blower override switch, located on the overhead panel, permits in-flight operation of the ground blower to augment the heater ram air in icing conditions and at low airspeeds.

AUTOMATIC HEATER LIMIT SWITCHES.

When the heater starting procedure has been completed, automatic shutdown of a malfunctioning heater is provided by the low and high thermal switches installed in each heater.

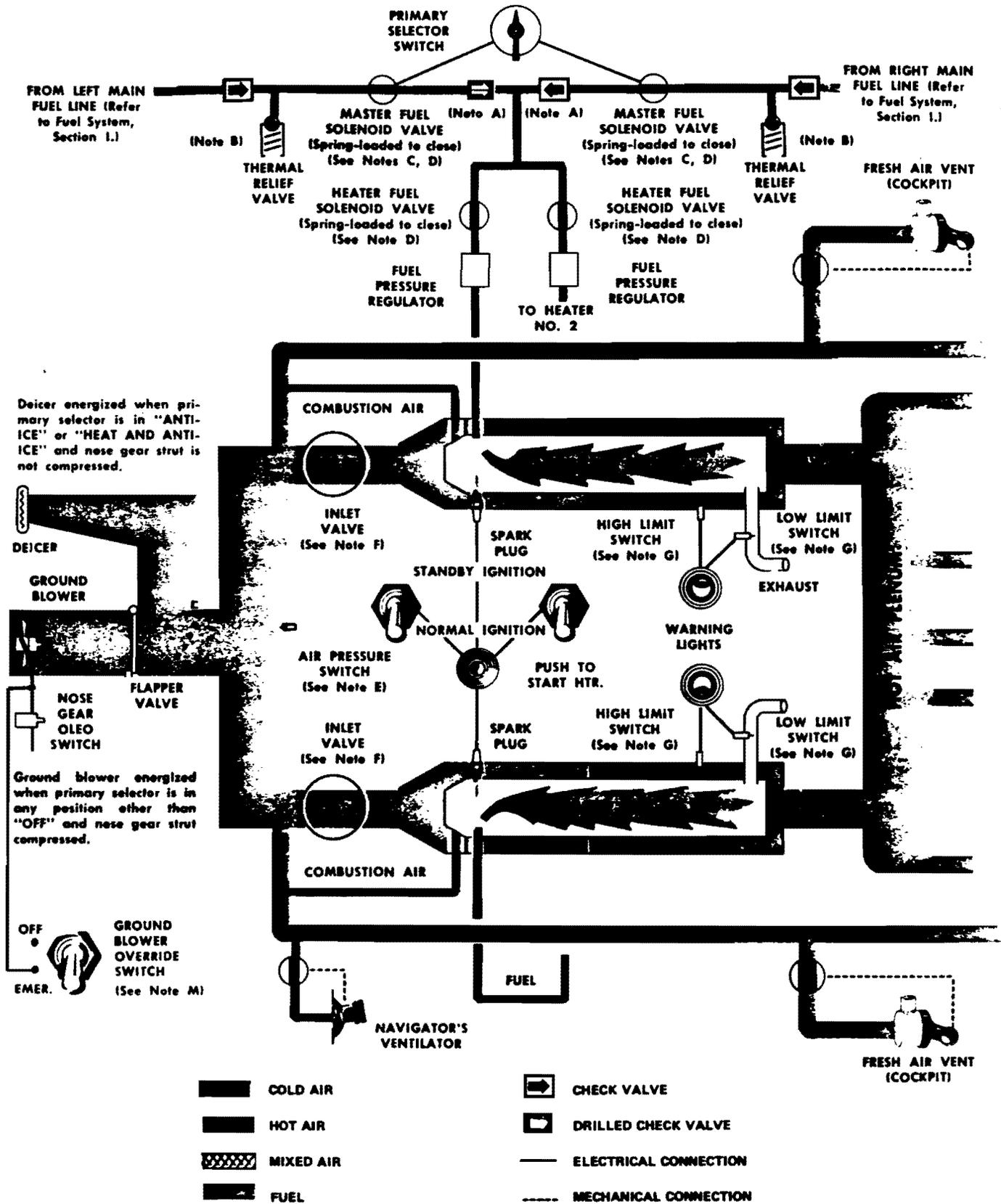
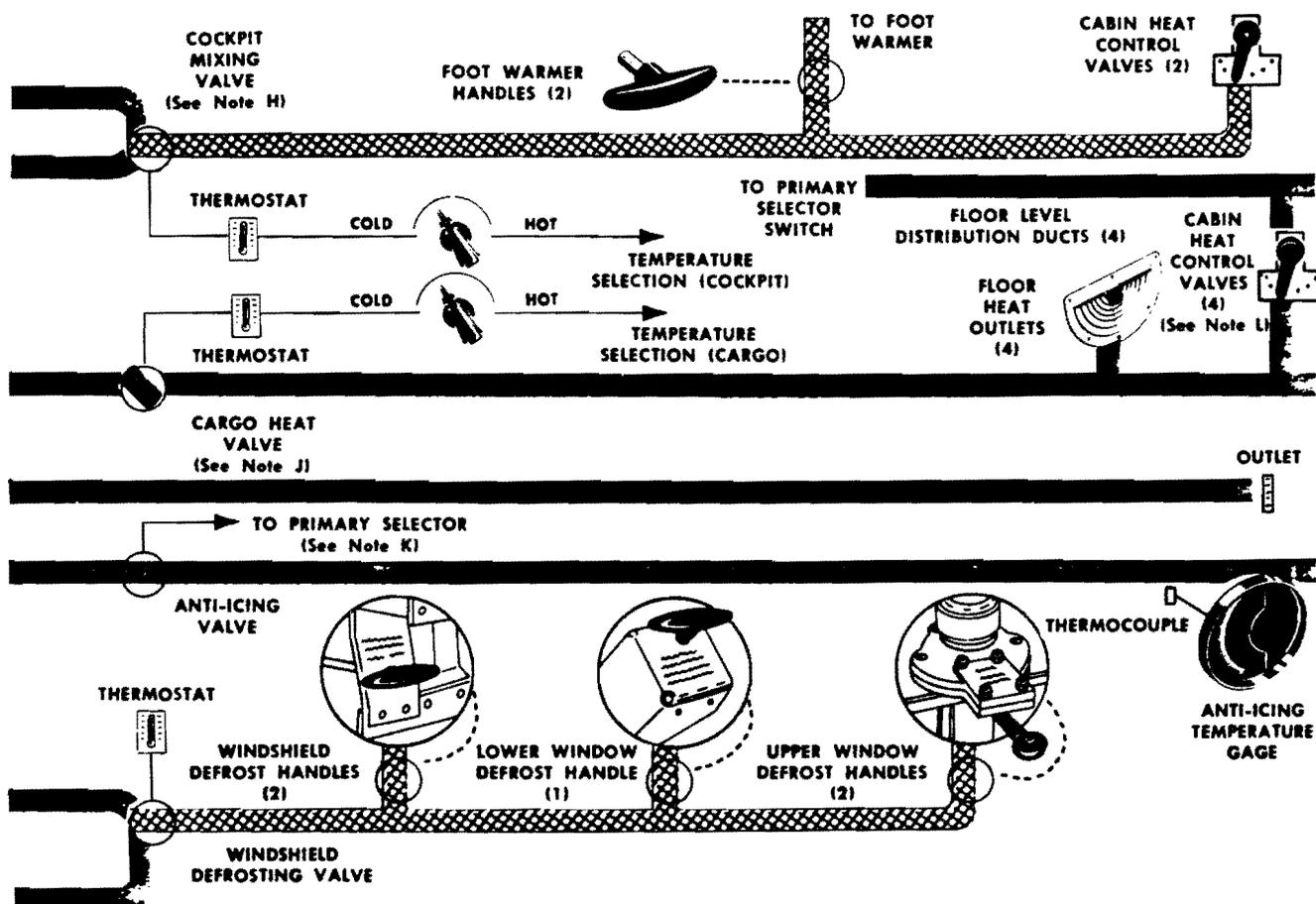


Figure 4-1

HEATING, VENTILATING and ANTI-ICING



NOTES

- A. AIRCRAFT AF 54-552 thru 54-666.
- B. AIRCRAFT AF 54-667 and subsequent.
- C. Valve permits reverse flow when closed in order to relieve thermal expansion pressure.
- D. Fuel Solenoid Valves open when ignition is ON, air pressure sufficient, Primary Selector Switch in any heat or anti-ice position and Starter Button depressed.
- E. Switch assures necessary air pressure before permitting operation of fuel solenoid valves.
- F. Inlet Valves opened by Primary Selector Switch in any position other than OFF.
- G. High & Low Limit Switches automatically cut off ignition and fuel whenever temperatures rise above or fall below normal operating range.
- H. Cockpit Mixing Valve is controlled directly by HOT and COLD Cockpit Temperature Switch positions. With the switch in AUTO position, desired temperature is selected by Temperature Selection Rheostat and mixing valve controlled by thermostat. Cockpit heat possible when Primary Selector Switch is in HIGH HEAT, LOW HEAT, HEAT & ANTI-ICE, or ANTI-ICE.
- J. Cargo Heat Valve controlled by Temperature Selector Rheostat and Thermostat. Cargo heat possible when Primary Selector Switch is in HIGH HEAT, LOW HEAT or HEAT & ANTI-ICE.
- K. Anti-icing Valve controlled directly by Primary Selector Switch and is fully open when Primary Selector Switch is in ANTI-ICE or HEAT & ANTI-ICE or LOW HEAT in Right (Aircraft 57-6289 thru 57-6294).
- L. Cabin heat valves and floor level distribution ducts are provided on some aircraft. On other aircraft, this distribution is accomplished through four overhead manifolds and twelve mechanically-operated outlets.
- M. On some aircraft, a ground blower override switch, located on the overhead panel, permits in-flight operation of the ground blower to augment the heater ram air in icing conditions and at low airspeeds.

Low Limit Switches.

A low limit thermal switch is located in the exhaust of each heater. When a temperature of 250°F develops in the exhaust during normal starting procedures, the low limit switch closes, energizing the heater fuel valve and ignition unit and turning off the warning light. If, at any time during heater operation, the heater ceases to operate because of poor ignition, lack of fuel, or some other malfunction, the low limit switch will open when the exhaust temperature drops below 250°F. The opening of the low limit switch shuts off heater fuel and ignition and illuminates the warning light.

High Limit Switches.

A high limit thermal switch is mounted on the aft end of each heater adjacent to the hot air plenum and extends into the heated air chamber of the heater. If, for any reason, the temperature of the heated air reaches 450°F, the high limit switch opens, cutting off fuel and ignition to the heater and causing the warning light to illuminate. The heater starting circuit is wired through the high limit switch and, if the switch is open, it is not possible to start the heater.

THERMOSTATS.

Four mercury thermostats control cargo compartment, crew compartment, and windshield air temperatures. All thermostats have preset controls which determine the temperature ranges. The cargo crew compartment thermostats are further adjustable by cockpit controls and may be set to maintain desired temperature. Time lag in the response of the crew compartment thermostat is reduced by an anticipator thermostat which senses the temperature in the crew compartment air duct, and prepares the crew compartment thermostat to react before its set temperature is reached. The crew compartment thermostat is located on the forward side of the instrument panel. The anticipator thermostat is in the crew compartment duct on the output side of the cockpit air mixing valve. The windshield thermostat is in the windshield air duct on the output side of the windshield defrosting valve; the windshield defrosting valve regulates the hot and cold air required to maintain a defrosting air temperature of 215°F. The cargo compartment thermostat is mounted in the cargo compartment on the forward side of the left wheel well.

Primary Selector Switch.

One rotary-type, six-position, primary selector switch (figure 4-6) on the accessory control panel, permits electrical selection of heating and ventilating operations. Switch positions are VENT, LO HEAT,

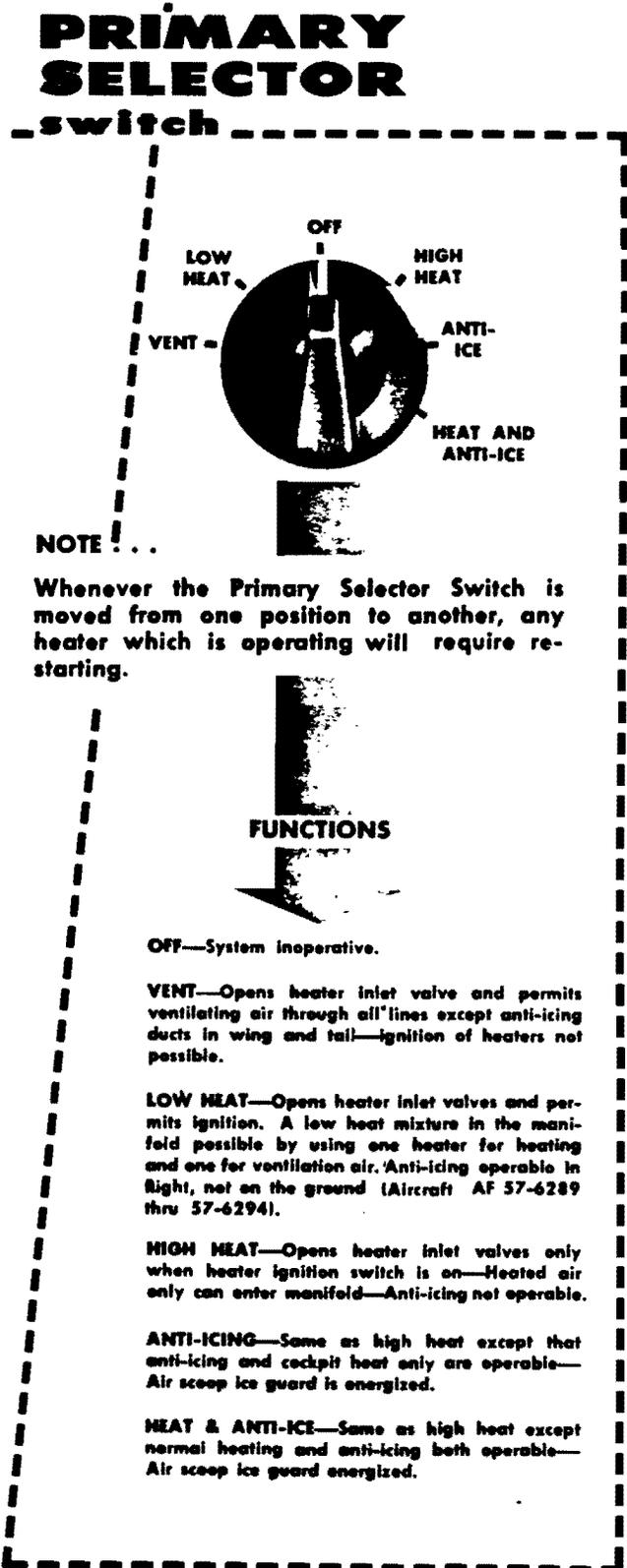


Figure 4-2

OFF, HI HEAT, ANTI-ICE, and HEAT AND ANTI-ICE. In the VENT position, the heater units do not operate. Ventilating air, from the ram air scoop in flight or from the ground blower during ground operation, is distributed through all ducts except those leading into flight surfaces. The LO HEAT position opens both heater inlet valves. Either heater may be turned on and the output of one operating heater may be mixed in the heater manifold with fresh air coming through the other heater. On aircraft AF 54-552 through 56-4387, this low heat mixture is directed to all ducts except the anti-icing ducts. On all other aircraft, low heat is directed to all ducts during flight but is excluded from the anti-icing ducts on the ground.

Note

If both heaters are ignited while the primary selector switch is in LO HEAT, the resultant condition will be the same as HI HEAT with both heaters operating.

In the OFF position of the switch, the system is inoperative. In HI HEAT either one or both heaters operate and supply hot air to all ducts except the anti-icing ducts. If only one heater is used, the valve of the inoperative heater is closed to prevent dilution of the output of the operative heater. The ANTI-ICE position directs power to heat the air scoop ice guard electric boot, closes the cargo compartment heating valve, and opens the anti-icing valve supplying heat to the wing, fin, and horizontal stabilizer leading edges, and the rudder sector wheel. The HEAT AND ANTI-ICE position permits a combination of normal heating and anti-icing operations.

Heater Ignition Switches.

A three-position ignition switch (figure 4-6) for each heater is located on the accessory control panel. Switch positions are NORMAL IGNITION, OFF, and STANDBY IGNITION. Electrical power is directed to these switches only when the primary selector switch is in a position requiring heater operation. Operation of the ignition switches is ineffective unless sufficient air pressure is available for the heaters and the high limit heat switch is closed, indicating that there is no overheat condition existing in the heater. NORMAL IGNITION selects the normal spark plug for the corresponding heater which is fired when the starter button is depressed. The OFF position prevents power delivery to the spark plugs. The STANDBY IGNITION position employs a spare ignition coil to fire a spare spark plug in the heater should normal ignition fail.

Heater Start Button.

A heater start button (figure 4-6) is located on the accessory control panel. When there is sufficient air pressure available for operation of the heaters, depressing this button completes the ignition circuit and opens the fuel valve to either or both heaters pro-

vided the corresponding ignition switch is in either NORMAL or STANDBY. Until the heater reaches operating temperature, the red warning light will continue to glow. After heater operating temperature is reached, the warning light goes out and the heater start button may be released. At any time during operation that the low or high limit switches open and cut off heater operation the warning light will again glow; operation of either or both heaters will be restored only by again depressing the start button.

Temperature Selection Rheostats.

Two rotary-type temperature selection rheostats (figure 4-6) on the accessory control panel are used to control crew and cargo compartment air temperatures. These rheostats vary current flow through a heating blanket on the mercury tube, thus changing the response of the thermostat to ambient temperature. Placarded positions are HOT and COLD. Positioning the rheostat to HOT will cause the corresponding compartment temperature to rise. Positioning to COLD will cause the compartment temperature to approach outside air temperature. Intermediate settings may be selected to keep the temperature at the desired level. The temperature selection rheostats are operative only when the primary selector switch is in a position which will supply heat to the crew and cargo compartments. In addition, the cockpit temperature selection rheostat functions only when the cockpit temperature switch is in the AUTO position.

Cockpit Temperature Switch.

A four-position switch (figure 4-6) mounted on the accessory control panel directly controls the crew compartment air mixing valve. The positions OFF and AUTO are permanent positions. The positions HOT and COLD are momentary-contact positions. In the OFF position, the crew compartment thermostat is ineffective and the cockpit air mixing valve is not responsive to temperature changes. In the AUTO position, the crew compartment thermostatic system is energized and the mixture valve setting is controlled by the thermostat to maintain a constant temperature as selected by the temperature selection rheostat. In the HOT position, the thermostat is deenergized and the mixing valve is directly actuated to open the heated air duct and close the cold air duct. In the COLD position, the thermostat is deenergized but the mixing valve is directly actuated to close the heated air duct and open the cold air duct. Toggling the switch momentarily to either HOT or COLD positions permits intermediate valve settings for temperature selection. The HOT and COLD positions are normally used only for rapid relief from uncomfortable crew compartment temperatures. The AUTO position, in conjunction with the desired setting of the temperature selection rheostat, should be used to maintain constant crew compartment heat level. There is a slight time lag between selection and temperature response.

Cargo Heat Distribution.

The distribution of heated or ventilating air throughout the cargo compartment on some aircraft is effected by floor-level anemostats in the wheel wells and anemostats located in overhead manifolds at the fore and aft ends of the compartment. On other aircraft the overhead manifolds are replaced by perforated ducts at floor level. Flow of air through these ducts is controlled by cabin heat control valves. Either installation will provide heating or ventilation of the cargo compartment depending on the type of system operation desired.

CAUTION

Do not stow equipment such as parachutes, life jackets, life rafts, etc. near the heat distribution ducts since damage to the equipment may result.

Floor-level Anemostats.

Two manually-operated anemostats, located in the base of each main gear wheel well, distribute heated or ventilating air to the center section of the cargo compartment. On some aircraft, the anemostats are adjusted by knobs; on others, a screw driver adjustment is provided. In either case, the anemostats may be positioned to the OPEN or CLOSED settings, or to any intermediate position in order to regulate the flow of heated or ventilating air.

Overhead Anemostats (Some Aircraft).

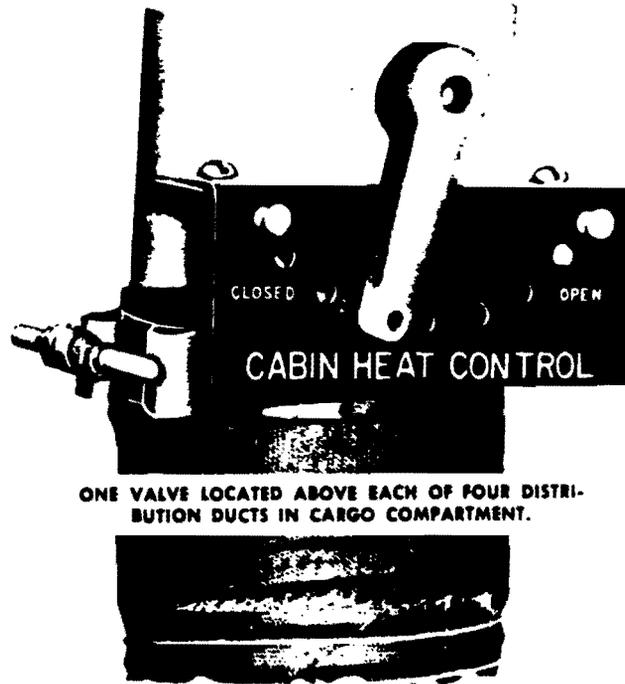
On aircraft with heat manifolds mounted overhead in the fore and aft sections of the cargo compartment, three anemostats located in each of the four manifolds control the flow of heated or ventilating air to these compartment areas. The twelve anemostats are manually operated by knobs which may be placed in the OPEN position, the CLOSED position, or at any intermediate position in order to regulate the flow of heated or ventilating air.

Cabin Heat Valve Handles (Some Aircraft).

Airflow to the floor-level distribution ducts in the cargo compartment is controlled by the four cabin heat valves (figure 4-3) two forward and two aft on either side of the cargo compartment. These valves are the butterfly-type and may be manually set in any of seven different positions ranging from OPEN to CLOSED.

Windshield Defrosting Valve Handles.

The flow of heated air (215°F as regulated by the windshield thermostat and mixing valve) to both windshields is controlled by iris valves manually operated



ONE VALVE LOCATED ABOVE EACH OF FOUR DISTRIBUTION DUCTS IN CARGO COMPARTMENT.

Figure 4-3

by pull-to-open handles (figure 4-4) located below the instrument panel on the pedestal. Each valve, which is fully open when its handle is pulled out, allows maximum flow of heated air to its respective windshield. When the handle is fully recessed, all airflow to the windshield is shut off. Varying rates-of-flow may be obtained by placing the handle in some intermediate setting between the fully out and recessed positions.

CAUTION

These valves should remain closed at all times unless nesa is inoperative.

Lower Side Window Defrosting Valve Handle.

The flow of heated air to the pilot's lower side window is controlled by an iris valve manually operated by a pull-to-open handle (figure 1-39) on the forward face of the pilot's console. The valve, which is fully open when its handle is pulled out, allows maximum flow of heated air to the lower side window. When the handle is fully recessed, all airflow is shut off. Varying rates-of-flow may be obtained by placing the handles in some intermediate setting between the fully out and recessed positions. This valve should be closed whenever the heaters are not operating to prevent fogging of the lower side window.

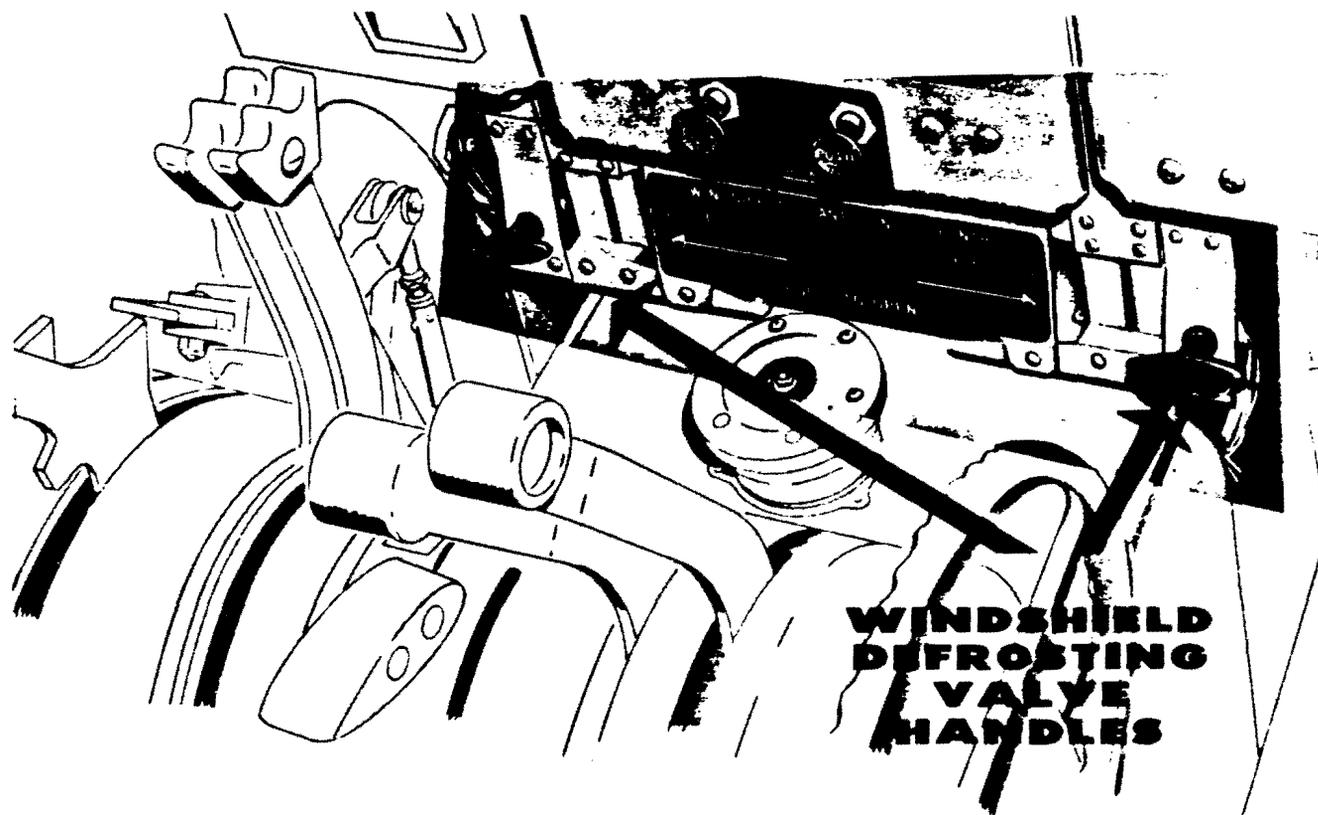


Figure 4-4

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Upper Side Window Defrosting Valve Handles.

A manually-operated iris valve (figures 1-39 and 1-40) adjacent to the upper side window on each side of the aircraft controls the flow of heated air to the upper side window. Each valve is operated by a handle, the positions of which are OPEN and CLOSE. In the OPEN position, the valve allows maximum flow of heated air to the windows; in CLOSE, all airflow through the valve is shut off. Placing the handle in some intermediate position between OPEN and CLOSE will vary the rate-of-flow. These valves should be closed whenever the heaters are not operating to prevent fogging of the upper side windows.

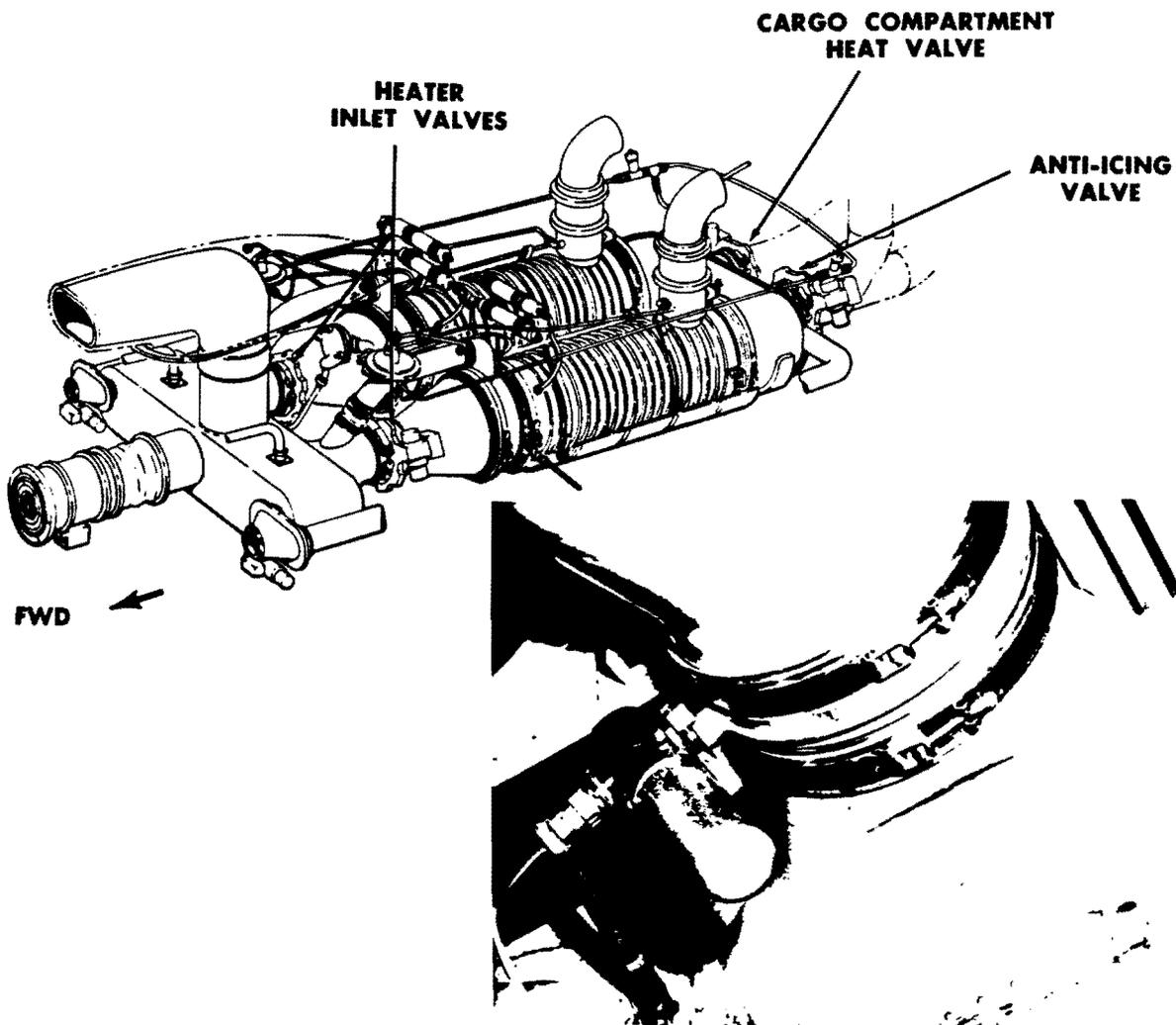
Auxiliary Heat Outlet.

An auxiliary heat outlet, normally capped, is located in the base of the hot air plenum and used for ground preheating of the engines or other heat needs in remote areas of the aircraft. When used, the cap is removed and flexible temporary heat ducts installed to direct hot air to the desired locations. Circular openings in cargo compartment windows and in the na-

celles are provided for the passage of the flexible ducts for engine preheating.

Foot Warmer Handles (Some Aircraft).

A push-pull handle (figure 1-58 or 1-59) is located on both the pilot's and copilot's instrument panels to control heated air at foot level for the pilot and copilot. The heated air is ducted from the cockpit air ducts forward of the mixing valve and is, therefore, at the temperature selected by the cockpit temperature switch and cockpit temperature selection rheostat. Control of the heated air to the foot warmer outlets, which are located forward of the rudder pedals, is provided by a butterfly valve installed in each foot warmer duct. The valve is mechanically connected to its respective manually-operated handle. When the handle is pulled out to the full extent of its travel, the valve opens and permits the maximum rate-of-airflow through the duct; when fully recessed, all airflow is shut off. Varying rates-of-flow may be obtained by placing the handle at an intermediate setting between the fully extended and the fully recessed positions.



TYPICAL BUTTERFLY TYPE VALVE
USED IN LOCATIONS SHOWN ABOVE

HEATING SYSTEM VALVES

Figure 4-5

Fresh Air Ventilating Valves And Nozzles (Some Aircraft).

Two variable-position, manually-operated fresh air valves and nozzles, located on each side of the engine emergency panel, control the distribution of fresh air from the cold air plenum to the cockpit. The rate of airflow through the valve and nozzle is controllable as is the position of the nozzle itself. Three detents provide regulation of the airflow; when the valve housing is pulled to the full aft detent, maximum airflow through the valve is obtained. Pushing the valve housing forward until a detent is reached will decrease the flow of air. When the housing is pushed

to the full forward detent, all airflow is shut off. The nozzle is adjustable through an arc of 35° to direct the stream of ventilating air as desired.

Navigator's Ventilator (Some Aircraft).

A PULL-TO-OPEN ventilator is provided overhead to the left of the navigator's seat. Fresh air from the cold air plenum of the heater is diverted to this outlet to provide ventilation for the navigator. Detents provide varying rates-of-flow between the fully open and fully closed positions. The ventilator nozzle is adjustable to direct the stream of ventilating air as desired.

Heater Warning Lights.

Two red warning lights (figure 4-6), one for each heater, are located on the accessory control panel. These lights, which will glow whenever the heater is on but not operating, are controlled by the low and high limit switches. In starting the heaters, the warning light remains on until heater operating temperature is reached.

Anti-icing Temperature Indicator.

An anti-icing temperature indicator (figure 1-58 or 1-59) mounted on the copilot's instrument panel indicates in degree centigrade the temperature of the heated air in the wing anti-icing duct. The temperature is sensed and transmitted by a thermocouple located in the left wing duct between the fuselage and engine. Refer to Instrument Range Markings, Section V.

HEATING SYSTEM VALVE CHECK.

The following ground check is recommended to ascertain that the actuators for the various heating system valves are operating properly. Any irregularity detected in actuator speed during the operating cycle should be investigated. Because this check must be accomplished visually and aurally, a quiet location (with engines, APU, external power generator, and ground blower off) is required. With the battery used to energize the system, operation of the valve actuators is distinctly audible.

- a. All electrical switches - OFF.
- b. Secondary bus - NORMAL.

Note

The secondary bus switch is placed in NORMAL to prevent energization of the ground blower.

- c. Battery - ON.
- d. Heater primary selector - HIGH HEAT. Check operation of the cargo compartment heat valve.

Note

If high ambient temperatures exist, it may not be possible to perform a check of the cargo compartment heat valve since operation of this valve depends upon thermostat setting. The windshield defrosting valve may operate when the primary selector switch is placed in HIGH HEAT; however, a full check of the windshield defrosting valve cannot be made without operating the heaters.

- e. Cockpit temperature - HOT, then COLD. Check operation of the cockpit mixing valve.
- f. No. 1 heater ignition - NORMAL. Check operation of the No. 1 heater inlet valve.
- g. No. 2 heater ignition - NORMAL. Check operation of the No. 2 heater inlet valve.
- h. Heater primary selector - HEAT AND ANTI-ICE. Check operation of the anti-icing valve.
- i. Heater primary selector - OFF.
- j. Heater ignition switches - OFF.

NORMAL OPERATING PROCEDURES.

CAUTION

Heater air inlet valves shall be checked for proper position immediately after starting heaters or changing primary selector to any position other than OFF or VENT.

To Obtain Low Temperature Heat.

The following procedure is recommended for obtaining low temperature crew and cargo compartment heat:

Note

- To energize the ground blower for heater operation on the ground when both engine generators are not operating, the secondary bus switch must be placed in MONITOR.
- To supply fuel under pressure to the heater fuel pressure regulators when both engines are not operating, the nacelle boost pumps switches should be placed in LO.
- During any heater operation a fuel leak check should be made.
 - a. Primary selector - LO HEAT.
 - b. Either heater ignition - NORMAL.
 - c. Depress the heater starter button until the warning light goes out.
 - d. Heater inlet valves - Checked open.
 - e. Cockpit temperature - As required.
 - f. Cockpit temperature selector rheostat - As desired.
 - g. Cargo compartment temperature selector rheostat - As desired.
 - h. Anemostats - As desired.
 - i. Cabin heat valves - As desired.

To Obtain High Temperature Heat.

The following procedure is recommended for obtaining high temperature crew and cargo compartment heat:

Note

To energize the ground blower for heater operation on the ground when both engine generators are not operating, the secondary bus switch must be placed in MONITOR.

Note

To supply fuel under pressure to the heater fuel pressure regulators when both engines are not operating, the nacelle boost pumps switches should be placed in LO.

Note

During any heater operation a fuel leak check should be made.

- a. Primary selector - HI HEAT.
- b. Either or both heater ignition - NORMAL.
- c. Depress the heater starter button until the warning light goes out.
- d. Heater inlet valves - Checked.
- e. Cockpit temperature switch - As required.
- f. Cockpit temperature selector rheostat - As desired.
- g. Cargo compartment temperature selector rheostat - As desired.
- h. Anemostats - As desired.
- i. Cabin heat valves - As desired.

To Obtain Wing And Tail Anti-icing.

The following procedure is recommended for anti-icing the wing and tail surfaces:

CAUTION

The anti-icing system may be operated on the ground only momentarily for functional checks. Excessive operation on the ground, especially during warm weather, can cause buckling of the skin due to expansion and subsequent contraction.

- a. Primary selector - ANTI-ICE.

Note

If crew and cargo compartment heat is desired during anti-icing, turn the primary selector switch to HEAT & ANTI-ICE. When the heaters are started, adjust crew and cargo

compartment heat controls as desired. If maximum anti-icing is required, the primary selector switch must be placed in ANTI-ICE.

- b. Either or both heater ignition - NORMAL.
- c. Depress heater starter button until warning lights go out.
- d. Heater inlet valves - Checked.
- e. Toggle the cockpit temperature switch to COLD if maximum anti-icing is desired.

Note

Toggleing the cockpit temperature switch to COLD will shut off all heated air to the cockpit but will not shut off the flow of cold air. Both the cabin heat and footwarmer valve handles should be placed in the closed position.

- f. Check anti-icing indicator to assure heat for anti-icing is being obtained.
- g. Attempt to maintain an airspeed of 150 knots or above.

Note

This has two beneficial effects. It will increase the mass flow and hence the amount of heat available to the leading edge double skin, and thereby reduce the amount of run-back moisture leaving the trailing edge. Also, because of the flatter angle of attack it will cause the least direct impingement to occur and reduce the projection of the aileron leading edge into the airstream.

Note

On some aircraft, a ground blower override switch, located on the overhead panel, permits in-flight operation of the ground blower to augment the heater ram air in icing conditions and at low airspeeds.

- h. On those aircraft which include a start button, if both heaters are being used and single heater operation is desired, momentarily turn one heater ignition switch OFF, then return to the NORMAL position for four minutes to insure venting of the heaters.

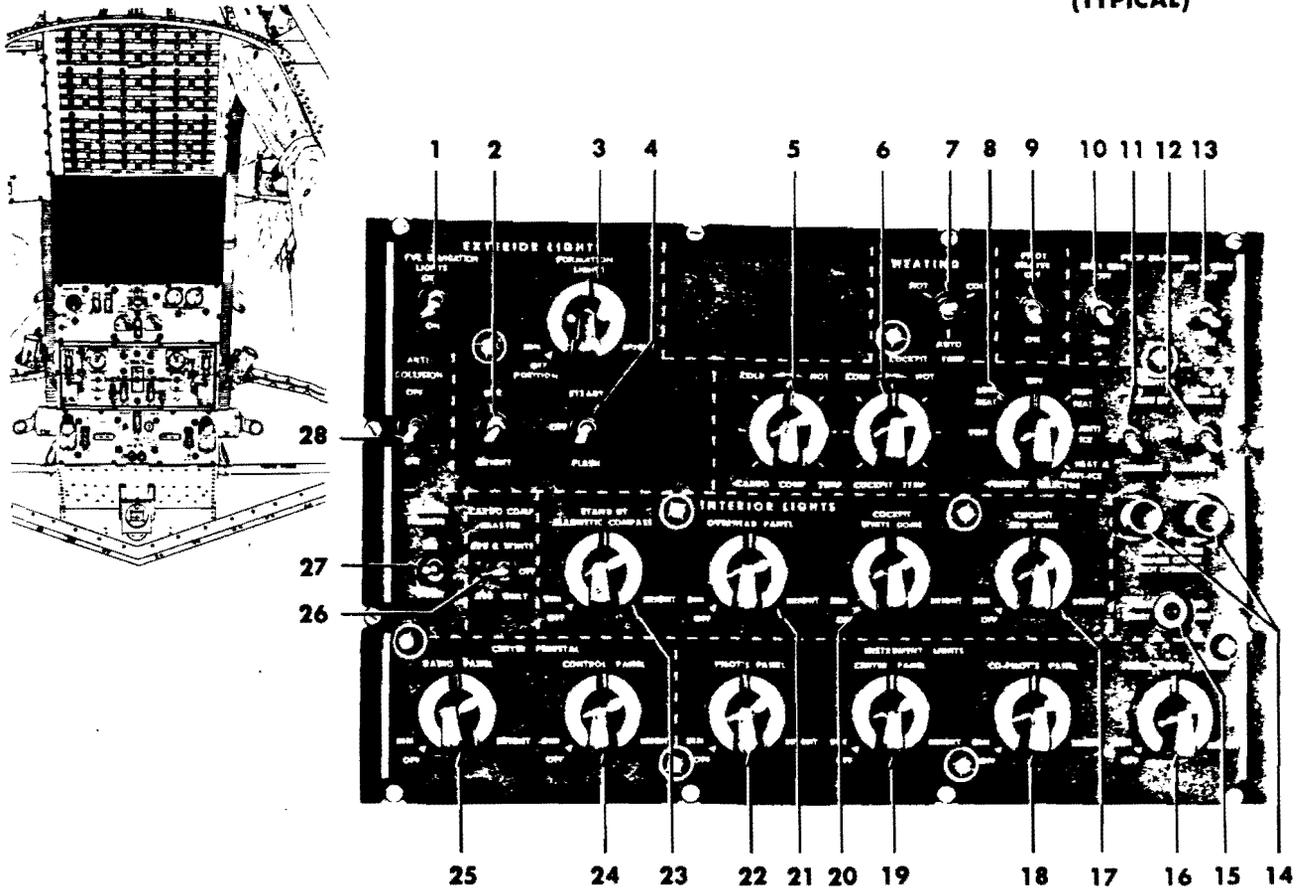
To Obtain Windshield Defrosting On The Ground.

The following procedure is recommended for obtaining windshield defrosting on the ground:

- a. Upon start of preflight inspection, employ an external heater or, if aircraft is manned, one aircraft heater and direct heat into the crew compartment area.
- b. Remove snow or ice from the windshield by hand, using a scraper that will not damage or scratch the glass.
- c. Allow heat (external or aircraft) to remain on while preflight inspection is completed. Allot sufficient time to allow windshield and retaining frames to warm up prior to applying windshield heat.

ACCESSORY CONTROL panel

(TYPICAL)



- | | |
|---|--|
| <ol style="list-style-type: none"> 1. FUSELAGE NAVIGATION LIGHTS SWITCH 2. POSITION LIGHTS DIM-BRIGHT SWITCH 3. FORMATION LIGHTS RHEOSTAT 4. POSITION LIGHTS SWITCH 5. CARGO COMPARTMENT TEMPERATURE SELECTION RHEOSTAT 6. COCKPIT TEMPERATURE SELECTION RHEOSTAT 7. COCKPIT TEMPERATURE SWITCH 8. PRIMARY SELECTOR SWITCH 9. PITOT HEATER SWITCH (LAND LIFT TRANSDUCER) 10. PROPELLER DEICING SWITCH (NO. 1 ENGINE) 11. HEATER NO. 1 IGNITION SWITCH 12. HEATER NO. 2 IGNITION SWITCH 13. PROPELLER DEICING SWITCH (NO. 2 ENGINE) 14. HEATER WARNING LIGHTS 15. HEATER START BUTTON | <ol style="list-style-type: none"> 16. INSTRUMENT PANEL FLOOD LIGHTS SWITCH 17. COCKPIT RED DOME LIGHTS RHEOSTAT 18. COPILOT'S INSTRUMENT PANEL LIGHTS RHEOSTAT 19. CENTER INSTRUMENT PANEL LIGHTS RHEOSTAT 20. COCKPIT WHITE DOME LIGHTS RHEOSTAT 21. OVERHEAD PANEL LIGHTS RHEOSTAT 22. PILOT'S INSTRUMENT PANEL LIGHTS RHEOSTAT 23. MAGNETIC COMPASS LIGHT RHEOSTAT 24. PEDESTAL CONTROL PANEL LIGHTS RHEOSTAT 25. PEDESTAL RADIO PANEL LIGHTS RHEOSTAT 26. CARGO COMPARTMENT LIGHTS MASTER SWITCH 27. WARNING LIGHTS DIMMING SWITCH 28. ANTI-COLLISION LIGHT SWITCH |
|---|--|

Figure 4-6

d. Open windshield defrosting valves gradually, allowing five-minute pauses at approximately each one inch of travel.

e. After the windshield has been properly heated the defrost valve should be closed.

CAUTION

- Excessive heat may cause failure of pilot's and copilot's windshields.
- When electrical heat windshields are installed use of defogging air should be used only upon failure of the electrical heat elements or in extreme fogging conditions. Air should be available if required.

**To Obtain Windshield Defrosting In Flight.
(Some Aircraft)**

Note

On aircraft with nesa windshield do not apply hot air when nesa is operating.

The following procedure is recommended for obtaining windshield defrosting in flight:

- a. Start either or both heaters.
- b. Open defrost valves approximately one inch of their travel to permit windshield and retaining frames to warm up.
- c. If icing conditions are encountered, open defrost valves gradually, allowing five-minute pauses at each one inch of travel.

To Shut Down Windshield Defrosting.

The following procedure is recommended for removing windshield heat:

CAUTION

Excessive temperature changes may cause failure of pilot's and copilot's windshield. This condition could occur when high heat for defrosting is removed rapidly.

- a. Close the defrost valves gradually allowing a five-minute pause at approximately each one inch of travel. This will prevent the full heat from being removed too rapidly.
- b. If, after the lowest heat level has been reached, there is no further need for heat, shut down the heaters.

To Obtain Engine Preheat.

The following procedure is recommended for obtaining engine preheat:

- a. Remove the auxiliary heat outlet cap and install temporary flexible heat ducts at the outlet leading through the openings provided in the cargo com-

partment windows to external heat ports in the engine covers.

- b. Secondary bus - MONITOR.

Note

- With both engines shut down, the ground blowers can be energized only when the secondary bus switch is placed in MONITOR.
 - To supply fuel under pressure to the heater fuel pressure regulators when both engines are not operating, the nacelle boost pumps switches should be placed in LO.
- c. Primary selector - HI HEAT.
 - d. Heater ignition - NORMAL.
 - e. Depress heater starter button until warning lights go out.
 - f. If maximum heat for engine preheat is desired, toggle cockpit temperature switch to COLD.

To Obtain Crew And Cargo Compartment Ventilation.

The following procedure is recommended to obtain crew and cargo compartment ventilation:

Note

To energize the ground blower for ground ventilation when both engine generators are not operating, the secondary bus switch must be placed in MONITOR.

- a. Fresh air ventilator valves - Open.
- b. Primary selector - VENT.
- c. Anemostats - As desired.
- d. Cabin heat valves - As desired.

To Shut Down Heaters.

The following procedures are recommended in shutting down the heaters:

- a. Heater ignition - OFF.
- b. Nacelle boost pumps - OFF (ground operation).
- c. Primary selector - VENT, for four minutes to allow heaters to cool.

CAUTION

If both heaters have been used in the HI HEAT, ANTI-ICE, or HEAT AND ANTI-ICE positions, do not merely switch one heater off to obtain less heat. Select LO HEAT and restart one heater. This will allow proper venting of the heater that is not being used.

- d. Primary selector - OFF.

EMERGENCY OPERATING PROCEDURES.

Heater Fails To Start.

If a heater should fail to ignite when the heater ignition switch is in NORMAL and the starter button depressed, turn the heater ignition switch to STANDBY and depress starter button again.

Note

When starting a heater, allow approximately one minute for the heater to reach the temperature at which the warning light goes out. If heater fails to start within one minute, switch to STANDBY ignition.

AILERON DEICING SYSTEM.

Aircraft modified by compliance with the appropriate technical order are equipped with pneumatic deicing boots on the leading edge of each aileron. Deicing action is accomplished by alternately inflating and deflating the boots. The thin layer of ice that forms during the deflated portion of the cycle is cracked loose and broken up when the boot is inflated. Loose ice is carried away by the slipstream. An electrically driven compressor and an accumulator tank are located adjacent to the aft bulkhead on the left side in the cargo compartment. The compressor supplies air pressure to the accumulator which is the compressed air reservoir. Air from the accumulator is ducted by tubing to the distribution valve in each wing. The distribution valves are solenoid-type valves which control the flow of air to the boots. Either automatic or manual operation of the system may be selected. During automatic operation the cycle is controlled by a timer which electrically energizes and deenergizes the distribution valves to permit inflation of the boots for four to eight seconds followed by a deflated period of approximately four minutes. The boots deflate by external pressure and do not require suction for air evacuation. Manual operation of the system bypasses the timer and permits manual control of the inflation and deflation cycle. A pressure switch automatically regulates the system by turning the compressor on or off as necessary to maintain the accumulator pressure. Protection against excessive pressure is provided by a relief valve set to open at 28 psi. System pressure indication is provided for the pilot. The compressor and distribution valves utilize 28-volt dc power from the primary bus. The pressure indication system requires 28-volt ac single-phase power. Approximately four minutes of compressor operation is required for initial charging of the accumulator when the system is turned on. A drain is provided in the base of the accumulator for the removal of moisture.

The aileron deicing system compressor and accumulator are also used to supply air for pressurization of the aircraft hydraulic system. A line is "teed" from the pressure line used for aileron deicing and routed

forward to the top of the hydraulic reservoir. A manually operated shut-off valve is installed downstream of the "tee" to shut off the aileron deicing system pressure. The shut-off valve is normally kept in the CLOSED position. Should operation of the aileron deicing system be desired, the valve must be placed in OPEN. Refer to figure 4-7.

Aileron Deicing System Operation.

To operate the aileron proceed as follows:

- a. Aileron deicing manual shutoff valve - Open.
- b. Pressure - Within limits.
- c. Distribution valve - MANUAL (note the pressure drop), then OFF (note pressure recovery), then AUTO (note cycling), then OFF. The flight mechanic will visually check the boots for operation.
- d. Aileron deicing manual shutoff valve - CLOSED.

Pressure Pump Switch.

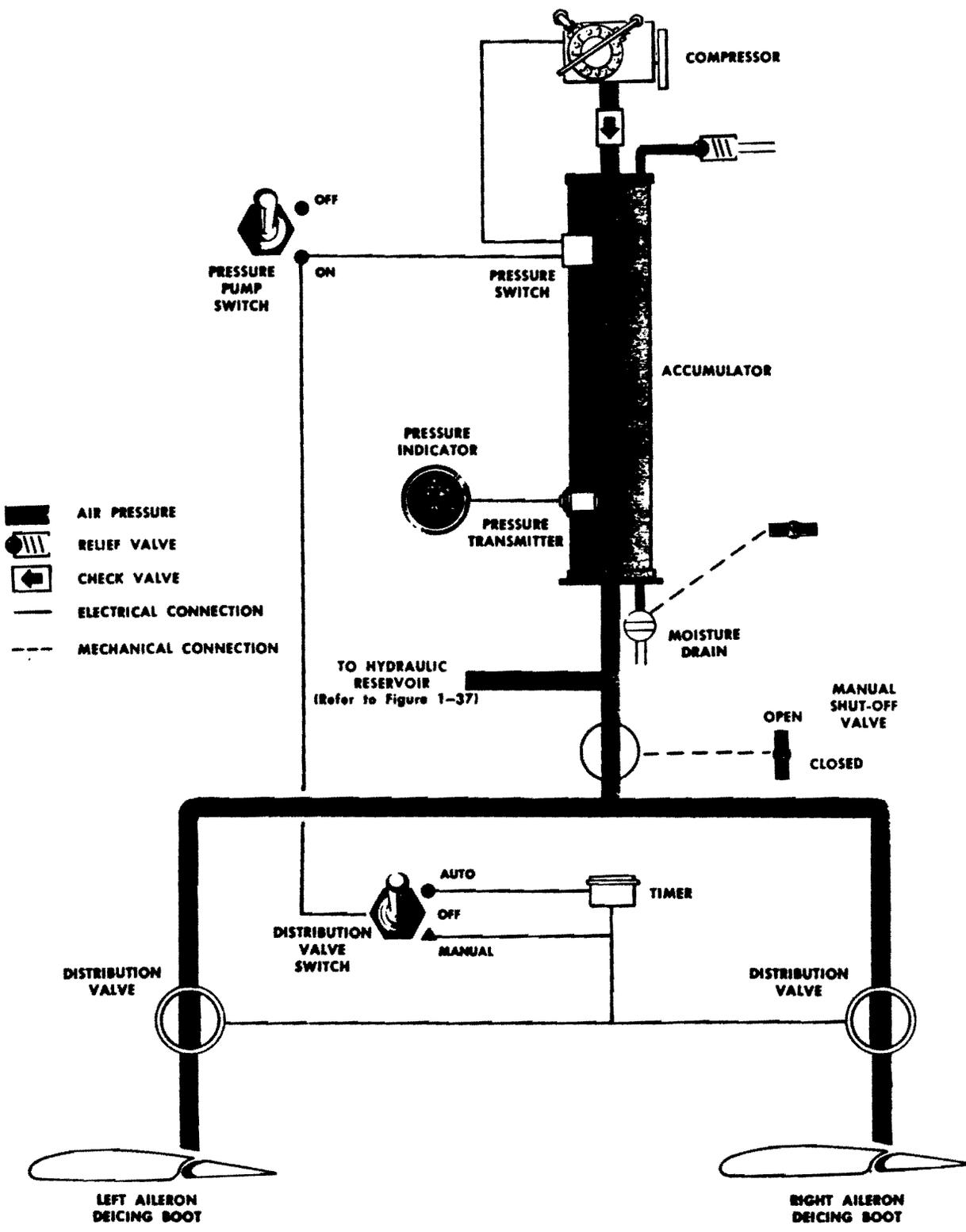
A two-position, ON-OFF switch (figure 1-7) on the engine starting panel controls operation of the aileron deicing system compressor. When placed in ON, power is supplied through a pressure switch to the compressor motor. Power is also routed through the ON position of the switch to the distribution valves switch. When placed in OFF, the compressor is inoperative as well as control of the distribution valves.

Distribution Valves Switch.

A three-position, AUTO-OFF-MANUAL switch (figure 1-7), on the engine starting panel, permits the aileron deicing system to be operated either automatically or manually. In the AUTO position, the timer controls the inflation and deflation cycle of the boots by controlling the distribution valves. The OFF position deenergizes the distribution valves and prohibits operation of the aileron deicing system, but permits operation of the compressor for maintaining the accumulator pressure. In the spring-loaded, momentary-contact MANUAL position, the distribution valves are directly energized to inflate the boots. Toggling the switch alternately to the MANUAL and OFF positions permits manual control of the inflation and deflation cycle of the deicing boots.

Manual Shut-off Valve.

A two-position, OPEN-CLOSED manual shut-off valve (figure 4-8) is installed aft of the left troop door at station 465 to assure shut-off of the aileron deicing system pressure. This valve is normally kept in the CLOSED position, permitting maximum use of pressure for hydraulic system pressurization, with the valve in OPEN, operation of the aileron deicing system is possible and is controlled by the distribution valves switch.



AILERON DEICING

Figure 4-7

AILERON DEICING SYSTEM MANUAL SHUT-OFF VALVE.

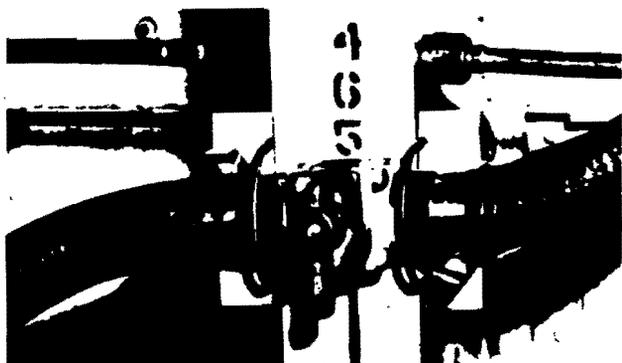


Figure 4-8

Pressure Gage.

A 0-50 psi pressure gage (figure 1-58) on the pilot's instrument panel indicates the air pressure available for aileron deicing. The gage is electrically operated in response to a pressure transmitter in the accumulator. The indication system utilizes 28-volt ac power for operation.

PROPELLER DEICING.

The propeller deicing system is composed of electrically heated elements imbedded in a neoprene rubber boot on the leading edge of each propeller blade. An intermittent power supply, fed to the blades through slip rings, is obtained from the 28-volt dc primary bus by means of an electrically-operated timer. The deicing cycle, as established by the deicing timer, is based on an overall time element of 60 seconds during which the system is alternately energized for a period of 15 seconds and off for a 15-second interval. If, for example, the timer begins the cycle with the left propeller, the heating elements of the left propeller are energized for 15 seconds. At the end of this period, the timer breaks the circuit and 15 seconds later completes the circuit to the heating elements of the right propeller blades. A 15-second period of shut-down follows, after which the left propeller is again energized. Each propeller deicing system, then, is energized for 15 seconds and off for 45 seconds during one complete deicing cycle.

Note

Propeller deicing check will be accomplished at 1500 rpm.

Propeller Deicing Switches.

A propeller deicing switch (figure 4-6) for each propeller is located on the accessory control panel. The positions of the switches are OFF and ON. In the OFF position, the deicing system is inoperative. When either switch is placed in ON, the deicing timer is energized and the deicing circuit of the respective propeller from the 28-volt dc power supply to the heating elements is completed intermittently by the timer. Either propeller deicing switch will operate the timer but both switches must be ON for the deicing of both propellers.

Propeller Deicing Loadmeters.

The two deicing loadmeters (figure 1-58) on the copilot's instrument panel are percentage loadmeters and, as such, indicate the percentage of current flow (250 amperes maximum) which the heating elements in either propeller are drawing at any given moment of operation. Refer to Instrument Range Markings, Section V, for the normal operating range as marked on each loadmeter.

PITOT TUBE AND LIFT TRANSDUCER HEATERS.

Heating elements in the pitot tubes and the lift transducer are electrically energized to prevent icing of this equipment. The heating elements are integral with the tubes and transducer.

Pitot Heat Switch.

The pitot heat switch (figure 4-6) on the accessory control panel controls the energization of the heating elements in the pitot tubes as well as in the lift transducer. When the pitot heat switch is placed to ON, power from the 28 volt DC flight emergency bus is made available to the pitot heat elements and from the 28 volt DC primary bus to the lift transducer element.

JET ANTI-ICING SYSTEMS

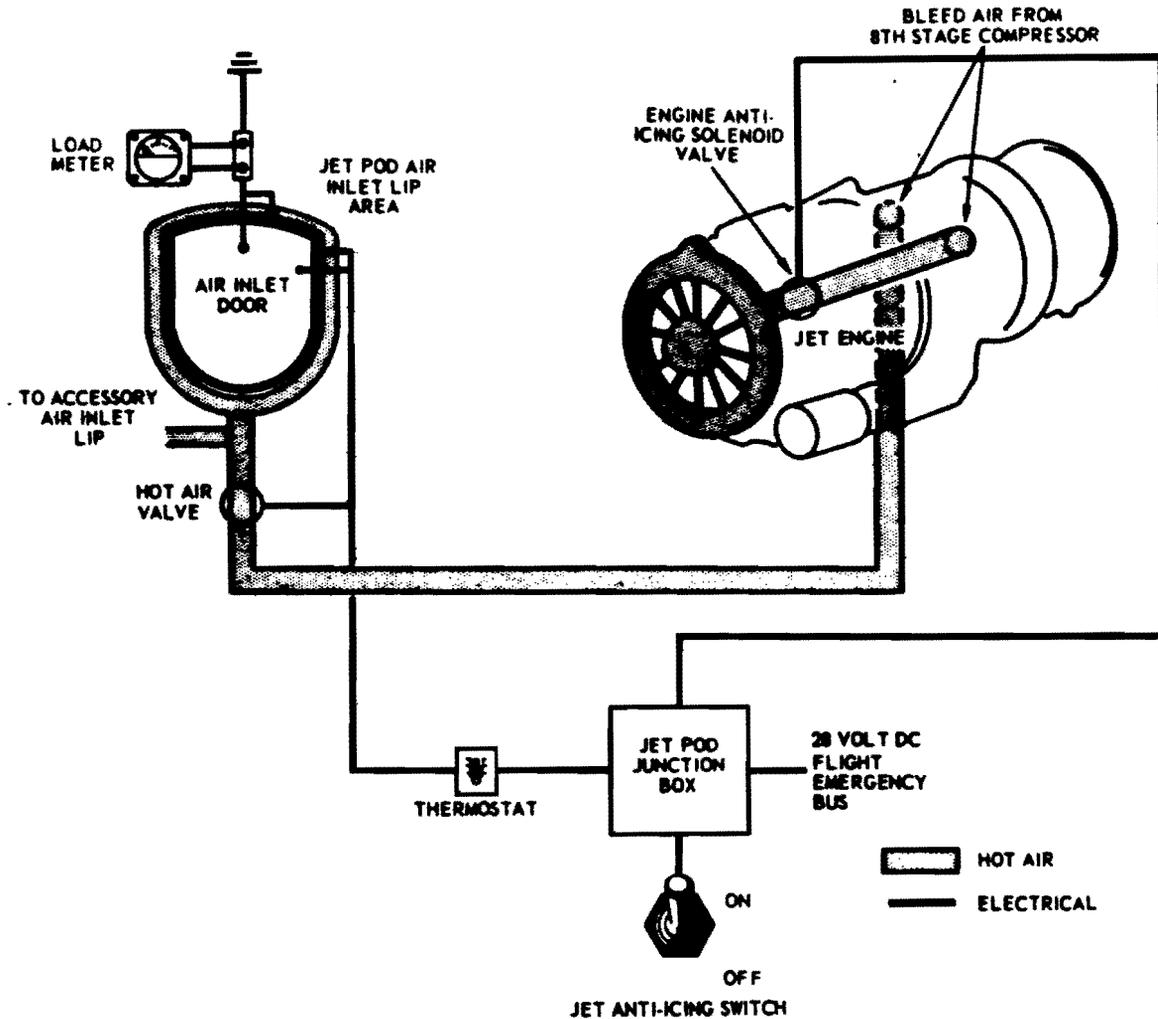


Figure 4-9

JET ENGINE ANTI-ICING SYSTEM.

The jet deicing and anti-icing systems are provided to remove and prevent any accumulation of ice on the jet pod air inlet door and the air inlet lip area. They also prevent any buildup of ice on the jet engine bullet nose, guide vanes, and struts as well as the lip of the engine accessory cooling air inlet. Hot air and electrical heating elements are both used for anti-icing of the jet engine and pod. Electrical heating elements, installed in the air inlet door and the air inlet lip area, provide anti-icing protection to the pod. Electrical power for anti-icing is supplied by the flight emergency bus. Hot air from the eighth compressor stage

is ducted to the air inlet lip area, and the engine accessory inlet lip when the jet engine is operating. Temperature control for these jet pod anti-icing systems is accomplished by a thermostat located in the pod nose section. Hot air, also from the eighth compressor stage, is supplied continuously to the engine bullet nose, guide vanes, and struts when the anti-icing switch is in the ON position. The anti-icing system for each jet engine is completely independent of the other and each is controlled by a single switch. When icing conditions are anticipated enroute, the jet anti-icing switches are placed in the ON position. The jet anti-icing circuits are automatically deenergized during the jet engine starting cycle.

Jet Anti-icing Switches.

A two position, ON-OFF switch, one for each jet engine pod anti-icing system is located on the copilot's instrument panel. When placed in the ON position, 28 volt dc power from the aircraft flight emergency bus is supplied to the jet pod air inlet door and air inlet lip area. If the jet engine is running and the contacts of the system's automatic thermostat are closed, the pod hot air valve is opened and the electrical heating elements are energized. The jet engine anti-icing hot air valve is energized with the same switch and allows continuous hot air flow to the engine bullet nose, guide vanes, and struts. Placing the anti-icing switch in the OFF position deenergizes the anti-icing circuits.

Note

It is not necessary to turn off the jet anti-icing switch during the jet engine starting cycle since the circuits are deenergized during jet starts.

Anti-icing Loadmeters.

Two anti-icing loadmeters, located on the copilot's instrument panel adjacent to the anti-icing switches indicate the percentage of current flow which the heating elements in the jet engine pod air inlet are drawing at any given moment of deicing operation based on 300 amp shunt.

Thermostats.

A thermostat, preset to open at 71°C (160°F) and close at 4.5°C (40°F) is in series with each jet engine pod anti-icing system hot air and heating element control circuit and prevents overheating of the pod air inlet area. The thermostat does not control the jet engine bullet nose, struts, and guide vanes hot air valve.

Note

An outside air temperature below +4.5°C (40°F) may be required to check jet anti-icing operation.

WINDSHIELD ELECTRICAL ANTI-ICING SYSTEM.

The pilot's and copilot's windshield panels are constructed of an electrically conductive transparent surface sandwiched between an outer and inner pane of glass. The windshield heater inverter supplies 115 volt ac, single-phase, 400 cycle current to the conductive surface to heat the windshield panel. A temperature of 100°F (38°C) is maintained by a sensing element, embedded in the panel, and a controller in the windshield heat control junction box, located behind

the pilot's seat. Electrically heated windshields provide the maximum elasticity in the event of bird impact as well as anti-icing protection.

Normal Operation of Windshield Electrical Anti-icing System.

On the ground, prior to flight, turn the windshield heat to ON before taxi when the ambient air temperature is below 81°F (27°C). Always turn on the windshield heat switch before takeoff to reduce thermal shock and increase elasticity of windshield. Monitor the operation of the windshield heat system by feeling with the hand. If the panels are excessively hot or electrical arcing is observed, the windshield heat switch should be turned to OFF.

Windshield Heat Switch.

A two position, ON-OFF switch (figure 1-58 or 1-59) on the copilot's instrument panel controls the operation of the windshield electrical anti-icing system. Positioning the switch to the ON position energizes the windshield heater inverter with 28 volt dc power from the primary bus. The windshield heat switch is wired through the jet engine junction box and will be deenergized when the jet engine start circuit is energized.

COMMUNICATION AND ASSOCIATED ELECTRONIC EQUIPMENT.

The aircraft is equipped with various electronic sets which provide intercommunication facilities; communication from aircraft to ground, sea, and air stations; and navigational aids.

EMERGENCY COMMUNICATIONS SWITCH.

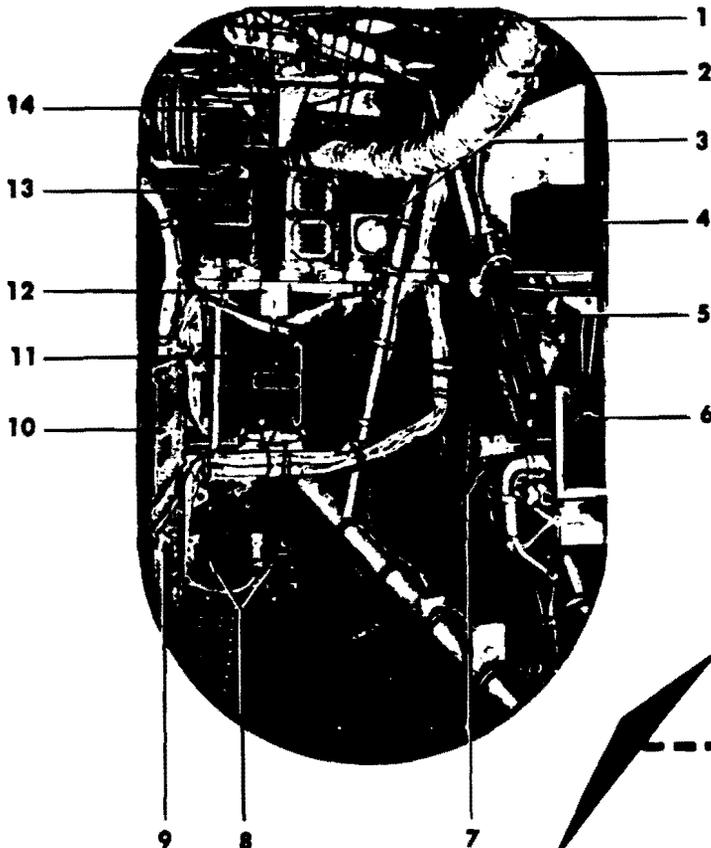
A push-button type switch (figure 4-12) is mounted on the forward end of the radio control panel to provide temporary energization of the emergency communications bus following complete generator failure. When the switch is depressed, power from the flight emergency bus energizes the emergency communications bus.

INTERCOMMUNICATION EQUIPMENT AN/AIC-10.

The interphone system provides intercommunication among the various crew members throughout the aircraft whenever the 28-volt dc emergency communications bus is energized. Control panels, providing all the necessary switches for use of the equipment either as an interphone or radio communications system are located at the pilot's and copilot's stations. The pilot's (figure 1-39) and copilot's (figure 1-40) panels are mounted on the consoles on either side of the crew compartment; on some aircraft, a navigator's panel

RADIO COMPARTMENT

TYPICAL



1. RADIO COMPARTMENT DOME LIGHT
2. COPILOT'S FOOT WARMER HEAT DUCT
3. ID/251 BEARING CONVERTER INDICATOR
4. ATTITUDE GYRO ASSEMBLY
5. BRAKE ACCUMULATOR
6. MARKER BEACON RECEIVER
7. BRAKE ACCUMULATOR FILLER GAGE
8. INTERPHONE DYNAMOTORS
9. INTERPHONE JUNCTION BOX
10. VOR JUNCTION BOX
11. GLIDE SLOPE RECEIVER
12. POWER OUTLET—ELECTRONIC TEST EQUIPMENT
13. VOR RECEIVER
14. VOR DYNAMOTOR

Figure 4-10

17897

(figure 4-23) is mounted on the bulkhead forward of the navigator's work table. Additional controls are located in the cargo compartment on the forward bulkhead, on the side of the fuselage aft of the right troop door, and (†) on the side of the fuselage aft of the left troop door. These control boxes permit the use of the equipment as an interphone system but contain no controls for transmission or reception of radio signals. A head set with boom-type microphone attached is provided at each interphone station. The intercommunication system is capable of performing the following functions:

a. Selection at forward interphone control panel of any one or combination of nine receiver outputs by individual toggle switches: interphone (INTER), UHF Command (UHF COMM), HF liaison (LIA), radio compass No. 1 (ADF-1), VHF Command (VHF COMM), TACAN (TACAN), marker beacon (MARKER), radio compass No. 2 (ADF-2), and VOR (VHF NAV).

b. Selection at forward interphone control panel of the microphone and control circuits of any one of installed transmitters: UHF Command (COMM UHF),

HF liaison (LIA), and VHF Command (COMM VHF).

c. Selection at each interphone control panel of the intercommunications feature by means of the microphone selector switch (INTER). During interphone communication, the output volume from any selected radio receivers is automatically reduced with respect to the interphone volume.

d. Adjustment at each interphone control panel and control box of the volume by means of a single volume control knob affecting all incoming signals.

e. At the pilot's and copilot's panels, filtering of the range and voice signals from the No. 1 and No. 2 radio compasses through a range filter switch.

f. At each station provisions are made for emergency CALL which interrupts all other reception and addresses all stations simultaneously.

g. At each station, provisions are made for emergency AUX. LISTEN, to permit reception in event of failure of the amplifier.

† Aircraft modified in accordance with T.O. 1C-123B-635

Emergency Operation.

In order to insure reception of important interphone messages at all crew stations, regardless of receiver switch settings, a spring-loaded CALL position is provided on the pilot's, copilot's, and on some aircraft, the navigator's microphone selector switches. This position interrupts all other reception and addresses all stations simultaneously. The NORMAL-AUX. LISTEN switch permits reception of any selected receiver should the mixer amplifier fail at any station. Since only one receiver can be heard at a time when the switch is in the AUX. LISTEN position, the desired receiver may be selected by turning on (up) the desired receiver switch and turning all others off (down).

Note

When the NORMAL-AUX. LISTEN switch is placed in the AUX. LISTEN position, no transmission side tone will be heard unless all receiver selector switches are turned off (down).

An emergency, spring-loaded CALL button is provided on each interphone control box in the cargo compartment. This button, when depressed, serves the same function as the CALL position of the switch on the control panels; that is, it interrupts all other reception and addresses all stations simultaneously. A plastic cap is normally screwed in place over the button to prevent its inadvertent use. The AUX. LISTEN position of the NORMAL-AUX. LISTEN switch on the control boxes bypasses the amplifier should the amplifier fail.

Range Filter Switch.

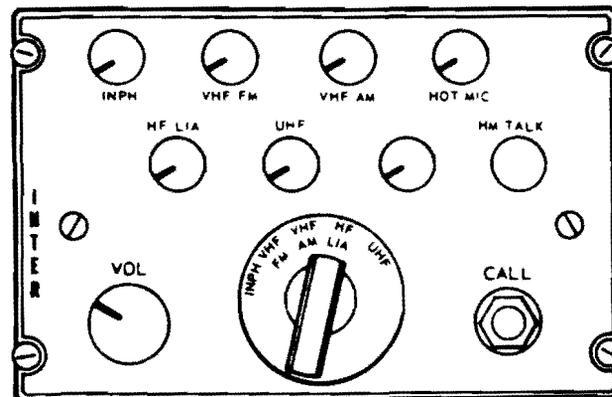
A five-position rotary-type filter switch (figures 1-29 and 1-30) is located on each interphone control panel in the crew compartment. This switch controls the volume relationship between radio compass voice and range signals. When the switch is placed in ADF-1 VOICE, the range signal from the No. 1 radio compass is reduced in volume and the voice signal may be heard more clearly. Conversely, when the switch is placed in ADF-1 RANGE, the voice signal is reduced and the range signal is restored. The ADF-2, VOICE and RANGE positions operate similarly for the No. 2 radio compass. In the BOTH position, the voice and range signals are permitted to pass with equal strength. To monitor the reception of only one radio compass in the BOTH position, turn OFF the unwanted compass by means of the corresponding switch on the interphone control panel.

Microphones And Headsets.

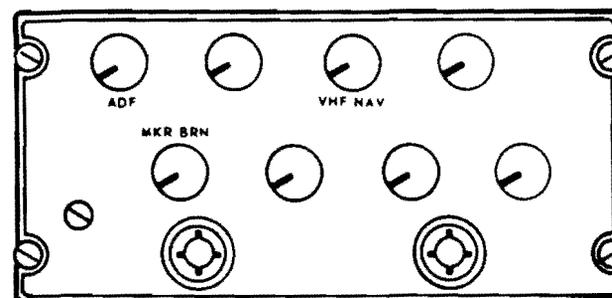
Each pilot's boom type microphone is controlled from a microphone switch (figure 1-39 and 1-40) on his

control wheel. On aircraft (†), an interphone switch figures 1-39 and 1-40) provides additional control of the pilots' microphones. On these aircraft, depressing the interphone switch connects the microphone to the common interphone channel; depressing the microphone switch connects the microphone to any other line that has been selected previously by the channel selector switch on the control panel. On some aircraft, the navigator's microphone is controlled by a foot switch (Figure 4-43) to the left on the navigator's foot rest. Depressing the switch permits transmission through the headset microphone. The microphones at the interphone stations in the cargo compartment are controlled in a similar manner by a push-button switch attached to the free end of a long cord. This switch may be attached to the operator's flight clothing by a metal clamp when in use, and should be stowed in the cloth bag on the bulkhead when not in use.

INTERCOMMUNICATION EQUIPMENT AN/AIC-18 (Some Aircraft, AF54-691 and 54-698).



C-2106/AIC-18 CONTROL PANEL



C-2323A/AIC-18 MONITOR PANEL

The AN/AIC-10 Interphone System has been removed and replaced with an AN/AIC-18 Interphone System on aircraft serial numbers AF54-691 and AF54-698. This interphone system provides intercommunications between the pilot, copilot, and cargo deck. C-2106/AIC-18 control panels are provided at the pilot's and copilot's stations to provide the necessary controls for use of the interphone system or radio communi-

† Aircraft modified in accordance with T.O. 1C-123B-635

cations system. The pilot's and copilot's control panels are mounted on the consoles on either side of the flight deck. C-2323A/AIC-18 monitor panels are installed at the pilot's and copilot's stations. The monitor panels are used to select various receiver outputs for monitoring. Two C-2105/AIC-18 control panels are used to select various receiver outputs for monitoring. Two C-2105/AIC-18 control panels are located in the cargo compartment. These controls permit the use of the equipment as an interphone system but do not permit transmission or reception of radio signals. A headset, with a boom-type microphone attached, is provided at each interphone station. The interphone system is capable of performing the following functions:

a. Each C-2106/AIC-18 control panel provides selection of any one or combinations of receiver outputs by individual push-pull switches, for on/off operation, and individual volume adjustment. The outputs of any one or combination of the receiver outputs can be selected by individual push-pull switches. Rotating the switch adjusts the volume of the selected signal. The HOT MIC switch permits communication between crew members without requiring use of push-to-talk buttons.

b. Selection at each C-2323A/AIC-18 monitor panel of the output of one of three receivers: Marker Beacon (MKR BCN), VOR (VHF NAV), or Radio Compass No. 1 (ADF-1).

c. Selection at each C-2106/AIC-18 control panel of the microphone and control circuits for any one of four transmitters: UHF Command (UHF), HF Liaison (HF LIA), VHF Amplitude Modulated (VHF AM), or VHF Frequency Modulated (VHF FM).

d. Filtering of the range and voice signals from radio compass No. 1 through a range filter at the pilot's panels.

e. Provisions are made at each station for emergency CALL which interrupts all other reception and addresses all stations simultaneously.

Emergency Operation.

The CALL switch ensures reception of important interphone messages regardless of receiver switch settings. Pressing this switch activates all stations on the interphone system. Call operation does not disconnect any lines monitored by any station. The sidetone level at the calling station is reduced during call operation.

Range Filter Switch.

A five-position rotary-type filter switch (figures 1-39 and 1-40) is located on each interphone control panel in the crew compartment. This switch controls the volume relationship between radio compass voice and range signals. When the switch is placed in ADF-1 VOICE, the range signal from the No. 1 radio compass is reduced in volume and the voice signal may be heard more clearly. Conversely, when the switch is placed in ADF-1 RANGE, the voice signal is reduced and the range signal is restored. The ADF-2, VOICE and RANGE positions are not used. In the BOTH position, the voice and range signals are permitted to pass with equal strength.

Microphones And Headsets.

The microphones and headsets used in the AN/AIC-18 system are the same as used in the AN/AIC-10 Interphone System.

COMMUNICATIONS and ASSOCIATED

EQUIPMENT	FUNCTION	RANGE	LOCATION OF CONTROLS
INTERPHONE, AN/AIC-10 or **AN/AIC-18	Crew communication, control of radio trans- mission and reception.		Pilot's and copilot's side consoles, naviga- tor's station, and two or three (†) stations in cargo compartment.
HF LIAISON RADIO, COLLINS 6185-1 or COLLINS 618T-1	Long range voice com- munication.	200-2500 miles depending upon time of day and frequency.	Radio control panel on pedestal.
VHF COMMAND, or WILCOX 807	Short range voice com- munication.	Line of sight.	Radio control panel on pedestal.
UHF COMMAND SET AN/ARC-27 or AN/ARC-34 or **AN/ARC-34C or ***AN/ARC-164(V)	Short range voice com- munication.	Line of sight.	Radio control panel on pedestal.
UHF DIRECTION FINDER AN/ARA-25 (With TCTO 1C-123B-628) or **AN/ARA-50	Provides direction- finding capabilities for UHF command set.	Line of sight.	Operates when ADF is selected on UHF command set.
RADIO COMPASS, AN/ARN-6	Reception of low fre- quency range signals for beam navigation; directional signals for bearing or homing.	20-200 miles depend- ing upon time of day and frequency.	Radio control panel on pedestal.
VOR/ILS RECEIVER, AN/ARN-14	Reception of VHF navi- gational radio aids (VOR and ILS)	Line of sight.	Radio control panel on pedestal.
FM HOMING GROUP AN/ARA-31 (Some Aircraft)	Provides directional indication for homing purposes.	Line of sight.	Copilot's console panel.
AIRBORNE LOUD- SPEAKER SYSTEM (With TCTO 1C-123-587)	Provides air-to-ground audio communications.	Approximately two miles.	Aft cargo com- partment at left troop door.
FM LIAISON RADIO SET AN/ARC-44 (Some Aircraft)	Provides two-way short range voice communi- cations.	Line of sight.	Copilot's console panel.

**Aircraft with T.O. 1C-123(N)K-501

†Aircraft with T.O. 1C-123B-635.

***Aircraft with T.O. 1C-123K-545

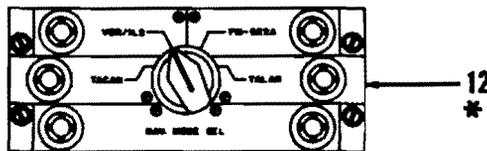
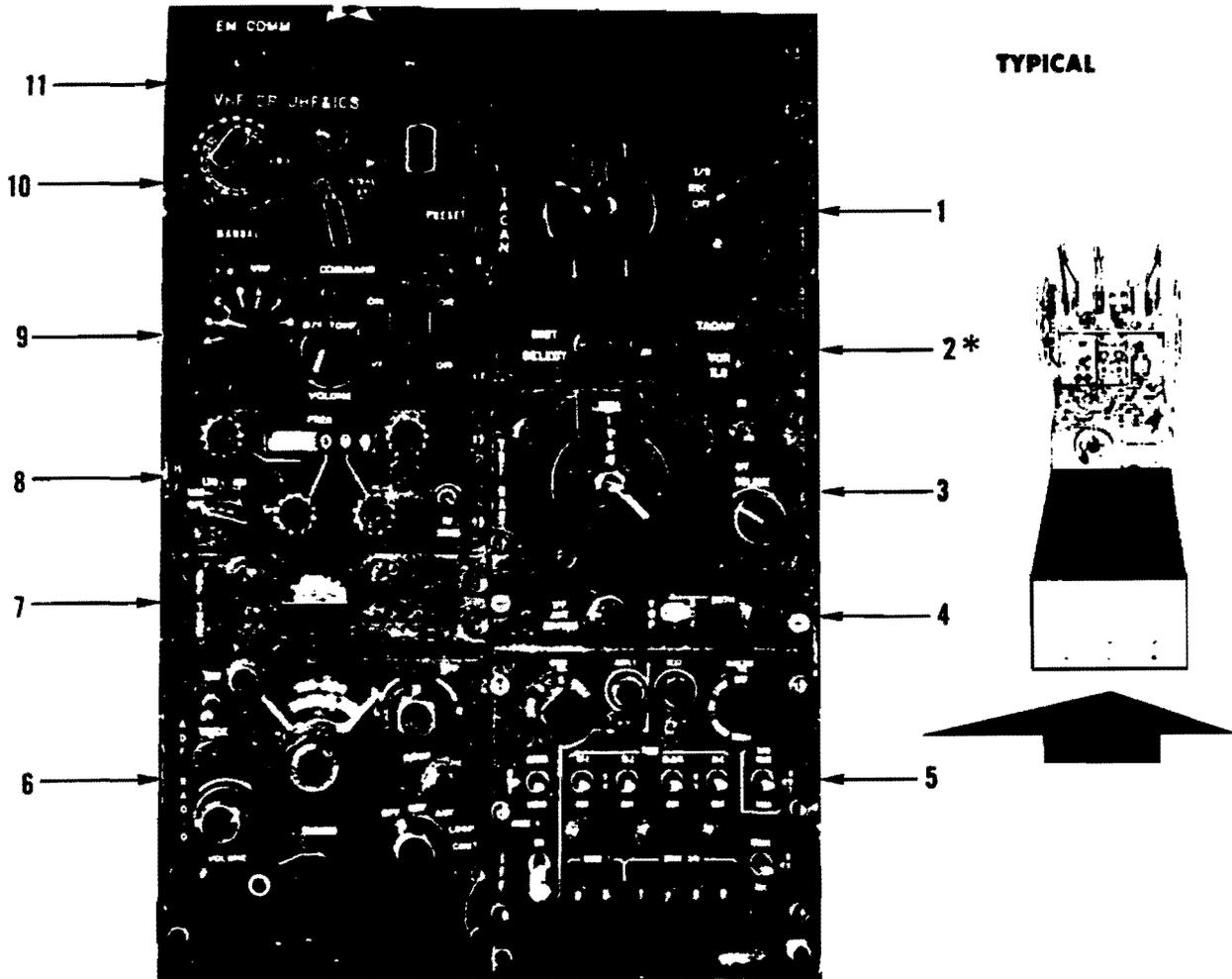
Figure 4-11. (Sheet 1 of 2)

ELECTRONIC EQUIPMENT

EQUIPMENT	FUNCTION	RANGE	LOCATION OF CONTROLS
GLIDE SLOPE SET, AN/ARN-31 (Some Aircraft)	Provides glide slope information for operation of the slope glide indicator of the course indicator.	Line of sight.	Operates simultaneously with localizer section of VOR.
TACAN SET, AN/ARN-21 (Some Aircraft)	Provides bearing and range from ground beacon stations.	0-195 miles line of sight.	Radio control panel on pedestal.
TACAN SET, AN/ARN-118(V) (AIRCRAFT MODIFIED IN ACCORDANCE WITH TO 1C-123K-544)	Provide bearing and range from ground beacon stations	Air to ground 390 NM Air to air 200 NM	Radio control panel on pedestal
MARKER BEACON, AN/ARN-12 or AN/ARN-32	Reception of marker beacon signals.		Indicator's on pilot's and copilot's instrument panel.
RADIO ALTIMETER AN/APN-22 or **AN/APN-150	Measures absolute altitude of aircraft.		Indicator on pilot's instrument panel.
IFF AN/APX-72 (AIRCRAFT MODIFIED IN ACCORDANCE WITH T O 1C-123-609)	Automatically identifies aircraft as friendly and provides altitude data when challenged by properly equipped facilities.	Line of sight	Transponder control on pedestal. Mode 2 code controls or receiver-transmitter.
LORAN SET AN/APN-157	Provides navigational fix.	2300 NM (day) 2300 NM (night)	Navigator's station.
TALAR RECEIVER AN/ARN-97	Provides accurate guidance on instrument approach.	10 miles with 10mm of rainfall per hour. 28 miles in clear weather.	Radio control panel
VHF/FM RADIO FM-622A (AIRCRAFT MODIFIED IN ACCORDANCE WITH T O 1C-123-589)	Provides communications with personnel using FM equipment. Also provides FM homing.	Line of sight.	Control panel on copilot's side panel; indicator on pilot's instrument panel.
TSEC/KY-8 SPEECH ENCRYPTION EQUIPMENT (AIRCRAFT MODIFIED IN ACCORDANCE WITH T O 1C-123-584)	Provides encoding for transmittal and decoding for reception of UHF signals.		Copilot's side panel.

Figure 4-11. (Sheet 2 of 2)

RADIO CONTROL panel



- 1. TACAN CONTROL PANEL
- 2. NAV MODE SELECT PANEL
- 3. VOR CONTROL PANEL
- 4. IFF ANTENNA SWITCH
- 5. IFF CONTROL PANEL
- 6. RADIO COMPASS CONTROL

- 7. RADIO COMPASS TUNER PANEL
- 8. HF LIAISON CONTROL PANEL
- 9. VHF COMMAND CONTROL PANEL
- 10. UHF COMMAND CONTROL PANEL
- 11. EMERGENCY COMMUNICATIONS SWITCH
- 12. NAVIGATION MODE SELECT PANEL
(AIRCRAFT WITH T.O. 1C-123-589)

Figure 4-12

VHF COMMAND SET AN/ARC-49 (Some Aircraft).



The VHF Command Set AN/ARC-49 is a remotely controlled communications radio designed to provide voice or MCW reception and transmission. The equipment is controlled from a panel (figure 4-12) on the pedestal, on which is mounted an ON-OFF power switch, volume control, D/F tone button, and two frequency selector knobs. Forty-eight preset channels are available in the frequency range of 100-156 megacycles. Transmission and reception are accomplished on the same frequency and both functions utilize the same antenna. The tone button permits MCW transmission for either D-F or communications purposes. The range of the equipment is based on line-of-sight distance and varies from approximately 30 miles at 1000 feet altitude to 135 miles at an altitude of 10,000 feet. Power for the operation of the set is supplied by the 28 volt dc emergency communications bus.

a. To start the equipment, turn the power switch ON and select the desired frequency with the channel selector knobs.

Note

The receiver will continuously monitor the frequency indicated by the frequency selector knobs except during periods of transmission at which time the receiver is shut off.

b. To stop the equipment, turn the power switch OFF.

CAUTION

After the set has been turned OFF, do not turn ON for at least one minute.

VHF COMMAND SET, WILCOX 807 (Aircraft modified in accordance with TCTO 1C-123B-630).



This set provides line-of-sight, air-to-air or air-to-ground communications. The installation consists of an antenna, a lightweight receiver-transmitter mounted forward of the pilot's instrument panel, and a remote control panel (figure 4-12) on the pedestal in the crew compartment. An OFF-PWR switch, a volume control, two frequency selector knobs, a COM TEST pushbutton switch, and a frequency indicator comprise the control panel. Voice communications is possible on any one of 1360 different frequencies in the band from 116.000 to 149.975 megacycles. Transmission and reception are accomplished on the same frequency and with the same antenna. The COMM TEST switch, when depressed, disables the squelch circuit in the receiver to permit reception of signals below threshold level. The range of the equipment, for air-to-ground communications, varies from approximately 30 miles at 1000 feet altitude to 135 miles at an altitude of 10,000 feet. Power for the operation of the set is supplied by the 28-volt dc emergency communications bus through a 10-ampere circuit breaker on the overhead radio circuit breaker panel.

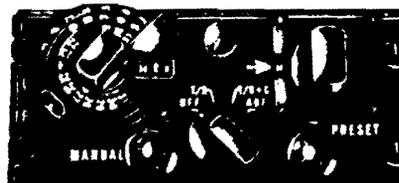
a. To start the equipment, rotate the power switch to the PWR position and select the desired frequency with the frequency selector knobs.

Note

The receiver will continuously monitor the frequency indicated except during periods of transmission at which time the receiver is isolated from the antenna.

b. To stop the equipment, rotate the power switch to OFF.

UHF COMMAND SET AN/ARC-27 (Some Aircraft).



This set has been designed to provide limited range AM communication on any one of 1750 frequencies from 225.0 to 399.9 megacycles. Transmission and reception are accomplished on the same frequency and on the same antenna and normally extend over a line-of-sight distance. The control panel (figure 4-12), located on the pedestal contains an audio volume control, a preset channel selector switch, manual frequency selector controls and a master function switch. The preset channel selector switch provides quick-selection of any one of twenty preset channels or when

placed in "M," permits use of the manual frequency selector controls. The "G" position of the channel selector switch is used only when transmission on the guard channel frequency is necessary. The manual frequency selector controls may be used to select any one of 1750 different channel frequencies. Primary control of the set is accomplished by use of the master function switch. When turned from OFF to T/R, the switch energizes the set to provide normal channel selection and operation. The T/R + G position energizes the separate guard receiver and provides monitoring of the guard frequency as well as normal channel transmission and reception. The ADF switch position couples the UHF main receiver to the UHF direction finding equipment, AN/ARA-25, on aircraft modified in accordance with TCTO 1C-123B-628. On the remaining aircraft, the ADF position is not connected. Power for operation of the set is supplied by the 28 volt dc emergency communications bus.

a. To start the equipment, turn the master function switch to T/R.

b. Turn the channel selector switch to the channel desired and allow the set to warm up.

CAUTION

Allow at least two minutes warm up time before attempting to transmit on UHF.

c. If manual channel selection is desired, turn the channel selector to "M" and use the manual frequency selector controls.

d. Adjust volume.

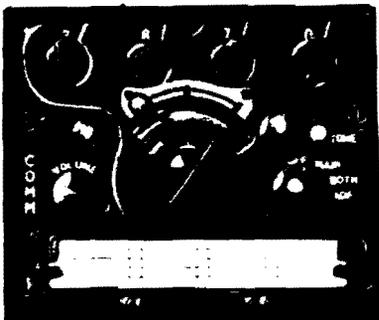
e. If guard channel monitoring is desired, turn the master function switch to T/R + G.

f. Should transmission be necessary on the guard channel frequency, turn the master function switch to T/R and the channel selector switch to "G". This actually turns the separate guard receiver off but tunes the main transmitting and receiving equipment to the guard channel frequency.

g. To stop the unit, turn the master function switch to OFF.

UHF COMMAND SET AN/ARC-34

(Some Aircraft).



This set consists of a light weight receiver-transmitter unit and mounting (figure 4-35) installed in the tail section of the aircraft and a remote control panel (figure 4-12) on the pedestal in the crew compartment. Two separate receivers are included in the RT unit; a main receiver for command frequencies and a guard receiver tuned to a preset guard channel frequency. Voice or MCW reception and transmission is possible on any one of 1750 different frequencies in the band from 225.0 to 399.9 megacycles. Twenty of these frequencies may be preset at the control panel for quick selection by means of the single large knob in the center of the panel. In addition to this channel selector knob, a set of four smaller knobs across the top of the panel permits the selection of any other desired frequency within the operating range of the equipment, without disturbing the preset channels. Changing of the guard receiver frequency requires removal of the control panel and is therefore accomplished only as a ground maintenance item. Control of the method of frequency selection is accomplished through the MANUAL-PRESET-GUARD switch. When placed in the MANUAL position, the numbers in the four small frequency windows at the top of the panel are exposed, and frequency selection is made by setting "hundreds," "tens," "units," and "tenths" of megacycles by means of the four small knobs below the windows. In the PRESET position, the top windows may be covered, and the channel selector knob is used to set the appropriate channel in the center window. The GUARD position tunes the transmitter and the main receiver to the preset guard channel frequency and turns off the guard receiver. A function switch on the right side of the control panel controls the operation of the set as follows: When placed in the MAIN position, the main receiver monitors the selected frequency and the transmitter is in a stand-by condition for immediate use on the same frequency; the BOTH position accomplishes the same function and in addition permits continuous reception of the guard channel frequency. The ADF switch position couples the UHF main receiver to the UHF direction finding equipment, AN/ARA-25, on aircraft modified in accordance with TCTO 1C-123B-628. On the remaining aircraft, the ADF position is not connected. The tone switch on the control panel permits continuous tone transmission for emergency or direction finding purposes. Transmission and reception are accomplished on the same antenna and normally extend over a line-of-sight distance. Power for the operation of the UHF set is supplied by the 28-volt dc emergency communications bus.

a. To start the equipment, place the function switch in MAIN or BOTH, and allow at least one minute for the set to warm-up.

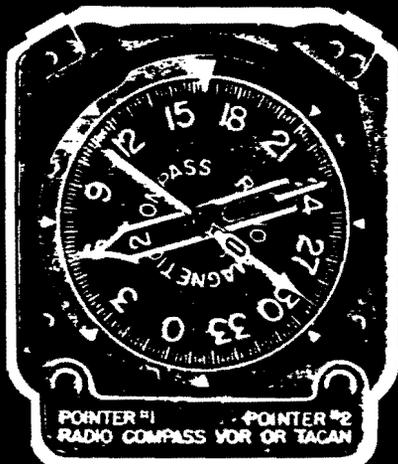
b. Select the desired frequency with the channel selector knob or the four small knobs across the top of the panel.

(1) If the channel selector knob is used, place the MANUAL-PRESET-GUARD switch in the PRESET position.

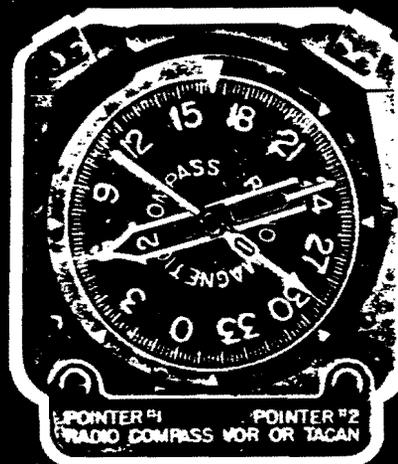
RADIO MAGNETIC INDICATORS

SINGLE COMPASS INSTALLATION

PILOT'S INDICATOR



COPILOT'S INDICATOR

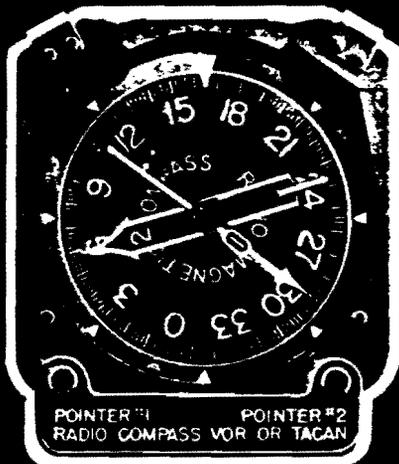


NO. 1 POINTER: RADIO COMPASS
 NO. 2 POINTER: VOR OR TACAN AS
 SELECTED

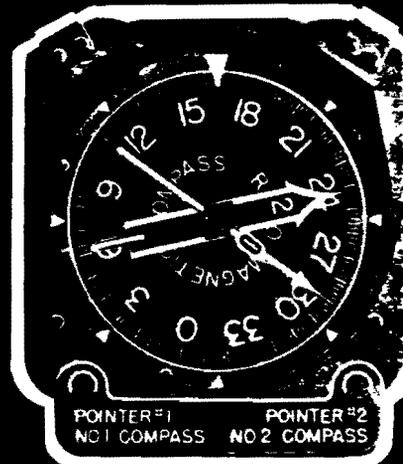
NO. 1 POINTER: RADIO COMPASS
 NO. 2 POINTER: VOR OR TACAN AS SELECTED
 * NO. 2 POINTER: VOR, TACAN, OR UHF/DF

DUAL COMPASS INSTALLATION

PILOT'S INDICATOR



COPILOT'S INDICATOR



NO. 1 POINTER: #1 RADIO COMPASS
 NO. 2 POINTER: VOR OR TACAN AS
 SELECTED

NO. 1 POINTER: #1 RADIO COMPASS
 NO. 2 POINTER: #2 RADIO COMPASS
 * NO. 2 POINTER: #2 RADIO COMPASS OR
 UHF/DF

NOTES ... Radio bearings indicated are magnetic. Magnetic heading as read from the card, is supplied by the gyro magnetic compass system and is indicated by the top index mark. Magnetic bearing is accurate only when the compass slaving cutout switch is IN.
 ... The placards and the optional selection of TACAN on the No. 2 pointers are effective only on aircraft with TACAN installed.
 ... * Aircraft modified in accordance with TCTO 1C-123B-628.

Figure 4-13

(2) If the individual knobs are used, place the **MANUAL-PRESET-GUARD** switch in the **MANUAL** position.

(3) To select the guard channel, place the **MANUAL-PRESET-GUARD** switch in the **GUARD** position.

Note

Although frequencies below 225.0 megacycles may be set using the four individual frequency knobs, the automatic tuning mechanism will be automatically turned off after approximately two minutes if a frequency below 225.0 megacycles is selected. To restore normal operation, it is then necessary to select a frequency within the range of the equipment (225.0-399.9 mcs), turn the function switch to **OFF**, then back to **MAIN** or **BOTH**, and wait one minute.

- c. Regulate volume with the **VOLUME** knob.
- d. To stop the equipment, turn the function switch **OFF**.

UHF DIRECTION-FINDING EQUIPMENT AN/ARA-25 (Aircraft modified in accordance with TCTO 1C-123B-628).

The direction finder indicates the relative bearing of radio signals, in the frequency range of 225.0 to 399.9 megacycles, when received on the UHF command set. The set is controlled by the UHF control panel on the pedestal and is maintained in a standby condition whenever the UHF equipment is operating. By placing the UHF function switch in the **ADF** position, the UHF main receiver is coupled to the directional antenna through the antenna switching relay. A UHF **PREAMP** switch connects the **AM3969/AR** amplifier in the antenna circuit thus increasing signal strength and improving the range of the equipment. Bearing is indicated by the No. 2 pointer of the copilot's radio magnetic indicator when the copilot's **RMI/DF** selector switch, on the copilot's instrument panel, is placed in the **UHF/DF** position. Refer to figure 4-13. Reception from the guard receiver or UHF transmission is not possible while using the direction finding equipment. Power for the set is supplied by the 28-volt dc primary bus through a circuit breaker on the radio circuit breaker panel.

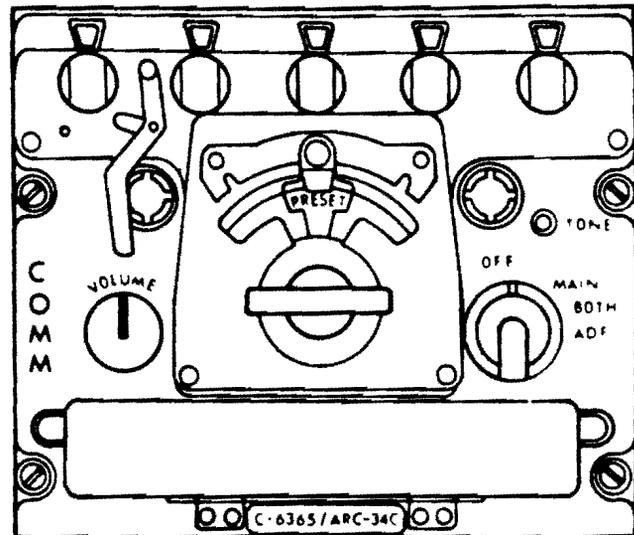
- a. To operate, turn UHF radio on. (Allow three minutes for warmup if the UHF operation switch was **OFF**.)
- b. Select the desired frequency with the channel selection switch.
- c. Place the UHF function switch in the **ADF** position.
- d. Place copilot's **RMI/DF** selector switch in **UHF/DF** position.

e. Bearing indication will be shown by the No. 2 pointer of the copilot's radio magnetic indicator.

f. To restore UHF transmission, place the UHF function switch in some operating position other than **ADF**. This returns the **AN/ARA-25** equipment to the standby condition.

g. To stop the equipment, turn the UHF function switch **OFF**.

UHF COMMAND SET AN/ARC-34C (Some Aircraft, AF54-691 and 54-698).



The UHF command set is used to transmit and receive amplitude modulated signals in the frequency range of 225.00 to 399.95 MHz on any one of 3500 selectable frequencies. The UHF command set consists of a transceiver, control unit and antenna. Remote control of the set is provided by the control unit installed on the pilot's pedestal. Any 20 of the 3500 available frequencies can be preset into the control unit in any order. The selection of the preset channels is accomplished by turning a knob on the control unit. In addition, five knobs are provided so any one of the remaining 3480 frequencies can be selected manually without disturbing any of the preset frequencies. Power for operation of the set is 28-volt dc supplied through the **UHF COMMUNICATIONS** circuit breaker on the flight deck overhead circuit breaker panel.

Control Unit C-6365/ARC-34C.

The control unit provides remote selection of the 3500 channels available in the receiver-transmitter. The control unit is installed on the pilot's pedestal with all operating controls on the front panel. The function selector switch selects the mode of equipment operation: In the **OFF** position the equipment is inoperative; in the **MAIN** position the transmitter and receiver are operative on the same frequency; in the **BOTH** position the main receiver, guard receiver, and transmitter are operative, permitting continuous monitoring of the guard channel during equipment op-

eration; in the ADF position the main receiver is connected to the AN/ARA-50 Direction Finder System, and the transmitter and guard receiver are disabled. The VOLUME control adjusts the output audio level of the main and guard receivers. The TONE button energizes the transmitter and an audio oscillator to transmit a continuous wave tone signal modulated at 1000 Hz. The MANUAL-PRESET-GUARD switch selects the method of frequency selection. The five manual selection knobs select the operating frequency while the MANUAL-PRESET-GUARD switch is in the MANUAL position. The selected frequency is indicated in the windows above the manual selection knobs.

Receiver-Transmitter RT-750/ARC-34C.

The receiver-transmitter is used to transmit on any one of 20 preset channels, on any one manually selected frequency, or on a guard frequency. The receiver-transmitter contains a main and a guard receiver, providing the capability of continuously monitoring the guard frequency during normal communications on the main receiver and transmitter. The main receiver and transmitter operate from 225.00 to 399.95 MHz. Operation of the receiver-transmitter is remotely controlled from the control unit. The guard receiver is crystal controlled and can operate on any frequency from 238.00 MHz. The frequency of the guard receiver is set before the receiver-transmitter is installed in the aircraft and can not be changed during flight. Power for operation of the receiver-transmitter is 28-volt dc supplied through the UHF COMMUNICATIONS circuit breaker on the flight deck overhead circuit breaker panel. A PP-1990/HRC-34A power supply is used to supply dc power.

Antenna, AT-256/ARC.

The antenna is installed in the forward top section of the vertical stabilizer. This antenna is used by the receiver-transmitter to radiate and receive RF signals. The frequency range of the antenna is 225.00 to 399.95 MHz.

UHF Command Set Operation.

To operate the set, rotate the function selector to MAIN or BOTH. Rotate the five manual selection knobs to select the desired operating frequency. Adjust the VOLUME control until the audio is at a comfortable listening level.

DIRECTION-FINDING SYSTEM, AN/ARA-50 (Some Aircraft, AF54-691 and 54-698).

The direction-finding system is used with the AN/ARC-34C UHF Command Set to determine relative bearing to any transmitter operating in the 225.00 to 399.95 MHz frequency range. The transmitted signal is detected by a directional antenna and is connected through switchover relays to the command set receiver. A rotating sensing element in the antenna supplies synchro signals to the pilot's and copilot's ID-250 indicators which provide bearing information. The communications receiver supplies signals to a control amplifier, which converts the signals into driver voltages to keep the rotating element of the antenna directed to the transmitter. A key interlock relay is provided in the system to disconnect the ADF antenna and connect the communications antenna to the receiver-transmitter when the transmitter is keyed. Power for system operation is 28-volt dc and 115-volt ac supplied through the UHF DF and UHF DF-AV circuit breakers on the flight deck overhead circuit breaker panel. The system is controlled from the C-6365/ARC-34C Control Unit at the pilot's pedestal.

Antenna AS-909/ARA-48.

The antenna is installed on the bottom of the fuselage and receives modulated or unmodulated signals in the 225.00 to 399.95 MHz frequency range.

Amplifier-Relay Assembly AM-3624/ARA-50.

The amplifier-relay assembly is installed in the cargo compartment aft of the aft cargo door and contains an RE-339/ARA-48 Relay Assembly, an AM-1779/ARA-48 Electronic Control Amplifier, and a J-942/ARA-50 Interconnecting Box. The relay assembly switches the direction-finder antenna and the communications antenna to the input of the communications receiver. The electronic control amplifier amplifies and filters the square wave signal from the receiver and drives the phase sensitive antenna drive motor in the antenna. The interconnecting box connects the amplifier-relay assembly to the other units of the system.

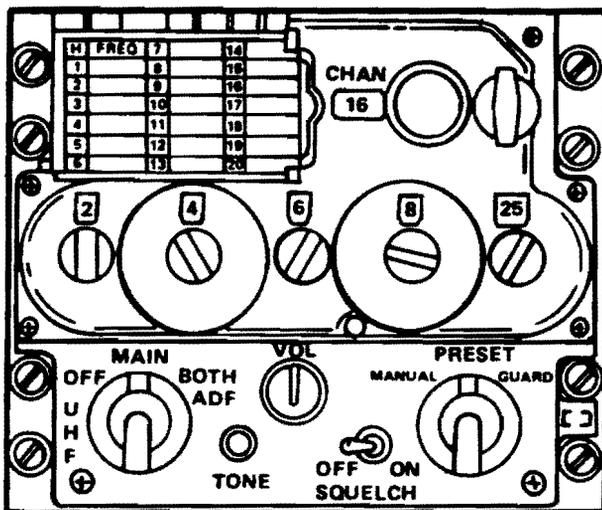
ADF Operation.

The direction-finding equipment is energized when the C-6365/ARC-34C control panel function selection switch is set to ADF.

UHF COMMAND RADIO (AN/ARC-164(V)10) (Aircraft modified in accordance with T.O. 1C-123K-545.)

The UHF command radio provides voice transmission and reception in the frequency range of 225.000 to 399.975 megahertz with 7000 frequencies available in steps of 0.025 megahertz. Receiver and transmitter tuning is accomplished automatically after a frequency change. A main receiver and a guard receiver are used in the system. The main receiver tunes to any selected frequency; the guard receiver remains tuned to a guard frequency. In addition, the UHF radio set is capable of automatic direction finder (ADF) reception. Power for the operation of the UHF set is supplied by the 28-volt dc emergency communications bus and is protected by a circuit breaker located on the pilot's overhead radio circuit breaker panel.

UHF Command Radio Controls.



The three-position (MANUAL, PRESET, GUARD) frequency mode selector switch, located on the right side of the control panel, is used to select the type of frequency control desired. With the switch positioned to PRESET, the preset channel selector knob, located at the top right of the control panel, can be used to select any one of 20 preset frequencies. The preset channel selected is displayed on the chan readout indicator to the left of the preset channel selector knob. When the frequency mode selector switch is positioned to MANUAL, the five-manual selector knobs, located across the top of the control panel, can be used to select any one of 7000 frequencies in the operating range. The manual selector knobs control the digits making up the desired frequency. Each of the digits appears in a window above the associated knob. When the selector switch is positioned to GUARD, reception and transmission are on the guard frequency.

Note

The GUARD position of the frequency mode selector switch should not be used except in actual emergencies.

The four-position (OFF, MAIN, BOTH, ADF) function selector switch on the left side of the control panel turns the radio set on and determines whether the main or the guard receiver is being used in conjunction with the transmitter. When the switch is positioned to MAIN, the main receiver and the transmitter are ready for use, and the guard receiver is inoperative. If the function selector switch is at MAIN and the frequency mode selector is at GUARD, the main receiver and the transmitter will be ready for use on the guard frequency. With the function selector switch positioned to BOTH, the main receiver, guard receiver, and the transmitter are all ready for use; the main receiver and transmitter are ready for use on the selected frequency and the guard receiver monitors the guard frequency.

When the function selector switch is positioned to ADF, the guard receiver is disabled and the main receiver is switched to the UHF direction finder antenna. When the switch is in this position, the transmitter will tune to the manual, preset, or guard frequency, depending on the position of the frequency mode selector switch, but the switching arrangement within the command control panel is such that no transmissions can be made. When the function selector switch is in any position other than ADF or OFF, the tone button at the bottom of the control panel can be used to transmit a continuous wave tone modulated at 1,020 Hz. Pressing the tone button energizes the transmitter and an audio oscillator. A volume control knob, located at the bottom center of the control panel, is used to adjust the level of the audio signal. The two-position (OFF, ON) squelch switch enables (ON position) or disables (OFF position) the main and the guard receiver squelch.

Normal Operation of the UHF Command Radio.

To put the radio into operation, proceed as follows:

- Place the function selector switch to any position except ADF or OFF; allow one minute for warmup.
- Select a channel, using the preset channel selector knob or the manual selector knobs.
- To receive, actuate the respective UHF monitor switch on the intercommunication system control panel.
- To transmit, place the selector on the intercommunication system control panel to UHF.
- To turn the UHF command radio system off, place the function selector switch to OFF.

Emergency Operation of the UHF Command Radio.

Note

When operating a UHF command radio under emergency conditions, set the frequency mode selector switch to GUARD and the function selector switch to MAIN. Do not use the BOTH position, since the noise from the two receivers may make the incoming signal unintelligible.

If the equipment fails in some particular function, the remaining workable functions may satisfy minimum requirements for operation. If transmission on a preset

VHF COMMAND SET, WILCOX 807
(Aircraft modified in accordance with TCTO
1C-123B-630).



This set provides line-of-sight, air-to-air or air-to-ground communications. The installation consists of an antenna, a lightweight receiver-transmitter mounted forward of the pilot's instrument panel, and a remote control panel (figure 4-12) on the pedestal in the crew compartment. An OFF-PWR switch, a volume control, two frequency selector knobs, a COM TEST pushbutton switch, and a frequency indicator comprise the control panel. Voice communications is possible on any one of 1360 different frequencies in the band from 116.000 to 149.975 megacycles. Transmission and reception are accomplished on the same frequency and with the same antenna. The COMM TEST switch, when depressed, disables the squelch circuit in the receiver to permit reception of signals below threshold level. The range of the equipment, for air-to-ground communications, varies from approximately 30 miles at 1000 feet altitude to 135 miles at an altitude of 10,000 feet. Power for the operation of the set is supplied by the 28-volt dc emergency communications bus through a 10-ampere circuit breaker on the overhead radio circuit breaker panel.

- a. To start the equipment, rotate the power switch to the PWR position and select the desired frequency with the frequency selector knobs.

Note

The receiver will continuously monitor the frequency indicated except during periods of transmission at which time the receiver is isolated from the antenna.

- b. To stop the equipment, rotate the power switch to OFF.

UHF COMMAND SET AN/ARC-27
(Some Aircraft).



This set has been designed to provide limited range AM communication on any one of 1750 frequencies from 225.0 to 399.9 megacycles. Transmission and reception are accomplished on the same frequency and on the same antenna and normally extend over a line-of-sight distance. The control panel (figure 4-12), located on the pedestal contains an audio volume control, a preset channel selector switch, manual frequency selector controls and a master function switch. The preset channel selector switch provides quick-selection of any one of twenty preset channels or when

placed in "M," permits use of the manual frequency selector controls. The "G" position of the channel selector switch is used only when transmission on the guard channel frequency is necessary. The manual frequency selector controls may be used to select any one of 1750 different channel frequencies. Primary control of the set is accomplished by use of the master function switch. When turned from OFF to T/R, the switch energizes the set to provide normal channel selection and operation. The T/R + G position energizes the separate guard receiver and provides monitoring of the guard frequency as well as normal channel transmission and reception. The ADF switch position couples the UHF main receiver to the UHF direction finding equipment, AN/ARA-25, on aircraft modified in accordance with TCTO 1C-123B-628. On the remaining aircraft, the ADF position is not connected. Power for operation of the set is supplied by the 28 volt dc emergency communications bus.

- a. To start the equipment, turn the master function switch to T/R.
- b. Turn the channel selector switch to the channel desired and allow the set to warm up.

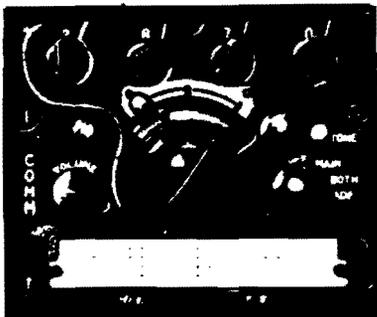
CAUTION

Allow at least two minutes warm up time before attempting to transmit on UHF.

- c. If manual channel selection is desired, turn the channel selector to "M" and use the manual frequency selector controls.
- d. Adjust volume.
- e. If guard channel monitoring is desired, turn the master function switch to T/R + G.
- f. Should transmission be necessary on the guard channel frequency, turn the master function switch to T/R and the channel selector switch to "G". This actually turns the separate guard receiver off but tunes the main transmitting and receiving equipment to the guard channel frequency.
- g. To stop the unit, turn the master function switch to OFF.

UHF COMMAND SET AN/ARC-34

(Some Aircraft).



This set consists of a light weight receiver-transmitter unit and mounting (figure 4-35) installed in the tail section of the aircraft and a remote control panel (figure 4-12) on the pedestal in the crew compartment. Two separate receivers are included in the RT unit; a main receiver for command frequencies and a guard receiver tuned to a preset guard channel frequency. Voice or MCW reception and transmission is possible on any one of 1750 different frequencies in the band from 225.0 to 399.9 megacycles. Twenty of these frequencies may be preset at the control panel for quick selection by means of the single large knob in the center of the panel. In addition to this channel selector knob, a set of four smaller knobs across the top of the panel permits the selection of any other desired frequency within the operating range of the equipment, without disturbing the preset channels. Changing of the guard receiver frequency requires removal of the control panel and is therefore accomplished only as a ground maintenance item. Control of the method of frequency selection is accomplished through the MANUAL-PRESET-GUARD switch. When placed in the MANUAL position, the numbers in the four small frequency windows at the top of the panel are exposed, and frequency selection is made by setting "hundreds," "tens," "units," and "tenths" of megacycles by means of the four small knobs below the windows. In the PRESET position, the top windows may be covered, and the channel selector knob is used to set the appropriate channel in the center window. The GUARD position tunes the transmitter and the main receiver to the preset guard channel frequency and turns off the guard receiver. A function switch on the right side of the control panel controls the operation of the set as follows: When placed in the MAIN position, the main receiver monitors the selected frequency and the transmitter is in a standby condition for immediate use on the same frequency; the BOTH position accomplishes the same function and in addition permits continuous reception of the guard channel frequency. The ADF switch position couples the UHF main receiver to the UHF direction finding equipment, AN/ARA-25, on aircraft modified in accordance with TCTO 1C-123B-628. On the remaining aircraft, the ADF position is not connected. The tone switch on the control panel permits continuous tone transmission for emergency or direction finding purposes. Transmission and reception are accomplished on the same antenna and normally extend over a line-of-sight distance. Power for the operation of the UHF set is supplied by the 28-volt dc emergency communications bus.

- a. To start the equipment, place the function switch in MAIN or BOTH, and allow at least one minute for the set to warm-up.

- b. Select the desired frequency with the channel selector knob or the four small knobs across the top of the panel.

- (1) If the channel selector knob is used, place the MANUAL-PRESET-GUARD switch in the PRESET position.

channel is not possible, an attempt may be made to use a manually selected channel or the guard frequency. If reception fails on a selected channel, reception on the guard frequency may be tried.

618T-1 LIAISON RADIO. (Aircraft modified in accordance with TCTO 1C-123B-631).



The 618T-1 high frequency radio set (HF-101) provides communication between aircraft and between aircraft and fixed mobile ground communications stations. The set transmits and receives voice communications in the high frequency band on any one of 28,000 frequencies between 2.0 and 29.999 mc. Modes of