# SECTION IV

# AUXILIARY EQUIPMENT

This section contains the description, normal and alternate operation of all equipment which does not contribute to flight, but which enables the helicopter to perform certain specialized functions. Examples of this auxiliary equipment include, but are not limited to, cargo hook, ramp, hoist, communication and navigation equipment.

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## HEATING SYSTEM

The heating system (figure 4-1) consists of a blower, an internal combustion heater, a plenum chamber, and ducts which run along the left and right sides of the cabin and into the cockpit. The heater has a 200,000 BTU output. The heater unit is located overhead in the cabin above the aft ramp. It operates on fuel pumped from the forward main tank to the heater fuel pump, cycling valve, and heater unit, where it is ignited by an ignitor plug. The ignitor plug operates electrically on current from the dc primary bus, boosted by the heater ignition unit mounted in the heater compartment. A blower draws air into the heater intake port located behind the aft ramp on the bottom of the tail pylon, and forces it through a heat exchanger surrounding the combustion unit. Heated air is then forced into the plenum chamber and the heater ducts. The blower also supplies air to the heater combustion chamber. The heating system is energized by the dc primary bus and is protected by a circuit breaker marked CABIN HEAT CONT, located on the pilot's circuit breaker panel under the general headings DC and PRI.

Fuel consumption of the heater unit, when operating continuously in the HIGH position, is 1.2 gallons (8 pounds) per hour. A spring-loaded fire access door is located above the aft ramp adjacent to the heater unit.

### HEATER SWITCH

The heating system is operated by a switch marked CABIN HEATER, with marked positions LOW, OFF, and HIGH, located on the overhead switch panel. The heater switch controls the heater fuel pump and cycling valve and the ignition unit. When the switch is in the LOW position, the heater will automatically maintain a temperature of approximately 66°C in the plenum chamber. When the switch is in the HIGH position, the heater will automatically maintain a temperature of approximately 141°C in the plenum chamber. An

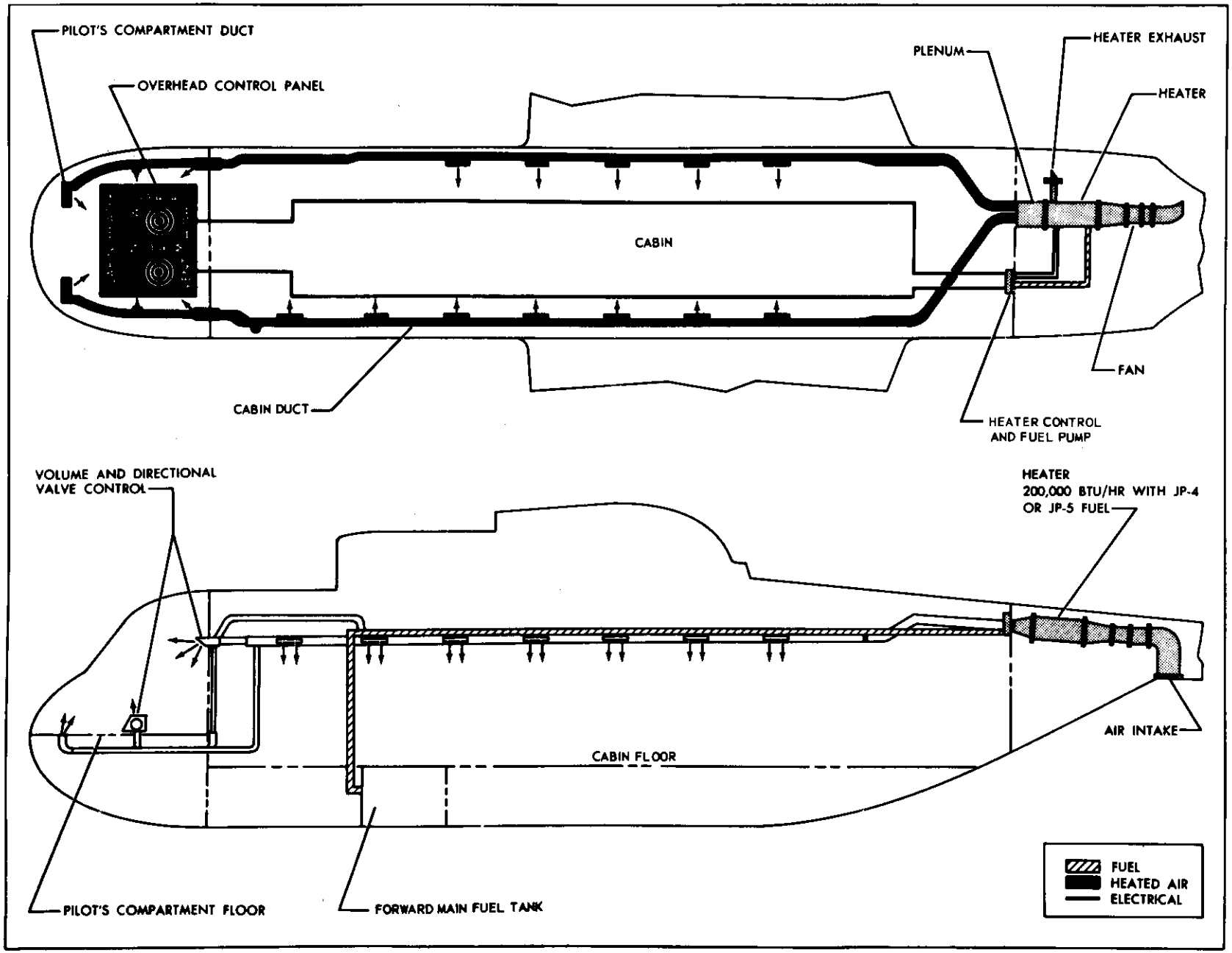



**Figure 4-1. Heating System**

overheat switch will shut off the heater if for any reason the heat in the plenum chamber rises to 177°C. The heater amber caution light, marked HEATER HOT, located on the caution-advisory panel, will illuminate and the heater will automatically shut off if any of the following conditions occur: the heater blower fails; there is no ignition 45 seconds after the heater has been turned on; the heater flame goes out after ignition; or an overheat condition is sensed. The caution light will flash momentarily whenever the heater is turned on.

#### HEATER BLOWER SWITCH

The heater blower switch, marked CABIN HEATER and located on the overhead switch panel, has marked positions NORM and VENT. The switch controls a relay connecting power from the No. 2 ac primary bus to the heater blower located in the heater air intake duct. The switch and blower control circuit is energized by the dc primary bus and is protected by a circuit breaker marked CABIN HEAT VENT, located on the pilot's circuit breaker panel under the general headings PRI and DC. The blower is protected by a circuit breaker gang bar marked CABIN HEATER BLOWER, located on the pilot's circuit breaker panel under the general heading No. 2 AC PRI. When the heater switch is in the NORM position, the blower operates in conjunction with the heating system. Placing the heater blower switch in the VENT position will operate the heater blower continuously.

#### VENTILATING SYSTEM

Placing the heater blower switch in the VENT position, without operating the heater, will draw outside air into the heater system and ventilate the cockpit and cabin.

**CAUTION**

Do not operate vent when hovering in a salt laden air environment because of corrosion.

#### HEATING AND VENTILATING DIFFUSERS

Heating and ventilating diffusers and registers are located in each of the heater ducts that extend along the sides of the cabin and into the cockpit. The cockpit has six diffusers. Two are located above and behind the pilot and copilot, and two located on each side of the cockpit near the floor. These four diffusers are of the round, adjustable nozzle, air-vent type. The open end of the nozzle has a knurled ring which can be turned to control the flow of air from full open to closed. The two remaining diffusers are of the register type and are located on the cockpit floor below the tail rotor pedals. There are twelve diffusers in the cabin, seven in the left-hand duct and five in the right-hand duct. Knobs, marked OPEN, are used to regulate the flow of air through the diffusers. The ducts are stenciled with operating instructions above each diffuser; TURN KNOB FOR VOLUME CONTROL, and PULL CENTER VANE DOWN FOR DIRECTIONAL CONTROL.

#### NORMAL OPERATION

1. Heater Fan Switch - NORM.
2. Heater Switch - HIGH OR LOW.
3. Heater Diffusers - ADJUST AS DESIRED.

**NOTE**

The heater is shut off by moving the heater switch to OFF. The fan will continue to operate after the heater is shut off until the temperature in the plenum chamber drops to 49°C. If the temperature in the plenum chamber should rise to 49°C during hot weather, the fan will begin to operate whenever the dc primary and No. 2 ac primary buses are activated.

**NOTE**

The ignition unit, secured to the fuselage next to the heater, converts 28 vdc current to high voltage oscillating current for continuous ignition in the heater. The ignition unit includes, among other components, two sets of points and a NORMAL/RESERVE point selector switch. Under normal conditions this switch is in the NORMAL position; however, if the heater fails to light-off the switch should be placed in the RESERVE position. A notation should be made on the CG-4377.

## ANTI-ICING SYSTEMS

There is an engine air inlet anti-icing system, an engine inlet guide vane (IGV) anti-icing system, a windshield anti-icing system and a pitot head anti-icing system.

## ENGINE AIR INLET AND IGV ANTI-ICING SYSTEMS

The engine air inlet and IGV anti-icing systems are designed to prevent ice from forming and subsequently being ingested into the engine. Both systems are operated by the same control switches.

**NOTE**

If the engine anti-ice advisory light on the caution-advisory panel illuminates during flight when the engine anti-ice switches are in the OFF position it indicates that the engine anti-ice solenoid valve has opened (de-energized) due to electrical failure, and that a loss of approximately 50 horsepower at maximum power will occur. With complete dc primary bus failure, the solenoid valve will open but the advisory panel light will not illuminate.

### Engine Anti-Icing Switches

Two engine anti-icing switches, marked ENGINE ANTI-ICE 1 and 2, with marked positions ON and OFF, are located on the overhead switch panel. The ON position activates the engine air inlet anti-icing systems and permits illumination of its associated #1 and #2 INLET ANTI-ICE caution lights. In addition, the ON position activates the IGV anti-icing systems and illuminates the associated #1 and #2 ENG IGV ANTI-ICE advisory lights. The OFF position turns all systems off. With the switch in the ON position, the INLET ANTI-ICE caution lights will illuminate if the inlet temperature is 38°C or less. The lights will go out when the inlet temperature is greater than 38°C. Under certain conditions of high speed and high power settings, the caution lights may illuminate when the FAT is as high as -5°C, without a malfunction. If the engine inlet anti-ice caution light should illuminate in flight at temperatures above -10°C, the system may be checked by reducing engine speed to 80% $N_g$ on the affected engine and airspeed to 65 KIAS or less. If the light does not go out, system failure is indicated. At lower temperatures where this may occur, icing conditions are not usually encountered due to a lack of liquid moisture in the air. At temperatures above -18°C the light should not illuminate during ground operation. In any case, with the anti-icing system on, the illumination of a caution light indicates insufficient heat to insure adequate anti-ice of the inlet duct.

### Engine Air Inlet Anti-Icing System

The engine air inlet ducts are anti-iced by thermal electrical resistance elements embedded in the epoxy glass intake ducts. The oil tank mounting ring is anti-iced by a thermal electric boot that is interconnected with the inlet duct heating elements. Electrical current is applied to the heating elements to raise the temperature of the affected areas higher than the temperature at which ice will form. The electrical heating elements for the No. 1 engine air inlet duct and oil tank mounting ring receive operating power from the No. 1 ac primary bus and are protected by a circuit breaker on the copilot's circuit breaker panel, marked NO 1 ENG INLET ANTI-ICE, under the general heading NO 1 AC PRI. The No. 2 engine air inlet duct and oil tank mounting ring anti-icing elements receive operating power from the No. 2 ac primary bus and are protected by a circuit breaker on the pilot's circuit breaker panel, marked NO 2 ENG INLET ANTI-ICE, under the general heading NO 2 AC PRI. Both systems receive control power from the dc primary bus and are protected by two circuit breakers on the overhead circuit breaker panel, marked INLET 1 and 2, under the general headings ENG ANTI-ICE, ICE PROTECTION, and DC PRI BUS. Ac $\phi$A control power is furnished to the No. 1 engine anti-ice switch from the No. 1 ac primary bus and is protected by a circuit breaker marked ANTI-ICE 1, on the copilot's circuit breaker panel, under the general heading NO 1 AC PRI. The No. 2 engine anti-ice switch receives ac $\phi$A power from the No. 2 ac primary bus and is protected by a circuit breaker on the pilot's circuit breaker panel, marked ENG 2, under the general headings ANTI-ICE and NO 2 AC PRI. Power to operate the amber #1 and #2 INLET ANTI-ICE caution lights comes from the dc primary bus and is protected by two circuit breakers on the overhead circuit breaker panel, marked INLET 1 and 2, under the general headings ENG ANTI-ICE, INDICATOR LTS, and DC PRI BUS.

### Engine IGV Anti-Icing System

The engine starter fairing, the inlet guide vanes, and the top (12 o'clock), right (3 o'clock) and left (9 o'clock) struts of the front frames of each engine are anti-iced by diverting engine tenth-stage compressor air to heat them. The bottom (6 o'clock) strut is continuously heated by scavenge oil from the No. 1 bearing area. Actuating the engine anti-ice switches de-energizes the engine mounted solenoid valve to the open position, allowing hot compressor air to flow through the front frame of the engines to the inside of the starter fairing and the inlet guide vanes. When the

engine solenoid valves are de-energized, power from the dc primary bus energizes green lights on the caution-advisory panel, marked #1 ENG IGV ANTI-ICE and #2 ENG IGV ANTI-ICE. Control power for both engine IGV anti-icing systems comes from the dc primary bus and is protected by two circuit breakers on the overhead circuit breaker panel, marked IGV 1 and 2, under the general headings ENG ANTI-ICE, ICE PROTECTION, and DC PRI BUS. The dc primary power for the green #1 and #2 ENG IGV ANTI-ICE advisory lights is protected by two circuit breakers on the overhead circuit breaker panel, marked IGV 1 and 2, under the general headings ENG ANTI-ICE, INDICATOR LTS, and DC PRI BUS.

### WINDSHIELD ANTI-ICING SYSTEM

The pilot's and copilot's windshields are anti-iced by electric current which passes through a transparent, electrically resistant film on the inner surface of the outer pane of the windshield. The windshield anti-icing system consists of a special windshield, a windshield anti-ice controller, transformers, and a switch located on the overhead switch panel. The windshield anti-icing system also serves to de-fog the windshield. The copilot's windshield anti-icing system operates from the No. 1 ac primary bus and is protected by a circuit breaker on the copilot's circuit breaker panel, marked WSHLD ANTI-ICE CO-PILOT, under the general heading NO 1 AC PRI. The pilot's windshield anti-icing system operates from the No. 2 ac primary bus and is protected by a circuit breaker on the pilot's circuit breaker panel, marked WSHLD ANTI-ICE PILOT, under the general heading NO 2 AC PRI. The control circuits use both ac and dc power. The ac control circuit uses $\phi$A from the No. 2 ac primary bus and is protected by a circuit breaker on the pilot's circuit breaker panel, marked WSHLD, under the general headings ANTI-ICE and NO 2 AC PRI. The dc control circuit operates from the dc primary bus and is protected by a circuit breaker on the overhead circuit breaker panel, marked WSHLD ANTI-ICE, under the general headings ICE PROTECTION and DC PRI BUS.

#### Windshield Anti-Ice Switch

The windshield anti-ice switch, marked WINDSHIELD ANTI-ICE, with marked positions LOW, OFF, and HIGH, is located on the overhead switch panel. When the switch is placed in the LOW position, the windshield controller is energized, current heats the windshield, and the low temperature setting is used for de-fogging and light icing conditions. When the switch is placed in the HIGH position, the windshield is heated and is capable of keeping the windshield ice-free in conditions as severe as an ambient temperature of -18°C.

**CAUTION**

The windshield anti-ice switches should be placed in the LOW position before going to the HIGH position to avoid the possibility of glass cracking due to sudden change in temperatures. Normally, the use of the HIGH position is not required, except at very low outside temperature, when ice cannot be removed using the LOW position.

### PITOT HEATERS

A pitot heater switch, marked PITOT HEAT, with marked positions ON and OFF, is located on the overhead switch panel. When the switch is placed in the ON position, an electric heater in each pitot head is turned on to prevent ice formation in the pitot head. The pitot heaters operate from the dc primary bus and are protected by two circuit breakers on the overhead circuit breaker panel, marked PITOT HEAT 1 and 2, under the general headings ICE PROTECTION and DC PRI BUS.

## LIGHTING EQUIPMENT

### INTERIOR LIGHTS

#### Pilot's and Copilot's Flight Instrument Panel Lights

The pilot's and copilot's flight instrument panel lights and VOR-TACAN selector lights are individually controlled by rheostats marked PILOT FLT INST and COPILOT FLT INST, located on the overhead switch panel. With the PILOT FLT INST or COPILOT FLT INST rheostats in the OFF position, the VOR-TACAN lights will operate with a bright, fixed intensity. The VOR-TACAN switch turns the appropriate VOR or TACAN light on. The intensity of the flight instrument lights may be varied by rotating each rheostat. The copilot's flight instrument lights operate from the No. 1 ac primary bus and are protected by a circuit breaker on the copilot's circuit breaker panel, marked CO-PLT FLT INST, under the general headings CKPT LTS and NO 1 AC PRI. The pilot's flight instrument lights operate from the No. 2 ac primary bus and are protected by a circuit breaker on the pilot's circuit breaker

panel, marked PILOT FLT INST, under the general headings CKPT LTS and NO 2 AC PRI.

### Non-Flight Instrument Lights

The non-flight instrument panel lights are controlled by a rheostat marked NON-FLT INST, located on the overhead switch panel. The intensity of the engine and transmission instrument lights, the hydraulic pressure gage lights, the fuel management panel backlighting, and fuel quantity lights may be varied by rotating the rheostat. The non-flight instrument lights operate from the No. 1 ac primary bus and are protected by a circuit breaker on the copilot's circuit breaker panel, marked NON-FLT INST, under the general headings CKPT LTS and NO 1 AC PRI.

### Console and Overhead Panel Lights

The white lights on the center console, the overhead switch panel, the pilot's side console, the copilot's side console, and the MARKER BEACON/RAWS control panel are controlled by rheostats under the heading CONSOLES LOWER and OVHD, located on the overhead switch panel. An additional rheostat for red lighting on the lower center console, pilots' side console, and copilots' side console is on the overhead switch panel under the heading LOWER CONSOLE RED LIGHTS. The center console lights operate from the No. 2 ac primary bus and are protected by a circuit breaker on the pilot's circuit breaker panel, marked CSL LOWER, under the general headings CKPT LTS and NO 2 AC PRI. The cockpit overhead panel lights operate from the No. 1 ac primary bus and are protected by a circuit breaker on the copilot's circuit breaker panel, marked CSL OVHD, under the general headings CKPT LTS and NO 1 AC PRI.

### Cockpit Dome Lights and Secondary Instrument Light

There is one red and one white dome light on the cockpit overhead dome light panel. These lights are controlled by a guarded switch on the dome light panel, marked DOME LIGHTS - CKPT, with the marked positions RED, OFF and WHT. This switch will supply white light of a fixed intensity. In addition, the red dome light may be used as a secondary instrument light. When the red dome light is used as an instrument light it should be turned on and its intensity adjusted with the rheostat marked SECONDARY INST, located on the overhead switch panel. These lights are powered by the dc primary bus and are protected by a circuit breaker marked COCKPIT DOME, under the general headings INT LTS and DC PRI BUS, located on the overhead circuit breaker panel.

### Cockpit Utility Lights

Two portable utility lights with coiled cords are secured, one on each outboard side of the cockpit, above the sliding windows. The lights may be adjusted on their mountings to direct the light beams, or they may be removed and used as portable lights. On helicopters modified by TCTO 1H-3(H)F-582, two additional mounting points are installed, one in front of each pilot's sliding window. The utility lights are each controlled by a rheostat or a pushbutton, located on the end of each light casing. The lens casing of the light may be rotated to position a red filter converting the white light to a red light. The cockpit utility lights operate from the dc primary bus and are protected by a circuit breaker marked COCKPIT DOME, located on the overhead circuit breaker panel, under the general headings INT LTS and DC PRI BUS.

### Scroll Checklist Light

The scroll checklist light is controlled by an on-off rheostat switch mounted on the left side of the check list container. The scroll checklist light operates from the dc primary bus through a circuit breaker marked CHECK LIST, under the general headings INT LTS and DC PRI BUS, on the overhead circuit breaker panel.

### Navigator's Panel Light Control

The navigator's panel light control rheostat, marked PNL LTS, is located on the radio rack in front of the navigator's table and controls light intensity of the LORAN control panel. The night lighting for the HF head, INTER ICS panel, and RADIO panel is controlled by the LOWER CONSOLE RED LIGHTS rheostat located on the overhead switch panel in the cockpit. The navigator panel lights operate from the No. 2 ac primary bus and are protected by a circuit breaker on the pilot's circuit braker panel, marked NAV, under the general headings CREW LTS and NO. 2 AC PRI.

### Navigator Utility Light

A portable utility light, with coiled cord and mounting base, is secured to the left side of the cabin beside the navigator's table. The light is controlled by a rheostat on the mounting base. The light may be adjusted on its mounting base to direct the light beam, or it may be removed and used as a portable light. The utility light can be adjusted to operate as a red or white light. The

navigator's utility light operates from the No. 2 ac primary bus and is protected by a circuit breaker on the pilot's overhead circuit breaker panel, marked MAP LT, under the general heading NO 2 AC PRI.

### Hoist Operator's Panel Light Control

The hoist operator's panel light control rheostat, marked PANEL LIGHTS, is located forward of the cargo door below the hover trim control. The hoist operator panel lights operate from the No. 2 ac primary bus and are protected by a circuit breaker on the pilot's circuit breaker panel, marked HOIST, under the general headings CREW LTS and No. 2 AC PRI.

### Emergency Exit Lights SEE OS-28

The two removable emergency exit lights, installed in the cabin above each emergency exit, have a self-contained battery that will cause the light to illuminate whenever dc power to the light is interrupted. The lights may be removed from the helicopter in the event of an emergency evacuation by pulling on the handle, marked PULL, located at the top of each light. When the light is removed, a switch on the light housing is actuated causing the light to operate on battery power. Once the light is removed, it may be turned off by pushing the handle in and turned on again by pulling the handle out. The emergency exit lights are controlled by a switch marked EMER EXIT LTS, with marked positions ARM, TEST and DISARM, located on the overhead switch panel. Placing the switch in the ARM position arms and provides electrical power to charge the self-contained battery. The lights are tested by moving the switch to the TEST position, which interrupts power to the lights causing them to illuminate. The lights are turned off by placing the switch in the DISARM position. The emergency exit lights receive power from the dc monitor bus through a circuit breaker marked EMER EXIT LTS ARM, under the general headings DC and MON, located on the pilot's circuit breaker panel.

**NOTE**

Prior to normal engine shutdown the emergency exit light switch must be placed in the DISARM position before the dc monitor bus is de-energized. If this is not accomplished the emergency exit lights will be illuminated, and the dc monitor bus will have to be re-energized.

### Cabin Dome Lights SEE OS-28

The four cabin dome lights (9, figure 4-2) are controlled by a guarded switch marked CABIN, under the general heading DOME LIGHTS, with marked positions RED, OFF, and WHT, located on the cockpit dome light panel. The cargo compartment dome lights are equipped with a red and a white lamp. The red or white light may be turned on at any time dc power is available at the dc monitor bus. The white light may be turned on only if the guard is lifted. The cabin dome lights operate from the dc monitor bus and are protected by a circuit breaker located on the pilot's circuit breaker panel, marked CABIN DOME LTS under the general headings DC and MON.

### Standby Compass Light

The standby compass on-off switch is on the compass casing, and the intensity is controlled by the nonflight instrument rheostat powered by the No. 1 ac primary bus.

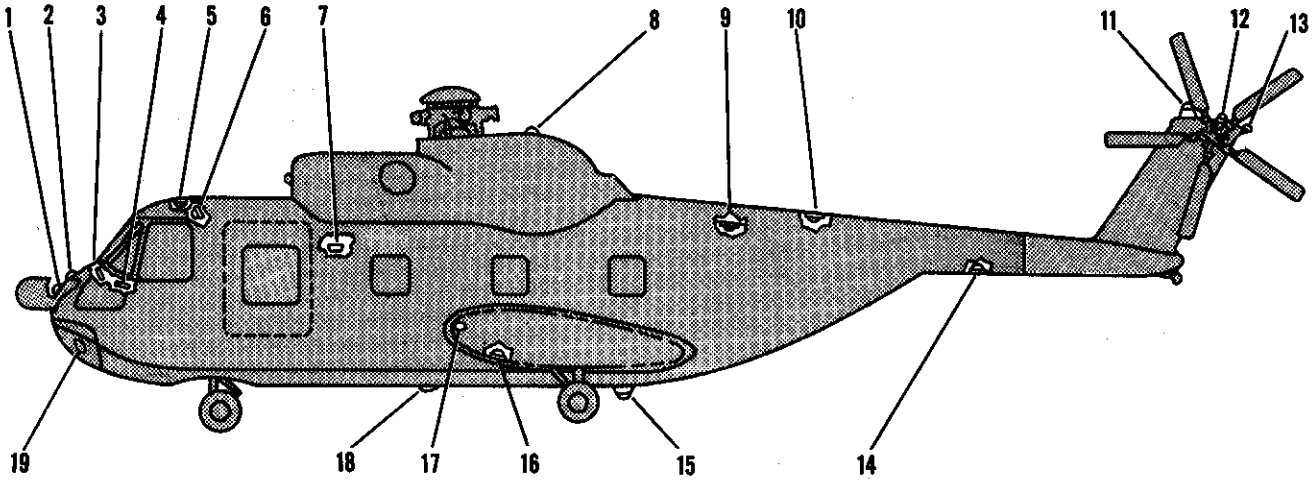
### Loading Lights

Two loading lights (10 and 14, figure 4-2), one in the ceiling of the cabin above the ramp and one in the bottom of the tail pylon, provide illumination for the ramp loading area. The lights are controlled by a two-position switch, marked LOADING LTS, ON, OFF, located on the overhead switch panel. The loading lights receive power from the dc primary bus and are protected by a circuit breaker marked LOADING, located on the overhead circuit breaker panel, under the general headings EXTERIOR LTS and DC PRI BUS.

## EXTERIOR LIGHTS

### Controllable Searchlight

The forward facing searchlight located in the nose of the helicopter can move on its hinged mounting bracket forward and down through a 120° arc. In addition, the searchlight can rotate 360° in either direction on its axis. However, it is restricted to 45° left or right until the unit has extended forward and down 110° to 120°, at which time the light can rotate 360°. The extend motor, rotate motor, limit switches and lamp are enclosed in waterproof housings. There are three searchlight position control switches, one located on each collective pitch grip, marked SLT TRAIN, and the third on the copilot's searchlight and ICS switch panel. The illumination switch labeled SEARCH, with




1. CONTROLLABLE SEARCHLIGHT
2. ANCHOR LIGHT
3. INSTRUMENT PANEL LIGHTS
4. COCKPIT CONSOLE AND PANEL LIGHTS
5. OVERHEAD SWITCH PANEL AND CIRCUIT BREAKER PANEL LIGHTS
6. PILOT'S COMPARTMENT WHITE AND RED DOME LIGHTS
7. EMERGENCY EXIT LIGHT (2 INSTALLED)
8. FUSELAGE LIGHT
9. CARGO COMPARTMENT DOME LIGHT (WHITE AND RED - 4 INSTALLED)
10. LOADING LIGHT
11. ROTATING ANTI-COLLISION LIGHT (TAIL RED)
12. ANCHOR LIGHT
13. TAIL POSITION LIGHT
14. LOADING LIGHT
15. ROTATING ANTI-COLLISION LIGHT (BOTTOM-RED)
16. FLOOD LIGHTS LEFT AND RIGHT SPONSON
17. POSITION LIGHTS (RIGHT SPONSON, GREEN-LEFT SPONSON, RED)
18. FUSELAGE LIGHT
19. FLOOD LIGHTS (LEFT AND RIGHT SIDE OF ELECTRONICS COMPT ACCESS DOOR)

S 8600

**Figure 4-2. Lighting System**

the marked positions STOW, OFF and ON, is on the overhead switch panel under the general heading EXTERIOR LTS. The SLT TRAIN switch is a spring-loaded, four-position, thumb switch, center position OFF, with marked positions, FWD, AFT, L and R. Placing the SEARCH switch in the ON position lights the controllable spotlight and furnishes power to the SLT TRAIN switch to control the searchlight movement. When the SLT TRAIN switch is placed in the FWD position, the controllable searchlight extends by revolving forward and down a maximum of 120° from its stowed position, and it may be stopped at any intermediate position by releasing the switch. Placing the switch in the AFT position retracts the light until the searchlight is in the fully stowed position. By placing the switch in the L or R positions, the searchlight will rotate to the left or right. The searchlight position control switch mounted on the copilot's landing light and ICS switch panel operates in the same manner and is marked LDG LTS, with the marked positions FWD, AFT, L and R. If the SEARCH switch is placed in the STOW position while the controllable searchlight is extended, the searchlight will automatically go out and then retract to the stowed position. The switch is then placed in the OFF position. The controllable searchlight operates from the dc primary bus and is protected by circuit breakers marked SEARCH LIGHT, PWR and CONT, located on the overhead circuit breaker panel under the general headings EXTERIOR LTS and DC PRI BUS.

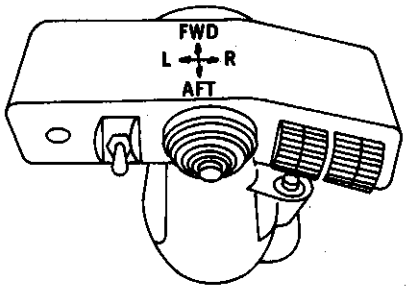
### Nightsun Searchlight

The high intensity searchlight system provides a high intensity light source particularly suited for most night operations, including search operations and examination of rescue locations from a safe altitude.

The searchlight system is comprised of the following components: remote control unit, junction box, gimbal mount, searchlight assembly, interconnecting cables and mounting hardware. The system utilizes the controllable searchlight position control switches for cockpit control of beam direction.

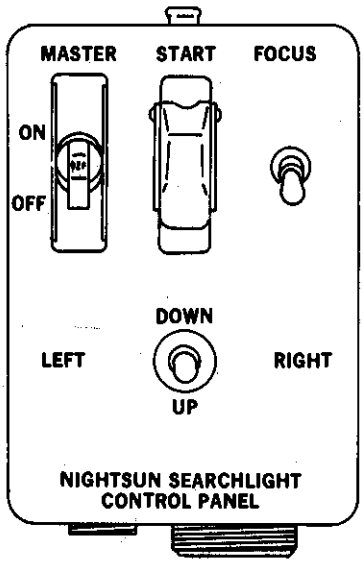
**Lamp** The assembly utilizes a xenon arc lamp capable of 3,800,000 peak beam candle power. The beam width is adjustable between 6.5° (SEARCH) and 10° (FLOOD).

**Electrical Power Supply** The system is powered by the dc primary bus. During the start sequence 30,000 volts are generated within the searchlight assembly, and a high current power surge develops in the junction box.



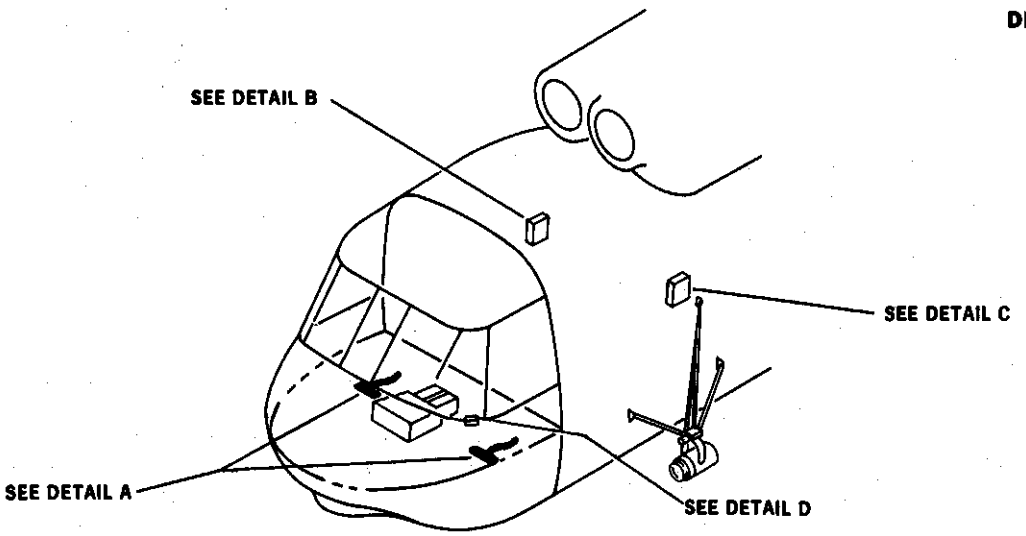

COLLECTIVE PITCH LEVER GRIPS

DETAIL A

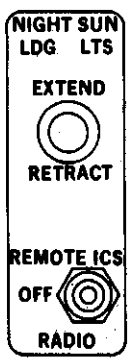



CREWMEMBER'S CONTROL PANEL

DETAIL B

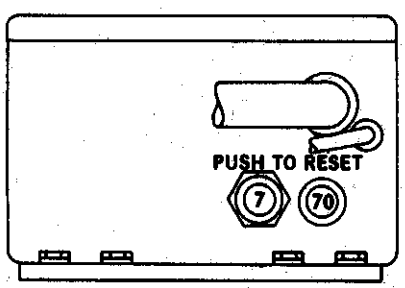



DETAIL D




COPILOT'S REMOTE PANEL

DETAIL C




CIRCUIT BREAKERS
ON BOTTOM OF JUNCTION BOX

S 42098

**Figure 4-3. Nightsun Searchlight**

**NOTE**

The start sequence may cause interference with radios in the helicopter.

After the start sequence is completed, only 28 vdc is required for the system to sustain illumination.

**External Mount** The external mounting consists of three support brackets, the gimbal mount, and the searchlight assembly. All the external equipment weighs 44 pounds and has only a slight influence on CG travel. The assembly is mounted on the port side of the helicopter below the avionicsman's window (Figure 4-3).

**Remote Control Unit** The control unit is mounted in the cabin below and aft of the hoist control handle. Two quick-disconnect releases permit moving the unit to other positions in the cabin for remote use. The control panel (Figure 4-3) contains a circuit breaker type ON-OFF switch marked MASTER. This switch powers the lamp, lamp starter, gimbal drive motors, focusing drive motor and a cooling fan in the lamp housing assembly. A guarded momentary contact switch marked START controls the start circuit. A third momentary contact toggle switch marked FOCUS controls the motor-driven focus mechanism. A four-way momentary contact toggle switch marked DOWN-UP-LEFT-RIGHT controls the movement of the searchlight in azimuth and elevation. The above four switches are on the face of the Remote Control Unit. On top of the Remote Control Unit is an unmarked momentary interrupt pushbutton. This extinguishes the lamp but allows the cooling fan to continue running. The cooling fan runs any time the MASTER SWITCH is ON.

**Junction Box** The junction box consists of a rectangular metal box containing relay and terminal connections for power distribution to the functional components of the searchlight equipment. The junction box is mounted in the cabin, portside, aft of the radioman's seat. Two circuit breakers (70 and 7) are mounted on the bottom of the case.

**Gimbal Mount** The gimbal mounting assembly consists of a yoke and two small dc motor actuators. One motor is mounted at the base of the yoke and turns the light for azimuth. The second motor is mounted on one leg of the yoke and drives the trunnion mounting for elevation. Stop pins in the yoke bearing housing limit the searchlight turning in azimuth. A slip clutch on each motor drive absorbs the motor torque when the searchlight is driven against a stop. The stops are adjustable in azimuth and may permit a maximum of 350° of turning. There are no physical stops for elevation. Normal range of elevation is from 10° above the horizontal to 70° below. The drive motors may cause some radio interference. Manual movement of the searchlight assembly will not damage the actuating mechanism.

**Searchlight Assembly** The searchlight assembly consists of a cylindrical housing within which are mounted an arc lamp bulb, a reflector, a cooling fan, a focusing rotor and various electrical components used in the start circuit of the lamp. The lens, made of specially-tempered glass, is capable of withstanding both mechanical stresses and high temperatures. The xenon arc lamp contains two tungsten electrodes permanently sealed in a quartz glass bulb filled with xenon gas under pressure. Unlighted pressure within the bulb is approximately 75 psi. Lighted, the pressure approaches 300 psi, and the temperature surrounding the arc will range between 300°F and 2100°F. Should the bulb explode, it will be contained by the searchlight housing and lens. The beam is focused by a focusing rotor driving the reflector towards or away from the lens. The motor continally drives the reflector back and forth through the focus cycle. The beam will focus from 10° width to 6.5° width. The searchlight assembly has a safety cable attached to the yoke.

**Hover Lights** SEE 05-28

Four hover lights, one located on each side of the electronics compartment door and one located on the lower leading edge of each sponson, are controlled by a pushbutton switch, marked FLOOD HOVER, on the overhead switch panel. The button portion of the switch is a green lens that illuminates when the switch is pressed to illuminate the hover lights and goes out when the button is pressed to turn off the hover lights. The hover lights illuminate an area forward and below the helicopter. The hover lights operate from the dc monitor bus and are protected by three circuit breakers located on the pilot's circuit breaker panel, marked CONT, LH, and RH, under the general headings DC, MON and FLOOD LTS.

**CAUTION**

To prevent overheating, the hover lights should not be left on for more than 15 minutes at a time. The length of time while illuminated and the OAT will determine the cooling off period.

### Aldis Lamp

The Aldis lamp is a portable searchlight provided with the helicopter. Usually operated by the crewman, it is hand-held and controlled by an ON-OFF switch on the handle. The lamp is plugged into a dc power receptacle for operation.

### Position Lights

The position lights (17, figure 4-2), located on the sponsons and pylon, are controlled by two switches on the overhead switch panel, marked POSITION, under the general heading EXTERIOR LTS. One switch will turn the lights on in a STEADY or FLASH configuration or turn the lights OFF. The switch marked DIM and BRT will adjust the intensity of the lights accordingly when they are in the STEADY or FLASH configuration. The position lights operate from the dc primary bus and are protected by a circuit breaker marked POS, located on the overhead circuit breaker panel under the general headings EXTERIOR LTS and DC PRI BUS. The STEADY configuration will be the normal mode of operation.

### Fuselage Lights

Two fuselage lights (8 and 18, figure 4-2) are installed on the helicopter. One light is located on the top rear side of the transmission compartment and the other on the bottom of the hull. Both lights are controlled by a three-position switch marked FUSELAGE, with marked positions DIM, OFF and BRIGHT, located on the overhead switch panel under the general heading EXTERIOR LTS. The lights receive power from the dc primary bus and are protected by a circuit breaker marked FUS, located on the overhead circuit breaker panel under the general heading EXTERIOR LTS and DC PRI BUS. The fuselage lights may be used in high density traffic areas in order to provide other aircraft a better visual presentation for proper separation.

### Anchor Lights

Two anchor lights (2 and 12, figure 4-2), one located on the nose and the other on the pylon, are controlled by a two-position switch marked ANCHOR, with marked positions ON and OFF, located on the overhead switch panel under the general heading EXTERIOR LTS. The anchor lights receive power from the battery bus and are protected by a circuit breaker, marked ANCHOR LTS, on the battery bus circuit breaker panel, located on the center console.

### Rotating Anti-collision Lights

Two rotating anti-collision lights (11 and 15, figure 4-2), one located on the top of the tail pylon and the other on the bottom of the fuselage, are controlled by two switches on the overhead switch panel, under the general headings EXTERIOR LTS and ANTI-COLLISION. The left-hand switch, under the heading FWD, with marked positions ON and OFF, controls the forward anti-collision light. The right-hand switch, under the heading AFT, with marked positions AFT, ON and OFF, controls the aft rotating anti-collision light. The rotating anti-collision lights operate from the dc primary bus and are protected by two circuit breakers, marked FWD and AFT, on the overhead circuit breaker panel under the general headings ANTI-COLL, EXTERIOR LTS and DC PRI BUS.

## AUXILIARY POWER UNIT

The auxiliary power unit (APU) (figure 4-4), located to the rear of the main gear box, enables ground starting of the engines and ground operation of the electrical and hydraulic systems. The APU system consists of a control panel, an accumulator assembly, a hydraulic starter motor, a turbine engine, a fuel system, a self-contained oil system, and a mechanical drive. Starting power for the APU is furnished by means of an accumulator system mounted on the transmission deck. The accumulator carriers an initial air charge of 1600 psi and is hydraulically charged to 3000 psi by the utility hydraulic pump. In addition, the system has provisions for hand pumping and may be charged in this manner with a hand pump, located on the right side of the cabin interior. When the starting circuitry is energized, the start valve is opened and hydraulic pressure from the accumulator is applied to the APU starter. As soon as the turbine reaches operating speed and is driving the main gear box accessory section, the utility pump pressure recharges the accumulator with 3000 psi pressure. The turbine engine has a self-contained oil system. Electrical power for the control circuit is supplied from the dc primary bus through a circuit breaker marked CONT, located on the overhead circuit breaker panel under the general headings APU and DC PRI BUS. This control circuit operates the automatic control system and the automatic emergency shutdown operation of the APU. The electrical power may be supplied from the battery or from an external power source. Fuel is supplied from the aft main tank. A fuel pressure switch actuates at approximately 110 psi to supply fuel to the combustion chamber through both the start fuel nozzle and main fuel ejectors and to commence ignition. At 90% speed, the start fuel nozzle

and ignition are turned off by the speed switch, and burning is self-sustaining as long as there is a flow of fuel through the APU main fuel valve. Fuel is consumed at 73 pounds (maximum) per hour. A mechanical drive with an automatic clutch is provided to drive the main gear box accessory section. The automatic clutch contains a freewheel unit that enables shutdown of the APU when the rotor head is engaged. Low oil pressure, high exhaust temperature or overspeed will cause the APU to shut down automatically.

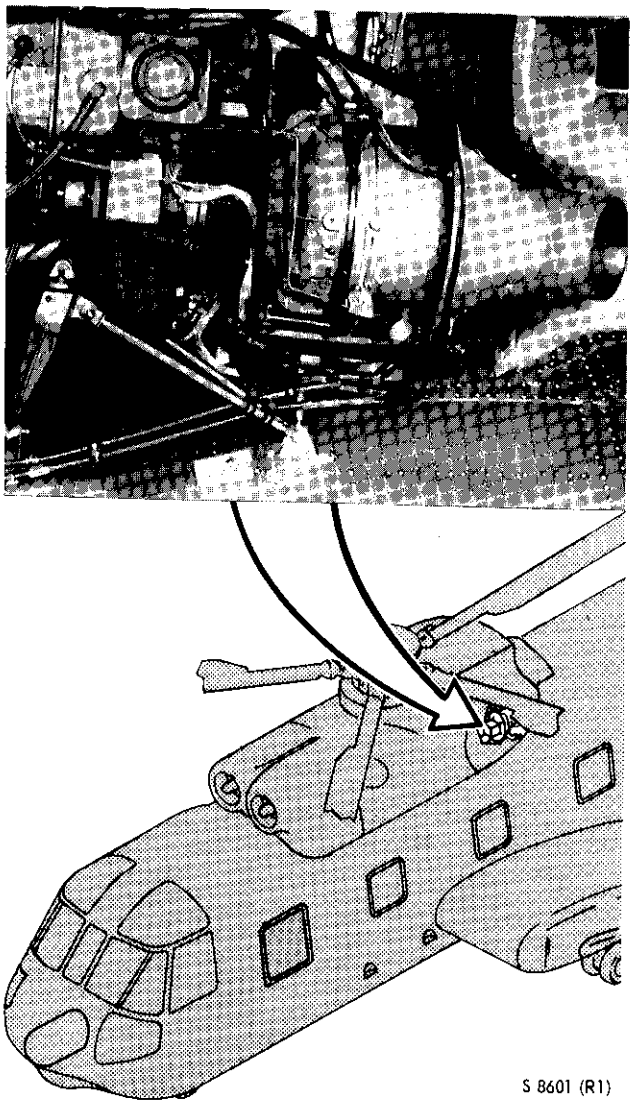



**Figure 4-4. Auxiliary Power Unit**

**APU CONTROL PANEL**

The APU control panel (figure 4-5) located on the pilot's side console contains a master switch, a tachometer, an emergency panel and the following amber caution lights: prime-pump pressure, low oil pressure, high exhaust temperature and overspeed. The emergency panel contains a red fire warning light and fuel shutoff and fire extinguisher switches. During starts, the hydraulic start valve opens to motorize the engine. The prime pump also comes on for 20 seconds, then automatically goes off.

**APU Function Switch**

The APU master switch, with marked positions START, RUN, and OFF, controls operation of the APU. The switch must be held in the START position as it is spring-loaded to the RUN position. Holding the switch in the START position energizes the components of the automatic starting system and starts the APU. When the switch is released and returns to the RUN position, the APU will run normally and drive the accessory section of the main gear box. The switch is placed in the OFF position to close the main fuel valve and shut down the APU. The APU master switch is energized by the dc primary bus and is protected by a circuit breaker marked CONT, located on the overhead circuit breaker panel under the general headings APU and DC PRI BUS.

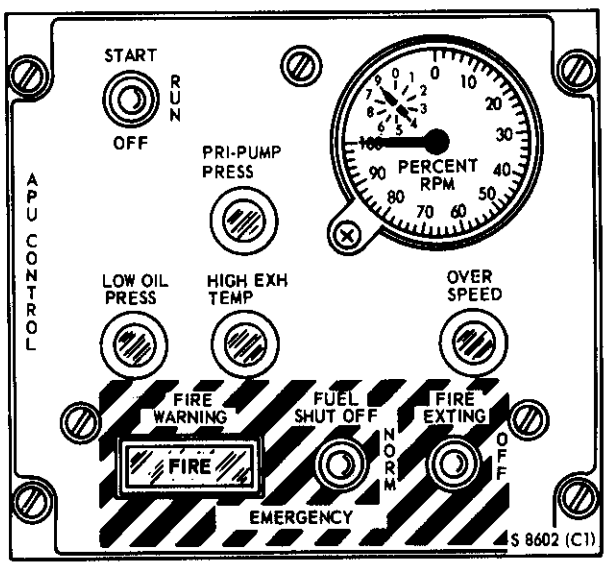



**Figure 4-5. Auxiliary Power Control Panel**

#### APU Tachometer

The tachometer indicates the percentage of APU engine rpm. The tachometer receives power from an APU-driven tachometer generator.

#### APU Low Oil Pressure Caution Light

An amber low oil pressure caution light, marked LOW OIL PRESS, will illuminate to indicate the APU has been automatically shut down because of low oil pressure.

#### APU High Exhaust Temperature Caution Light

An amber exhaust temperature caution light, marked HIGH EXH TEMP, will illuminate to indicate the APU has been automatically shut down because of abnormally high exhaust temperatures.

#### APU Overspeed Caution Light

An amber overspeed caution light, marked OVERSPEED, will illuminate to indicate the APU has been automatically shut down because its speed reached 110% rpm.

#### APU Prime Pump Press Caution Light

An amber prime fuel pump pressure caution light, marked PRI-PUMP PRESS, will illuminate whenever the prime pump is not delivering enough fuel pressure to open the pressure switch. A prime pump failure would be indicated by the illumination of the PRI PUMP caution light for 20 seconds after initiating starting procedures.

#### APU Emergency Fuel Shutoff Switch

The emergency fuel shutoff switch, with marked positions FUEL SHUTOFF and NORM, is used to shut the APU down in an emergency. When the switch is in the NORM position, the APU performs normally and the APU fire extinguisher circuit is de-energized. Placing the switch in the FUEL SHUTOFF position closes the main fuel valve and allows the APU fire extinguisher circuit to be energized. The emergency fuel shutoff switch is energized from the dc primary bus through the CONT circuit breaker.

#### APU Fire Extinguisher Switch

The APU fire extinguisher switch, with marked positions FIRE EXTING and OFF, discharges the APU fire extinguishing agent to the APU. The switch receives power from the dc primary bus through the FUEL SHUTOFF position of the APU emergency fuel shutoff switch, through a circuit breaker marked EXT, located on the overhead circuit breaker panel under the general headings FIRE, APU, and DC PRI BUS. The emergency fuel shutoff switch must be placed in the FUEL SHUTOFF position in order to activate the APU fire extinguisher.

#### APU Fire Warning Light

A red press-to-test APU fire warning light, marked FIRE WARNING, provides an indication of fire in the APU. The light receives electrical power from the dc primary bus through the APU fire detection system through a circuit breaker marked DET, located on the overhead circuit breaker panel under the general headings FIRE, APU, and DC PRI BUS. On helicopters modified by T.O. 1H-3(H)F-563, a fire in the APU compartment would also be indicated by illumination of the master caution lights and a capsule marked APU FIRE on the caution-advisory panel.

#### APU Advisory Light

A green light on the caution-advisory panel, marked APU, comes on whenever the main fuel valve opens (at approximately 30% APU speed) just before light-off and will stay on until the APU is shut down.

#### APU HANDPUMP AND ACCUMULATOR GAGE

The handpump and gage are located in the cabin forward of the last window on the right-hand side. The handpump (figure 4-6) is used before starting of the turbine if the 3000 psi pressure from the accumulator is not available or is insufficient. At -54°C, a pressure of approximately 4000 psi is required to start the turbine. A visual indication of pressure can be observed on the handpump gage during pumping operations.

#### APU STARTING PROCEDURE

For APU starting procedure, refer to **BEFORE STARTING ENGINES,** Section II.

#### APU Emergency Starting Procedure

The 3000 psi pressure from the accumulator has a two time starting capability. However, if the pressure in the accumulator becomes depleted, the manual hydraulic pumping system can be used to replenish pressure in the accumulator.

## FLOTATION SYSTEM, AUXILIARY

The auxiliary flotation system (figure 4-7) is provided to give the helicopter additional stability while on water with the rotor system stopped. The system consists of two inflatable bags, two compressed air cylinders and a manual release. A bag is located on the outboard chine of each sponson and is stowed in a fabric enclosure. The bags are inflated by two cylinders located in the leading edge of the left sponson. Each bag is divided into two compartments, fore and aft.

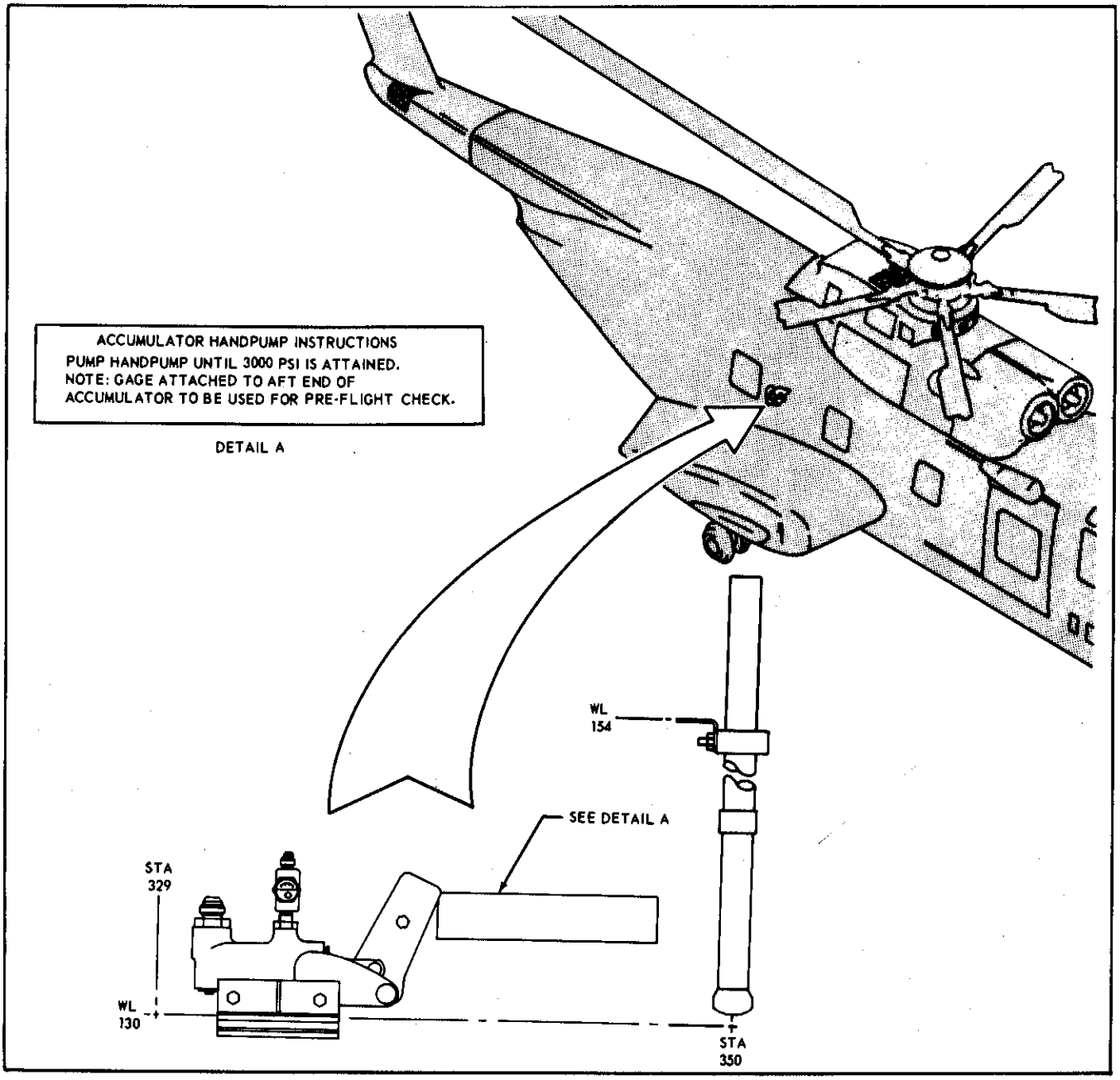



**Figure 4-6. APU Accumulator Handpump**

The forward compartments of the bags are inflated by the bottom air cylinder, and the aft compartments are inflated by the top cylinder. The two air cylinders are connected to their respective bag compartments by separate air lines. This system of inflation ensures a symmetric configuration of the pop-out bags in the event of damage to any component. The system is activated by pulling the AUX FLOAT handle down. The handle is located on the left side of the cabin between and above the second and third windows. An additional release handle is mounted on the bulkhead aft and above the copilot's seat. To activate the system from this position, the trapeze handle is removed from its securing clip and pulled forward. Pressure gages are provided for both air pressure cylinders and can be viewed through a window in the left sponson. The cylinders are fully serviced if the gages indicate between 2650 and 3000 psi.

## AUXILIARY FLOTATION COLLARS

The auxiliary flotation collar system provides increased lateral stability while the helicopter is on the water with the rotor system stopped. The auxiliary flotation

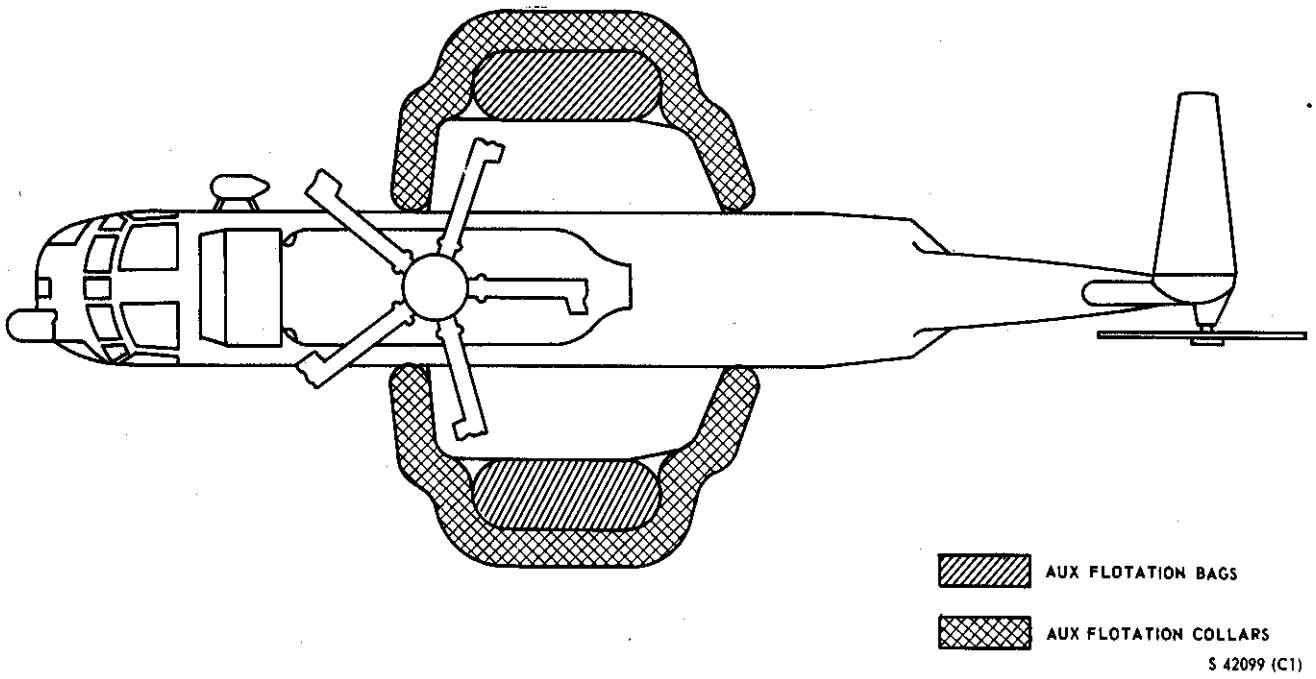



**Figure 4-7. Auxiliary Flotation Equipment**

collar system consists of two collars: one for attachment to the left sponson (container identified by LEFT HAND and with a RED STRIPE), and one for attachment to the right sponson (container identified by RIGHT HAND and with a GREEN STRIPE). Each collar is packed in a modified MARK-7 lift raft container, and each weighs about 60 pounds. The system is installed from the sponsons, once the helicopter is on the water. Detailed installation instructions are in the salvage portion of the HH-3F Maintenance Manual. When both collars have been attached, they should be inflated simultaneously. The collars are made of raft fabric and contain primary and secondary inflation chambers. The inflation chambers are not interconnected and are inflated by separate self-contained $CO_2$ bottles. The secondary chamber should only be used when the primary chamber malfunctions.

**CAUTION**

Inflation of both chambers at the same time will cause overinflation and possible rupture of the collar.

A takeoff from the water may be made with the auxiliary flotation collars attached, but air speed shall be limited to no higher than 70 knots. Tow speeds of up to 4 knots may be used, depending on sea conditions, with the auxiliary flotation collars attached.

## CABIN EQUIPMENT

The cabin (figure 4-8), located from station 137.0 to station 379.5, is capable of carrying cargo, personnel, litters, and wheeled vehicles. The impact and wear resistant cabin floor has a positive non-skid surface for personnel footing and skid strips to facilitate the movement of cargo and provide floor protection. The cabin floor is divided into six sections and is capable of sustaining static loads of 200 pounds per square foot.

Tiedown fittings, rated at 2500 pounds, are installed on the cabin floor to facilitate cargo tiedown and are provided with fittings that serve as troop-seat and litter attachment points. The cabin contains a personnel door and a ramp, both of which may be used for loading personnel and cargo. When loading the helicopter, refer to section V for center of gravity and weight limitations and T.O. 1-1B-40, Handbook of Weight and Balance Data.

### CARGO LOADING STATIONS

The cabin is divided into marked CG stations between fuselage stations 150 and 375. Cargo loading scales, corresponding to these marked stations, are provided on the load adjuster. The CG loading stations are marked at eye level for easy reference.

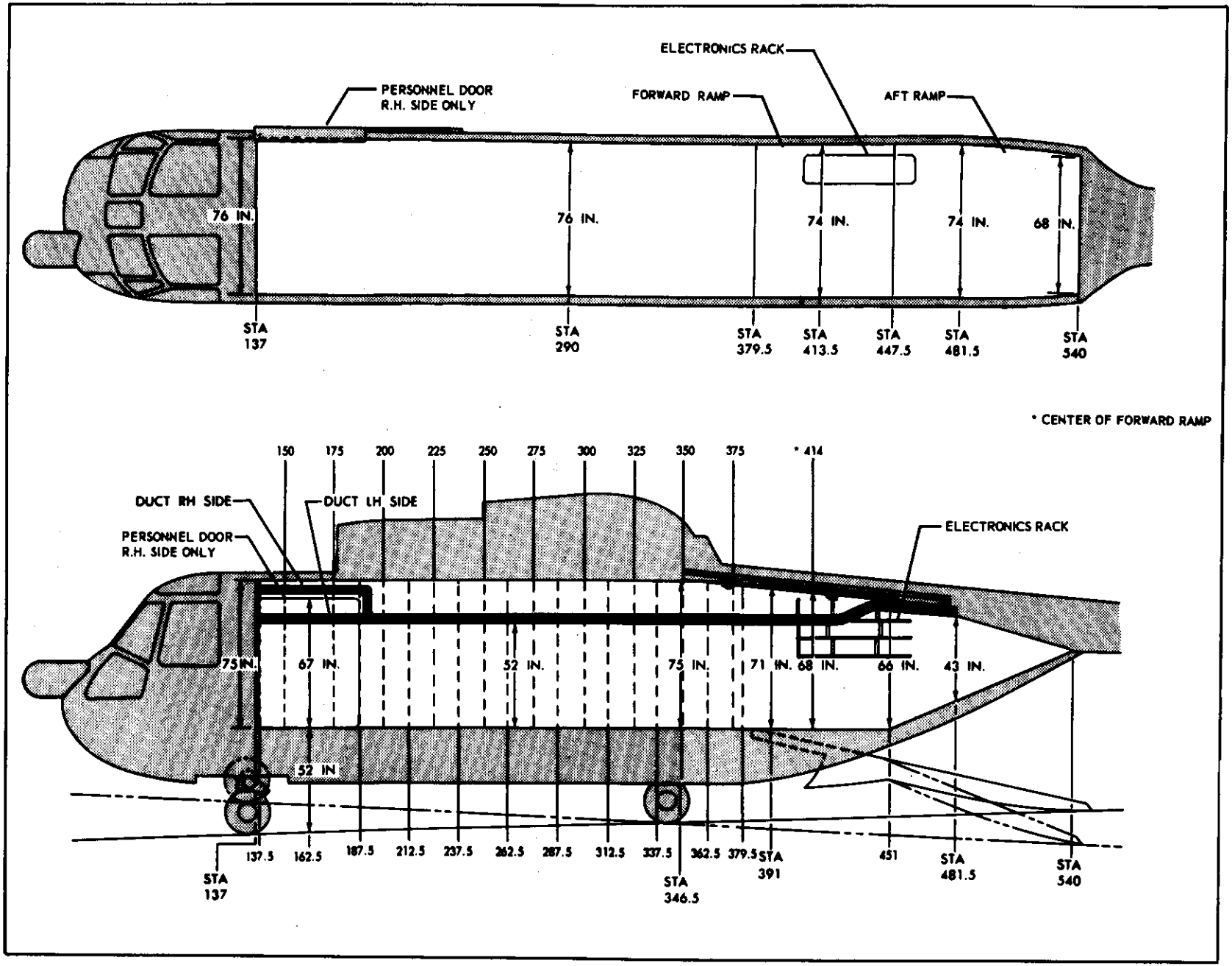



**Figure 4-8. Cabin (Sheet 1 of 2)**

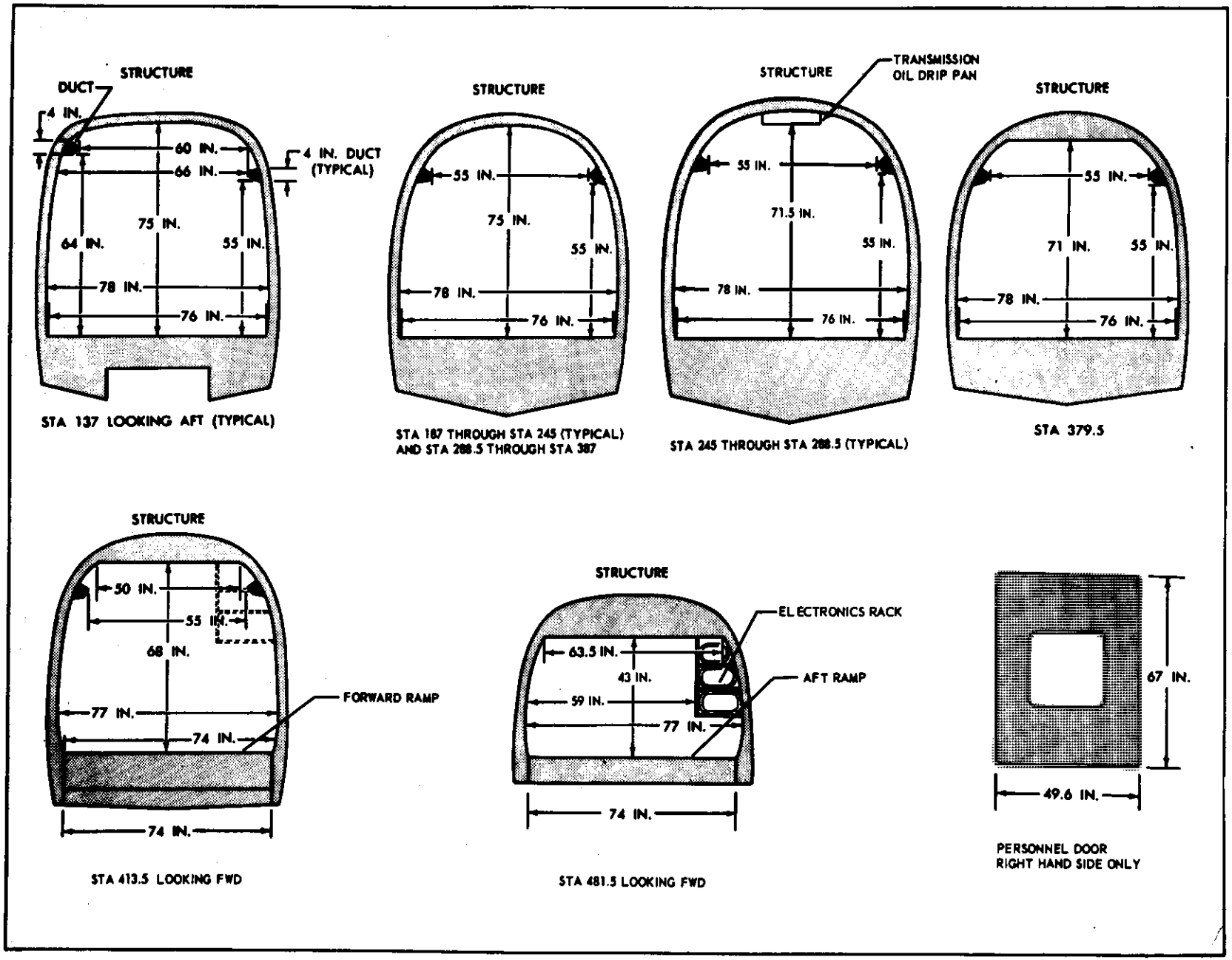



**Figure 4-8. Cabin (Sheet 2 of 2)**

## CABIN FLOOR

The cabin floor, made up of one inch thick honeycomb floor panels, is supported by transverse bulkheads and beams. The cabin floor is approximately 310.5 inches long and 76 inches wide. The forward ramp forms the last 68 inches of horizontal floor. The floor has a positive non-skid surface. Three rows of low friction, longitudinal skid strips are installed on top of the cabin floor to provide floor protection and facilitate cargo handling. The cabin floor area is designed to support a maximum load of 200 pounds per square foot; however, higher weights may be carried if shoring is used to distribute the weight over a larger area.

## TIEDOWN FITTINGS

The type of tiedown fitting (figure 4-9) used is the combination cargo restraint and lug for troop seat and litter floor attachments. The recessed tiedown fittings have a 2500-pound restraint capability. The 2500 pound tiedown fittings are used to secure cargo, litter support straps, troop seat legs, and the crewman's safety harness.

## TIEDOWN DEVICES

Various types of tiedown devices may be used for securing cargo. One type is a turnbuckle arrangement for tightening the tiedown chains. Another is a webbed type strap with hooks for attaching to tiedown fittings.

## RAMP SYSTEM

The ramp system (figure 4-10) is divided into two sections, the forward ramp and the aft ramp. In the closed position, the forward ramp is an extension of the cabin floor, and the aft ramp conforms to the contour of the fuselage. The aft ramp is hinged to the forward ramp and opens outward and downward. The clearance between the ramp, in the open position, and the fuselage structure may be increased by KNEELING the helicopter. The ramp surface has transverse non-skid material installed for personnel footing and for loading vehicular cargo. Fittings rated at 2500 pounds are installed to secure light cargo carried on the forward ramp. There are no cargo tiedown fittings on the aft ramp floor. Two tiedown fittings rated at 5000 pounds each are used to suspend the ramp. The ramp system is electrically controlled and hydraulically actuated by hydraulic pressure from the utility hydraulic system. The auxiliary power unit is the normal source of power for operation of the ramp. Both ramps may be lowered manually when hydraulic or electrical power is not available. The aft ramp may be opened in the air, on the ground, or on the water. The forward ramp can be opened only when the weight of the helicopter is on the helicopter's wheels and the aft ramp is unlocked. The ramp system controls consist of a pilot's ramp control panel, a crewmember's ramp control panel, and a manual uplock release. When actuated, electrical switches on the ramp control panels energize hydraulic solenoid valves, which direct hydraulic pressure to the up or down side of the ramp actuating cyclinders.

**CAUTION**

To avoid possible damage to the ramp hydraulic system, personnel should refrain from standing on the aft ramp unless it is resting on a surface or supported by the cables.

### Aft Ramp

An aft ramp, approximately 8 feet in length, at the aft end of the cargo compartment, is used for the loading and unloading of cargo and personnel. The aft ramp is locked in the closed position by two uplock cylinders. The uplock cylinders are mechanically latched and hydraulically released. Two safety cables are to be attached to the aft ramp before and during flight whether the aft ramp is open or closed. The cables are attached to the fuselage structure and are stowed above the aft ramp. Before and during flight, the cables shall be attached to the ramp. An advisory light, marked RAMP, on the caution-advisory panel will illuminate when the aft ramp is not up or not locked. The light receives electrical power from the dc primary bus through a circuit breaker marked RAMP WARN, located on the overhead circuit breaker panel under the general heading INDICATOR LTS.

### Forward Ramp

The forward ramp, approximately 5 feet, 8 inches in length, may be lowered with the aft ramp, making an inclined entrance to the cabin. The forward ramp contains tiedown fittings for cargo tiedown, troop seats, skid strips, and a non-skid material surface for traction. The forward ramp is normally lowered after the aft ramp is lowered and raised before the aft ramp is raised. The forward ramp is locked in the closed position by mechanically latched uplocks incorporated in the forward ramp actuating cylinders. The forward ramp is released by hydraulic pressure.

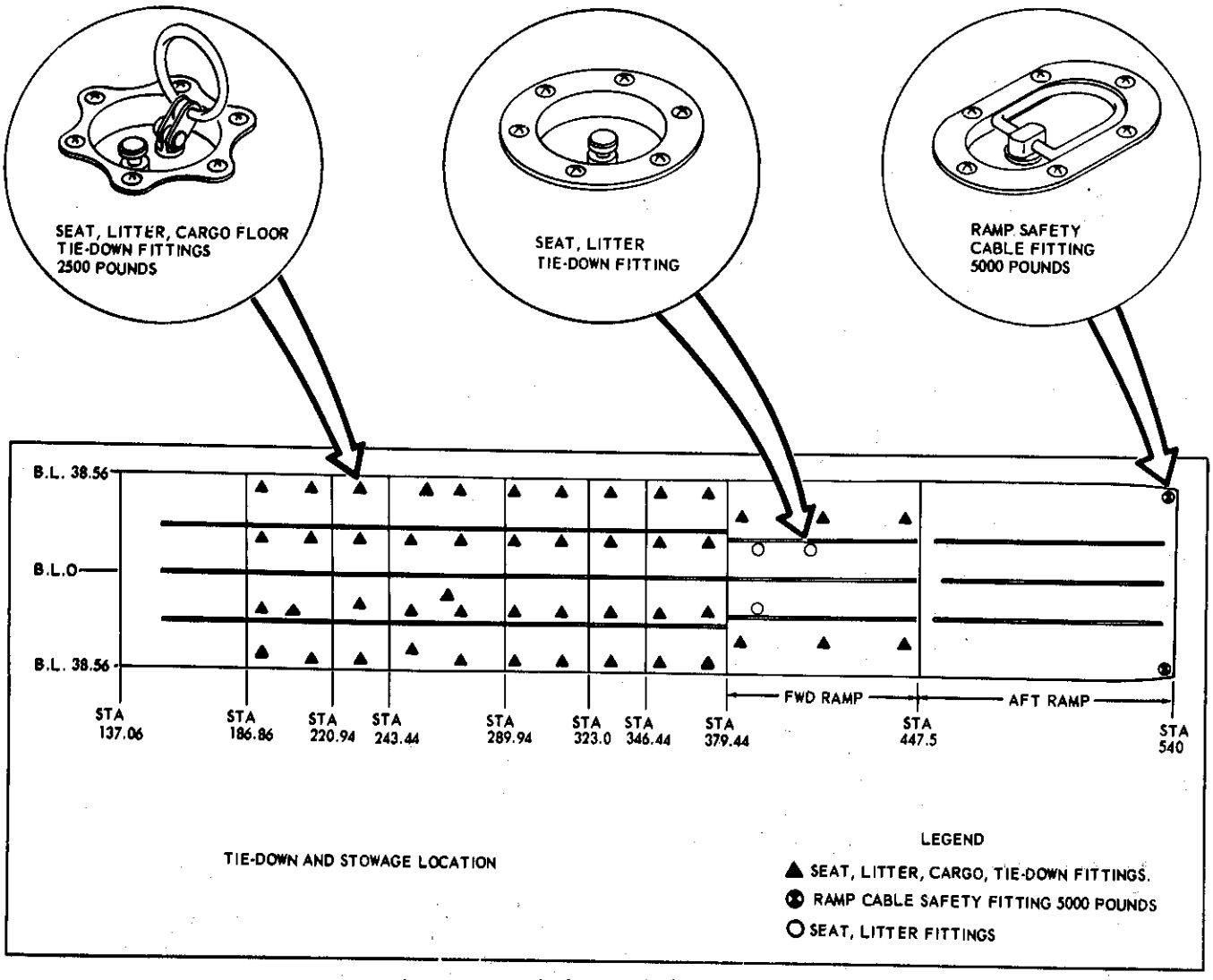



**Figure 4-9. Tiedown Fittings, Location**

### Pilot's Ramp Master Switch

The ramp master switch, marked MASTER, located on the pilot's RAMP CONTROL panel (figure 4-11), has marked positions, PILOT, OFF, and CREW. Placing the master switch in the PILOT position energizes the switches on the pilot's ramp control panel. Placing the master switch in the CREW position transfers electrical power to the switches on the crewmember's ramp control panel. The master switch receives electrical power from the dc primary bus through a circuit breaker marked RAMP PWR, located on the overhead circuit breaker panel.

### Pilot's and Crewmember's Ramp Control Panels

A pilot's RAMP CONTROL panel (figure 4-11) is located on the center console. The crewmember's ramp control panel, marked RAMP CONT, is located on the right-hand cabin side panel above the ramp. Both ramp control panels consist of a forward ramp switch, aft ramp switch, and forward and aft RAMP OPEN caution lights. The CABLE caution light on the crewmember's ramp control panel is inoperative. The aft ramp switch, marked AFT, with marked positions CLOSE, HOLD, and OPEN, controls operation of the aft ramp. The RAMP OPEN caution light, marked AFT, will illuminate when the aft ramp is not up and locked. The forward ramp switch, marked FWD, with marked positions CLOSE, HOLD and OPEN, controls the operation of the forward ramp. The RAMP OPEN caution light, marked FWD, will

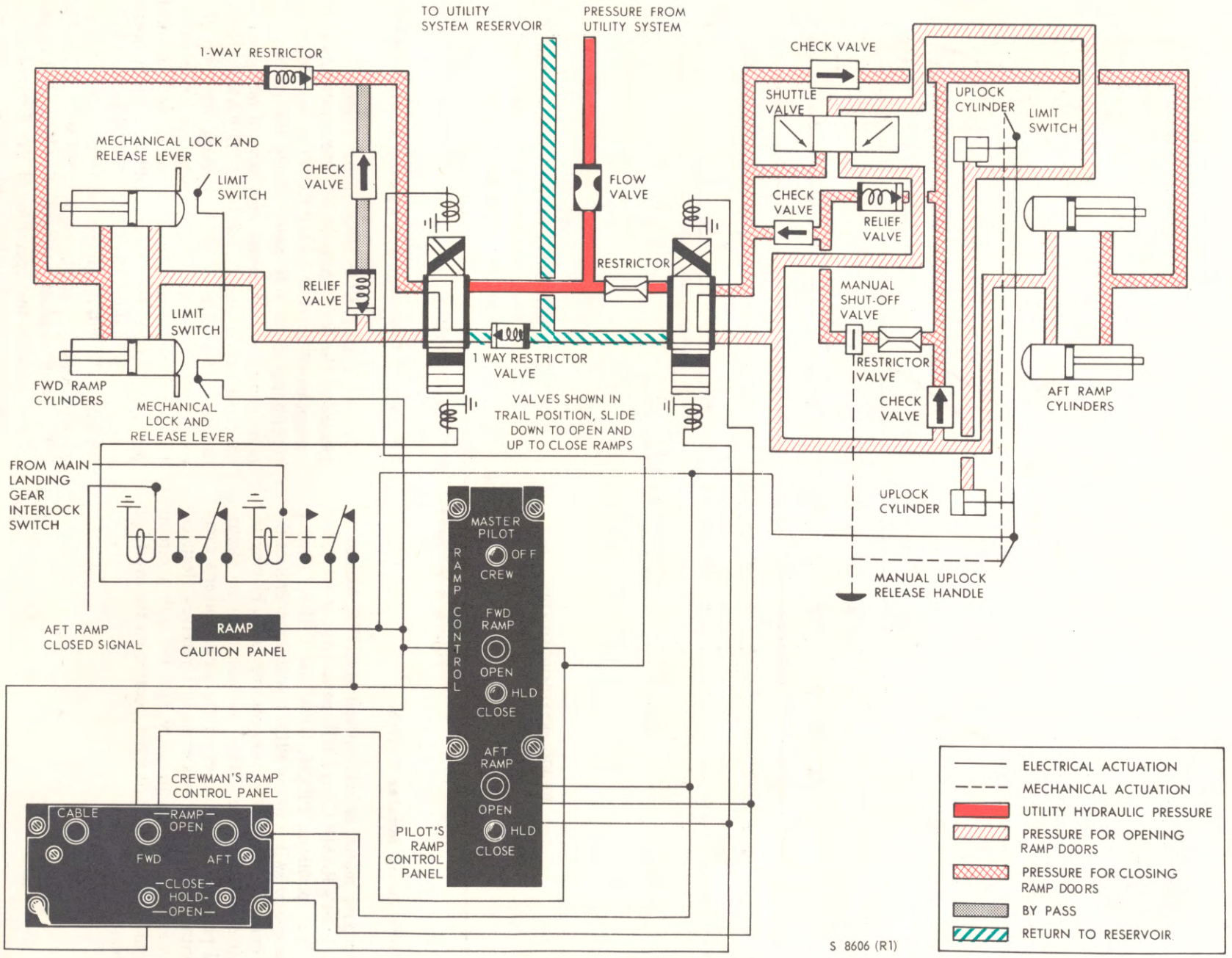



**Figure 4-10. Ramp Actuating System**

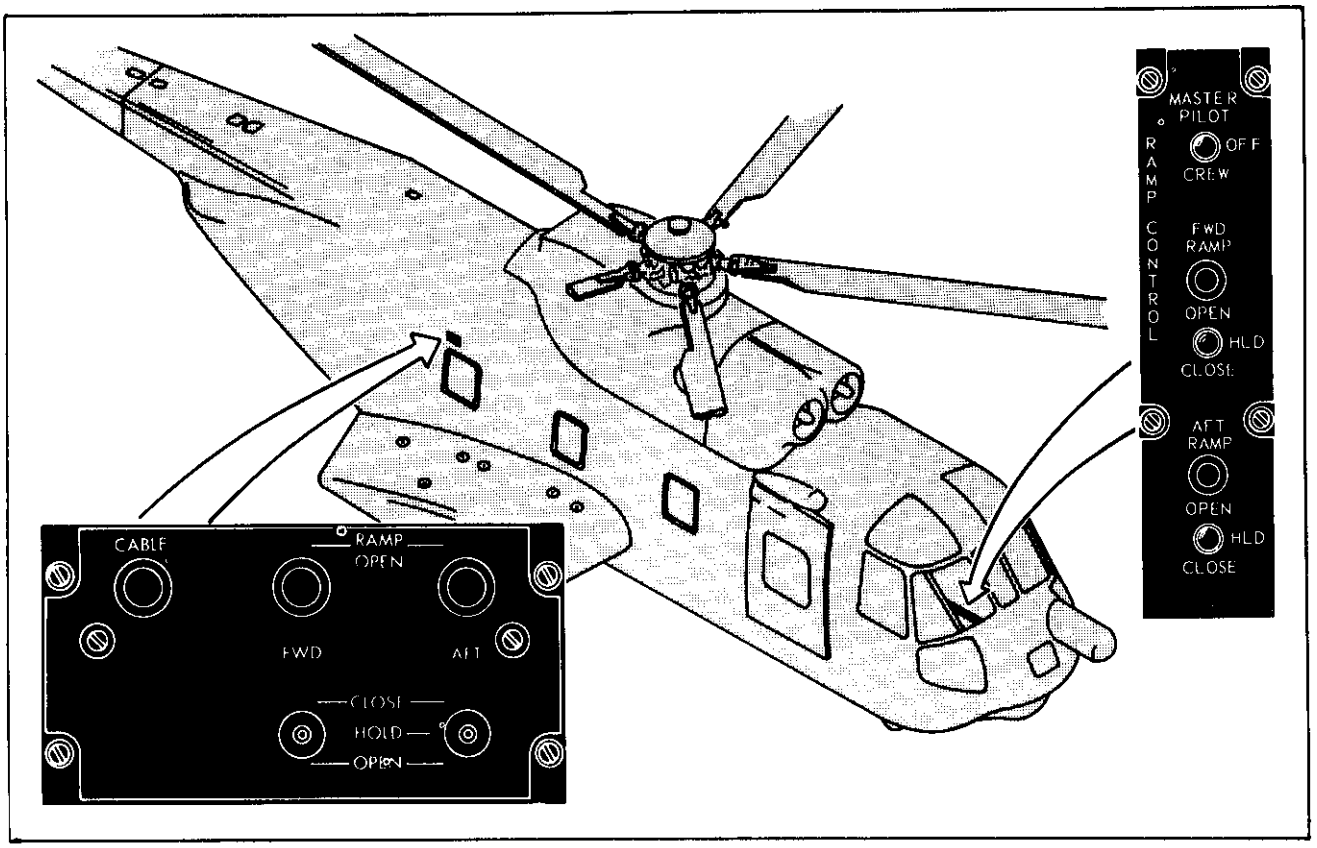



**Figure 4-11. Ramp Control Panels**

illuminate when the forward ramp is not up and locked. Extra long cargo may be extended over the aft ramp door with the aft ramp open (horizontal) in flight, but should be loaded in such a way that cargo does not come in contact with the aft ramp. Due to interlocks in the forward ramp control circuit, the forward ramp cannot be opened until the aft ramp is unlocked and the weight of the helicopter is on the helicopter's wheels. The caution lights on both ramp control panels are powered by the dc primary bus and are protected by the same circuit breaker on the overhead circuit breaker panel that protects the RAMP caution light on the caution-advisory panel.

### Aft Ramp Uplock Release Levers

There are two aft ramp manual uplock release levers (figure 4-12). One lever is located on the right side of the cabin above the ramp. The other, the handle type, is located externally under the right-hand side of the tail pylon, aft of the ramp, in an oblong metal container with a hinged cover marked RAMP RELEASE HANDLE PULL. Both controls are connected by a cable to provide a mechanical release of the aft ramp uplocks when electrical or hydraulic power is not available. When actuated, the uplocks are released and the ramp will lower under its own weight. Snubbing action, during the ramp opening, is provided by a restrictor in the ramp actuating system hydraulic lines.

### Forward Ramp Uplock Release Levers

A manual release lever for the forward ramp actuating cylinder uplocks is installed on the top side of each actuating cylinder. The manual releases provide the means of unlocking the forward ramp when electrical or hydraulic power is not available. The ramp will then lower under its own weight. The rate of ramp lowering is controlled by a restrictor.

### Normal Operation

To lower the ramp, proceed as follows:

1. APU - ON.

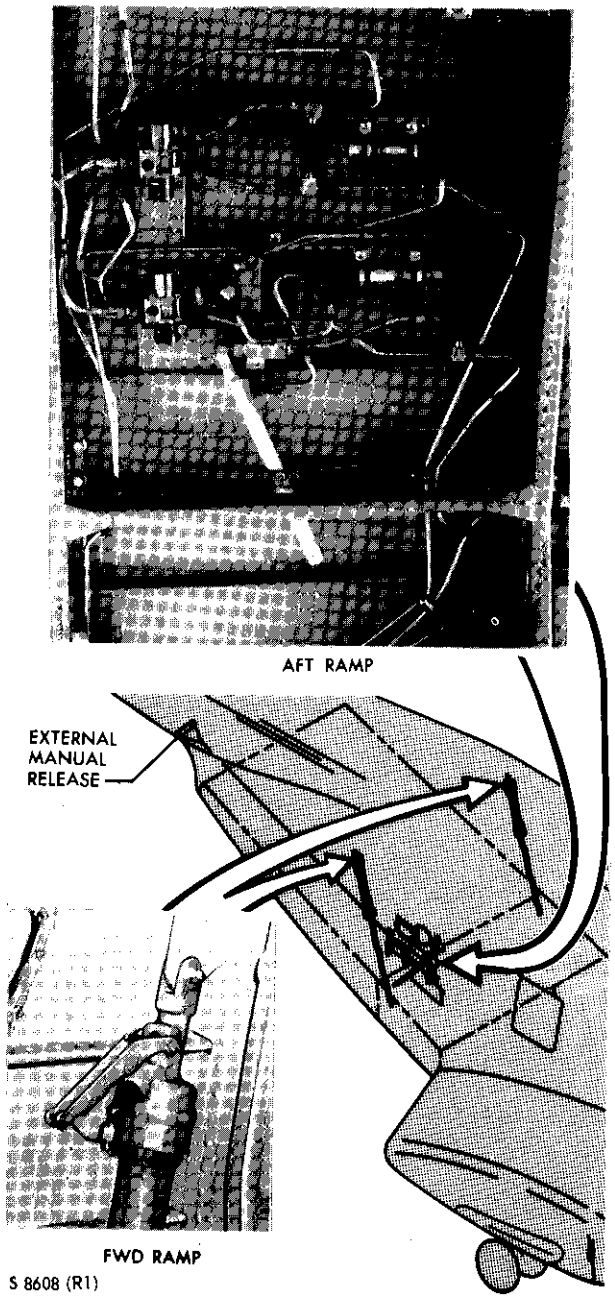



**Figure 4-12. Ramp Uplock Release Levers**

**CAUTION**

Before lowering the ramp, make sure that the area under the ramp is clear of personnel and equipment and the ground under the ramp is of equal load-carrying ability, to avoid twisting the ramp when heavy loads are applied. Make sure the ground is free of rocks, stumps, etc., to avoid damaging aft ramp outer skin.

**NOTE**

Before lowering the ramp, check that passenger seats and cargo tiedown devices are disconnected from the forward ramp.

2. Ramp Master Switch - PILOT OR CREW.

3. AFT Ramp Switch - OPEN (RAMP Caution Light - On, AFT RAMP OPEN Caution Light - ON).

4. FWD Ramp Switch - OPEN (FWD RAMP OPEN Caution Light - ON).

To raise the cargo ramp, proceed as follows:

1. APU - ON.

2. Ramp Master Switch - PILOT OR CREW.

3. FWD Ramp Switch - CLOSE (FWD RAMP OPEN Caution Light - OUT).

4. FWD Ramp Switch - HOLD.

5. AFT Ramp Switch - CLOSE (AFT RAMP OPEN Caution Light - OUT).

6. AFT Ramp Switch - HOLD.

### Manual Operation

To lower the ramp manually, proceed as follows:

1. Manual Release - PULL.

2. Forward Ramp Uplock Release Levers - PULL.

## CARGO DOOR

A door is installed in the forward section of the cabin on the right-hand side of the fuselage. The door, approximately 5.5 feet high and 4 feet wide, rides on tracks mounted above and below it on the outside of the fuselage. A positive acting latch is installed in the door to prevent inadvertent opening in flight. The latch allows the door to be held open in three different positions. The door may be opened from inside the cabin or from the outside by turning the latch handle and sliding the door aft. A removable personnel ladder is installed in the sill of the door to permit entry of personnel. A light, marked CARGO DOOR, on the caution-advisory light panel will illuminate any time the door is not closed and latched. The light receives electrical power from the dc primary bus through a circuit breaker marked PWR, located on the overhead

circuit breaker panel under the general headings WARN and INDICATOR LIGHTS.

## RESCUE HOIST

The helicopter is equipped with a hydraulic rescue hoist with 240 feet of usable cable, suspended on a fixed truss over the cargo door. The rescue hoist is powered by the utility hydraulic system and has a lifting and lowering capacity of 600 pounds. An open throat hook is used for attaching equipment. The rescue hoist incorporates a load holding brake which locks automatically when the hoist stops. This lock is also effective if hydraulic pressure or the hoist hydraulic motor fails. Feed rollers and a level wind mechanism prevent cable snarling. Microswitches turn off the hoist when the cable is reeled completely in or out. The last 20 feet of cable is painted in a pattern of alternating two inch stripes of red and white to provide a visual indication that the cable is nearly unwound. Automatic slow down to a maximum of 100 fpm as the cable nears extremities of travel is provided by an intermediate limit switch within the hoist. An electrically operated cartridge-type guillotine, controlled by switches in the cockpit and the cargo compartment, may be used to cut the cable at the rescue hoist. The rescue hoist may be controlled from either the cockpit or the cabin by switches that utilize power from the dc primary bus to operate solenoid valves in the hydraulic lines. The rescue hoist control circuit is protected by a circuit breaker marked RESCUE HOIST, located on the overhead circuit breaker panel. Two manual override buttons on the four-way valve permit hoist up or down activation in the event of electrical power failure.

### RESCUE HOIST MASTER SWITCH

A three-position switch labeled HOIST MASTER, with marked positions CREW, OFF and PILOT, is located on the cockpit overhead switch panel (see figure FO-3). When the switch is placed in the CREW position, the rescue hoist may only be operated by a crewman using either the crewman's rescue hoist control switch, located on a bracket over the cargo door opening, or the rescue hoist throttle control, located on the aft side of the cargo door opening. With the switch in the PILOT position, only the pilot may operate the hoist by using the rocker switch on the pilot's collective pitch lever grip. The OFF position renders the hoist inoperative from any station.

### RESCUE HOIST THROTTLE CONTROL VALVE

The crewman's primary control for operating the rescue hoist is the throttle control valve lever, located on the aft side of the cargo door opening (see figure 4-13). The throttle is spring-loaded to the off position, and a detent provides a positive lock to maintain the throttle in the off position. The throttle control lever has marked positions UP and DOWN. Moving the throttle UP will raise the cable and DOWN will lower the cable. Cable speed is proportional to the handle travel so that it will vary from 0 to approximately 200 fpm. Limit switches electrically stop the hoist when the cable reaches the full up or down position. An intermediate limit switch automatically limits the cable speed to a maximum of 100 fpm when the cable is within 10 feet of full up or down.

### RESCUE HOIST CONTROL SWITCH, CREWMAN'S

The crewman's rescue hoist control switch is on a hand grip bracket over the cargo door opening (figure 4-13). The switch panel is marked HOIST and the switch has marked positions UP, OFF and DOWN. The switch is spring-loaded to the OFF position. The switch operates the hoist at a fixed rate of 100 fpm, and limit switches stop the hoist automatically just prior to reaching the full up or down position.

### RESCUE HOIST CONTROL SWITCH, PILOT'S

The pilot's rescue hoist control rocker switch is located on the forward side of the pilot's collective pitch stick grip (figure 1-5). The rocker switch is labeled HOIST, on the aft side of the stick, with the marked positions UP and DN. The switch is spring-loaded to the off position. The rocker switch operates the hoist at a fixed rate of 100 fpm, and limit switches stop the hoist automatically just prior to reaching the full up or down position. The copilot has no control of the rescue hoist.

### RESCUE HOIST MANUAL OVERRIDE

In the event of electrical failure, two buttons on the four-way solenoid valve, located directly above the throttle control lever, may be used to operate the hoist. The button marked UP will raise the cable, and the button marked DOWN will lower the cable. The crewman must depress the appropriate UP or DOWN override button and move the throttle control out of its neutral position to initiate and maintain hoist operation.

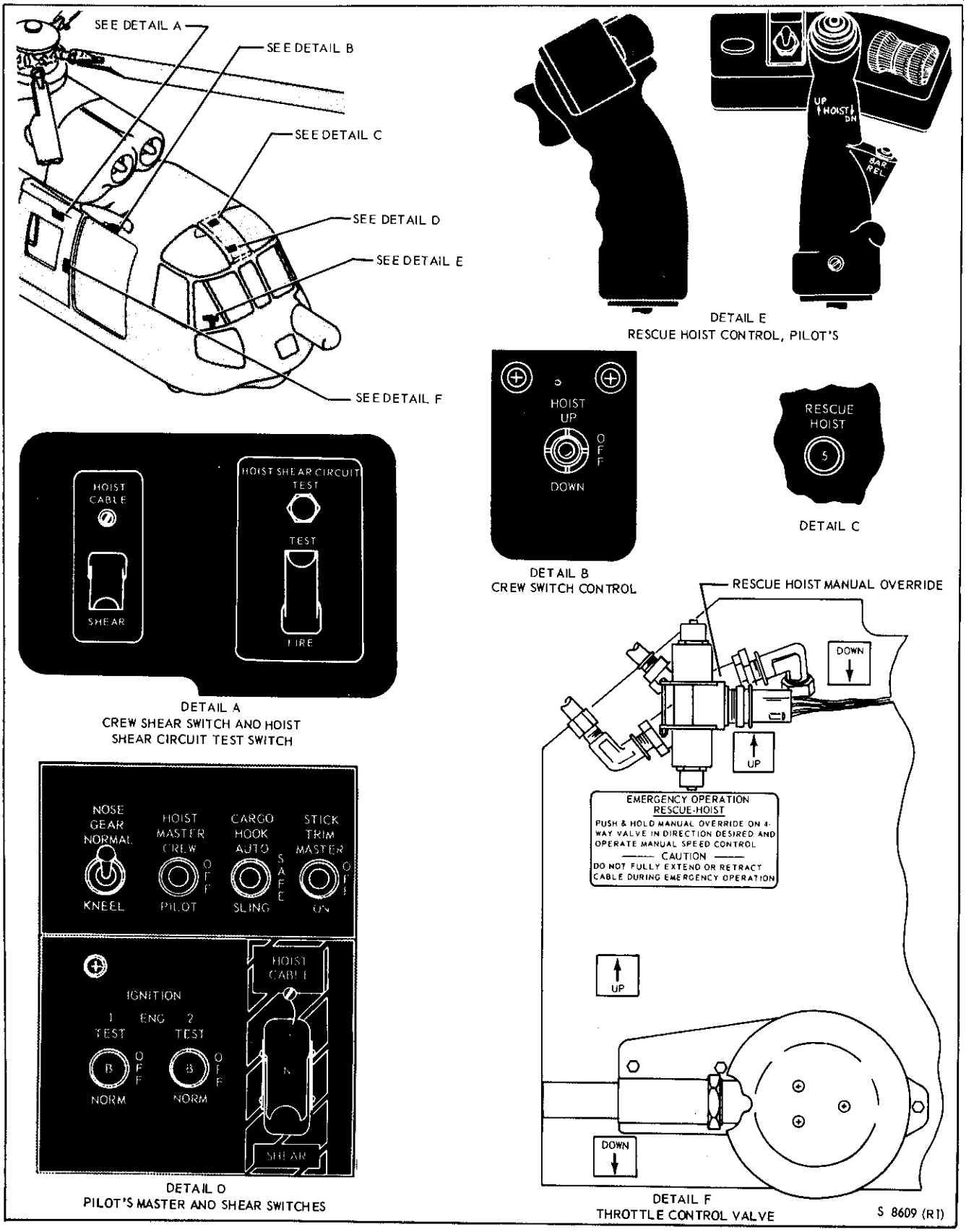



**Figure 4-13. Rescue Hoist Controls**

**CAUTION**

The intermediate limit switch and the up- and down-limit switches are inoperative with electrical power loss, and the hoist is capable of operating in excess of 100 fpm in this configuration. Therefore, exercise caution when operating near cable extremities, and adjust cable speed accordingly.

**CAUTION**

Use of the guillotine is not possible with an electrical power loss.

**CAUTION**

Before using manual override, operator must check condition of hoist cable and reel. Abnormal stresses encountered during hoisting can prevent electrical operation of the hoist. Manual override operation of hoist with fouled cable or reel can cause damage to hoist and possible parting of cable.

#### RESCUE HOIST SHEAR CIRCUIT TEST PANEL

A hoist shear circuit test panel, marked HOIST SHEAR CIRCUIT TEST, mounted on the right-hand cabin side panel aft of the cargo door, provides the means to test the winch cable shear circuit. A green light is located on the top center of the panel. A guarded switch, with marked positions TEST and FIRE, is located on the bottom center of the panel. A decal is located on the side of the panel. To test the hoist shear circuit, refer to T.O. 1H-3(H)-F-2-3 for the correct procedures.

#### RESCUE HOIST CABLE SHEAR SWITCH

There is a guarded HOIST CABLE SHEAR switch on the cockpit overhead switch panel and another located at the hoist operator's station aft of the cargo door. Lifting the guard and actuating the switch in the cockpit will operate a guillotine that will cut the cable at the rescue hoist, regardless of the position of the HOIST MASTER switch. The shear switch at the cargo door will operate only when the HOIST MASTER switch is in the CREW position.

**WARNING**

Discharge static electricity generated by the helicopter by touching the hoist hook to the ground or water prior to attempting hoist hookup. Do not ground the hook near spilled fuel from damaged aircraft or vehicles.

**WARNING**

When operating the hoist from the cargo compartment with the cargo door open, the crewmen's safety belt shall be used.

**WARNING**

The rescue hoist master switch must be placed in the off position when using the manual hydraulic override to prevent injury to personnel or equipment should electrical power suddenly be restored.

**CAUTION**

To prevent injury to personnel or damage to the hoist or to cargo on the hoist cable, do not fully raise the hoist until oscillations of the hoist cable have stopped.

### AIR DELIVERABLE ANTI-POLLUTION TRANSFER SYSTEM (ADAPTS)

Additional equipment may be added to the rescue hoist for delivery of ADAPTS equipment. These modifications increase the weight capacity of the hoist to 1200 pounds. For a description of this equipment and procedures for its delivery, refer to Section II.

### EXTERNAL CARGO SLING

#### LOW RESPONSE EXTERNAL CARGO SLING

The low response external cargo sling (figure 4-14) permits carrying loads up to 8000 pounds beneath the helicopter. The sling is made up of universal sling fittings, cables, cargo hook, pulleys and a suspension frame. The sling is attached to four hard points on the bottom of the helicopter by four universal sling fittings.

The fittings, in turn, are attached to a suspension frame, which contains a pulley in each corner. Two cables are threaded through the pulleys and support the cargo hook. Each cable picks up a suspension ring on the cargo hook, is threaded through a pulley, passed diagonally below the tub and threaded through the opposite pulley. It is then attached to the opposite suspension ring. This suspension system permits the hook to swing independently of the helicopter in any direction. The path of the hook during its swing is elliptical; therefore, the line of reaction of the load is a perpendicular to a tangent on the elliptical path. This line of reaction passes through the helicopter between the floor and the center of gravity and eliminates undesirable aircraft responses. The cargo release circuit operates on current from the dc primary bus and is protected by a circuit breaker marked CARGO HOOK PWR, located on the overhead circuit breaker panel. Ground personnel may open the hook by actuating the manual release lever located on the side of the cargo hook. The load beam for the cargo hook will automatically return to the normally closed position after the load is released. For a pickup, the helicopter can be hovered over the load and the load attached to the hook from outside the helicopter; or the helicopter can be maneuvered to fly the cargo hook into a preset ring. When the cargo sling is attached, but not in use, it is stowed under the fuselage by means of a nylon stowage line. A light marked CARGO HOOK on the pilot's advisory panel will illuminate any time the cargo hook is open. The light receives electrical power from the dc primary bus through a circuit breaker marked CARGO HOOK WARN, located on the overhead circuit breaker panel under the general headings INDICATOR LTS and DC PRI BUS.

**NOTE**

With external loads, radio communication and navigation systems may be unreliable.

### Cargo Sling Master Switch

A switch marked CARGO HOOK, located on the overhead switch panel (figure FO-3), controls operation of the cargo sling hook. The switch has marked positions AUTO, SAFE and SLING, and should be kept in the SAFE position during flight to prevent accidental discharge of the cargo by gusts or conditions that would lighten the load force. The SLING position energizes the thumb switches on the pilot's and copilot's cyclic stick grips, marked CARGO, and enables the pilot or copilot to electrically release the load on the sling. The cargo sling master switch should be in the SLING position during cargo hookups and until a safe altitude and airspeed are reached, to allow for quick release of the external load in the event of an emergency. The AUTO position energizes the cargo release switches and also a touchdown switch on the cargo hook. The touchdown switch will not be activated unless the load tension on the cargo hook is at least 125 pounds. It will automatically release the load when the load touches the ground and the load tension on the hook becomes less than 100 pounds. After an AUTO cargo release, the CARGO HOOK OPEN light will blink continuously until the switch is positioned to SAFE. Although the automatic touchdown release is set to actuate at 100 pounds or less, it is recommended that it not be used with loads less than 200 pounds. The master switch should always be returned to the SAFE position and the sling stowed after the load has been released. The master switch receives electrical power from the dc primary bus through a circuit breaker marked CARGO HOOK PWR, located on the overhead circuit breaker panel.

**CAUTION**

When loads weighing less than 200 pounds are being carried, the cargo sling master switch should never be in the AUTO position during flight. The cargo sling hook may open if a gust of air lightens the load. The AUTO position should be used just prior to touchdown to avoid an inadvertent release of cargo.

### Cargo Release Buttons

A cargo release button, marked CARGO, is located on the pilot's and copilot's cyclic stick grips. Either cargo release button may be depressed to open the cargo sling hook when the cargo sling master switch is in either the AUTO or SLING position.

### Cargo Release Pedal

A cargo release pedal, located on the pilot's side of the cockpit, is connected mechanically by cable to the manual release lever on the cargo hook. The pedal may be depressed to mechanically open the cargo sling hook when the electrical release circuit is inoperative. The load will be released in the air or on the ground regardless of the position of the cargo sling master switch.

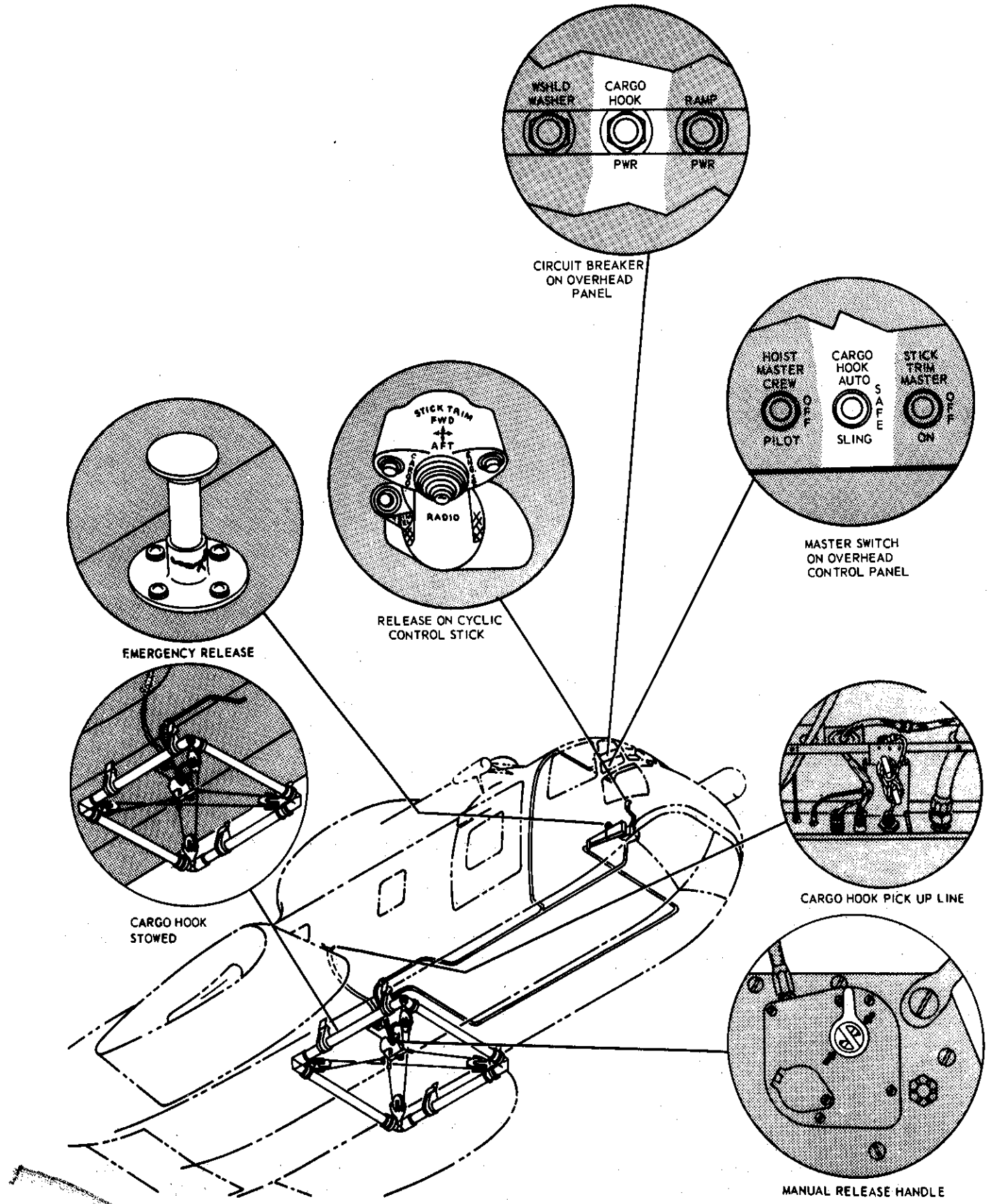



**Figure 4-14. Cargo Sling System, Low Response**

#### Cargo Hook Open Advisory Light

The cargo hook open advisory light is actuated by a microswitch on the cargo hook. A green advisory light marked CARGO HOOK, located on the caution-advisory panel, will illuminate whenever the cargo hook load beam is open.

#### Cargo Hook Manual Release Arm

The cargo hook may be manually released by ground personnel by operating the manual release arm on the cargo hook. A force of 15 to 22 pounds is required to move the release arm in an upward direction to release a load of 8000 pounds. With no load, 10 pounds force is the maximum required to open the load beam.

#### Cargo Hook Stowage Line

The cargo hook stowage line runs from the cargo hook into the fuselage, to a cleat close to the deck on the right-hand compartment side panel just aft of the cargo door. The cargo hook is stowed by lifting the cargo hook by the nylon line and tying the line to the tiedown cleat inside the cargo compartment. To release the cargo hook from the stowed position, untie the nylon line and slowly lower the cargo hook. A bungee cord, attached from the cargo hook cables to the fuselage, removes the slack from the cables when the hook is stowed.

**WARNING**

Any static electricity that may have been generated by the helicopter should be dissipated, prior to attempting a hookup, by allowing the sling to touch the ground or by grounding the sling through a conductor.

**WARNING**

External loads may cause oscillations to the extent that the load may oscillate into the rotor blades and/or fuselage, or that the load may cause a deterioration in the stability of the helicopter. Oscillations can usually be controlled by slowing the forward speed of the helicopter.

**CAUTION**

The cargo sling should be stowed before landing to prevent the hook from striking the ground. Striking the hook on the ground can cause damage and subsequent failure of the hook. Landing on water with an unstowed hook can cause damage by denting or puncturing the hull. Normally, with the hook installed, running water landings will not be accomplished.

## PASSENGER SEATS

Passenger seats (figure 4-15) equipped with seat belts may be installed in the cabin to accommodate up to 20 people. The seat legs are attached to the cargo tiedown studs in the cabin floor at the front of the seat assemblies. The seats are folded by disconnecting the front legs from the floor and securing the front of the seats against the upper back support with the straps provided.

**NOTE**

During search operations, when maximum visibility from the cabin is necessary for scanning, the seat backs blocking windows should be stowed. The over sponson emergency window exits and the access to them will be kept clear at all times to permit quick egress from the aircraft in event of an emergency.

## MISCELLANEOUS EQUIPMENT

#### CHECKLISTS

A scroll type checklist is located on the instrument panel glare shield in the cockpit.

#### STOWAGE BAG

A stowage bag is installed on the floor of the cockpit under the copilot's seat.

#### ICE SHIELD, ENGINE INLET

A removable foreign object deflector is installed to prevent chunks of ice breaking off the top of the fuselage or other foreign objects from being ingested by the engines.

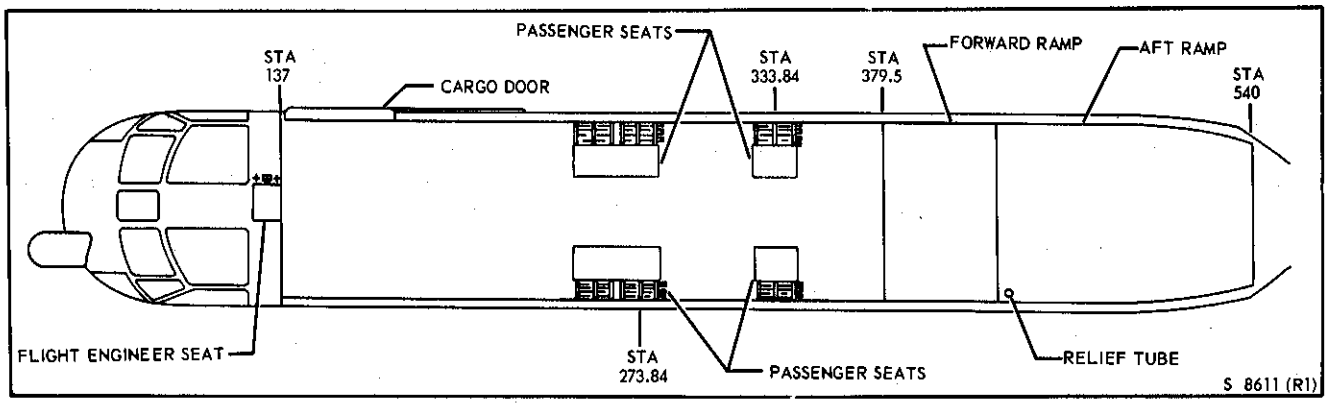



**Figure 4-15. Seats, Passenger**

## CREWMAN'S SAFETY HARNESS

The harness will be attached to an overhead fitting behind the navigator's seat. During rescue platform recoveries, it may be attached to a jump seat belt ring. It shall be worn during hoist operation and/or any time the cargo door is open in flight and personnel are working in the vicinity of the cargo door.

## CARGO DOOR SAFETY STRAP

The helicopter is equipped with a safety strap (figure 4-16), installed in the cargo door opening, for the purpose of restraining personnel. The safety strap is a fixed length, nonadjustable strap. The forward end is permanently attached to an eyebolt and ring assembly on the cargo door forward frame (Station 137). The right end of the safety strap has a quick release snap that attaches to a ring and eyebolt assembly on the cargo door rear frame (Station 186). During loading, or whenever the safety strap is not required, it is stowed by attaching the right end snap to the ring on the forward door frame.

**WARNING**

The cargo door safety strap shall be attached whenever the helicopter is in motion, except when operational necessity dictates otherwise, such as during hoist or platform operations.

## MAP CASE

A map case is installed on the bulkhead behind the copilot's seat in the cockpit.

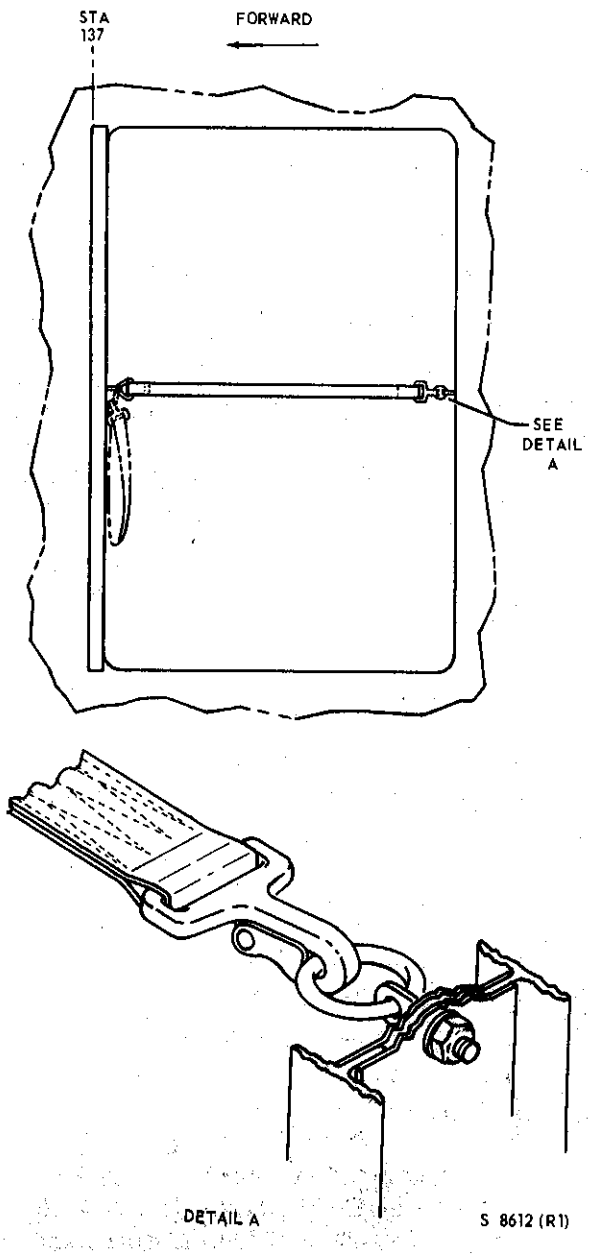



**Figure 4-16. Safety Strap, Cargo Doors**

### TIEDOWN RINGS

Five mooring rings are provided on the helicopter. Each main landing gear trunnion assembly has a mooring ring on the inboard and outboard side. A mooring ring is located on the bottom of the fuselage forward of the nose landing gear.

### RELIEF TUBES

Two relief tubes are installed in the helicopter. One is in the cockpit on the bulkhead behind the pilot's seat; the other is on the left-hand side of the cabin above the ramp.

### ASHTRAYS

Three ashtrays are installed in the cockpit. One is on the side panel to the right of the pilot, another is on the side panel to the left of the copilot, and the third is on the bulkhead behind the pilot's seat.

### AC UTILITY RECEPTACLE

Two capped, 115 VAC, 400 Hz utility receptacles (figure-17) are installed on the helicopter. One is on the left side of the transmission deck, and the other is on the right side of the cabin. The receptacles receive power from the No. 1 ac monitor bus through two circuit breakers on the copilot's overhead circuit breaker panel, marked CABIN and XMSN, under the general heading UT RECEP and NO. 1 AC MON.

### DC UTILITY RECEPTACLE

Three capped, 28 volt dc utility receptacles (figure 4-17) are installed on the helicopter. One is on the left side of the transmission deck, another is on the right side of the cabin, and the third is on the cockpit dome light panel. The receptacles receive power from the dc monitor bus through three circuit breakers on the copilot's circuit breaker panel, marked COCKPIT, CABIN, and XMSN, under the general headings UT RECP and DC MON.

### SIGNAL LIGHT

A portable signal light is installed on a bracket in the stowage area alongside the cargo door. The light is controlled by an on-off switch on the handle and may be plugged into any dc utility receptacle for operation.

### HOT CUP RECEPTACLE

A hot cup receptacle is installed in the stowage area alongside the personnel door. The hot cup receptacle receives electrical power from the No. 2 ac monitor bus through a circuit breaker marked HOT CUP, located on the pilot's circuit breaker panel under the general heading NO. 2 AC MON.

### COCKPIT CANOPY SHADES

Retractable window shades are installed on the overhead windows in the cockpit to provide sun protection for the pilot and copilot. When drawn, the shades are secured by a bungee cord to a hook in the frame of the window.

### REAR-VIEW MIRRORS

The helicopters are equipped with two manually adjustable external rear-view mirrors installed on the upper forward window post of the canopy, one on each side of the cockpit (figure 4-18). The mirrors can be adjusted from within the cockpit by opening the respective windows. The dual rear-view mirrors provide the pilots with a means of viewing the engine and transmission areas during flight or ground operations. The pilot can view the personnel hoist and cargo door opening when engaged in rescue hoist operations. The mirrors are mounted so that mirror viewing will require the viewer to lean his head slightly toward the mirror side. This means of viewing is considered desirable as it prevents the helicopter's exterior lights from reflecting into the pilot's eyes during night operations when the mirrors are not being used.

### PILOT'S COMPARTMENT CURTAIN

A curtain is installed at the entrance to the cockpit to prevent the entry of extraneous light from the cabin. The curtain is rolled up and stowed overhead when not in use. Snap fasteners are used to secure the curtain to the frame of the entrance.

### LADDER, CARGO DOOR

A portable ladder is provided for entering the helicopter through the cargo door. The ladder is secured to the sill of the cargo door opening by two quick-disconnect claws. The ladder is swung out and down to allow personnel to enter the cabin and is swung up and in to allow closing of the cargo door. During flight, the ladder is stowed on the left side of the cabin between

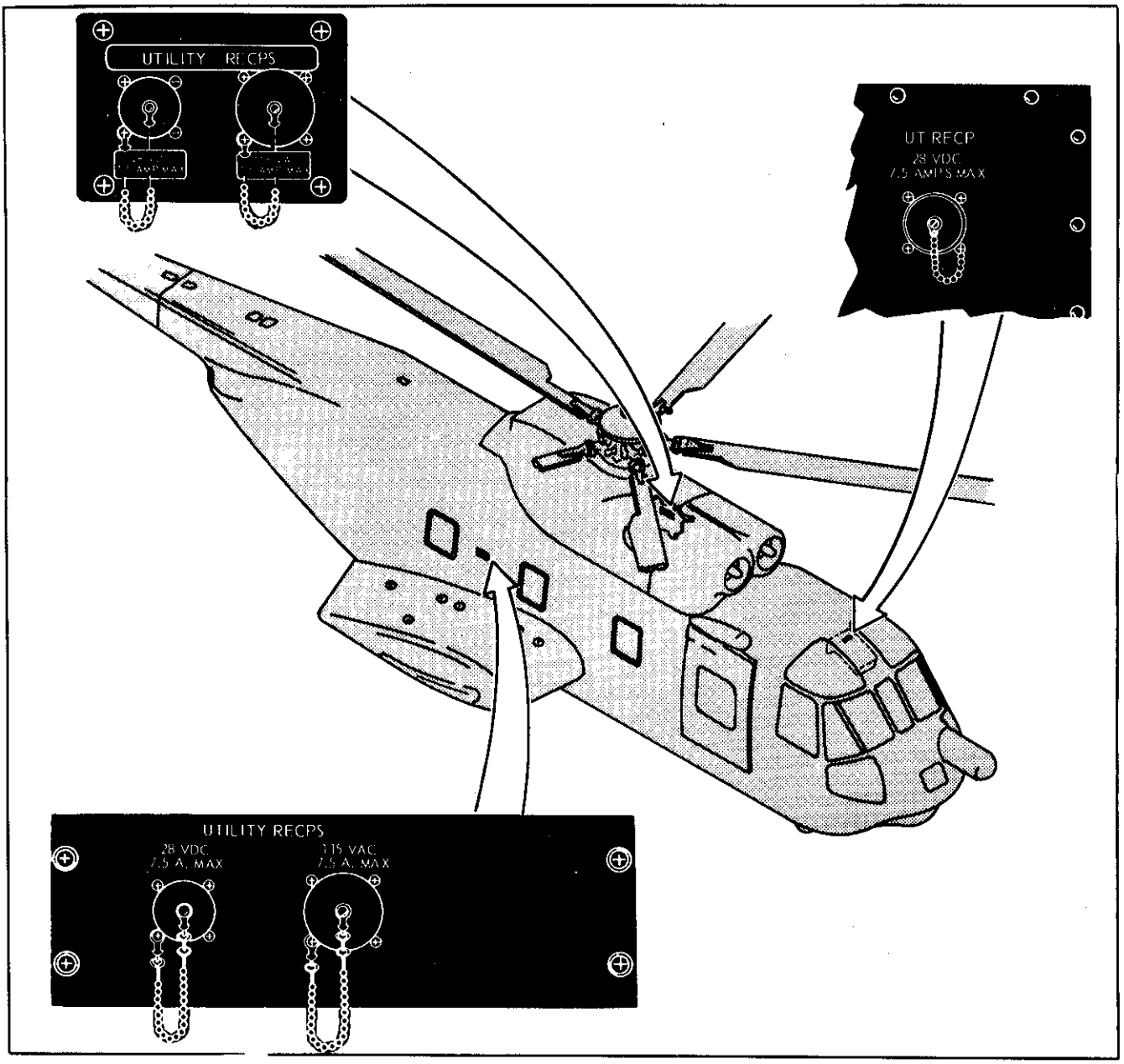



**Figure 4-17. Utility Receptacles, Electric**

the first and second windows by engaging the quick-disconnect claws to two storage pins and securing it with a bungee cord.

### RESCUE PLATFORM

The helicopter is equipped with a detachable rescue platform (figure 4-18). It is provided to aid in the recovery of personnel or objects from the sea when the helicopter is afloat. The platform is secured outboard of the cargo door by studs and support cables. When not in use, the platform should be stowed in the aft cabin area.

**NOTE**

Whenever the platform is stowed, ensure that the platform support cables are secured with bungee.

### ANCHOR

An anchor and anchor line are installed on the left forward bulkhead of the cabin. The anchor is secured by a strap, and a cleat is provided for stowage of the anchor line. The exterior anchor line runs from the tow ring, which is located on the front end of the helicopter below the waterline, to a cleat on the right-hand side

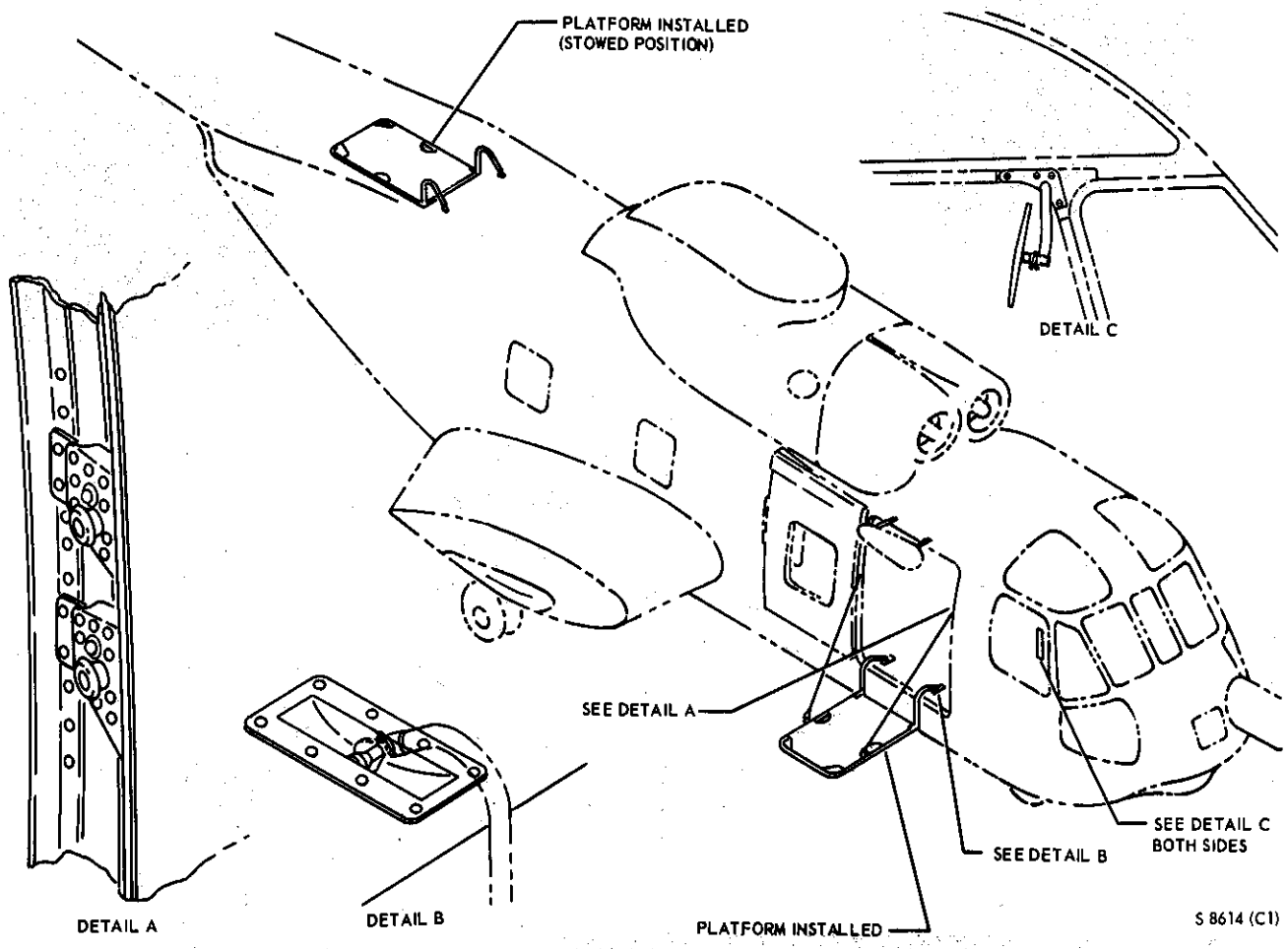



**Figure 4-18. Rescue Platform and Rear-View Mirrors**

just forward of the personnel door. A bungee cord at the end of the anchor line keeps the line tight when hitched to the cleat.

### ANCHOR, SEA

A sea anchor, made up of a 96-inch drogue chute and line, is located on the left side of the cabin near the deck between the first and second windows.

### SPARE LAMPS

Spare lamps are stowed in the cockpit on both sides of the overhead switch panel and on the aft side of the cockpit dome light panel.

### TIP SOCK STOWAGE

Provisions are made to stow the tip socks in the right side of the cabin above the aft ramp and aft of the portable fire extinguisher.

### WATER CONTAINER

A 2-gallon drinking water container, held in place by two quick-disconnect straps, can be mounted on either side of the forward ramp.

**WARNING**

Storage of water in the water container for extended periods of time may result in bacteria growth. Care should be taken to ensure the pureness of the water and periodic checks made by qualified medical personnel.

### BEACON, UNDERWATER ACOUSTIC

The beacon at station 198 on the left side of the cabin is a highly reliable, impact-resistant, water-activated, lightweight unit that will enhance locating crashed aircraft in water to a depth of 20,000 feet. This unit

has an operating life of 30 days after actuation by immersion in fresh or salt water and has a detection range of 2,000 to 4,000 yards, depending upon exposure and sea state.

## WINDSHIELD WIPER SYSTEM

The electrically operated windshield wiper system consists of a two-speed motor, two converters, two wipers, and a rotary control switch. The two-speed motor, located below the windshields, drives flexible drive shafts to each converter, which in turn transmits oscillating motion to the arms and wipers. One converter is located below the pilot's windshield, and the other is located below the copilot's windshield. The wipers are located on each windshield and have an approximate 56° range of travel. The rotary control switch, located on the overhead switch panel, with marked positions PARK, OFF, LOW and HIGH, controls the entire system. The system is actuated and the desired speed of the wipers selected, by placing the switch in the LOW or HIGH position. When the switch is placed in the PARK position, the wipers are automatically positioned to the inboard edge of the windshields. The system operates on alternating current from the No. 1 ac primary bus and is protected by a circuit breaker marked WINDSHIELD WIPER, located on the copilot's circuit breaker panel under the general heading NO. 1 AC PRI.

**CAUTION**

To prevent scratching the windshields, do not operate the wipers on dry glass.

### WINDSHIELD WASHER

The windshield washer system has a six-quart reservoir located on the bulkhead behind the pilot, a windshield washer motor, and a spray bar. The windshield washer motor is controlled by a switch marked WSHLD WASH, located on the overhead switch panel. Turning the windshield washer motor on pumps fluid through the spray bars onto the windshield. The windshield wipers are then operated in the normal manner. The windshield washer motor is powered from the dc primary bus and is protected by a circuit breaker marked WSHLD WASHER, located on the overhead circuit breaker panel.

## BILGE PUMP

A portable, hand-operated bilge pump (figure 4-19) is stowed on the left side of the cabin at station 440. The self-priming pump has a capacity of 5 gallons per minute. The pump will draw water from a depth of 4-1/2 feet and pump water to a height of 10 feet above the pump. The bilge side of the hose is attached to one of the connectors in the cabin floor. The discharge side of the hose is placed out the nearest exit. After the pump is mounted and the hoses are in position, the pump crank is rotated in a clockwise direction. There are four pump mounting brackets on the right side of the cabin, two at station 220 and two at station 322. There are also four pump mounting brackets on the left side of the aircraft. Two are located at station 176.5 to facilitate bilge pump operation in the electronics compartment, and two are located at station 322. There are four bilge pump connectors located in the deck on the extreme left side. Two are at station 179 and the other two at station 351. These connectors provide access to four compartments beneath the deck. The connectors have removable screw type covers with an attaching chain.

**CAUTION**

If water cannot be pumped through the standpipe when pumping out the watertight fuel tank compartments, it can only be assumed that the compartment is dry or the standpipe is clogged. There are no access or visual inspection plates to check water level. Trapped or undetected water in these compartments could lead to inflight CG problems and accelerate corrosion within the compartment. These compartments should be pumped periodically to determine presence of leakage. After water operations, the hull drains for these compartments should be opened to prevent water accumulation which might affect gross weight and/or CG, and accelerate corrosion.

**NOTE**

The bilge pump should be available and manned whenever the helicopter is moored or sitting on water for an extended period.

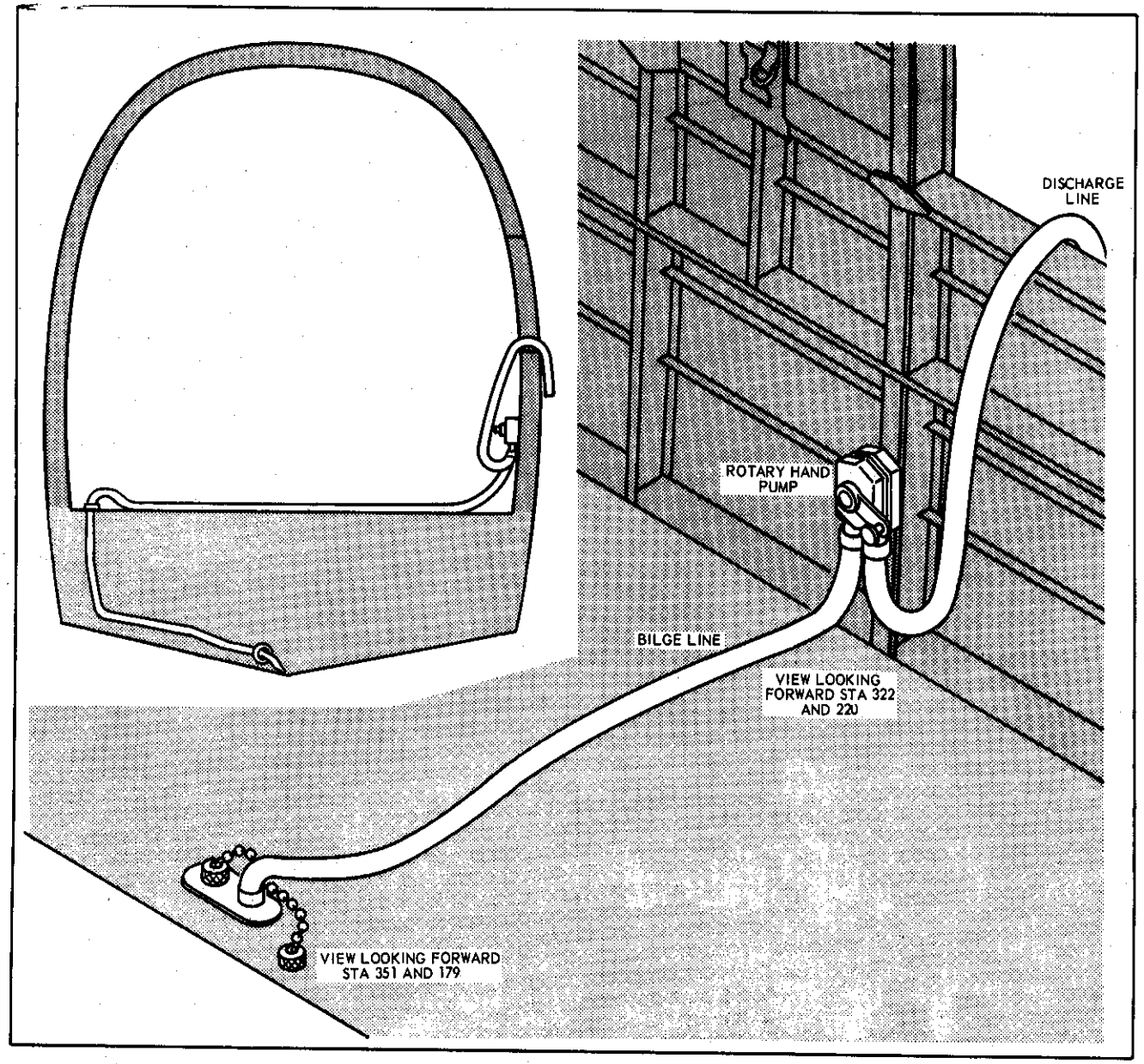



**Figure 4-19. Bilge Pump**

## LOAD ADJUSTER

A slide-rule-type load adjuster (figure 4-20) is used for computing CG limits when loading the helicopter. Operating proficiency will save the time and effort of having to solve the center of gravity problem by means of mathematical calculations. When used with the charts and forms in the Weight and Balance Manual Data, T.O. 1-1B-40, a safe loading is provided by checking in advance exactly how the balance position will be affected by each item of load added or removed (figure 4-21).

## INSTRUCTIONS FOR USE OF THE LOAD ADJUSTER

### Colored Top Strip

The colored top strip of the load adjuster ensures safe loading as the red sections show the limits of the loading range. A sloping line defines a limit according to the gross weight of the loaded helicopter, and a vertical line indicates a limit that is constant at all gross weights. The colored top strip also contains a note to check landing conditions. This note is very important in that the use of fuel and other expendable loads can cause a change in the balance position. The

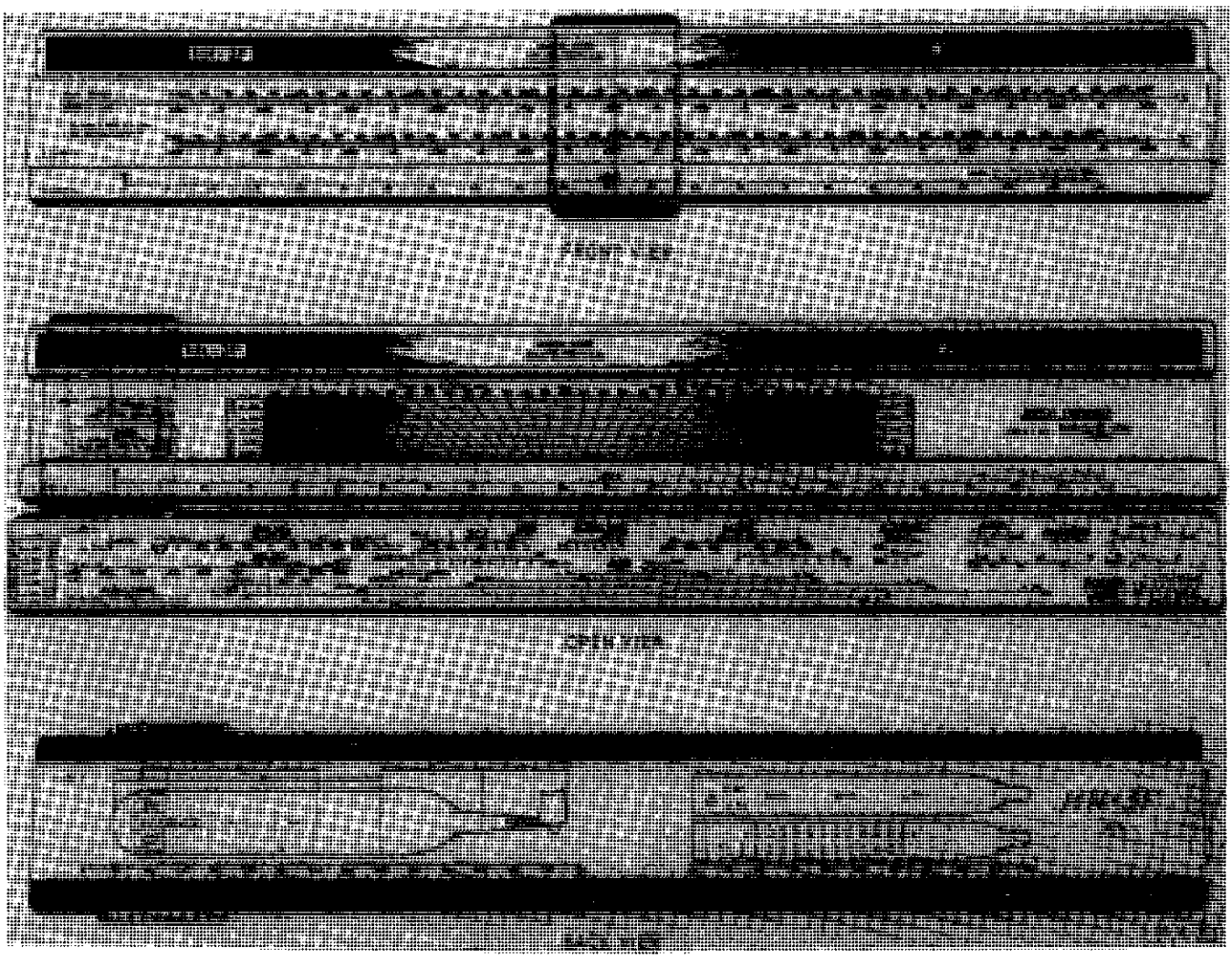


**Figure 4-20. Load Adjuster**

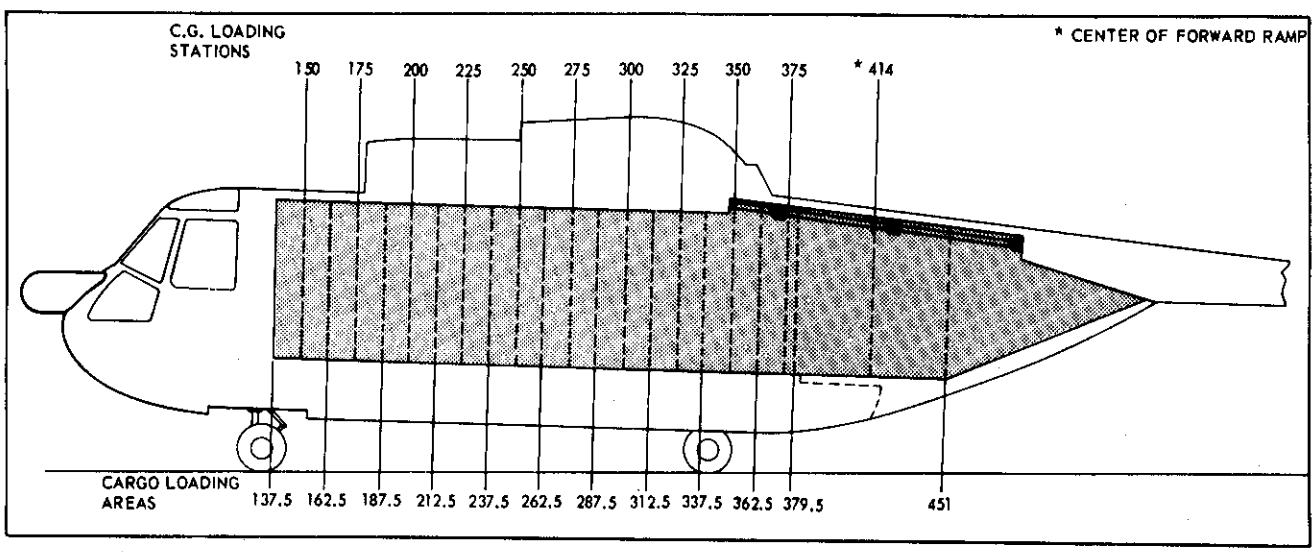



**Figure 4-21. Cargo Loading Data**

loading must then be rearranged to allow for the CG change, or the allowable limits will be exceeded as fuel or other expendable loads are consumed.

### Transparent Indicator

The transparent indicator is movable to translate the change in balance position as the load is changed in terms of the index scale on the bottom of the adjuster. The index scale is merely a simple reference that is mathematically related to the center of gravity grid, or balance diagram, which appears on the inner recess of the load adjuster.

### Center of Gravity Grid

The center of gravity grid is the basis of the load adjuster's design. The forward and aft red sections show the CG limits in terms of inches from the reference datum, and it is from these limits that the top strip of the load adjuster is devised. The CG position in terms of inches from the reference datum may be read directly from this grid. The horizontal lines represent the weight, and diagonal lines represent inches. To convert an index reading to inches from the reference datum, note the point at which the indicator hairline and the gross weight line intersect. The inches from the reference datum are estimated at that intersection. The marks across the top of the grid are inches from the reference datum.

### Fuselage Diagrams

The fuselage diagrams on the back of the load adjuster will be of great assistance in deciding where to place load items, since they provide information concerning station locations.

### Basic Weight and Moment Scales

The basic weight and moment scales on the inner side of the load adjuster slide determine the basic index, which is the starting point of all loading calculations. These scales are based on the index formula shown in the recess on the inside of the rule. The procedure outlined below should be followed to arrive at a basic index:

1. Set the indicator hairline at 0 on the index scale.

2. Move the slide until the basic weight is under the hairline.

3. Slide the indicator to the basic moment and read the basic index under the hairline on the index scale.

If the basic moment should happen to be on a scale other than that containing the basic weight, proceed as follows:

4. Move the slide until the basic weight is under the index scale.

5. Move the indicator to the final moment mark at the end of the scale containing the basic weight.

6. Move the slide again until the same moment value at the beginning of the next scale, below, is under the hairline.

7. Move the indicator to the applicable moment figure and read the index under the hairline.

## LOAD ADJUSTER OPERATION

After the basic index has been determined, all loading calculations start with the hairline of the indicator over the basic index. From this point on, two operations are required to load each item shown on the Form 365F. The computations are made in the order that the items appear on the Form 365F and the resulting index is progressively entered in the index column.

1. Move the slide until the 0 vertical starting line of the scale to be used is under the hairline.

2. Move the indicator until the hairline is over the weight to be added. The new index is then read under the hairline on the index scale at the bottom of the rule.

The effect of the removal or redistribution of a load is determined by following the same two steps above, except the hairline is not set over the 0 line of any given scale, but instead is set over the total weight to be removed and the last recorded index reading. The indicator is then moved to the 0 line of the scale, or to an intermediate weight, and the new index is read under the hairline on the index scale.

**NOTE**

When moving the slide, ensure that the indicator does not move, and when moving the indicator, ensure that the slide remains in position.

**SAMPLE PROBLEM FOR THE HH-3F LOAD ADJUSTER**

Suppose that the CHART C in the weight and balance book for your helicopter shows a basic weight of 14,200 pounds and a basic index of 66.0. FORM F is filled out as in the example given here. Index readings for each of the load items have been listed so that you can start using the load adjuster. Check your answer with the index readings given.

| ITEM | WEIGHT | INDEX |
|---|---|---|
| Basic Helicopter | 14,200 | 66.0 |
| Oil | 44 | 65.6 |
| Crew (4 - 180# each) | 720 | 55.8 |
| OPERATING WEIGHT | 14,964 | 55.8 |
| Takeoff Fuel (6.5 #/gallon) | | |
| Main - Forward (Full) | 2,240 | 44.2 |
| - Aft (Full) | 2,225 | 55.4 |
| Aux. - Forward | 500 | 50.5 |
| - Aft | 500 | 50.5 |
| Passengers (D12 + D14) | 400 | 50.4 |
| (D11 + D13) | 400 | 50.2 |
| Cargo (Sta. 375) | 500 | 55.8 |
| TAKEOFF CONDITION | 21,729 | 55.8 |
| TAKEOFF CG IN INCHES 269.5" | | |

Set the INDICATOR hairline over the BASIC INDEX of 66.0 to begin.

1. Move the SLIDE until the "0" vertical starting line of the OIL scale is under the hairline.

2. Move the INDICATOR until the hairline is over the 44.3, full oil tick mark. The index will now be 65.6.

3. Move the SLIDE until the "0" vertical starting line of the CREW scale is under the hairline.

4. Move the INDICATOR until the hairline is over the 360 pound tick mark on the PILOT & CO-PILOT portion of the scale. (59.5)

5. Move the SLIDE until the starting line of the NAVIGATOR (FLT MECH) scale is under the hairline. Move the indicator hairline to the 180 pound mark. (57.5)

6. Repeat the above operation using the HOIST OPERATOR (AVIONICSMAN) scale to load the fourth crew member. Upon completion of the crew loading, the index will be 55.8.

**Addition of Fuel**

The foregoing computations produce the balance position for the operating weight of the helicopter (Ref. 4 of Form F). To this must be added the weight of the fuel before payload distribution can be considered.

1. Set the "0" starting line of the MAIN FUEL scale under the indicator hairline at the operating weight index of 55.8.

2. Move the INDICATOR until the hairline is over the 6.5 #/gallon tick mark on the FWD fuel scale. The result is an index of 44.2.

3. By using the AFT fuel scale and the FWD AUX FUEL scale in the same manner, an index of 50.5 will be determined.

4. The addition of the 500 pounds of AFT AUX FUEL will not affect the index reading, since no scale is required for the addition of this fuel. Only the added weight must be considered.

**Distribution of Allowable Load**

The balance of the loading computation showing the load distribution is worked on the PASSENGERS and CARGO scales, resetting the slide to the zero line before each new addition from Form F. For the addition of the passengers in Seats D12 and D14:

1. Move the SLIDE until the D10 mark (empty seat prior to passengers) of the PORT SIDE scale is under the hairline at the 50.5 index position.

2. Move the INDICATOR to the D14 position for an index of 50.4. If the zero line is used and the indicator moved to D14, passengers are placed in seats D6 through D14 and must therefore be removed from D6 through D10.

3. Move the SLIDE until D9 mark of the STARBOARD scale is under the hairline at the 50.4 index reading.

4. Move the INDICATOR to the D13 tick mark for an index reading of 50.2.

5. Using the Sta. 375 CARGO scale in the same manner to load the 500 pounds carried will produce the takeoff index of 55.8.

### Determination of Landing CG

It is very important to determine that the CG will be safe when landing after fuel has been consumed. This computation is accomplished by the reverse use of the load adjuster scales. Let us assume that the auxiliary fuel is still on board and that all but 1000 pounds of fuel in each of the main tanks has been consumed.

1. Set the INDICATOR hairline at the takeoff index of 55.8.

2. Move the SLIDE until the 6.5 #/gallon tick mark on the FWD MAIN FUEL scale is under the hairline.

3. Move the INDICATOR to the 1000 pound mark, thus removing 1240 pounds of fuel. Removing 1225 pounds of fuel by using the aft fuel scale in the same manner will produce a landing index of 55.9.

4. This same operation may also be accomplished by setting the slide to 1240 and 1225 respectively and moving the slide to the zero mark.

### Redistribution of Load

The same reverse use of the load adjuster scales may be followed for redistributing the load when required corrections are to be accomplished by moving cargo. If the corrections are to be produced by relocating passengers, then the PERSONNEL CHANGE scale would be used. It will be assumed that a more aft CG position is now to be produced by moving the occupant of Seat D13 to D21.

1. Set the D13 tick mark on the PERSONNEL CHANGE scale under the hairline at the takeoff index of 55.8.

2. Move the INDICATOR to the D21 position, producing the more aft CG reading of 57.3.

### Reading the CG Position from the Grid

To convert the takeoff index of 55.8 inches from the reference datum:

1. Set the hairline at the takeoff index of 55.8 and move the slide so that the gross weight figures on its left-hand end will be conveniently close to the indicator hairline.

2. Note the point of intersection of the hairline and the takeoff gross weight line on the grid.

3. This intersection occurs between the 269-inch and 270-inch lines. Therefore the reading in inches may be estimated at 269.5.

### Distribution of Allowable Load (Main Cabin Cargo)

The cargo loading compartment is divided into marked stations at 25-inch intervals between station 150 and station 375. Cargo loadings scales corresponding to these marked stations are provided on the load adjuster, enabling the distribution of load throughout the compartment. A cargo load CG located between the marked stations may be set up by moving the indicator the proportionate distance between the corresponding points on the adjacent scales.

### Example:

Add 3000 pounds of cargo at station 235 with the aircraft index already at 55.0. Move the slide until the "0" pound line at station 267 is under the hairline. The 3000 pound mark for station 225 is over index 42.4. The 3000 pound mark for station 250 is over 49.8. Therefore 3000 pounds at station 235 will be over index:

$$42.4 + \frac{235 - 225}{250 - 225} \quad (49.8 - 42.4) \text{ or } 45.4$$

## COMMUNICATION AND ASSOCIATED ELECTRONIC EQUIPMENT

Refer to figure 4-22 for a listing of electronic equipment.

### INTERCOMMUNICATION SYSTEM (ICS) AN/AIC-18

The AN/AIC-18 intercommunication system, ICS, is installed to provide communication between the various crew members. The ICS also links the audio channels of the communication and associated electronic equipment, to provide simplified control and simultaneous operation. The system is controlled through identical ICS control and monitor panels,

| TYPE | DESIGNATION | FUNCTION | RANGE | LOCATION OF CONTROL |
|---|---|---|---|---|
| Intercommunication System | AN/AIC-18 | Interphone and radio communication | Internal | At the following stations: pilot, co-pilot, navigator, jump seat, hoist operator, and aft cabin station |
| UHF/COMM | AN/ARC-51A | Two-way voice communication | Line of sight | Cockpit console |
| VHF/COMM | AN/ARC-84 | Two-way voice communication | Line of sight | Cockpit console |
| HF/COMM | AN/ARC-94 | Two-way voice communication | Long range | Copilot console, navigator console |
| IFF Transponder | AN/APX-72 | Identification, azimuth, and range | Line of sight | Cockpit console |
| UHF-VHF/ADF | AN/ARA-25 | Automatic direction finding | Line of sight | Cockpit console |
| VHF/FM | AN/ARC-160 | Automatic direction finding and VHF/FM transceiver in 150.000 to 173.995 MHz frequency range | Line of sight | Cockpit console |
| VHF/NAV | AN/ARN-87(V) | ILS and VOR navigation | Line of sight | Cockpit console |
| Glide Slope | GSA-8A-1 | Glide slope receiver | Short range | Cockpit console and instrument panel |
| Marker beacon | MKA-23A | Marker beacon receiver | N/A | VHF/NAV RAD and ICS panel and instrument panel |
| TACAN | AN/ARN-52(V) SEE 05-23 | Tactical air navigation | Line of sight | Cockpit console |
| LF/ADF | AN/ARN-89A | Automatic direction finding | Long range | Cockpit console |
| Radar Altimeter | AN/APN-171(V) | Measure absolute altitude | 5000 feet | Instrument panel |
| Radar | AN/APN-195 | Weather search and navigation | 60 miles | Instrument panel |

**Figure 4-22. Electronic Equipment (Sheet 1 of 2)**

| TYPE | DESIGNATION | FUNCTION | RANGE | LOCATION OF CONTROL |
|---|---|---|---|---|
| Doppler | AN/APN-175(V)-1 | Doppler sensor | N/A | Cockpit console |
| LORAN A | AN/APN-180 | Long range navigation | Long range | Navigator's station |
| Navigation Computer | AN/AYN-1 | Compute navigation problems and present visual read-out | N/A | Cockpit console |
| Flight Director | AN/AYN-2 | Present visual read-out of navigation radio aid receivers | N/A | Instrument panel |

**Figure 4-22. Electronic Equipment (Sheet 2 of 2)**

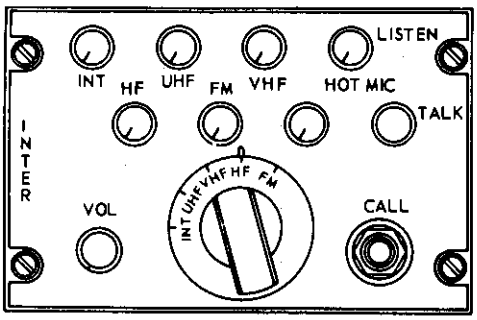
provided for the pilot, copilot, and navigator (figures 4-23 and 4-24). In addition, the copilot has a remote ICS switch. The hoist station is equipped with a monitor panel, ICS station, and a hot mike switch (figure 4-25). The aft cabin station is equipped with an ICS station and a hot mike switch (figure 4-26). The jump seat is equipped with a monitor panel and ICS station (figure 4-27). The ICS circuits for the pilot, copilot, navigator, and crewmen are powered by the dc primary bus. The forward and aft exterior ICS receptacles are on the crewman's ICS circuit (figure 4-28). When the forward external ICS receptacle is in use, the jump seat ICS station is inoperative. When the aft external ICS receptacle is in use, the aft cabin ICS station is inoperative. The pilot's and navigator's ICS circuits are protected by circuit breakers, marked PILOT and NAV, on the pilot's circuit breaker panel under the general headings DC, PRI, and ICS. The copilot's and crewmen's ICS circuits are protected by circuit breakers, marked CO-PLT and CREW, on the copilot's circuit breaker panel under the general headings DC, PRI, and ICS.

**NOTE**

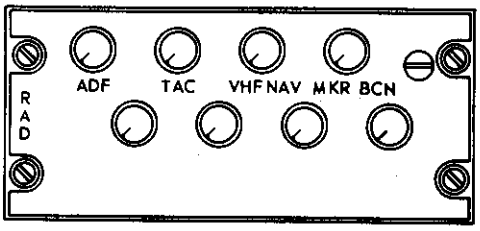
If any of the ICS circuit breakers pop, complete communication capability (ICS, CALL, RADIOS, and HOT MIKE) is lost to the respective position.

### ICS Control

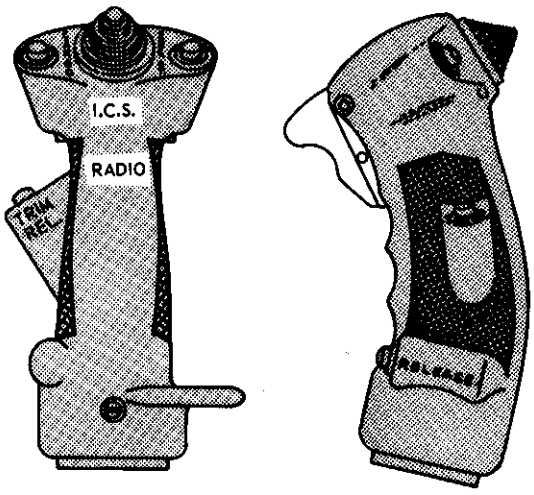
The ICS control, marked INTER, is a panel-mounted assembly on the pilot's, copilot's and navigator's console. All switches and controls are front mounted except the external talk switch. Seven separate combination monitor selector/volume controls enable monitoring and individual listening level adjustment of the seven audio lines. The associated monitor switches are pulled out to monitor the desired audio lines. The level of the individual audio line is adjusted by rotating the associated monitor volume control. The six monitor selector/volume controls used are marked: INT, UHF, VHF, HOT MIC LISTEN, HF, and FM. A HOT MIC TALK switch is also on this panel. A rotary selector switch enables transmission and reception on ICS or selected radio communications systems. The switch is marked INT, UHF, VHF, HF, and FM. The external talk switches control operation of the selected transmitter. The ICS control panel also contains a VOL control to adjust the signal level to the associated headphones, a HOT MIC TALK on-off switch, and a CALL button for emergency call operation. The ICS controls provide four modes of microphone operation; one button, two button, HOT MIC, and CALL. The navigator has one button operation which provides a capability to talk on the interphone line or a radio transmitter, as selected by the rotary selector switch. Two button operation is a mode whereby the pilot and copilot may talk on the interphone line or a selected radio transmitter without the need for operating the selector switch on the ICS control panel. This capability is provided by rocker switches located on the pilot's and copilot's cyclic pitch stick. In addition, the copilot may talk on interphone or a selected radio by using the copilot's remote ICS switch. HOT MIC operation provides hand free intercommunication. Call operation provides exalted intercommunication for high priority or emergency messages. The call signal is heard at least six decibels louder than any other signal present.




DETAIL A




DETAIL B




ICS ROCKER SWITCH, PILOT'S AND COPILOT'S
DETAIL C


ICS SWITCH PANEL, REMOTE, COPILOT'S
DETAIL D

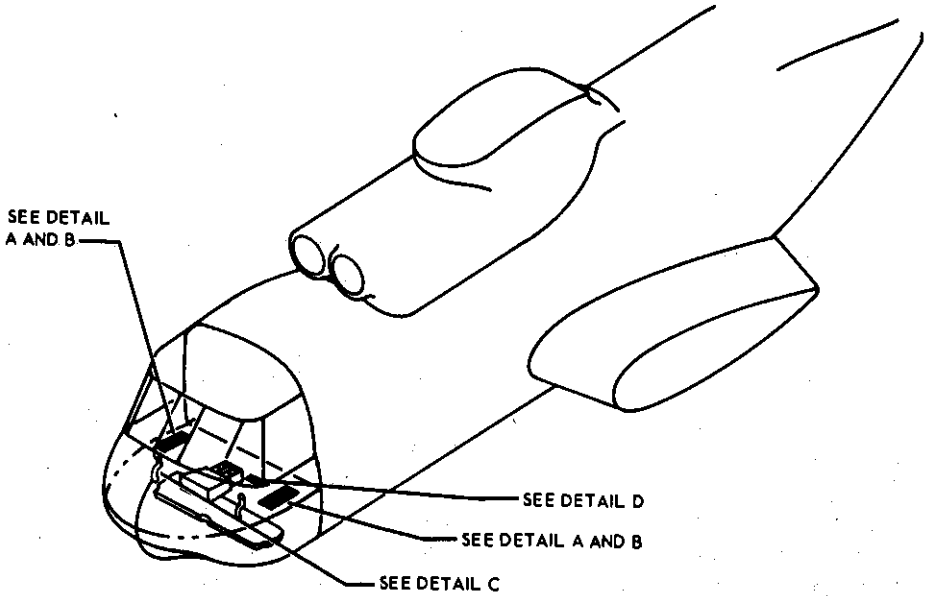



**Figure 4-23. ICS System Pilot and Copilot AN/AIC-18**

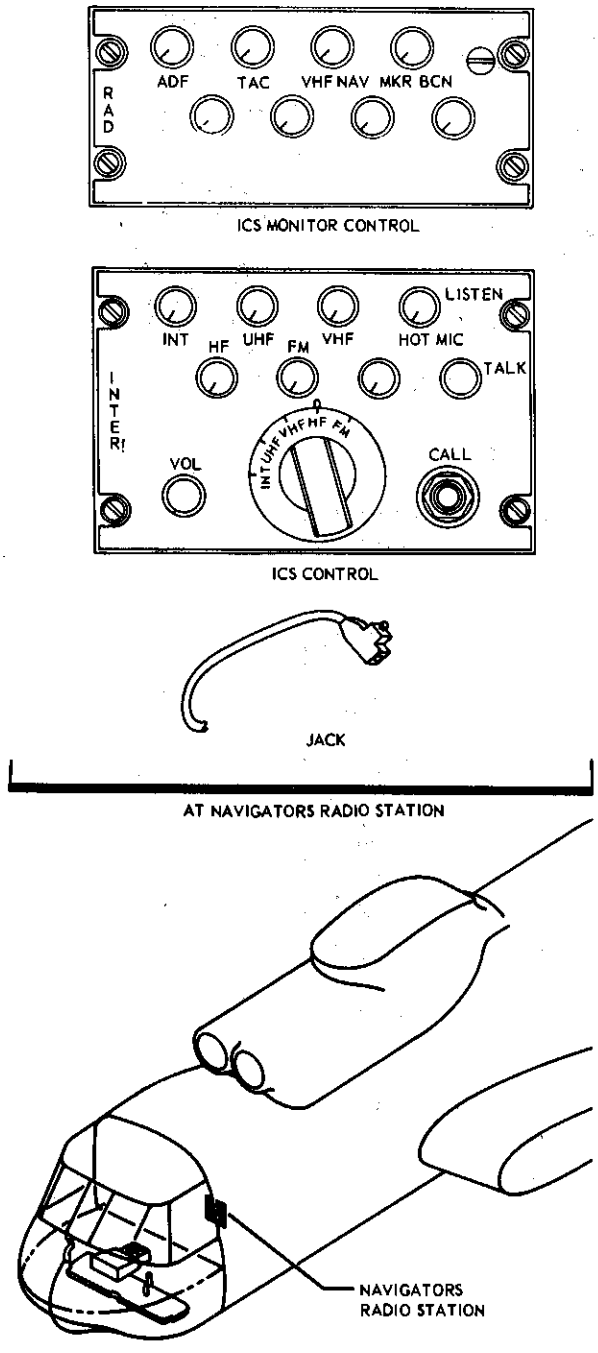



**Figure 4-24. ICS System Navigator AN/AIC-18**

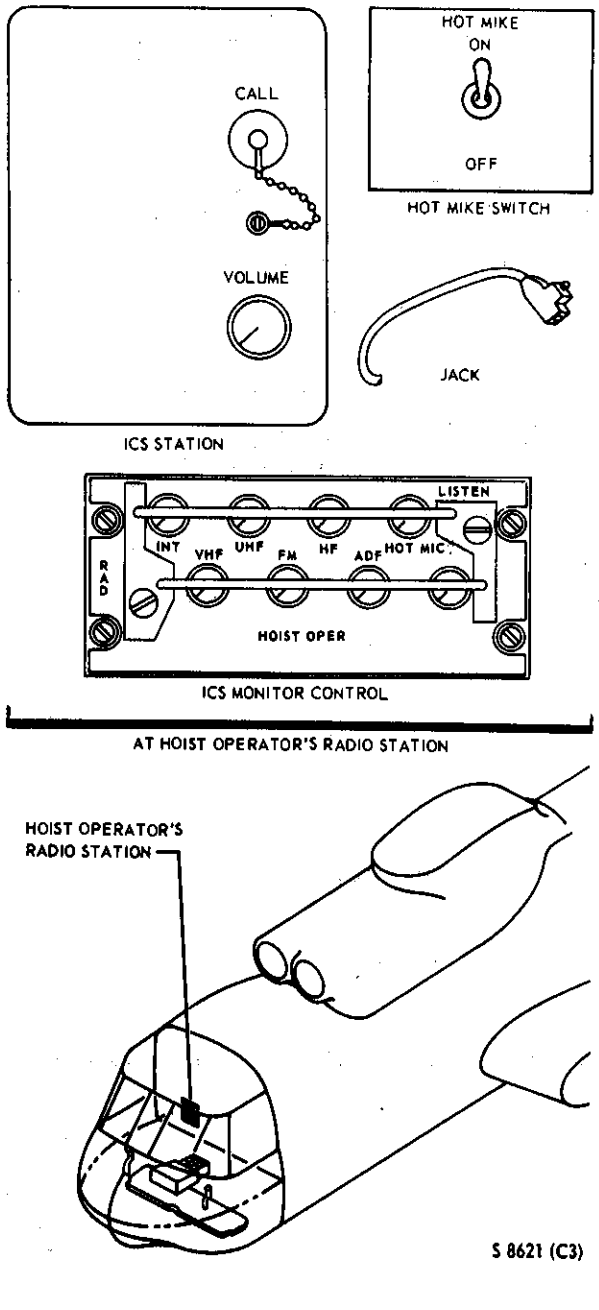


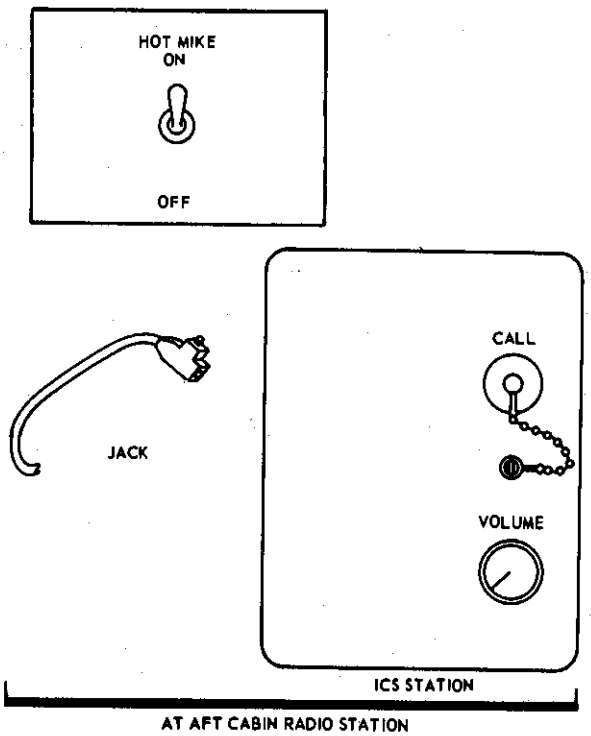

**Figure 4-25. ICS System Hoist Operator AN/AIC-18**

### ICS Station

The ICS station is a bulkhead-mounted assembly with two controls mounted on the front panel. The VOLUME control adjusts the signal level to the headphones. The CALL button, which has a cap guard and chain, provides for emergency call operation on the interphone line. A plug connector and associated cable is used to connect the headset-microphone to the ICS station. The plug connector is a telephone jack with a push-to-talk switch and clip.

### ICS Monitor Control

The monitor panel, marked RAD, is a panel-mounted assembly with eight combination monitor selector/volume controls. At the pilot's, copilot's, and navigator's consoles, only four are used and they are marked



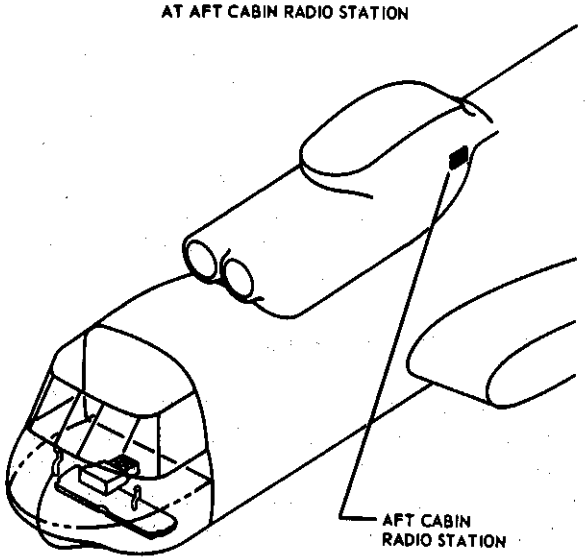
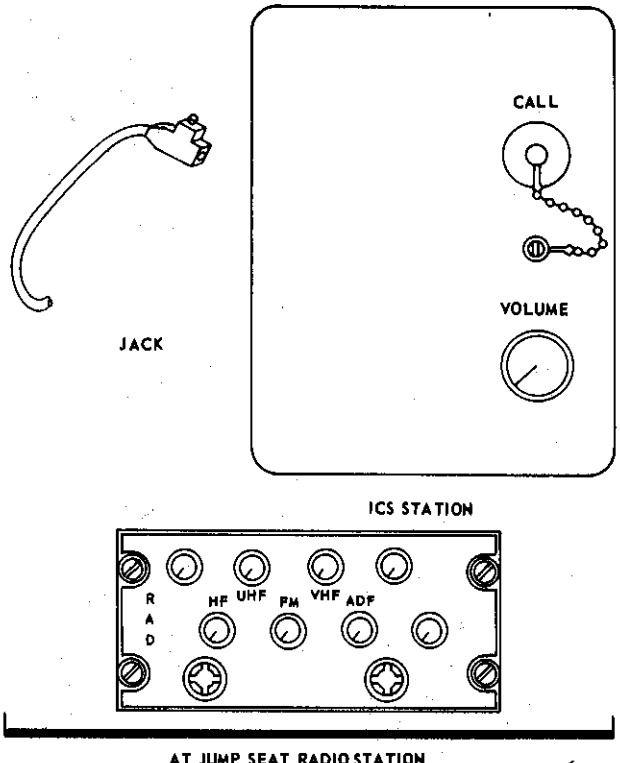




**Figure 4-26. ICS System Aft Cabin Station AN/AIC-18**



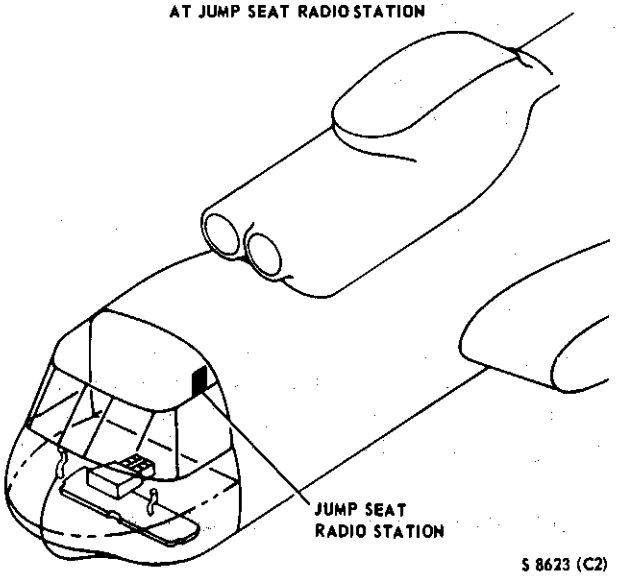




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**Figure 4-27. ICS System Jump Seat AN/AIC-18**

ADF, TAC, VHF NAV, and MKR BCN. These monitor switch-volume controls permit monitoring of navigational systems which have output signals in the audio range. The hoist operator's console is equipped with monitor panel, marked RAD and HOIST OPERATOR, and seven of the eight monitor selector/volume controls are used. They are marked INT, UHF, HF, HOT MIC LISTEN, VHF, FM, and ADF. These controls permit monitoring and individual listening level adjustment. The jump seat position is equipped with a monitor panel, with five monitor selector/volume controls. They are marked VHF, HF, FM, UHF, and ADF.

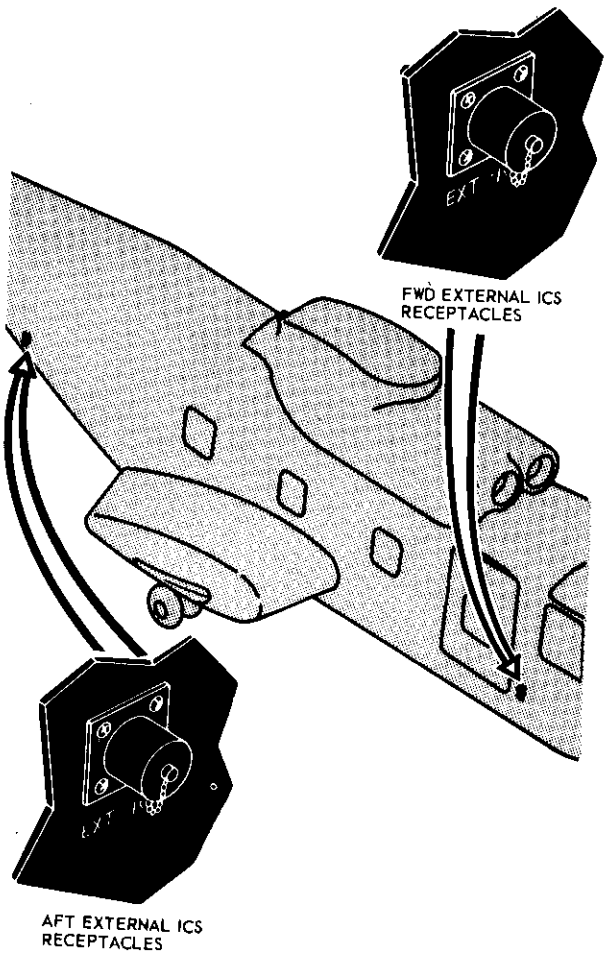



**Figure 4-28. ICS External Stations AN/AIC-18**

### HOT MIKE Switch

The hoist operator and aft cabin stations are equipped with a two-position HOT MIKE switch with the marked positions ON and OFF. These switches permit hands-free intercommunication.

### UFH/COMM RADIO SET AN/ARC-51A

The UHF/COMM system AN/ARC-51A is composed of a receiver-transmitter, and a control panel. The set provides two-way voice communication between land based, seaborne or airborne stations. This can be accomplished on any one of 20 preset frequencies, or by manually selecting any one of 3500 channels spaced at 50 kHz intervals within the equipment's frequency range of 225.0 through 399.95 MHz. The radio set includes a guard receiver which permits continuous monitoring of the guard frequency at the same time the main transmitter receiver is tuned to a tactical frequency. In addition, the radio set provides automatic direction finding (ADF) in conjunction with the

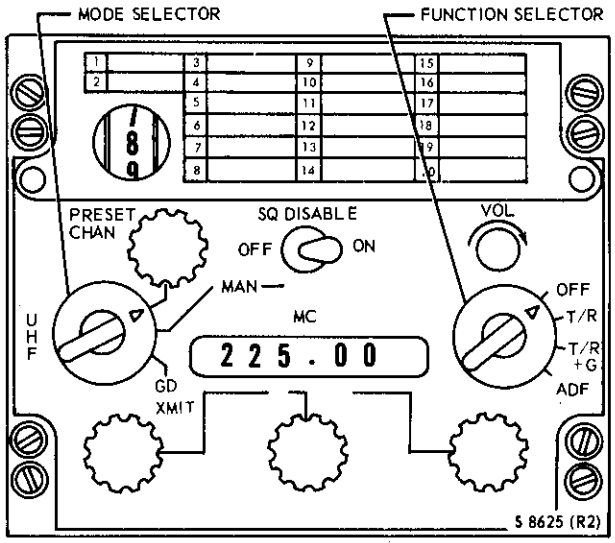



**Figure 4-29. UHF/COMM Radio AN/ARC-51A**

direction finding group AN/ARA-25. Magnetic bearing will be displayed by the NO. 1 pointer on both RMI's. The UHF/COMM system is equipped with two antennas. The antenna normally used is located above the cockpit and the alternate antenna is located aft on the bottom of the pylon. The alternate antenna is used to eliminate UHF transmission and reception dead spots. The AN/ARC-51A UHF radio set is powered from the No. 2 ac primary bus and the dc primary bus. The circuits are protected by circuit breakers on the pilot's circuit breaker panel. The ac circuit breaker is marked UHF, under the general heading NO. 2 AC PRI. The dc circuit breaker is marked UHF, under the general headings DC and PRI.

### UHF/COMM Control Panel

The operating controls located on the AN/ARC-51A radio control panel (figure 4-29) are the function selector, the mode selector, the preset channel control, the preset channel indicator, the frequency selectors, the frequency display window, the volume control, and the squelch disable switch.

**Function Selector** The function selector has four positions. In the OFF position, all power is removed from the equipment. The T/R position energizes the receiver-transmitter, and the T/R + G energizes the receiver-transmitter and guard receiver. In the ADF position, the AN/ARA-25 is energized to provide automatic direction finding operation.

**Mode Selector** The mode selector has three positions. The PRESET CHAN position permits selection of one of 20 preset channels by means of a preset

channel control. In the MAN position, 3500 frequency channels may be selected by use of the manual frequency selectors. The GD XMIT position selects the preset guard frequency for the transmitter and receiver, with the function selector set at T/R. Setting the function selector to T/R + G, with the mode selector set at GD XMIT, turns the guard receiver on and places the transmitter, guard receiver, and main receiver on the guard frequency.

**Preset Channel Control** The preset channel control selects any one of the 20 preset channels. The preset channel indicator displays the preset channel.

**Frequency Selectors** Frequency selectors provide manual frequency selection when the mode selector is set at MAN.

**VOL Control** The VOL control adjusts the audio level of the receiver.

**SQ DISABLE Switch** The SQ DISABLE switch has two positions. In the ON position, the receiver squelch is disabled. In the OFF position, the receiver squelch circuit is unaffected.

**Antenna Selector Switch** The antenna selector switch, marked FORWARD and AFT, is on the UHF ANTENNA switch panel (figure 4-30) located on the center console.

### UHF/COMM Operation

To turn set on:

1. Function Switch (UHF/COMM Control Panel) - AS REQUIRED.

2. Antenna Switch (UHF ANTENNA Switch Panel) - AS REQUIRED.

3. ICS Monitor Selector/Volume Control - UHF.

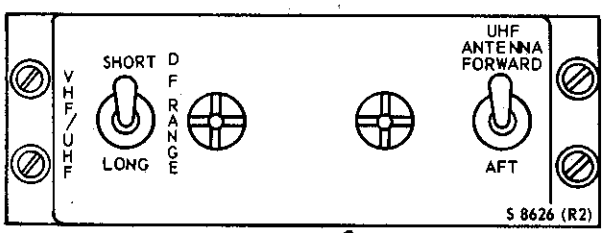
4. ICS Transmit Selector Switch - UHF.

5. Squelch Disable Switch - OFF.

6. Volume Control Knob (UHF/COMM Control Panel) - AS REQUIRED.

7. Mode Selector (UHF/COMM Control Panel) - AS REQUIRED.

8. Preset Channel Control (UHF/COMM Control Panel) - AS REQUIRED.




SEE 05-30

**Figure 4-30. UHF Switch Panel**

9. To transmit from the pilot's position - DEPRESS THE MICROPHONE TRIGGER SWITCH ON THE CYCLIC STICK GRIP TO THE RADIO POSITION, AND SPEAK INTO THE MICROPHONE.

10. To transmit from the copilot's position - DEPRESS THE MICROPHONE TRIGGER SWITCH ON THE CYCLIC STICK GRIP OR PLACE THE COPILOT'S REMOTE ICS SWITCH TO THE RADIO POSITION AND SPEAK INTO THE MICROPHONE.

To secure set:

1. Function Switch (UHF/COMM Control Panel) - OFF.

SEE 05-30

## VHF-FM/COMM RADIO SET AN/ARC-160

The VHF-FM COMM System AN/ARC-160 (figure 4-31) is composed of a receiver-transmitter and a control panel. The set provides two-way voice communications between land based, seaborne or airborne stations. This may be accomplished on any one of 4800 manually selected channels spaced at 5 kHz increments in the 150.000 to 173.995 MHz frequency range. The radio set includes a guard receiver which permits continuous monitoring of 156.800 MHz at the same time the main transmitter-receiver is tuned to an operating frequency. The set is used in conjunction with the AN/ARA-25 Homer. It is powered by the DC Primary Bus and is protected by a circuit breaker marked FM on the pilot's overhead circuit breaker panel under the general headings DC, PRI, and VHF.

### VHF-FM/COMM Control Panel

The VHF-FM/COMM control panel, located on the center console (FO-9), marked VHF-FM, contains a 100 MHz indicator, frequency selection indicator switches, a receiver test switch, a high-low power switch, a function selector switch, a half duplex switch, a squelch control, and a volume control.

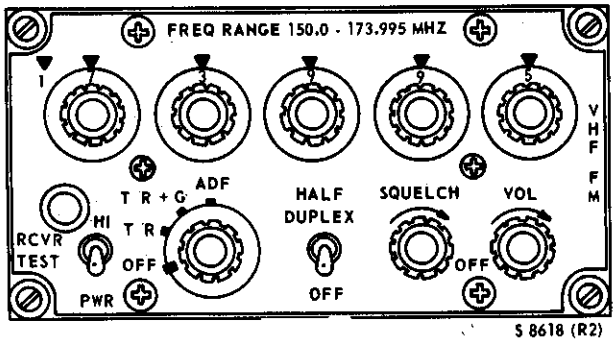



**Figure 4-31. VHF/FM/COMM/ADF Radio AN/ARC-160**

**Frequency Selection Indicator Switches** Five rotary frequency selector indicator switches allow manual tuning of the radio set.

**NOTE**

Do not change the frequency indicator selector switch while keying the transmitter, as damage to the radio set may occur.

**NOTE**

Reception on the guard channel (156.8 MHz) is not affected by the settings of the frequency selection indicator switches unless 156.8 MHz is selected. However, if guard channel signals are heard while receiving signals on a main receiver communication channel, detune the main receiver by rotating the frequency selection indicator switches to an open channel. This will permit only the priority guard channel signal to be monitored. If 156.8 MHz is selected on the frequency selection indicators and T/R + G on the function switch, the main and guard receivers may interfere with each other and cause reception difficulties. Place the function switch in T/R if transmitting on 156.8 MHz.

**Receiver Test Switch** A momentary pushbutton receiver test switch, marked RCVR TEST provides an audible indication of proper receiver performance. With the function selector switch in T/R or TR+G, depressing the switch causes an 800 kHz tone to be heard in the receiver.

**High - Low Power Switch** A high-low power toggle switch, marked HI LO PWR, selects 5-watt(HI) or 1-watt(LO) power output.

**Function Selector Switch** The function selector switch has four positions. In the OFF position power is removed from the set. The T/R position energizes the receiver-transmitter to the manually selected frequency. The T/R+G position energizes the receiver-transmitter and the 156.800 guard receiver. The ADF position is utilized when a VHF-FM frequency is selected for homing with the broadband homing system. When homing, place squelch control in the full clockwise position for maximum signal homing sensitivity.

**CAUTION**

Do not key the transmitter when the control unit function selector switch is in the ADF position. Damage to the AN/ARA-25 will result.

**Half Duplex Switch** The two position half duplex switch, marked HALF DUPLEX-OFF, provides simplex or duplex operation. In the OFF position, simplex operation is permitted. The HALF DUPLEX position permits half duplex operation in the 156.000 to 157.995 MHz marine band. When the transmitter is tuned to one of these frequencies the receiver frequency is offset 4.6 MHz above the selected frequency (160.600 to 162.595 MHz).

**SQUELCH Control** The SQUELCH control eliminates background noise. The receiver is unsquelched with the knob in the fully clockwise position.

**Volume Control** The volume control knob, marked VOL, adjusts to audio output level of the set.

**VHF-FM/COMM Operation**

To Turn Set ON.

1. Function selector switch (VHF-FM/COMM control panel) - AS REQUIRED

2. ICS receiver select switch - FM - ON.

3. ICS transmit select switch - FM.

4. Frequency Selector switches (VHF-FM/COMM control panel) - AS REQUIRED.

5. HI LOW PWR switch (VHF-FM/COMM control panel) - AS REQUIRED.

6. VOL control knob (VHF-FM/COMM control panel) - AS DESIRED.

7. Squelch control knob (VHF-FM/COMM control panel) - AS REQUIRED.

8. HALF DUPLEX switch (VHF-FM/COMM control panel) - AS REQUIRED.

9. RCVR TEST switch (VHF-FM/COMM control panel) - PRESS TO TEST AS DESIRED.

10. To transmit from the pilot's position - DEPRESS THE MICROPHONE TRIGGER SWITCH ON THE CYCLIC STICK GRIP TO THE RADIO POSITION.

11. To transmit from the copilot's position - DEPRESS THE MICROPHONE TRIGGER SWITCH ON THE CYCLIC STICK GRIP OR PLACE THE COPILOT'S REMOTE ICS SWITCH TO THE RADIO POSITION AND SPEAK INTO THE MICROPHONE.

SEE 05-30

**VHF/COMM RADIO SET AN/ARC-84**

The VHF/COMM system AN/ARC-84 is composed of a receiver, a transmitter, and a control panel. The set provides two-way voice communication between land based, sea born and airborne stations. The transmitter and receiver are designed to operate on crystal controlled channels spaced 50 kHZ apart. The range of the transmitter is 118.0 through 135.95 MHz, and the range of receiver is 108.0 through 135.95 MHz. In addition, the receiver is designed to operate in conjunction with the ARA-25 direction finder group to allow VHF/ADF homing. Magnetic bearing will be displayed by the No. 1 pointer of both RMIs. The VHF receiver and transmitter are powered by the dc primary bus. The receiver and transmitter are protected by circuit breakers, marked RCVR and XMTR respectively, located on the pilot's circuit breaker panel under the general headings DC, PRI, and VHF.

**VHF/COMM Control Panel**

The operating controls are provided by a control panel (figure 4-32), marked COMM, located on the cockpit center console. The panel consists of two frequency selectors, the frequency display window, the off-on/volume control, a squelch control, a momentary VHF-ADF homing select switch, a VOR momentary check switch, and a mode selector switch.

**Frequency Selectors** The frequency selectors mechanically select and display frequencies spaced 50 kHz apart over the 108.00 through 135.95 MHz range.

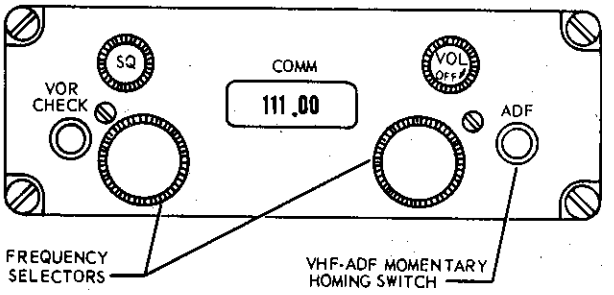



**Figure 4-32. VHF/COMM Radio AN/ARC-84**

**VOL OFF Switch** The VOL OFF switch provides power control to the radio and volume control of the audio level.

**SQ Control** The SQ control eliminates background noise.

**ADF Switch** The momentary ADF homing select switch displays magnetic bearing with the NO. 1 pointer of each RMI, as long as the switch is held down.

**VOR Check Switch** The VOR momentary check switch is inoperative on the VHF/COMM control panel.

**VHF/COMM Operation**

To turn set on:

1. VOL OFF Switch ( VHF/COMM Selector Panel) - ON.

2. ICS Monitor Selector/Volume Control - VHF.

3. ICS Transmit Select Switch VHF.

4. Frequency Selectors (VHF/COMM Control Panel) - AS REQUIRED.

5. SQ Control (VHF/COMM Control Panel) - AS REQUIRED.

6. To transmit from the pilot's position - DEPRESS THE MICROPHONE TRIGGER SWITCH ON THE CYCLIC STICK GRIP TO THE RADIO POSITION, AND SPEAK INTO THE MICROPHONE.

7. To transmit from the copilots position - DEPRESS THE MICROPHONE TRIGGER SWITCH ON THE CYCLIC STICK GRIP OR PLACE THE COPILOT'S REMOTE ICS SWITCH TO THE RADIO POSITION AND SPEAK INTO THE MICROPHONE.

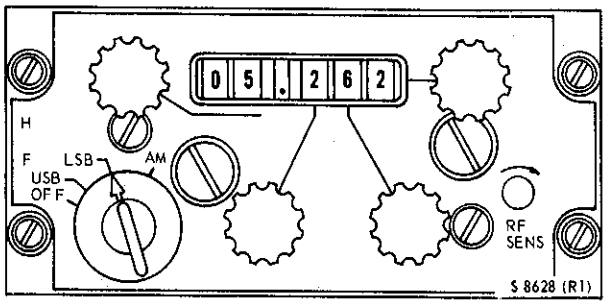



**Figure 4-33. HF/COMM Radio AN/ARC-94**

To secure set:

1. VOL OFF Switch (VHF/COMM Control Panel) - OFF.

### HF/COMM RADIO SET AN/ARC-94

The HF/COMM system AN/ARC-94 consisting of a receiver-transmitter, two control panels, an antenna, a coupler and a coupler blower provides two-way voice communication between land based, seaborne and airborne stations. The operating frequency range is from 2.0 to 29.999 MHz, divided into 28000 discrete channels in one kHz increments. The HF/COMM system receives and transmits on either single sideband (USB or LSB) or amplitude modulated equivalent (AM). The receiver transmitter and the coupler blower are both powered by the No. 2 ac primary bus. The radio set uses 400 Hz three phase 115 volt ac, and the coupler blower uses 400 Hz single phase 115 volt ac power. Each unit is protected by a circuit breaker, on the pilot's circuit breaker panel, under the general heading NO. 2 AC PRI. The receiver and transmitter circuit breaker is marked HF and the coupler blower circuit breaker is marked HF COUPLER BLOW $\phi$B. The control circuit illuminates the radio navigators HF control light and is powered by the dc primary bus. This circuit is protected by a circuit breaker on pilot's circuit breaker panel, under the general heading DC PRI, and is marked HF.

### HF/COMM Operating Controls

The system is remotely controlled by either one of two control panels (figure 4-33) marked HF. One control panel is located on the copilot's console and the other on the navigator's console. In addition, the copilot's console contains an HF/COMM switch panel (figure 4-34), with marked positions RADIO NAV and CO-PILOT. This switch permits the copilot to transfer control to or remove control from the navigator's control panel. The COPILOT position gives control of the set to the copilot and the RADIO NAV position


**Figure 4-34. HF/COMM Switch Panel**

gives control of the set to the navigator. An advisory light (figure 4-35), marked HF CTR, is illuminated on the navigator's console above the HF COMM control panel when the navigator has control. Both HF control panels contain a mode selector, four frequency selector knobs and associated display window, and a volume control knob.

**Mode Selector** The mode selector has four marked positions. The OFF position removes aircraft power from the set. The USB position selects single sideband upper and the LSB position selects single sideband lower. The AM position provides amplitude modulation operation of the radio.

**Frequency Control** The control panels each have a frequency display window that reads in megahertz and four frequency selector knobs to select operating frequencies.

**Volume Control** A volume control knob marked RF SENS adjusts the receiver sensitivity of the receiver-transmitter.

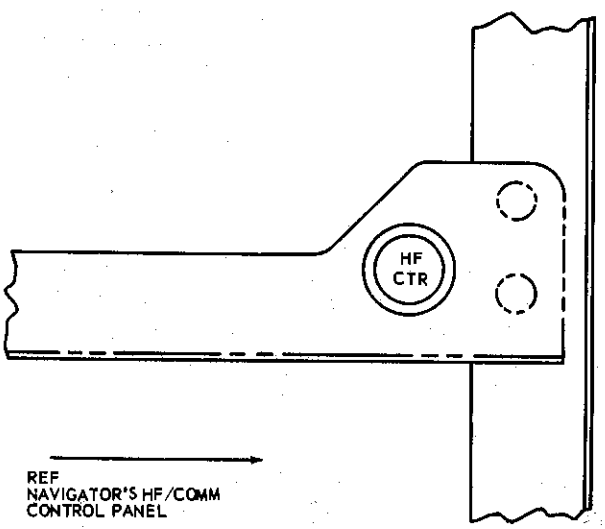



**Figure 4-35. HF/COMM Control Advisory Light**

**WARNING**

During ground operation of the AN/ARC-94, ensure that personnel are clear of the antenna. Serious burns may result if bodily contact is made with the antenna during ground operation.

**WARNING**

Do not transmit in 3.0 to 3.6 MHz range during doppler or coupler hover operation. Transmission in this range will result in erratic aircraft attitude.

### HF/COMM Radio Set AN/ARC-94 Operation

To put the equipment into operation:

1. HF/COMM Control Selector Switch (HF/COMM Switch Panel) - AS REQUIRED.

2. Mode Selector (HF/COMM Control Panel) - AS REQUIRED.

3. ICS Monitor Selector/Volume Control- HF.

4. ICS Transmit Selector Switch- HF.

5. Frequency Selector (HF/COMM Control Panel) - AS REQUIRED.

**NOTE**

While set is channeling no background noise will be heard in the headset. The channeling cycle is complete when background noise is heard.

6. Microphone Switch - DEPRESS MOMENTARILY.

**NOTE**

When microphone switch is depressed, a one kHz tone will be heard in the headset. When the tone disappears antenna loading is complete and the set is ready for operation.

NEW 7. To transmit from the pilot's position - DEPRESS THE MICROPHONE TRIGGER SWITCH ON THE CYCLIC STICK GRIP TO THE RADIO POSITION AND SPEAK INTO THE MICROPHONE.

8. To transmit from the copilot's position - DEPRESS THE MICROPHONE TRIGGER SWITCH ON THE CYCLIC STICK GRIP OR PLACE THE COPILOT'S REMOTE ICS SWITCH TO THE RADIO POSITION AND SPEAK INTO THE MICROPHONE. NEW

To secure equipment:

1. Function Selector Switch (HF/COMM Control Panels) - OFF.

### AIMS/IFF TRANSPONDER AN/APX-72

The AN/APX-72 AIMS/IFF transponder is composed of a receiver- transmitter, a transponder set control, a transponder in-flight test set, an altimeter encoder and an antenna. The transponder provides IFF identification in response to coded interrogations from ground, seaborne, or airborne stations. In addition, the signals returned from the IFF transponder can be used by the interrogating station to determine range and azimuth information. The IFF transponder is powered by the dc primary bus and the NO. 2 ac primary bus. These circuits are protected by circuit breakers on the pilot's circuit breaker panel. There are two dc circuit breakers, marked PWR and TEST under the general headings DC, PRI, and IFF. The ac circuit breaker is marked IFF $\phi$A, under the general heading NO. 2 AC PRI. NEW

### AIMS/IFF Transponder Control Panel

The transponder control panel (figure 4-36), marked IFF, is located on the cockpit console.

**MASTER Switch** The MASTER switch selects five conditions of operation. In OFF, power is not applied to the set components. In STBY (standby), power is applied to components, the transponder is warmed up ready to respond, but no signals will be transmitted. In LOW, receiver sensitivity is reduced by a preset amount such that only higher energy signals will trigger the transponder. In NORM, the transponder will operate at normal sensitivity and respond to interrogations in accordance with setting of other controls. In EMER (emergency), emergency signal responses will be transmitted in modes 1, 2, or 3/A regardless of the settings of the mode control toggle switches. A detent prevents accidental selection of the EMER position. To bypass the detent, raise the center cap on the switch.

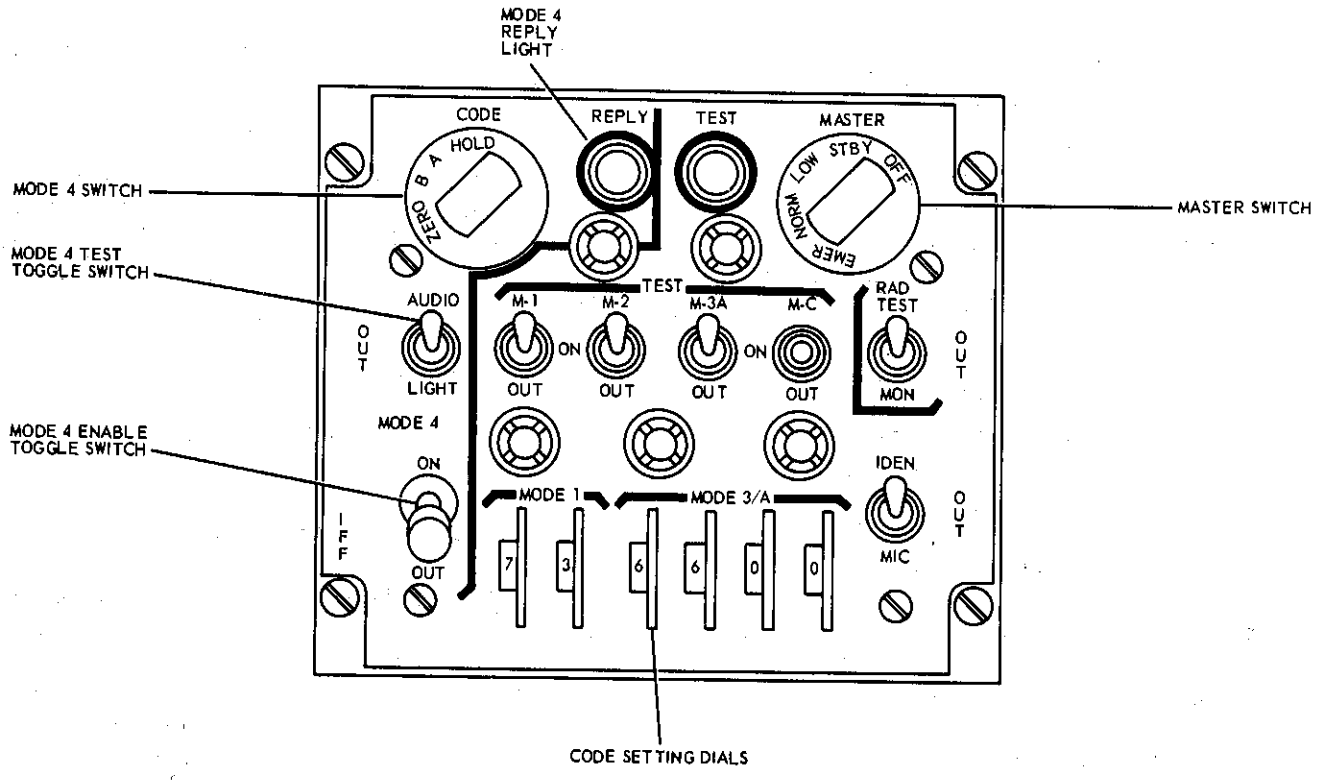



**Figure 4-36. AIMS/IFF Transponder AN/APX-72**

**Mode Enable Toggle Switches** Four toggle switches marked M-1, M-2, M-3/A, and M-C have three marked positions OUT, ON, and TEST. The OUT (down) position prevents responses in each mode. The ON (center) position permits responses in each mode. The TEST (up) position will illuminate the TEST light, in the upper section of the control box, if the transponder is replying. Mode C, when ON, operates in conjunction with the pilot's AAU-21/A or AAU-32/A pressure altimeter-encoder to automatically provide encoded pressure altitude information from the helicopter to interrogating ground stations with Mode C decoding capability. Mode C operates independently of the other modes selected.

**Code Setting Dials** Make desired Mode 1 settings on the two numeral wheels marked Mode 1. MODE 1 selects a desired code from 00 through 73. MODE 2 settings must be made on the transponder's front panel marked MODE 2. Four numeral windows display the selected codes. MODE 2 selects a desired code from 0000 through 7777.

**NOTE**

The transponder is located in the electronics compartment, therefore, MODE 2 settings must be made before flight.

Mode 3/A settings must be made on the four numeral wheels marked MODE 3/A. MODE 3/A selects a desired code from 0000 through 7777. On the right side of each numeral, in the windows along the lower edge of the control box, is a protruding blunted spike. Light finger pressure on the spikes, either up or down, will rotate the numeral wheels.

**Mode 4 Controls** The mode four controls contained on the left side of the panel are inoperative in this installation.

**Identification Position (IDENT) Toggle Switch** At the lower right of the control unit is a three-position toggle switch with the marked positions IDENT, OUT and MIC. To provide approximately 20 seconds of IDENT signals on modes 1, 2, or 3/A, press this toggle switch momentarily upward to the IDENT position. A spring-load will return the switch to OUT or center position. To provide approximately 20 seconds of IDENT signals on those modes each time the UHF radio is keyed, set the toggle switch to MIC.

**RAD Test-Out-Mon Switch** This switch is on the right center of the control unit. The RAD TEST position is used for maintenance test only. OFF disables the switch and MON enables monitoring of the transponder replies to external interrogations. The TEST light will illuminate if the transponder is replying.