SECTION IV—AUXILIARY EQUIPMENT

TABLE OF CONTENTS

AIR CONDITIONING SYSTEM.

The heating, ventilating, cooling, and pressurization systems on this aircraft are so combined and controlled that they will be considered as one air conditioning system. (See figure 4-1.)

HEATING.

Heated air for the cabin is supplied by two 125,000-btu combustion heaters (figure 4-2) located in the wing fillets. Each heating package contains its own ignition system and individual units for supplying the combustion fuel/air mixture. Fuel is supplied to the heaters from the No. 2 and No. 3 engine fuel systems. During auxiliary ventilation operation, outside ram air is heated. During pressurized operation, recirculated cabin air from the recirculation fans is heated. The recirculated air is picked up by the fans through the recirculation check valves from the area around the outside of the aft cargo compartment liner. A mixture of heated and unheated air from the output side of the heaters is then mixed with fresh air from the cabin superchargers before entering the cabin distribution system (figure 4-4, 4-5). Heated air for the flight station may be recirculated cabin air or, by positioning the flight station mixing valve, a mixture of fresh and recirculated air or all fresh air. If the air is not as warm as desired, it can be further heated by operating the pilots' electric auxiliary heater.

AUXILIARY VENTILATION.

Ambient air for auxiliary ventilation is provided by circulating ram air from inlets in the leading edges of the left and right wing center sections. The ram air is directed from the inlets through the cabin recirculating fans, to the cabin distributing system. The air from the cabin is exhausted overboard through the auxiliary ventilation exit valve and the cabin safety relief and dump valve. Ventilation on the ground is furnished by the recirculation fans drawing air through the auxiliary ventilation inlet valves and distributing it to the cabin in the same manner as during flight.

REFRIGERATION.

Cooled or refrigerated air is supplied to the cabin and flight station from equipment in both wing panels. Partial cooling may be accomplished by positioning the cabin air mixing and selector valve toward the cool position, forcing supercharged air to pass through the primary heat exchanger before reaching the fuselage. Heat is transferred from the supercharged air within the tubes to the cooling ram air around the tubes. The cooling ram air is carried away through the exit door in the upper surface of the wing panel. The amount of cooling is then modulated by adjusting the position of the primary heat exchanger ram air scoop. Full cooling and refrigeration may be accomplished by positioning the cabin air mixing and selector valve toward the cool position, thus forcing air to be refrigerated to pass through the primary heat exchanger as in cooling. The air flows from the outlet side of the primary heat exchanger into the compressor turbine of the cooling unit. It passes from the compressor turbine through the secondary heat exchanger and then back into the expansion turbine of the cooling unit. It then flows from the expansion turbine through the water separator to the air mixing and

AIR CONDITIONING SYSTEM

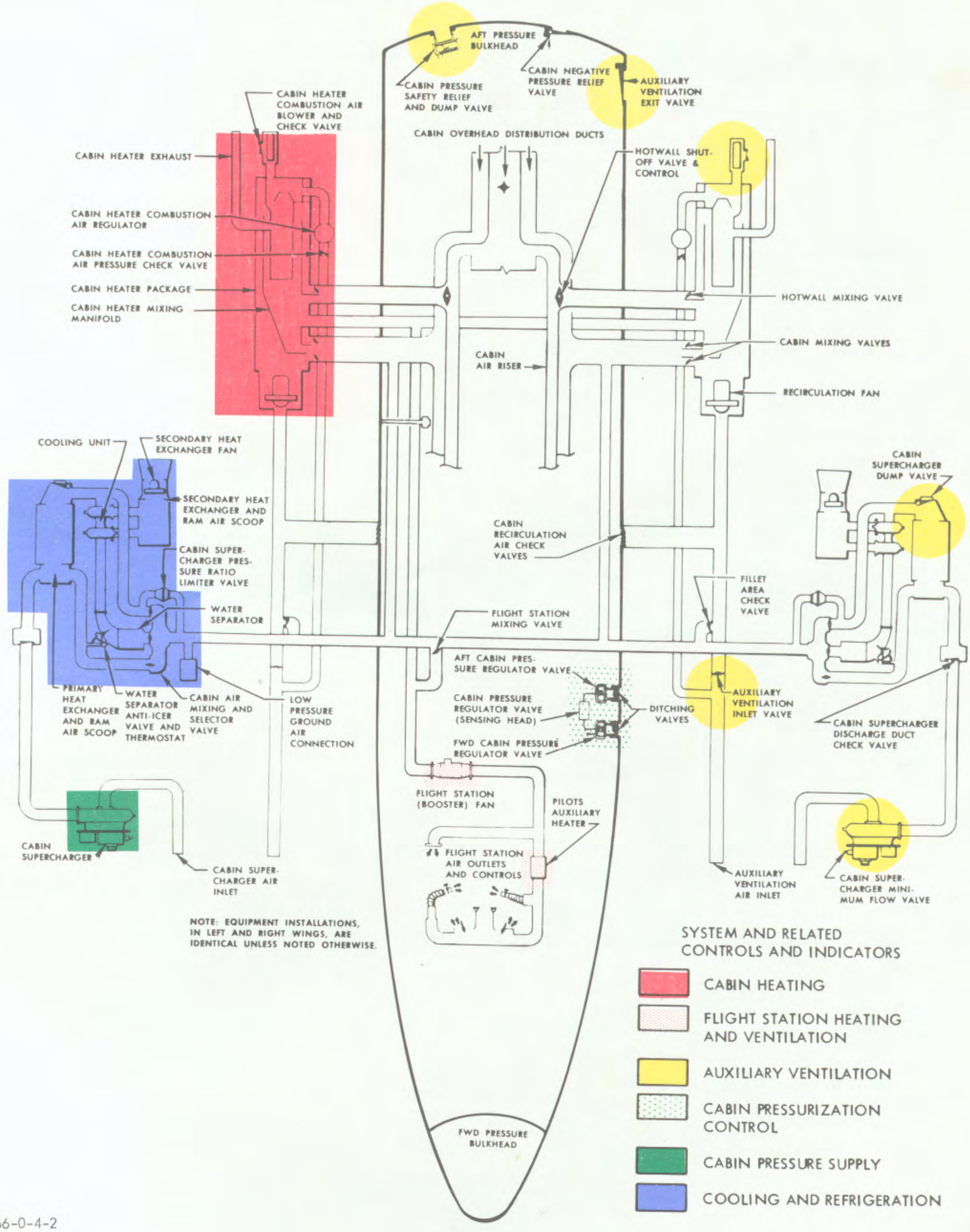

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Figure 4-1

PRESSURIZATION SYSTEM

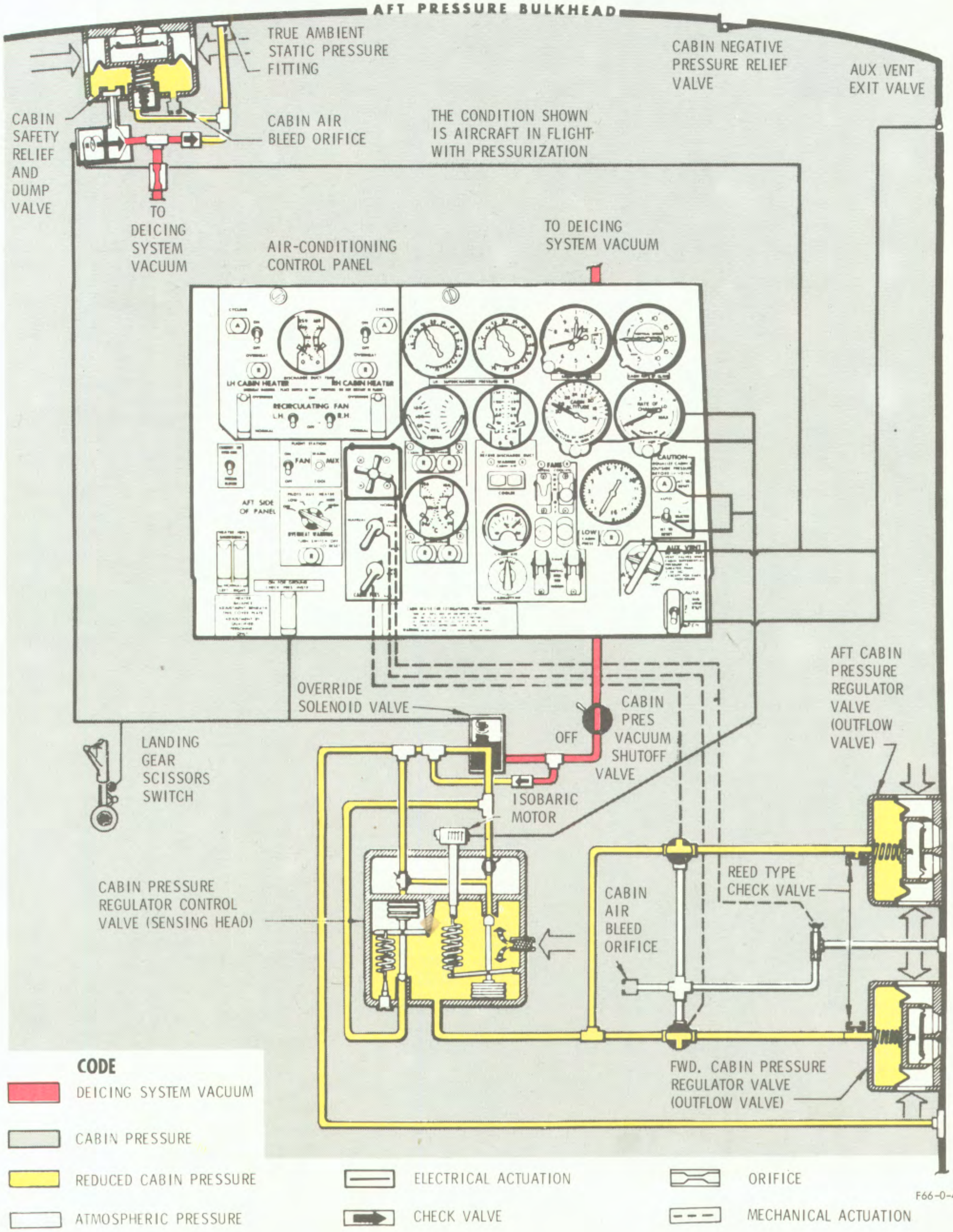

Figure 4-2

HEATING SYSTEM

NOTE:

- FUEL IS SUPPLIED TO THE HEATERS FROM THE NO. 2 AND NO. 3 ENGINE FUEL PUMPS.

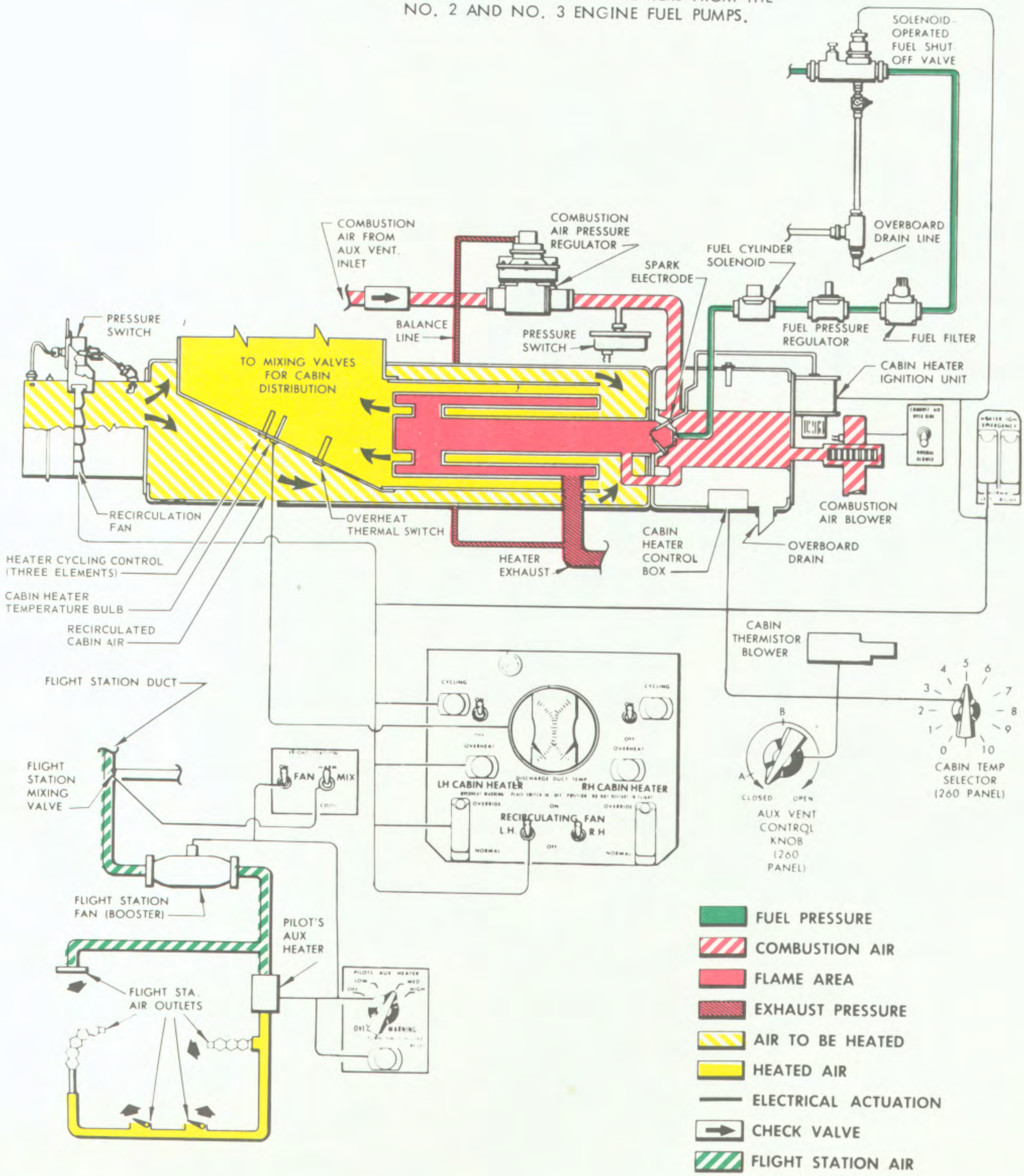

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Figure 4-3

AIR CONDITIONING DUCTING

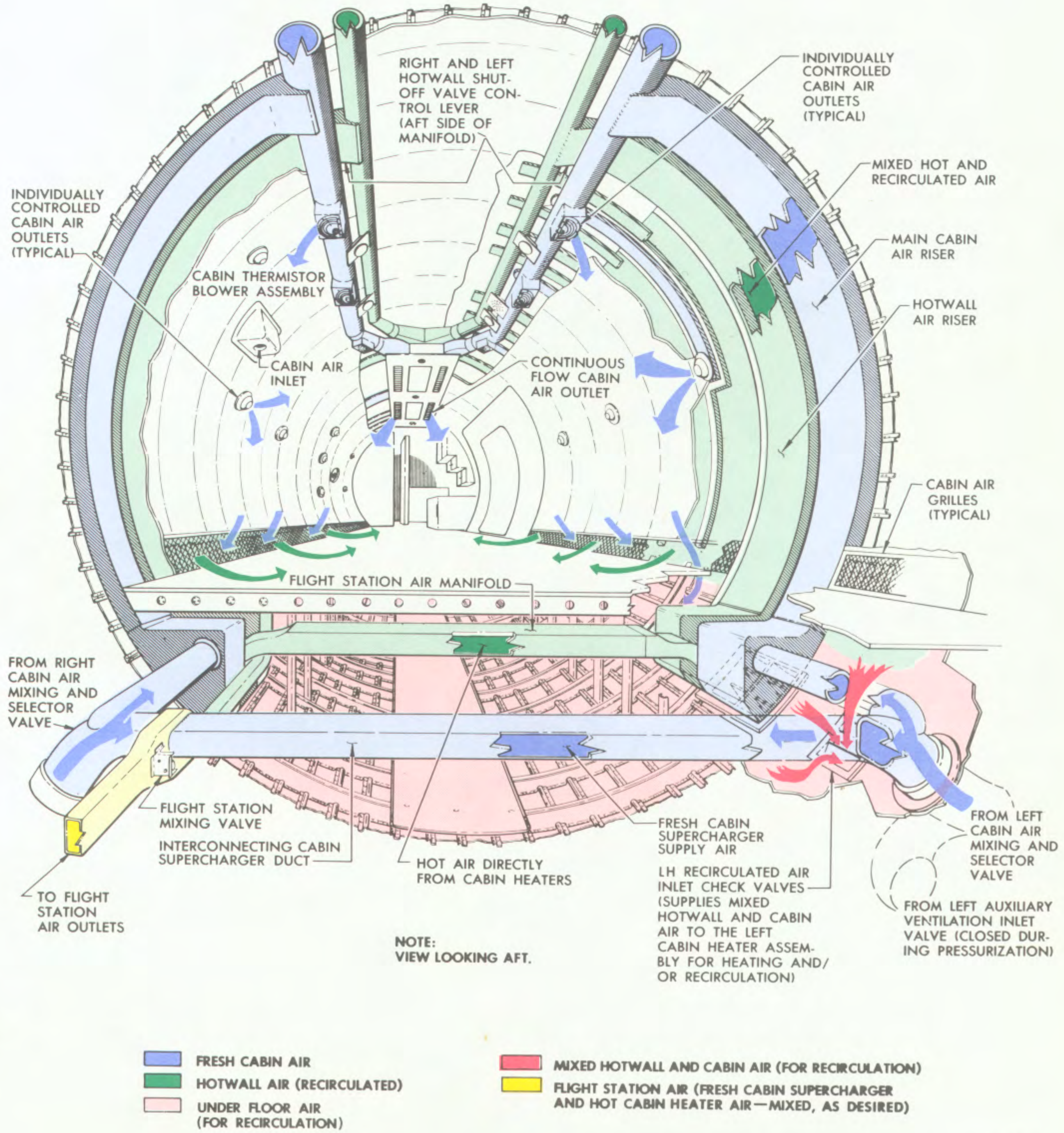


Figure 4-4 (Sheet 1 of 2)

AIR CONDITIONING DUCTING

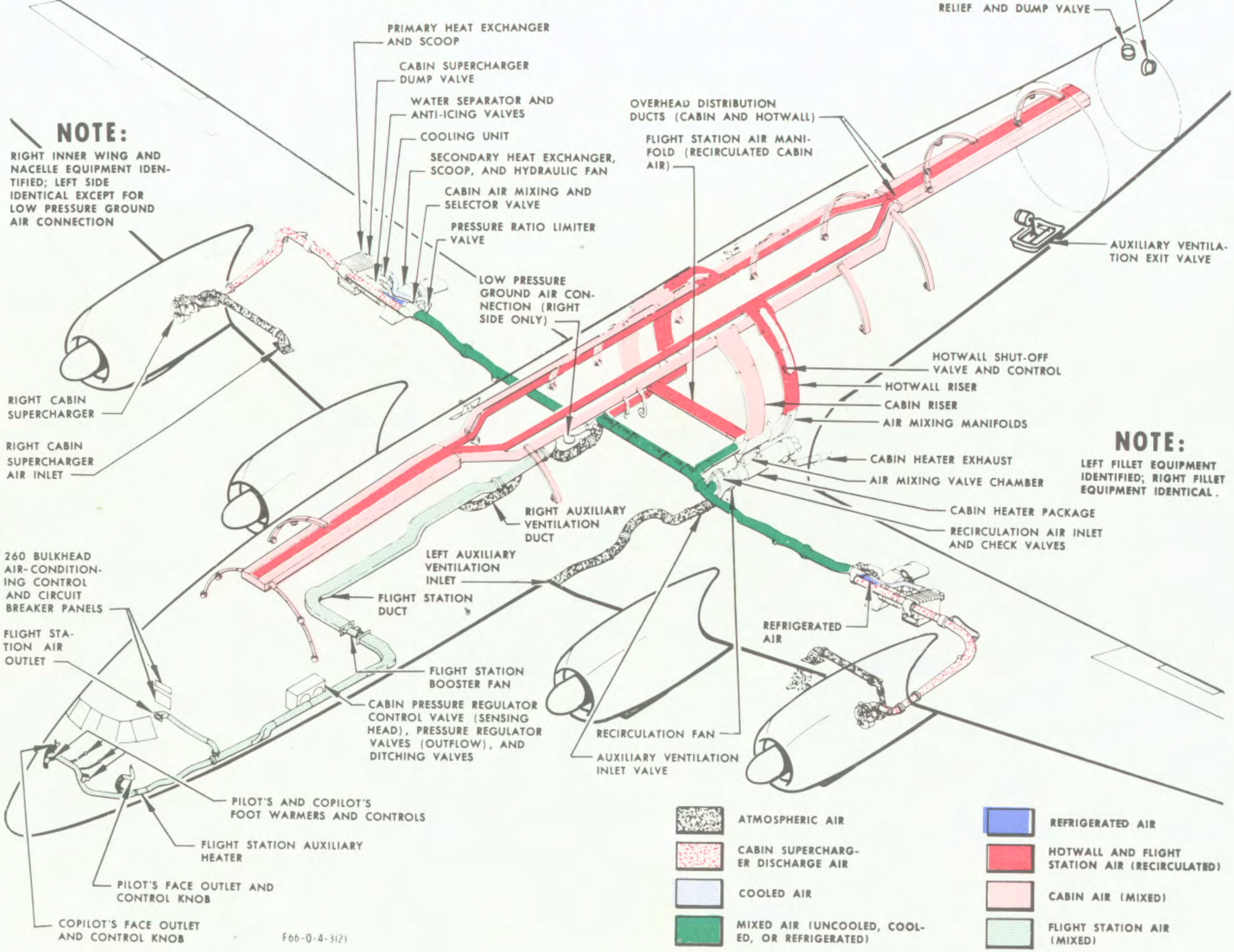


Figure 4-4 (Sheet 2 of 2)

REFRIGERATION SYSTEM CABIN COOLING

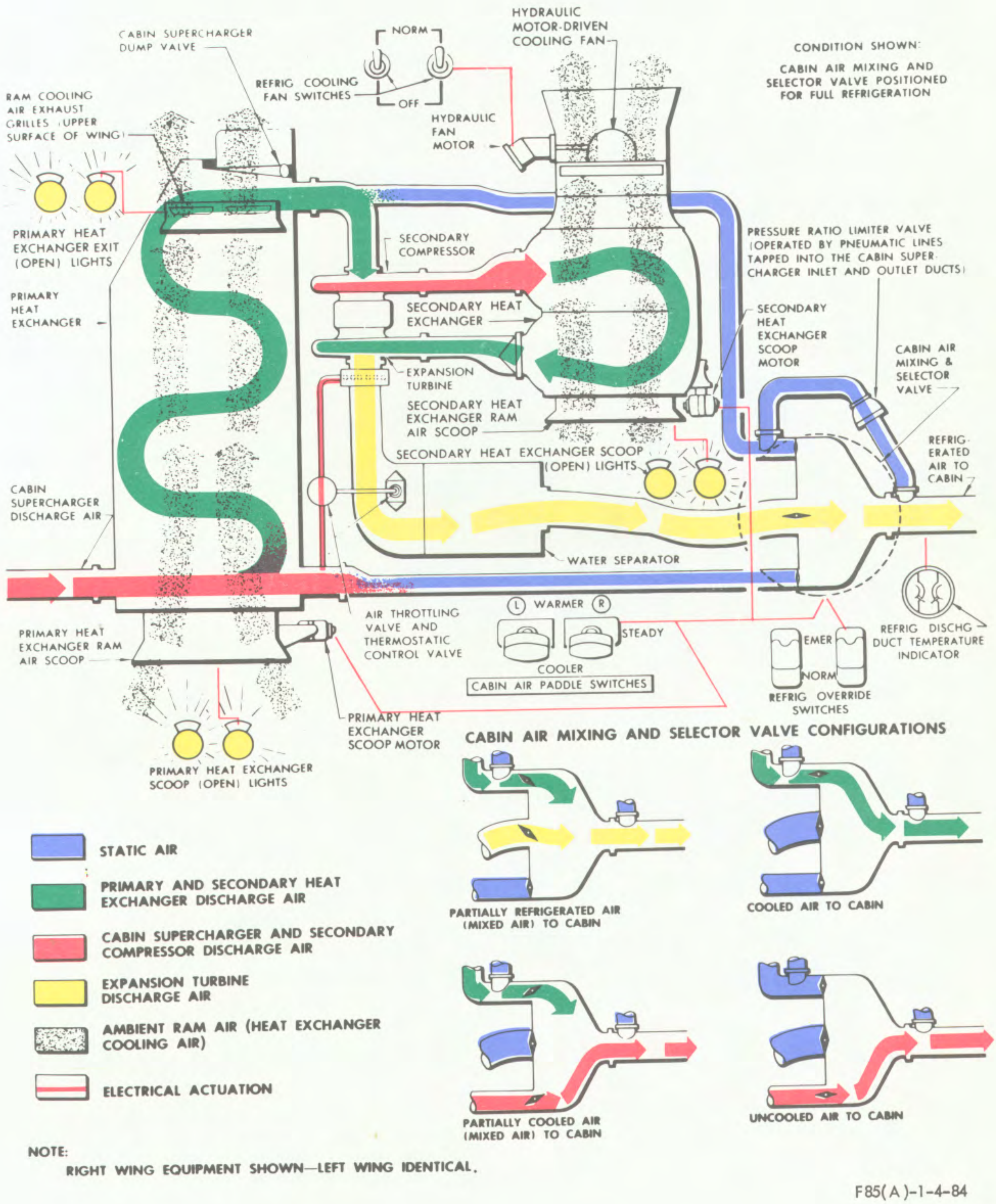


Figure 4-5

CABIN PRESSURIZATION VERSUS ALTITUDE

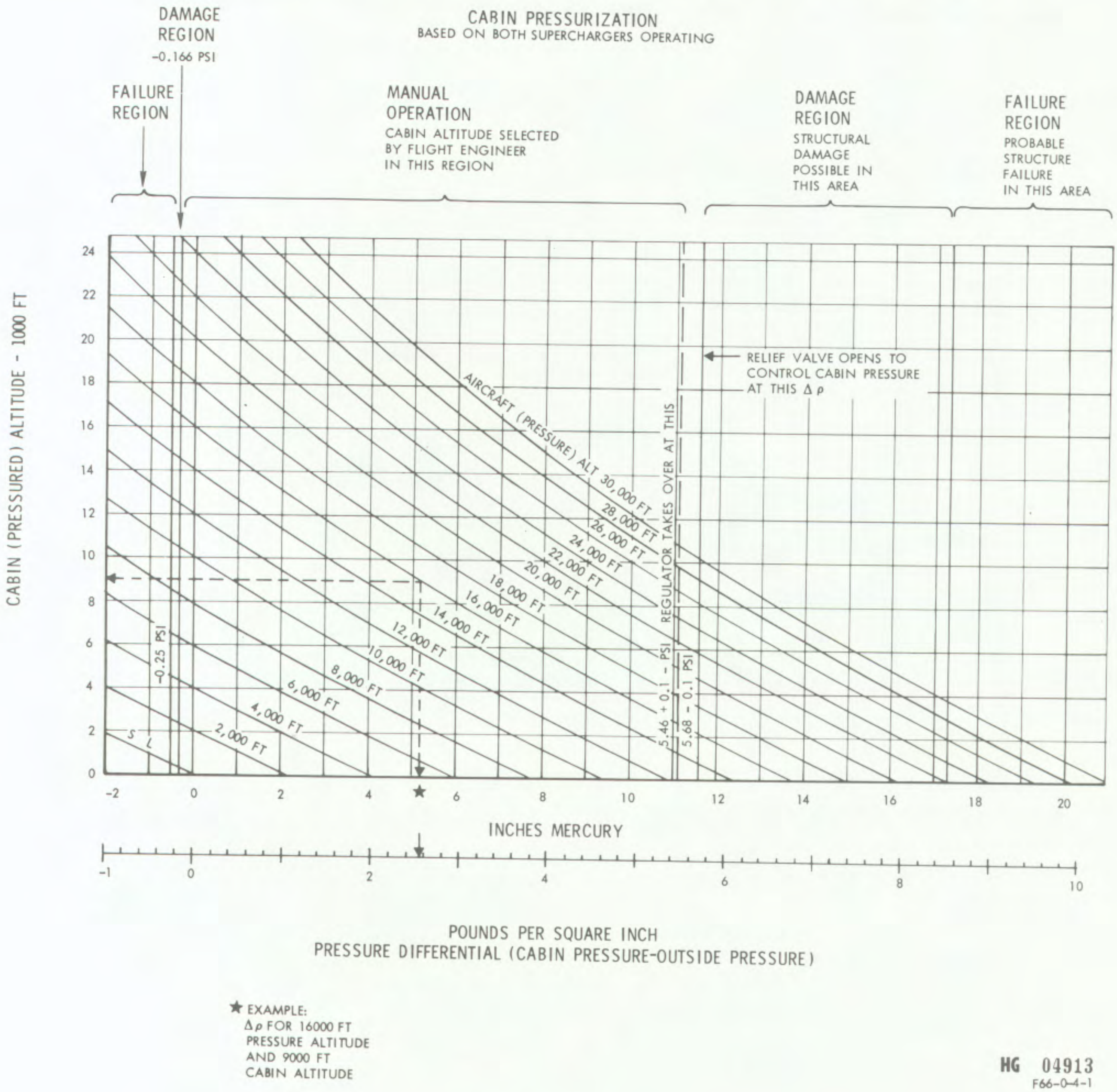


Figure 4-6

selector valve into the fuselage duct. Duct temperature just downstream of the air mixing and selector valve is registered on a temperature indicator. This permits the controls to be positioned for a desired discharge temperature within the capacity of the equipment.

PRESSURIZATION.

Ambient air is ducted from inlets just aft of the leading edge of the wings to the cabin superchargers, which are located in the outboard nacelles. It is then compressed and passed through the refrigeration and cooling equipment located in the wings (the path through this equipment is dependent upon cabin temperature selection and the position of the cabin air mixing valve) and then introduced into the fuselage structure to pressurize and ventilate this area when the auxiliary ventilation system is closed. Sea level cabin pressure can be maintained up to an altitude of 12,300 feet. Any further increase in altitude will cause a proportional decrease in cabin pressure (see figure 4-6). At 25,000 feet, the cabin pressure can be maintained at a pressure equivalent to 10,600 feet. The amount and rate at which the cabin air is exhausted overboard to maintain selected cabin pressure are determined by the auxiliary pressure regulator valves, the master pressure regulator valve, the altitude selector, and the rate-of-change selector. The auxiliary pressure regulator valves automatically meter the outflow of cabin air in response to variable pneumatic control forces from the master pressure regulator control valve. This valve varies the pneumatic control forces in response to the manually selected positions of the altitude and rate-of-change selectors. These instruments provide for remote positioning of the isobaric section of the valve, permitting selective automatic operation up to a pressure differential of 10.92 inches Hg (5.36 psi). If the range of the isobaric section is exceeded the differential section of the valve provides for nonselective automatic operation up to a maximum pressure differential of 11.32 inches Hg (5.46 psi). A cabin pressure safety relief and dump valve is installed on the aft pressure bulkhead. The valve acts as a pressure safety relief valve and a pressure dump valve. A vacuum or negative pressure relief valve is installed on the aft pressure bulkhead, adjacent to the cabin pressure safety relief and dump valve. This valve is hinge-mounted from the top to permit it to swing inward if outside pressure is greater than inside pressure. In addition, the outflow valves act as negative relief valves.

AIR CONDITIONING SYSTEM CONTROLS AND INDICATORS.

Cabin Heater Switches.

The cabin heater switches (4, figure 4-7) are two-position switches labeled ON and OFF. The ON position permits operation of the cabin heaters provided the recirculating fan switches are ON, the cabin temperature selector switch is set above a specified temperature, and the No. 2 and No. 3 engine fuel pumps or the auxiliary boost pumps are operating. This automatic-type electrical system is protected by several cabin temperature circuit breakers located on the upper 260 panel. Power for the various heater components is routed through the 260 bus and the main dc bus.

Cabin Heater Temperature Override Switches

Two-position guarded cabin heater temperature override switches (5, figure 4-7) are labeled OVERRIDE, and NORMAL (guarded down). The OVERRIDE position of each switch provides for higher heater output if the cabin temperature control rheostat fails to supply sufficient cabin heat. A bridge circuit breaker, located on the 260 upper switch panel, protects this phase of of the cabin heater system. Electric power is routed through the 260 dc bus.

Cabin Heater Combustion Air Blower Switch.

A two-position cabin heater combustion air blower switch (38, figure 4-7) is labeled OVERRIDE and NORMAL. The OVERRIDE position permits operation of both combustion air blowers, which supply air for combustion in the cabin heaters when ram air is insufficient because of ice accumulation in the auxiliary ventilation inlets. In the NORMAL position, the combustion air blower is inoperative unless the cabin heating system is operating on the ground and the auxiliary ventilation knob is in position A or beyond. The flower will then be turned on automatically through a pressure switch. This portion of the cabin heater electrical system is protected by the recirculating fan circuit breakers located on the 260 upper switch panel. Electric power for the combustion air blower switch is routed through the 260 dc bus and the main dc bus.

Cabin Heater Emergency Ignition Switches.

The two 2-position, guarded, heater ignition emergency switches (34, figure 4-7) are labeled EMERGENCY and NORMAL (guarded down). The EMERGENCY position selects an alternate set of ignition points if the first set does not function. The NORMAL position selects the first set of ignition points. The cabin heater circuit breakers, located on the 260 upper switch panel, protect the emergency ignition switches.

Recirculating Fan Switches.

The recirculating fan switches (39, figure 4-7) are two-position switches labeled ON and OFF. The ON position permits operation of the electric fans which circulate hot or cold air throughout the cabin. The fans are located on the forward end of each heater. Recirculating fan circuit breakers, located on the 260 upper switch panel, protect this system. Electric power for these switches is routed through the 260 dc bus.

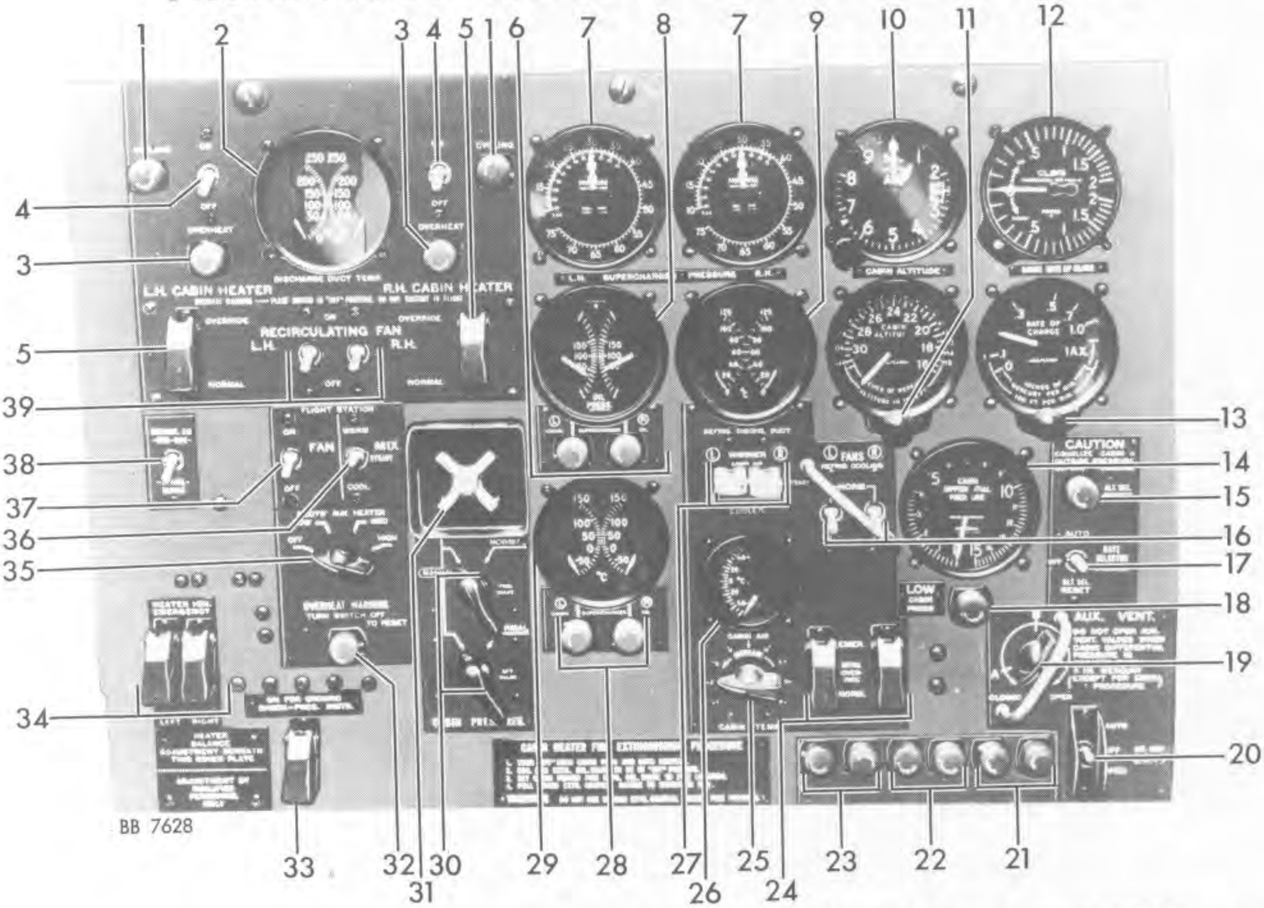
Cabin Temperature Selector Switch.

A rheostat-type cabin temperature selector switch (25, figure 4-7) is marked 1 through 10 with the word DECREASE and an arrow pointing to the low number. The 1 through 10 positions are relative and permit selection of various cabin temperatures, provided the heater switches and recirculating fan switches are ON. Cabin-heat sensing thermistors are provided to automatically control selected temperatures. A bridge circuit breaker located on the 260 upper switch panel protects this portion of the cabin heater electrical system. Electrical power is routed through the 260 dc bus.

Pilots' Auxiliary Heater Switch.

The pilots' auxiliary heater switch (35, figure 4-7) is a four-position, dual, wafer-type switch located on the

AIR CONDITIONING CONTROL PANEL



1. CABIN HEATER CYCLING LIGHTS (L & R)
2. CABIN HEATER DISCHARGE DUCT TEMPERATURE INDICATOR
3. CABIN HEATER OVERHEAT WARNING LIGHTS (L & R)
4. CABIN HEATER SWITCHES (L & R)
5. CABIN HEATER TEMPERATURE OVERRIDE SWITCHES (L & R)
6. CABIN SUPERCHARGER LOW OIL PRESSURE WARNING LIGHTS (L & R)
7. CABIN SUPERCHARGER DIFFERENTIAL AIR PRESSURE INDICATORS (L & R)
8. CABIN SUPERCHARGER OIL PRESSURE INDICATOR
9. REFRIGERATION DISCHARGE DUCT TEMPERATURE INDICATOR
10. CABIN ALTITUDE INDICATOR
11. CABIN ALTITUDE SELECTOR
12. CABIN VERTICAL VELOCITY INDICATOR
13. CABIN PRESSURE RATE OF CHANGE SELECTOR KNOB
14. CABIN DIFFERENTIAL PRESSURE INDICATOR
15. CABIN ALTITUDE SELECTOR RESET LIGHT
16. REFRIGERATOR COOLING FAN SWITCHES (L & R)
17. RATE SELECTOR OVERRIDE SWITCH
18. CABIN LOW PRESSURE WARNING LIGHT
19. AUXILIARY VENT. CONTROL
20. AUXILIARY VENT. EXIT VALVE OVERRIDE SWITCH
21. SECONDARY HEAT EXCHANGER SCOOP OPEN LIGHTS (L & R)
22. PRIMARY HEAT EXCHANGER EXIT OPEN LIGHTS (L & R)
23. PRIMARY HEAT EXCHANGER SCOOP OPEN LIGHTS (L & R)
24. REFRIGERATOR OVERRIDE SWITCHES (L & R)
25. CABIN TEMPERATURE SELECTOR SWITCH
26. CABIN AIR TEMPERATURE INDICATOR
27. CABIN AIR PADDLE SWITCHES (L & R)
28. CABIN SUPERCHARGER HIGH OIL TEMPERATURE WARNING LIGHTS (L & R)
29. CABIN SUPERCHARGER OIL TEMPERATURE INDICATOR
30. CABIN PRESSURE REGULATOR SELECTOR VALVE (FWD & AFT)
31. CABIN PRESSURE REGULATOR CONTROL VALVE
32. PILOTS' AUXILIARY HEATER OVERHEAT WARNING LIGHT
33. GROUND CHECK SWITCH
34. CABIN HEATER EMERGENCY IGNITION SWITCHES
35. PILOTS' AUXILIARY HEATER SWITCH
36. FLIGHT STATION MIXING VALVE SWITCH
37. FLIGHT STATION FAN SWITCH
38. CABIN HEATER COMBUSTION AIR BLOWER SWITCH
39. RECIRCULATING FAN SWITCHES (L & R)

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Figure 4-7

260 instrument panel. The four positions are OFF, all circuits open; LOW, 1-kw heater output energized; MEDIUM, 2-kw heater output energized; HIGH, 1-kw and 2-kw (3-kw total) heater output energized. LOW, MEDIUM, and HIGH switch positions arm the overheat warning light, thermal switches, and the overheat lockout relay circuits which prevent excessive heater temperatures. The pilots' heater vent should be open during heater operation to prevent actuating the overheat lockout relay. Operating power, activated by the flight station fan switch, is drawn from both the main dc bus (forward cargo compartment) and the 260 dc positive bus.

Flight Station Fan Switch.

The flight station fan switch (37, figure 4-7) is an electrically actuated, two-position ON-OFF switch that arms the pilots' auxiliary heater and controls the flight station fan. When the switch is ON, air circulation in the flight station is increased, and heat from the pilots' auxiliary heater is dissipated. Circuit protection is a afforded by the booster fan circuit breaker (260 switch panel), and operating power is drawn from the 260 dc positive bus.

Flight Station Mixing Valve Switch.

Air mixture in the flight station is controlled by a three-position mixing valve switch (36, figure 4-7) labeled WARM, STEADY, and COOL. Either the WARM or COOL position actuates the flight station mixing valve. The mixing valve moves to provide a mixture of recirculated cabin air and fresh supercharger discharge air during pressurized operation. During auxiliary ventilation, the mixture valve moves to provide a mixture of free auxiliary ventilation air, and heated fresh air (if desired) from the cabin heaters. The mixing valve ceases to change position when the switch is returned to the STEADY position. Note that the full-warm position supplies no fresh air, but recirculated heated air only. This circuit is protected by the flight station mix circuit breaker (260 switch panel). Power is drawn from the 260 dc positive bus.

Cabin Air Paddle Switches.

The three-position cabin air paddle switches (27, figure 4-7) are labeled WARMER, STEADY, and COOLER. The WARMER and COOLER positions electrically energize a cam arrangement which allows a continuous cam travel to the full-cool or full-warm positions, as selected, unless interrupted by the paddle switches being positioned to STEADY for a desired intermediate air temperature. These cams in turn electrically control the operation of the cabin air mixing and selector valves, the primary and secondary heat exchanger scoops, and the primary heat exchanger exit door, which provide air of the selected temperature to the cabin. All circuits involved are protected by the left and right refrigeration control circuit breakers, the left and right secondary aft cooler circuit breakers, and the left and right fan solenoid circuit breaker, all located on the 260 switch panel. Power is drawn from the crew door bus.

Refrigerator Cooling Fan Switches.

The refrigerator cooling fan switches (16, figure 4-7) have two positions, NORM and OFF, and are for ground operation of the refrigerated air system only. In the NORM position, the hydraulically driven cooling air fans, located on the aft sides of the secondary heat exchanger, operate and supply cooling air for the secondary heat exchanger when actuated by the landing gear scissors switch (see figure 4-8). Note that this setting is for all normal operation. The circuit is protected by the left and right fan solenoid circuit breaker on the 260 upper switch panel; the fan switches draw power from the crew door bus.

HEAT EXCHANGER HYDRAULIC SYSTEM

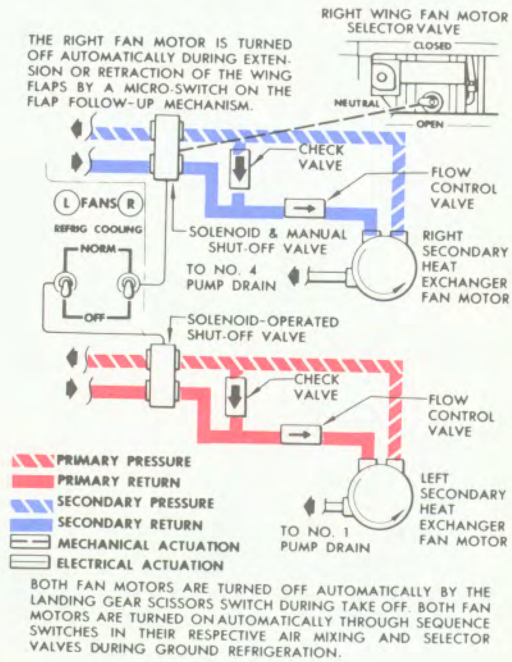

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Figure 4-8

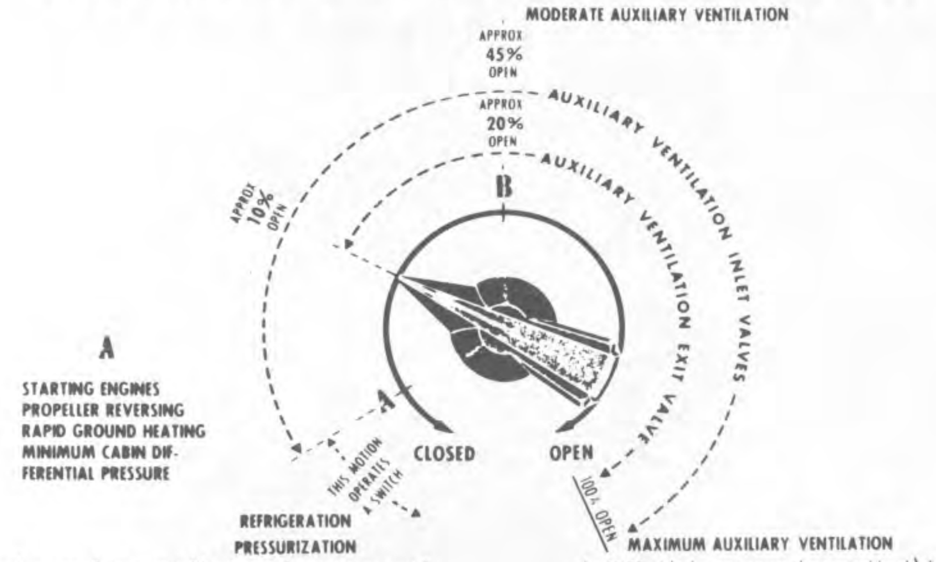
Refrigerator Override Switches.

The two-position, guarded, refrigerator override switches (24, figure 4-7) are placarded NORM and EMER. In the EMER position, these switches bypass the sequence switches in the cabin air mixing and selector valve actuator, disconnecting the primary heat exchanger scoop from the cabin air mixing valve control cycle. This allows the cabin air mixing and selector valve to be operated if the primary heat exchanger scoop malfunctions.

Auxiliary Ventilation Control Knob.

The auxiliary ventilation control knob switch (19, figure 4-7) is a rheostat switch circularly labeled CLOSED, A, B, and OPEN. This switch is mechanically interconnected with the supercharger control and altitude warning

AUXILIARY VENT CONTROL KNOB



The auxiliary ventilation control knob is a rheostat-type switch placarded CLOSED, A, B, and OPEN. In the A position the aux vent. control knob dumps the cabin superchargers and puts them on minimum flow; completes an electrical circuit to the combustion air blowers (they will operate if the cabin thermostatic controls call for heat); and opens the vacuum-controlled cabin safety relief and dump valve (if the inboard engines are operating to supply vacuum to the system).

Clockwise movement of the aux vent. control knob past the A position progressively opens the auxiliary ventilation inlet and exit valves. When the inlet valves are 10% open (approximately the 10:00 o'clock position on the control knob) the aux vent. exit valve starts to open. The last 90% travel of the control knob completes the opening of both inlet and exit valves. Any degree of OPEN is obtainable by positioning the control knob.

The position B of the aux vent. control system is a recommended position for moderate cabin and flight station ventilation without excessive air circulation. The OPEN position provides maximum auxiliary ventilation (the aux vent. inlets and exit are fully open). In the CLOSED position the cabin superchargers are supplying air to the fuselage according to flow requirements; the cabin safety relief and dump valve is closed; the combustion air blower is de-energized; and the aux vent. inlets and exit valves are closed.

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Figure 4-9

switch (which also completes an electrical circuit to the combustion air blowers), to the pressurization control switch, and is electrically connected to micropositioners which in turn control the left and right auxiliary ventilation inlets and the auxiliary ventilation exit. In the A position the switch (see figure 4-9) dumps the cabin supercharger discharge air, causes the supercharger air setting to assume minimum flow, arms the combustion air blowers circuit (they will operate if the cabin heater control calls for heat), arms the thermistor blowers, and opens the vacuum-controlled cabin safety relief and dump valve (with inboard engines operating to supply system vacuum). Clockwise movement of the auxiliary ventilation control knob switch past the A position progressively opens the auxiliary ventilation inlet and exit valves by energizing the micropositioners; however, the inlet valves open 10 percent prior to the initial opening of the exit valves. Any degree of opening of the auxiliary ventilation inlet and exit valves is obtainable by positioning of the switch. Position B of the switch provides moderate cabin and flight station ventilation without excessive air circulation. The OPEN position provides maximum auxiliary ventilation (the auxiliary ventilation inlets and exit are fully open). The CLOSED position provides cabin supercharger discharge air to the fuselage according to flow requirements, closes the cabin safety relief and dump valve, deenergizes the combustion air blower, and closes the auxiliary ventilation inlet valves and exit valve. All circuits are protected by the auxiliary ventilation control circuit breaker, the supercharger control and altitude warning circuit breaker, the cabin altitude control circuit breaker, and the pressure release control circuit breaker. All circuit breakers are located on the 260 upper switch panel. Power is derived from the 260 dc bus.

Auxiliary Ventilation Exit Valve Override Switch.

The auxiliary ventilation exit valve override switch (20, figure 4-7) is a three-position switch labeled AUTO, OFF, and OPEN. AUTO is the normal position, which allows control of the auxiliary ventilation exit and inlets by the auxiliary ventilation control knob switch. In the OFF position, the auxiliary ventilation exit door is removed from the circuit, thereby preventing movement from the last selected position. The OPEN position of the override switch bypasses the auxiliary ventilation exit micropositioner, and actuates the exit to the full-open position.

Cabin Altitude Selector.

The cabin altitude selector knob (11, figure 4-7) operates a needle-type indicator mounted on a dial that is calibrated both in inches of mercury and in thousands of feet. The knob (and needle) is mechanically connected to a potentiometer in such a manner that selection of an altitude on the dial mechanically positions the arm of the potentiometer so that each selected altitude is equal to a certain resistance value on the potentiometer. An isobaric changer potentiometer is connected to the selector potentiometer relay coil so that when an altitude is selected and the selector potentiometer moves to put the circuit in an unbalanced condition, the micropositioner moves the isobaric changer potentiometer, which actuates the isobaric spring tension-motor to correspond to the altitude selected, resulting in an increase or decrease in the sensing head valve release pressure until the circuit is again in balance. This circuit is protected by the cabin altitude control circuit breaker, located on the 260 switch panel, and draws power from the 260 dc bus.

Cabin Pressure Rate-of-Change Selector.

The cabin pressure rate-of-change selector knob (13, figure 4-7) operates a needle-type indicator mounted on a dial calibrated both in inches of mercury per minute, and in hundreds-of-feet per minute. The knob (and needle) is mechanically connected to a movable brush making electrical contact with a plastic cylinder having a wedge-shaped contact inlay in its outer surface. This contact completes the circuit to the sensing head valve. A constant-speed electric motor causes the contact-cylinder to revolve, resulting in the interruption of this circuit. Rate-of-change in cabin pressure varies directly with the width of the contact-inlay which is determined by selection on the instrument (and, as a result, on the movable brush). This circuit is protected by the cabin altitude control circuit breaker, located on the 260 switch panel, and draws power from the 260 dc bus.

Rate Selector Override Switch and Altitude Selector Reset Light.

The rate selector override switch (17, figure 4-7) is a three-position dual switch labeled AUTO, OFF, and ALT. SEL. RESET. AUTO is the position for all normal flight conditions, OFF stops the changer assembly at the existing condition, and ALT. SEL. RESET bypasses the cabin rate-of-change selector for an approximate 2500 feet per minute rate of change. When the switch is in the ALT. SEL. RESET position, the reset light (15, figure 4-7) glows until the cabin altitude selector setting has been obtained. This switch and light are part of the cabin rate-of-change selector circuit.

Cabin Pressure Regulator Selector Valve.

The forward and aft cabin pressure regulator selector valves (30, figure 4-7) are mechanically operated two-position valves labeled NORMAL and MANUAL. The NORMAL position permits control of the cabin pressure outflow valves by the cabin altitude selector. The MANUAL position permits direct manual control of the cabin pressure outflow valves by the emergency cabin pressure regulator control valve (located directly above the regulator selector valves).

Cabin Pressure Regulator Control Valve.

The cabin pressure regulator control valve (31, figure 4-7), labeled DEPRESSURIZE (with an arrow pointing left), is a needle valve that meters a source of true ambient air pressure to the cabin pressure outflow valves. Clockwise movement of this valve handle causes the cabin to pressurize; counterclockwise movement causes the cabin to depressurize. The valve is effective only when the cabin pressure regulator selector is in the MANUAL position.

Ground Check Switch.

The guarded ground check test switch (33, figure 4-7), is labeled ON FOR GROUND CHECK – PRES. INSTR. In the ON position it permits pressurization tests on the ground by removing the vacuum source from the cabin pressure safety relief valve and outflow valves, which allows them to close. The OFF position is for all other operating conditions.

Hot Wall Shutoff Valves (Left and Right).

A hot wall shutoff valve is located in each hot wall cabin air riser approximately 6 feet above the cabin floor. These valves are labeled OPEN and SHUT. The OPEN position is used during all normal operations. The SHUT position is used for maximum refrigeration when operating at low ambient air temperatures and one cabin heater inoperative.

Cabin Supercharger Disconnect Levers.

The cabin supercharger disconnect levers (7, figure 1-14) are the No. 1 and No. 4 engine supercharger control levers located on the flight engineer's control quadrant. They are labeled EMERGENCY CABIN SUPCHGR. DISCONNECT with an arrow pointing outboard. The full outboard, or quadrant-stop, position is the driveshaft disconnect position. The spring-loaded gate latch is provided to prevent inadvertent disconnection of the supercharger driveshaft when operating the supercharger levers. Squeezing the latches toward levers 2 or 3 permits the levers to be moved to the cabin supercharging disconnect position (full outboard).

DITCHING VALVE RELEASE HANDLE

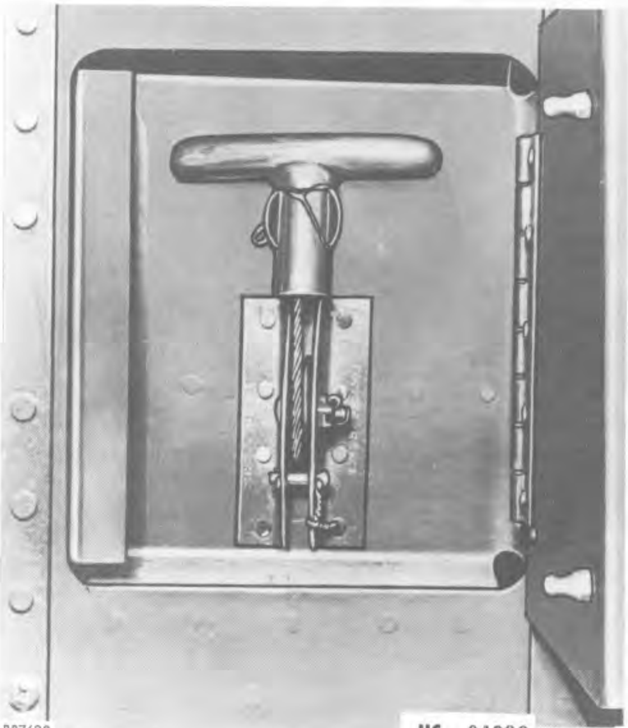

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Figure 4-10

NOTE

Once disconnected, the cabin supercharger driveshafts cannot be reconnected in flight.

Ditching Valve Release Handle.

The ditching valve release handle (figure 4-10), located behind a door under the air-conditioning control panel, is a T-handle that, when pulled, releases the spring-loaded ditching valve located in the discharge manifold of each cabin air outflow valve. This prevents water from entering the fuselage through the outflow valves. These valves cannot be reset in flight.

Cabin Heater Cycling Lights.

The cabin heater cycling lights (1, figure 4-7) blink amber whenever cabin heaters are being operated.

Cabin Heater Discharge Duct Temperature Indicator.

The discharge duct temperature indicator (2, figure 4-7) is a dual gage providing a continuous indication of cabin discharge air temperatures in degrees centigrade.

Cabin Heater Overheat Warning Lights.

The cabin heater overheat warning lights (3, figure 4-7) glow red whenever the cabin heaters reach an unsafe temperature (180°C). When one of these lights glows, it also indicates that the cabin heater is locked-out (off).

Pilots' Auxiliary Heater Overheat Warning Light.

The pilots' auxiliary heater warning light (32, figure 4-7) glows red whenever the pilots' auxiliary heater temperature exceeds a safe value. When this light glows, it also indicates that the heater is locked out.

Cabin Supercharger Differential Air Pressure Indicators.

The direct reading cabin supercharger differential air pressure indicators (7, figure 4-7) provide a continuous indication of the pressure differential, in inches-of-mercury (absolute), existing between the inlet and outlet ducts of the cabin superchargers.

Cabin Supercharger Oil Temperature Indicator.

The cabin supercharger oil temperature indicator (29, figure 4-7) is a dual dc-powered indicator providing the oil-in temperature of the cabin superchargers in degrees centigrade.

Cabin Supercharger High Oil Temperature Warning Lights.

The dc-operated cabin supercharger high oil temperature warning lights (28, figure 4-7) glow red whenever the oil-in temperature exceeds a safe value (107°C). When one of these lights glows, the associated cabin supercharger should be disconnected (if confirmed by the reading on the temperature indicator).

Cabin Supercharger Oil Pressure Indicator.

The 26-volt, ac-operated cabin supercharger oil pressure indicator (8, figure 4-7) is a dual gage providing continuous indication of the cabin supercharger oil-in pressure in pounds per square inch.

Cabin Supercharger Low Oil Pressure Warning Lights.

The dc-operated cabin supercharger low oil pressure warning lights (6, figure 4-7) glow red whenever the oil pressure is below a safe value (35 ± 5 psi). The affected cabin supercharger should be disconnected when the light glows (if confirmed by the oil pressure indication).

Cabin Differential Pressure Indicator.

The cabin differential pressure indicator (14, figure 4-7) provides a continuous indication, in inches-of-mercury, of the pressure differential between cabin and atmospheric pressure.

Cabin Low Pressure Warning Light.

The cabin low pressure warning light (18, figure 4-7) glows red whenever the cabin altitude is 10,300 feet or above.

Cabin Altitude Indicator.

The cabin altitude indicator (10, figure 4-7) provides a continuous indication of the cabin pressure altitude in feet.

Cabin Vertical Velocity Indicator (Rate-of-Climb).

The cabin vertical velocity indicator (12, figure 4-7) indicates in feet per minute the rate of change in cabin pressure altitude.

Altitude Selector Reset Indicator Light.

(Refer to Rate Selector Override Switch under Air Conditioning Controls).

Cabin Supercharger Driveshaft Rear Bearing Temperature Indicator.

The cabin supercharger driveshaft rear bearing temperatures are sensed by dc electrical resistance-type bulbs connected to the rear bearing temperature indicator (15, figure 1-15) located in the flight engineer's lower instrument panel. This indicator is a dual gage.

Cabin Air Temperature Indicator.

The dc-operated cabin air temperature indicator (26, figure 4-7) provides a continuous indication of cabin air temperature. It is calibrated in degrees centigrade.

Refrigeration Discharge Duct Temperature Indicator.

The dc-operated refrigeration discharge duct temperature indicator (9, figure 4-7) is a dual gage providing a continuous indication of the inner wing duct air temperature downstream of the cabin air mixing and selector valve. This instrument indicates the duct temperature of refrigerated, cooled, or uncooled air to the cabin distribution system.

CAUTION

The water eliminator tubes may be damaged by freezing if duct temperature drops below 2°C. Refrigeration should be turned off it duct temperature cannot be maintained at 2°C or above.

Primary Heat Exchanger Scoop Open Lights.

The primary heat exchanger scoop open lights (23, figure 4-7) glow amber whenever the scoops begin to open, enabling the operator to modulate the position of the scoop (during flight) from CLOSED to 66 percent open.

Primary Heat Exchanger Exit Open Lights.

The primary heat exchanger exit door lights (22, figure 4-7) glow amber whenever the exit doors are open. Inasmuch as the exit doors are indirectly connected to the primary heat exchanger scoops, the exit doors will not begin to open nor the lights to come on until the primary scoops reach the OPEN position.

Secondary Heat Exchanger Scoop Open Lights.

The secondary heat exchanger scoop open lights (21, figure 4-7) glow amber whenever the secondary heat exchanger scoops are in the full open position.

NORMAL OPERATING PROCEDURES.

Ground Truck Heating or Cooling.

The flight compartment and cabin areas may be heated or cooled on the ground without engines operating by performing the following steps:

1. Attach low-pressure truck to the ground – air connection.
2. Attach electrical ground power cart.
3. Recirculating fan switches – ON.
4. Aux vent control knob – FULL OPEN.
5. Cabin heater switches – OFF.
6. Flight station air outlets – OPEN.
7. Flight station fan switch – ON.
8. Flight station mixing valve – COOL.
9. If additional flight compartment heat is required, pilots' aux heater – Position to heat required.

Heating and Cooling During Ground Operation.

The flight compartment and cabin areas may be heated or cooled on the ground during engine operation by performing the following steps:

1. Recirculating fan switches – ON.
2. Flight station fan – As desired.
3. All windows and doors – Closed.

If ground heating is required:

1. Aux vent control knob – Position A.
2. Cabin air paddle switches – WARMER.

3. If additional heat is required:

a. Cabin heater temperature selector – As required.

b. Cabin heater switches – ON.

4. If additional flight compartment heat is required:

a. Flight station mix valve – WARM.

b. Flight station fan switch – ON.

c. Pilots' aux heater – Position to heat required.

If ground cooling or refrigeration is required:

NOTE

Before the engines are started, the superchargers are in low ratio. When the engines are started and supercharger oil pressure builds up, they shift to high ratio. This occurs at approximately 900 rpm. As rpm is increased above 1400-1500 for engine runup the superchargers will shift to low ratio. After runup, the engine rpm must be reduced to approximately 1100 in order for the superchargers to shift back to high ratio. In high ratio, approximately 1200 rpm will provide adequate ground refrigeration. If necessary during taxiing, idle inboard engines to prevent high taxi speed.

1. Altitude selector – Set 1000 to 1500 feet above field elevation.

2. Aux vent. control knob – CLOSED.

3. Cabin air paddle switches – COOLER.

4. Flight station mixing valve – Position as required.

CAUTION

The refrigerator cooling fan switches must be in the NORMAL position during ground refrigeration.

Heating and Cooling During Flight.

The flight compartment and cabin areas may be heated or cooled during flight as follows:

1. Recirculating fan switches – ON.

If heating is required:

1. Cabin air paddle switches – WARMER.

2. Cabin temperature selector – Set to temperature required.

3. Cabin heater switches – ON.

4. If additional flight compartment heat is required:

a. Flight station mix valve – WARM.

b. Flight station fan switch – ON.

c. Pilots' aux heater – Position to heat required.

If cooling or refrigeration is required:

1. Cabin air paddle switches – COOLER as required.

2. If additional flight compartment cooling is required:

a. Flight station fan switch – ON.

b. Flight station mix valve – COOL.

NOTE

If only partial refrigeration is required while using both superchargers, an increase of 1 to 3 knots can be realized if the desired cabin temperature is maintained with one supercharger.

Auxiliary Ventilation During Ground Operation.

The flight compartment and cabin areas may be ventilated on the ground during engine operation by performing the following steps:

1. Aux vent. control knob – OPEN.

2. Aux vent. exit valve switch – AUTO.

3. Altitude selector – Set to 1000-1500 feet above field elevation.

4. Rate-selector override switch – AUTO.

5. Cabin pressure regulator valves – NORMAL.

6. Cabin pressure regulator needle valve – Closed.

7. Recirculating fan switches – ON.

8. Flight station fan – As required.

9. All windows and doors – Closed.

Auxiliary Ventilation During Flight.

The flight compartment and cabin areas may be ventilated during flight as follows:

1. Before takeoff.

a. Recirculating fans – ON.

b. Aux vent. control knob – OPEN.

c. Altitude selector – Set to 1000-1500 feet above field elevation.

2. During flight.

a. Aux vent. exit valve override switch – OPEN.

b. Aux vent. control knob – As required to maintain adequate ventilation.

c. Flight station mix valve – As desired.

d. Flight station fans – ON.

3. Before landing.

a. Aux vent. exit valve override valve switch – OPEN.

b. Recirculating fan switches – OFF.

c. Aux vent. control knob – Position A.

Pressurization Control.

The procedure for switching from automatic to manual operation, and vice versa, is presented in figure 4-11. Automatic control of pressurization in the flight compartment and cabin areas is obtained by performing the following steps:

1. Before starting engines.

a. Ground test switch – OFF (down).

b. Cabin altimeter – Set 29.92 in. Hg and correlate with other aircraft altimeters.

c. Cabin altitude selector – Set 1000 to 1500 feet above field elevation.

d. Rate selector override switch – ALT SEL RESET until cabin altitude selector reset light goes out, then move switch to AUTO position.

e. Aux vent. control knob – Position A.

f. Aux vent, exit valve override switch – AUTO.

g. Cabin air paddle switches – As required.

h. Rate-of-change selector – 300 feet per minute.

i. Cabin pressure regulator valves – NORMAL.

j. Cabin pressure regulator needle valve – 1½ turns open.

2. During engine operation (before taxiing).

a. Recirculating fans switches – ON.

b. Flight station fan switch – ON.

c. All windows and doors – Closed.

d. Aux vent. control knob – AS REQUIRED.

3. During climb.

a. Cabin altitude selector – During climb select desired cabin altitude.

4. Descent.

a. At the start of descent, reset cabin altitude selector to 1000-1500 feet above field altitude. Control rate-of-change as aircraft descends.

NOTE

If, during descent, it appears that the altitudes will not meet at approximately 1500 feet above the field, increase or decrease the cabin rate-of-change setting, as required.

5. Before landing.

a. Cabin heater switches – OFF.

b. Recirculating fan switches – OFF.

c. Aux vent. control knob – Position A for propeller reversing.

d. Cabin heater paddle switches – WARM.

NOTE

Refer to paragraphs on heating, cooling, and refrigeration for procedure to be followed to maintain required cabin and flight station temperatures.

EMERGENCY OPERATING PROCEDURES.

Cabin Heater Malfunction.

If the heater does not operate properly, as indicated by the cycling lights not glowing or by low cabin temperature, accomplish the following:

CAUTION

If cycling light glows, but duct temperature does not increase, turn heater off.

1. Check the recirculating fans and circuit breakers. Be sure they are ON.

2. Turn the cabin temperature selector to a higher setting (toward 10). If heaters still do not cycle, move the cabin heater emergency orerride switches to OVERRIDE.

3. Switch to alternate ignition points by operating the cabin heater emergency ignition switches to EMERGENCY.

4. Combustion air blower switch – OVERRIDE.

PRESSURIZATION CONTROL - AUTOMATIC TO MANUAL

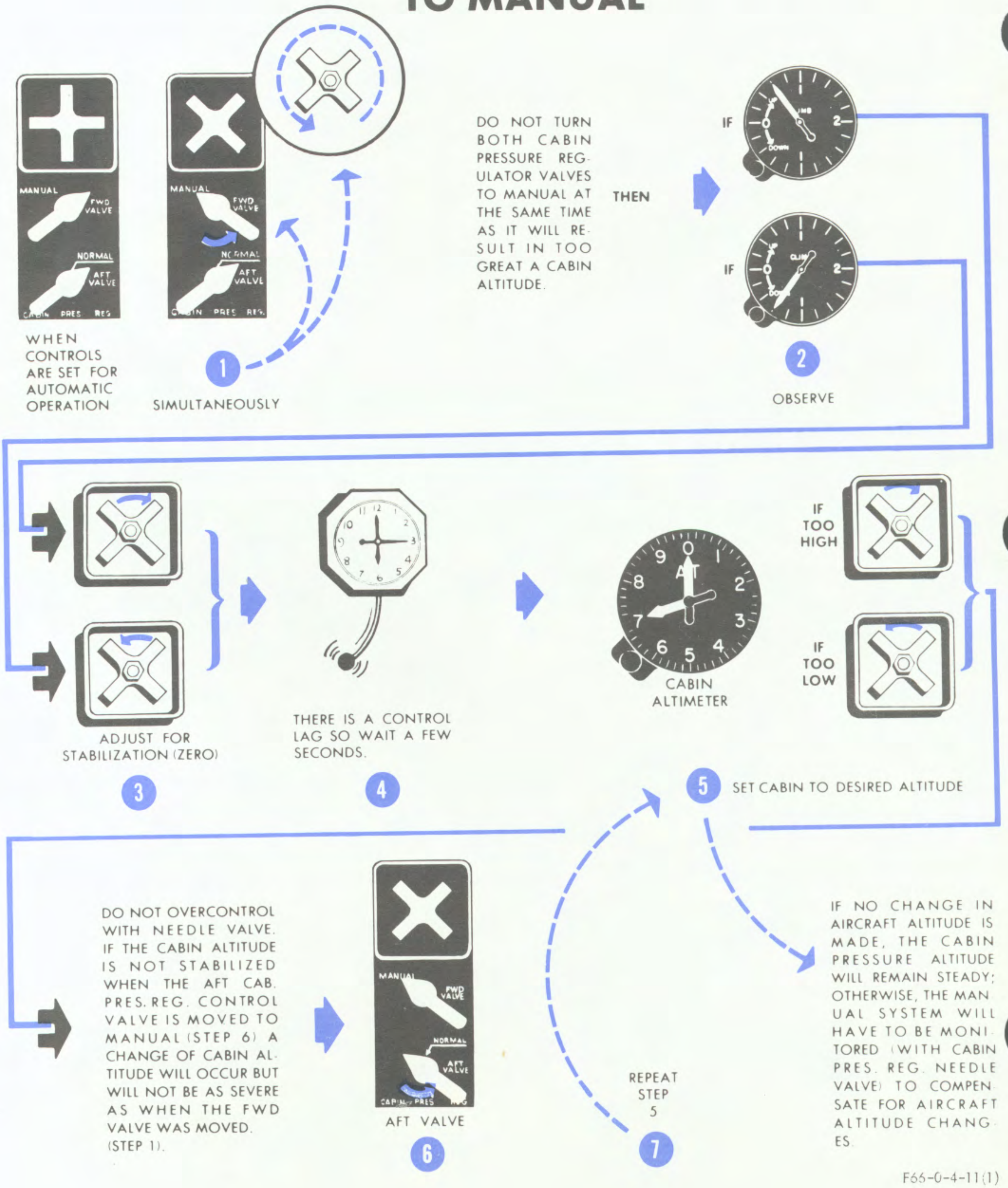


Figure 4-11 (Sheet 1 of 2)

PRESSURIZATION CONTROL - MANUAL TO AUTOMATIC

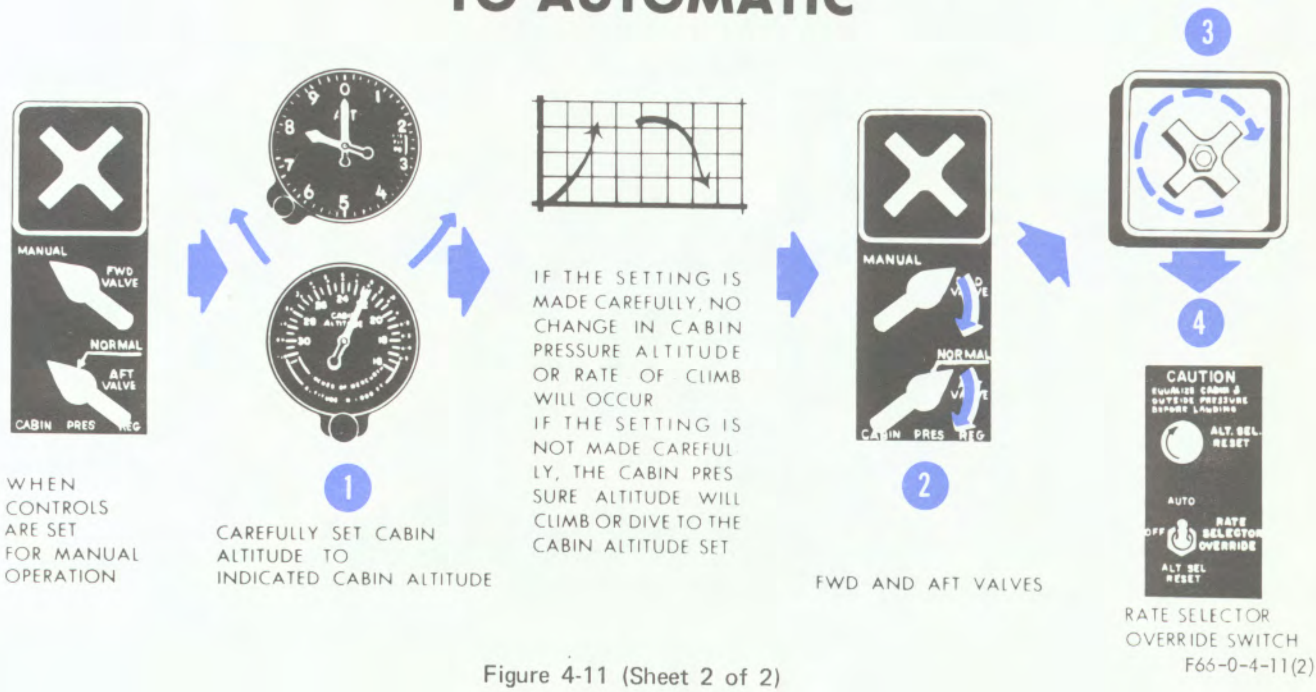


Figure 4-11 (Sheet 2 of 2)

NOTE

Each cabin heater is protected by a Fenwal overheat switch. Should both the cycling controls fail, or some other unit malfunction, causing the heater to overheat, the Fenwal switch will shut off the heater and electrically lock it off at an indicated temperature of approximately 180°C. Occasionally, under extreme conditions of airflow, a rapid rise of the combustion chamber temperature may also cause a heater to lock "off" with an indicated temperature that does not seem excessive.

5. To reenergize heater circuit. place heater switch to OFF position, then return switch to the ON position. If the Fenwal switch has cooled, the heater will start.

CAUTION

If the heater circuit locks OFF twice in succession, it should not be reset until the cause has been determined.

Pilots' Auxiliary Heater Inoperative.

When the pilots' aux heater overheat warning light comes ON, the heater is in a locked-out (off) condition. The heater may be reset by:

1. Pilots' aux heater switch – OFF.

NOTE

Allow time for heater to cool.

2. Pilots' aux heater switch – ON as required.

CAUTION

The face and foot air outlets should be partially or fully open to ensure adequate air flow over the pilots' heater elements or the heater will lock out again.

Emergency Depressurization.

(See figure 4-12.)

1. Operate the aux vent. control knob to the full OPEN position. Return the knob to position A as soon as the cabin differential pressure is 1 inch of mercury. The aux vent. control knob must be returned to position A to prevent partial pressurization of the cabin by the auxiliary ventilation system, which is sufficient to interfere with the opening of windows and doors.

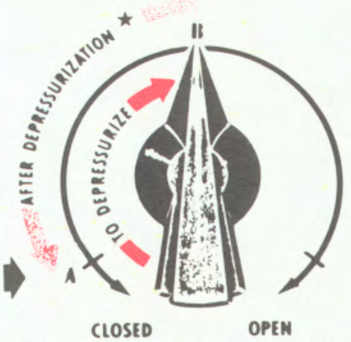
CAUTION

Electrical power must be available for emergency depressurization with aux vent. control knob.

AUXILIARY VENTILATION CONTROL OPERATION

FUSELAGE FIRE PROCEDURE

The cabin superchargers are dumped and put on minimum flow; the cabin safety relief and dump valve is opened; and the auxiliary ventilation inlet and exit valves are closed.



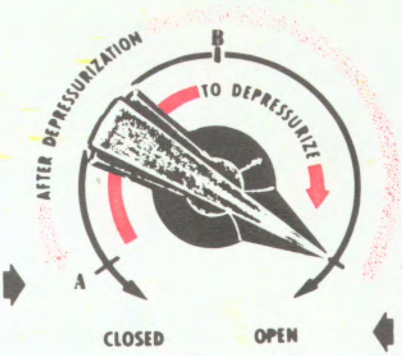
Auxiliary ventilation inlet valves are approximately 45% open; the auxiliary ventilation exit valve is approximately 20% open; the air recirculation check valves are closed.

Depressurization, without excessive air circulation that might fan a fire, is accomplished by placing the auxiliary ventilation control knob in the B position.

★ If the cabin is not occupied and oxygen is available for crew members, the aux vent. knob is to be placed in the A position (after depressurization) to minimize air circulation. If the cabin is occupied, the auxiliary ventilation control knob is to be left in the B position as it affords moderate auxiliary ventilation.

SMOKE REMOVAL

After depressurization, the auxiliary ventilation control knob is placed at position A so that the auxiliary ventilation system is closed and will not circulate smoke through the cabin or flight station.

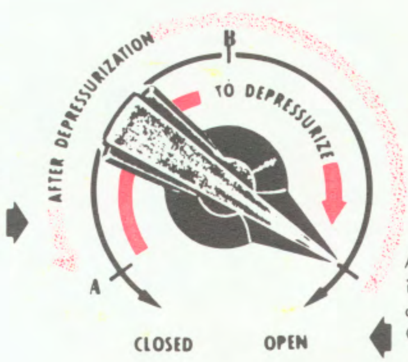


Aux vent. inlet valves and exit valve— Completely OPEN

Auxiliary ventilation inlet valves and exit valve are closed; the cabin superchargers are dumped and put on minimum flow; the cabin safety relief and dump valve is open.

EMERGENCY DEPRESSURIZATION

Auxiliary ventilation inlet valves and exit valve are closed; the cabin superchargers are dumped and put on minimum flow; the cabin safety relief and dump valve is open.



Aux vent. inlet valves and exit valve— Completely OPEN

After depressurization, the auxiliary ventilation control knob is placed at position A so that the auxiliary ventilation system will be closed and will not partially pressurize the airplane. Partial pressurization could interfere with the opening of windows and doors.

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Figure 4-12

2. Cabin heater switches – OFF.
3. Recirculating fan switches – OFF.
4. Pilot's aux heater switch – OFF.
5. Flight station fan switch – OFF.
6. Descend to a low, safe altitude.

Pressurization With One Cabin Supercharger Inoperative.

If it becomes necessary to maintain cabin pressurization on one cabin supercharger, it should be understood that operation with the cabin pressurized at full differential from the output of one cabin supercharger is marginal; it is dependent upon the cabin differential required and the rate of leakage from the cabin through normal deterioration of seals with service use. Therefore, if operating with only one cabin supercharger connected, and full differential is required, it is recommended that the following steps be performed:

1. Galley venturi – Closed.
2. Radio rack venturi – Closed, if it is still impossible to maintain desired cabin pressure.

CAUTION

If difficulty is experienced in maintaining cabin pressure up to the maximum differential with both venturi tubes closed, descent to a cruising altitude where the cabin altitude can be maintained at 10,000 feet or less.

Cabin Supercharger Driveshaft Disconnect.

CAUTION

If the cabin supercharger driveshaft bearing temperature starts rising rapidly and continues to rise beyond 125°C, the cabin supercharger should be disconnected before 150°C is exceeded. If cabin supercharger fails to disconnect, reduce rpm to 1800 and repeat procedure.

1. Release hook-type lock on No. 1 or No. 4 engine supercharger control lever.
2. Move control lever past the LOW position to the end of its travel.
3. Return lever to desired engine supercharger position.

CAUTION

Do not make more than one shift from LOW to HIGH blower within a 5-minute interval or the engine may be damaged.

When the cabin supercharger driveshaft is completely disconnected, one or more of the following indications will be noted:

1. A drop in cabin supercharger oil temperature (this may require several minutes).
2. Oil pressure warning light, if not already on, will come on as soon as the driveshaft is disengaged from the engine.
3. No oil pressure on the oil pressure indicator.
4. No pressure differential on the dual pressure gage.

CAUTION

The propeller of the affected engine should be feathered immediately if the cabin supercharger does not disconnect.

ANTI-ICING, DEICING, AND DEFOGGING SYSTEMS.

Anti-icing or deicing facilities are provided for the leading edges of the wing, empennage, windshield, carburetors, propellers, and pitot heads. Defogging facilities are provided for the four aft windshield panels and the cabin windows. The pilot's and copilot's forward windshield panels are equipped with wipers.

WING AND EMPENNAGE DEICING SYSTEM.

Ice may be removed after it has formed on the leading edges of the wing and empennage by electronic-timed, pneumatic inflation and deflation of rubber boots cemented to those surfaces. Pressure and vacuum for the pneumatic system are supplied by four engine-driven air pumps. (See figure 4-13.)

Deicer Boots.

The deicer boots are made in segments designed for and firmly bonded to the leading edges of the wing, and empennage. Each segment incorporates two separate systems of tubes with independent connections to their respective distributor valves except those segments attached

PNEUMATIC DE-ICING SYSTEM

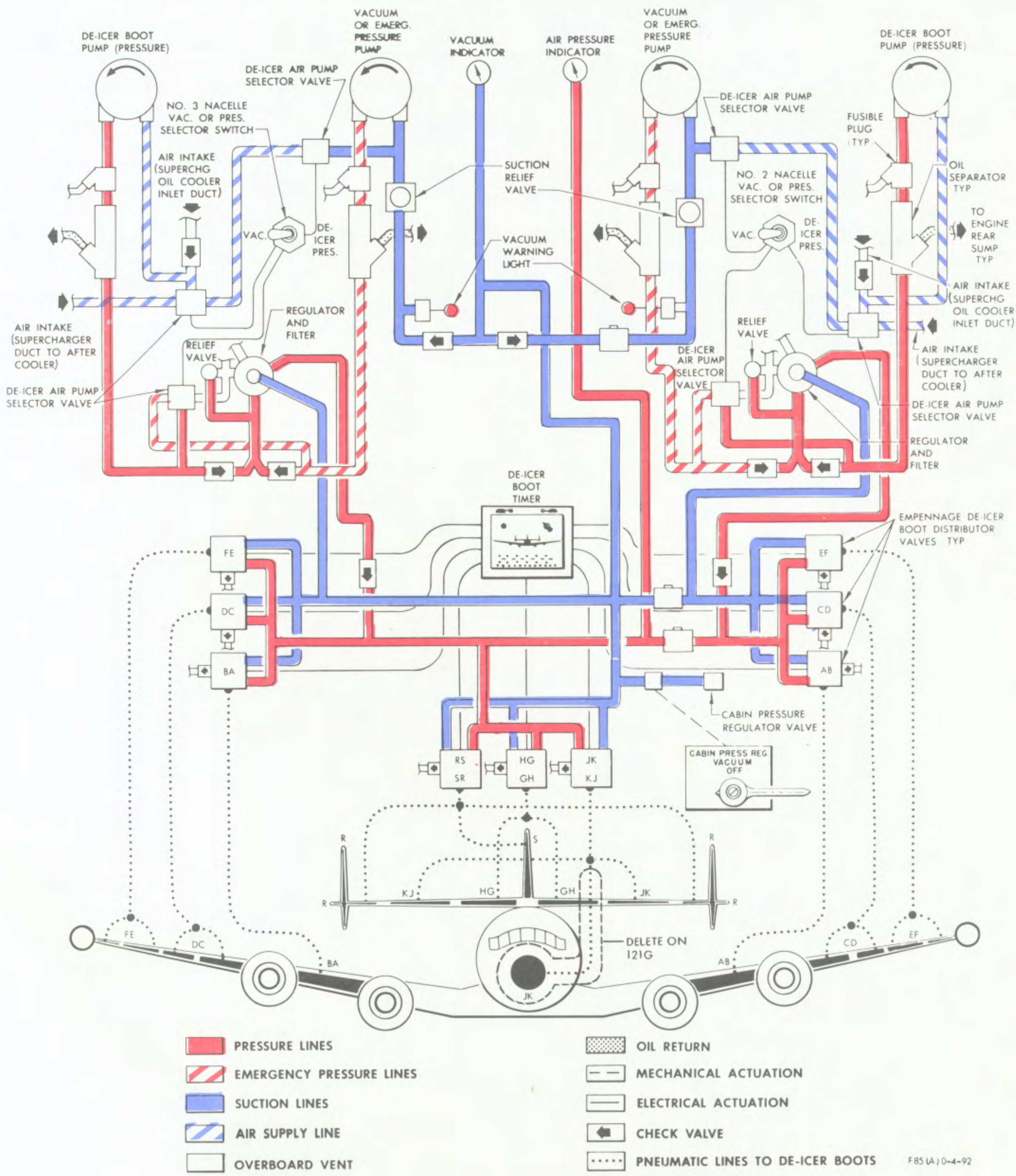


Figure 4-13

to the tips of the stabilizer and to the fins, each of which has one system of cells. The boots are surfaced with a conductive coating to prevent accumulation of static electricity.

Deicer System Pumps.

Four rotary, four-vane, positive displacement type engine-driven air pumps, one mounted on each engine, supply air pressure and vacuum for the pneumatic deicer system. The two outboard pumps supply pressure; the two inboard pumps supply vacuum for normal operation, but can be used as pressure sources in an emergency. Air for the pneumatic system is drawn from the cabin supercharger air ducts, and cooling air for the pumps is drawn from the oil cooler scoop ahead of the radiator.

Suction Pumps.

The two inboard pumps supply suction for the deicer boot, the cabin pressure regulator valves, and the cabin pressure safety relief and dump valve. Normally, the output from the pressure side of the two pumps which supply vacuum is bypassed around the air regulator and filter, and is vented overboard. In an emergency, the vacuum pumps may be used as a source of pressure.

Pressure Pumps.

Pneumatic pressure from the two outboard pumps is directed through oil separators to pressure regulators and filters. Solenoid valves in the regulators maintain approximately 22 pounds per square inch pressure at the outlet ports, discharging excess air overboard. Relief valves between the pumps and regulators protect the regulators from pressure surges of approximately 24 pounds per square inch or above. Check valves downstream from the oil separators prevent loss of system pressure in the event of failure of either pump. From the regulators, the compressed air passes to the main pressure line. Branches from the main pressure line extend to the distributor valves from which pressure is delivered to the deicer boot segments in metered pulsations.

Distributor Valves.

The solenoid-operated manifold deicer distributer valves deliver alternate pressure and vacuum to the deicer boot segments. Each valve has five ports comprising two inlets, two outlets, and one overboard vent. The outlet ports serve individual boot tube systems. Air pressure is supplied through one of the inlet ports and dumped through the overboard vent. Vacuum is applied through the other inlet port. When the solenoid is energized, air pressure flows through the outlet port to the associated boot segment. When the solenoid is deenergized, pressure is relieved overboard until the pressure drops to approximately 1 inch of mercury; then 4 inches of mercury suction is applied through the vacuum port to evacuate the tubes and flatten the boot segment against the leading edge surface.

Deicer Boot Cycle Selector Switch.

The dc electronic timer is controlled by a three-position switch (3, figure 4-14) located on the timer control panel. The switch is placarded EXTENDED CYCLE, NORMAL CYCLE, and OFF. When the switch is moved to either EXTENDED or NORMAL CYCLE, the system will warm up within 20 seconds, and the cycling lights will flash in sequence with the inflation-deflation cadence in the deicer boot segments. In NORMAL, the inflation cycle requires 90 seconds; in EXTENDED, it requires 135 seconds. The selector switch may be turned OFF at any stage of cycling sequence, and a stepping switch will return the electronic timer to its starting position. The timer is designed for continuous duty in flight, and receives its power from the MJB positive bus.

Deicer Boot Segment Switches and Cycling Lights.

Most of the aircraft have nine 3-position (center off) switches (5, figure 4-14), located on the control panel between the two rows of cycling lights, which permit out-of-sequence inflation of any individual boot segment. These switches are placarded with the identification letters of the inflation tube groups they control. A schematic diagram etched on the face of the control panel shows the corresponding location of each tube group. When any individual switch is moved to either of its "ON" positions, the adjacent cycling light will flash to show that the individual circuit is closed and the selected boot tube group is inflated. When more than one switch is closed, the one to the left will control, and until it is released, the switches to the right of it will be inoperative. Energizing the individual boot segment switches does not affect the cadence of the inflation-deflation cycle.

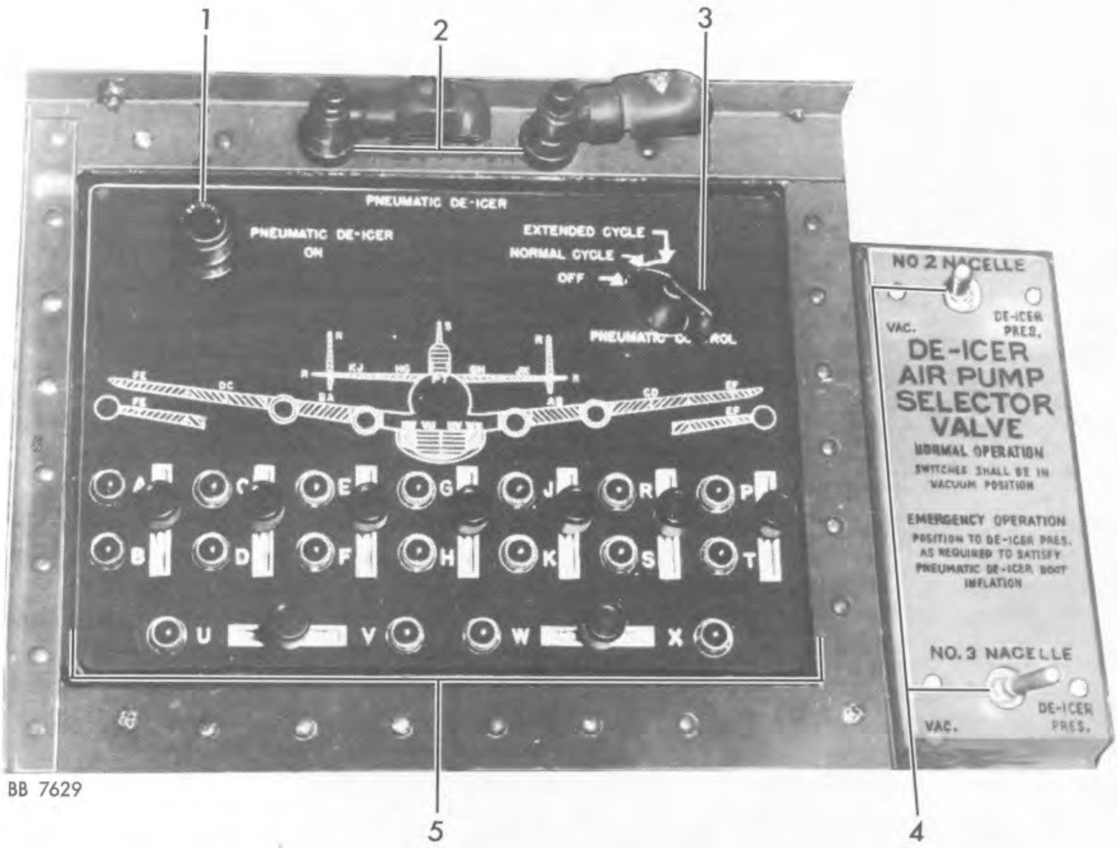
Deicer Air Pump Selector Valve Switches.

Two 2-position toggle switches placarded NO. 2 NACELLE and NO. 3 NACELLE (4, figure 4-14), located forward of the electronic timer control panel, operate the deicer pump selector valves which permit the use of either or both of the vacuum pumps as sources of deicer boot pressure. The valves are positioned by electric motors mounted on the valves. The switches are placarded VAC. and DE-ICER PRES. and are normally positioned VAC. In this position, the valves dump the pressure output overboard. When the switches are moved to DE-ICER PRES., air is vented to the vacuum line upstream of the pump, and the output is routed around the overboard dump into the deicer boot pressure system. In this switch position, the vacuum system is isolated from the pump. Either or both vacuum pumps may be used to supply deicer boot pressure.

Cabin Pressure Regulator Vacuum Shutoff Levers.

A cabin pressure regulator vacuum shutoff lever (4, figure 1-32) is located on the offset in the flight station floor behind the pilot's seat. This lever controls the valve

DEICER BOOT TIMER



1. PNEUMATIC DEICER ON LIGHT
2. PANEL LIGHTS
3. DEICER BOOT CYCLE SELECTOR SWITCH
4. DEICER AIR PUMP SELECTOR VALVE SWITCHES
5. DEICER BOOT SEGMENT SWITCHES AND CYCLING LIGHTS

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Figure 4-14

that shuts off the suction to the cabin outflow valves. If the outflow valves' solenoid malfunctions and holds the outflow valves open, this valve should be closed.

Deicer Pressure Indicator.

One direct-reading deicer pressure gage (45, figure 1-6) is mounted on the pilot's auxiliary instrument panel. It registers the pressure in pounds per square inch available in the deicer pressure system.

Vacuum Indicator.

Adjacent to the deicer pressure gage is the vacuum gage (43, figure 1-6) which registers the vacuum in the system in inches of mercury.

Vacuum Warning Lights.

A warning light for each vacuum pump is located on the pilot's auxiliary panel (1, figure 1-6) above the deicer pressure gage and on the flight engineer's upper instrument panel (10, figure 1-16). Energized by vacuum warning units in the vacuum lines upstream of the suction relief valves, they glow whenever the vacuum drops below 4 inches of mercury.

Pneumatic Deicer Indicator and Cycling Lights.

When the deicer boot cycle selector switch is in either NORMAL or EXTENDED CYCLE position, a dc-operated indicator light (1, figure 4-14) in the upper left corner of the timer control panel will glow. This light may be dimmed or brightened by turning its cover. The double bank of lights (5, figure 4-14) at the bottom of the control panel are the cycling lights which indicate the progress of the pressure vacuum cycle through the deicer boot segments.

NORMAL OPERATING PROCEDURE FOR DEICER BOOTS.

Ice may be eliminated more effectively from the leading edges of the wing and empennage if it is permitted to build up to 3/8 and 3/4 inch in thickness before the deicer boots are turned on. A thin film of ice may be flexible, but when it thickens, the expansion and contraction of the boots will crack it and permit it to be blown off. When icing conditions are encountered, permit the ice to accumulate on the leading edges until it is between 3/8 and 3/4-inch thick. Then put the system in operation by moving the deicer boot cycle selector switch to NORMAL CYCLE. Allow the boots to operate for one or at the most two cycles and then turn them off until 3/8 to 3/4 inch of ice builds up again. The time between cycles will vary with the rate of buildup. More effective ice removal has been experienced by using this procedure and not operating the boots continuously.

CAUTION

- Air from the cabin superchargers is directed to the pressure pumps to lower the operating pressure ratio of the pumps. When operation of the boots is necessary, cabin altitude shall be maintained at or below 10,000 feet. This is to ensure sufficient pressure to maintain normal boot operation.
- Wing and empennage deicers must be turned off prior to landing.

EMERGENCY OPERATING PROCEDURES.

Deicer Pump Failure.

The deicer air pump selector switches permit the use of either or both of the vacuum pumps as a pressure source if one of the pressure pumps fails.

NOTE

- The positions of the deicer air pump selector valve switches may be reversed at the discretion of the pilot.
- If both pressure pumps have failed and inadequate pressure is available with only one pump, switch both vacuum pumps from VAC. to DEICER PRES. Return to VAC. when need for pressure no longer exists, or when vacuum is required.

1. Deicer boot cycle selector switch (pneumatic control) – EXTENDED CYCLE.

NOTE

In the event of uneven icing, or in case ice fails to come off any boot segment, move the appropriate segment switch up or down as required.

ELECTRICAL WINDSHIELD (NESA) ANTI-ICING SYSTEM.

The three center windshield panels can be warmed by electrically generated heat to prevent the formation of ice on the exterior surfaces. Current for heating the windshield glass is supplied by the ac generators. Normal power provides adequate heat in the windshield panels to handle anti-icing under most conditions. It also maintains the temperature of the vinyl layer within the range of maximum resistance to shattering due to impact. Normal power will also assist the defogging air system in keeping the inner windshield surfaces free of fog.

Panels.

The electrically heated panels are a laminated product consisting of a 1/4-inch layer of vinyl plastic between two sheets of glass. The outside sheet is 3/16-inch thick; the inside sheet is 3/8-inch thick, and is structurally designed to contain maximum cabin differential pressure in the event of fracture or delamination of the outer sheet. The inner surface of the outside layer of glass is coated with a transparent conductive coating which generates heat when electric current is passed through it. Bus bars, imbedded in the top and bottom of the panels, distribute electric current to the conductive coating. Thermistors connected in parallel, one imbedded in the vinyl layer of each panel, control the application of power to the panels. The cycling of alternating current through the three windshield panels is accomplished by a Wheatstone bridge control energized by direct current from the MJB bus. The resistance variation of the thermistors with temperature provides the bridge unbalance necessary to produce the cycling action that automatically controls the temperature of the windshield panels.

Nesa System Switch.

A three-position Nesa system power switch (10, figure 1-9) is located on the copilot's side panel. It is placarded HIGH, OFF, and NORMAL. In the HIGH position a more rapid and greater temperature rise in the outer sheet of glass is possible. NORMAL is recommended for routine use in all conditions and provides 40 percent of the HIGH position power output.

NESA Power Switch.

A NESA power switch, located on the MJB No. 2 panel, is placarded ALTERNATOR and OFF. When this switch is in the ALTERNATOR position, either of the two 30 KVA ac generators can furnish power to the NESA system if the rotary power selector switch on the aft power distribution panel is turned to either L, R, or NORM.

Nesa Reset Switch.

The spring-loaded, pushbutton Nesa RESET switch (13, figure 1-9) located near the Nesa system switch on the co-pilot's switch panel performs two functions. First, it permits restart of heating as soon as the thermistors cool as much as 3°C. Second, it initiates the start of cycling when the windshield is so cold (approximately –40°C) that high thermistor resistance prevents application of heating current.

Nesa System Power-On Light.

A power-on light, located adjacent to the Nesa system switch (11, figure 1-9), is illuminated whenever power for the Nesa system is available.

Nesa Cycling Light.

The Nesa cycling light (12, figure 1-9), located adjacent to the system power-on light, glows whenever the conductive material in the windshield panels is energized and goes off when current to the panels is interrupted by the cycling circuit. In flight at low OAT, the cycling light stays ON continuously with NORMAL power. This indicates marginal ability of normal power to supply sufficient heat to start the cycling operation.

NORMAL OPERATING PROCEDURES.

The use of windshield heat is recommended at all times. The electric windshield heating system should be placed in operation as follows:

1. Nesa system switch – NORMAL.

NOTE

If the Nesa cycling light does not come on, and heating has not started due to the thermistor too cold, heating may be initiated by maintaining continual pressure on the reset switch until release does not cause the cycling light to go off.

HIGH POWER OPERATION.

It is recommended that high power be used under the following conditions:

NOTE

A 3-minute warmup period in NORMAL is required prior to selecting HIGH.

1. When ice begins to form on the windshield panels when using normal power.
2. At 10,000 feet altitude, during descent into areas where birds are numerous.
3. When icing is anticipated at outside temperatures near the low end of the icing range – 25°C to 0°C.
4. At 10,000 feet altitude during descent into areas of high temperature and high humidity.

NOTE

To maintain windshield heat for defogging in high temperature, high humidity conditions, maintain pressure on the Nesa reset switch until the cycling light comes on. This will raise the lower limit within 3°C of the upper limit.

CAUTION

- If high power is used without first warming the panels with normal power, the resulting thermal shock may cause local delamination of the outer layer of glass from the vinyl plastic core or cracking of the outer layer of glass. If visibility is not impaired, cracking of the outer layer of glass is not an emergency condition, since the inner layer is structurally capable of containing the maximum cabin pressure differential.
- In the event of sparking or arcing in the electric windshield panels, leave in, or change, the power setting to NORMAL. Make only such changes in operation of the aircraft as are required by reduced vision through the damaged panel.

ALCOHOL DEICING SYSTEMS.

Alcohol deicing systems provide the means for removing ice from the carburetors and propellers. With the exception of the alcohol tanks, the systems are independent. (See figure 4-15.)

Tanks.

One 20-gallon alcohol tank is mounted in the aft end of each outboard engine nacelle. The filler wells are located

ALCOHOL DEICING SYSTEM

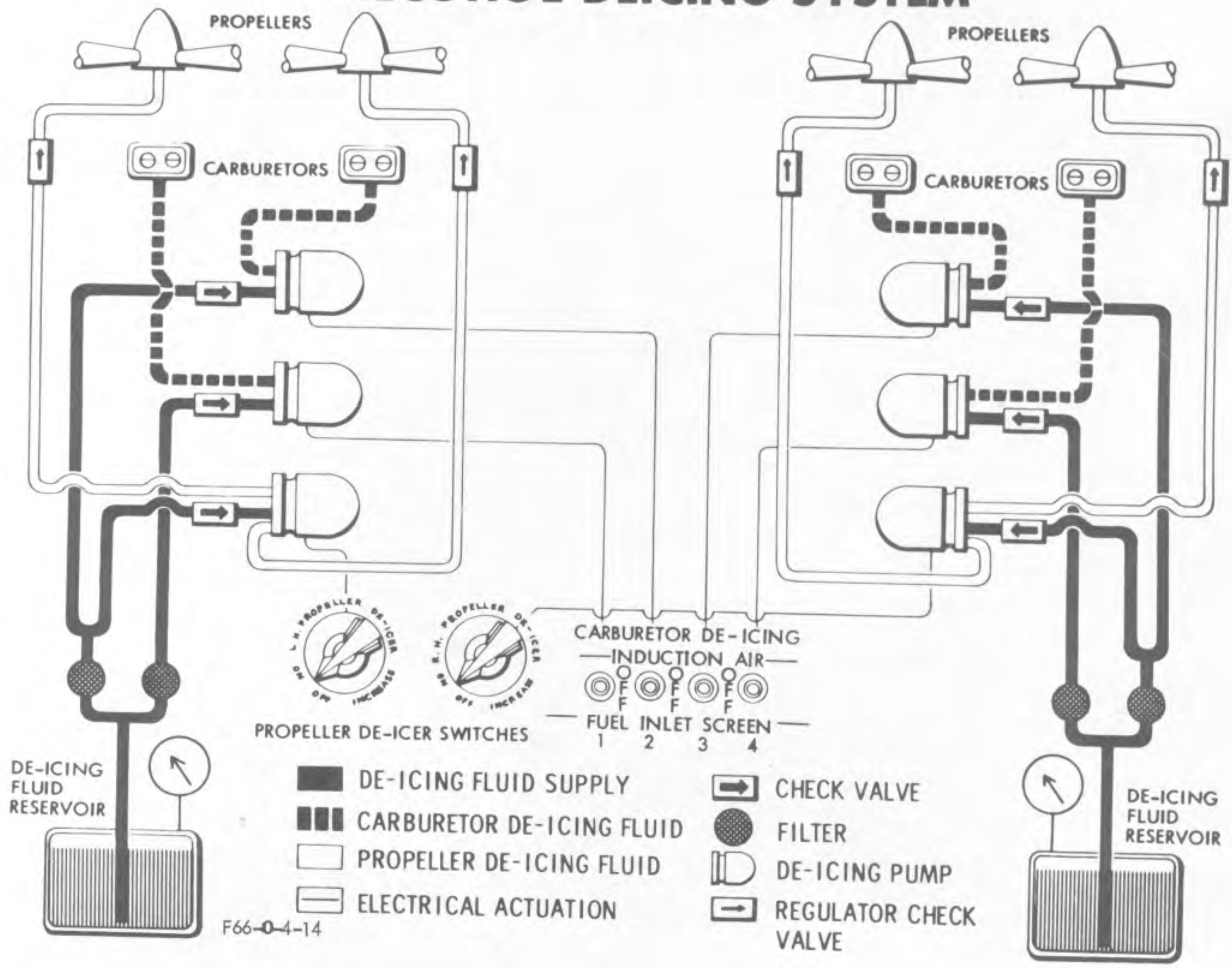

Figure 4-15

in the upper surface of the wing and equipped with drains leading overboard. The carburetors and propellers are supplied from the tank located on their respective sides of the aircraft.

Pumps.

Three dc electrically driven deicing pumps are mounted in each outboard engine nacelle. One pump in each nacelle delivers alcohol to both propellers on its side of the aircraft. The inboard and outboard carburetors on each side of the aircraft are individually supplied by the other two pumps in each nacelle. The pumps are similar except for their rated delivery capacities. Each of the two pumps serving the propellers delivers a minimum of 5 gallons per hour (2.5 gallons per propeller) in the full increase position, and each of the four pumps serving the carburetors is capable of delivering a maximum of 26 gallons per hour at 51 pounds per square inch.

Alcohol Deicing Fluid Quantity Indicator.

Each alcohol tank is equipped with a dc electrically operated liquidometer-type fluid quantity transmitter which registers alcohol quantity in gallons on a dual indicator (2, figure 1-16) mounted on the flight engineer's upper instrument panel.

CARBURETOR ALCOHOL DEICING SYSTEM.

Alcohol may be used to dislodge ice after it has formed in the carburetors. The carburetor deicing system delivers alcohol to the carburetors through three dual outlets in

WINDSHIELD ANTI-ICING AND DEFOGGING

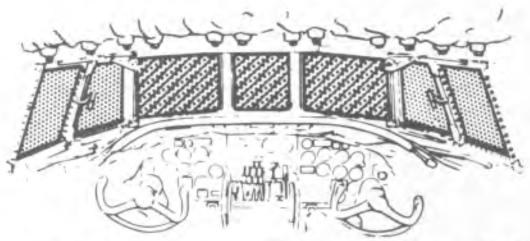

Figure 4-16

each throat, each positioned to provide adequate coverage of the critical carburetor icing area. Provisions are made to add alcohol to the fuel line upstream of the carburetor.

Carburetor Deicing Switches.

The four carburetor deicing system alcohol pumps are individually controlled by four 3-position switches (13, figure 1-26) spring-loaded to the OFF position. In the up position, placarded INDUCTION AIR, alcohol is pumped directly into the carburetor throat. In the down position, placarded FUEL INLET SCREEN, alcohol is pumped into the fuel line upstream of the carburetor. These switches are mounted on the MJB No. 2 switch panel.

CAUTION

Operate these switches in FUEL INLET SCREEN position only when the engines are operating and mixtures are in AUTO RICH. Improper operation may damage the carburetor diaphragms.

NORMAL OPERATING PROCEDURES.

When alcohol injection is necessary to combat carburetor icing, momentary application (from 3 to 5 seconds) is usually sufficient. If more alcohol is necessary to control heavy or continued icing, it should be injected intermittently. Refer to Section VII, Carburetor Icing, for further discussion of this procedure.

1. Close the appropriate switch or switches momentarily, and release.

2. Repeat if necessary, until engine power is stabilized.

PROPELLER ALCOHOL DEICING SYSTEM.

One of the two outlets of each propeller deicing pump supplies the outboard propeller, and the other supplies the inboard propeller. Alcohol is delivered by the pumps to the propeller slinger rings. Centrifugal force draws the alcohol to the outside of the slinger ring and through feeder tubes to the grooved boots mounted on the leading edges of the propeller blades. The regulator check valve in the alcohol line prevents alcohol from escaping except when the pumps are operating.

Propeller Deicing Switches.

The regulator check valves and the alcohol pumps are controlled by two rheostat switches (18, figure 1-26) located on the MJB No. 2 switch panel. One switch controls alcohol delivery to the two left propellers, the other controls delivery to the two right propellers. The switches are labeled OFF, ON, and at the extreme clockwise limit of the arc, INCREASE. The ON position energizes the pumps; the positions clockwise from ON control the delivery rate of the alcohol.

NORMAL OPERATING PROCEDURES.

To start the propeller alcohol deicing system do the following:

1. Turn propeller deicing switches clockwise to full INCREASE, then back to the position which will give the desired delivery rate.

2. Increase or decrease the alcohol delivery rate as may be required by icing conditions.

3. To stop the propeller deicing system, turn the rheostat switches counterclockwise to OFF.

PITOT HEAD ANTI-ICING SYSTEM.

Electrically energized resistance elements mounted inside the two pitot heads provide heat to prevent the accumulation of moisture or the formation of ice in the impact tubes. The heating elements operate from the dc electrical system and are energized, as required, through the pitot heat switches.

Pitot Heat Switches and Indicator Lights.

A two-position toggle switch (4, 7, figure 1-9) for each pitot heater is mounted on the copilot's side panel. These two switches are placarded LEFT or RIGHT, and OFF. The heaters are energized by dc when the switches are in the up (LEFT or RIGHT) position. Two indicator lights (5, 6, figure 1-9), mounted between the switches, glow when the pitot heaters are energized and operating normally. The lights will go out if an open circuit occurs. Pitot heaters should be turned on during taxi to allow sufficient time for them to reach operating temperature before takeoff.

CAUTION

Pitot heaters must be turned OFF when the aircraft is on the ground to avoid burning ground personnel who might inadvertently touch the pitot heads, and to prevent damage to the pitot heads if covered.

WINDOW DEFOGGING SYSTEM.

The two aft windshield panels, on each side of the flight station, which are not Nesa glass are equipped with distributor manifolds (figure 4-16) through which heated air may be directed against the inner surface of the panels to prevent fogging. A dc electrically energized heater-blower assembly, mounted forward of the pilot's instrument panels, supplies warm air for the system. The heater is protected by a special low-melting-point alloy link which will open the relay circuit if the heater becomes overheated. In addition, the heater circuit is protected by a push-to-reset circuit breaker on the MJB No. 3 circuit breaker panel. The blower circuit is protected by a push-pull circuit breaker. The circuit is designed so that the heater will function only when the blower is operating; however, the blower may be operated without the heater. The space between the inner and outer panes of the cabin windows is ventilated by warm air from the air-conditioning system of the aircraft to prevent fogging and icing. Operation is automatic, and air circulates between the double window panes whenever the air-conditioning system is operating. Overhead ducting is provided to supply heated air for all windshield panels from two 28-volt dc-operated heater assemblies, one located behind the flight engineer's upper switchpanel and one on the left-hand side wall ceiling.

Windshield Defog Blower Switch.

A three-position toggle switch (9, figure 1-9) on the copilot's side panel controls the dc blower and arms the heater circuit so that the heater may be turned on if required. The blower switch is placarded HIGH, OFF, and LOW.

Windshield Defog Heater Switch.

A two-position windshield defog heater switch placarded HEAT and OFF (8, figure 1-9), is located on the copilot's side panel.

Windshield Spot Defogger.

For spot defogging of any windshield areas, a flexible hose has been provided which can be attached to the pilot's foot or face air duct outlets, and warm air from the air-conditioning system of the aircraft can be directed against the windshield. When not in use, the hose is coiled and stowed in a canvas sling attached to the flight station canopy.

NORMAL OPERATING PROCEDURES.

When fogging occurs on the windshield panels, put the system in operation as follows:

1. To start, move the blower switch to HIGH or LOW, as required.
2. If heat is necessary, move the heater switch to HEAT.
3. When defogging is no longer necessary, heater switch – OFF. After 30 seconds, blower switch – OFF.

CAUTION

Leave the windshield defogging blower switch on at least 30 seconds after turning off heater switch or residual heat in the heater may melt the heater fusible links.

WINDSHIELD WIPERS.

Electric windshield wipers are provided for the pilot's and copilot's forward windshield panels. Both wipers are driven through a flexible shaft by a dc electric motor mounted on the flight station canopy above the MJB switch panels.

CAUTION

Do not operate windshield wipers on dry glass.

Windshield Wiper Rheostat.

The windshield wipers are controlled by a rheostat located on the pilots' pedestal. The rheostat-type switch (23, figure 1-10) is labeled PARK, OFF, HIGH, MED., and LOW. Clockwise movement starts the motor at high speed. Counterclockwise movement reduces speed as desired. The PARK position stops the wiper blades and positions them at the sides of the windshield panels so that they will not obstruct vision.

ELECTRONIC EQUIPMENT.

Electronic equipment consists of radio and interphone equipment which provide aircraft-to-aircraft communication, air-to-ground communication, interphone communication between crewmembers, navigation equipment for guidance and instrument approaches, and various specialized functions that involve radar search, and identification.

A functional breakdown of the equipment in the aircraft is listed in the Table of Electronic Equipment, figure 4-17.

INTERCOMMUNICATION SET AN/AIC-10.

The AN/AIC-10 intercommunication set provides voice and signal communication facilities. Use of the intercom panel controls permits intercommunication within the aircraft, access to radio equipment for communication beyond the aircraft, monitoring of received radio signals, including simultaneous monitoring of a number of radio receivers, and a call facility for use in establishing communication between stations of the aircraft intercom system. Primary power for operating the intercom is 28 volts, supplied from the main dc bus through the radio junction box. This dc power supply is used to drive dynamotors which supply filtered output at 170 volts dc for system operation. Intercom stations are provided at the following locations: pilot, copilot, navigator, radio operator, flight engineer, CICO, EWO forward crew compartment, aft crew compartment, forward and center lower compartments, each engine nacelle, nose gear compartment, and tailcone. The pilot, copilot, radio operator, and navigator are provided with Control Panels C-824 and C-826. The flight engineer EWO and CICO station are provided with Control Panel C-824. All other stations are provided with Control Panel C-823. The control panels provide transmitting and receiving facility on the interphone circuit, and all control panels provide a call facility and are equipped with provisions for emergency operation in the event of station equipment failure. Those stations equipped with Control Panel C-824 provide facilities for transmitting and receiving through radio equipment connected thereto. Control Panel C-826 is used with panel C-824 to extend monitoring facilities.

AN/AIC-10 INTERCOM CONTROL PANELS.

The intercom control panels and their controls are described in the following paragraphs.

ICS Panel C-824.

The pilot, copilot, navigator, radio operator, EWO, CICO and flight engineer stations are equipped with the C-824 control panel. (See figure 4-21.)

Microphone Selector Switch. The rotary-type microphone selector switch is located at the lower center of the panel. The switch provides six positions which control the mode of transmission. The CALL position is used to alert any or all stations in the intercom system. Since it interrupts all communication throughout the system, it should be used as briefly as possible. The microphone selector switch is spring-loaded to rotate to INTER position from the CALL position when the switch is released; it must be rotated manually to all other positions. CALL transmission from any station is heard at all interphone stations except the pilot's. The pilot can hear CALL transmission from another interphone station only when the pilot's microphone selector switch or audio selector switch is set to INTER. An exception to this is the EWO station, which has CALL priority over the pilot. The pilot will hear CALL transmission from the EWO station, regardless of switch setting on his Interphone Control Panel. The INTER (interphone) position is used for communication between the various stations in the aircraft. The remaining four positions are labeled according to the function provided at the various stations.

When microphone output is to be directed through a radio transmitter, it is necessary to set up the desired frequency on the control panel for the individual radio.

Monitoring Switches. Five toggle switches are arranged horizontally across the top of the panel. These switches control the choice of aural reception coming through the headphones. Placing any switch in the down position cuts off audible sound from the related circuit. Placing any switch in the up position connects the audio output from the related receiver or interphone circuit to the headphones. Any combination of circuits may be monitored simultaneously.

Normal-Aux Listen Switch. The normal-aux listen switch is a toggle-type switch located to the right of the microphone selector switch. This switch is safetied in the NORMAL position. The AUX LISTEN position is for emergency use only.

Volume Control. The volume control, placarded VOL, is located to the left of the microphone selector switch and regulates the audio level of the signal heard in the headset. This control does not regulate volume when CALL facility is being used.

Control Panel C-826.

Control Panel C-826 (figure 4-21) operates with Control Panel C-824 to extend the monitoring facilities for pilot, copilot, radio operator, and navigator. This panel has five toggle switches which operate in the same manner as those on Control Panel C-824.

Control Panel C-823.

Control Panel C-823 (figure 4-22) provides facilities for communication on the interphone circuit only, and is used for stations other than the flight crew.

TABLE OF ELECTRONIC EQUIPMENT

TYPE	DESIGNATION	FUNCTION	OPERATOR	RANGE	LOCATION OF CONTROLS	POWER AND CB AND FUSE LOCATION
COMMUNICATIONS						
INTERCOM	AIC-10	Intercrew communication, audio distribution, microphone function		Crew stations within aircraft and mechanic's station	Primary fit crew, CICO, EWO and mechanics	2 each DC dynamotor 170 VDC. CB radio operator's junction box
HF XCVR	618T-3	AM, SSB MCW operation	No. 1 and No. 2 radio operator	To 2000 nautical miles	Radio operator's control panel	DC and AC. Radio operator's junction box
UHF XCVR	AN/ARC-27	Short-range voice communication UHF relay operation (No. 7 & No. 8)	No. 6 pilots No. 7 and No. 8 radio operator	Line of sight	Pilots' overhead control panel No. 6, No. 7 & No. 8 radio operator	DC. Radio operator's junction box
VHF XCVR	Wilcox 807	Short range voice communication	No. 2 radio operator No. 1 pilots	Line of sight	Pilots' overhead panel and radio operator's panel	DC. Radio operator's junction box
PA SYSTEM	MI-36A	Announcements	Pilots and CICO	Within aircraft (also has external speaker)	Pilots' overhead panel, CICO	DC, AC. Radio operator's junction box
NAVIGATION						
TACAN	AN/ARN-21	Gives bearing and distance information	Pilots	Bearing, line of sight DME to 195 nautical miles	Pilots' overhead panel	DC, AC. Radio operator's auxiliary junction box and forward junction box fuse panel
VOR	AN/ARN-14	Reception of VOR localizer signals and voice reception	Pilots	Line of sight	Pilots' overhead panel	DC, AC. Radio operator's junction box AC forward junction box fuse panel
LF ADF	AN/ARN-6	Reception of voice or code signals for direction finding and bearings	No. 1 pilots and navigator No. 2 pilots	300 nautical miles	Pilots' overhead panel and navigator's panel	DC. Radio operator's junction box AC. Forward junction box fuse panel
UHF DF	AN/ARA-25	Reception of UHF signals for direction finding and homing	Pilots	Line of sight	Function switch of No. 6 ARC-27 to ADF	DC. Radio operator's junction box

Figure 4-17 (Sheet 1 of 2)

TABLE OF ELECTRONIC EQUIPMENT—Continued

TYPE	DESIGNATION	FUNCTION	OPERATOR	RANGE	LOCATION OF CONTROLS	POWER AND CB AND FUSE LOCATION
GS RCVR	AN/ARN-18	Reception of glide slope signals from ILS stations	Pilots	Line of sight	Pilot's overhead panel	DC, AC. Radio operator's junction box
MKR BCN RCVR	AN/ARN-12	Reception of marker beacon signals	Pilots	Any vertical distance over marker beacon	None	DC. Radio operator's junction box
NAVIGATION						
LORAN RCVR	DLR 70/AC (AN/APN-70B)	Long range navigation A, C and CS capability	Navigator	Day 70 Night 1400	Navigator's station	DC (used for coupler), AC (V). Radio operator's junction box and aft power distribution panel
NAV RADAR	AN/APS-42	Navigation aid, collision avoidance, weather surveillance and search	Pilots	200 nautical miles	Pilots' overhead panel	DC, AC. Radio operator's junction box and auxiliary junction box and fuse on synchronizer
RADAR ALT	AN/APN-22	Indicates altitude above terrain	Pilots navigator	10,000 feet over land, 20,000 feet over water	On/limit control on front of indicators	DC, AC (AC)v. Radio operator's junction box and three fuses on amplfier rack
IDENTIFICATION						
IDENTIFICATION SET	AN/APX-25	IFF/SIF	Pilots	Line of sight	Pilots' overhead panel	DC, AC Radio operator's junction box

Figure 4-17 (Sheet 2 of 2)

AFT POWER DISTRIBUTION PANEL

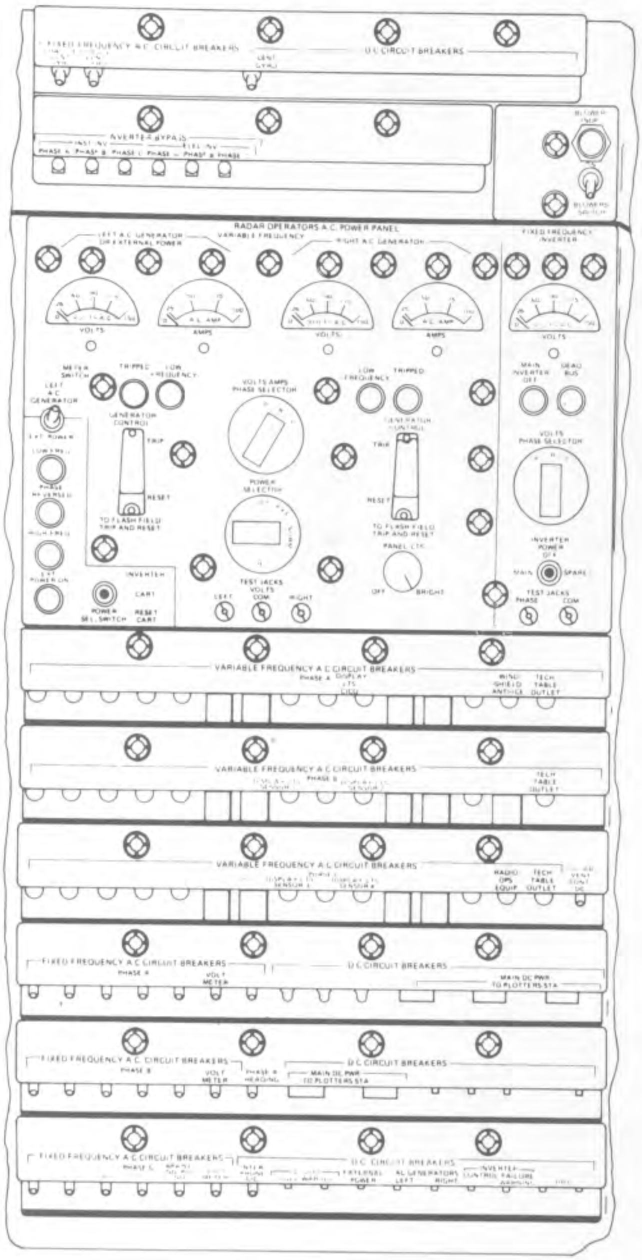

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Figure 4-18

RADIO OPERATOR'S CIRCUIT BREAKER PANEL

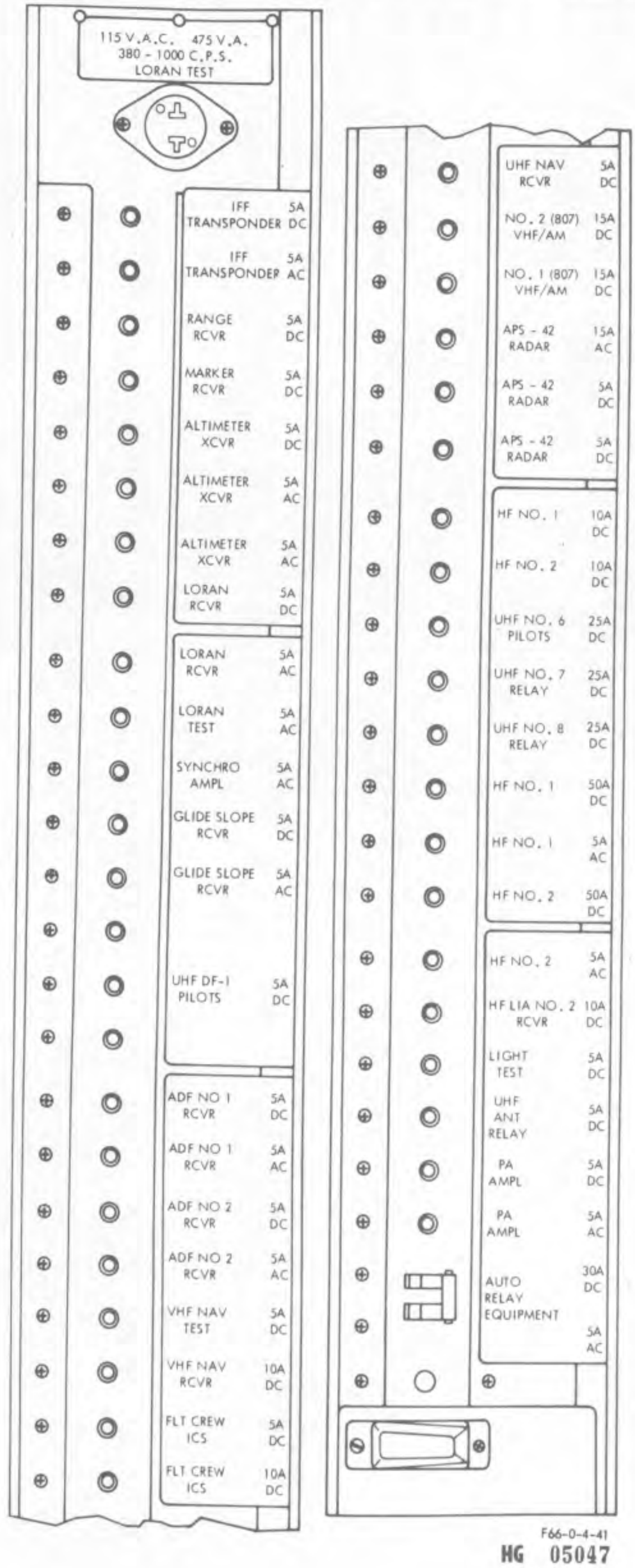

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Figure 4-19

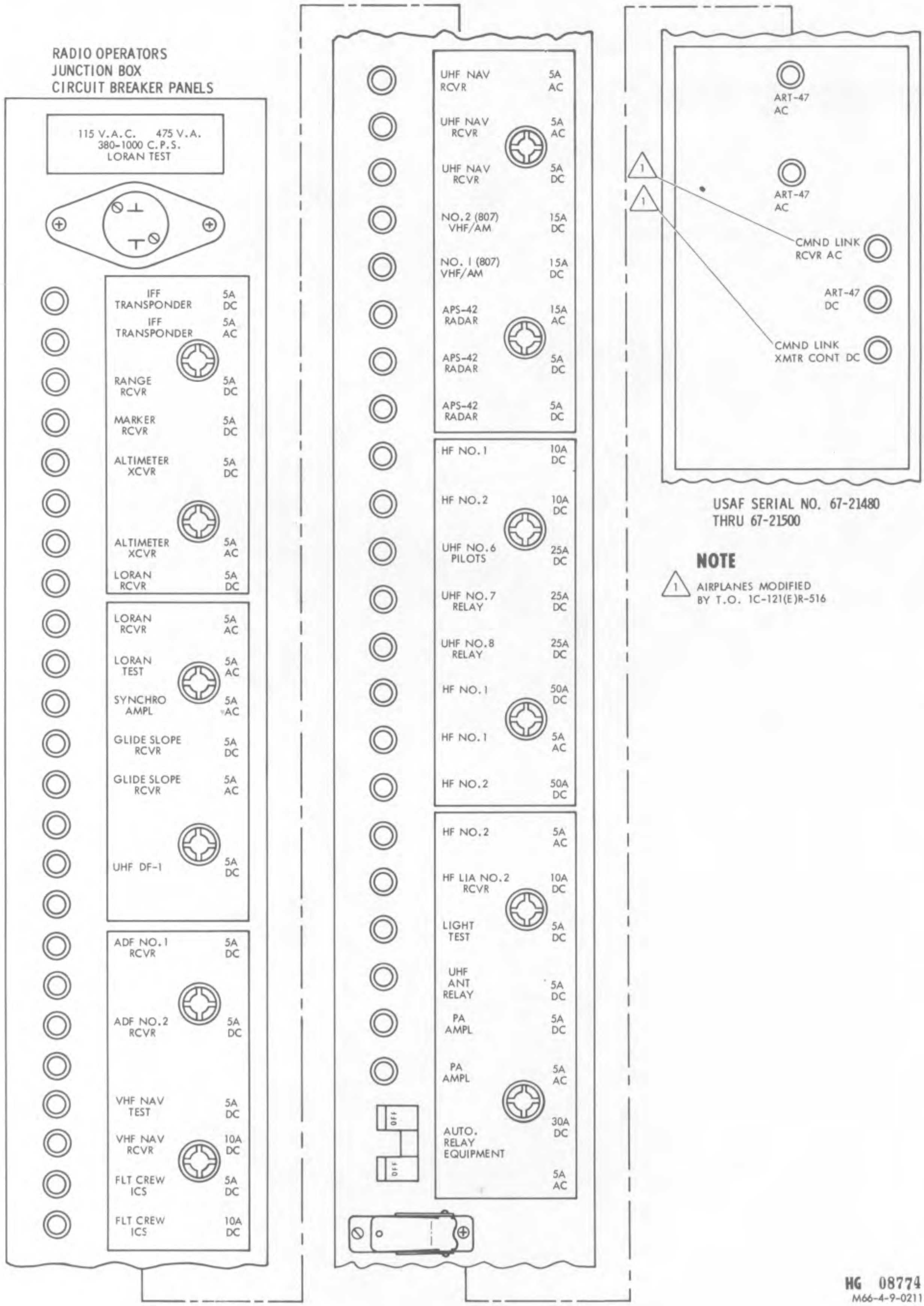


Figure 4-20. Circuit Breaker and Fuse Locations

AIC-10 ICS CONTROL PANEL (TYPICAL)

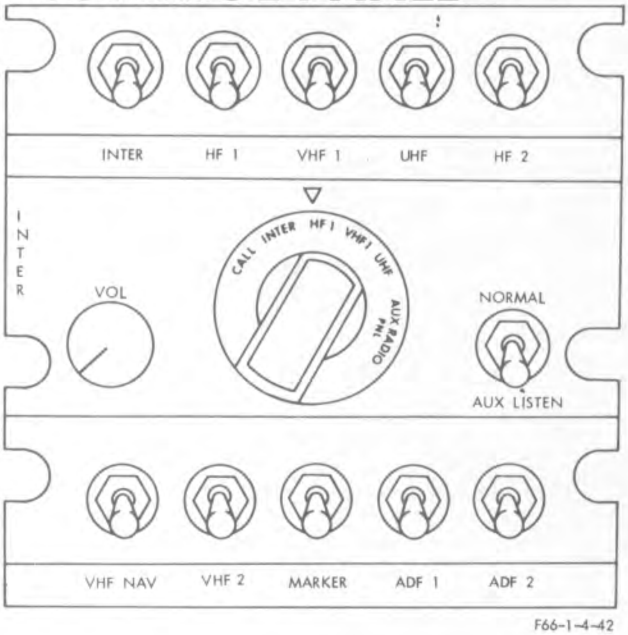


Figure 4-21

C-823 ICS CONTROL PANEL

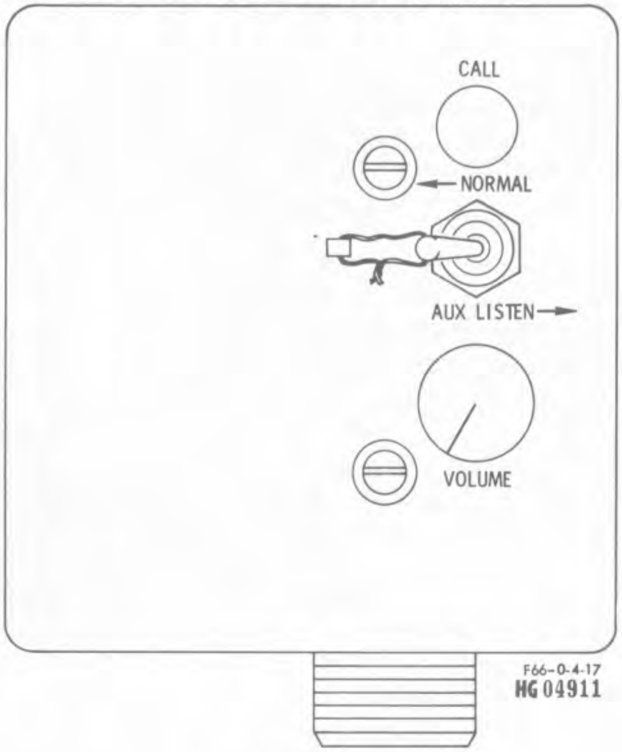


Figure 4-22

Call Button. The CALL button is protected by a cover which must be unscrewed in order to depress the button. Depressing the CALL button interrupts all communications in the system, including radio reception, and is designed for initiating a call only.

Normal-Aux Listen Switch. The two-position normal-aux listen toggle switch is located in the center of the right side of the panel. This switch is safetied in the NORMAL position. AUX LISTEN position is for emergency use only.

Volume Control. The VOLUME control is located below the NORMAL-AUX LISTEN switch on the right side of the panel. The volume control on this panel regulates audio level when CALL facility is being used. Do not set the volume so low that an incoming CALL will not be heard.

NORMAL OPERATION OF THE AIC-10 INTERCOM SET.

Turning On the Equipment.

The AIC-10 intercom set is turned on when the main electrical power supply for the aircraft is turned on, except that the mechanic stations are turned on and off by means of a toggle switch on the radio equipment rack just aft of the pilot's seat. The equipment is connected through the operators junction box by means of a circuit breaker switch (which normally is not to be used to turn the equipment on and off except in an emergency).

To Call from Control Panel C-823.

Unscrew the call button cover. Depress the CALL button simultaneously and initiate the CALL. Release the CALL button, and continue communication on the normal interphone circuit. The microphone button must be released to listen. Use the volume control for best audibility.

To Call from Control Panel C-824.

Place the monitor switch for the interphone circuit in the on position. Rotate the microphone selector switch to CALL position and hold it there while initiating the call through the microphone. Release the microphone selector switch, permitting the switch to rotate automatically to the INTER position for normal interphone communication.

NOTE

The call facility is intended primarily for use in alerting a station equipped with Control Panel C-824, where the monitor switch connected to the INTER circuit may be in the off position. Under this condition, use of the call facility will interrupt all other circuits being monitored and bypass the INTER switch, permitting the message to be audible in the headphones.

EMERGENCY OPERATION.

Station Equipment Failure.

Control Panels C-824 and C-823 are equipped with amplifier AM-476, a plug-in subassembly which makes each station an independent unit. If a station unit does not operate properly, this amplifier unit may be replaced. If a number of stations fail to function, or function poorly, the power equipment may be at fault. There is no mode of emergency operation for the power equipment, but any station may be operated on an emergency basis by use of the NORMAL-AUX LISTEN switch.

Emergency Operation of Control Panel C-823.

Break the safety wire on the NORMAL-AUX LISTEN switch and set the switch to AUX LISTEN. This disconnects a malfunctioning amplifier and enables the station to monitor messages on the interphone line at line-level volume. The volume control will be inoperative. It is not possible to transmit with the switch in the AUX LISTEN position.

Emergency Operation of Control Panel C-824.

The NORMAL-AUX LISTEN switch operates in the same manner on this panel as on Control Panel C-823; however, stations equipped with Control Panel C-824 may monitor radio receivers in addition to the interphone line. Only one facility at a time may be monitored. Volume will be at line level, and the volume control will be inoperative. It is not possible to transmit with the switch in the AUX LISTEN position.

Monitoring priority follows a left to right sequence on the monitoring switches. The switch farthest to the left that is on is connected to its related channel. No other circuit is connected to switches to the right of it regardless of their position. If it is desired to monitor a circuit connected to a switch on the right side, all switches to the left of that position must be in the off position.

Where Control Panel C-826 is installed with Control Panel C-824, AUX LISTEN switching priority lies with the first switch on the left that is on, and proceeds to the right. When all the monitoring switches on Control Panel C-824 are set to off, priority passes to the switches on Control Panel C-826, and follows a left-to-right sequence. When all the switches on both panels are in off position, the microphone selector switch of Control Panel C-824 controls selection of the equipment used for transmitting and receiving.

618T-3 RADIO SET.

The 618T-3 radio set provides transmitting and receiving facilities for high-frequency voice communications in the 2.0 to 29.999 mHz range. Frequencies are available in increments of 1000 Hz. Frequencies are set up by the radio operator who is provided with a radio set control unit for this purpose. The communications facilities provided by this set are available to the pilots navigator and CICO through their interphone system. The sets utilize the overhead wire antennas for both the transmission and reception of radio signals. Power requirements are 28 volt dc and 115 volt ac single phase with circuit protection at the radio operator's junction box.

NOTE

The 618T-3 is limited to 25 MHz by the antenna tuner; however, operation is available from 25 to 30 MHz but the transmission range will be reduced.

618T-3 Controls. (See figure 4-23.)

The controls are located on the radio operator's control panel.

Function Switch. The function switch is a four-position rotary-type switch that is used to control the application of power to the set and to select the type of emission. The switch affords selection in either USB (upper sideband) or LSB (lower sideband). In the CW position.

Channel Selector Switches. Four channel selector knobs are used for manual frequency selection. A channel is selected by rotating the knobs until the desired frequency is aligned in the channel window.

RF Sens Control. The RF gain control is used to control the r-f gain of the receiver.

M1-36A PUBLIC ADDRESS SYSTEM BY THE PILOT.

The public address system is operated by ac and dc power through one 5-amp dc breaker located at the radio operator's junction box. The system provides announcements to the primary flight crew and the CIC crew or to ground personnel.

The pilot and CICO may make public address announcements by priority. The pilot has priority operation of the public address system and the CICO has normal control for

618T-3 HF TRANSCEIVER CONTROL PANEL

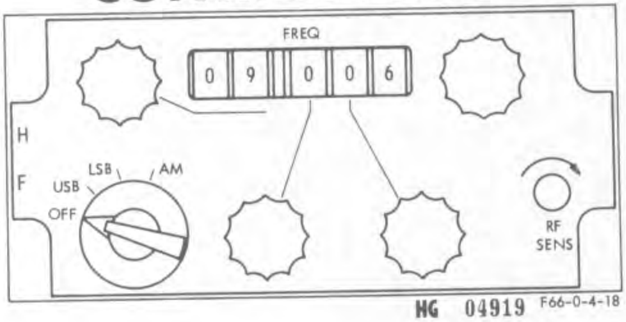


Figure 4-23

ARC 27 UHF CONTROL PANEL

Figure 4-24

announcements. The PA system has 12 loudspeakers, one in the flight station, three in the forward crew position, five in the CIC area, two in the aft crew area and one in the nose wheel well.

To put in operation:

1. Aircraft dc power supply – ON.
2. PA circuit breakers – ON.
3. Main instrument inverter – ON.

To turn this equipment off:

1. PA circuit breakers – OFF.

Pilot's Public Address Control Panel.

The pilot's public address control panel is located on the pilot's overhead panel (figure 1-7, Item 17). The panel includes one two position (ON and OFF) power switch, one three-position (LOW, HIGH and MED.) flight station speaker volume switch and one two-position (INTERNAL and EXTERNAL) speaker selector switch. When the power switch is in the ON position the pilot or copilot may transmit through the PA system. The volume control switch controls the volume to the loudspeaker in the flight station. The speaker selector switch allows the pilot or copilot to transmit to the ground crew by placing the switch in the external position and by placing the switch in the internal position the pilot or copilot may transmit to flight crew and the CIC crew.

CICO Public Address Control Panel.

The CICO control panel is located on the CICO intercommunication control panel (1C 121(E)R-1A). The panel includes four separate two-position speaker switches (FLIGHT DECK, FWD, CIC AREA and AFT). These switches permit the CICO to transmit to any one station individually or collectively. The microphone selector switch is not used in this aircraft.

Operation of PA System by CICO.

Public address announcements can be made by the CICO to each or all of the following compartments: Flight Deck, Forward, CIC, and Aft, using the following procedures:

1. Place speaker selector switch located on PA control panel (to right of CICO station) in the UP position, for compartment(s) selected.
2. On AIC-10 control panel, place rotary selector knob in VHF-1/PA position.
3. On CICO call light panel, place VHF-1/PA toggle switch in UP or PA position and place intercom toggle switch in up or AIC-10 position.
4. Depress microphone button.

NOTE

The microphone selector switch shall be secured in the OFF position to prevent inadvertent continuous keying of the public address system. The CICO operator uses his foot switch to directly key the system.

Pilot's Emergency Interphone and Public Address Operation.

In an emergency, the pilot's microphone transmissions may be connected to all of the interphone stations in the airplane and to the public address system, interrupting all other interphone and public address operations. In addition all CIC call lights will illuminate. Emergency interphone operation is conducted by the pilot placing the EMERG.

ICS CALL-CREW CALL switch on the pilot's emergency interphone control panel (11, figure 1-7) in the EMERG. ICS CALL position. Emergency interphone operation is conducted by:

1. Placing the Pilots C-824/AIC-10 in Inter.

2. Placing the EMERG. ICS CALL CREW CALL switch on the pilot's Aux ICS control panel (figure 4-26) in the EMERG. ICS CALL position.

3. Key microphone.

NOTE

The Radio Operator's emergency ICS cutout switch has two positions, operative and inoperative. With the switch in the operative position the Radio Operator will be connected to the EMERG. ICS system. With the switch in the inoperative position the Radio Operator is disconnected from the EMERG. ICS system and can transmit regardless of the position of the Pilot's EMER. ICS CREW-CALL switch.

AN/ARC-27 UHF TRANSMITTER/RECEIVER SETS.

Three AN/ARC-27 transmitter-receiver sets installed in the aircraft operate on 28 volts dc power from the radio operator's junction box. These sets provide short-range communication between aircraft and between the aircraft and ground station. Normally, the No. 6 transceiver is available to the pilot or copilot. No. 7 and 8 UHF sets are utilized by the radio operator for voice communications and UHF relay operations. A switch labeled PILOT UHF/RELAY UHF is located on the radio operator's auxiliary ICS control panel providing the pilot with the use of No. 7 or No. 8 ARC-27 in the event of failure of No. 6 ARC-27. With the switch in Relay UHF, the pilot has keying control of the selected ARC-27 at the radio operator's position but the radio operator retains frequency control of the set.

AN/ARC-27 No. 6 utilizes the C-1904/ARC-27 Radio Set Control, located on the pilot overhead panel, (12, figure 1-7). It provides the pilot with facilities for quickly selecting frequencies either manually or by a PRESET channel selector. This preset control selects any of 20 preset channels or the guard channel. When the selector is to M, three concentric MANUAL frequency selectors can be used to select any one of 1750 available frequencies. When the PRESET channel selector is set to G, the guard channel may be used for transmitting and receiving. A function switch is provided to select the operating mode. A VOL control is used to adjust the audio level at the headset.

Two C-626/ARC-27 Radio set controls, No. 7 (left) and No. 8 (right), installed at the Radio Operator station, provide channel selection to the respective receiver-transmitters. The CHANNEL SELECTOR switch selects 18 preset frequencies positioned by the three MEGACYCLES switches. The power ON-OFF, tone-voice, and Local-Remote switches are provided to control functions of the receiver-transmitter.

One C-853/ARC-27 control is located at the Radio Operator position and is common to radio sets No. 7 and 8. The control incorporates two CHANNEL selector switches. A preset No. 1 CHANNEL selector switch permits the Radio Operator to select any one of 18 frequency channels preset in the No. 7 C-626/ARC-27 control which in turn controls the No. 7 RT-178/ARC-27 receiver and transmitter. In exactly the same way, No. 2 CHANNEL selector switch permits the Radio Operator to select any one of 18 frequency channels preset in the No. 8 C-626/ARC-27 control, which in turn controls the No. 8 RT-178/ARC-27 receiver-transmitter. A single VOLUME control adjusts the audio level at the headsets. Separate function selector switches (No. 1 and No. 2) are used for No. 7 and No. 8 RT-178/ARC-27) receiver/transmitters respectively. ADF operation is not available in this configuration. A six-position master function switch, located in the center of the panel is used to control the mode of operation for receiver-transmitters No. 7 and 8.

An antenna changeover switch is located on the Pilots Aux ICS Control Panel (overhead, figure 4-25) with the switch in LOWER No. 6 UHF is connected to the lower antenna and No. 8 UHF is connected to the UPPER antenna, with the switch in UPPER No. 6 UHF is connected to the UPPER antenna and No. 8 to the lower antenna.

AN/ARC-27 Operation: No. 6 UHF.

1. Aircraft power supply – ON.

2. 30 amp dc circuit breaker – ON.

3. Function selector switch – T/R T/R+G

4. Microphone selector switch – UHF.

5. Set PRESET CHANNEL or MANUAL FREQUENCY SELECTORS to desired frequency; allow a minimum of one minute for the set to warm up.

6. Adjust volume control on the UHF control panel and the interphone system control panel for the desired output.

NOTE

To transmit on guard rotate the PRESET SELECTOR to G. No test transmissions will be made on emergency (distress) frequency channels in order to prevent transmissions of messages that could be construed as actual emergency messages.

WILCOX 807 CONTROL PANEL

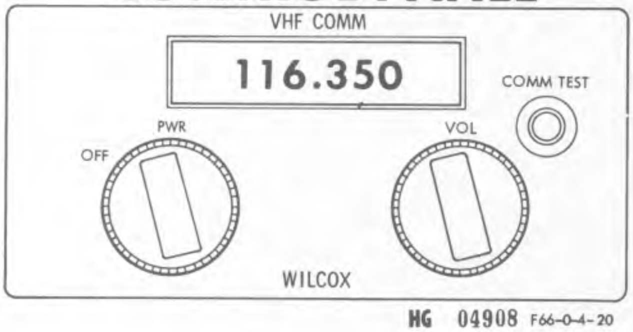


Figure 4-25

PILOTS AUX ICS CONTROL PANEL

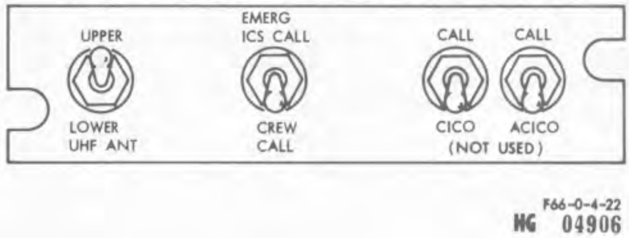


Figure 4-26

Voice Operation: No. 7 and 8 UHF.

1. Aircraft power supply – ON.
2. 30 amp dc circuit breaker – ON.
3. Local-remote switch – REMOTE.
4. Function selector switch – T/R or T/R & G REC.
5. Tone-voice switch – VOICE.
6. C-853/ARC-27 Control – as required No. 1 T/R – No. 8 receiver-transmitter turned OFF. No. 7 receiver-transmitter operating as selected on No. 1 function selector switch.

No. 1 T/R No. 7 receiver-transmitter operating as selected on No. 1 function selector switch. No. 8 receiver-transmitter operates in receive only.

No. 2 T/R No. 1R – No. 8 receiver-transmitter operating as selected on No. 2 function selector switch. No. 7 receiver-transmitter operates in receive only.

No. 2 T/R – No. 7 receiver-transmitter turned OFF, No. 8 receiver operating as selected on No. 2 function selector switch.

7. Microphone selector switch – UHF.
8. Rotate the channel selector switch ON, the UHF panel to the desired channel; allow a minimum of one minute for the set to warm up.
9. Adjust volume control on the interphone control panel for desired output.

UHF Relay Operation.

1. Aircraft power supply – ON.
2. Local-remote switch – REMOTE.
3. Function Selector switch – T/R.
4. Tone-voice switch – VOICE.
5. Frequency controls – AS DESIRED.
6. C-853/ARC-27 function selector – RELAY.

To turn equipment off:

1. Operate aircraft power supply – OFF.

Wilcox 807 VHF Communications Transceivers.

Two Wilcox VHF transceivers provide 680-channel two-way communication facilities for the pilots and radio operator. The two sets are completely separate.

Power requirement is 28 vdc with circuit protection at the radio operator's junction box.

The pilot's control panel (figure 4-25) is located on the pilots' overhead panel. The radio operator's is located on the radio operator's control panel. The transceiver units are located at the radio operator's position.

Power is applied to the set by turning the ring type switch on the left side of the control panel to PWR. Volume is controlled by the ring on the right.

Frequencies are selected by the two flat-sided knobs in the centers of the ring controls. The left one selects the frequency numbers to the left of the decimal while the right one selects those to the right, such as 116. (left knob), and .350 (right knob).

A COMM TEST button can be used to check for background noise when the set is turned on but not tuned to a station.

AN/ARN-21 TACAN SYSTEM.

The AN/ARN-21 TACAN system is airborne equipment designed to operate in conjunction with a surface navigation beacon; it provides the pilots with continuous indications of distance and bearing for any selected surface beacon located within a line of sight up to 195 nautical miles. It also provides duplicate range data to the navigator by means of a slave ID-310/ARN range indicator located in the navigator's panel. This system is operated from the pilots' overhead control panel (18, figure 1-7). The bearing and distance information are displayed on three separate indicators (figure 1-11). A separate bearing indicator (figure 4-27) is located on the navigator's instrument panel. Audio selector switches are located on the pilot's and copilot's speakers. The audio output is available for the pilot and copilot only. Power is supplied to the TACAN system from the 28-volt dc system and from the 115-volt ac generators.

Audio Selector Switch. Two audio selector switches, one on the pilot's auxiliary side panel and one located with the radio controls on the copilot's side panel, select either the ARN-21 audio or the VHF NAV audio. These switches are placarded VHF NAV and NAV ARN-21.

Function Switch. The OFF, REC, T/R switch is a three-position toggle switch. The OFF position deenergizes all AN/ARN-21 equipment. The REC position energizes only the receiver portion of the receiver-transmitter. When the switch is in this position only bearing information is furnished. When the switch is in the T/R position the AN/ARN-21 interrogates and receives a signal which produces both distance and bearing information on the respective indicators.

Channel Selector.

The channel (CHAN) selector consists of two rotary switches with knobs and dial skirts for selecting the desired navigation beacon channel. The left-hand knob selects the tens and hundreds figures of the beacon channel number and the right-hand knob selects the units figures of the beacon channel number. Combinations of dial settings may be made from 00 to 129; however, the equipment is functional only on 01 to 126, a total of 126 channels.

CAUTION

No attempt should be made at any time to set the CHAN dial below channel 01 or above channel 126.

Volume Control. The volume control is used to adjust the volume of an audio identification signal received from the beacon. The identification signal, audible in the pilots' headphones when they are connected to the regularly used audio jack, consists of a two or more three-letter tone signal in International Morse Code.

AN/ARN-14 NAVIGATION RECEIVER.

The VHF omnidirectional navigational system provides the pilot, copilot, and navigator with all of the radio aids to navigation now available in the vhf frequency range between 108.0 and 135.9 megacycles, inclusive. This frequency range includes both military and commercial amplitude-modulated communications channels, omnirange (VOR) channels and runway localizer channels. All of the navigation information is visual and may be observed on indicator units mounted near and accessible to the pilot, copilot, and navigator. Since the receiver operates in the VHF bands, reception is effectively limited to line-of-sight, the distance from a station whose signals are received depending largely upon the airplane altitude. Signals are displayed on the No. 2 VOR bearing pointer. ID-250/ARN radio magnetic indicator.

Control of the receiver is entirely remote. The remote control panel is installed in the overhead panel of the pilots' station and two ID-250 are installed on the pilots' and copilot's instrument panel.

AN/ARN-14 Controls.

Frequency Selector Switch. The frequency selector switch (1, figure 4-28), which consists of two concentric knobs, is located on the remote control panel. The large knob selects whole megacycles and the small knob, tenths of megacycles.

Volume Control. The volume control knob (2, figure 4-28) controls the audio output of the receiver.

Power Switch. The power switch (3, figure 4-28) is used to turn the receiver on or off.

AN/ARN-6 AUTOMATIC RADIO COMPASS.

The AN/ARN-6 automatic radio compass may be operated by either pilot or by the navigator. The pilots' automatic radio compass controls are located on the pilots' overhead panel and the navigator's controls are located at his station. Receiving facilities are also provided for the radio operator. An indicating instrument is installed at each pilot's station and at the navigator's station. Power is supplied to the equipment from the aircraft 28-volt dc system, and 36 volts ac to the indicators through the C-1 amplifier.

AN/ARN-6 Operation.

1. Aircraft power supply, dc and ac – ON.

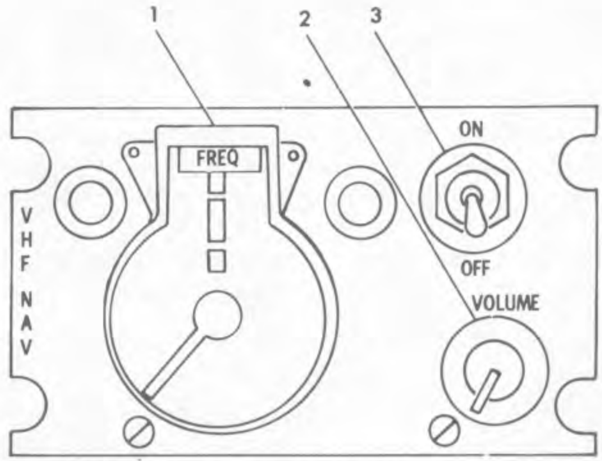
2. Receiver toggle switch on intercommunication control panel – ADF.

3. Function switch on automatic compass control panel – COMP, ANT, or LOOP, as desired.

TACAN INDICATOR

Figure 4-27

ARN-14 RECEIVER CONTROL PANEL



1 FREQUENCY SELECTOR SWITCH
2 VOLUME CONTROL
3 POWER SWITCH

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F66-0-4-24

Figure 4-28

To turn equipment off:

1. Function switch on automatic compass control panel – OFF.

2. Receiver toggle switch on intercommunication control panel – OFF.

AN/ARA-25 (UHF) DIRECTION FINDER.

The AN/ARA-25 direction finder is used in conjunction with the No. 6 AN/ARC-27 UHF set. Operating the function switch of the pilots' AN/ARC-27 control to ADF connects the direction-finder antenna relay, and puts the AN/ARA-25 amplifier in operation. Relative bearings of the received signals are displayed on the No. 1 pointer, and two ID-250's are installed on the pilot's and copilot's instrument panel. Power is supplied to the equipment from the aircraft's 28-volt dc system, and 26 volts ac to the indicators through the C-1 amplifier.

NOTE

- No test transmissions will be made on emergency (distress) frequency channels in order to prevent transmission of messages that could be construed as actual emergency messages.

- To DF a signal on the guard frequency, the main receiver must be tuned to the guard channel either manually or the preset selector switch must be set to G. Internal characteristics of the ARC-27 receiver do not allow the output of the guard receiver to be routed to the ADF equipment.

AN/ARN-18 GLIDE SLOPE RECEIVER.

The Glide Slope Receiver, R-322/ARN-18 is installed in the forward radio rack. The receiver is connected to a glide slope antenna located in the nose radome. The receiver detects 90/150 cps tone-modulated signals in the uhf range between 329.3 to 335 mc. Controls are located on the pilots' overhead panel and the indicator is located on the glareshield panel. Power is supplied to the equipment from the aircraft's 28-volt dc system and from the No. 1 inverter or variable frequency ac generator system.

AN/ARN-12 MARKER BEACON RECEIVER.

The 28-volt dc (AN/ARN-12) marker beacon receiver has no controls but comes on automatically when power is supplied to the dc bus. Marker beacon indicator lights are located on the pilots' instrument panel. An aural signal will be heard at the pilots' and navigator's stations when the aircraft is within the radiation pattern of a 75-megacycle marker beacon transmitter and the MARKER switch on the intercommunication control panel is ON.

POWER SOURCES AND CIRCUIT PROTECTION FOR THE APR 25/26 EQUIPMENT.

The ac power circuit breaker for the APR 25/26 are located on the aft power distribution panel and are labeled ECM

EQUIP. AC power is supplied by the electronic inverter. The equipment circuit breakers (one ac and one dc) for the APR 25/26 are located on the aft side of the EWO position for aircraft with only the APR 25/26 equipment installed. On aircraft with the ALR 27 and ALT 28 equipment installed, the circuit breakers for the APR 25/26 equipment are located on the forward side of the EWO position. DC power is provided by the aircraft generators.

The APR-25 contains one active and one spare fuse located on the face of the analyzer. The APR-26 contains one active and one spare fuse located on the face of the receiver.

POWER SOURCES AND CIRCUIT PROTECTION FOR THE ALR 27 AND ALT 28 EQUIPMENT.

1. The right ac generator is the primary power source.
2. Variable frequency ac, produced by the right ac generator is rectified to 28 volts dc by six transformer rectifier units.
3. The six transformer rectifier units supply dc power to operate the four 5KVA inverters.
4. The power circuit protection, for the 5KVA inverters, is located on the power distribution panel.
5. The aft power distribution panel has four circuit breakers for dc power to the number 1, 2, 3, 4 inverters (5KVA) which supply ac power to the ALR 27 and ALT 28 equipment.
6. The lower auxiliary section of the aft power distribution panel has six circuit breakers for the transformer rectifier units plus the ON-OFF switches for the four (5KVA) inverters.
7. The forward side of the EWO position has the 115VA, 400 cycle ac circuit breakers for the ALR 27 and ALT 28 equipment. The dc circuit breakers for this equipment are also location in this area.
8. Three active and one spare fuses are located on the front of the ALR 27 indicator. There are three active and one spare fuses on the ALR 27 low band tuner. Two active and two spare fuses are located on the front of each ALT 28 transmitter unit. The ALT 28 programmer contains one active and one spare fuse located on the reverse side of the programmer unit.

AN/APN-70B LORAN RECEIVER.

The AN/APN-70B Loran receiver equipment (figure 4-29) is operated from the navigator's station and is used for long-range navigation. Power is supplied to the equipment from the aircraft's 115-volt variable frequency ac system, phase C. The Loran circuit breakers are located on the radio operator's circuit breaker panel.

APN-70 CONTROL PANEL

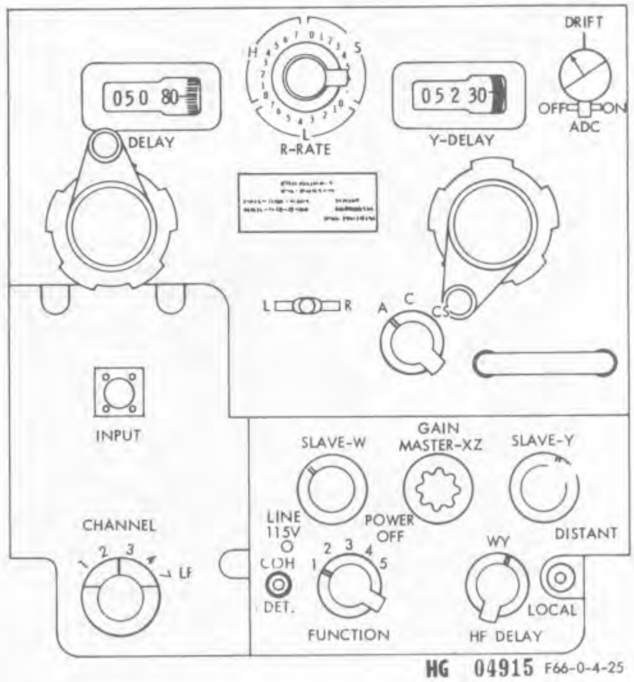

Figure 4-29

AN/APN-70B Operation.

1. Aircraft power supply, ac and dc – ON.
2. Radio operator equipment and Loran ac and dc circuit breakers – ON.
3. Rotate the master-XZ gain control clockwise until the panel lettering is illuminated. The set is ready for operation when the trace appears on the scope.
4. For LORAN A operation:
   a. Select LORAN-A channel switch and R-rate control.
   b. Select A on operational mode switch.
5. For LORAN C operation:
   a. Select position 7/LF with channel switch.
   b. Select C or Cs as applicable with operational mode switch. .

To turn equipment off:

1. Turn the master-XZ gain control to POWER OFF and see that panel lettering light is out. Also see that the pattern on the indicator screen disappears.

CU308/U ANTENNA COUPLER.

The CU308/U coupler provides facilities for the AN/APN-70B LORAN receiver and 618T-3 HF command transceiver to share the right overhead long wire antenna. The AN/APN-70B and the 618T-3 are connected to the CU308/U at connector posts placarded LORAN and COMM, respectively. The antenna input to the CU308/U is obtained from the 618T-3 hf command automatic tuner, 180L-3. The CU308/U is located against the bulkhead forward of the navigator's equipment rack. Power is upplied to the equipment from the aircraft dc system through the LORAN DC circuit breaker on the radio operator's circuit breaker panel. Also, 120 volts dc is supplied to the COMM and AUX posts on the CU308/U through the radio operator's junction box for the AN/AIC-10 system.

AN/APS-42 NAVIGATION RADAR.

The AN/APS-42 navigation radar set is designed for use as a navigational aid, as an anti-collision warning device, and as a search instrument. Either a pencil-beam pattern or a cosecant-squared beam may be formed by the reflector. The antenna, which is located in the nose of the aircraft, is pitch-and-roll stabilized so that it maintains an essentially constant inclination in adverse flying conditions. The nose radome is unpressurized; however, pressurization is provided for some components within the radome. Two indicators (figure 4-30) may be used at one time. One is located at the navigator's station and the other on the pedestal floor between the pilot and copilot in accordance with operational requirements. The radar uses both ac and dc power. Circuit breakers are located on the radio operator's junction box or auxiliary panel. The ac power is furnished from No. 2 inverter bus. The control unit contains all of the operating controls for the radar as well as the tilt indicator. The control panel is located on the pilots' overhead panel.

PILOTS' APS-42 INDICATOR

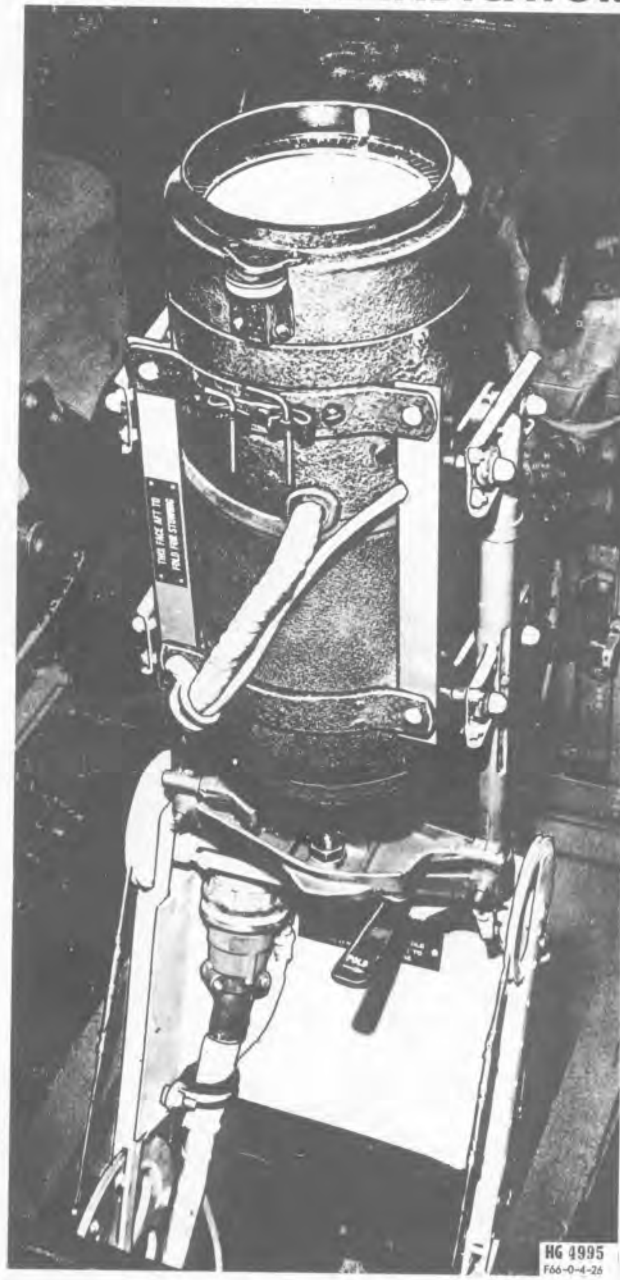

Figure 4-30

APS-42 Controls. (See figure 4-31.)

Function Switch. The function switch energizes the equipment, and selects SEARCH, BEACON, or WEATHER operation.

NOTE

> Before changing the function switch from STANDBY to SEARCH or SEARCH to STANDBY be sure the antenna is scanning.

OBS-MAP Switch. The OBS-MAP switch operates the beam-pattern change motor in the antenna assembly. The OBS position provides the pencil beam and the MAP position provides the cosecant-squared beam.

HTR Switch. Antenna AS-428A/APS-42 does not employ heaters, as satisfactory operation is obtained without their use. The heater switch should therefore be left in the OFF position at all times.

Scan Switch. The scan switch controls the rotation of the antenna. In FULL position the antenna rotates 240 degrees in azimuth centered along the airplane longitudinal axis; in the SECTOR position the antenna rotates 120 degrees. The apex of the sector is automatically offset on SECTOR position for all ranges except the 200-mile position, thus giving a larger size sweep on the scope.

Range Switch. The range switch has 5, 10, 30, 100, 200 (mile), and TD marked positions; it is used to select the minimum operating range of the equipment.

APS-42 CONTROL PANEL

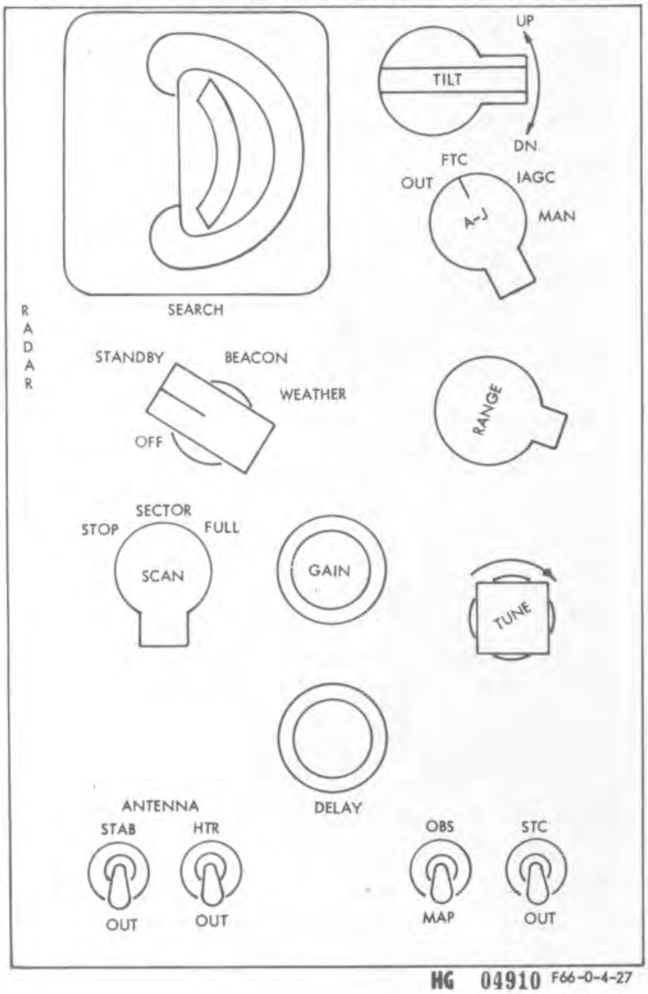

Figure 4-31

Gain Switch. The gain switch adjusts the sensitivity of the radar set; it should be adjusted to the point at which the target has the clearest presentation.

Tune Switch. The tune switch has two positions, placarded AFC and MAN. When the switch is in the MAN position the switch must be turned until the targets come in clearly. Normally the switch is left in the AFC (automatic frequency control) position and the tuning is automatic.

A-J Switch. The A-J switch has three positions, marked OUT, FTC, and IAGC. In the OUT position the FTC (fast time constant) and IAGC (instantaneous automatic gain control) circuits in the receiver are inoperative. In the FTC position, the FTC circuit is operative, reducing clutter and sharpening up targets as presented on the PPI. In the IAGC position, both the FTC and IAGC circuits are operative. Clutter is practically eliminated and all targets are sharpened.

STC Switch. The STC switch has two positions, marked OUT and ON. In the OUT position of the STC (sensitivity time control) switch, the STC circuits are inoperative, with the receiver gain functioning normally. In the ON position, the STC circuits are operative, thereby reducing the intensity of presentation of targets and clutter effective in the first 3 to 4 miles of range.

Stabilizer Switch. The stabilizer switch (STAB) has two positions, marked STAB and OUT. When the switch is in the STAB (normal) position, the radar antenna is stabilized by gyros to compensate for pitch and roll of the aircraft so that the target will not be lost.

CAUTION

Operation in stab position during other than level flight will subject antenna stabilizer circuit to overload and failure.

Delay Switch. The delay switch provides a movable range spot, variable between 5 and 175 miles, on the first five positions of the range switch. On the sixth, or TD, position of the range switch, the movable range spot becomes the start of the 30-mile expanded sweep. The 30-mile expanded sweep can be started between 5 and 175 miles from the aircraft by means of the delay control. These indicators have the following five adjustments: edge light dimmer, focus control, cursor knob, video gain control, and an intensity control.

Edge Lights Dimmer. The edge lights dimmer control is used to adjust the illumination of the indicator lights.

Focus Control. The focus control is used as an aid in obtaining a clear presentation.

Cursor Knob. The cursor knob turns the cursor, calibrated in degrees, so that bearings to targets can be determined.

Video Gain Control. The video gain control is used in conjunction with the gain switch on the control unit. Turn the gain control on the control unit to zero and then adjust the video gain control until the range marks are observed. Then adjust gain control on the control unit until the target is clear.

Intensity Control. The intensity control is used to adjust brilliancy of the trace.

AN/APS-42 OPERATION.

NOTE

CCW denotes counterclockwise. CW denotes clockwise.

Before Operation Check.

Pilot and navigator indicators.

1. Intensity control – CCW to OFF.
2. Focus control – CCW to OFF.
3. Edge light control – CCW to OFF.
4. Cursor control knob – ZERO.

Radar set control panel.

5. Antenna HTR switch – OUT.
6. Functions switch – OFF.
7. Scan switch – STOP.
8. Gain control – CCW to OFF.
9. A-J switch – OUT.
10. STC switch – OUT.
11. Antenna stab switch – OUT.
12. OBS-MAP switch – MAP.
13. Tilt control – CENTER.
14. Range switch – 10 MILES.
15. Delay control – 175 MILES.
16. Tune switch – AFC.
17. Pressurization indicator – 28-32 in. Hg.

Turn On Procedure.

During cold weather operation turn scan to FULL and range to 100 MILES before turning function from OFF to STANDBY. Wait at least five minutes (ten minutes if below -20 degrees C) before selecting a fast scan rate or SECTOR scan.

CAUTION

Do not operate the radar when the radar pressure indicator shows pressure of less than 26 inches of mercury.

Radar set control panel.

1. Function switch – STANDBY.

NOTE

Normal operation begins after a three-minute time delay cycle. This cycle is completed when the tilt indicator moves to the full up position.

Pilot and navigator azimuth and range indicator.

2. Intensity control – Sweep plainly visible.
3. Focus control – Sweep sharp and clear.
4. Intensity control – CCW until sweep just visible.
5. Edge light control – As desired.

Radar set control panel.

6. Scan switch – FULL for general coverage. SECTOR (120 degrees) for specific objects ahead of aircraft.

7. Function switch – SEARCH.

8. Gain control – CW for clearest viewing and definition.

9. A-J switch (if required) –FTC (reduces sea return or heavy masses of objects). IAGC (further sharpening of display) readjust gain if required.

10. STC switch (if required) – STC (reduces intensity of nearby objects, ground clutter, and sea return).

11. OBS-MAP switch – OBS (pencil beam for longer range or object at same altitude) MAP (for terrain). Use zero TILT when utilizing MAP.

12. Tilt control – UP or DOWN as required (OBS position).

13. Lights control – As required for cursor and range marker lights.

14. Range switch – As required.

NOTE

- Range marks are as follows:

Range	Number of Marks	Dist (in miles) Between Marks
5 miles	2.3	2
10 miles	5	2
30 miles	6	5
100 miles	4	25
200 miles	8	25
TD	6	5 (Variable)

- Readjust tilt after changing range if in OBS position.

15. Tune – MAN (check whether manual tuning is sharper than AFC).

Beacon Operation.

Radar set control panel.

1. Function switch – BEACON.

2. Range switch – 200 miles or less range if desired. TD position may be used for amplifier view.

CAUTION

Do not use TD continuously; this overloads the beacon transmitter.

3. Antenna stab switch – STAB.
4. Scan switch – SECTOR or FULL.
5. Gain control – Best return.
6. Tilt control – Best return.

Pilot and navigator azimuth and range indicators.

1. Edge light control – Best viewing position.

Weather Operation.

Radar set control panel.

1. Function switch – WEATHER.
2. Range switch – As desired. Use TD position to observe particular formations.
3. Scan switch – SECTOR or FULL.
4. OBS-MAP switch – OBS.
5. Tilt control – Start with ZERO. Then adjust slightly for clearest presentation.

NOTE

TD position will provide an amplified, more complete analysis of weather formation.

Standby Operation.

Place Function to STANDBY. There is no transmission or reception when in STANDBY position.

Radar set control panel.

TURN OFF PROCEDURE.

1. Function switch – STANDBY.
2. Scan switch – STOP 180°.

NOTE

Position antenna 180 degrees from dead ahead by operating the scan switch intermittently.

3. Tilt control – FULL UP (minimum pickup position).
4. Gain control – CCW.
5. Delay control – CCW to 175.
6. A-J switch – OFF.
7. Range switch – 10 MILES.
8. Tune switch – AFC.
9. All toggle switches – DOWN.

Pilot and navigator azimuth and range indicators.

10. Intensity control – CCW to OFF.
11. Focus control – CCW to OFF.
12. Edge light control – CCW to OFF.

Radar set control panel.

13. Function switch – OFF.

NOTE

Pressurize wave guide system to 40 in. Hg. Return switch to AUTOMATIC (down) position. This prevents wet air from entering wave guide system (through undetected leak) as equipment cools off.

AN/APS-42 RADAR PRESSURIZATION SYSTEM.

The radar pressurization system is designed to maintain an air pressure approximately equal to that of the atmosphere at sea level in the AN/APS-42 radar transmitter-receiver and associated wave guides. A pressure switch automatically energizes the air compressor when the line pressure drops below 28 inches of mercury (absolute) and stops the air compressor at about 32 inches. A check valve at the air compressor outlet retains pressure in the line after the compressor is stopped. This system is capable of pressurization at any altitude within the limits of the aircraft. However, the cabin superchargers are able to maintain sea-level pressure within the pressurized sections of the aircraft (and through lines to the radar) up to an altitude of 12,000 feet. If cabin pressure is maintained at a value below 2000 feet the radar pressurization system usually will not operate; therefore, if this system should fail it may be possible to pressurize the cabin sufficiently to continue use of the radar. The radar pressurization controls and indicators are mounted on a panel located on the copilot's side panel.

A silica gel dehydrator, located in the flight station, is installed in the radar pressurization lines to remove moisture from the cabin air that is used to pressurize the radar components.

Radar Pressurization Switch.

The radar pressurization switch has three positions; NORMAL, ON and OFF; it is spring-loaded from the momentary ON to the OFF position. In the NORMAL position, the pressure switch controls the air compressor. When the switch is held in the momentary ON position, the pressure switch is bypassed and the compressor is energized.

Bleed Button.

The bleed button is used to bleed pressure from the lines so that the pressure indicator can be calibrated.

Radar Pressure Indicator.

The radar pressure indicator shows the air pressure in the radar pressurization lines.

Radar Pressure Indicator Light.

A radar pressure indicator glows whenever the radar pressurization pump is operating.

Calibration of Radar Pressure Indicator.

1. Turn radar pressurization switch OFF.
2. Turn the dial shield to point the calibration arrow at approximately sea-level pressure (29.92 in. Hg on the instrument).
3. Depress the bleed button and hold until any existing pressure differential equalizes. The pressure gage should then indicate the barometric pressure of the station at which the aircraft is located. If this barometric pressure is unknown, the average reading of the supercharger pressure ratio indicators may be used as the true barometric reading while the aircraft is on the ground.

AN/APN-22 RADAR ALTIMETER.

The AN/APN-22 radar altimeter is designated as a low-altitude altimeter (0 to approximately 20,000 feet) and is operated from the pilots' station and the navigator's station. The equipment gives a visual indication of the aircraft altitude with respect to the terrain beneath. Power is supplied to the equipment through circuit breakers on the radio operator's circuit breaker panel from the aircraft 28-volt dc system and from the 115-volt ac generator and inverter system. Fusing for the AN/APN-22 is located at the rear of the mounting rack for AM-291/APN-22 in the aft crew compartment.

AN/APN-22 Operation.

1. Aircraft power supply, ac and dc – ON.
2. On/Limit control knob on front of indicator – ON.

To turn equipment off:

1. Turn On-Limit control knob on front of indicator at both pilots' and navigator's station – OFF.

WARNING

The AN/APN-22 radar altimeter is unreliable in areas covered by large depths of snow and ice, such as encountered over polar regions. An apparent terrain clearance 1600 feet greater than actual clearance has been recorded. Do not rely on your APN-22 equipment to provide terrain clearance when flying over areas covered by a large depth of snow or ice.

RADAR IDENTIFICATION TRANSPONDER.

AN/APX-25 Radar Identification Transponder. The purpose of the AN/APX-25 is to identify the aircraft as friendly when correctly challenged by a friendly shore, shipboard or airborne radar, and to permit surface tracking and control of aircraft in which it is installed. The AN/APX-25 controls are located at the pilot's overhead panel. Power is supplied to the equipment from the aircraft 28-volt dc system and from the 115-volt ac generator system. (T.O. 1C-121(E)R-526 changes the power source to one of the inverter fixed frequency buses, to improve communications with the aircraft during take-off and emergencies.)

AN/APX-25 Controls.

(See figure 4-32.)

Master Selector Switch. The master selector switch is used to turn the set on and off and to select the desired type of operation. During normal operation the switch should be in the NORM position. To maintain the equipment ready for instant use but inoperative, rotate the master switch to the STBY position. To indicate emergency or distress, depress the red dial stop and rotate the master switch to EMERGENCY. The LOW position should not be used unless otherwise directed by the proper authority.

Mode Switches. The mode switches should be set on their OUT positions unless otherwise directed by proper authority.

AN/KY95A TRANSPONDER SET CODER GROUP.

Coder Group AN/KY95A is an airborne coder which operates in conjunction with the AN/APX-25 radar identification set to provide coded electronic recognition known as SIF. The primary purpose of coder group AN/KY95A, when used in conjunction with the AN/APX-25 is to selectively identify the airplane in which it is installed as friendly, when correctly challenged by an interrogator responser associated with friendly radars. Functionally, the

C1128/APX25 CONTROL PANEL

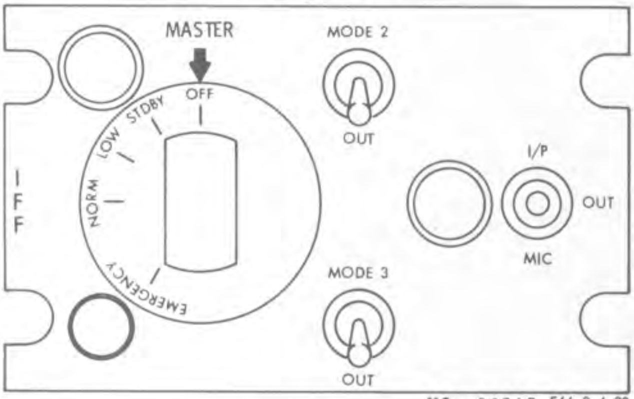

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Figure 4-32

C1158/APX CONTROL PANEL

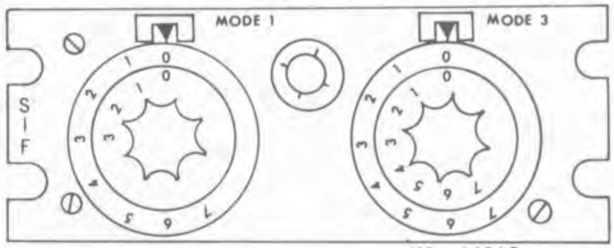

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Figure 4-33

receiver portion of the associated radar identification set receives the challenges which are initiated by an interrogator-responser and applies these signals to Coder group AN/ KY95A which generates a special coded reply. This reply is then transmitted by the transmitter portion of the radar identification set back to the interrogator-responser where the replies are decoded and displayed, along with associated radar targets on the radar indicators. When a radar is accompanied by a proper reply, that target is considered friendly. Actual employment of the different modes of operation, and the code settings of the coder group, is governed by operational doctrine.

C-1158/APX Control Panel. (Figure 4-33.)

The C-1158/APX control panel, permits the selection of codes in both Mode 1 and Mode 3 operation. The master switch on the C-1128 APX-25 control panel must be in NORM or LOW and the mode switches must be on before codes can be selected on the C-1158/APX control panel which has the following controls:

Mode 1 Dial. The Mode 1 dial consists of two coaxial knobs, the outer of which bears the numbers 0 through 7; the inner knob 0 through 3. It is used to select any of the normal mode 1 reply codes from 00 to 73.

Mode 3 Dial. The Mode 3 dial also consists of two coaxial knobs; however, both inner and outer dials are placarded from 0 through 7. It is used to select any of the normal Mode 3 reply codes from 00 to 77. This set will reply to Mode 2 interrogations whenever the Mode 2 switch on the C-1128/APX-25 control panel is in the Mode 2 position.

The reply will be in any of the normal Mode 2 reply codes from 0000 to 7777 as pre-set on the video coder KY95A/ APX-25 located on the forward radio rack.

KY95A/APX-25 Control Panel Operation.

After the engine has been started and before takeoff is initiated adjust the controls as follows unless tactically instructed otherwise:

1. C-1128/APX-25, master switch – STDBY or NORM, mode switches and IP-OUT-MIC switches – as briefed.
2. C-1158/APX, Modes 1 and 3 dials – Select reply codes as briefed.

If an inflight emergency occurs set the master switch on the C-1128/APX-25 control panel at EMERGENCY.

J-2 COMPASS SYSTEM (EC-121R).

The J-2 compass system (C-2 remote compass transmitter with compensator) located in the outer right wing and at the navigator's station provides visual indication of the aircraft magnetic heading. A J-2 repeater heading indicator is located on the pilot's instrument panel, on the navigator's instrument panel and on the CICO's panel. The J-2 compass system is supplied 115-volt ac power from the instrument inverter; 28-volt dc power is supplied from the aircraft dc system. Circuit breakers for the J-2 compass are located on the aft Power Distribution Panel.

J-2 Operation (EC-121R).

1. Aircraft power supply, ac and dc – ON.
2. J-2 compass ac and dc circuit breakers – ON.

CAUTION

AC and dc power supplies must be turned on simultaneously for proper functioning of the J-2 compass system. Loss or nonapplication of the dc power while ac power is applied will cause the fast erect cycle to be in effect. The fast erect cycle is designed for short time usage. Prolonged usage in fast (initial) erect will burn out the gyro. Single-phase ac power to the gyro will also burn out the gyro.

If the gyro does not start within 20 seconds, turn the subsystem power off. If the gyro does not precess and the indicators do not show approximate magnetic heading within 2-1/2 minutes, turn off the subsystem power. Prolonged operation (over 4 minutes) of the subsystem in fast slave operation will result in damage to the gyro.

3. Wait at least 3 minutes for the gyro to reach operating speed, to level, and to synchronize with magnetic north.

4. Observe the settable dial indicator on the J-2 repeater indicator on the navigator's instrument panel, and compare the indicator with the S-3A directional gyro control heading as it appears in the glass window (under the navigator's table). They should agree within 2 degrees. Correct any malfunction before takeoff.

NOTE

Due to local disturbances, the J-2 magnetic heading may differ by 15 degrees or more from the actual heading of the aircraft as obtained from a celestial true heading check.

If the master indicator and the repeater indicator agree within 2 degrees, the deviation should not be so large once the aircraft is airborne. Determine the deviation correction by another celestial true heading check after takeoff.

To turn equipment OFF:

1. J-2 circuit breakers (3) – OFF.

LIGHTING SYSTEM.

All lights are dc-operated unless otherwise indicated.

EXTERIOR LIGHTS.

The exterior lights include the landing lights, taxi lights, leading edge lights, fuselage lights, wing tip lights, tail lights, wheel well lights, and anti-collision lights. (See figure 4-34.) The control systems incorporate the necessary switches and relays. Circuit breakers protecting the external light circuits are located in the MJB No. 3 panel except for the anti-collision light circuit breaker, which is located on the lower 212 panel.

Anti-Collision Lights.

Rotating anti-collision lights are installed on the top of the center vertical fin and on the lower fuselage.

NOTE

The rotating anti-collision lights should be turned OFF during flight through conditions of reduced visibility where the pilot could experience vertigo as a result of the rotating reflections of the light against the clouds.

Exterior Light Master Switch.

Primary control of all exterior lights is provided by a master switch located on the copilot's auxiliary instrument panel (20, figure 1-6. The master switch has three positions, OFF, FLASH, and STEADY. When this switch is in any position but OFF, the master relay closes to supply dc power for steady operation of the leading edge lights, the taxi lights, and the landing lights. The STEADY and FLASH positions control the operation of the position lights.

Position Light Brilliance Control.

A position lights brilliance control (22, figure 1-6), located on the copilot's auxiliary instrument panel, is marked DIM, MED., and BRT, and may be used to control the intensity of the position lights.

Wing Tip Light Switch.

A two-position switch (5, figure 1-8) on the pilot's side panel, labeled WING TIP LTS., and OFF, is used to control the wing tip lights.

Tail Light Switch.

A two-position switch (4, figure 1-8) on the pilot's side panel, labeled TAIL LIGHTS and OFF, controls the white (bottom) and amber (top) tail lights.

Landing Lights Switches.

Two 600-watt landing lights are installed in the lower surface of each outer wing panel and are controlled by switches on the pilots' overhead panel. A switch for each light

EXTERIOR LIGHT ARRANGEMENT

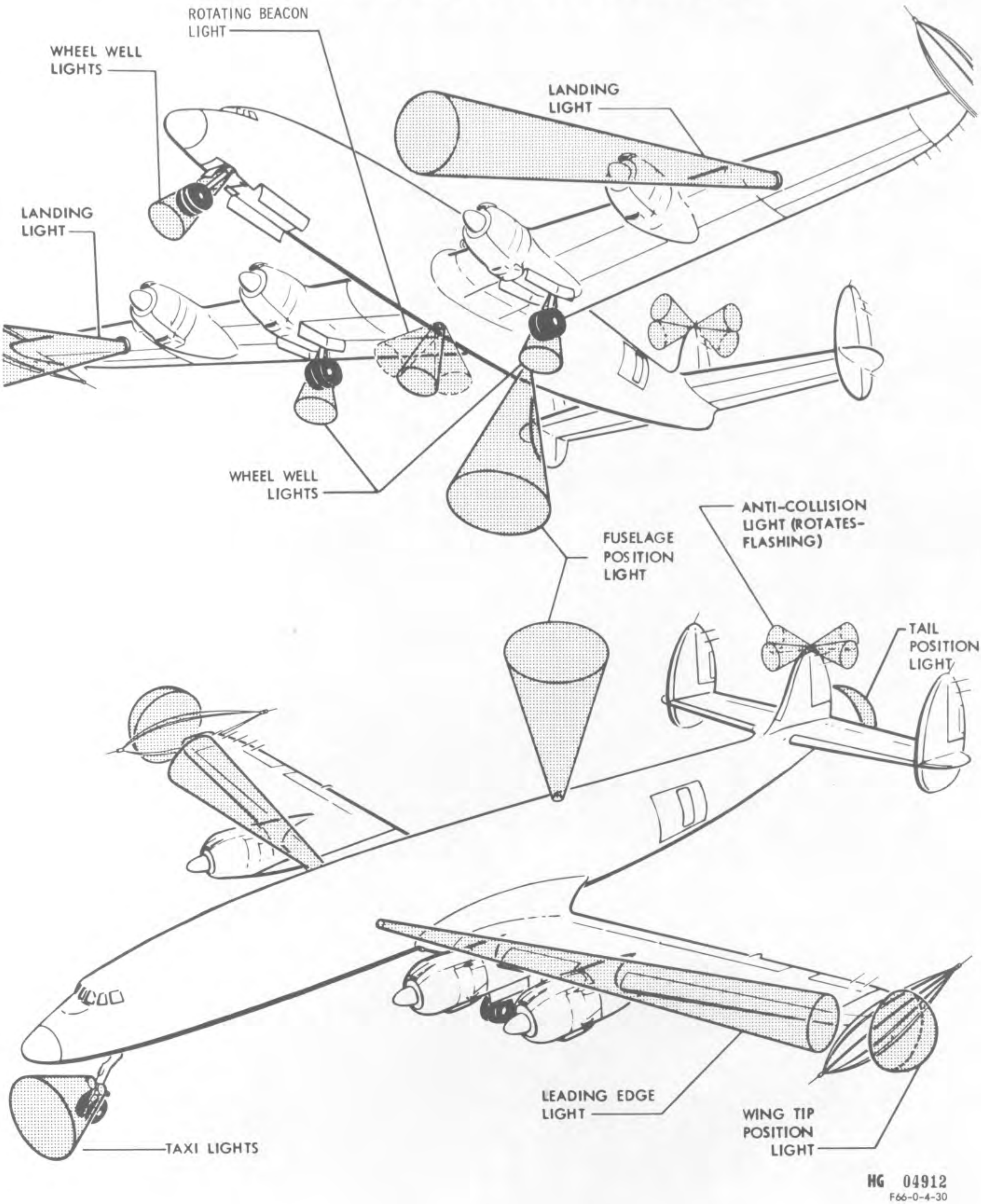

Figure 4-34

(2, figure 1-7), labeled LAMP ON and OFF, turns the light on or off. Two switches (1, figure 1-7), each labeled EXTEND, OFF, and RETRACT, control the motors which extend and retract the lights independently of the exterior light master switch. It is possible to turn the lights on while they are extended, retracted, or in any intermediate position, provided the exterior master switch is ON.

CAUTION

Do not leave landing lights on for more than 30 seconds without an airblast on the lens as the heat produced by the filament is sufficient to crack the lens.

Taxi Lights Switch.

A taxi lights switch (6, figure 1-8) on the pilot's side panel labeled TAXI LIGHTS and OFF is used to control the two white taxi lights mounted on the nose landing gear.

Leading Edge Lights Switch.

A switch (3, figure 1-8), located on the pilot's side panel, placarded LEADING EDGE LTS. and OFF controls two white lights mounted on each side of the fuselage. These lights are used to illuminate the wing leading edge for detection of ice, visual engine inspection, etc.

Anti-Collision Light Switches.

The anti-collision light switches are located on the pilot's side panel (7, figure 1-8) and are placarded ANTI-COLLISION and OFF.

Wheel Well Lights Switch.

The wheel well lights switch (3, figure 1-8) on the pilot's side panel labeled WHEEL WELL, may be used to illuminate the wheel area.

INTERIOR LIGHTS.

Interior lighting provides general illumination for the cabin, flight station, and cargo compartments and illumination for the controls and control panels provided for the flight crew and CIC crew. The cabin overhead lights consist of three sets, individually controlled. They are the forward crew compartment lights, the CIC compartment direct lights, and the aft crew compartment lights. Night lights are provided and consist of two amber and two white lights located in the cabin. Lavatory lights, crew compartment reading lights, and CIC compartment indirect green lights are provided. A white flexible arm light is installed at each operator's station at the aft power distribution, and near the driftmeter.

Cabin Lights Control Switches.

Three switches, placarded BRIGHT, OFF, and DIM control the cabin lights. One of the switches controlling the forward crew compartment lights is located above the flight station door on the cabin side and a switch controlling the aft cabin lights is located on the switch panel, aft of the cabin door. Another switch controlling the CIC compartment lights is located on the wall adjacent to the CICO position.

Night Lights Switches.

The night lights are controlled by two ON-OFF switches. One switch is located on the cabin side of the partition above the flight station door and the other switch is located on the switch panel aft of the aft cabin door.

Lavatory Lights Switches.

A switch controlling the forward lavatory light is located adjacent to the cabin doorway; another switch, controlling the aft lavatory lights, is located adjacent to the doorway in the aft lavatory compartment.

Crew Reading and Galley Light Switches.

Crew reading and galley light switches are located on the light panel.

Flex Light Switches.

A rheostat is installed at each operator's station to control the illumination of the flex-arm light in that station.

Pilots' Instrument Panel Lights Rheostat.

Red and white direct lighting is provided for the pilots' instrument panels and glareshield. The rheostats that control these lights are located under the glareshield on the copilot's side and are labeled PILOT'S RED, EMERGENCY WHITE, and COPILOT'S RED and GLARE SHIELD.

Flight Station Dome Light and Switch.

A combination red-white dome light is provided in the flight station for general illumination. The switch, labeled DOME LIGHT (1, figure 1-17), for controlling this light is located on the flight engineer's upper switch panel and is placarded WHITE, OFF, and RED.

Pilots' Switch Panels Light Switches.

Switches (9, figure 1-8 and 1, figure 1-9), located on each pilot's side panel, labeled PANEL LIGHT, OFF, controls the respective switch panel lights. A rheostat (11, figure 1-8 and 22, figure 1-9), located directly below the panel light switch, controls the intensity of these lights. The switch is labeled PANEL LIGHT, DIM, and BRIGHT.

Chart Lights and Switches.

The chart light switches are located on each pilot's side panel (8, figure 1-8 and 2, figure 1-9). They are placarded CHART LIGHT and OFF. Also on these panels are the chart light rheostats (11, figure 1-8 and 20, figure 1-9) which control the intensity of illumination desired. The rheostats are placarded DIM and BRIGHT. The lights are located above and slightly behind each pilot. Each light has a removable red lens and may be removed from its base and used as a hand light.

Pedestal Light Switch.

A light, controlled by a two-position toggle switch (3, figure 1-9) on the copilot's side panel, labeled PEDESTAL REAR LT., illuminates the area between the pilots' seats, aft of the center control stand.

Compass Light Switch.

A rheostat-type switch (19, figure 1-9), located on the copilot's side panel, labeled COMPASS LIGHT, DIM, OFF, and BRIGHT, may be used to turn on the light in the standby compass and to control its intensity.

Pilots' Radio Remote Control Panel Light Switches.

The pilot's and copilot's radio remote control panels are illuminated by small red floodlights installed directly above each box. The lights contain integral switches that can be rotated in either direction to turn on or off.

Pilots' Overhead Panel Light Switch.

Red edge lighting is provided for the pilots' overhead panel. The rheostat-type switch (5, figure 1-7) for this purpose is located on the right side of the overhead switch panel; it is marked OFF and BRIGHT.

Edge Lighting Circuit Breaker Location.

Circuit breakers for the rheostat-controlled edge lighting on the pilots' overhead panel and on the radio operator's and navigator's panels are located on the lower right portion of the plotter's circuit breaker panel below a placard reading AUXILIARY ICS.

Deicer Control Panel Light Switches.

The pneumatic deicer panel, located to the left of the pilot, is illuminated by direct red incandescent floodlights (2, figure 4-14) controlled by integral switches.

Cargo and Tail Section Inspection Light Switch.

A switch labeled CARGO LIGHTS, located on the wall adjacent to the CICO position, controls the five overhead lights in the forward and aft cargo compartments. These lights are automatically energized when the cargo compartment door is opened, regardless of the position of the inspection lights switch. The cargo door switch also actuates the door warning light located on the flight engineer's lower instrument panel.

Flight Engineer's Instrument Panel Floodlights Switch.

A switch labeled F. E. INSTR. PANEL FLOODLIGHT (2, figure 1-17), located on the flight engineer's upper switch panel, may be used to illuminate the flight engineer's instrument panels with either red or white floodlights.

Flight Engineer's Instrument Panel Auxiliary Light Switch.

A rheostat switch, labeled F. E. INSTR. PANEL AUX. LTS. with DIM, OFF, and BRIGHT positions, located on the flight engineer's upper switch panel (figure 1-17), controls the small incandescent lights installed in a glareshield below the instrument panels.

Station 260 Instrument Panel Light Switch.

A rheostat, labeled STA. 260 PANEL LIGHTS, installed under the flight engineer's lower instrument panel controls illumination of the station 260 panel.

Flight Engineer's Desk Lights and Switches.

The flight engineer's desk lights are controlled by a switch located beneath the flight engineer's lower instrument panel (figure 1-15).

Master Junction Box Panel Light Switch.

A switch (10, figure 1-26), located on the MJB No. 2 panel, with positions labeled DIM, OFF, and BRIGHT, controls the lights that illuminate the MJB panels.

Cabin Indirect Lights.

A switch located on the wall adjacent CICO position controls the cabin indirect lights.

OXYGEN SYSTEM.

The oxygen system consists of a fixed system available to all crew stations and portable bottles to supplement the fixed system. All oxygen containers are charged with the gaseous type oxygen.

FIXED OXYGEN SYSTEM.

A high-pressure gaseous oxygen system (figure 4-35) is installed in the aircraft. The three flight crew stations are provided with individual diluter-demand regulators. Continuous-flow oxygen is provided in the cabin. Outlets are provided at each cabin crewmember duty station, and additional outlets are provided in the relief crew area. The system is supplied from four high-pressure oxygen cylinders located aft of the pilot's station. Three of the oxygen cylinders are plumbed together to supply the cabin crew. These cylinders may also be used to supply the flight crew

OXYGEN SYSTEM

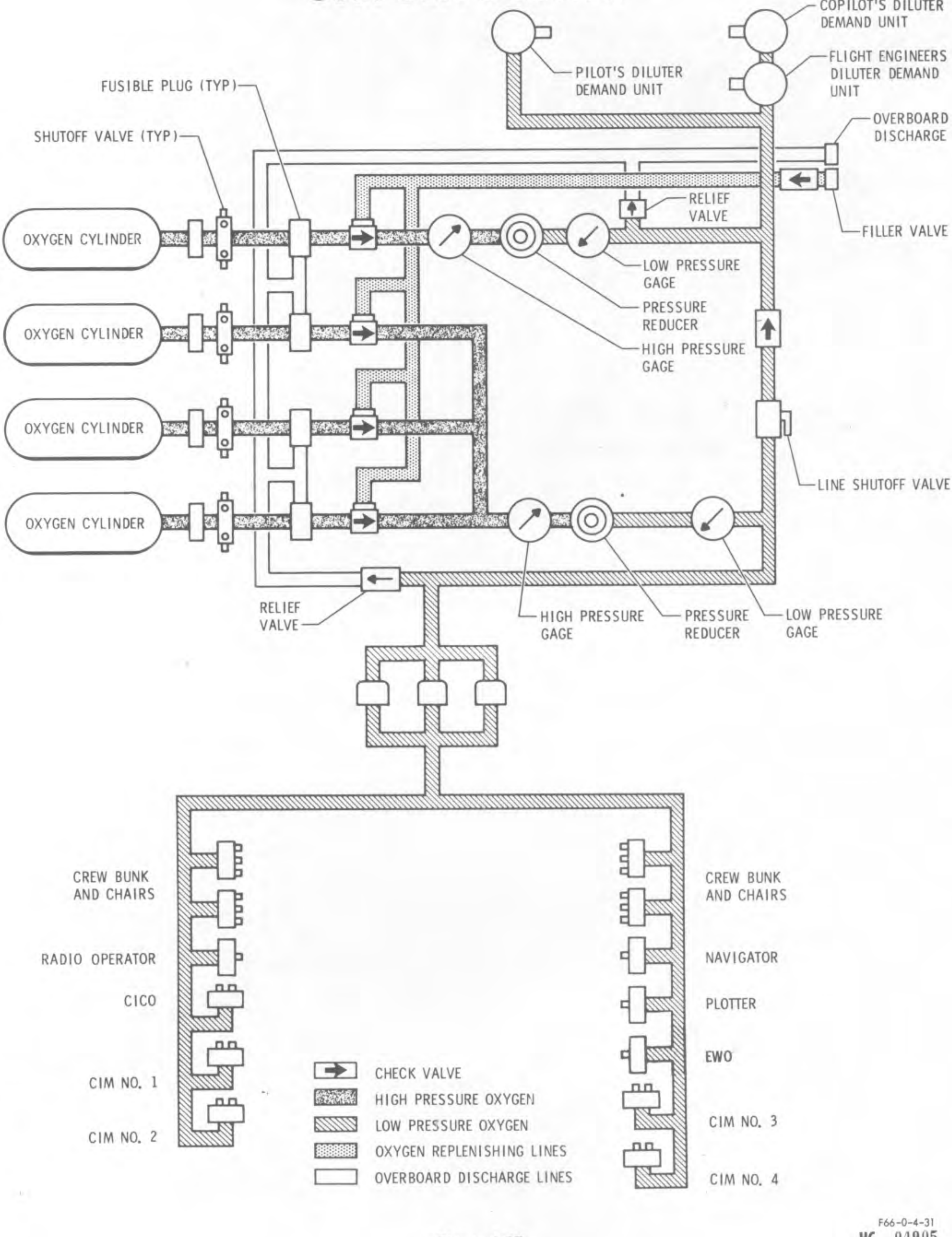

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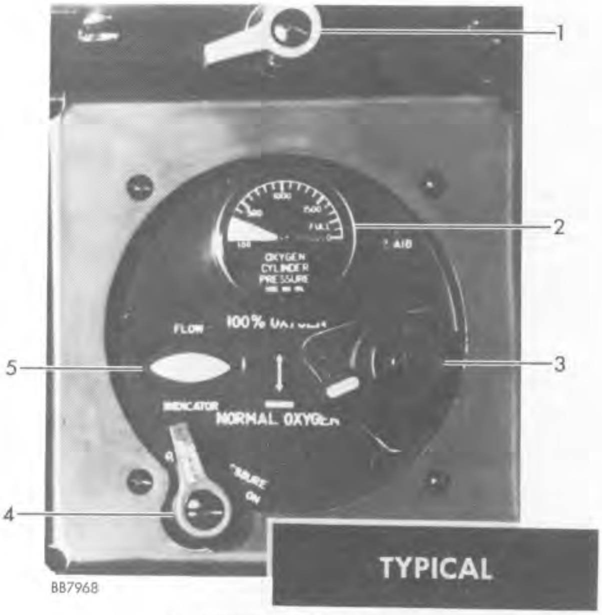
Figure 4-35

OXYGEN REGULATOR



1 OXYGEN SUPPLY LEVER
2 REGULATOR PRESSURE GAGE
3 AIR VALVE LEVER
4 SAFETY PRESSURE LEVER
5 FLOW INDICATOR

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Figure 4-36

by means of a line shutoff valve (crew valve) and bypass check valve which are plumbed between the radar supply line and flight crew pressure reducer. The fourth cylinder supplies only the flight crew. The oxygen cylinders are recharged through a filler assembly located forward of the crew door. Oxygen is routed from the three cabin crew cylinders to a high-pressure cylinder gage, pressure reducer, and low-pressure system gage. From the pressure reducer, the line is teed to a relief valve. One end of the tee is plumbed to the flight station supply line. The other end of the tee is plumbed to three automatic, continuous-flow regulators and then to the cabin crew manifolds. Oxygen from the flight station cylinder is routed in a similar manner to the pilot's, copilot's, and flight engineer's diluter-demand regulators. The relief valves, from the cabin crew system and flight station system, are plumbed together and join the oxygen cylinder overboard discharge line which discharges through a flush fuselage skin fitting immediately aft of the main cylinders. The relief valves discharge the oxygen overboard in the event of pressure reducer regulator failure. Each oxygen supply cylinder is equipped with a retainer safety disc that includes a fusible metal plug which will melt at 100°C to discharge the oxygen overboard.

NOTE

As an airplane climbs to high altitudes, where the temperature is normally quite low, the oxygen cylinders become chilled. As the cylinders grow colder, the oxygen gage pressure is reduced, sometimes rather markedly. With a 100°F decrease in temperature in the cylinders, the gage pressure can be expected to drop 20%. This fall in pressure is occasionally a cause for unnecessary alarm. The oxygen is still there, and as the airplane descends to warmer altitudes, the pressure will rise again, so that the rate of oxygen usage may appear to be slower than normal. A rapid fall in oxygen pressure while the airplane is in level flight, or while it is descending, is not ordinarily due to falling temperature, of course, and when this happens, leakage or loss of oxygen must be suspected.

Oxygen Cylinder Shutoff Valve.

Each of the four main oxygen supply cylinders, clamped to the left side of the flight station behind the pilot's seat, is equipped with a poppet-type shutoff valve. The shutoff valves control the flow of oxygen to the system and should be off when the aircraft is parked.

Radar-Flight Crew Shutoff Valve.

A crew valve (figure 4-37) is located on the oxygen control panel above the oxygen cylinders. When this valve is opened, the flight station oxygen is supplied from the three radar crew cylinders as well as from the flight crew cylinder.

High Pressure Cylinder Gages.

One high-pressure gage for the radar crew oxygen cylinders and one for the flight crew oxygen (figure 4-37) are located on the oxygen control panel above the oxygen cylinders. They indicate the pressure in the cylinders from 0 to 3000 psi and register 1800 psi at 21°C when fully charged.

Low Pressure System Gages.

Two low pressure system gages (figure 4-37), placarded OXYGEN PRESSURE, are located adjacent to the high pressure cylinder gages, downstream of the flight station and radar crew system pressure reducers. These gages indicate system pressure from 0 to 200 psi. Normal pressure is 65 psi.

Diluter-Demand Oxygen Regulator.

The pilot, copilot, and flight engineer stations are equipped with individual diluter-demand oxygen regulators.

OXYGEN CONTROL PANEL

Figure 4-37

Mounted on each regulator are an oxygen supply lever, regulator pressure gage, air valve lever, safety pressure lever, and flow indicator.

Oxygen Supply Control Lever.

The green oxygen supply control lever (1, figure 4-36) mounted on the oxygen regulator is used to open or close the incoming oxygen supply line that is connected to the regulator. The oxygen supply lever should be left in the OFF position when oxygen is not being used.

Regulator Pressure Gage.

The regulator gage (2, figure 4-36) indicates system pressure at the regulator (not cylinder pressure as placarded). Since the regulator is an "off-the-shelf" item not designed specifically for C-121 series aircraft, the scale is marked from zero to 2000 pounds with FULL placarded at 1800 pounds and a white "attention" area from zero to 300 pounds. In the EC-121R the normal pressure indication is 65 psi, and the gage serves primarily to indicate that there is pressure in the system.

Air Valve Control Lever.

The air valve control lever (3, figure 4-36), mounted on the oxygen regulator, can be set to NORMAL OXYGEN or 100% OXYGEN. In the NORMAL OXYGEN position, a mixture of air and oxygen is delivered to the mask as required. In the 100% OXYGEN position, undiluted oxygen is delivered to the mask.

Safety Pressure Control Lever.

When the red safety pressure control lever, mounted on the oxygen regulator (4, figure 4-36), is in the ON position, a slight pressure builds up inside the mask. This prevents outside air from being drawn into the mask when inhaling.

Flow Indicators.

Each diluter-demand regulator incorporates an oxygen flow indicator (5, figure 4-36). The flow of oxygen through the demand valve is indicated by the oscillation of a plate under the glass of the flow indicator.

PORTABLE OXYGEN SYSTEM.

Six individual portable oxygen cylinders are supplied; one in the flight station and five in the cabin and lavatory. Each cylinder is equipped with a diluter-demand oxygen regulator with an oxygen flow indicator, a carrying strap, breathing tube with quick disconnect coupling, a clothing clamp, a shutoff valve, and cylinder pressure gage. (See figure 4-36.) The oxygen regulator will reduce the cylinder pressure to approximately 65 psi if the pressure reducer fails.

NORMAL OPERATING PROCEDURES.

(See figure 4-38 for oxygen duration chart.)

NOTE

Check the system by blowing gently into the end of the oxygen regulator hose as during normal exhalation. If there is a resistance to blowing, the system is satisfactory. Little or no resistance indicates a faulty demand diaphragm or diluter air valve.

1. Oxygen supply cylinder shutoff valves – Open slowly.
2. Oxygen supply control lever – ON.
3. Cylinder and system pressure gages – Check for proper pressures.
4. Air valve control lever – NORMAL OXYGEN.
5. Oxygen masks – Connect and check for leakage.
6. Flow indicator – Check.
7. Flight crew shutoff valve – OFF. If it is desired to supply the flight station from the radar crew system – OPEN.

EMERGENCY OPERATING PROCEDURES.

1. If symptoms of hypoxia occur or the regulator fail, turn the safety pressure control lever clockwise to the ON position and descend to an altitude not requiring oxygen.
2. Whenever excessive carbon monoxide or other noxious or irritating gas is present or suspected, put on oxygen mask regardless of altitude and set the air valve control lever to the 100% OXYGEN position until danger is past.

AUTOMATIC PILOT.

The PB-10A automatic pilot installed in the aircraft is an electrically operated system that requires alternating and direct current. Alternating current is supplied by the No. 1 inverter or by the spare inverter. DC power is supplied by the main dc bus. The automatic pilot establishes references for automatic control of the aircraft. Whenever there are any deviations in the attitude of the aircraft from these flight references, the system senses these deviations and electronically operates the rudders, ailerons, and elevators through the normal flight control system to reestablish the original attitude.

AUTOMATIC PILOT COMPONENTS.

Fundamentally, the automatic pilot is made up of ten components. Of these the gyro fluxgate transmitter, the amplifier signal generator, the dynamic vertical sensor, the three main servos, and the elevator trim tab servo, make up the working units of the system. The remaining three components, the master direction indicator, the three-axis trim indicator, and the controller, provide indications and operating controls for the pilots. In addition, switches are provided to control the various functions of the equipment. An elevator trim tab servo eliminates the need for manual nose-up or nose-down trimming when the automatic pilot is being used, because the elevator trim tab servo is controlled directly by the elevator servo signal. When the elevator servo is required to sustain a force for a period of time to hold an elevator position, the elevator trim tab servo will be actuated automatically and will position the trim tab to provide aerodynamic balance. The manual trim tab wheel will move very slowly and the tab position indicator will show the position of the tab.

SAFETY CIRCUIT.

A safety circuit in the amplifier causes disengagement of the automatic pilot servoclutches in case of ac power failure likely to affect the operation of the gyros. The automatic pilot clutches are also automatically disengaged in the case of dc failure.

Circuit Breakers.

Three circuit breakers on the MJB No. 2A panel (figure 1-26) labeled PB-10A AUTO PILOT, are individually labeled Aϕ, Cϕ, and DC. When these circuit breakers are pushed in, both ac and dc power are directed to the system.

OXYGEN DURATION CHART

FLIGHT CREW OXYGEN DURATION

HOURS FOR 3 FLIGHT CREW MEMBERS, 1 LAC 654114 OXYGEN CYLINDER

CABIN ALTITUDE FEET	GAGE PRESSURE — PSI 1800	1500	1200	900	600	300
25,000	.8 1.4	.6 1.1	.5 .8	.3 .5	.2 .3	EMERGENCY DESCEND BELOW 10,000 FEET
20,000	.6 2.3	.5 1.8	.4 1.4	.2 .9	.1 .5	
15,000	.5 2.8	.4 2.3	.3 1.7	.2 1.1	.1 .6	
10,000	.4 3.0	.3 2.4	.2 1.8	.2 1.2	.1 .6	
HOURS FOR 2 FLIGHT CREW MEMBERS, 4 LAC 654114 OXYGEN CYLINDERS						
5000	1.9 15.6	1.5 12.4	1.1 9.4	.8 6.2	.4 3.1	EMERGENCY

BLACK FIGURES INDICATE DILUTER DEMAND LEVER "NORMAL OXYGEN."
RED FIGURES INDICATE DILUTER DEMAND LEVER "100% OXYGEN."

CABIN CREW OXYGEN DURATION

HOURS FOR 30 CREW MEMBERS, 3 LAC 654114 OXYGEN CYLINDERS

CABIN ALTITUDE FEET	GAGE PRESSURE — PSI 1800	1500	1200	900	600	300
25,000	.85	.62	.46	.31	.16	EMERGENCY
20,000	.92	.77	.54	.38	.16	
15,000	1.23	1.0	.77	.46	.23	
10,000	1.84	1.46	1.1	.69	.38	

ABOVE FIGURES BASED UPON "CONTINUOUS-FLOW OXYGEN."

PORTABLE OXYGEN CYLINDER DURATION

HOURS FOR 1 CREW MEMBER, 1 BU AER 9208 CYLINDER-REGULATOR ASSEMBLY

CABIN ALTITUDE FEET	GAGE PRESSURE — PSI 1800	1500	1200	900	600	300
25,000	.4 8	.4 6	.3 .5	.2 .3	.1 .2	EMERGENCY
20,000	.3 1.3	.3 1.0	.2 .8	.1 .5	.1 .3	
15,000	.3 1.6	.2 1.3	.2 1.0	.1 .6	.1 .3	
10,000	.2 1.7	.2 1.4	.1 1.0	.1 .7	— .3	

BLACK FIGURES INDICATE DILUTER DEMAND LEVER "NORMAL OXYGEN."
RED FIGURES INDICATE DILUTER DEMAND LEVER "100% OXYGEN."

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Figure 4-38

AUTOMATIC PILOT CONTROLS

1. PITCH TRIM THUMBWHEELS
2. AUTOPILOT ON SWITCH
3. TURN KNOB
4. ALTITUDE CONTROL SWITCH
5. FLUXGATE CAGING SWITCH
6. AILERON SERVO DISCONNECT LEVER
7. RUDDER SERVO DISCONNECT LEVER
8. ELEVATOR SERVO DISCONNECT LEVER

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Figure 4-39

Servodisconnect Levers.

The three servo disconnect levers (6, 7, and 8, figure 4-39), located on the lower aft side of the center control stand, operate mechanical clutches in each of the servos. Raising any one lever completely disengages the corresponding servo pulley from the servo driveshaft so that the pulley is free to turn with cable control movement. The servo disconnect levers also operate interlock switches at the beginning of their travel which interrupt the dc power to the clutch switch and prohibit its engagement before the actual mechanical engagement. (This disconnects all servo electric clutches.)

Fluxgate Caging Switch.

The momentary-contact fluxgate caging switch (5, figure 4-39), located on the center control stand, provides a means for expediting the erection of the gyro in the gyro fluxgate transmitter and the automatic pilot vertical flight gyro. When the caging switch is operated to the CAGE position and then released, the caging motors are energized to drive and lock the gimbal rings of the gyros so that the gyros are caged; then, the gyros are automatically released (uncaged) and the caging motors are stopped. The caging circuit to the automatic pilot and fluxgate compass also includes an interlock so that in case the caging switch is closed while the automatic pilot is engaged, all servo clutches are deenergized. This releases the engage switch, allowing it to return to the OFF position disengaging the automatic pilot.

Automatic Pilot On (Clutch) Switch.

The automatic pilot ON switch (2, figure 4-39) is located on the center control stand above the turn controller. When engaged, it operates an electric clutch in each of the servos and the direction indicator to engage the automatic pilot, provided ac and dc power have been on approximately 2 minutes, servo disconnect levers are in the ON position, altitude control switch is OFF, and gyros are uncaged. A clutch time-delay prevents engagement of the clutch for approximately 2 minutes after the automatic pilot is turned on. The delay set in by the relay allows time for the amplifier tubes to warm up, the gyros to reach operating speed, and the servos to turn to cancel the net channel signal before the automatic pilot takes control of the aircraft. During this delay period, the clutch switch will not hold when pressed and will not operate the servo clutches. The trim tab functions with the automatic pilot clutch switch. With the engage switch OFF and the automatic pilot not engaged, a clutch inside the trim tab servo disengages to free the servo. A pulley friction release on the servo shaft permits overpowering the trim tab servo.

Altitude Control Switch.

The altitude control switch (4, figure 4-39), mounted above the turn controller, energizes a clutch which connects the altitude control autosyn to its sensing aneroid. Any deviation from the altitude at which this clutch is engaged will cause a signal to be generated to control the elevator automatically and hold the aircraft at any pressure altitude up to 30,000 feet. As a safeguard, the maximum pitch change that the unit can set in to return the aircraft to its original altitude is 8 degrees regardless of the amount the aircraft is displaced in altitude. The switch is electrically interlocked with the engage switch to prevent engagement of the automatic pilot while the altitude control switch is ON.

Controller.

The controller comprises the turn knob and two pitch trim thumbwheels. Mounted on the center control stand, these controls make it possible to use the automatic pilot to make coordinated turns, climbs, descents, climbing turns, and descending turns.

Turn Controller. The turn controller (3, figure 4-39) incorporates a cutout switch which operates automatically whenever the turn controller is displaced 2 degrees maximum in either direction from the center position. The switch is normally closed and is connected in series with the clutch solenoid in the master direction indicator. When the switch is opened, the course autosyn is disengaged, thus allowing the selection of a new heading by use of the turn controller.

Pitch Trim Thumbwheels. The pitch trim thumbwheels (1, figure 4-39) are connected to the pitch autosyn. Rotating the pitch trim thumbwheels forward displaces the pitch trim autosyn to originate a signal for the application of down elevator; rotation aft causes the aircraft to climb.

Pilots' Clutch Disconnect Switches. The pilots' clutch disconnect switches, mounted on the outboard grip of each pilot's control wheel, provide a means for disengaging the automatic pilot. When pressed, either of these switches will electrically disconnect the automatic pilot system, and the clutch switch will pop out. When this occurs, the clutches in the servos and in the direction indicator are disengaged, preventing automatic control from being applied to the aircraft control surfaces.

Fluxgate Sensitivity Control.

The fluxgate sensitivity control, located under a removable cover on the lower right corner of the automatic pilot amplifier-signal generator is used for adjusting fluxgate compass sensitivity. For latitudes approximating that of the continental United States or lower, this adjustment can be full counterclockwise. For latitudes nearer the poles where the horizontal component of the earth's flux is weaker, increased sensitivity will probably be preferred. Oscillation of the master direction indicator and of the aileron servo indicate that the setting is too high; sluggish movement of the direction indicator occurs when the setting is too low.

Fluxgate Compass Master Heading Indicator.

The fluxgate compass master heading indicator (17, figure 1-6), located on the copilot's instrument panel, indicates the magnetic heading of the aircraft whether the automatic pilot is engaged or disengaged. The dial is directly connected through gears and linkages to an induction motor which operates both directionally and proportionally to changes of the magnetic heading of the aircraft. When the heading changes, the gyro fluxgate transmitter, mounted in the wing, electrically senses this change due to its change of position in the earth's magnetic field, and transmits a signal to the fluxgate direction indicator. This signal serves two purposes; it is used to drive the dial of the fluxgate direction indicator, and to originate a course signal for automatic control. The course signal is used to energize the aileron servomotor in order to turn the aircraft back to its former heading.

Three-Axis Trim Indicator.

The three-axis trim indicator (13, figure 1-6) is dc-operated and mounted on the pilots' center instrument panel; it indicates trim condition in all three axes. A sustained displacement of the indicator bars show that the servo is putting out torque in the direction of the displacement.

NORMAL OPERATING PROCEDURES.

To Engage the Automatic Pilot for Ground Check.

1. Circuit breakers – IN.
2. Servo disconnect levers – ON.
3. Gyros – CAGED (after the inverter has been operating at least 2 minutes). Allow about 30 seconds for completion of the caging cycle.
4. Three-axis trim indicator – Check.
5. Altitude control switch – OFF.
6. Automatic pilot engage (clutch) switch – ON.

Ground Check.

The forces tabulated below refer to elevator force applied on the center of the control wheel hub, aileron force applied at the rim of the control wheel, and rudder force applied on the rudder pedals.

	Stall
Elevator	33 (±7) pounds
Rudder	65 (±15) pounds
Aileron	16 (±3) pounds

To determine that the values of the above stall forces are approximately correct, proceed as follows:

1. With the engines running and with boost on, operate the surface controls several times.
2. Neutralize (center) surface controls.
3. Engage the automatic pilot.
4. By use of the pitch trim thumbwheel and turn controller, move the surface controls each way.
5. Operate the turn controller and determine that the rotation of the control wheel can be stopped with moderate effort of one hand.
6. Operate the pitch trim thumbwheel forward and aft and determine that the control column movement can be stopped with moderate effort of one hand.
7. Operate the turn controller and determine that the rudder motion can be stopped with moderate effort. (The rudder will move only a few inches.)

To check the overpowering forces, proceed as follows:

1. Set the pitch trim wheel and turn controller in the NEUTRAL position.

2. Operate each of the surface controls against the power of the automatic pilot.

The above check gives the pilot an approximation of the forces that the automatic pilot can produce.

Before Takeoff.

1. Pilot's clutch disconnect switch – Press.
2. Servo disconnect levers – OFF.

Climb.

1. After climb power is set – Trim the aircraft before the automatic pilot is used.
2. Altitude control – OFF.
3. Servo disconnect levers – ON.
4. Automatic pilot engage (clutch) switch – ON.
5. Three-axis trim – Trim for alignment.

Cruise.

When the desired cruising altitude has been attained, turn altitude control switch ON.

For normal changes in trim, such as power changes or changing weight due to fuel consumption, the altitude integrator mechanism will automatically retrim the pitch axis of the aircraft. When sustained displacements of the indicators on the three-axis trim indicator occur, the pilot may adjust manual trim without disengaging the automatic pilot or altitude control.

Descent.

1. Altitude control – OFF.
2. Pitch trim knobs – SET.

To Disengage Autopilot

1. Pilot's or copilot's clutch switch – Press.
2. Servo disconnect levers – OFF.

EMERGENCY OPERATING PROCEDURES.

Refer to Section III.

FUSELAGE FURNISHING AND MISCELLANEOUS EQUIPMENT.

NAVIGATOR'S EQUIPMENT.

The navigator's station is located on the right forward side of the cabin and is equipped with a chair, table, instrument panel, data case, periscopic sextant, sextant stand and mount, and (if installed) a driftmeter and tube. A periscopic sextant with case is issued to the navigator according to type of mission to be flown.

Driftmeter.

A gyrostabilized driftmeter is installed to aid the navigator in determining terrestrial bearings of objects relative to the heading of the aircraft. The driftmeter is mounted on the floor of the navigator's station. A switch, mounted on the lower gyro housing, controls the gyro erection system. A rheostat installed on top of the upper gyro housing controls illumination of the reticle optical system. A lever mounted on the filter housing marked SHADE GLASS controls a shade glass filter. By operating the lever, the shade glass may be interposed in the optical system to reduce the intensity of light when the ground image is too bright. A one-power eyepiece and a three-power eyepiece are secured in an ocular housing. The eyepieces are equipped with rubber guard buffers and the unused eyepiece is stowed in a holder on the side of the driftmeter. The driftmeter telescope tube extends downward through the fuselage floor and projects through a hole in the lower fuselage skin. A red warning light labeled DO NOT USE indicates when the gyro is caged. The power supply for the driftmeter is provided by the instrument inverter system and is protected by two fuses located on the lower 212 panel. Alinement for the driftmeter may be checked by sighting on the nosewheel door actuating cam. This bearing should read approximately 004 degrees.

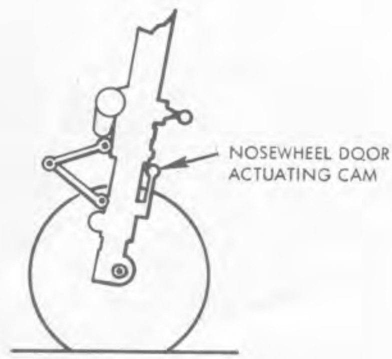

Figure 4-40

CAUTION

The driftmeter should be caged at all times when not in use. Set the driftmeter at 270 degrees for takeoff, landing, and ground operations to prevent damage to the outer lens.

CABIN DOOR OPERATION

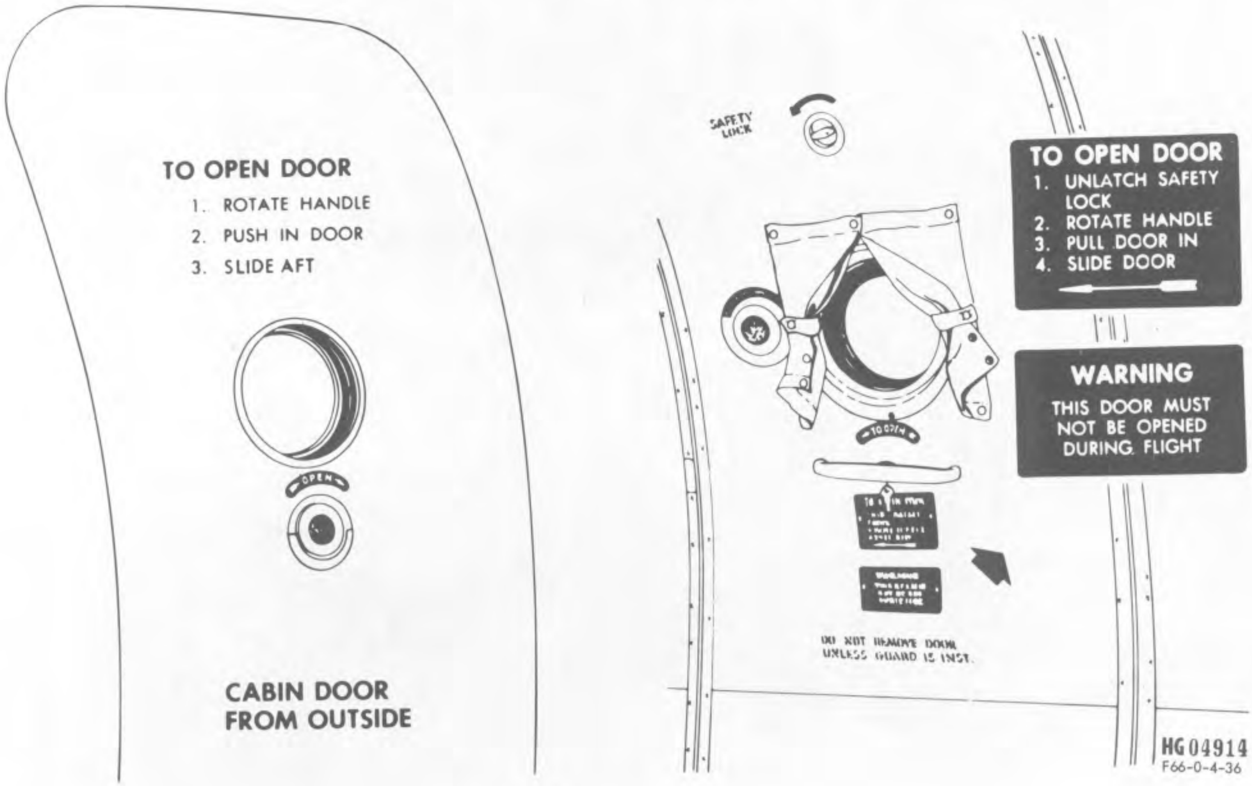

Figure 4-41

Periscopic Sextant.

A periscopic sextant is provided which, through a periscopic optical system, enables the navigator to make observations from within the fuselage by projecting the periscope outside of the aircraft. To accommodate the sextant, a mount is installed at the navigator's station. When the mount is installed, it is alined with the aircraft longitudinal axis. Mount alinement may be checked by sighting the anticollision light on the center vertical stabilizer. With 0 degrees set in the azimuth counter, this bearing should read 18°. Illumination for the sextant is provided by the aircraft dc power supply and is controlled by an ON-OFF switch on the mount. The circuit breaker for the sextant power supply is located on the upper 260 switch panel at the flight engineer's station.

MISCELLANEOUS EQUIPMENT.

Aft Cabin Door.

The aft cabin crew door is located on the left side of the fuselage and is built into the cargo door. Refer to figure 4-41 for operating instructions.

Cargo Door.

The cargo door in the left side of the fuselage is hinged at the top and operated by a hydraulic mechanism consisting of a hydraulic fluid reservoir, handpump bypass control valve, and door actuating cylinder. Open cargo door as follows:

1. Remove table (if installed).
2. Door latches – Release.
3. Hydraulic bypass valve – Close by turning clockwise.
4. Pump handpump until cylinder is fully extended.

Close cargo door as follows:

1. Hydraulic bypass valve – Open slowly, by turning counterclockwise, to control rate of downward movement.
2. Cargo door latches – Engage.

GALLEY
(TYPICAL)

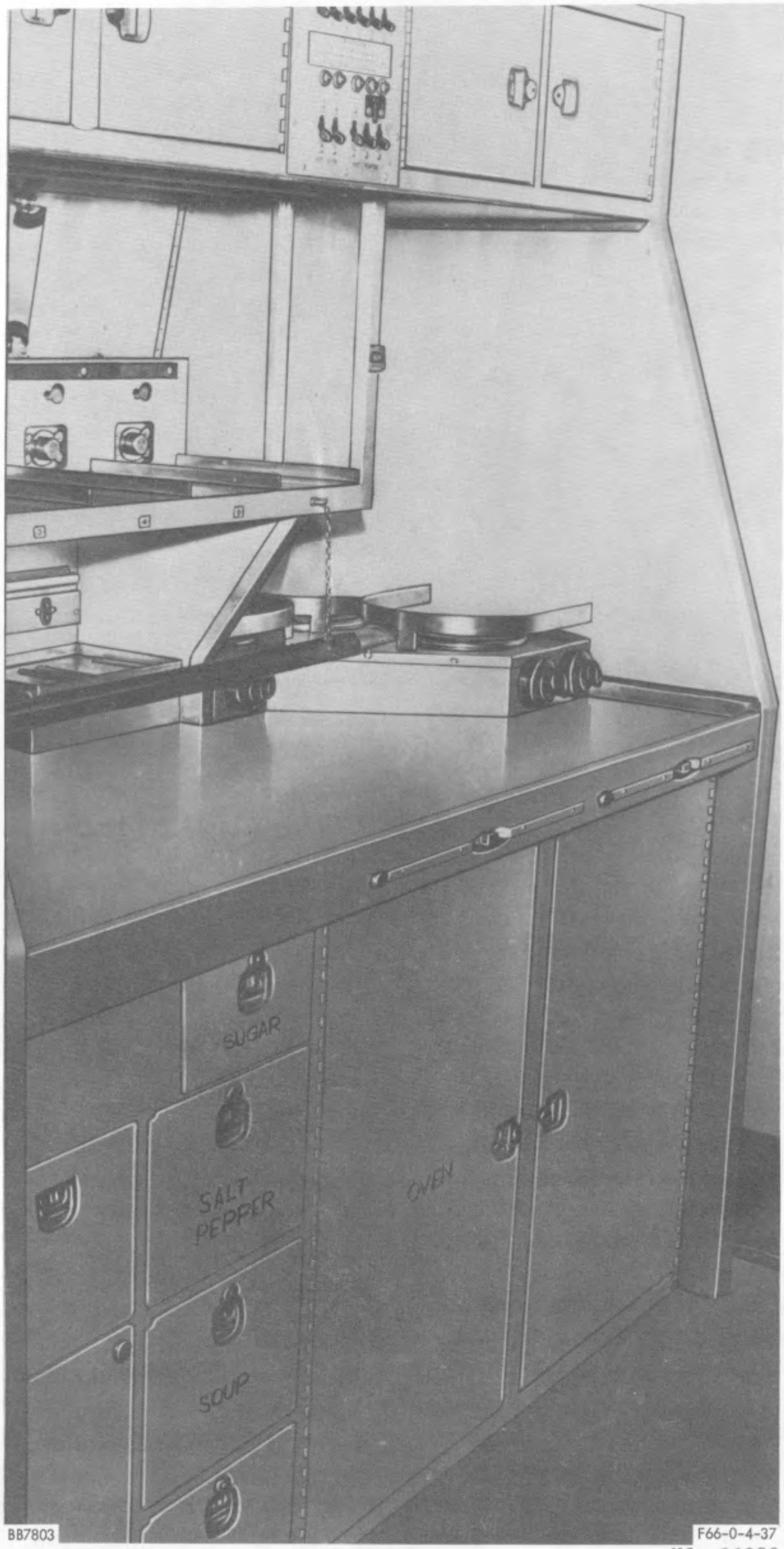

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Figure 4-42

CAUTION

Leave the bypass valve open, except when the cargo door is being raised, to prevent pressure buildups resulting from thermal expansion.

Door Open Latching Pin. A latching mechanism (figure 1-38) is installed on the aft exit door upper slide. With the door in the open position, a pin can be inserted in the slide rod for the purpose of holding the door open for crash landing.

Table and Bench Installations.

One table and two benches are installed in the forward crew compartments. Each bench is provided with airfoam seat and back cushions.

Navigator's Seat.

The navigator's seat is a tubular framed stool adjustable through a vertical range of approximately 11 inches and is provided with a padded back rest. The stool is secured to the floor with quick-detachable latches.

Relief Crew Seat-Bunks.

Relief crew seat-bunks are located on both sides of the forward cabin. This seat-bunk is arranged to seat four side by side and is convertible without modification into an upper and lower bunk. Two safety straps are provided with the upper bunks and should be utilized. Three additional bunks are installed, one on each side in the forward cabin, and one in the aft cabin.

Curtains.

One drape-type curtain covers the flight station doorway. Another is hung just forward of the CICO area. Crew compartment bunk curtains and window curtains also are provided.

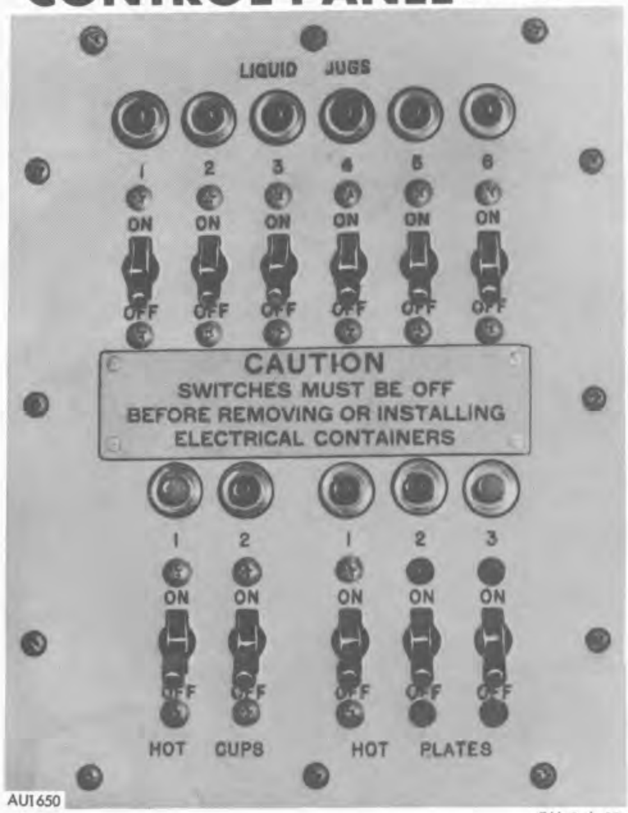
Station 260 Locker.

A small locker is located on the aft side of the 260 bulkhead.

GALLEY.

The galley (figure 4-42) is installed on the right side forward area. The galley provides complete facilities for the preparation of meals. Two storage compartments with double doors are installed in the upper part of the galley, on either side of the galley switch panel. Directly below the upper compartments six heated liquid containers are installed, each with a 2-gallon capacity. Each of these containers has provisions for installation of a dry-ice cup. Each container is held in position by an individual locking device,

GALLEY ELECTRICAL CONTROL PANEL (TYPICAL)



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HG 04898

Figure 4-43

and, to remove these containers, the handle directly in front of the desired container to be removed is turned in the down position. This releases the lock and the container then can be pulled out. The heater switches for the liquid containers are located on the upper row of the galley switch panel (figure 4-43) and are placarded ON- OFF.

CAUTION

These switches must be in the OFF position before removing or installing the liquid containers.

A sink is installed on the forward end of the galley working surface. The sink is provided with a water faucet, overdrain, and a flush perforated top for use when the sink is not required. Water for this sink is supplied from the forward water tank. Two 1-quart hot cup receptacles are installed in the center above the working surface. The switches that control that hot cup are located on the forward end of the lower row of switches on the galley switch panel and are placarded ON-OFF. Three hotplate assemblies are installed in the aft outboard corner of the galley. The master switch that controls the hotplates is located in the middle of the lower row of switches on the galley switch panel and is placarded ON-OFF. Individual switches for the hotplates are located on the hotplate assemblies and are placarded OFF-LOW-MED-HIGH. A waste container is mounted directly below the sink; it is readily removable for emptying and cleaning. Four storage drawers are installed on the inboard face of the galley just aft of the waste container. Two heating ovens are installed aft of the storage drawers. The control switches for these ovens are located at the aft end of the lower row of switches on the galley switch panel; they are labeled OVEN LEFT and RIGHT and are placarded ON-OFF. Two pullout boards are located above the two ovens. Identical locks are provided on all compartment doors and drawers. Provisions are incorporated in all drawers and work boards to prevent their being accidentally pulled all of the way out. The galley is powered by 28-volt dc current.

Galley Exhaust.

The galley area may be vented through a sonic venturi which is installed in the upper aft corner. A manual control lever is located on the aft side of the venturi; to open the venturi, place the lever in the DOWN position. The opening is protected by a slotted metal shroud.

Food Locker.

A refrigerator is installed immediately forward of the galley. A thermostat, located inside the refrigerator, automatically controls the inside temperature while in use. The refrigerator is powered by a 28-volt dc bus.

Lavatory and Locker.

A lavatory and locker compartment is located on the left side forward area. Entrance to the lavatory is through a doorway opening into the center aisle of the aircraft; entrance into the locker is through the lavatory. The lavatory contains a wash basin, soap dispenser, waste container, towel holder, mirror, paper-cup holder, and an ash tray. Another lavatory, located in the aft end of the cabin, contains a wash basin, mirror, towel holder, soap dispenser, urinal, and toilet.

Water System.

There are two gravity fed water systems. Each system consists of a supply tank, a drain and filler valve (figure 4-44), a tank shutoff valve, an external ground filler connection, overboard drain, and the necessary piping to form an integral system. The galley supply and drain lines are plumbed into the forward system. The capacity of the forward tank is approximately 40 gallons. The tank in the aft system contains 15 gallons. The inboard partition of each water tank cabinet includes a sight gage for determining the water level.

WATER FILLER VALVE

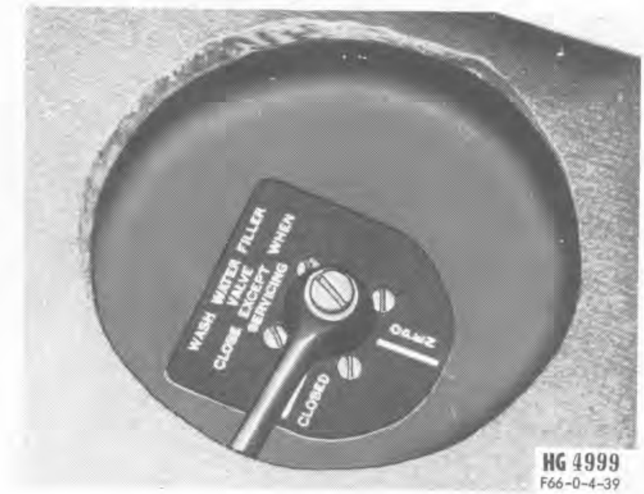

Figure 4-44

FLIGHT INSTRUMENT AND NAVIGATIONAL AIDS TROUBLESHOOTING PROCEDURES.

The following procedures are designed to provide the pilot with a simplified method of recognizing and correcting electrical failures to flight and nav aid instruments during flight. These procedures are particularly useful during certain phases of flight when direct reference to technical publications cannot be made.

WARNING

If the flight instruments of the pilots fail during a critical phase of flight such as takeoff or landing the pilots should immediately select their alternate sources of power to preclude the loss of basic aircraft control. Extreme caution should be used in continuing the instrument approach as other instruments may be inoperative which if considered reliable could endanger the aircraft. When the essential flight instruments are providing reliable information then detailed actions should be taken to restore the power to the malfunctioning systems.

1. When the pilot and copilot are operating their essential flight instruments from the No. 1 inverter bus and the pilot observes an OFF flag in his gyro flight horizon proceed as follows:

a. Check the copilot's gyro flight horizon for the presence of an OFF flag. If no OFF flag is observed then check the fuses for the gyro flight horizon on the pilot's instrument panel.

CAUTION

When removing or replacing fuses use care that the hand does not ground the fuse holder to the instrument panel.

b. If the copilot's gyro flight horizon has an OFF flag visible then No. 1 inverter and the change-over relay can be suspected.

NOTE

Change-over relay normally takes 3-5 seconds to function.

c. To minimize power loss from essential flight instruments, select the 250va inverter for the pilot's gyro flight horizon and turn and bank instruments and direct the copilot to select the 100va LH or RH alternator. If the pilot does not receive power for his essential flight instruments after selection of the 250va inverter then the power and control circuit breakers on the engineer's MJB 2A panel should be checked.

CAUTION

If the power and control circuit breakers for the 250va inverter are normal then the copilot should be advised to closely monitor the flight instruments since tumbling of the pilot's flight instruments can be expected should prolonged troubleshooting be required. The only reliable heading indicator will be the standby magnetic compass.

d. Direct the flight engineer to select the SPARE inverter. If no power is received have the engineer check the control circuit breakers for the No. 1 and No. 2 inverters on the MJB 3 panel.

NOTE

If the flight engineer's instruments are operating normally and no additional indications are evidencing an inverter failure then it may be suspected that the WYE to DELTA transformer (T-16) has failed. The No. 1 ac fuse transfer panel contains a circuit breaker for this transformer and may be checked.

CAUTION

This is a HOT fuse panel. Do not open unless actual emergency conditions exist.

NOTE

There is no control circuit breaker for the SPARE inverter. The SPARE inverter uses the control circuit breaker for the inverter to which it is selected. If the No. 2 inverter has previously failed, and is using the SPARE inverter, the No. 2 inverter switch must be placed OFF before the SPARE inverter will supply power to the No. 1 inverter bus.

e. Direct a crewmember to check the power circuit breakers at the remote circuit breaker panel for the No. 1, No. 2 and SPARE inverters.

NOTE

The circuit breakers are the thermal type and will not be noticeable if not set. All three should be reset.

f. If power has not been restored to the instruments it can be suspected that a multiple inverter/current limiter failure has occurred. Proceed to the nearest suitable field and land.

WARNING

If an attempt is made to replace the current limiters in the lower forward baggage compartment all dc power on the aircraft must be turned OFF.

FLUXGATE SYSTEM MALFUNCTIONS.

During flight the pilot should continuously check the fluxgate compass system with all other compass systems to identify malfunctions. If a malfunction in the fluxgate system is discovered the following procedures may be used.

1. Check the master direction indicator (MDI) on the copilot's instrument panel. If the MDI is inoperative, check the PB-10 amplifier circuit breakers on the MJB 2A panel.

NOTE

If a PB-10 circuit breaker(s) is found failed then reset the failed breaker(s). If the circuit breaker(s) again fail do not attempt to reset. In this condition the ADF bearing pointers will give only relative bearing information. The VOR bearing pointer will not be used for magnetic bearing information until this has been positively confirmed by the pilot.

2. If the MDI is operating then check the C-1 amplifier. To verify a C-1 amplifier failure place either radio compass to the LOOP position (after pilot control of the set has been obtained). If the ADF needle will not rotate then it may be suspected that the C-1 amplifier is inoperative. Check the C-1/Syncro amplifier circuit breaker at the radio operator's position. If this circuit breaker is normal, check the VOR indicator fuse on the forward radio rack then check the C-1/Syncro amplifier fuse located on the No. 1 ac Fuse Transfer Panel in the lower forward baggage compartment.

CAUTION

This is a HOT fuse panel, do not open unless actual emergency conditions exist.

NOTE

If power cannot be restored to the ID 250's then the No. 1 and 2 ADF bearing pointers and the VOR bearing pointer will not be reliable/operative and will not be used for instrument flying.

J-2 COMPASS FAILURE.

Check the J-2 compass system circuit breakers located on the Aft Power Distribution Panel.

TURN AND SLIP INDICATOR FAILURE.

If Turn and Bank Power Failure Light comes on, check pilot's attitude gyro. If it is operational, check turn and slip fuses on the pilot's instrument. If the attitude gyro is inoperative, proceed according to attitude gyro failure procedure.

VOR (ARN-14) RECEIVER FAILURE.

a. Check ARN-14 on/off switch, then check the VOR receiver circuit breakers located on the radio operator's circuit breaker panel.

b. If still inoperative, check the VOR indicator fuse located on the forward radio junction box. Failure of this fuse could make the RMI cards unreliable and will render the No. 2 bearing pointer inoperative.

ADF (ARN-6) RECEIVER FAILURE.

a. Check the function switch for control and recheck frequency tuned.

b. Check the ADF circuit breakers located on the radio operator's circuit breaker panel.

c. Check the ADF indicator fuse located on the forward radio junction box. Failure of this fuse will render No. 1 bearing pointer inoperative in ADF or loop position.

TACAN (ARN-21) FAILURE.

a. Check the Tacan function switch on T/R.

b. Check the Tacan circuit breakers located on the radio operator's circuit breaker panel.

c. Check the Tacan indicator fuse located on the forward radio junction box.

ILS (ARN-18) RECEIVER FAILURE.

a. Check ARN-18 glide slope and VOR (ARN-14) receiver circuit breakers located on the radio operator's circuit breaker panel.

b. Check ac power source – ac generator/inverter.

NOTE

In cases of radio navigation equipment failure, a check with the appropriate ground station/facility may determine that the failure is with the ground transmitter, not the airborne equipment.