# 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 the cargo sling, hoist, communication and navigation equipment.

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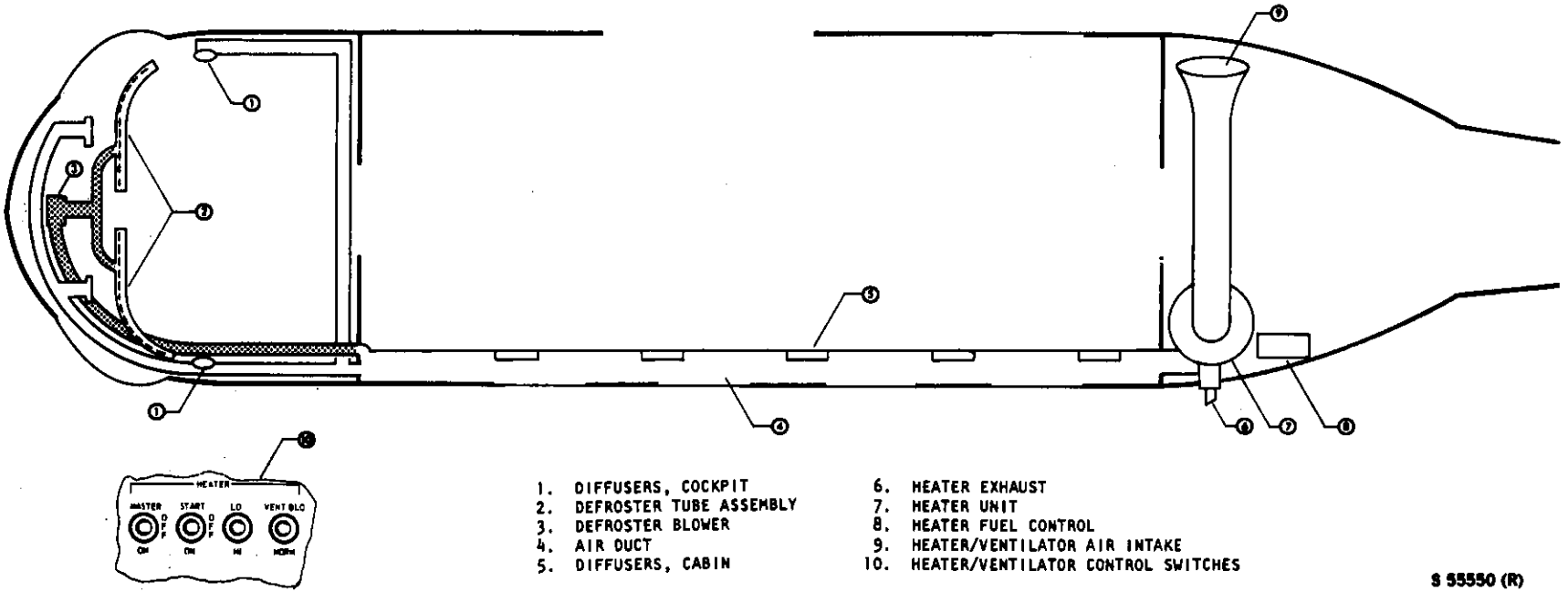
## HEATING SYSTEM

The heating system (figure 4-1) heats outside air and distributes it to the cabin and cockpit for crew comfort. It also provides heated air for windshield defrosting (Refer to WINDSHIELD DEFROSTER SYSTEM in this section) and can be used to circulate unheated air for ventilation (Refer to VENTILATING SYSTEM in this section.) The system consists of a heater unit, a heater blower, air ducts and diffusers, a caution panel light and control switches. A choice of two heat ranges is available. A caution light warns of heater unit overheat and as a further safety measure, the heater will not start unless the blower is providing sufficient airflow for proper combustion. Heater operation is continuous and automatic, after starting, until turned off. The heating system is actuated by a master switch, a heater start switch, and a high-low cycling switch, on the overhead switch console (figure FO-2). The heating system operates on direct current from the essential bus and is protected by circuit breakers, marked VENT RELAY, and CONT, under the general heading CAB HTR, on the forward circuit breaker panel.




1. DIFFUSERS, COCKPIT
2. DEFROSTER TUBE ASSEMBLY
3. DEFROSTER BLOWER
4. AIR DUCT
5. DIFFUSERS, CABIN
6. HEATER EXHAUST
7. HEATER UNIT
8. HEATER FUEL CONTROL
9. HEATER/VENTILATOR AIR INTAKE
10. HEATER/VENTILATOR CONTROL SWITCHES

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**Figure 4-1. Heating, Ventilating, and Defroster Systems**

### HEATER UNIT

The heater unit, in the transition section, is the internal combustion type rated at 50,000 BTU's. It operates on fuel pumped from the forward tank and consumes a maximum of 5 pounds per hour.

### HEATER BLOWER

The heater blower draws air into the system through an outside intake vent, on the upper right side of the fuselage, and forces it through a heat exchanger unit surrounding the combustion heater unit where it is heated. The heated air is then forced through a plenum chamber in the ducting.

### AIR DUCTS

The air duct passing through the cabin has five adjustable diffusers for cabin heating. In the pilots' compartment the air duct divides into three smaller ducts: one duct mounts an adjustable diffuser just above the floor to the right of the pilot and a fixed diffuser by the pilot's pedals, one duct mounts an adjustable diffuser just above the floor to the left of the copilot and a fixed diffuser by the copilot's pedals, and one duct leads to the windshield defroster diffusers.

### HEATER CONTROL SWITCHES

#### Master

The heater switch, marked MASTER, with positions, ON and OFF, is on the overhead switch panel under the general heading HEATER. The heater master switch must be in the ON position before the START switch can be energized. When the heater master switch is placed in the ON position, the HEATER HOT caution light will go on and remain on until the heater is started. Heater operation is stopped by placing the MASTER switch in the OFF position.

#### Start

The heater start switch, marked START, with marked position, ON and OFF, is on the overhead switch panel under the general heading HEATER. The start switch is of the momentary type, spring-loaded to the OFF position. Prior to actuating the START switch, the heater master switch is placed in the ON position and the heater blower switch is placed in the NORM position. Holding the START switch momentarily in the ON position will start the heater when the heater blower develops sufficient air pressure to close the ram air switch. This in turn energizes the master fuel valve, ignition unit, fuel pump and cycle valve starting the heater.

#### Blower

The heater blower switch with marked positions VENT BLO and NORM, under the heading HEATER, is on the overhead switch panel. The VENT BLO position is used to operate the heater blower for ventilation. The heater MASTER switch does not have to be ON to use the VENT BLO position. The NORM position causes the heater blower to function automatically during heater operation. The blower motor is powered by the dc essential bus through a circuit breaker, marked VENT BLO, on the air circuit breaker panel.

#### High-Low Cycling

The high-low cycling switch, with marked positions LO and HI, under the general heading HEATER, is on the overhead switch panel. When the cycling switch is in the LO position, the heater automatically maintains a temperature of 65.5°C (150°F) in the ducts. In the HI position the heater automatically maintains a temperature of 140.6°C (285°F) in the ducts.

### CAUTION LIGHT

A caution light marked HEATER HOT, on the caution-advisory panel (figure 1-27) goes on when the MASTER switch is placed in the ON position and remains on until the heater START switch is activated. The caution light also goes on during heater operation if heater unit temperature reaches 176.7°C (350°F). Insufficient air pressure for proper combustion will also cause the HEATER HOT caution light to go on.

**NOTE**

If HEATER HOT caution light goes on, do not restart heater until cause of overheat has been determined.

## WINDSHIELD DEFROSTER SYSTEM

The windshield defroster (figure 4-1) system consists of a defroster blower, ducts and diffusers, and a switch marked WSHLD DEFROST with two marked positions ON and OFF. The windshield defroster switch controls a blower motor, in the main duct of the windshield defroster. When the windshield defroster switch is placed in the ON position and the heater is operating, the blower motor provides a rapid flow of heated air

against the windshield. The blower may also be utilized for defogging the windshield without turning the heater on. The defroster blower motor operates on direct current from the dc essential bus, and is protected by a circuit breaker, marked DEFROST BLO MOTOR, on forward circuit breaker panel. Maximum heated defrost air is obtained by operating the heater, closing all of the adjustable diffusers in the cabin and cockpit and positioning the WSHLD DEFROST switch to the ON position. Maximum unheated air for defogging is obtained by closing all of the adjustable diffusers with the heater off, heater blower switch in the VENT BLO position and the WSHLD DEFROST switch in the ON position.

## VENTILATING SYSTEM

The ventilating system (figure 4-1) utilizes the heater blower, ducts and diffusers to draw air from outside and circulate it throughout the helicopter. The ventilating system may also be used as an aid to dissipate smoke or fumes from the helicopter interior.

Ventilation is accomplished by actuating the heater blower switch marked VENT BLO and NORM under the general heading HEATER, on the overhead switch panel. Placing the blower switch in the VENT BLO position turns the blower on, which forces air through the heater and windshield defroster ducts.

## ENGINE ANTI-ICE SYSTEMS

There are two separate anti-ice systems which are actuated by a single switch on the pilot's overhead switch panel. These two systems are the Engine IGV Anti-Ice System and the Engine Inlet Duct Anti-Ice System. These systems should be turned on when outside air temperature is 10°C (50°F) or below.

### ENGINE IGV ANTI-ICE SYSTEM

The engine IGV anti-ice system prevents the formation of ice on the compressor front frame, the starter cover at the front of the engine and the inlet guide vanes. Viewing from the rear of the engine, hot air is supplied from the tenth stage of the compressor, when the system is on, to heat the 12 o'clock and the 3 o'clock struts of the front frame, the starter bullet nose cover, and the inlet guide vanes. The 9 o'clock and 6 o'clock struts are continuously heated and require no separate anti-icing. The 6 o'clock strut is heated by oil from the compressor rotor front bearing while the 9 o'clock strut is heated by balance chamber air. The anti-icing of the 12 o'clock strut, 3 o'clock strut, front frame of the engine and the starter fairing commences whenever the ANTI-ICE switch on the pilot's overhead panel is placed in the ON position. The system is comprised of the anti-ice switch, compressor bleed air solenoid valve and an advisory light on the caution-advisory panel (figure 1-27). The engine anti-icing system operates on current from the dc essential bus, and is protected by a circuit breaker, marked IGV, under the general heading ANTI-ICE, on the forward circuit breaker panel.

**NOTE**

Continued operations at ground idle under known icing conditions should be avoided because there is insufficient compressor bleed available to maintain the engine components at the desired anti-icing temperatures.

#### Engine Anti-Ice Switch

The engine anti-ice switch, marked ENG ANTI-ICE with marked positions, TEST, OFF, and ON, on the overhead switch panel (figure FO-2), controls engine anti-icing in the OFF and ON positions. The ON position functions to de-energize the solenoid valve allowing it to open and admit hot de-icing air to the engine. The TEST position is used only to check the engine inlet anti-ice controller.

#### Solenoid Valve

Compressor bleed air is controlled by a solenoid valve which is held closed, against spring tension, when energized. When the ENG ANTI-ICE switch is placed in the ON position, the solenoid is de-energized and the valve is opened by spring force. If an electrical power failure occurs which de-energizes the solenoid valve, it will open and provide continuous anti-icing to the engine.

#### Advisory Light

An advisory light, marked ENG IGV ANTI-ICE, on the caution-advisory panel (figure 1-27), goes on when the solenoid valve is de-energized. Therefore, the ENG IGV ANTI-ICE advisory light will go on when the ENG ANTI-ICE switch is placed in the ON position. Lighting of the advisory light when the ENG ANTI-ICE switch is in the OFF position indicates loss of electrical power at the solenoid valve, causing continuous anti-icing of the engine components. The

engine anti-icing system advisory light operates on current from dc essential bus and is protected by a circuit breaker, marked ANTI-ICE IGV, under the general heading ENGINE, on the forward circuit breaker panel.

### ENGINE INLET DUCT ANTI-ICE SYSTEM

The engine inlet duct anti-ice system prevents formation of ice on the engine air intake duct. This is accomplished by passing electrical current through heating elements embedded in the fiberglass duct. A temperature sensor, also embedded in the duct sends signals to the anti-ice controller. This controller automatically cycles electrical power to the heating elements to maintain the inlet duct in the desired temperature range, 48.9°C (120°F) to 54.4°C (130°F) when the system is turned on. The engine inlet duct anti-icing system is comprised of these components: the air inlet duct, the anti-icing controller, the caution panel light and the inlet duct anti-icing system switch.

#### Inlet Duct

The engine inlet duct (bellmouth) is made of laminated Fiberglass. Embedded between laminations are electrical heating elements and a temperature sensor that provides signals for the anti-ice controller. A thermal switch, normally closed below 4.1°C (40°F), is mounted externally on the inlet duct for actuation of the caution panel light. The heating elements receive electrical power from the ac essential bus through the ENG INLET ANTI-ICE circuit breaker on the aft circuit breaker panel.

#### Anti-Ice Controller

The engine inlet anti-ice transistorized controller is in the transition section of the helicopter. The temperature sensor embedded in the inlet duct senses temperature for the controller which automatically cycles current to the heating elements to maintian the duct temperature between 48.9°C (120°F) and 54.4°C (130°F). The automatic controller utilizes current from both the ac essential bus and current from the dc essential bus. The alternating current circuits of the automatic controller are protected by a circuit breaker, marked ANTI-ICE CONT, located on the forward circuit breaker panel. The direct current circuits of the automatic controller are protected by a circuit breaker, marked INLET, under the general heading ANTI-ICE, also on the forward circuit breaker panel.

#### Caution Light

The engine anti-icing system caution light, marked ENG INLET ANTI-ICE is on the caution-advisory panel (figure 1-27). The caution light, controlled by the duct-mounted thermal switch, goes on when the inlet duct temperature is 4.1°C or less whether the system is ON or OFF. With the ENG ANTI-ICE switch in the ON position, lighting of the caution light indicates that the inlet duct temperature has dropped to 4.1°C or less because of system malfunction or because system capability has been exceeded. With the ENG ANTI-ICE switch in the OFF position, lighting of the caution light at 4.1°C (40°F) or below reminds the pilot to turn the engine anti-icing system on. The engine inlet anti-icing system caution light operates on current from the dc essential bus and is protected by a circuit breaker, marked ANTI-ICING INLET, under the general heading ENGINE, on the forward circuit breaker panel.

#### Anti-Icing System Switch

The engine anti-ice switch, marked ENG ANTI-ICE, with marked positions TEST, OFF, and ON, is on the overhead switch panel (figure FO-2). It controls both the engine inlet duct anti-ice system, and the engine anti-ice system. (Refer to Engine ANTI-ICE, SYSTEM in this section.) When the engine anti-ice switch is placed in the ON position the anti-ice controller functions continuously and automatically to maintain the desired inlet duct temperature. The engine anti-ice switch, momentary in the TEST position, is used to check the functioning of the controller. When held in the TEST position, the ENG INLET ANTI-ICE caution light goes on, indicating that power is being cycled to the heating elements by the controller. When duct temperature reaches 54.4°C (130°F) the controller stops current flow to the heating elements and the caution light goes off. Continued cycling of the controller may be observed by holding the switch in the TEST position. During conditions of high ambient temperatures subsequent off cycles (caution light out) may be several minutes because of the slower cooling rate of the duct.

## COMMUNICATION/NAVIGATION SYSTEMS

Communication control panels (figure 4-2) in the cockpit are on the upper and lower consoles (figure FO-2). All panels may be operated by either pilot. In addition, two communication control panels are in

| Type | Designation | Function | Range | Location of Control |
|---|---|---|---|---|
| Interphone Communication system | AN/AIC-12 | Interphone and radio Communications | Internal | At the following stations; pilot, copilot, observer, and hoist operator. |
| UHF/COMM | AN/ARC-51A | Two way voice Communications | Line of sight | Cockpit lower console |
| VHF/COMM | AN/ARC-84 | Two-way voice Communications | Line of sight | Cockpit lower console |
| HF/COMM | AN/ARC-94 | Two-way voice Communications | Long range | Cockpit upper console |
| VHF-FM/COMM | AN/ARC-160 | Two-way voice Communications | Line of sight | Cockpit upper console |
| Transponder | AN/APX-99 | Identification Azimuth, and range | Line of sight | Cockpit lower console |
| Loud Hailer | N/A | Loudspeaker communications | 1/2 mile | Upper radio console |
| VHF/NAV | AN/ARN-123 | ILS and VOR navigation | Line of sight | Upper radio console |
| VHF/NAV | AN/ARN-87 | ILS and VOR navigation | Line of sight | Cockpit lower console |
| Glide slope | GSA-8A-1 | Glide slope receiver | Short range | Cockpit lower console and instrument panel |
| Marker beacon | MKA-23A | Marker beacon receiver | N/A | Instrument panel |
| TACAN | AN/ARN-52(v) | Tactical air navigation | Line of sight | Cockpit upper console |
| LF/ADP | AN/ARN-73 | Automatic direction finding | Long Range | Cockpit lower console |
| Radar Altimeter | AN/APN-171(v) | Measure absolute altitude | 5000 feet | Instrument panel |
| VHF/UHF Broad Band Homing System | DMSE-47-2 | Homing | Variable | Cockpit upper console |

**Figure 4-2. Avionics Equipment**

the cabin for the crewman, one above the cargo door, and one on the left side of the cabin. All radio equipment is installed on the integrated electronics rack, in the right forward area of the cabin, which is easily accessible in flight. The radio equipment utilizes both direct and alternating current. Master control for the radio equipment is provided by a radio master switch, on the overhead switch panel in the pilot's compartment (figure FO-2). Indicators, used in conjunction with the navigation sets, are on the instrument panel in front of the pilot and copilot (figure FO-1).

The antennas used for communications, navigations, transponder, and radar altimeters are on various sections of the aricraft (figure 4-18).

## ELECTRICAL POWER DISTRIBUTION

### Communication System DC Power

The helicopter's dc system supplies voltage from the helicopter's battery, transformer rectifier, or external power source through the start bus, through the essential bus relay to the dc essential bus. From the dc essential bus the dc voltage divides into two paths. The first path is through the RADIO MASTER POWER circuit breaker, on the circuit breaker panel (figure FO-3) behind the copilot's bulkhead, to the normally open contacts of the radio master relay. The second path from the dc essential bus is through the 5 ampere RADIO MASTER CONTROL circuit breaker, forward circuit breaker panel, to the RADIO MASTER switch. Placing the RADIO MASTER switch ON energizes the radio master relay, allowing dc voltage from the RADIO MASTER POWER circuit breaker to be supplied through closed contacts of the radio master relay to the dc radio bus, in the radio circuit breaker panel (figure FO-3). The dc voltage continues through the dc radio bus, and through individual circuit breakers to the specific system.

### Communication System AC Power

115 volt, 400 cycles per second, three-phase power is supplied from the helicopter's generators, or from an external power source through the ac essential bus, through three RADIO circuit breakers, on the forward circuit breaker panel, to the ac radio bus, on the radio circuit breaker panel. The ac voltage continues through the ac radio bus and through individual circuit breakers to the specified system.

### Navigation System DC Power

The dc power system for the Navigation equipment is the same system used to supply dc power to the Communication equipment.

### Navigation System AC Power

The ac power system for the Navigation equipment is the same system used to supply ac power to the Communication equipment. However, there is an additional source of ac power for the Navigation equipment.

A radio autotransformer converts 115 volts, phase-B, ac power, coming directly from the ac essential bus to 26 volts ac. The radio autotransformer is protected by a circuit breaker marked AUTO XMER on the forward circuit breaker panel. The 26 volts ac, passes through a circuit breaker labeled IND, on the radio circuit breaker panel, on its way to power the BDHI, RMI, COURSE INDICATORS, the VHF navigation system, the compass adapter, and the loop antenna.

**NOTE**

The course deviation indicators and glide slope indicators require dc power only in the ILS mode of operation.

### Radio Circuit Breaker Panel

The radio circuit breaker panel (figure FO-3) is on the forward end of the integrated electronics rack by the pilot's compartment access door. The direct current operating circuits, each protected by an appropriately marked circuit breaker, are connected to the helicopter's dc power supply system through the radio master switch. The ac operating circuits, each protected by an appropriately marked circuit breaker, are connected directly to the helicopter's ac power supply system. Both power sources must be operative for the communication and associated electronics equipment to be fully operative.

### Radio Master Switch

The switch (figure FO-2), marked RADIO MASTER, OFF and ON, on the overhead switch panel, controls the dc power supply to the radios. The radio master circuit is energized from the dc essential bus through

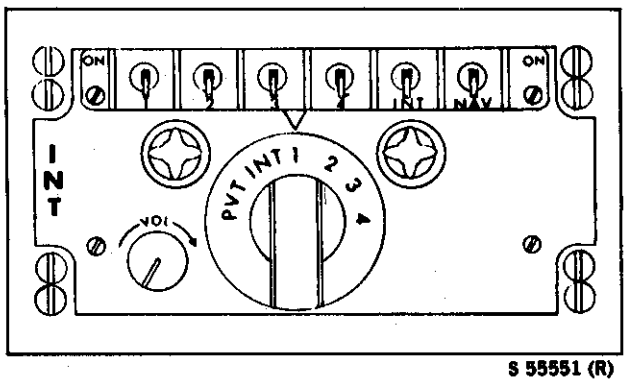


**Figure 4-3. ICS Control Panel**

two circuit breakers, marked PWR and CONT, under the general heading RADIO MASTER, located on the forward circuit breaker panel. The Radio Master switch must be on for operation of all Comm/Nav equipment.

## COMMUNICATIONS EQUIPMENT

### INTERPHONE COMMUNICATION SYSTEM (ICS) AN/AIC-12

The AN/AIC-12 is installed to provide communication between various crew members. The ICS also links the audio channels of the communications and associated electronic equipment, to provide simplified control and simultaneous operation. Components of the system are four interphone-radio control panels, two coil headphone cord assemblies, cyclic trigger switches, a junction box, a hoist position remote switch, the copilots remote switch and headsets. The system operates on dc power from the radio bus and is protected by circuit breakers, marked CO-PLT and PLT, under the general heading ICS, on the radio circuit breaker panel.

#### Interphone Control Panels

There are four interchangeable panels (figure 4-3) throughout the helicopter. Two panels are on the forward portion of the lower radio console. The remaining two panels are in the cabin, one above the cargo door and the other on the opposite bulkhead. A coil cord assembly and jack is attached to each of the cabin interphone panels to provide mobility for the crewman or observer. Each panel is equipped with a volume control knob, a rotatable six-position transmit selector switch, and six receiver switches. The volume control knob, marked VOL, controls the level of headset audio signals from all equipment except the LF/ADF, and RAWS. The panels operate on dc power from the radio bus.

**Transmit Selector Switch** The transmit selector switch enables selection of interphone (INT), private (PVT), or one of four transmitters: #1—UHF, #2—VHF, #3—HF, and #4—FM. The transmit selector switch also provides reception of the selected equipment. The passenger interphone control panel will not transmit on any radio, nor will it receive or transmit private communications. The hoist operator's interphone control panel will not transmit on any radio, but will receive and transmit on PVT. The PVT position is used in conjuction with the Loud Hailer System and for private communications. Private communications is accomplished by selecting PVT and keying the microphone. Only those stations that have PVT capability and have selected PVT will hear the communications.

**NOTE**

If TCTO 1H-52A-503, the Loud Hailer System installation, has not been completed, the PVT position is inoperative at all stations.

**Receiver Select Switches** The Receiver Select switches marked RECEIVERS 1, 2, 3, 4, INT, and NAV, permit selection of any of six receivers, independent of the position of the transmit selector switch. The number 1, 2, and 3 switches select the UHF, VHF, and HF receivers, respectively. The number 4 switch selects the TACAN and FM receivers. The INT switch provides intercommunication reception. The INT switch is internally wired ON at the pilot's and hoist operator's position. This prevents either station from disconnecting from the intercommunication circuit. The NAV switch enables selection of the LF automatic direction finder and marker beacon receivers, except that the cabin stations may only receive the LF automatic direction finder. If the AN/ARN-123 VHF NAV System is installed, VOR and LOC audio is received through the NAV switch. If the AN/ARN-123 is not installed, VOR and LOC audio is received through the number 2 switch.

**Cyclic Microphone Trigger Switch** A spring-loaded, three-position microphone trigger switch, marked ICS and RADIO, is on the pilot's and copilot's cyclic stick grips (figure 1-19). When the upper portion of the switch is held in the ICS position, the respective microphones are connected to the interphone transmission circuit. When the lower portion of the switch is held in the RADIO position, the respective microphone is connected to the radio transmission circuit selected by the Transmit-Interphone Select switch.

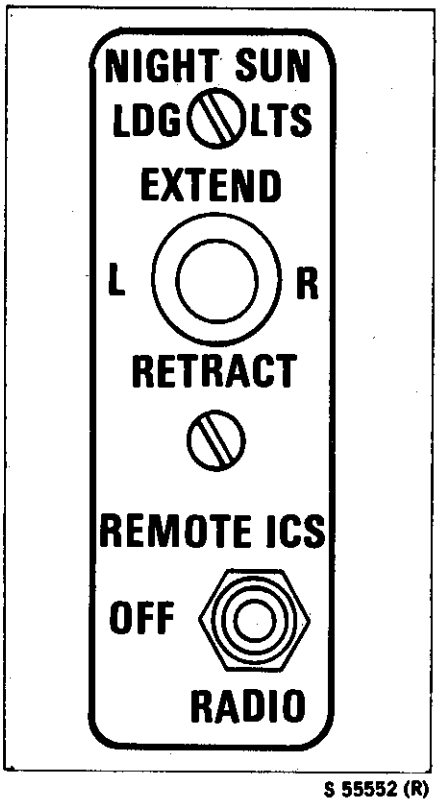


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**Figure 4-4. Copilot's Remote ICS Switch**

**Copilot's Remote ICS Switch** The copilot's remote ICS switch (figure 4-4), marked REMOTE ICS, OFF, and RADIO, is in the cockpit to the left and forward of the copilot's seat. The switch is connected in parallel to the cyclic stick trigger switch permitting operation of the interphone and radio systems. When the switch is placed in the ICS MAINTAINED position, intercommunications may be conducted. When the switch is placed in the OFF position, normal radio operation through the cyclic stick switch is maintained. The RADIO MOMENTARY position allows the copilot to conduct radio communications. When the switch is released, it will return to the OFF position.

**Hoist Operator's Interphone Switch** The hoist operator's interphone switch (figure 4-5), marked HOT MIKE, with positions MOMENTARY, OFF, and MAINTAINED, is above the cargo door on the hoist control panel to the left of the interphone control panel. Intercommunications may be conducted in either the MOMENTARY or MAINTAINED positions. When the switch is placed in the MAINTAINED position, hands-off operation of the interphone system is provided during rescue or hoist operations. From the MOMENTARY position the switch is spring-loaded to the OFF (centered) position. A warning light, on the

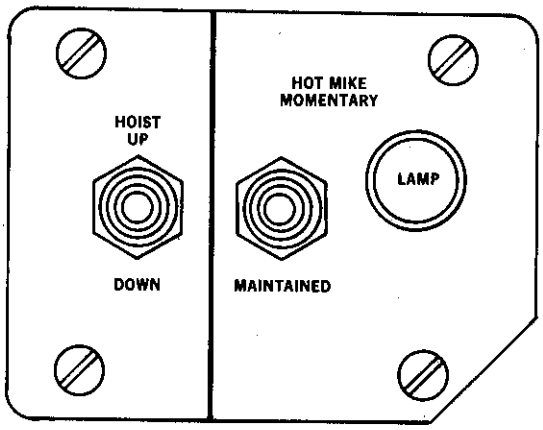


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**Figure 4-5. Hoist Operators ICS Switch**

HOT MIKE switch, is used as a safety precaution to indicate that power is applied to the HOT MIKE switch, which may interfere with interphone and radio communications.

### UHF/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. The system operates on ac and dc power from the radio bus, is protected by four circuit breakers on the radio circuit breaker panel marked UHF and UHF A$\phi$, B$\phi$, and C$\phi$.

**NOTE**

With loss of ac power, the guard receiver only will continue to function.

#### UHF/COMM Control Panel

The operating controls on the AN/ARC-51A radio control panel (figure 4-6) are the function selector, the mode selctor, the preset channel control, the preset

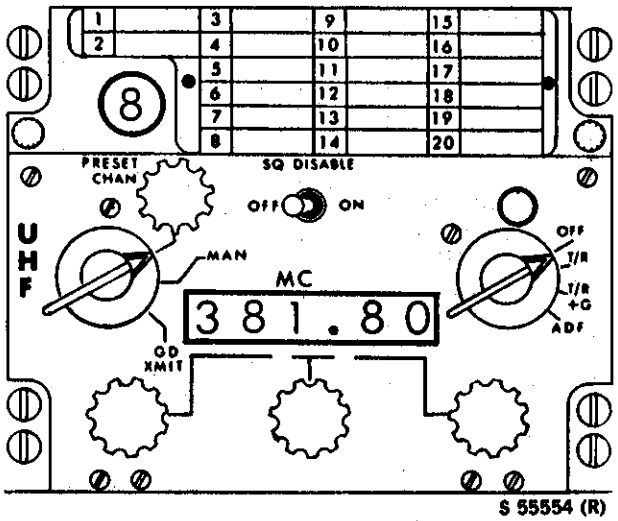


Figure 4-6. UHF Control Panel

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. T/R +G energizes the receiver-transmitter and guard receiver. The ADF position of the function switch is not used in this installation.

**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.

**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.

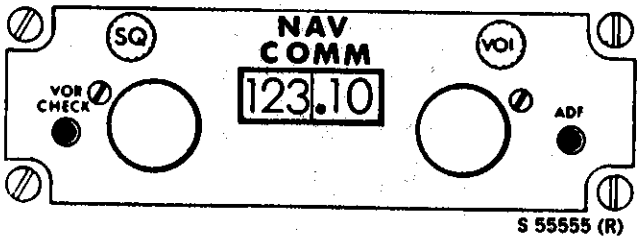


Figure 4-7. VHF Control Panel

**UHF/COMM Operation**

To Turn Set On:

1. Function switch (UHF/COMM control panel)—AS REQUIRED.

2. ICS receiver select switch—UHF—ON.

3. ICS transmit select switch —Position 1 (UHF).

4. Squelch disable switch—OFF.

5. Volume control knob (UHF/COMM control panel)—AS REQUIRED.

6. Mode selector (UHF/COMM control panel)—AS REQUIRED.

7. Preset channel control (UHF/COMM control panel)—AS REQUIRED.

8. To transmit—Depress the microphone trigger switch on the cyclic stick grip to the radio position.

To Secure Set:

1. Function switch (UHF/COMM control panel)—OFF.

**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, seaborne and airborne station. 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 the receiver is 108.0 through 135.95 MHz. The VHF receiver and transmitter are dc powered by the radio bus. The system is protected by circuit breakers marked VHF RCVR, and XMTR, on the radio circuit breaker panel.

### VHF/COMM Control Panel

The operating controls are provided by a control panel (figure 4-7), marked COMM, on the lower 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, and a VOR momentary check switch.

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

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

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

**ADF Switch** Equipment not installed.

**VOR CHECK Switch** The VOR check switch is used for an internal check of the system (see VHF NAV RADIO OPERATION this section).

**NOTE**

If the AN/ARN-123 is installed, this VOR check switch is inoperative.

### VHF/COMM Operation

To Turn Set On:

1. VOL OFF switch (VHF/COMM-NAV control panel)—ON.

2. ICS receiver select switch—VHF—ON.

3. ICS transmit select switch—Position 2 (VHF).

4. Frequency selectors (VHF/COMM—NAV control panel)—AS REQUIRED.

5. SQ control (VHF/COMM—NAV control panel)—AS REQUIRED.

6. To transmit—Depress the microphone trigger switch on the cyclic stick grip to the radio position.

To Secure Set:

1. VOL OFF switch (VHF/COMM control panel)—OFF.

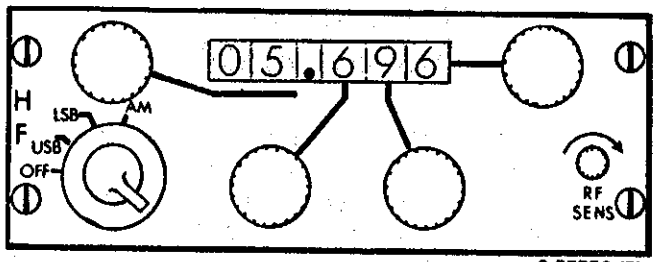


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**Figure 4-8. HF Control Panel**

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

The HF/COMM system AN/ARC-94 consisting of a receiver-transmitter, a control panel, and an antenna, provides 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 units of 1 kHz. The HF/COMM system receives and transmits on either single side band (SSB) or amplitude modulated equivalent (AM). The radio set uses ac and dc power from the radio bus. The set is protected by 3 ac circuit breakers marked HF-SSB and 1 dc circuit breaker marked HF SSB, all on the radio circuit breaker panel.

### HF/COMM Operating Controls

The system is remotely controlled by a control panel (figure 4-8) on the upper console. The HF control panel has 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. 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.

**WARNING**

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

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

To Put Equipment Into Operation:

1. Mode selector (HF/COMM control panel)—AS REQUIRED.

2. ICS receiver select—Position 3 (HF)—ON.

3. ICS transmit select switch—Position 3 (HF).

4. 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.

5. Microphone switch—DEPRESS MOMENTARILY.

**NOTE**

When microphone switch is depressed, a 1-kHz tone will be heard in the headset. When the tone disappears antenna loading is complete and the set is ready for operation.

6. To transmit—Depress the microphone trigger switch on the cyclic stick grip to the radio position.

To Secure Equipment:

1. Function selector switch (HF/COMM control panel)—OFF.

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

The VHF-FM COMM System AN/ARC-160 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 units 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 may also be used in conjuntion with the Broadband Homing System (DMSE 47-2).

**VHF-FM/COMM Control Panel**

The VHF-FM/COMM control panel (figure 4-7), on the upper radio console (figure FO-2), marked VHF-FM, contains a 100 MHz indicator, frequently 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.

**100 MHz Indicator** The hundreds MHz digit is represented by a permanently displayed "1" in the upper left corner of the control panel.

**Frequency Selection Indicator Switches** Five rotary frequency selector indicator switches allow manual tuning of the radio set. From left to right, these switches control the 10 MHz, 1 MHz, 100 kHz, 10 kHz, and 5 kHz steps.

**Receiver Test Switch** A momentary pushbutton receiver test switch, marked RCVR TEST audibly indicates proper receiver performance. With the Function Selector Switch in T/R or T/R +G, depressing the switch causes a 800 Hz tone to be heard. If the tone is not heard, the receiver has a malfunction and may not operate properly.

**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 not utilized.

**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.

The transmitter is tuned to the frequency selected on the frequency selector indicator switches while 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 the 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—TAC/FM—ON.

3. ICS transmit select switch—Position 4 (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—Depress the microphone trigger switch on the cyclic stick grip to the radio position.

**NOTE**

Do not attempt to receive messages on 156.8 MHz on both the main and guard receivers simultaneously. A garbled message will be heard.

To Secure Set:

1. Function Selector Switch (VHF-FM/COMM control panel)—OFF.

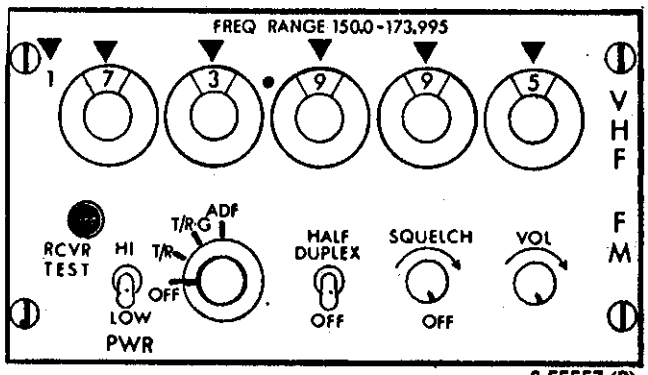


**Figure 4-9. VHF/FM Operating Controls**

**LOAD HAILER SYSTEM**

**NOTE**

The Loud Hailer System TCTO is expected to be delivered to the units during the second half of calendar year 1978.

The Loud Hailer System consists of a 250-watt transistorized amplifier, a two-speaker assembly, and a remote control head. The amplifier is on the front side of the radio rack. The two speaker assembly, when mounted, is on the right side of the fuselage forward of the cabin door. The control head is on the upper radio console. The amplifier and speaker assembly are designed for quick installation and removal.

**WARNING**

Do not attempt to install the speaker assembly in flight.

**CAUTION**

Insure that power is secured to the system prior to installing the amplifier and speaker system.

**NOTE**

With the speaker assembly installed, all normal flight operations, including water landings, are permitted.

The system uses dc power from the radio bus and is protected by a circuit breaker marked LOUD HAILER on the radio circuit breaker panel.

#### Loud Hailer Operation

The system is energized by the ON-OFF switch on the control head. The pilot, copilot, or hoist operator may operate the system by placing their respective transmit selector switch to PVT and depressing the radio microphone switch. The speaker volume is controlled by the gain control on the amplifier.

**NOTE**

Loud Hailer operation at the hoist operator position is of limited use due to high feedback between the crewman's microphone. The feedback may be reduced somewhat by turning the volume down on the ICS control panel.

**NOTE**

Feedback at the pilot's station may be reduced by closing the sliding window and, if necessary, reducing the volume on the ICS control panel.

## NAVIGATION EQUIPMENT

### BEARING DISTANCE HEADING INDICATOR (ID-663/U)

The BDHI is installed on the pilot's instrument panel. The BDHI has two rotating pointers, a central digital distance window, and a rotating compass card. The number one pointer provides a magnetic bearing from the LF-ADF radio. The number two pointer provides either VOR or TACAN information. The central digital distance window provides line of sight distance from a selected TACAN station or other aircraft. The rotating compass card repeats the information from the MA-I Compass System.

### RADIO MAGNETIC INDICATOR

The RMI (8, figure FO-1) is mounted on the copilot's instrument panel. The RMI consists of a fixed outer dial, an inter rotating compass card, and two pointers. The rotating compass card repeats the information from the MA-1 Compass System. The number one pointer provides a magnetic bearing from the LF-ADF radio. The number two pointer provides a magnetic bearing from the VHF navigation system or TACAN.

**NOTE**

With a BDHI or RMI compass card malfunction, the ADF pointer displays relative bearing only and will continue to point to the station. The TACAN pointer does not point to the station, but will continue to display TACAN radials. The VOR pointer may not be reliable and SHOULD NOT BE USED. The CDI and ambiguity information on the OMNI Course Indicator is reliable.

### VOR/TAC SELECTOR SWITCHES

Two VOR/TAC selectors switches (41, figure FO-1) are on the instrument panel. Each switch has two positions marked VOR and TAC. The pilot's VOR/TAC selector switch selects the navaid that will control the No. 2 needle on the BDHI. The copilot's switch selects the navaid input to the No. 2 needle on the RMI.

### COURSE INDICATORS

Two course indicators (20 and 30, figure FO-1) labeled OMNI and TACAN are installed on the instrument panel. Designation of the course indicators used are ID-249, ID-351 and ID-387. All of these instruments present the same information. The term, "course indicator" will be used when referring to this instrument in the flight manual.

### FLIGHT DIRECTOR

Two identical navigation flight director indicators (figure 1-24) are on the instrument panel (5 and 37, figure FO-1) for the pilot and copilot. The navigation flight director indicator has four modes of operation that are determined by the position of the mode selector knob. The Mode Selector Knob is marked with the letters A, T, V, and G to identify modes. The pilot and copilot can monitor the same mode or any combination of modes by placing their respective mode selector knobs in either A, T, V, or G position. A Mode Indicator Window in the upper right quadrant of the face indicates the mode selected by displaying the letters ASE, TAC, VOR, or GVR.

#### ASE (A) Mode

When the indicator is in ASE mode and the ASE engaged, the indicator will monitor the automatic stabilization equipment electrical signal to each ASE channel. For additional information refer to Section I, Automatic Stabilization Equipment.

#### VOR (V) Mode

When the indicator is in the VOR mode and the VHF NAV radio is tuned to a VOR station, lateral course deviation is shown by the vertical needle. The indicator monitors the lateral deviation from the course selected on the OMNI Course Indicator. The vertical bar warning flag disappears when the radio is turned on and the signal is reliable. During VOR operation, the horizontal bar is not used. TO-FROM course information as well as relative heading pointer information is available only on the OMNI Course Indicator. When the indicator is in the VOR mode and the VHF NAV radio is tuned to an ILS or LOC station, the vertical bar provides lateral deviation from the localizer course. The vertical bar is not affected by the course selctor on the OMNI Course Indicator. The horizontal bar provides vertical deviation from the selected glide slope. The vertical and horizontal bar warning flags disappear when the radio is turned on and the respective signal is reliable.

#### TACAN (TAC) Mode

When the indicator is in the TAC mode and the AN/ARN-52(V) TACAN radio is in use, the vertical bar will indicate lateral course deviation. The indicator monitors lateral deviation from the course selected on the TACAN course indicator.

#### GVR Mode

The vertical bar in the GVR mode displays course information when used with the Broadband Homing System.

### TACAN RADIO SET AN/ARN-52(V) (TACTICAL AIR NAVIGATION)

The TACAN system AN/ARN-52(V), an airborne navigation set consisting of a receiver-transmitter and control panel, supplies inputs to the BDHI, RMI, the TACAN course indicator and the flight director when TAC is selected. The TACAN is powered by the ac and dc radio buses and is protected by two circuit breakers marked TACAN on the radio circuit breaker panel. It operates in conjunction with a selected fixed ground station or with another cooperating aircraft equipped with air-to-air TACAN. In the receive mode of operation, the AN/ARN-52(V) provides continuous information of the bearing (azimuth angle) from the helicopter to a selected ground station. In the receiver-transmit mode of operation, the AN/ARN-52(V) provides continuous information on the line of sight distance from the aircraft to a selected ground station in addition to bearing information. In the receiver-transmit and receive modes of operation the selected ground station is identified by the identity tone signal. In the air-to-air mode of operation, the AN/ARN-52(V) provides continuous information of the line of sight distance between two cooperating aircraft that are each equipped with air-to-air TACAN. Although the maximum range of the equipment is governed by line of sight considerations, the maximum indicated range is 300 miles.

**NOTE**

Operation in the air-to-air mode requires prearrangement with a cooperating aircraft. The second aircraft must be equipped with an air-to-air TACAN which is set to the air-to-air mode of operation and is set to a channel 63 channels away from the channel setting of the AN/ARN-52(V) in the first aircraft. One aircraft may reply to as many as five others, but it will only display the distance to the nearest aircraft. Bearing information is not provided in the air-to-air mode.

Visual presentation of the TACAN course is made on the pilot's course indicator, the pilot's BDHI, the copilot's RMI and the flight directors (figure 1-24) in TAC mode. Ambiguity in TACAN bearing information of a TACAN (manually) course is resolved by the to/from FLAG. Visual presentation of (automatic) TACAN bearing is presented with NO. 2 pointer of the BDHI and RMI. The distance to a TACAN or VORTAC station is displayed by the nautical miles counter on the pilot's BDHI.

**CAUTION**

It is possible that improperly adjusted or malfunctioning ground or airborne TACAN equipment may "lock-on" to a false bearing. The error will probably be plus or minus 40°, but can be of any value to either side of the correct bearing in multiples of 40°. This possibility is inherent in the TACAN system and, therefore, the TACAN should be cross-checked with ground radar, airborne radar, VOR, or LF-ADF.

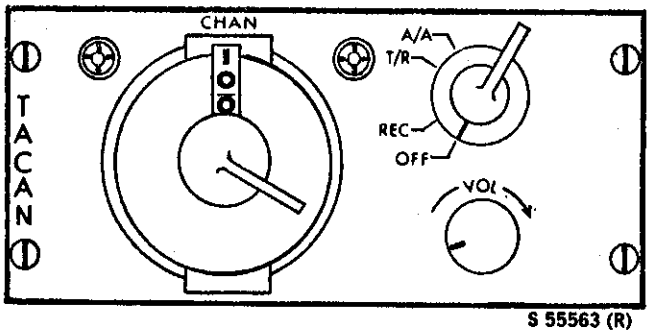


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**Figure 4-10. Tacan Control Panel**

### TACAN Operating Controls

The control panel (figure 4-10), on the upper console (figure FO-2), contains the channel selector, the volume control and the function selector switch.

**CHAN Selector Knob** The channel selector knob is a rotary switch that allows selection of 126 TACAN channels.

**VOL Control** The control allows for adjustment in volume of beacon identitiy tone signal.

**NOTE**

In order to receive the TACAN identification it may be necessary to momentarily turn down the volume on the VHF-FM receiver.

**Function Selector** The function selector switch is a four-position rotary switch that determines the mode of equipment operation. OFF removes power from the set. REC turns the receiver on. T/R turns the transmitter and receiver on. A/A enabled air-to-air distance measuring. The equipment requires a 3-minute warm-up period regardless of the mode selected.

### TACAN Operation

To Turn Set On:

1. ICS Receiver select switch (TAC/FM)—ON.

2. Function selector switch (TACAN control panel)—AS REQUIRED.

3. Channel selector knob (TACAN control panel)—AS REQUIRED.

4. VOR-TACAN selector switch (Instrument panel)—TACAN.

5. VOL control—AS REQUIRED.

To Secure Set:

1. Function selector switch (TACAN control panel)—OFF.

### VHF NAV RADIO SET (AN/ARN-87)

**NOTE**

If the AN/ARN-123 TCTO has been completed, the AN/ARN-87 NAV Radio components, including the Marker Beacon, and Glide Slope receivers, will be removed.

The navigation system, is a fully transistorized airborne navigation unit that is to be used in conjunction with VHF radio set receiver (AN/ARC-84) to provide VOR (VHF omni-directional range) and LOC (Localizer) modes of operation. Controls for system are contained within AN/ARC-84 control panel (figure 4-7). When a frequency of from 108.1 to 111.9 megahertz (odd tenths only) is selected, the LOC mode of operation is automatically obtained, and this frequency selection also provides a corresponding glide slope (GSA-8A) frequency. When a frequency of 108.0 to 111.8 megahertz (even tenths only) is selected or a 112.0 to 117.9 megahertz frequency is selected, the VOR mode of operation is obtained and the glide slope, GSA-8A, receiver is returned to a standby condition. The VHF transmitter is automatically tuned to 121.5 MHz in both LOC and VOR modes. The course information obtained from these modes of operation is fed to the flight director, (figure 1-24), OMNI course indicator, BDHI, and RMI for presentation to the pilot or copilot. The VHF navigation system is powered by the dc radio bus and is protected by a circuit breaker marked VHF RCVR on the radio circuit breaker panel.

**NOTE**

Reverse sensing will be displayed on the OMNI Course Indicator and the Flight Directors when inbound on a localizer back course approach.

#### VHF NAV Radio Operation

1. ICS receiver select switch—VHF—ON.

2. VHF RCVR VOL—OFF—ON switch (VHF COMM/NAV control panel)—ON.

3. Frequency selector knob—108.0 to 117.9 as desired for VOR or LOC operation (VHF COMM/NAV control panel).

#### VOR Check

1. Tune to VOR station (reliable signal).

2. Set 000 in the VOR Course Indicator.

3. Press VOR—CHECK button.

   a. BDHI and RMI—000 ±5°.

   b. CDI vertical needle on VOR Course Indicator—CENTERED.

   c. VOR Flight Director—To/From Indication—TO.

   d. Vertical bar flag—VISIBLE.

4. Release VOR—CHECK button.

### GLIDE SLOPE SYSTEM (GSA-8A-1)

The GSA-8A-1 glide slope system is installed on helicopters that have not been modified to incorporate the AN/ARN-123 VHF NAV radio set. The GSA-8A-1 glide slope system is an airborne UHF receiver designed to receive glide slope transmissions for vertical guidance during ILS approaches, when 108.1 to 111.9 MHz (odd tenths only) is selected on the VHF NAV set. The receiver is controlled by the VHF navigation set control and can be modified to provide either ten or twenty channel operation. Information is provided through the flight director indicators and the OMNI course indicator, on the instrument panel in front of the pilot and copilot. When a localizer frequency of 108.1 to 111.9 mc (odd tenths only) is selected on the control unit, the corresponding glide slope frequency is automatically selected. When the horizontal bar on the flight director indicator (figure 1-24) is up, the glide path is above the helicopter; if the bar is down, the glide path is below the helicopter; if the bar is centered in a horizontal position, the helicopter is directly on the glide path. The glide slope system operates on direct current from the dc radio bus through circuit breakers marked VHF RCVR and GLIDE SLOPE, located on the radio circuit breaker panel.

### MARKER BEACON SYSTEM (MKA-23A)

The MKA-23A marker beacon system is installed on helicopters that have not been modified to incorporate the AN/ARN-123 VHF NAV radio set. The marker beacon system, MKA-23A, detects 75 megahertz signals modulated by either a 400, 1300, or 3000 cycle-per-second tone. Accordingly, it identifies airway fan markers, station locator Z-markers, and approach markers of an instrument landing system. The system provides a visual light indication on both course indicators. Controls for the system consist of a volume and on-off knob and a sensitivity switch, on the instrument panel, under the heading MARKER BEACON. The volume control knob, marked VOLUME OFF, permits regulation of audio volume in the headsets. The sensitivity switch, marked SENSITIVITY, LO, MED, and HI, provides a means of selecting three sensitivity settings, for the marker beacon receiver. In this installation, the LO and MED positions provide the same sensitivity. The system operates on dc power from the radio bus and is protected by a circuit breaker, marked MB, on the radio circuit breaker panel. An aural signal can be heard over the Interphone Control Panel NAV position.

#### Marker Beacon System Operation

To turn the set on:

1. ICS receiver select switch—NAV—ON.

2. Volume control knob—ON (AN/ARN-123 NAV radio control panel).

3. Sensitivity switch—As required (AN/ARN-123 NAV radio control panel).

To turn the set off:

1. Volume control knob—OFF (AN/ARN-123 NAV radio control panel).

### VHF NAV RADIO SET (AN/ARN-123)

**NOTE**

The AN/ARN-123 TCTO is expected to be delivered to the units during the first half of calendar year 1978.

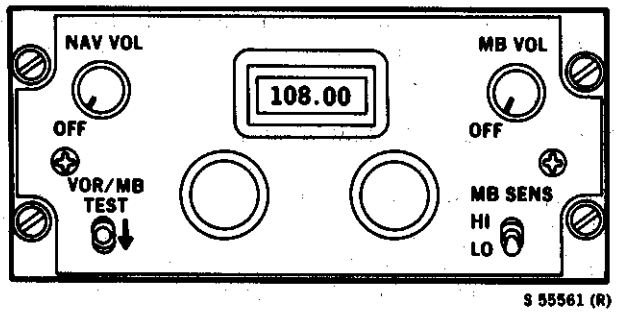



**Figure 4-11. AN/ARN-123 NAV Radio Control Panel**

The AN/ARN-123 receiver is a remotely located, integrated navigation package which contains a 200 channel VOR/LOC receiver, a 40 channel glide slope receiver, and a marker beacon receiver. The three receivers perform the intended mission of the unit without depending on each other. The receiver is powered by the dc radio bus and the 26 volt radio autotransformer ($\phi$B), and is protected by two circuit breakers marked VHF NAV, on the radio circuit breaker panel.

#### VHF Omnirange (VOR)/Localizer (LOC) Receiver Section

The VOR/LOC receiver section receives and processes VOR and localizer signals over a frequency range of 108.00 to 117.95 MHz, with a channel spacing of 50 kHz. Of the 200 channels available, 160 are for VOR operation and 40 are for LOC operation. VOR course information is fed to the OMNI Course Indicator, Flight Directors, BDHI, and RMI. LOC course information is provided to the OMNI Course Indicators and Flight Directors only. VOR/LOC audio signals are fed through the pilot's and copilot's ICS control panel's NAV switch. Volume adjustment is accomplished by turning the NAV VOL-OFF control on the control head.

**NOTE**

Reverse sensing will be displayed on the OMNI Course Indicator and Flight Directors when inbound on a localizer back course approach.

#### Glide Slope (GS) Receiver Section

The GS receiver section processes glide slope signals over a frequency range of 329.15 to 335.00 MHz with a channel spacing of 150 kHz. Whenever one of the 40 localizer frequencies is selected the appropriate GS frequency is tuned on the GS receiver. Glide slope information is fed to the OMNI Course Indicator and the Flight Directors.

#### Marker Beacon (MB) Receiver Section

The MB receiver section processes 75 MHz signals and converts them into an output that drives the marker beacon lights on the OMNI and TACAN Course Indicators and provides audio signals to the pilot's and copilot's ICS Control Panel, NAV switch.

#### VHF NAV Radio Control Panel

The VHF NAV Radio control panel (figure 4-11) on the upper radio console (figure FO-2), contains a NAV VOL-OFF control, frequency indicator, frequency selector knobs, MB VOL-OFF control, MB Sensitivity switch (HI/LO), and a VOR/MB test switch.

#### VHF NAV Radio Operation

To turn the set on:

1. Radio master—ON.
2. NAV VOL-OFF control—ON, VOLUME AS DESIRED.
3. MB VOL-OFF control—ON, VOLUME AS DESIRED.
4. MB Sensitivity—HI.
5. Frequency selector knobs—AS DESIRED.

To turn set off:

1. NAV VOL-OFF control—OFF.

**NOTE**

The NAV VOL-OFF control is the master power switch for the entire radio.

**NOTE**

In the event of loss of ac power to the set, VOR course information will be lost. Localizer, glide slope, and marker beacon information will continue to be provided.

**VOR/MB Check**

1. Tune in a nearby VOR station.

2. OMNI course selector—315 RADIAL.

3. VOR/MB test switch—HOLD IN TEST POSITION.

4. CDI needle—CENTERED PLUS OR MINUS 2 DOTS.

5. #2 needle (VOR selected)—315 RADIAL PLUS OR MINUS 5.

6. Both marker beacon lights—ON.

7. VOR/MB test switch—RELEASE.

**LF AUTOMATIC DIRECTION FINDER EQUIPMENT (LF/ADF AN/ARN-73)**

The LF/ADF set AN/ARN-73 provides automatic or manual compass bearings with the No. 1 pointer of the BDHI and RMI on any radio signal between 100 and 3000 kHz. The tuning range is divided into four bands as follows: 100-235 kHz, 235-560 kHz, 560-1335 kHz, and 1335-3000 kHz. The LF/ADF also functions as a low-frequency radio range and communications receiver. A beat frequency oscillator permits identification of keyed CW stations and may be used to obtain improved indications of an aural null during loop operations.

**NOTE**

The LF/ADF sense relay is energized when the ARC-94 (HF/COMM) transmitter is keyed to prevent damage to the internal components of the LF/ADF receiver.

The LF/ADF set is powered by the dc radio bus and ac from the radio autotransformer. The LF/ADF set dc circuit is protected by a circuit breaker, marked ADF, on the radio circuit breaker panel.

**LF/ADF Control Panel**

(figure 4-12)

**VOL-OFF Switch**

The VOL-OFF switch turns the LF/ADF on or off. It controls the audio gain of the receiver when the

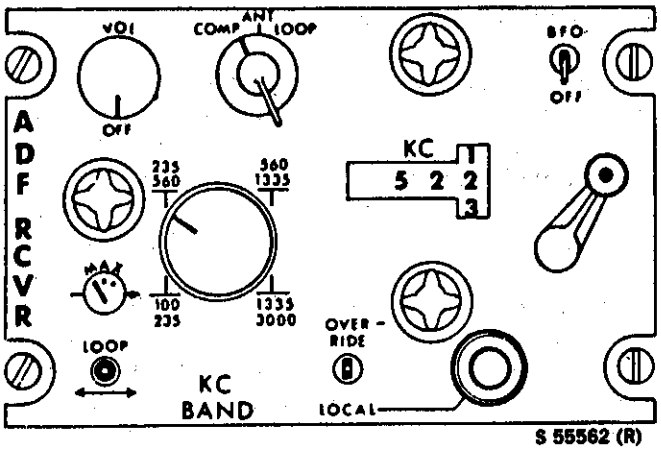



**Figure 4-12. LF/ADF Control Panel**

COMP-ANT-LOOP switch is in the COMP position, or RF sensitivity when the COMP-ANT-LOOP switch is in the ANT or LOOP position.

**COMP-ANT-LOOP Switch**

The COMP-ANT-LOOP switch has three positions. The COMP position connects both the loop and sense antennas and the LF/ADF functions as an ADF. In the ANT position, only the sense antenna is connected and the LF/ADF functions as a standard low-frequency receiver. Only in this position are complete and accurate aural signals received. In the LOOP position, only the loop antenna is connected and the LF/ADF may be used for manual direction finding.

**KC BAND Switch**

The KC BAND switch controls the frequency band in which the LF/ADF operates. Four bands are available, and digital counters corresponding to the selected band are displayed as the KC BAND switch is operated.

**LOOP Control**

The LOOP control slews the goniometer rotor (corresponding to loop rotation in earlier ADF systems) in either direction regardless of the COMP-ANT-LOOP switch position. It is used to position the goniometer rotor as desired when the COMP-ANT-LOOP switch is in the LOOP position. It is used to override an incoming signal momentarily to test signal reliability when the COMP-ANT-LOOP switch is in the COMP position.

**OVERRIDE-LOCAL Switch**

The OVERRIDE-LOCAL switch is inoperative in this installation.

**BFO Switch and Operation**

The BFO is used principally to identify CW transmission occurring within the frequency range of the LF/ADF such as those employed in areas outside the United States, but may also be used to aid in determining aural nulls. For CW identification, the COMP-ANT-LOOP switch is placed in the ANT position; for aural-null procedures, the switch is set to the LOOP POSITION. When BFO is operating, a 1000-hertz beat note will be heard when properly tuned to a CW signal. This beat note (tone) appears in the audio output of the receiver. As the receiver is detuned slightly, the frequency of the beat note will decrease. As the receiver is tuned from one side of the signal to the other, the tone will increase to 1000-hertz from zero on either side of the proper frequency.

**Tuning Crank**

The tuning crank tunes the LF/ADF to the desired frequency, which is displayed in the KC window. With the COMP-ANT-LOOP switch at COMP, peak deflection of the MAX meter indicates proper turning.

**NOTE**

When two adjacent peaks are noted, the dip between them indicates proper tuning.

**LF/ADF Operation**

To turn set on for use as a Conventional Radio Receiver:

1. ICS receiver select switch—NAV Position—ON.
2. VOL OFF switch—ON and adjust as desired.
3. Function switch—ANT.
4. KC BAND switch—Set to desired operating band.
5. Tuning control—Tune to desired station.

To turn set on for use as an Automatic Direction Finder:

1. ICS receiver select switch NAV—ON.
2. VOL-OFF switch—ON and adjust as desired.
3. Function switch—ANT.
4. KC BAND switch—Set to desired operating band.
5. Tuning control—Tune to desired station.
6. Function switch—COMP.
7. Tuning meter—Adjust to MAX.

To turn set on for use as a Manual Direction Finder:

1. ICS receiver selector switch NAV—ON.
2. VOL-OFF switch—ON and adjust as desired.
3. Function switch—ANT.
4. KC BAND switch—Set to desired band.
5. Tuning control—Tune to desired station.
6. Function switch—LOOP.
7. LOOP Control—Operate for aural null.
8. VOL-OFF switch—Adjust for null width.

For navigation with an unmodulated Continuous Wave (CW) Station:

9. Function switch—ANT.
10. BFO switch—BFO.

Tune to desired station; a properly tuned CW signal will produce a 1000-hertz beat note. To obtain proper CW identification, detune slightly until frequency of beat note changes, tune receiver from one side of signal to other. Tone will decrease from high pitch to zero and increase again on other side of zero beat.

11. Volume control—Adjust as desired.

To turn set OFF:

1. VOL-OFF switch—OFF.

**Operating Limitations and Precautions**

The set is subject to the following operations limitations which are imposed by terrain, weather, and general operating conditions.

**Night Effect** At night radio waves reflected by the ionosphere return to the earth at some point 30 to

60 miles from the station. This night effect may cause the pointer to fluctuate. It is most prevalent during the period just before and after sunrise and sunset. Generally, the greater the distance from the station, the greater the effect. The effect can be minimized by averaging the fluctuations, by flying at a higher altitude, or by selecting a lower-frequency station. Maximum night effect will be present with stations operating in frequency ranges above 1000 kHz. Frequencies below 1000 kHz are generally less subject to night effect.

**Mountain Effect** Bearings taken in the vicinity of mountainous terrain may be erroneous and the pointer may fluctuate due to magnetic deposits or radio wave reflection.

**Shoreline Effect** As radio waves pass from land to water, their direction of travel is changed. Because of shoreline effect, a bearing taken on an island station from an aircraft over water is inaccurate if it makes an angle of less than 30 with the shoreline. At greater angles, bending is negligible. When taking bearings over water, therefore, choose stations which are either right on the shore, or so located that bearings to them make angles greater than 30 with the shoreline.

#### General Operating Procedures

The following operating procedures should be used. Only head-on bearings are entirely dependable. Keep the helicopter in a level attitude when taking side bearings: accurate bearings cannot be taken with the aircraft in a steep bank, especially when close to a station.

For manual direction finding, place the COMP-ANT-LOOP switch in the LOOP position and slew the LOOP control for an aural null. When using the aural null method for taking bearings, the 180° ambiguity must be resolved. Set the VOL-OFF control to produce a null of satisfactory width.

### BROADBAND HOMING SYSTEM (DMSE 47-2)

The DMSE 47-2 System is composed of a Homing Selector, an antenna switching unit, two antennas, an antenna feed network, and the Flight Director. The System is used in conjunction with the aircraft communications equipment to visually indicate the direction of flight toward an RF Homing Signal (emergency beacon, etc). The equipment operates in the frequency range of 120.0 to 245.0 MHz in conjunction with the UHF, VHF, and VHF/FM radio sets. The System

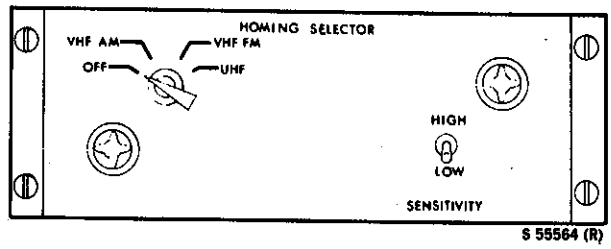



**Figure 4-13. VHF/UHF Homing Selector Panel**

operates on dc power from the radio bus and is protected by a circuit breaker on the radio circuit breaker panel, marked DF.

#### Homing Selector

The homing selector, (figure 4-13), on the upper console, has a four-position rotary type switch and a two-position toggle switch. The four-position switch enables the operator to energize the homing system and to select the communications radio to be used in the homing operation. The four-positions are: OFF, VHF/AM, VHF/FM, and UHF. The two-position toggle, marked SENSITIVITY, enables the operator to select HIGH or LOW sensitivity for the homing system. The LOW position cuts needle deflection in half.

#### Antenna Switching Unit

The antenna switching unit, on the radio rack, is controlled automatically by the homing selector switch from the cockpit. It provides for interconnection between the radio sets and communication antennas. The processed homing signal is transmitted to the Flight Director.

#### Homing System Antennas

The system has two low profile antennas (figure 4-14) on the bow of the helicopter for reception of homing signals.

**Antenna Feed Network** The feed network provides the antenna array with the phase difference between the two antennas to effect a "right" or "left" signal.

#### Flight Director

The processed signal is visually displayed on the flight director in the GVR Mode. The flight director's vertical bar deflects "left" if the signal source is left of the aircraft, or "right" if the signal is right of the aircraft. The display is continous so that the operator can fly

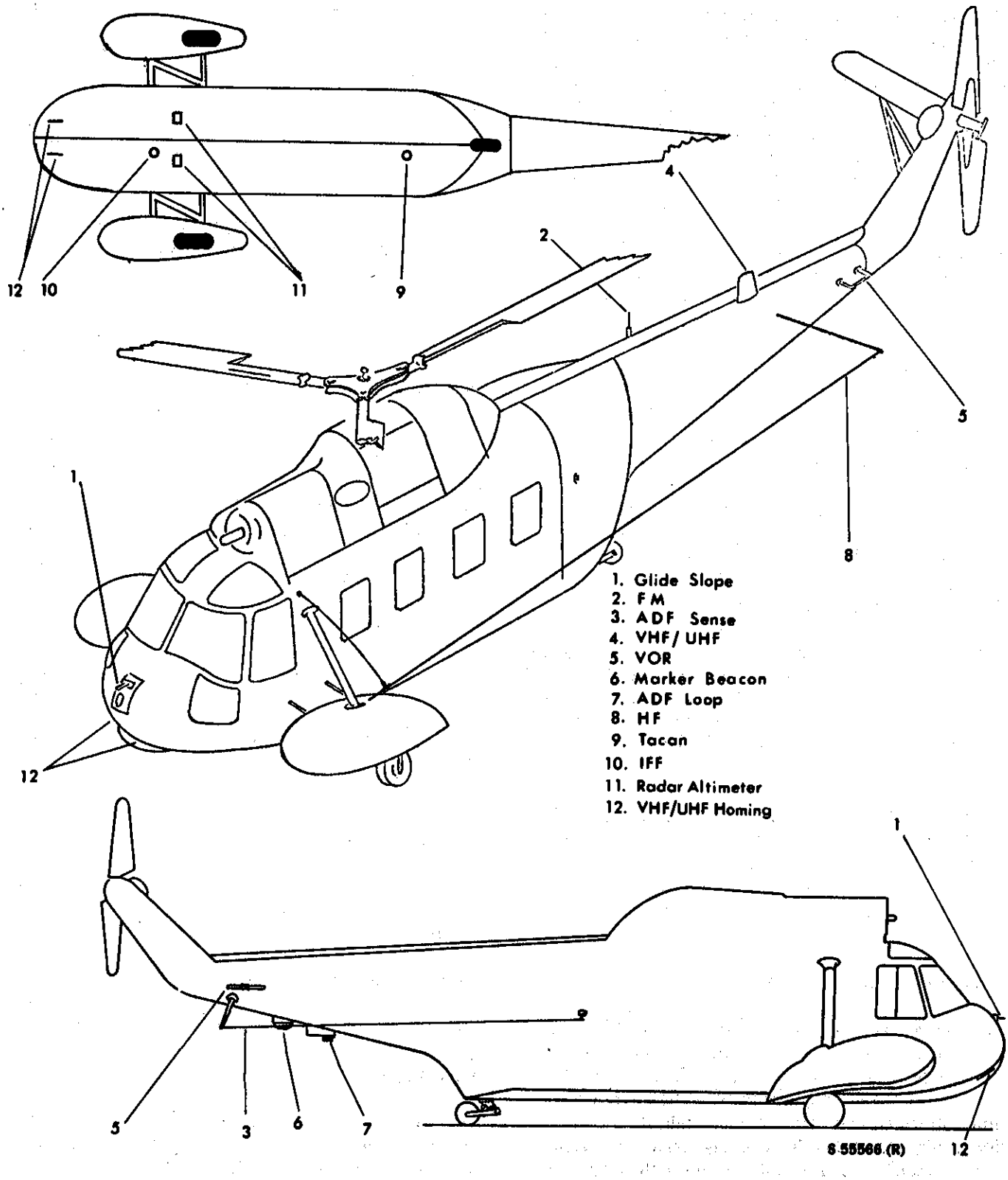



Figure 4-14. Antennas

toward the direction of the bar deflection. When the display indicates Zero deflection, the aircraft's centerline is in line with the direction of the signal source and is headed toward the signal source. Ambiguity is solved by always turning toward the vertical bar deflection.

**Homing System Operation**

1. Turn on the communication radio set to be used and set frequency.

**CAUTION**

Frequencies outside the 120.0-245.0 range may be selected and received by the Homing System. These signals may not be reliable and should be used with extreme caution.

2. Select VHF/AM, VHF/FM, or UHF as appropriate on the Homing Selector.

3. Set SENSITIVITY switch to HIGH.

4. Set the Flight Director to GVR mode.

5. Identify 1800 Hertz signal.

6. Turn the aircraft in the direction of the bar deflection until the vertical bar on the Flight Director "Centers." This is the course toward the homing signal source.

**Homing Procedures**

The reception of a homing signal is indicated by a 1800-Hertz signal tone and the deflection of the vertical bar on the Flight Director. The strength of the signal tone will be at a maximum when the aircraft is to the "left" or "right" of the source signal and will decrease to minimum strength when the aircraft is "on course." Under certain conditions, such as weak signals and long distances, bar deflection will be observed, but there will be no 1800-Hertz signal. Temporarily turn the homing selector to "OFF" for aural identification of the homing signal then back to homing. Once a homing course has been established, the aircraft should be flown so that the vertical bar remains centered. As the signal source is approached, the bar becomes more sensitive and will indicate larger course deviations. Set the SENSITIVITY switch to LOW in order to reduce Flight Director sensitivity. If visual contact cannot be established, the overflight will be indicated by a rapid swing of the bar from left to right. A rapid decrease in audio signal strength is most noticeable during station passage. During homing operations the pilot may transmit on the frequency selected for homing system.

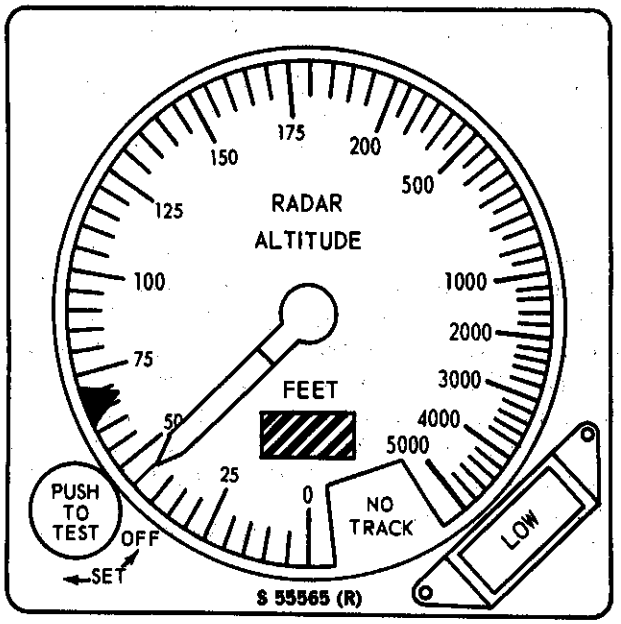



**Figure 4-15. Radar Altimeter AN/APN-171**

## RADAR ALTIMETER AN/APN-171(V)

Radar Altimeter Set, AN/APN-171(V), consists of a receiver-transmitter, two indicators, and two antennas. The set provides instantaneous indication of actual clearance between the helicopter and terrain from 0 to 5000 feet with the following accuracies:

| Altitude (Ft) | Accuracies |
|---|---|
| 0-200 | ± ( 3 ft + 2% of altitude) |
| 200-1000 | ± ( 7 ft + 2% of altitude) |
| 1000-5000 | ± (25 ft + 2% of altitude) |

Altitude, in feet, is indicated by the radar altimeter indicators (figure 4-15) on the pilot's and copilot's instrument panel (10 and 42, figure FO-1). The radar altimeter is powered by the dc radio bus and the ac radio bus. The altimeter's dc circuit is protected by a circuit breaker marked RAD HEIGHT on the radio circuit breaker panel. The ac circuit is protected by a circuit breaker marked RAD HEIGHT ϕB on the radio circuit breaker panel.

### RADAR ALTIMETER OPERATION

A control knob on the lower left corner of the indicator, combines functions to serve as a test switch, a low level warning index set control, and an on/off power switch. The system is turned on by turning the control knob, marked PUSH-TO-TEST, clockwise from the OFF position, and is the only control necessary for equipment operation. Three minutes must be allowed for system warmup. Control knobs on both radar altimeter indicators must be in the OFF position to secure the set. Continued clockwise turning of the control knob toward the SET position will permit each pilot to select any desired low-altitude limit, which will be indicated by the low-level warning index warning light, on the lower right corner of the indicator. The light will go on and show the marking LOW any time the helicopter is at or below the low-altitude limit that has been selected. Pressing the PUSH-TO-TEST control switch provides a testing feature of the system at any time and altitude. When the PUSH-TO-TEST control knob is pressed, a visual indication of 100 ±15 feet on the indicator indicates satisfactory system operation. Releasing the PUSH-TO-TEST control knob restores the system to normal operation.

**NOTE**

If ac power is lost, the pointers freeze in position. An audio warning will be heard on the ICS if ac power is lost and the RAWS switch is ON.

### FAILURE INDICATIONS

Loss of system power or tracking condition will be indicated by a black- and yellow-striped flag which appears in the indicator window, on the lower center portion of the indicator. If the system should become unreliable, the black- and yellow-striped flag will appear, the indicator pointer will go behind a mask, marked NO TRACK, to prevent erroneous readings, and a 1000 Hz audio tone will sound in both pilots' ICS. During normal flight operations, it is not necessary to turn the system off when operating above 5000 feet.

### RADAR ALTIMETER WARNING SYSTEM (RAWS)

Three audio warning signals are developed by the altimeter and are fed into the pilot's and copilot's headsets. The first is a 1000 Hz steady tone which sounds when the altimeter is unreliable. At 150 feet a 1000 Hz tone is switched on for 3 seconds and is pulsed at a rate of two pulses per second. At 50 feet, this tone is again switched on for 3 seconds but is pulsed at a rate of four pulses per second. A two-position switch on the instrument panel, marked ON and OFF, under the heading RAWS (figure FO-2) turns the RAWS system on and off. In the OFF position a caution light on the caution-advisory panel marked RAWS OFF, goes on. The RAWS OFF caution light and the RAWS are powered by the dc radio bus and protected by a circuit breaker marked RAD HEIGHT on the radio circuit breaker panel.

## TRANSPONDERS

### TRANSPONDER AN/APX-99

The AN/APX-99 transponder is composed of a receiver-transmitter, a control panel, and an antenna. The transponder is powered by the dc radio bus and is protected by a circuit breaker marked IFF on the radio circuit breaker panel.

**Transponder Control Panel**

The transponder control panel, (figure 4-16) marked TRANSPONDER, is on the lower radio console (figure FO-2). The control panel contains the function selector switch, reply lamp and ident pushbutton, dim adjustor, and code selector switches.

**Function Selector Switch** The function selector switch is a five-position rotary selector which determines the operating mode of the transponder. The positions are identified:

OFF. Eliminates all power to the set.

STBY. Turns the transponder power supply ON and applies power to the transmitter tube filament. Turning to STBY will keep the transponder from replying to interrogations and allow instant return to the operating modes.

ON. Places the transponder in the operating mode (Mode A). The transponder is ready to reply to interrogations from ground, sea, or airborne stations.

ALT. Places the transponder in the operating mode (Mode A) and in the altitude reporting mode (Mode C). When used in conjunction with the altimeter-encoder, the set will automatically transmit altitude information to the interrogating station.

TEST. This position is used to self-test the operation of the transponder. It may be used at any time as it does not interfere with normal operation. By holding the selector switch in the TEST position, a test signal is sent to interrogate all internal circuitry of the set, except the receiver. If the transponder is working properly, the REPLY lamp will go on. When the selector switch is released it will return to the ALT position and the REPLY lamp will operate normally.

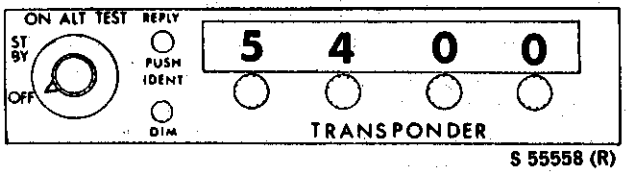



Figure 4-16. Transponder Control Panel

**Reply Lamp and Push Ident Button** The REPLY LAMP AND PUSH IDENT button are contained within a single assembly. The REPLY lamp automatically goes on when the set is replying to interrogations. The lamp intensity is adjustable by turning the DIM control. The PUSH IDENT button activates a special signal to the interrogating station for approximately 20 seconds. The REPLY lamp will go on during this period.

**Code Selector Switches** The code selector, comprised of four eight-position rotary switches, provides a total of 4096 active positions for identificaiton. The code selector sets up the number and spacing of the pulses that are transmitted by the set.

**Transponder Operation**

To put equipment into operation:

1. Function selector switch—STBY, ON, or ALT.

After a 60 second warmup period the set will be ready to operate.

2. Code selector switches—AS REQUIRED.

3. Function selector switch—HOLD IN TEST POSITION

If the REPLY lamp goes on, the transponder should function properly.

4. Function selector switch—RELEASE TO ALT POSITION.

**NOTE**

There is no EMERGENCY squawk position on the function selector switch. An EMERGENCY squawk must be set in using the code selector switches.

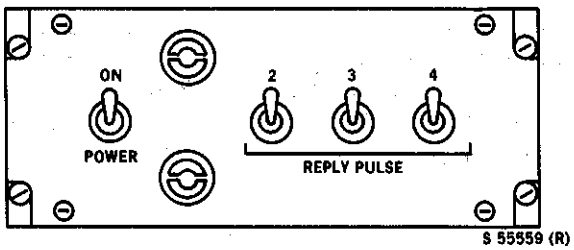



**Figure 4-17. X-Band Transponder Control Panel**

### X-BAND TRANSPONDER SST-185X

The X-Band Transponder is an identification transponder which will respond to each interrogation with up to five closely spaced reply pulses. The transponder accomplishes this function by receiving pulsed interrogations from a shipboard surface radar (operating in the X-band) and transmitting pulsed replies of much greater signal strength in the same frequency band. The transponder is powered by the dc essential bus and is protected by a circuit breaker marked XPNDR on the aft circuit breaker panel. (Not shown on figure 1-23.)

**NOTE**

The X-Band Transponder is scheduled to be installed in POPDIV and ALPAT helicopters only.

#### Control Panel

The X-Band transponder control panel (figure 4-17) is on the Upper Radio Console. It contains the master power switch and three reply switches.

**Master Power Switch** The switch controls all power to the system.

**Reply Switches** The reply switches control the second, third, and fourth pulses, respectively. The first and fifty pulses always reply to interrogations.

**Remote Unit** The X-Band transponder remote unit is in the transition section and contains the receiver, transmitter, and power supply.

#### Antenna

The antenna is 2-1/2 inches left of the keel below the transition section.

#### X-Band Transponder Operation

To put equipment into operation:

1. Power switch—ON.
2. Reply pulse switches—AS REQUIRED.

## MA-1 DIRECTIONAL GYRO COMPASS SYSTEM

The MA-1 directional gyro compass system consists of a magnetic flux valve in the tail cone, a diretional gyro in the forward cabin section aft of the pilots bulkhead, a directional gyro amplifier mounted on the radio rack, and a control panel and ACKNOWLEDGE switch on the upper console. Compass headings are indicated by the rotating azimuth card on the BDHI and RMI, on the instrument panel (figure FO-1). The system operates on ac and dc current from the ac and dc essential buses, and is protected by circuit breakers, COMPASS and COMP SLAVE, on the forward circuit breaker panel. The system provides stabilized compass indications by combining the advantages of the remote indicating magnetic compass with the gyro compass. The oscillations of the magnetic compass and the drift error of directional gyro are eliminated when operating as a gyro-magnetic compass and an accurate stabilized magnetic heading is indicated. In magnetically unreliable regions, such as encountered in northern latitudes, the gyro may be unslaved from the compass system to act as a free directional gyro. The system also supplies directional signals to the automatic stabilization equipment (ASE).

### MA-1 COMPASS CONTROL PANEL

The MA-1 Compass Control Panel (figure 4-18) is on the upper console and labeled COMPASS. The panel has a synchronizing indicator, a heading set knob mode switch, and a latitude set switch. A Slave Compass Caution light is contained in the caution-advisory panel (figure 1-27).

#### Synchronizing Indicator and Heading Set Knob

The synchronizing indicator is a white pointer visible through a window, directly above the mode switch. When the pointer is in line with the white arrow on the control panel, the system is in synchronization. A red flag on the synchronizing indicator appears whenever electrical power to the system is turned off or has failed. Synchronization is obtained by pulling out the

heading set knob, marked PULL-TO-SET, and turning it until the pointer of the synchronizing indicator is in line with the arrow.

**CAUTION**

Two settings of the heading-set knob will cause the synchronizing indicator to line up with the arrow. One is correct and the other will result in an unstable 180° ambiguity. The correct setting can be recognized when the synchronizing pointer moves in the same direction that the knob is turned. The synchronizing indicator continues to provide a check on the slaving operation during flight. The pointer will oscillate about the arrow.

#### Mode Switch

The mode switch is in the center of the compass control panel and has three marked positions: FREE N. LAT, SLAVED, and FREE S. LAT. When the switch is placed in either of the FREE positions, the system will function as a free directional gyro, with either north or south latitude corrections for the drift effect of the rotation of the earth. When the switch is placed in the SLAVED position, the directional gyro is slaved to the magnetic compass heading and the rotating azimuth card on the course indicators indicate stabilized magnetic heading.

#### Latitude Set Switch

This switch is marked SET TO LAT. When the compass system is being used in the FREE N. LAT. or FREE S. LAT. mode the Latitude Set Switch is set to the local latitude. This allows the system to compensate for gyro drift due to the rotation of the earth. In the Slaved mode of operation this switch has no effect on the compass system.

### SLAVE COMPASS PANEL AND CAUTION LIGHT

A Slave Compass caution light (figure 1-27), on the caution-advisory panel, is used as a reminder to the pilot to slave the compass system. The Slave Compass Caution light will go on any time there is an interruption or loss of ac power to the compass system. When the ACKNOWLEDGE switch, on the Slave Compass Panel (figure 4-12) is pressed and ac power is being

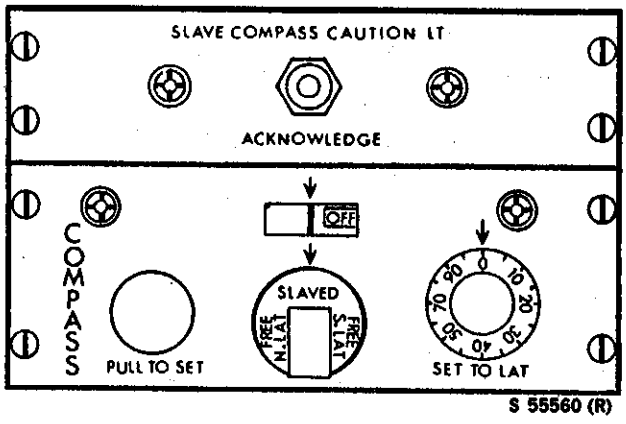



**Figure 4-18. MA-1 Compass Control Panel**

supplied to the compass system, the caution light will go off. The Slave Compass caution light is powered by the dc essential bus and is protected by a circuit breaker marked COMP SLAVE under the general heading WARNING LIGHTS, on the forward circuit breaker panel.

### MA-1 COMPASS OPERATION

Slaved Gyro Operation:

1. Mode switch—SLAVED.

2. Heading-set knob—Synchronize gyro and magnetic heading by pulling knob and turning it until synchronizing indicator is centered. (See caution note under Synchronizing Indicator and Heading Set Knob).

Free Gyro Operation.

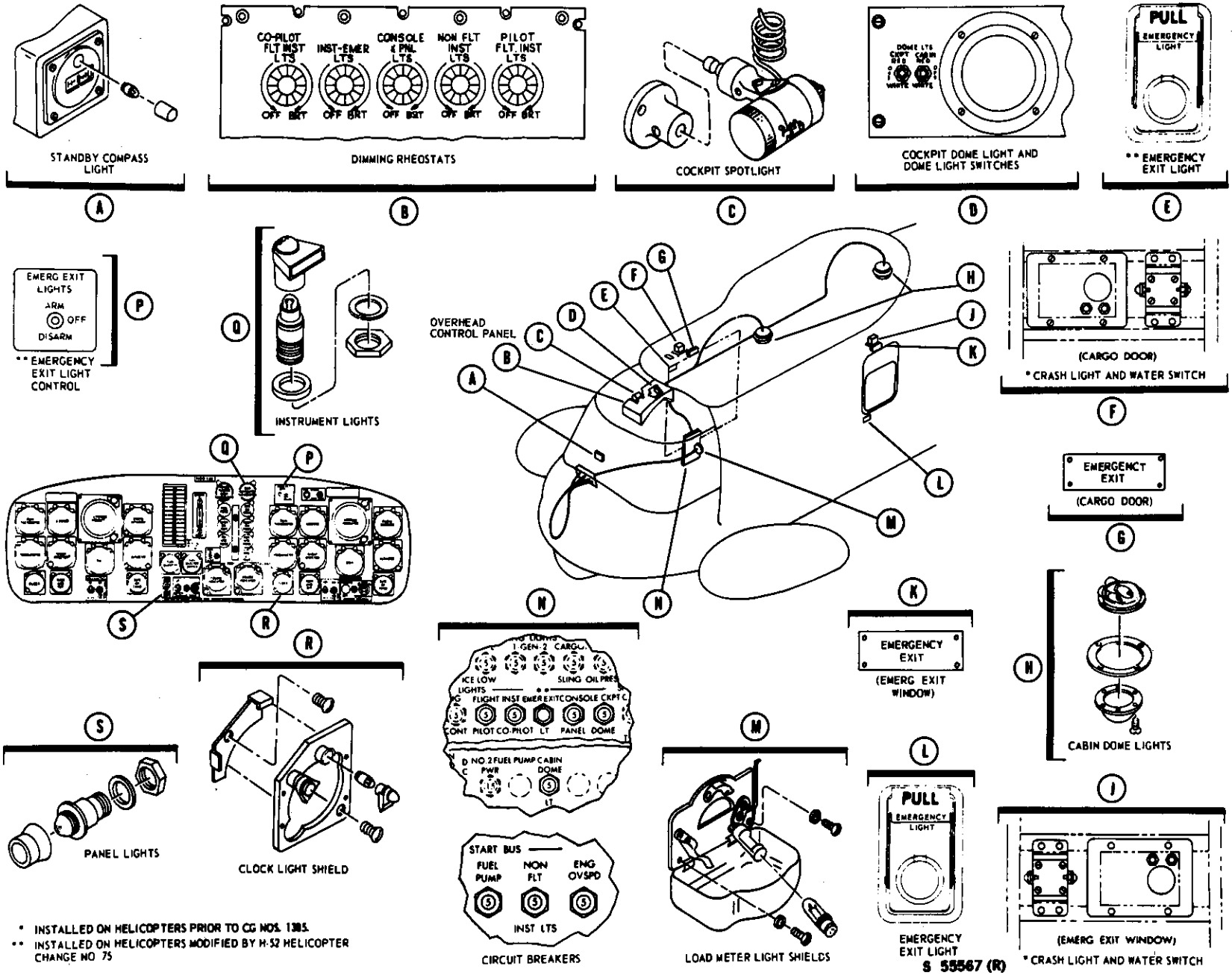
1. Mode switch—FREE N. LAT. or FREE S. LAT., as required.

2. Latitude set switch—Set to degree of latitude.

3. Heading control knob—Set to desired heading.

## LIGHTING EQUIPMENT

All lights operate on direct current and are protected by circuit breakers. The cabin dome lights, the flood and hover lights and the Aldis lamp operate from the dc non-essential bus. All other lights operate from the dc essential bus.




* INSTALLED ON HELICOPTERS PRIOR TO CG NOS. 1385.

** INSTALLED ON HELICOPTERS MODIFIED BY H-52 HELICOPTER CHANGE NO 75

**Figure 4-19. Interior Lighting**

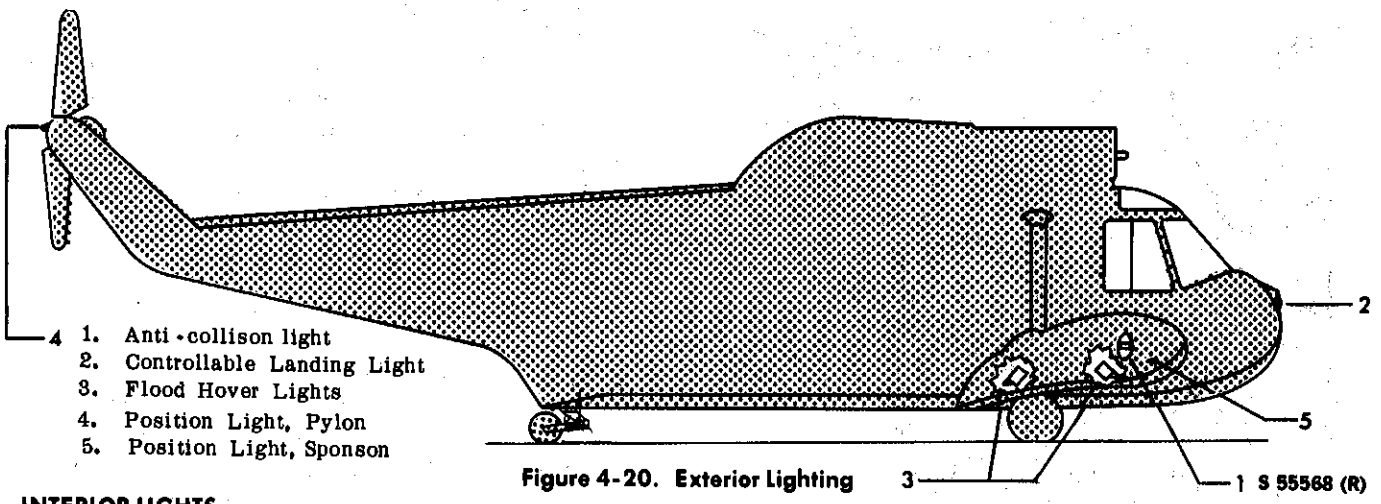



Figure 4-20. Exterior Lighting

## INTERIOR LIGHTS

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

The pilot's and copilot's instrument panel lights are individually controlled by rheostats (figure 4-19) on the overhead switch panel. The pilot's and copilot's flight instrument light circuit is protected by circuit breakers, marked PILOT and COPILOT, under the general heading, FLIGHT INST, on the forward circuit breaker panel.

### Non-Flight Instrument Lights

The non-flight instrument lights are controlled by a rheostat, marked NON-FLT INST, on the overhead switch panel (figure 4-19). The non-flight instrument lights are protected by a circuit breaker, marked NON-FLT under the general heading START BUS, on the forward circuit breaker panel.

### Console and Overhead Panel Lights

A rheostat marked CONSOLE & PNL LTS is on the overhead switch panel (figure 4-19). The console and panel light rheostat controls the lights on the overhead switch panel, radio control console, forward circuit breaker panel, and the hoist operator's and observer's radio control panels, through a circuit breaker, marked CONSOLE PANEL, on the forward circuit breaker panel.

### Cockpit Dome Light

The cockpit dome light switch marked CKPT, under the general heading DOME LTS, is on the dome light panel (figure 4-19) in the pilot's compartment. The dome light switch has marked positions, RED, OFF, and WHITE, and controls the dome light, in the panel. The dome light contains a red lamp and a white lamp, either of which may be selected by placing the dome light switch in the RED or WHITE position. The cockpit dome light is protected by a circuit breaker marked, CKPT DOME, on the forward circuit breaker panel (figure FO-3).

### Cockpit Spotlight

A portable utility light (figure 4-19) with a coiled cord is secured on the right side of the overhead console. The light may be adjusted in its mounting to direct the light beam, or it may be removed and used as hand-held portable light. The light is controlled by a rotary ON-OFF switch, on the end of the spotlight, through the circuit breaker, marked CKPT DOME, on the forward circuit breaker panel. The intensity and color of the light may be varied by turning the casing.

### Cabin Dome Lights

The cabin dome light switch (figure 4-19), marked CABIN, under the general heading DOME LTS, is on the dome light panel in the cockpit compartment. The cabin dome light switch has marked positions RED, OFF, and WHITE, and controls the two cabin dome lights, located in the cabin ceiling, through a circuit breaker, marked CABIN DOME LT, on the forward circuit breaker panel. The two cabin dome lights each contain a red lamp and a white lamp, either of which may be selected by placing the cabin dome light switch in the RED or WHITE position.

### Emergency Exit Lights

See Section I.

## EXTERIOR LIGHTS

See figure 4-20.


**Figure 4-21. Copilot's Landing Light Control Switch**

#### Controllable Landing Light

A controllable landing light is in the nose of the helicopter and may be extended downward through an arc of 120°. It may be rotated 45° left or right of center when extended between 0° and 110°. It may be rotated 360° when extended greater than 110°. The controllable landing light circuit operates on direct current from the dc essential bus and is protected by two circuit breakers, marked PWR and CONT, under the general heading CONT LDG, on the forward circuit breaker panel.

#### Controllable Landing Light Master Switch

A push type, controllable landing light master switch, marked CONTR LT, is on the forward end of the pilot's collective pitch (figure 1-20). When the switch is pushed in, power is supplied to the landing light and the landing light control switches, on the pilot's collective pitch stick and the copilot's remote control panel, and the INDICATOR light in the center of the master switch goes on. The indicator light intensity is controlled by the caution panel bright/dim switch.

#### Pilot Landing Light Control Switch

The pilot's landing light control switch is on the forward end of the pilot's collective pitch stick (figure 1-20). The control switch is a spring-loaded, four-position, thumb switch, marked EXT, RET, L, and R, with a center OFF position. Pushing the switch forward to the EXT position causes the landing light to extend through an ARC of 120°. Pushing the switch AFT to the RET position causes the landing light to retract, but the light may be stopped at any vertical angle between 120° and FULL UP stowed position. Moving the control switch to the L or R position causes the landing light to turn to the left or right of any point within 360° provided the light is extended 110° or more. If the light is not fully extended, it only turns within a 45° arc to the left or right. The landing light will stow automatically if it is trained RIGHT OF CENTER BEFORE retracting the light to the full up position.

#### Copilot's Landing Light Control Switch

The copilot's landing light control switch is on the copilot's remote control panel (figure 4-21). The control switch is a spring-loaded, four-position toggle switch, marked EXTEND, RETRACT, L and R, with a center OFF position. The switch provides the same type of operation as the pilot's landing light control switch.

#### Flood and Hover Lights

The flood and hover light switch is on the forward end of the pilot's collective pitch stick (figure 1-20), and has marked positions HOVER LT, OFF, and FLOOD LT. The flood and hover light switch controls the flood and hover lights mounted below the forward strut assemblies of each sponson, through four circuit breakers, marked CONT, 1, 2, and 3, under the general heading HOVER LTS, on the aft circuit breaker panel. The circuit breaker, marked 1, protects the Hover Light mounted by the right sponson that provides illumination directly below and AFT of the helicopter. The circuit breaker marked 2 protects the FLOOD-HOVER light mounted by the left sponson that provides forward illumination, and the circuit breaker marked 3 protects the FLOOD-HOVER light mounted by the right sponson, that also provides forward lighting. When the flood and hover light switch is placed in the HOVER LT position, all three lights are operated. When the switch is placed in the FLOOD LT position, the light by each sponson that provides forward lighting will be operated.

**NOTE**

Do not operate the lights for more than 10 minutes at a time. Bulb life is sharply decreased by longer operating periods.

#### Navigation Lights Master Switch

A navigation lights master switch, marked MASTER, under the general heading NAV LTS, is on the overhead switch panel in the pilot's compartment (figure FO-2). The switch has marked positions ON and

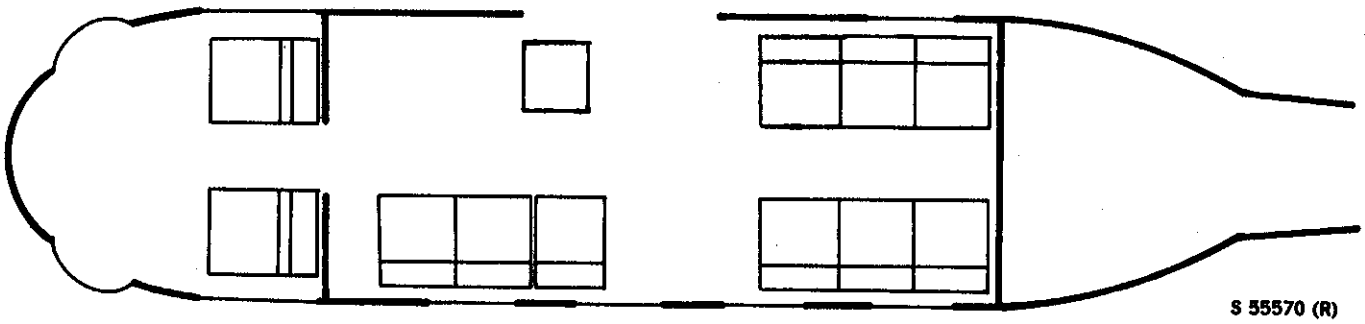



Figure 4-22. Passenger Seats

OFF, and controls the power source to the position and anti-collision lights. The switch must be in the ON position before the position and anti-collision lights can be operated.

#### Position Lights

The position lights (figure 4-20) on the sponson and pylon, are controlled by a switch on the overhead switch panel marked POSITION under the general heading NAV LTS (figure FO-2). The switch has marked positions, DIM, OFF, and BRI, and controls the operation of the three position lights. The position lights operate on current from the dc essential bus and are protected by a circuit breaker, marked POS, under the general heading LIGHTS, on the forward circuit breaker panel.

#### Rotating Anti-Collision Lights

An anti-collision light switch, marked ANTI-COL, under the general heading NAV LTS, is on the overhead switch panel (figure FO-2). The switch has marked position, ON and OFF, and controls the operation of the two anti-collision lights. A red, rotating anti-collision light is on the outboard side of each sponson (figure 4-20). The anti-collision lights operate on current from the dc essential bus and are protected by circuit breakers, marked ANTI-COL, LEFT and RIGHT, under the general heading LIGHTS, located on the forward circuit breaker panel.

## CABIN EQUIPMENT

The cabin, from station 180 to station 348, is capable of carrying cargo, personnel, and litters. Cargo tiedown fittings are installed on the cabin floor. The cabin door is on the right side of the helicopter. When loading the helicopter, refer to Section V for center of gravity and weight limitations and the Handbook of Weight and Balance Data.

#### CABIN FLOOR

The cabin floor, capable of sustaining static loads of 175 pounds per square foot and a maximum load of 2400 pounds, consists of five panels which form the top of the tub (lower fuselage). Each panel is made of aluminum honeycomb bonded between two sheets of aluminum. The areas around the openings in the floor panels are filled with resin. The floor contains cargo tiedown rings, a plate for leveling the helicopter with a plumb line, provisions for troop seats, and covers for access to the fuel cells, in-flight refueling adapter and for inspection of the tub compartments.

#### TIEDOWN FITTINGS

Twenty-two fittings are installed in the cabin floor for cargo tiedown. Each is secured with rivets. The fittings are spaced approximately 20 inches apart, with each containing a ring that can be raised for cargo tiedown.

#### PASSENGER SEATS

Passenger seats (figure 4-22) equipped with seat belts may be installed in the cabin to accommodate nine people. Normally only the three forward port seats are installed. 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. During search operations, when maximum visibility from the cabin is necessary for scanning, the seat backs blocking windows should be stowed. The seat back should also be stowed during water operations to permit quick access to the windows for emergency exit.

#### FLIGHT MECHANIC'S SAFETY HARNESS

The Flight Mechanic's safety harnes is stowed in the cabin. When in use the harness snap hook end is attached to an overhead fitting. The harness shall be

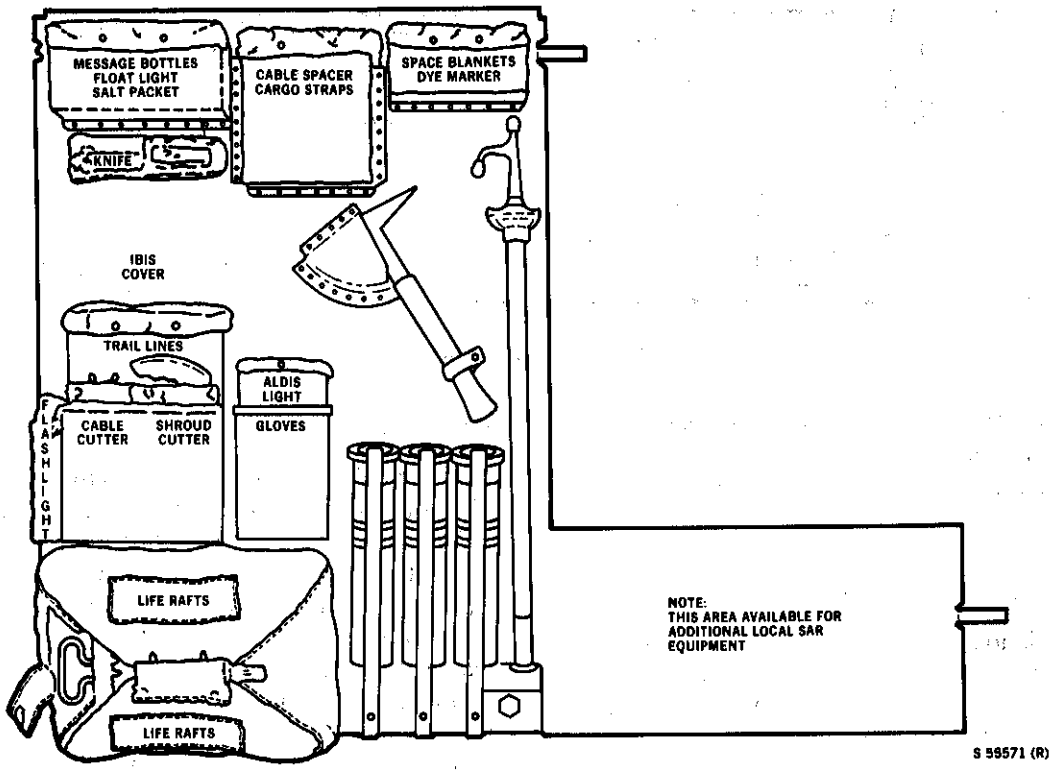



**Figure 4-23. Standard HH-52A SAR Equipment Board**

worn during hoist operations, rescue platform recoveries, and/or any time the cabin door is open in-flight and personnel are not in their seats with their respective lap belts secured.

### STANDARD HH-52A SAR EQUIPMENT BOARD

The HH-52A SAR Equipment Board (figure 4-23), on the starboard side of the cabin aft of the cabin door, provides for standard stowage of required essential SAR equipment listed in figure 4-24. A 27- by 14-inch space on the lower right corner of the board is available for addition of local SAR equipment. Weight of the empty board is 28 pounds. The weight increases to 90 pounds with the addition of the required equipment listed in figure 4-24. Installation of the standard SAR equipment board will eliminate the existing SAR box and boards and allow for a standardized training program for newly assigned Flight Mechanic trainees.

### ALDIS LAMP

A portable searchlight is provided on the Standard SAR Equipment Board. The light is controlled by an on-off switch on the handle and may be plugged into the dc utility receptacle for operation.

### DC UTILITY RECEPTACLE

A 28-volt dc electrical utility receptacle, marked UT RECP, is aft of the cabin door. The circuit is protected by a 10 ampere circuit breaker, marked UTILITY RECEPT, on the aft circuit breaker panel.

### LADDER, CARGO DOOR

A portable ladder (figure 4-25) is provided for entering the helicopter through the cabin cargo door. The ladder is secured to the sill of the cabin cargo door opening by two quick detachable NORCO locks. The ladder is swung out and down when used by personnel entering the cabin and may be swung up and in to permit closing of the cabin cargo door.

### RESCUE PLATFORM

The helicopter is equipped with a detachable rescue platform (figure 4-25). 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 cabin cargo door by studs and support cables. When not in use, the platform is stowed in the aft cabin area.

### LITTERS

The litter installation (figure 4-26) consists of six litters, three against the right cabin wall aft of the cabin

| Description | Quantity |
|---|---|
| MK-25 Marine Location Marker | 3 |
| Hoist Gloves | 1 (Pr) |
| Trail Lines (Note 1) | 2 |
| Message Droppers | 4 |
| Space Blanket | 4 |
| Flashlight | 1 |
| Survival Knife | 1 |
| Cable Cutter | 1 |
| SDU-5/E Strobe Float Light | 2 |
| Aldis Lamp | 1 |
| Crash Axe | 1 |
| Five-Pound Trail Line Weights (Note 2) | 2 |
| Shroud Line Cutter | 1 |
| Flotation Device SDU-5/E Light (Note 3) | 2 |
| LR-1 Life Rafts (Note 4) | |
| Dye Markers, Vest Type | 2 |
| Helo Hoist Quick Splice | 1 |
| Cargo Straps | 3 |
| Boat Hook | 1 |
| Salt Packets (For Pyro in Fresh Water Use) | 15 |
| IBIS Indicator Cover | 1 |

**Notes:**

1. 100 ± 5-foot lines.
2. Bag made from number 80 Herculite Cloth, filled with number 8 lead shot for weight.
3. Electronic Division, 3901 North 29th Ave. Hollywood, Florida 33020.
4. Rafts folded and stowed in modified NC-3 parachute container. Use of four-man Winslow life raft is optional.

**Figure 4-24. HH-52A SAR Equipment Board**

door and three against the left wall aft of the ASE components shelves. The bottom litter of each set rests on the cabin deck. The other four are suspended from the overhead airframe. The litters are installed by using four support strap assemblies, each with three bracket hooks for securing the litter handles. Eight additional bracket hooks are secured to the cabin walls for the suspended litters. The bottom ends of the straps are secured to cabin deck tiedown rings by clips. The top ends of the straps pass through fittings bolted to the overhead frame. The straps are adjustable and tightened at the top end. The litters resting on the cabin deck have stops for the outboard handles secured to the cabin wall frame. Each litter has a retaining cap assembly to prevent forward movement of the litter. The cap is installed so as to fit over the end of the forward outboard handle.

### CABIN DOOR

The cabin door, used for loading personnel and cargo into the helicopter, is on the right hand side of the helicopter (figure 4-27). Two steps that may be pivoted

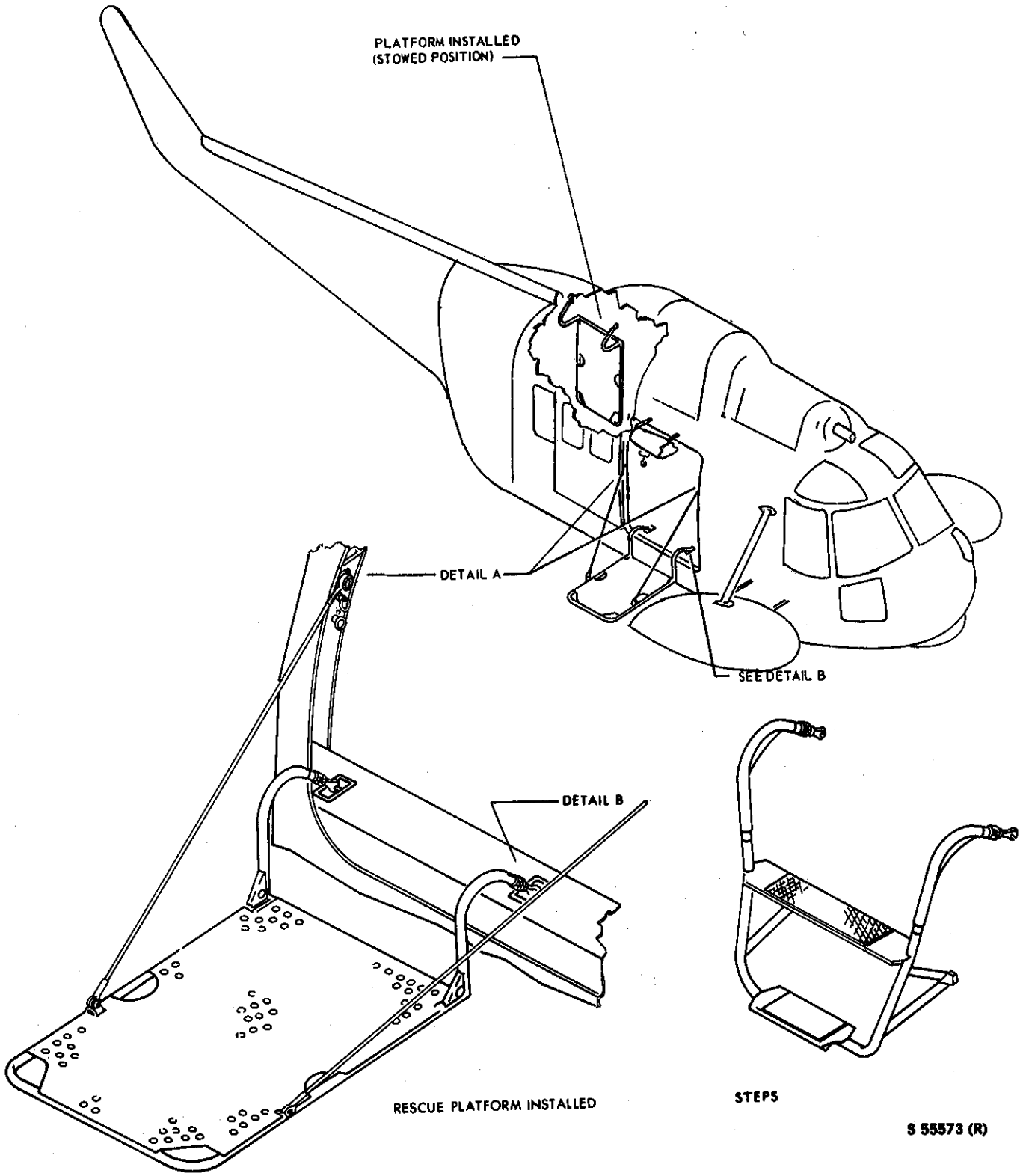



**Figure 4-25. Rescue Platform and Steps**

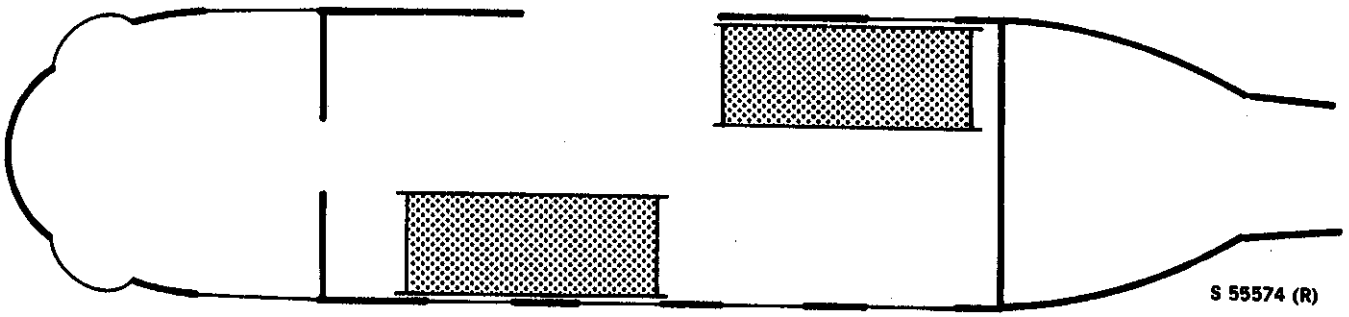



Figure 4-26. Litter Installation

up into the cabin are secured to fittings on the floor just inboard of the door sill to aid entry into the helicopter. The steps may be easily removed by turning and pulling the Norco Lock, and may be interchanged with the rescue platform that is secured in the same manner. The door is approximately 4 feet wide by 5 feet high, and contains two 19- by 20-inch windows, and six small inspection windows along the top skin of the door. The large windows are held in place with riveted retainers and the inspection windows are bonded in place. The door slides on an upper and lower track. The door is secured in the closed position with a mechanical latch. The cabin door has an inner and outer emergency handle. When either handle is turned, the upper part of the door is disconnected from the upper track. The door may then be pushed or pulled outward and away from the helicopter fuselage.

#### RESCUE BASKET

The rescue basket, in the cabin, consists of welded steel tubing. The basket bail is a beam assembly of tubing and steel plating. An opening in the center of this plate provides for attachment of rescue hoist hook. Each end of the basket contains a resin-impregnated fiberglas polyurethane foam cylinder for flotation.

#### CABIN DOOR SAFETY STRAP

The helicopter is equipped with a safety strap (figure 4-27) installed in the cargo door opening, for the purpose of restraining personnel. The safety strap is adjustable with two quick release snaps that attach to ring and eye bolt assemblies on the cargo door opening. The cargo door safety strap shall be installed whenever the cargo door is open and the helicopter is in motion. When not in use, the safety strap is stowed by attaching the forward snap to the ring on the aft door frame.

### RESCUE HOIST

The rescue hoist provides a means of suspending external cargo from the helicopter. The 600-pound capacity hydraulic hoist is supported from a fixed truss over the cabin door on the right-hand side of the fuselage. The hydraulic hoist system consists primarily of a hoist, hoist solenoid valve (four-way control valve), accumulator, flow regulator, hoist electrical controls, hook and handwheel assembly, circuit tester, and circuit breaker. The system operates at 1250 psi hydraulic pressure supplied from the auxiliary hydraulic system. Operation of the hoist system is controlled by electrical switches from either the pilot's compartment or the cabin. A built-in shear (guillotine) circuit permits shearing of the hoist cable in the event of cable fouling. Faulty wiring in the shear circuit can be detected by the circuit tester. The accumulator dampens pressure surges and is installed on the transmission deck. It is precharged with 600 psi air pressure. The flow regulator controls the fluid flow to the hoist and limits the cable travel to 80 feet-per-minute. The hoist is rated at 600 pounds capacity. It consists primarily of a hydraulic motor, cable drum, cable, brake, level wind mechanism, limit switches, and a shear mechanism. The hydraulic motor drives the cable drum through two stages of planetary gear reduction. The cable drum, in turn, reels in or pays out up to 100 feet of 3/16-inch-diameter stainless steel cable, the last 10 feet of which are painted red and white. The self energizing-type brake enables the hoist operator to stop the cable at any desired length and hold it in place, with or without a load. The level wind mechanism serves to distribute the cable evenly on the reel. The limit switches provide automatic stopping of the hoist at extreme cable positions during electrical operation of the hoist. The hoist will not stop automatically during operation with the hoist manual override. The ballistic-type shear cartridge permits shearing of the hoist cable in case of emergency.

#### HOIST MASTER SWITCH

The hoist master switch, marked HOIST MASTER, is on the overhead switch panel (figure FO-2). When the

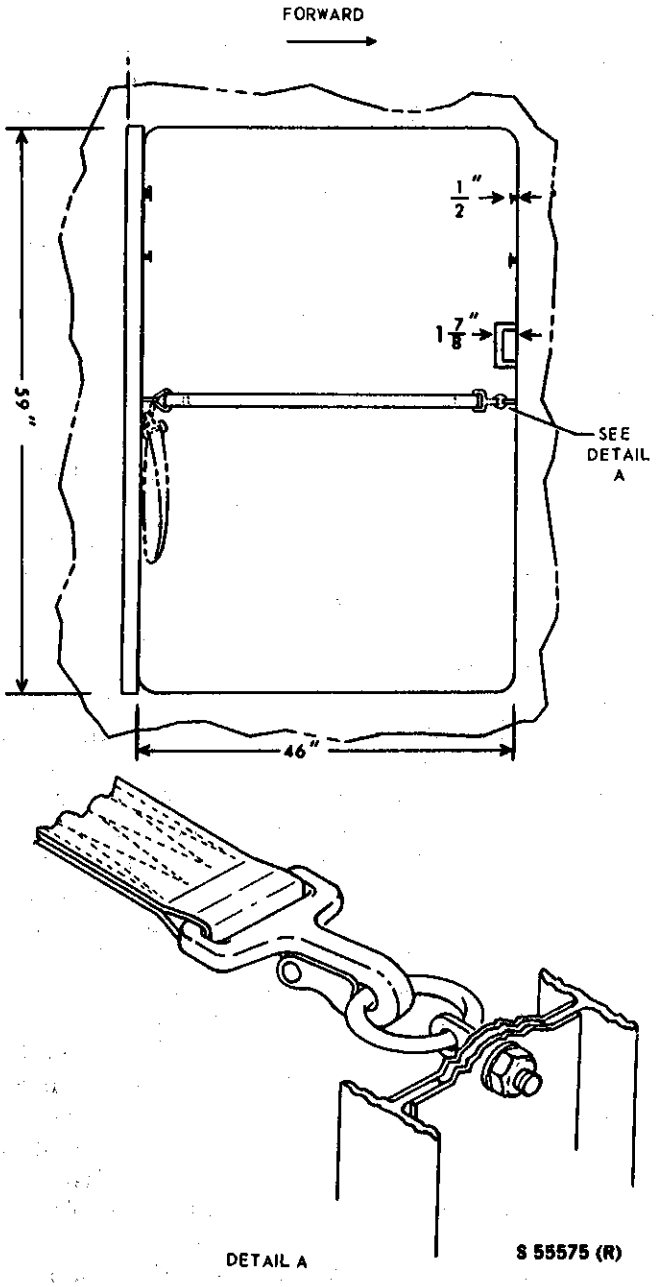



**Figure 4-27. Cabin Frame and Safety Strap**

switch is placed in the CREW position, the hoist winch is controlled by the Hoist Operator's switch and the cabin portable control switch. When the switch is placed in the PILOT position, the hoist is controlled only by the Pilot's hoist switch. When the switch is in the OFF position, all three hoist switches are inoperative. The hoist master switch uses power from the dc essential Bus and is protected by a circuit breaker marked HOIST on the forward circuit breaker panel.

### PILOT'S HOIST SWITCH

The thumb switch, marked HOIST with the positions UP, OFF (CENTER), and DOWN, on the pilot's collective pitch control box (figure 4-28), controls the hydraulic hoist winch. The switch is pushed to either position, UP or DOWN, to operate the hoist. When released, the switch returns to the center (OFF) position and the hoist winch stops and locks. The switch is operative when the hoist master switch is placed in the PILOT position.

### CREWMAN'S HOIST SWITCH

A momentary-type switch (figure 4-28), marked UP, OFF, DOWN, on a small panel marked HOIST, above and forward of the door on the right side of the cabin, allows a crew member to control thhe hoist. The switch is pushed to either extreme position to operate the hoist winch. When released, the switch returns to the center (OFF) position, and the hoist winch stops and locks automatically. The switch is operative when the hoist master switch on the pilot's overhead switch panel is placed in the CREW position.

### CABIN PORTABLE CONTROL SWITCH

A momentary-type thumb operated portable hoist control switch (figure 4-28), marked DOWN and UP, is stowed on a bracket on the cabin frame forward of the cargo door. The switch will provide the hoist operator with greater mobility during hoist operations. The switch is wired in parallel with the cabin hoist control switch and is operative when the hoist master switch is in the CREW position.

**CAUTION**

If the hoist does not respond properly to the electrical controls, the crewman should attempt to determine the cause (Bent cable, fouled cable, etc.) and inspect the hoist prior to using the manual hydraulic override. Use of the override with a fouled reel or cable may cause further damage and possible parting of the cable. If resistance is encountered when using the override, the hoist should be stopped immediately to prevent further damage.

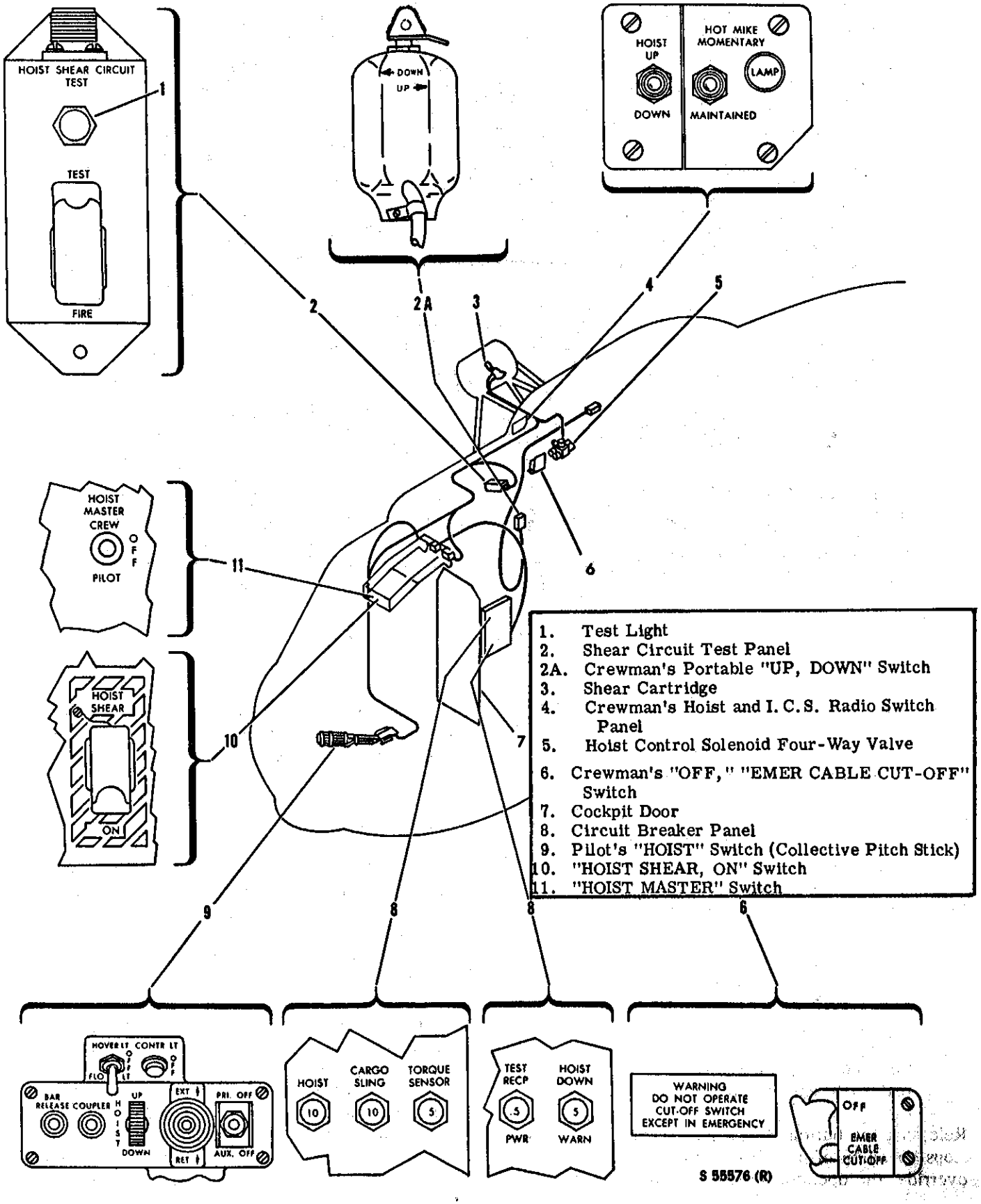



**Figure 4-28. Rescue Hoist Component Locations**

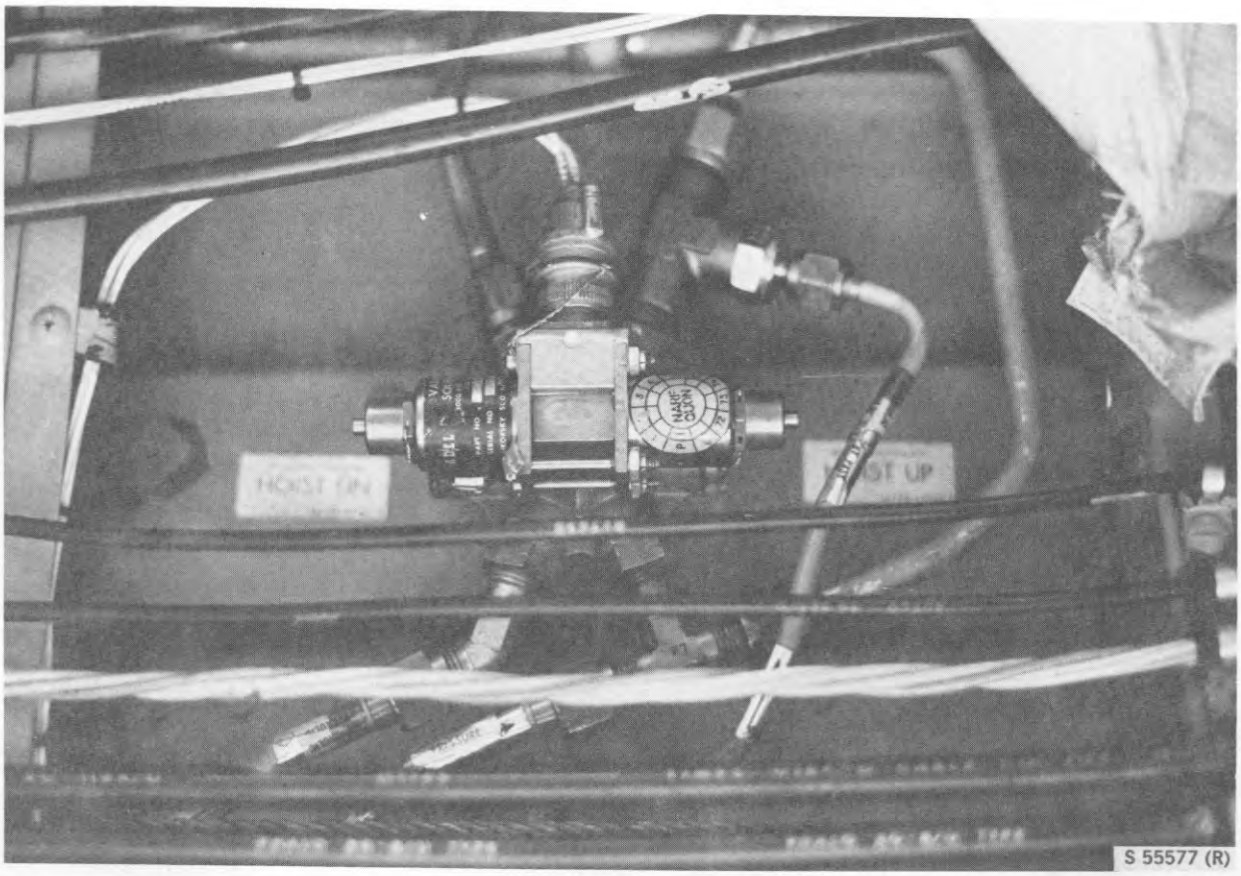



**Figure 4-29. Hoist Operator's Override Valve**

### HOIST MANUAL OVERRIDE

A hydraulic hoist manual override valve, installed above cabin door, is provided to lower or raise hoist in event of electrical failure. The three-position, four-way valve operates on power from the auxiliary hydraulic system and is actuated by two hydraulic hoist manual override valve buttons on the valve. Depressing either of the spring-loaded buttons, marked HOIST DOWN and HOIST UP, opens the override valve and actuates the hoist winch.

**CAUTION**

The hoist will not stop automatically during manual operation when the cable reaches the extreme ends.

Releasing the button closes the override valve and stops operation of hoist winch. Before using manual override, the operator must check the condition of hoist cable and reel. Abnormal stresses encountered during hoisting may result in malfunctions of the reel and level-wind mechanism which can prevent electrical operation of hoist.

### HOIST CABLE SHEAR SWITCHES

Two guarded momentary-type, hydraulic hoist cable shear switches are provided to cut the hoist cable at the winch in an emergency should the cable become entangled with an obstruction on the ground. One switch marked HOIST SHEAR with a position marked ON is on the overhead switch panel in the pilots compartment (figure FO-2), the other switch marked EMER CABLE CUT-OFF with a position marked OFF is on the cabin wall above the cabin door (figure 4-28). To shear the hoist cable, lift the guard and actuate the switch. An electrically-fired cartridge will fire a guillotine and cut the hoist cable at the winch. The hoist master switch must be placed in the crew position to permit shearing from the CREW position. The pilot's shear switch is operable with the hoist master switch in

either position (CREW or PILOT). Electrical power for the Test and Shear circuit comes from the dc essential bus and is protected by a circuit breaker marked HOIST on the forward circuit breaker panel. This is the same circuit breaker that protects the HOIST MASTER switch.

#### HOIST SHEAR CIRCUIT TEST PANEL

A hydraulic hoist shear circuit test panel, marked HOIST SHEAR CIRCUIT, is mounted on the cabin wall above the cabin door (figure 4-28). A light, marked TEST, is on the top center of the panel. With the test switch in the TEST position, and either the pilot's or crewman's HOIST CABLE SHEAR SWITCH is activated, the green TEST light above the test switch should come on. This indicates that the shear circuit is in working order. Testing of the hoist shear circuit must be accomplished in the following sequence:

#### HOIST SHEAR CIRCUIT TEST

1. Separate the break away wire, lift guard on hoist shear circuit test panel and move switch to TEST.

2. Separate the break away wire, lift the guard and actuate the pilot's and/or hoist operator's hoist cable shear switch.

3. The test light on the hoist shear circuit test panel goes on, indicating that the hoist shear circuit is functioning properly.

4. Upon completion of the test return test switch to FIRE position and install breakaway wire on all switch guards.

### TUGBIRD

The Tugbird system is no longer installed in the HH-52A. The TUGBIRD position of the release mode switch on the overhead switch panel (figure FO-2) should be disregarded.

## EXTERNAL CARGO SLING

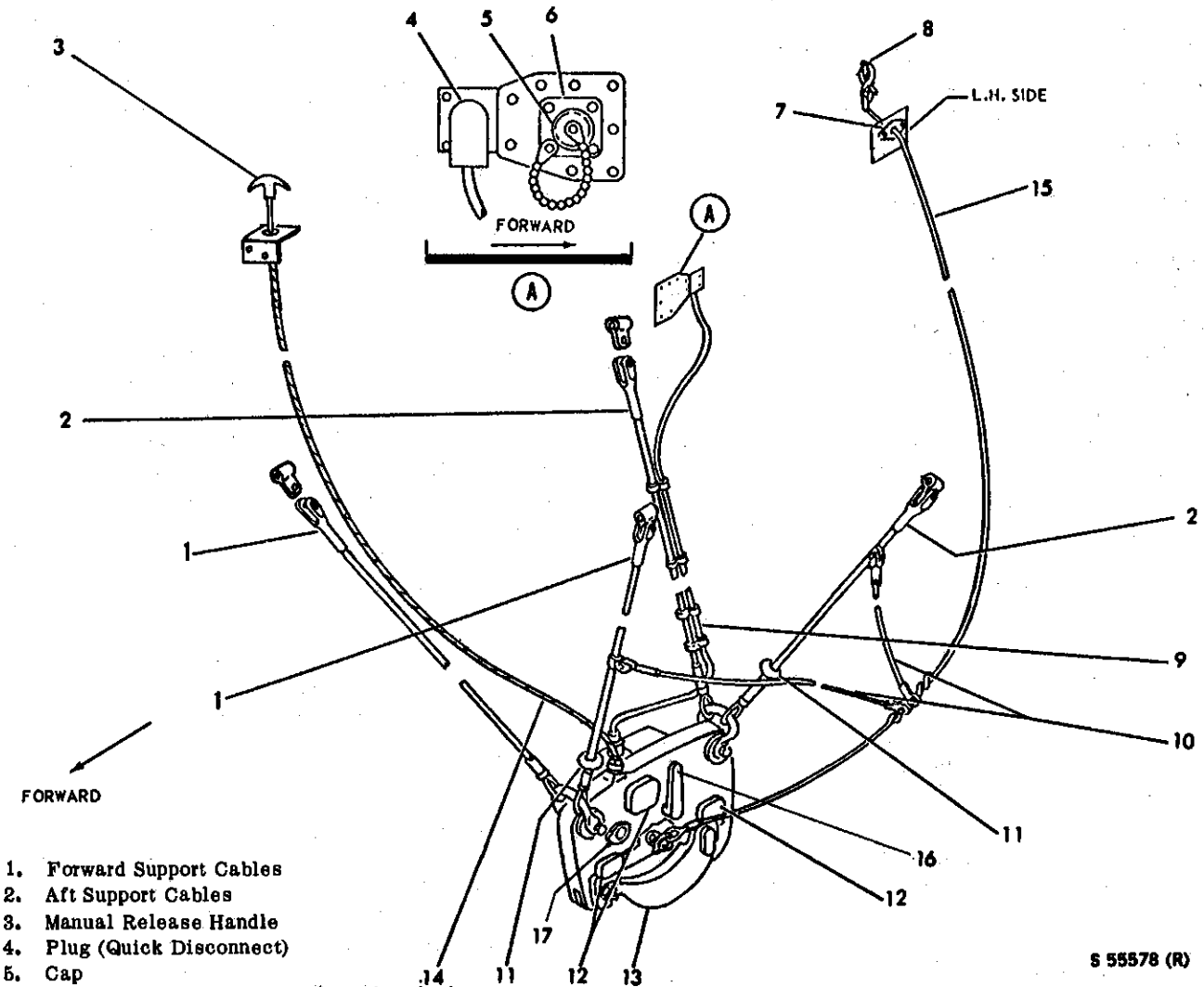
The 3000-pound capacity cargo sling (figure 4-30) consists of four cables suspended from fixed mount supports attached to the left and right chines on the lower fuselage structure of the helicopter, a cargo hook suspended from the cables, a cable assembly for stowing the hook, a mechanical release cable, electrical components and wiring and sling stowage provisions. These components weigh 16 pounds. The four cables converge at the centerline of the helicopter below the fuselage and are shackled to the cargo hook. The cargo release circuit operates on direct current from the essential bus and is protected by a circuit breaker, marked CARGO SLING, on the forward circuit breaker panel. A light, marked SLING OPEN, on the caution panel will go on any time the cargo hook is open. The light receives electrical power from the dc essential bus through a circuit breaker marked CARGO SLING, on the forward circuit breaker panel under the general heading WARNING LIGHTS. When the cargo sling is attached but not in use, it is stowed under the fuselage by means of a stowage line. A manual release lever, on the cargo hook, permits mechanical opening of cargo hook by ground personnel. The crewman may open the cargo hook during flight or while on the ground by actuating the release cable handle attached to the manual release mechanism on the hook, The release handle is secured to the forward cabin door frame. Cargo is attached to the hook by ground personnel who must manually close the hook.

**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 the water with an unstowed hook can cause damage by denting or puncturing the hull. It should be noted on the pink sheet if the cargo hook has made water or ground contact so that preventive action can be taken against corrosion and damage.

#### CARGO HOOK

The hook contains a load beam that supports cargo below the main rotor centroid during cargo carrying operations. When the sling is properly installed, the cargo hook load beam pivots at the aft end; the forward end engages a latch when the hook is closed. The latch controls the opening of the hook, which may be accomplished by either manual, electrical controls, or automatically. The hook may be opened manually by either the manual release lever on the hook or by the manual release handle attached to the forward edge of the cargo door. The hook may be opened electrically by depressing either the pilot's or copilot's "CARGO" switch on the cyclic stick grip, when the "RELEASE




1. Forward Support Cables
2. Aft Support Cables
3. Manual Release Handle
4. Plug (Quick Disconnect)
5. Cap
6. Dummy Receptacle
7. Fair Lead
8. Chock (Cleat)
9. Electrical Cable
10. Cable
11. Cable Bumpers
12. Hook Bumpers (Bonded)
13. Cargo Release Hook
14. Manual Release
15. Stowage Line
16. Manual Release Lever
17. Hook Closed Indicator Window

**Figure 4-30. External Cargo Sling**

MODE" switch is in the "SLING" position and the "CARGO SLING MASTER" switch is in the ON or AUTO position.

### CARGO SLING MASTER AND MODE SWITCHES

A switch, marked RELEASE MODE, SLING, and TUGBIRD, is provided. The cargo sling master switch, marked CARGO SLING MASTER, on the overhead switch panel, (figure FO-2), controls the electrical actuation of the cargo hook. The switch has three positions, ON, SAFE, and AUTO. When preparing to release cargo electrically, the master switch should be in either the ON or AUTO position. With switch in the ON position, cargo may be released by actuating either cyclic stick cargo release switch. With the switch in the AUTO position, cargo is released by the automatic touchdown release circuit when the load on the cargo hook is reduced to 100 ±20 pounds or less. The cargo hook cannot be closed by ground personnel if the master switch is in the AUTO position.

### CARGO RELEASE SWITCHES

A push-button, momentary-contact type cargo release switch is on the grip of both cyclic sticks (figure 1-19). Either thumb-operated switch, marked CARGO, may be depressed to open the cargo hook when the cargo sling master switch is in the ON or AUTO position.

#### CARGO HOOK MANUAL RELEASE LEVER

The cargo hook may be opened manually by ground hookup personnel by operating the manual release lever on the cargo hook.

#### CARGO HOOK MANUAL RELEASE HANDLE

The manual release cable leads from the cargo hook to the manual release handle intalled on the forward edge of the cabin door. It permits manual release of the cargo hook from the cabin.

#### CARGO SLING OPEN CAUTION LIGHT

The sling open caution light is actuated by a microswitch on the cargo hook. A yellow caution light marked SLING OPEN, on the caution panel (figure 1-27), will go on whenever the cargo hook load beam is open, provided the MODE switch is in the SLING position and the CARGO SLING MASTER switch is in either the ON or AUTO position.

#### CARGO HOOK STOWAGE LINE

Stowage of the cargo sling is accomplished with the nylon line that is attached to the hook. It enters the left side of the fuselage through a fairlead, and is secured to a tiedown chock. Two short cables, attached by thimbles to the forward and aft left sling cables, are attached to this line. Pulling this line inside the fuselage secures the cargo sling and hook under the left side of the hull.

**WARNING**

Any static electricity that may have been generated by the helicopter should be dissipated prior to attempting hookup.

### MOORING

Mooring is accomplished by securing the helicopter with tiedowns, usually as a precaution against high wind conditions. (figure 4-31). If necessary the struts may be deflated and the fuel tanks filled.

#### TIEDOWN RINGS

Five mooring rings (figure 4-31) are provided on the helicopter. Each main landing gear trunnion assembly has a mooring ring on the outboard side. A mooring ring is on the tailwheel assembly and one at the top of each compression strut. High tiedown extensions will be installed for shipboard operations.

#### BLADE TIP COVERS (BOOTS)

Blade tip covers (figure 4-31) are used as a precaution against high and/or gusty winds. Two types of boots are available for blade security. Canvas type boots are for use in light wind conditions and are installed with a maximum of 6 inches downward deflection of the blade. Special HEAVY WEATHER (METAL) BLADE BOOTS are designed for use in winds up to 70 knots. See the Maintenance Manual for installation procedures for both types of boots.

**CAUTION**

Blade deflection with the Heavy Weather Blade Boots is 26 inches. Damage to the main rotor blades is likely if more than 6 inches deflection is used with the canvas-type boots.

#### MAIN ROTOR BLADE FOLDING AND STOWAGE

The main rotor blades may be folded (figure 4-32) when parking the helicopter in a small area. A taper pin puller, blade crutch, and blade pocket assemblies are required to fold the blades.

### WINDSHIELD WIPER SYSTEM

The electrically-operated windshield wiper system consists of a two-speed ac motor, two converters, two arm and link assemblies, two wiper assemblies and a control switch. Actuation of the motor drives a flexible drive shaft to a converter which transmits oscillating motion to the arms and wipers. The converters are just below the pilot's and copilot's windshield. The wipers are on each windshield and have approximately 72° range of travel. The control switch, on the overhead switch panel (figure FO-2) with marked positions PARK, OFF, LOW, and HIGH, controls the entire system. When the switch is placed in the LOW or HIGH position, the system is actuated at the selected speed. When the switch is placed in the momentary PARK position the wipers are automatically positioned to the inboard edge of the windshields. The windshield wiper system operates on power from the ac essential bus and is protected by a circuit breaker marked

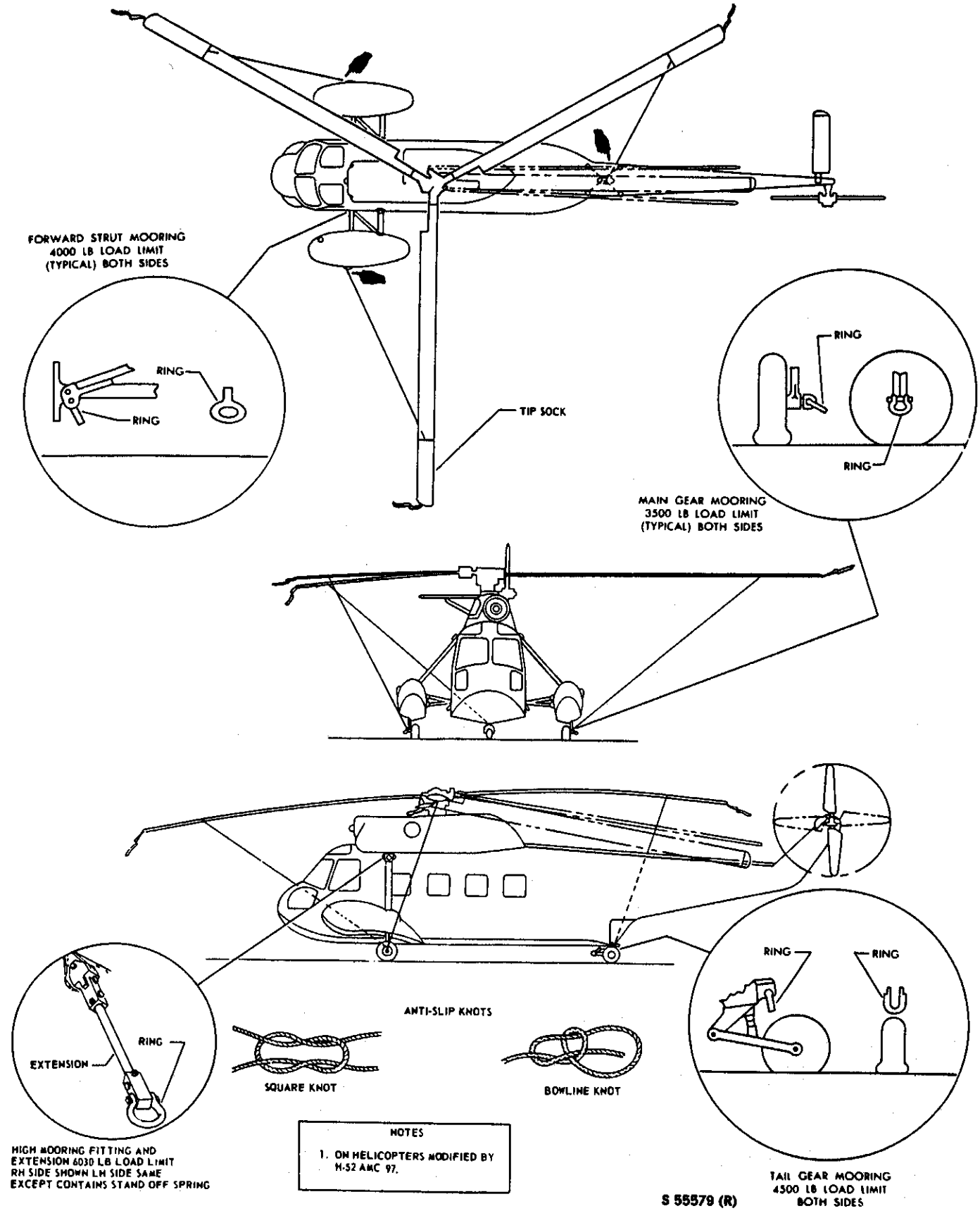



**Figure 4-31. Mooring**

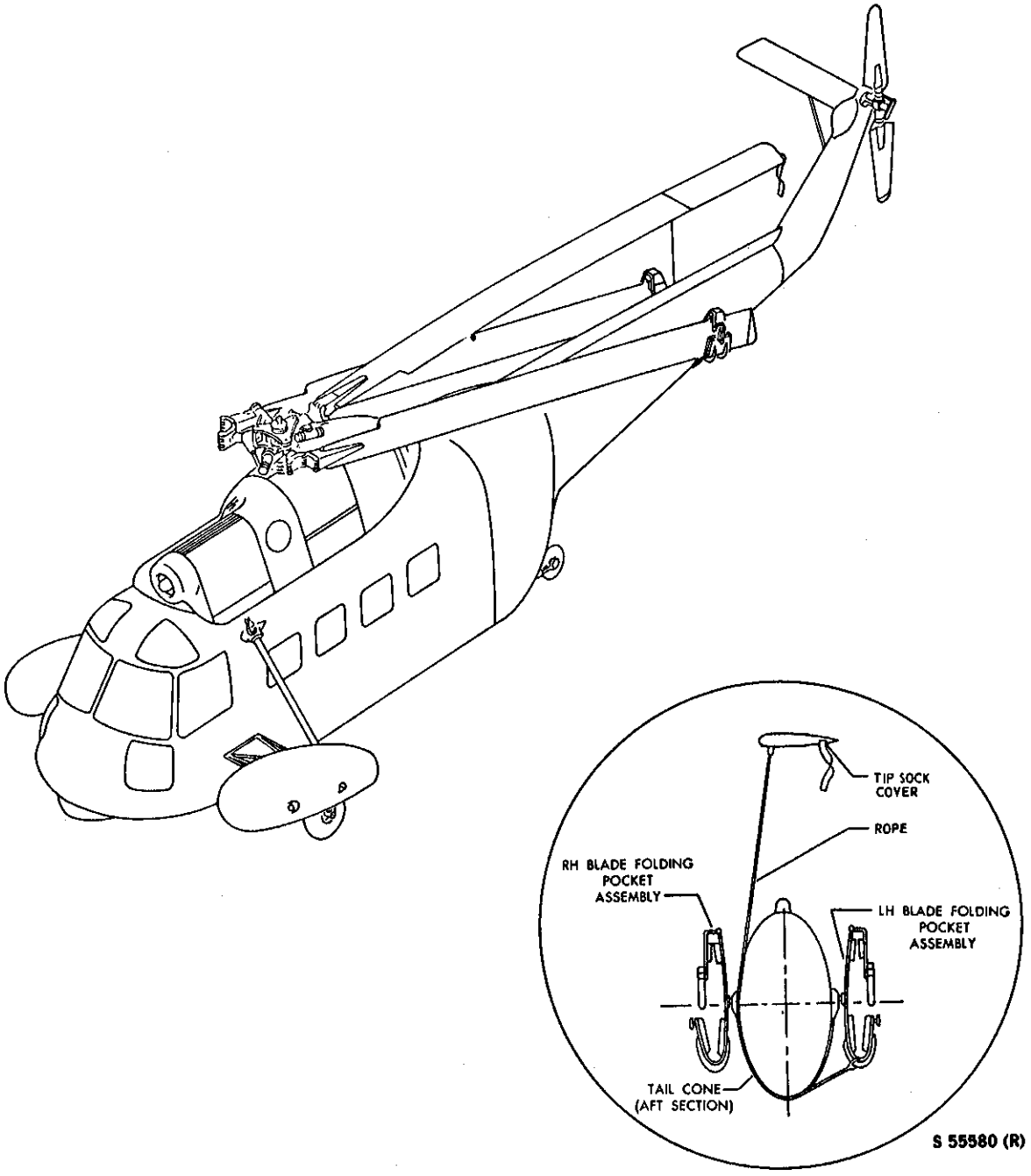



**Figure 4-32. Main Rotor Blades Folded and Stowed**

WINDSHIELD WIPER on the aft circuit breaker panel. To prevent scratching the windshield, do not operate wipers on dry glass.

## WINDSHIELD WASHER

The windshield washer system consists of a reservoir attached to the forward cabin bulkhead behind the pilot's seat, a surgemeter foot pedal on the cockpit floor near the pilot's right foot, two nozzles, and connecting rubber hoses. Pressure for operating the windshield washer system is supplied by actuating the surgemeter button with the right foot. When the button is depressed, pressure is directed toward the nozzles. When the button is released, fluid is drawn from the reservoir. Repeated actuation of the button

causes the fluid from the reservoir to be forced through the nozzles and onto the windshields. Water is used as the washing fluid. A 60% ethylene glycol solution and 40% water is used during freezing weather. Due to slipstream effect in forward flight, the windshield washer system is most effective if operated on deck in a low pitch condition. The system is marginally effective in a hover and least effective in forward flight.

## HIGH-INTENSITY SEARCHLIGHT

The high-intensity searchlight system (Night Sun) provides a high-intensity light source particularly suited for most night operations, including seach operations and examination of rescue locations from a safe altitude. Night photographic missions are possible using daylight techniques and film.

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 landing light toggle switch for cockpit control of beam direction (figure 4-21).

### 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 non-essential 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.

**NOTE**

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

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

**NOTE**

One transformer/rectifier is capable of powering the searchlight system.

**CAUTION**

Do not attempt to operate the searchlight from battery power only.

### EXTERNAL MOUNT

The external mounting consists of four support brackets, the gimbal mount, and the searchlight assembly. All the external gear weighs 44 pounds and has only a slight influence on CG travel. The assembly is mounted on the port side of the helicopter aft of the cabin emergency exit. Water landings will immerse the searchlight.

**NOTE**

Water landings with the searchlight installed should be limited to emergency circumstances. If a water landing is necessary and the searchlight is in use, if possible turn the light off and allow it to cool prior to landing (any cooling period is beneficial). The MASTER switch should also be secured prior to water contact.

### REMOTE CONTROL UNIT

The remote control unit (figure 4-33) is mounted in the cabin above the radio rack. Two quick-disconnect releases permit moving the unit to other positions about the cabin for remote use. The control panel 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 lamphousing 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 turns off 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 emergency exit. Two circuit breakers are mounted on the bottom of the case (70A and 7A).

### 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 rotation 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 rotation. 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.

**NOTE**

Manual movement of the searchlight assembly will not damage the actuating mechanism.

**WARNING**

Avoid training the searchlight on any part of the helicopter. The heat generated is capable of melting a tire or igniting paint or fiberglass. When changing azimuth from side to side, DEPRESS ELEVATION to avoid shining the light inside the helicopter.

### 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 motor 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.

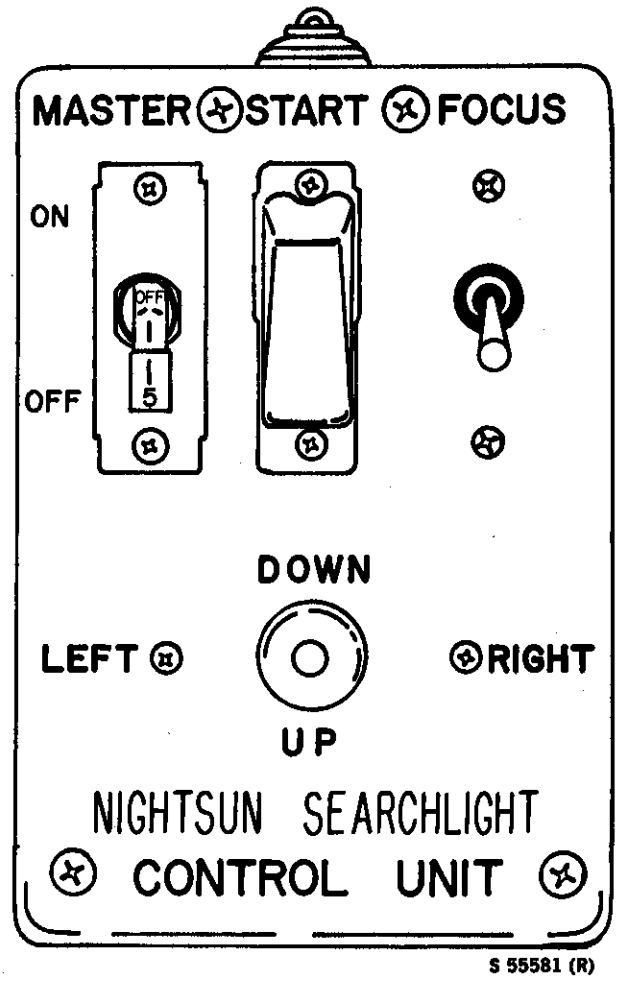



**Figure 4-33. Remote Control Unit**

**NOTE**

Unlighted pressure within the bulb is approximately 75 psi. Lighted, the pressure approaches 300 psi and the temperature surrounding the arc will range between 800° and 2100°F. Should the bulb explode, it will be contained by the searchlight housing and lens.

The beam is focused by a focusing motor driving the reflector towards or away from the lens. The motor is nonreversing and continually drives the reflector back and forth through the same cyclic. The focus is from a 10° beam width to a 6.5° beam width. The searchlight assembly has a safety cable attached to the yoke.

### SEARCHLIGHT OPERATION

#### Preflight

1. Lens clean—CHECKED.

**NOTE**

Do not touch the lens with hands; smudges may cause an uneven heating of the lens and subsequent cracking.

2. MASTER switch—OFF.

**Starting**

1. MASTER switch—ON.

2. START switch—DEPRESS UNTIL LAMP IGNITES (5-10 seconds).

**CAUTION**

Continuing to depress the switch after ignition may seriously damage the searchlight.

**Operation**

1. FOCUS switch—ADJUSTED TO DESIRED BEAM WIDTH.

2. Direction control switch—OPERATE AS DESIRED.

**NOTE**

If the controllable landing light is OFF, the cockpit controllable landing light toggle switch controls the searchlight positioning. The cockpit control will override the Remote Control Unit inputs.

**Securing**

1. Pushbutton (top of Remote Control Unit)—DEPRESS UNTIL SEARCHLIGHT GOES OFF.

2. Allow 3 minutes for cooling.

3. MASTER switch—OFF.

**OPERATING TECHNIQUES**

Techniques for use of the searchlight must vary with the object of the search, area being searched, and meteorological conditions. General guidelines for its use are listed below; however, proficiency in its use can only be acquired through actual experience. The following techniques are only general guidelines for good search conditions.

1. Search airspeed—as required (55 to 70 knots is recommended. Faster airspeeds can be used for larger search objects.)

2. Altitude—proportional to search objects size:

a. Vessels or boats 40 feet or over—1000 to 1500 feet.

b. Boats less than 40 feet—300 to 1000 feet.

c. Personnel—300 to 500 feet (hover search also a satisfactory technique).

3. Beam width—as desired. Midway between narrow and widest points provides a nearly solid beam spot.

4. The port side of the helicopter is the best search side and can be used by both the copilot and crewman. The lighted area is limited on the starboard side forward.