

Figure 83-1-9. Symbols Chart

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Sheets 1 and 2 deleted.

Harness Extension ①

19 Wire Code 18

A	Red	A	Red
B	Yellow	B	Yellow
C	Blue	C	Blue
C	Shield	C	Shield
D	1E4B20	D	1E4B20
E	Red	E	Red
F	Yellow	F	Yellow
G	Blue	G	Blue
G	Shield	G	Shield
H	1E3C20	H	1E3C20
J	1E5C20	J	1E5C20
K	1E6B20	K	1E6B20
L	1D3B20	L	1D3B20
M	1D4B20	M	1D4B20
N	1E9C20	N	1E9C20
P	1E2B20	P	1E2B20
R	1E8F20	R	1E8F20
S	1D1B20	S	1D1B20
T	1E28B20	T	1E28B20
U	1L4R18	U	1L4R18
V	1L1B18	V	1L1B18
W	1D5C20	W	1D5C20
X	1ETB20	X	1ETB20
Y	1E20B20	Y	1E20B20
Z	1E11B20	Z	1E11B20
a	1RF325B16	a	1RF325B16
b	1RU1210B14	b	1RU1210B14
c	1RF235B16	c	1RF235B16
d	1d-16	d	1d-16
e	1P13C18	e	1P13C18
f	1P14B18	f	1P14B18
g	1P11C20	g	1P11C20
h	1L3B18	h	1L3B18
j	1j-16	j	1j-16
k	1L9B18	k	1L9B18
l	1E21B20	l	1E21B20
m	1E1B20	m	1E1B20

Harness Extension ②

21	2E1B20	20	A
	2E2B20		B
	2E8F20		C
	2C1B20		D
	2RF325B16		E
	2L5B18		F
	2G-16		G
	2L1B18		H
	2Q5B20		I
	2H1B14		J
	2RU1Z10B14		K
	2P10B14		L
	2P5D10		M
	2N-16		N
	2Q1B20		P
	2D1B20		R
	2P2C18		S
	2P3B18		T
	2RF235B16		U
	2E16B20		V
	2W-16		W
	2L4R18		X

Harness Extension ③

38	3C2A20	37	A
	3C3A20		B
	3C4A20		C
	3C7D20N		D
	3C5A20		E
	3C7G20N		F
	3L8A20		G
	3C7B20N		H
	3RC29B20		I
	3RC27C20		J
	3K-16		K
	3L-16		L
	3M-16		M
	3U1A16		N

NOTES:

1. Refer to the individual wiring diagrams on the following figures related to detailed wire splices for field installed 4-place conversions.
2. Harness extensions ①, ②, and ③ are used for field installed 4-place conversions only.

Figure 81-1-10. Electrical Systems Wiring Diagram

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COMMUNICATIONS EQUIPMENT

84-101-1. PORTABLE LOUDSPEAKER. (See figures 10-6 and 84-101-1.)

84-101-2. DESCRIPTION. The portable "Audio Chief" model S-159 loudspeaker, available as optional equipment, consists of an electric megaphone and transistorized amplifier with a self-contained battery supply. When the amplifier is located at the right-hand side of the cabin, the megaphone may be used by a passenger in the left-hand seat by routing the megaphone cable behind the pilot.

84-101-40. MAINTENANCE OF THE PORTABLE LOUDSPEAKER. Replace the amplifier dry-cell batteries as follows:

- a. Remove the amplifier case cover.
- b. Position the case so that the battery plugs are up; remove the cardboard spacer and slide the batteries from the case.
- c. Observe (and record, if necessary) the terminal locations of the battery plugs and then remove the plugs.
- d. Substitute the new batteries, reconnect and reinstall in the reverse order of removal.

84-201-1. NARCO SIMPLEXER AND LFR-3 RADIO INSTALLATION. (See figure 84-201-1.)

84-201-2. DESCRIPTION. The Narco Simplexer and LFR-3 radio installation is located on top and forward of the instrument panel pedestal and consists of a VC-27-B multichannel vhf transmitter-receiver unit, an LFR-3 low frequency receiver unit, a V24MP-2 power unit, and the shelf and base assemblies used for the structural support of the radio and power units. Two bent whip-type antennas are installed beneath the basic body and are used for transmitter-receiver operation. A long wire antenna assembly extends from beneath the basic body to

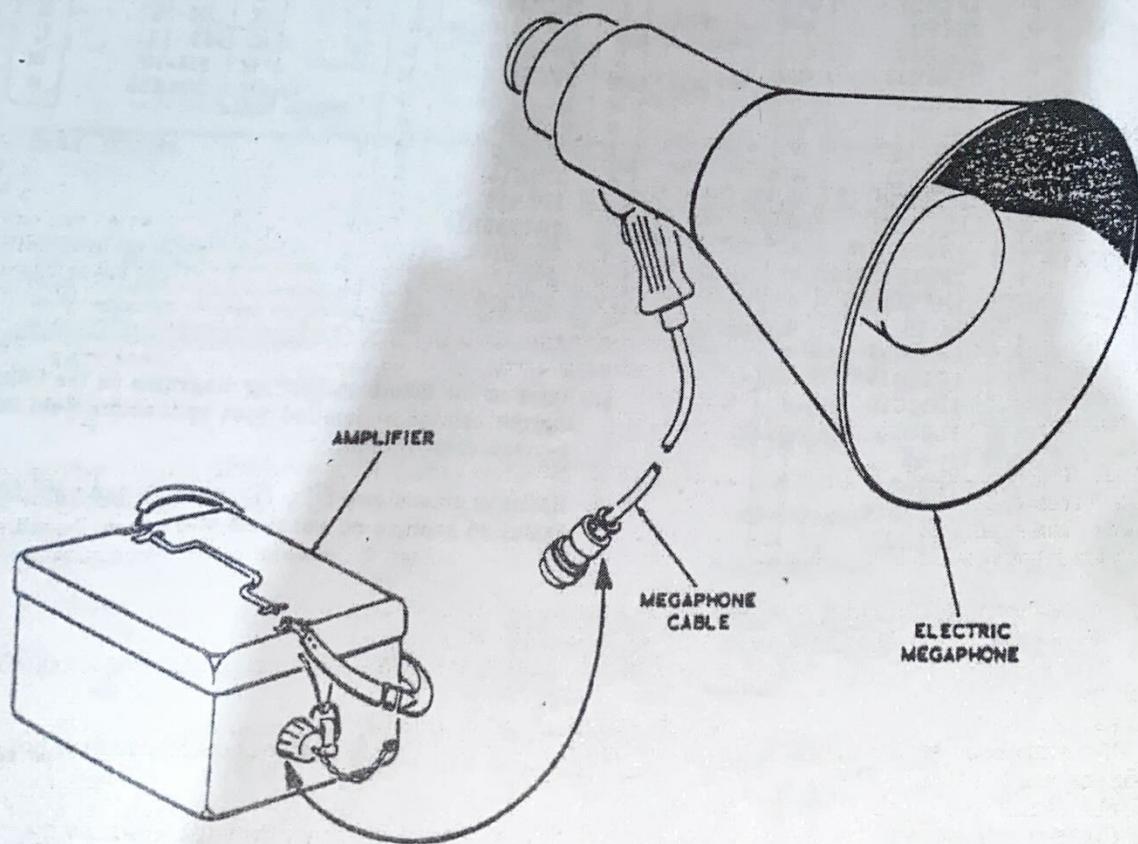


Figure 84-101-1. Portable Loudspeaker Equipment

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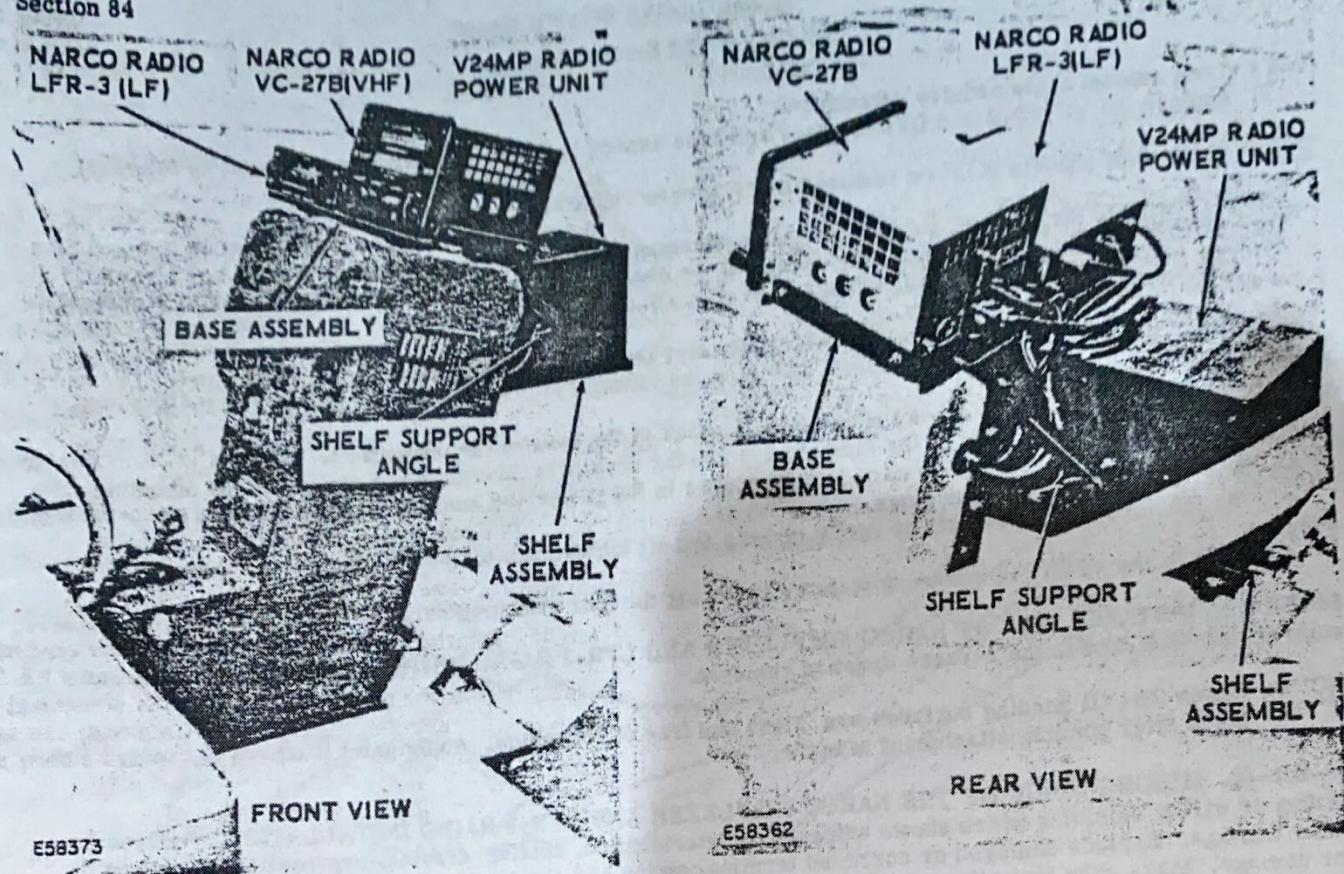


Figure 84-201-1. Narco Simplexer and LFR-3 Radio Installation

the aft end of the tail boom and is used for low frequency reception. The VC-27-B transmitter, which can accommodate up to 27 standard vhf crystals in the frequency range of 118.1 to 126.7 megacycles, provides voice communication with a reliable range from about 45 miles at one thousand feet altitude to 120 miles at ten thousand feet altitude. The VC-27-B receiver provides reception between 108.0 and 126.7 megacycles and employs a Simplex switch feature which enables the operator to use any crystal presently installed in the transmitter as a tuning marker so that the transmitter and receiver may be precisely tuned to the equivalent tower channel frequency. The LFR-3 low frequency receiver provides reception of low frequency range stations from 200 to 400 kilocycles and broadcast stations from 550 to 1500 kilocycles. The V24MP-2 modulator power unit provides the continuous 280-volt output necessary for transmitter operation and 140-volt output for singular or simultaneous operation of the vhf and lf receivers. The speech amplifier-modulator section of the power unit produces the high audio gain level desired for more effective communication. The Narco Simplexer radio installation receives input power from the 10-amp RADIO circuit breaker located on the protection panel.

84-201-3. TROUBLESHOOTING THE NARCO SIMPLEXER AND LFR-3 RADIO INSTALLATION. Troubleshooting Narco radio components is beyond the intended scope of this Manual. Circuit description, alignment procedure, and supplementary accessory information may be obtained from the Narco Operation, Installation and Service Manual published by the National Aeronautical Corporation, Fort Washington, Pennsylvania.

84-201-10. REMOVAL OF NARCO SIMPLEXER AND LFR-3 RADIO UNITS.

- a. Remove the VC-27-B transmitter-receiver in the following manner:
 - (1) Disconnect the wing nut and ground wire from the long chassis grounding stud projecting through the back of the case.
 - (2) Withdraw the two coaxial cable connectors from the chassis.
 - (3) Slide back the plastic tube insulation, and disconnect the knife-splice connectors at the two wires entering the transmitter-receiver unit.
 - (4) Detach the power plug from the chassis.
 - (5) Remove the four sheet metal screws from the corners of the panel face and withdraw the chassis from the case.
- b. Remove the LFR-3 receiver. Removal of the low frequency-receiver is accomplished by using the method employed in the removal of the vhf transmitter-receiver unit with the exception that only one power

lead and one coaxial cable require detachment.

c. Remove the VC-27-B and LFR-3 cases and base assembly from the instrument pedestal as follows:

NOTE: Radio unit chassis must be removed prior to case removal.

- (1) Remove the screws, washers and nuts attaching the cases to the base assembly.
- (2) Open the instrument panel for access to the base assembly mounting screws. (Refer to Section 81.)
- (3) Remove the four screws, washers and nuts attaching the base assembly to the instrument pedestal hood and remove the base assembly.
- d. Remove the V24MP-2 modulator power unit using the following procedure:
 - (1) Remove the sheet metal screw attaching the bonding wire to the right-hand side of the power unit case.
 - (2) Loosen the four hex-head sheet metal screws at the base of the power unit.
 - (3) Slide the power unit to the side and upward far enough to disengage the case from the mounting plate.
 - (4) Move the power unit forward to gain access to the power and accessory plugs inserted at the aft end of the power unit and remove the plugs.
 - (5) Remove the power unit by lifting upward and aft taking care to avoid hitting the compass mounting bracket.
- e. Remove the V24MP-2 mounting plate by removing the four attaching screws, nuts and associated washers.

84-201-11. INSTALLATION OF NARCO SIMPLEXER AND LFR-3 RADIO UNITS. Installation of Narco radio units is accomplished in the reverse order of removal.

NOTE: Check that all bonding surfaces are clean and free of corrosion. Apply paint touch-up to exposed surfaces after bonding attachment is made.

84-201-40. MINOR REPAIR OF THE NARCO SIMPLEXER AND LFR-3 RADIO INSTALLATION. Replace any wiring or wiring shielding which shows evidence of deterioration, chafing, fraying, overheating, corrosion or other damage. Replace damaged or corroded terminal strips and electrical connectors. Check all equipment for damage. Make sure that all mountings and connections are tight. Replace any tubes that are defective. For further information regarding maintenance, refer to the Narco Operation, Installation and Service Manual.

84-201-41. CLEANING OF NARCO SIMPLEXER AND LFR-3 RADIO UNITS. Wipe the exterior of each unit with a soft, clean, lint-free cloth.

84-210-1. NARCO SIMPLEXER AND LFR-3 ANTENNA SYSTEM. (See figure 84-201-2.)

84-210-2. DESCRIPTION. The VC-27-B vhf antennas are two Narco M-71110-103 bent whip-type antennas located in the basic body skin beneath the cabin and 15 inches to each side of the helicopter centerline. The right-hand antenna is used for receiving and the left-hand antenna for transmitting. A body skin doubler is installed at each location to provide additional strength for the antenna mount. In addition to the normal antenna bend which is designed to reduce the bending load caused by the slipstream, a second bend is employed in each antenna to maintain approximately six to eight inches ground clearance. The bends are in the same plane, approximately 3-1/2 inches apart, and are directed rearward to help prevent fouling during takeoff and landing. Coaxial cables connect the antennas to the VC-27-B transmitter-receiver unit.

NOTE: Do not interchange the coaxial cables at the antenna terminal ends. Different types of connectors are used at the transmitter-receiver unit ends of the coaxial cables. The receiver cable is fitted with an automotive type connector, and the transmitter cable is a phono type.

a. The fixed-wire LFR-3 low frequency antenna is located at the right-hand side of the basic body and extends underneath the cabin to a tail skid attachment. This antenna is terminated with insulators at either end; the aft end attached through a thimble, shackle and clip arrangement, the forward end through a tension spring. A coaxial disconnect adapter and cable connect the antenna to the LFR-3 receiver.

84-220-1. VC-27-B ANTENNAS.

84-220-10. REMOVAL OF VC-27-B ANTENNAS. Remove the receiving and transmitting antennas as follows:

- a. Remove the forward cabin-floor access covers. (See figures 10-7 and 10-8.)
- b. Remove the screw, washer and nut securing the coaxial cable braided shielding to the basic body skin.
- c. Disconnect the antenna cable terminal lug from the threaded end of the antenna rod by removing the first hexnut, lock and flat washers.
- d. Support the antenna externally and remove the next hexnut, lock and flat washers, the special head or vellumoid washer, the feedthrough insulator-half (male ceramic bushing) and the cork or vellumoid washer.
- e. Withdraw the antenna rod, standoff insulator-half (female ceramic bushing) and external cork or vellumoid washer from the basic body. Use care to retain the washers remaining on the antenna rod.
- f. If the helicopter is to be operated with the antenna removed, take care to install a snap type protective

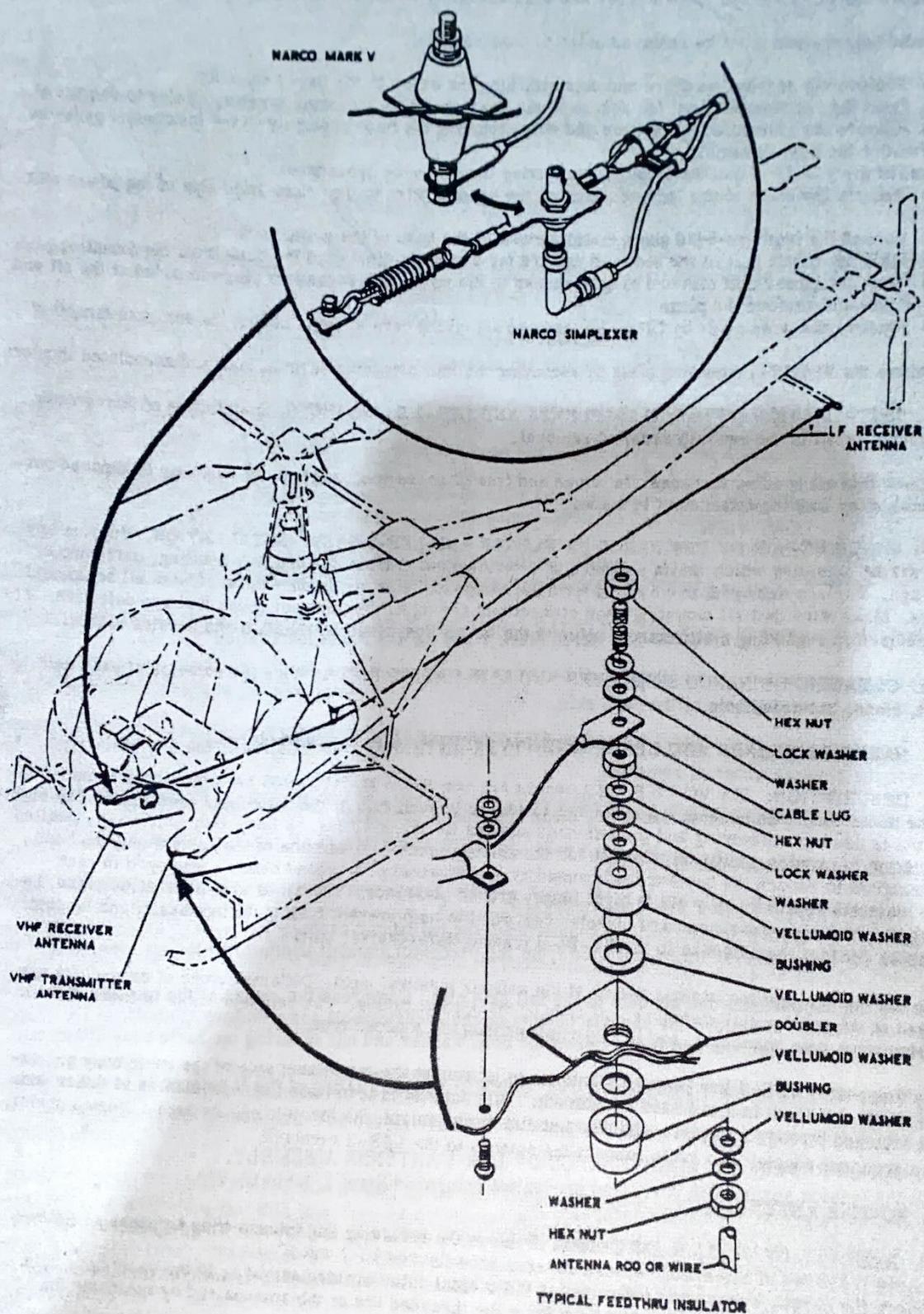


Figure 84-201-2. Antenna System

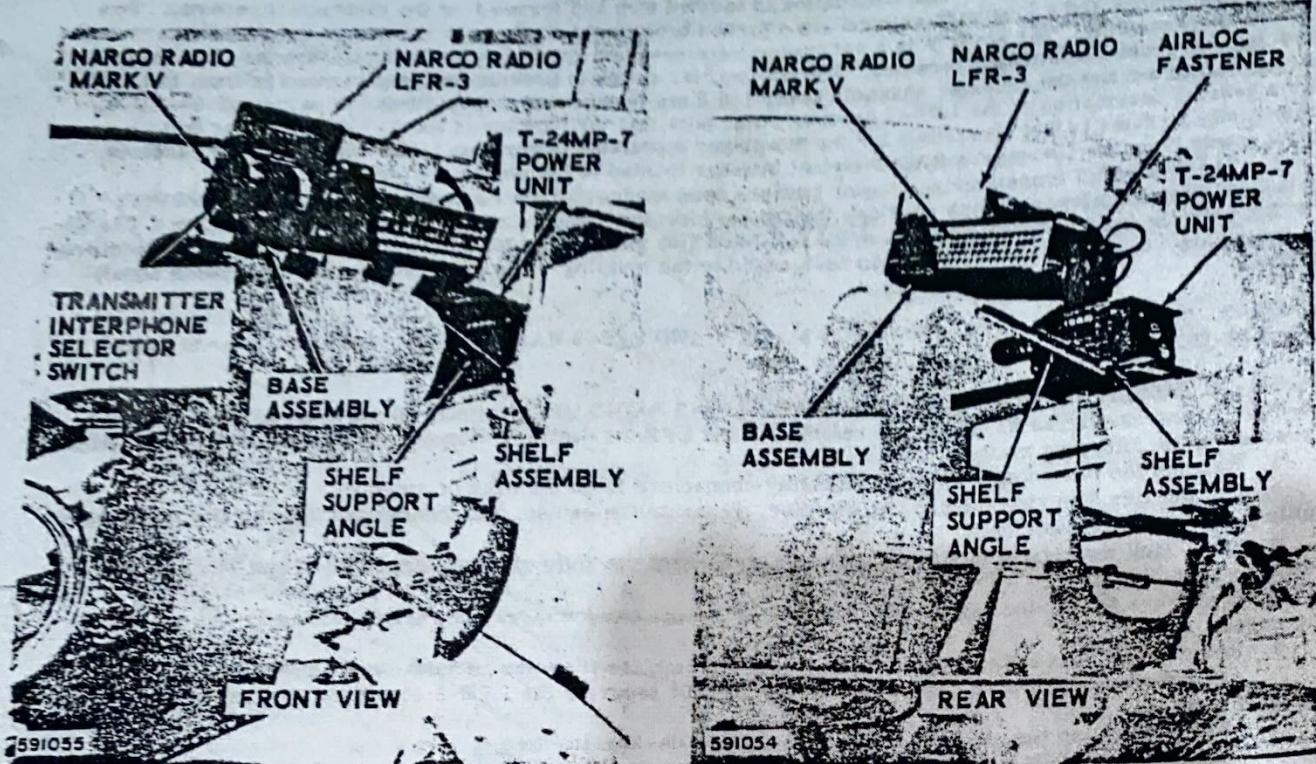


Figure 84-301-1. Narco Mark V and LFR-3 Radio Installation

plug in the antenna mounting hole of the body skin.

84-220-11. INSTALLATION OF VC-27 BENT WHIP-TYPE ANTENNAS. Installation of the bent whip-type antennas is in the reverse order of removal.

NOTE: Check that metal bonding surfaces are clean and free of corrosion.

84-230-1. LFR-3 ANTENNA ASSEMBLY.

84-230-10. REMOVAL OF LFR-3 ANTENNA ASSEMBLY.

- Disconnect the lead-in cable connector underneath the helicopter cabin.
- Remove the nylon clamp, screw and wire from the porcelain standoff insulator at the aft lower end of the basic body.
- Remove the nut securing the shackle to the tail skid clip. Compress the spring at the forward basic body attach point sufficiently to relieve the shackle tension on the securing bolt and withdraw the bolt.
- Carefully coil the antenna and then remove the bolt, washer and nut securing the basic body attach clip.

84-230-11. INSTALLATION OF LFR-3 ANTENNA ASSEMBLY. Installation of the lf antenna is in the reverse order of removal.

84-230-40. MINOR REPAIR AND MAINTENANCE OF LFR-3 ANTENNA ASSEMBLY.

- Coat the tension spring with corrosion preventive compound (item 2, table 10-VI.)
- Tighten the retention clips when necessary.
- Tighten the parallel connector which connects the lead-in wire to the antenna wire, if necessary, by crimping with a pair of smooth-jawed pliers.
- In the event that support or antenna wires become kinked, broken or severely nicked, replace the affected length with a new wire of the same type and length.

84-301-1. NARCO MARK V AND LFR-3 RADIO INSTALLATION. (See figure 84-301-1.)

84-301-2. DESCRIPTION. The Narco Mark V radio installation consists of a Mark V transmitter-receiver, and LFR-3 low frequency receiver, a T-24MP-7 transistorized power unit, and the shelf and support assemblies

used to mount the power units. The installation is located atop and forward of the instrument pedestal. Two bent whip antennas and a long wire antenna are attached beneath the basic body to provide the means for transmitting and receiving. The Mark V is a vhf transmitter-receiver containing a 90-channel transmitter and a 190-channel crystal-controlled receiver. The transmitter channels provide frequency coverage from 118.0 mc through 126.9 mc and the receiver channels cover 108.0 mc through 126.9 mc. (Refer to paragraph 84-201-2 for a general description of the LFR-3 receiver; also note that the function of the T-24MP-7 power unit is essentially the same as that described for the Simplexer modulator power unit.) The Narco Mark V receives input power from the 10-ampere RADIO circuit breaker located in the protection panel.

a. The T-24MP-7 transistorized power unit has been modified from its basic configuration to include a relay and resistor network which provides interphone circuitry. Interphone operation is controlled by a TRANS-INTER selector toggle switch mounted in the left-hand side plate of the Mark V and LFR-3 support. An additional "mic gain" variable resistor has also been added to the existing "mic gain" control for interphone equalization.

84-301-3. TROUBLESHOOTING THE ARCO MARK V AND LFR-3 RADIO INSTALLATION. Refer to paragraph 84-201-3.

84-301-10. REMOVAL OF NARCO MARK V AND LFR-3 RADIO UNITS. Refer to paragraphs 84-210-10 and 84-210-11, and see figure 84-301-1 for removal of the LFR-3 receiver. Remove the Narco Mark V transmitter-receiver in the following manner:

- a. Remove the two coaxial antenna assembly connectors from the back of the case.
- b. Cut the ties securing the cabling together. Separate the cables, and then loosen and remove the Mark V cable plug from the power unit.
- c. Slide back the plastic tube insulation and disconnect the knife clasp joining the red and white (28-volt d-c power) wires.
- d. Disengage the Airloc fastener at the back of the case and withdraw the Mark V chassis and cable from the case.
- e. Remove the Narco Mark V and LFR-3 case assemblies from the pedestal as follows:
 - (1) Remove the clamp, screws, washer and nut securing the LFR-3 electrical cabling at the rear of the Mark V case.
 - (2) Accomplish the steps outlined in paragraph 84-201-10, step c.
- f. Remove the T-24MP-7 Power Unit. (Refer to paragraph 84-201-10, steps d and e.)

84-301-11. INSTALLATION OF NARCO MARK V AND LFR-3 RADIO UNITS. Refer to paragraph 84-201-11.

NOTE: Shim between the Mark V case and the support as required to center the case in the support. Use AN960PD6L washers for shimming.

84-301-40. MINOR REPAIR OF THE NARCO MARK V AND LFR-3 RADIO UNITS. Refer to paragraph 84-201-40.

84-301-41. CLEANING OF NARCO MARK V AND LFR-3 RADIO UNITS. Refer to paragraph 84-201-41.

84-310-1. NARCO MARK V AND LFR-3 ANTENNA SYSTEM. (See figure 84-201-2.)

84-310-2. DESCRIPTION. The antenna system used with the Narco Mark V installation is essentially the same as that used with the Narco Simplexer installation. Remove, service and install the antennas using the instructions provided in paragraphs 84-210-1 through 84-230-40. The only noticeable exception to the antenna system installation is that the LFR-3 long wire antenna forward attachment is the same as that for the vhf antennas.

84-320-1. RADIO INTERFERENCE REDUCTION COMPONENTS.

84-320-2. DESCRIPTION. The generator is equipped with a 1.0 ufd 200V d-c capacitor connected across the armature output terminals, as described in Section 83. This capacitor serves to minimize radio interference due to the operation of the generator. The capacitor within the magneto helps reduce radio interference from the ignition system.

84-320-3. TROUBLESHOOTING RADIO INTERFERENCE. Should an undue amount of radio interference be present, and it is suspected that this interference originates within the helicopter, probable causes are a defective generator capacitor, a defective magneto capacitor or, if external lighting is installed, a defective anti-collision light noise filter. The cause of the interference can be determined and remedied as follows:

- a. If interference is present only when the engine is running, inspect and test the magneto and generator capacitors. Also check the magneto points for possible replacement.
- b. Check the anticollision light noise filter for defective condition.

84-401-1. KING VHF RADIO INSTALLATION. (See figure 84-401-1.)

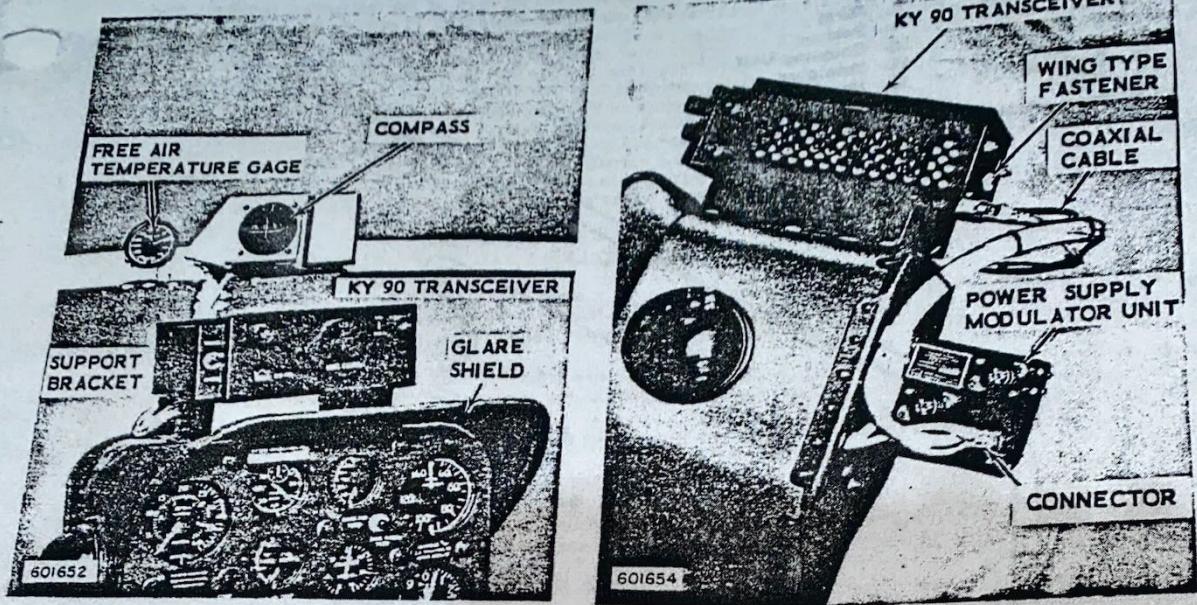


Figure 84-401-1. King VHF Radio Installation

84-401-2. DESCRIPTION. The King VHF radio installation includes the KY-90 transceiver, KS-502 power supply-modulator, ARC type A-15 antenna, two cord sets, plug assemblies, coaxial cable and mounting brackets. The King KY-90 transceiver is mounted on the top of the instrument panel pedestal. The KS-502 power unit is mounted on brackets attached to the forward side of the instrument pedestal. The bent whip-type antenna is mounted beneath the basic body and is used for both transmitting and receiving.

84-401-3. TROUBLESHOOTING THE KING VHF RADIO INSTALLATION. Refer to the King Radio KY-90 Instruction Manual for troubleshooting information.

84-410-1. KING VHF RADIO UNITS.

84-410-10. REMOVAL OF KING VHF RADIO UNITS.

- a. Remove the KY-90 transceiver as follows:
 - (1) Loosen the wing type fastener at the back of the transceiver case.
 - (2) Disconnect the coaxial cable and power supply plug at the back of the transceiver case.
 - (3) Withdraw the transceiver from the case.
- b. Remove the KS-502 power supply-modulator as follows:
 - (1) Disconnect the connector plug from the power supply unit.
 - (2) Remove the four screws attaching the power supply unit to the front of the pedestal.
 - (3) Remove the power supply unit.

84-410-11. INSTALLATION OF KING VHF RADIO UNITS. Installation of radio units is essentially the reverse of removal.

84-420-1. ARC TYPE A-15 ANTENNA. (See figure 84-401-2.)

84-420-2. DESCRIPTION. The ARC Type A-15 antenna is a bent whip-type antenna mounted underneath the helicopter cabin. The antenna consists of a solid stainless steel, L-shaped rod flexibly mounted in rubber to an aluminum junction box mounted above the antenna just inside the basic body. The antenna rod connects to the junction box through a threaded connector which also serves as a support. A coaxial lead-in cable connects

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- | | |
|----------------|-------------------|
| 1. Antenna Rod | 8. Rivet |
| 2. Nut | 9. Box |
| 3. Washer | 10. Coupling Unit |
| 4. Washer | 11. Insulator |
| 5. Grooppin | 12. Base Assembly |
| 6. Nut | 13. Spring |
| 7. Nameplate | 14. B-Nut |

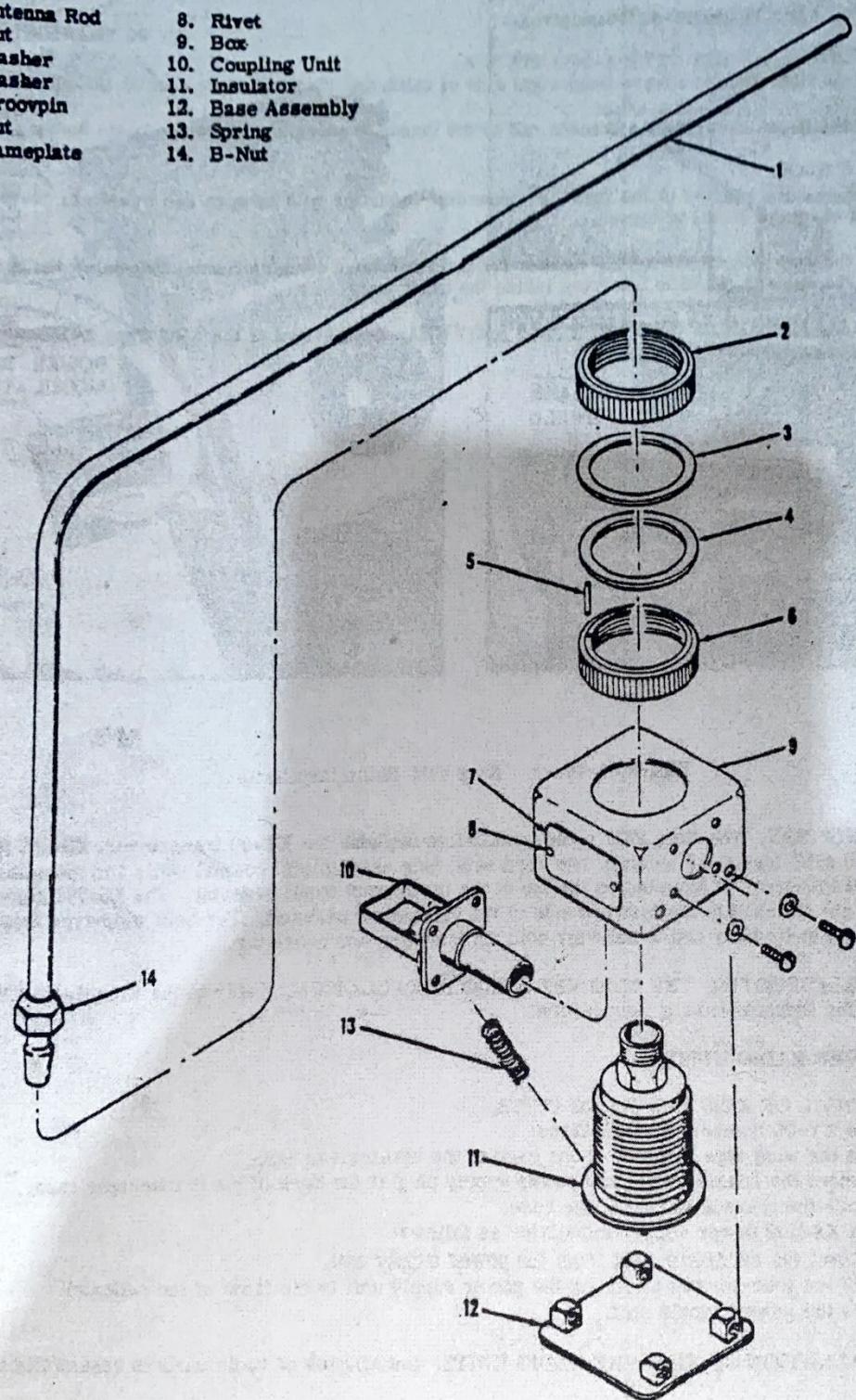


Figure 84-401-2. ARC Type A-15 Antenna

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the antenna junction box to the KY-90 transceiver.

84-420-10. REMOVAL OF THE TYPE A-15 ANTENNA.

- a. Remove the floor access covers from right side of cabin and disconnect the coaxial lead-in cable from the junction box.
- b. Back off the B-nut securing the antenna rod to the threaded connector under the basic body and remove the antenna rod.

NOTE: Hold the hexagon portion of the threaded connector insulator with an open end wrench to prevent it from twisting when the B-nut is turned.

- c. Remove the knurled nut and spring washer from the threaded connector extending below the basic body.
- d. Remove the antenna junction box from inside the basic body.

84-420-11. INSTALLATION OF THE TYPE A-15 ANTENNA. Installation of the ARC Type A-15 antenna is the reverse of removal.

PERSONNEL ACCOMODATIONS

85-1-1. CABIN FURNISHINGS. (See figure 85-1-1.)

85-1-2. DESCRIPTION. The cabin enclosure is outfitted with two plastic covered seat cushions and three seat-back cushions. Two map pockets are incorporated in the back of the right-hand side seatback cushion. Three individual safety belts are provided.

85-1-10. REMOVAL AND INSTALLATION OF CABIN FURNISHINGS. Removal (or installation) of either of the cabin furnishings installations may be accomplished in any convenient order by removing (or installing) the nuts, washers, and/or screws attaching the cushions or carpeting.

a. The special collective pitch friction knob, a part of the custom interior furnishings installation, has a knob insert extension providing the necessary seat back clearance for hand adjustments of collective pitch friction. (Refer to Section 31 for removal and installation of the collective friction knob.)

b. When installing either of the two seat belt halves located adjacent to the collective pitch stick, take care to route the belt ends through the attachment buckles so that the ends of the buckle are located at the underside of the belt as shown in figure 85-1-1.

WARNING: REVERSAL OF THE END ATTACHMENT BUCKLE WILL ALLOW THE METAL END STRAPS OF THE BUCKLE TO INTERFERE WITH THE COLLECTIVE PITCH STICK. WHEN PROPERLY INSTALLED, THE CENTER STRAP (TONGUE) OF THE BUCKLE SHOULD BE LOCATED AT THE SIDE OF THE BELT NEAREST TO THE COLLECTIVE PITCH STICK.

85-101-1. CABIN FURNISHINGS, FOUR-PLACE CONFIGURATION. (See figure 85-101-1.)

85-101-2. DESCRIPTION. The pilot's seat includes one seat and one backrest cushion; an individual safety belt; and a release lever which permits three position adjustments of the backrest. Two alternate arrangements are available for passenger seating. One is identical with that used on the three-place configuration (see figure 85-1-1); the optional passenger seat is constructed of an aluminum alloy tubing framework supporting a single bench type seat cushion. Three individual safety belts are installed. The seat cushion support framework is bolted to the seat deck. (See figure 85-101-1.)

85-101-10. REMOVAL OF SEATS.

a. Remove the pilot's seat as follows:

- (1) Remove cap-nut and cover from each side of pilot's seat.
- (2) Remove bolt attaching collective friction control tube to friction bearing block.
- (3) Remove clamp attaching fuel shutoff control tube to seat frame.
- (4) Remove four bolts attaching seat frame to cabin floor and lift out pilot's seat.

b. Remove the optional passenger seat as follows:

- (1) Unfasten the snaps securing the front flap of the seat cover to the seat deck to gain access to the four bolts attaching the seat frame to the seat deck.
- (2) Remove the four attaching bolts and lift off the seat frame and cushion.

85-101-11. INSTALLATION OF THE SEATS. Installation procedures for the pilot's seat and passenger's seat are the reverse of removal.

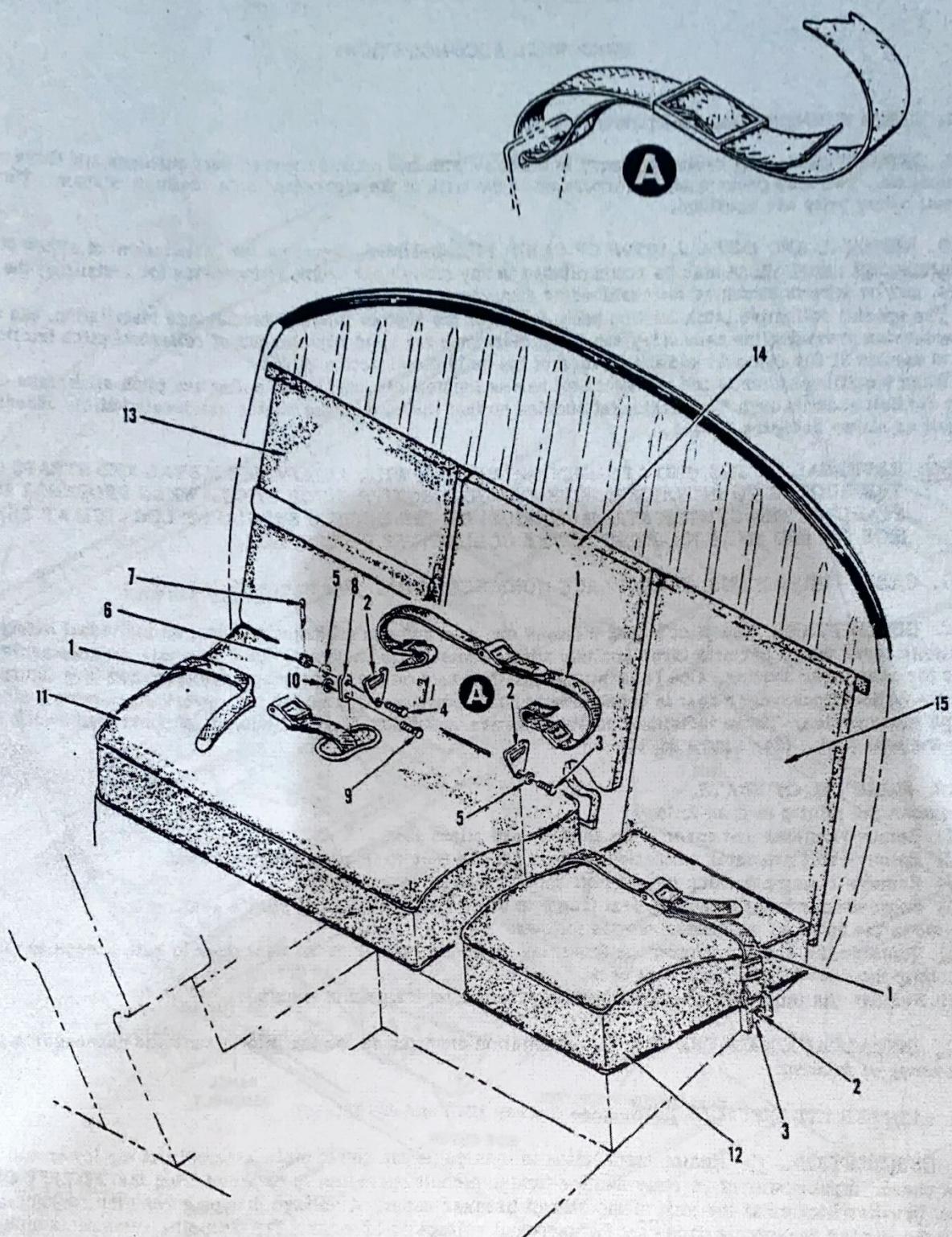
85-201-1. LIGHTER KIT INSTALLATION. (See figures 10-6 and 85-201-1.)

85-201-2. DESCRIPTION. The lighter installation is located on the cover plate assembly at the lower end of the instrument panel. Input power of 24 volts d-c for lighter circuit operation is obtained from the UTILITY OUTLET circuit breaker located at the side of the circuit breaker panel. A voltage dropping resistor connected in series with the lighter receptacle drops the lighter input voltage to 12 volts. The dropping resistor is mounted internally, behind the instrument panel cover plate, and is located laterally centered approximately 1.4 inches below the lighter receptacle.

85-201-10. REMOVAL OF LIGHTER KIT INSTALLATION.

- a. Remove the plastic face from the instrument panel. (Refer to Section 81.)
- b. Remove the four screws attaching the cover plate assembly to the instrument panel.
- c. Withdraw the cover plate and lighter assembly far enough to expose the power input wire connection at the dropping resistor.
- d. Disconnect the input wire from the dropping resistor and completely remove the cover plate assembly.
- e. Remove the nuts, washers and screws securing the lighter and dropping resistor in whatever order is appropriate.

85-201-11. INSTALLATION OF LIGHTER KIT. Installation of the lighter kit is in the reverse order of removal.



- | | |
|----------------------------|----------------------------------|
| 1. Safety Belt | 9. Bolt |
| 2. Safety Belt End Fitting | 10. Washer |
| 3. Bolt | 11. Right-hand Seat Cushion |
| 4. Bolt | 12. Left-hand Seat Cushion |
| 5. Washer | 13. Right-hand Seat Back Cushion |
| 6. Nut | 14. Center Seat Back Cushion |
| 7. Cotter Pin | 15. Left-hand Seat Back Cushion |
| 8. Link | |

Figure 85-1-1. Cabin Furnishings

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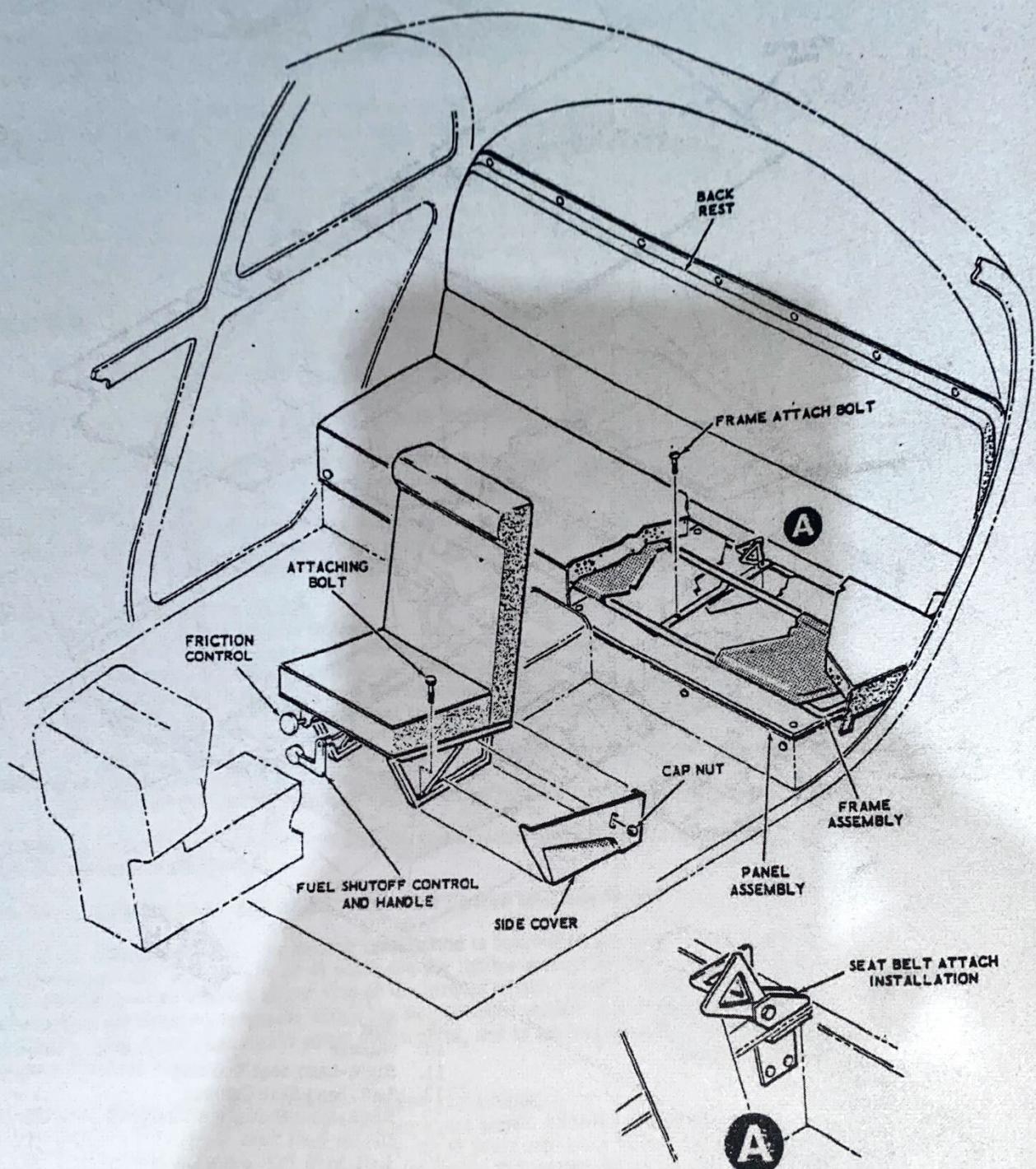


Figure 85-101-1. Cabin Furnishings, Four-Place Configuration

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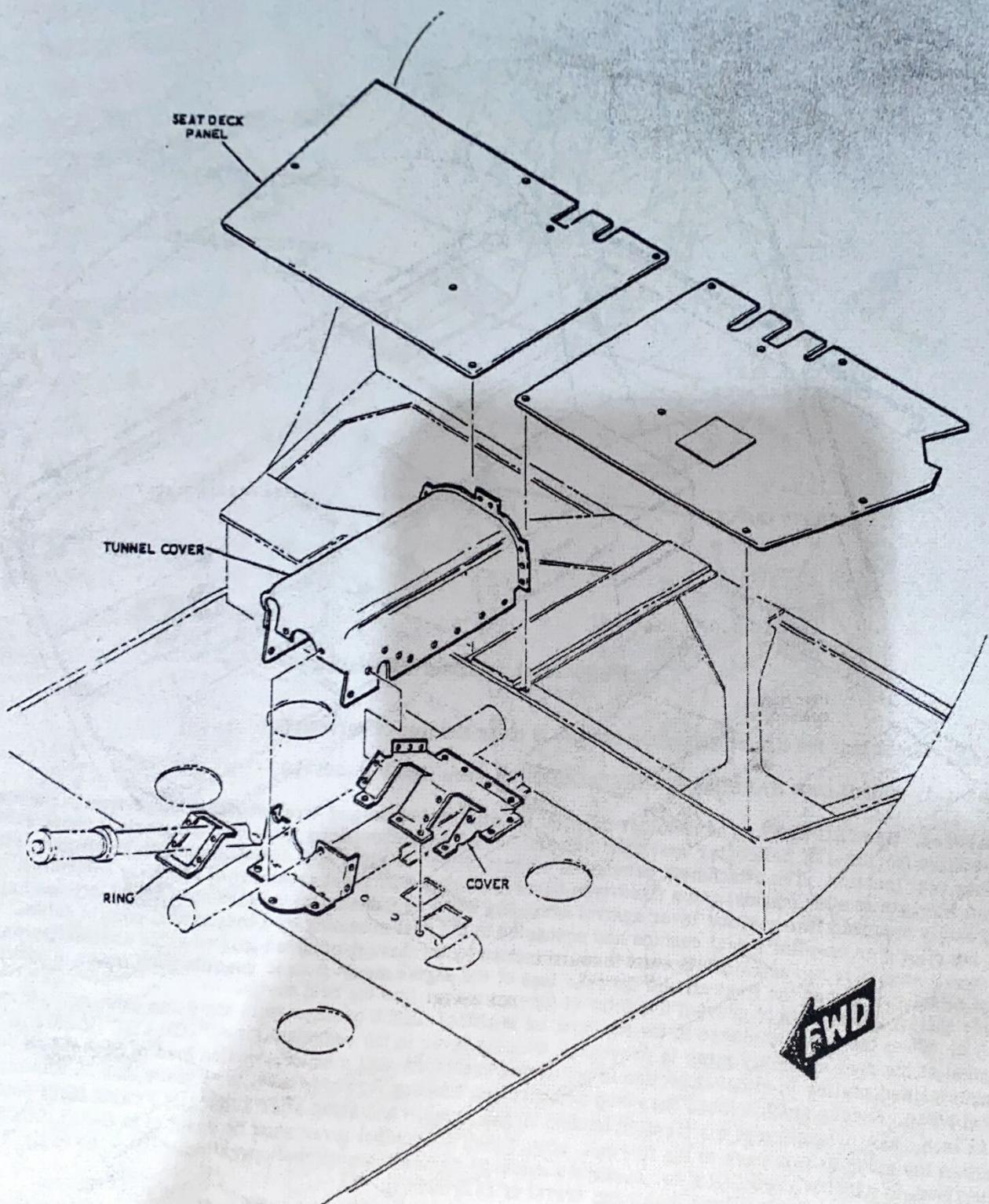


Figure 85-101-2. Seat Deck Panels and Tunnel Cover, Four-Place Configuration
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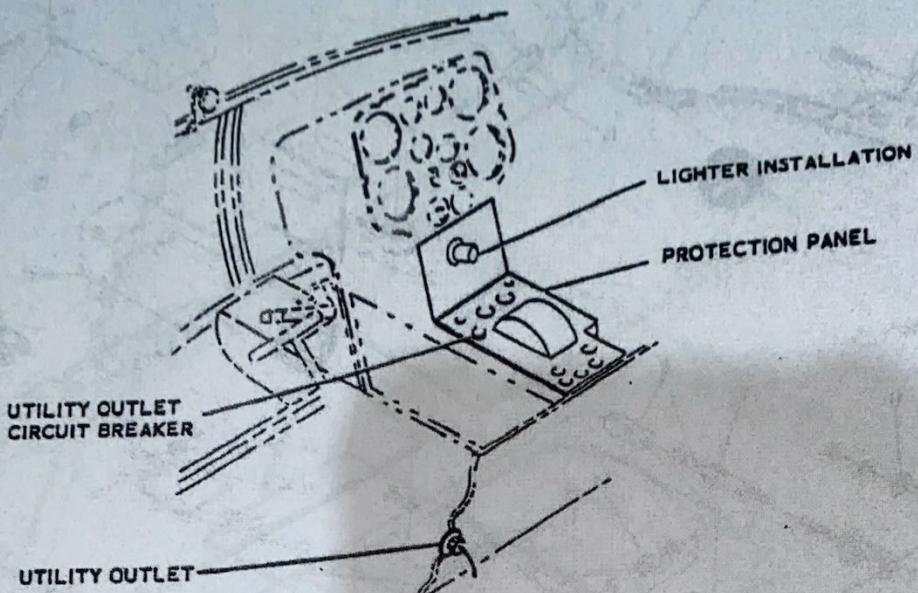


Figure 85-201-1. Lighter Installation

NOTE: Check that the lighter grounding surface is clean and free of corrosion.

85-301-1. SHOULDER HARNESS KIT INSTALLATION. (See figure 85-301-1.)

85-301-2. DESCRIPTION. The shoulder harness installation consists of three standard USAF type harnesses (modified for UH-12E helicopter use) with individual attachment provisions located in the firewall above each cabin seat location. The attachment provisions consist of two identical reel assemblies (with an ultimate static load strength of 4000 pounds) and a fixed-type harness fitting. Each reel assembly is remotely controlled by a manually operated two-position lever control assembly which is mounted on the structure at the left-hand side of the pilot's or co-pilot's seat cushion and connected to the reel assembly by a mechanical control cable. The firewall structure is restrained against forward motion by turnbarrel-adjusted tension cable assemblies which are attached between the firewall and the rear legs of the engine mount frame. An aluminum cover is provided over the reel assembly to prevent the entry of foreign matter into the reel cavity.

a. When the lever is placed in the forward, or **MANUAL LOCK** position (with any strap extension), forward travel of the reel assembly strap is prevented; with the lever in the rearward, or **AUTOMATIC LOCK** position, unrestrained reeling in either direction is easily accomplished until a sudden tension load is imposed on the reel strap. Sudden tension locks the strap and harness, limiting forward travel to no more than an additional 1/2 inch. Any relaxation of the forward tension on the harness and strap after automatic locking takes place allows the strap to reel back to the firewall, after which the control lever must be reset to **MANUAL LOCK** and then back to **AUTOMATIC LOCK** for continued automatic (unrestrained) reel operation. The forward limit of strap extension is set to allow a maximum travel of 18.5 inches.

85-301-10. REMOVAL OF SHOULDER HARNESS UNITS. The removal procedure for both reel assemblies and for both control assemblies is the same because their respective mountings are identical.

- a. Remove the reel assembly as follows:
 - (1) Remove the bolt, washer and nut attaching the reel assembly strap to the harness.
 - (2) Disconnect the knurled cable connector from the control head fitting at the right-hand side of the control assembly.
 - (3) Loosen the two upper mounting bolts; then remove the two lower bolts, washers and the washer spacers from between the reel assembly and the firewall structure. (One or two washer spacers are installed,

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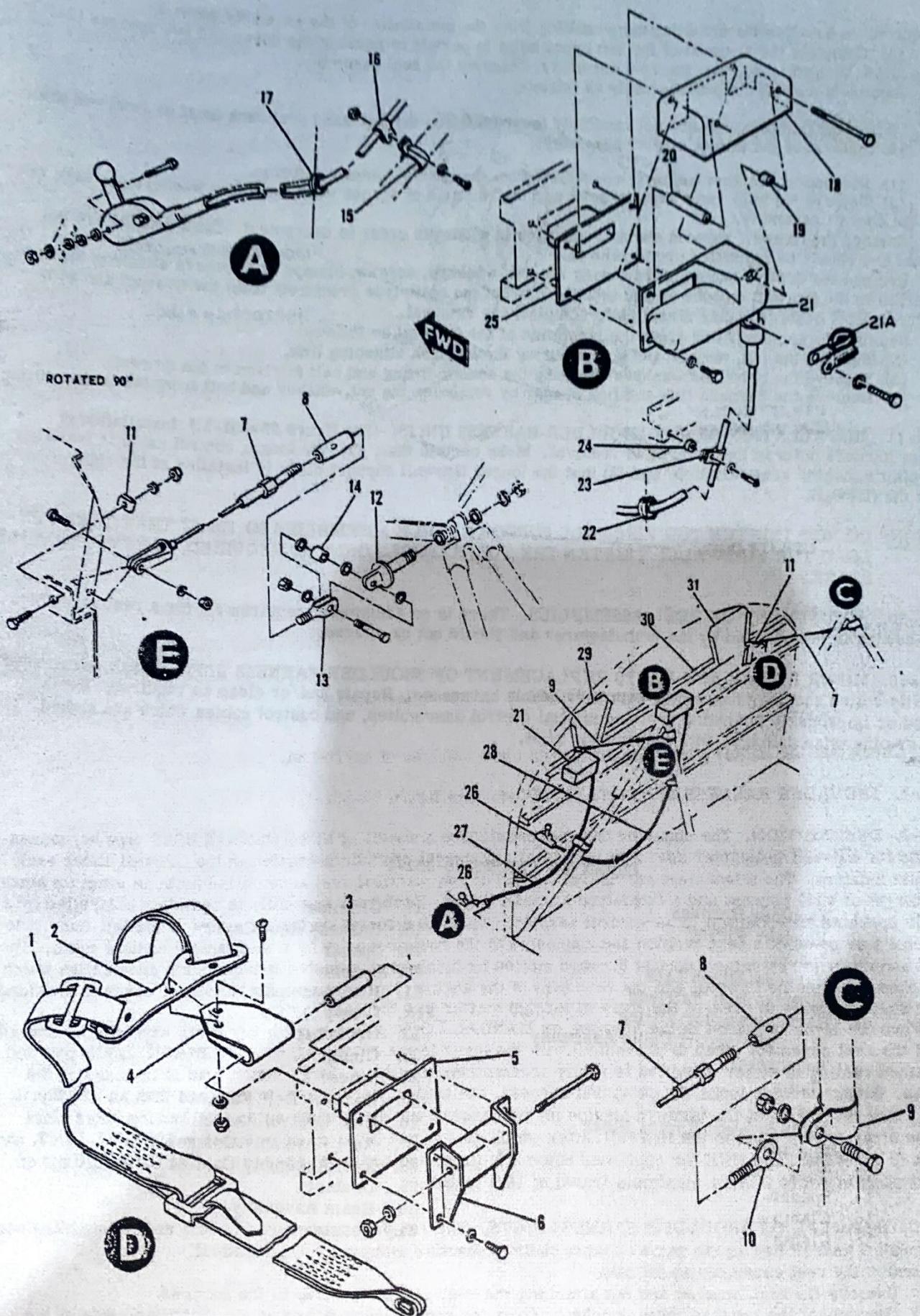


Figure 85-301-1. Shoulder Harness Installation

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as required to equalize the mounting gap resulting from the installation of the assembly cover.)
 (4) Complete the removal of the two upper bolts to permit removal of the cover and two spacers (2-1/8 inches and 5/16-inch long) from the reel assembly. Remove the reel assembly.

b. Remove a manual control assembly as follows:

NOTE: Both seat cushions, the control assembly lever knob and the left-hand seat deck must be removed prior to removal of the pilot's control assembly.

- (1) Disconnect the knurled cable connector from the control assembly fitting.
- (2) Remove the nuts and washers, bolts and the two sets of spacer washers (three washers per set); remove the control assembly.
- c. Remove the firewall support cable assemblies in whatever order is convenient. Cable lengths are not identical and should be identified upon removal.
- d. Remove the control cables by removing the nut, washers, screws, clamps and spacers attaching the control cables to the firewall and the engine mount. Extract the split-type grommets from the firewall and withdraw the control cable in either direction to complete the removal.
- e. Remove the anchor fitting from the right side of the firewall as follows:
 - (1) Remove the nut, washer and bolt securing the harness attaching link.
 - (2) Remove the bolts and washers securing the anchor fitting and belt fairlead to the firewall.
 - (3) Remove the harness link and link spacer by removing the nut, washer and bolt from the anchor fitting.

85-301-11. INSTALLATION OF THE SHOULDER HARNESS UNITS. (See figure 85-301-1.) Installation of shoulder harness units is the reverse of removal. Make certain that: (1) the longer control cable is installed in the pilot's (center seat) location, and (2) that the longer firewall support cable is installed at the right-hand side of the firewall.

CAUTION: DO NOT TIGHTEN THE FIREWALL SUPPORT CABLE ASSEMBLIES SO TIGHT THAT THEY PRELOAD THE FIREWALL. TIGHTEN THE TURNBARRELS ONLY AS REQUIRED TO REMOVE CABLE SLACK.

85-301-30. ADJUSTMENT OF REEL ASSEMBLIES. There is no adjustment requirement for a reel assembly. The G-setting is preadjusted by the manufacturer and should not be altered.

85-301-40. MINOR REPAIR AND PARTS REPLACEMENT OF SHOULDER HARNESS UNITS. Replace damaged or heavily soiled shoulder harnesses with serviceable harnesses. Repair and/or clean as required. Replace damaged or improperly operating reel and manual control assemblies, and control cables which are kinked, rusted or otherwise damaged with serviceable units.

INDEX TO FIGURE 85-301-1

- | | |
|------------------------------------|---------------------------------|
| 1. Shoulder Harness | 17. Grommet |
| 2. Harness Fitting | 18. Harness Reel Cover |
| 3. Spacer | 19. Spacer |
| 4. Harness Attach Line | 20. Spacer |
| 5. Harness Belt Fairlead | 21. Reel Assembly |
| 6. Harness Anchor Fitting | 21A. Clamp |
| 7. Firewall Support Cable Assembly | 22. Grommet |
| 8. Turnbarrel | 23. Clamp |
| 9. Clamp | 24. Spacer |
| 10. Eye | 25. Harness Belt Fairlead |
| 11. Cable Support Radius Block | 26. Reel Control Assembly |
| 12. Eye Bolt | 27. Reel Assembly Control Cable |
| 13. Fork | 28. Reel Assembly Control Cable |
| 14. Spacer | 29. Doubler |
| 15. Clamp | 30. Beam Assembly |
| 16. Clamp | 31. Doubler |

88-101-1. CABIN HEAT KIT INSTALLATION. (See figures 10-6 and 88-101-1.)

88-101-2. DESCRIPTION. The cabin enclosure is heated by a forced air system driven by the engine cooling fan. Air enters the system at the top of the engine cooling system shroud on the right-hand side. The air passes through a flexible tubing to the muffler located on the right-hand engine exhaust stack. From the aft end of the muffler the warmed air passes through flexible ducts to the cabin heat duct assembly located outside the canopy. When the cabin heat duct assembly is open, the air passes into the cabin enclosure through the heat diffuser. When the assembly is closed, the air discharges to atmosphere.

88-101-3. TROUBLESHOOTING THE CABIN HEATING SYSTEM. Refer to Table 88-101-I for cabin heating system troubleshooting data.

88-101-10. REMOVAL OF CABIN HEATING SYSTEM.

- a. Loosen the clamps securing the flexible ducts to the engine cooling system shroud, the muffler and the cabin heat duct assembly.
- b. Remove the clamps securing the flexible ducts to the engine mount assembly.
- c. Remove the flexible ducts.
- d. Remove the diffuser from the cabin heat duct assembly.
- e. Disconnect the cabin heat duct assembly push-pull control cable from the valve gate crank, muffler shroud assembly, cooling system shroud and engine mount. Take care to retain the special control clamps removed from the engine mount.
- f. Remove the two screws securing the push-pull control cable support bracket to the canopy and the duct assembly.
- g. Remove the remaining screws, nuts and plastic spacers securing the cabin heat duct assembly to the canopy.
- h. Remove the gasket, the cabin heat duct assembly and the push-pull control cable.
- i. Loosen the exhaust shroud clamps and remove the stainless steel screws and washers attaching the shroud to the exhaust stack.
- j. Expand the exhaust shroud and slide the shroud rearward to remove. Remove and retain the seal gasket.

88-101-11. INSTALLATION OF CABIN HEATING SYSTEM. Installation of the cabin heating system is the reverse of removal.

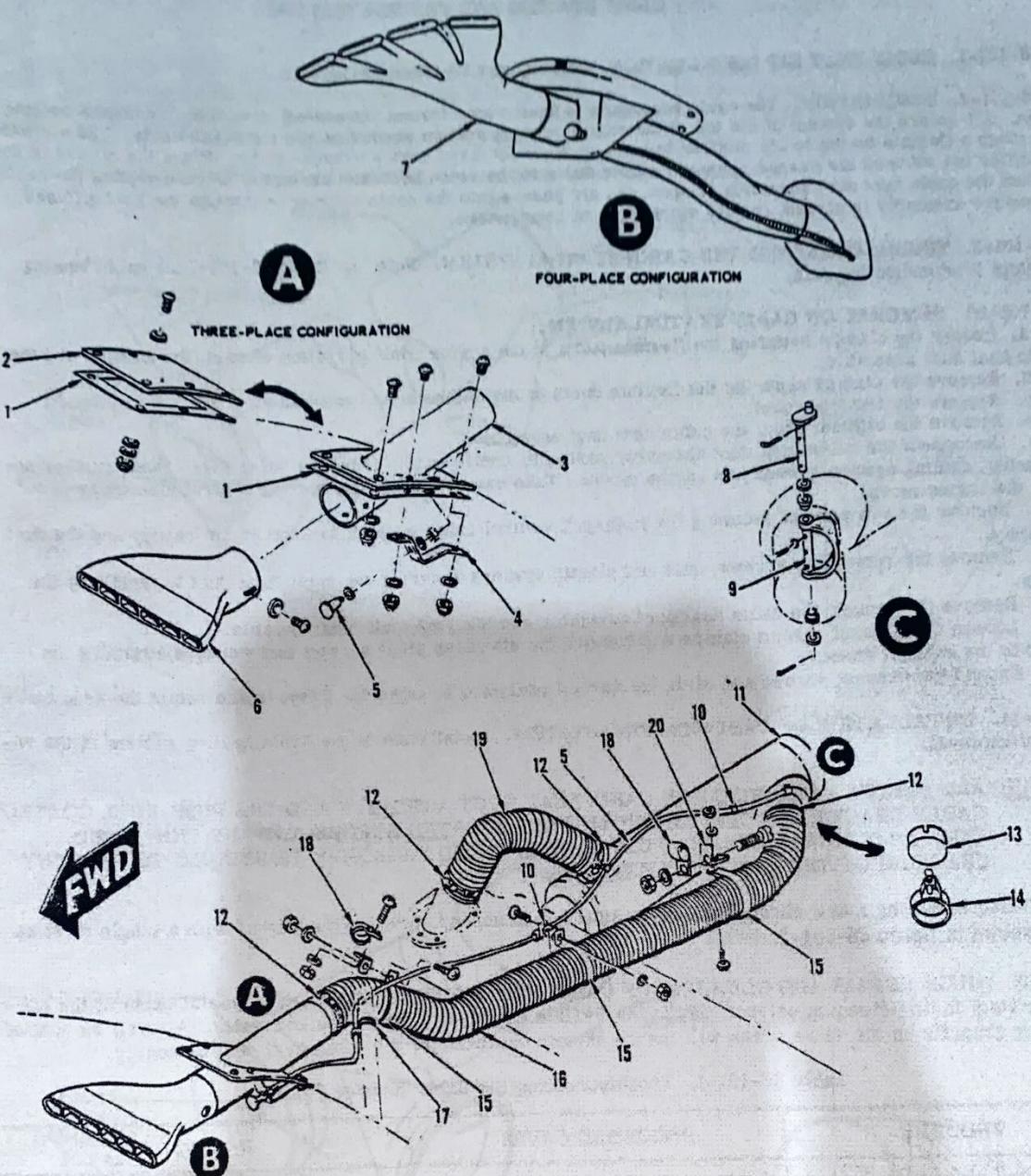
CAUTION: ALL SCREWS ATTACHING THE CABIN HEAT DUCT ASSEMBLY AND THE PUSH-PULL CONTROL CABLE BRACKET TO THE CANOPY MUST BE STARTED BEFORE ANY ARE TIGHTENED. TIGHTEN SCREWS UNIFORMLY UNTIL SNUG. AVOID EXCESSIVE TIGHTENING TO PREVENT CRACKING OF THE CANOPY PLEXIGLASS.

NOTE: When installing a new shroud assembly, attach each shroud clamp to the shroud with a single rivet as shown in figure 88-101-2.

88-101-40. MINOR REPAIR AND CLEANING OF CABIN HEATING SYSTEM. Wash all metal parts of the cabin heating system in dry-cleaning solvent. Wash the flexible tubing with mild soap and water. A small amount of lubricating graphite on the valve crank will insure smooth operation of the cabin heat duct assembly.

Table 88-101-I. Troubleshooting the Cabin Heating System

TROUBLE	PROBABLE CAUSE	REMEDY
Insufficient or erratic flow of heated air into cabin	Leaks in flexible tubing	Replace damaged or defective tubing.
	Improper operation of cabin heat duct assembly	Check condition of valve gate and push-pull control cable.
	Broken or defective gasket between diffuser flange and canopy	Replace gasket.
	Leakage between duct and diffuser	Remove diffuser and wrap forward end of duct with friction tape. Install diffuser to duct.
Exhaust gases detected in cabin	Cracks or leaks in engine exhaust stack	Replace exhaust stack.



- | | |
|---------------------------------|---------------------|
| 1. Gasket | 11. Shroud Assembly |
| 2. Heater Duct Hole Cover | 12. Clamp |
| 3. Cabin Duct Assembly | 13. Cap |
| 4. Bracket | 14. Clamp |
| 5. Control Cable Assembly | 15. Clamp |
| 6. Cabin Heat Diffuser Assembly | 16. Flexible Duct |
| 7. Cabin Heat Diffuser Assembly | 17. Clamp |
| 8. Bellcrank | 18. Clamp |
| 9. Control Gate Valve | 19. Flexible Duct |
| 10. Clamp | 20. Clip |

Figure 88-101-1. Cabin Heat Kit Assembly

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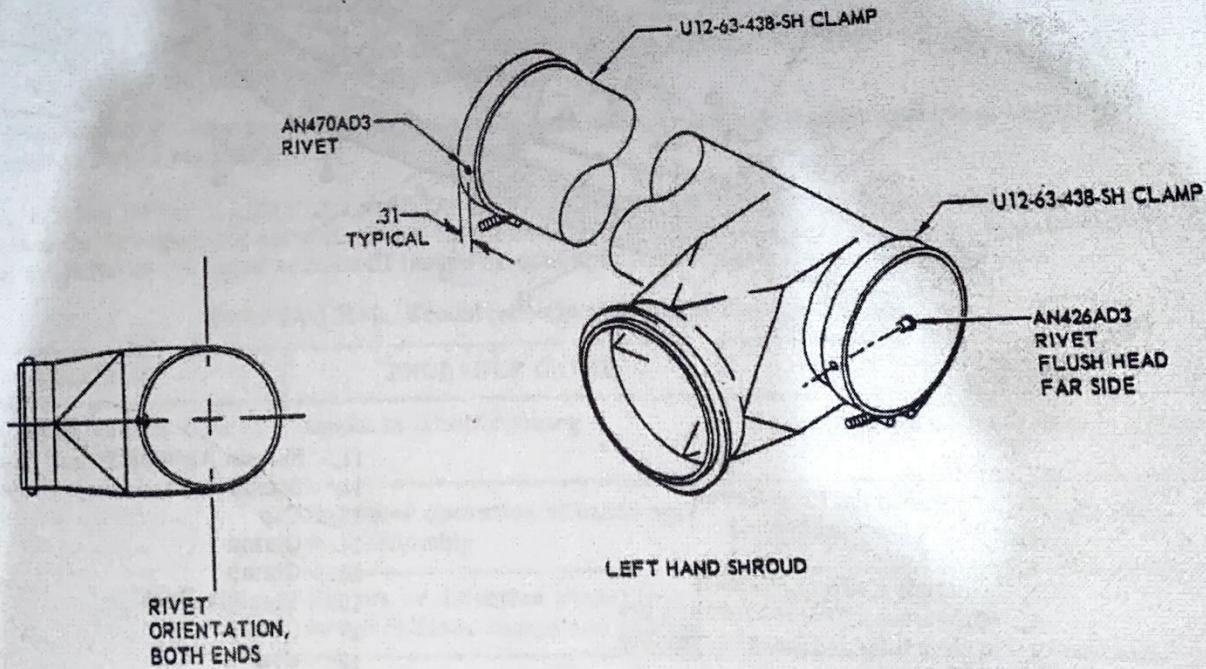
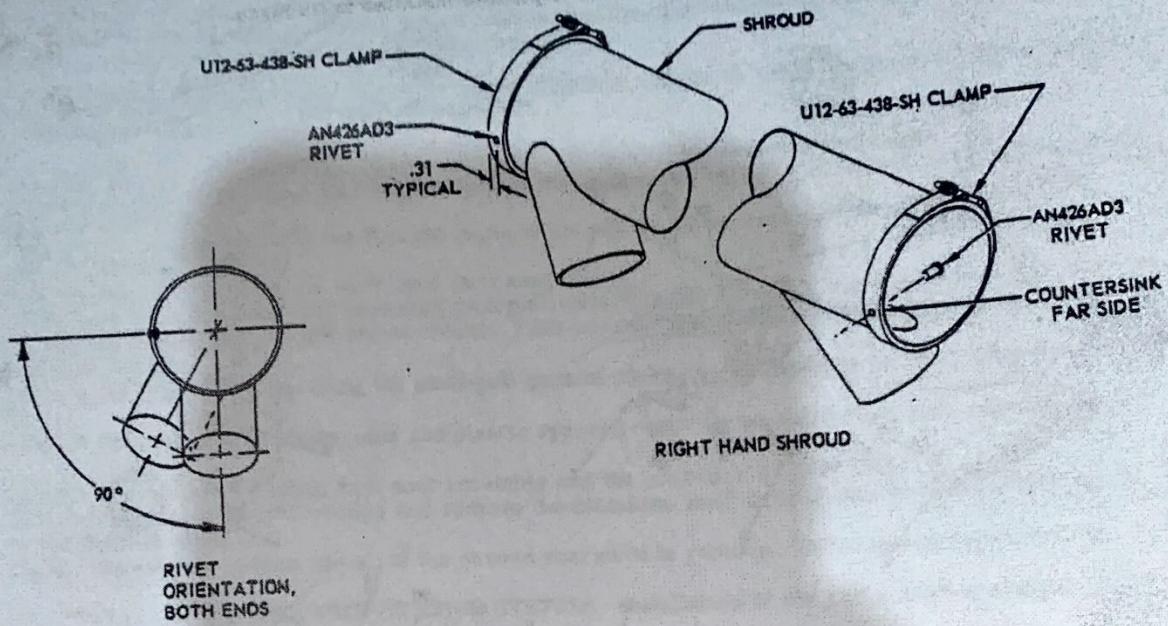


Figure 88-101-2. Riveting Clamps To New Shrouds

Changed 1 February 1989

88-3

88-201-1. CABIN HEAT KIT INSTALLATION, FOUR-PLACE CONFIGURATION. (See figures 10-6 and 88-101-1.)

88-201-2. DESCRIPTION. The cabin heat kit installation for the four-place configuration helicopter is essentially the same as for the standard configuration helicopter except that the four-place helicopter cabin heat diffuser assembly is attached to the canopy head. Refer to paragraphs 88-101-1 through 88-101-40 for troubleshooting, removal, installation and minor repair instructions.

NOTE: If the diffuser assembly is not installed, a cover plate is installed in its place.

CARGO HOOK

91-101-1. CARGO HOOK INSTALLATION. (See figures 10-6 and 91-101-1.)

91-101-2. DESCRIPTION. The cargo hook installation provides the helicopter with an externally mounted, easily attached load carrying device capable of transporting any load within the gross weight limitations of the helicopter (1000 lb. maximum). The cargo hook installation consists of a hook assembly suspended beneath the body structure, an emergency cargo release pedal assembly mounted to the forward end of the cabin floor, and the associated electrical and mechanical controls used to release the hook. An auxiliary equipment cyclic stick grip installation is required in conjunction with the cargo hook installation to provide the normal means for control of the hook release. (Refer to Section 33 for information and instructions pertaining to the auxiliary equipment stick grip installation.) Power for electrical operation of the cargo hook release is provided through the ACCESSORY circuit breaker located in the protection panel. A guard-protected CARGO HOOK RELEASE ARMING SWITCH, located on the face of the left-hand seat deck bulkhead, is used to isolate the release circuit controlled by the cyclic stick grip cargo hook release switch.

91-101-10. REMOVAL OF CARGO HOOK INSTALLATION. Remove cargo hook installation components by the procedure outlined below.

a. Remove the cargo hook assembly in the following manner:

(1) Remove the emergency release control cable. (See figure 91-101-1.)

(2) Cut the lockwire and remove the cargo hook harness plug from the basic body receptacle.

(3) Support the hook assembly; then release and disengage the L-shaped quick-release pins from the hook assembly clevises and the beam hanger, and remove the cargo hook from the beam hanger.

b. Remove the emergency cargo release pedal assembly in the following manner:

(1) Remove the cotter pin and clevis pin and detach the cable terminal from the lever protruding through the slot in the lower right-hand windshield glass.

(2) Remove the upper mounting nuts, bolts and washers, and the lower mounting bolts and washers attaching the pedal assembly bracket to the cabin floor bulkhead.

CAUTION: CAREFULLY LIFT THE PEDAL ASSEMBLY FROM ITS MOUNTING. CHECK THAT THE PEDAL LEVER IS NOT COCKED DURING THE REMOVAL FROM THE WINDSHIELD GLASS SLOT.

c. Remove the emergency cargo release cable in the following manner:

(1) Remove the cotter pins and clevis pins from the cable terminals and detach the terminals from the pedal assembly lever and the emergency release latch.

(2) Remove the terminal and the small and large rubber boots from the cable end. Loosen and remove the nut securing the cable to the hook assembly cable bracket. (Do not remove the cable from the bracket until the electrical harness is separated from the cable.)

(3) Cut the ties and/or tape securing the harness to the cable; then remove the screws, washers and clamps securing the cable to the basic body.

(4) Remove the screws, nuts and washers used to secure the cable clip to the forward cable support bracket.

(5) Slide the cable forward to remove the aft end from the hook assembly cable bracket.

91-101-11. INSTALLATION OF CARGO HOOK. Installation of cargo hook components is essentially the reverse of removal. Check that the emergency release control cable is rigged in accordance with paragraph 91-101-30.

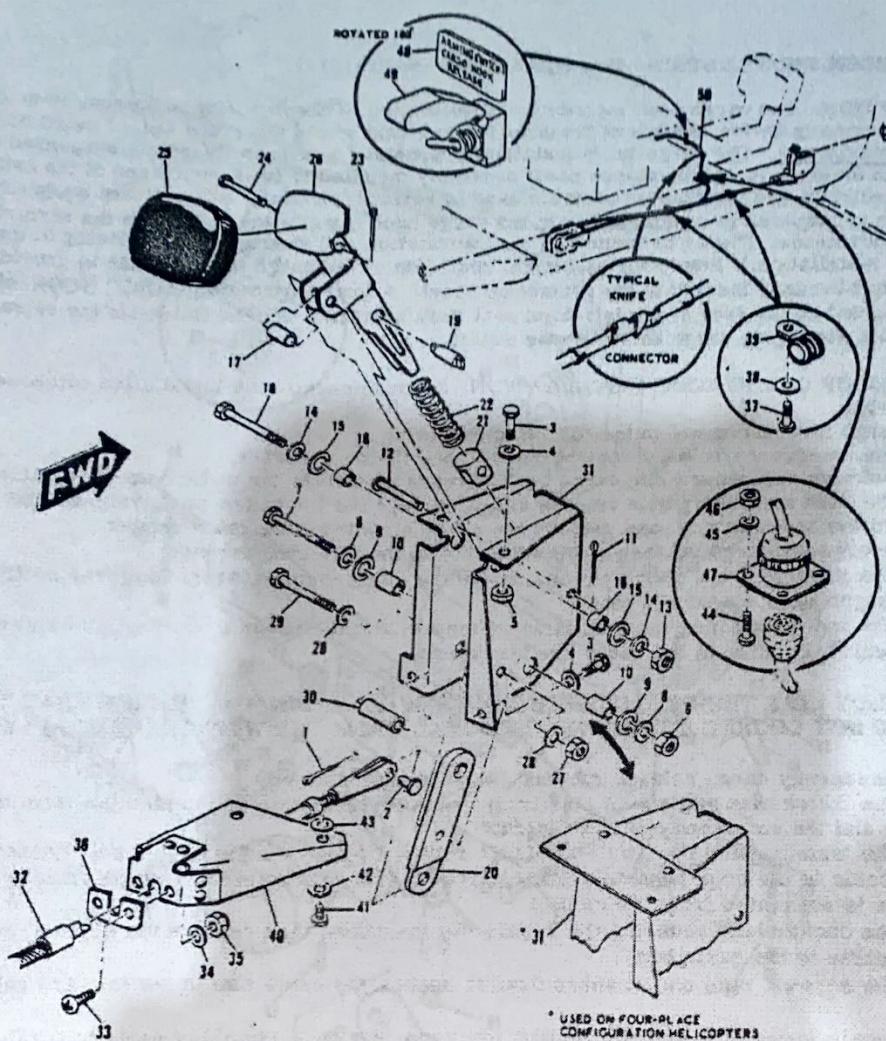
91-101-30. RIGGING EMERGENCY CARGO RELEASE CONTROL CABLE. (See figure 91-101-1.)

a. Check that the emergency release pedal is in the nonactuated position.

b. Check the clearance between the edge of the emergency release latch and the cargo hook release lever spring pin. The patch-to-pin clearance should be 0.010-inch minimum to 0.080-inch maximum.

c. To increase the clearance between the pin and latch, increase the effective length of the emergency release cable by unscrewing the cable terminal of either end of the cable.

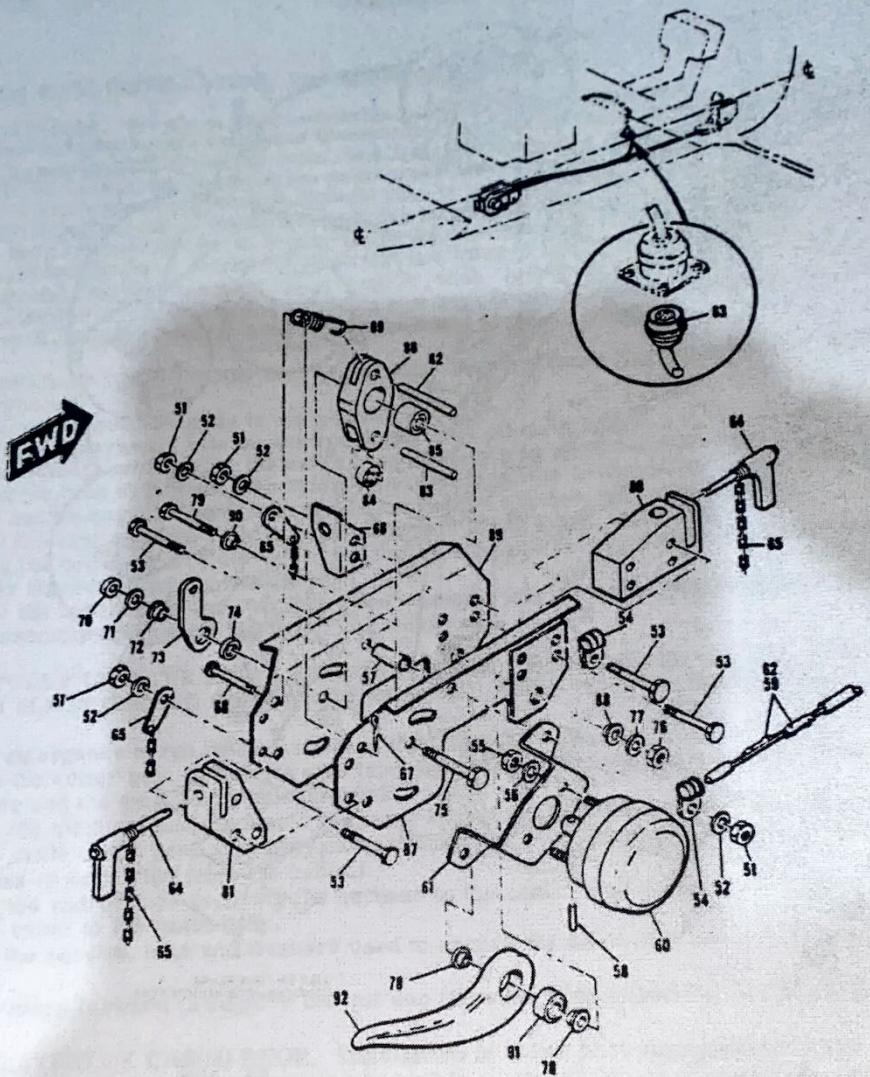
d. To decrease the pin-to-latch clearance, shorten the effective cable length.



- | | | |
|----------------|-------------------------------------|--|
| 1. Cotter Pin | 18. Bolt | 35. Nut |
| 2. Pin | 19. Pin | 36. Cable Clip |
| 3. Bolt | 20. Release Pedal Assembly Lever | 37. Screw |
| 4. Washer | 21. Release Pedal Assembly Plug | 38. Washer |
| 5. Nut | 22. Release Pedal Assembly Spring | 39. Clamp |
| 6. Nut | 23. Cotter Pin | 40. Cable Bracket |
| 7. Bolt | 24. Pin | 41. Screw |
| 8. Washer | 25. Release Pedal Pad | 42. Washer |
| 9. Washer | 26. Release Pedal | 43. Washer |
| 10. Bushing | 27. Nut | 44. Screw |
| 11. Cotter Pin | 28. Washer | 45. Washer |
| 12. Pin | 29. Bolt | 46. Nut |
| 13. Nut | 30. Bushing | 47. Receptacle Connector |
| 14. Washer | 31. Pedal Assembly Bracket | 48. Arming Switch Identification Plate |
| 15. Washer | 32. Emergency Release Control Cable | 49. Arming Switch |
| 16. Bushing | 33. Screw | 50. Harness Assembly |
| 17. Bushing | 34. Washer | |

Figure 91-101-1. Cargo Hook Installation (Sheet 1 of 2)

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- | | | |
|-----------------------------|---------------------------------|--------------------------|
| 51. Nut | 65. Chain Assembly | 79. Bolt |
| 52. Washer | 66. Cargo Hook Bracket | 80. Forward Clevis |
| 53. Bolt | 67. Cotter Pin | 81. Aft Clevis |
| 54. Clamp | 68. Pin | 82. Spring Pin |
| 55. Nut | 69. Release Lever Return Spring | 83. Spring Pin |
| 56. Washer | 70. Nut | 84. Bearing |
| 57. Bushing | 71. Washer | 85. Bearing |
| 58. Spring Pin | 72. Bushing | 86. Release Lever |
| 59. Terminal | 73. Emergency Release Latch | 87. Hook Retaining Plate |
| 60. Solenoid | 74. Release Latch Spacer | 88. Bushing |
| 61. Solenoid Bracket | 75. Bolt | 89. Hook Retaining Plate |
| 62. Terminal | 76. Nut | 90. Bushing |
| 63. Cargo Hook Harness Plug | 77. Washer | 91. Bearing |
| 64. Quick-Release Pin | 78. Bushing | 92. Cargo Hook |

Figure 91-101-1. Cargo Hook Installation (Sheet 2 of 2)

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92-1-1. SPECIAL TOOLS.

92-1-2. DESCRIPTION.

The special tools used for general maintenance of the helicopter are listed in Table 92-1-1. Refer to the parts catalog for a complete illustrated listing of all special tools available for the UH-12E helicopter.

Table 92-1-1. Special Tools

<u>ITEM NO.</u>	<u>PART NO.</u>	<u>NOMENCLATURE</u>
1	92012	Sling, hoisting - helicopter complete or main rotor
2	92013	Template, rigging - control rotor and stabilizer
3	92016-21	Block assembly, mooring - main rotor (replaced by 92225)
4	92019	Puller - engine cooling fan
5	92028	Cover assembly - main rotor head
6	92029	Cover assembly - tail boom
7	92030	Cover assembly - tail rotor
8	92043-4	Holder - tail rotor gear box
9	92052-3	Fixture assembly, aligning - main rotor
10	92052-9	Block, Aligning fixture - main rotor
11	92057	Wrench, socket - tail rotor gear box
12	92060	Stand assembly, balance - main rotor
13	92061	Pivot, balance centering - main rotor
14	92062	Ring assembly, balancing - main rotor
15	92063	Mast support, balancing - main rotor
16	92065-5	Stand installation - main rotor
17	92067	Bar assembly, extension and retraction - skid wheel
18	92071	Puller - main rotor head and wobble plate
19	92072	Eye, hoisting - main transmission and helicopter
20	92074-5	Wrench, spanner - main rotor gimbal thrust nut
21	92083	Puller - main rotor hub bearing
22	92091	Wrench, spanner - spline fitting to main rotor drive tube nut
23	92096	Level assembly, balancing - main rotor
24	92107	Reflector set, tracking - main rotor blade
25	92108	Reflector, tracking - main rotor blade
26	92109	Reflector, tracking - main rotor blade
27	92124	Billet, hole aligning - main rotor blade pin
28	92163-3	Block, leveling - main rotor hub
28A	92163-4	Block, leveling - wobble plate
29	92168	Kit, grease injector
30	(Deleted)	
31	(Deleted)	
32	92188	Arbor press - stabilizer spar
33	92191	Brace assembly, rigging - cyclic stick
34	92193	Cover assembly - basic body
35	92202	Arm assembly, blade leveling - main rotor stand
36	92211	Wrench, socket - tail rotor outboard stop
37	92216	Mandrel, balancing - tail rotor (Part of 92077-6)
38	92221-17	Template, tail rotor rigging (Alternate for 92221)
39	92077-6	Stand assembly, balance - tail rotor
40	92070	Wrench, spanner - wobble plate lock ring
41	92222	Cover, pitot tube
42	(Deleted)	
43	92225	Clamp assembly, main rotor blade mooring (spares replacement for 92016-21)
44	92230	Wrench, socket - engine mount gimbal bearing lock ring
45	92231	Sleeve gage - slip joint centering pin
46	92197	Tracking light
47	92232-3	Gage assembly, pressure, dial indicating - float bag
47A	92232-5	Gage assembly, pressure, dial indicating - float bag (for use on air cruiser floats without automotive type air valve)
48	92150-8	Billet, oil seal installation
49	92171	Mandrel, cooling fan balancing
50	92240	Adapter, timing, square to spline drive
51	92241	Adapter set, shaft balancing

Table 92-1-I. Special Tools (cont)

NOMENCLATURE

<u>ITEM NO.</u>	<u>PART NO.</u>	
51A	92243	Fixture assembly, wobble plate check
52	92150-7	Billet, oil seal installation
53	92227	Extractor - installer set, oil seal, input shaft, mechanical transmission

Changed July, 1965

RESCUE AND LITTER EQUIPMENT

96-101-1. FIRE EXTINGUISHER INSTALLATION. (See figure 10-6.)

96-101-2. DESCRIPTION. The lightweight fire extinguisher installation available for use and installation in the helicopter is a Model CF-2 1 1/2 extinguisher containing 2 1/2 pounds of pressurized dry chemical. The extinguisher is fitted with a bracket and supports which attach to the right-hand seat deck bulkhead.

NOTE: Any one of several brand-name extinguishers may be used if the unit has Underwriters Laboratories approval.

96-101-10. REMOVAL OF THE FIRE EXTINGUISHER. Removal of the extinguisher is conventional and obvious.

96-101-11. INSTALLATION OF FIRE EXTINGUISHER.

NOTE: The right-hand standard seat cushion map case is removed (cut off) when a fire extinguisher is installed. Install the fire extinguisher in the conventional manner, with its handle position downward next to the seat deck.

96-101-40. SERVICING FIRE EXTINGUISHER. Servicing requirements of the unit manufacturer must be followed when servicing the extinguisher.

96-201-1. LITTER INSTALLATION. (See figures 10-6 and 96-201-1.)

96-201-2. DESCRIPTION. (Refer to the UH-12E Flight Manual for operating limitations applicable to the helicopter when litters are installed.) The litter installation consists of two litter assemblies, each fitted with a canopy, cover, and zipper fastener. Each litter assembly is comprised of three aluminum bed sections secured to aluminum tubes which are mounted on bowed, tubular steel supports at each end. The bed is designed so that a standard-length field stretcher (collapsible or fixed) may be placed in position on the bed, eliminating the need for transferring a patient from a stretcher to a litter. The canopy is a tubular aluminum framework covered with vinyl-coated nylon fabric. Two plexiglas windows provide a view of the patient's head from the helicopter cabin. The canopy is easily detachable by means of quick-release pins. A safety belt, equipped with steel clip-on type hooks attached to each belt for litter attachment is furnished; a shoulder harness with attaching provisions is available.

a. Attachment of the litter assembly to either the float landing gear or the skid landing gear is accomplished by the insertion of two quick-release pins at each litter support. On skid landing gear equipped helicopters, one pin is chain-fastened and permanently installed at the skid landing gear leg-to-spring tube location in place of the inboard bolt that attaches the leg to the spring tube. The mating quick-release pin is chain-fastened to the litter support and secures the litter support to a similar clamp attached to the landing gear spring tube. The clamps and release pins attached to the landing gear spring tubes are normally left installed to facilitate rapid attachment and removal of the litter assemblies. On float landing gear equipped helicopters, the litter attachment is identical to conventional landing gear installation with the exception that the outboard quick-release pin chains are secured to the litter support instead of the landing gear. The litter assembly front support C-shaped end tubes have slotted holes for the attaching bolts to allow forward or rearward adjustment of the litter assembly to accommodate minor tolerance variations in the span between the landing gear spring tubes. With the litters installed the skid wheels may be raised or extended by using the skid wheel extension and retraction bar.

NOTE: When litter support clamps are removed, the clamp halves should be secured together because the clamps are manufactured as matched sets.

96-201-10. REMOVAL OF LITTERS. Remove attachments to remove litters.

NOTE: If difficulty is encountered in aligning the attachment holes of a litter support assembly and a spring tube, check to make sure that: (1) the litter support clamp is located so that it touches the support indexing pin, and (2) the spring tube clamp has not shifted.

96-201-11. INSTALLATION OF LITTERS. Litter installation procedures are essentially the reverse of removal.

NOTE: The tapered bores of the support clamps match the spring tube taper.

96-201-40. MINOR REPAIR AND PARTS REPLACEMENT OF LITTER ASSEMBLIES. Repair a damaged litter assembly, canopy, or attaching support clamps in accordance with instructions provided in the UH-12E Structural Repair Manual. Replace the litter support clamp with a serviceable clamp when the release pin holes become worn (oversize). All inboard support clamps have a hole diameter (1/4-inch nominal diameter quick-

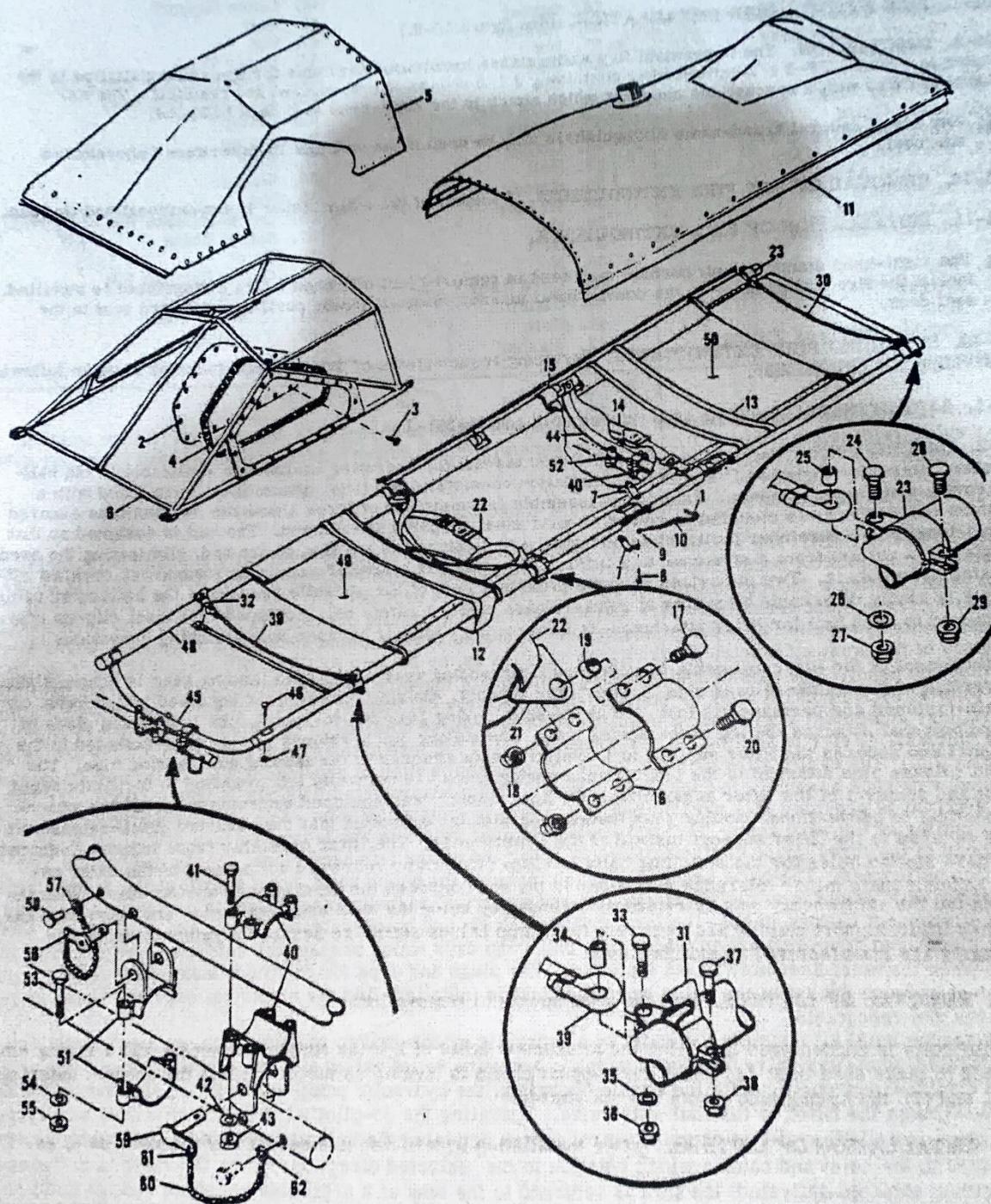


Figure 96-201-1. Litter Installation

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INDEX FOR FIGURE 96-201-1

1. Quick-Release Pin	22. Shoulder Harness Belt	43. Nut
2. Litter Canopy Window	23. Clamp Assy	44. Litter Support
3. Screw	24. Bolt	45. Litter Support
4. Canopy Window Seal	25. Spacer	46. Bolt
5. Canopy Cover	26. Washer	47. Nut
6. Canopy Frame Assy	27. Nut	48. Litter Tube
7. Clamp Assy	28. Bolt	49. Forward Litter Bed Assy
8. Bolt	29. Nut	50. Aft Litter Bed Assy
9. Split Key Ring	30. Cord Assy	51. Clamp
10. Safety Chain	31. Clamp	52. Clamp
11. Cover and Zipper Assy	32. Clamp	53. Bolt
12. Forward Boot Assy	33. Bolt	54. Washer
13. Aft Boot Assy	34. Spacer	55. Nut
14. Safety Belt	35. Washer	56. Quick-Release Pin
15. Safety Belt Hook	36. Nut	57. Safety Chain
16. Shoulder Harness Bracket Assy	37. Bolt	58. Rivet
17. Bolt	38. Nut	59. Quick-Release Pin
18. Nut	39. Cord Assy	60. Safety Chain
19. Spacer	40. Clamp	61. Split Key Ring
20. Bolt	41. Bolt	62. Terminal
21. Shoulder Harness Fitting	42. Washer	

release pin) limit of 0.275-inch maximum; outboard support clamps have a hole diameter (5/16-inch nominal diameter quick-release pin) limit of 0.350-inch maximum. Repair support clamps which exceed maximum hole diameter limits.

96-301-1. RESCUE HOIST KIT. (See figures 96-301-1 and 10-6.)

96-301-2. DESCRIPTION. The rescue hoist is an electrically controlled, hydraulically actuated hoist installation with a two-position hoisting boom mounted on the right-hand side of the helicopter. The hoist assembly is designed to permit lifting a 250-pound load. A 70-foot wire rope is provided with the winch; a survivors sling is available to increase hoist versatility. The nominal operating hydraulic pressure (1000 psi) of the hoist installation components is supplied by a pump mounted on the engine vacuum pump accessory drive pad. 28vdc power for operation of the hoist kit electrical circuits is supplied by the 10-amp ACCESSORY circuit breaker located in the protection panel. The raising and lowering operation of the wire rope is controlled from either the left-hand (co-pilot's) cyclic control stick or the right-hand (observer's) control station. A left-hand (co-pilot's position) auxiliary equipment grip must be installed when the rescue hoist kit is installed; dual auxiliary equipment grips are optional. (Refer to Section 33, paragraph 33-101-1 for instructions pertaining to auxiliary equipment grip installation.) The cyclic stick grip guillotine (pushbutton) switch is provided to permit immediate cutting of a lowered wire rope assembly in case of emergency. A guard-protected RESCUE HOIST CABLE CUTTER ARMING SWITCH is provided as a precautionary measure to isolate the hoist cable guillotine circuit and prevent accidental cutting of the wire rope. The cable cutter arming switch is located on the face of the left-hand seat deck bulkhead in the three-place configuration helicopter and on the left-hand tunnel access door in the four-place configuration helicopter. The hoist assembly, which includes the winch hoist, hoist guard, boom, frame, wire rope assembly with weight, and the attaching hose and electrical harness assemblies, is completely equipped with quick-disconnect fittings in the electrical and fluid lines, and quick-release pins on the frame. The socket and nipple disconnect couplings are provided with plugs and caps which prevent the entry of foreign matter into the fittings when the hoist assembly is not installed. The plugs and caps for the fluid lines are normally kept in any convenient stowage pocket of the cabin when the hoist is installed, and the electrical caps are chain-attached to the harness and receptacle.

a. The rescue hoist kit consists basically of a hydraulic motor-driven rescue winch, an electrically activated, solenoid operated, four-way valve for flow control, a pressure relief valve, a filter, a hydraulic oil tank assembly and a fixed displacement pump. With the engine operating, the hydraulic pump draws fluid from the tank and produces a flow through the filter to the four-way valve. Operating the co-pilot's (or pilot's with dual auxiliary equipment grips installed) cyclic stick grip control switch activates the selected solenoid which ports the engine pump pressure to the hoist and causes winch rotation in the selected direction. When the valve is in the neutral position (neither solenoid activated) the flow is returned to the tank at a negligible pressure and the hoist control oil passages are blocked, causing hydraulic locking of the hydraulic motor and winch hoist; this locking action eliminates need for a clutch or brake. Drain oil from the hydraulic motor is returned to the tank; the engine pump drain and tank vent are both routed overboard.

96-301-3. TROUBLESHOOTING THE RESCUE HOIST INSTALLATION. Refer to Table 96-301-1 for troubleshooting information.

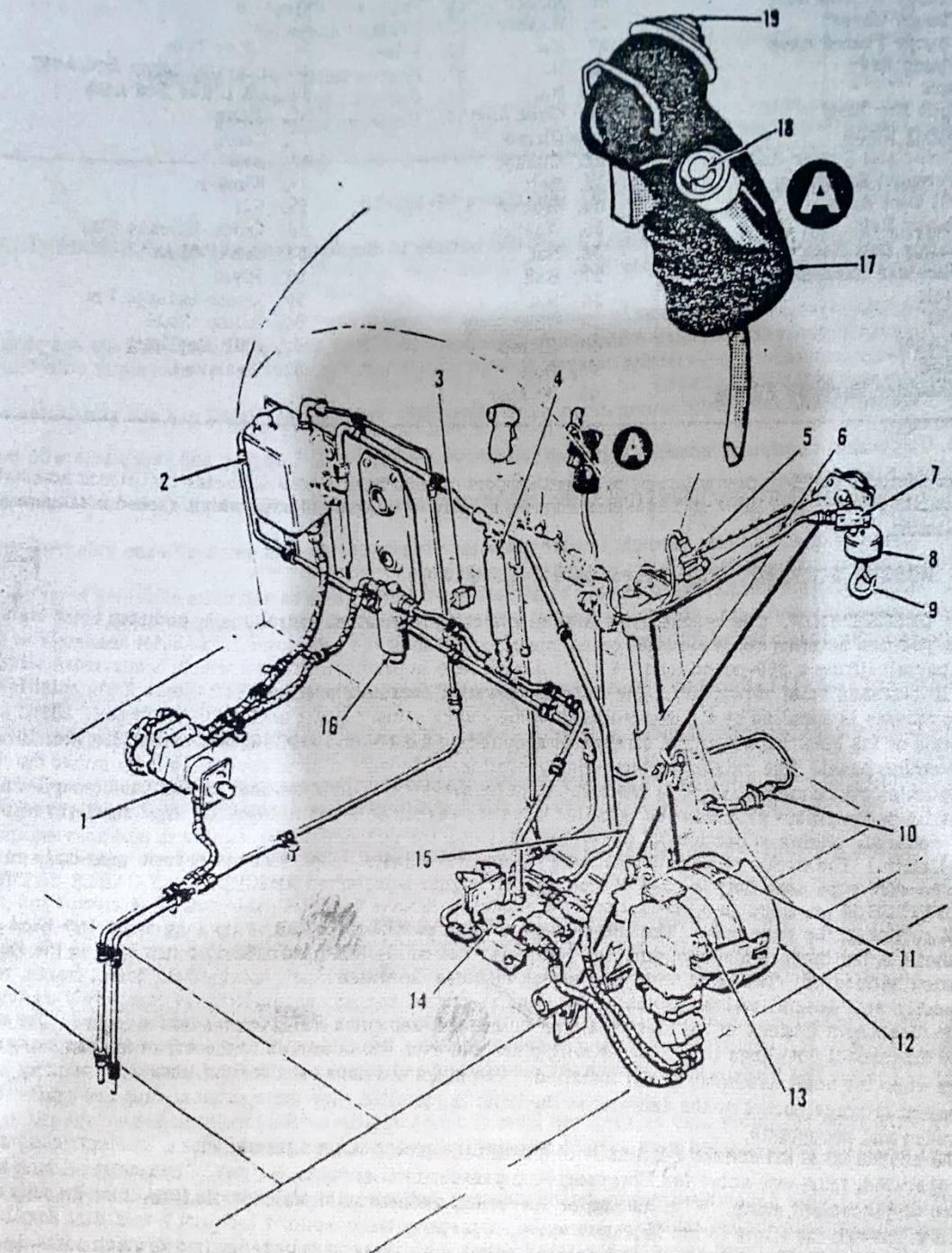


Figure 96-301-1. Rescue Hoist Installation

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| 4. Relief Valve | 14. Four-way Valve |
| 5. Guillotine | 15. Frame Assembly |
| 6. Boom Assembly | 16. Filter |
| 7. Switch | 17. Rescue Hoist Switch Assembly |
| 8. Weight | 18. Cable Cutter Switch |
| 9. Cable Assembly | 19. Up-Down Hoist Switch |
| 10. Rescue Hoist Switch Connector Plug | |

96-301-10. REMOVAL OF RESCUE HOIST KIT. (See figure 96-301-1.)

NOTE: Prior to removal of any kit component, check that battery is disconnected and that ACCESSORY circuit breaker is pulled up to the OFF position.

a. Remove hoist assembly as follows:

- (1) Disengage pressure inlet and outlet quick-disconnect couplings and install coupling caps and plugs. (The caps and plugs provided to prevent the entry of foreign matter into the couplings are normally stored in the right-hand seat cushion flap pocket.)
- (2) Disengage hoist hydraulic motor drain quick-disconnect coupling and install cap and plug (refer to step (1) above).
- (3) Disconnect electrical harness plug from the firewall receptacle. Cap plug and receptacle with the chain-attached caps.
- (4) Support the frame assembly from outboard side and remove quick-release pin from the frame-to-firewall brackets.
- (5) Support frame and hoist assembly under the hoist and remove the two quick-release pins from the accessory attachment fittings. Remove frame and hoist assembly.
- (6) Separate hoist from frame assembly by removing the nuts, washers and bolts attaching hoist gear case to frame assembly supports. Note the location, and retain the hoist assembly support clips.

b. Remove boom assembly as follows:

NOTE: Disregard step (1) below if hoist assembly is removed from the helicopter.

- (1) Disconnect electrical harness plug from firewall receptacle. Cap plug and receptacle with the chain-attached caps.
- (2) Remove bolt that attaches the guard assembly bracket to hoist gear case. Remove screws securing guard assembly to supporting clips and clamp used to attach guard to frame assembly; remove guard assembly from hoist.
- (3) Remove the self-locking nut and washer from hoist winch. Slide winch away from gear box and off the shaft spline.

CAUTION: WITH THE HOIST ASSEMBLY INSTALLED ON THE HELICOPTER, PAD A SECTION OF THE BOOM AND SECURE THE WIRE ROPE HOOK AND WEIGHT TO THIS POINT TO PREVENT THE WEIGHT FROM FREE-FALLING AND CAUSING POSSIBLE DAMAGE.

- (4) Unreel wire rope assembly to its full length by rolling winch along the ground. (Avoid unreeling in dirt or sand.) Loosen and remove the nuts and washers securing the cable clip to the wire rope end. Remove cable clip and cable from winch. Check winch for cleanliness and remove any foreign matter.

NOTE: The wire rope assembly may be removed from boom at this time. Release hook and weight and carefully slide the nylon-coated wire rope from hoist frame and boom assemblies.

- (5) Support frame assembly from outboard side and remove quick-release pin from the frame-to-firewall brackets; then accomplish the following:
- (6) Remove the two bolts securing the small bracket to frame assembly upper tube and remove and retain bolts and contoured outer spacer.

NOTE: The contoured, tube ID filler (with nut plates) should fall to the bottom of the frame assembly lower tube. Recover the filler by extracting it through the wire rope slot in the lower tube, or by inverting frame assembly after its (frame) removal.

- (7) Remove quick-release pin used to secure the boom position and lift boom assembly from frame assembly.

Table 96-301-I. Troubleshooting the Rescue Hoist

TROUBLE	PROBABLE CAUSE	REMEDY
Hoist will not operate in either direction.	Hydraulic pump not delivering oil or delivering insufficient pressure.	Refer to Vickers Service Data. Check pressure relief valve. Replace a defective pump.
	Hydraulic motor supplying insufficient pressure.	Refer to Vickers Service Data. Replace a defective motor. Check pressure relief valve.
	Four-way valve not being actuated.	Check wiring and connectors to the valve solenoids.
	Defective four-way valve.	Repair or replace valve.
	Loose connections or open wiring in hoist control circuit; improper electrical connections in control circuit.	Tighten or repair connections; make correct connections.
	Defective cyclic stick switch.	Repair or replace cyclic stick control switch
Hoist operates in wrong direction.	Hydraulic hoses reversed.	Make correct connections.
	Improper electrical connections.	Make correct connections.
Guillotine fires without intention.	One or more filter bypass capacitors open. (Used to filter out induced currents).	Replace defective filter bypass capacitors (guillotine and four-way valve solenoids).
Guillotine will not fire.	Defective arming switch.	Replace defective switch.
	Defective cyclic stick switch.	Replace defective switch.
	Guillotine firing circuit open.	Repair loose circuit connections or broken wires.
Hoist does not stop at upper limit.	Limit switch defective.	Replace limit switch.

CAUTION: USE CARE DURING SEPARATION AND REMOVAL OF THE BOOM FROM THE FRAME TO AVOID SNAGGING OR SCRAPING THE NYLON COATING OF THE WIRE ROPE (IF NOT PREVIOUSLY REMOVED---REFER TO STEP (4) ABOVE).

- c. Remove the four-way valve as follows: (See figure 96-103-1.)

- (1) Remove electrical connector plugs from the two valve solenoids.
- (2) Disengage, and cap or plug the three quick-disconnect couplings (refer to paragraph a, step (1)).
- (3) Loosen and disconnect the 1/2-inch ID pressure and pressure return tube assemblies. Cap valve port fittings and plug tube fittings to prevent the entry of foreign matter.
- (4) Remove the three bolts, clamp standoff spacers and washers used to secure tubing clamps and four-way valve to valve support (Note location and length of each bolt and spacer during removal to facilitate re-assembly).
- (5) Remove valve from support. Retain the two washers installed between the valve and valve support at each bolt location.

- d. Remove hydraulic oil tank assembly as follows:

- (1) Locate a one-gallon capacity container below hydraulic oil tank; remove drain plug from the DRAIN

FLANGE (bottom left-hand side of the tank) and drain the oil. Reinstall and tighten drain plug.

CAUTION: BE CAREFUL NOT TO TIGHTEN DRAIN PLUG EXCESSIVELY TO PREVENT POSSIBLE DAMAGE TO THE TANK OR ITS SUPPORTS.

(2) Loosen and disconnect the SUCTION, RETURN, VENT and HOIST DRAIN tube assemblies from the tank fittings. Cap tank fittings and plug tubing assemblies to prevent entry of foreign matter.

(3) Cut lockwire securing the two upper bolts attaching tank to tank supports. Remove the four bolts and washers securing tank to tank supports and remove tank.

NOTE: The attachment bolts used at the top of the tank are 1/4-inch longer than the attachment bolts used at the lower end of the tank and tank supports.

e. Remove the Purolator micronic filter as follows:

(1) Disconnect tube and hose assemblies; plug or cap all fittings ports to prevent the entry of foreign matter.

(2) Remove bolts, washers and spacers used to attach filter to filter support; remove filter.

f. Remove relief valve as follows:

(1) Remove screws and spacers securing the four tube assembly clamps to firewall; retain spacers for reinstallation.

(2) Disconnect tube assemblies from relief valve; remove relief valve and plug or cap all fitting ports to prevent entry of foreign matter.

g. Remove the hydraulic pump from the engine as follows:

(1) Disconnect the SUCTION, PRESSURE AND DRAIN hose assemblies from pump, and cap all fitting ports to prevent entry of foreign matter.

(2) Remove nuts, lockwashers and plain washers used to secure pump to engine, and remove pump.

96-301-11. INSTALLATION OF RESCUE HOIST. (See figure 96-301-1.) Installation of rescue hoist kit components and hydraulic units is essentially the reverse of removal. The following additional checks should be made before the installation is complete:

a. Upon installing and connecting the hoist assembly, check hose assembly inlets and outlets for interconnections to the correct ports. (See figure 96-301-1.)

b. Prior to making the hoist assembly electrical connection accomplish a functional check of the guillotine circuitry. (Refer to paragraph 96-301-60.)

c. Check that relief valve and hydraulic oil filter are mounted correctly with relation to fluid flow direction.

d. With hoist assembly installed on the helicopter, check for sufficient clearance around rope assembly where it is routed into and out of the center of the hoist assembly tubing. The wire rope should be centered within 1/8-inch where it enters tubing at the assembly tip. (Refer to paragraph 96-301-40 if the wire rope is not properly aligned.)

e. Check hydraulic fluid level in oil tank and add oil if necessary. (See figure 96-301-1.)

f. Unreel wire rope and inspect for breaks or cuts in nylon coat that extend into the wire rope strands. Avoid use of alcohol or ketones as a rope cleaning agent. Check tightness of U-bolt securing wire rope to hoist winch.

NOTE: The winch will continue in operation as long as the "up-down" switch is held in the down position, which means that when the end of the rope is reached, the winch, still in operation, will reel the rope backward. To avoid incorrect reeling, the last ten feet of the rope is color coded in orange to warn operator that the rope is completely unreeled. Should the rope be reeled backward, unreel and operate winch in the desired direction.

96-301-30. HANDLING OF GUILLOTINE EXPLOSIVE UNITS. Each guillotine explosive unit contains Class C high explosives.

WARNING: ALTHOUGH NORMAL HANDLING IS NOT DANGEROUS THE FOLLOWING SAFETY PRECAUTIONS MUST BE OBSERVED WHEN HANDLING THE GUILLOTINE UNIT:

a. Do not drop, throw or handle units roughly.

b. Do not force the unit into the charge holder. Any attempt to rework a unit can be hazardous.

NOTE: Contact Beckman and Whitley Inc. Explosive Ordnance, San Carlos, California, for instructions regarding the disposition of questionable explosive units.

c. Do not dispose of an explosive unit in a fire or place in an electric heater.

d. Do not handle explosive units during dust, dry snow or lightning storms (conditions when the unit can accumulate large concentrations of static electricity).

e. Do not handle explosive units in the close vicinity of active broadcasting of radar (high radiation) equipment. High output may cause detonation by inducing current into the unit.

1. Do not make electrical circuit checks with the guillotine connected. (Refer to paragraph 96-301-60 for functional testing.)

96-301-40. MINOR REPAIR AND PARTS REPLACEMENT OF RESCUE HOIST.

NOTE: Service data information which is beyond the intended scope of this handbook and is relative to the major repair and overhaul of Vickers parts may be obtained from Vickers Incorporated, 1400 Oakman Boulevard, Detroit 32, Michigan; Attention Product Service Department, Publications Section.

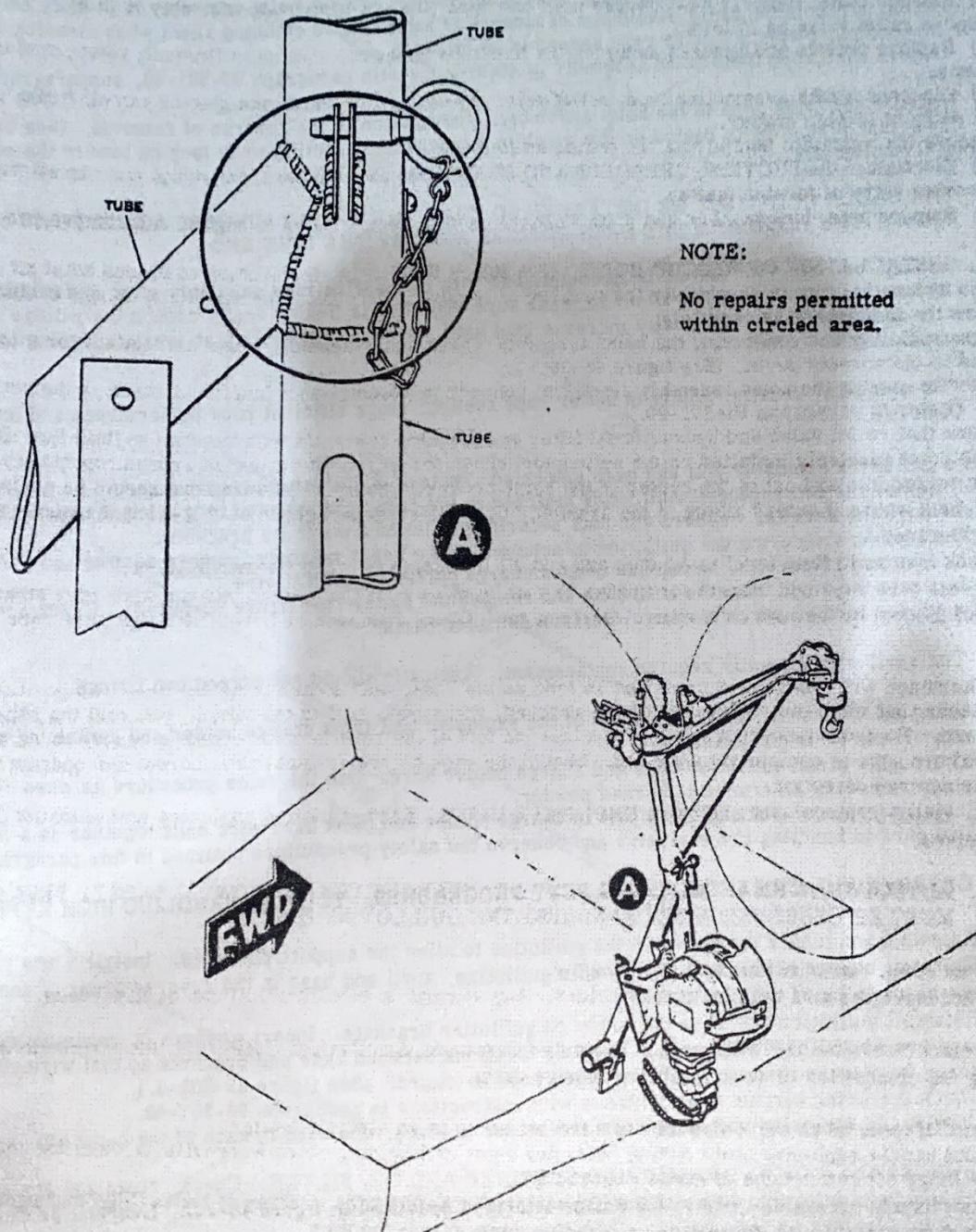


Figure 96-301-2. Rescue Hoist Frame Assembly, Nonreparable Areas

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a. Minor repair and parts replacement of rescue hoist components (other than hydraulic) should be accomplished in accordance with the procedures and limitations specified herein. Repair or replacement of hydraulic lines (tubing and hose assemblies) and fittings shall be made using the specifications and procedures outlined in Civil Aeronautics Manual 18, Volume III.

b. Minor scratches, nicks, small dents and light rust may be considered as negligible damage and repaired by polishing and blending defect into surrounding area. Repair extensively damaged tubes of the boom and frame assemblies in accordance with the welding, patching (by insertion) and straightening instructions provided in either the UH-12E Structural Repair Manual or Civil Aeronautics Manual 18, Volume III, as applicable.

CAUTION: REPAIRS ARE NOT PERMISSIBLE IF DAMAGE OCCURS IN THE AREA ILLUSTRATED IN FIGURE 96-301-2. REPLACE A FRAME ASSEMBLY DAMAGED IN THIS AREA.

c. Replace a wire rope assembly if damage, such as a break or cut, extends through nylon coating into wire rope strands. If nylon coating is cut but no wire strands are damaged, the wire rope assembly may be considered serviceable. Establish regular inspection intervals on a calendar basis to preclude the possibility of an in-service failure due to rope fatigue, kinking, rust or corrosion. (When hoist assembly is in daily service, postflight inspection is recommended.) Avoid use of alcohol or ketones as a cleaning agent when cleaning the wire rope for inspection. Replace a wire rope assembly as follows:

(1) Remove wire rope from hoist assembly in accordance with paragraph 96-301-10, subparagraph 2, steps (2), (3) and (4).

(2) Install a new wire rope in the hoist assembly. Installation is the reverse of removal. (See figure 96-301-1.) Check that wire rope is reeled on the winch in a clockwise direction when looking toward the reel and the rear of the helicopter.

CAUTION: THE CABLE CLIP MUST BE INSTALLED SO THAT THE U-BOLT CINCHES AGAINST THE DEAD END OF THE ROPE AND THE BASE CINCHES AGAINST THE LIVE END.

(3) A short "breaking-in" should be accomplished with a new wire rope assembly after installation. Operate the winch with a light load a few times to make sure that rope is flexing easily around the pulleys and winding correctly on hoist winch. Gradually increase load until the rope is operating at average loading (not to exceed 250 pounds).

NOTE: "Breaking-in" usually results in better rope reeling, more efficient rope performance and longer rope life.

d. After a guillotine explosive unit has been detonated, replace it in the following manner:

- (1) Unsolder the two explosive unit leads attached to the capacitor mounted on guillotine bracket base.
- (2) Remove the screws, washers and nuts securing guillotine base to its brackets.
- (3) Cut lockwire securing the guillotine attachment screw heads together; remove screws and guillotine.
- (4) Loosen and remove the hexagonal-headed charge holder from guillotine.
- (5) Separate the anvil from the guillotine and remove the cutter (see figure 96-301-3). Check condition of cutter and anvil for further serviceability. Replace damaged parts.

NOTE: The anvil will normally require replacement. Anvil life should not exceed two firings.

(6) Using a drift punch, tap the remains of the explosive unit from charge holder and remaining portion of the cutter support pin from guillotine.

(7) Thoroughly clean guillotine bore and charge holder bore. Use the same procedure as when cleaning a gun after firing, removing all traces of burned powder.

(8) Install a replacement explosive unit in charge holder and twist bare wire ends together as a safety precaution. Use care in handling the explosive and observe the safety precautions outlined in this paragraph.

WARNING: OBSERVE ALL THE SPECIFIED SAFETY PROCEDURES. YOU ARE HANDLING HIGH EXPLOSIVES.

(9) Reinstall and locate the cutter in the guillotine to align the support pin holes. Install a new pin.

(10) Reinstall charge holder and reassemble guillotine, anvil and base in the reverse order of removal. Lockwire screw heads in pairs with lockwire.

(11) Reinstall guillotine and base assembly on guillotine brackets. Insert washers (a maximum of one AN960PD10L and two AN960PD10 washers) at the four locations between base and brackets so that wire rope is correctly centered in passage through guillotine when rope is loaded. (See figure 96-301-3.)

(12) Check the firing circuit in accordance with instructions in paragraph 96-301-60.

(13) Untwist the explosive unit wire ends and solder in place, one wire to each of the capacitor lugs.

96-301-41. MAINTENANCE OF HYDRAULIC OIL STRAINER AND OIL FILTER. Check, clean and replace the hydraulic oil strainer and micronic filter at the time intervals specified in figure 10-20A, Lubrication Chart.

a. Clean the oil strainer as follows:

(1) Drain the hydraulic oil tank. (Refer to paragraph 96-301-10, subparagraph 2, step (1).)

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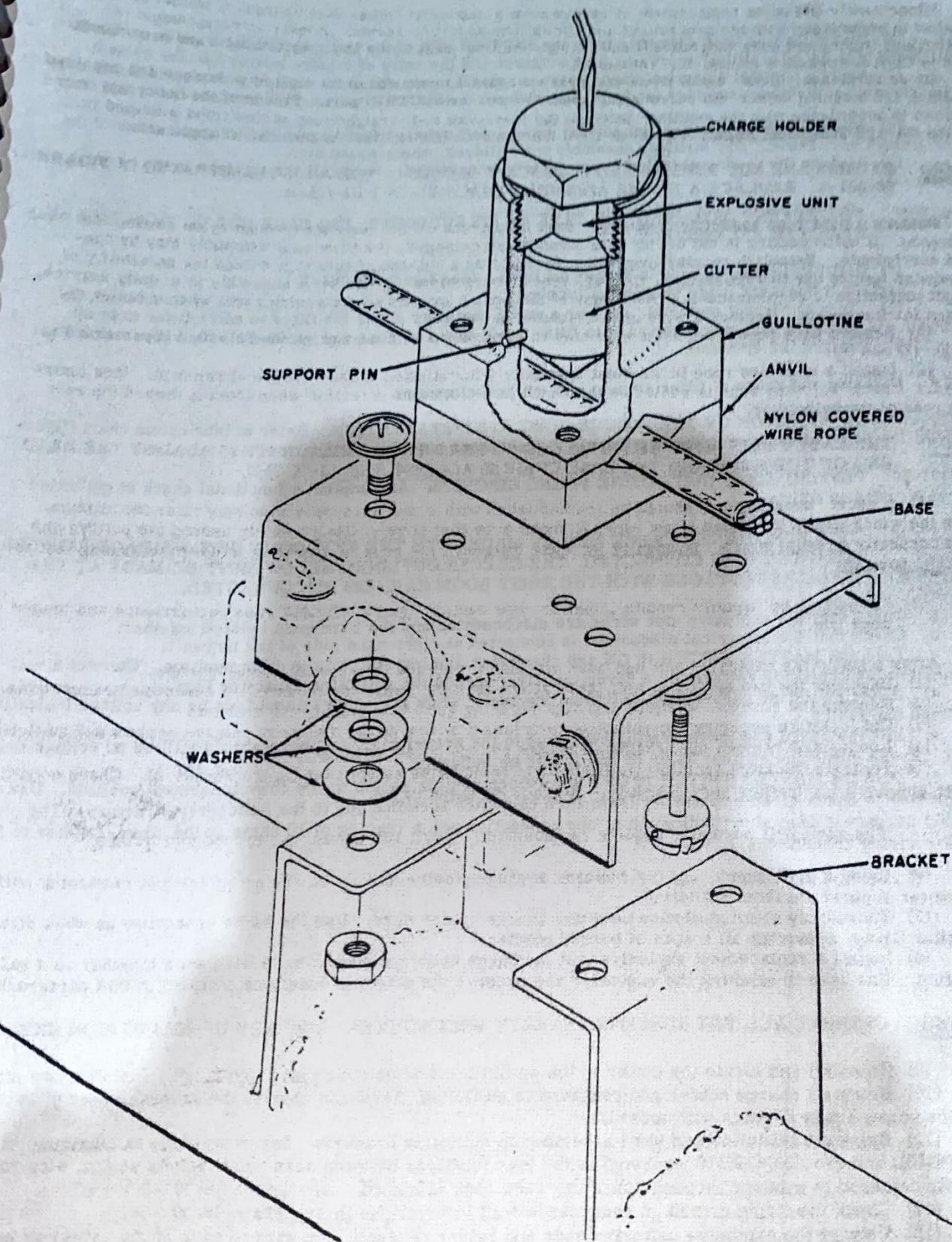


Figure 96-301-3. Guillotine

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- (2) Disconnect the hose assembly from the SUCTION port of the tank; secure the hose in an elevated position and plug the hose fitting to prevent fluid drainage and the entry of foreign matter into the system.
- (3) Apply a nominal amount of hand pressure against lower end of the tank to provide additional support during removal of strainer assembly (reducer fitting) from the SUCTION port. Place suitable covering over port.
- (4) Wash screen in dry cleaning solvent using a soft bristle brush to open any clogged areas of the monel screen wire mesh. Dry strainer assembly with filtered, compressed air.
- (5) Replace the O-ring gasket if cut or otherwise damaged. Reinstall the strainer in the reverse order of removal.

CAUTION: TO PREVENT DAMAGING THE TANK OR ITS SUPPORTS, USE CARE NOT TO TIGHTEN THE STRAINER EXCESSIVELY.

(6) Refill hydraulic oil tank to proper oil level. (See figure 96-301-1.)

b. Replace a micronic filter element as follows:

(1) Place absorbent material, rags or a small container under the filter to catch filter case oil drainage: cut lockwire securing filter case to filter head, unscrew case and remove element (Purolator Part No. 31888). Discard the element.

NOTE: Cleaning and reuse of filter elements is not recommended.

96-301-42. LUBRICATION OF THE RESCUE HOIST KIT INSTALLATION. Refer to lubrication chart (figure 10-20A) for lubrication instructions applicable to the rescue hoist kit installation.

96-301-60. TESTING HOIST GUILLOTINE FIRING CIRCUITS. Accomplish a functional check of guillotine firing circuits as follows:

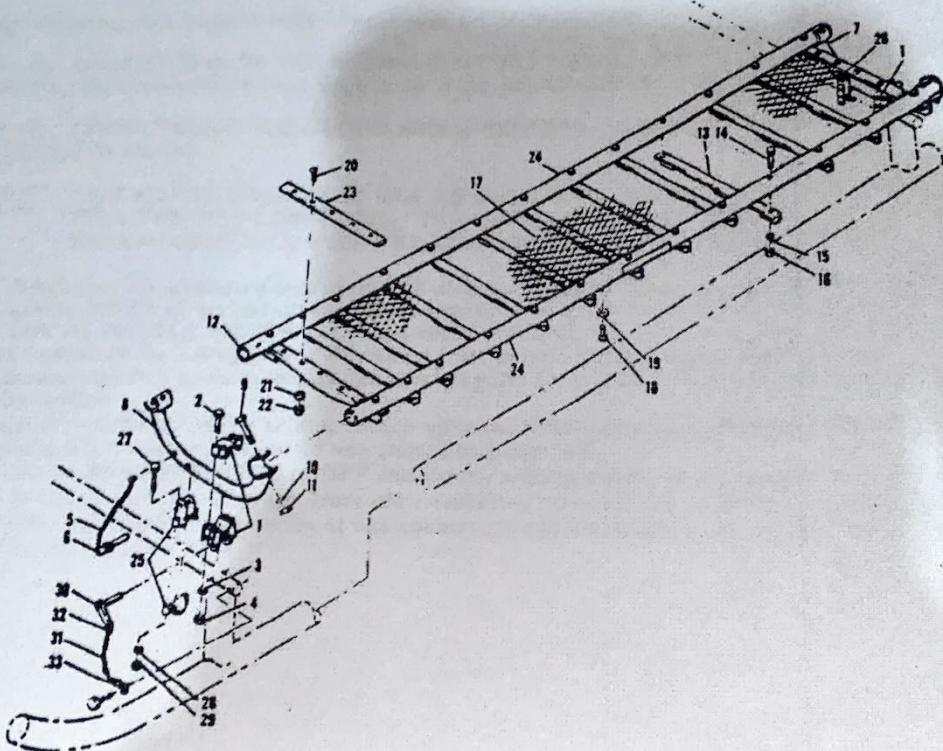
CAUTION: THIS FUNCTIONAL CHECK MAY BE MADE WITH THE EXPLOSIVE UNIT WIRES CONNECTED. WITH THE UNIT CONNECTED. THE CHECKS OUTLINED BELOW MUST BE MADE AT THE FIRE-WALL RECEPTACLE WITH THE HOIST BOOM HARNESS DISCONNECTED.

- a. Check that the explosive unit wires are disconnected and the bare ends twisted together.
- b. Check that the electrical disconnect is connected at right-hand side of the firewall.
- c. Turn the MASTER SWITCH to ON and check that arming switch is in down position. Connect a voltmeter (switched for voltage) or a 28vdc test light across the guillotine capacitor lugs.
- d. Press guillotine push-button switch on the cyclic stick grip; there should not be any voltage indication. Release the switch.
- e. Lift the guard and move arming switch up to the armed position; there should still be no voltage indication. Press guillotine switch: 24 to 28 vdc should be indicated.
- f. Turn the MASTER SWITCH to OFF and return arming switch to the down (unarmed) position. Use an ohmmeter to check circuit continuity from each capacitor terminal lug to the helicopter structure. The check should produce a dead short indication at one connection and a reading of 10 ohms at the other. (Refer to Section 83 for wiring connections.)

CARGO RACKS

98-101-1. CARGO RACK INSTALLATION. (See figures 10-6 and 98-101-1.)

98-101-2. DESCRIPTION. (Refer to the Flight Manual for cargo rack installation operating limitations.) The cargo rack installation consists of a rack assembly mounted on bowed, tubular steel supports at the front and rear ends of the rack, and two spring tube clamps (inboard) with securing quick-release pins. The rack assembly is comprised of: a bed assembly constructed of two longitudinal aluminum tubes; a stainless steel mesh (expanded sheet) deck with thirteen extruded aluminum, hook-ended stiffeners; two support clamps (outboard) with securing quick-release pins and the two bowed supports previously mentioned. The same cargo rack assembly may be used at either side of the helicopter by installing the rack assembly so that the loading instruction warning plate on the bed assembly is facing outboard. Slotted bolt holes are provided at the front support C-shaped end tubes (rack in the left-hand installation) to allow forward and rearward adjustment of the rack as necessary to accommodate span variations between the landing gear spring tubes. With the cargo racks installed, the skid wheels may be raised or extended by using the skid wheel extension and retraction bar, Special Tool No. 92087-11 and -13. (See figure 10-9.)



- | | | | |
|----------------------|---------------------|----------------------|-----------------------|
| 1. Clamp | 10. Washer | 18. Screw | 26. Clamp |
| 2. Bolt | 11. Nut | 19. Washer | 27. Bolt |
| 3. Washer | 12. Cargo Rack | 20. Screw | 28. Washer |
| 4. Nut | 13. Stiffener | 21. Washer | 29. Nut |
| 5. Safety Chain | 14. Bolt | 22. Nut | 30. Quick-Release Pin |
| 6. Quick-Release Pin | 15. Washer | 23. Cargo Rack Strip | 31. Safety Chain |
| 7. Support | 16. Nut | 24. Tube | 32. Split Key Ring |
| 8. Support | 17. Cargo Rack Deck | 25. Clamp | 33. Terminal |
| 9. Bolt | | | |

Figure 98-101-1. Cargo Rack Installation

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NOTE: Attachment of a cargo rack assembly to either the float landing gear or the skid landing gear is accomplished easily in exactly the same manner as for a litter assembly. (Refer to Section 96, paragraph 96-201-1.)

98-101-10. REMOVAL AND INSTALLATION OF CARGO RACKS. (Refer to Section 96, paragraph 96-201-1.)

98-101-40. MINOR REPAIR AND PARTS REPLACEMENT OF A CARGO RACK ASSEMBLY. (Refer to Section 96, paragraph 96-201-40.)

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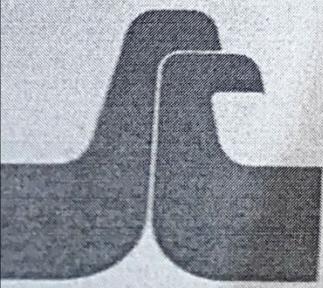
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Service Manual

for
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SERVICE MANUAL
Soley/Hiller UH-12D/E Turbine Helicopters

Supplement to

SERVICE MANUAL MODEL UH-12E SERIES HELICOPTERS

-INTRODUCTION-

This publication (latest revision) provides complete service/maintenance instructions for the Soley/Hiller UH-12D/E Turbine helicopter when used with the Service Manual for Hiller Model UH-12E Series Helicopters.

For easy reference, the basic format of the Hiller Manual has been maintained for this UH-12D/E Turbine manual. Each group, section and paragraph of the Hiller manual has been referenced in this publication.

Those portions of the Hiller manual which pertain to the UH-12D/E Turbine helicopter have been retained and/or enlarged upon.

EXAMPLE:

31-110-1 through 31-110-12. Remains the same.

(The original material of these paragraphs is contained in the Hiller manual which should be consulted.)

Those portions of the Hiller manual which have been made superfluous by Soley Conversions' turbine conversion of the Hiller models are referenced as deletions in this manual.

EXAMPLE:

73-56-1 through 73-101-40. Delete.

(The material in these paragraphs is not needed for maintaining a UH-12D/E Turbine helicopter.)

Those areas for which entirely new instructions are needed to explain the maintenance of the Soley/Hiller UH-12D/E helicopters have been added within the existing group numbering structure of the Hiller manual and are designated by the addition of '560' to the paragraph number.

EXAMPLE:

23-560-1.

└───────── Individual Paragraph Number
 └──────── Designates Added Sections for UH-12D/E Turbines
 └──────── New Section Number

GENERAL SERVICING INFORMATION

10-1-1 through 10-1-3. Remains the same for UH12-J series.

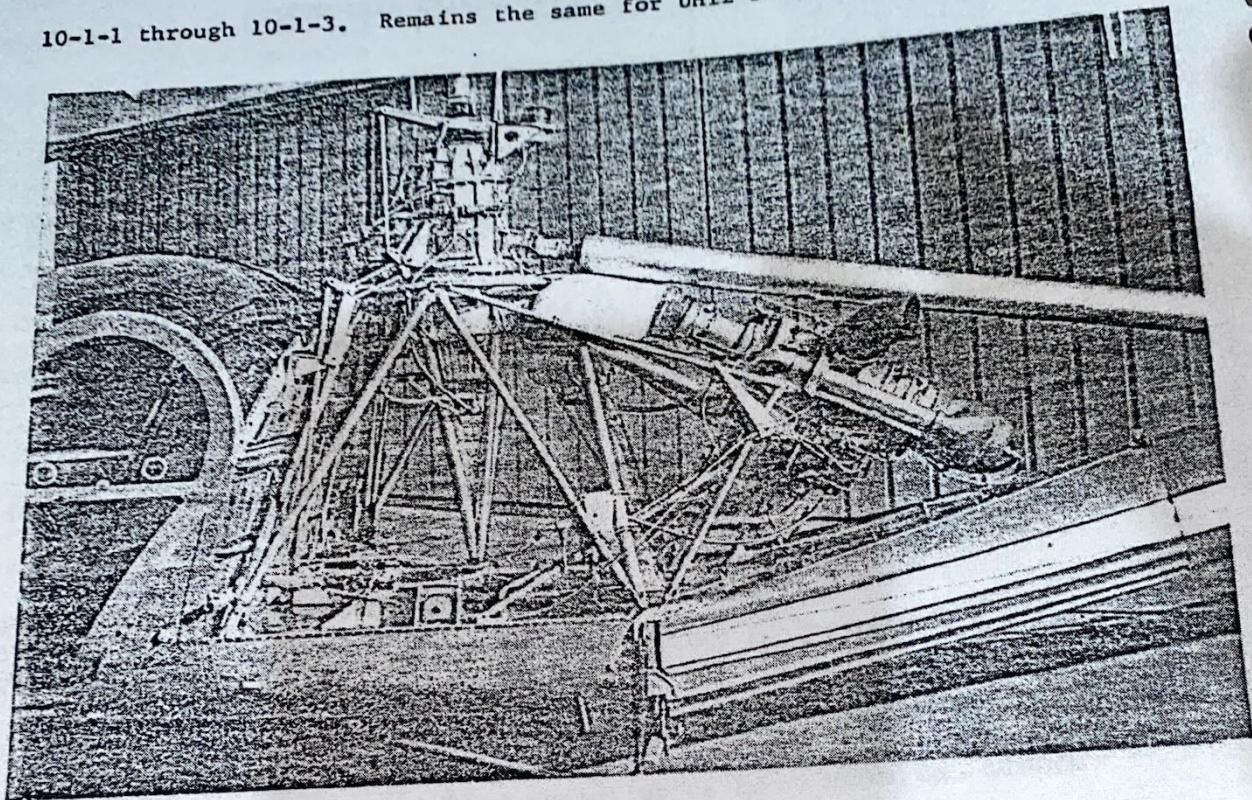


Figure 10-1 (560). UH12-J3 Helicopter, standard configuration.

10-1-4. The main rotor assembly is located above the power plant. It is driven by a two-stage planetary transmission, through a lower gearcase assembly, which is powered by an Allison turbine engine. The tail rotor is driven by the same transmission through a mechanical drive system mounted externally on the tail boom section. The main rotor rotates in a horizontal plane.

10-1-5. Remains the same for UH12-J series.

10-1-6. The engine controls include a twist-action throttle control integral with the grip of the collective stick. A synchronized governor control is incorporated in the collective pitch control system. Additional engine controls, including an engine control quadrant, are located on the instrument tunnel in the center of the cabin.

10-1-7. Remains the same for UH12-J series.

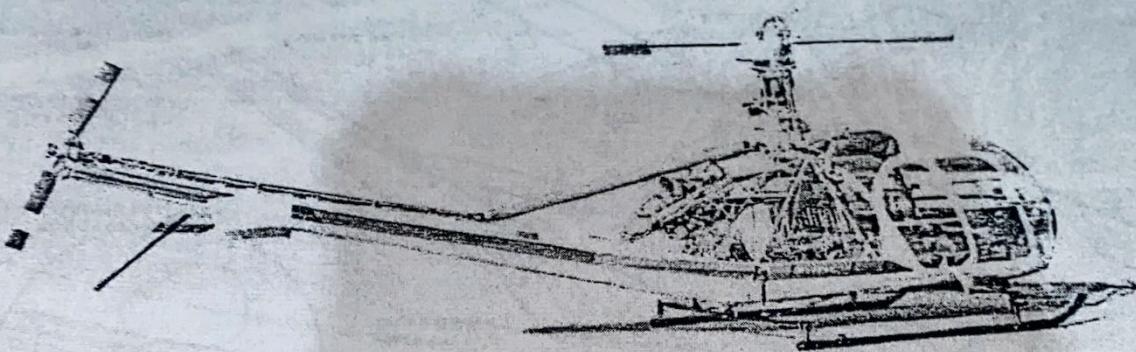
10-2-1 through 10-12-1. Remains the same for UH12-J series.

UH-12J SERIES SERVICE MANUAL

Group 10
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Figure 10-2 (560). UH12-J5 Helicopter, standard configuration.



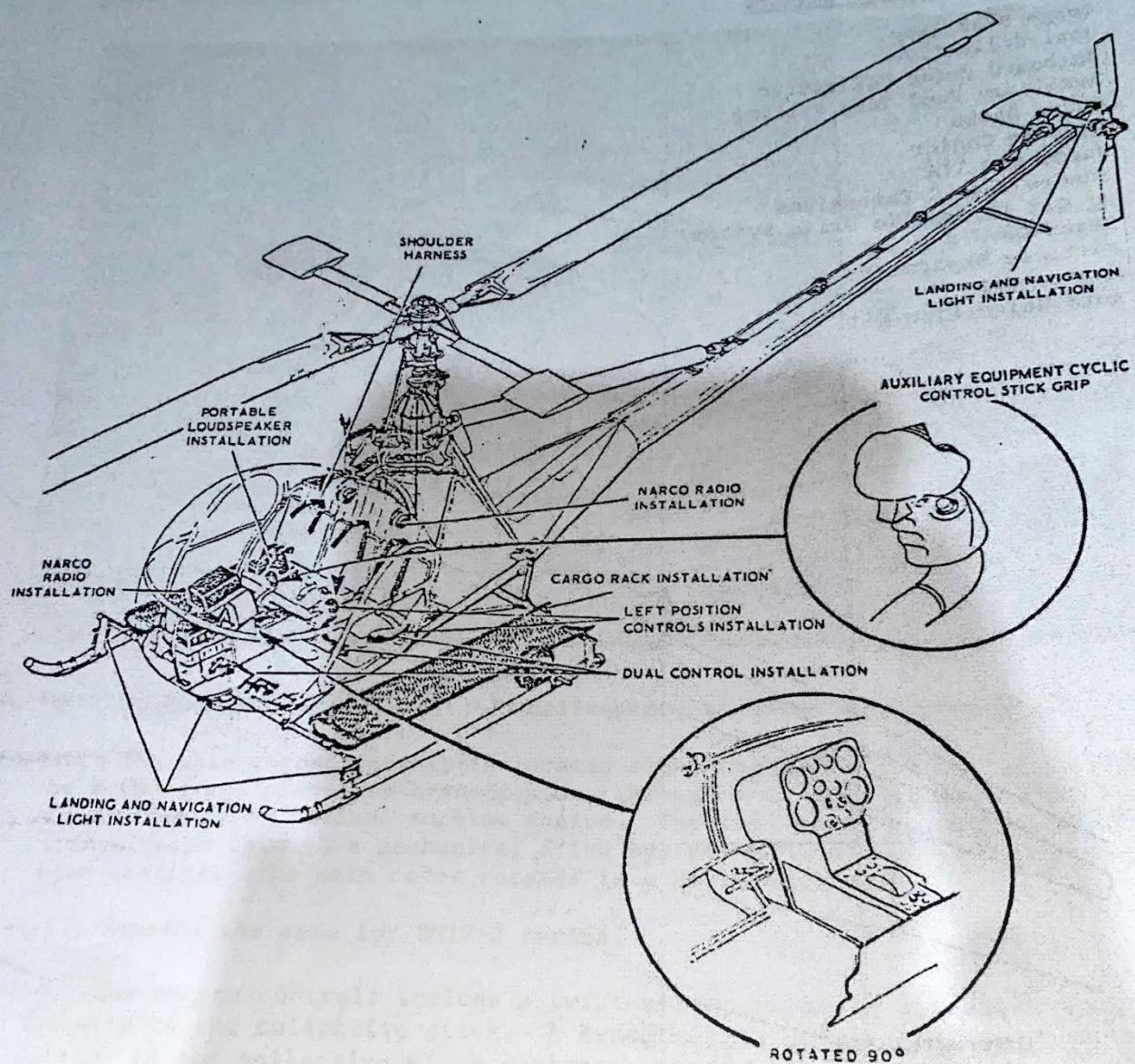


Figure 10-6. (560). Accessory Equipment (Sheet 1 of 2)

Soley Turbine Conversion Accessories

Itemized Listing

Cargo Hook Assy.
Dual Collective
Outboard Prime Collective
Auxiliary Fuel Tank Fitting
Cargo Racks
Ejector Cooler
Narco Com IIA
Tundra Pads & Extensions
Ag Kit (Hydraulic Drive System)
Stack Covers
Particle Separator
Heater Kit
Auto Reignition Kit

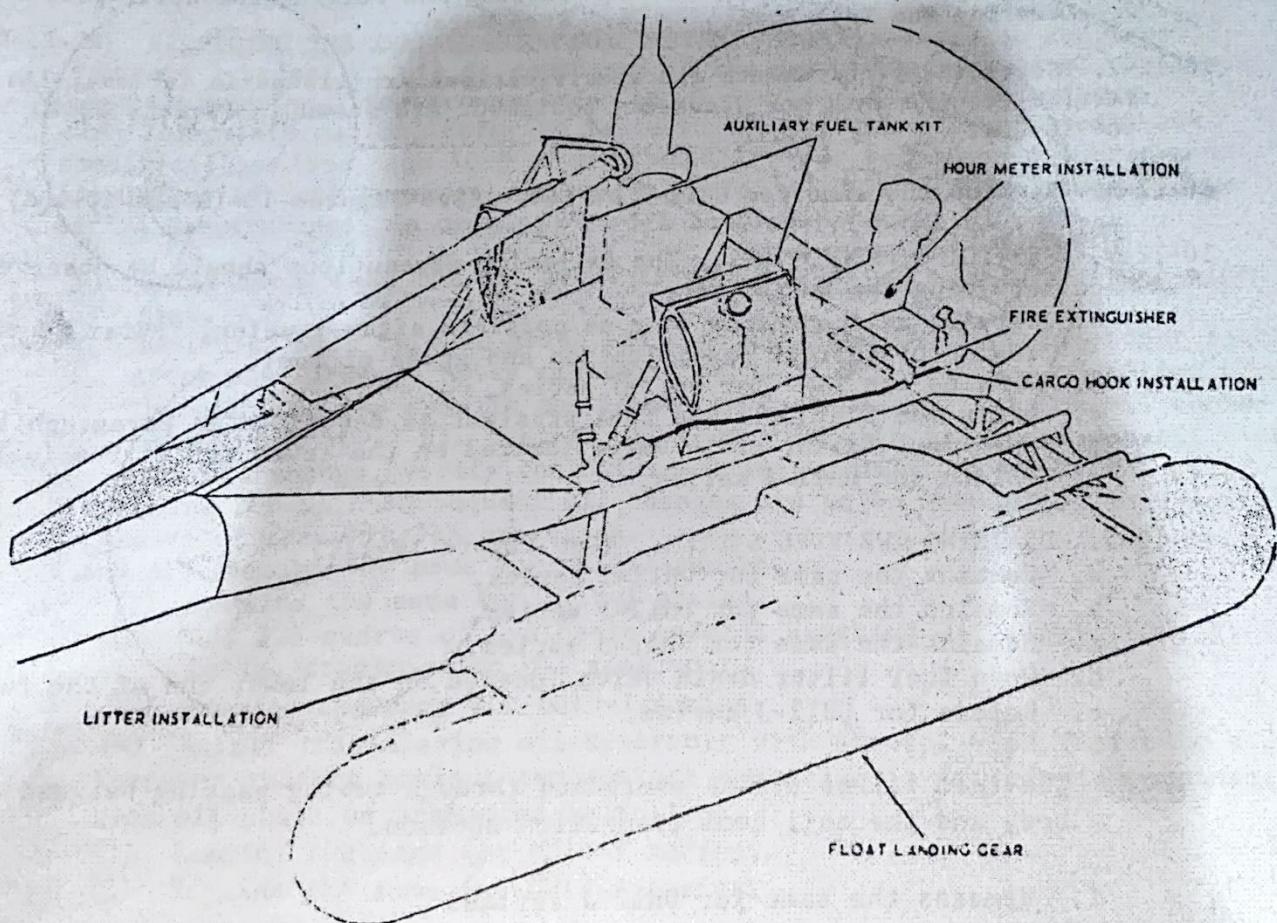


Figure 10-6 (560). Accessory Equipment (Sheet 2 of 2)

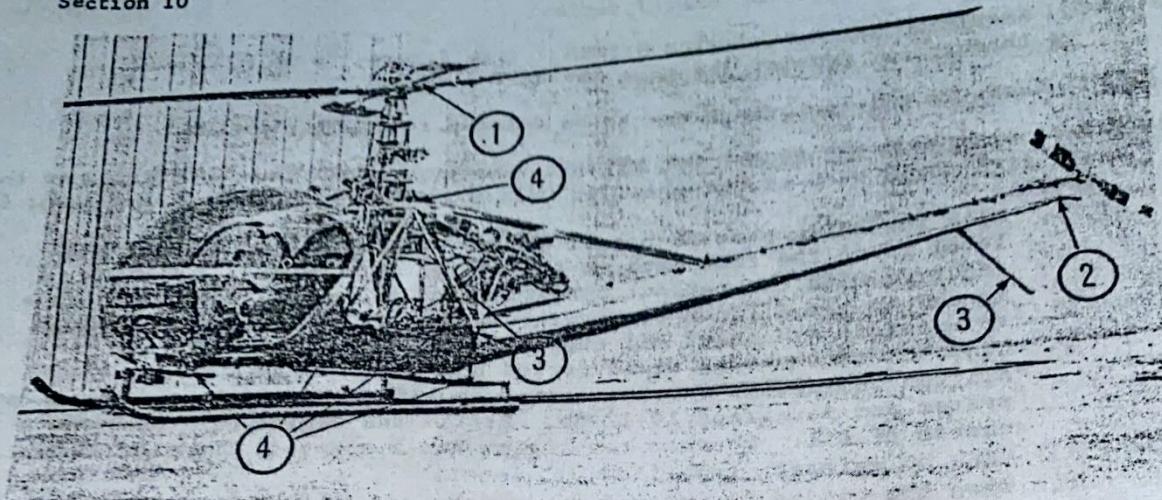


Figure 10-10 (560). Handholds and Steps.

- | | |
|---------------------------|---------------------------------------|
| 1. Rotating the Rotors | 3. Pushing and Pulling the Helicopter |
| 2. Lowering the Tail Boom | 4. Step Here |

10-12-2. Servicing requirements and specifications are listed in table 10-1A. Service requirements for accessory equipment are shown in figures 10-20 and 10-20A.

10-12-3. Remains the same for UH12-J series. (See Figures 10-16 and 10-16A)

10-12-4. SERVICING PRECAUTIONS. The following precautions should be observed when servicing the helicopter.

- Service helicopter as soon as possible after landing. Refer to table 10-1A for correct specification and grade of fuel.
- Remains the same for UH12-J series.
- Drain the fuel cell and fuel strainer as described in paragraph 10-12-5.
- Open fuel filter drain valve located on the lower end of the fuel filter.
- Delete for UH12-J series.

10-12-5. DRAINING THE FUEL SYSTEM. (See figure 10-17.)

- Remains the same for UH12-J series.
- Remains the same for UH12-J series.
- Remains the same for UH12-J series.
- Open fuel filter drain valve located on the lower end of the fuel filter.
- Delete for UH12-J series.

NOTE: The fuel filter drains overboard through tubing passing between the basic body and the tail boom transition section.

- Remains the same for UH12-J series.

10-12-6. Remains the same for UH12-J series.

10-12-7. SERVICING THE LUBRICATION SYSTEM. (See figures 10-16 & 10-16A)
a through d. Remains the same for UH12-J series.

NOTE: Notes in this paragraph are to be deleted for UH12-J series.

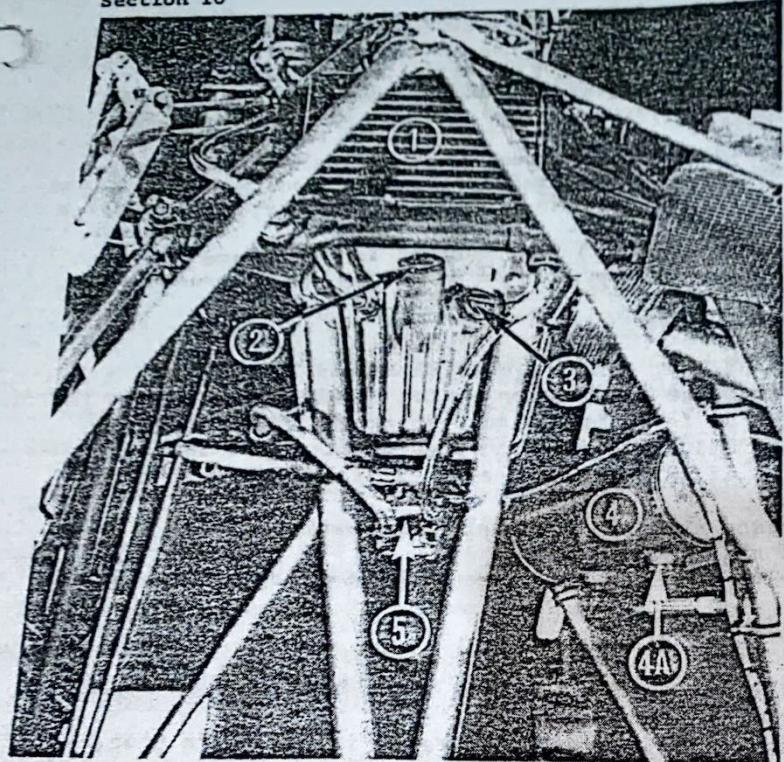
10-12-7A. SERVICING THE ENGINE OIL SYSTEM. The engine oil tank is located on the aft right hand side of the existing UH12 engine mount. (See figure 10-16 & 10-16A)

- a. With the helicopter in normal ground attitude, check that the oil level is at the full mark on the visual sight gage. Replenish as required with the correct specification and grade lubricant recommended in the Allison Commercial Service Letter 250-C20, CSL-1002 to maintain a 4 quart oil supply in the tank.
- b. When the recommended drain period has been reached, refer to the Allison Commercial Service Letter 250-CSL-1002, drain the engine oil system per paragraph 10-12-8b. Refill the engine oil tank with 4 quarts of oil. Operate the engine for 5 minutes, then refill the oil tank to maintain specified oil level.
- c. When the engine is motored during the engine compressor cleaning, per the Allison 250-C20 Operation and Maintenance Manual, the oil level in the engine oil tank will indicate low. Do not add oil at this time as the oil does not return to the oil tank until the engine is run.

10-12-7B. SERVICING THE TRANSMISSION OIL SYSTEM. The transmission and lower gearcase lubrication oil is contained in the reservoir portion of the lower gearcase housing. For transmission and lower gearcase lubricant replenishing information, refer to Table 10-IA, Servicing Requirements and Specifications (see page 10-9 of this manual). For recommended lubrication at various ambient temperatures, refer to Table 10-1A, Transmission Lubrication Requirements, in original UH-12E Service Manual.

- a. Daily check that the oil level is at the full mark on the visual sight gage.
- b. Replenish with correct grade and specification to maintain proper level.
- c. After the first 25 hours transmission and lower gearcase operation, drain the oil from the sump in the lower gearcase housing and the oil cooler (paragraph 10-12-8). Refill oil reservoir with 5.0 quarts of oil. After each oil change, verify the oil level in the oil tank after the first engine run-up. Subsequent oil changes are to be accomplished every 200 hours of transmission operation.
- d and e. Remains the same for UH12-J series.
 - (1) Remains the same for UH12-J series.
 - (2) Add 3.5 quarts of Synthetic Anderol Flushing Oil (Table 10-VII) to the transmission oil reservoir.
 - (3) Remains the same for UH12-J series.
 - (4) Refill transmission oil reservoir with Anderol 456H (Refer to step c.)
- f. Whenever subzero ambient temperature operation is anticipated, transmission oil shall be preheated as follows.
 - (1) Remains the same for UH12-J series.
 - (2) Remains the same for UH12-J series.

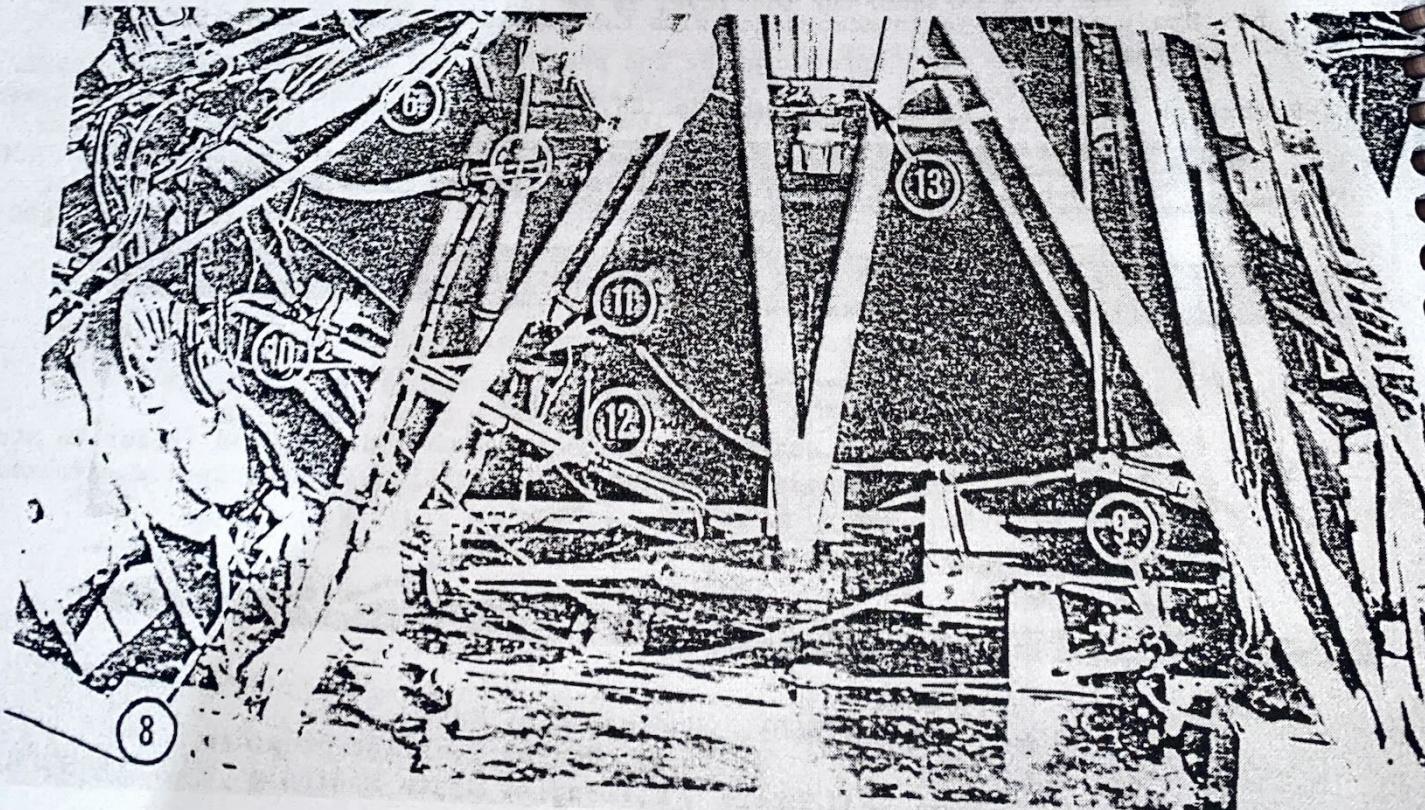
Figure 10-16 (560). Servicing The Fuel And Oil Systems, Left View.



For Figures 10-16 and 16A (560)

- 1-Transmission Oil Cooler
- 2-Transmission Oil Filler Cap
- 3-Transmission Oil Level Sight Gauge
- 4-Engine Oil Tank
- 4A-Engine Oil Tank Drain Plug
- 5-Transmission Oil Tank
- 6-Engine Oil Tank Filler Cap
- 7-Engine Oil Level Sight Gauge
- 8-Engine Overboard Vent Tube
- 9-Fuel Pump, Electric
- 10-Engine Torque Pressure Accumulator
- 11-Fuel Filter
- 12-Fuel Filter Drain Valve
- 13-Transmission Oil Drain and Chip Detector

Figure 10-16A (560). Servicing the Fuel and Oil Systems, Right View.



- 10-12-7C. STORAGE PRESERVATION REQUIREMENTS FOR LUBRICATION SYSTEM. Whenever an engine, transmission and lower gearcase, in operating condition, are to be placed in storage, accomplish the following preservation procedures.
- a. Drain the transmission and lower gearcase oil system (paragraph 10-12-8) and fill the reservoir with preservation lubricating oil. (Table 10-VI, Item 2)
 - b. Upon completion of preservation ground run, accomplish the following.
 - (1) Drain preservation oil from the transmission and lower gearcase lubrication system and refill with operating lubricant. (Table 10-1A)
 - (2) The engine and compressor shall be preserved in accordance with the procedures outlined in the Allison Operation and Maintenance Manual.
 - c. Delete for UH12-J series.

10-12-8. DRAINING THE LUBRICATION SYSTEM. (See figures 10-16 and 10-16A)
The transmission and lower gearcase lubrication system should be drained at normal operating temperature, it is advisable to operate the engine until operating temperature is indicated on the engine gage unit. There is no requirement to run the engine if only the engine lubrication system is to be drained.

- a. Draining the transmission and lower gearcase lubricating system:
 - (1) Use a funnel and suitable container.
 - (2) Remove lockwire and chip detector from the lower gearcase housing.

NOTE: If oil cooler is installed, complete number 3.

- (3) Disconnect the transmission oil cooler inlet hose line at the oil pump and drain into a container.
 - (4) Inspect and clean oil chip detector located in the drain plug.
 - (5) Install drain plug and safety.
 - (6) Reconnect oil cooler line.
 - (7) Service lubrication system per paragraph 10-12-7B.
- b. Drain the engine in accordance with the Allison Operation and Maintenance Manual.

10-12-9 through 10-15-1. Remains the same for UH12-J series.

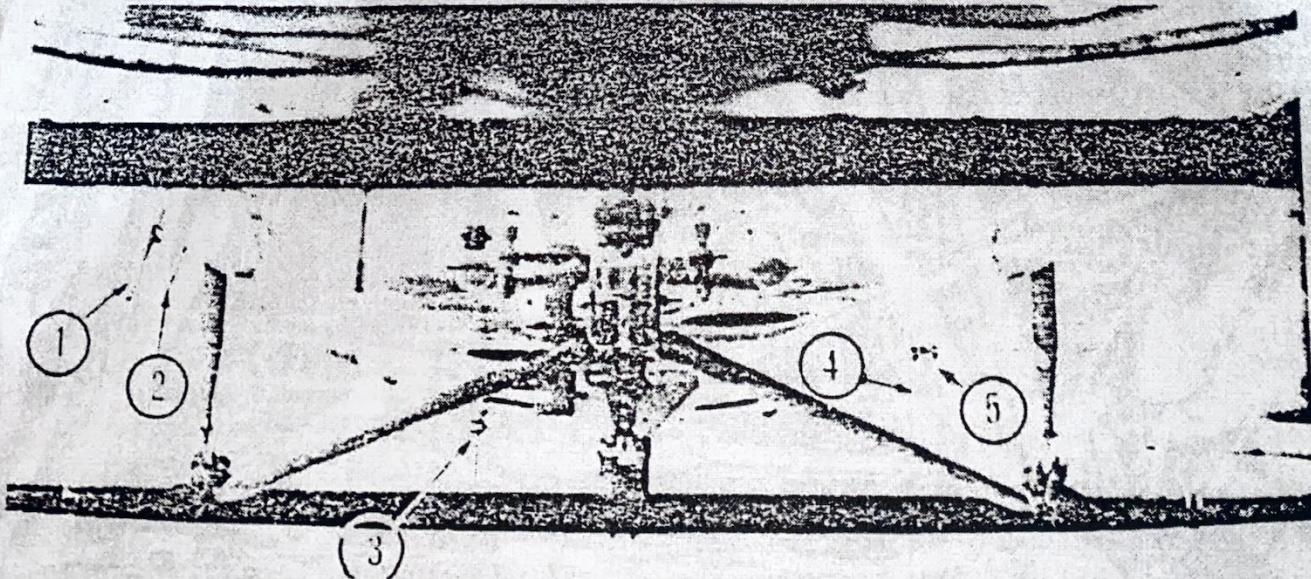


Figure 10-17 (560). Underside of Ship

1. Fuel Tank Vent
2. Aux. Fuel Pump Seal Drain
3. Engine Gearcase Breather
4. Engine Drain Manifold
5. Fuel Filter Drain

10-15-1A. Lubrication requirements are listed in Tables 10-1A and illustrated in figures 10-19 through 10-20A. Commercial equivalents for specified lubricants identified in the figures are listed in Table 10-VII.

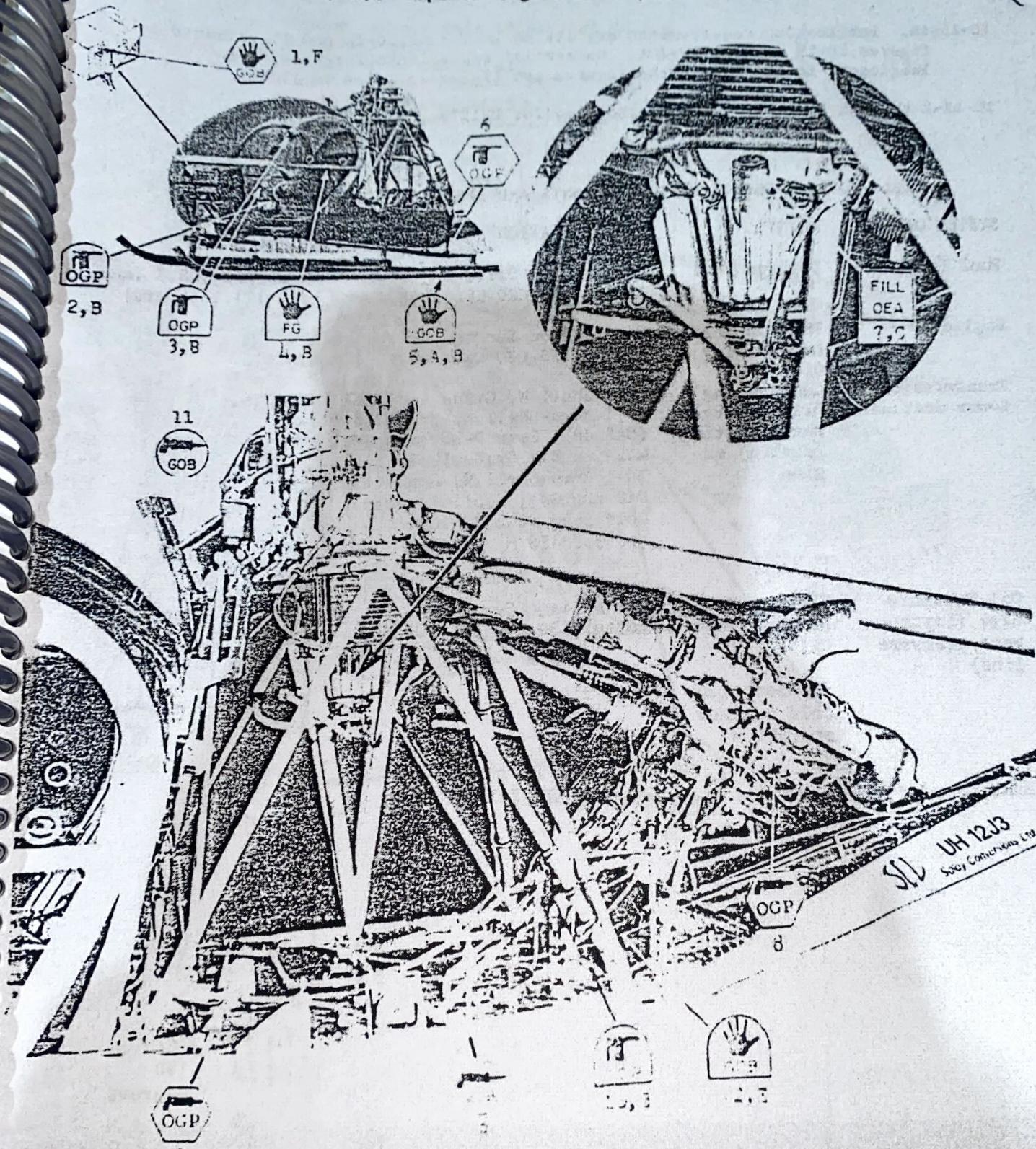
10-15-2 through 10-21-2. Remains the same for UH12-J series.

TABLE 10-IA. SERVICING REQUIREMENTS AND SPECIFICATIONS

SYSTEM OR ITEM	AGENT	SPECIFICATION	CAPACITY
Fuel Tank(s)	Turbine Fuel	Per Allison Service Letter 250-C20 CSL 1003	46 US gal (38.3 Imp. gal, 174.1 liters)
Engine	Turbine Engine Lubricating Oil	Per Allison Service Letter 250-C20 CSL 1002	5.0 QTS.
Transmission & Lower Gearcase	Lubricating Oil, Aircraft reciprocating (piston) engine	Aero-Shell W, Grade 100 (SAE 50); Aero-Shell W, Grade 80 (SAE 40); Esso E-80 (SAE 40); MIL-L-6082, Grade 1065 (SAE 30); Aero-Shell W, Grade 65 SAE 20W/30; Mobiloil Aero Gold Band (SAE 20-20W); Anderol 456 H	6.0 QTS.
Oil Pressure Gage (instrument pressure line)	Turbine Engine Lubricating Oil	Per Allison Service Letter 250-C20 CSL 1002	1/2 pint (approximately)
	Kerosene (for cold weather operation)	VV-K-211	1/2 pint (approximately)

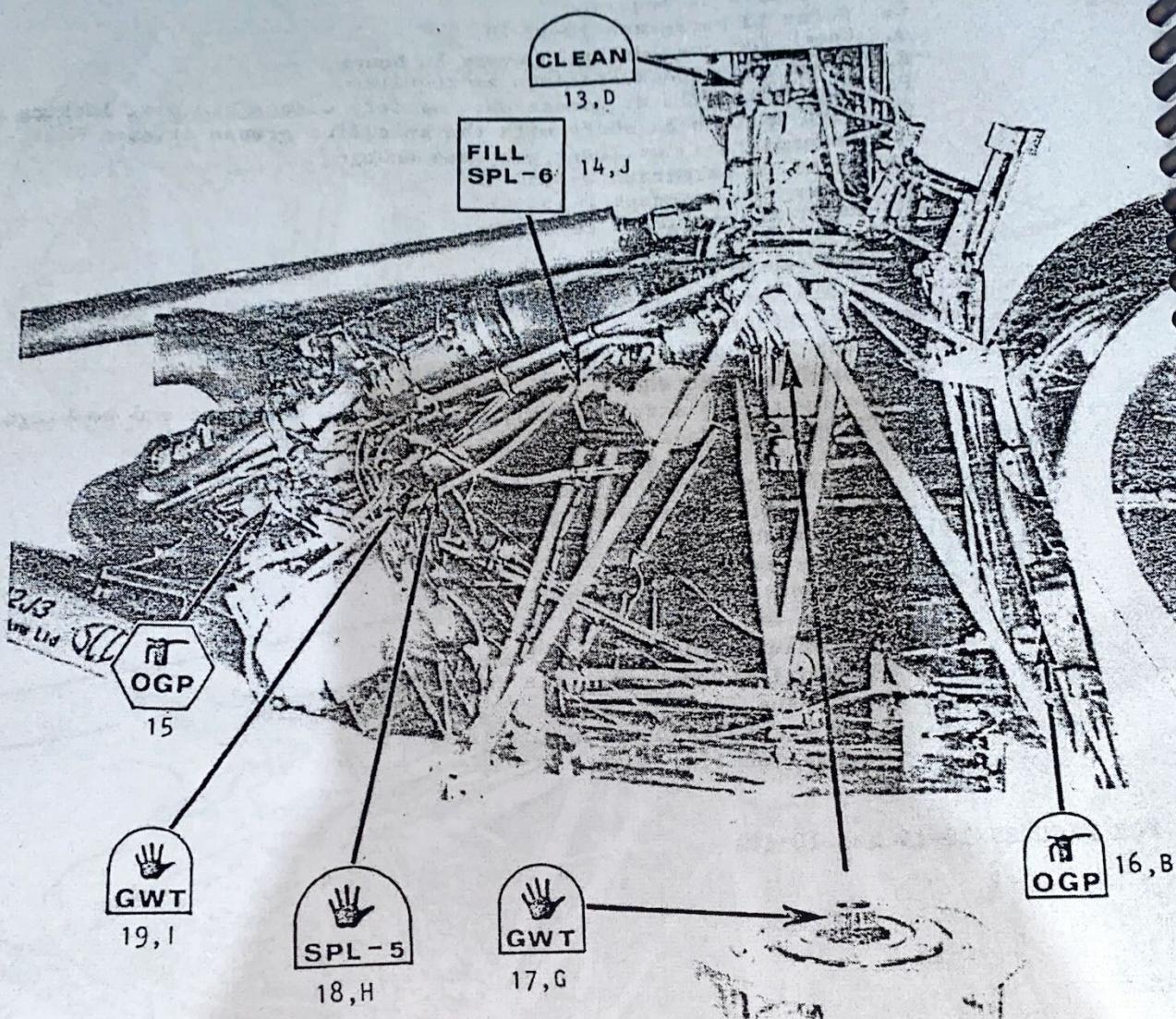
Remainder of table remains the same for UH12-J Series.

Figure 10-19 (560). Replaces Figure 10-19 (Sheet 3 of 6)



Group 10
Section 10

Figure 10-19A (560). Lubrication Chart (Replaces Figure 10-19, Sheet 6 of 6)

Rotated
180
Degrees

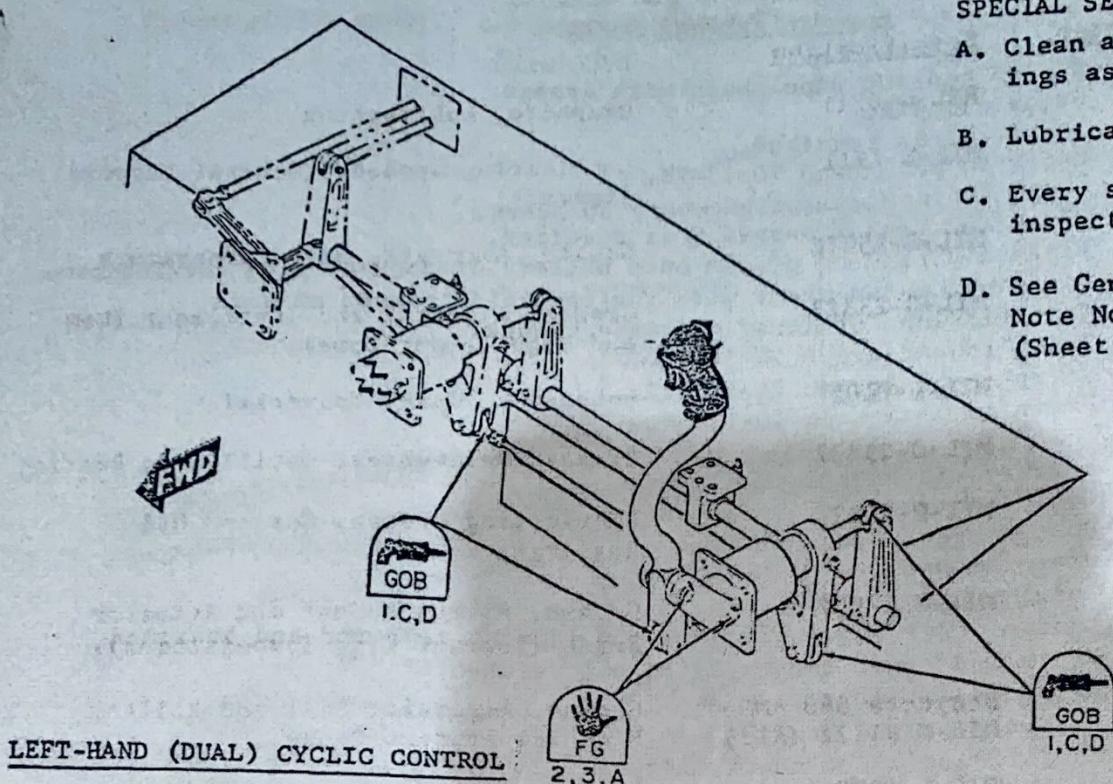
SPECIAL SERVICE NOTES

- A. Remove pin and wipe shank with grease.
Reinstall pin.
 - B. Lubricate as required.
 - C. Refer to paragraph 10-12-7B.
 - D. Check for contamination every 50 hours.
 - E. Clean and repack bearings as required.
 - F. Wipe thin film of grease onto battery disconnect plug locking cam.
 - G. Coat splines on shaft with the specified grease at each transmission or lower gearcase change.
 - H. Refer to paragraph 24-560-6.
 - I. Refer to paragraph 24-560-12.
 - J. Refer to paragraph 10-12-7A.
-
1. Battery disconnect plug
 2. Cable control clevis fitting
 3. Door hinges
 4. Door latches
 5. Wheel support shank
 6. Landing gear strut fittings and landing gear rod end bearings
 7. Upper and lower transmission oil reservoir
 8. N₂ cable fittings
 9. Snubber rod end bearing
 10. Fuel filler access door hinge
 11. Gimble support bearing
 12. Pulley bearings
 13. Transmission vent filter.
 14. Engine oil tank
 15. N₁ cable fittings
 16. External power receptacle cover hinge
 17. Upper and lower transmission coupling spline
 18. Main transmission coupling assembly
 19. Engine coupling shaft

R FIGURES 10-19 and 10-19A

SPECIAL SERVICE NOTES:

- A. Clean and repack bearings as required.
- B. Lubricate as required.
- C. Every second 100-hour inspection.
- D. See General Service Note No. 3, figure 10-19 (Sheet 1 of 6)



OUTBOARD (DUAL) COLLECTIVE CONTROL

1. Rod End Bearings
2. Torque Tube Bearings
3. Cyclic Stick Yoke Bearings
4. Stub Shaft Bearing
(Left Position Controls Only)
5. Collective Stick Throttle Shaft Bearing
6. Collective Stick Throttle Shaft U-Joint
7. Collective Pitch Shaft Support Bearing

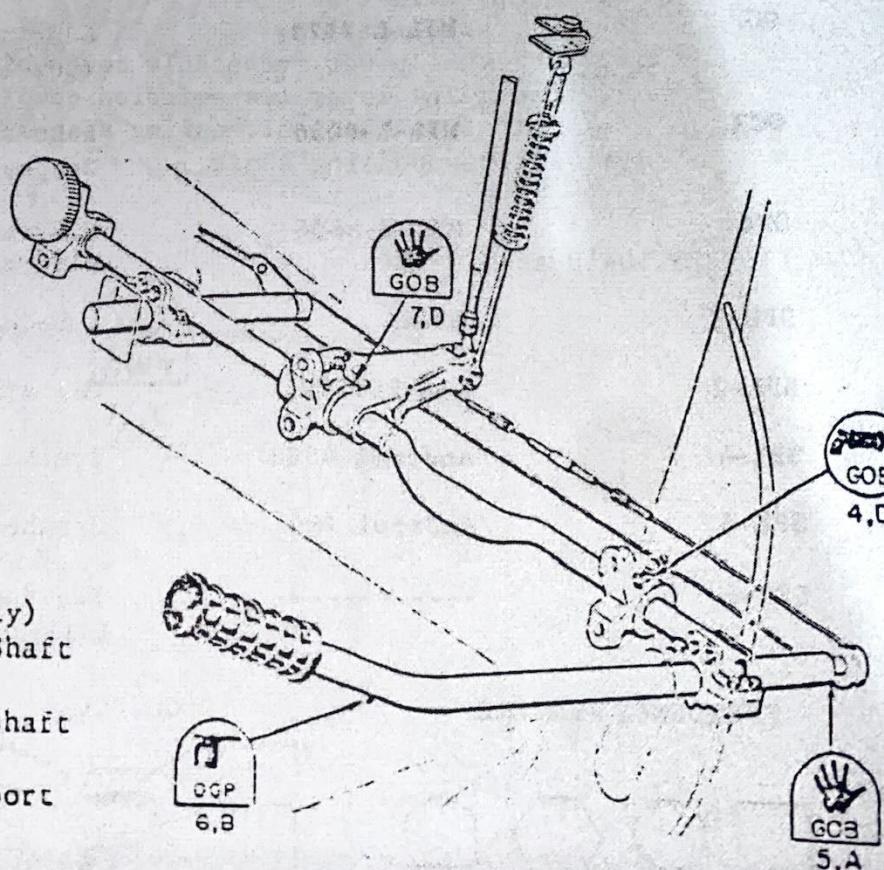
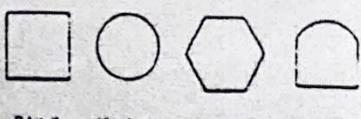


Figure 10-20A (560). Lubrication Chart, Optional Kit Equipment (sheet 1 of 3)

TABLE 10-II. LUBRICANTS AND SYMBOLS

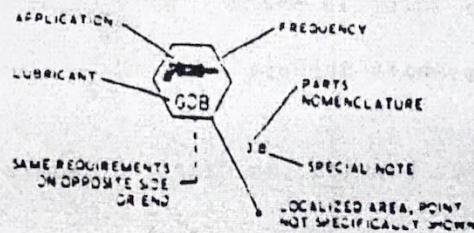
<u>Identification Letter</u>	<u>Specification</u>	<u>Lubricant</u>
FG	MIL-G-6711	Graphite, Lubricating
GB	MIL-L-7711	Lubricating Grease, (General Purpose Aircraft)
GH	MIL-G-3545C	Grease, Aircraft, High Temperature
GLT	MIL-G-23827	Grease, Aircraft and Instrument (Low and High Temperature)
GO	MIL-L-2105	Lubricant, Gear, Universal
GOB	MIL-G-25537	Grease, Helicopter, Oscillating Bearing
GRG	MIL-G-6032	Lubricating Grease, Gas and Oil Resistant
GSG	MIL-G-23827	Grease, Aircraft Gear and Actuator Screw (Low and High Temperatures)
GWT	Braycote 660 AMS-5 MIL-G-81322 (Alt)	Grease, Aircraft; Ball and Roller, Wide Temperature Range
OEA	MIL-L-6082 Aero Shell W, or ESSO E-80 (SAE 40)	Lubricating Oil, Aircraft Reciprocating (Piston) Engine (Grade as specified in Table 10-1A)
OGP	MIL-L-7870	Lubricating Oil, General Purpose (Low Temperature)
OGR	MIL-L-6086	Lubricating Oil, Gear, Petroleum Base; Grades L and M
OHA	MIL-H-5606	Hydraulic Fluid, Petroleum Base, Aircraft and Ordnance
SPL-1	630AA	Lubriplate
SPL-2	SAE-20/20W	Oil Aircraft Engine (Noncompounded)
SPL-4	Anderol 456H	Synthetic Multi-Purpose Oil
SPL-5	Anderol 786	Synthetic Gear Grease
SPL-6	-----	See Engine Manufacturers Recommendation (Allison Commercial Service Letter 1002)

FREQUENCY SYMBOLS



DAILY 25 HOURS 100 HOURS SPECIAL

EXAMPLE



10-14

APPLICATION SYMBOLS

	HAND
	ZERK OR ALEMITE
	OIL CAN

Group 20
Section 21

UH12-J SERIES SERVICE MANUAL

Group 20
Section 21

MAIN DRIVE CLUTCH

Delete for UH12-J series.

Group 20
Section 22

UH12-J SERIES SERVICE MANUAL

Group 20
Section 22

ROTOR BRAKE INSTALLATION

Delete for UH12-J series.

MECHANICAL TRANSMISSION

23-1-1. MECHANICAL TRANSMISSION AND ACCESSORY DRIVES.

23-1-2. DESCRIPTION. (See figure 23-1-1.) The mechanical transmission is mounted on the lower gearcase housing assembly. The two-stage planetary type transmission comprises the main rotor drive shaft; the upper, center, and lower housings, two planetary gear carriers, accessory drive assemblies and a one-way clutch unit. The accessory drive assemblies, mounted on the lower housing, include the single-stage tail rotor drive and the two-stage tachometer generator and the original cooling fan drive (figure 23-1-2). All accessory drive assemblies are directly geared to the first stage planetary gear train, rotating in direct proportion to the rotor drive shaft. Removal of these externally mounted drive assemblies does not require major disassembly of the transmission. Lubrication of the transmission is accomplished as described in Section 73. All parting surfaces are sealed against oil leakage by O-ring packings and conventional oil seals are used at input and output locations.

23-1-3. TROUBLESHOOTING THE MECHANICAL TRANSMISSION. Refer to table 23-1-1 for mechanical transmission troubleshooting information.

TABLE 23-1-1. TROUBLESHOOTING THE MECHANICAL TRANSMISSION

TROUBLE	PROBABLE CAUSE	REMEDY
Excessive oil leakage at input gearshaft, tail rotor drive and fan drive assemblies.	Faulty oil seal or O-ring packing.	Replace seal or O-ring packing.
Indication of abnormally high oil temperature or low oil pressure.	Lubrication system defect.	Refer to Section 73-560.

23-1-10. Remains the same for UH12-J series.

- a. Remains the same for UH12-J series.
- (1) through (7). Remains the same for UH12-J series.

CAUTION: Delete for UH12-J series.

(8). Delete for UH12-J series

NOTE: Delete for UH12-J series.

- b. Remains the same for UH12-J series.
- (1) Remains the same for UH12-J series
- (2) Remove hardware securing transmission mounting flange to lower gearcase housing assembly.
- (3) Remains the same for UH12-J series.

23-1-11. INSTALLATION OF THE MECHANICAL TRANSMISSION. For greater convenience, install the following items on the transmission prior to its installation on the helicopter: Collective yoke, collective control brackets and push rods (Section 31); Wobble plate (Section 34; Cyclic control rods and brackets (Section 33); Anticollision light and bracket (Section 83); Transmission oiling system lines and fittings (Section 73).

- a. Remains the same for UH12-J series.
- b. Delete for UH12-J series.
- c. Install O-ring packings on interconnect shaft and lubricate splines (Section 10).

CAUTION: SERIOUS DAMAGE CAN OCCUR TO THE INTERCONNECT SHAFT AND MATING PARTS IF FULL WEIGHT OF TRANSMISSION IS ALLOWED TO BEAR ON INTERCONNECT SHAFT.

- d. Apply a coat of Permatex No. 3 (Item 23, Table 10-VI) to the mounting flange of the lower gearcase housing assembly. Carefully lower transmission onto lower gearcase assembly, taking care to engage interconnect splines.
- e. (See figure 23-1-1) Install bolts, nuts and washers to secure transmission to lower gearcase assembly, setting bolts and washers in primer (Item 3, Table 10-VI). Tighten nuts to 100/140 pound/inch torque valve.

NOTE: Remains the same for UH12-J series.

- f. Remains the same for UH12-J series.
 - (1) through (5). Remains the same for UH12-J series.
 - (6) and (7). Delete for UH12-J series.
- g. Remains the same for UH12-J series.
 - (1) and (2). Remains the same for UH12-J series.
 - (3) Pre-oil the transmission and lower gearcase assembly as follows:
 - A. Disconnect pressure lines and hoses from the oil jets and orifices.
 - B. Using an oil can fill the oil lines, jets and orifices with proper lubricating oil (Section 10).
 - C. Connect pressure lines and hoses.
- h and i. Remains the same for UH12-J series.

23-1-20. Remains the same for UH12-J series.

CAUTION: Remains the same for UH12-J series.

23-1-30. Delete for UH12-J series.

NOTE: Delete for UH12-J series.

a through d. Delete for UH12-J series.

23-1-40. Remains the same for UH12-J series.

a through b. Remains the same for UH12-J series.

c. Remains the same for UH12-J series.

(1) Delete for UH12-J series.

(2) Remove the three bolts (Item 20) and washers (Item 21) and withdraw fan drive seal retainer (Item 23) and cover (Item 35) from fan drive shaft.

(3) through (5). Remains the same for UH12-J series.

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23-1-40. (Continued)

- (6) Place oil seal installation billet, (Table 92-1-1, Item 52 or equivalent) over fan drive shaft splines to protect seal lip from damage; install seal, retainer and cover.
 - (7) Remains the same for UH12-J series.
 - (8) Delete for UH12-J series
- d through f. Remains the same for UH12-J series.

23-1-41. Remains the same for UH12-J series.

23-1-42. REMOVAL AND REPLACEMENT OF INPUT GEAR SHAFT ASSEMBLY. (See figure 23-1-2) To avoid damage to the gears, it is necessary to remove all accessory drive assemblies prior to removing the input gear shaft assembly. Any of the accessory drives may be removed and reinstalled independently. a through c. Remains the same for UH12-J series.

23-1-43. CHECKING TRANSMISSION CONNECTING SHAFT FOR WEAR
a. The allowable minimum over pin dimension for the spline area is, 2.1532 inches over .1920 inch diameter pins.

23-101-1 through 23-101-40. Delete for UH12-J series.

LOWER GEARCASE ASSEMBLY

23-560-1. LOWER GEARCASE ASSEMBLY

23-560-2. DESCRIPTION.

The lower gearcase assembly is mounted below the mechanical transmission and is supported by bolts used to attach the lower gearcase assembly to outer gimbal assembly. A pylon assembly is bolted to the lower gearcase housing and the longitudinal and lateral snubber assemblies.

The lower gearcase assembly is a single stage, speed reduction unit. The gears are the spiral bevel type. The major sub-assemblies are: Input quill assembly; gear, bearing and housing assembly; and intermediate shaft assembly; mounted in the main housing. The intermediate shaft is also utilized to drive the oil pump drive shaft. The input quill assembly can be removed without major disassembly of the gearcase assembly. Lubrication of the lower gearcase assembly is accomplished as described in Section 73-560-1.

TABLE 23-560-1. TROUBLESHOOTING THE LOWER GEARCASE

TROUBLE	PROBABLE CAUSE	REMEDY
Oil leakage at transmission to gearcase flange.	Not sealed properly.	Reseal surface.
Excessive oil leaking at input coupling.	Faulty seal.	Replace seal.
Indication of abnormally high oil temperature or low oil pressure.	Lubrication system defect.	Refer to section 73-560.

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- 23-560-3. REMOVAL OF LOWER GEARCASE ASSEMBLY.** Remove the mechanical transmission in accordance with paragraph 23-1-10.
- Remove or disconnect the following parts or assemblies as applicable.
Refer to sections referenced for detailed instructions.
 - (1) Disconnect electrical connections to the lower gearcase chip detector and oil temperature switch.
 - (2) Remove the engine oil cooler blower drive belts if installed (Section 73-560).
 - (3) Remove the engine to lower gearcase assembly drive coupling (Section 24-560).
 - (4) Disconnect and cap oil system lines and fittings (Section 73-560).
 - (5) Disconnect the lateral and longitudinal snubber assemblies.

NOTE: The pylon assembly may be left on to aid in supporting and removal of the gearcase assembly.

- (6) Support the lower gearcase assembly and loosen the aft bolt securing the outer gimbal assembly and remove the nut and washer from the forward bolt.
- (7) Loosen the bolts securing the engine strut assemblies to the engine mount assembly.

NOTE: Do not remove the nuts or bolts, only loosen to rotate the forward engine strut assemblies.

- (8) Remove the forward bolt securing the outer gimbal to the engine mount and raise the left and right engine strut assembly. Reinstall the forward bolt through the engine mount and outer gimbal.

NOTE: Take care not to lose the shim washers if installed.

- (9) Remove the two nuts, washers and bolts used to attach the outer gimbal to the lower gearcase assembly.

NOTE: As the bolts are withdrawn remove the washers between the gimbal and spacers.

- (10) Remove the gearcase assembly by rotating the bottom to the right as it is lowered and remove between the lower (wider) section of the engine mount assembly.

NOTE: The outer spacers and shims if installed, should be removed when the gearcase is below the outer gimbal.

NOTE: Identify which side the gimbal bearings, spacers and shims are on and maintain as a matched set.

23-560-4. INSTALLATION OF THE LOWER GEARCASE ASSEMBLY. For greater convenience install the following items on the lower gearcase prior to its installation on the helicopter: Lube pump, shaft, relief valve, fittings and lines (Section 73-560) and pylon assembly (Section 28-560).

- a. Install or connect the following parts and assemblies.
- (1) Install the inner spacers into the gearcase mounting bearings and if previously installed place shims over inner spacer next to bearing.
- (2) Place the outer spacers over the inner spacer.

NOTE: The longer outer spacer must be at the right-hand end of the bearing when viewed from each side of the gearcase assembly.

23-560-4. (Continued)

NOTE: If any of the gimbal spacers or bearings have been changed, the following steps must be accomplished, for each side and parts must not be interchanged when completed.

- (A) Measure the length of the inner spacer and record as Dimension A.
 - (B) Measure the length of the outer spacers and record as Dimension B.
 - (C) Measure the width of the gimbal bearing and record as Dimension C.
 - (D) Add Dimension B and C and subtract from Dimension A.
 - (E) The difference is the amount of shims required to be installed over the inner spacer between the gimbal bearing and the outer spacer.
- (3) Install the gearcase assembly through the right-hand lower (wider) section of the engine mount assembly and rotate the bottom to the left as it is raised into position and supported.
 - (4) Install the two bolts through the outer gimbal, washers and spacers. The bolt heads should be located at the forward side of the outer gimbal assembly. Secure the bolts with the nuts and washers and tighten to 500/600 pound-inch torque value.
 - (5) Remove the forward bolt used to retain the outer gimbal and shim washers in the engine mount. Lower the left and right forward engine struts and reinstall the bolt, washer and nut.

NOTE: The forward bolt head must be to the right-hand side of the helicopter. The aft bolt head must be to the left-hand side of the helicopter.

- (6) Check that the maximum gap between each gimbal bearing the engine mount frame fitting assembly does not exceed 0.015 inch before tightening the bolt. If necessary, use AN960-1016L or AN960PD1016L washers to reduce the gap. Insert the washers between the gimbal bearing lockring and the frame fitting assembly.
- (7) Tighten the forward and aft bolts securing the outer gimbal to 250/300 pound-inch torque value.
- (8) Tighten the bolts securing the engine strut assemblies to the engine mount assembly.
- (9) Install the snubber bracket assembly (Section 28-560).
- (10) Oil system lines and fittings (Section 73-560).
- (11) Engine to lower gearcase assembly drive coupling (Section 24-560).
- (12) Engine oil cooler blower drive belts (Section 73-560).
- (13) Electrical connections to the lower gearcase chip detector and oil temperature switch.
- (14) Install the mechanical transmission (Paragraph 21-1-11).

23-560-5. REPLACEMENT OF INPUT QUILL SEAL. The following paragraphs provide instructions for replacement of the input quill seal. (See Figure 23-560-1).

- (1) Remove the engine to lower gearcase drive coupling assembly. (Section 24-560).

23-560-5. (Continued) REPLACEMENT OF INPUT QUILL SEAL

- (2) Remove safety wire and retainer from input quill assembly as follows:

- (A) Use a suitable tool or special holding tool, T-560-2312-1, to prevent input collar from rotating.
- (B) Remove the retainer, which has left hand threads, using a standard 3/8" square drive tool.
- (C) Remove collar.
- (3) Remove the bolts and washers securing the seal plate and input quill housing to the lower gearcase and remove the seal plate. Reinstall one bolt to prevent input quill from sliding out.
- (4) Remove carbon seal and o-ring assembly from seal plate.
- (5) Remove magnet and o-ring assembly from seal cap.
- (6) Lubricate new o-ring and install on new magnet. Cover highly-polished face of magnet with a lint-free cloth and HAND-PRESS magnet into seal cap bore so that polished surface faces away from seal cap shoulder.
- (7) Install new o-ring on new carbon seal and gently place seal on magnet.

CAUTION: DO NOT SLIDE SEAL ACROSS MAGNET AND DO NOT ALLOW SURFACES TO SLAM TOGETHER FROM MAGNETIC ATTRACTION.

- (8) Lubricate new o-ring and install on seal cap.
- (9) Place seal cap onto quill housing flange and attach seal cap to housing with washers and bolts. Tighten bolts to 50-70 in-lbs.

CAUTION: SEAL ADAPTER MUST BE SEATED AGAINST AFT PINION GEAR BEARING DURING SEAL CAP INSTALLATION TO PREVENT OIL LEAKAGE.

- (10) Install bolts and washers in collar.
- (11) Insert lockwire (MS20995C32) through safety holes in collar at location tending to tighten retaining nut.
- (12) Gently insert collar assembly into seal cap assembly.
- (13) Install washer and retaining nut. Tighten retaining nut to 400-500 in-lbs. while holding collar with suitable tool or Special Tool T-560-2312-1. Safety retaining nut with lockwire (MS20995C32).
- (14) Install the engine to lower gearcase coupling assembly (Section 24-560).

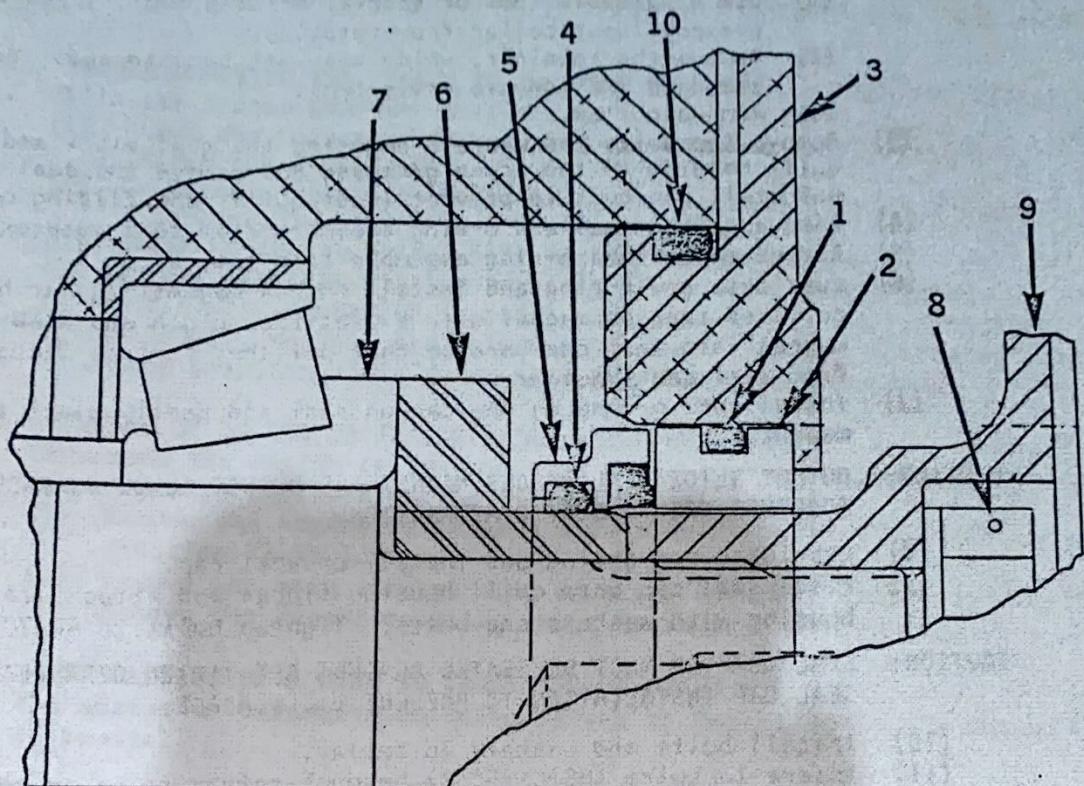


Figure 23-560-1 MAGNETIC SEAL, INPUT QUILL ASSEMBLY

Key to Figure 23-560-1

1. Packing
2. Magnet
3. Seal Cap
4. Packing
5. Carbon Seal
6. Seal Adapter
7. Aft Pinion Gear Bearing
8. Retainer
9. Collar
10. Packing

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Section 24

UH12-J SERIES SERVICE MANUAL

Group 20
Section 24

TAIL ROTOR DRIVE SYSTEM

24-1-1 through 24-60-40. Remains the same for UH12-J series.

ENGINE TO TRANSMISSION DRIVE SYSTEM

24-560-1. ENGINE TO TRANSMISSION DRIVE SYSTEM.

24-560-2. DESCRIPTION. (See figures 24-560-1) The engine to transmission drive system includes the main transmission coupling assembly and the engine coupling shaft.

24-560-3. TROUBLESHOOTING THE ENGINE TO TRANSMISSION DRIVE SYSTEM FOR VIBRATIONS.

a. Check the system for out-of-tolerance conditions as follows:

(1) Check the runout of the main transmission coupling assembly (Paragraph 24-560-16).

(2) Check main transmission coupling for correct lubricant level (Section 10).

(3) Check engine coupling shaft nut for proper torque.

(4) Check main transmission coupling for proper installation.

b. If drive system vibration is still excessive after completing step

a. (24-560-3), replace the main transmission coupling (paragraph 24-560-9) or engine coupling shaft (paragraph 24-560-14) as required.

24-560-4. REMOVAL OF ENGINE TO TRANSMISSION DRIVE SYSTEM.

a. To remove the engine to transmission drive system components, remove the components as outlined in the paragraphs referenced.

(1) Remove the engine oil cooler blower drive belts (if installed) (Section 73-560).

(2) Remove the main transmission coupling assembly (paragraph 24-560-9).

(3) Remove the engine coupling shaft (paragraph 24-560-14).

24-560-5. INSTALLATION OF ENGINE TO TRANSMISSION DRIVE SYSTEM.

a. The engine to transmission drive system is installed in the reverse order of removal.

24-560-6. The main transmission coupling assembly and engine coupling shaft lubrication requirements are given in the lubrication chart, Figure 10-19A. paragraph 24-560-11b.

24-560-7. THE MAIN TRANSMISSION COUPLING ASSEMBLY (See figure 24-560-1).

24-560-8. DESCRIPTION. The main transmission coupling assembly is a crowned gear type coupling and transmits the rotary motion and power from the engine coupling shaft to the lower gearcase input quill assembly.

24-560-9. REMOVAL OF THE MAIN TRANSMISSION COUPLING ASSEMBLY

NOTE: Item a. (1) of paragraph 24-560-4 should be accomplished first.

a. Remove the safety wire, bolts and washers securing the main transmission coupling to the engine coupling shaft.

b. Remove the safety wire, bolts and washers securing the main transmission coupling to the collar on the input quill assembly.

NOTE: When loosening bolts pull coupling sleeve aft to prevent bolts from going into seal plates.

c. Remove the main transmission coupling assembly.

24-560-9. (Continued)

NOTE: Remove engine end first and hold sleeve to maintain installed length. When sleeve is clear of the engine coupling shaft flange allow the transmission coupling to extend.

24-560-10. INSTALLATION OF THE MAIN TRANSMISSION COUPLING ASSEMBLY.

- a. The main transmission coupling assembly is installed in the reverse order of removal.

24-560-11. MINOR REPAIR AND PARTS REPLACEMENT OF THE MAIN TRANSMISSION COUPLING ASSEMBLY. Repair of the main transmission coupling assembly shall be limited to replacement of the seals, O-rings and lubrication every 400 hours.

- a. Replacement of seals for either end.

NOTE: Match mark parts during disassembly. DO NOT USE A SCRIBE.

- (1) Remove the lock wire and capscrews securing the washer ring, boot seal to the sleeve assembly.
 - (2) Remove the spacer with hub and seal from the sleeve assembly.
 - (3) Remove the lockwire and bolts securing the hub and boot seal to the spacer and remove the hub and boot seal.
 - (4) Assemble the washer ring and boot seal on the spacer then install a new boot seal with a new O-ring on the spacer. Assemble the hub and secure with bolts and washers. Tighten bolts to 115/125 pound-inches torque value. Safety bolt heads in pairs with 0.032 inch diameter lockwire (Item 6, Table 10-VI).
 - (5) Check the level of lubricant in sleeve (Paragraph 24-560-11, b.).
 - (6) Install the spacer with hub and seal into the sleeve assembly, observing match marks. Slide the boot and washer ring into position and secure with capscrews. Tighten capscrews to 40/50 pound-inches torque value. Safety in pairs with 0.032 inch lockwire (Item 6, Table 10-VI).
- b. Lubricate the main transmission coupling assembly as follows every 400 hours.
- (1) Disassemble (Paragraph 24-560-11, a. (1) & (2)).
 - (2) Remove all old lubricant.
 - (3) Hand pack new lubricant 1/8" above minor diameter of teeth in sleeve. (See Figure 24-560-3)
 - (4) Reassemble. (Paragraph 24-560-11, a. (6)).

24-560-12. ENGINE COUPLING SHAFT. (See figure 24-560-1)

24-560-13. DESCRIPTION. The engine coupling shaft is splined to the output gear of the engine and transmits and power and rotary motion to the main transmission coupling assembly.

24-560-14. REMOVAL OF THE ENGINE COUPLING SHAFT.

- a. Remove the main transmission coupling assembly. (Paragraph 24-560-9.)
- b. Remove the lockwire, nut and cone washer from the aft end of the engine shaft
- c. Slide the engine shaft forward to remove.

24-560-15. INSTALLATION OF THE ENGINE COUPLING SHAFT

- a. Apply grease (figure 10-19) on the external splines of the engine shaft.
- b. Install engine shaft through engine drive gear and secure with cone washer and nut. Tighten nut to 180 Inch lbs. plus drag torque. Safety nut with .041 lockwire.
- c. Install main transmission coupling assembly (paragraph 24-560-10).

NOTE: After approximately ten hours of flight, recheck torque of engine coupling shaft nut.

24-560-16. CHECKING RUN OUT OF MAIN TRANSMISSION COUPLING assembly is accomplished as follows: (See figure 24-560-2).

- a. Remove the safety wire and two cap screws which are used to secure the washer ring and boot seal at each end.
- b. Attach the special dial indicator fixture or an equivalent bracket and locate the dial indicator contact point at the dimension shown in figure 24-560-2.
- c. Rotate the shaft and check the T.I.R. of the main transmission coupling assembly. Allowable limits are:
 1. Transmission end .300" T.I.R.
 2. Engine End .200" T.I.R.
- d. Remove the dial indicator and special fixture.
- e. Install the cap screws and safety.

24-560-17. ADJUSTMENT, MAIN TRANSMISSION COUPLING SHAFT: Three locations are provided to adjust the runout of the main transmission coupling assembly.

- a. Between the existing Hiller engine mount and the turbine engine mount (both sides).
- b. Between the lower turbine engine mount and the mounting pad on the engine.

Adjust at these locations (using 560-6312-12 & -13 on the side mount, and 560-6312-0 & -11 for the bottom mount) to obtain the runout limits in paragraph 24-560-16.

Figure 24-560-1. Engine to Transmission Drive System

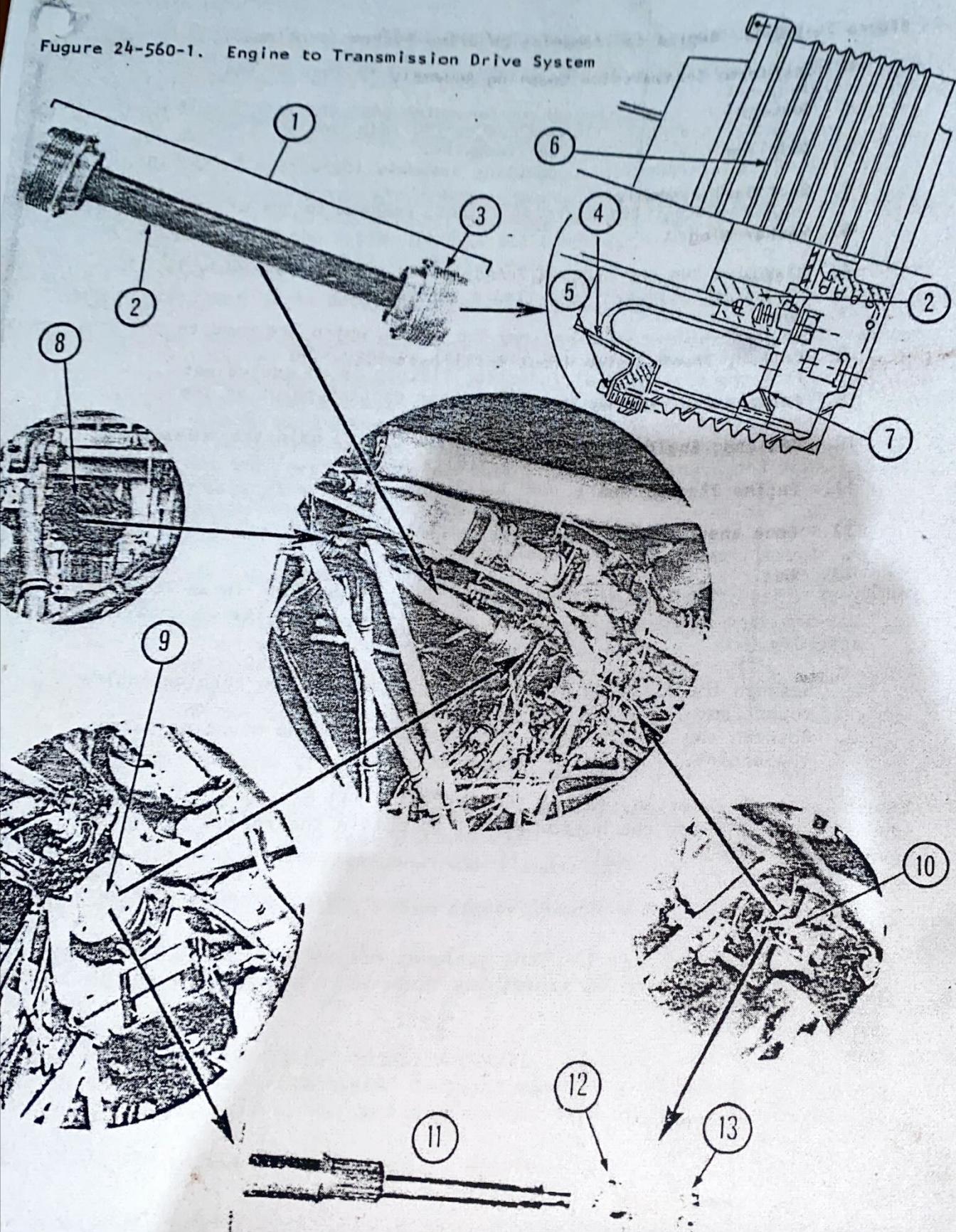


Figure 24-560-1. Engine to Transmission Drive System (Continued)

1. Engine to Transmission Coupling Assembly
2. Spacer
3. Coupling
4. Boot Seal Assembly
5. Washer Ring
6. Sleeve
7. Hub
8. Collar, Transmission Input Quill Assembly
9. Forward End, Engine Through Shaft
10. Aft End, Engine Through Shaft
11. Engine Through Shaft
12. Cone Washer
13. Nut

24-560-5

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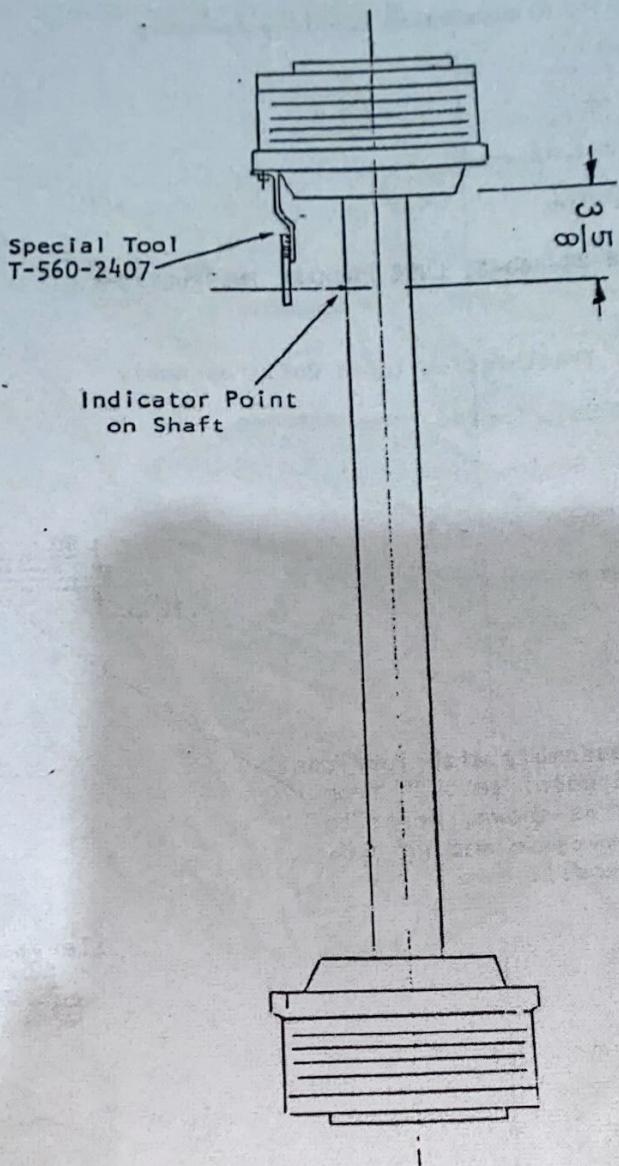
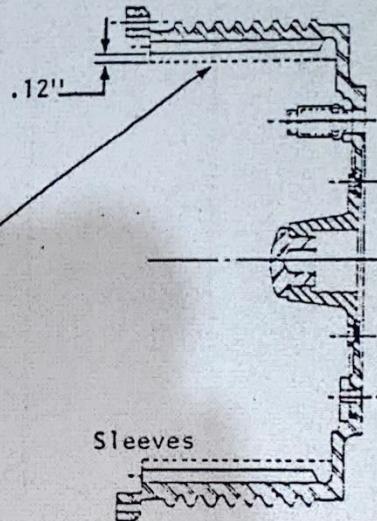


Figure 24-560-2. Main Transmission Coupling Assembly.

24-560-6

Figure 24-560-3. LUBE PACKING INSTRUCTIONS.

Hand pack at assembly with lubricant (Anderol 786 Grease) to .12" from minor diameter as shown, prior to assembling sleeves to mating hubs (typical both ends).



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Section 25

UH12-J SERIES SERVICE MANUAL

Group 20
Section 25

TAIL ROTOR SPEED DECREASER

This section remains the same for UH12-J series.

PYLON ASSEMBLY

28-560-1. PYLON ASSEMBLY

28-560-2. DESCRIPTION. The pylon assembly is a welded tubular structure of type 4130 steel tubing with four machined fittings on the upper end for attachment to the lower gearcase housing and a attach ring with four lugs at the lower end for attachment to the snubber assembly rod ends.

The lateral snubber rod assembly is a welded assembly of type 4130 steel tubing and machined end fittings. The original lateral snubber rod is retained and is installed in the longitudinal position.

28-560-3. REMOVAL OF THE PYLON ASSEMBLY

- a. Hoist the helicopter (see section 10) to support the transmission assemblies.

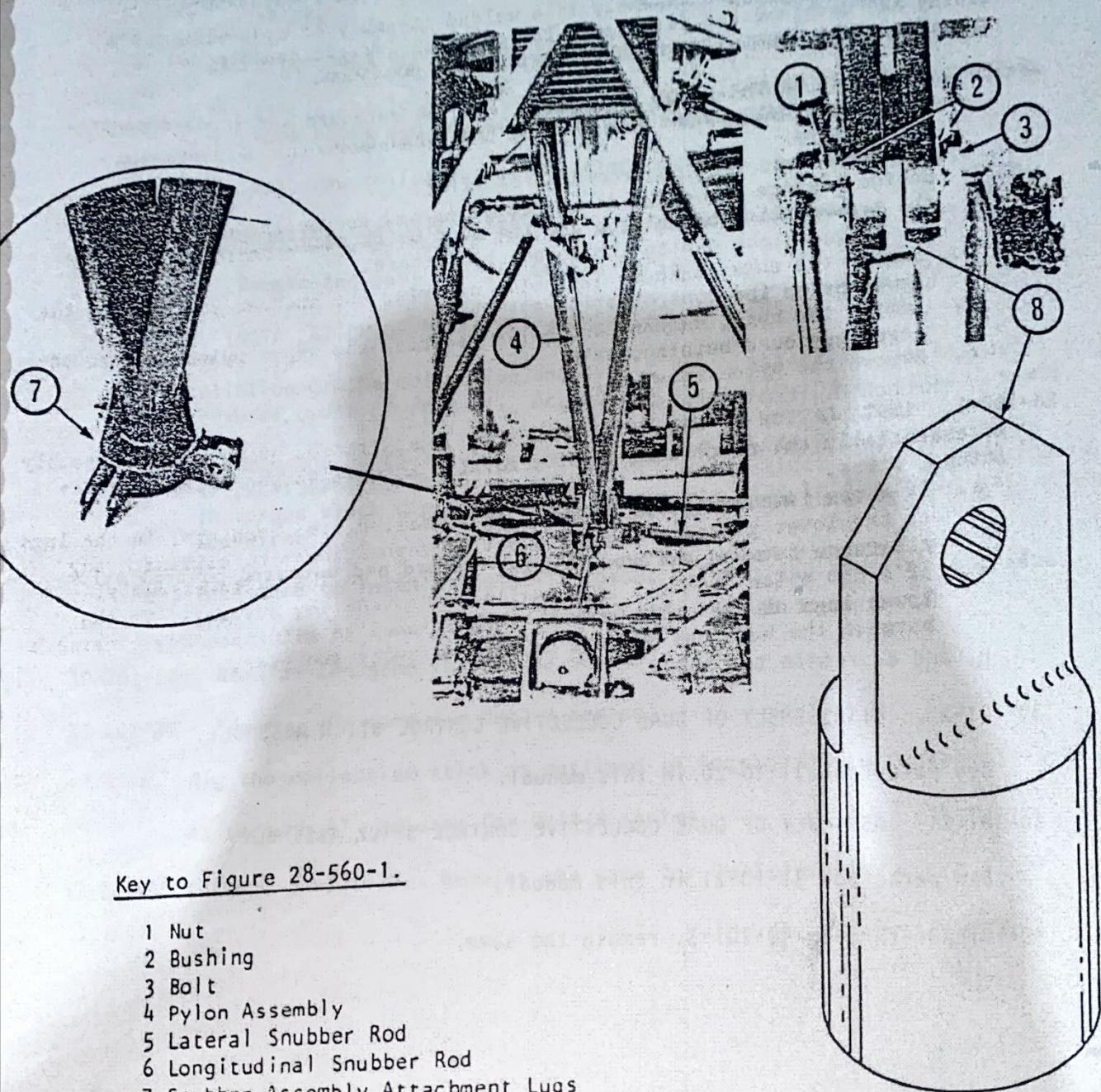
NOTE: Serious damage can occur to the coupling and connecting components if the transmission assemblies are not supported with a hoist.

- b. Remove the nuts, washers and bolts securing the snubber rod ends to the lower pylon lugs.
- c. Remove the nuts, washers and bolts securing the upper pylon lugs to the lower gearcase housing.
- d. Remove the pylon assembly.

28-560-4. INSTALLATION OF THE PYLON ASSEMBLY. Installation of the pylon assembly is essentially the reverse order of removal. Accomplish the following additional steps.

- a. If a new lower gearcase assembly is installed, the bushings, in the lugs of the lower gearcase housing, must be repositioned to eliminate any clearance between the bushings and the lugs on the pylon assembly.
- b. If a new pylon assembly is installed, the floating bushings, in the lower lugs of the pylon must be repositioned to eliminate any clearance between the bushings and the snubber assembly rod ends.

Figure 28-560-1. PYLON ASSEMBLY.



Key to Figure 28-560-1.

- 1 Nut
- 2 Bushing
- 3 Bolt
- 4 Pylon Assembly
- 5 Lateral Snubber Rod
- 6 Longitudinal Snubber Rod
- 7 Snubber Assembly Attachment Lugs
- 8 Pylon End Fitting

Group 30
Section 30

FLIGHT CONTROLS SYSTEMS

30-1-1. through 30-101-3. Remains the same for UH12-J series. (See Table 30-560-1 for conversion of rotor speed from RPM to percent RPM.) All references to 3200 engine RPM should be deleted. Operate engine at 100% RPM.

30-101-30. REMOVAL OF DUAL CONTROL KIT INSTALLATION (See figures 30-101-1, -2, -3 and 30-560-1).

a. Remove the dual collective stick assembly as follows:

1. Disconnect the isolation tube from the outboard and inboard control stick. Disconnect cannon plug from seat deck.
2. Remove end fitting from control stick.
3. Remove the locking stud and the four bolts securing the outboard torque block cap to the torque block base.
4. Withdraw the control stick assembly.
5. through 6. remain the same.

b. through d. remain the same.

30-101-11. INSTALLATION OF DUAL CONTROL KIT.

a. 1. through 4. remain the same.

5. Connect isolation tube to both inboard and outboard control sticks.
6. Connect cannon plug on seat deck.

b. and c. remain the same.

30-101-20. DISASSEMBLY OF DUAL COLLECTIVE CONTROL STICK ASSEMBLY.

See paragraph 31-10-20 in this manual.

30-101-21. ASSEMBLY OF DUAL COLLECTIVE CONTROL STICK ASSEMBLY.

See paragraph 31-10-21 in this manual.

30-101-30. through 30-201-3. remain the same.

30-201-10. REMOVAL OF LEFT-POSITION CONTROL KIT INSTALLATION.

- a. Remove the collective stick as follows:
 - 1) Disconnect the isolation tube from the aft end of the collective stick.
 - 2) Disconnect cannon plug at seat.
 - 3) Remove the locking stud and the four bolts securing the torque tube block cap to torque block base.
 - 4) Withdraw collective stick assembly.
- b. Deleted for the UH12-J series.
- c.-d. Remain the same for the UH12-J series.

30-201-11. INSTALLATION OF LEFT-POSITION CONTROL KIT INSTALLATION.

Installation of the collective and cyclic stick assemblies is essentially the reverse order of removal. Accomplish the following additional steps:

- a. Tighten the bolts securing the torque block caps of the collective stick assemblies to 10-15 pound inch torque value. Safety stud located in torque block cap to the head of one box head torque block bolt with lockwire.
- b. Take care to install the small spacer between the rod ends and lever arm.

30-201-20. Remains the same for UH12-J series.

30-201-30. Remains the same for UH12-J series.

- a. Rig the collective stick as outlined in Section 31, paragraph 31-1-31.
 - 2) through 4) Deleted for UH12-J series.

30-201-40 through 30-301-30. Remains the same for UH12-J series.

30-560-1. OUTBOARD COLLECTIVE THROTTLE ISOLATION LINKAGE KIT. (Figure 30-560-1)

30-560-2. DESCRIPTION. The outboard collective throttle isolation linkage kit provides a solid link between the outboard collective and the throttle bellcrank. Its development was necessary to prevent hysteresis inherent in a cable system. The kit consists of a rod assembly and a collective end fitting. The collective end fitting converts twist grip rotational movement to lateral movement which acts on the bellcrank through the rod assembly.

30-560-3. RIGGING THE OUTBOARD COLLECTIVE THROTTLE ISOLATION LINKAGE KIT.

Rigging of the gas producer fuel control will be identical with the steps outlined in sections 75-560-6-UH12-J3 and 75-560-11-UH12-J5, with the exception of the rod which connects the center collective stick to the bellcrank which is deleted in the outboard collective throttle isolation linkage kit. In its place is the rod assembly connecting the outboard collective to the bellcrank. The nominal length of this rod assembly is 30 inches between hole centers of rod ends.

30-560-4. REMOVAL OF THE OUTBOARD COLLECTIVE THROTTLE ISOLATION LINKAGE KIT.

Remove the outboard collective throttle isolation linkage kit in the following order:

1. Remove bolts, nuts and washers attaching rod assembly to bellcrank on one end and outboard collective stick end fitting on the other. Remove rod assembly.
2. Remove collective stick end fitting from collective.

30-560-5. INSTALLATION OF THE OUTBOARD COLLECTIVE THROTTLE ISOLATION LINKAGE KIT. Install the outboard throttle isolation linkage kit in the reverse order of removal.

CAUTION: INSURE THAT ROD ASSEMBLY IS NOT INSTALLED END-FOR-END OR IT WILL CONTACT LINEAR ACTUATOR.

30-560-6. DUAL CONTROL THROTTLE ISOLATION LINKAGE KIT. (Figure 30-560-2)

30-560-7. DESCRIPTION. The dual control throttle isolation linkage kit provides a solid link between the outboard and inboard collective sticks. Its development was necessary to prevent hysteresis inherent in cable systems. The kit consists of a rod assembly and inboard and outboard collective end fittings. Twist grip rotational movement is converted to lateral motion by the collective end fittings.

30-560-8. RIGGING THE DUAL CONTROL THROTTLE ISOLATION LINKAGE KIT.

Rigging of the gas producer fuel control will be identical with the steps outlined in section 75-560-6-UH12-J3 and 75-560-11-UH12-J5. The nominal length of the inboard and outboard collective rod assembly is 22.5 inches between hole centers of rod ends.

30-560-9. " REMOVAL OF THE DUAL CONTROL THROTTLE ISOLATION LINKAGE KIT.
 Remove the dual control throttle isolation linkage kit in the following order.
 1. Remove nuts, bolts and washers attaching rod assembly to collective end fittings. Remove rod assembly.
 2. Remove collective stick end fittings from collectives.

30-560-10. INSTALLATION OF DUAL CONTROL THROTTLE ISOLATION LINKAGE KIT.
 Installation of the dual control throttle isolation linkage kit is the reverse of removal.

NOTE: End fittings are not interchangeable. Refer to Parts Manual for correct installation.

CAUTION: INSURE THAT ROD ASSEMBLY IS NOT INSTALLED END-FOR-END OR IT WILL CONTACT LINEAR ACTUATOR.

Table 30-560-1. RPM CONVERSION.

<u>Rotor RPM = % Rotor RPM</u>	<u>Rotor RPM = % Rotor RPM</u>
3 .8	350 94.6
5 1.4	352 95.1
7 1.9	353 95.4
15 4.0	354 95.7
329 88.9	355 95.9
333 90	356 96.2
335 90.5	357 96.5
337 91	358 96.8
338 91.4	359 97
339 91.6	360 97.3
340 91.9	362 97.8
342 92.4	363 98.1
343 92.7	364 98.4
344 93	365 98.6
345 93.2	366 98.9
346 93.5	367 99.2
347 93.8	369 99.7
348 94	370 100
349 94.3	372 100.5

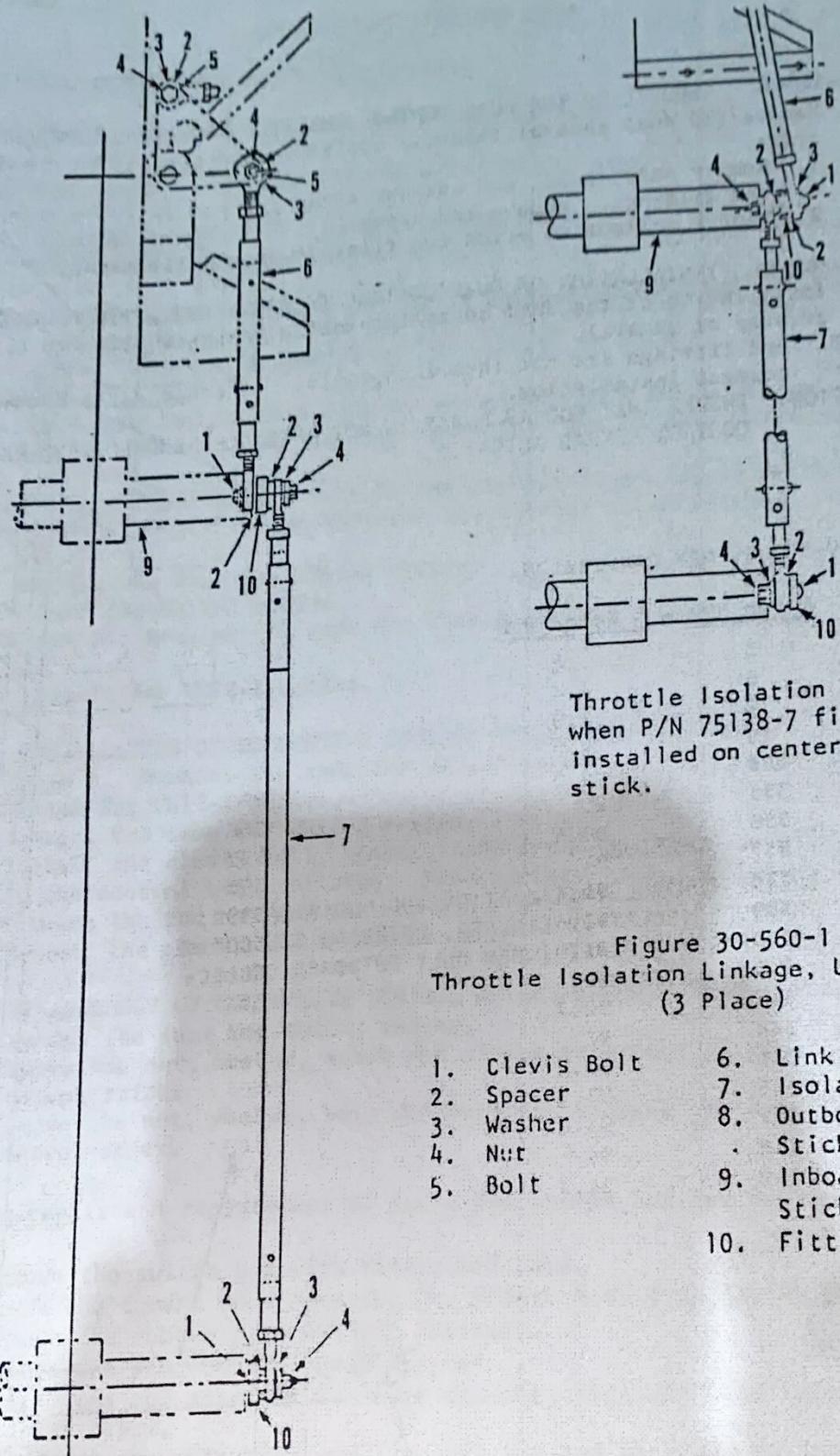


Figure 30-560-1
Throttle Isolation Linkage, UH-12D/E
(3 Place)

- | | |
|----------------|----------------------------|
| 1. Clevis Bolt | 6. Link |
| 2. Spacer | 7. Isolation Tube |
| 3. Washer | 8. Outboard Coll.
Stick |
| 4. Nut | 9. Inboard Coll.
Stick |
| 5. Bolt | 10. Fitting |

Group 30
Section 30-560

1. Fitting
2. Rod End
3. Clevis Bolt
4. Jam Nut
5. Tube
6. Rod End
7. Bolt
8. Outboard Collective Stick

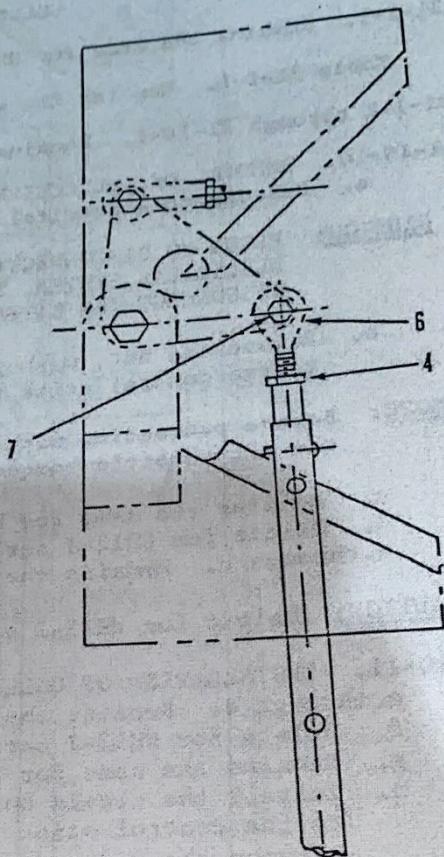
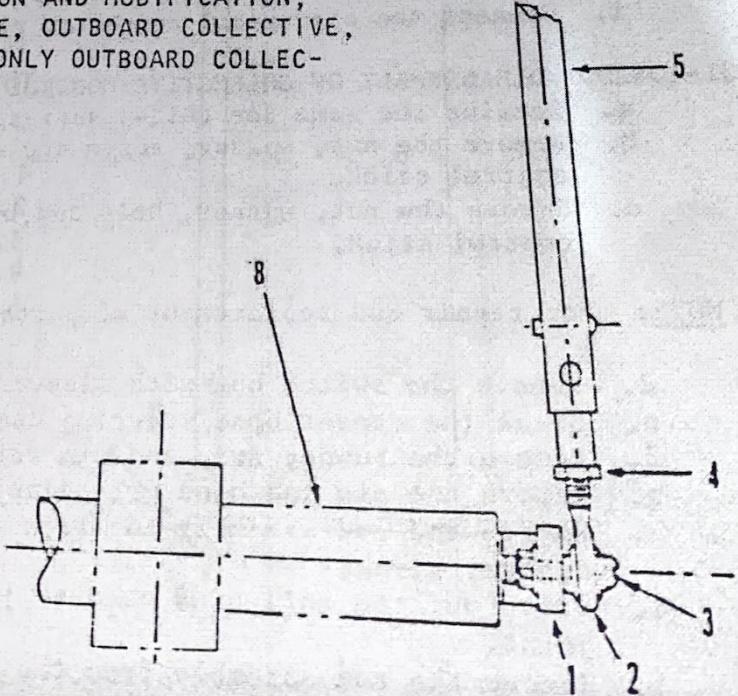


Figure 30-560-2.

ENGINE CONTROL INSTALLATION AND MODIFICATION,
THROTTLE ISOLATION LINKAGE, OUTBOARD COLLECTIVE,
UH-12D/E - 3 PLACE (WHEN ONLY OUTBOARD COLLEC-
TIVE IS INSTALLED)



COLLECTIVE PITCH CONTROLS

31-1-1. Remains the same for UH12-J series.

Table 31-1-1. Remains the same for UH12-J series.

31-1-2 through 31-10-1. Remains the same for UH12-J series.

31-10-10. REMOVAL OF COLLECTIVE CONTROL STICK ASSEMBLY
a. Disconnect electrical connector plug.

CAUTION: PRIOR TO DISCONNECTING OR REMOVING ANY COMPONENT WHICH INVOLVES THE ELECTRICAL SYSTEM, TURN THE MASTER SWITCH TO THE OFF POSITION. DISCONNECT THE BATTERY FROM THE ELECTRICAL SYSTEM.

b. Remove the nut, washer, spacer and clevis bolt which connect the rod end to the control stick fitting. Take care not to lose the spacer.

NOTE: Before proceeding with further disassembly steps, apply match-markings to the aft throttle torque tube and the control stick fitting. DO NOT SCRIBE.

c. Remains the same for UH12-J series.

d. Delete for UH12-J series.

e. through h. Remains the same for UH12-J series.

CAUTION: Delete for UH12-J series.

31-10-11. INSTALLATION OF COLLECTIVE CONTROL STICK ASSEMBLY

a. through e. Remains the same for UH12-J series.

f. Delete for UH12-J series.

g. Remains the same for UH12-J series.

h. Install the clevis bolt, spacer, washer and nut which connect the rod end to the control stick fitting. Make certain that the spacer is installed between the rod end and the control stick fitting.

i. Connect the electrical connector plug.

31-10-20. DISASSEMBLY OF COLLECTIVE CONTROL STICK ASSEMBLY (See Figure 31-1-3.)

a. Remains the same for UH12-J series.

b. Remove the nut, washer, screw and clamps securing the conduit tube to the control stick.

c. Remove the nut, washer, bolt and bushing securing the switch box to the control stick.

NOTE: For repair and replacement of parts for switch box see Section 83-560.

d. Remove the switch box with sleeve and tube.

e. Break the cement bond securing the rubber hand grip to the hand grip adapter.

f. Remove the rubber grip and pin retainer.

g. Remove the pin and hand grip adapter.

h. Rotate the rod assembly to align the roll pins with the holes in the control stick.

i. Drive out the roll pins used to join the rod assembly to the universal joint.

j. Remove the rod assembly from the forward end of the control stick.

k. Remove the torque tube, nylon washer, universal joint, and bearing assembly from the aft end of the stick assembly.

Group 30
Section 31

31-10-21. ASSEMBLY OF COLLECTIVE CONTROL STICK ASSEMBLY. (See figure 31-1-3.)

NOTE: Delete for UH12-J series.

- a. Insert the torque tube, nylon washer, universal joint and bearing assembly into the aft end of the control stick.
- b. Insert the rod assembly through the forward end of the control stick and engage the universal joint.
- c. Rotate the rod assembly to align the holes in the rod assembly, universal joint and control stick. Secure the parts together with two roll pins.
- d. Align the slots in the rod assembly with the slots in the control stick and the holes in the hand grip adapter and install pin.
- e. Apply fresh rubber cement to the hand grip adapter and pin retainer.

NOTE: Pin retainer is to be flush with forward end of rubber grip.

- f. Install the rubber grip and pin retainer.
- g. Assemble the switch box with sleeve and tube to the control stick and secure with bolt, spacer, washer and nut. Do not overtighten nut.
- h. Install the clamps on the control stick and tube and secure with screw, washer and nut.
- i. Install the assembled control stick assembly as described in paragraph 31-10-11.

31-20-1 through 31-60-40. Remains the same for UH12-J series.

31-101-1 through 31-110-1. Remains the same for UH12-J series.

31-110-10. REMOVAL OF COLLECTIVE CONTROL STICK ASSEMBLY, FOUR-PLACE CONFIGURATION
(See figure 31-101-3.)

- a through c. Remains the same for UH12-J series.
- d. Disconnect electrical connector plug.
- e. Remove nut, washer and bolt securing rod end to the control stick throttle arm.
- f. Remove nuts, washers and bolts securing collective stick torque block to forward collective control torque tube.
- g. Withdraw collective stick assembly.
- h and i. Delete for UH12-J series.

31-110-11. Remains the same for UH12-J series.

- a. Remains the same for UH12-J series.
- b through d. Delete for UH12-J series.

31-110-20. DISASSEMBLY OF COLLECTIVE CONTROL STICK ASSEMBLY (See figure 31-101-3.)

- a. Remains the same for UH12-J series.
- b. Remove the nut, washer, screw and clamps securing the conduit tube to the control stick.
- c. Remove the nut, washer, bolt and bushing securing the switch box to the control stick.

NOTE: For repair and replacement of parts for switch box, see section 83-560.

- d. Remove the switch box with sleeve and tube.
- e. Break the cement bond securing the rubber hand grip to the hand grip adapter.