SECTION III

EMERGENCY PROCEDURES

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LIST OF ILLUSTRATIONS

INTRODUCTION.

This section describes procedures for meeting emergencies that can reasonably be expected to occur. No attempt has been made to cover every conceivable malfunction or emergencies that are complicated by failure of other systems. A sound knowledge of these procedures and the basic aircraft systems, will, however, provide the necessary background to properly evaluate and cope with multiple emergencies and those situations not covered.

In any emergency situation, contact should be established with an appropriate ground station as soon as possible after completing the initial corrective action. Include position, altitude, course, ground speed, the nature of the emergency, and the pilot's intentions in the first transmission. Thereafter keep the ground station informed of the progress of the flight and of any change or developments in the emergency.

The pilot should make full use of the copilot and other crew members in combating an emergency so that his primary attention may be directed to the control of the aircraft. Although certain items require immediate action, the difficulty may be compounded by hurried commands to the crew. Analyze the situation carefully before taking any corrective action. Give the commands clearly and concisely, allowing time for acknowledgement before issuing further instruction. Certain actions are of such urgency that they must be committed to memory and performed immediately to prevent further damage, and to avoid aggravating the emergency. These "Immediate Action" items are printed in **BOLD FACE CAPITAL LETTERS.** The remaining steps are considered to be less urgent and must be accomplished by direct reference to the check-list.

ENGINE FAILURE.

FLIGHT CHARACTERISTICS UNDER PARTIAL POWER CONDITIONS.

Engine failure during flight can be determined by observing cylinder head temperature, oil pressure, fuel flow, manifold pressure, and rpm indications. If difficulty is encountered in determining the failed engine, retard a throttle on the same side of the aircraft as the direction of yaw caused by asymmetrical power. If yaw increases, the retarded throttle is to the good engine. If the yaw does not increase, the inoperative engine has been isolated.

Only at maximum power and low airspeeds does the aircraft require a great amount of control deflection to compensate for unbalanced thrust resulting from engine failure. Very little trim is required in cruise configuration with one propeller feathered. Control pressures required with one engine out will decrease as airspeed increases.

During takeoff, under normal wind conditions, and above 83 knots IAS (minimum control speed), nosewheel steering is not necessary to maintain directional control. Nosewheel steering will be required with a crosswind from the same side as the failed engine. In this case, apply slight forward pressure to the control wheel to increase traction. Keep the nosewheel on the ground until takeoff speed is reached. Apply slight back pressure to the control wheel approximately 5 knots below takeoff speed and continue takeoff. Begin landing gear retraction when the aircraft is definitely airborne and a positive rate of climb has been established. Control pressures required for a windmilling propeller will be greater than those required for a feathered propeller. To reduce drag, feather the propeller and then close cowl flaps of the inoperative engine as soon as possible. Since emergencies present different problems under various flight conditions, the pilot will direct the copilot or the flight engineer to shut down the affected engine with the command, "Feather number ." (See figure 3-1 for smoke and flame identification.) Maintain takeoff speed until obstacles have been cleared. Banking the aircraft away from the failed engine reduces the rudder deflection and resultant drag.

Note

Minimum control speed in flight is 83 knots IAS under the following conditions: an outboard engine inoperative and the propeller windmilling, maximum power on the remaining engines, wing flaps at 15 degrees, and the aircraft banked 5 degrees away from the inoperative engine.

WARNING

Recommended airspeed with one engine inoperative is never less than 110 percent of minimum control speed, (92 knots IAS) or 115 percent of power-off stalling speed, whichever is greater. This airspeed is commonly defined and referred to as takeoff speed.

Note

Minimum control speed in flight with two engines out on the same side, propellers windmilling, and maximum power applied to the remaining engines, 15 degrees wing flaps, with a 5 degree bank angle away from the failed engines is 95 knots IAS.

WARNING

Recommended airspeed with two engines inoperative is never less than 110 percent of the minimum control speed for two-engine operation (105 knots IAS) or 115 percent of power-off stalling airspeed, whichever is greater.

For best control and maneuverability of the aircraft, use up to 3 degrees of bank away from the failed engine and 3 degrees of yaw toward the failed engine. This position can best be described as a slight forward slip away from the failed engine. Indications of the amount of bank and yaw on the turn and slip indicators are: needle centered, and the ball displacement about one fourth width away from the failed engine. With the aircraft in this position, minimum control displacement is required, and rudder buffeting is minimized.

When all obstacles have been cleared, allow the aircraft to accelerate to wing flap retraction speed. For each degree of wing flap retraction from the takeoff setting, an airspeed increase of approximately one knot is required to maintain a safe wing flap retraction speed margin above takeoff speed. Under conditions of reduced acceleration, it may become necessary to maintain a slight amount of back pressure on the control column to increase the angle of attack. This will prevent settling as the wing flaps are retracted. After wing flap retraction, the aircraft should be flown with the wings level and zero yaw.

SMOKE AND FLAME

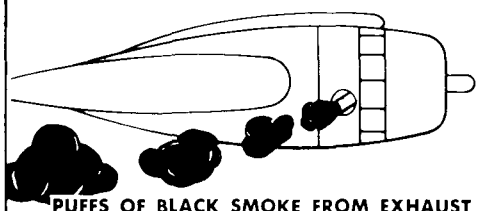
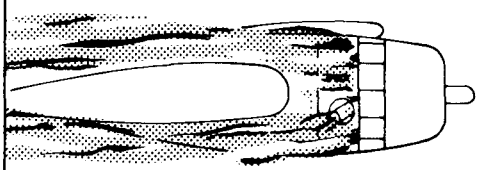
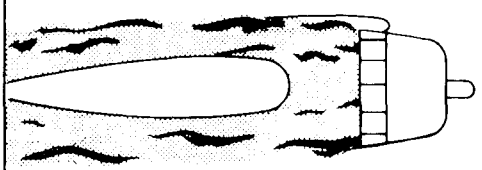
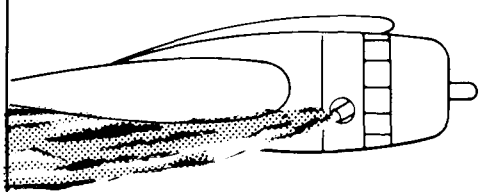
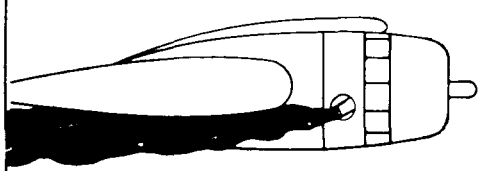
	POSSIBLE INSTRUMENT INDICATION	DANGER	CAUSE AND REMEDY
 PUFFS OF BLACK SMOKE FROM EXHAUST	HIGH CYLINDER HEAD AND CARBURETOR AIR TEMPERATURES. FLUCTUATING MANIFOLD PRESSURE, RPM, AND FUEL FLOW.	LOSS OF POWER AND ENGINE FAILURE.	CAUSE: DETONATION, AFTERFIRE, OR BACKFIRE FROM AN EXCESSIVELY LEAN MIXTURE. REMEDY: ENRICH MIXTURE, REDUCE POWER, AND MONITOR ENGINE INSTRUMENTS.
 THIN WISPS OF BLUISH-GREY SMOKE FROM EXHAUST AND COWL FLAP AREAS	DROP IN OIL QUANTITY.	SLIGHT POSSIBILITY OF FIRE.	CAUSE: SLIGHT OIL LEAK. REMEDY: WATCH CLOSELY AND FEATHER IF VOLUME OF SMOKE NECESSITATES.
 GREY SMOKE COMING FROM COWL FLAP OF FORWARD ENGINE SECTION	HIGH CYLINDER HEAD TEMPERATURE. FLUCTUATING MANIFOLD PRESSURE AND RPM. LOW OIL PRESSURE.	ENGINE FAILURE AND FIRE.	CAUSE: CYLINDER HEAD OR EXHAUST STACK FAILURE. REMEDY. FEATHER AND ALERT CREW.
 BLUISH SMOKE COMING FROM EXHAUST	HIGH CYLINDER HEAD TEMPERATURE AND LOSS OF POWER.	ENGINE FAILURE.	CAUSE: WORN PISTON RINGS OR PISTON FAILURE. REMEDY: WATCH CLOSELY AND FEATHER TO SAVE ENGINE.
 BLACK SMOKE COMING FROM EXHAUST	SUDDEN DROP IN MANIFOLD PRESSURE AND RPM. HIGH CYLINDER HEAD TEMPERATURE.	UNCONTROLLED FIRE.	CAUSE: INITIAL INDUCTION FIRE FROM BURNING FUEL. REMEDY: FIRE AND FEATHER PROCEDURES AND ALERT CREW.

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Figure 3-1 1 of 2)

IDENTIFICATION CHART

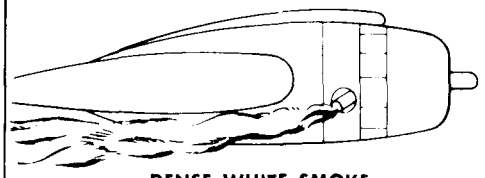
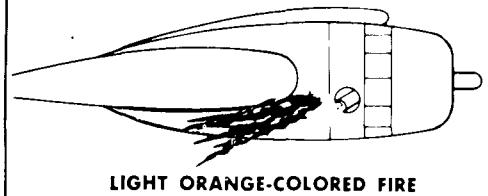
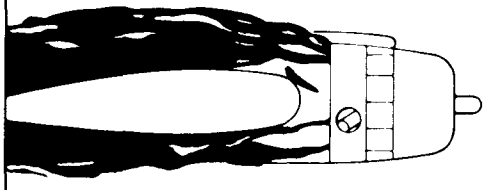
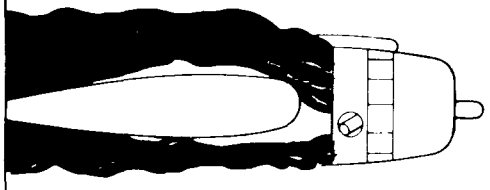
	POSSIBLE INSTRUMENT INDICATION	DANGER	CAUSE AND REMEDY
 DENSE WHITE SMOKE COMING FROM EXHAUST	VERY HIGH CYLINDER HEAD, CARBURETOR AIR, AND OIL TEMPERATURES.	UNCONTROLLED FIRE.	CAUSE: INDUCTION CASTING BURNING. REMEDY: FIRE AND FEATHER PROCEDURES AND ALERT CREW.
 DENSE WHITE SMOKE COMING FROM COWL FLAP AREAS	VERY HIGH CYLINDER HEAD, CARBURETOR AIR, AND OIL TEMPERATURE.	UNCONTROLLED FIRE.	CAUSE: INDUCTION CASTING BURNED THROUGH. REMEDY: FIRE AND FEATHER PROCEDURES AND ALERT CREW.
 LIGHT ORANGE-COLORED FIRE COMING FROM EXHAUST	SLIGHTLY HIGH FUEL FLOW.	IF RICH MIXTURE, NONE. OIL, BURNED FAIRING.	CAUSE: RICH MIXTURE OR OIL FIRE IN EXHAUST AREA. REMEDY: CHECK MIXTURE LEVER. IF OIL FIRE, FEATHER ENGINE AND ALERT CREW.
 BLACK SMOKE COMING FROM ACCESSORY SECTION	VARIABLE FUEL PRESSURE. HIGH CARBURETOR AIR TEMPERATURE. FIRE DETECTION LIGHTS ON.	UNCONTROLLED FIRE.	CAUSE: OIL LEAK AND OIL FIRE. REMEDY: FIRE AND FEATHER PROCEDURES AND ALERT CREW.
 BLACK SMOKE WITH ORANGE-YELLOW FLAME COMING FROM ACCESSORY SECTION	VARIABLE FUEL PRESSURE. HIGH CARBURETOR AIR TEMPERATURE. FIRE DETECTION LIGHTS ON.	UNCONTROLLED FIRE.	CAUSE: FUEL LEAK AND FUEL FIRE. REMEDY: FIRE AND FEATHER PROCEDURES AND ALERT CREW.

Figure 3-1 (Sheet 2 of 2)

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When climb airspeed is reached, reduce power to METO and maintain METO power until sufficient altitude is reached to maneuver the aircraft safely.

ENGINE FAILURE DURING TAKEOFF.

Before each takeoff, the refusal speed for the takeoff configuration must be determined by referring to the Appendix.

Aborted Takeoff.

Refer to ABORT, this section.

Continued Takeoff.

During takeoff when refusal speed has been exceeded, proceed as follows:

a. Takeoff and climb at takeoff speed.

b. Raise the landing gear after the aircraft is safely airborne.

c. Retard throttle (if no fire is evident) and feather the propeller of the failed engine immediately to reduce drag.

d. After obstacles are cleared, retract wing flaps at appropriate airspeed and accelerate to proper climb airspeed.

e. Accomplish Engine Failure/Fire During Flight Checklist with exception of those steps already performed.

ENGINE FAILURE/FIRE DURING FLIGHT.

If engine failure occurs at a time when additional power is required to maintain safe flight, increase power prior to isolating the failed engine.

Engine Shutdown.

1. **THROTTLE — RETARD (P).**

WARNING

Do not retard the throttle in case of fire.

2. **PROPELLER FEATHERING BUTTON — PUSH** (FE).

   As directed by pilot, flight engineer will feather propeller.

3. **MIXTURE LEVER — IDLE CUT OFF** (FE).

If Smoke or Fire Exists, Proceed As Follows:

4. **FIRE EXTINGUISHER SELECTOR HANDLE — PULL (P/CP).**

5. **EITHER CO_2 CYLINDER DISCHARGE HANDLE PULL (P, CP).**

6. **COWL FLAP LEVER — TRAIL** (FE).

Engine Clean-up—Affected Engine.

7. Smoke or Oxygen Mask— ON (CREW).

8. Vacuum Pump Selector Handle— AS REQUIRED (CP).

9. Ignition Switch—OFF (FE).

10. Booster Pump Switch—OFF (FE)..

11. Generator Switch—OFF (FE).

12. Fuel Tank Selector Lever—AS REQUIRED (FE).

13. Crossfeed Selector Levers—AS REQUIRED (FE).

14. Propeller Anti-Icing Rheostat Switches—AS REQUIRED (FE).

ENGINE FAILURE. (Continued)

Note

In case of fire while the propeller anti-icing system is in operation, the alcohol to the affected engine should be shut off. This will also shut off the alcohol to the opposite engine. When it has been determined that the fire is extinguished, the anti-icing rheostat switch may be turned ON to furnish alcohol to the unaffected propeller, if necessary.

15. Cowl Flap Lever CLOSE, then OFF (FE).

CAUTION

If any fire extinguisher selector handle has been pulled, the handle must be repositioned prior to discharge of CO_2 to another selected area, otherwise a split shot will result.

Note

If an engine is to be shut down for precautionary reasons during cold weather operations, oil dilution should be accomplished prior to shutdown if operation of the engine is anticipated prior to landing. (See Appendix for three-engine performance).

FAILURE OF TWO ENGINES.

Two-engine operation is critical at gross weights exceeding 63,000 pounds at altitudes higher than 5000 feet above sea level, using METO power. (See Appendix for two-engine performance).

Note

Above 5000 feet altitude above sea level at gross weights exceeding 63,000 pounds, it will not be possible to maintain altitude with two engines inoperative. However, the two operating engines allow a controlled descent to the critical altitude.

a. Jettison all cargo except emergency equipment, as soon as possible after isolating the two failed engines.

b. Prepare for an emergency landing or ditching. Land as soon as practicable.

FAILURE OF THREE ENGINES.

Except under ideal conditions (inboard engine operating, no cargo and light fuel load), it is impossible to maintain altitude with three engines inoperative. Abandon the aircraft or make an emergency landing or ditching as the situation dictates. Decision to make an emergency landing must be based on the ability to control the rate of descent, the availability of a suitable spot for an emergency landing, and whether sufficient altitude remains to jettison sufficient cargo to lighten the aircraft prior to landing.

ENGINE RESTART DURING FLIGHT.

If it becomes necessary to unfeather a propeller after an engine shutdown during flight, proceed as follows:

WARNING

Do not restart an engine that has been shut down due to fire or broken fuel line.

1. Fire Extinguisher Selector Handle—Push IN **(FE).**
2. Fuel Tank Selector Lever—ON **(FE).**
3. Crossfeed Selector Lever—As required **(FE).**

ENGINE FAILURE (Continued)

4. Propeller Lever—DECREASE RPM (FE).
5. Throttle—One fourth OPEN (FE).
6. Airspeed—Reduce to 120 KIAS maximum (P).
7. Booster Pump Switch—LOW then HIGH (FE).
8. Starter Switch—ON, turn twelve blades (P/CP).

   Turn propeller through twelve blade to check for hydraulic lock and to assure lubrication.
9. Propeller Feathering Button—Push (FE).

   Depress propeller feathering button and hold until propeller windmills at 500 to 800 rpm.

CAUTION

In the event of propeller overspeed while unfeathering, and the propeller feathering pump is ineffective, move the propeller lever rapidly and firmly to full INCREASE RPM and back to DECREASE RPM.

10. Ignition Switch—BOTH (FE).
11. Mixture Lever—AUTO RICH (FE).

    Move mixture lever to AUTO RICH when engine speed reaches minimum propeller governing rpm of 1200.
12. Temperatures and Pressures—Check (FE).
13. Propeller Lever—1500 prm (FE).
14. Cowl Flap Lever—As required (FE).
15. Generator Switch—ON (FE).
16. Booster Pump Switch—OFF (FE).
17. Power—As required (FE).

    As directed by pilot, advance rpm and manifold pressure to desired settings.

FUEL PRESSURE DROP — ENGINE OPERATING NORMALLY.

DURING GROUND OPERATION.

If the fuel pressure drops below the operating limits during ground operation, but the engine continues to operate normally, stop the aircraft, mixture IDLE CUTOFF, pull the fire extinguisher selector handle and shut down the engine immediately. Do not take off. Investigate the cause.

DURING FLIGHT.

If the fuel pressure drops below the operating limits during flight, but the engine continues to operate normally, the cause may be one or more of the following: primer leakage; oil dilution solenoid leakage; engine driven fuel pump bypass valve leakage; clogged pressure line; instrument failure; or line leakage. Proceed with of the the following courses of of action, depending on the cause of the pressure drop:

a. Shut down the engine immediately by moving the mixture lever to IDLE CUTOFF. Do this if power is not necessary to sustain flight or to reach a safe destination.

b. Continue to operate the engine normally. This can be done if it can be reasonably ascertained that the fuel pressure drop did not result from a fuel leak.

c. Operate the affected engine at or above cruising airspeed, maintaining a constant watch for fire. This can be done if it cannot be determined whether or not an actual fuel leak exists and the engine is required to sustain flight or maintain the required altitude for arrival at a safe destination. However, prior to power reduction for entrance to the landing pattern, shut down the affected engine completely and accomplish a partial power landing. Shut down the engine by moving the mixture

lever to IDLE CUTOFF, not by retarding the throttle. Unless the added power is absolutely essential to effect a safe landing, do not reduce airspeed until the affected engine is shut down.

WARNING

Whenever fuel pressure drops, and the engine continues to operate normally, the first concern of the crew is to guard against outbreak of an engine fire. The greatest danger lies in the fact that the crew develops a false sense of security because no fire exists at the time the fuel pressure drop is noticed or for several hours thereafter. However, when the throttle is retarded, as in preparation for landing, an engine fire develops and the results are usually disastrous. What has happened is that a fuel leak existed, but the cooling and dispersing effect of the airflow through the engine nacelle at cruising airspeed has prevented the start of a fire. When the throttle was retarded, the airflow was reduced sufficiently to permit ignition of the leaking fuel. Any change in airflow pattern, such as feathering the propeller or entering a climb, can start a fire if a fuel leak exists. Increasing the power is less likely to start a fire since airspeed will be increased, but even here there is a possibility of fire since the exhaust heat and flame pattern may change sufficiently to outweigh the increase in cooling airflow. Accordingly, it must be the objective of the crew to eliminate the fuel before any change in airflow or exhaust pattern is made. The most effective means of accomplishing this is by moving the mixture lever to IDLE CUTOFF before any throttle reduction, propeller feathering, or any other engine shutdown procedure is initiated. An additional advantage of moving the mixture lever to IDLE CUTOFF is that it provides the most rapid means of eliminating exhaust stack flames and reducing exhaust heat.

All other factors being equal, shutting down the engine immediately is generally the best procedure. However, action to be taken depends entirely upon the circumstances existing at the time. Such factors as the known condition of the aircraft, the remaining engines, stage and requirements of the mission, and power requirements of the aircraft should be considered.

PRACTICE MANEUVERS WITH ONE OR MORE ENGINES INOPERATIVE.

Engine failures may be simulated for practice. To simulate a feathered propeller condition, retard the throttle(s) of the selected engines(s) to approximately 15 inches Hg and propeller lever(s) to approximately 1500 rpm. The procedures on encountering engine failure will be called out without actually performing the steps.

CAUTION

When maneuvering with low power or during descents with low power, it is important to cushion the high inertia loads on the master rod bearings which occur at high rpm and low manifold pressure. As a rule of thumb, each 100 rpm requires at least 1 inch Hg manifold pressure. Use high rpm and low manifold pressure only when necessary.

PROPELLER FAILURE.

PROPELLER OVERSPEEDING.

Note

An overspeeding propeller is one which has allowed the RPM to exceed 2700 but is controllable by the propeller controls.

If an engine tends to overspeed (runaway propeller) indicating that the propeller governor is not functioning, proceed as follows:

CAUTION

Do not confuse momentary surging with actual overspeeding.

On Takeoff.

If propeller overspeed is encountered before reaching refusal speed, close all throttles and stop the aircraft.

If runaway propeller occurs after refusal speed or inflight, perform the following steps:

1. MAINTAIN DIRECTIONAL CONTROL (P).
2. THROTTLE - RETARDED (P).
3. AIRSPEED - AS REQUIRED (P).

   Airspeed must be maintained at 120 knots or below to help prevent propeller overspeeding.

4. PROPELLER CONTROL - RETARD (FE).

   Note

   If engine performance is not sufficient to clear obstacles on terrain, some power may be obtained by repeated use of the feathering button to hold RPM within limits. If this condition exists proceed with step 5.

5. PROPELLER FEATHERING SWITCH. INTERMITTENT FEATHERING - AS REQUIRED (FE).

   Push the feathering switch in, then pull out as the RPM drops within limits. Repeat as required.

   Note

   If propeller is not controllable after steps 1 thru 5 have been accomplished proceed with step 6. If feathering action controls RPM, feather the propeller after reaching a safe altitude.

6. PROPELLER-FEATHER - IF REQUIRED (FE).

WARNING

- If propeller is uncontrollable feathering should be attempted prior to exceeding 3100 RPM.
- In the event a propeller is uncontrollable do not pull the Fire Extinguisher Selector handle. This will result in Engine Oil starvation. Possible engine seizure, propeller and/or engine separation.

7. Complete Engine clean-up checklist.

During Cruise Flight.

If propeller overspeeds during cruising flight, accomplish the first three steps of ENGINE FAILURE/FIRE DURING FLIGHT checklist. After engine is secured, complete the checklist.

WARNING

Airspeed must be reduced to 120 knots or below as rapidly as possible. This should be accomplished while performing the first three steps under ENGINE FAILURE/FIRE DURING FLIGHT checklist.

Note

The speed of a windmilling propeller is related to true airspeed; therefore, if unable to feather the propeller, maintain reduced airspeed and descend to a lower altitude when practical.

CAUTION

- If rpm is above 3100 rpm, it is doubtful that the feathering pump can overcome the centrifugal twisting moment, therefore, an effort must be made to reduce the rpm below 3100 before feathering is attempted or the feathering pump may burn out. After the mixture has been placed in IDLE CUT OFF, as a last resort, reduce airspeed to less than 120 knots IAS and advance the throttle to the full forward position. This will force the engine to operate against the maximum air charge, further reducing rpm.

- If the above procedure fails and dangerous vibration exists, the oil system firewall shutoff valve may be closed to stop the oil flow, consequently freezing the engine. The oil system firewall shutoff valve is closed by pulling out the appropriate fire extinguisher selector handle. Should this procedure be required, the handle should be pulled out and left out rather than operated intermittently. Extreme caution should be exercised in this step because of the possibility of shearing the propeller from the propeller shaft when the engine freezes. In addition, more drag may be encountered with a frozen propeller. Attempts to feather the propeller may be continued after this step is taken.

PROPELLER GOVERNOR CONTROL FAILURE.

Engine rpm will stabilize at approximately 2300 if the propeller governor control cables

or cable pulleys fail forward of the firewall during flight.

FIRE.

WARNING

Any time a fire develops in flight, a decision to accomplish an emergency descent should be made immediately.

CAUTION

If any fire extinguisher selector handle has been pulled, the handle must be repositioned prior to discharge of CO_2 to another selected area, otherwise a split shot will result.

ENGINE FIRE ON GROUND.

If an engine fire occurs on the ground, stop the aircraft (if taxiing), shut down the engine and investigate. If an induction fire occurs during starting, perform the following steps in the order listed:

1. **STARTER SWITCH — ENGAGED (P/CP).**

   Keep starter engaged and continue cranking.

2. **PRIMER SWITCH — OFF (P/CP).**

3. **MIXTURE LEVER — IDLE CUT OFF (FE).**

4. **THROTTLE — OPEN (FE).**

If Fire Continues:

5. STARTER SWITCH — DISENGAGED (P/CP)
6. BOOSTER PUMP — OFF (FE)
7. FUEL TANK SELECTOR — OFF (FE)
8. COMBAT FIRE.

   Signal the ground crew to use portable fire extinguishing equipment and notify the control tower. If away from the flight line, or if fire continues, pull the fire extinguisher selector handle for the affected engine, then pull the CO_2 cylinder discharge handle.

9. Shut Down All Engines.
10. Secure Aircraft.
11. Abandon Aircraft.

    Notify crew and passengers to abandon the aircraft.

WARNING

Do not attempt to restart an engine after discharging CO_2.

ENGINE FIRE DURING FLIGHT.

See Engine Failure/Fire During Flight, this section.

LANDING GEAR OR BRAKE FIRE — GROUND OPERATION.

a. Head aircraft into wind (P).

b. Request fire fighting equipment (CP)

c. Stop aircraft by use of brake on the side opposite the fire (P)

d. Maintain 2000 RPM on engine ahead of fire (CP)

e. Wing flaps - Full Down (FE).

f. Shut down other engines (CP)

g. Shut down engines (when fire fighting equipment is in place.) (CP)

h. Secure aircraft

i. Abandon aircraft

WARNING

To reduce the risk of injury, fire guard should stand in a direct line with the landing gear, aft of the wheel. In case of an explosion, parts from the wheel will fly to the side of the wheel.

FUSELAGE FIRE.

In the event of a fuselage fire proceed as follows:

1. **HATCHES, DOORS, AND VENTILATING DUCTS — CLOSED (CREW).**

2. **SMOKE OR OXYGEN MASKS — ON (CREW).**

   Don smoke or oxygen masks, and set regulator to 100% OXYGEN.

3. **ASBESTOS GLOVES — ON (FE).**

4. **FIRE — COMBAT (FE).**

   Combat fire with all available extinguishers.

WARNING

Prolonged exposure (5 minutes or more) to high concentrations (pronounced irritation of eyes and nose) of Bromochloromethane (CB) or its decomposition products should be avoided. CB is an anesthetic agent of moderate intensity. It is safer to use than previous fire extinguishing agents (carbon tetrachloride, methylbromide). However, especially in confined spaces, adequate respiratory and eye protection from excessive exposure, including the use of oxygen when available, should be sought as soon as the primary fire emergency will permit.

LOWER CARGO (BAGGAGE) COMPARTMENT OR AUXILIARY POWER PLANT (APP) FIRE.

If a lower cargo compartment fire occurs, proceed as follows:

1. **APP — OFF (FE).**

   NOTE

   Not applicable on aircraft with cabin mounted APP.

2. **DOORS AND HATCHES — CLOSED (CREW).**

WARNING

If fuselage tanks are in use, perform emergency items 3, 4 and 5.

3. FUEL TANK SELECTOR LEVERS – MAIN TANKS (FE).

4. FUSELAGE TANK ROOSTER PUMP – OFF (FE).

5. FUSELAGE TANK SELECTOR – OFF (FE).

6. **CARGO COMPARTMENT FIRE EXTINGUISHER SELECTOR HANDLE — PULL (CP).**

   On Navy C-54 aircraft, pull applicable baggage compartment selector handle.

7. **SMOKE OR OXYGEN MASKS — ON (CREW).**

   Don smoke or oxygen masks, and set regulator to 100% OXYGEN.

8. CO_2 CYLINDER DISCHARGE HANDLES — PULL BOTH (Navy C-54 AND EC-54 — PULL ONE) (P, CP).

   On Navy C-54 and EC-54 aircraft with four CO_2 cylinders installed (two banks of two cylinders each), only one CO_2 cylinder discharge handle need be pulled. Pull applicable handle.

   Note

   Do not release CO_2 solely on the basis of the baggage compartment fire warning light (APP). Investigate and insure that a fire or smoke is present prior to discharging CO_2.

9. **HYDRAULIC SYSTEM BYPASS HANDLE — UP (FE).**

10. Land at first suitable airfield.

NOSE SECTION FIRE.

USAF C-54, EC-54, HC-54, and TC-54 Aircraft.

In the event of a nose section fire, proceed as follows:

1. **COCKPIT HEATER AND BLOWER SWITCHES — OFF (P, FE)**
2. **NO. 2 AND NO. 3 MAIN TANK BOOSTER PUMP SWITCHES — OFF (FE).**
3. **AN/APS-42 — OFF (N/FE)**
4. **FOOTWARMER AND DEFROSTER VENTS — CLOSED (P, CP).**
5. **NOSE SECTION FIRE EXTINGUISHER SELECTOR HANDLE — PULL (P).**
6. **SMOKE OR OXYGEN MASKS — ON (CREW).**

   Don smoke or oxygen masks, and set regulator to 100% OXYGEN.
7. **CO_2 CYLINDER DISCHARGE HANDLE — PULL (P/CP).**
8. Land at first suitable airfield

Navy C-54 Aircraft.

Navy C-54 aircraft are not equipped with a nose section fire extinguisher selector handle. In the event of a nose section fire, proceed as follows:

1. **COCKPIT HEATER SWITCH — OFF.**
2. **COCKPIT HEATER BLOWER CIRCUIT BREAKER — OFF (TRIPPED).**
3. **BLOWER MANUAL SWITCH — ON.**
4. **RADAR — OFF.**
5. **HYDRAULIC SYSTEM BYPASS HANDLE — UP.**
6. **FOOT WARMER AND DEFROSTER VENTS — CLOSED.**
7. **SMOKE OR OXYGEN MASKS — ON.**

   Don smoke or oxygen masks, and set regulator to 100% OXYGEN.
8. **CO_2 CYLINDER DISCHARGE HANDLE — PULL.**

Note

Line from the CO_2 cylinder to the selection manifold is drilled to allow CO_2 to be discharged in the nose-wheel well when no selection is made.

WING FIRE.

There are no provisions installed for controlling a wing fire. If a wing fire occurs during flight, attempt to control it as follows:

1. Emergency Descent (P).

   Begin emergency descent immediately.
2. Alert Crew (P).

   Alert the crew for possible bailout, ditching, or crash landing.
3. Sideslip (P).

   Attempt to extinguish the fire by sideslipping the aircraft away from the fire.
4. Land/Abandon Aircraft.

   If fire cannot be extinguished, make an emergency landing or abandon the aircraft.

ELECTRICAL FIRE.

When fire or smoke in the aircraft is suspected to be of electrical origin, but the source is not determined, proceed as follows:

1. **BATTERY SWITCH — OFF (FE)**

2. **ALL GENERATOR SWITCHES — OFF (FE).**

Turn off all generator switches including APP.

3. **SMOKE OR OXYGEN MASKS — ON (CREW).**

Don smoke or oxygen masks, and set regulator at 100% OXYGEN.

4. **ASBESTOS GLOVES — ON (FE).**

5. **FIRE — COMBAT (FE).**

If Fire Source Is Still Not Determined, Proceed As Follows:

X See Change 1C-C54D-155 13

6. Circuit Breakers—Tripped **(FE).**

Manually trip all circuit breakers.

7. Fire Source—Determine **(FE).**

Flight mechanic will inspect all electrical wiring and ascertain, if possible, the cause of the fire.

8. Battery Switch—ON **(FE).**

9. Generator Switches—ON, one at a time **(FE).**

10. Circuit breakers—Reset **(FE).**

Only those circuits necessary to maintain safe flight will be restored to operation. Maintain a close watch for recurrence of smoke or fire.

CABIN HEATER FIRE.

To combat a cabin heater fire, proceed as follows:

1. **CABIN HEATER CONTROL RHEOSTAT AND EMERGENCY SWITCH — OFF (FE).**

2. **NO. 2 AND NO. 3 MAIN TANK BOOSTER PUMP SWITCHES — OFF (FE).**

3. **SMOKE OR OXYGEN MASKS—ON (CREW)**

Don smoke or oxygen masks, and set regulator to 100% OXYGEN.

4. **ASBESTOS GLOVES—ON (FE).**

5. **FIRE—COMBAT (FE).**

If smoke is emanating from the cabin heater vent, insert nozzle of the CO_2 hand fire extinguisher in the heater trap door and discharge the extinguisher. If smoke is emanating from around the heater duct, expose the burning material and use fire extinguisher.

APP FIRE (CABIN MOUNTED).

To combat a fire in an auxiliary power plant which is mounted in the aft fuselage cabin section, proceed as follows:

1. **BATTERY AND GENERATOR SWITCHES — OFF (CP).**

2. **APP IGNITION SWITCH — OFF (P/FE).**

3. **SMOKE OR OXYGEN MASKS — ON (CREW).**

Don smoke or oxygen masks, and set regulator to 100% OXYGEN.

4. **ASBESTOS GLOVES — ON (FE).**

5. **FIRE — COMBAT (FE).**

SMOKE ELIMINATION.

To eliminate smoke concentration in the pilots' compartment and main cabin compartment, open the forward bulkhead door and the left and right forward emergency exits in the cabin.

CAUTION

Under no circumstances should the pilots' side windows or clear vision windows be opened prior to opening an aft exit, as this will cause smoke to be drawn into the pilots' compartment.

EMERGENCY DESCENT.

Descend from altitude at the highest possible rate of descent as follows:

a. Close throttles.

b. Propeller levers full forward (INCREASE RPM).

c. Do not exceed a maximum of 290 knots IAS with landing gear and wing flaps up.

d. If this procedure cannot be used, descend as rapidly as possible with landing gear and wing flaps down; throttles retarded; propeller levers full forward (INCREASE RPM); cowl flaps open; and observe landing gear and wing flap airspeed restriction of 125 knots IAS.

WARNING

Do not lower the landing gear until ready to land if fire exists on No. 2 or No. 3 engines, since the firewall may be bypassed and the situation aggravated.

TAKEOFF AND LANDING EMERGENCIES. (EXCEPT DITCHING).

ABORT.

When an engine fails before reaching refusal speed, considerable yawing of the aircraft will occur, and the aircraft will tend to bank in the direction of the yaw. This effect is greater for an outboard engine failure than for an inboard engine failure. Banking tendencies are aggravated by a crosswind from the opposite side of the failed engine. To control yawing and banking at the instant of engine failure, immediately apply rudder and aileron, and perform the following steps:

1. **THROTTLES — CLOSE (P).**

2. **BRAKES — APPLIED (P).**

   Pilot will apply brakes as required to affect as rapid a stop as desired. Nosewheel steering, brakes, and rudder displacement will be used to maintain directional control.

BLOWN-OUT TIRE ON TAKEOFF.

If there is sufficient runway ahead to stop, retard the throttles and stop the aircraft. If there is insufficient runway for a safe stop, ease the aircraft off the ground and do not retract the landing gear. Land the aircraft.

CAUTION

Do not retract the landing gear until a visual inspection has been made, as the blown tire may jam the landing gear in the wheel well.

LANDING EMERGENCIES.

WARNING

All combustion type heaters must be shut off before an emergency landing.

When an emergency crash landing is required, complete the checklist, and make a normal approach. The crew will occupy the same positions that are required for ditching (see figure 3-7). The alarm bell procedure is the same as for ditching.

LANDING WITH ONE ENGINE INOPERATIVE.

Use the following procedure during a landing with one engine inoperative (see figure 3-2):

a. Make a normal approach and landing, except use 2300 rpm upon entering traffic pattern. When at high gross weights, keep approach airspeed and altitude slightly higher than normal. As landing gear is lowered, advance rpm to 2550.

b. Do not extend wing flaps beyond 20 degrees until assured runway can be reached.

LANDING WITH TWO ENGINES INOPERATIVE.

Since two-engine performance is limited, any power that is available from the failed engines will increase the safety factor. Perform the landing operation as follows (see figure 3-2).

WARNING

Failure to push in the Fire Extinguisher Selector Valve Handle prior to wind-milling a propeller will result in oil starvation, engine seizure, and possible propeller or engine separation.

a. Upon entering the traffic pattern, set rpm at 2550.

b. Wing flaps 10 degrees on base leg. Airspeed 120 knots IAS minimum.

c. On the final approach, 120 knots IAS is minimum airspeed. When it is certain that the field can be reached, lower the landing gear and advance rpm to 2700.

d. Wing flaps as required when certain that runway can be reached.

If both inboard engines are inoperative, the vacuum flight instruments and the two engine-driven hydraulic pumps located on the inboard engines will be inoperative (on Navy C-54 aircraft, the generators also are inoperative). If IFR conditions exist, an effort should be made to permit the propeller of either of the inoperative engines to windmill to provide vacuum flight instruments with pressure. If both inboard propellers must be feathered, see Aircraft Systems Failure, this section, for operation of the wing flaps, landing gear, and hydraulic brakes.

GO-AROUND WITH ONE OR TWO ENGINES INOPERATIVE.

The sooner the decision to go around is made, the greater the margin of safety. When considering the possibilities for go-around, altitude, airspeed, gross weight, aircraft configuration, wind conditions, runway facilities, and visibility should be considered. If the pilot deems it necessary to go around, he will accomplish the following:

a. Pilot states, "Go-around max power," to co-pilot and flight engineer.

b. Flight Engineer moves propeller levers to full INC RPM.

c. Pilot advances the throttles, flight engineer follows and sets to maximum manifold pressure.

d. At the direction of the pilot, flight engineer will raise wing flaps to 15 degrees.

e. Pilot will attain airspeed (takeoff speed, minimum) for best angles of climb for obstacle clearance and will establish climb.

WARNING

- If a three-engine go-around is required from an airspeed at or below takeoff speed, begin climb when takeoff speed is reached. Be alert to meet control requirements resulting from the application of maximum power at low airspeeds. Maximum power should not be applied if airspeed is below minimum control airspeed (83 KIAS). Maintain takeoff speed until all obstacles are cleared.

- Within the normal range of operating gross weights, if a two-engine go-around is required below climb airspeed and the landing gear and wing flaps are extended, transition

must be made to climb airspeed and configuration before a positive rate of climb can be established. The amount of altitude lost during this transition will vary with gross weight, degree of wing flap extension, and airspeed existing at time the go-around is begun.

● When power is applied to go around at 110 percent (105 KIAS) of the minimum control speed (95 KIAS) with two engines inoperative on one side, it will require nearly full rudder, one-half to two-thirds aileron displacement, and a 5-degree bank toward the two operating engines to maintain a constant heading. The aircraft must be flown straight directionally, but with 5-degree of bank in order to attain the best attitude required for both acceleration and climb performance.

f. Copilot will move landing gear lever to UP position.

g. After obstacles have been cleared, maintain maximum power and increase airspeed. At wing flap retraction speed, the pilot will direc mechanic to raise wing flaps to full up, in 5 degree increments, and increase airspeed to normal climb.

h. Proceed with normal climb until reaching safe altitude to maneuver, then reduce to required power.

LANDING GEAR MALFUNCTION

When a malfunction is experienced with either retraction or extension of the landing gear, it is recommended that the landing gear be secured in the down position and landing be made as soon as practical. No attempt should be made to diagnose the gear malfunction by cycling gear during flight.

LANDING GEAR TIRE FAILURE.

a. If the nosewheel tire is flat at the time of landing, keep the nosewheel off the ground as long as possible. Prior to landing, move the passengers to the rear as seating permits, and have them fasten safety belts. If cargo can be shifted safely, move enough to obtain an aft center of gravity. Use a minimum of braking. Retract wing flaps immediately after touchdown.

b. If one or both tires are flat on one main landing gear, make contact with the nosewheel as quickly as possible.

Note

There is very little actual danger in landing with one flat tire on one main landing gear. The landing should be made smoothly and taxiing done slowly to clear the runway.

c. If both tires are flat on one main landing gear there may be more damage than just flat tires. For example, a hydraulic hose may have torn loose, a wheel may have been broken, or the landing gear itself may have been sprung. The aircraft tends to swerve to the flat tire side. This tendency may be counteracted by using braking on the good tire side and by nosewheel steering, with forward pressure on the control column to give good steering control. The outboard engine on the flat tire side may also be used to assist in holding the aircraft straight, but should be used cautiously as the added power will increase the landing roll.

MAIN LANDING GEAR DOWNLATCH FAILURE (LANDING GEAR WARNING LIGHT ON).

If a landing gear downlatch fails to engage, as indicated by the red landing gear warning light, and a visual inspection at or below approximately 120 KIAS confirms that the landing gear is extended, attempt to engage the downlatch by use of the hydraulic handpump. If the downlatch fails to engage, the following procedure is recommended.

LANDING AND GO-AROUND PATTERN — ONE OR TWO ENGINES

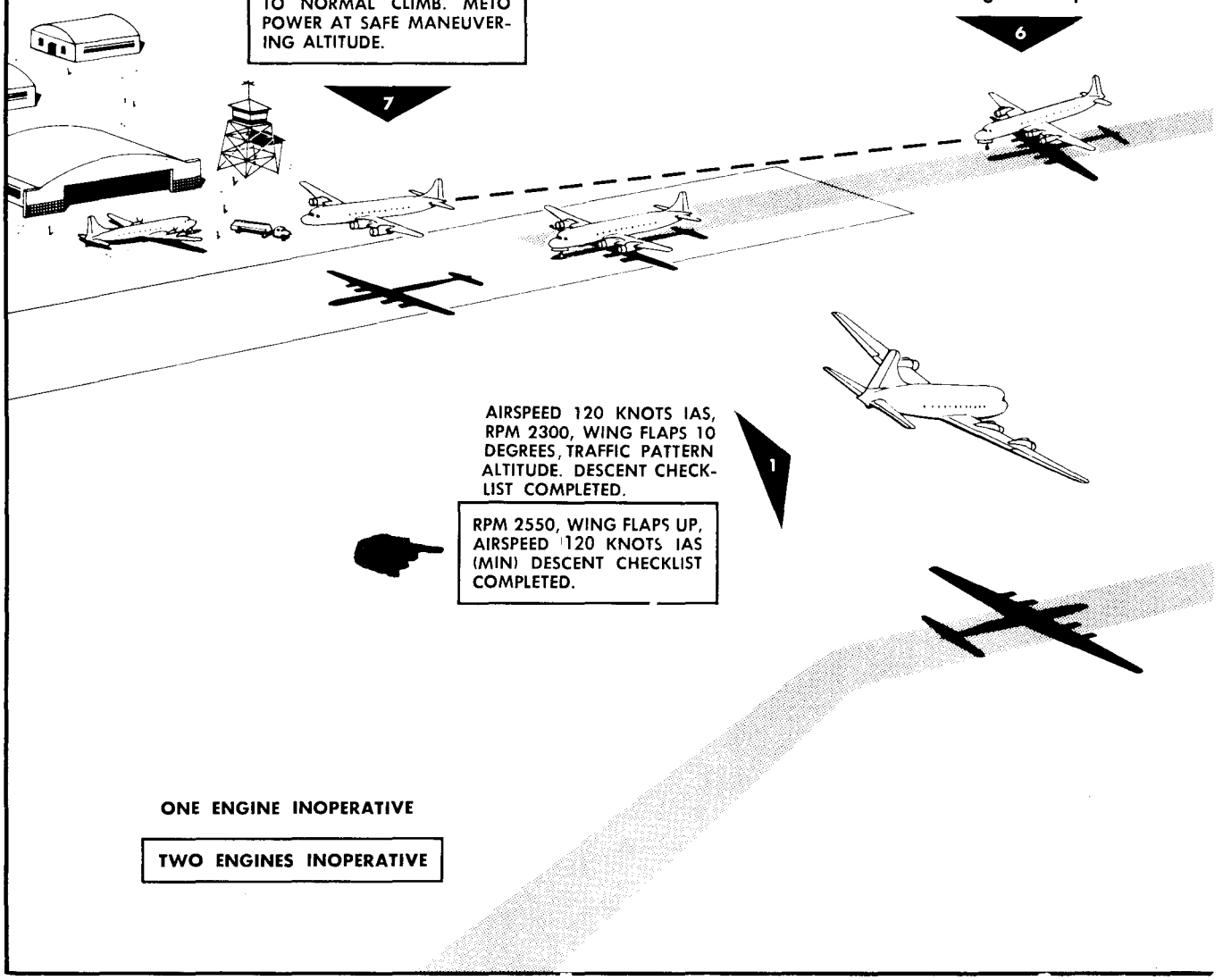
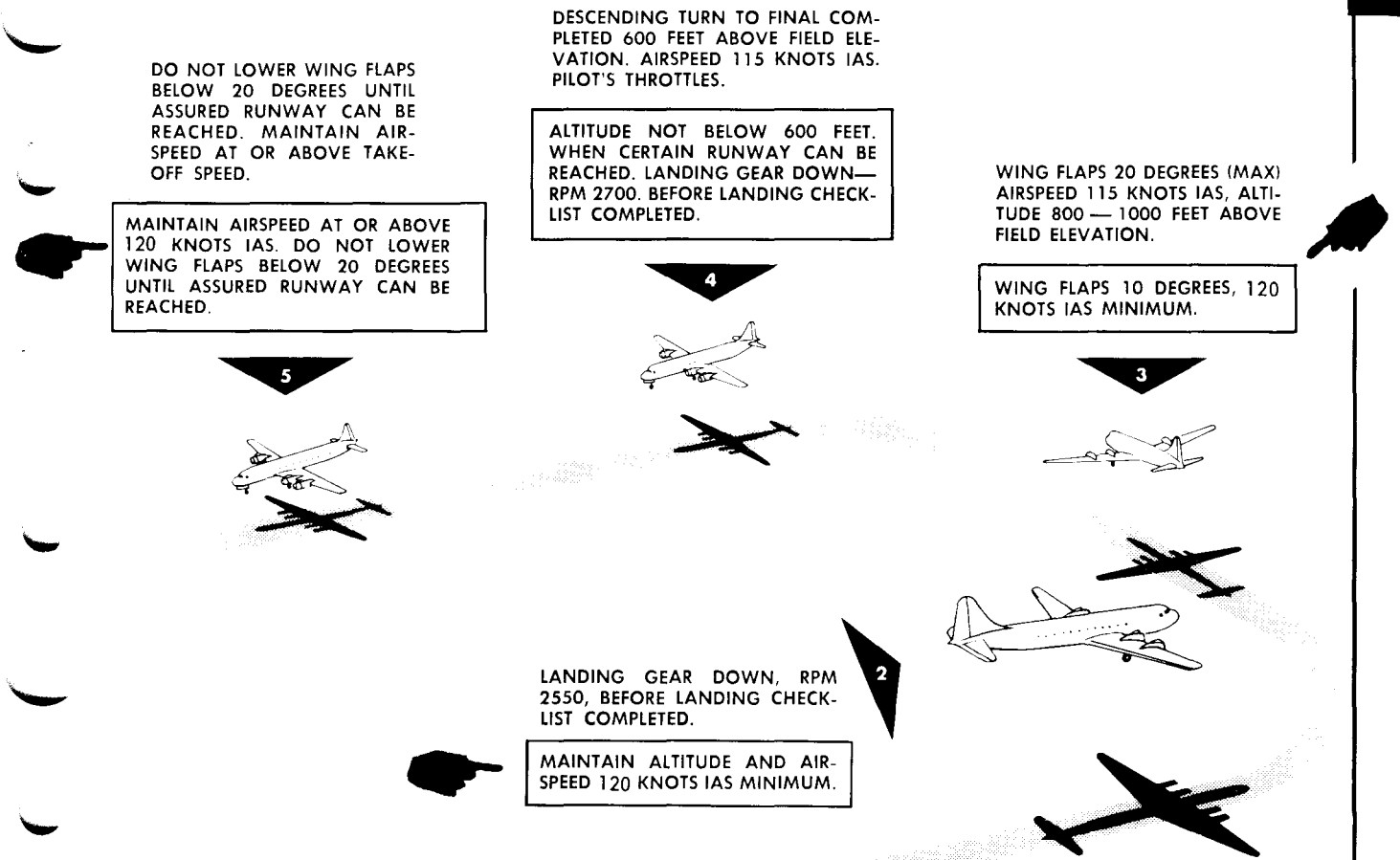


Figure 3-2 (Sheet 1 of 2) X1-214

INOPERATIVE — Typical



WARNING:

WITH THE LIMITED POWER AVAILABLE, A SUCCESSFUL TWO-ENGINE GO-AROUND IS CRITICALLY DEPENDENT UPON AIRCRAFT GROSS WEIGHT, EXISTING AIRSPEED, DEGREE OF WING FLAPS EXTENSION, AND THE ALTITUDE AT WHICH THE GO-AROUND IS INITIATED.

Note:

Traffic pattern shown is typical for gross weight 63,500 pounds, and must be modified to comply with local field conditions and for variances in gross weight. For two- or three-engine performance data and other non-standard conditions, refer to the appendix.

Figure 3-2 (Sheet 2 of 2) X1-213

To help hold the affected main landing gear in the back and down position (approximately 3 degrees aft stagger) it is recommended that the aircraft be landed in as near a three-point attitude as possible. Apply light braking action to the wheels of the defective landing gear during the landing ground roll to prevent the landing gear from folding forward. As the aircraft approaches a stop, the engine on the affected side should be slowly advanced toward 1500 rpm. The gradual addition of power before stop will lessen any lurch or rock back caused by bottoming reaction of the nose gear strut. Maintain 1500 rpm on the affected landing gear side and shut down the remaining engines. This procedure applies a constant back tension on the defective landing gear. Do not move the aircraft or reduce power on the engines until the landing gear down lock pin has been installed. In event the landing gear downlatch has failed, it will be impossible to install the down lock pin properly; therefore, the upper and lower drag link will have to be tied or strapped at the center hinge point to the main landing pivot prior to stopping the engines.

NOSEWHEEL SHIMMY.

Nosewheel shimmy is an indication of an unbalanced condition of the nosewheel or failure of the nosewheel steering system. If this occurs during take off, decreasing the load on the nosewheel will decrease the shimmy tendency; therefore, pull the nosewheel off the ground as soon as possible. If shimmy occurs during the landing roll, decelerate gradually, since loading the nosewheel will increase the shimmy tendency. On landing with a known shimmy condition, keep the nosewheel off the ground as long as possible.

CRASH LANDINGS.

In the event of a landing gear malfunction where any gear will not extend, take the necessary action and make an emergency landing as conditions dictate. In any case, preparation is the key to a successful landing. If crash equipment is available the use of foam on the runway is recommended to minimize aircraft damage through reduction of fire potential, providing there is an adequate supply of foam available and that enough is retained to extinguish any flash fire that might develop after the aircraft has come to a stop. Landing should be made as soon as possible after the foam has been laid. In placing the foam emphasis should be made on putting it in the area where the aircraft will come to a stop. In the case of a landing with the nose gear or one main gear retracted, foam should be laid in a strip sufficiently wide to insure that the malfunctioning gear stays in the foam area. For a belly landing with all gear retracted, sufficient area should be covered to insure that the nacelles are in the foam. The crash crew should be apprised of the probable point of touchdown. It is much more desirable to land in dry runway and slide into the foam than to run out of the foam onto dry runway.

Time permitting, passengers should be informed of the circumstances, the aircraft geographical position, required safety precautions, actions required of them during the emergency, and their safest course of action upon vacating the aircraft. Brief the crew on procedures to be used during landing, and perform such checklist items as may be required before entering the final **phases of the landing. The crew should assume their ditching position. After the aircraft has come to a complete stop, the flight engineer will standby to assist pilot and co-pilot. Make a normal approach and landing in a slightly nose high attitude, using full flaps. There is a tendency to overshoot with any of the gear retracted, particularly with all gear retracted for a belly landing. Consider this in planning the approach so as to make contact at the desired point on the runway.**

In the event of an emergency landing immediately after takeoff, warn the crew and passengers of the impending action and perform such IMMEDIATE ACTION checklist items as time permits. The following procedures outline the steps to be taken under varying circumstances.

Nose Landing Gear Retracted– Main Landing Gear Down.

In the event that the nose gear cannot be extended, and the main landing gear is down,

landing can be accomplished either by allowing the nose to settle to the runway, or maintaining a nose high attitude and allowing the aircraft to come to a stop resting on the tail skid.

For a nose-down landing, make a normal approach, landing in the runway in a slightly nose-up attitude. Immediately on contact with the runway apply sufficient up-elevator to keep the aircraft in a level attitude and retract the wing flaps. Maintain a level attitude until full up-elevator is reached. As the nose starts to pitch over, lower the nose to the runway. If the nose is held too high just before elevator effectiveness is lost, nose contact with the runway will be severe. Do not apply brakes prior to the nose contacting the runway. After the nose is on the ground, apply as little braking as possible to maintain directional control.

The technique used when not allowing the nose section to contact the runway is similar to that outlined above with the following exceptions. Prior to landing, cargo or passengers must be shifted aft to insure an aft cg so that the nose will not settle as the aircraft slows down and still insure that the aircraft is controllable during final approach.

WARNING

For a nose-down landing an aft cg, not to exceed the normal limit of 33% MAC is recommended to lighten the load on the nose. For a nose-high landing, shifting cargo or passengers to an aft cg of 36.7% MAC will insure that the aircraft will remain in a nose-up attitude after landing providing brakes are not used during the final portion of the landing ground roll. As the cg is shifted beyond the normal limit of 33% MAC longitudinal stability will be reduced, requiring increased attention of the pilot to control the aircraft as the cg is moved aft. When passengers are relocated to adjust the cg, they must be assigned to seats and provided with seat belts.

After the main gear has contacted the runway, maintain a nose-high attitude and retract the wing flaps to reduce blanking of the elevator as the tail is lowered. Lower the tail until the tail skid contacts the runway before elevator effectiveness is lost. Do not use brakes otherwise the nose will pitch over.

The following procedures will be used prior to and during landing for either nose-down or nose-up landing as noted:

1. Gross Weight—Reduce **(FE).**

   Jettison loose equipment and non-critical cargo, retaining only enough to maintain the required cg. Time permitting, circle the landing area to reduce fuel load to minimum required for landing.

Note

On aircraft with fuselage fuel tanks installed, it may be impossible to obtain an aft cg with fuel in the fuselage tanks. If time does not permit using the fuel from the fuselage tanks, fuel can be transferred to the wing tanks by placing the fuel tank selector levers and crossfeed selector levers ON, placing the fuselage fuel tank selector handle ON, and turning on the fuselage tank booster pump.

WARNING

Monitor the fuel quantity indicators closely to insure that the fuel is shut off to the tanks before they are full to prevent overflow, and that transfer from the fuselage tanks is stopped before the tank quantity is depleted below 50 gallons. Under no circumstances other than landing emergencies will fuel transfer be accomplished.

2. Cargo—Relocate and secure **(FE).**

   Relocate cargo as necessary to obtain cg required for type of landing to be made. Make certain that all cargo is securely tied down.

3. Passengers—Briefed and secured (P).

   Time permitting, the pilot or his designated representative will inform passengers of the circumstances, aircraft geographical position, required safety precautions, actions required of them, emergency exits, and safest course of action on vacating the aircraft.

4. All unnecessary Equipment–OFF **(FE).**

   Turn off all unnecessary equipment, anti-icers, heaters, etc.

5. APP — OFF **(FE).** as 14 Sec. 5-K

5A. AIMS/FFF-EMERC P,CP,FE).

6. Battery and Generator Switches–OFF **(FE).**

   After final radio call before landing, turn off all electrical power.

7. **Alarm Bell — ON (P).**

   Approximately 10 seconds prior to touchdown, turn on alarm bell and leave ON.

8. **Throttles — CLOSED (P).**

   Close throttles just prior to touchdown.

9. **Master ignition switch — OFF (CP).**

   Master ignition switch will be turned OFF just prior to touchdown.

10. **Wing Flaps — UP (CP).**

    As soon as touchdown is made on the main gear the copilot will retract the wing flaps as directed by the pilot.

11. **Engine fire extinguisher selector handles — PULL (P, CP).**

12. **CO_2 cylinder discharge handles — PULL (P, CP).**

    If fire or smoke is noticed after sliding to a stop, discharge both CO_2 cylinders before abandoning the aircraft.

13. **Full system controls — OFF (P, CP).**

    Immediately after throttles are closed, place mixture controls to IDLE CUT OFF and fuel tanks selector levers OFF.

14. **Abandon the aircraft.**

    Supervise the evacuation of all personnel and abandon the aircraft.

CAUTION

If a nose high landing is made, do not permit any movement of passengers or cargo within the cabin unless a fire exists. Movement in the cabin can upset the balance of the aircraft, allowing the nose to settle. Wait until the ground crew can install jacking equipment under the nose or tie the tail to a ground securing point.

Either Main Gear Retracted—Nose Gear Down.

When either main landing gear will not extend, it is recommended that the landing gear be retracted and a crash landing be made. If, for any reason, either main gear cannot be retracted, the following technique should be used for landing on the remaining gear.

If time permits, reduce gross weight as much as possible by jettisoning cargo and using the remaining fuel load. Use as much fuel as possible from the side on which the landing gear is retracted to lighten the load on that wing for better control after touchdown. Plan the approach to touchdown on the side of the runway of the extended main gear regardless of the headwind component. A crosswind from

the side with the gear retracted will assist in holding the wing up during the initial ground roll, providing the wing is held up, but will tend to turn the aircraft into the wind and force the wing down after forward speed is lost and the wing drops below level flight attitude. A crosswind from the side with the extended gear will tend to reduce the rate of turn due to the weather vane effect.

Make a normal approach with wing flaps full down. Ground contact should be made in a slightly tail-down attitude with the wings level. Ease the nosewheel into the ground as soon as possible after contact is made, and hold full aileron to keep the wing up on the side with the gear retracted. Use elevator as necessary to keep the nosewheel in firm contact with the runway, and maintain directional control with rudder, nosewheel steering, and moderate use of brakes on the remaining gear. As forward speed is lost and the wing settles, apply full braking action to the remaining gear to reduce the skid and pivoting around the wing tip. Be alert for indications of fire. Perform the following steps prior to, and during landing.

1. Gross Weight—Reduce **(FE).**

   Jettison all loose equipment and non-critical cargo. Time permitting, reduce the fuel load in the wing on the side with the gear retracted by operating all engines from tanks on that side.

Note

Retaining maximum available fuel load on the side opposite the retracted gear will assist in holding the wing down on that side after touchdown. However, asymmetrical loading will make control of the aircraft more difficult during the approach.

2. Cargo—Secure **(FE).**

   Make certain that any cargo not jettisoned is securely tied down.

3. Passengers—Briefed and secured (P).

   Time permitting, the pilot or his designated representative will inform the passengers of the circumstances, aircraft geographical position, required safety precautions, actions required of them, emergency exits, and the safest course of action on evacuating the aircraft.

4. Emergency Exits—OPEN **(FE).**

   Open all emergency exits and forward portions of the main cargo door (Auxiliary cargo door—HC-54). Either jettison doors or make sure they are securely tied down.

5. All Unnecessary Equipment-OFF **(FE).**

   Turn off all unnecessary equipment such as anti-icers, heaters, etc.

6. **APP — OFF (FE).**

7. Battery and Generator Switches—OFF **(FE).**

   After final radio call before landing, turn off all electrical power.

8. **Alarm Bell** — ON (P).

   Approximately 10 seconds prior to touchdown turn on alarm bell and leave on.

9. **Throttles** — CLOSED (P).

   Close throttles just prior to touchdown.

10. **Master ignition switch** — OFF (CP).

    Master ignition switch will be turned off just prior to touchdown.

11. **Engine fire extinguisher selector handles** — Pull (P, CP).

12. **Brakes** — As Required (P).

    After nosewheel contacts the ground, use moderate braking as necessary.

When wing settles, apply maximum braking to reduce skidding and pivoting around wing tip.

13. CO_2 cylinder discharge handles — PULL (P, CP).

If fire or smoke is noticed after sliding to a stop, discharge both CO_2 cylinders before abandoning the aircraft.

14. Fuel system controls — OFF (P, CP).

Place mixture controls to IDLE CUT OFF and fuel tank selector levers OFF.

15. Abandon the aircraft.

Check that all personnel have been evacuated and abandon the aircraft.

Both Main Gear Retracted-Nose Gear Up or Down.

In the event that none of the landing gear can be extended, make a crash landing. If equipment is available, the runway should be foamed. Make a normal approach and landing, taking into consideration the tendency to float after flare-out due to decreased drag. Opening the cowl flaps to full open on the final approach will provide additional aerodynamic drag which will assist in slowing the aircraft. Touchdown in a slightly tail-down attitude, being careful not to hold the tail so low that the nose is slammed violently onto the runway after initial contact.

If the nose gear is extended, proceed as with all gears retracted but with a lower tail-down attitude. Hard contact with the runway with the nose gear before the tail skid touches down may cause porpoising. Keep wings level as long as possible. The rudder will have little effectiveness in maintaining directional control due to drag of the tail skid, however, some nosewheel steering control will be available during the initial portion of the landing, unless hydraulic failure was the cause of the landing gear malfunction.

Procedures prior to, and during landing, are the same as for landing with one main gear retracted except for the use of brakes. In the event of a crash landing immediately after takeoff, perform such immediate action checklist items as time permits.

NO FLAP LANDING.

a. Compute ground roll distance from a point of touchdown at the approach end of the runway.

Note

Without anti-skid brakes or reverse thrust to minimize landing roll additional precuations and measures will be required to execute this maneuver safely.

1. Obtain ground roll distance from applicable chart (figure A6-1). This figure represents ground roll distance for full flap configuration. Multiply the ground roll distance for full flaps by 175% (see correction factor table on chart).

Note

This figure does not include total landing distance from 50 feet over runway threshold.

2. Make corrections for RCR (see figure A6-2).

WARNING

It is important that proper correction of the landing ground roll be applied so that the crew will be aware of conditions which may be marginal.

3. Based on computations made above, select a runway for landing which provides adequate safety margin.

B. Proceed at normal pattern altitude and plan on approach in power-on condition with RPM 2550.

Note

Minimum airspeeds specified are based on emergency landing at design gross weight of 73,000 pounds. Vs should be computed for variances in gross weights.

1. Fly downwind at 135 KIAS (130% Vs minimum).

2. Upon turning base, complete BEFORE LANDING Checklist and maintain 125 KIAS (120% Vs minimum).

CAUTION

Maximum speed with the landing gear extended is 125 KIAS.

3. Roll out on final at a minimum of 600 feet above field elevation and approximately two miles from end of runway. It may be desirable to plan the roll-out at a distance greater than two miles in order to provide more time to stabilize the approach angle and/or airspeed. If this is done however, altitude above the runway must be increased proportionately so that a minimum descent rate of 500 fpm can be maintained.

Note

Due to increased airspeed there will be a tendency to overshoot the turn onto final approach accordingly.

4. Touchdown a 120% Vs. Touchdown below 120% Vs should not be attempted since it is possible to drag the tail skid at lower airspeeds.

Note

During the no-flap approach and touchdown, aircraft attitude will be more nose high than experienced during normal landings. The The abnormal attitude should pose no problem to forward visibility when the proper descent of approximately 500 fpm is maintained.

5. Immediately after touchdown throttles closed and cowl flaps to full open if possible.

6. Maintain nose high attitude to effect the maximum use of aerodynamic drag.

CAUTION

Do not obtain too extreme a nose high attitude as it is possible to drag the tail skid at low airspeeds with zero or partial flaps.

7. As lift is lost on elevator lower nosewheel to runway.

Note

Nosewheel contact with the runway can be severe due to the abnormally nose-high attitude at touchdown and lack of cushioning effect from wing flaps.

8. Maintain directional control with rudder and initiate hydraulic brake emergency operation if possible.

WARNING

Use brakes cautiously, over use of brakes could result in a locked wheel and severe yaw of the aircraft and/or tire blowing out.

9. Be prepared to use emergency airbrakes.

CAUTION

Airbrakes may have to be initiated prior to loss of rudder effectiveness if directional control cannot be maintained. Inability to extend wing flaps by utilizing emergency hydraulic fluid remaining in reservoir for use by the hand pump could also indicate a complete lack of hydraulic brakes and nosewheel steering.

JETTISONING.

In the event it becomes necessary to jettison cargo during flight, care must be taken to avoid damage to the horizontal stabilizer. Proceed as follows:

a. Reduce airspeed to 120 knots IAS maximum.

b. Lower wing flaps to 10 degrees to attain a tail-high attitude.

c. Cargo may be jettisoned through the aft cabin emergency exits, through the

forward portion of the main cargo door, or through the auxiliary cargo door (HC-54).

WARNING

- Personnel jettisoning cargo will be secured to the interior of the aircraft fuselage.
- When there is a possibility of ditching, do not jettison the forward portion of the main cargo door unless absolutely necessary.

EMERGENCY ENTRANCE.

The structure of the fuselage is so designed in various areas that ground personnel can chop through the structure to gain emergency entrance to the fuselage interior. These areas are clearly outlined in yellow on the fuselage outer surface, as shown in figure 3-3.

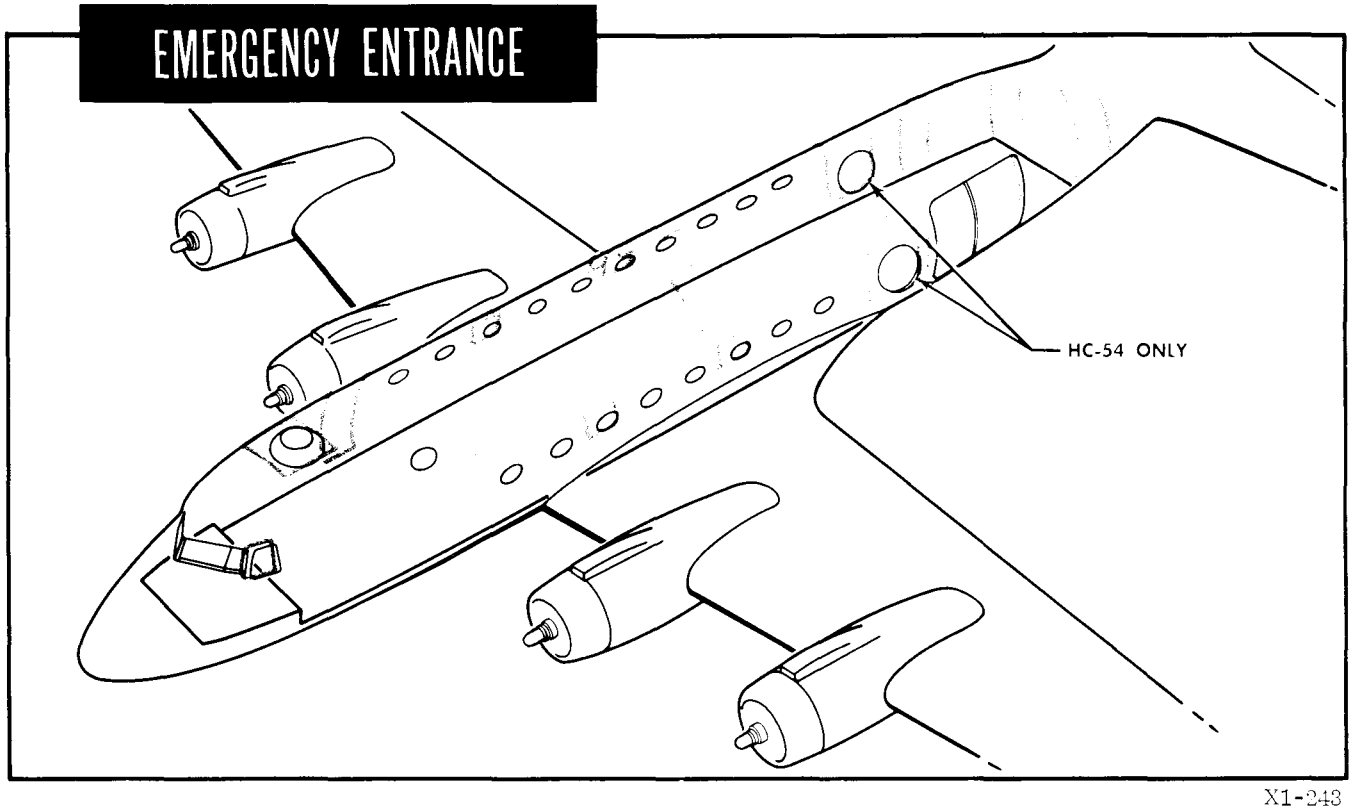


Figure 3-3

AIRCRAFT SYSTEMS FAILURE.

ENGINE IGNITION SYSTEM FAILURE.

Operation With One Or More Dead Cylinders.

In event both spark plugs are inoperative on the same cylinder or cylinders of an engine, the possible courses of action are as follows:

a. Feather propeller.

b. Operate at reduced power. This will be done only as a precaution, if other engine trouble exists which might cause a compound emergency.

c. Operate normally only as a last resort for safe aircraft operation.

Operation With One Magneto Dead.

When one spark plug in a cylinder is inoperative, the cylinder operates as if the spark is retarded 10 to 15 degrees. Continued operation will not be detrimental to the engine if the engine is operated at reduced power. Operation at high settings may cause detonation. With one spark plug in one or more cylinders inoperative proceed as follows:

a. Operate at reduced power.

b. Operate at high power settings only in cases of emergency. If operated in this manner engine instruments and ignition analyzer must be closely monitored for detonation and possible failure.

ELECTRICAL POWER SYSTEM FAILURE.

Circuit Breakers.

If a circuit breaker opens, disconnecting power to any circuit, it indicates an overload or short in that circuit. If the circuit breaker reopens after being reset, do not use that circuit unless the safety of the aircraft depends upon its continued operation.

WARNING

Manually holding a circuit breaker closed after it has been reset and has reopened constitutes a fire hazard, inasmuch as the circuit is then functioning without adequate protection.

Current Limiters.

In the event that a current limiter burns out, or blows, the cause of the failure should be determined and corrected before the limiter is replaced. If it becomes necessary to restore power from the inoperative generator or feathering pump in flight, replace the current limiter as follows:

a. Place all generator switches, battery switch, and APP load switch in the OFF position.

WARNING

Make certain that all electrical power sources are OFF before removing the generator junction box cover.

b. Remove the cover from the generator junction box, figure 1-21.

c. Disconnect the lead from the generator relay at the current limiter terminal for the defective limiter.

d. Remove and replace the defective current limiter, connect the leads and replace junction box cover.

e. Restore electrical power in the following sequence; (1) battery switch—ON, (2) generator switches for generators known to be functioning properly—RESET, generator switch on which malfunction occurred—RESET.

f. Monitor the generator on which malfunction occurred. If abnormal conditions appear, turn generator OFF and continue operation with remaining generators.

Generators.

If there is no indication on one loadmeter/ammeter, but the others indicate normal readings, make the following check.

a. Check the generator voltage, which should be the same as that of the other generators (approximately 28 volts).

b. If the switch for the malfunctioning generator is ON, turn it OFF and see whether the readings of the other ammeters increase. If they do, the trouble may be attributed to the ammeter. Place the generator switch momentarily to RESET, then to ON.

c. In case a generator failure warning light illuminates, indicating a fault in the generator system, place the generator switch momentarily to RESET, then ON. If the warning light does not go out and stay out, turn the generator switch OFF and check the generator field reset circuit breaker on the generator circuit breaker panel in the crew lavatory. If the generator field

reset circuit breaker retrips, the generator can be reset with the generator switch ON by depressing the reset pushbutton on the generator field control relay in the top of the generator control equipment junction box located in the crew lavatory. If the generator failure warning light does not go out, turn the generator switch OFF.

d. If the generator voltage reads zero and the generator failure warning light is illuminated, check the field circuit breaker on the generator circuit breaker in the crew lavatory. If it has tripped, reset it. If it immediately retrips, leave it off and turn the generator switch OFF.

CAUTION

The following safety precautions must be observed in connection with the electrical system to prevent complete loss of electrical power and possible fire.

a. Do not remove a voltage regulator without first opening the field circuit breaker. Except in emergency, voltage regulators should not be removed in flight.

b. In the event a generator current limiter burns out, or blows, the cause of failure should be determined and corrected before the limiter is replaced.

c. If the generator OFF light, or the generator loadmeter, indicates that a generator has failed, check the loadmeters on the remaining generators. If an overload is indicated, nonessential equipment should be turned off.

d. All generators should be operating and properly paralled before takeoff.

CAUTION

If a generator fails, the inoperative generator switch must be placed in the OFF positions and the generator field circuit breaker pulled, due to potential fire hazard. Land as soon as practical and determine the cause of the malfunction.

e. If for any reason the total number of operating generators is reduced, the loadmeters must be observed to determine if any generator is in danger of being overloaded. If so, certain nonessential, or least essential loads must be turned off. If a generator is operating at overload, there is not only the danger of burning out the generator, but also the danger of blowing the generator feeder current limiter. This is especially true for single, or perhaps even two-generator operation. Normally do not turn off an overloaded generator, as to do so merely transfers the load to the remaining generators and makes the overload condition worse. Either adjust the voltage regulator down on the overloaded regulator or reduce the load.

Single-Phase Inverter Failure.

In the event that the NORMAL (MAIN) single-phase inverter fails the radar inverter, which supplied power to the AN/APS-42 radar equipment, can be used by placing the inverter switch in the EMER. (SPARE) position. With the switch in this position, the search radar equipment will be inoperative. Failure of ac power is indicated when the red inverter failure light, located below the inverter switch, comes on.

Note

- Inverter failure lights are not installed on Navy C-54 aircraft.
- If both inverters are inoperative, and only 28 volt dc power is available, the course deviation indicator (CDI), the warning flag, and the TO/FROM indicator on the course indicator will operate normally. However, the glide slope indicator will be inoperative.
- See the Ac Power Distribution chart (figure 1-19) for the applicable aircraft to determine communications equipment, navigation equipment and engine instruments which will be inoperative when ac power is lost.

Three-Phase (Autopilot) Inverter Failure.

In the event of main three-phase inverter failure, position the Autopilot Inverter Switch to SPARE. Failure of ac power to the autopilot and N-1 compass is indicated by the autopilot inverter failure light coming on.

Flight Instrument Power Failure.

The turn and slip indicator(s) and attitude indicator(s) are vacuum driven and are not affected by an electrical power failure. On some aircraft, the copilot's indicators are electrically powered.

Note

If vacuum pressure is lost in flight on either No. 2 or No. 3 engine, and the opposite engine appears to have negative vacuum pressure, a check should be made of the manifold intake to the vacuum system. The manifold intake is located below the instrument panel forward of the control pedestal, and should be clear of foreign matter blocking the intake.

Dc Bus Failure.

In the event of failure of the dc power distribution system, no electrical power will be available to the aircraft electrical systems except the alarm bell which is connected directly to the batteries.

Batteries.

In case of complete generator failure, all electrical loads should be monitored to conserve the energy of the batteries. Heavy loads such as suit heaters and buffet should be turned off, and only essential radio or electrical equipment should be used. Start APP if installed.

HYDRAULIC SYSTEM FAILURE.

Note

If hydraulic pressure falls from 3000 ± 50 psi to 2600 psi in less than 1 minute, the drop should be considered excessive, and action should be taken to isolate the malfunctioning system.

If the hydraulic system pressure fails to come up to, and remain within limits (engine operating, bypass handle down) during ground operation, stop the aircraft, shut down the engines, and investigate. Do not take off until the malfunction is corrected.

If the hydraulic system pressure fails to come up to, and remain within limits during flight, with the bypass handle down, proceed as follows:

a. Hydraulic selector or control handles (all systems)—OFF or NEUTRAL.

b. Hydraulic system bypass handle—UP.

c. Hydraulic fluid level—Check.

If the fluid level is low, refill the hydraulic reservoir. If the hydraulic fluid level goes down after refilling, an external leak is indicated.

Note

In the event of an external leak, the engine pumps may pump overboard all hydraulic fluid in excess of 2.5 gallons which will remain in the reservoir for emergency use by the hand pump.

If the quantity is normal, an internal leak is indicated. With an internal leak, actuation of units may be slower than normal. If the quantity is normal and the pressure is zero, with the bypass handle down, failure of the engine driven hydraulic pumps is indicated.

Landing Gear Extension (Free Fall).

When hydraulic system pressure is below normal, the landing gear may be extended as follows:

1. Hydraulic Equipment Handles—OFF or NEUTRAL **(FE).**

   Deactivate all hydraulically operated equipment to facilitate exclusive use of the hydraulic system pressure for gear extension assistance.

2. Emergency Landing Gear Extension Handle—OPEN (aft) **(FE).**

   Set handle to the OPEN position. This will bypass any hydraulic pressure from the up-side of the retraction cylinder.

3. Hydraulic Hand Pump Selector Handle—CLOSED **(FE).**

   With the selector handle in the CLOSED position, sufficient pressure can be built up in the lines with the hand pump, to break the uplatch shear bolts without pressurizing the hydraulic accumulator.

4. Landing Gear Lever—DOWN (CP).

   With the landing gear lever in the DOWN position the landing gear will extend as the uplatches are released.

5. Hydraulic Hand Pump—As required **(FE).**

   If the landing gear does not fully extend, operate the hand pump approximately 60 cycles to build up pressure on the extension side of the hydraulic gear actuator.

Wing Flap Emergency Operation.

The wings flaps may be lowered or raised with the hydraulic system pressure at zero, as follows:

1. Hydraulic Equipment Handles—OFF or Neutral **(FE).**

   Deactivate all hydraulically operated equipment to facilitate use of hydraulic system pressure for flap actuation.

2. Hydraulic Hand Pump Selector Handle—CLOSED **(FE).**

   With the selector handle in the CLOSED position, pressure generated by the hand pump can be routed directly to the flap actuating cylinder without pressurizing the accumulator.

3. Wing Flap Lever—As required (UP or DOWN) **(FE).**

4. Hydraulic Hand Pump—As required **(FE).**

   Operate hand pump to position flaps as desired setting.

5. Wing Flap Lever—OFF **(FE).**

   Place lever in the OFF position to trap pressure in the actuating cylinder to maintain desired flap setting.

6. Landing Gear Lever—DOWN (CP).

   Place landing gear lever in the DOWN position prior to landing.

Note

If a go-around becomes necessary after the landing gear and flaps have been extended with the normal hydaulic system inoperative, the landing gear should be left down and the wing flaps retracted.

Hydraulic Brake Emergency Operation.

Should the engine-driven hydraulic pumps fail or the hydraulic system malfunction, no

hydraulic pressure will be available for brake operation. Braking action can be obtained by operating the hydraulic hand pump to supply pressure for brake operation.

Note

Do not pump the brake pedals while pressure for brake operation is being supplied by the hand pump as this will expend hydraulic pressure unnecessarily.

It is recommended that braking action be attempted by fully depressing the brake pedal and then operating the hand pump.

Note

No benefit will be derived by attempting to pressurize the hydraulic accumulator since in all probability a bad leak exists in the system and no system pressure would be obtainable

Emergency Airbrake Operation.

If no hydraulic pressure is available to operate the brakes, the emergency airbrake system can be used to stop the aircraft. After touchdown, use aerodynamic braking as long as possible. Do not use the airbrakes until the nose wheel is on the ground. On most aircraft there is no intermediate position of the airbrakes; they are either full ON or OFF. On some aircraft however, the air brake system employs a metering valve which permits gradual application of the brakes. However, to insure positive braking of the aircraft, this metering method should not be used. Instead, allow the aircraft to reduce to a minimum speed during ground roll, runway length permitting, and then apply full emergency airbrake system pressure by pulling the emergency airbrak handle.

CAUTION

- If an attempt is made to use the metering system, valuable air pressure may be lost without appreciably reducing speed or stopping the aircraft.

- The hydraulic system must be bled after operation of the airbrake system to release the wheel brakes and eliminate air from the system which would cause erratic braking action or result in no braking action.

Note

When air pressure is applied, equal pressure will be provided to both brakes, therefore, individual braking will not be possible.

Excessive Hydraulic Pressure In Flight.

If hydraulic pressure in excess of 3300 psi is encountered, the hydraulic pressure regulator valve may be sticking. If the hydraulic system bypass handle cannot be pulled up, accomplish the following:

a. Place emergency landing gear extension handle in the OPEN (aft) position.

b. Place landing gear lever in the UP position.

c. Pull hydraulic system bypass handle up.

If the hydraulic system bypass handle still will not come up, there is no cause for alarm. In this condition, the emergenc landing gear extension valve acts as a bypass.

Refilling Hydraulic Reservoir In Flight.

WARNING

- If entry to the hydraulic compartment is required, bleed off the system pressure prior to entering compartment.

- While refilling the hydraulic reservoir in flight, do not lower the hydraulic system bypass handle to the DOWN position when the filler neck cap is removed, otherwise fluid will be blown back through the filler neck.

Note

In an emergency, any fluid except gasoline may be used to fill the hydraulic reservoir, When other than hydraulic fluid is used, make a notation in the Form 781 so that the system may be purged.

The hydraulic reservoir may be refilled in flight through the auxiliary filler neck located in the auxiliary oil system control box in the navigator's compartment. The funnel is also stowed in this box. If considerable fluid has been lost due to a leak, it is advisable to refill the hydraulic reservoir. If a hydraulic leak is known to exist in the main system, there is no reason to refill the reservoir, since the additional fluid will also be lost. To service the hydraulic reservoir in flight proceed as follows:

a. Pull hydraulic system bypass handle up.

b. Loosen the hydraulic vent line cap enough to relieve system air pressure.

c. Remove the vent line cap and filler neck cap.

d. Attach the funnel assembly and fill the reservoir with hydraulic fluid.

Proper level can be ascertained by checking the hydraulic reservoir quantity gage located to the right of the pilots' overhead panel or the sight gage on the reservoir.

DITCHING.

Ditching an aircraft requires more coordination on the part of each crew member than does any other emergency procedure. In order to develop coordination, the pilot must require each crew member to demonstrate his knowledge of ditching duties by oral questioning prior to departure from the home base. Circumstances permitting, efforts should be made prior to the day of departure to conduct trial-run ditching drill during which all crew members actually perform their assigned duties.

Upon determining that ditching is probable, the pilot will inform the crew and passengers by interphone or verbally, to prepare for ditching.

Note

This alert should not be confused with the six short rings of the alarm bell which is the signal to assume ditching positions.

ALARM BELL SIGNALS.

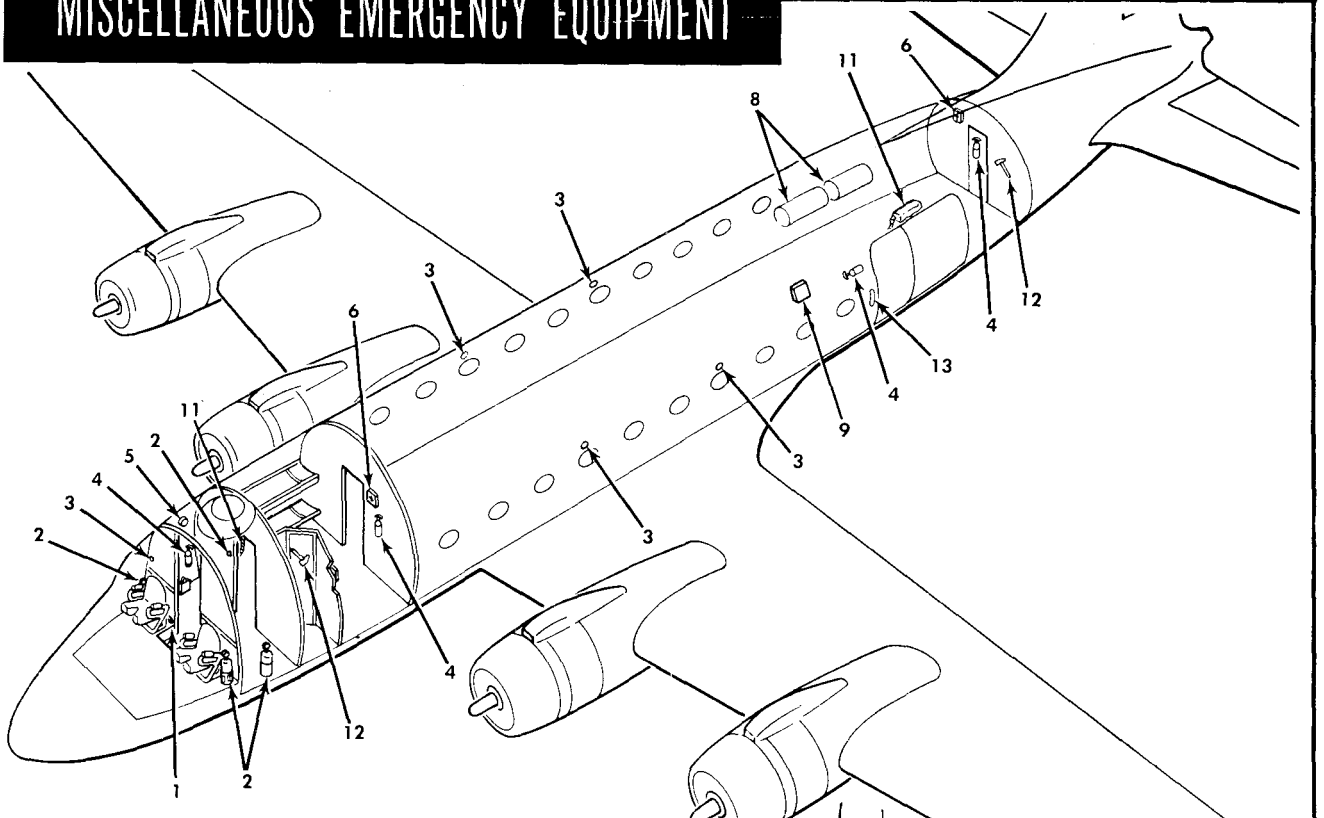
The following are the standard alarm bell signals for ditching:

6 Short Rings	Assume ditching positions.
1 Long Ring	Prepare for ditching impact.

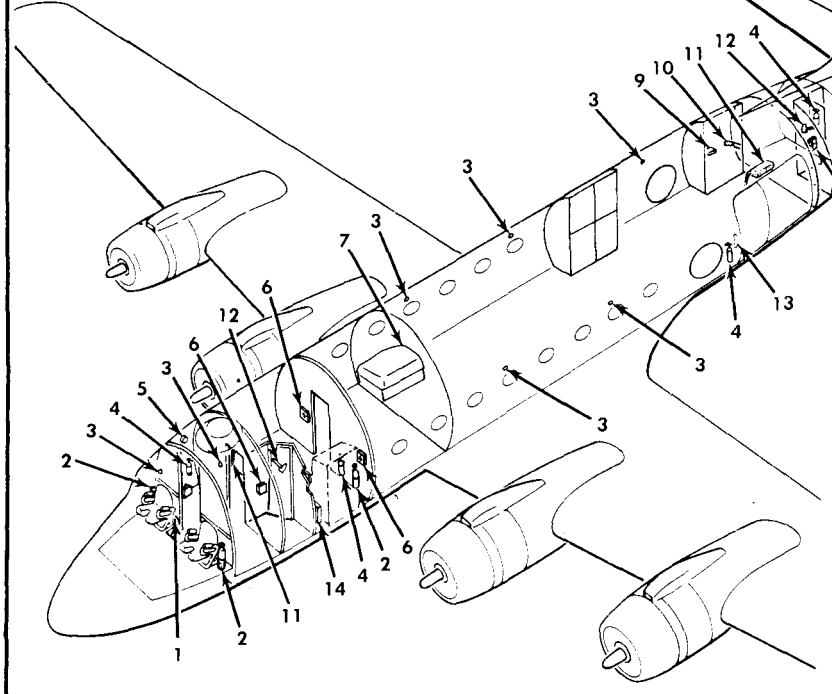
EMERGENCY EQUIPMENT LOCATIONS.

Emergency equipment should be in readiness at all times when flying over water. Prior to each overwater flight, the pilot will insure that the following equipment is aboard, in serviceable condition, and stowed in the proper places (see figure 3-4).

MISCELLANEOUS EMERGENCY EQUIPMENT



USAF and NAVY C-54 — Typical



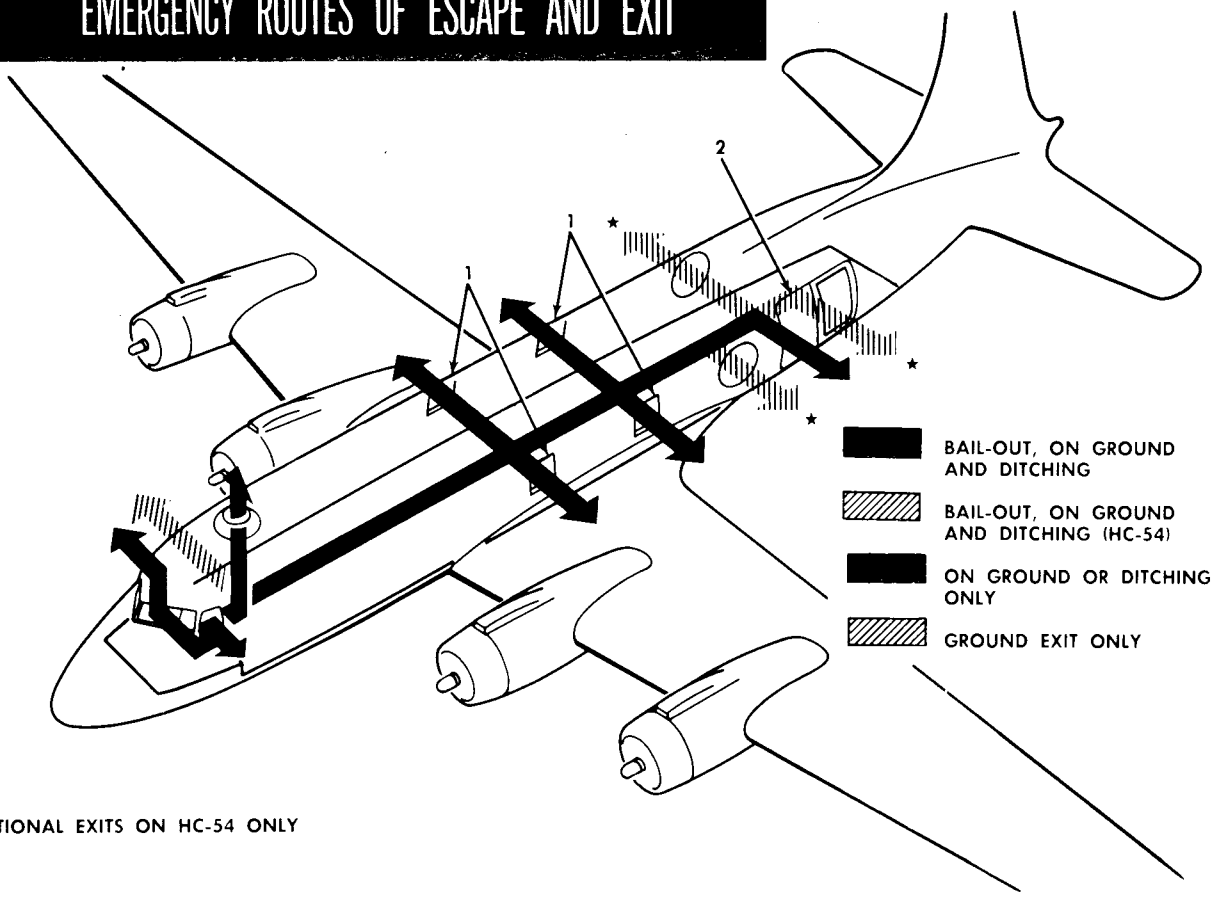
HC-54 — Typical

1. PYROTECHNIC PISTOL AND FLARE STOWAGE CONTAINER
2. PORTABLE OXYGEN CYLINDERS AND SMOKE MASK (4 PLACES)
3. EMERGENCY IMPACT LIGHT (AS NECESSARY)
4. FIRE EXTINGUISHER (4 PLACES)
5. PYROTECHNIC PISTOL MOUNT
6. FIRST AID KIT (4 PLACES)
7. TWENTY-MAN LIFE RAFT (HC-54)
8. LIFE RAFTS (USAF AND NAVY C-54)
9. EMERGENCY RADIO
10. EMERGENCY SAFETY HARNESS (HC-54 ONLY)
11. ESCAPE ROPE (2 PLACES)
12. HAND AXE (2 PLACES)
13. MAIN CABIN DOOR EMERGENCY RELEASE
14. PARACHUTES (HC-54)

Figure 3-4

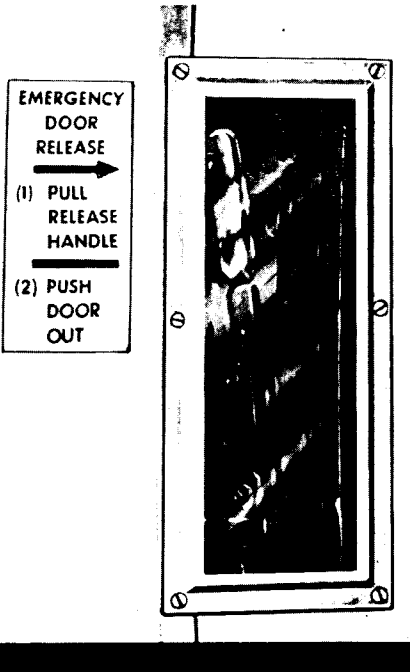
X1-241

EMERGENCY ROUTES OF ESCAPE AND EXIT



★ ADDITIONAL EXITS ON HC-54 ONLY

1. EMERGENCY EXIT (OVER THE WING) DOOR HANDLE (TYPICAL)



2. MAIN CARGO DOOR EMERGENCY RELEASE HANDLE

Figure 3-5

X1-242

Liferafts.

A sufficient quantity of liferafts will be aboard to accommodate maximum authorized cabin capacity plus crew.

Passenger liferafts will be securely stowed at strategic locations near the emergency exits.

Life Vests.

One life vest will be conveniently located for each person on board.

Each crew member will insure that his life vest, CO_2 cartridges, and flashlight are in serviceable condition before each flight.

Emergency Radio Transmitter.

One emergency radio transmitter will be stowed adjacent to the main cargo door.

Anti-Exposure Suits.

One anti-exposure suit will be conveniently located for each person on board when required.

Very Pistol.

Aboard in accessible location.

SEA EVALUATION.

USE OF SURFACE VESSEL IN SEA EVALUATION.

Many ships will be able to give an estimate of the sea conditions. Coast Guard Ocean Station vessels maintain current information on wind direction and velocity, swell direction, height, length and velocity, and can give a suggested ditching heading if so requested. If no surface vessel assistance is available, Air Rescue facilities can give invaluable assistance to the pilot in distress, even though they are not in the immediate vicinity.

ROUTINE SEA EVALUATION.

Whenever practicable, pilots flying over water should make a habit of evaluating the sea. This procedure ensures a tentative ditching heading at all times. It also provides practice in swell system identification.

SEA EVALUATION TECHNIQUE.

The pilot should begin analyzing the surface from as high an altitude as the surface can be seen, 2000 feet or more if possible. The primary, or basic swell can readily be distinguished from high altitude and will be seen first. It may be hidden beneath another system plus a surface chop, but from altitude the largest, and most dangerous swell system will be the first one recognized. This will appear as a definite pattern or differences in light intensity on the surface; not necessarily a line of shadows, although this might be possible near sunrise or sunset, but a pattern will definitely stand out. By watching the pattern for a few seconds, the direction of motion of the system can be determined. Once the basic swell system is found, look in different directions for other systems. Perhaps the second system may not be visible until altitude is decreased, so continued scanning is required. Some minor systems may not be seen until an altitude of 500 to 800 feet is reached. The wind-driven sea, if any, will, easily be recognized by the appearance of white caps. Ironically, once a low altitude is reached, 1500 feet or so, the basic system will disappear from view, hidden by the secondary system and the local chop. It is essential, therefore, to plot the direction of the various systems as they are recognized.

Plans for ditching cannot be made without taking the wind direction into consideration. Waves move downwind and the spray from wave crests is also blown downwind. Swells however, do not always indicate the wind direction, and can be very large, even when the wind is calm. Swells are the result of underwater or distant disturbances. Use the following table for estimating the surface wind velocity.

WIND VELOCITY (KNOTS)	SEA CONDITIONS	HEIGHT OF SEA (FEET)
1-3	Small, occasional ripples	1/2
4-6	Small wavelets	1
7-10	Large wavelets, crest begins to break	2
11-16	Small waves, frequent white caps	5
17-21	Moderate waves, many white caps	10
22-27	Large waves, white foam crests, some spray	15
28-33	Heavy seas, pronounced white streaks	20
34-40	Higher waves of greater length, foam blown in well marked streaks in direction of wind	25
41-47	Dense streaks of foam, sea begins to roll, spray affects visibility	30

Once primary and secondary systems are recognized, the analysis can be checked by flying on various headings around the compass just above the water, the lower the better. When flying into any system the seas appear to be steep, fast and rough. When flying down or parallel to the systems, the surface appears much more calm. This is true because the relative speed over the uneven surface is materially reduced.

DITCHING PROCEDURES.

The following ditching procedures are based on experience gained in ditching similar aircraft.

NORMAL POWER-ON DITCHING.

Experience gained in ditching the aircraft has shown that the best results are obtained, after using up most of the fuel supply, to lighten the aircraft and reduce stalling speed. Empty tanks also contribute to better flotation. Ditch with full flaps while power is still available. Power will enable you to choose the spot for ditching, to obtain the best possible sea conditions, and the most favorable landing position and aircraft attitude. The best airspeed for ditching is 10 knots above power-off stall speed. This will afford a slightly nose high attitude at touchdown. Under no circumstances should the aircraft be in a stalled condition at touchdown, as this will result in severe impact forces and cause the aircraft to nose into the sea.

In daylight, it is recommended that the aircraft be ditched along the top of the swell, parallel to the row of swells, if the wind velocity does not exceed 30 knots. In high winds, it is recommended that ditching can be conducted upwind, to take advantage of lowered forward speed. However, it must be remembered that the possibility of ramming nose-on into a wave is increased, as is the possibility of striking the tail on a wave crest and nosing in.

WARNING

Over open sea, the pilot must be more exacting and alert when judging height. Ditching directly into the sun should be avoided, when possible, due to the blinding effect of the sun.

PARTIAL POWER DITCHING.

When ditching with one or more engines inoperative, the following should be kept in mind.

a. If two engines are inoperative on the same side of the aircraft, use power on the opposite inboard engine only.

DITCHING CHART

CREW MEMBER/DUTY
PILOT Order crew and passengers to prepare for ditching. Order MEC to assume duties. Order radio operator to start emergency radio procedure. (Shoulder harness — Fastened, Navy C-54.)
COPILOT As directed by pilot. (Shoulder harness — Fastened, Navy C-54.)
MASTER EVACUATION CONTROLLER OR FLIGHT ORDERLY Assume MEC duties. Supervise preparation of passengers.
ASSISTANT EVACUATION CONTROLLER Make sure that main cargo doors which may take in water are closed and locked. Open forward emergency exits over the wings.
NAVIGATOR Stow essential navigation equipment in navigational equipment briefcase.
FLIGHT ENGINEER Stand by to assist pilot and copilot.
RADIO OPERATOR Send emergency signal (SOS) giving position, altitude, course, speed, and intention of pilot.

Figure 3-6 (1 of 2) X1-21

Note: When possible, the main cargo door will be the primary means of exit. The exits listed below are to be used when the main cargo door is not accessible.

PROVIDE	POSITION	SECONDARY EXIT
Flashlight.	Pilot's seat.	Forward emergency exit over left wing.
Flashlight.	Copilot's seat.	Forward emergency exit over right wing.
Available survival equipment, life rafts, and first aid kit.	Immediately forward main cargo door.	Forward emergency exit over left wing.
Available survival equipment, life rafts, and emergency radio transmitter.	Opposite main cargo door.	Forward emergency exit over right wing.
Navigational equipment and magnetic compass.	Braced against right main cabin bulkhead or in a front seat.	Forward emergency exit over right wing.
Emergency drinking water and first aid kit.	Braced against left main cabin forward bulkhead or in a front seat.	Forward emergency exit over left wing.
First aid kit.	Radio operator's seat	Forward emergency exit over right wing.

Figure 3-6 (2 of 2)

X1-22

b. If power is available from the No. 2 and No. 4 engines, or the No. 1 and No. 3 engines, considerable power may be used to control the aircraft.

c. If symmetrical power conditions exist, use power as required to give the flattest approach and a forward speed of 10 knots above stalling speed.

d. If letting down with an engine inoperative, hold speed 20 knots above stalling speed until flare-out, then reduce airspeed to 10 knots above stalling speed.

UPWIND DITCHING.

The basic rules for ditching, listed in normal power-on ditching, will still apply in addition to the following:

a. Maintain a nose-up attitude; avoid nose striking wave face.

b. Touch down immediately before the crest of a rising wave.

c. Hold the nose up after first impact.

NIGHT DITCHING.

During night ditching, all visual reference to the sea will be greatly reduced. Because of reduced visibility, it is of prime importance that the aircraft attitude be established with the aid of instruments. An airspeed of 20 knots above power-off stall speed should be used throughout the descent until approximately 10 seconds prior to touchdown, at which time an airspeed reduction to 10 knots above power-off stall speed should be made. Maintain the lowest possible rate of descent. The radio low altimeter, set on the 0 to 400 foot scale, should be used to its fullest extent to give an accurate indication of the aircraft height above the water. Use of landing lights will assist considerably in affording more precise depth perception.

Note

Coast Guard surface vessels and Air Rescue aircraft can provide illumination for night ditching.

RAFT LAUNCHING.

When the aircraft has come to a complete stop, the MEC and AEC will launch the rafts. Launching through the forward section of the cargo door presents no particular problem. Rafts should be secured to the aircraft prior to inflating them. The rafts should not be inflated inside the aircraft. Each successive raft launched should be tied to the already launched raft. As a raft is launched it should be loaded with passengers. Every effort should be made to keep the rafts clear of objects that could puncture the raft, such as the flaps or torn metal on the wings or fuselage. Launching rafts through the emergency exits presents a more complex problem. The MEC or AEC must first exit to assist in getting the raft through the opening. The rafts should be inflated and launched outboard of the engines, over the leading edge of the wings (see figure 3-7). The MEC or AEC who preceded the raft, should insure that the raft is properly secured, inflated and loaded. Only small rafts can be launched through the astrodome.

ABANDONING AIRCRAFT.

Evacuation of the aircraft after ditching should be accomplished in an orderly manner in the shortest time possible. The crew and passengers must not leave ditching positions until the aircraft has come to a complete stop. Each group of passengers, plus the crew, must evacuate the aircraft in the correct order through the emergency exit previously assigned to them, carrying the equipment that has been allotted to them. They must also make sure that each piece of equipment for use in the raft is secured by lines, to prevent its being lost overboard in passing from aircraft to raft. The safety ropes provided at the forward section of the cargo door

and at the astrodome should be used while boarding the rafts.

WARNING

Do not jump into the rafts.

CREW ACTIONS.

At the first indication that ditching is a possibility, crew members will accomplish the following:

PILOT.

First Actions.

1. Crew and Passengers — Alerted.

   The pilot will alert the crew and advise them to accomplish appropriate pre-ditching duties. He will use the CALL position on the interphone, giving a verbal alert and have a crew member relay the word to the cabin compartment.

2. Distress Signal — Initiated.

   The pilot will direct the radio operator and copilot to notify ground stations of the emergency, aircraft position, intentions and approximate ditching position.

3. Cabin—Prepared.

   Direct crew to assemble, stow and secure the emergency equipment each is to provide (see figure 3-6) near his ditching position. Direct the MEC to assign passengers any additional emergency equipment, stow and secure the equipment near the exit. Direct the flight **engineer** and MEC to secure cargo and loose equipment that is too bulky to jettison and which will not be taken aboard the rafts after ditching.

4. Survival Equipment—Donned.

   Make sure that all personnel remove tie, loosen collar and all tight clothing and discard sharp objects that might puncture survival equipment. Don anti-exposure suit and life vest. Direct MEC to supervise passenger donning of anti-exposure suits and life vests.

Approximately 10 Minutes Prior to Ditching (6 Short Rings On Alarm Bell).

5. Passengers—Prepared.

   Direct MEC to advise passengers that ditching will be in approximately 10 minutes. Ring alarm bell 6 short rings.

6. FASTEN SEAT BELT and NO SMOKING signs—ON.

7. FINAL MESSAGE DISPATCHED.

   Direct radio operator and copilot to transmit final messages, giving intended position of ditching. Direct radio operator to lock liaison transmitter key down.

8. Emergency Cabin Lights—ON.

   Direct MEC to turn on impact lights.

9. Emergency Exits—Opened.

   Direct MEC to open the two forward over wing exits in the cabin compartment. Secure the hatch panels or throw **them overboard. Direct flight engineer to remove and stow astrodome hatch.**

WARNING

The astrodome hatch opens inward, not outward.

10. Ditching Positions—Assumed.

    Navigator will check cabin occupants to see that they are securely positioned and then report to the pilot. Navigator will then assume ditching position making sure to secure himself.

11. Unnecessary Electrical Equipment—OFF.

12. Cockpit and Cabin Heaters—OFF.

13. Radio (low) Altimeter—ON, 0-400 foot scale.

14. Landing Lights—As required.

15. Wing Flaps—Full DOWN.

16. Alarm Bell — ON.

Ten seconds prior to impact, turn the alarm bell on as a signal to "Brace for impact."

After Ditching.

17. Evacuate.

Check condition of copilot, proceed to escape exit, checking to see that all occupants have left the aircraft. If crew compartment door is blocked or jammed, leave through the astrodome. After evacuation is accomplished, board last life raft and paddle well clear of the aircraft.

18. Assume Command.

The pilot will be in command of the raft flotilla. When two rafts are launched, the pilot will command one raft and the copilot the other. If evacuation circumstances preclude planned raft boarding, raft occupancy will be as directed by the pilot. The pilot, MEC and flight **engineer,** should be in one raft and the navigator, radio operator, and copilot in another raft. After this basic assignment is accomplished, distribute the survivors equally among the life rafts. Every effort should be made to tie the rafts together.

COPILOT.

First Actions.

1. Emergency call — Transmitted.

At the direction of the pilot, transmit "MAYDAY" on UHF and VHF emergency channels three times followed by distress message. Example: "MAYDAY MAYDAY MAYDAY" Air Force 58762, Air Force 58762, Air Force 58762, Number 1 and 3 engines feathered, (Position, time, altitude, course, airspeed, and intentions)."

1A. See CS-14 Sec 3-M for next step.

2. Survival Equipment—Donned.

Remove tie, loosen collar and tight fitting clothing and discard sharp objects that might puncture survival equipment. Don anti-exposure suit and life vest.

Approximately 10 Minutes Prior to Ditching (6 Short Rings On Alarm Bell).

3. Final Distress Message—Transmitted.

At the direction of the pilot, transmit latest distress information to ground stations, giving intended ditching position.

After Ditching.

4. Evacuate.

After the aircraft has ceased forward motion, check condition of the pilot, proceed to the cabin. Supervise loading of the first life raft. When raft is loaded board raft last (see figure 3-7). If crew compartment door is blocked or jammed, leave aircraft through astrodome.

MASTER EVACUATION CONTROLLER (MEC).

First Actions.

1. Passengers—Alerted.

   Upon notification from the pilot, advise passengers of the emergency and initiate their preparation.

WARNING

Have all personnel remove ties, loosen collars and tight fitting clothing and discard sharp objects that might puncture survival equipment.

2. Cabin—Prepared.

   a. Assemble, stow, and secure emergency equipment near ditching positions (see figure 3-7). Assign passengers any additional equipment that is to be taken aboard the life rafts and make sure that it is secure for ditching.

   b. Assist AEC in securing cargo and loose equipment that is too bulky to jettison and which will not be taken aboard the life rafts after ditching.

   c. Position and secure passengers at their ditching stations.

Note

If ditching at night, instruct all passengers to turn on emergency flashlights attached to life vests (if available).

   d. Advise the navigator when the main cabin is prepared for ditching.

3. Survival Equipment—Donned.

   Remove tie, loosen collar and tight fitting clothing, and discard sharp object that might puncture survival equipment. Don anti-exposure suit and life vest.

Approximately 10 Minutes Prior to Ditching (6 Short Rings On Alarm Bell).

4. Ditching Station—Assumed.

   Proceed to ditching station and secure in position. (See figure 3-7.)

After Ditching.

5. Rafts—Launched.

   After forward motion has ceased, assist in launching, inflating and loading of life rafts.

Note

If primary exit is not accessible, assist the flight **engineer** in launching raft through the left hand forward emergency exit.

WARNING

Do not launch raft over aft edge of wing, since jagged metal may be present which will puncture the raft.

6. Evacuate

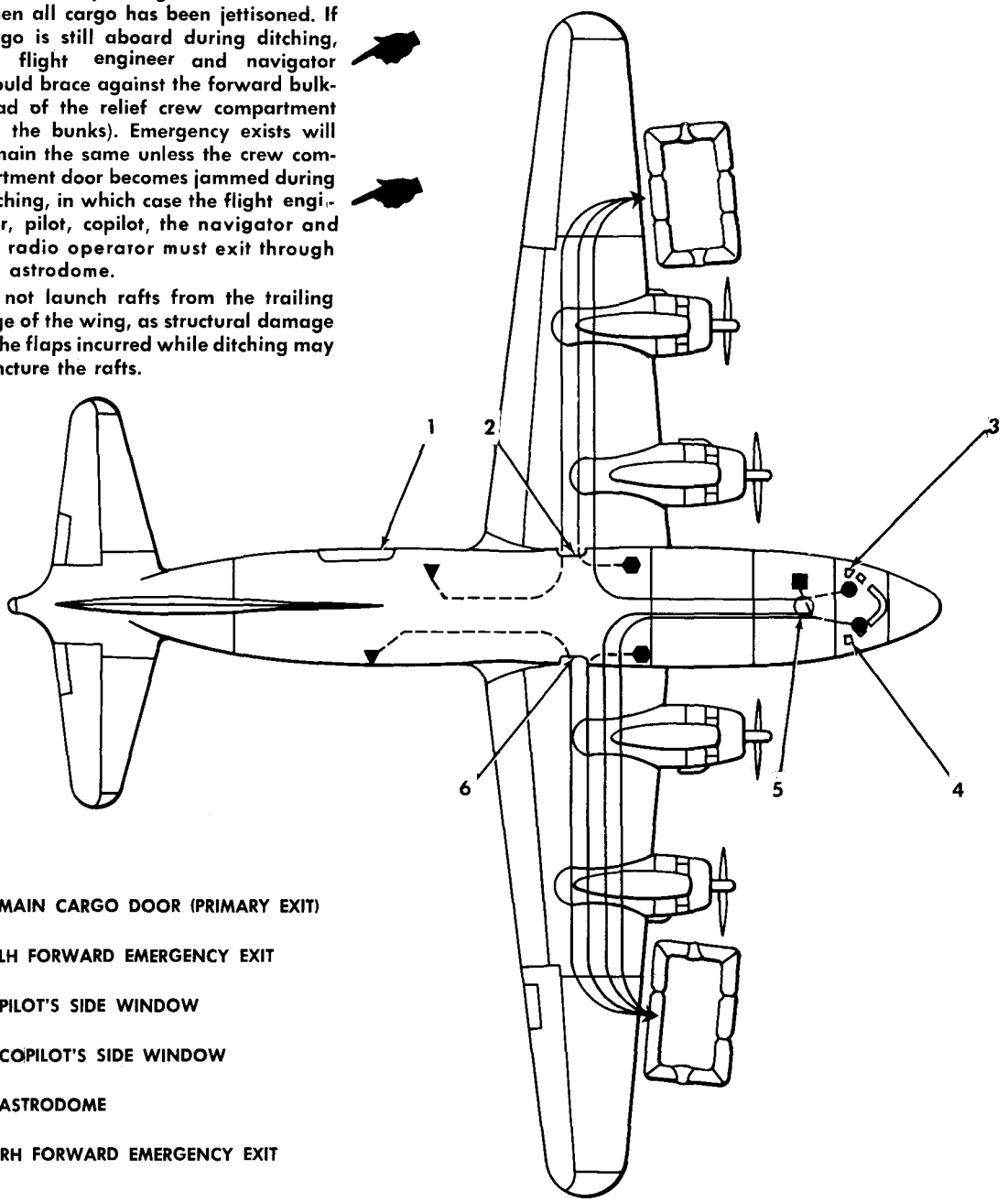
   The MEC will board the last raft to be loaded, just prior to the flight engineer and pilot.

DITCHING SEQUENCE DIAGRAM

CREW POSITION AND ROUTES OF ESCAPE

Notes:

1. These exits based on non-accessibility of main cargo door. Main cargo door will be used by all crew members, if possible.
2. The below ditching stations are applicable when passengers are aboard or when all cargo has been jettisoned. If cargo is still aboard during ditching, the flight engineer and navigator should brace against the forward bulkhead of the relief crew compartment (on the bunks). Emergency exists will remain the same unless the crew compartment door becomes jammed during ditching, in which case the flight engineer, pilot, copilot, the navigator and the radio operator must exit through the astrodome.
3. Do not launch rafts from the trailing edge of the wing, as structural damage to the flaps incurred while ditching may puncture the rafts.



1. MAIN CARGO DOOR (PRIMARY EXIT)
2. LH FORWARD EMERGENCY EXIT
3. PILOT'S SIDE WINDOW
4. COPILOT'S SIDE WINDOW
5. ASTRODOME
6. RH FORWARD EMERGENCY EXIT

● PILOT ● CO-PILOT ■ RADIO OPERATOR ⬢ FLIGHT ENGINEER ⬢ NAVIGATOR ▼ MEC ▼ AEC

Figure 3-7

X-111

NAVIGATOR.

First Actions.

1. Aircraft Position — Plotted.

   Determine exact geographical position of the aircraft. Pass to the pilot the course to be flown to the nearest land. Obtain resume of emergency from pilot and what his intentions might be. Pass position, time, course, airspeed, altitude, nature of emergency, and intentions of the pilot, to the radio operator for inclusion in the distress message.

2. Stool — Positioned.

   Place and secure navigator stool directly below the astrodome and raise seat to highest position.

3. Emergency Equipment — Stowed.

   Put essential navigation equipment, including Very pistol, flares, smoke signals, and aircraft standby compass, in brief case and stow near ditching station (see figure 3-7).

4. Survival Equipment—Donned.

   Remove tie, loosen collar and tight fitting clothing and discard sharp objects that might puncture survival equipment. Don anti-exposure suit and life vest.

5. Cabin—Secured.

   Advise pilot when cabin is secured for ditching.

Approximately 10 Minutes Prior to Ditching (6 Short Rings On Alarm Bell).

6. Ditching Station—Assumed.

   Proceed to ditching station and secure in position (see figure 3-7).

After Ditching.

7. Evacuate.

   After aircraft has ceased forward motion, proceed to ditching exit and assist in launching and inflating the first life raft. The Navigator will be the first man aboard the first life raft launched.

Note

If primary exit is not accessible, assist AEC in launching raft through the forward emergency exit over the right wing.

WARNING

Do not launch raft over aft edge of wing, since jagged metal may be present which will puncture the life raft.

FLIGHT ENGINEER.

First Actions.

1. Jump Seat — Stowed.

   Stow jump seat to leave escape route for pilot and copilot free of obstructions.

2. Survival Equipment — Distributed.

   Obtain and distribute anti-exposure suits and life vests to crew members. On HC-54 aircraft ensure the 20-man life raft is moved and secured in the lower rear equipment stowage bin.

3. Emergency Equipment — Stowed.

   Assemble emergency equipment required by Ditching Chart (figure 3-6) and secure at ditching station.

4. Survival Equipment Donned.

   Remove tie, loosen collar and tight fitting clothing and discard sharp objects that might puncture survival equipment. Don anti-exposure suit and life vest.

5. Astrodome—Removed.

As directed by the pilot, remove astrodome and stow in forward lavatory.

WARNING

The astrodome opens inward, not outward.

6. Cabin preparation—Completed.

Approximately 10 Minutes Prior to Ditching (6 Short Rings On Alarm Bell).

7. Ditching Station—Assumed.

Proceed to ditching station and secure in position (see figure 3-7).

After Ditching.

8. Evacuate.

After aircraft has ceased forward motion, proceed to ditching exit and assist in launching, inflating, and loading the life rafts. The flight **engineer** will be among the last personnel to board the last raft.

Note

If primary exit is not accessible, assist MEC in launching raft over the left wing.

RADIO OPERATOR.

First Actions.

See CS 14 Sec 3-N for new STEP

1. Emergency — Declared.

Immediately upon notification by the pilot of a possible ditching, set IFF/SIF to EMERGENCY, then transmit distress call.

2. Emergency Message — Sent.

As soon as possible the navigator will furnish aircraft position, altitude, course, airspeed, nature of emergency, and pilot's intentions to be transmitted on air-ground frequency in use at the time. After transmission of distress message, request Direction Finding Service.

WARNING

Once communication has been established, remain on the same frequency for the duration of the emergency.

Note

Continue emergency communications procedure every 10 minutes.

3. Survival Equipment—Donned.

Remove tie, loosen collar and tight fitting clothing, and discard sharp objects that might puncture survival equipment. Don anti-exposure suit, and life vest.

Approximately 10 Minutes Prior To Ditching (6 Short Rings On Alarm Bell).

4. Final Communication—Sent.

At pilot's direction send latest information, giving intended ditching position, and set transmitter for continuous tone.

5. Ditching Station—Assumed.

Fold radio table. Secure in position. Obtain and use any available padding for body protection.

After Ditching.

6. Evacuate.

After aircraft has ceased forward motion, check condition of pilot and copilot, collect classified material, proceed

to ditching exit, and board first life raft with first aid kits. If crew compartment door is blocked or jammed, leave aircraft through the astrodome.

ASSISTANT EVACUATION CONTROLLER (AEC).

First Actions.

1. Emergency Exits—Removed.

   As directed, remove the left hand forward and right hand forward emergency exits in the cabin to afford a secondary route of escape, in the event that the main cargo door becomes inaccessible after ditching.

2. Cargo and Baggage—Jettisoned.

   Jettison all cargo, loose equipment and baggage not necessary for survival that can be discharged through the emergency exits.

3. Emergency Equipment—Secured.

   Assemble, stow and secure emergency equipment and the emergency radio transmitter (figure 3-6) near ditching station.

4. Cargo and Loose Equipment—Secured.

   Secure any cargo or loose equipment too large to jettison.

5. Survival Equipment—Donned.

   Remove tie, loosen collar and tight fitting clothing and discard sharp objects that might puncture survival equipment. Don anti-exposure suit and life vest.

Approximately 10 Minutes Prior To Ditching (6 Short Rings On Alarm Bell).

6. Ditching Station—Assumed.

   After cabin is secure and ready for ditching, proceed to ditching station opposite the main cargo door and secure in position (see figure 3-7).

After Ditching.

7. Evacuate.

   After aircraft has ceased forward motion, jettison main cargo door, launch and inflate life raft, and direct loading of the raft. The AEC should board the first raft with extra equipment, emergency rations, and the emergency radio transmitter.

Note

If primary exit is inaccessible, launch raft through right hand forward exit.

WARNING

Do not launch raft over the aft edge of the wing, since jagged metal may be present which will puncture the raft.

BAILOUT.

See figure 3-5 for emergency exits in flight.

ALARM BELL SIGNALS.

The following are the standard alarm bell signals for bailout.

3 short rings—Prepare for bailout.

1 long ring—Bailout.

BAILOUT PROCEDURE.

Upon the first indication of an emergency, the pilot will give a warning signal to "Prepare for bailout." The warning signal will be three short rings of the alarm bell. When all personnel are ready for bailout, the pilot will be notified by the master evacuation controller or flight steward. When the pilot desires to have all on board abandon the aircraft, he will give a warning signal to bailout which will be one long sustained ring on the alarm bell. In addition to the alarm bell signals, the pilot will give verbal warnings over the interphone. The senior flight steward or flight orderly will ordinarily be the master evacuation controller (MEC) but any crew member may be called upon in an emergency. Exit will normally be through the main cargo door on all aircraft except the HC-54 and through the auxiliary cargo door on the HC-54. Preparation for bailout will be accomplished as follows:

Pilot.

1. Crew and Passengers—Alerted.

   When it is determined that a bailout may be necessary, the alarm bell will be rung three short rings and a verbal warning will be made over the interphone, using the CALL position.

2. Wing Flaps—Set, 10 Degrees.

   Extend wing flaps 10 degrees. This will raise the horizontal stabilizer and afford a bailout path under the stabilizer as well as assist a more rapid reduction in airspeed.

3. Airspeed—120 knots IAS.

4. Autopilot—Engaged.

   Put aircraft on autopilot and engage altitude control.

5. Survival Equipment—Donned.

   Don anti-exposure suit and life vest if over water. Don parachute. Direct MEC to launch all available survival equipment.

6. Landing Lights—Extend and ON.

7. Alarm Bell—ON.

   Give the bailout signal of one long ring on the alarm bell. Also transmit "Bailout" over the interphone.

WARNING

Bailout will not be accomplished over water unless surface vessels are in the immediate vicinity, except in extreme emergencies.

8. Evacuate Aircraft.

   Determine that all personnel are out of the aircraft, then bailout.

Copilot.

1. Survival Equipment—Donned.

   Don anti-exposure suit and life vest if over water. Don parachute.

2. Emergency Signal—Transmitted.

   Upon advice from the pilot, contact ground station, with whom listening watch is being maintained, and declare emergency, giving nature of the emergency and position.

3. Assist Pilot.

4. Evacuate Aircraft.

   As directed by the pilot, proceed to the emergency exit and bailout.

Navigator.

1. Survival Equipment—Donned.

   Don anti-exposure suit and life vest if over water. Don parachute.

2. Position—Determine.

   Give pin-point aircraft position to the pilot, copilot, and radio operator. When radio operator is not carried, turn IFF/SIF to EMERGENCY.

3. Evacuate Aircraft.

   As directed by the pilot, proceed to emergency exit and bailout.

Flight Engineer.

1. Flight **Engineer's** Jump Seat—Stowed.

   Stow jump seat to leave excape route for pilot and copilot free of obstructions.

2. ~~IFF/SIF — EMERGENCY.~~ Delete CS-14 Sec 3-P

3. Survival Equipment—Donned.

   Don anti-exposure suit and life vest if over water. Don parachute.

4. Evacuate Aircraft.

   During bailout keep pilot informed as to progress and advise when completed. As directed by the pilot, proceed to the emergency exit and bailout.

Radio Operator.

See CS-14 Sec 3-Q

1. ~~IFF/SIF — EMERGENCY.~~

   As directed by the pilot, turn on EMERGENCY code on IFF/SIF. Delete

2. Emergency Signal—Transmit.

   As soon as possible, the navigator will furnish aircraft position, course, and speed. Pilot will advise nature of the emergency and his intentions. Transmit this information on air-ground frequency in use at the time.

Note

Once communication has been established, remain in the same frequency for the duration of the emergency.

3. Survival Equipment—Donned.

   Don anti-exposure suit and life vest if over water. Don parachute.

4. Evacuate Aircraft.

   As directed by the pilot, proceed to the emergency exit, taking code book and flimsy, and bailout.

Master Evacuation Controller.

1. Passengers—Prepared.

   Supervise bailout preparation of cabin occupants.

2. Survival Equipment—Donned.

   Don anti-exposure suit and life vest if over water. Don parachute.

3. Main Cargo Door—Jettison.

   Unlock cargo door, pull red handle just forward of door to release hinge pins. Kick door away from the aircraft.

WARNING

Before jettisoning door, personnel must be securely tied to inside of aircraft.

4. Cabin—Ready for bailout.

   Advise flight **engineer** when bailout preparations are complete.

5. Evacuate Aircraft.

   When bailout signal or command is given by the pilot, launch all available survival equipment, and supervise orderly bailout of cabin occupants. Advise flight **engineer** when bailout is completed and bailout.

OVER WATER AND ARCTIC BAILOUT.

Bailout is not recommended unless visual contact is made with adequate surface help. If no rescue vessels are in the vicinity, bailout should be used only as a last resort because of the extreme difficulty of getting the crew together in the water. The large life rafts offer more elaborate survival and signaling equipment than do one-man life rafts. In any but the warmest seas, a man will survive only a few hours if kept afloat by means of a life vest alone. Wearing an anti-exposure suit will increase this time but it still cannot compare with the length of time survival is possible in a life raft. If bailout is required or decided upon, the following procedures are recommended.

a. It is important to keep the crew as close together as possible in the water or in the arctic. Crewmembers can aid each other, expecially in regard to those injured. Most important of all, a group of men on life rafts is much easier to find than a single individual. This is true whether the search is from a surface vessel or from an aircraft. The aircraft should be flown in as tight a circle as conditions will permit, bailing out three or four men at a time, and then come around in relation to the other men or the surface vessel before bailing out the other crewmembers. This should be accomplished in order to place crewmembers as close as possible to other crewmembers or the surface vessel.

b. As in ditching, try to plan the bailout before the last minute. The pilot must warn the crew as soon as bailout is decided. Give three short rings on the alarm bell, and, if time permits, warn the crew on interphone and receive acknowledgements.

c. When the bailout warning is given, crewmembers should check each other's equipment to insure that all straps and packs are properly secured and adjusted. Upon receiving the bailout signal, crewmembers and passengers will evacuate with the least possible delay through the main cargo door or auxiliary cargo door (HC-54) in accordance with the previous procedure or as prescribed by the pilot to cope with the existing emergency.

ABBREVIATED CHECKLISTS.

The Pilots' and Flight Engineers Emergency Abbreviated Checklists for USAF C-54, EC-54, and HC-54 aircraft are contained in T.O. 1C-54D-1CL-1.

The Pilots' and Flight Engineers Emergency Abbreviated Checklists for Navy C-54 aircraft are reproduced following Section II N.

The Navigator's Emergency Abbreviated Checklist is contained in T.O. 1C-54D-1CL-2.

The Radio Operator's Emergency Abbreviated Checklist is contained in T.O. 1C-54D-1CL-3.

The Master Evacuation Controllers Emergency Abbreviated Checklist is contained in T.O. 1C-54D-1CL-4.

The Assistant Evacuation Controllers Emergency Abbreviated Checklist is contained in T.O. 1C-54D-1CL-4.

SECTION IV

DESCRIPTION AND OPERATION OF AUXILIARY EQUIPMENT

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

HEATING AND VENTILATING SYSTEMS.

(See figures 4-1 and 4-2)

Ram ventilating air, at heated or ambient temperatures, is supplied to the main cabin, relief crew's compartment, and pilots' compartment through ducts and is discharged through ceiling anemostats, cold air outlets, and footwarmer outlets. Heat is supplied by three combustion heaters. Fuel is supplied to the heaters from either No. 2 or No. 3 main wing tank. A heater fuel solenoid shutoff valve is mounted in the left main gear wheelwell if fuel is drawn from No. 2 tank. If fuel is drawn from No. 3 tank, the shutoff valve is located in the right wheelwell.

PILOTS' COMPARTMENT (COCKPIT) HEATER.

The pilots' compartment (cockpit) heater, sometimes referred to as the nose heater, is located in the nose section of the aircraft. The heater supplies heated air for the pilots' compartment through the pilot's and copilot's footwarmer outlets, and for the windshield deicing and defrosting panels (see Thermal and Pneumatic Deicing Systems, this section). On some aircraft, the heater automatically maintains a preset discharge air temperature. Heat is regulated by a thermal limit switch which remains closed when the heater air temperature output is below approximately 141° C. When temperature of the air output rises above this limit, the thermal limit switch opens and stops the heater. When the temperature drops, the switch closes, reopening the fuel valve and allowing the heater to resume operation. On this system there is no provision for manually cycling the heater.

On some late aircraft, a variable cycle limit switch, with a remote control knob, is installed to allow manual adjustment of the heater temperature. The variable cycle limit switch allows the selection of the temperature at which the limit switch opens between the temperature range of 32° to 160° C. Operation of the limit switch is the same as for the automatic preset control system.

The heater is protected by an overheat switch which opens the ignition circuit and shuts off the fuel supply to discontinue heater operation in case a temperature of approximately 177° C is reached. When the temperature has lowered, the overheat switch will close; but, because the circuit to the wing tank solenoid has been opened, the heaters will not resume operation.

When the heater has been shut off by the overheat switch, it must be turned off and restarted manually after the temperature has been reduced below the thermal limit switch setting of 141° C or the selected setting of the variable cycle limit switch.

CAUTION

The maximum operating temperature of the heater is 185° C. If the overheat switch fails to shut off the heater at 177° C, the heater must be shut off manually and allowed to cool before restarting.

In flight, ram air is supplied to the heater through an intake duct in the nose of the aircraft. A 28-volt dc powered ground blower is installed to provide airflow for ground operation of the heater or to provide ventilating air to the pilots' compartment without turning on the heater. Footwarmer outlets control the flow of heated or ventilating air to the pilots' compartment. Cold air for ventilation during flight is taken from the ram air intake of the heater.

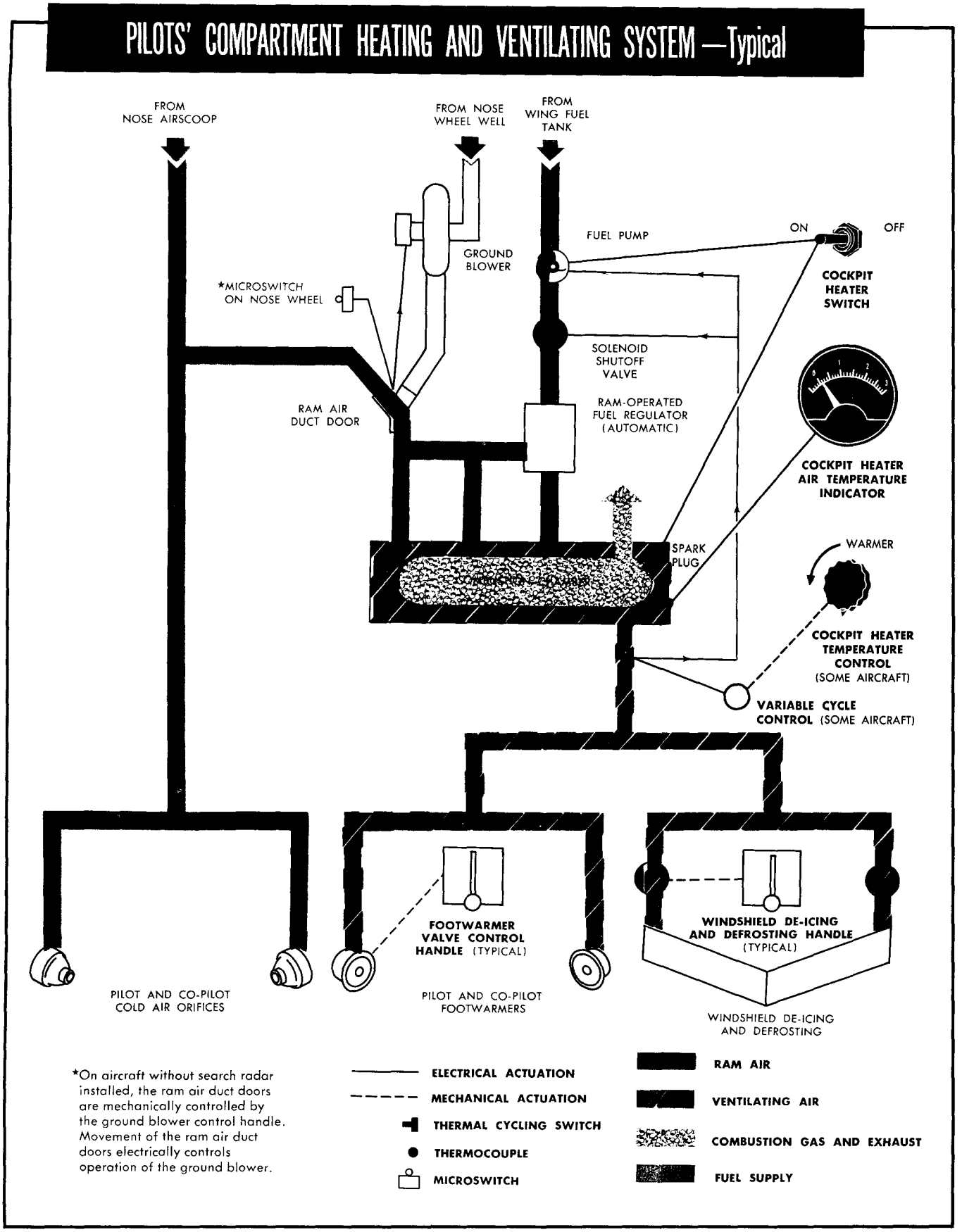
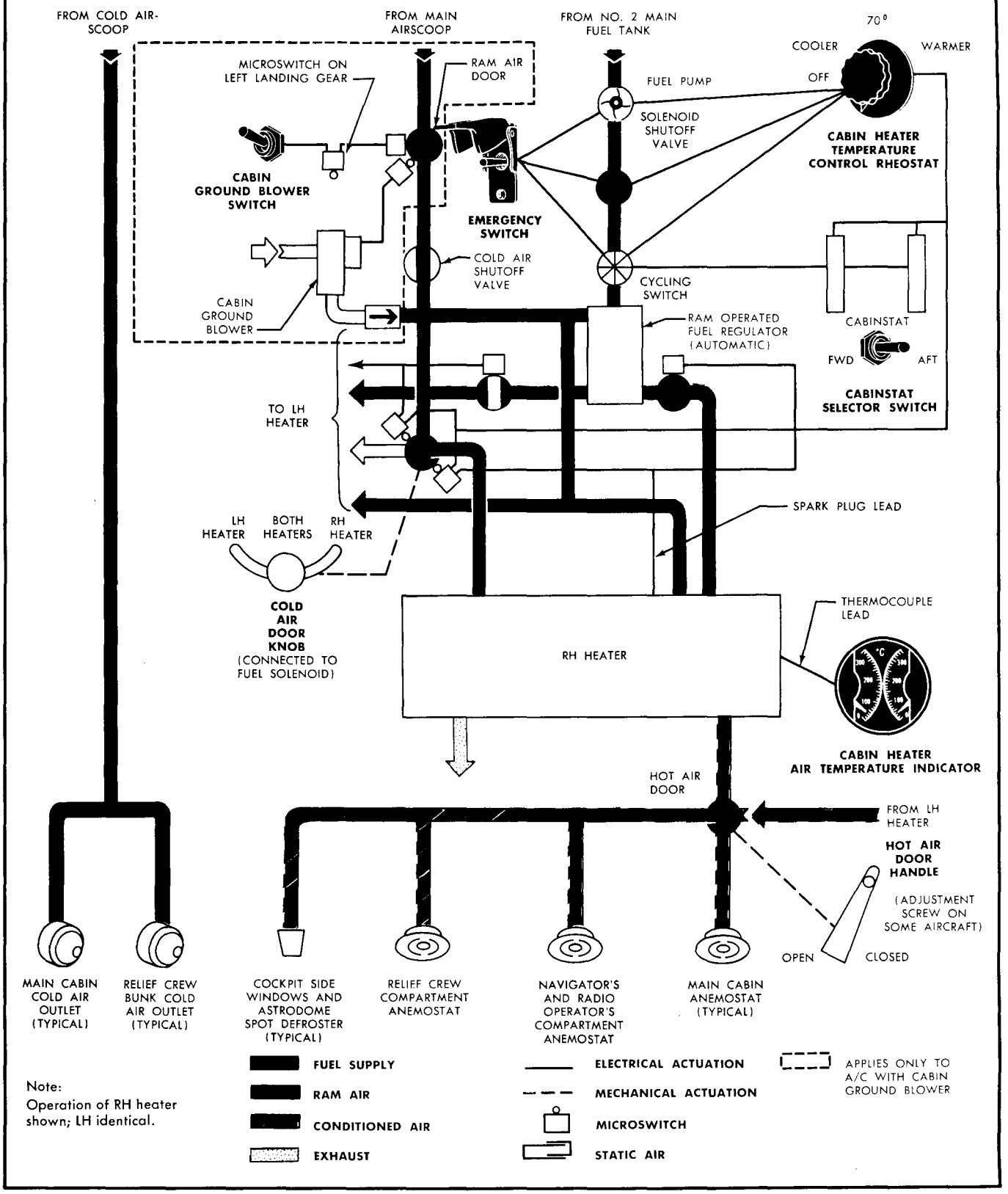


Figure 4-1

X1-130

CABIN HEATING AND VENTILATING SYSTEM—Typical



X1-129

Figure 4-2

PILOTS' COMPARTMENT (COCKPIT) GROUND BLOWER.

A pilots' compartment ground blower (figure 4-1) installed in the nose section of the aircraft provides ventilation or, when operated in conjunction with the pilots' compartment heater, supplies heated air to the pilots' compartment when the aircraft is on the ground. The ground blower is automatically turned on by a microswitch, connected to the nose gear uplatch, when the nose gear is extended and turned off when the gear is retracted. Power for the blower is supplied from the 28-volt dc bus.

Ground Blower Handle (Aircraft Without Search Radar).

On aircraft without search radar installed, the blower must be manually controlled by a ground blower handle, placarded ON and OFF, and installed on top of the glareshield in front of the pilot's seat. Placing the handle in the ON position closes a door in the ram air duct and opens a door in the ground blower duct. Movement of the duct doors completes a 28-volt dc circuit and energizes the ground blower motor. The blower should be turned OFF when above 105 knots IAS to prevent excessive wear on the blower motor.

Note

During icing conditions, if the nose ram air inlet becomes iced over, the ram air switch will deactivate, shutting off the heater. On aircraft with the ground blower handle installed, heater operation may be resumed by placing the ground blower handle in the ON position.

PILOTS' COMPARTMENT (COCKPIT) HEATER SWITCH (USAF C-54, EC-54, HC-54, AND TC-54 AIRCRAFT).

A pilots' compartment (cockpit) heater switch (3, figure 1-29) with ON and OFF positions is installed under the glareshield to the right of the left emergency airbrake handle. Placing the switch in the ON position completes a 28-volt dc circuit to the pilots' compartment heater ignition system, opens the heater fuel solenoid valve, energizes the heater fuel pump, and starts the heater.

Extension of the nose gear automatically energizes the pilots' compartment ground blower and provides air for ground operation of the pilots' compartment heater. On aircraft without search radar installed, manual selection of the ground blower (by use of the ground blower handle) is necessary. The heater switch is placarded:

DO NOT TURN ON HEATER IF INDICATED AIRSPEED IS LESS THAN 105 KNOTS (120 MPH) UNLESS THE BLOWER IS OPERATING.

PILOTS' COMPARTMENT HEATER MANUAL TEMPERATURE CONTROL SWITCH (SOME AIRCRAFT).

On some late model aircraft, a manual temperature control knob is installed to allow manual selection of the operating temperature of the thermal limit switch. The knob is mechanically connected to the variable cycle limit switch. By rotating the knob the temperature at which the limit switch opens can be controlled within the range of 32° to 160° C.

PILOTS' COMPARTMENT HEATER MANUAL CONTROL SWITCH (NAVY C-54 AIRCRAFT).

A manual heater control switch with ON and OFF positions is installed under the glareshield on the left side of the pilots' compartment. Since all heater fuel flow is controlled by the A and B heater fuel valve switches on the cabin heater control panel, the A fuel valve switch must be used to open the valve before the pilots' compartment heater may be operated. After the amber light on the cabin heater control panel comes on and an

CABIN HEATING AND VENTILATING SYSTEM—Typical

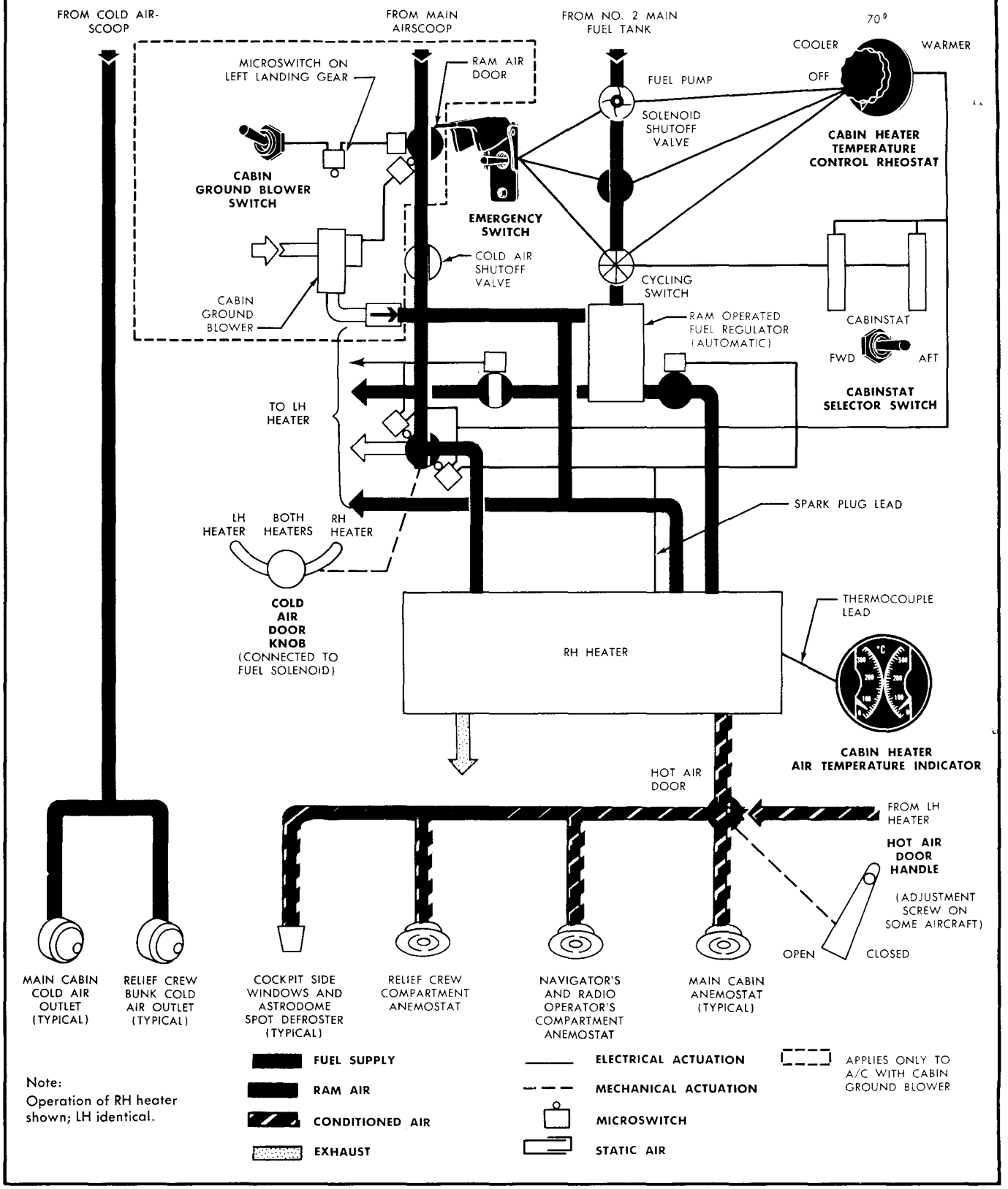


Figure 4-2

X1-129

PILOTS' COMPARTMENT (COCKPIT) GROUND BLOWER.

A pilots' compartment ground blower (figure 4-1) installed in the nose section of the aircraft provides ventilation or, when operated in conjunction with the pilots' compartment heater, supplies heated air to the pilots' compartment when the aircraft is on the ground. The ground blower is automatically turned on by a microswitch, connected to the nose gear uplatch, when the nose gear is extended and turned off when the gear is retracted. Power for the blower is supplied from the 28-volt dc bus.

Ground Blower Handle (Aircraft Without Search Radar).

On aircraft without search radar installed, the blower must be manually controlled by a ground blower handle, placarded ON and OFF, and installed on top of the glareshield in front of the pilot's seat. Placing the handle in the ON position closes a door in the ram air duct and opens a door in the ground blower duct. Movement of the duct doors completes a 28-volt dc circuit and energizes the ground blower motor. The blower should be turned OFF when above 105 knots IAS to prevent excessive wear on the blower motor.

Note

During icing conditions, if the nose ram air inlet becomes iced over, the ram air switch will deactivate, shutting off the heater. On aircraft with the ground blower handle installed, heater operation may be resumed by placing the ground blower handle in the ON position.

PILOTS' COMPARTMENT (COCKPIT) HEATER SWITCH (USAF C-54, EC-54, HC-54, AND TC-54 AIRCRAFT).

A pilots' compartment (cockpit) heater switch (3, figure 1-29) with ON and OFF positions is installed under the glareshield to the right of the left emergency airbrake handle. Placing the switch in the ON position completes a 28-volt dc circuit to the pilots' compartment heater ignition system, opens the heater fuel solenoid valve, energizes the heater fuel pump, and starts the heater.

Extension of the nose gear automatically energizes the pilots' compartment ground blower and provides air for ground operation of the pilots' compartment heater. On aircraft without search radar installed, manual selection of the ground blower (by use of the ground blower handle) is necessary. The heater switch is placarded:

DO NOT TURN ON HEATER IF INDICATED AIRSPEED IS LESS THAN 105 KNOTS (120 MPH) UNLESS THE BLOWER IS OPERATING.

PILOTS' COMPARTMENT HEATER MANUAL TEMPERATURE CONTROL SWITCH (SOME AIRCRAFT).

On some late model aircraft, a manual temperature control knob is installed to allow manual selection of the operating temperature of the thermal limit switch. The knob is mechanically connected to the variable cycle limit switch. By rotating the knob the temperature at which the limit switch opens can be controlled within the range of 32° to 160° C.

PILOTS' COMPARTMENT HEATER MANUAL CONTROL SWITCH (NAVY C-54 AIRCRAFT).

A manual heater control switch with ON and OFF positions is installed under the glareshield on the left side of the pilots' compartment. Since all heater fuel flow is controlled by the A and B heater fuel valve switches on the cabin heater control panel, the A fuel valve switch must be used to open the valve before the pilots' compartment heater may be operated. After the amber light on the cabin heater control panel comes on and an

indicated airspeed of 96 knots IAS is reached (or blower is operating), the manual control switch may be placed in the ON position, completing a 28-volt dc circuit to the heater.

PILOTS' COMPARTMENT (COCKPIT) HEATER AIR TEMPERATURE INDICATOR.

A thermocouple-type heater air temperature indicator is installed to indicate the temperature, in degrees centigrade, of the heated air output directly aft of the heater. On some aircraft, the indicator is located on the pilots' overhead panel (49, sheet 3, figure 1-11). On Navy C-54 aircraft, the indicator is located on the main instrument panel (27, sheet 2, figure 1-10).

FOOTWARMER HANDLES.

A footwarmer handle (figure 4-6) with OPEN and CLOSED positions is installed outboard of each pilot's seat. Each handle mechanically and individually regulates the volume of heated or ambient air delivered to the cockpit. The full OPEN position delivers maximum airflow. Full CLOSED shuts off the flow of air.

CABIN HEATERS.

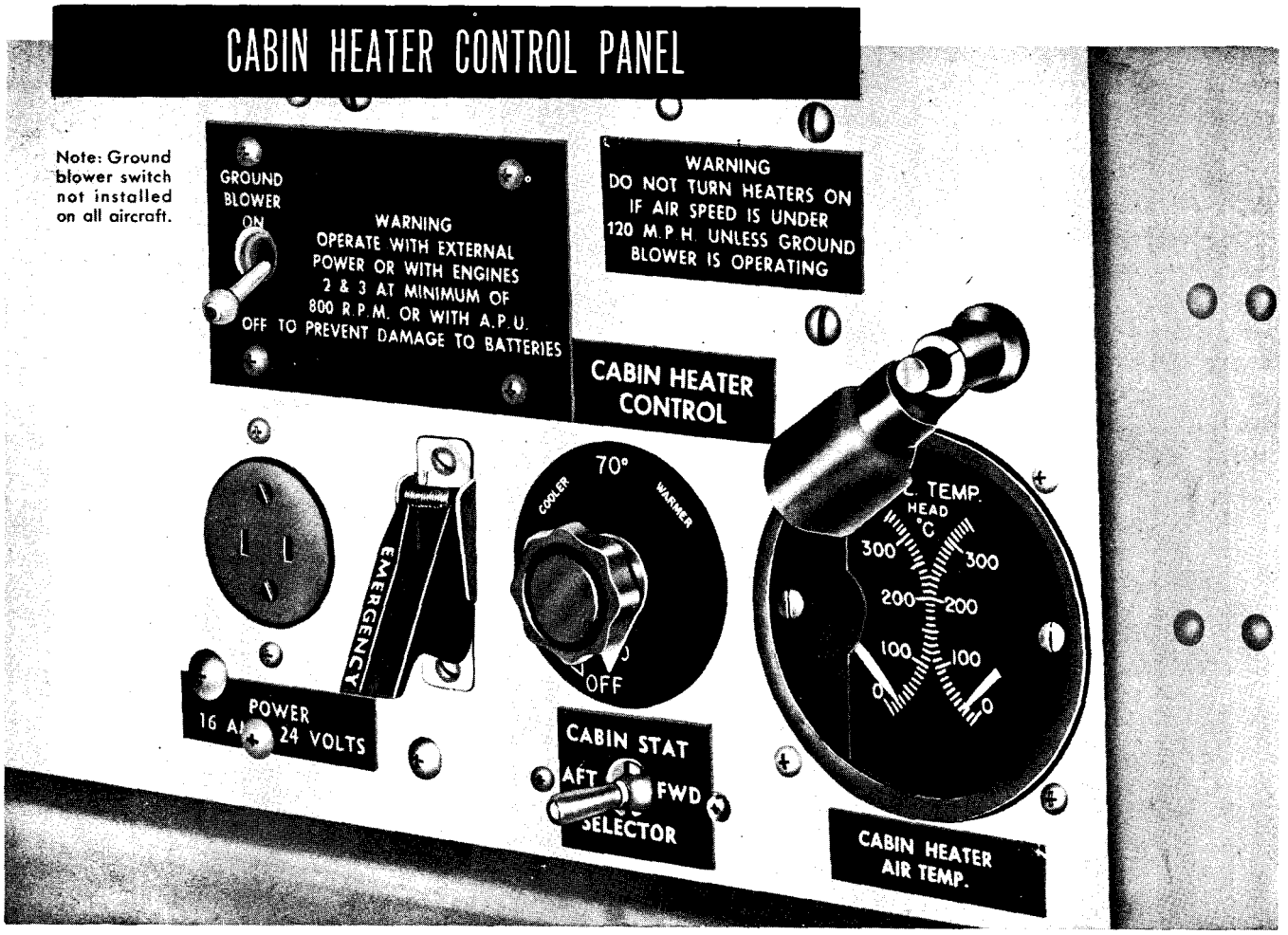
Two cabin heaters, which operate either independently or as one unit, are installed in the ceiling of the relief crew's compartment and supply ventilating air at heated or ambient temperature for the main cabin (cargo compartment), relief crew compartment, and the radio operator's and navigator's stations only during flight. The cabin heaters also provide heated air to defrost the astrodome and cockpit side windows. (see Thermal and Pneumatic Deicing Systems, this section.)

The cabin heaters are normally automatic in operation but can be manually cycled to maintain adequate temperature. Automatic temperature control is accomplished by two cabinstats, which are connected to a 115-volt ac amplifier circuit, and a heater cycling switch which cycles the heaters by opening or closing the heater fuel solenoid valve and the ignition circuit simultaneously. When temperature in the cabin or relief crew compartment fluctuates below the selected setting of the temperature control rheostat, the heaters are cycled on and continue to operate until the temperature rises to that of the rheostat switch setting. At this temperature, the cabinstats actuate the automatic temperature control system and discontinue heater operation. The heater cycling switch is set at approximately 110° C, which corresponds to the 70° position of the temperature control rheostat switch. The heaters are protected by an overheat switch which opens the electric circuit to all components of the automatic temperature control system and closes the heater fuel solenoid valve, discontinuing heater operation if a temperature of approximately 177° C is reached. When heaters have been shut off by the overheat switch, they must be turned OFF and manually restarted after temperature has been reduced below the temperature setting of the heater cycling switch (approximately 110° C).

CAUTION

The maximum operating temperature of the cabin heaters is 185° C. If the overheat switch fails to shut off the heater at approximately 177° C, the heater must be manually shut off and allowed to cool before restarting.

A cold air door, installed in the duct forward of the cabin heaters, controls the flow of ram air into either or both heaters. A hot air door, located in the duct aft of the heaters, directs the flow of heated air from the main cabin to the relief crew compartment if required. A spring-loaded trap door located in the duct forward of the heaters permits the application of CO_2 by a hand-operated fire extinguisher in case of heater fire. Heated air is supplied to the cabin and the



X1-122

Figure 4-3

relief crew compartment through ducts installed in the cabin ceiling and is discharged through anemostats. An external airscoop, located on top of the fuselage to the left and aft of the astrodome, provides ram air for the heaters or cold air for the ventilating system when the heaters are not in operation. On some aircraft, a separate cold air ventilating system is installed with adjustable outlets at each set of cabin seats or litters and at each crew bunk. Cold ram air is supplied through an external airscoop installed on the right side of the fuselage. Ventilating exhaust ducts are installed in the main cabin paneling and in the lavatories. On some aircraft, a ground blower is installed in the forward lower cargo compartment for ground operation of the cabin heaters or to supply ambient ventilating air to the main cabin, relief crew compartment, and the navigator's and radio operator's stations.

CABIN HEATER TEMPERATURE CONTROL RHEOSTAT.

A cabin heater temperature control rheostat, with OFF, COOLER, 70°, and WARMER positions, is installed on the cabin heater control panel (figures 4-3 and 4-4). Placing the rheostat in any intermediate position between OFF and WARMER varies the resistance in the heater amplifier circuit to maintain constant heater temperature. The temperature control rheostat governs the setting of either the forward or aft cabinstat; this automatically cycles the heaters to regulate cabin temperature or relief crew compartment temperature as selected by the cabinstat selector switch. On USAF C-54, EC-54, HC-54, TC-54, and on Navy C-54 aircraft without heater fuel valve switches installed,

moving the rheostat from the OFF position also completes the 28-volt dc circuit to the heater fuel valves and the heater fuel pump.

CABINSTAT SELECTOR SWITCH.

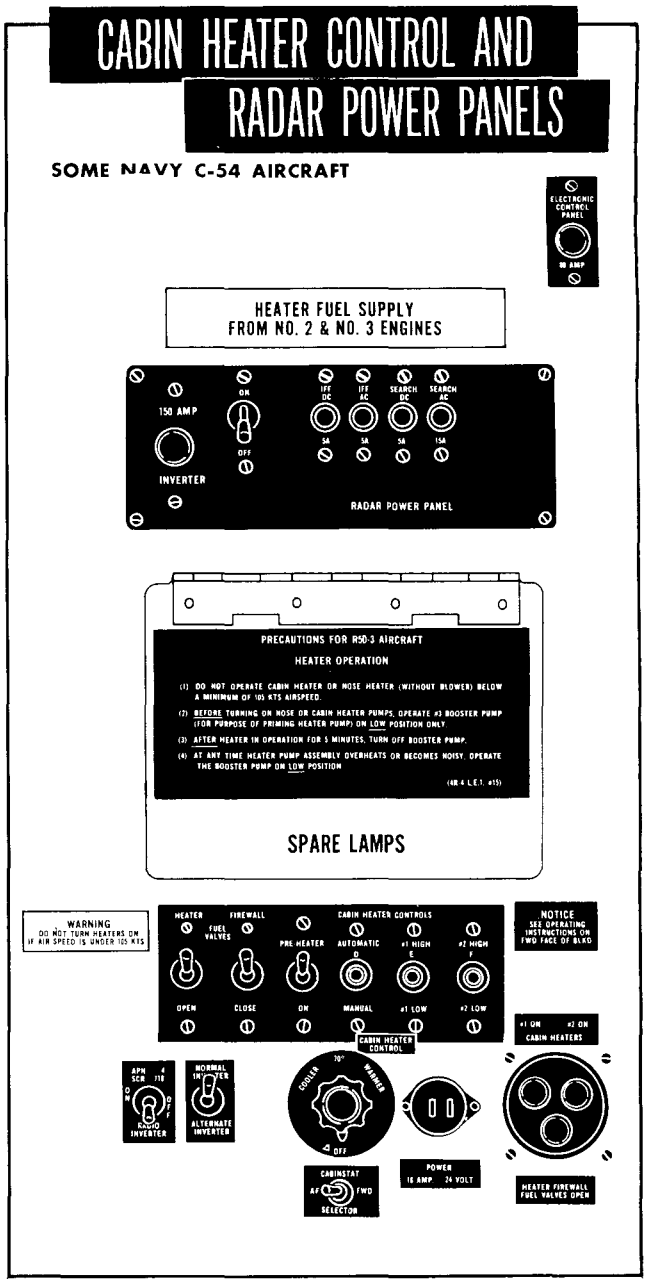
A cabinstat selector switch with FWD and AFT positions is located on the cabin heater control panel (figures 4-3 and 4-4). Placing the cabinstat selector switch in the FWD position completes a 28-volt dc circuit to actuate the cabinstat in the relief crew's compartment to automatically cycle the heaters and maintain the desired temperature as selected by the cabin heater temperature control rheostat. When the cabinstat selector switch is placed in the AFT position, the cabinstat in the main cabin is actuated to automatically cycle the heaters and maintain the desired temperature as selected by the cabin heater temperature control rheostat.

CABIN HEATER EMERGENCY SWITCH (USAF C-54, EC-54, HC-54, AND TC-54 AIRCRAFT).

A guarded cabin heater emergency switch with ON and OFF positions is mounted on the cabin heater control panel (figure 4-3) and may be used to operate the heaters if the automatic (ac-powered) temperature control system fails to function. Positioning the heater emergency switch alternately to the ON and OFF positions will manually cycle the heaters to maintain the desired temperature by bypassing the automatic temperature control system. Power is supplied from the 28-volt dc bus.

CABIN HEATER AIR TEMPERATURE INDICATOR (USAF C-54, EC-54, HC-54, AND TC-54 AIRCRAFT).

A dual-indicating cabin heater air temperature indicator is located on the cabin heater control panel (figure 4-3). The indicator is calibrated in degrees centigrade, indicates the temperature of the heated air output directly aft of the heaters. Power source for the indicator is the 28-volt dc bus.



X1-273

Figure 4-4

HEATER INDICATOR LIGHTS (NAVY C-54 AIRCRAFT).

Three heater indicator lights, one amber and two green, are installed on the cabin heater control panel (figure 4-4). The amber light comes on when fuel at proper operating pressure has reached the fuel regulator valves. A green light for each heater comes on when

the respective heater is operating and its output has reached a temperature of above 43° C. Power for the heater indicator lights is the 28-volt dc bus.

HEATER FUEL VALVE SWITCHES (NAVY C-54 AIRCRAFT).

Fuel flow to the heaters is controlled by two spring-loaded heater fuel valve switches marked A and B and installed on the cabin heater control panel (figure 4-4). The A switch has a momentary-contact OPEN position and the B switch has a momentary-contact CLOSED position. Both switches control a 28-volt dc solenoid-operated shutoff valve located in the heater fuel line. The fuel valve may be opened by holding the A switch in the OPEN position until the amber indicating light comes on. The fuel valve is closed when the B switch is held in the CLOSED position and the amber light comes on.

FUEL PREHEATER SWITCH (NAVY C-54 AIRCRAFT).

A fuel preheater switch, with a placarded ON position and spring-loaded to the up (OFF) position, is installed on the cabin heater control panel (figure 4-4). Fuel preheating is required if outside air temperature is below -18° C. When the preheater switch is held in the ON position, a 28-volt dc circuit is completed to the fuel preheater coils in the heater combustion chambers.

TEMPERATURE CONTROL SELECTOR SWITCH (NAVY C-54 AIRCRAFT).

A three-position temperature control selector switch, marked D on the placard, is located on the cabin heater control panel (figure 4-4) and selects either automatic or manual temperature control of the heaters. Placing the switch in the AUTOMATIC position closes a 26-volt ac amplifier circuit to two cabinstats, which automatically regulate the heaters to maintain constant temperatures. In the center (OFF) position, the heater electrical circuit is disconnected. If the automatic control system fails to function, the MANUAL (dc powered) position may be used to bypass the amplifier and provide continuous heater operation. Heater output with the switch in MANUAL position may be regulated by use of the fuel regulator valve switches.

FUEL REGULATOR VALVE SWITCHES (NAVY C-54 AIRCRAFT).

Two three-position fuel regulator valve switches, marked E and F, are located on the cabin heater control panel (figure 4-4) and may be used to govern the output of the heaters by regulating fuel flow to the heater combustion chambers. Two solenoid valves in the heater fuel lines are controlled by each fuel regulator valve switch. One solenoid is located in a free flow heater fuel line; the other, in a restricted flow heater fuel line. Placing either switch in the HIGH position completes a 28-volt dc circuit to the valve in the unrestricted line to allow maximum fuel flow to the respective heater combustion chamber. Placing either switch in the LOW position completes a 28-volt dc circuit to the valve in the restricted line to allow approximately three-quarters of maximum fuel flow to the heater combustion chamber. When the switches are in the center (OFF) position, both valves remain closed, restricting all fuel flow.

COLD AIR DOORKNOB (USAF C-54, EC-54, HC-54, AND TC-54 AIRCRAFT).

A mechanically operated cold air doorknob (figure 4-2), with LH HEATERS, AND RH HEATER positions, is located under the forward Y-duct of the two cabin heaters. The doorknob is normally set in the BOTH HEATERS position, which equally divides the flow of cold ram air to each cabin heater. Placing the doorknob in the LH HEATER position diverts the entire flow of cold ram air through the left heater, making the right heater inoperative. Placing the doorknob in the RH HEATER position diverts the entire flow of cold ram air through the right heater, making the left heater inoperative. When the

doorknob is positioned to close the cold air door to either heater, the electrical circuit is opened and the fuel supply to the respective heater is shut off.

COLD AIR SHUTOFF VALVE.

On some aircraft, a valve is located in the forward Y-duct which may be positioned to the closed position, completely shutting off the supply of cold air to both cabin heaters.

HOT AIR DOOR HANDLE.

On some aircraft, a mechanically operated hot air door handle (figure 4-2), with OPEN and CLOSED positions, is located in the hot air duct aft of the two cabin heaters. The door handle is normally set in the full OPEN position. Placing the door handle in the CLOSED position directs the flow of hot ventilating air to the relief crew's compartment and the radio operator's and navigator's stations, and shuts off the hot ventilating air supply to the cabin. The door may be closed to supply the crew with heated ventilating air in the case of insufficient heat output by the cabin heaters. On some aircraft, the hot air door handle is replaced by an adjustment screw located on the underside of the hot air duct aft of the two cabin heaters.

WARNING

With heaters operating at full capacity, the hot air door must be in the full OPEN position to avoid dangerous overheating conditions.

AUXILIARY COLD AIR DUCT MIXING VALVE.

On some late aircraft, a valve is located in the hot air duct aft of the anemostat in the crew compartment ceiling. This mixing valve is manually operated by a handle on the crew compartment ceiling and can be set to regulate the amount of cold or hot airflow, in any proportion, to the crew compartment and the radio operator's and navigator's stations.

CABIN GROUND BLOWER AND SWITCH.

On some aircraft, a cabin ground blower is installed in the forward lower cargo compartment for ground operation of the cabin heaters or to supply ambient ventilating air to the main cabin, relief crew compartment, and the navigator's and radio operator's stations. A cabin ground blower switch, with ON and OFF positions (figure 4-3), is located on the cabin heater control panel. When the switch is placed in the ON position, a 28-volt dc circuit is completed to the ground blower motor, and a damper motor installed on the ram air duct is energized to close a damper in the ram air duct forward of the cabin heaters. Air pressure from the blower opens a pressure-actuated door in the ground blower duct, and ambient air is supplied either for ventilating or, in conjunction with the cabin heaters, for heating the main cabin, the relief crew compartment, and the navigator's and the radio operator's stations when the aircraft is on the ground. A microswitch, located on the left landing gear, automatically controls operation of the blower motor and the damper motor when the ground blower switch is in the ON position. When the main gear wheels leave the ground, the damper motor is energized to open the damper in the ram air duct and the blower motor is deenergized. When the main gear wheels touch down, the damper motor is energized to close the damper in the ram air duct, and the blower motor is energized.

If desired, the ground blower may be turned off on the ground by placing the ground blower switch on the cabin heater control panel to the OFF position.

HEATING AND VENTILATING SYSTEM OPERATION.

NORMAL OPERATION — (USAF C-54, EC-54, HC-54, AND TC-54 AIRCRAFT).

Pilots' Compartment Heating and Ventilating System Operation On The Ground.

The pilots' compartment can be ventilated or heated while on the ground as follows:

1. Power Supply—ON.

2. Cockpit Ground Blower—ON.

3. No. 2 or No. 3 Main Fuel Tank Booster Pump Switch—LOW (if heat required).

4. Cockpit Heater Switch—ON (if heat required).

5. Footwarmer Handles—OPEN.

6. Temperature Indicator—Checked.

   Observe heater temperature indicator for heater operation.

7. No. 2 or No. 3 Main Fuel Tank Booster Pump Switch—OFF.

   After determining that heater has ignited, turn main fuel tank booster OFF since heater fuel pump will supply sufficient pressure for heater operation.

Pilots' Compartment Heating and Ventilating System Operation in Flight.

The pilots' compartment can be ventilated or heated while in flight as follows:

1. Cockpit Ground Blower Handle (if installed)—OFF.

   Turn cockpit ground blower OFF after attaining a minimum airspeed of 105 knots IAS.

2. No. 2 or No. 3 Main Fuel Tank Booster Pump Switch—LOW if heat required).

3. Cockpit Heater Switch—ON (if heat required).

4. Footwarmer Handles—As desired.

5. Temperature Indicator—Checked.

   Observe heater temperature indicator for heater operation.

6. No. 2 or No. 3 Main Fuel Tank Booster Pump Switch—OFF.

   After determining that heater has ignited, turn main fuel tank booster OFF since heater fuel pump will supply sufficient pressure for heater operation.

Cabin Heating and Ventilating System Operation On The Ground (Aircraft With Cabin Ground Blower).

Note

No heating or ventilating operation on the ground is provided on aircraft without a cabin ground blower installed.

The main cabin, relief crew compartment, and navigator's and radio operator's stations can be heated or ventilated while on the ground as follows:

1. Hot Air Door Handle (Hot Air Door Adjustment Screw, some aircraft)—Full OPEN.

2. No. 2 or No. 3 Main Fuel Tank Booster Pump Switch—LOW (if heat required).

3. Cold Air Doorknob—As required.

4. Ground Blower Switch—ON.

5. Cabin Heater Temperature—Control Rheostat—As desired.

   Turn to desired temperature if heat is required.

6. Cabinstat Selector Switch—As desired.

   Place in FWD or AFT position, as desired, if using heaters.

7. No. 2 or No. 3 Main Fuel Tank Booster Pump Switch—OFF.

   Turn main fuel tank booster pump OFF when temperature increase is noted on temperature indicator.

Cabin Heating and Ventilating System Operation In Flight.

The main cabin, relief crew compartment, and navigator's and radio operator's stations can be heated or ventilated while in flight as follows:

1. Hot Air Door Handle (Hot Air Door Adjustment Screw, some aircraft)—Full OPEN.
2. No. 2 or No. 3 Main Fuel Tank Booster Pump Switch—LOW (if heat required).
3. Cold Air Doorknob—As required.
4. Cabin Heater Temperature Control Rheostat—As desired.

   Turn to desired temperature if heat is required.

5. Cabinstat Selector Switch—As desired.

   Place in FWD or AFT position, as desired, if using heaters.

6. No. 2 or No. 3 Main Fuel Tank Booster Pump Switch—OFF.

   Turn main fuel tank booster pump OFF when temperature increase is noted on temperature indicator.

NORMAL OPERATION — (NAVY C-54 AIRCRAFT).

Cockpit Heating and Ventilating System Operation On The Ground.

The pilots' stations can be heated or ventilated while on the ground as follows:

1. Power Supply—ON.
2. Cockpit Ground Blower Control Handle (if installed)—ON.
3. Heater Fuel Valve Switch A—OPEN (if heat required).
4. Cockpit Heater Manual Control Switch—ON (if heat required).
5. Preheater Switch—As Required.

   If outside air temperature is below -18° C, hold fuel preheater switch ON.

CAUTION

Do not hold fuel preheater switch on for more than 2 minutes, as preheater coils may burn out.

6. No. 2 or No. 3 Main Fuel Tank Booster Pump Switch—LOW (if heat required).
7. Footwarmer Handles—As desired.
8. Temperature Indicator—Checked.

   Observe heater temperature indicator for heater operation.

9. No. 2 or No. 3 Main Fuel Tank Booster Pump Switch—OFF.

   After determining that heater has ignited, turn main fuel tank booster pump OFF since heater fuel pump will supply sufficient pressure for heater operation.

Cockpit Heating and Ventilating System Operation in Flight.

1. Cockpit Ground Blower Handle (if installed)—OFF.

Turn cockpit ground blower OFF after attaining a minimum airspeed of 105 knots IAS.

2. Heater Fuel Valve Switch A—OPEN.
3. Cockpit Heater Manual Control Switch—ON.
4. Preheater Switch—As required.

   If outside air temperature is below -18° C, hold fuel preheater switch ON.

5. No. 2 or No. 3 Main Fuel Tank Booster Pump Switch—LOW.
6. Footwarmer Handles—As desired.
7. Temperature Indicator—Checked.

   Observe temperature indicator for heater operation.

8. No. 2 or No. 3 Main Fuel Tank Booster Pump Switch—OFF.

   After determining that heater has ignited, turn main fuel tank booster pump OFF since heater fuel pump will supply sufficient pressure for heater operation.

Cabin Heating and Ventilating System Operation in Flight.

Note

No provisions are made for operation of the cabin heating and ventilating system on the ground. If desired, the cabin heaters may be turned on prior to takeoff. Heater operation will begin when an airspeed of 105 knots IAS is reached.

To operate the cabin heating and ventilating system in flight proceed as follows:

1. Hot Air Door Adjustment Screw—Full OPEN.
2. Cold Air Damper—As required.
3. Heater Fuel Valve Switch A—OPEN.
4. Temperature Control Selector Switch D—AUTOMATIC.
5. Cabin Heater Control Rheostat—As desired.
6. Preheater Switch—As required.

   If outside air temperature is below -18° C, hold fuel preheater switch ON.

CAUTION

Do not hold fuel preheater switch ON for more than 2 minutes, as preheater coils may burn out.

7. No. 2 or No. 3 Main Fuel Tank Booster Pump Switch—LOW.
8. Fuel Regulator Valve Switches E and F—As required.

   Place switches to HIGH or LOW position, according to temperature table on control panel placard.

9. Heater Indicator Lights—Checked.

   Check heater indicator lights to determine that heaters are operating.

10. No. 2 or No. 3 Main Fuel Tank Booster Pump Switch—OFF.

    After determining that heaters have ignited, turn main fuel tank booster pump OFF since heater fuel pump will supply sufficient pressure for heater operation.

HEATING AND VENTILATING SYSTEM EMERGENCY OPERATION.

Pilots' Compartment Heater Emergency Operation (All Aircraft).

The following are the only emergency procedures provided for pilots' compartment heater operation:

1. In the event the heater is shut off due to icing of the nose ram air inlet, heater operation can be resumed by placing the ground blower handle (if installed) to the ON position.
2. If overheat switch fails to shut off the heater at approximately 177° C, turn heater off manually before a temperature of 185° C is reached.

Cabin Heater Emergency Operation (USAF C-54, EC-54, HC-54, and TC-54 Aircraft).

1. In case one cabin heater fails, close the cold air door to that heater.
2. If the automatic temperature control system fails to function, place the cabin heater emergency switch to the ON position. Heat output may be reduced by closing the cold air door to either one of the heaters, which will allow only one heater to operate, or by alternately positioning the emergency switch to OFF and ON.

Cabin Heater Emergency Operation (Navy C-54 Aircraft).

1. In case one cabin heater fails, close the cold air door to that heater.
2. If the automatic temperature control system fails, place the temperature control selector switch D to the MANUAL position. Heat output can be reduced by means of the fuel regulator valve switches E and F, by closing the cold air door to either one of the heaters which allows only one heater to operate, or by alternately positioning the temperature control selector switch to OFF and MANUAL.

ALCOHOL ANTI-ICING SYSTEM.

Ice is prevented from forming or is removed from the propellers, carburetors, and windshield by an alcohol anti-icing system (figure 4-5) incorporating a 40-gallon supply tank (18, figure 1-30) and three alcohol pumps located in the aft lower cargo compartment. Two 28-volt dc powered pumps, installed under the alcohol supply tanks, pump alcohol to the four propellers. One pump supplies anti-icing fluid to propellers No. 1 and 4. The other pump supplies anti-icing fluid to propellers No. 2 and 3. On Navy C-54 aircraft, each pump can supply all four propellers. Each pump supplies alcohol at a rate of from 2 to 10 quarts per hour per propeller, depending upon the setting of the propeller anti-icing rheostat switch. Alcohol is pumped from the supply tank to slinger rings on the aft side of each propeller hub and is distributed over the baldes by centrifugal force. Alcohol for the carburetors and the windshield is supplied by the third 28-volt dc-powered pump installed under the supply tank. The rate-of-flow to each carburetor is approximately 4 gallons per hour. Alcohol is pumped from the supply tank to two manifolds in each carburetor airscoop and is sprayed in the carburetor airstream through four jet nozzles. Windshield anti-icing fluid is pumped from the alcohol supply tank through an adjustable needle valve to distribution lines on the bottom and top of each windshield panel. The anti-icing fluid sprays out into the air and is blown back onto the surface of the windshield (see figure 1-30 for fluid specification).

Propeller Anti-Icing Rheostats (Navy C-54 Aircraft).

Two propeller anti-icing rheostats (9 - figure 1-11) placarded PROP ANTI-ICER, with OFF, ON, and DECREASE FLOW positions, are mounted on the top right section of the pilots' overhead panel. When a rheostat is turned to the ON position, 28-volt dc circuit is closed to the respective anti-icing pump motor and alcohol is pumped to the selected propellers. The speed of the pump motor regulates the rate of alcohol flow to the propellers. Turning the rheostat clockwise will decrease the volume of anti-icing fluid delivered to the propellers.

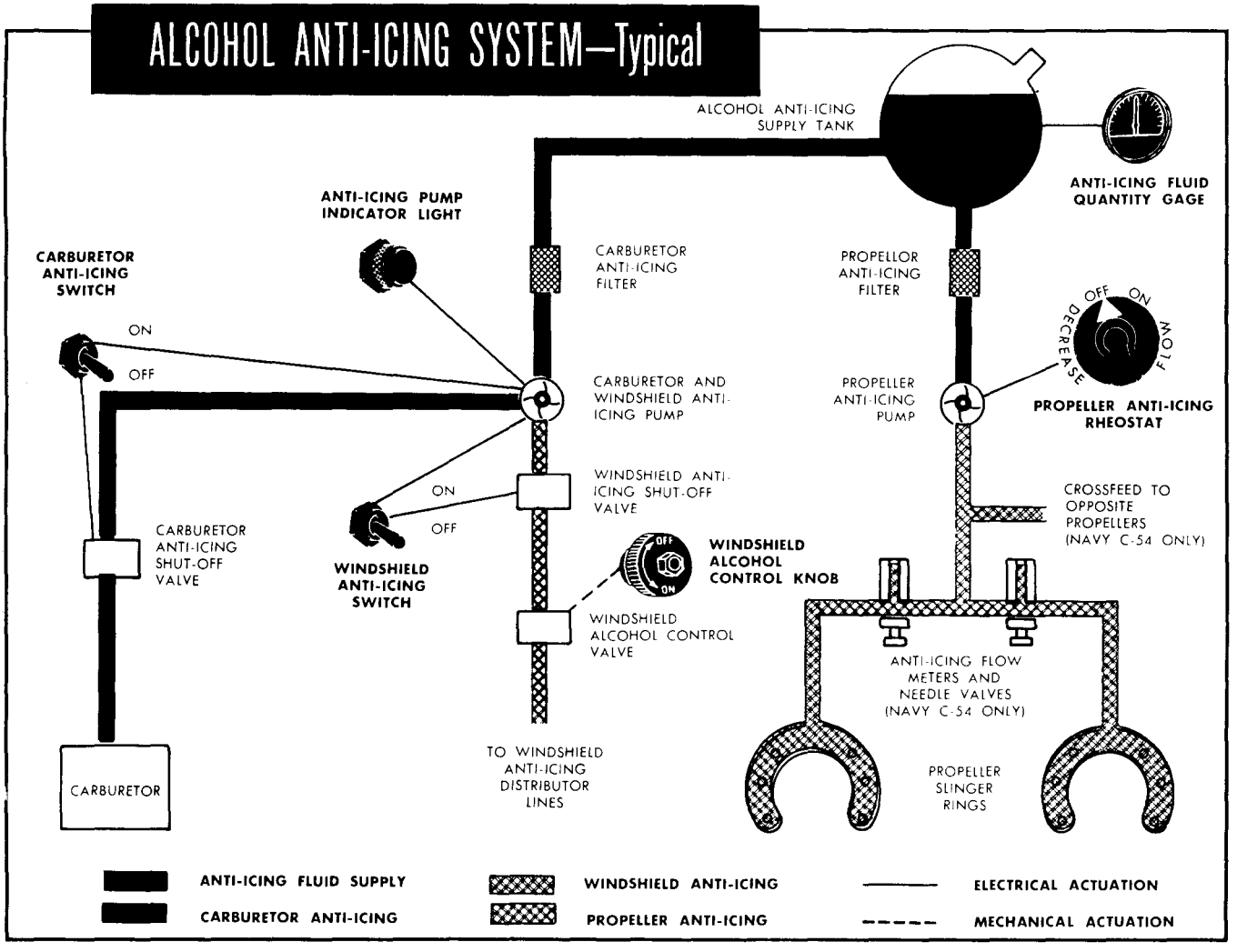


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Figure 4-5

Propeller Anti-Icing Rheostats (Navy C-54 Aircraft).

Two propeller anti-icing rheostats (19 - figure 1-11) placarded PROP ANTI-ICER, with OFF, ON, and DECREASE FLOW positions, are mounted on the top right section of the electrical control panel. Rotating a rheostat to the ON position completes a 28-volt dc circuit to the respective anti-icing pump motor, and alcohol is pumped through four flowmeter needle valves to the propellers. The speed of the pump motor regulates the rate of alcohol flow to the propellers. Rotating the rheostat clockwise will decrease the volume of anti-icing fluid delivered to the propellers.

Propeller Anti-Icing Flowmeter Needle Valves and Gages (Navy C-54 Aircraft).

Four flowmeter needle valves located on the upper aft bulkhead of the navigator's station (21, figure 4-14) control propeller anti-icing fluid flow from the anti-icing pump motors to the respective propellers. The needle valves must be opened before the system may be operated. Four direct-reading fluid flowmeter gages, calibrated in quarts per hour, are mounted in the unit with the needle valves. A light switch, placarded PROP ANTI-ICER, with ON and OFF positions, is mounted below the unit.

Caburetor Anti-Icing Switches.

Four carburetor anti-icing switches, one for each engine, with ON and OFF positions are mounted on the top right section of the pilots' overhead panel (8, figure 1-11). Each switch is spring-loaded to the OFF position. When an anti-icing switch is held in the ON position, a 28-volt dc circuit is closed to the anti-icing pump motor, and alcohol is pumped to the selected carburetor.

Windshield Anti-Icing Switch and Alcohol Control Knob.

A windshield anti-icing switch (6, figure 1-11), with the placarded positions ON and OFF, is mounted on the top center section of pilots' overhead panel. When the switch is placed in the ON position, a 28-volt dc circuit is closed to the anti-icing pump motor. A windshield alcohol control knob (9, figure 1-8) is located outboard of the copilot's seat. When the control knob is turned counterclockwise, a needle valve is mechanically opened which will regulate the flow of alcohol to the windshield.

Windshield Alcohol Pump Indicator Light.

An amber windshield alcohol pump indicator light (5, figure 1-11) is mounted on the top center of the electrical control panel. When the windshield anti-icing switch is in the ON position, the 28-volt dc alcohol pump indicator circuit is energized and the light comes on indicating that the windshield anti-icing pump is operating.

Anti-Icing Fluid Quantity Gage.

An anti-icing fluid quantity gage (29, figure 1-11) calibrated in gallons is located on the upper instrument panel. The fluid quantity gage indicates the amount of alcohol in the supply tank. Power source is 28-volt dc bus.

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Figure 4-6

THERMAL AND PNEUMATIC DEICING SYSTEMS.

WINDSHIELD DEICING AND DEFROSTING SYSTEM.

On some aircraft, windshield ice accretion is prevented or removed and defrosting is accomplished by heated air supplied from the cockpit heater. The hot air flows through ducts (figure 4-1) and is distributed between the windshield and removable deicer panels. The panels may be stowed under the relief crew lower bunk when not in use. On some aircraft, the deicer panels are permanently installed and serve primarily as a means of defrosting the windshield, since other provisions for ice removal are installed. (See the paragraph on alcohol anti-icing systems, this section.) The clearview corner windows are deiced or defrosted by hot air supplied through the same duct that directs heated air to the windshield.

Windshield Deicing and Defrosting Control Handles

A windshield deicing and defrosting control handle (figure 4-6) with OPEN and CLOSED positions is located outboard of each pilot's

seat. Each control handle mechanically regulates the volume of air delivered to the windshield and the clearview corner window for deicing or defrosting. The full OPEN position permits maximum airflow. The full CLOSED position shuts off the flow of air.

Note

For maximum windshield heat, the footwarmer handles must be in the CLOSE position.

Astrodome and Side Window Defrosting System.

Two flexible air ducts (9, figure 1-7), one located behind each pilot's seat, supply heated air from the flight compartment anemostat for spot defrosting of the astrodome and the pilots' side windows. Heated air is available only when the cabin heaters are in operation.

Blister Defrosting System (HC-54).

A flexible air duct at each scanners station supplies heated air from the cabin heaters for defrosting the scanners blisters. The amount of heated air supplied to the blisters may be manually regulated by the blister defrosting knobs (1, figure 4-28), located on each flexible air duct. Heated air is available only when the cabin heaters are operating.

WIND AND EMPENNAGE DEICING SYSTEM.

Ice accretion on the leading edges of the wing and empennage surfaces is eliminated in flight by the operation of the wing and empennage deicing system (figure 4-7). The system consists of expanding boots installed along the leading edge of each wing, each horizontal stabilizer, and the vertical stabilizer. The boots are inflated and deflated intermittently in sequence by air pressure from the four engine-driven vacuum pumps, one on each engine. The pumps on the inboard engines also provide vacuum pressure for the operation of the flight instruments. The air pressure from the four pumps flows through individual oil separators mounted in each engine nacelle, to a regulating oil separator installed in the fuselage accessories compartment, and passes through an air filter to an air distributor valve which directs the flow of air to the wing and empennage deicer boots. The oil separators remove oil and moisture from the air. Check valves located in the individual pressure lines from each engine-driven pump prevent the loss of air pressure in case of pump failure.

One deicing cycle is completed every 40 seconds. Each cycle consists of five 8-second pressurizing periods. The pulsating action cracks ice formations on the boots, and the air stream blows the ice off. The distributor valve is controlled by a 28-volt dc motor which opens and closes the ports in the distributor valve unit. Operation of the motor is controlled by the wing deicer control switch on the pilots' overhead panel. A pressure relief valve in the air-oil separator regulates the pressure in the system.

WARNING

Do not land or take off with the wing deicer boots in operation because of the resultant disturbance of airflow over the wing.

Wing Deicer Control Switches.

A wing deicer control switch (7, figure 1-11) with ON and OFF positions is located on the top section of the pilots' overhead panel. When the switch is placed in the ON position, a 28-volt dc circuit is completed to an electric motor that operates the deicer air distributor valve. This valve controls the sequence of inflation and deflation of the deicer boots on the wings and empennage.

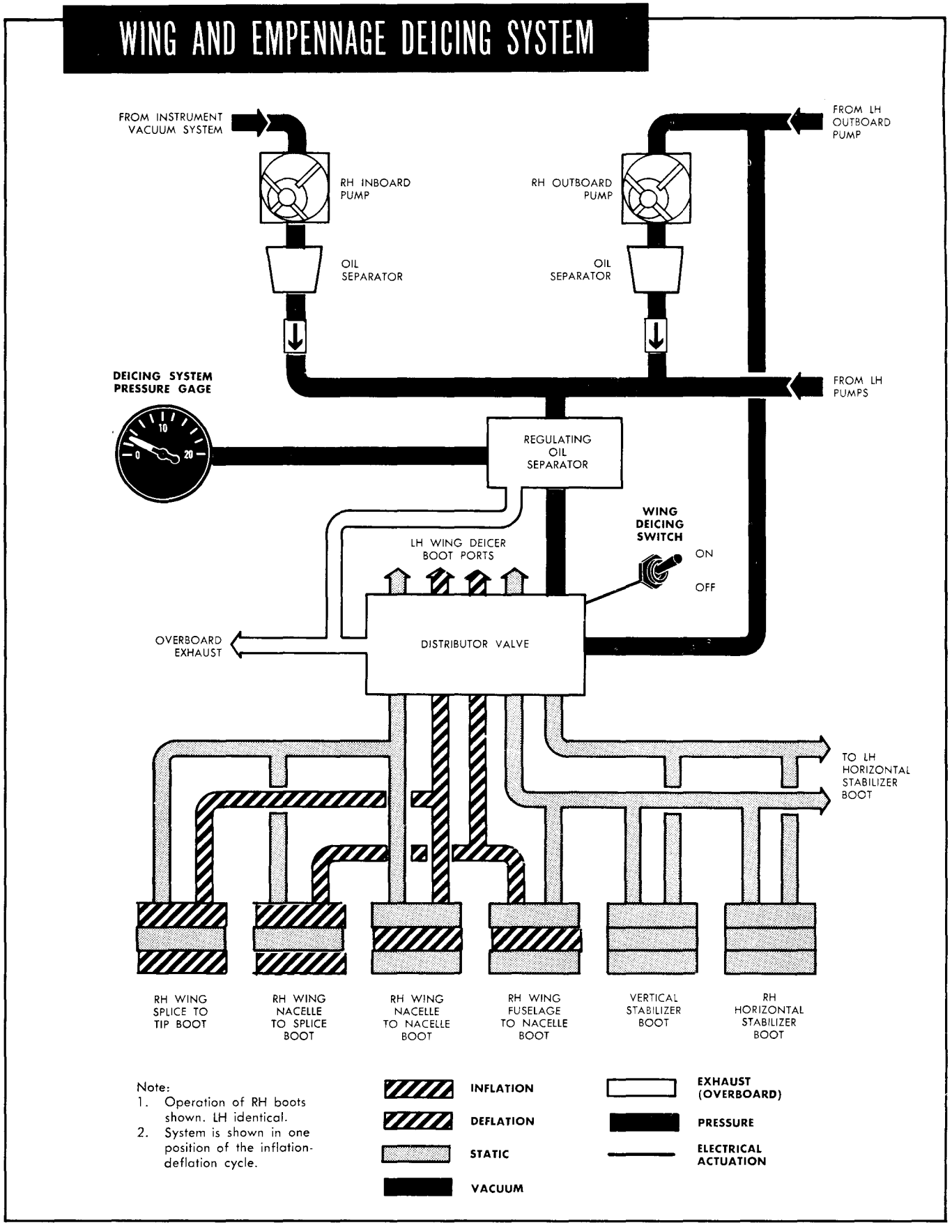

Figure 4-7

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Note

When the wing deicer control switch is turned off, the deicer air distributor valve continues to operate until the completion of the cycle.

WARNING

In the event of loss of power to the distributor valve, the deicing system will continue to deliver air to the boots that are inflated at the time of power failure. Stalling airspeed of the aircraft will be affected due to the disturbance of airflow over the wing.

Deicing System Pressure Gage.

A direct-reading deicing system pressure gage (19, figure 1-10), located on the right side of the main instrument panel in front of the copilot's seat, is calibrated in psi. Deicing system pressure is taken from the regulating oil separator.

WIND AND EMPENNAGE DEICING SYSTEM OPERATION.

Note

For best results, wait until ice has formed before starting the deicing system. If the ice is too thin, it will crack in small patterns and will not have enough weight and body to be blown off by the slipstream.

Set the wing and empennage deicing system in operation by turning the wing deicer control switch to the ON position.

1. Make certain the surface deicer boots function properly by observing the pulsation of the deicer boots.

2. Deicing system pressure—Check within limits (8 to 8.5 psi).

Note

When the system is operating, the gage will not give a constant recording psi because of the fluctuation of air pressure; however, it must reach 8 psi at the peak of each inflation to properly inflate the individual tubes in each boot.

3. Wing deicer control switch—OFF.

Pitot Head Heat and Ventilating Airscoop Deicing Switches.

Two pitot head heat and ventilating airscoop deicing switches (17, figure 1-11), one for the right pitot head circuit and one for the left pitot head and ventilating airscoop circuits, have ON and OFF positions and are mounted on the pilots' overhead panel. When the switches are placed in the ON position, a 28-volt dc circuit is completed to the heating elements in the pitot heads and the ventilating airscoop to prevent the accumulation of ice. The left switch controls the heating elements in the pilot's pitot head and the ventilating airscoop. The right switch controls the heating elements in the copilot's and the navigator's pitot head.

WARNING

Do not operate the pitot heaters for extended periods on the ground; lack of a cooling airstream will result in damage to the pitot heads.

Pitot Head Heat Ammeter.

A pitot head heat ammeter (26, figure 1-11) is installed on the pilots' overhead panel and indicates when the pitot head heaters are ON. Power source is a 28-volt dc bus.

COMMUNICATION AND ASSOCIATED ELECTRONIC EQUIPMENT (TYPICAL).

Unless otherwise noted, the following equipment is typical for all C-54 aircraft. Each aircraft must be checked to determine the exact radio equipment installed.

Note

Only transmissions of an emergency nature will be made on emergency (distress) frequency channels. This will preclude transmission of messages which might falsely be interpreted as actual emergency messages, and will keep the frequencies open for actual emergencies.

AN/AIC-2 OR AN/AIC-3 INTERPHONE SYSTEM (USAF C-54, EC-54, HC-54, AND TC-54 AIRCRAFT).

Multiple interphone control panels are located in the flight compartment adjacent to each crew member's station (except the flight engineer). The interphone equipment provides communication facilities between all crew members and enables the flight compartment crew members to use the VHF, UHF, and HF command sets, the liaison set, the radio compass, VHF, NAV, LF receiver, and the marker beacon. Interphone boxes are also installed in the main cabin and in the nosewheel well. To operate the interphone equipment, connect the aircraft external power supply, or place the master battery switch in the ON position and check the radio master switch and interphone circuit breakers to make certain they are in the ON position. On some aircraft, no provisions are made for turning the interphone equipment off separately. The power source is the 28-volt dc bus.

Note

The emergency telephone jack is normally connected to the output circuit of another control box. This provides emergency listening facilities. The same signals will be heard as are heard at the station to which the EMER. TEL. jack is connected.

AN/AIA-2C INTERPHONE SYSTEM (NAVY C-54 AIRCRAFT).

Interphone system control panels are located in the flight compartment adjacent to the pilot's, copilot's, and radio operator's stations. A navigator's station box is installed on the navigator's shelf, behind the copilot's seat. A crew station box is located near the passenger cargo door in the main cabin. In addition, a jack box installed in the nosewheel well is provided for the flight engineer. Power source for the interphone system is a 28-volt dc bus. The system provides communication facilities between all crew members and enables the flight compartment crew members to select UHF, VHF, command, liaison receiver, red and green radio compass, and marker beacon. The interphone equipment may be turned off by placing the ICS switch in the OFF position.

AN/ARC-3 (AN/ARC-36) VHF COMMAND TRANSMITTER-RECEIVER (USAF C-54, EC-54, HC-54, AND TC-54 AIRCRAFT).

The VHF command radio provides two-way, air-to-air or air-to-ground, voice or modulated code communications. Range of the equipment is limited to line-of-sight and atmospheric conditions. The set operates on a frequency range of 100 to 156 megacycles. Eight crystal-controlled channels are provided and may be selected at the VHF control panel on the control pedestal. Channelization crystal changes are possible and limited only by the availability of crystals in the sets frequency range. The radio is turned ON and OFF with the power switch on the VHF control panel. Power to the radio is supplied from the 28-volt dc bus.

COMMUNICATION AND ASSOCIATED ELECTRONIC

The following equipment is typical for USAF C-54, EC-54, HC-54 and TC-54 aircraft. Each aircraft must be checked to determine the exact equipment installed, and equipment's location.

TYPE	DESIG-NATION	USE	OPERATOR	RANGE	POWER	LOCATION OF CONTROLS
VHF COMMAND	AN/ARC-3, AN/ARC-36, OR AN/ARC-49 TYPE 807	TWO-WAY VOICE COMMUNICATION	PILOT COPILOT	LINE OF SIGHT	28 VOLT DC	CONTROL PEDESTAL
UHF COMMAND	AN/ARC-27	TWO-WAY VOICE COMMUNICATION	PILOT COPILOT	LINE OF SIGHT	28 VOLT DC	CONTROL PEDESTAL
VHF HOMING ADAPTER (SC-54)	AN/ARA-8	HOMING (AIR TO AIR OR AIR TO GROUND)	PILOT COPILOT	LINE OF SIGHT	28 VOLT DC	CONTROL PEDESTAL AND MAIN RADIO RACK
UHF HOMING ADAPTER	AN/ARA-25	HOMING (AIR TO AIR OR AIR TO GROUND)	PILOT COPILOT	LINE OF SIGHT	28 VOLT DC AND 115 VOLT AC	CONTROL PEDESTAL
TRANSCEIVER	618S-1	TWO-WAY VOICE COMMUNICATION	PILOT COPILOT	5000 MILES	28 VOLT DC AND 115 VOLT AC	CONTROL PEDESTAL
HF LIAISON	AN/ARC-8, AN/ART-13, OR BC348	LONG RANGE TWO-WAY CODE AND VOICE COMMUNICATION	RADIO OPERATOR	200— 5000 MILES	28 VOLT DC	RADIO OPERATOR'S STATION
LF RECEIVER	BC453-B	MONITOR LF RANGE SIGNALS	PILOT COPILOT		28 VOLT DC	CONTROL PEDESTAL
VHF NAV (VOR) RECEIVER	AN/ARN-14, AN/ARN-36, OR AN/ARN-38	OMNI, VHF NAV, AND LOCALIZER	PILOT COPILOT	LINE OF SIGHT	28 VOLT DC	CONTROL PEDESTAL
GLIDE SLOPE RECEIVER	AN/ARN-5D, AN/ARN-18 OR AN/ARN-39	INSTRUMENT AND AUTOMATIC APPROACH	PILOT	25 MILES	115 VOLT AC	CONTROLLED BY VHF NAV EQUIPMENT ON CONTROL PEDESTAL
RADIO COMPASS	AN/ARN-6, AN/ARN-7, OR AN/ARN-44	RECEPTION OF VISUAL AND AURAL SIGNALS FOR DIRECTION FINDING	PILOT COPILOT NAVIGATOR	20— 200 MILES	28 VOLT DC AND 115 VOLT AC	CONTROL PEDESTAL AND NAVIGATOR'S STATION
LORAN	AN/APN-9	RECEPTION OF RADO NAVIGATION SIGNALS	NAVIGATOR	700 MILES (DAY) 1400 MILES (NIGHT)	115 VOLT AC	NAVIGATOR'S STATION
SEARCH RADAR (IF INSTALLED)	AN/APS-42 OR AN/APS-42A	NAVIGATIONAL AID	PILOT NAVIGATOR	LINE OF SIGHT	28 VOLT DC AND 115 VOLT AC	PILOT'S STATION NAVIGATOR'S STATION
MARKER BEACON	AN/ARN-8 OR AN/ARN-12	RECEPTION OF MARKER BEACON SIGNALS FROM INSTRUMENT APPROACH STATIONS	PILOT COPILOT	3 MILES	28 VOLT DC	
TACAN	AN-ARN-21 OR AN/ARN-45	BEARING AND DISTANCE INFORMATION	PILOT COPILOT	LINE OF SIGHT	28 VOLT DC AND 115 VOLT AC	PILOT'S STATION, OVERHEAD PANEL/CONTROL PEDESTAL

Figure 4-8 (Sheet 1 of 3) X1-204

EQUIPMENT — TYPICAL

TYPE	DESIGNATION	USE	OPERATOR	RANGE	POWER	LOCATION OF CONTROLS
RADAR ALTIMETER (HIGH RANGE)	SCR-718	ABSOLUTE ALTITUDE	NAVIGATOR	0—40,000 FEET	115 VOLT AC	NAVIGATOR'S STATION
INTERPHONE	AN/AIC-2 OR AN/AIC-3	INTER-CREW COMMUNICATION	ANY CREW MEMBER	WITHIN AIRCRAFT	28 VOLT DC	CREW MEMBER STATIONS, MAIN CABIN, NEAR CARGO DOOR, NOSE WHEEL WELL
EMERGENCY TRANSMITTER	AN/CRT-3	EMERGENCY RESCUE	ANYONE IN DISTRESS	100—500 MILES		STOWED FORWARD OF MAIN CABIN DOOR
EMERGENCY TRANSCEIVER	AN/URC-4	EMERGENCY RESCUE	ANYONE IN DISTRESS	LINE OF SIGHT		STOWED FORWARD OF MAIN CABIN DOOR
~~IFF/SIF~~ AIMS-IFF	~~AN/APX-6 OR AN/APX-25~~ AN/APX-72	~~IDENTIFICATION~~ AUTOMATIC RADAR IDENT. AND ALTITUDE REPORTING	~~RADIO OPERATOR~~ CO-PILOT	LINE OF SIGHT	28 VOLT DC AND 115 VOLT AC	~~RADIO OPERATOR'S STATION~~ CO-PILOT STATION
INTERROGATOR (HC-54)	AN/APX-28	INTERROGATES AN/APX—25 SIGNALS AND PRESENTS VISUAL INDICATION OF SIGNAL	NAVIGATOR	200 MILES	28 VOLT DC AND 115 VOLT AC	NAVIGATOR'S STATION AND NO. 2 RADIO RACK
RECORDER REPRODUCER (EC-54)	AN/GNQ-1A	REPRODUCED SIGNALS RECORDED BY AN/ANQ-1A	ANY CREW MEMBER		28 VOLT DC	PORTABLE SET LOCATED IN MAIN CABIN
WIRE RECORDER (EC-54)	AN/ANQ-1A	RECORDS SIGNALS FROM INTERPHONE SYSTEM	PILOT		28 VOLT DC	LEFT OF PILOT'S SEAT
DC RECORDING MILLIAMETER (EC-54)	MODEL AW SERIES 421A	GRAPHICALLY RECORDS DATA RECEIVED DURING FLIGHT CHECK	DATA RECORDER OPERATOR		28 VOLT DC	DATA RECORDER OPERATOR'S STATION
FLIGHT PATH COMPUTER (EC-54)	16004-2-A	AUTOMATIC VOR TRACKING AND AUTOMATIC LANDING APPROACH	PILOT COPILOT		28 VOLT DC AND 115 VOLT AC	CONTROL PEDESTAL

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Figure 4-8 (Sheet 2 of 3)

Note

On some aircraft, the AN/ARC-3 is modified and redesignated as the AN/ARC-36 by the addition of a switch and eight additional channels. The switch has the positions REG and AUX and provides selection of a total of 16 crystal-controlled channels.

VHF Command Transmitter-Receiver Controls.

The AN/ARC-3 VHF control panel (17, sheet 1; 21, sheet 3; and 17, sheet 4, figure 1-9) located on the control pedestal contains the following controls:

VHF Power Switch: Controls power to radio. Switch has placarded positions ON and OFF. Radio is turned on and off by positioning switch to desired position.

Channel Selector Switch: Used for selection of available channels. Switch has positions marked A through H.

D/F Tone Button: Used to supply tone for direction finding. May also be used as key when

COMMUNICATION AND ASSOCIATED ELECTRONIC EQUIPMENT—TYPICAL

NAVY C-54

The following equipment is typical for NAVY C-54 aircraft. Each aircraft must be checked to determine the exact equipment installed, and equipment's location.

TYPE	DESIG-NATION	USE	OPERATOR	RANGE	POWER	LOCATION OF CONTROLS
VHF COMMAND	AN/ARC-1 OR BENDIX	TWO-WAY VOICE COMMUNICATION	PILOT COPILOT	LINE OF SIGHT	28 VOLT DC	CONTROL PEDESTAL
UHF COMMAND	AN/ARC-27	TWO-WAY VOICE COMMUNICATION	PILOT COPILOT	LINE OF SIGHT	28 VOLT DC	CONTROL PEDESTAL OR RADIO OPERATOR'S STATION
HF COMMAND	AN/ART-13	LONG RANGE VOICE AND CODE TRANS-MISSIONS	PILOT COPILOT	200— 2500 MILES	28 VOLT DC	RADIO OPERATOR'S STATION
LIAISON RECEIVER	BC348	LONG RANGE VOICE AND CODE RECEP-TION	RADIO OPERATOR	200— 2500 MILES	28 VOLT DC	RADIO OPERATOR'S STATION
HF TRANSCEIVER	AN/ARC-38	TWO-WAY VOICE COMMUNICATION	PILOT COPILOT RADIO OPERATOR	200— 2500 MILES	28 VOLT DC AND 115 VOLT AC	OUTBOARD OF PILOT'S SEAT AND RADIO OPERATOR'S STATION
VHF NAV (VOR) RECEIVER	AN/ARN-14	OMNI, VHF NAV AND LOCALIZER	PILOT COPILOT	LINE OF SIGHT	28 VOLT DC	CONTROL PEDESTAL
GLIDE SLOPE RECEIVER	AN/ARN-5 OR AN/ARN-18	INSTRUMENT APPROACH	PILOT	25 MILES	115 VOLT AC	CONTROL PEDESTAL
RADIO COMPASS	SCR-269G (GREEN) AND AN/ARN-7 (RED)	RECEPTION OF VISUAL AND AURAL SIGNALS FOR DIRECTION FINDING	PILOT COPILOT	20— 200 MILES	28 VOLT DC AND 115 VOLT AC	CONTROL PEDESTAL
LORAN	AN/APN-4 OR AN/APN-70	RECEPTION OF RADIO NAVIGATIONAL SIGNALS	NAVIGATOR	700 MILES (DAY) 1400 MILES (NIGHT)	115 VOLT AC	NAVIGATOR'S STATION
SEARCH RADAR (IF INSTALLED)	AN/APS-42	NAVIGATIONAL AID	PILOT COPILOT NAVIGATOR	LINE OF SIGHT	28 VOLT DC AND 115 VOLT AC	OVERHEAD BETWEEN PILOTS OR NAVIGATOR'S STATION
MARKER BEACON	AN/ARN-8	RECEPTION OF MARKER BEACON SIGNALS FROM INSTRUMENT APPROACH STATIONS	PILOT COPILOT	3 MILES	28 VOLT DC	CONTROLLED BY TURNING ON GREEN RADIO COMPASS
TACAN	AN/ARN-21	BEARING AND DISTANCE INFORMATION	PILOT COPILOT	LINE OF SIGHT	28 VOLT DC AND 115 VOLT AC	CONTROL PEDESTAL
RADAR ALTIMETER	SCR-718A	ABSOLUTE ALTIMETER	NAVIGATOR	0— 40,000 FEET	115 VOLT AC	RADIO OPERATOR'S STATION
INTERPHONE	AN/AIA-2C	INTER CREW COMMUNICATION	ANY CREW MEMBER	WITHIN AIRCRAFT	28 VOLT DC	CREW MEMBER STATIONS, MAIN CABIN REAR CARGO DOOR
EMERGENCY TRANSMITTER	AN/CRT-3	EMERGENCY RESCUE	ANYONE IN DISTRESS	100— 500 MILES		STOWED IN MAIN CABIN
EMERGENCY TRANSCEIVER	AN/URC-4 OR AN/URC-11	EMERGENCY RESCUE	ANYONE IN DISTRESS	LINE OF SIGHT		STOWED IN MAIN CABIN
IFF/SIF	AN/APX-6 OR AN/APX-25	IDENTIFICATION	COPILOT	LINE OF SIGHT	28 VOLT DC 115 VOLT AC	OVERHEAD IN FRONT OF COPILOT

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Figure 4-8 (Sheet 3 of 3)

MCW operation is desired. Maximum keying speed is 15 words per minute.

Auxiliary Channel Selector Switch (AN/ARC-36 only): Used in conjunction with channel selector switch to select additional VHF channels. Switch has placarded positions REG and AUX.

Volume Control Knob: Used to adjust volume to interphone.

Normal Operation.

The VHF radio can be operated at any crew station that has an interphone control panel; however, channelization and power are controlled at the VHF control panel only. Operation of the set is as follows:

1. VHF Power Switch—ON.

   Turn ON power switch, allow 30 to 45 seconds for set to warm up. Set is ready for operation when channelization tone is heard.

2. Microphone Transfer Switch (If installed)—VHF

3. Microphone Selector Switches—Set.

   Check that interphone box selector switch is in VHF COMM position and VHF toggle switch on (up).

4. Channel Selector Switch(s)—As desired.

   Place channel selector switch and auxiliary channel selector switch (if installed) on desired channel. Receiver will continuously monitor selected channel.

5. Volume Control Knob—Adjust.

   Adjust sound level as desired with volume control knob.

To turn the equipment off:

1. VHF power Switch—OFF.

   When VHF communication is no longer required, turn power switch OFF.

Emergency Operation.

If an obstruction has caused the defective operation of a desired channel, place the channel selector switch to a different frequency and return immediately to the desired channel. This will often correct the difficulty. A crystal failure on one frequency will not affect all frequencies.

AN/ARC-49 VHF COMMAND TRANSMITTER-RECEIVER (USAF C-54, EC-54, HC-54, AND TC-54 AIRCRAFT).

On some aircraft, the AN/ARC-49 VHF command set is installed in lieu of the AN/ARC-3. The set has 48 crystal-controlled channels in the frequency range of 100 to 156 megacycles. It provides air-to-air or air-to-ground communication over line-of-sight distances and receives power from a 28-volt dc bus.

VHF Command Transmitter-Receiver Controls.

Location of the controls for the AN/ARC-49 radio (when installed) are the same as for the AN/ARC-3 (see figure 1-9). The controls and usage are identical with the exception that two channel selector switches are installed, one with positions numbered 1 through 12 and one with positions A through D. The additional switch positions accommodate the wider range of channels available with this set.

Normal Operation.

1. VHF Power Switch—ON.

   Turn ON power switch, allow 30 to 45 seconds for set to warm up. Set is

...peration when channeliza-...e is heard.

3. Microphone Transfer Switch (if installed)—VHF.

3. Microphone Selector Switches—Set.

Check that interphone box selector switch is in VHF COMM position and VHF toggle switch on (up).

4. Channel Selector Switches—Set.

Rotate two channel selector switches on VHF control panel to desired settings. Receiver will continuously monitor selected channel.

5. Volume Control Knob—Adjust.

Adjust sound level as desired with volume control knob.

To turn equipment off:

1. VHF Power Switch—OFF.

When VHF communication is no longer required, turn power switch OFF.

VHF COMMAND TRANSCEIVER, TYPE 807, (50KC SPACING C-54 AND VC-54 AIRCRAFT).

The VHF transceiver is an airborne unit providing two-way air-to-air and air-to-ground voice communications. The set operates on a frequency range of 116.0 to 149.9 megacycles. A total of 1360 channels are available to transmit and receive. Channel selection may be made on the VHF control panel on the control pedestal. The radio is turned ON and OFF with the power switch on the VHF control panel. The radio power source is the aircraft 28-volt dc bus.

VHF Command Transceiver (807) Controls.

The 50KC spacing (807) VHF control panel (17A, sheet 1 of 4 figure 1-9) located on the control pedestal contains the following controls:

VHF Power Switch: Controls power to radio. The switch has placarded positions OFF and PWR. The radio is turned on and off by positioning switch to the desired position.

Channel Selector Knob: The selector knob is for selection of the desired channel. 1360 channels are available for selection from the range of 116.0 through 149.9 megacycles.

Volume Control Knob: The control knob is used for selection of the desired volume to interphone.

Normal Operation.

1. VHF-UHF Transfer Switch.

Place the transfer switch in the VHF position.

2. VHF Power Switch – PWR.

Turn the power switch to the PWR position and allow 30 to 45 seconds for set to warm up. Set is ready for operation when channelization tone is heard.

3. Channel Selector Knob – Channel desired.

Rotate selector knob to the desired channel. The transceiver automatically selects the desired frequency.

4. Volume – Adjust.

Adjust the volume control knob to the desired volume.

To turn equipment off:

1. Power Switch – OFF.

When VHF communication is no longer required, turn power switch OFF.

AN/ARC-1 VHF TRANSMITTER-RECEIVER (NAVY C-54 AIRCRAFT).

The AN/ARC-1 VHF command set is operated from a remote control panel mounted above the pilot's station, aft of the pilots' overhead panel (figure 1-11). The equipment is short-range VHF and is used as a two-way system for air-to-air or air-to-ground communication within a frequency range of 100 to 156 megacycles. Nine preset frequencies and a fixed guard channel frequency are provided on the control panel. On some aircraft, the AN/ARC-1 has been modified by adding nine additional channels and a switch placarded 1 and 2, which provides a total of 18 crystal-controlled channels. A three-position function selector switch placarded GUARD,

BOTH, and MAIN T/R provides for guard channel, main channel, or simultaneous guard and main channel operation. A two-position switch with positions ON and OFF, located at the left of the control panel, controls the power for the set. Power is supplied from the 28-volt dc bus.

Normal Operation.

1. Power Switch—ON.

   Turn on power switch and allow set to warm up.

2. Microphone Selector Switches—Set.

   Check that interphone box selector switch is in VHF position and VHF toggle switch on (up).

3. Function Selector Switch—As desired.

   Select main or guard channels as desired.

4. Channel Selector Switch(s)—Set.

   Rotate channel selector switch to desired setting. Receiver will continuously monitor selected channel.

5. Volume—Adjust.

   Adjust sound level as desired with volume control at interphone box.

To turn equipment off:

1. Power Switch—OFF.

   When VHF communication is no longer required, turn power switch OFF.

BENDIX VHF TRANSCEIVER (NAVY C-54 AIRCRAFT).

The Bendix VHF transceiver control panel (21, sheet 2, figure 1-9), located on the control pedestal, contains all controls for operation of the set. Transmission and reception is possible on any one of 180 channels between 118.0 and 135.9 megacycles. The power switch for turning the set on and off is combined with the volume control mounted on the channel selector head. Power to the set is supplied from the 28-volt dc bus.

AN/ARA-8 VHF HOMING ADAPTER (HC-54 AIRCRAFT).

The VHF homing adapter is used in conjunction with the VHF command radio to provide ground-to-air or air-to-air homing on CW, MCW, or audio VHF signals. The homing adapter consists essentially of a modulator keying unit, located under the floor adjacent to the main radio rack; an antenna relay and an automatic volume control unit, located on the bottom shelf of the main radio rack; a switch panel (16, sheet 3, figure 1-9) on the control pedestal; and four antennas (figure 4-11), two under each wing tip. Primary power for operation of the VHF homing adapter is supplied from the 28-volt dc bus.

Note

- If U (●●-) is heard, always turn right to home on the transmitter. If D (-●●) is heard, always turn left to home on the transmitter.

- Indications received when the aircraft is in a bank greater than 15 degrees are not reliable. Do not attempt to use the VHF homing adapter outside of the 120 to 140 megacycle frequency range.

VHF Homing Adapter Controls.

The VHF homing adapter control panel (16, sheet 3, figure 1-9), located on the control pedestal contains the following controls:

VHF Homing Adapter Selector Switch: Switch is used for selecting VHF radio for homing or communications, and has placarded positions HOMING, COMM and TRANS.

CW/MCW Selector Switch: Used to select CW or MCW depending on signal transmitted by station to which VHF radio is tuned. Switch has placarded positions CW and MCW.

VHF Homing Adapter Operation.

1. VHF Command Radio—ON.

   Turn on VHF radio and tune to desired station.

2. VHF Homing Adapter Selector Switch—HOMING.

3. CW/MCW Selector Switch—As required.

To turn equipment off:

1. VHF Homing Adapter Selector Switch—COMM.

AN/ARC-27 UHF COMMAND TRANSMITTER-RECEIVER.

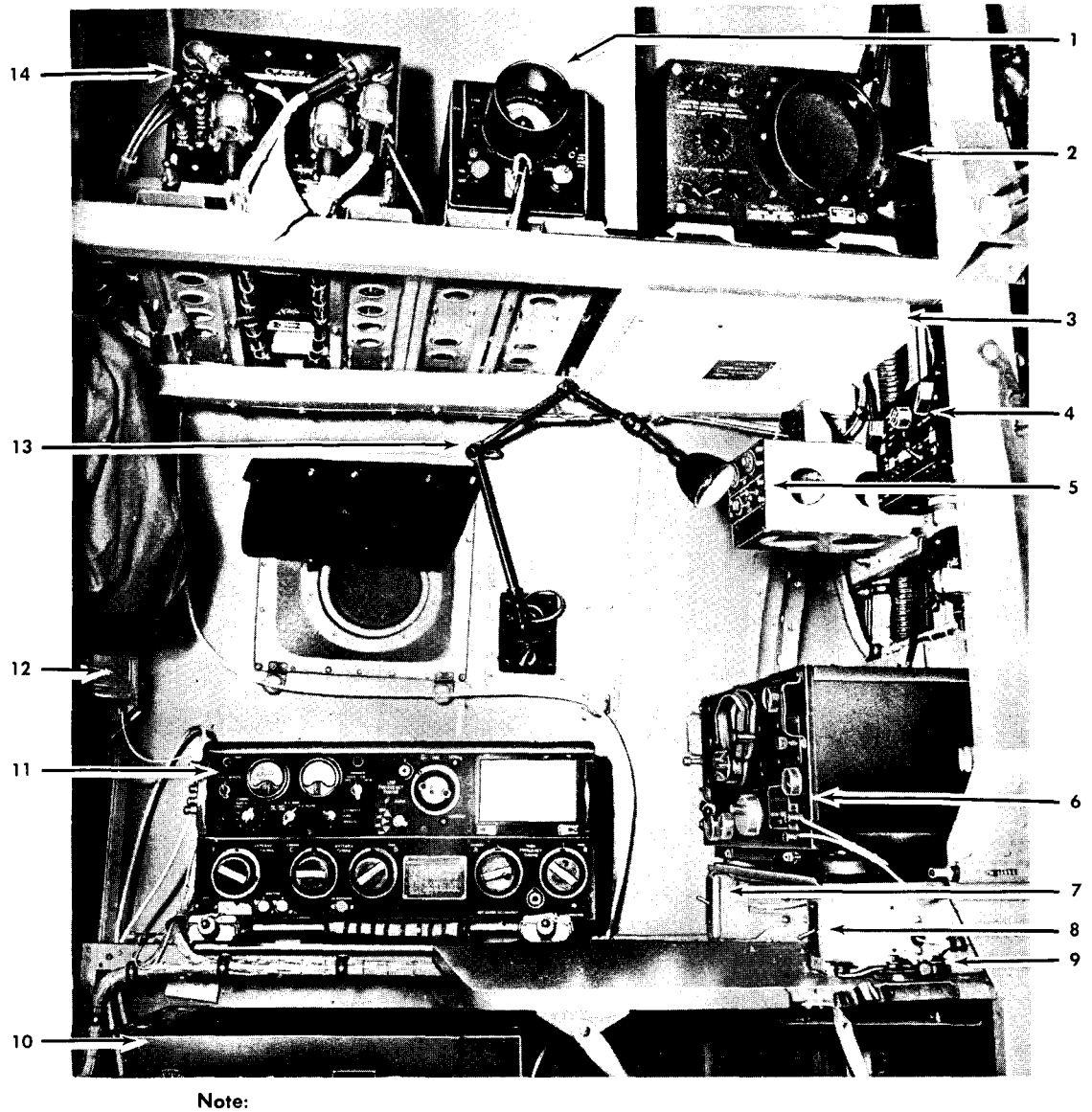
The AN/ARC UHF command radio provides voice or modulated code air-to-air or air-to-ground communication. A guard receiver is used to facilitate constant monitoring of a frequency channel other than the channel being used by the main receiver and transmitter. Two separate panels are used to control the set, one at the radio operator's station and another on the control pedestal. Any 18 channel frequencies (20 on Navy C-54), within a frequency range of 225.0 to 399.9 megacycles, may be preset at the UHF master control panel at the radio operator's station. In addition, the guard channel may be preset to any frequency between 238.0 to 248.0 (normally 243.0) megacycles. The master control panel has facilities for manually selecting any one of 1750 available frequencies. Power for the UHF radio is supplied from the 28-volt dc bus.

C-1904/ARC-27 UHF COMMAND TRANSMITTER-RECEIVER CONTROL.

Some aircraft are equipped with a UHF radio control C-1904/ARC-27 (6, figure 1-9) located on the control pedestal. The control panel provides 20 preset channel frequencies and 1750 manually selected channel frequencies. To select a manual frequency, turn the

RADIO OPERATOR'S STATION—Typical

USAF C-54



Note:
Items illustrated typical for installations shown. Equipment installed and location of equipment will vary with different aircraft configurations.

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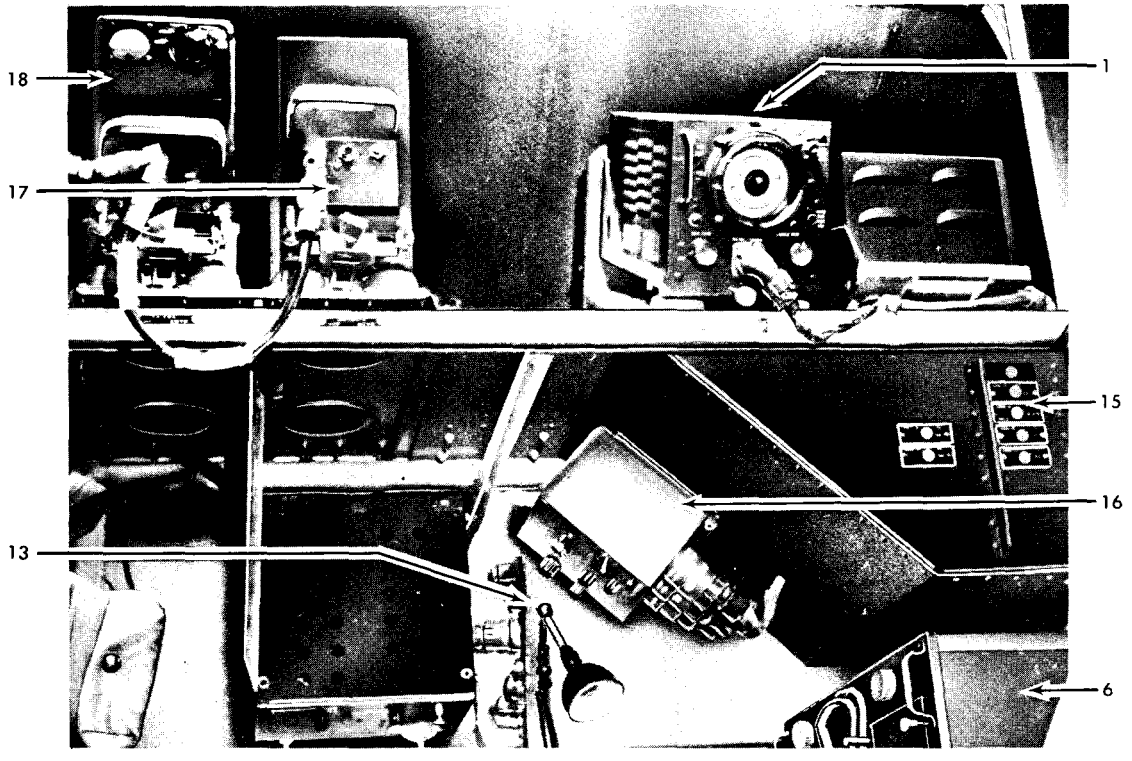
Figure 4-9 (Sheet 1 of 2)

RADIO OPERATOR'S STATION—Typical

NAVY C-54



1. RADAR (HIGH RANGE) ALTIMETER INDICATOR
2. IGNITION ANALYZER
3. SEARCH RADAR JUNCTION BOX
4. INTERPHONE CONTROL PANEL
5. IFF/SIF CONTROL PANEL
6. HF LIAISON RADIO RECEIVER
7. KEY TRANSFER SWITCH
8. LIAISON RADIO MONITOR SWITCH
9. TRANSMITTER KEY
10. ANTENNA LOADING COIL
11. HF LIAISON RADIO TRANSMITTER
12. ANTENNA COUPLER
13. TABLE LIGHT
14. SEARCH RADAR SYNCHRONIZER
15. ELECTRONIC CONTROL PANEL CIRCUIT BREAKERS
16. VHF COMMAND RADIO REMOTE CONTROL HEAD
17. VHF COMMAND RADIO RECEIVER
18. VHF COMMAND RADIO TRANSMITTER

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Figure 4-9 (Sheet 2 of 2)

channel selector to M and rotate the manual frequency selector knobs to the desired frequency as indicated in the frequency window. Tone capability is not provided with this control panel. The following controls are located on the panel:

Manual Frequency Selector: Used to select frequencies other than those available on preset channels.

UHF Function Switch: Used to turn set on and OFF, to select channels to be monitored, and to select homing adapter. Switch has placarded positions OFF, T/R, T/R + G, and ADF.

Volume Control Knob; Used to control sound level of reception.

Channel Selector Switch: Used to select preset channels.

Normal Operation.

1. Control Transfer Switch (Radio Operators' Station)—REMOTE.

   To operate UHF radio from control pedestal, control transfer switch to radio operator's station must be in REMOTE position.

2. UHF Function Switch—Set.

   Select required mode of operation.

CAUTION

Allow at least one minute for set to warm up before operating to preclude damage to the equipment.

3. Channel Selector Switch—Set.

   Select desired channel. If frequency other than available preset channel frequencies is desired, place selector in M position and rotate manual frequency selector knobs to desired frequency.

4. Microphone Selector Switches—Set.

   Check that interphone box selector switch is in UHG COMM position and UHF toggle switch is on (up).

5. Volume Control Knob—Adjust.

   Adjust sound level as desired.

To turn equipment off:

1. UHF Function Switch—OFF.

Emergency Operation.

If an obstruction has caused defective operation of a desired channel, place the channel selector switch to a different frequency and return immediately to the desired channel. This will often correct the difficulty. In case the channel selector switch on the pilots' control panel becomes inoperative, the equipment may be operated using the channel selector at the master control panel at the radio operator's station. If neither channel switch functions properly, turn channel selector switch to M and adjust the manual frequency selector knobs to desired frequency.

AN/ARA-25 UHF HOMING ADAPTER (USAF C-54, EC-54, HC-54, AND TC-54 AIRCRAFT).

The AN/ARA-25 homing adapter indicates the relative bearing of radio signals in the frequency range of 225 to 400 megacycles. The signals are received by the UHF command radio set (AN/ARC-27), using the direction finder antenna. The homing adapter is controlled from the UHF control panel when pilot's UHF function switch is positioned to ADF. Bearing of the received signal is indicated by the pointer of the pilot's UHF D/F radio magnetic indicator (RMI). If the homing adapter is being used for homing, fly the aircraft to keep the UHF D/F pointer of the RMI under

the reference index at the top of the instrument. If the homing adapter is being used for direction finding, observe the direction of signal source (relative bearing of source) as indicated on the azimuth scale under the arrow of the UHF D/F pointer of the RMI. Power for the homing adapter is supplied from the 28-volt dc bus.

Normal Operation.

1. UHF Function Switch (Control Pedestal)—ADF.

   Place UHF function switch on the control panel at pedestal in ADF position. Allow 3-minute warmup period if switch was in OFF position.

Note

The control transfer switch on the UHF master control panel must be in the REMOTE position.

2. Channel Selector Switch—Set.

   Place channel selector switch on desired channel.

To turn equipment off:

1. UHF Function Switch—As required.

   When not using homing facility of UHF radio, function switch will be set to any position other than ADF.

MICROPHONE TRANSFER SWITCH (SOME AIRCRAFT).

On some aircraft, a microphone transfer switch (18, sheet 1, figure 1-9) located on the control pedestal is used to select either VHF or UHF command transmitters.

618S-1 HF COMMAND RADIO.

The 618S-1 HF command radio set provides air-to-air or air-to-ground voice or code communications within a frequency range of 2.0 to 25.0 megacycles. Voice and CW operation is possible on any one of 144 preset crystal-controlled frequencies. Tuning is completely automatic whenever a new channel is selected, the transmitter and receiver circuits being tuned to the desired frequency and using a common crystal for both receiver and transmitter. Power is supplied to the set from the 28-volt dc and 115-volt ac busses.

HF Command Radio Controls.

The HF transceiver control panel (15, sheet 1; 23, sheet 3; and 17, sheet 4, figure 1-9), located on the control pedestal, contains the following controls for operation of the HF command radio:

OFF-PHONE-CW Switch: Used to turn set on or off and to select either radiotelephone or CW operation. Three-position switch with placarded positions OFF, PHONE, and CW.

BFO Knob: BFO knob provides variable beat signal to be used when receiving CW signals. Tone is adjusted as desired by rotating knob either to left or right.

Channel Selector Switches: Two channel selector switches, mounted on control head, are rotated until desired channel appears in indicator window.

Volume Control Knob: Used to adjust the audio output. Volume control knob, placarded SENSITIVITY.

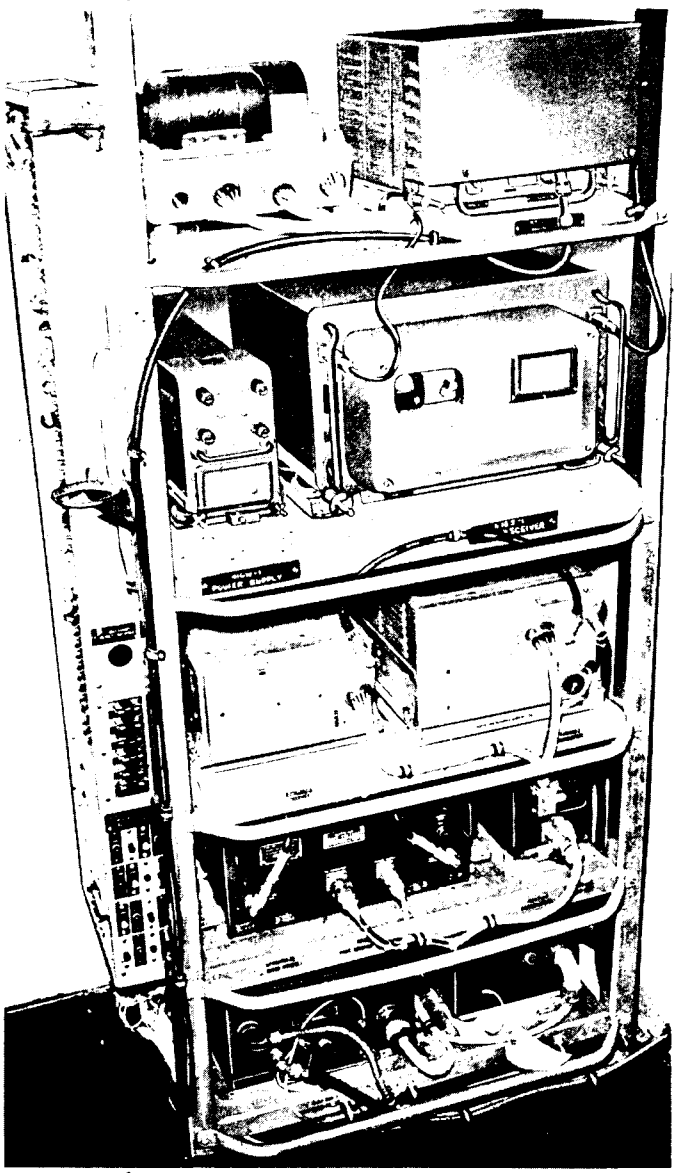
Normal Operation.

1. OFF-PHONE-CW (Power) Switch—PHONE.

RADIO

Note:
Items listed are typical for configurations illustrated. Items not identified by aircraft model are common to all three configurations shown. Check aircraft for type and location of installed equipment.

1. VHF COMMAND RADIO POWER JUNCTION BOX (USAF C-54 AND HC-54)
1A. VHF COMMAND RADIO POWER JUNCTION BOX (USAF C-54 AND VC-54)
2. INTERPHONE AMPLIFIER (USAF C-54)
3. TACAN RECEIVER-TRANSMITTER
4. TRANSCEIVER POWER SUPPLY (USAF C-54 AND NAVY C-54)
5. TRANSCEIVER (USAF C-54 AND HC-54)
6. VHF COMMAND RADIO RECEIVER (USAF C-54 AND HC-54)
7. VHF COMMAND RADIO TRANSMITTER (USAF C-54 AND HC-54)
7A. VHF COMMAND TRANSCEIVER (807) (USAF C-54 AND VC-54)
8. RADAR ALTIMETER (HIGH RANGE) TRANSMITTER-RECEIVER (USAF C-54 AND HC-54)
9. UHF HOMING ADAPTER AMPLIFIER (USAF C-54)
10. GLIDE SLOPE RECEIVER
11. RADIO COMPASS (2 ON HC-54)
12. C-1 COMPASS SIGNAL POWER AMPLIFIER
13. TRANSCEIVER INTERLOCKING AND ANTENNA GROUNDING RELAY (HC-54)
14. TRANSCEIVER AUTOMATIC ANTENNA TUNER (HC-54)
15. NAVIGATIONAL RECEIVER (VOR) INDICATOR (2 ON NAVY C-54)
16. INTERROGATOR ANTENNA TWITCH (HC-54)
17. RADIO COMPASS REMOTE TUNING AMPLIFIER (HC-54, 2 PLACES)
18. INTERROGATOR RECEIVER TRANSMITTER (HC-54)
19. TACAN RADIO BEARING INDICATOR (HC-54 AND NAVY C-54)
20. S-2 AMPLIFIER (NAVY C-54)
21. NAVIGATIONAL RECEIVER (VOR) (NAVY C-54, 2 PLACES)
22. NAVIGATIONAL RECEIVER (VOR) DYNAMOTOR (NAVY C-54, 2 PLACES)
23. UHF COMMAND RADIO TRANSMITTER-RECEIVER (NAVY C-54)
24. JUNCTION BOX



USAF C-54 Main Radio Rack — Typical

X1-276

Figure 4-10 (Sheet 1 of 2)

RACKS—Typical

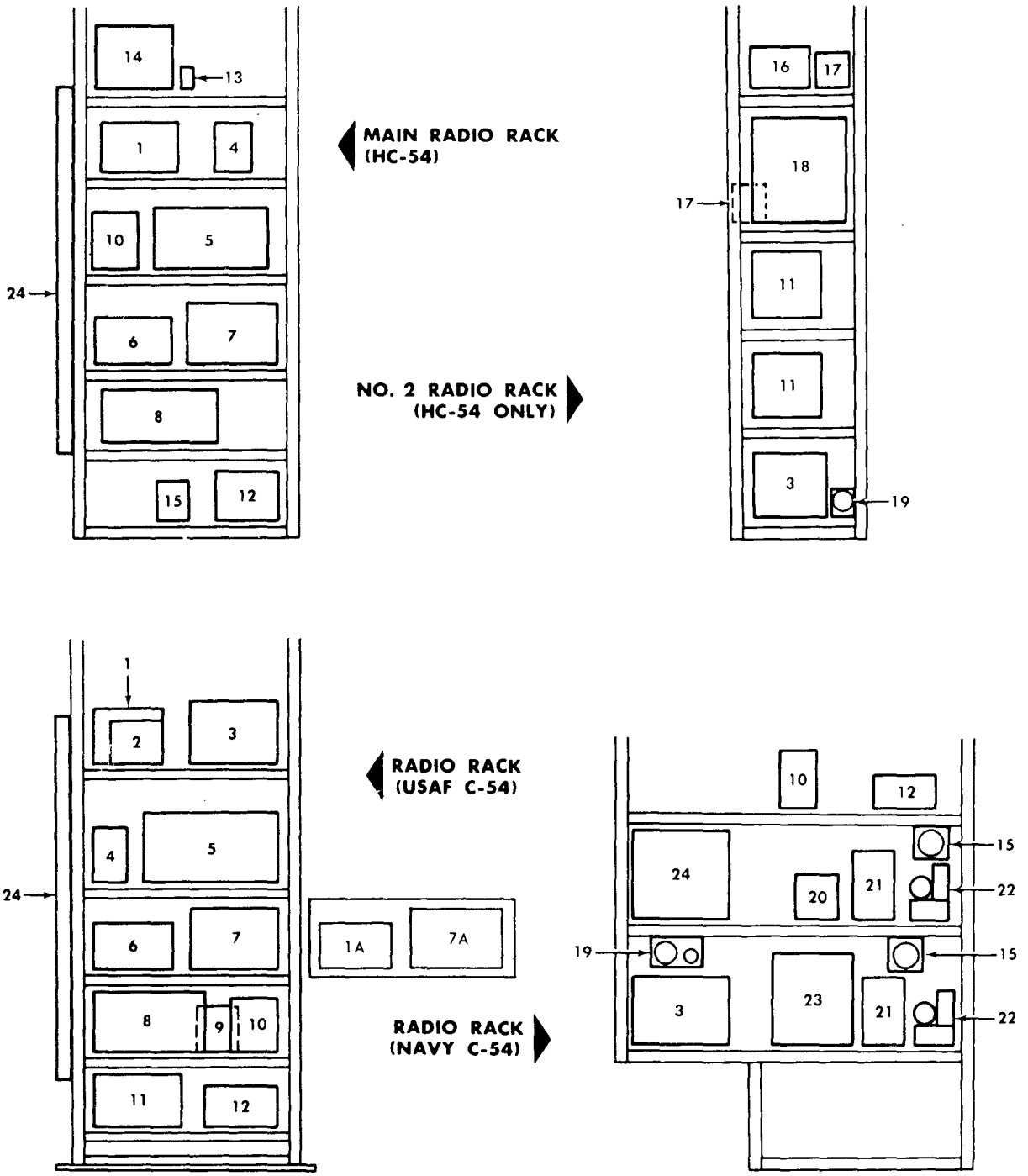


Figure 4-10 (Sheet 2 of 2)

X1-277

2. Channel Selector Switches—Set.

   To determine desired channel for particular frequency, consult installed frequency chart for 618S-1 Command radio.

Note

Do not attempt to channel the HF command radio more than once during any 1-minute period, as a time delay will deenergize the set.

3. Microphone Selector Switch—Set.

   Check that interphone box selector switch is in proper position.

4. Microphone Switch—Depress and release.

   When red light on HF command radio comes on, depress microphone switch momentarily and release.

5. Volume Control Knob—Adjust.

   Adjust sound level as desired.

6. BFO Knob—As required.

   When using HF command set for CW operation, adjust BFO knob as desired.

To turn equipment off:

1. OFF-PHONE-CW (Power) Switch—OFF.

   When HF command communication is no longer required, turn power switch OFF.

Emergency Operation.

If the transceiver fails to operate during flight, the following procedures should be employed in an attempt to restore communications.

1. Check 28-volt indication on meter switch to determine whether adequate power is being applied to equipment. Check switches, fuses, circuit breakers, and connections in primary power supply lines, and power supply.

2. Attempt operation on different frequency by selecting another channel.

3. Attempt operation from both pilots' stations and radio rack.

4. Replace microphone, key, or headset, as necessary with similar equipment from another operating position.

5. Make certain that all external connections are securely in place and that cables and connectors are not broken.

6. Check that antenna is not shorted to aircraft skin or carried away. Should tune-up of automatic antenna tuner require more than 45 seconds, thermal time delay relay will open and prevent further operation of automatic antenna tuner. Allow at least 45 seconds for restoration of relay before attempting to change channels. Check antenna for faults.

618T-1 HF COMMUNICATION.

The HF 101 high frequency radio set (618T-1) provides communication between aircraft and between aircraft and fixed or mobile ground communication stations. The set transmits and receives voice communications in the high frequency band on any one of 28,000 frequencies between 2.0 and 29.999 mc. Modes of transmission upper side band (USB), lower side band (LSB) and AM. The remote control panel located on the radio control pedestal provides the operator remote selection of any one of the 28,000 frequencies. Power is supplied to the set from the 28 volt dc and 115 volt ac busses.

Normal Operation.

1. Place the rotary selector switch on the liaison radio control panel at the desired mode of operation.
2. Allow approximately one minute for warmup.
3. Select the desired channel frequency.
4. Trigger the microphone to tune the transmitter.
5. To receive, place the interphone mixer switch in the on (UP) position.
6. To transmit, place the interphone transmission switch in the appropriate position.
7. To turn the liaison set off, turn the function selector switch to OFF.

AN/ARC-38 HF COMMAND TRANSMITTER-RECEIVER (NAVY C-54 AIRCRAFT).

The AN/ARC-38 HF Command transmitter-receiver provides two-way voice or CW communication in the 2.0 to 25.0 megacycle range. The equipment has 20 preset frequencies with an additional 1750 frequencies that may be selected manually. Changing channels or frequencies will normally be accomplished within 15 seconds. Transmission and reception are accomplished by use of one common antenna that is automatically tuned and loaded for the particular frequency selected. The AN/ARC-38 radio is designed to operate from the 28-volt dc bus and the 115-volt, 400-cycle ac power source. The 28-volt power is used to operate the transmitter-receiver and the 115-volt ac power is used to drive the tuning train. Therefore, if an ac power loss is experienced, the equipment may be operated on the channel already selected but another frequency cannot

be tuned. The master control box and transmitter-receiver are normally installed at the radio operator's station, with remote selector boxes in the pilot's compartment.

CAUTION

If the transmitter is keyed during the tuning cycle, the frequency selector relays may be damaged. During the tuning cycle, a 400-cycle tone will be heard through the receiver. At the completion of the tuning cycle, the tone will cease and the transmitter may be safely keyed.

AN/ARC-8, AN/ART-13 HF LIAISON TRANSMITTER AND BC-348 RECEIVER.

The AN/ARC-8 or AN/ART-13 HF liaison transmitter and BC-348 receiver (11 and 6, figure 4-9), located at the radio operator's station, provide long-range, two-way, voice and code communication. The transmitter operates on a high frequency range of 2,000 to 18,000 kilocycles, and a low frequency range of either 200 or 1500 kilocycles or 300 to 500 kilocycles, depending on the type of oscillator installed. The receiver operates on frequency ranges of 200 to 500 kilocycles and 1.5 to 18.0 megacycles. Controls for turning on power, selecting frequencies and tuning are located at the radio operator's station; however, voice transmission and reception are available at each crew member's station when the microphone selector switch and toggle switch on the interphone control box are positioned to LIAISON. A transmitter key (9, figure 4-9) is mounted on the radio operator's table for operation in CW. On some aircraft, a remote control box is installed, to provide for remote control of the transmitter on preset channels. Power for both the transmitter and the receiver is supplied from the 28-volt dc bus.

HF Liaison Transmitter Controls.

The following controls are located on the face of the transmitter (11, figure 4-9) at the radio operator's station:

Transfer Switch: Used to transfer control of transmitter to remote control box, if installed. Switch has placarded positions LOCAL and REMOTE.

Emission Switch: Used to select mode of operation. Switch has placarded positions OFF, VOICE, CW and MCW.

Channel Selector Switch: Used to select preset channel frequencies and high or low frequency manual tuning. Switch has positions CHANNEL MANUAL, L FREQ and positions 1 through 10.

Power Level Switch: Used to select power level for type of operation. Switch has positions CALIBRATE, TUNE, and OPERATE.

Remote Control Box (Some Aircraft): Control box has an emission switch with same positions as emission switch on transmitter and channel selector switch with LF and 1 through 10 positions. When transfer switch on transmitter is in REMOTE position, mode of operation, and frequency selection of 10 preset channels or low frequency to which set is tuned can be selected.

Tuning Knobs and Miscellaneous Controls: Knobs for high and low frequency tuning, antenna tuning and loading, indicators for antenna current and voltage are used for manually tuning and calibration are located on set.

Normal Operation.

On aircraft with remote control box installed, all operation except CW transmission and selection of frequencies other than preset channels may be accomplished at pilots' stations. On aircraft without remote control box, all

tuning and frequency selection must be done at transmitter.

1. Transfer Switch—As required.

   If remote control box is installed, place transfer switch to REMOTE; if not, LOCAL.

2. Emission switch—As required.

   For transmission from crew members stations place switch in VOICE position.

3. Channel Selector Switch—Set.

   Select desired channel. For other than preset channels, place switch in L FREQ or MANUAL and tune desired frequency at transmitter.

4. Power Level Switch—OPERATE.

5. Microphone Selector Switches—Set.

   Check that interphone box selector switch is in LIAISON position and liaison toggle switch is on (up).

To turn equipment off:

1. Emission Switch—OFF.

HF Liaison Receiver Controls.

All controls for operation of the HF liaison receiver are located on the receiver at radio operator's station.

Power Switch: Used to turn power to set on and off and to select either manual or automatic volume control. Switch has placarded positions AVC, OFF, and MVC.

Band Switch and Tuning Knob: Used to select frequency band and tune set to desired frequency.

Volume Knob: Used to control volume level.

CW/OSC Switch: Used to select CW (ON) or voice (OFF) reception. Switch has placarded positions ON and OFF.

Crystal Filter Switch: Allows increased selectivity of receiver for reception through heavy interference.

Antenna Alignment Knob: Used to align antenna for best signal reception.

Normal Operation.

1. Power Switch—MVC.
2. CW/OSC Switch—OFF.
3. Crystal Filter Switch—OUT.
4. Microphone Selector Switches—Set.

   Check that interphone box selector switch is in LIAISON position and liaison toggle switch is on (up).

5. Volume Knob—Set.

   Adjust until slight background noise is heard.

6. Band Switch and Tuning Knob—Set to desired frequency.

To turn equipment Off.

1. Power Switch—OFF.

TRAILING WIRE ANTENNA (SOME AIRCRAFT).

The trailing wire antenna (figure 4-11) is electrically extended and retracted by a motor controlled from the trailing wire antenna reel control box located at the radio operator's station. The trailing wire antenna, when extended, serves either the liaison radio or

LORAN receiver. A red indicator light, located on the trailing wire antenna reel control box, comes on when the antenna is extended. The trailing wire antenna reel motor receives power from the 28-volt dc bus.

BC-453B LF RECEIVER (SOME AIRCRAFT).

The BC-453B LF receiver (23, sheet 1 and 19, sheet 4, figure 1-9), located on the control pedestal, is used to monitor low-frequency radio range signals on a frequency of 190 to 550 kilocycles. Power to the set is supplied from the 28-volt dc bus.

LF Reveiver Controls.

Controls for operation of the LF receiver are located on the control panel (see sheets 1 and 4, figure 1-9) and consist of a function switch with positions OFF, CW, and MCW, a volume control knob, and a tuning crank.

Normal Operation.

1. Function Switch—CW or MCW as required.
2. Tuning Crank—Set.

   Select desired frequency.
3. Volume Control Knob—Adjust.

To turn equipment off:

1. Function Switch—OFF.

AN/ARN-21 TACAN.

The TACAN radio is designed to operate in conjunction with a surface navigation beacon transponder. The TACAN radio provides a radio navigation system that enables the crew to obtain continuous indications of bearing and distance from any selected surface beacon located within a line-of-sight distance from the aircraft up to 195 nautical miles. The navigational system consists essentially of a TACAN receiver-transmitter (3, figure 4-10); a bearing indicator (2, figure 4-14, or 19, figure 4-10); a phase detecting network; a range indicator (28, sheet 1; 33, sheet 3; and 31, sheet 4, figure 1-10); a course indicator (6, figure 1-10) and RMI (7, figure 1-10), located on the main instrument panel; a control panel (22, sheet 2; 14, sheet 3; 22, sheet 4, figure 1-9 and 34, sheet 1, figure 1-11); and a TACAN radio antenna (figure 4-11). Power to the TACAN radio is supplied from the 28-volt dc bus and from the 115-volt single-phase, ac bus.

WARNING

- In the event of failure or blown fuse in the C-1 amplifier, the course indicator will become inoperative without any indication from the OFF flag or the TO/FROM indicator.

WARNING

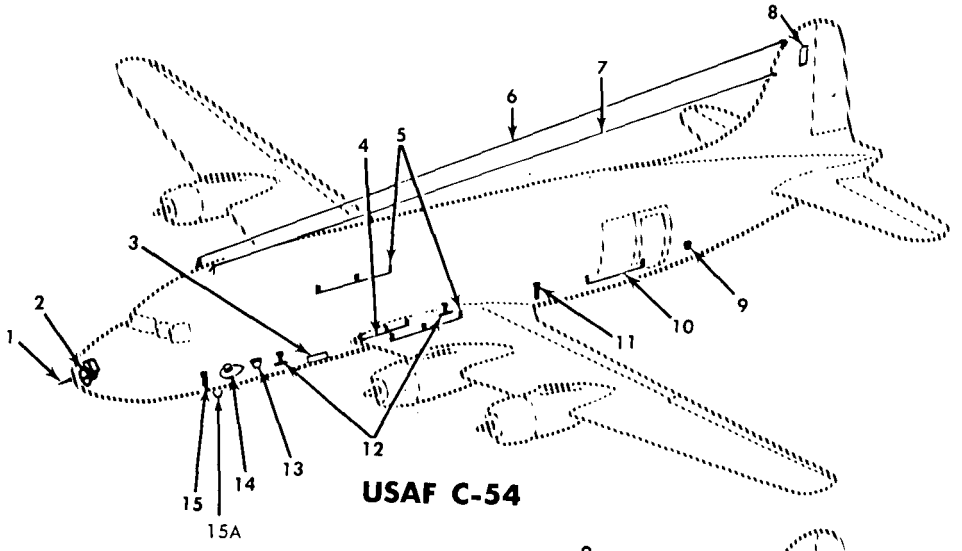
- Occasionally TACAN equipment will "Lock-On" to a false bearing which will be 40 degrees or a multiple of 40 degrees in error. These errors can be on either side of the correct bearing. When the TACAN locks on a false bearing, switching to another channel and then back to the desired channel, or turning the set off and then back on will recycle the search mode. This will most probably result in a correct lock-on.

Note

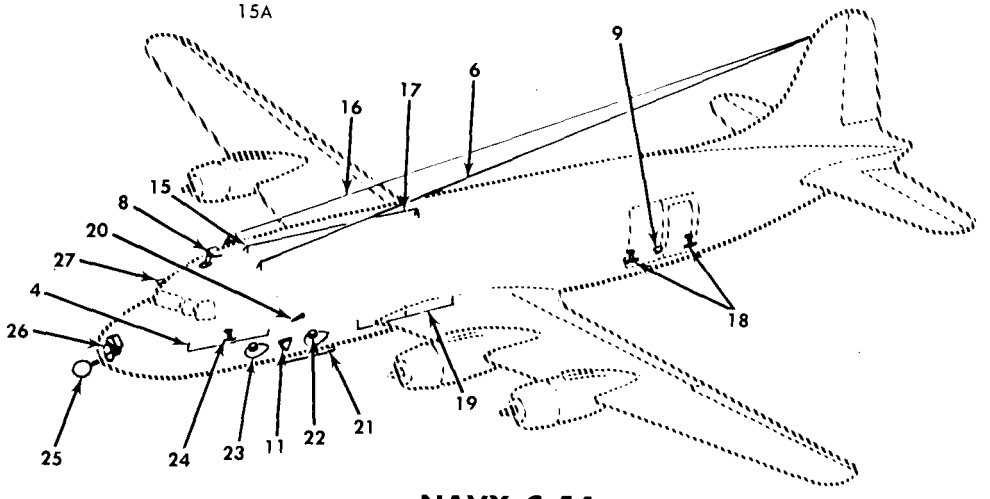
A false lock-on does not effect the DME display provided by the TACAN equipment.

When using TACAN cross check for false lock-on with ground radar, airborne radar, VOR, dead reckoning or other available means.

RADIO ANTENNAS—Typical



USAF C-54



NAVY C-54

1. GLIDE SLOPE (IF SEARCH RADAR NOT INSTALLED)
2. SEARCH RADAR AND GLIDE SLOPE (IF INSTALLED) (USAF C-54)
3. UHF HOMING ADAPTER (USAF C-54)
4. LF RANGE RECEIVER
5. RADIO COMPASS SENSE (USAF C-54)
6. LIAISON
7. TRANSCEIVER (USAF C-54)
8. VHF NAVIGATIONAL (VOR) RECEIVER
9. IFF/SIF
10. MARKER BEACON
11. UHF COMMAND
12. RADIO LOW AND RADAR ALTIMETER (USAF C-54)
13. TACAN
14. RADIO COMPASS LOOP (USAF C-54)
15. VHF COMMAND
15A. VHF COMMAND 50KC SPACING (807) (USAF C-54 AND VC-54)
16. LORAN (NAVY C-54)
17. HF COMMAND (NAVY C-54)
18. RADIO LOW ALTIMETER (NAVY C-54)
19. MARKER BEACON AND LF RANGE RECEIVER
20. LIAISON TRAILING ANTENNA LEAD-IN (NAVY C-54)
21. RADIO COMPASS (RED) SENSE (NAVY C-54)
22. RADIO COMPASS (RED) LOOP (NAVY C-54)
23. RADIO COMPASS (GREEN) LOOP (NAVY C-54)
24. RADAR ALTIMETER (NAVY C-54)
25. RADIO COMPASS (GREEN) ANTISTATIC LOOP (NAVY C-54)
26. SEARCH RADAR (NAVY C-54)
27. GLIDE SLOPE (NAVY C-54)

Figure 4-11 (Sheet 1 of 2)

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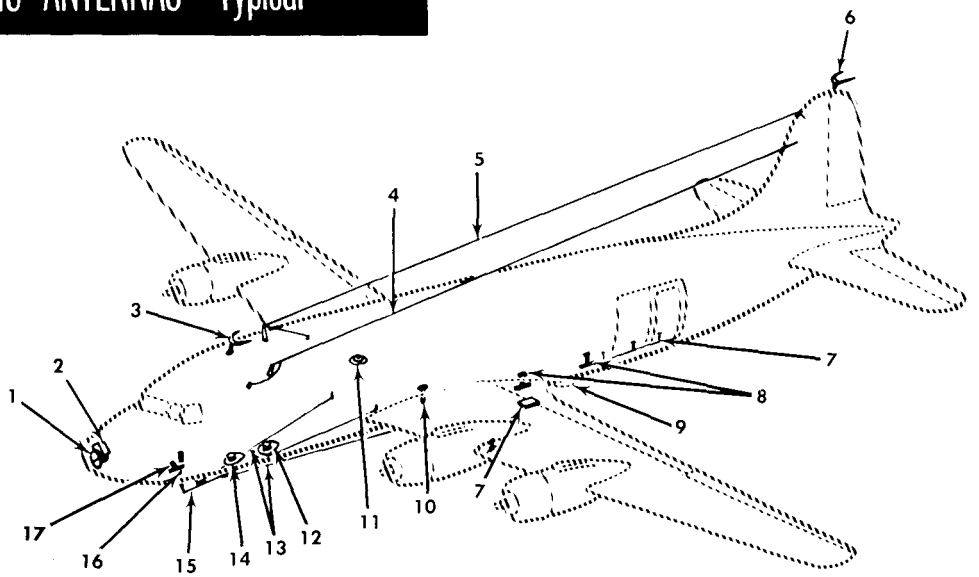
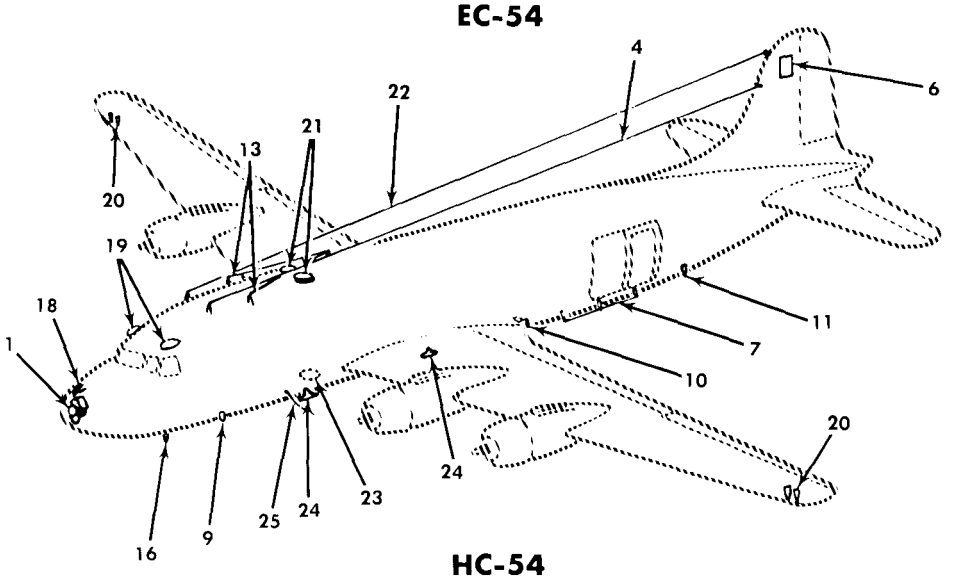
RADIO ANTENNAS—Typical



EC-54



HC-54

1. SEARCH RADAR
2. GLIDE SLOPE (NO. 2) (EC-54)
3. GLIDE SLOPE (NO. 1) (EC-54)
4. TRANSCEIVER
5. LIAISON (EC-54)
6. VHF NAVIGATIONAL (VOR) RECEIVER
7. MARKER BEACON
8. RADAR ALTIMETER (2 PLACES) (EC-54)
9. TACAN
10. UHF COMMAND
11. IFF/SIF
12. RADIO COMPASS (NO. 2) LOOP (EC-54)
13. RADIO COMPASS SENSE
14. RADIO COMPASS (NO. 1) LOOP (EC-54)
15. LF RANGE RECEIVER (EC-54)
16. VHF COMMAND
17. RADIO LOW ALTIMETER (EC-54)
18. GLIDE SLOPE (HC-54)
19. INTERROGATOR (HC-54)
20. VHF HOMING ADAPTER (2 PLACES) (HC-54)
21. RADIO COMPASS LOOP (HC-54)
22. LORAN RECEIVER AND LIAISON RADIO (HC-54)
23. UHF HOMING ADAPTER (HC-54)
24. RADAR AND RADIO LOW ALTIMETER (2 PLACES) (HC-54)
25. TRAILING WIRE ANTENNA (HC-54)

Figure 4-11 (Sheet 2 of 2)

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These checks are especially important when switching channels or when turning the set on. When false lock-on is suspected check as follows:

1. Switch to another channel, check for correct bearing, then switch back to desired channel.
2. Check for correct lock-on to desired channel.
3. If false lock-on is still suspected, turn set off and then ON.
4. Recheck for correct lock-on.
5. If false lock-on still persists, utilize other equipment or navigational aids available.

Note

If, during an emergency the magnitude and direction of error can be determined, TACAN can be utilized if compensation is made for the error in the TACAN bearing.

TACAN Controls.

The following controls are located on the TACAN control panel:

Function Selector Switch: Used to turn equipment on and OFF and to select mode of operation. Switch has placarded positions T/R, REC, and OFF.

Channel Selector Knob: Used to select desired channel. Channel selection is indicated in the window on the control head.

Volume Control Knob: Used to adjust sound level of reception.

TACAN Operation.

1. Navigational Instrument Selector Switch —TACAN.
2. Function Selector Switch—REC.

   Allow 3-minute warmup period before selecting T/R function. REC position turns equipment on so that only bearing information is received. T/R position operates equipment so that both bearing and distance information is displayed.
3. Channel Selector Knob—Desired frequency.

Note

It is not necessary to return the selector switch to REC position when selecting a new frequency.

4. Volume Control Knob—As desired.

To turn equipment off:

1. Selector Switch—OFF.

AN/ARN-14 VHF NAVIGATIONAL RECEIVER (VOR).

The AN/ARN-14 navigational receiver is an aid to navigation operating in the frequency range of 108° to 135.9 megacycles. The system consists essentially of a course indicator and two radio magnetic indicators (6 and 7, figure 1-10), located on the main instrument panel; a receiver, located in the tail compartment; a control panel (23, sheet 1; 15, sheet 2; 22, sheet 3, and 24, sheet 4, figure 1-9), located on the control pedestal; and an antenna (figure 4-11). On some aircraft, additional VOR indicators (15, figure 4-10) and the receiver 21, figure 4-10) are located on the radio rack. Power for operation of the receiver is supplied from the 28-volt dc bus.

WARNING

When ac power is lost the course deviation indicator, warning flag, and TO/FROM indicator will continue to operate as they are powered from the 28-volt dc bus.

Note

During a VOR approach using a VOR-TAC facility, it is not necessary to turn the TACAN set off, provided the TACAN is selected to the same facility.

VHF Navigation System Operation.

1. Navigational Instrument Selector Switch —VOR ILS.
2. VHF Navigation Receiver Power Switch —ON.
3. Frequency Selector—Set.

   Select desired frequency.

To turn equipment off:

1. VHF Navigational Receiver Power Switch—OFF.

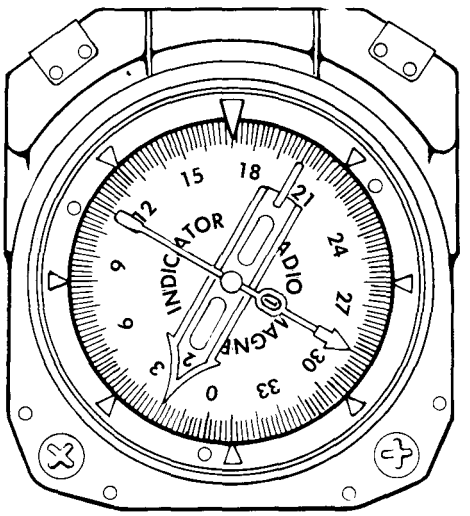
NAVIGATIONAL INSTRUMENT SELECTOR SWITCH.

The navigational instrument selector switch (20, sheet 3 and 23, sheet 4, figure 1-9; and 35, sheet 1, figure 1-11) is located on either the control pedestal or the pilots' overhead panel depending on aircraft configuration. The switch has the placarded positions TACAN and VOR-ILS and allows selection of either the navigational system (TACAN) or the instrument approach system for the desired operation. On some aircraft two indicator lights located next to the switch correspond to the switch positions and indicate which navigational system is being used.

RADIO MAGNETIC INDICATOR (RMI).

Three radio magnetic indicators (figure 4-12) indicate the aircraft's magnetic bearing with respect to a selected surface beacon. Two

RADIO MAGNETIC INDICATOR (RMI)



X1-280

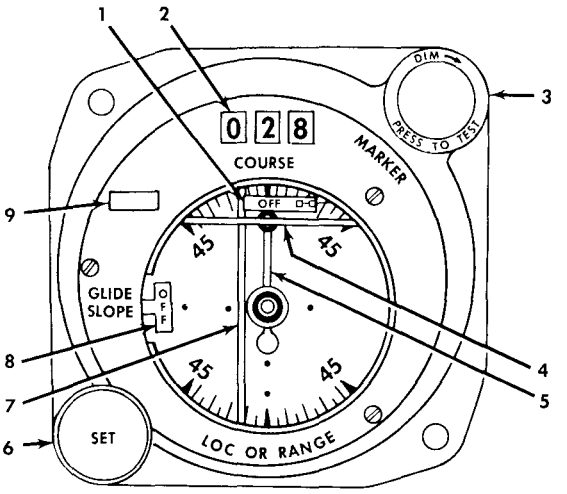
Figure 4-12

indicators (27, figure 1-10) are located on the main instrument panel and one indicator (12, figure 4-14 and 11, figure 4-15), at the navigator's station. The No. 1 bearing pointer of the pilot's radio magnetic indicator is controlled by the No. 1 radio compass or the UHF homing adapter, if operating. The No. 2 pointer is controlled by the navigational receiver (VOR) or the navigational system (TACAN), as selected by the navigational instrument selector switch. The No. 2 radio compass or the UHF homing adapter, if operating, controls the No. 1 bearing pointer of the copilot's indicator. The navigational receiver (VOR) or navigational system (TACAN), as selected on the navigational instrument selector switch, controls the No. 2 bearing pointer. The No. 1 pointer of the navigator's indicator is controlled by the No. 1 radio compass or the UHF homing adapter, if operating. The No. 2 bearing pointer is controlled by the No. 2 radio compass. When the radio magnetic indicators are receiving information from the UHF homing adapter, indicator light (31, sheet 3, figure 1-10 and 12, figure 4-14), located adjacent to each indicator, will come on.

WARNING

The radio magnetic indicators are operated (both cards and pointers) by the C-1 amplifier. The amplifier receives 115-volt, single-phase, ac power from the main inverter system. Loss of ac power to, or from, the C-1 amplifier will render the radio magnetic indicators inoperative.

COURSE INDICATOR



1. COURSE WARNING FLAG: Detects signal strength.
2. COURSE SELECTOR WINDOW: Indicates course selected by pilot.
3. MARKER BEACON LIGHT: Indicates when aircraft is within range of marker beacon transmitter.
4. GLIDE SLOPE INDICATOR: Indicates vertical deviation from glide slope.
5. HEADING POINTER: Indicates relationship between aircraft heading and selected course.
6. COURSE SET KNOB: Used to select any one of 360 courses.
7. COURSE DEVIATION INDICATOR: Indicates position of the selected course in relation to the position of the aircraft.
8. GLIDE SLOPE WARNING FLAG: Detects signal strength.
9. TO-FROM INDICATOR: Indicates whether the course selected, if intercepted and flown, will take you to or from the station.

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Figure 4-13

INSTRUMENT LANDING SYSTEM (ILS).

Instrument landing system (ILS) frequencies are selected on the VHF navigation control panel (23, sheet 1; 15, sheet 2; 22, sheet 3; and 24, sheet 4, figure 1-9), located on the control pedestal. The appropriate information received is displayed on the course indicator (figure 4-13).

AN/ARN-5, AN/ARN-18 GLIDE SLOPE RECEIVER.

A glide slope receiver (10, figure 4-10), either AN/ARN-5 or AN/ARN-18, is installed and is used in conjunction with the localizer function of the VHF navigational receiver (AN/ARN-14). Visual glide slope indications

are presented on the course indicator (6, figure 1-10) located on the main instrument panel. The glide slope receiver is controlled from the VHF navigational receiver control panel. Selection of an ILS localizer frequency automatically results in the corresponding slide slope frequency being tuned in the glide slope receiver. The AN/ARN-5 set is powered from the 28-volt dc bus, and the AN/ARN-18 set is powered from the 115-volt ac bus.

Glide Slope Receiver (ILS) Operation (AN/ARN-5 or AN/ARN-18).

1. VHF Navigational Receiver Power Switch—ON.
2. Navigational Instrument Selector Switch—VOR-ILS.
3. VHF Navigational Receiver Frequency Selector—Set. Select desired localizer and glide slope frequency.
4. Volume Control Knob—Adjust. Adjust volume control to desired sound level.
5. Observe glide slope indications on the pilot's course indicator.

To turn equipment off:

1. VHF Navigational Receiver Power Switch—OFF.

AN/ARN-6, AN/ARN-7, OR AN/ARN-44 RADIO COMPASS.

Three types of radio compasses, AN/ARN-6, AN/ARN-7 or AN/ARN-44, may be installed. All three types are identical in function and operation, the differences being frequency ranges covered and the power required for operation. The AN/ARN-6 and -7 sets both cover a frequency range of 100 to 1750 kilocycles in four bands, while the AN/ARN-44 covers a frequency range from 200 to 1750 kilocycles in three bands with a fourth band which covers a range of 2000 to 3500 kilocycles. Power for operation of the AN/ARN-6 and -44 is supplied from the 28-volt dc bus. The AN/ARN-7 requires both 28-volt dc and 115-volt ac power.

The radio compasses are controlled from the radio compass control panels located on the control pedestal (figure 1-9) at the navigator's station (figures 4-14 and 4-15), or at the pilots' stations, adjacent to the pilots' overhead panel, depending on configuration of the aircraft. On Navy C-54 aircraft, the two radio compasses are designated as RED and GREEN radio compass. Output of each radio compass receiver is coupled to a radio magnetic indicator to display bearing information received from that receiver.

Radio Compass Controls.

The radio compass control panels (21, sheet 1; 14, sheet 2; 15, sheet 3, figure 1-9 and 15, figure 4-14) contain the following controls:

Function Switch: Used to select mode of operation. Switch has positions OFF, COMP, ANT, and LOOP.

Frequency Band Selector, Tuning Crank, and Tuning Meter: Used to select frequency band and tune radio to desired frequency.

Audio Selector Switch: CW position is used for code reception. Switch has CW and VOICE positions. On some aircraft, this switch is incorporated into function switch.

Loop Switch: Provides control of rotation of loop antenna when function switch is in LOOP position. Switch has positions L and R.

Volume Control Knob: Used to control volume to interphone system.

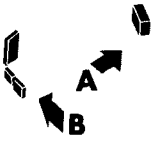
Radio Compass Operation.

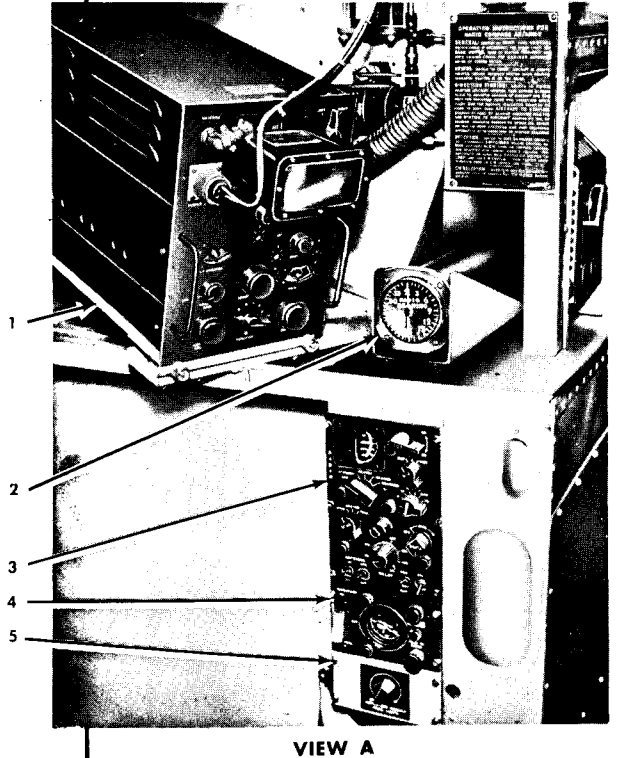
1. Function Switch—ANT.

NAVIGATOR'S STATION—Typical

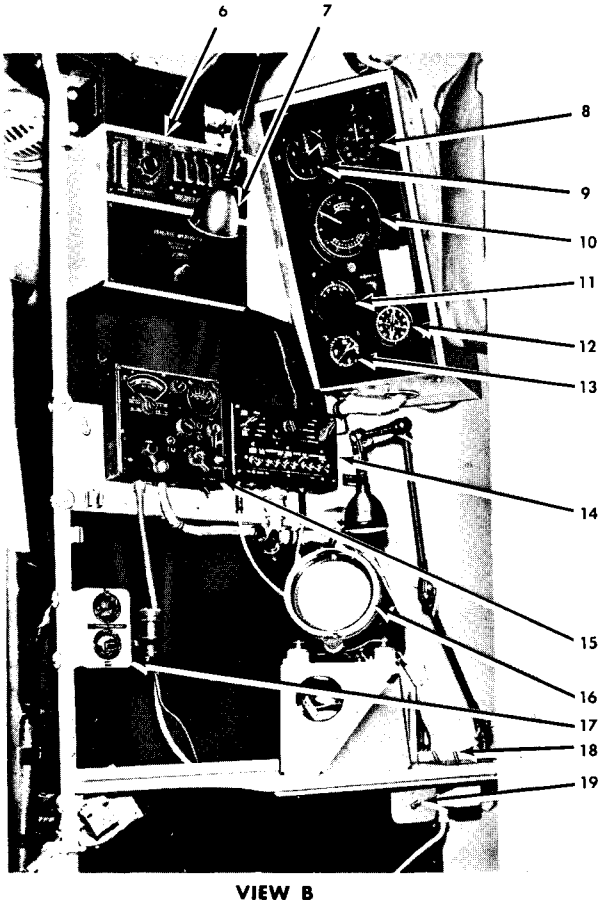
USAF C-54

1. LORAN RECEIVER AND INDICATOR
★ 2. TACAN BEARING INDICATOR
★ 3. SEARCH RADAR CONTROL PANEL
★ 4. RADAR PRESSURIZATION CONTROL PANEL
★ 5. PRESSURIZATION CONTROL PANEL LIGHTS RHEOSTAT
★ 6. IGNITION ANALYZER SWITCH PANEL
7. TABLE LIGHT
8. AIRSPEED INDICATOR
9. ALTIMETER
10. FLUX GATE/N-1 COMPASS MASTER INDICATOR
★11. VOR BEARING CONVERTER INDICATOR
★12. RADIO MAGNETIC INDICATOR
★13. CLOCK





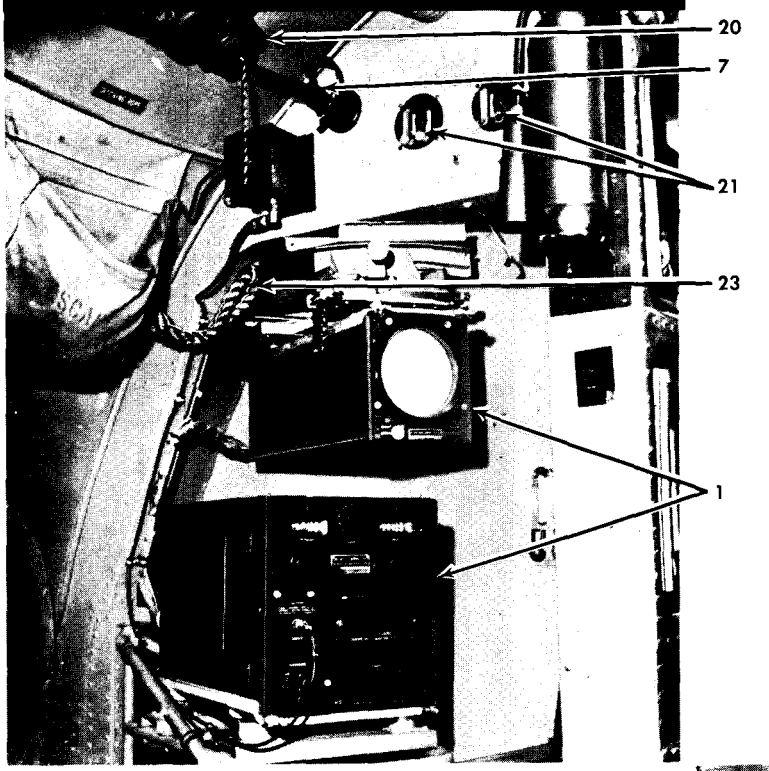
VIEW A



VIEW B

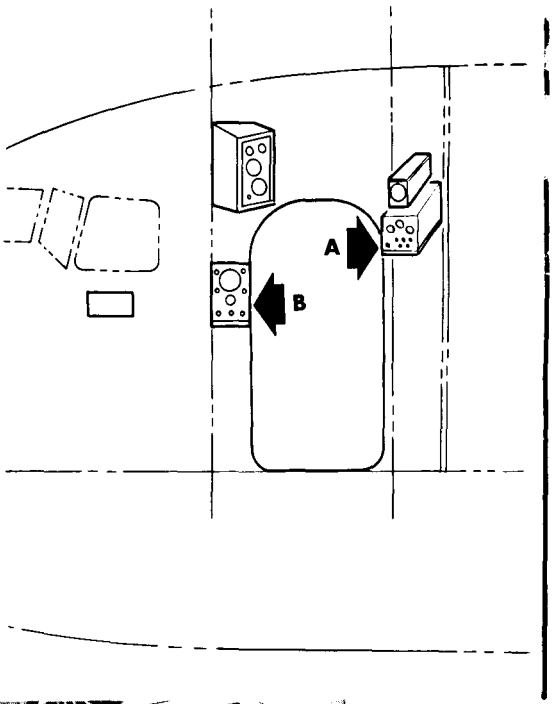
Figure 4-14 (Sheet 1 of 2)

NAVIGATOR'S STATION—Typical



VIEW A

NAVY C-54



14. INTERPHONE CONTROL PANEL (STATION BOX, NAVY C-54)

★15. RADIO COMPASS CONTROL PANEL

★16. SEARCH RADAR SCOPE

17. INSTRUMENT LIGHT CONTROL PANEL

★18. TABLE LIGHT SWITCHES

★19. DRIFTMETER SWITCH

★★20. VERY PISTOL MOUNT

★★21. PROPELLER ANTI-ICING NEEDLE VALVES AND FLOWMETERS

★★22. RADIO COMPASS REPEATER INDICATOR

★★23. ESCAPE ROPE

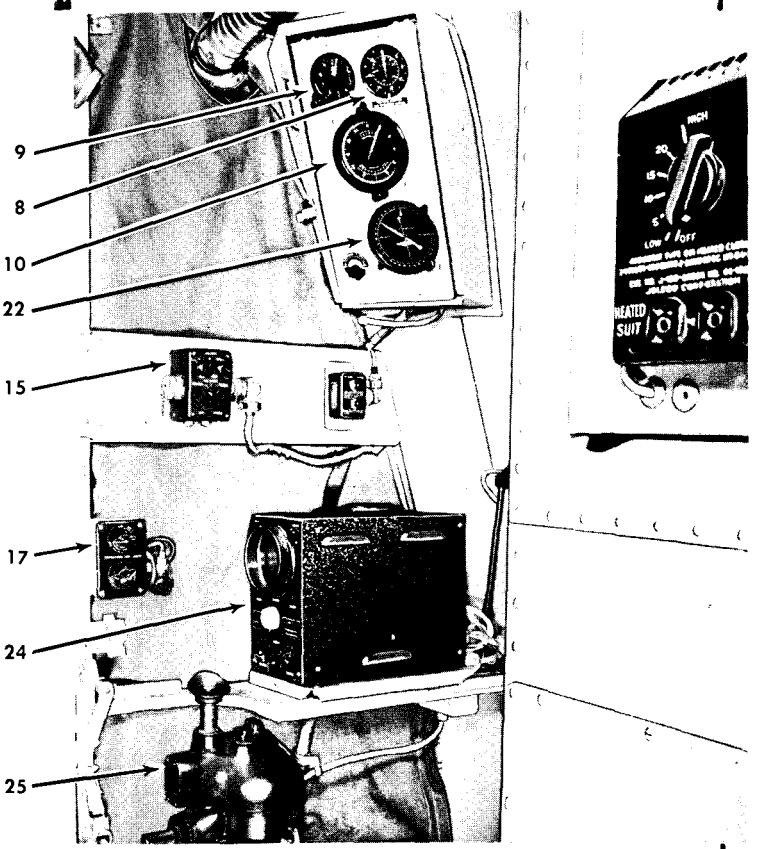
★★24. IGNITION ANALYZER

25. DRIFTMETER

★ USAF C-54 ONLY

★★ NAVY C-54

ALL ITEMS NOT MARKED COMMON TO BOTH CONFIGURATIONS

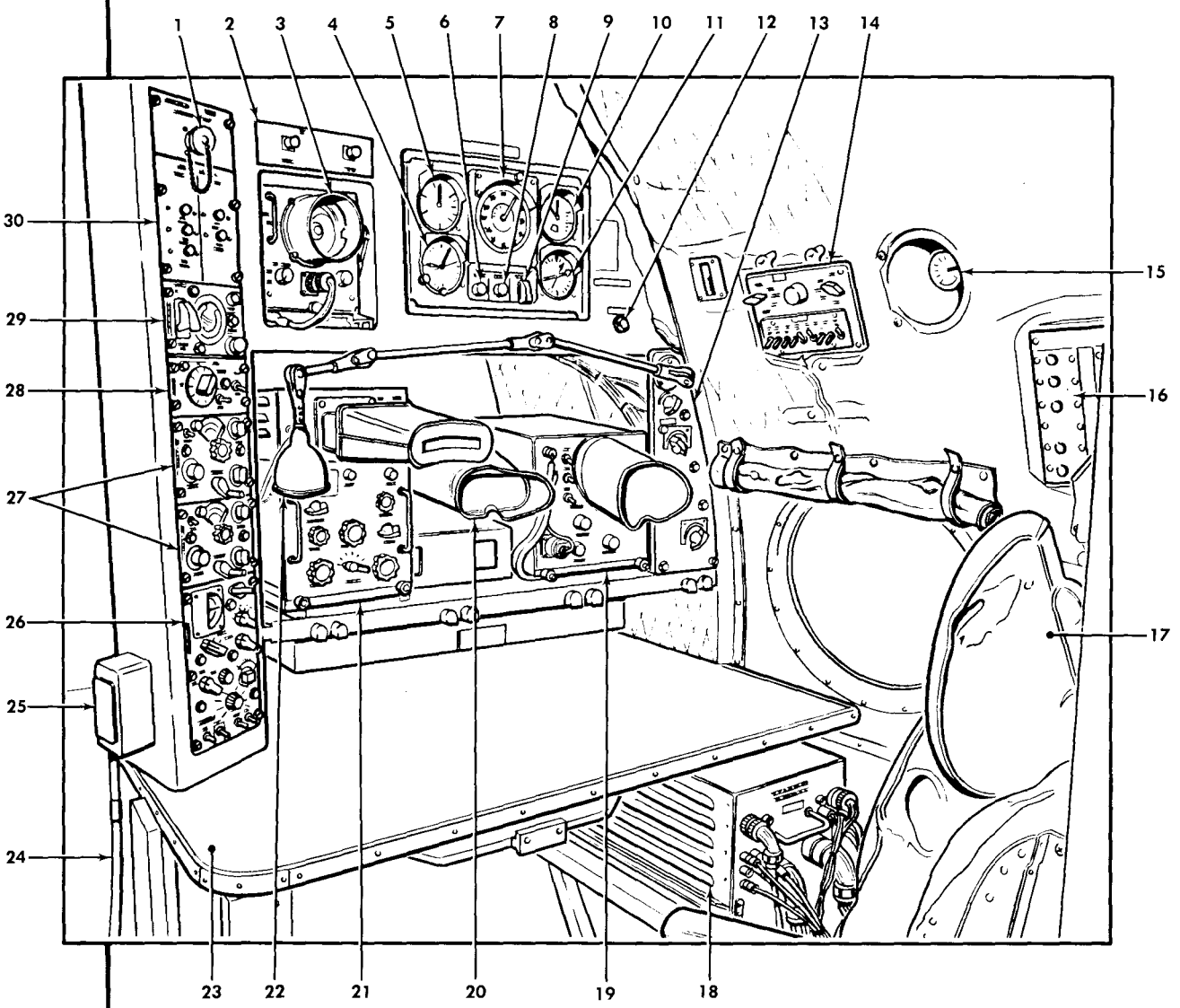


VIEW B

Figure 4-14 (Sheet 2 of 2)

X1-283

NAVIGATOR'S STATION—HC-54



1. ELECTRONIC TEST RECEPTACLE
2. INTERROGATOR TEST PANEL
3. RADAR HIGH ALTIMETER INDICATOR
4. CLOCK
5. AIRSPEED INDICATOR
6. C-1 AMPLIFIER POWER FAILURE WARNING LIGHT
7. N-1 COMPASS MASTER INDICATOR
8. N-1 COMPASS POWER FAILURE WARNING LIGHT
9. N-1 COMPASS POWER SWITCH
10. ALTIMETER
11. RADIO MAGNETIC INDICATOR
12. UHF HOMING ADAPTER INDICATOR LIGHT
13. NAVIGATOR'S LIGHTING CONTROL PANEL
14. INTERPHONE CONTROL PANEL
15. FREE-AIR TEMPERATURE INDICATOR
16. RADIO COMPASS AND TACAN RADIO CIRCUIT BREAKER PANEL
17. NAVIGATOR'S SEAT
18. SEARCH RADAR SYNCHRONIZER
19. INTERROGATOR INDICATOR
20. SEARCH RADAR INDICATOR
21. LORAN RECEIVER-INDICATOR
22. NAVIGATOR'S TABLE LAMP
23. NAVIGATOR'S TABLE
24. PORTABLE OXYGEN CYLINDER RECHARGER ASSEMBLY
25. ASH TRAY
26. SEARCH RADAR CONTROL PANEL
27. RADIO COMPASS CONTROL PANELS
28. INTERROGATOR CONTROL PANEL
29. SEARCH RADAR PRESSURIZING CONTROL PANEL
30. NAVIGATOR'S CIRCUIT BREAKER PANEL

Figure 4-15

X1-284

2. Volume Control Knob—Adjust.

3. Frequency Band Selector Switch and Tuning Crank—Set.

   Set band switch to desired frequency band and rotate tuning crank to desired frequency. Adjust to maximum swing of tuning meter.

Note

On some aircraft, the radio compass control panel does not have a tuning meter. On these aircraft, fine tuning for ADF must be accomplished with the function switch in the ANT position and the audio selector switch in the CW position. Tune for minimum modulated tone; return the audio selector switch to VOICE position and the function switch to COMP.

4. Function Switch—Set

   After tuning place function switch in desired operating position.

To turn equipment off:

1. Function Switch—OFF.

AN/ARN-8 OR AN/ARN-12 MARKER BEACON.

Two amber marker beacon lights (3, figure 4-13) are located on the main instrument panel. One light is incorporated with the pilot's course indicator (16, figure 1-10) and the other light is mounted in front of the co-pilot. When the aircraft is within the radiation pattern of a 75-megacycle marker beacon transmitter, the marker beacon lights come on and an aural signal is received. The marker beacon receiver has no controls but is energized when power is supplied to the main dc bus. The lights are energized by a 28-volt dc circuit. On some aircraft, the marker beacon receiver is energized when the radio compass is turned ON.

WARNING

Verify reception with aural signal because of possible interference from television channel No. 5.

AN/APX-25 IFF/SIF. See 05-14 Section 3-5 for supplement

The AN/APX-25 IFF/SIF transponder (receiver-transmitter) is a signaling device for radar echo identification. The receiver turns on the transmitter momentarily each time coded challenges are received from suitably equipped surface or airborne radar. The reply from the transmitter accomplishes the display of associated echo on the indicators of the challenging radar, thereby identifying the echo. The transponder, operating in the Mark X and selective identification feature (SIF) systems, is used primarily for military air traffic control and interception purposes. Simultaneous operation in both the SIF and normal Mark X systems is not possible, and the system of operation is determined by a preset switch, with NORMAL and MOD positions, in the transponder. The IFF transponder consists essentially of a receiver-transmitter and a coder located in the tail compartment, an SIF control panel and an IFF transponder control panel (5, figure 4-9) located at the radio operator's station, and an IFF antenna (figure 4-11). On some aircraft the IFF/SIF transponder control panel is located overhead in the pilots' compartment, adjacent to the pilots' overhead panel. Primary power for operation of the transponder is supplied by the 28-volt dc system and the 115-volt, single-phase, ac system.

IFF/SIF Operation.

Note

No transmission will be made on emergency (distress) frequency channels, except for emergency purposes in order to prevent transmission of messages that could be construed as actual emergency messages.

1. To start, Transponder MASTER Switch—STDBY.

   While equipment is warming up, set operational codes on SIF control panel for modes 1 and 3. Codes for mode 2 are set up on coder by maintenance personnel.

CAUTION

Allow at least 1 minute for set to warm up before operating to preclude damage to the equipment.

Note

The SIF control panel is effective only when operating in the SIF system, therefore, it is unnecessary to set up operational codes for modes 1 and 3 if operating in the Mark X system.

2. Transponder MASTER Switch—As desired.

   Place transponder MASTER switch in desired position of operation. In LOW position, receiver sensitivity is low and operates only when strong interrogating signals are received. In NORMAL position, receiver is operating at full sensitivity and provides maximum performance. EMERGENCY position provides full sensitivity and when operating with Mark X system replies to any interrogated mode. When operating with SIF system using KY-95 coder, replies are made to mode 1 interrogations; and, when using KY-95A coder, replies are made to mode 1 and 3 interrogations. Red button located to left and below transponder MASTER switch must be manually pushed in before transponder MASTER switch may be positioned to EMERGENCY position.

3. Mode 2 Switch—As desired.

   Mode 2 switch has OUT and MODE 2 positions. In OUT position, transponder replies to normal mode 1 interrogations for Mark X operation or, for SIF operation, coded mode 1 replies are made to mode 1 interrogations; but in this position, no replies are made to mode 2 interrogations. In MODE 2 position, mode 1 operations are retained and, in addition, normal mode 2 replies for Mark X operation and coded mode 2 replies for SIF operation are available.

4. Mode 3 Switch—As desired.

   Mode 3 switch has OUT and MODE 3 positions. In OUT position, transponder operates in mode 1 as described in step 3. In MODE 3 position, mode 1 operations are retained and, in addition, normal mode 3 replies for Mark X operation and coded mode 3 replies for SIF operation are available.

5. I/P-MIC Switch—As desired.

   I/P-MIC switch has I/P, OUT, and MIC positions. When switch is held in spring-loaded I/P position, transponder replies to mode 2 interrogations with mode 2 replies during Mark X operation. During SIF operation, using the KY-95 coder, transponder replies to mode 1 interrogations with two coded mode 1 replies. When using KY-95A coder, replies are made to mode 1 interrogations, as described, and two coded mode 3 replies to mode 3 interrogations are transmitted. In MIC position, I/P replies are transmitted when pilot's microphone button is depressed.

To turn equipment off:

1. Transponder MASTER Switch—OFF.

Note

Consult appropriate publications for latest changes.

AN/APX-28 INTERROGATOR (HC-54).

The interrogator operates in conjunction with the IFF transponder, in the Mark X or selective identification feature system of identification, to provide three interrogating modes

and a means of receiving three reply codes over a range of 200 miles. Interrogating modes are produced internally by the interrogator while the reply codes received by the interrogator are produced by a remote IFF transponder. These reply codes are produced visually on the interrogator indicator as an L-scope presentation and indicate any deviation in aircraft heading from the reply code source. During operation, the two antennas are alternately pulsed through the antenna lobe switch slow enough that the transponder replies are received at the same antenna from which the interrogating challenge was transmitted, yet fast enough to prevent any flicker on the indicator screen. The indicator sweep starts at the time the interrogating pulse leaves the antenna; therefore, the transponder reply signal is presented on the indicator at some later instant in time, causing the reply deflection, as shown on the range scale, to correspond to the distance to the remote transponder. If the aircraft is heading directly toward the reply source, both antennas will receive equal signal strength, and left-right deflection of the indicator sweep will be equal, indicating that the aircraft is on course. If the reply source is to the left, the left antenna will receive a greater amount of the signal than the right antenna, resulting in corresponding deflections on the indicator, indicating that the reply source is to the left of the aircraft heading. If the right antenna receives the greater amount of signal, the reverse is true, indicating the reply source is to the right of the aircraft heading. The interrogator consists essentially of a receiver-transmitter (18, figure 4-10) located on the No. 2 radio rack, a control panel (28, figure 4-15) and an indicator (19, figure 4-15) at the navigator's station, and two antennas (figure 4-11). The interrogator receives power from the 115 volt, single-phase, ac and 28-volt dc buss-5.

Interrogator Operation.

1. Mode Selector Switch—Desired mode of operation.
2. Challenge Switch—OUT.
3. Receiver Gain Control Knob—Set to approximately 5.
4. Intensity Control Knob—Full counterclockwise.
5. Range Selector Switch—Desired range of operation.
6. Power Switch—ON.

CAUTION

Allow approximately 1 minute for the equipment to warm up. A 45-second time delay is built into the transmitter to provide protection for the tubes in the high voltage circuits.

7. Challenge Switch—As desired.

   To initiate identification of any transponder within range, position challenge switch to ON or LOCK ON position. Either position initiates interrogations; however, ON position is spring loaded which requires operator to manually hold switch in position for as long as he wishes to challenge target aircraft. Placing switch to LOCK ON position eliminates need for manually holding switch for continuous interrogation.

8. Intensity Control Knob—Adjust.

   Adjust intensity control knob as necessary to obtain desired trace illumination.

9. Focus Control Knob—Adjust.

   Adjust focus control knob to obtain sharp sweep trace line.

10. Receiver Gain Control Knob—Adjust.

    Adjust receiver gain control knob to obtain best signal-to-noise ratio as seen on indicator screen. Signal-to-noise ratio (grass or noise signal) should be approximately 1/16-inch wide.

11. Range Selector Switch—As desired.

    For expanded sweep operation, delay positions of range selector switch may

be used. As an example, assume that interrogated source is at some range beyond 50 miles. Range may be roughly calculated by location of reply pulse deflection along calibrated scale on indicator screen. Rotate delay range control to bring delay range marker on sweep trace under reply deflection. Place range selector switch to 50-D position. Display on indicator screen will now start at delay range (at bottom of screen) and sweep length will represent 50 nautical miles. If range selector switch is placed in 10-D position, sweep length will represent 10 nautical miles. Delay range marker will not be visible in either delay setting of range selector switch since original position on undelayed sweep trace now corresponds to beginning of sweep. Range at which delay sweep starts is presented on delay range dial located below indicator screen. Range should be read to first received pulse.

12. Challenge Switch—OUT.

To place interrogator in standby operation, place challenge switch to OUT position. All circuits are energized to maintain operating temperature but interrogating trigger circuits are disabled, preventing transmission of interrogating pulses until desired. In standby operation, equipment is available for instant operation by simply positioning challenge switch to ON or LOCK ON position.

To turn equipment off:

1. Challenge Switch—OUT.
2. Power Switch—OFF.

Note

The interrogator has no emergency mode available for transmission in the Mark X system and will not transmit any emergency code or signals. Only one method of operation is available, that of an interrogator.

SCR-718 RADAR ALTIMETER.

A radar altimeter (high range)(1, figure 4-9) is installed at the navigator's station. If search radar equipment is installed, the radio altimeter is located above the radio operator's seat. The function of the equipment is to provide a positive altitude reading of aircraft above the existing terrain or surface of the water. Range is from 0 to 40,000 feet. To turn on the equipment, rotate the receiver gain control clockwise from the OFF position. To turn off the equipment, turn the receiver gain control to OFF. The radar altimeter receives power from the 115-volt ac bus.

WARNING

Do not rely on the SCR-718 equipment to provide terrain clearance when flying over areas covered by a large depth of snow and/or ice.

CAUTION

The SCR-718 radio altimeter operating in the band 420-460 MC/S is a source of interference to the radio astronomy receivers and other authorized electronics radiation equipment operating in 406-450 MC/S. Except in emergency the SCR-718 Radio Altimeter equipment will be used only over broad ocean area starting not less than 50 miles off shore unless restriction is specifically waivered by Headquarters USAF.

AN/APN-9 LORAN RECEIVER (AN/APN-70 — NAVY C-54 AIRCRAFT).

CAUTION

The LORAN receiver is a navigational aid used to receive and display signals transmitted on the LORAN principal and operates at altitudes up to 40,000 feet over a daytime range of 700 miles and up to 1400 miles at night. The LORAN receiver consists essentially of a receiver-indicator (1, figure 4-14 and 21, figure 4-15) located at the navigator's station. All controls necessary for operation of the LORAN receiver are located on the front of the receiver-indicator. Power to the LORAN receiver is supplied by the 115-volt, single-phase, ac system.

LORAN Receiver Operation.

1. To Start, Amplitude Balance Knob—Center Position.
2. Fine Delay Knob—Center Position of rotation.
3. Drift Knob—Center position of rotation.
4. Receiver Gain Knob—Rotate clockwise.

   Rotate receiver gain knob clockwise until station rate identification light (pilot light) comes on. Wait at least 5 minutes to allow equipment to warm up. Set is now ready for operation.

To turn equipment off:

1. Receiver Gain Knob—Power OFF.

   Check that pilot light is off and pattern on indicator screen has disappeared.

AN/APS-42 SEARCH RADAR.

The search radar is a navigational aid as well as an anticollosion warning device that provides a visual indication of the position of cities, landmarks, shorelines, islands, other aircraft, cloud formations, and beacon stations. The position of the targets are indicated visually in azimuth and range relation to the heading of the aircraft. The search radar consists essentially of a receiver-transmitter located in the nose-wheel well; two indicators (15, figure 1-7 or 14, figure 1-8 and 16, figure 4-14), one at the pilot's station and one at the navigator's station; a synchronizer (18, figure 4-15); a control panel (3, figure 4-14 and 26, figure 4-15); a pressurizing kit and a pressurizing control panel (4, figure 4-15, 29, figure 4-15) at the navigator's station; and an antenna (figure 4-11), located in the nose radome. The search radar receives power from the 28-volt dc and 115-volt ac busses.

Search Radar Operation.

Preoperational Check.

1. Function Knob—OFF.
2. Intensity Control Knob (On Both Pilot's And Navigator's Indicators)—Full counterclockwise.
3. Scan Selector Knob—STOP.
4. Gain Control Knob—Full counterclockwise.
5. Tune Control Knob—AFC (Full counterclockwise).
6. Antenna Stab Switch—OUT.
7. Antenna Heater Switch—OUT.
8. Search Radar Circuit Breakers—Check.

Operation.

1. Main Inverter Switch—MAIN.
2. Master Radio Switch—ON.
3. Voltage And Frequency—Check.

   Check that voltage and frequency have stabilized at 115 to 120 volts and 380 to 420 cycles.

4. Function Knob—STANDBY.

CAUTION

After placing the function knob in the STANDBY position, wait at least 3 minutes before further operation. This is an added precaution as there is an automatic 3-minute time delay anytime the function knob or heater switch is moved from the OFF position. However, excessive damage could result should the automatic time delay be inoperative.

Note

The antenna tilt meter will be deflected by operation of the antenna tilt control knob when the equipment has warmed up sufficiently.

5. Intensity Control Knob—Adjust.

   Adjust intensity control knob until trace on indicator is just visible.

6. Focus Control Knob—Adjust.

   Adjust focus control knob for sharp and clear trace.

7. Function Knob—SEARCH.

8. Scan Selector Knob—FULL.

9. Antenna Stab Switch—STAB.

   Placing antenna stab switch to STAB position gyro-stabilizes the antenna. If sweep turn is anticipated, place antenna stab switch to OUT position.

10. Gain Control Knob—Clockwise until target appears.

11. Intensity Control Knob—Adjust.

    Adjust intensity control knob so that trace is barely visible. There is an optimum position for clearest viewing and highest degree of definition.

Note

- If no signal appears after turning up the gain control knob a reasonable amount or, in the event that the sweep starts spoking, move the tune control knob from the AFC position and attempt to tune the set manually. This is a critical adjustment requiring careful procedure. Use the manual tuning only when absolutely necessary. The AFC position is much more advantageous.
- The search radar has a much higher amplification factor than is normally needed to ensure that equipment will still be operative in the event that some tubes become weak during flight.

12. Antijam Knob—As desired.

    When it is desired to materially reduce returns from heavy masses of targets, better definition may be had by setting antijam knob to FTC position. Further sharpening may be obtained by placing knob to IAGC position. Use setting that gives clearest results and readjust the gain control knob, if desired.

Note

The antijam knob should not be used unless definite improvements are noted as the overall sensitivity of the radar is reduced, making small targets at longer ranges more difficult to receive.

13. STC Switch—As desired.

    At times, returns from large nearby cities or from rough sea will appear too bright on indicator. In this case, place STC switch to STC position. This will reduce the magnitude of return from targets up to 10 miles away. Adjust gain control knob to compensate for reduction in intensity.

14. OBS-MAP Switch—As desired.

    Search radar should be operated in low ranges (5, 10, and 30) with OBS-MAP switch in MAP position and antenna at approximately zero degrees. In this position, radiation pattern of antenna is such that distant targets will return as much energy as nearby targets, thereby creating a good mapping presentation. In OBS position, all radiated energy is concentrated into narrow beam of approximately 5 degrees. Experimentation, by operation of antenna tilt control knob, is necessary for best

results. Using zero tilt and OBS position, objects at approximately same altitude can be observed to aid in prevention of collisions.

15. Range Selector Knob—As desired.

First 5 positions on range selector knob indicate range in nautical miles. Range marks will appear on search radar indicator with intervals corresponding to illuminated number at top of indicator; that is, 5- and 10-mile ranges will have 2-mile intervals, 30-mile range will have 5-mile intervals, and 100- and 200-mile ranges will have 25-mile intervals. The TD position enables operator to select any 30-mile sector within range of equipment for presentation on entire indicator. Operation may be performed with use of the delay control knob.

16. Delay Control Knob—As desired.

With range selector knob in TD position, delay control knob varies start of sweep from 5 to 175 miles, as desired. With range selector knob in any other position, variable delay marker will appear on indicator distance from start of sweep as indicated by delay control knob setting.

17. Edge Lights Control Knob—As desired.

Adjust edge lights control knob, located on top of indicator housing, as desired to vary brightness of lights for cursor line and azimuth scale and range marker indicator lights.

18.. Cursor Knob—As desired.

Adjust cursor knob, located on lower edge of indicator housing, to rotate cursor lines to desired azimuth position.

TD Operation. After the search radar has been set up for search operation, assume that a target to be observed is 150 miles out; therefore, the search radar could be switched to the TD mode of operation and the target scrutinized by the following procedure:

1. Range Selector Knob—200.

With range selector knob in 200 position, observe target on approximately sixth range marker (each range marker indicates 25-mile intervals at this setting).

2. Delay Control Knob—Adjust.

Adjust delay control knob until variable delay marker is between fifth and sixth range markers (approximately 135 miles from start of sweep).

3. Range Selector Knob—TD.

With range selector knob in TD position, target will appear approximately half way from start of sweep to edge of indicator, and enlarged. Exact distance will be number of miles, as indicated by delay control setting, plus distance from start of sweep to target.

Note

Two screwdriver adjustments, on the front of the search radar synchronizer, are provided for adjustment of the intensity of the fixed range marks and variable delay marker.

4. Continue as in Search Operation.

Beacon Operation. For beacon operation, after the search radar has been set up for search operation, the following steps should be performed:

1. Function Knob—BEACON.

2. Antijam Knob—OUT.

3. STC Switch—OUT.

4. Antenna Tilt Control Knob—Zero tilt as indicated on antenna tilt meter.

   In beacon and mapping operations, beam is automatically selected; therefore, antenna tilt should be zero.

Note

No ground returns are used when utilizing beacon operation and the exact range of the station will be 1/2 mile less than the distance to the first arc line from the start of the sweep. The bearing may be obtained by placing the cursor line through the center of the arcs and reading the bearing from the azimuth scale. To read the beacon station code, interpret the long intervals between arcs as dashes and the short intervals as dots.

5. Continue as in Search Operation.

Weather Operation. Energy returns from clouds are proportional to the amount of precipitation contained in the clouds; therefore, the denser the cloud formation, the brighter the return will appear on the scope. When it is desired to view the surrounding weather conditions, the following steps should be performed, after setting up as in search operation.

1. Function Knob—WEATHER.
2. OBS-MAP Switch—OBS.
3. Antenna Tilt Control Knob—Zero, as indicated on antenna tilt meter.
4. Proceed as in Search Operation.

Note

If spoking is observed on indicators during weather or long range search operation, the pulse transformer is probably burning out. Use the search radar on low range search operation only if this occurs.

Sector Scan Operation. Sector scan operation may be used any time it is desired by placing the scan selector knob in the SECTOR position. Sector scan operation improves slightly the observation of specific targets in the direction of the aircraft heading.

To Turn Requirement Off:

Note

Any time the search radar is not in use, place the function knob to the STOP position, the antenna stab switch to the OUT position, and the scan selector knob to the STOP position. There will be no time delay when search radar operation is again desired.

1. Antenna Stab Switch—OUT.
2. Scan Selector Knob—STOP.
3. Intensity Control Knob (On both indicators)—Full counterclockwise.
4. Gain Control Knob—Full counterclockwise.
5. Function Knob—OFF.

CAUTION

The AN/APS-42A gyro stabilizer should be turned off prior to landing since damage to the circuit can result from a hard landing.

Terms And Abbreviations.

AFC—Automatic Frequency Control

AJ —Antijamming Operation

FTC—Fast Time Constant

HTR—Antenna Heater

MAIN

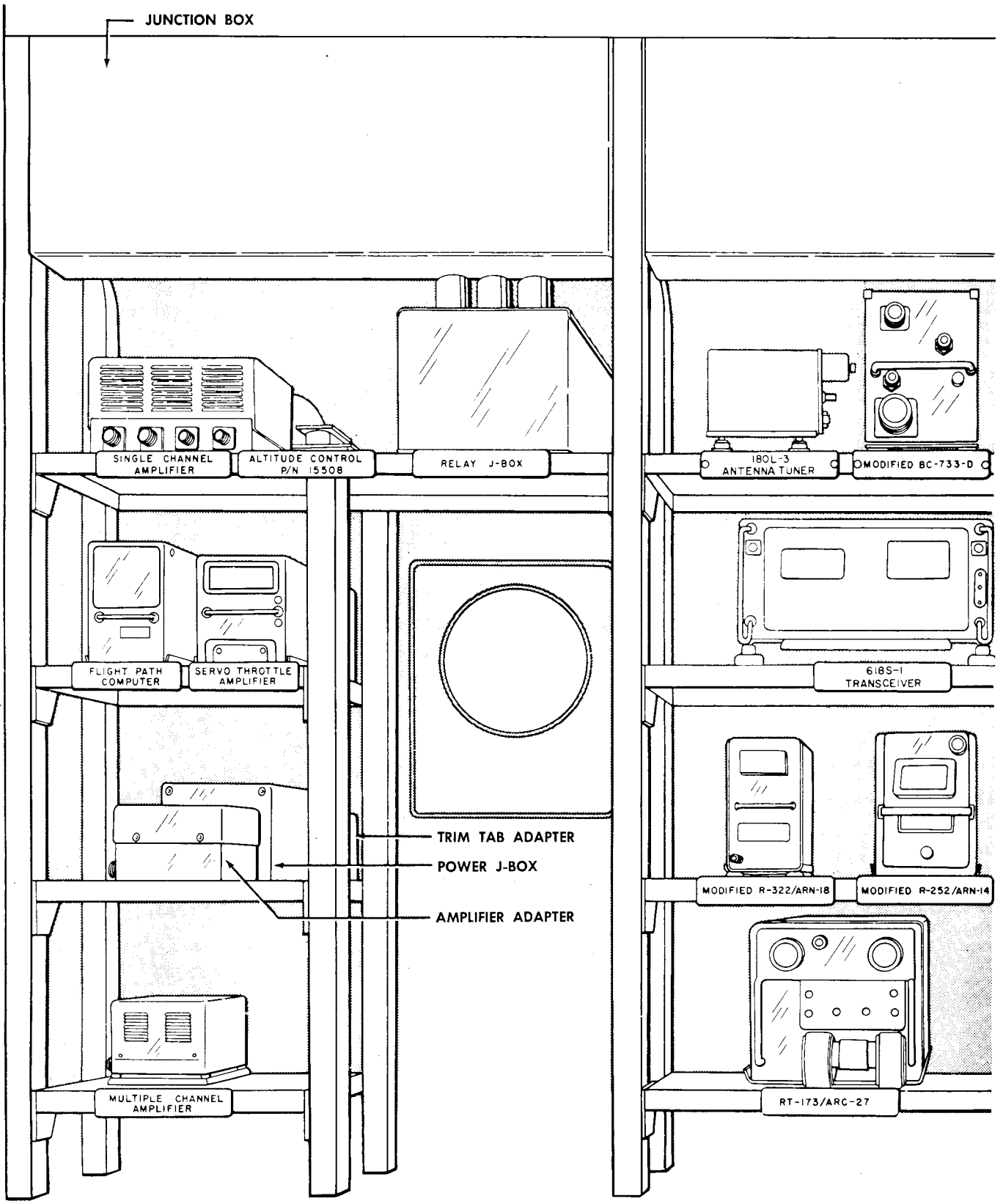


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Figure 4-16 (Sheet 1 of 2)

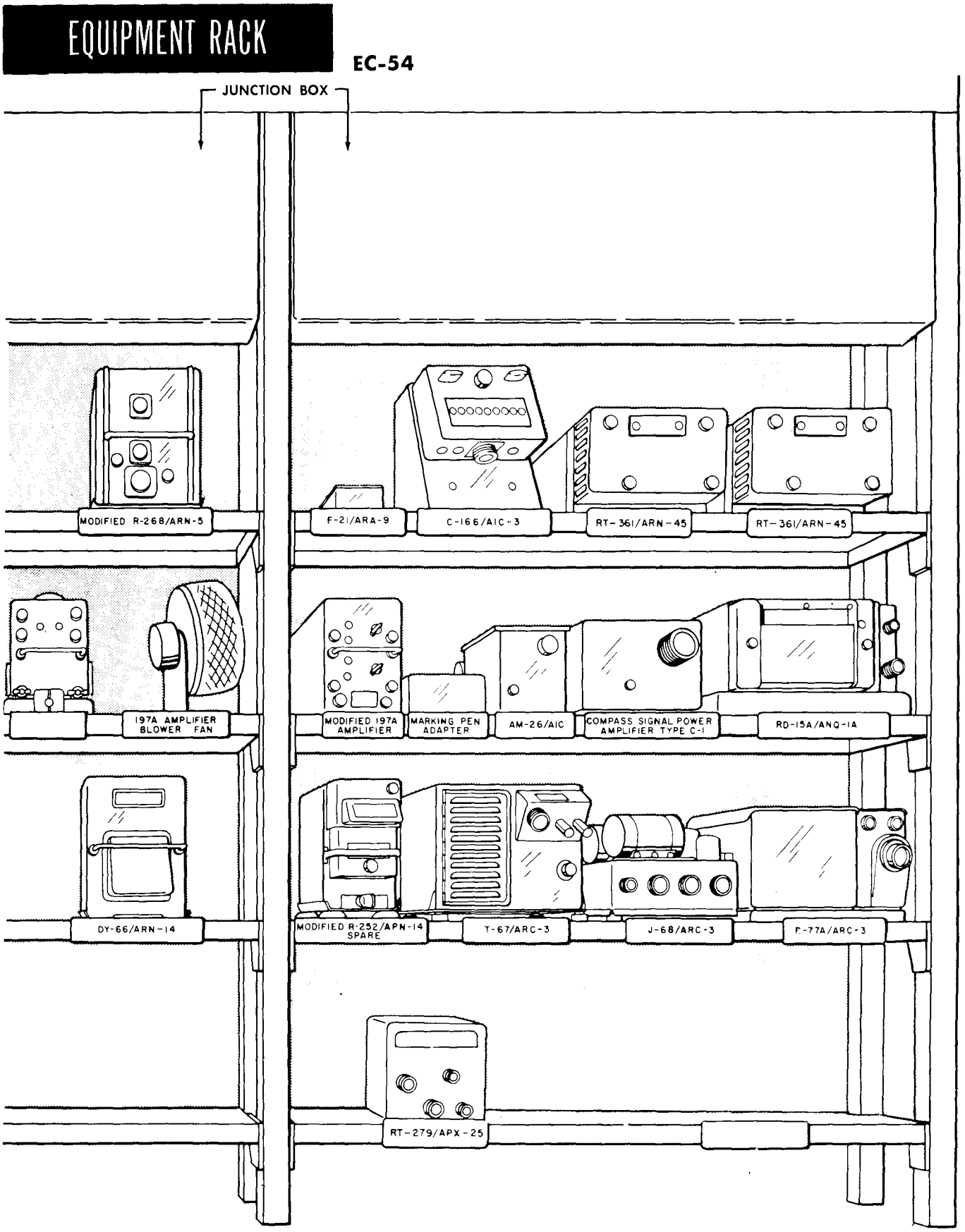


Figure 4-16 (Sheet 2 of 2) XI-286

IAGC—Instantaneous Automatic Gain Control

MAN—Manual Frequency Control

MAP—Equal Energy Return Beam

OBS—Pencil Beam

STAB—Antenna Stabilizer

STC—Sensitive Time Control

TD—Target Discriminator

AN/CRT-3 (GIBSON GIRL) EMERGENCY RADIO TRANSMITTER.

The AN/CRT-3 (Gibson Girl) radio is an emergency transmitter that operates on a preset medium or high frequency. Power for the set is supplied by a hand-operated generator. Operating instructions are provided with the set.

FACILITIES FLIGHT CHECK RECORDING SYSTEM (EC-54 AIRCRAFT).

The following electronic equipment is installed in the EC-54 aircraft for use with the facilities flight check recording system.

AN/ANQ-1A WIRE RECORDER.

The aircraft is equipped with a wire recorder which is used to record tone or voice signals through the interphone system, or through a microphone which can be connected directly to the equipment. The recorder will record for 1 hour and may be used continuously or intermittently. Reproduction of the recording can be done only on the ground by a recorder-reproducer (AN/GNQ-1A). The equipment consists of a recorder unit and magazine on the main equipment rack (figure 4-16) and a control panel to the left of the pilot's seat. Power for operating the equipment is taken from the 26-28-volt dc system.

Wire Recorder Control Panel.

The control panel, installed to the left of the pilot's seat, incorporates a selector switch with OFF, INTER, MIC, and SPECIAL POSITION, a RECORD-STANDBY switch, and a volume control knob.

Magazine Latching Handle.

A magazine latching handle is located at the base of the recorder unit (figure 4-16). The positions of the handle are LOCK, LATCH, and RELEASE.

Indicator Lights.

Two indicator lights are located on the control panel. When the green light marked MOTOR comes on the recorder motor is running. The red light marked WARN comes on when approximately 5 minutes of recording time remain.

Elapsed Time Indicator.

The elapsed time indicator, located on the recorder unit, shows the recording time elapsed and is calibrated in minutes.

Interphone System Recording.

To record through the interphone system, proceed as follows:

1. Interphone Signal Selector Switches—As desired.
2. Microphone Selector Switch—INTER.
3. Recorder STANDBY-RECORD Switch—STANDBY.
4. Selector Switch—INTER. Allow 1 minute for recorder to warm up.

5. STANDBY-RECORD switch—RECORD.

Note

When not recording, keep the STANDBY-RECORD switch in the STANDBY position to keep the tubes heated and ready for immediate recording.

To turn equipment off:

1. Selector Switch—OFF.

SWITCHING PANEL.

The switching panel (figure 4-18) is located at the data recorder operator's station (figure 4-17). This panel is used to aid in making graphic recordings of radio signals when flight checking navigational aids. The switching panel provides a means of manually selecting a desired circuit from the signal source to the graphic recorder.

Switching Panel Controls.

The controls located on the switching panel are as follows: cross-pointer (CP) select switch, flag alarm (FA) select switch, and an automatic volume control (AVC) select switch, each having the positions OFF, VOR, GP2, LOC, and GPI; a rectified audio select switch with OFF, MB, ADF1, ADF2, and LF positions; a side pen input select switch with OFF, VHF, VOR, and MB positions; and a record-calibrate switch with REC ALL, CAL CP, CAL FA, and CAL AVC positions.

PATCHING PANEL.

The patching panel (figure 4-18) is located at the data recorder operator's station. The panel is used to aid in making graphic recordings of radio signals when flight checking navigational aids. The patching panel provides a flexible method of applying selected signals of various radio receivers to the dc amplifier and graphic recorder.

Patching Panel Controls.

The controls located on the patching panel are as follows: three recorder input reversal switches marked 1, 2, and 3; polarity reversal switch; meter range switch with 0 to 200 and 0 to 400 positions; filter volts switch with ILS and VOR positions; calibrate-adjust knob; rectifier audio gain knob; and a side pen (SP) amplitude gain knob. Also located on the patching panel are three input and three output plugs, and the necessary plug receptacles for routing signals to either or both graphic recorders.

Note

Only two graphic recorders (No. 1 and No. 3) are provided; therefore, switches, plugs, and plug receptacles for operating graphic recorder No. 2 are inoperative.

DC AMPLIFIER AND SIDE PEN CONTROL PANEL.

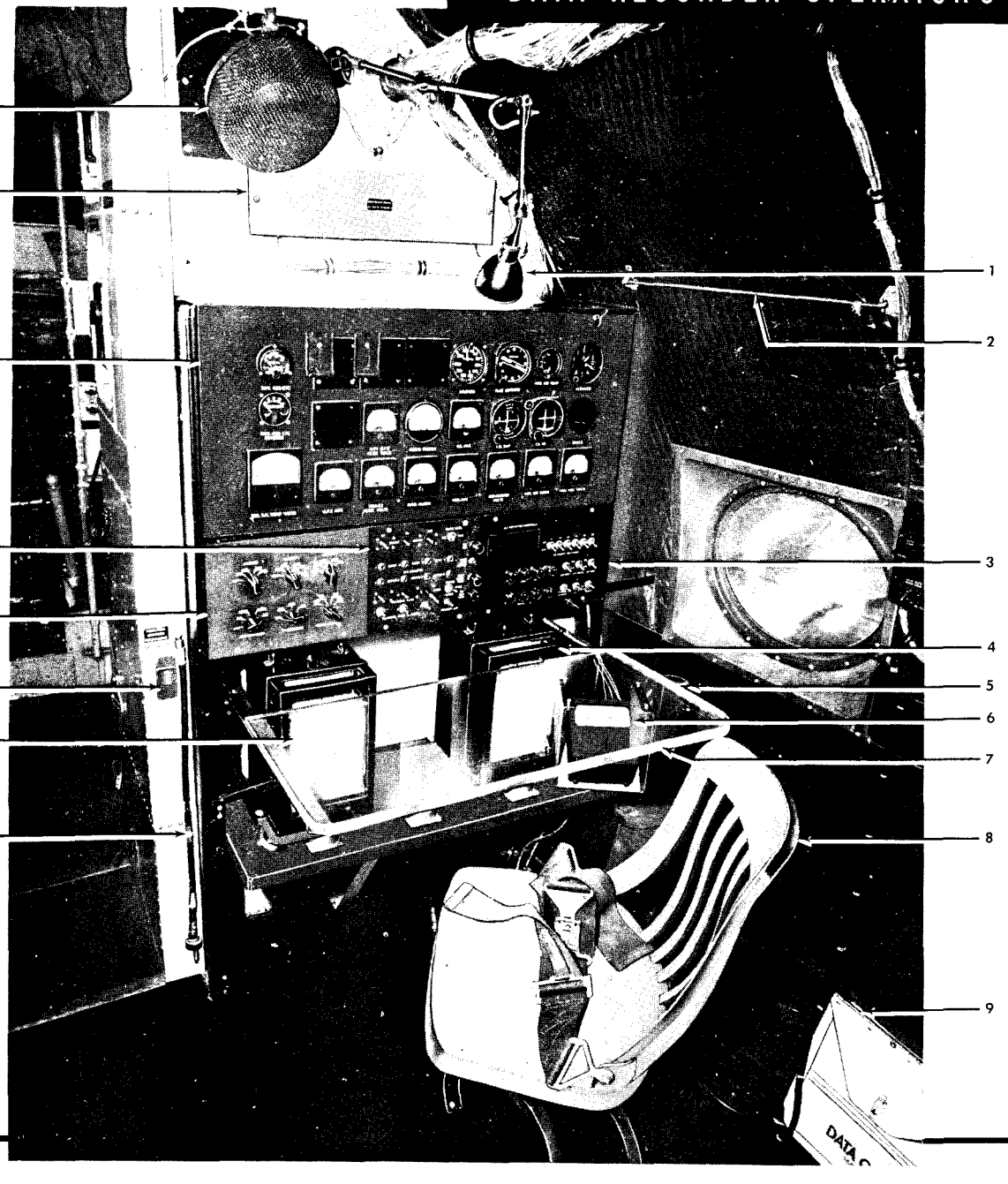
The dc amplifier and side pen control panel (figure 4-18) is located at the data recorder operator's station. This panel provides a means of controlling the dc amplifier and the graphic recorder side pens. The controls located on this panel are as follow: four center adjust knobs; four calibrate knobs; six toggle switches for energizing the left and right side pens of recorders No. 1, 2, and 3; three dc amplifier ON-OFF switches; an automatic side pen switch with LEFT and RIGHT positions; and two manual side pen switches for manually energizing the LEFT or RIGHT side pen.

Note

Only two graphic recorders (No. 1 and No. 3) are provided; therefore, controls for operating graphic recorder No. 2 are inoperative.

FORWARD VIEW

DATA RECORDER OPERATOR'S

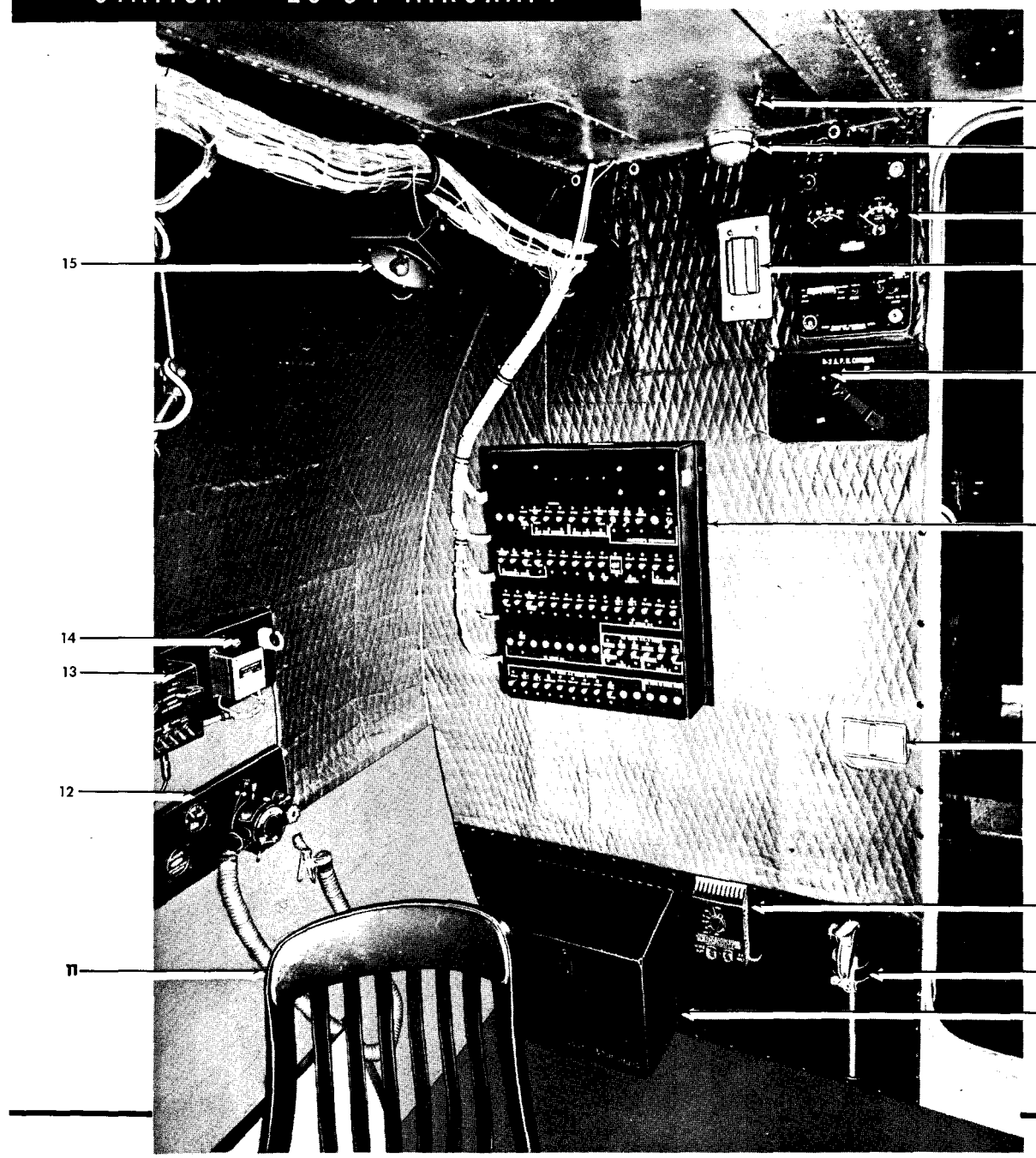


1. FLEXIBLE WORK LIGHT
2. TABLE TOP STAY CORD
3. DC AMPLIFIER AND SIDE PEN CONTROL PANEL
4. GRAPHIC RECORDER NO. 3
5. SUPPLY HOLDERS
6. CROSSPOINTER PRECISION METER
7. TABLE
8. SEAT
9. DATA CASE
10. OXYGEN CYLINDER RECHARGER HOSE
11. GRAPHIC RECORDER NO. 1
12. ASH TRAY
13. SWITCHING PANEL
14. PATCHING PANEL
15. INSTRUMENT PANEL
16. INTERPHONE JUNCTION BOX
17. VENTILATING FAN

Figure 4-17 (Sheet 1 of 2)

STATION — EC-54 AIRCRAFT

AFT VIEW



1. HEATER REGULATOR MOISTURE DRAIN
2. ALARM BELL
3. APP CONTROL PANEL
4. CABINSTAT
5. APP THROTTLE CONTROL LEVER
6. MISCELLANEOUS EQUIPMENT CIRCUIT BREAKER PANEL
7. ASH TRAY
8. SUIT HEATER PANEL
9. FIRE EXTINGUISHER
10. TOOL BOX
11. SEAT
12. OXYGEN PANEL
13. INTERPHONE CONTROL PANEL
14. FILTER BOX
15. SPOTLIGHT

Figure 4-17 (Sheet 2 of 2)

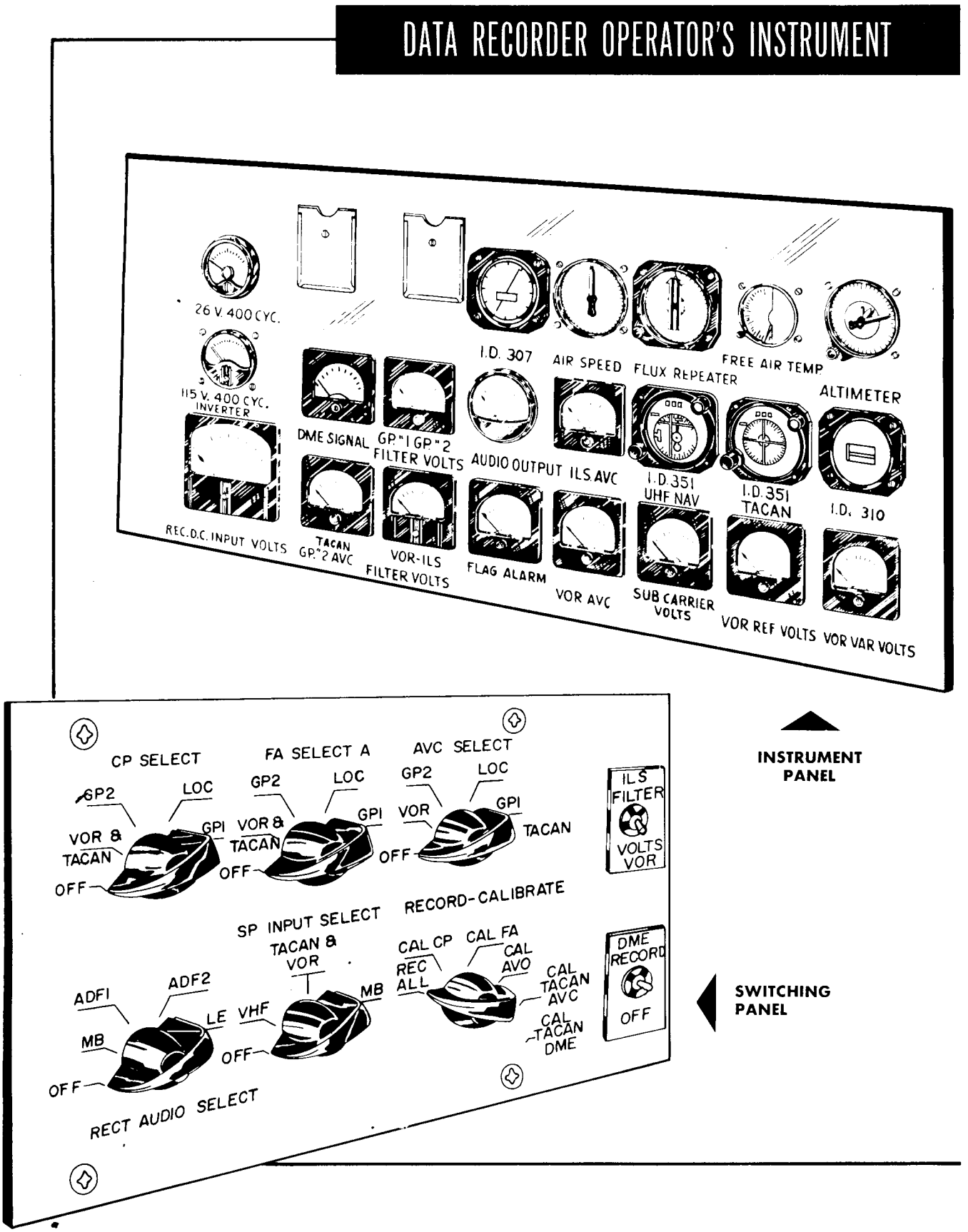


Figure 4-18 (Sheet 1 of 2)

AND CONTROL PANELS — EC-54

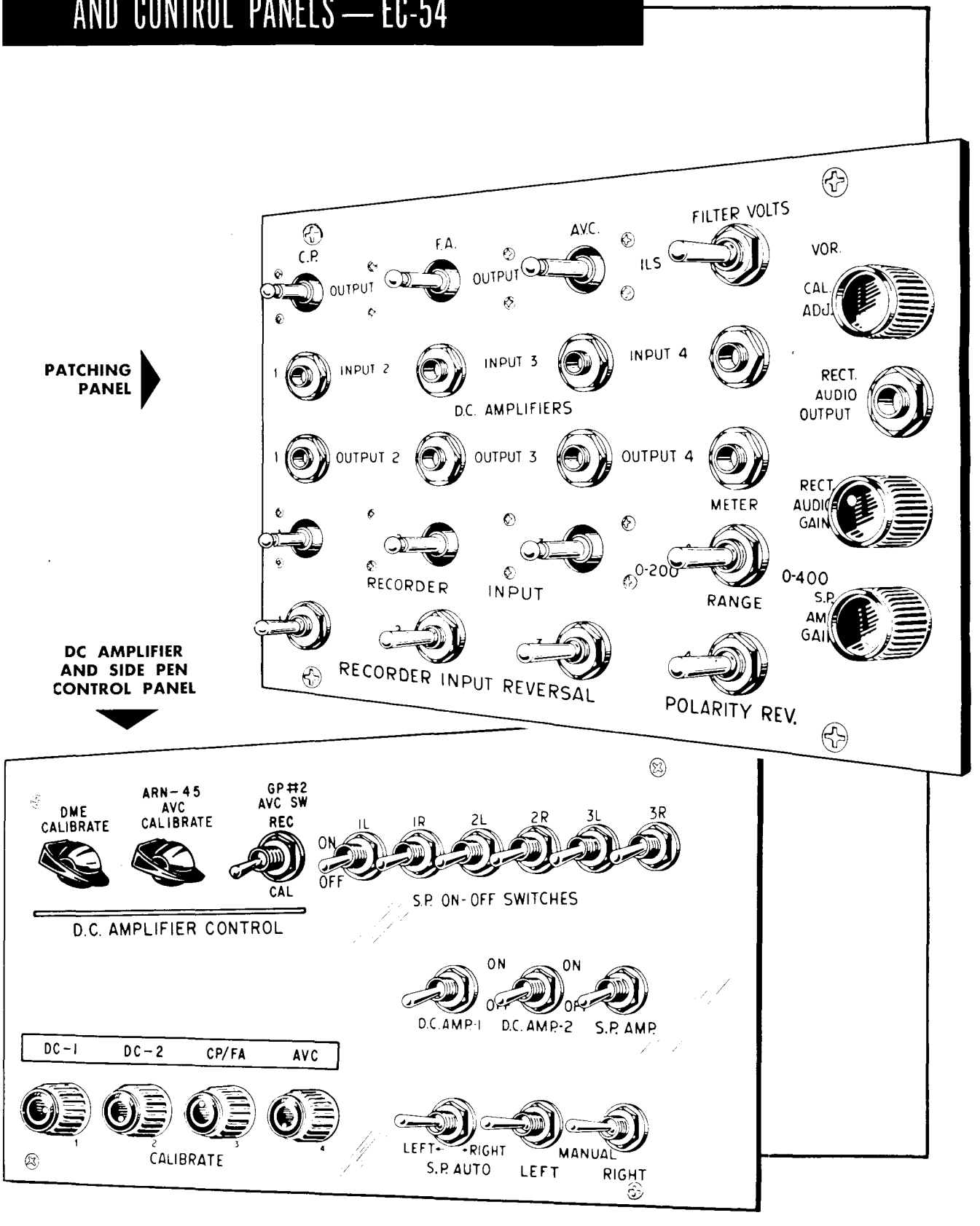


Figure 4-18 (Sheet 2 of 2)

X1-290

LEFT SIDE
FORWARD VIEW

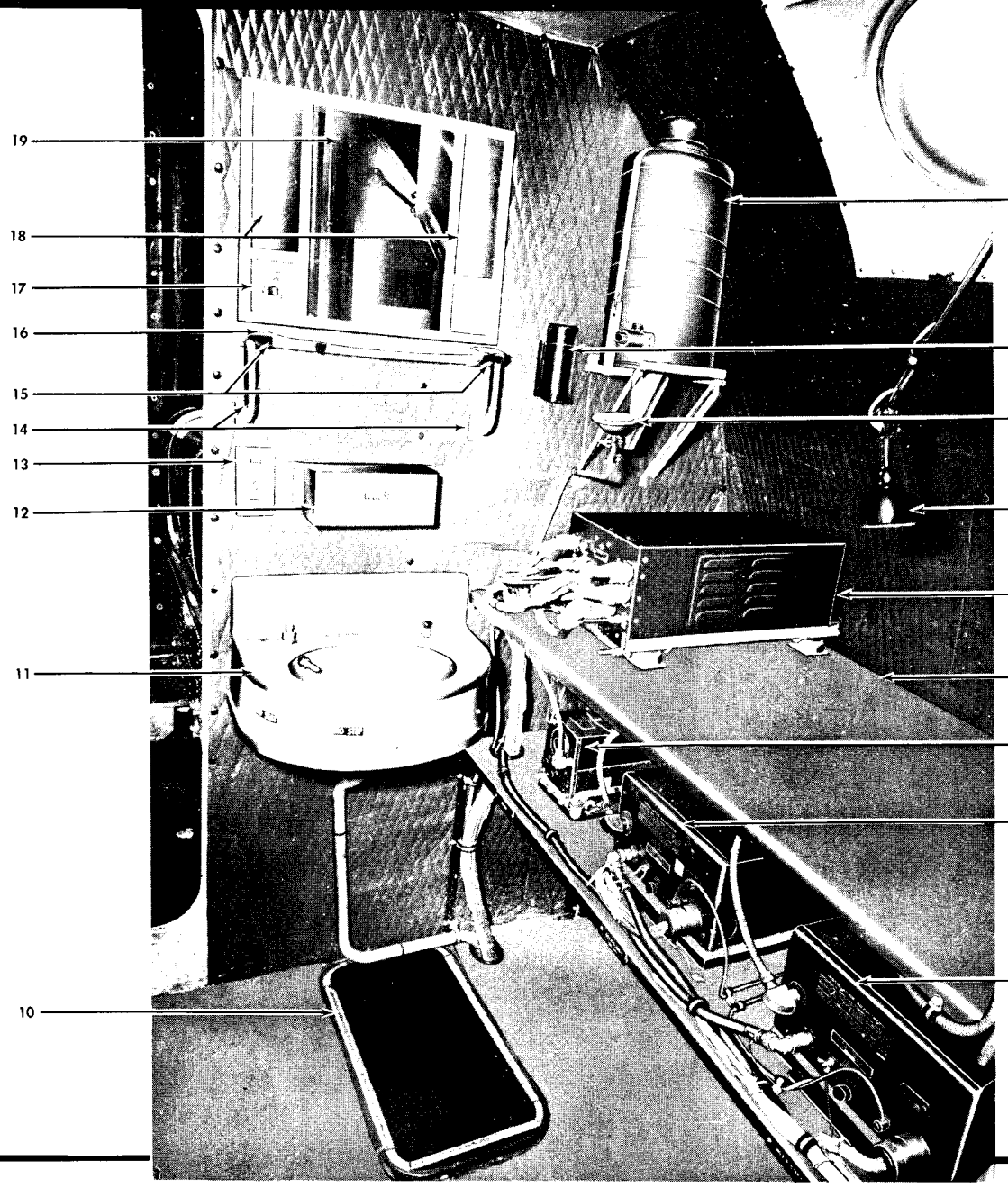
DATA RECORDER OPERATOR'S

1. CREW'S LAVATORY DOOR
2. WORK LIGHT SWITCHES
3. SPARE LAMP BOX
4. HEATER CONTROL PANEL
5. DATA CASE
6. DOME LIGHT SWITCH
7. MAIN JUNCTION BOX
8. FIRE AXE
9. LOOP ANTENNA DEHYRATORS
10. LOWER AFT CARGO COMPARTMENT HATCH
11. RANGE RECEIVER
12. NO. 1 RADIO COMPASS
13. NO. 2 RADIO COMPASS
14. RADAR SYNCHRONIZER
15. RADIO-RADAR REPAIR TABLE
16. RADIO JUNCTION BOX
17. FLEXIBLE WORK LIGHT
18. HEATER SPARE PARTS KIT
19. DOME LIGHT

Figure 4-19 (Sheet 1 of 2) X1-291

COMPARTMENT — EC-54 AIRCRAFT

LEFT SIDE
AFT VIEW



1. THERMOS JUG
2. CUP DISPENSER
3. DRIP CUP
4. FLEXIBLE WORK LIGHT
5. RADAR SYNCHRONIZER
6. RADIO-RADAR REPAIR TABLE
7. RANGE RECEIVER
8. NO. 1 RADIO COMPASS RECEIVER
9. NO. 2 RADIO COMPASS RECEIVER
10. LOWER FORWARD CARGO COMPARTMENT HATCH
11. WASH BASIN
12. TOWEL DISPENSER
13. FUEL TANK COMPARTMENT DOME LIGHT SWITCH
14. ASSIST HANDLES
15. ASH TRAYS
16. JEWEL SHELF
17. MIRROR LIGHT SWITCH
18. MIRROR LIGHTS
19. MIRROR

Figure 4-19 (Sheet 2 of 2) X1-292

PRECISION METER.

The precision meter (9, Sheet 1, figure 4-17) is located at the data recorder operator's station. This meter is calibrated in microamps dc and will indicate within a range of 0 to 200 or 0 to 400. The desired range may be selected by operating the meter range switch located on the patching panel.

DC RECORDING MILLIAMMETERS.

Two dc recording milliammeters—graphic recorders (7, and 13, Sheet 1, figure 4-17) are located at the data recorder operator's station. The units are identical and each provides a permanent record of inspection data. The data consists of two types of measured cross-pointer deviations: cross-pointer deflection current of a beam, measured by the center pen; and reference and/or time data noted along the edge of the chart by the side pen. Both pens inscribe inked lines on a moving roll-type chart, scaled transversely in terms of current, and longitudinally in terms of time expiration. The chart is driven at a constant rate, giving a correlated reference for purpose of interpolation. The center pen is adjusted so that the zero position is on the chart centerline. A pointer and a calibrated scale on the face of the recorder show the position of the pen. The side pen is used to indicate certain reference, such as the instant of passing over a check point or the length of time required to fly through a space pattern. The side pen can be controlled manually by switches, or automatically by radio signals. The chart drive mechanism is powered by two manually wound springs. When the springs are completely run down, it will require 175 to 185 turns on the winding crank, in a clockwise direction, to rewind springs. Operation of the chart drive is then possible for a period of eight days at any speed registered in inches per hour. A stowage receptacle (8, Sheet 1, figure 4-17) is located at the data recorder operator's station for storing extra charts, ink, and filling pens.

Dc Recording Milliammeter Controls.

The controls consist of a winding crank, chart feed lever, zero adjusting lever, time set wheel, and a chart drive control lever, all located on the dc recording milliammeter.

Side Pen Switches.

Two manual side pen switches and an automatic side pen switch are located on the data recorder operator's dc amplifier and side pen control panel (figure 4-18). A manual marking side pen switch (5, figure 4-23), located on the auto pilot's control panel, is marked LEFT (recorder No. 1) and RIGHT (recorder No. 3).

Dc Recording Milliammeter Operation.

1. Chart drive control lever—START.

   Check that mechanism is running by looking through small window at left edge of chart. If mechanism is not running, move control lever from START to STOP and back to START several times.

To turn equipment off:

1. Chart drive control lever—STOP.

LIGHTING SYSTEM.

All lights are wired to the 28-volt dc power supply through the respective circuit breakers and switches.

EXTERIOR LIGHTING.

Landing Lights and Switches.

An electrically actuated landing light is installed on the underside of each outer wing panel. Each light is controlled by a switch, (13, figure 1-11) with EXTEND & ON, OFF, and RETRACT positions, that is installed on the pilots' overhead panel. When either

switch is placed in the EXTEND & ON position, the respective landing light motor is energized and the extension and retraction mechanism is actuated to lower the landing light. An automatic switch in the light assembly turns the light on when the landing light extends beyond 10 degrees of the fully retracted position. Placing the switch in the OFF position stops the landing light motor to permit intermediate positioning of the light. Placing the switch in the RETRACT position energizes the motor and retracts the light. The automatic switch turns the light off. Some aircraft have separate EXTEND, OFF, RETRACT, and ON-OFF filament switches, and landing lights may be turned on when retracted.

Navigation Position Lights and Switch.

The navigation position lights consist of a green light on the right wing tip, a red light on the left wing tip, and white and amber lights in the tail cone tip. A navigation lights switch with STDY., FLASH, and OFF position is installed on the pilots' overhead panel (40, sheet 3: 37, sheet 5: 39, sheet 6, figure 1-11, and 16, figure 1-9). When the switch is placed in the STDY. position, the navigation lights are on continuously. When the switch is placed in the FLASH position, the light circuit is connected to a flasher mechanism and the navigation lights are automatically flashed on and off. Placing the switch in the OFF position opens the navigation lights circuit.

Red Taillight and Switch (Some Aircraft).

A red taillight is installed in the tail cone tip below the white navigation light. The light is controlled by a three-position toggle switch located on the pilots' overhead panel (figure 1-11) with BRIGHT, DIM, and OFF positions. The switch is placarded: RED TAIL LIGHT MUST BE OFF WHEN USING NAVIGATION LIGHTS. When the switch is placed in the BRIGHT position, current is supplied directly to the light from the main bus. When the switch is placed in the DIM position, the light intensity is reduced through a dimming resistor. Placing the switch in the OFF position opens the circuit to the light.

Anticollision Light and Switch.

Two red rotating anticollision lights are installed, one on top of the vertical stabilizer and the other on the underside of the fuselage. The lights are actuated by a switch (43, sheet 3; 37, sheet 4; 43, sheet 5 and 42, sheet 6, figure 1-11) with placarded positions ON and OFF, located on the pilots' overhead panel. Power for both lights and motors is supplied from the 28-volt dc bus through the anticollision light circuit breaker located on the main junction box circuit breaker panel.

WARNING

Use of the anticollision light during night weather operation may result in spatial disorientation.

INTERIOR LIGHTING.

Pilots' Compartment Lights Master Switch (Some Aircraft).

A pilots' compartment lights master switch (41, sheet 3 and 40, sheet 4, figure 1-11), located on the pilots' overhead panel, must be turned ON before any of the lights controlled by the rheostat switches on the pilots' overhead panel will be operative. These rheostat switches are: instrument panel floodlights, center instrument panel lights, upper instrument and pedestal lights, compass light, cockpit floodlight (two switches), accessory lights (two switches), and instrument panel lights (two switches). (See figure 1-11.)

Instrument Pannel Red Floodlights and Switch.

Four shielded instrument red floodlights are installed above the main instrument panel below the glareshield. The intensity of the lights is controlled by a rheostat switch placarded OFF-BRIGHT, located on the pilots' overhead panel. The pilots' compartment lights master switch must be ON before the rheostat is operative.

Center Instrument Panel Lights and Switch.

The center instrument panel is provided with individual red (eyebrow-type) lighting for each instrument. The intensity of the lights is controlled by a rheostat switch placarded OFF-BRIGHT, located on the pilots' overhead panel. The pilots' compartment lights master switch must be ON before the rheostat is operative.

Upper Instrument Panel and Control Pedestal Lights and Switch.

A rheostat switch placarded OFF-BRIGHT and UPPER INST-OV'HD SW & PEDESTAL LIGHTS controls intensity of individual instrument red (eyebrow-type) lighting and edge lighting for the pilots' overhead panel, and shielded red flood lighting for the aft face of the control pedestal. The pilots' compartment lights master switch must be ON before the rheostat is operative.

Compass Light and Switch.

A compass light installed above the window in the magnetic compass provides illumination of the compass card. A rheostat switch placarded OFF-BRIGHT, located on the pilots' overhead panel, controls intensity of the light. The pilots' compartment lights master switch must be ON before the rheostat is operative.

Pilots' Compartment Floodlights and Switches.

Two floodlights, one installed above and aft of each side window, may be used for high intensity illumination of the pilots' compartment, as desired. Intensity of the light is controlled by a rheostat switch placarded OFF-BRIGHT. On some aircraft, a 3-position toggle switch placarded RED-OFF-WHITE, located adjacent to each rheostat, allows selection of either red or white flood, or turns the light off. The pilots' compartment lights master switch must be ON before either the rheostat switches or the toggle switches are operative.

Accessory Lights and Switches.

Illumination of the pilot's and copilot's side panels is provided by two shielded red floodlights mounted on each side panel. Intensity of the pilot's side panel is controlled by a rheostat switch, placarded OFF-BRIGHT, located on the left side of the pilots' overhead panel. Intensity of the copilot's side panel is controlled by an identical rheostat switch, located on the right side of the panel. The right rheostat switch also controls the intensity of red (eyebrow-type) lighting of the main hydraulic pressure gage, brake hydraulic pressure gage, and emergency airbrake pressure gage. The pilots' compartment lights master switch must be ON before either rheostat switch is operative.

Instrument Panel Lights and Switches.

The main instrument panel is provided with red (eyebrow-type) lighting of each individual instrument. Intensity of the main instrument panel lights is controlled by a rheostat switch, placarded OFF-BRIGHT, located on the left side of the pilots' overhead panel. Intensity of the copilot's instrument panel lights is controlled by an identical rheostat switch located on the right side of the pilots' overhead panel. The pilots' compartment lights master switch must be ON before either rheostat switch is operative.

Intercall Lights and Switches (Some Aircraft).

Two intercall lights that serve as signal devices between crew members in the pilots' compartment and main cabin have pushbutton switches and are located as follows: one light and switch on the pilots' overhead panel,

and one light and switch on the cabin electrical control panel. When the switch on either control panel is depressed, a 28-volt dc circuit is completed to illuminate both intercall lights.

FASTEN SEAT BELT and NO SMOKING Signs.

An electrically illuminated FASTEN SEAT BELT sign and a NO SMOKING sign are located in the main cabin, above the entrance door to the relief crew's compartment. A switch for each sign is located on the pilots' overhead panel (figure 1-11) in the pilots' compartment. When either switch is in the ON position, the respective sign will be illuminated. On Navy C-54 aircraft, the FASTEN SEAT BELT and NO SMOKING signs are powered directly from the battery.

Pilot's Compartment Dome Light and Switches.

An anemostat-type dome light installed in the ceiling forward of the astrodome provides illumination of the aft part of the pilots' compartment and the radio operator's and the navigator's stations. The dome light can be controlled by either of two switches. One is located on the pilots' overhead control panel (figure 1-11) and the other is located aft of the crew entrance door at the navigator's station.

Pilots' Map Reading Lights and Switches.

Two adjustable map reading lights, one mounted above and aft of each pilot's side window, provide illumination for the pilot and copilot. The lights are individually controlled by a rheostat that is an integral part of the light assembly.

Control Pedestal Spotlight and Switches.

A control pedestal spotlight located in the ceiling of the pilots' compartment provides illumination for the top section and aft face of the control pedestal. The light is controlled by a toggle switch on the aft face of the control pedestal, or by a momentary switch button on each control wheel. The momentary switches on the control wheels are spring loaded to OFF.

Radio Control Panel Edge Lighting and Switch.

The radio control panel is on the control pedestal (figure 1-9) are provided with red edge lighting which illuminates only the placarded markings of the radio switch controls. A rheostat switch, located on the aft lower face of the control pedestal, controls the intensity of the light and turns the light off.

Door-Open Light.

A door-open amber light (30, figure 1-11) installed on the pilots' overhead panel (figure 1-11) comes on when any one of the following doors is open: main cargo door, lower cargo doors, or the crew entrance door. The light is energized by a 28-volt dc circuit.

Radio Operator's Table Light and Switch.

A flexible table light (13, figure 4-9), installed at the radio operator's station, is equipped with a dimming rheostat.

Navigator's Table Lights and Switches.

Two flexible table lights (7, figure 4-9) are installed at the navigator's station as follows: one on the forward outboard side of the navigator's chart table and one on the aft bulkhead above the LORAN indicator. Each light is equipped with a dimming rheostat that is located at the base of the forward light.

Navigator's Fluorescent Instrument Lights and Switches.

Two adjustable fluorescent lights that provide illumination for the navigator's instrument panel are located as follows: one is mounted above the instrument lights switch control panel (17, figure 4-14) that is aft of the co-pilot's seat, and one is installed above the crew entrance door. Each light is controlled by a rheostat switch, with START, ON, DIM, and OFF positions, that is located on the instrument lights switch control panel.

Navigator's Red Instrument Lights and Switch.

The navigator's instruments are provided with red eyebrow lighting on each instrument (master compass indicator, UHF and ADF compass, altimeter, airspeed indicator, and clock). Intensity of the lights is controlled by a rheostat switch on the instrument lights switch control panel (17, figure 4-14) aft of by copilot's seat.

Relief Crew Compartment Lights and Switches.

The relief crew compartment is provided with an anemostat-type dome light and integral switch with ON and OFF positions. Two mirror lights are controlled by an ON-OFF switch located above the washbowl.

Fuel Tank Compartment Light and Switch.

The fuel tank compartment is provided with a dome light. This light is controlled by a switch from the forward and aft sides of the fuel tank compartment.

Cabin Dome Lights and Switches.

Six anemostat-type lights are installed in the ceiling of the main cabin. The lights are controlled by either one of the two switches: one on the main cabin forward bulkhead and one on the cabin electrical control panel located forward of the main cargo door. Two lights installed over the main cargo doors are controlled by a switch on the cabin electrical control panel.

Lavatory Dome Lights and Switches.

A dome light is installed in the relief crew compartment lavatory and is controlled by an integral ON-OFF switch. A dome light and integral ON-OFF switch is installed in the main cabin lavatory.

Tail Compartment Light and Switch.

The tail compartment is equipped with a dome light. The light operates on 28-volt direct current from the aft junction box and is controlled by a switch located above the tail compartment door.

Lower Cargo Compartment Lights and Switches.

The forward and aft lower cargo compartments are each provided with three lights. A switch located on the center light box in each compartment controls the respective lights.

Emergency Impact Lights.

Emergency impact lights are installed on some of the aircraft to provide an emergency lighting system for illumination of all exit markings and to provide adequate lighting for the evacuation of passengers and crew members in the event of crash landing and ditching. The system consists of seven self-contained battery-operated lights, installed and numbered as follows: (1) above and to the left of the radio operator's station, (2) on the overhead panel at the navigator's station, (3) over the forward right emergency exit, (4) over the aft right emergency exit, (5) over

the forward left emergency exit, (6) over the aft left emergency exit, and (7) over the right scanner's station (HC-54 aircraft). The emergency impact lights operate on impact with inertia switch preset to actuate under a force of 3 G's.

Spare Light Bulbs.

Spare light bulbs are contained in a box located on the cabin heater control panel.

OXYGEN SYSTEM.

A gaseous oxygen system with a normal operating system pressure of 100 to 400 psi is installed. The complete system may be filled through a single filler valve (15, figure 1-30).

Note

As an aircraft ascends 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 rapidly. With a 37.9° C decrease in temperature in the cylinders, the gage pressure can be expected to drop 20 percent. This rapid fall in pressure is occasionally a cause for unnecessary alarm. All the oxygen is still there. As the aircraft descends to warmer altitudes, the pressure will tend to rise again, so that the rate of oxygen usage may appear to be slower than normal. A rapid fall in oxygen pressure while the aircraft is in level flight, or while it is descending, is not ordinarily due to falling temperature. When this happens, leakage or loss of oxygen must be suspected.

CREW OXYGEN SYSTEM.

The oxygen system installed may be one of two types. On most aircraft a diluter-demand system is provided for the pilot and crew, using three interconnected oxygen cylinders. Two type G-1 cylinders provide oxygen for the pilot and one type J-1 cylinder provides oxygen for the copilot, crew engineer, radio operator, and navigator. On HC-54 aircraft two, interconnected, type J-1 cylinders supply oxygen to both pilot and copilot. Check valves, for safety in combat areas, are installed between the pilot's section and the crew's section. Some aircraft have a continuous-flow system installed utilizing either a single type J-1 cylinder or three interconnected cylinders (two type G-1 cylinders supply the pilot, and one type J-1 cylinder supplies the crew). If the latter type is installed, check valves in the filler lines of the cylinders prevent loss of oxygen in the event either the pilot or crew oxygen systems are damaged. The approximate duration of both the diluter-demand system and the continuous-flow system is given in figure 4-20.

Oxygen Regulators.

The diluter-demand system regulator, type A-12, is installed at each crew member's station and at each relief crew bunk. The regulator automatically supplies a proper mixture of air and oxygen when the AUTO-MIX lever is in NORMAL oxygen position, and 100 percent oxygen when it is in 100% OXYGEN position. The continuous-flow system regulator, a manually controlled type A-9A, is installed at each crew member's station. The regulator must be manually adjusted to provide the proper mixture of air and oxygen at different cabin altitudes.

Oxygen Regulator Auto-Mix Lever (Diluter-Demand System).

An AUTO-MIX lever is provided on each type A-12 regulator to select NORMAL OXYGEN for all normal usage or to select 100% OXYGEN for emergency use. When the lever is placed in the NORMAL OXYGEN position, the air inlet valve is opened so that the regulator automatically supplies a proper mixture of air and oxygen to the mask at all altitudes. When the lever is placed in the 100% OXYGEN

OXYGEN DURATION TABLE

CREW OXYGEN DURATION — MAN HOURS

CABIN ALTITUDE — FEET	GAGE PRESSURE — P.S.I. 400	350	300	250	200	150	100	BELOW 100
30,000	36.4	31.2	26.0	20.8	15.6	10.4	5.2	Emergency — Descend to altitude not requiring oxygen.
25,000	44.0	38.0	31.6	25.2	18.8	12.8	6.4	
20,000	52.4	45.2	37.6	30.0	22.4	15.2	7.6	
15,000	62.0	53.2	44.4	39.6	26.8	12.6	8.8	
10,000	72.8	62.4	52.0	41.6	31.2	20.8	10.4	

Cylinders: 1 Type J-1

CONTINUOUS FLOW REGULATOR OXYGEN DURATION TABLE (SOME AIRCRAFT)

NOTES:

1. All figures shown in man hours; divide by number of crew members or passengers being serviced from cylinders.
2. Figures shown [ ] are for normal operation, Diluter Lever in NORMAL position.

   Figures shown [ ] are for emergency operation, Diluter Lever in 100% OXYGEN position.
3. Number of cylinders installed may vary from tables shown. Aircraft should be checked to determine number of cylinders installed.

PILOT OXYGEN DURATION — MAN HOURS

CABIN ALTITUDE — FEET	GAGE PRESSURE — P.S.I. 400	350	300	250	200	150	100	BELOW 100
30,000	8.6 8.8	7.4 7.6	6.1 6.3	4.9 5.0	3.7 3.8	2.5 2.5	1.2 1.3	Emergency — Descend to altitude not requiring oxygen.
25,000	6.5 8.3	5.6 7.2	4.7 6.0	3.7 4.8	2.8 3.6	1.9 2.4	0.9 1.2	
20,000	5.0 9.4	4.3 8.1	3.6 6.7	2.9 5.4	2.2 4.0	1.4 2.7	0.7 1.3	
15,000	4.0 11.5	3.5 9.8	2.9 8.2	2.3 6.6	1.7 4.9	1.2 3.3	0.6 1.6	
10,000	3.2 15.2	2.3 13.0	2.3 10.9	1.9 8.7	1.4 6.5	0.9 4.3	0.5 2.2	

Cylinders: 2 Type G-1

DILUTER DEMAND REGULATOR OXYGEN DURATION TABLE (MOST AIRCRAFT)

PASSENGER, TROOP, OR PATIENT OXYGEN DURATION — MAN HOURS

CABIN ALTITUDE — FEET	GAGE PRESSURE — P.S.I. 400	350	300	250	200	150	100	BELOW 100
30,000	98.0	84.0	70.0	56.0	42.0	28.0	14.0	Emergency — Descend to altitude not requiring oxygen.
25,000	106.0	91.0	76.0	61.0	46.0	30.0	15.0	
20,000	117.0	100.0	84.0	67.0	50.0	33.0	17.0	
15,000	130.0	111.0	93.0	74.0	56.0	37.0	19.0	
10,000	146.0	125.0	104.0	83.0	63.0	42.0	21.0	

Cylinders: 2 Type J-1

PASSENGER OXYGEN DURATION TABLE (MOST AIRCRAFT)

CREW OXYGEN DURATION — MAN HOURS

CABIN ALTITUDE-FEET	GAGE PRESSURE — P.S.I. 400	350	300	250	200	150	100	BELOW 100
30,000	73.6 75.2	63.2 64.8	52.8 53.6	42.4 43.2	31.2 32.0	20.8 21.6	10.4 10.4	Emergency — Descend to altitude not requiring oxygen
25,000	56.8 72.0	48.8 61.6	40.8 51.2	32.8 40.8	24.0 31.2	16.0 20.8	8.0 10.4	
20,000	43.2 80.8	36.8 68.8	31.2 57.6	24.8 46.4	18.4 34.4	12.0 33.2	6.4 11.2	
15,000	34.4 97.6	29.6 84.0	24.8 69.6	20.0 56.0	15.2 41.6	9.6 28.0	4.8 13.6	
10,000	28.0 129.6	24.0 111.2	20.0 92.8	16.0 74.4	12.0 56.0	8.0 36.8	4.0 17.6	

Cylinders: 2 Type J-1

DILUTER DEMAND REGULATOR OXYGEN DURATION TABLE (HC-54)

Copilot, Flight Engineer, Radio Operator and Navigator OXYGEN DURATION — MAN HOURS

CABIN ALTITUDE — FEET	GAGE PRESSURE — P.S.I. 400	350	300	250	200	150	100	BELOW 100
30,000	36.8 37.6	31.6 32.4	26.4 26.8	21.2 21.6	15.6 16.0	10.4 10.8	5.2 5.2	Emergency — Descend to altitude not requiring oxygen.
25,000	28.4 36.0	24.4 30.8	20.4 25.6	16.4 20.4	12.0 15.6	8.0 10.4	4.0 5.2	
20,000	21.6 40.4	18.4 34.4	15.6 28.8	12.4 23.2	9.2 17.2	6.0 16.6	3.2 5.6	
15,000	17.2 48.8	14.8 42.0	12.4 34.8	10.0 28.0	7.6 20.8	4.8 14.0	2.4 6.8	
10,000	14.0 64.8	12.0 55.6	10.0 46.4	8.0 37.2	6.0 28.0	4.0 18.4	2.0 8.8	

Cylinders: 1 Type J-1

DILUTER DEMAND REGULATOR OXYGEN DURATION TABLE (MOST AIRCRAFT)

Figure 4-20

X1-123

position, the air inlet valve is closed and the regulator supplies 100 percent oxygen to the mask.

Oxygen Regulator Flow Adjustment Knob (Continuous-Flow System).

An oxygen regulator flow adjustment knob is provided on each type A-9A regulator. Manual adjustment of the knob controls the flow of oxygen to correspond with the cabin altitude.

Oxygen Regulator Emergency Value (Diluter-Demand System).

The emergency valve of the oxygen regulator is for use in the event the demand oxygen regulator becomes inoperative. The valve is always safetywired in the closed position and should be opened only in an emergency. The valve provides a means of manually supplying oxygen pressure to the mask in the event of regulator failure.

Portable Oxygen Cylinders and Recharger Assemblies.

Four portable oxygen cylinders (5, figure 1-3) are located as follows: one on the bulkhead aft of the pilot's seat, one at the right of the copilot's seat, one at the radio operator's station, and one in the relief crew compartment. Two portable oxygen cylinder recharger assemblies (4, figure 1-7) are located as follows: one outboard of the copilot's seat and one in the radio operator's compartment. Additional recharger assemblies may be located throughout the aircraft.

WARNING

Most oxygen regulators carried on the walk-around bottles are diluter-demand type; and, unless the wire mask screen on the regulator is covered, smoke will still be inhaled with the oxygen or smoke mask on.

Oxygen Pressure Gages.

An oxygen pressure gage that indicates system pressure is installed at the pilot's and copilot's stations on their respective oxygen system indicator panels. Additional pressure gages may be installed at each crew member's station.

Oxygen Flow Indicators.

An oxygen blinker-type flow indicator is installed at each crew member's station.

OXYGEN SYSTEM NORMAL OPERATION.

Note

If the diluter-demand system is installed, each crew member should check his oxygen regulator with the diluter valve, first at the NORMAL OXYGEN position and then at the 100% OXYGEN position as follows: remove the mask and blow 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 to blowing, indicates a faulty demand diaphragm or diluter air valve, or a leak in the mask-to-regulator tubing. Use only a demand oxygen mask. For normal operation of the diluter-demand system, set the AUTO-MIX lever to the NORMAL OXYGEN position. For normal operation of the continuous-flow system, turn the flow adjustment knob counterclockwise until the flow indicator needle corresponds to the cabin altitude.

OXYGEN SYSTEM EMERGENCY OPERATION.

Diluter-Demand System.

1. With the first symptoms of hypoxia, accomplish the following:

   a. Break safetywire and open emergency valve by turning red emergency knob counterclockwise.

b. After determining that sufficient amount of oxygen is being received, set AUTO-MIX lever to 100% OXYGEN position and emergency knob to CLOSED position.

c. If 100% oxygen is adequate, check equipment to determine if NORMAL OXYGEN position may again be used. If conditions permit, set AUTO-MIX lever to NORMAL OXYGEN position.

2. If smoke or fumes should enter cabin, accomplish following:

a. Set AUTO-MIX lever in 100% OXYGEN position.

b. After emergency condition has been corrected, set AUTO-MIX lever in NORMAL OXYGEN position.

Continuous-Flow System.

1. With first symptoms of hypoxia or if smoke or fumes enter cabin, turn flow adjustment knob on regulator counterclockwise to full open position (100% OXYGEN).

CAUTION

Use of 100% OXYGEN or opening of the emergency valve exhausts the oxygen supply rapidly. After the emergency condition has been corrected, turn the emergency flow off and AUTO-MIX lever to the NORMAL OXYGEN position. If the continuous-flow system is used, adjust the flow adjustment knob of the regulator to correspond with the cabin altitude. If for any reason the AUTO-MIX lever must be left in the 100% OXYGEN position, the emergency valve must be left open or the adjustment knob on the continuous-flow regulator) must be left in the full open position, the pilot will be notified so that he may descend to a lower altitude. During all oxygen system emergency operations, the oxygen pressure will be monitored closely.

TROOP, PASSENGER, OR PATIENT OXYGEN SYSTEM.

A continuous-flow gaseous oxygen system is provided for passengers or patients, using two type J-1 oxygen cylinders (installed only when required). Three type A-11 continuous-flow oxygen regulators are installed on each side of the main cabin and are connected to 44 oxygen outlets for troop use. Four type A-9A oxygen regulators are installed on the forward right main cabin wall for ambulance patients requiring oxygen for treatment. The continuous-flow regulators automatically supply the proper amount of oxygen required with altitude. An oxygen outlet coupling is provided for each seat or each ambulance and for the cabin lavatory compartment. The coupling automatically opens to supply oxygen when a mask bayonet is inserted. Continuous-flow oxygen masks must be used. The approximate duration of the passenger or patient oxygen system is given in figure 4-20.

Troop, Passenger, or Patient Oxygen System Pressure Gage and Line Valve.

A passenger or patient oxygen system pressure gage is installed on the aft right main cabin wall. An oxygen line valve located above the oxygen pressure gage must be closed if the passenger or patient oxygen cylinders are removed.

PASSENGER OXYGEN SYSTEM EMERGENCY.

If the passengers' continuous-flow regulators should become inoperative, descend to an altitude not requiring oxygen.

AUTOPILOT — A3-A SYSTEM.

The type A3-A autopilot is a gyroscopically controlled, hydraulically actuated system which automatically operates the flight-control cable systems to maintain a desired magnetic heading and a normal stabilized

attitude. Hydraulic fluid for the autopilot system is supplied by the main hydraulic system. An engine-driven autopilot hydraulic pump (figures 1-22 and 1-23) mounted on the No. 2 engine provides autopilot system pressure. Bypass valves in the servo units are operated by the servo unit handles. Relief valves in each servo unit permit manual overpowering of the autopilot in the event of an emergency by limiting the oil pressure in each servo cylinder. An autopilot control panel (figure 4-21), installed on the main instrument panel, contains the controls necessary for actuating the autopilot in maneuvering and trimming the aircraft.

AUTOPILOT OIL SHUTOFF HANDLE.

An autopilot oil shutoff handle (6, figure 4-21) with ON and OFF positions is located outboard of the copilot's seat. It mechanically controls the power to the hydraulic units of the autopilot system. When the shutoff handle is placed in the ON position, oil pressure is permitted to flow from a pressure regulating valve to three balanced oil valves on the autopilot control unit. Placing the shutoff valve in the OFF position bypasses the oil pressure from the pressure regulating valve to the hydraulic reservoir.

Note

The autopilot oil shutoff handle should remain in the ON position.

AUTOPILOT SERVO UNIT HANDLES.

Three autopilot servo unit handles (figure 4-21), mounted on the aft section of the control pedestal, have ON and OFF positions. When the handles are pushed to the ON position, hydraulic fluid pressure is admitted to the servo cylinders and operates the autopilot. Pulling the handles to the OFF position permits the hydraulic fluid to bypass the servo cylinders and return to the hydraulic reservoir.

CAUTION

Trimming the aircraft should not be accomplished with the autopilot engaged.

ELEVATOR TRIM KNOB.

The elevator trim knob, located on the autopilot control panel (3, figure 4-21), controls the aircraft in pitch attitude. Rotating the knob counterclockwise results in a nose-up attitude; rotating the knob clockwise produces a nose-down attitude.

RUDDER TRIM KNOB.

The rudder trim knob (3, figure 4-21), located on the autopilot control panel, controls the aircraft about the vertical axis. Rotating the knob clockwise produces a right turn; rotating the knob counterclockwise results in a left turn.

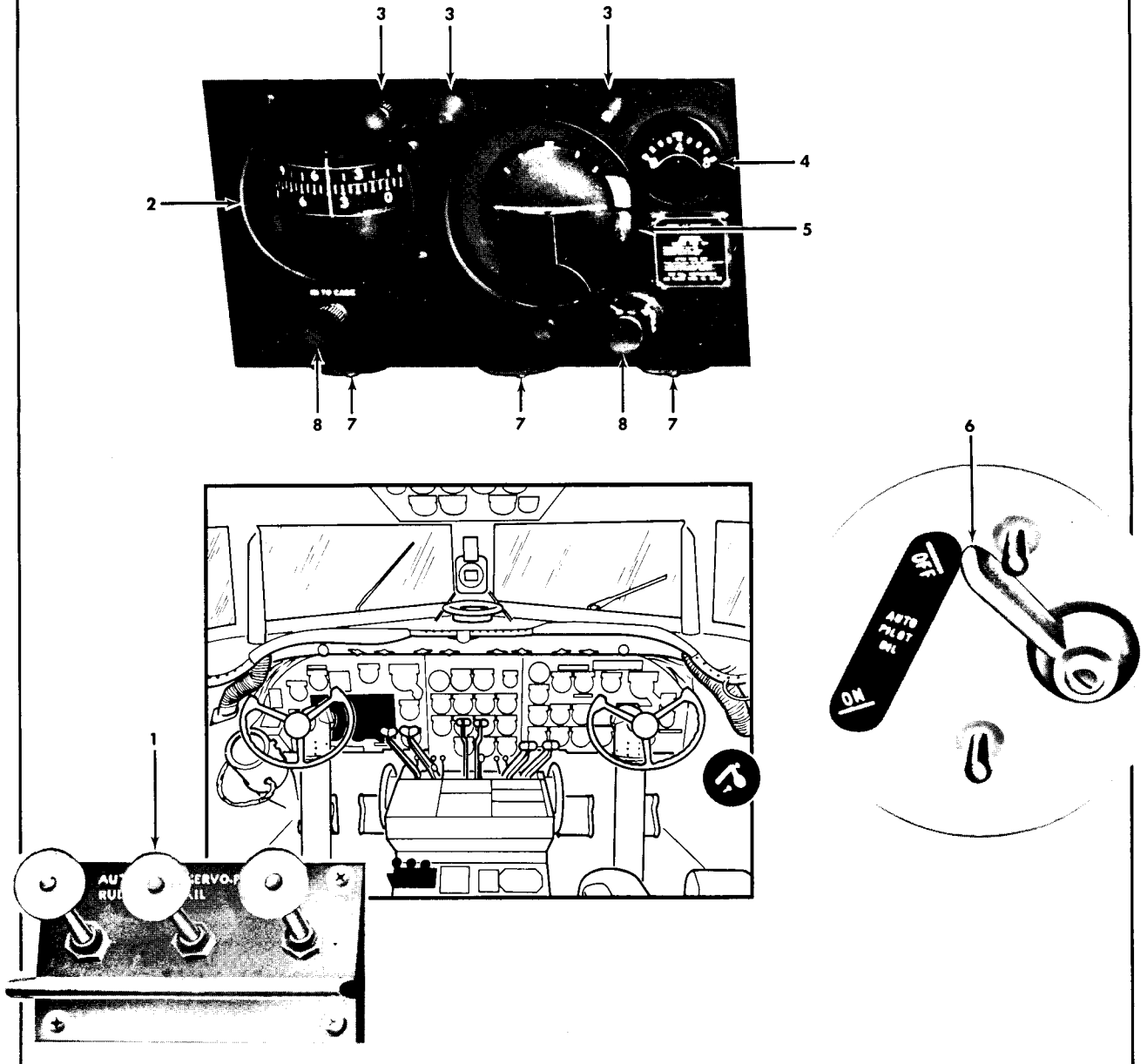
AILERON TRIM KNOB.

The aileron trim knob (3, figure 4-21), located on the autopilot control panel, controls the aircraft about the roll axis. Turning the knob toward the high wing will bring the aircraft to a level attitude.

Autopilot Indicators.

A directional indicator and an attitude indicator (2 and 5, figure 4-21) are incorporated in the autopilot control panel to provide visual indication of the autopilot signal in each axis. If the needles diverge more than one pointer width from the respective index, an excessive out-of-trim condition exists and should be corrected.

A3-A AUTOPILOT CONTROLS



1. AUTOPILOT SERVO UNIT HANDLES
2. AUTOPILOT HEADING INDICATOR
3. TRIMMING KNOBS (3)
4. AUTOPILOT VACUUM GAGE
5. AUTOPILOT ATTITUDE INDICATOR
6. AUTOPILOT OIL SHUTOFF HANDLE
7. SENSITIVITY DIALS (3)
8. CAGING KNOBS (2)

Figure 4-21

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Vacuum Gage.

A direct-pressure-operated vacuum gage (4, figure 4-21), installed on the autopilot control panel, indicates the vacuum pressure of the autopilot system in inches of Hg. Vacuum pressure indication is taken directly from the vacuum manifold. The normal vacuum pressure limits are 3.75 to 4.25 inches Hg.

Autopilot Oil Pressure Gage.

A pressure-operated autopilot oil pressure gage (31, sheet 1 and 24 sheet 2, figure 1-10) mounted on the right side of the main instrument panel in front of the copilot's station, indicates the system oil pressure. Normal operating pressure of the autopilot system is 125 (±5) psi.

Caging Knobs.

Caging knobs (8, figure 4-21) for the autopilot gyro instruments are installed on the autopilot control panel. The limit of the gyro turn unit is 55 degrees from vertical in bank, glide, or climb. The limit of the attitude gyro unit is 50 degrees from vertical in bank, glide, or climb. Any maneuver that exceeds these limits will result in gyro spill or tumble, causing the instruments to give incorrect indication. Pushing the gyro turn caging knob to the IN position, and turning the attitude caging knob clockwise to the CAGE position will mechanically set the gyro gimbal rings of each unit in the proper positions. After resetting the gyro units for proper heading and indication, the gyro turn caging knob may be pulled to full OUT, and the attitude caging knob may be turned counterclockwise to the UNCAGE position for gyro operation of both units.

Note

Instruments should be uncaged at all times, except during maneuvers which exceed their operational limits.

Sensitivity Dials.

Three sensitivity dials (7, figure 4-21) with settings 0 through 9 are installed on the autopilot control panel. A dial for each surface control permits mechanical selection of the desired autopilot control response. The sensitivity dials mechanically control the amount of airflow through an air relay valve that is connected to a balanced oil valve in each servo unit. Sensitivity may be increased by turning the dials clockwise toward higher numbers, which increases the airflow and stimulates quicker control response.

AUTOPILOT OPERATION.

In Flight.

1. Trim aircraft to fly hands off.
2. Autopilot Oil Shutoff Handle — ON.
3. Select desired aircraft heading and align followup cards and indexes on control panel.
4. Autopilot Servo Unit Handles—Push ON.
5. Trim aircraft in axis indicated by gyro indexes with autopilot in operation.

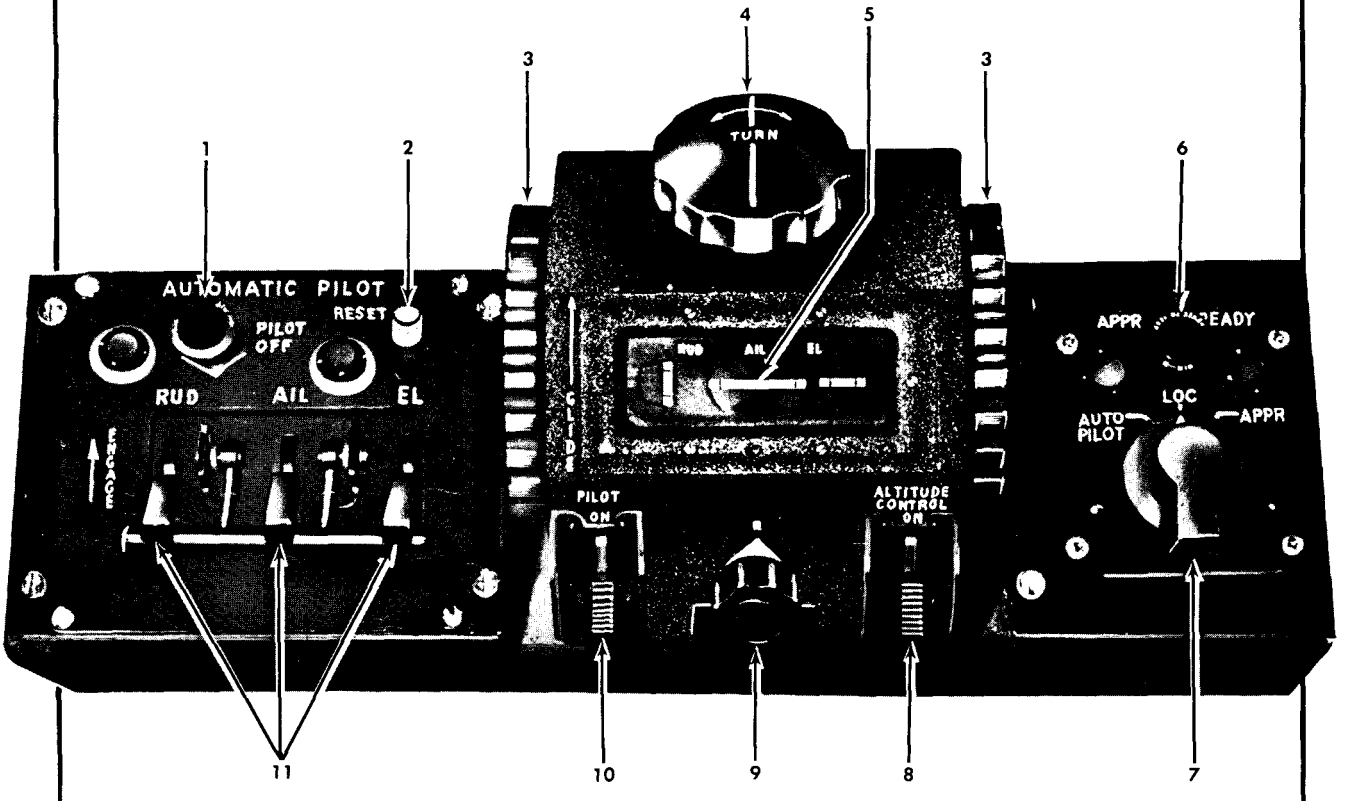
Note

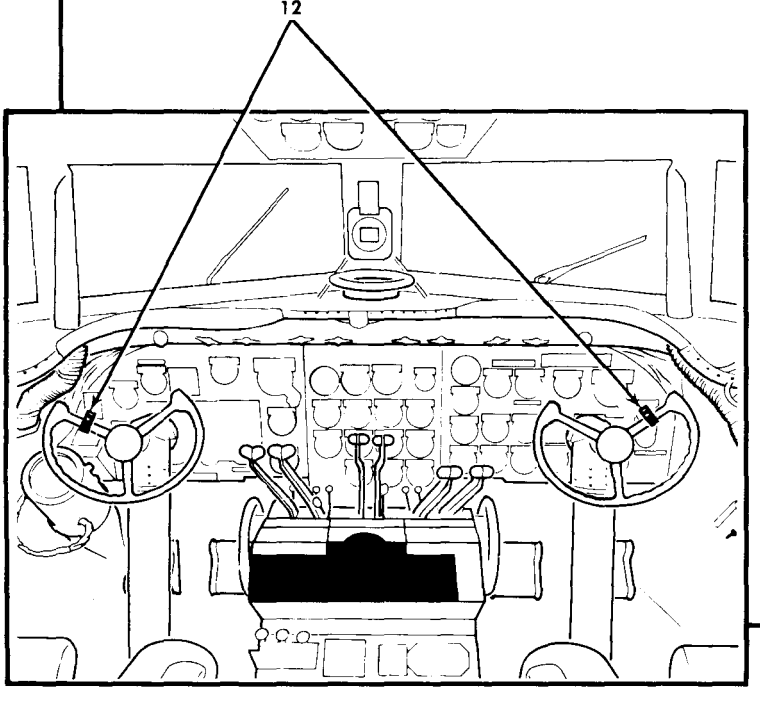
Autopilot will not operate if No. 2 engine is shut down.

AUTOPILOT — E-4 SYSTEM.

Some aircraft are equipped with a modified E-4 autopilot. The electromechanical device automatically positions the control surfaces for level flight and any desired magnetic heading. In addition, the system provides constant attitude control, coordinated turn control, automatic elevator trim compensation for

E-4 AUTOPILOT CONTROLS





1. AUTOPILOT OFF INDICATOR LIGHT
2. AUTOPILOT RESET BUTTON
3. AUTOPILOT PITCH CONTROL KNOB (2 PLACES)
4. AUTOPILOT TURN CONTROL KNOB
5. AUTOPILOT INDICATORS
6. AUTOMATIC APPROACH INDICATOR LIGHT
7. AUTOMATIC APPROACH SELECTOR SWITCH
8. ALTITUDE CONTROL SWITCH
9. AUTOPILOT AILERON TRIM CONTROL KNOB
10. AUTOPILOT POWER SWITCH
11. AUTOPILOT CONTROL SURFACE ENGAGING SWITCHES
12. AUTOPILOT RELEASE BUTTONS (2 PLACES)

Figure 4-22

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changes in weight distribution, and automatic approach control for instrument landing operation. The autopilot can be engaged or disengaged with the flight systems when the aircraft is in any level flight attitude. The electrical controls for nonautomatic actuation of the autopilot in maneuvering and trimming aircraft are grouped on the autopilot control unit (figure 4-22), located on the control pedestal. The autopilot equipment receives 28-volt dc and 115-volt ac power through circuit breakers on the autopilot and N-1 compass circuit breaker panel and in the main junction box. The N-1 compass system supplies the directional signal to the autopilot from the directional gyro.

Note

The autopilot can be engaged with complete safety when the aircraft is in normal straight and level flight or in any normal descent or climb. The autopilot should not be engaged when the aircraft is turning. If the autopilot is engaged in a climb or dive, the aircraft will continue to fly in that attitude until the signal is originated to change the attitude. After electrical power is supplied to the autopilot, approximately 2 minutes are required for the gyros to complete the erection process.

AUTOPILOT SYSTEM POWER SWITCH.

The autopilot system power switch (33; sheet 5, figure 1-11), with ON and OFF positions, is located on the pilots' overhead panel. The switch controls the relays that supply ac and dc power to the autopilot.

AUTOPILOT POWER (PILOT) SWITCH.

The autopilot power switch (10, figure 4-22), with ON and OFF positions, controls the power to the electronic units of the autopilot system. An interlock system prevents the power switch from being placed in the ON position or, if in the ON position, will return the switch to the OFF position if any of the following conditions exist:

1. Aircraft ac or dc power supply exceeds or falls below operating limits.
2. Ac power has not been applied to autopilot for a minimum of 2 minutes.
3. Autopilot turn control knob is not centered.
4. Autopilot release buttons on pilots' control wheels are not out.
5. Automatic approach selector switch is in LOCALIZER or APPROACH position.

AUTOPILOT PITCH CONTROL KNOB.

The aircraft is controlled in pitch attitude by either of the two pitch control knobs (3, figure 4-22). Rotating the pitch control knobs toward the nose of the aircraft results in a nose-down attitude; rotating the knobs aft, or away from the nose, produces a nose-up attitude. The pitch control knobs are inoperative when the altitude control switch is on.

AUTOPILOT TURN CONTROL KNOB.

The turn control knob (4, figure 4-22) is used to make coordinated turns of the aircraft at any airspeed. The knob must be centered before engaging the autopilot, or the power switch cannot be placed to the ON position.

AUTOPILOT AILERON TRIM CONTROL KNOB.

The attitude of the aircraft about the roll axis is controlled by the aileron trim control knob (9, figure 4-22). Rotating the knob toward the high wing will bring the aircraft to a level attitude; the magnitude of reaction being proportional to the amount of knob rotation.

ALTITUDE CONTROL SWITCH.

The altitude of the aircraft can be automatically maintained at any barometric pressure altitude by placing the altitude control switch (8, figure 4-22) to the ON position. Altitude will also continue to be maintained during turns with the unit in operation. An interlock system prevents operation of the altitude control switch when the autopilot control surface engaging switches are not in the ENGAGE position. If climbing or descending when the altitude control switch is placed to the ON position, the aircraft will level off and hold a constant altitude. However, when the switch is later moved to the OFF position, the aircraft will resume the climb or descent attitude effective at the time the switch was moved to the ON position. It is recommended that the aircraft be leveled off at the cruising altitude before placing the altitude control switch to the ON position.

CAUTION

The altitude control switch must be in the OFF position prior to changing the pilot's static source selector valve switch to the alternate position. Failure to do so will result in an abrupt change of attitude up to the limit of 6 degrees.

AUTOPILOT CONTROL SURFACE ENGAGING SWITCHES.

The autopilot servos are electrically activated for mechanical engagement with the control surface cable systems by the autopilot control surface engaging switches (11, figure 4-22). Each switch has two positions, ENGAGE and DISENGAGE, and can be operated either individually or together as a gang switch. Disengaging the switches while the altitude control switch is in the ON position will automatically return the altitude control switch to the OFF position, but will leave the electronic units of the autopilot operating.

Note

The N-1 compass must be operating before the engaging switches are engaged. If the N-1 compass should go off, the rudder control will be disengaged from the autopilot.

AUTOPILOT RELEASE BUTTONS.

The autopilot can be electrically deenergized by depressing the autopilot release button (12, figure 4-22) located on each control wheel. Depressing either button automatically returns the autopilot power and altitude control switches to the OFF positions.

AUTOMATIC APPROACH SELECTOR SWITCH.

A three-position automatic approach selector switch (7, figure 4-22) and an automatic approach indicator light (6, figure 4-22) are mounted on the autopilot control panel for use in coordinated operation of the autopilot, and the localizer and glide slope equipment for instrument landing. The switch should remain in the AUTOMATIC PILOT position at all times that automatic approach operation is not desired. The LOCALIZER position causes the autopilot to respond to localizer signals. The APPROACH position is used when the horizontal needle is centered and the aircraft has been trimmed to fly the glide slope, when using the control on a known glide slope frequency.

WARNING

When the automatic approach selector switch is in the LOCALIZER position, do not control the aircraft with the turn control knob. To do so will disengage the autopilot.

AUTOPILOT RESET BUTTON.

On some aircraft, an autopilot reset button (2, figure 4-22) is located on the autopilot

control panel. The button is used to stop operation of the autopilot off indicator light when the light comes on intermittently to indicate that the autopilot is ready to be engaged or that the autopilot is not engaged. Pressing the button will cause the autopilot off indicator light to go off and remain off.

AUTOPILOT INDICATORS.

The autopilot indicators (5, figure 4-22) are incorporated on the autopilot control panel to provide a visual indication of autopilot signals in each axis. A constant deflection of the indicator needle in any axis indicates that the autopilot is correcting an out-of-trim condition. While the needles need not be exactly centered, a divergency of more than one pointer width indicates an excessive out-of-trim condition that should be corrected by retrimming in that axis. The elevator (EL) axis is automatically trimmed by the elevator trim tab servo, but the aileron (AIL) must be trimmed with the aileron trim control knob located on the control panel, and the rudder (RUD) trimmed with the rudder trim tab wheel located on the pilots' instrument panel glareshield. Trimming should be accomplished with the autopilot engaged. The autopilot will hold the aircraft substantially on course in the event of engine failure, but the rudder and aileron must be trimmed out until the respective trim indicators are centered.

AUTOPILOT OFF INDICATOR LIGHT.

The autopilot off indicator light (1, figure 4-22) is located on the autopilot control panel. When the autopilot system power switch has been placed to the ON position and the warm-up period has elapsed, the indicator light will come on intermittently indicating the autopilot is ready to be engaged or, if during operation the power (pilot) switch is returned to the OFF position, the light will come on intermittently indicating that the autopilot is not engaged. The autopilot off indicator light will be on continuously when the autopilot is engaged.

AUTOMATIC APPROACH INDICATOR LIGHT.

The automatic approach indicator light (6, figure 4-22) is located on the autopilot control panel. When power is applied and the autopilot is operating, the light will come on indicating that the automatic approach selector switch is ready for operation.

AUTOPILOT OPERATION.

Operating Limitations.

The following limitations should be observed during operation. All limitation specifications given are maximum and are measured from the normal level flight reference position. During autopilot operation: bank limitation is 45 degrees; climb and descent limitation is 18 degrees, with the altitude control switch in the ON position, the climb and descent limitation is reduced to approximately 6 degrees; aileron trim limitation is 8 degrees bank in either direction.

CAUTION

Pitch attitude change through the use of the altitude control is limited to plus or minus 6 degrees of level flight attitude. If the altitude control is engaged while the aircraft is climbing or descending at greater than this limit, the altitude control will compensate for 6 degrees, and the aircraft will continue to climb or descend at a pitch attitude 6 degrees less than the original attitude. In this case, if the aircraft continues to climb or descend, the altitude control may be damaged.

With the automatic approach selector switch in the LOCALIZER position, the bank limitation is 25 degrees. With the automatic approach selector switch in the APPROACH position, the bank limitation is approximately 10 degrees and the climb and descent limitation is approximately 5 degrees.

Turning On Autopilot.

WARNING

The pilot or copilot will monitor the controls continuously when flying with the autopilot engaged. If an autopilot malfunction results in a hard-over rudder action, the pilot shall apply force to the rudder pedal that is in the forward position, prior to releasing the autopilot. This prevents the rudder from abruptly returning to neutral when the autopilot is disengaged. After disengaging the autopilot, the rudder shall be allowed to return to neutral slowly.

1. To Start: Automatic Approach Selector Switch—AUTOPILOT.
2. Autopilot System Power Switch—ON.
3. Autopilot Inverter Switch—MAIN.

   Check that autopilot inverter switch is in MAIN position.
4. Aircraft—Trim.
5. Autopilot Turn Control Knob—Center.
6. Autopilot Power (Pilot) Switch—ON.
7. Autopilot Control Surface Engaging Switches—ENGAGE.
8. Altitude Control Switch—ON.

   Place altitude control switch to ON position to maintain constant pressure altitude.
9. Aircraft—Trim.

   Trim aircraft in axis indicated by signal meters with autopilot engaged. Any additional out-of-trim condition noticed after autopilot has been set will be corrected by disengaging autopilot and retrimming aircraft manually.
10. To Turn Off Autopilot: Autopilot Release Button (on either control wheel)—Depress.

WARNING

If an Autopilot Release Bottom Fails to disengage autopilot, procede as follows:

1. Autopilot System Power Switch - OFF.
2. Autopilot Power (Power Switch) - OFF.
3. Autopilot Circuit Breakers - OFF.

If the above procedure fails to disengage autopilot, the affected flight control servo motor must be physically released from the flight control system.

Note

If an erratic control column or rudder motion occurs, the autopilot should be turned off by means of the autopilot power switch, rather than by attempting to catch the moving control column to depress the autopilot release button. Excessive nose-down or nose-up control column motion should be handled by grasping the control wheel before releasing the autopilot.

AUTOMATIC APPROACH EQUIPMENT.

Automatic approach equipment is installed and is used in conjunction with the autopilot to provide a means of instrument guidance whereby the autopilot responds to radio signals and maintains an on-course flight path through interpretation of localizer and glide slope radio beam signals. The automatic approach equipment consists of an automatic approach control and an automatic approach selector switch.

WARNING

The automatic approach selector switch stops are stressed to withstand a torque of 25 inch-pounds.