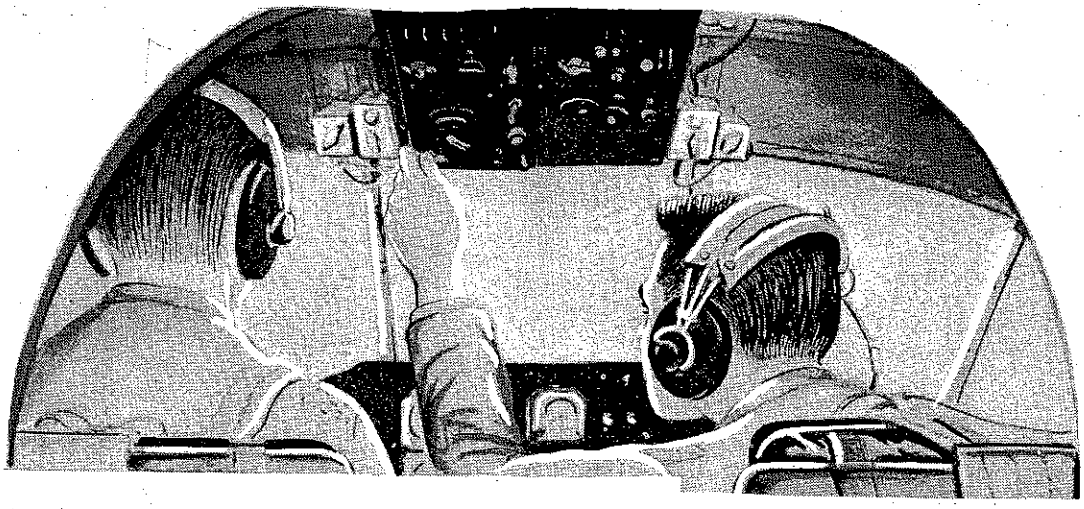

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section IV DESCRIPTION AND OPERATION OF AUXILIARY EQUIPMENT

INTERIOR HEATING AND WINDSHIELD DEFROSTING SYSTEM.

GENERAL

Heated air is furnished the aircraft interior by two identical systems, each with its own control. One system supplies air to all outlets on one side of the aircraft, the other system to the other side. Each engine is the source of heat for the corresponding system. There are no means for providing heat to either the cabin area or the pilot's compartment separately.

With the understanding that both heating systems are identical, the operation of only one side will be discussed in detail.

HEATING AND DUCTING. Outside air enters the system through an air intake which is located in the nacelle in such position that will pick up clean outside air. It is then heated by the engine exhaust, utilizing a heat exchanger. Two ducts lead from the nacelle; one to a cabin outlet which is located near the floor between the seats, the other to the pilot compartment. Two outlets are provided in the pilot's compartment, one on the side of the aircraft forward of the seat; the other, for defrosting, at the base of the windshield.

NOTE

With propeller anti-ice operating, alcohol fumes will be picked up by the heating system and will become quite noticeable in the cabin.

CABIN HEAT BUTTONS.

Control valves, located in the nacelles are operated by push-pull buttons (figure 1-5) on the pedestal. This button incorporates a locking device, for maintaining the desired setting, which should be released by depressing the center plunger before repositioning.

With the pedestal button full out all of the heated air is dumped overboard; full in, all the heated air is directed into the cabin and pilots' compartment. Any intermediate position will direct a proportional amount of heated air to the aircraft interior.

For that portion of the air which flows to the cabin, there is no further control.

PILOT COMPARTMENT OUTLET SHUT-OFF.

The outlet forward of the pilot's seat is equipped with a combined deflector and shut-off valve. The outlet is in the OFF position when the opening is pointed aft. Turning counterclockwise it begins opening, reaching a full open position after approximately 90 degrees and remaining full open until the forward position where it begins to close. All air which does not pass through this outlet will be directed to the windshield defrost outlet. So remember, MAXIMUM DEFROSTING HEAT IS OBTAINED WITH THE PILOTS' COMPARTMENT OUTLETS CLOSED.

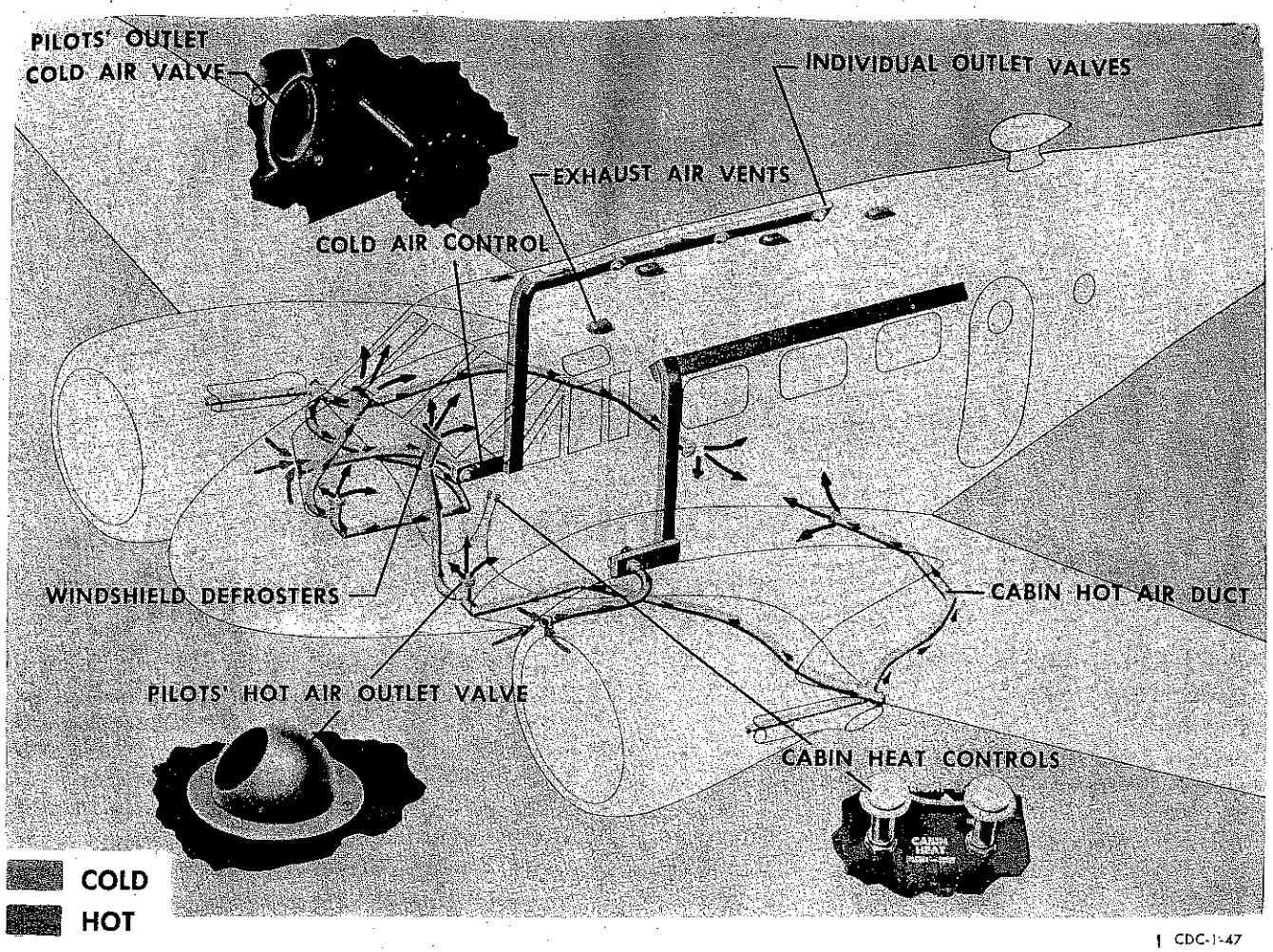
VENTILATION SYSTEM.

Cold air for ventilation enters the leading edge of the wing between the nacelle and the fuselage and passes through a duct to the cold air control valve in the wall of the pilots' compartment. From here it is ducted to the individual outlets in the cabin and to the pilot's and co-pilot's outlets. Individual and identical systems are provided on each side of the fuselage and are individually controlled.

Overhead exhaust vents are provided in the pilots' compartment and in the cabin section to permit the escape of air from the aircraft.

COLD AIR CONTROLS.

The cold air control valve (figure 4-1) is a screw type valve located to the rear of each pilot's seat on the cabin wall. Turning the valve clockwise closes



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HEATING AND VENTILATING SYSTEM

Figure 4-1

off the air flow and counterclockwise increases flow. The individual outlets located by each pilot's seat just ahead of the control valve and one above and ahead of each passenger seat are the same in operation as the pilot's and copilot's individual hot air outlets, in that they may be used for deflecting or shutting off air flow.

ANTI-ICING AND DEICING SYSTEMS.

PROPELLER ANTI-ICING.

The propellers are equipped with a liquid type anti-ice system. Both propellers are anti-iced simultaneously from a single supply tank through a single pump. The flow is from the 3 gallon tank, located on the floor boards behind the pilot's seat, through check valves in the nacelles and into the slinger rings on the propeller hubs.

PROPELLER ANTI-ICE CONTROL. The propeller anti-icing fluid pump, and thus the rate of flow, is controlled by the rheostat (figure 1-8) on the right subpanel. As the knob is turned in a clockwise direction from the OFF position, the maximum rate of flow (approximately 35 minutes' supply) is obtained as the pump starts to operate. Continued turning of the rheostat in a clockwise direction decreases the rate of flow to a minimum (approximately 3½ hours' supply). The maximum travel of the rheostat is approximately 270 degrees.

PROPELLER ANTI-ICE OPERATION. The normal operating position is indicated by a rectangular block with the word NORMAL on it across the placarded arrow. This setting affords approximately 3 hours' supply of fluid. The propeller anti-icing system is designed to prevent the formation of ice, not to remove it after it has formed.

Refer to Servicing Diagram for fluid specifications.

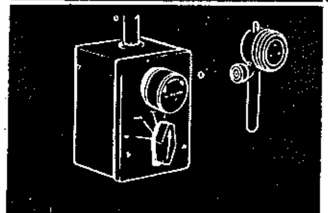
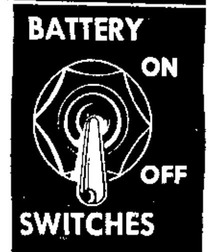
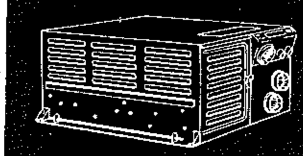
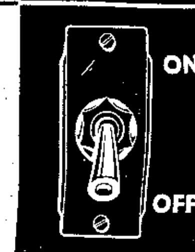
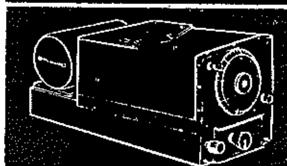
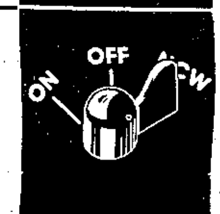
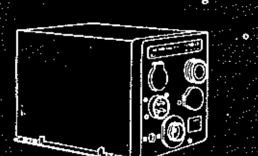
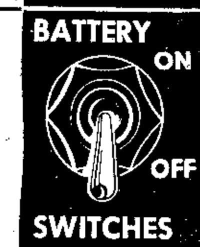
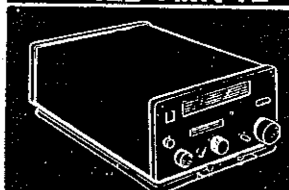
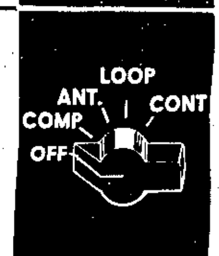
DESIGNATION	TYPE	FUNCTION	PRIMARY OPERATOR	RANGE	LOCATION OF CONTROLS	ON-OFF PROCEDURE
 RC-36 INTERPHONE	Interphone Equipment	Intercommunication Between Pilots and Passengers	Crew Members	Stations Within The Airplane	Jack Box Installation Near Each Pilot's Seat and on the Right Hand Cabin Wall.	
 AN ARC-27	VHF Command Set	Short Range Two-Way Voice and Code Communication	Pilot and Copilot	Line of Sight	Radio Control Panel Overhead Between Pilot and Copilot	
 BC 453-B	Low Frequency Receiver	Radio Navigation	Pilot and Copilot	20-200 Miles, Depending on Frequency Used and Time of Day	Radio Control Panel Overhead Between Pilot and Copilot	
 BC 1333 OR R 122 ARN-12	Marker-Beacon Receiver	Receives Location Marker Signal on Navigational Beam	Pilot and Copilot	Airplane to Ground		
 R 122 ARN-12	Radio Compass	Receive Voice and Code Signals for Homing and Direction Finding	Pilot and Copilot	20-200 Miles, Depending on Frequency Used and Time of Day	Radio Control Panel Overhead Between Pilot and Copilot	

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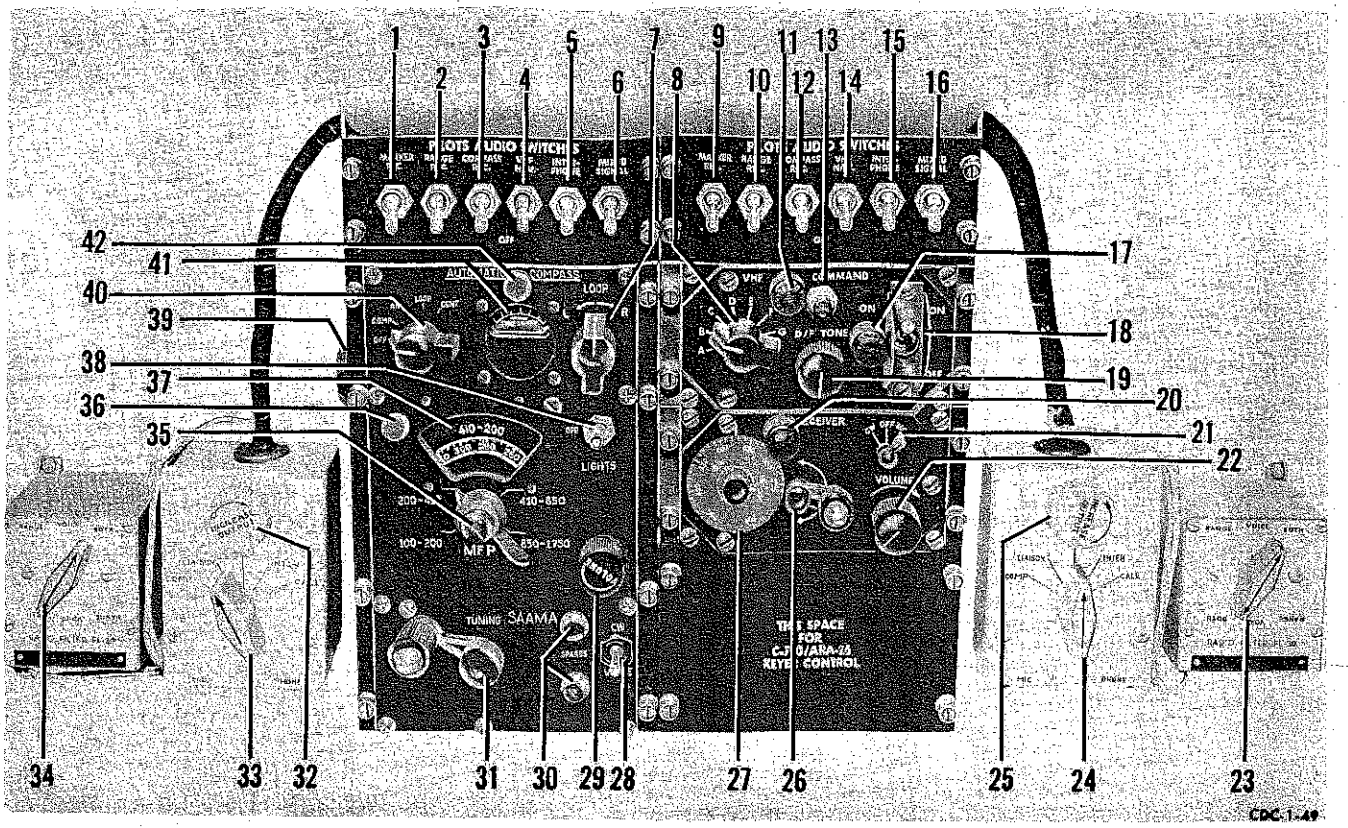
Figure 4-2. Communications Equipment Table

COMMUNICATION EQUIPMENT



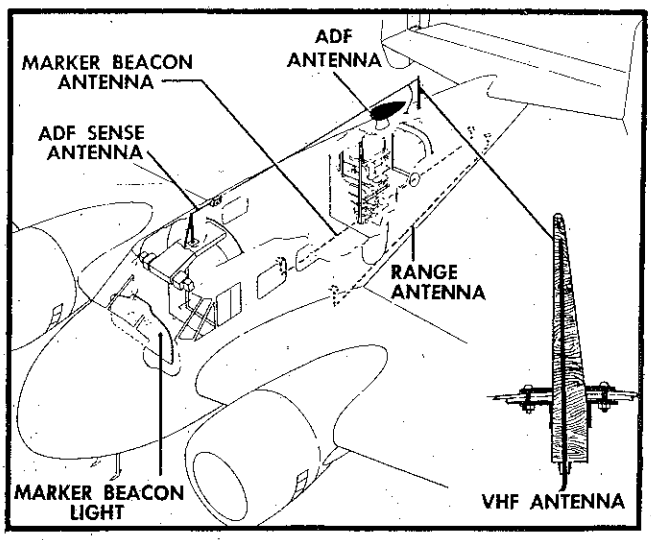


Figure 4-3. Communications Equipment

NOTE

With the heating system in operation, alcohol fumes will be noticeable in the cabin.

WING AND TAIL DEICER.

The leading edges of the wings and the horizontal tail surfaces are equipped with pneumatic deicer boots. Pressure for operation is taken from the exhaust side of the engine driven vacuum pumps.

WING AND TAIL DEICER CONTROL. A push-pull button (figure 1-8) for the control of the wing and tail deicers is mounted on the right subpanel. The button is self locking so the center plunger should be depressed when the control is repositioned. There are two operating positions; full OUT directs pressure into the deicing system and also actuates an electrically driven cycling valve which further directs the pressure to the various cells within the deicer boots. With the button full IN, the cycling operation is stopped and the air is dumped overboard.

CAUTION

If at any time in flight with the deicer system not in operation a rippling of the boots is noticed, they should be inspected upon landing and replaced if necessary. A rippling or loose boot is a flight hazard and may cause failure of the skin.

WARNING

Do not attempt to land or take-off with deicer in operation. The boot changes the shape of the airfoil as it inflates and deflates. If the airplane is flown near stalling speed

with the boot in operation, a stall may result.

PITOT HEATER.

A conventional electrically heated head is used on the pitot tubes.

PITOT HEATER SWITCHES.

Two toggle switches (figure 1-7) on the left subpanel complete the circuits to the heating elements in the pitot heads; the left switch for the left pitot tube and the right switch for the right tube.

PITOT HEAT OPERATION.

Whenever possible, conditions which may cause ice to form in the pitot tubes should be anticipated so that the heater may be turned on in advance, to preclude even temporary instrument failure.

CAUTION

Prolonged ground operation of the pitot heaters will result in excessive pitot head temperatures with possible failure of the heating elements.

COMMUNICATION AND ASSOCIATED RADIO EQUIPMENT.

GENERAL.

Equipment for radio navigation as well as communication is provided in the aircraft. The various items which comprise this equipment are located in the lavatory compartment, but all controls are grouped in the overhead control panel in the pilots' compartment.

AUDIO SWITCH PANELS. Each pilot station is equipped with audio switch panel for the purpose of selecting those particular receivers to which he wishes to listen. Any number of switches may be placed ON for simultaneous reception if desired. All switches are clearly placarded as to the equipment they serve with the exception of that marked MIXED SIGNAL which serves to connect all receivers to the headset simultaneously.

FILTER SWITCHES. Each pilot station has installed conventional range filter switches.

COMP - LIAISON - COMM AND INTER - CALL SWITCH AND VOLUME CONTROL. This unit is installed for each pilot to have supplemental individual control of volume and as an interphone selector and call switch.

RC-36 INTERPHONE.

This unit is installed to provide interphone communication throughout the aircraft. It has no separate controls of its own and is on whenever the battery switches are on.

BC 1333 or R-122/ARN-12 MARKER BEACON RECEIVER. This receiver covers a range of 62 to 78 megacycles with a preset circuit for reception of the 75 megacycle fan marker, "Z" marker and ILS localizer marker signals.

BC 1333 or R-122/ARN-12 RECEIVER INDICATORS. An indicator light (figure 1-8) on the instrument panel will light in response to signal reception. This is in addition to the aural signal which may or may not be selected.

BC 1333 or R-122/ARN-12 OPERATION. No separate and individual controls are provided for this equipment since it is in operation whenever battery power is available to the bus.

AN/ARC-27 COMMAND.

This equipment provides VHF Communication from aircraft to aircraft or aircraft to ground through a frequency range of 100 to 156 megacycles. The set has line of sight range, with eight preset channels.

AN/ARC-27 OPERATION.

VHF Master Switch — ON.

VHF Channel Selector Switch — Desired frequency.

Allow 45 seconds for warm-up.

Adjust volume.

To transmit — Press microphone button and speak.

To receive — Release microphone button.

To transmit code — Use D/F TONE button on the VHF panel as a key. (Limit your speed.)

To turn off set — Move Master Switch to — OFF.

AN/ARN-7 RADIO COMPASS.

The AN/ARN-7 radio compass provides for visual and aural radio navigation as well as ordinary radio reception through a frequency range of 100 to 1750 kcs. At your discretion either automatic or manual direction finding procedures may be followed.

AN/ARN-7 RADIO COMPASS OPERATION.

To operate as an ordinary receiver:

Function switch on ANT.

Frequency Selector Switch to desired band.

Volume Control — Adjust.

Tuning Crank — Tune to maximum audio level on the chosen station.

To operate as direction finding or homing equipment manually:

Function switch — ANT.

Frequency Selector Switch — Desired Band.

Volume Control — Adjust.

Tuning Crank — Tune to the maximum audio level and identify the desired stations.

CW Switch on CW.

Retune the receiver for maximum audio level.

Function Switch — LOOP.

Retune for maximum audio level.

Proceed with desired loop operation.

To operate as automatic direction finding equipment:

Function Switch — ANT.

Select the desired frequency band.

Tune to and identify the desired station.

Adjust volume.

CW Switch — CW.

Retune to greatest deflection of the tuning indicator needle.

Function Switch — COMP.

Proceed with automatic DF navigation.

BC 453-B RECEIVER.

This receiver provides for voice and code reception through a frequency range of 190 to 550 kilocycles.

BC 453-B OPERATION.

Range Receiver Switch — MCW.

Adjust volume.

Tune and identify the desired station.

NOTE

For code reception, place the Range Receiver Switch in the CW position, then tune for the highest audio level. This position may also aid in tuning stations, that are very weak, for voice reception. After attaining maximum audio level, if the switch is returned to MCW, it should be the best tuning for voice reception.

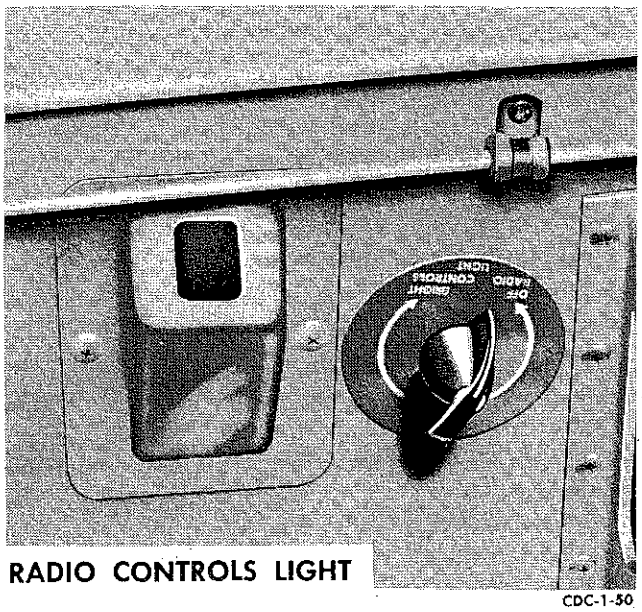


Figure 4-4

RADIO CONTROL PANEL LIGHTING.

On the left side of the radio control panel, a rheostat (figure 4-3) is provided for the control of edge lighting in the VHF and range receiver control panels. The AN/ARN-7 control panel incorporates its own lighting control, with a HI-OFF-LO toggle switch.

In addition to the lighting provided within the panels, a spotlight (figure 4-4) is located on the bulkhead below the threshold of the pilots' compartment. This light illuminates all the radio controls with any intensity of light desired. Mounted adjacent to the light is a rheostat for its control.

LIGHTING EQUIPMENT.

INTERIOR LIGHTING.

In addition to those radio panels which have interior panel lights, the following lighting is provided in the aircraft:

CABIN, LAVATORY AND BAGGAGE COMPARTMENT LIGHTS.

Dome lights are provided in the cabin, lavatory and baggage compartments. The three overhead lights in the cabin will furnish either white or red lighting, while the single fixtures in the lavatory and nose baggage compartment are white only.

LAVATORY AND BAGGAGE COMPARTMENT LIGHT SWITCHES. The overhead lights in the lavatory and baggage compartment are operated by toggle switches adjacent to the lights.

CABIN DOME LIGHT SWITCHES. The white lamps in all three cabin dome lights are controlled by a single two position switch (figure 1-7) on the left subpanel. The red lamp in each dome light is controlled by a two position toggle switch. The switch for the forward light is on the right hand cabin wall, above the window and forward of the front seat. The middle light switch is similarly located above the rear seat while the rear switch is on the rear cabin bulkhead.

PILOT COMPARTMENT LIGHTING.

A utility light is mounted above each seat to serve as a reading light. For greater utility, these lights are on six foot extension cords and may be pulled from their mounting brackets when advantageous. The utility lights have a clear lamp but are furnished with an attached red filter which may be clipped over the lens when necessary.

White map reading lights (figure 4-5) are mounted overhead on each side of the pilot compartment and provide illumination of the entire area.

A spotlight (figure 4-4) is located on the bulkhead below the threshold of the pilot's compartment for lighting all the radio controls with any intensity of light desired.

All instruments are individually lighted with shaded red lamps and are arranged on three separate circuits so the desired intensity of each group may be obtained. The pilot's flight instrument lights are on one circuit, the engine instruments and subpanel lights are on a separate circuit and the copilot's flight instruments on a third circuit.

UTILITY LIGHT SWITCHES. Snap switches for control of the utility lights are provided within the light housing and operated by a knob on the side.

MAP READING LIGHTS SWITCHES. Two position toggle switches are provided on the map reading light fixtures for individual control.

PILOT'S MAP READING LIGHT CDC-1-51

Figure 4-5

RADIO CONTROLS SPOTLIGHT RHEOSTAT. Adjacent to the radio controls spotlight, on the bulkhead, is a rheostat which serves not only to control the intensity of the light but also to turn it off and on.

INSTRUMENT LIGHTING CONTROL. Each of the three groups of instrument lights are provided with its own rheostat which not only controls intensity but also serves as an on-off switch. The rheostat for the pilot's flight instruments is located on the left side of the instrument panel; the rheostat for the engine instruments and the subpanels is adjacent to the one for the pilot's flight instruments; and the one for the copilot's flight instruments is on the right side of the instrument panel. All of these knobs can be located on figure 1-9.

EXTERIOR LIGHTING.

Exterior lighting consists of conventional navigation lights, a passing light, two taxi lights, fuselage clearance lights and two landing lights. The passing light is mounted in the leading edge of the left wing, the taxi lights in the nose and the landing lights are retractable into the lower surface of each wing. The clearance lights are mounted one on the top and one on the bottom of the fuselage.

NAVIGATION LIGHTS SWITCH. Both the navigation and the clearance lights are operated by the navigation lights switch (figure 1-7) on the left subpanel. The switch, a three position toggle, is placarded FLASHER-OFF-STEADY and when in the STEADY position, all lights burn continuously. In the FLASHER position, operation of the clearance lights remains continuous but the navigation lights are alternately on and off.

NOTE

If the automatic flashing device should fail while in operation, it is designed to fail safe and the lights will automatically revert to steady operation.

PASSING LIGHT SWITCH. The passing light is operated by a two position toggle switch (figure 1-7) on the left subpanel.

TAXI LIGHTS SWITCH. A two position toggle switch (figure 1-7) on the left subpanel operates the taxi lights.

LANDING LIGHTS SWITCHES. Each landing light is operated by two toggle switches. One, a three position switch, is placarded RETRACT-OFF-EXTEND; its purpose is obvious. During extension or retraction, the light may be stopped in any position by moving the switch to OFF. The other, a two position switch, is for turning the lamp off and on. The lamp may be turned on at any time except when the light is fully retracted. All four switches are together, on the left subpanel, as seen in figure 1-7.

CAUTION

Only in case of extreme emergency should the landing lights be used for ground operation. Due to the slow speed of the aircraft during ground operation, the flow of cooling air is insufficient to provide adequate cooling of the landing lights; thus overheating of the lamp filament will result in its burning out.

MISCELLANEOUS EQUIPMENT.

WINDSHIELD WIPERS.

The electrically operated windshield wipers are designed and installed for use during take-off and landing. They should not be turned on in flight, except in an emergency, since they are relatively ineffective at cruising speed and the air loads imposed on them could cause damage to the operating mechanism.

They are controlled by the windshield wiper switch (figure 1-8) on the right subpanel which is a fixed position toggle switch having FAST-OFF-SLOW, position, the center position being OFF.

CAUTION

Do not operate windshield wipers on dry glass. Such action can severely damage the linkage as well as scratching the windshield.

DATA CASE.

A data case is provided on the lavatory door.

FLIGHT REPORT CASE.

An airplane flight report case is mounted on the back of the copilot's seat.

MAP CASE.

A map case is located on the wall to the left of the pilot's seat. The case rests on the floor.

PASSENGER SEATS.

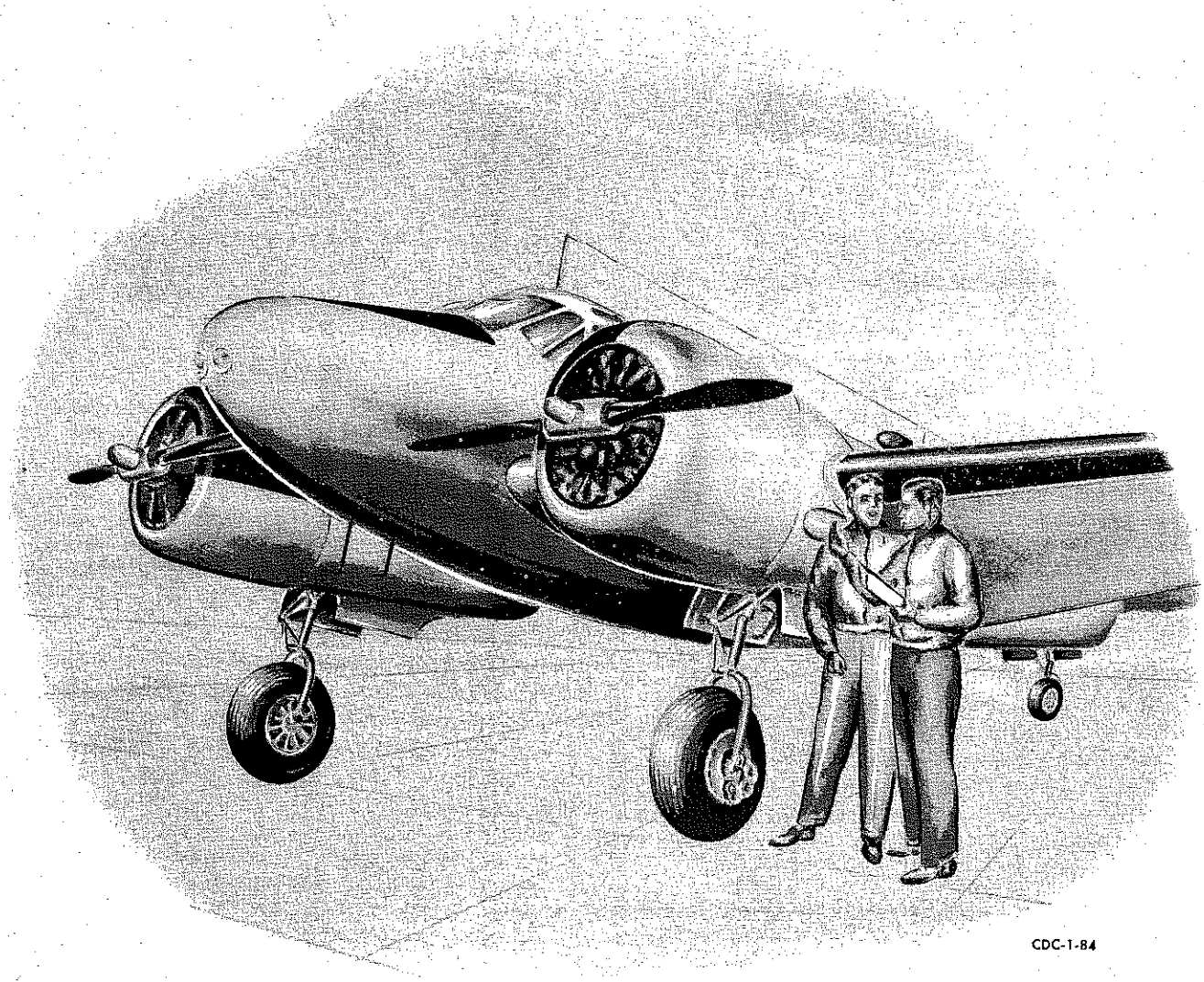
Four bucket type seats are provided in the cabin section. The seats are provided with foam rubber cushions, safety belts and fixed type G-1 shoulder straps.

MOORING KIT.

A mooring kit is stowed on the floor of the lavatory compartment.

RELIEF EQUIPMENT.

A relief tube is provided for the pilot's comfort. When not in use, it is stowed in a clip under the pilot's seat. For the passengers, there is provided in the lavatory compartment, a chemical-type toilet and relief tube.



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