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CHAPTER 1
INTRODUCTION

Section I — Scope

1-1. Scope. Part II of the multiple part manual is the Organizational Maintenance Manual and covers all assigned maintenance functions as outlined in the Maintenance Allocation Chart for organizational maintenance level.

1-2. Distribution and Revision System. Refer to AR 310-1.

1-3. Definitions of Notes, Cautions and Warnings. Throughout this manual adjuncts to the text are used, the definitions of which are as follows:

a. NOTE — An operating procedure, condition, etc., which is essential to highlight.

b. CAUTION — An operating procedure, practice, etc., which, if not correctly followed, will result in damage to or destruction of equipment.

c. WARNING — An operating procedure, practice, etc., which, if not strictly observed, will result in personal injury or loss of life.

1-4. Authorization for Issue. Refer to AR 310-3.

1-5. Mandatory Requirements. This manual, issued expressly for organizational maintenance, is the official document for Army Model UH-1A helicopters, (Serial No. 58-2078 through 58-2093; 58-3017 through 58-3047; 59-1607 through 59-1716; and 60-3530 through 60-3545), and Army Model UH-1B helicopters, (Serial No. 60-3546 through 60-3619; 61-686 through 61-803; 62-1872 through 62-2105; 62-4566 through 62-4605; 62-12515 through 62-12555; 63-8500 through 63-8738, 63-12903 through 63-12952; 64-13902 through 64-14191; 65-9416 through 65-9564; 65-12738 through 65-12744; 65-12772 and 66-491 and subsequent). The purpose of this manual is to supply you with the maintenance functions to be performed at the organizational maintenance level. A Table of Contents for this manual is provided to assist in determining the chapter in the manual in which individual functions are covered. The study and use of this manual will enable a maintenance crew of limited experience to perform the assigned functions with maximum efficiency. This manual provides all essential information for personnel to accomplish Army organizational maintenance on the complete airframe, its components and systems with functions and related functions of the same general scope and magnitude as prescribed for organizational maintenance activities in the Maintenance Allocation Chart. (Refer to Appendix II.)

Note

> Do not destroy any pages in this manual unless the data contained thereon has been replaced, superseded, or included in the manual by a change or revision.

1-6. Reporting of Equipment Manual Improvements. The direct reporting of errors, omissions, and recommendations for improving this manual by the individual user, is authorized and encouraged. DA Form 2028 will be used for reporting these improvements. This form may be completed using pencil, pen or typewriter. DA Form 2028 will be completed by the individual user and forwarded directly to: Commanding General, U.S. Army Aviation Materiel Command, P.O. Box 209, Main Office, St. Louis, Missouri 63166.

Section II — General Information

1-7. Summary of Manual Contents. This manual is divided into sixteen chapters, four appendices and an index. In several instances comparable systems vary between serial numbered blocks of helicopters. In such cases two or more sections with the same section number and title have been employed to cover the various configurations most accurately and efficiently.

1-8. *Chapter 1 — Introduction.* This chapter describes this part of the multiple part manual and gives a summary of the information contained herein. It also contains a detailed description of the entire aircraft, ground handling methods and procedures, servicing instructions, and a list of special tools and equipment.

1-9. *Chapter 2 — Lubrication Instructions.* This chapter covers the lubrication requirements of the aircraft by inclusion of complete lubrication instructions and applicable lubrication charts.

1-10. *Chapter 3 — Inspection Requirements.* This chapter contains complete requirements for special inspections, test flight inspections, overhaul and retirement schedule and standards of serviceabality applicable to the aircraft.

1-11. *Chapter 4 — Airframe and Alighting Gear.* The function of this chapter is to provide all the essential information for maintenance personnel to accomplish organizational maintenance on the complete airframe and alighting gear.

1-12. *Chapter 5 — Power Plant and Related Systems.* The purpose of this chapter is to provide necessary information to perform organizational maintenance on the complete power plant and its related systems.

1-13. *Chapter 6 — Hydraulic and Pneumatic Systems.* This chapter contains organizational maintenance instructions for components of all hydraulic systems used in the aircraft covered by this manual. Pneumatic systems data is not applicable.

1-14. *Chapter 7 — Power Train System.* Included in this chapter are detailed descriptions of the mast, transmission, driveshafts and gear boxes with organizational maintenance instructions as necessary.

1-15. *Chapter 8 — Main and Tail Rotor Groups.* This chapter contains organizational maintenance instructions for components of the main rotor system, including hub and blades, and for the tail rotor hub and blades.

1-16. *Chapter 9 — Flight Controls.* Necessary instruction for the performance of organizational maintenance to all fixed and movable flight control systems are contained in this chapter.

1-17. *Chapter 10 — Instruments.* Organizational maintenance instructions are provided herein for all flight, navigation, engine, and miscellaneous instruments.

1-18. *Chapter 11 — Utility Systems.* This chapter contains organizational maintenance instructions applicable to the various utility systems which may be installed in the aircraft covered by this manual.

1-19. *Chapter 12 — Electrical Systems.* Included in this chapter are instructions necessary for the performance of organizational maintenance on components of all electrical systems.

1-20. *Chapter 13 — Avionics and Photographic.* Necessary avionics organizational maintenance instructions are covered by reference to applicable manual. Photographic data is not applicable.

1-21. *Chapter 14 — Armament.* Necessary organizational maintenance instructions for the various armament systems which may be installed on these aircraft will be found in this chapter.

1-22. *Chapter 15 — External Stores — Nonarmament.* This chapter contains organizational maintenance instructions for all nonarmament external stores which may be utilized by the aircraft covered by this manual.

1-23. *Chapter 16 — Storage of Aircraft.* This chapter contains comprehensive procedures for preparing the aircraft and components for flyable, temporary and limited storage. Activation after storage and demolition methods are also contained herein.

1-24. *Appendix I — References.* This appendix consists of a list of official publications available to organizational maintenance personnel.

1-25. *Appendix II — Maintenance Allocation Chart.* This chart reflects the maintenance functions to be performed at each maintenance level.

1-26. *Appendix III — Aircraft Inventory Master Guide.* This appendix provides standard inventory procedures and furnishes the using activities with a master guide to determine the inventoriable items of installed and loose equipment authorized and required by the specific aircraft in performance of its mission.

1-27. *Appendix IV — Weight and Balance.* Necessary data for this appendix is covered by reference to applicable manual.

1-28. *Index.* The index lists, in alphabetical order, every important subject under the topic which may be of significance to organizational maintenance.

1-29. Coding Data. The contents of this manual are applicable to Army Model UH-1A helicopters and Army Model UH-1B helicopters. The following code system has been used in the text and illustrations to designate applicability to a given model or version.

CODE	APPLICATION
No Code	All UH-1A and UH-1B helicopters.
A	UH-1A helicopters only.
B	UH-1B helicopters. (Including 540.)
B 5	UH-1B helicopters with T53-L-5 Engine.
B 9	UH-1B helicopters with T53-L-9 and L9A Engine.
B 11	UH-1B helicopters with T53-L-11 Engine.
5 4 0	Peculiar to 540 UH-1B equipped helicopters only.

1-30. Reference Data. In addition to the referenced publications contained in Appendix I, a list of consumable materials will be found in Section III of this chapter. Repair parts and special tools are contained in TM 55-1520-211-20P.

1-31. Systems Description and Diagrams. Necessary descriptions and diagrams will be found in either TM 55-1520-211-10 or adjacent to the procedural paragraph(s) which they clarify.

1-32. Ground Support Equipment. Descriptions and necessary illustrations of ground support equipment required for organizational maintenance will be found in chapters 4 through 16 adjacent to the applicable instructions for their use.

1-33. Maintenance Data. The following paragraphs contain maintenance data of a general nature which is applicable to the aircraft as a unit. Detailed maintenance instructions will be found in chapters 4 through 16.

1-34. *Power Load Charts.* Power load data for all electrical items used on the aircraft covered by this manual will be found on figures 1-1 through 1-7.

A EQUIPMENT	B PART DESIGNATION	C NUMBER OF UNITS	D AMPERES PER UNIT	E OPERATING TIME-MIN.	F OPERATING CONDITIONS — START & WARM UP F-2					TAKE OFF F-4					CRUISE F-5					LAND F-7					EMERGENCY F-8				
					AMPS	AVERAGE AMPS 0.5 MIN.	2.0 MIN.	15.0 MIN.	MIN.	AMPS	AVERAGE AMPS 0.5 MIN.	2.0 MIN.	15.0 MIN.	MIN.	AMPS	AVERAGE AMPS 0.5 MIN.	2.0 MIN.	30.0 MIN.	MIN.	AMPS	AVERAGE AMPS 0.5 MIN.	2.0 MIN.	5.0 MIN.	MIN.	AMPS	AVERAGE AMPS 0.5 MIN.	2.0 MIN.	30.0 MIN.	60.0 MIN.
C. FLIGHT CONTROLS																													
MAGNETIC BRAKE-FORCE TRIM	AIRBORNE ACC. R460M10	3	0.5	30.0	1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5	1.5
SOLENOID-HYDRAULIC CONTROL	ADEL 52657	1	1.5	2																									
E. ENGINE INSTRUMENTS																													
ENGINE OIL TEMPERATURE	AERNO 61-8830 (MS28009-1)	1	0.04	30.0	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	0.1
XMSN OIL TEMPERATURE	AERNO 61-8842 (MS28009-2)	1	0.04	30.0																									
F. FLIGHT INSTRUMENTS																													
GYRO COMPASS	TYPE J-2	1	0.6	30.0	0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8	0.8
POWER INTERLOCK RELAY	LEAR 5819C	1	0.2	30.0																									
HEATER-PITOT TUBE	AERNO 60-9660 (AN5813-1	1	4.0	30.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0
VERTICAL GYRO IND. SYSTEM																													
CONTROL	AERNO 60-8553 (TYPE K4B)	1	0.6	30.0																									
INDICATOR	AERNO 60-5601 (TYPE B1A)	1		30.0	0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8	0.8
POWER INTERLOCK RELAY	LEAR 5819C	1	0.2	30.0																									
TURN & SLIP TYPE MD-8	AERNO 60-5704 (MS28024-3)	1	0.1	30.0	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	0.1
H. HEATING																													
CABIN HEATER	JANITROL S-100	1	29.6	30.0						29.6	29.6	29.6	29.6		29.6	29.6	29.6	29.6		29.6	29.6	29.6	30.4						
HEATED BLANKET OUTLETS		2	10.0	30.0						20.0	20.0	20.0	20.0		20.0	20.0	20.0	20.0		20.0	20.0	20.0	20.0						
ENGINE ANTI-ICING		1	11.0	1	11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9	2.9
CABIN HEATER PURGING			4.75	2.0																					4.7	4.7	4.7	0.3	0.2
J. ENGINE IGNITION SYSTEM		1	1.5	0.5	1.5	1.5	0.4	NEG.																					
K. ENGINE CONTROLS																													
STARTER-GENERATOR	AERNO 42-7028 TYPE MC1, MIL-S-9181	1	1.0	0.5	1.0	1.0	0.2	0.1																					
RELAY STARTER	MS24172D1	1	0.04	0.5																									
		1	2.0	0.01	NEG.																								
L. LIGHTING																													
DOME LIGHT BULB - RED	MS25235R311 LAMP	3	1.28	1	2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6						
COCKPIT LIGHT BULB	MS25231-313 LAMP	2	0.17	1	0.3	0.3	0.2	NEG.		0.3	0.3	0.2	NEG.		0.3	0.3	0.2	NEG.											
INSTR. & EDGE LIGHT BULB	MS25237-327 LAMP	94	0.04	30.0	3.8	3.8	3.8	3.8		3.8	3.8	3.8	3.8		3.8	3.8	3.8	3.8		3.8	3.8	3.8	3.8		3.8	3.8	3.8	3.8	3.8
INSTR. SECONDARY LIGHT BULB	MS25069-1495 LAMP	4	0.34	2																									
FUS. LT. BULB - TOP & BOTTOM	AN3120-1047 LAMP	3	2.7	30.0																									
FUS. LIGHT BULB - SIDE	ASA-7512 LAMP	4	0.83	30.0	12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6	12.6
FUS. LIGHT BULB - TAIL	MS25232-1683 LAMP	1	1.15	30.0																									
FLASHER-FUSELAGE LIGHTS	TYPE C-2 MIL-F-7414	1	0.4	1																									
MASTER CAUTION PANEL	204-075-223-1	1	0.2	30.0	0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2		0.3	0.3	0.3	0.3	0.3
SEARCHLIGHT	TYPE MA-3 (MIL-L-26998)	1	17.0	5.0											17.0	17.0	17.0	2.8		17.0	17.0	17.0	17.0						
LANDING LIGHT	GRIMES G-8385-1	1	16.5	5.0																16.5	16.5	16.5	16.5		16.5	16.5	16.5	2.8	1.4
ANTI COLLISION LIGHT	GRIMES G-7740-8-24	1	3.0	30.0						3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0						
M. MISCELLANEOUS																													
WINDSHIELD WIPER	ALCO VALVE CO.	1	3.5	30.0						3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5
SOLENOID CARGO HOOK RELEASE	EASTERN ROTORCRAFT SP-3094	1	1.0	0.1											10.2	2.1	0.5	NEG.							10.2	2.1	0.5	NEG.	NEG.
RELAY - HOOK RELEASE	AN3311-2 IUS 130R1302-3-1	1	0.2	0.1	65.6	65.6	65.6	65.6																					
P. POWER																													
BATTERY CHARGING	24 A.H. NICKEL CADMIUM, TYPE MA-4	1		1						26.4	26.4	16.5	8.9		64.8	64.8	40.5	15.3		21.6	21.6	11.5	10.8		21.6	21.6	13.5	5.1	2.8
RELAY-BATTERY	MS24171D1	1	0.6	30.0	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6	0.6
RELAY-NON ESSENTIAL BUS	MS24171D1	1	0.6	30.0	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6						
RELAY-BUS CONTROL	MS25024-2	1	0.35	30.0	0.3	0.3	0.3	0.3		0.3	0.3	0.3	0.3		0.3	[illegible]	0.3	0.3		0.3	0.3	0.3	0.3						
INVERTER - MAIN	AN3532-2	1	12.9	30.0	12.9	12.9	12.9	12.9		12.9	12.9	12.9	12.9		12.9	12.9	12.9	12.9		12.9	12.9	12.9	12.9		12.9	12.9	12.9	12.9	12.9
INVERTER - SPARE	AN3532-2	1	29.6																										
RELAY - A-C LOAD TRANSFER	AN3311-2	1	0.2																										
Q. FUEL & OIL																													
PUMP - FUEL BOOST	204-060-627-1	1	2.5	30.0	2.5	2.5	2.5	2.5		2.5	2.5	2.5	2.5		2.5	2.5	2.5	2.5		2.5	2.5	2.5	2.5		2.5	2.5	2.5	2.5	2.5
PUMP - FUEL TRANSFER	204-060-627-1	1	2.5	30.0																									
VALVE - FUEL SHUTOFF	WE452-1D	1	1.0	0.02	2.0	0.1	NEG.													2.0	0.1	NEG.			2.0	0.1	NEG.		
VALVE - OIL SHUTOFF	WE450-1D	1	1.0	0.02																									
SOLENOID VALVE - IGNITER		1	0.75	0.5	0.8	0.8	0.2	NEG																					
SOLENOID VALVE - GOV. BYPASS		1	1.0	30.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0
ACTUATOR - GOVERNOR R.P.M.	204-060-730-3	1	0.9	1.0	0.9	0.9	0.4	0.1							0.9	0.9	0.4	NEG.											
SOLENOID - IDLE STOP RELEASE	CANNON 1700	1	6.5	0.03																NEG.					NEG.				
R. RADIO NAVIGATION & COMM.																													
RADIO COMPASS	AN/ARN-59	1	2.8	30.0	2.8	2.8	2.8	2.8		2.8	2.8	2.8	2.8		2.8	2.8	2.8	2.8		2.8	2.8	2.8	2.8		2.8	2.8	2.8	2.8	2.8
MARKER BEACON RCVR.	AN/ARN-32	1	0.59	30.0	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6						
FM HOMING ADAPTER	AN/ARA-31	1	1.0												1.0	1.0	1.0	1.0											
FM TRANSCEIVER - RECEIVER	AN/ARC-44	1	4.92	30.0	4.9	4.9	4.9	4.9		4.9	4.9	4.9	4.9		4.9	4.9	4.9	4.9		4.9	4.9	4.9	4.9		4.9	4.9	4.9	4.9	4.9
(ADDITIONAL PWR.) - TRANSMIT			1.43							1.4	1.4	0.7	0.1							1.4	1.4	0.7	0.3		1.4	1.4	0.7	0.1	0.1
UHF TRANSCEIVER - RECEIVE	AN/ARC-55	1	17.0	30.0	17.0	17.0	17.0	17.0		17.0	17.0	17.0	17.0		17.0	17.0	17.0	17.0		17.0	17.0	17.0	17.0		17.0	17.0	17.0	17.0	17.0
(ADDITIONAL PWR.) - TRANSMIT			3.0		3.0	3.0	1.5	0.3		3.0	3.0	1.5	0.3		3.0	3.0	1.5	0.3		3.0	3.0	1.5	0.6		3.0	3.0	1.5	0.3	0.3
OMNI RECEIVER	AN/ARN-30A (POWER PROV.)	1	2.9	30.0	2.9	2.9	2.9	2.9		2.9	2.9	2.9	2.9		2.9	2.9	2.9	2.9		2.9	2.9	2.9	2.9						
RELAY - INTERCOM	AN3303-1	2	0.15		0.3	0.3	0.1	NEG.		0.3	0.3	0.1	NEG.		0.3	0.3	0.1	NEG.		0.3	0.3	0.1	0.1		0.3	0.3	0.1	NEG.	NEG.
SIGNAL DISTRIBUTION PANEL	SB-329/AR	2	0.28	30.0	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6	0.6
SIGNAL DISTRIBUTION PANEL - AUX.	MX-1646/AIC	2	NEG.																										
RELAY AUX. DIST. PANEL	MS24115-6	2	0.14	30.0	0.3	0.3	0.3	0.3		0.3	0.3	0.3	0.3		0.3	0.3	0.3	0.3		0.3	0.3	0.3	0.3		0.3	0.3	0.3	0.3	0.3
S. RADAR																													
IFF TRANSPONDER	AN/APX ( ) (POWER PROV.)	1	4.0	30.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0
W. WARNING																													
FIRE DETECTION	EDISON 227-28-3	1	0.07	30.0	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	0.1
		TOTALS - AVERAGE AMPS			101.90	91.9	84.49	81.10		236.20	228.10	198.10	165.80		242.20	226.00	197.80	156.00		206.50	196.50	185.90	181.90		144.90	126.80	114.60	85.70	81.90

204475-40-1

Figure 1-1. UH-1A Helicopter power loading chart (Serial No. 58-2078 thru 58-3047) (Sheet 1 of 2)

A EQUIPMENT	B PART DESIGNATION	C TOTAL NO. OF UNITS	D OPERATING TIME-MIN.	E ELECTRICAL REQUIREMENTS PER UNIT: 115 VOLTS 3 PH. VA.	115 VOLTS 3 PH. WATTS	115 VOLTS 3 PH. VARS.	115 VOLTS 1 PH. VA.	115 VOLTS 1 PH. WATTS	115 VOLTS 1 PH. VARS.	28 VOLTS 1 PH. VA.	28 VOLTS 1 PH. WATTS	28 VOLTS 1 PH. VARS.	F POWER FACTOR	G VOLTAGE REGULATION	H FREQUENCY RANGE	I CONNECTED LOADS: PHASE A TO B WATTS	PHASE A TO B VARS.	PHASE C TO A WATTS	PHASE C TO A VARS.	PHASE B TO C WATTS	PHASE B TO C VARS.
INVERTER – MAIN	AN3532-2	1		250									.90 LAG .95 LEAD	±4-1/3	390/410						
D INSTRUMENTS:																					
INDICATOR-XMSN OIL PRESSURE	AERNO 61-3121 (MS28010-2)	1	30							3.25	0.59	3.19	0.18	±10	360/440					0.59	3.19
TRANSMITTER-XMSN OIL PRESSURE	AERNO 61-3005 (MS28005-2)	1	30							3.25	0.59	3.19	0.18	±10	360/440					0.59	3.19
E ENGINE INSTRUMENTS:																					
INDICATOR-ENGINE OIL PRESSURE	AERNO 61-3121 (MS28010-2)	1	30							3.25	0.59	3.19	0.18	±10	360/440					0.59	3.19
TRANSMITTER-ENGINE OIL PRESSURE	AERNO 61-3005 (MS28005-2)	1	30							3.25	0.59	3.19	0.18	±10	360/440					0.59	3.19
INDICATOR-FUEL PRESSURE	AERNO 61-2461 (MS28010-1)	1	30							2.60	0.45	2.57	0.17	±10	360/440					0.45	2.57
TRANSMITTER-FUEL PRESSURE	AERNO 61-3008 (MS28005-1)	1	30							3.25	0.59	3.19	0.18	±10	360/440					0.59	3.19
INDICATOR-TORQUE PRESSURE	AERNO 61-2461 (MS28010-1)	1	30							2.60	0.45	2.57	0.17	±10	360/440					0.45	2.57
TRANSMITTER-TORQUE PRESSURE	AERNO 61-3008 (MS28005-1)	1	30							3.25	0.59	3.19	0.18	±10	360/440					0.59	3.19
FUEL QUANTITY-INDICATOR	204-060-655-2	1	30				2.5	2.5					1.0	±10	360/440	2.50					
-TANK UNIT	204-060-655-3	1	30																		
F FLIGHT INSTRUMENTS:																					
VERTICAL GYRO INDICATOR SYSTEM: INDICATOR	TYPE B-1A AERNO 60-5601 (MIL-I-6501)	1	30	110	77.0	78.5							0.70	±10	380/420	25.70	26.20	25.70	26.20	25.70	26.20
CONTROL	TYPE K4B AERNO 60-8553 (MIL-C-6585)	1	30																		
POWER INTER-LOCK RELAY	LEAR 5819C	1	30	8	8								1.0	±10	360/440	4.00				4.00	
COMPASS-TYPE J-2: AMPLIFIER	AERNO 60-1702 (TYPE A-2)	1	30	27.7	25.56	8.08							0.92 AVG	±10	360/440	6.61	5.49	12.00	1.21	6.95	1.38
CONTROL GYRO	AERNO 60-1480 (TYPE S-3A)	1	30																		
TRANSMITTER &	AERNO 60-1483 (TYPE C-2)	1	30																		
COMPENSATOR	AERNO 60-1479 (TYPE C-2)	1	30																		
REPEATER INDICATOR	AERNO 60-1522 (TYPE V-7A)	1	30				3.45	2.2	2.65				0.64	±10	360/440			2.20	2.65		
PWR INTERLOCK RELAY	LEAR 5819C	1	30	8	8								1.0	±10	360/440	4.00				4.00	
M MISCELLANEOUS:																					
CAPACITOR-P.F. CORRECTION	CP53B1EE105K (MIL-C-25)	4	30	33.2		-33.2							0.0				-33.2		-33.2		-66.4
X A.C. POWER (WARNING)																					
A.C. FAILURE RELAY	TYPE D-1 (MIL-R-8373)	1	30				13.2	0.8	13.1				0.06							0.79	13.10
															TOTALS	42.81	- 1.51	39.90	- 3.13	45.88	- 1.44
															TOTAL LOAD ⟶		129	V.A.	0.99	P.F.	LEAD
INVERTER – SPARE	AN3532-2	1																			
SPARE INVERTER LOADS ARE IDENTICAL TO MAIN INVERTER LOADS																					

204475-40-2

Figure 1-1. UH-1A Helicopter power loading chart (Serial No. 58-2078 thru 58-3047) (Sheet 2 of 2)

A EQUIPMENT	B PART DESIGNATION	C NUMBER OF UNITS	D AMPERES PER UNIT	E OPERATING TIME - MIN.	OPERATING CONDITIONS-F: START & WARM UP F-2					TAKE OFF F-4					CRUISE F-5					LAND F-7					EMERGENCY F-8				
					AMPS	AVERAGE AMPS. 0.5 MIN	2.0 MIN	15.0 MIN	MIN	AMPS	AVERAGE AMPS. 0.5 MIN	2.0 MIN	15.0 MIN	MIN	AMPS	AVERAGE AMPS. 0.5 MIN	2.0 MIN	30.0 MIN	MIN	AMPS	AVERAGE AMPS. 0.5 MIN	2.0 MIN	5.0 MIN	MIN	AMPS	AVERAGE AMPS. 0.5 MIN	2.0 MIN	30.0 MIN	60.0 MIN
C—FLIGHT CONTROLS																													
MAGNETIC BRAKE—FORCE TRIM	AIRBORNE ACC R460M10	1	0.5	30.0	1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5	1.5
SOLENOID—HYDRAULIC CONT	ADEL 52657	1	1.5																										
E—ENGINE INSTRUMENTS																													
ENGINE OIL TEMPERATURE	AERNO 61-8833 (MS28009-1)	1	0.04	30.0	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	0.1
XMSN OIL TEMPERATURE	AEDNO 61-8842 (MS28009-2)	1	0.04	30.0																									
F—FLIGHT INSTRUMENTS																													
GYRO COMPASS	TYPE J-2	1	0.6	30.0	0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8	0.8
POWER INTERLOCK RELAY	LEAR NO. 5819E	1	0.2	30.0																									
HEATER—PITOT TUBE	AERNO 60-966C (AN5813-1)	1	4.0	30.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0
VERTICAL GYRO IND SYSTEM																													
CONTROL	AERNO 60-8553 (TYPE K4B)	1	0.6	30.0																									
INDICATOR	AERNO 60-5601 (TYPE B1A)	1		30.0	0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8	0.8
POWER INTERLOCK RELAY	LEAR NO. 5819E	1	0.2	30.0																									
TURN & SLIP TYPE MD-8	AERNO 60-5704 (MS28024-3)	1	0.1	30.0	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	0.1
H—HEATING																													
CABIN HEATER	JANITROL S-100	1	29.6	30.0						29.6	29.6	29.6	29.6		29.6	29.6	29.6	29.6		29.6	29.6	29.6	29.6						
CABIN HEATER PURGING			4.75	2.0																					4.7	4.7	4.7	0.3	0.2
HEATED BLANKET OUTLETS		2	10.00	30.00						20.0	20.0	20.0	20.0		20.0	20.0	20.0	20.0		20.0	20.0	20.0	20.0						
ENGINE ANTI-ICING		1	11.00		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9	2.9
J—ENGINE IGNITION SYSTEM		1	1.5	0.5	1.5	1.5	0.4	NEG																					
K—ENGINE CONTROLS																													
STARTER—GENERATOR	AERNO 42-7028 TYPE MC-1 (MIL-S-9181)	1																											
RELAY—STARTER	MS24172D1	1	4.5	0.5	4.5	4.5	1.1	0.2																					
L—LIGHTING																													
DOME LIGHT—RED	MS25235 R 311 LAMP	3	1.28		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6						
COCKPIT LIGHT	MS25231-313 LAMP	2	0.17		0.3	0.3	0.2	NEG		0.3	0.3	0.2	NEG		0.3	0.3	0.2	NEG											
INSTRUMENT & EDGE LIGHT	MS25237-327 LAMP	94	0.04	30.0	3.8	3.8	3.8	3.8		3.8	3.8	3.8	3.8		3.8	3.8	3.8	3.8		3.8	3.8	3.8	3.8		3.8	3.8	3.8	3.8	3.8
INSTRUMENT SECONDARY LT	MS25069-1495 LAMP	4	0.34																										
FUS LIGHT—TOP & BOTTOM	AN3120-1047 LAMP	3	2.7	30.0																									
FUS LIGHT—SIDE	ASA-7512 LAMP	4	0.83	30.0	12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6	12.6
FUS LIGHT—TAIL	MS25232-1683 LAMP	1	1.15	30.0																									
FLASHER—FUS LIGHTS	TYPE C-2, MIL-F-7414	1	0.4																										
MASTER CAUTION PANEL	204-075-223-1	1	0.2	30.0	0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2		0.3	0.3	0.3	0.3	0.3
SEARCHLIGHT	TYPE MA-3, MIL-L-26998	1	17.0	5.0											17.0	17.0	17.0	2.8		17.0	17.0	17.0	17.0						
LANDING LIGHT	GRIMES G8385-1	1	16.5	5.0																16.5	16.5	16.5	16.5		16.5	16.5	16.5	2.8	1.4
ANTI-COLLISION LIGHT	GRIMES G7740A-8-24	1	3.0	30.0						3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0						
M—MISCELLANEOUS																													
WINDSHIELD WIPER	ALCO VALVE CO	1	3.5	30.0						3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5
SOLENOID—CARGO HOOK RELEASE	EASTERN ROTORCRAFT SP-3094	1	10.0	0.1											10.2	2.1	0.5	NEG							10.2	2.1	0.5	NEG	NEG
RELAY—CARGO HOOK RELEASE	AN3311-2	1	0.2	0.1																									
P—POWER																													
BATTERY CHARGING	24AH NICKEL CADMIUM, TYPE MA-4	1								86.5	86.5	54.0	28.8		64.8	64.8	40.5	15.3		21.6	21.6	13.5	10.8		21.6	21.6	13.5	5.1	2.8
RELAY—BATTERY	MS24171D1	1	0.6	30.0	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6	0.6
RELAY—NON ESS BUS	MS24171D1	1	0.6	30.0	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6						
RELAY—BUS CONTROL	MS25024-2	1	0.35	30.0	0.3	0.3	0.3	0.3		0.3	0.3	0.3	0.3		0.3	0.3	0.3	0.3		0.3	0.3	0.3	0.3						
INVERTER—MAIN	MS25173-1	1	12.9	30.0	12.9	12.9	12.9	12.9		12.9	12.9	12.9	12.9		12.9	12.9	12.9	12.9		12.9	12.9	12.9	12.9		12.9	12.9	12.9	12.9	12.9
INVERTER—SPARE	MS25173-1	1	12.9																										
Q—FUEL & OIL																													
PUMP—FUEL BOOST	204-060-627	1	2.5	30.0	2.5	2.5	2.5	2.5		2.5	2.5	2.5	2.5		2.5	2.5	2.5	2.5		2.5	2.5	2.5	2.5		2.5	2.5	2.5	2.5	2.5
PUMP—FUEL TRANSFER	204-060-627	1	2.5	30.0																									
VALVE—FUEL SHUTOFF	204-060-013	1	1.0	0.02	2.0	0.1	NEG													2.0	0.1	NEG			2.0	0.1	NEG		
VALVE—OIL SHUTOFF	204-060-013	1	1.0	0.02																									
SOLENOID VALVE—IGNITER		1	0.75	0.5	0.8	0.8	0.2	NEG																					
SOLENOID VALVE—GOV BYPASS		1	1.0	30.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0
ACTUATOR—GOV RPM	204-060-730	1	0.9	1.0	0.9	0.9	0.4	0.1							0.9	0.9	0.4	NEG											
SOLENOID—IDLE STOP RELEASE	204-060-775	1	6.5	0.03																NEG					NEG				
R—RADIO NAVIGATION & COMM																													
RADIO COMPASS	AN/ARN-59	1	2.8	30.0	2.8	2.8	2.8	2.8		2.8	2.8	2.8	2.8		2.8	2.8	2.8	2.8		2.8	2.8	2.8	2.8		2.8	2.8	2.8	2.8	2.8
MARKER BEACON RCVR	AN/ARN-32	1	0.59	30.0	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6						
FM HOMING ADAPTOR	AN/ARA-31	1	1.0												1.0	1.0	1.0	1.0											
FM TRANSCEIVER—RECEIVE	AN/ARC-44	1	4.92	30.0	4.9	4.9	4.9	4.9		4.9	4.9	4.9	4.9		4.9	4.9	4.9	4.9		4.9	4.9	4.9	4.9		4.9	4.9	4.9	4.9	4.9
(ADDITIONAL PWR—XMIT)		1	1.43							1.4	1.4	0.7	0.1							1.4	1.4	0.7	0.3		1.4	1.4	0.7	0.1	0.1
UHF TRANSCEIVER—RECEIVE	AN/ARC-55	1	17.00	30.0	17.0	17.0	17.0	17.0		17.0	17.0	17.0	17.0		17.0	17.0	17.0	17.0		17.0	17.0	17.0	17.0		17.0	17.0	17.0	17.0	17.0
(ADDITIONAL PWR—XMIT)			3.0		3.0	3.0	1.5	0.3		3.0	3.0	1.5	0.3		3.0	3.0	1.5	0.3		3.0	3.0	1.5	0.6		3.0	3.0	1.5	0.3	0.3
OMNI RECEIVER	AN/ARN-30A (POWER PROV)	1	2.9	30.0	2.9	2.9	2.9	2.9		2.9	2.9	2.9	2.9		2.9	2.9	2.9	2.9		2.9	2.9	2.9	2.9						
RELAY—INTERCOMM	AN3303-1	2	0.15		0.3	0.3	0.1	NEG		0.3	0.3	0.1	NEG		0.3	0.3	0.1	NEG		0.3	0.3	0.1	0.1		0.3	0.3	0.1	NEG	NEG
SIGNAL DISTRIBUTION PANEL	SB-329/AR	3	0.28	30.0	0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8		0.8	.08	0.8	0.8	0.8
SIGNAL DISTRIB PANEL—AUXIL	MX-1646/AIC	2	NEG																										
RELAY AUXIL DISTRIB PANEL	MS24115-6	3	0.14	30.0	0.4	0.4	0.4	0.4		0.4	0.4	0.4	0.4		0.4	0.4	0.4	0.4		0.4	0.4	0.4	0.4		0.4	0.4	0.4	0.4	0.4
S—RADAR																													
IFF TRANSPONDER	AN/APX-44 (POWER PROV)	1	4.5	30.0	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5
W—WARNING																													
FIRE DETECTION	EDISON 227-28-5	1	0.07	0.1	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	0.1
	TOTALS—AVERAGE AMPS				102.7	92.7	85.2	81.9		237.0	228.9	139.9	166.6		243.0	226.8	198.6	156.8		207.3	197.3	186.7	182.7		145.7	127.6	115.4	86.5	82.7

204099-28-1

Figure 1-2. UH-1B Helicopter power loading chart (Serial No. 59-1607 thru 60-3045) (Sheet 1 of 2)

A EQUIPMENT	B PART DESIGNATION	C TOTAL NO. OF UNITS	D OPERATING TIME - MIN.	ELECTRICAL REQUIREMENTS PER UNIT-E									F POWER FACTOR	G VOLTAGE REGULATION	H FREQUENCY RANGE	CONNECTED LOADS-I					
				115 VOLTS 3 PH.			115 VOLTS 1 PH.			28 VOLTS 1 PH.						PHASE A TO B		PHASE C TO A		PHASE B TO C	
				VA.	WATTS	VARS.	VA.	WATTS	VARS.	VA.	WATTS	VARS.				WATTS	VARS.	WATTS	VARS.	WATTS	VARS.
INVERTER MAIN	AERNO 42-2318 (MS25173-1)	1		250									.90 LAG .95 LEAD	±4½	390/410						
D—INSTRUMENTS																					
INDICATOR—XMSN OIL PRESSURE	AERNO 61-2476 TYPE MO-2	1	30							1.72	0.47	1.65	0.28	±10	360/440					0.47	1.65
TRANSMITTER—XMSN OIL PRESSURE	AERNO 61-2475 TYPE MH-3	1	30							2.29	0.66	2.20	0.29	±10	360/440					0.66	2.20
E—ENGINE INSTRUMENTS:																					
INDICATOR—ENGINE OIL PRESSURE	AERNO 61-2476 TYPE MO-2	1	30							1.72	0.47	1.65	0.28	±10	360/440					0.47	1.65
TRANSMITTER—ENGINE OIL PRESSURE	AERNO 61-2475 TYPE MH-3	1	30							2.29	0.66	2.20	0.29	±10	360/440					0.66	2.20
INDICATOR—FUEL PRESSURE	AERNO 61-2461 (MS28010-1)	1	30							2.60	0.45	2.57	0.17	±10	360/440					0.45	2.57
TRANSMITTER—FUEL PRESSURE	AERNO 61-3008 (MS28005-1)	1	30							3.25	0.59	3.19	0.18	±10	360/440					0.59	3.19
INDICATOR—TORQUE PRESSURE	AERNO 61-2486 TYPE MO-3	1	30							1.72	0.47	1.65	0.28	±10	360/440					0.47	1.65
TRANSMITTER—TORQUE PRESSURE	AERNO 61-2487 TYPE MH-4	1	30							2.29	0.66	2.20	0.29	±10	360/440					0.66	2.20
FUEL QUANTITY—INDICATOR	204-060-655-2	1	30				2.5	2.5					1.0	±10	360/440	2.50					
TANK UNIT	204-060-655-3	1	30																		
F—FLIGHT INSTRUMENTS:																					
INDICATOR	AERNO 60-5601 (MIL-I-6501) TYPE B-1A	1	30	110	77.0	78.5							0.70	±10	380/420	25.70	26.20	25.70	26.20	25.70	26.20
VERTICAL GYRO CONTROL	AERNO 60-8553 (MIL-C-6585) TYPE K4B	1	30																		
IND. SYSTEM POWER INTERLOCK RELAY	LEAR NO. 5819E	1	30	8	8								1.0	±10	360/440	4.00				4.00	
AMPLIFIER	AERNO 60-1702 (TYPE A-2)	1	30																		
CONTROL GYRO	AERNO 60-1480 (TYPE S-3A)	1	30	27.7	25.56	8.08							0.92 AVG.	±10	360/440	6.61	5.49	12.00	1.21	6.95	1.38
COMPASS TRANSMITTER &	AERNO 60-1483 (TYPE C-2)	1	30																		
TYPE J-2 COMPENSATOR	AERNO 60-1479 (TYPE C-2)	1	30																		
REPEATER INDICATOR	AERNO 60-1522 (TYPE V-7A)	1	30				3.45	2.2	2.65				0.64	±10	360/440			2.20	2.65		
POWER INTERLOCK RELAY	LEAR NO. 5819E	1	30	8	8								1.0	±10	360/440	4.00				4.00	
M—MISCELLANEOUS:																					
CAPACITOR—PF CORRECTION	CP53BIEE105K MIL-C-25	4	30	33.2		—33.2							0.0				—33.2		—33.2		—66.4
X—AC POWER (WARNING)																					
AC FAILURE RELAY	MIL-R-8373 TYPE D-1	1	30				13.2	0.8	13.1				0.06							0.79	13.10
															TOTALS:	42.81	—1.51	39.90	—3.13	45.87	—8.41
															TOTAL LOAD	129VA @ 0.99 PF LEAD					
INVERTER—SPARE	AERNO 42-2318 (MS25173-1)	1		250																	
SPARE INVERTER LOADS ARE IDENTICAL TO MAIN INVERTER LOADS																					

204099-28-2

Figure 1-2. UH-1B Helicopter power loading chart (Serial No. 59-1607 thru 60-3045) (Sheet 2 of 2)

A EQUIPMENT	B PART DESIGNATION	C NUMBER OF UNITS	D AMPERES PER UNIT	E OPERATING TIME – MIN	OPERATING CONDITIONS – F																								
					START & WARM UP F-2					TAKE OFF F-4					CRUISE F-5					LAND F-7					EMERGENCY F-8				
						AVERAGE AMPS					AVERAGE AMPS					AVERAGE AMPS					AVERAGE AMPS					AVERAGE AMPS			
					AMPS	0.5 MIN	2.0 MIN	15.0 MIN	MIN	AMPS	0.5 MIN	2.0 MIN	15.0 MIN	MIN	AMPS	5.0 MIN	2.0 MIN	30.0 MIN	MIN	AMPS	0.5 MIN	2.0 MIN	5.0 MIN	MIN	AMPS	0.5 MIN	2.0 MIN	30.0 MIN	60.0 MIN
C. FLIGHT CONTROLS																													
MAGNETIC BRAKE – FORCE TRIM	AIRBORNE ACC CORP R460M15	3	0.5	30.0	1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5	1.5
SOLENOID – HYDRAULIC CONT	ADEL 57657	1	1.5																										
E. ENGINE INSTRUMENTS																													
ENGINE OIL TEMPERATURE	AERNO 61-8833 (MS28009-1)	1	0.04	30.0	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	0.1
XMSN OIL TEMPERATURE	AERNO 61-8842 (MS28009-2)	1	0.04	[illegible]																									
F. FLIGHT INSTRUMENTS																													
GYRO COMPASS	TYPE J-2	1	0.6	30.0	0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.4		0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8	0.8
POWER INTERLOCK RELAY	LEAR 5819E	1	0.2	30.0																									
HEATER – PITOT TUBE	AERNO 60-9660 (AN5813-1)	1	4.0	30.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0
TURN & SLIP TYPE ND-8	AERNO 60-5704 (MS28024-3)	1	0.1	30.0	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	0.1
H. HEATING																													
CABIN HEATER	JANITROL S-100	1	31.1	30.0						31.1	31.1	31.1	31.1		31.1	31.1	31.1	31.1		31.1	31.1	31.1	31.1		31.1	31.1	31.1	31.1	31.1
MOTOR – BLEED AIR VALVE	204-060-444	1	2.0	0.2	2.0	0.8	0.2	NEG												2.0	0.8	0.2	0.1						
ENGINE ANTI-ICING	COOK ELECT 575-758 & 667-20	1 EA	11.0		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9	2.9
HEATED BLANKET OUTLETS	HUBBELL 7540	2	10.0	30.0						20.0	20.0	20.0	20.0		20.0	20.0	20.0	20.0		20.0	20.0	20.0	20.0						
J. ENGINE IGNITION SYSTEM		1	1.5	0.5	1.5	1.5	0.4	NEG																					
K. ENGINE CONTROLS																													
STARTER GENERATOR	AERNO 42-7031 TYPE STU-6/A	1																											
RELAY – STARTER	MS24172-D1	1	4.5	0.5	4.5	4.5	1.1	0.2																					
L. LIGHTING																													
DOME LIGHT – RED	MS25235R311 LAMP	3	1.28		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6	2.6
COCKPIT LIGHT	MS25231-313 LAMP	2	0.17		0.3	0.3	0.2	NEG		0.3	0.3	0.2	NEG		0.3	0.3	0.2	NEG							0.3	0.3	0.2	NEG	
INSTRUMENT & EDGE LIGHTS	MS25237-327 LAMP	131	0.04	30.0	5.2	5.2	5.2	5.2		5.2	5.2	5.2	5.2		5.2	5.2	5.2	5.2		5.2	5.2	5.2	5.2		5.2	5.2	5.2	5.2	5.2
INSTRUMENT SECONDARY LIGHTS	MS25069-1495 LAMP	4	0.34																										
FUS LIGHT – TOP & BOTTOM	AN3120-1047 LAMP	3	2.7	30.0																									
FUS LIGHT – SIDE	ASA 7512 LAMP	4	0.83	30.0	12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6	12.6
FUS LIGHT – TAIL	MS25232-1683 LAMP	1	1.15	30.0																									
FLASHER – FUS LIGHTS	TYPE C-2, MIL-F-7414	1	0.4																										
MASTER CAUTION PANEL	204-075-705	1	0.2	30.0	0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2		0.3	0.3	0.3	0.3	0.3
SEARCHLIGHT	TYPE MA-3, MIL-L-26998	1	17.0	5.0											17.0	17.0	17.0	17.0		17.0	17.0	17.0	17.0						
LANDING LIGHT	GRIMES G8383-1	1	16.5	5.0																16.5	16.5	16.5	16.5		16.5	16.5	16.5	2.8	1.4
ANTI-COLLISION LIGHT	GRIMES G8400A-8-24	1	3.0	30.0						3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0
M. MISCELLANEOUS																													
WINDSHIELD WIPER	ALCO VALVE CO	1	3.5	30.0						3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5
SOLENOID – CARGO HOOK REL	EASTERN ROTORCRAFT SP4100-3	1	10.0	0.1											10.2	2.1	0.5	NEG							10.2	2.1	0.5	NEG	
RELAY – CARGO HOOK REL	AN3311-2	1	0.2	0.1																									
P. POWER																													
BATTERY CHARGING	MS24498-1, 34 AMP – HR	1								129.6	129.6	81.0	43.2		97.2	97.2	60.7	22.9		32.4	32.4	20.2	16.2		32.4	32.4	20.2	7.6	4.3
RELAY – BATTERY	MS24171D1	1	0.6	30.0	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6	0.6
RELAY – NON-ESS BUS	MS24171D1	1	0.6	30.0	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6						
RELAY – BUS CONTROL	MS25024-2	1	0.35	30.0	0.3	0.3	0.3	0.3		0.3	0.3	0.3	0.3		0.3	0.3	0.3	0.3		0.3	0.3	0.3	0.3						
INVERTER – MAIN	MS25173-1	1	16.7	30.0	16.7	16.7	16.7	16.7		16.7	16.7	16.7	16.7		16.7	16.7	16.7	16.7		16.7	16.7	16.7	16.7		16.7	16.7	16.7	16.7	16.7
INVERTER – SPARE	MS25173-1	1	16.7																										
Q. FUEL & OIL																													
PUMP – FUEL BOOST	204-060-627	2	2.5	30.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0
PUMP – FUEL TRANSFER	204-060-627	1	2.5	30.0																									
VALVE – FUEL SHUT-OFF	204-060-013	1	1.0	0.02	2.0	0.1	NEG													2.0	0.1	NEG			2.0	0.1	NEG		
VALVE – OIL SHUT-OFF	204-060-013	1	1.0	0.02																									
SOLENOID VALVE – IGNITER		1	0.75	0.5	0.8	0.8	0.2	NEG																					
SOLENOID VALVE – GOV BYPASS		1	1.0	30.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0
ACTUATOR – GOV RPM	204-060-762	1	0.9	1.0	0.9	0.9	0.4	0.1							0.9	0.9	0.4	NEG											
SOLENOID – IDLE STOP REL	204-060-775	1	6.5	0.03																NEG					NEG				
R. RADIO NAV & COMM																													
RADIO COMPASS (ADF)	AN ARN-59	1	2.8	30.0	2.8	2.8	2.8	2.8		2.8	2.8	2.8	2.8		2.8	2.8	2.8	2.8		2.8	2.8	2.8	2.8		2.8	2.8	2.8	2.8	2.8
MARKER BEACON RCVR	R-737 ARN	1	0.04	30.0	NEG					NEG					NEG					NEG					NEG				
VOR RECEIVER (VHF)	AN ARN-30	1	2.9	30.0	2.9	2.9	2.9	2.9		2.9	2.9	2.9	2.9		2.9	2.9	2.9	2.9		2.9	2.9	2.9	2.9		2.9	2.9	2.9	2.9	2.9
FM HOMING ADAPTER	AN ARA-31	1	1.0												1.0	1.0	1.0	1.0											
FM AUXILIARY RCVR	AN ARR-46 (POWER PROV)	1	0.14	30.0	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	0.1
FM TRANSCEIVER (RECEIVE)	AN ARC-44	1	4.92	30.0	4.9	4.9	4.9	4.9		4.9	4.9	4.9	4.9		4.9	4.9	4.9	4.9		4.9	4.9	4.9	4.9		4.9	4.9	4.9	4.9	4.9
(ADDITIONAL PWR XMIT)			1.43							1.4	1.4	0.7	0.1							1.4	1.4	0.7	0.3		1.4	1.4	0.7	0.1	0.1
UHF TRANSCEIVER (RECEIVE)	AN ARC-55B	1	17.0	30.0	17.0	17.0	17.0	17.0		17.0	17.0	17.0	17.0		17.0	17.0	17.0	17.0		17.0	17.0	17.0	17.0		17.0	17.0	17.0	17.0	17.0
(ADDITIONAL PWR XMIT)			3.0		3.0	3.0	1.5	0.3		3.0	3.0	1.5	0.3		3.0	3.0	1.5	0.3		3.0	3.0	1.5	0.6		3.0	3.0	1.5	0.3	0.3
VHF XMTR (STANDBY)	T-366 ARC	1	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5	1.5
RELAY – INTERCOM	MS24139-5	2	0.09		0.2	0.2	0.1	NEG		0.2	0.2	0.1	NEG		0.2	0.2	0.1	NEG		0.2	0.2	0.1	NEG		0.2	0.2	0.1	NEG	
SIGNAL DISTRIBUTION PANEL	10-329 AR	3	0.20	30.0	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6	0.6
SIGNAL DISTR PANEL – AUX	MT-1646 AIC	2	NEG																										
RELAY – AUX SIG DISTR PNL	COOK ELECTRIC 645-6105	1	0.15	30.0	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	0.1
S. RADAR																													
IFF TRANSPONDER	AN APX-44 (POWER PROV)	1	4.5	30.0	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5
IFF ADAPTER	MARK XII (POWER PROV)	1	4.2	30.0	4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2	4.2
ALTIMETER	AN APN-100 (POWER PROV)	1	3.0	30.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0
W. WARNING																													
FIRE DETECTION	EDISON 227-28-5	1	0.07	30.0	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	0.1
	TOTALS – AVG AMPERES				119.2	108.0	100.0	95.6		296.1	288.0	237.0	197.1		291.4	275.2	234.9	180.5		236.1	224.9	209.7	204.2		206.8	188.7	172.4	143.5	138.8

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Figure 1-3. UH-1B Helicopter power loading chart (Serial No. 60-3546 thru 61-803) (Sheet 1 of 2)

A	B	C	D	ELECTRICAL REQUIREMENTS PER UNIT – E									F	G	H	CONNECTED LOADS – I					
EQUIPMENT	PART DESIGNATION	TOTAL NO. OF UNITS	OPERATING TIME – MIN	115 VOLTS 3 PH.			115 VOLTS 1 PH.			28 VOLTS 1 PH.			POWER FACTOR	VOLTAGE REGULATION	FREQUENCY RANGE	PHASE A TO B		PHASE C TO A		PHASE B TO C	
				VA.	WATTS	VARS.	VA.	WATTS	VARS.	VA.	WATTS	VARS.				WATTS	VARS.	WATTS	VARS.	WATTS	VARS.
INVERTER - MAIN	AERNO 42-2318 (MS25173-1)	1		230									.90 LAG	± 4 1/3	390/410						
													.95 LEAD								
D. INSTRUMENTS																					
INDICATOR – XMSN OIL PRESSURE	AERNO 61-2476 TYPE MO-2	1	30.0							1.72	0.47	1.65	0.28	± 10	360/440					0.47	1.65
TRANSMITTER – XMSN OIL PRESSURE	AERNO 61-2497 TYPE TRU-20/A	1	30.0							2.29	0.66	2.20	0.29	± 10	360/440					0.66	2.20
E. ENGINE INSTRUMENTS																					
INDICATOR – ENGINE OIL PRESSURE	AERNO 61-2476 TYPE MO-2	1	30.0							1.72	0.47	1.65	0.28	± 10	360/440					0.47	1.65
TRANSMITTER – ENGINE OIL PRESSURE	AERNO 61-2497 TYPE TRU-20/A	1	30.0							2.29	0.66	2.20	0.29	± 10	360/440					0.66	2.20
INDICATOR – FUEL PRESSURE	AERNO 61-2461 (MS28010-1)	1	30.0							2.60	0.45	2.57	0.17	± 10	360/440					0.45	2.57
TRANSMITTER – FUEL PRESSURE	AERNO 61-3008 (MS28005-1)	1	30.0							3.25	0.59	3.19	0.18	± 10	360/440					0.59	3.19
INDICATOR – TORQUE PRESSURE	AERNO 61-2486 TYPE MO-3	1	30.0							1.72	0.47	1.65	0.28	± 10	360/440					0.47	1.65
TRANSMITTER – TORQUE PRESSURE	AERNO 61-2487 TYPE MH-4	1	30.0							2.29	0.66	2.20	0.29	± 10	360/440					0.66	2.20
FUEL QUANTITY-INDICATOR	204-060-683	1	30.0				3.50	3.50					1.0	± 10	360/440	3.50					
FUEL QUANTITY – TANK UNIT	204-060-683	2	30.0																		
F. FLIGHT INSTRUMENTS																					
VERTICAL GYRO IND SYSTEM – PILOT: INDICATOR	LEAR 4005G	1	30.0				15.00	14.10	5.10				0.94	± 10	380/420	14.10	5.10				
AMPLIFIER	LEAR 5404G	1	30.0																		
CONTROL GYRO	AERNO 60-5937 TYPE MD-1	1	30.0	25.00	23.50	8.50							0.94	± 10	380/420	4.80	2.80	7.80	2.80	7.80	2.80
RATE GYRO	AERNO 60-5938 TYPE MC-1	1	30.0				4.80	4.50	1.60				0.94	± 10	380/420	4.50	1.60				
ATTITUDE INDICATOR – COPILOT	TYPE J-8, MIL-I-5133	1	30.0	9.00	7.70	4.70							0.85	± 10	380/420	2.57	1.57	2.57	1.57	2.57	1.57
COMPASS SYSTEM TYPE J-2: AMPLIFIER	AERNO 60-1702 TYPE A-2	1	30.0																		
CONTROL GYRO	AERNO 60-1480 TYPE S-3A	1	30.0	27.70	25.56	8.08							0.93	± 10	360/440	6.61	5.49	12.80	1.21	6.95	1.30
TRANSMITTER &	AERNO 60-1483 TYPE C-2	1	30.0																		
COMPENSATOR	AERNO 60-1479	1	30.0																		
PWR INTERLOCK RLY	LEAR 5819E	1	30.0	8.00	8.00								1.0	± 10	360/440	4.00				4.00	
MASTER INDICATOR	SPERRY C-6H	1	30.0							22.50	5.30	21.90	0.24	± 10	360/440					5.30	21.90
SERVO AMPLIFIER	SPERRY 1783867-1	1	30.0				17.40	14.80	9.20				0.85	± 10	360/440					14.80	9.20
REPEATER IND	ID-250A/ARN	1	30.0							6.69	1.20	6.57	0.18	± 10	360/440					1.20	6.57
M. MISCELLANEOUS																					
CAPACITOR – P.F. CORRECTION	CP53B1EE105K MIL-C-25	2	30.0				33.20		-33.20				0.0								-66.40
RESISTOR – LOAD BALANCING	RW20G911 MIL-R-26	1	30.0				14.90	14.50					1.0					14.50			
R. RADIO NAVIGATION																					
RMI CONVERTER	A.R.C. TYPE B-18A	1	30.0							7.28	7.28		1.0							7.28	
X. A-C POWER (WARNING)																					
A-C FAILURE RELAY	TYPE D-1 AAF 32471	1	30.0				13.30	0.80	13.10				0.06	± 10	360/440					0.80	13.10
														TOTALS:		30.39	16.56	36.87	5.50	55.13	7.43
														TOTAL	LOAD:		126 VA	@ 0.97	PF (LAG)		
INVERTER – SPARE	AERNO 42-2318 (MS25173-1)	1		230																	
NOTE: SPARE INVERTER LOADS ARE IDENTICAL TO MAIN INVERTER LOADS.																					

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Figure 1-3. UH-1B Helicopter power loading chart (Serial No. 60-3546 thru 61-803) (Sheet 2 of 2)

A EQUIPMENT	B PART DESIGNATION	C NUMBER OF UNITS	D AMPERES PER UNIT	E OPERATING TIME-MIN.	OPERATING CONDITIONS-F																								
					START & WARM UP F-2					TAKE OFF F-4					CRUISE F-5					LAND F-7					EMERGENCY F-8				
						AVERAGE AMPS.					AVERAGE AMPS.					AVERAGE AMPS.					AVERAGE AMPS.					AVERAGE AMPS.			
					AMPS	0.5 MIN	2.0 MIN	15.0 MIN	MIN	AMPS	0.5 MIN	2.0 MIN	15.0 MIN	MIN	AMPS	0.5 MIN	2.0 MIN	30.0 MIN	MIN	AMPS	0.5 MIN	2.0 MIN	5.0 MIN	MIN	AMPS	0.5 MIN	2.0 MIN	30.0 MIN	60.0 MIN
C—FLIGHT CONTROLS																													
MAGNETIC BRAKE-FORCE TRIM	AIRBORNE ACC CORP R460M15	3	0.5	30.0	1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5	1.5
SOLENOID—HYDRAULIC CONT	ADEL 52657	1	1.5																										
E—ENGINE INSTRUMENTS																													
ENGINE OIL TEMPERATURE	AERNO 61-8833 (MS28009-1)	1	0.04	30.0	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	0.1
XMSN OIL TEMPERATURE	AERNO 61-8842 (MS28009-2)	1	0.04	30.0																									
F—FLIGHT INSTRUMENTS																													
GYRO COMPASS	TYPE J-2	1	0.6	30.0	0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8	0.8
POWER INTERLOCK RELAY	LEAR 5819E	1	0.2	30.0																									
HEATER—PITOT TUBE	AERNO 60-9660 (AN5813-1)	1	4.0	30.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0
TURN & SLIP TYPE MD-8	AERNO 60-5704 (MS28024-3)	1	0.1	30.0	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	0.1
H—HEATING																													
CABIN HEATER	JANITROL S-100	1	31.1	30.0						31.1	31.1	31.1	31.1		31.1	31.1	31.1	31.1		31.1	31.1	31.1	31.1		31.1	31.1	31.1	31.1	31.1
MOTOR—BLEED AIR VALVE	204-060-444	1	2.0	0.2	2.0	0.8	0.2	NEG												2.0	0.8	0.2	0.1						
ENGINE ANTI-ICING	COOK ELECT 575-758 & 667-20	1 EA	11.0		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9	2.9
HEATED BLANKET OUTLETS	HUBBELL 7540	2	10.0	30.0						20.0	20.0	20.0	20.0		20.0	20.0	20.0	20.0		20.0	20.0	20.0	20.0						
J—ENGINE IGNITION SYSTEM		1	1.5	0.5	1.5	1.5	0.4	NEG																					
K—ENGINE CONTROLS																													
STARTER-GENERATOR	AERNO 42-7031 TYPE STU-6/A	1																											
RELAY—STARTER	MS24172-D1	1	4.5	0.5	4.5	4.5	1.1	0.2																					
L—LIGHTING																													
DOME LIGHT—RED	MS25235R311 LAMP	3	1.28		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6	2.6
COCKPIT LIGHT	MS25231-313 LAMP	2	0.17		0.3	0.3	0.2	NEG		0.3	0.3	0.2	NEG		0.3	0.3	0.2	NEG							0.3	0.3	0.2	NEG	
INSTRUMENT & EDGE LIGHTS	MS25237-327 LAMP	131	0.04	30.0	5.2	5.2	5.2	5.2		5.2	5.2	5.2	5.2		5.2	5.2	5.2	5.2		5.2	5.2	5.2	5.2		5.2	5.2	5.2	5.2	5.2
INSTRUMENT SECONDARY LTS	MS25069-1495 LAMP	4	0.34																										
FUS LIGHTS—TOP & BOTTOM	AN3120-1047 LAMP	3	2.7	30.0																									
FUS LIGHTS—SIDE	ASA 7512 LAMP	4	0.83	30.0	12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6	12.6
FUS LIGHT—TAIL	MS25232-1683 LAMP	1	1.15	30.0																									
FLASHER—FUS LIGHTS	TYPE C-2 MIL-F-7414	1	0.4																										
MASTER CAUTION PANEL	204-075-705	1	0.2	30.0	0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2		0.3	0.3	0.3	0.3	0.3
SEARCH LIGHT	TYPE MA-3 MIL-L-26998	1	17.0	5.0											17.0	17.0	17.0	2.8		17.0	17.0	17.0	17.0						
LANDING LIGHT	GRIMES G8385-1	1	16.5	5.0																16.5	16.5	16.5	16.5		16.5	16.5	16.5	2.8	1.4
ANTI-COLLISION—LIGHT	GRIMES G8400A-8-24	1	3.0	30.0						3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0
M—MISCELLANEOUS																													
WINDSHIELD WIPER	ALCO VALVE CO.	1	3.5	30.0						3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5
SOLENOID—CARGO HOOK REL	EASTERN ROTORCRAFT SP4100-3	1	10.0	0.1											10.2	2.1	0.5	NEG							10.2	2.1	0.5	NEG	
RELAY—CARGO HOOK REL	AN3311-2	1	0.2	0.1																									
P—POWER																													
BATTERY CHARGING	MS24498-1 34 AMP HR	1								129.6	129.6	81.0	43.2		97.2	97.2	60.7	22.9		32.4	32.4	20.2	16.2		32.4	32.4	20.2	7.6	4.3
RELAY—BATTERY	MS24171-D1	1	0.6	30.0	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6	0.6
RELAY—NON ESSENTIAL BUS	MS24171-D1	1	0.6	30.0	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6						
RELAY—BUS CONTROL	MS25024-2	1	0.35	30.0	0.3	0.3	0.3	0.3		0.3	0.3	0.3	0.3		0.3	0.3	0.3	0.3		0.3	0.3	0.3	0.3						
INVERTER—MAIN	MS21983-1	1	15.1	30.0	15.4	15.4	15.4	15.4		15.4	15.4	15.4	15.4		15.4	15.4	15.4	15.4		15.4	15.4	15.4	15.4		15.4	15.4	15.4	15.4	15.4
INVERTER—SPARE	MS21983-1	1	15.1																										
RELAY—INVERTER POWER	MS24166-D1	2	0.35	30.0																									
O—FUEL & OIL																													
PUMP—FUEL BOOST	204-060-627	2	2.5	30.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0
PUMP—FUEL TRANSFER	204-060-627	1	2.5	30.0																									
VALVE—FUEL SHUT-OFF	204-060-013	1	1.0	0.02	2.0	0.1	NEG													2.0	0.1	NEG			2.0	0.1	NEG		
VALVE—OIL SHUT-OFF	204-060-013	1	1.0	0.02																									
SOLENOID VALVE—IGNITER		1	0.75	0.5	0.8	0.8	0.2	NEG																					
SOLENOID VALVE—GOV BYPASS		1	1.0	30.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0
ACTUATOR—GOV RPM	204-060-762	1	0.9	1.0	0.9	0.9	0.4	0.1							0.9	0.9	0.4	NEG											
SOLENOID—IDLE STOP REL	204-060-775	1	6.5	0.03																NEG					NEG				
R—RADIO NAV & COMM																													
RADIO COMPASS (ADF)	AN/ARN-59	1	2.8	30.0	2.8	2.8	2.8	2.8		2.8	2.8	2.8	2.8		2.8	2.8	2.8	2.8		2.8	2.8	2.8	2.8		2.8	2.8	2.8	2.8	2.8
MARKER BEACON RCVR	R-1041/ARN	1	0.04	30.0	NEG					NEG					NEG					NEG					NEG				
VOR RECEIVER (VHF)	AN/ARN-30D	1	2.9	30.0	2.9	2.9	2.9	2.9		2.9	2.9	2.9	2.9		2.9	2.9	2.9	2.9		2.9	2.9	2.9	2.9		2.9	2.9	2.9	2.9	2.9
FM HOMING ADAPTER	AN/ARA-31	1	1.0												1.0	1.0	1.0	1.0											
FM AUXILIARY RCVR	AN/ARR-46 (POWER PROV)	1	0.14	30.0	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	0.1
FM TRANSCEIVER (RECEIVE)	AN/ARC-44	1	4.92	30.0	4.9	4.9	4.9	4.9		4.9	4.9	4.9	4.9		4.9	4.9	4.9	4.9		4.9	4.9	4.9	4.9		4.9	4.9	4.9	4.9	4.9
(ADDITIONAL POWER XMIT)			1.43							1.4	1.4	0.7	0.1							1.4	1.4	0.7	0.3		1.4	1.4	0.7	0.1	0.1
UHF TRANSCEIVER (RECEIVE)	AN/ARC-55B	1	17.0	30.0	17.0	17.0	17.0	17.0		17.0	17.0	17.0	17.0		17.0	17.0	17.0	17.0		17.0	17.0	17.0	17.0		17.0	17.0	17.0	17.0	17.0
(ADDITIONAL POWER XMIT)			3.0		3.0	3.0	1.5	0.3		3.0	3.0	1.5	0.3		3.0	3.0	1.5	0.3		3.0	3.0	1.5	0.6		3.0	3.0	1.5	0.3	0.3
VHF XMTR (STANDBY)	T-366/ARC	1	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5	1.5
RELAY—INTERCOM	M24139-5	2	0.09		0.2	0.2	0.1	NEG		0.2	0.2	0.1	NEG		0.2	0.2	0.1	NEG		0.2	0.2	0.1	NEG		0.2	0.2	0.1	NEG	
SIGNAL DISTRIBUTION PANEL	SB-329/AR	3	0.20	30.0	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6	0.6
SIGNAL DISTR PANEL—AUX	MX-1646/AIC	2	NEG																										
RELAY—AUX SIG DISTRIB PNL	COOK ELECTRIC 645-6105	1	0.15	30.0	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	0.1
S—RADAR																													
IFF TRANSPONDER	AN/APX-44 (POWER PROV)	1	4.5	30.0	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5
IFF ADAPTER	MARK XII (POWER PROV)	1	4.2	30.0	4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2	4.2
ALTIMETER	AN/APN-100 (POWER PROV)	1	3.0	30.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0
W—WARNING																													
FIRE DETECTION	EDISON 227-28-5	1	0.07	30.0	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	0.1
	TOTAL AVERAGE AMPERES				117.9	106.7	98.7	95.2		294.8	286.7	235.7	195.8		290.1	273.9	233.6	179.2		234.8	223.6	208.4	202.9		205.5	187.4	171.1	142.2	137.5

204099-30-2

Figure 1-4. UH-1B Helicopter power loading chart (Serial No. 62-1872 thru 62-12555) (Sheet 1 of 2)

A EQUIPMENT	B PART DESIGNATION	C TOTAL NO. OF UNITS	D OPERATING TIME - MIN.	ELECTRICAL REQUIREMENTS PER UNIT-E									F POWER FACTOR	G VOLTAGE REGULATION	H FREQUENCY RANGE	CONNECTED LOADS-I					
				115 VOLTS 3 PH.			115 VOLTS 1 PH.			28 VOLTS 1 PH.						PHASE A TO B		PHASE C TO A		PHASE B TO C	
				VA.	WATTS	VARS.	VA.	WATTS	VARS.	VA.	WATTS	VARS.				WATTS	VARS	WATTS	VARS	WATTS	VARS
INVERTER—MAIN	MS21983-1			250									.80 LAG	±2.2							
													.95 LEAD		390/410						
D—INSTRUMENTS																					
INDICATOR—XMSN OIL RRESSURE	AERNO 61-2476 TYPE MO-2	1	30.0							1.72	0.47	1.65	0.28	±10	360/440					0.47	1.65
TRANSMITTER—XMSN OIL PRESSURE	AERNO 61-2497 TYPE TRU-20/A	1	30.0							2.29	0.66	2.20	0.29	±10	360/440					0.66	2.20
E—ENGINE INSTRUMENTS																					
INDICATOR—ENGINE OIL PRESSURE	AERNO 61-2476 TYPE MO-2	1	30.0							1.72	0.47	1.65	0.28	±10	360/440					0.47	1.65
TRANSMITTER—ENGINE OIL PRESSURE	AERNO 61-2497 TYPE TRU-20/A	1	30.0							2.29	0.66	2.20	0.29	±10	360/440					0.66	2.20
INDICATOR—FUEL PRESSURE	AERNO 61-2461 (MS28010-1)	1	30.0							2.60	0.45	2.57	0.17	±10	360/440					0.45	2.57
TRANSMITTER—FUEL PRESSURE	AERNO 61-3008 (MS28005-1)	1	30.0							3.25	0.59	3.19	0.18	±10	360/440					0.59	3.19
INDICATOR—TORQUE PRESSURE	AERNO 61-2486 TYPE MO-3	1	30.0							1.72	0.47	1.65	0.28	±10	360/440					0.47	1.65
TRANSMITTER—TORQUE PRESSURE	AERNO 61-2487 TYPE MH-4	1	30.0							2.29	0.66	2.20	0.29	±10	360/440					0.66	2.20
FUEL QUANTITY—INDICATOR	204-060-683	1	30.0				3.50	3.50					1.0	±10	360/440	3.50					
FUEL QUANTITY—TANK UNIT	204-060-683	2	30.0																		
F—FLIGHT INSTRUMENTS																					
VERTICAL GYRO IND SYSTEM—PILOT: INDICATOR	LEAR 4005G	1	30.0				15.0	14.10	5.10				0.94	±10	380/420	14.10	5.10				
AMPLIFIER	LEAR 5404G	1	30.0																		
CONTROL GYRO	AERNO 60-5937 TYPE MD-1	1	30.0	25.00	23.50	8.50							0.94	±10	380/420	7.80	2.80	7.80	2.80	7.80	2.80
RATE GYRO	AERNO 60-5938 TYPE MC-1	1	30.0				4.80	4.50	1.60				0.94	±10	380/420	4.50	1.60				
ATTITUDE INDICATOR—CO-PILOTS	TYPE J-8 MIL-I-5133	1	30.0	9.00	7.70	4.70							0.85	±10	380/420	2.57	1.57	2.57	1.57	2.57	1.57
COMPASS SYSTEM TYPE J-2: AMPLIFIER	AERNO 60-1702 TYPE A-2	1	30.0																		
CONTROL GYRO	AERNO 60-1480 TYPE S-3A	1	30.0	27.70	25.56	8.08							0.92	±10	360/440	6.61	5.49	12.00	1.21	6.95	1.38
TRANSMITTER &	AERNO 60-1483 TYPE C-2	1	30.0																		
COMPENSATOR	AERNO 60-1479	1	30.0																		
PWR INTERLOCK RLY	LEAR 5819E	1	30.0	8.00	8.00								1.0	±10	360/440	4.00				4.00	
MASTER INDICATOR	SPERRY C-6H	1	30.0							22.50	5.30	21.90	0.24	±10	360/440					5.30	21.90
SERVO AMPLIFIER	SPERRY 1783867-1	1	30.0				17.40	14.80	9.20				0.85	±10	360/440					14.80	9.20
REPEATER INDICATOR	ID-250A/ARN	1	30.0							6.69	1.20	6.57	0.18	±10	360/440					1.20	6.57
M—MISCELLANEOUS																					
CAPACITOR—PF CORRECTION	CP53B1EE105K MIL-C-25	2	30.0				33.20		-33.20				0.0								-66.40
RESISTOR—LOAD BALANCING	RW20G911 MIL-R-26	1	30.0				14.50	14.50					1.0					14.50			
R—RADIO NAVIGATION																					
RMI CONVERTER	ARC TYPE B-18A	1	30.0							7.28	7.28		1.0							7.28	
X—AC POWER (WARNING)																					
AC FAILURE RELAY	TYPE D-1 AAF 32471	1	30.0				13.20	0.80	13.10				0.06	±10	360/440					0.80	13.10
															TOTALS	43.08	16.56	36.87	5.58	55.13	7.43
														TOTAL LOAD		138 VA @ 0.98 PF (LAG)					
INVERTER—SPARE	MS21983-1	1		250																	

NOTE—SPARE INVERTER LOADS ARE IDENTICAL TO MAIN INVERTER LOADS

204099-30-1

Figure 1-4. UH-1B Helicopter power loading chart (Serial No. 62-1872 thru 62-12555 (Sheet 2 of 2)

A EQUIPMENT	B PART DESIGNATION	C NUMBER OF UNITS	D AMPERES PER UNIT	E OPERATING TIME-MIN.	OPERATING CONDITIONS-F: START & WARM UP F-2					TAKE OFF F-4					CRUISE F-5					LAND F-7					EMERGENCY F-8				
						AVERAGE AMPS.					AVERAGE AMPS.					AVERAGE AMPS.					AVERAGE AMPS.					AVERAGE AMPS.			
					AMPS	0.5 MIN	2.0 MIN	15.0 MIN	MIN	AMPS	0.5 MIN	2.0 MIN	15.0 MIN	MIN	AMPS	0.5 MIN	2.0 MIN	30.0 MIN	MIN	AMPS	0.5 MIN	2.0 MIN	5.0 MIN	MIN	AMPS	0.5 MIN	2.0 MIN	30.0 MIN	60.0 MIN
A—ARMAMENT																													
MISSILE LAUNCHING SYS	SS-11	1	15.0																										
STABILIZATION SYSTEM	AN/ASW12	1	5.0																										
SIGHT	MARK VIII	1	5.0																										
ROCKET LAUNCHER SYS	XM-3	1	0.6																										
SIGHT	MARK VIII	1	5.0																										
MACHINE GUN SYS	XM-6	1	45.0												45.4	45.4	22.7	1.5											
FIRE CONTROL RELAY	MS25024-2	1	0.35																										
C—FLIGHT CONTROLS																													
MAGNETIC BRAKE—FORCE TRIM	AIRBORNE ACC R460M15	3	0.5	30.0	1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5	1.5
SOLENOID—HYD CONT	ADEL 52657	1	1.5																										
E—ENGINE INSTRUMENTS																													
XMSN OIL TEMPERATURE	AERNO 61-8842 (MS28009-2)	1	0.04	30.0																									
ENGINE OIL TEMPERATURE	AERNO 61-8833 (MS28009-1)	1	0.04	30.0	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	0.1
F—FLIGHT INSTRUMENTS																													
TURN & SLIP IND (TYPE MD-8)	AERNO 60-5704 (MS28024-3)	1	0.1	30.0	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	0.1
HEATER—PITOT TUBE	AERNO 60-9660 (AN5813-1)	1	4.0	30.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0
GYRO COMPASS	TYPE J-2	1	0.6	30.0	0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8		0.8	0.8	0.8	0.8	0.8
POWER INTERLOCK RLY	204-075-363	1	0.2	30.0																									
H—HEATING																													
PUMP—ROTOR DE-ICING	LEAR ROMEC P1632A (PROV ONLY)	1	2.1	30.0						2.1	2.1	2.1	2.1		2.1	2.1	2.1	2.1		2.1	2.1	2.1	2.1						
PUMP—WINDSHIELD DE-ICING	ADEL 20093 (PROV ONLY)	1	1.0	30.0						1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0						
SOLENOID VALVE—DE-ICING	RONSON 1-U-1025 (PROV ONLY)	1	1.2	30.0						1.2	1.2	1.2	1.2		1.2	1.2	1.2	1.2		1.2	1.2	1.2	1.2						
CABIN HEATER	JANITROL S-100	1	31.1	30.0						31.1	31.1	31.1	31.1		31.1	31.1	31.1	31.1		31.1	31.1	31.1	31.1		31.1	31.1	31.1	31.1	31.1
MOTOR—BLEED AIR VALVE	204-060-444	1	2.0	0.2	2.0	0.8	0.2	NEG												2.0	0.8	0.2	0.1						
ICE DETECTOR SYS—ENG	COOK ELEC 575-758 & 667-20	1 EA	11.0		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9	2.9
DEFROST/AFT OUTLET VALVE	LELAND A38153-001	2	3.1	0.05	6.2	0.6	NEG	NEG												6.2	0.6	NEG	NEG						
HEATED BLANKET OUTLET	HUBBELL 7540	2	10.0	30.0						20.0	20.0	20.0	20.0		20.0	20.0	20.0	20.0		20.0	20.0	20.0	20.0						
J—ENGINE IGNITION SYS		1	1.5	0.5	1.5	1.5	0.4	NEG																					
K—ENGINE CONTROLS																													
STARTER—GENERATOR	AERNO 42-7031 TYPE STU-6/A	1																											
RELAY—STARTER	MS24172-D1	1	4.5	0.5	4.5	4.5	1.1	0.2																					
L—LIGHTING																													
DOME LIGHT—RED	MS25235R311 LAMP	3	1.28		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6	2.6
COCKPIT LIGHT	MS25231-313 LAMP	2	0.17		0.3	0.3	0.2	NEG		0.3	0.3	0.2	NEG		0.3	0.3	0.2	NEG							0.3	0.3	0.2	NEG	NEG
INSTRUMENT & EDGE LTS	MS25237-327 LAMP	131	0.04	30.0	5.2	5.2	5.2	5.2		5.2	5.2	5.2	5.2		5.2	5.2	5.2	5.2		5.2	5.2	5.2	5.2		5.2	5.2	5.2	5.2	5.2
INSTRUMENT SECONDARY LTS	MS25069-1495 LAMP	4	0.34																										
FUS LIGHTS—TOP & BOTTOM	AN3120-1047 LAMP	3	2.7	30.0																									
FUS LIGHTS—SIDE	ASA 7512 LAMP	4	0.83	30.0	12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6	12.6
FUS LIGHTS—TAIL	MS25232-1683 LAMP	1	1.15	30.0																									
FLASHER—FUS LIGHTS	SEABOARD ELECTRIC 3295	1	0.4																										
MASTER CAUTION PNL	204-075-705	1	0.2	30.0	0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2		0.3	0.3	0.3	0.3	0.3
SEARCH LIGHT	TYPE MA-3 MIL-L-26998	1	17.0	5.0											17.0	17.0	17.0	17.0		17.0	17.0	17.0	17.0						
LANDING LIGHT	GRIMES G8385-1	1	16.5	5.0																16.5	16.5	16.5	16.5		16.5	16.5	16.5	2.8	1.4
ANTI-COLLISION LIGHT	GRIMES G8400A-8-24	1	3.0	30.0						3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0
M—MISCELLANEOUS																													
WINDSHIELD WIPER	204-090-907	1	3.5	30.0						3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5
SOLENOID—CARGO HOOK REL	EASTERNROTORCRAFT SP4100-3	1	10.0	0.1											10.2	2.1	0.5	NEG							10.2	2.1	0.5	NEG	
RELAY—CARGO HOOK REL	MS24149D1	1	0.2	0.1																									
P—POWER																													
BATTERY CHARGING	BB433A 34 AMP HR	1								129.6	129.6	81.0	43.2		97.2	97.2	60.7	22.9		32.4	32.4	20.2	16.2		32.4	32.4	20.2	7.6	4.3
RELAY—BATTERY	MS24171-D1	1	0.6	30.0	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6	0.6
RELAY—NON ESSENTIAL BUS	MS24171-D1	1	0.6	30.0	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6						
RELAY—BUS CONTROL	MS25024-2	1	0.35	30.0	0.4	0.4	0.4	0.4		0.4	0.4	0.4	0.4		0.4	0.4	0.4	0.4		0.4	0.4	0.4	0.4						
INVERTER—MAIN	PU-543/A	1	15.1	30.0																									
INVERTER—SPARE	PU-543/A	1	15.1		15.3	15.3	15.3	15.3		15.3	15.3	15.3	15.3		15.3	15.3	15.3	15.3		15.3	15.3	15.3	15.3		15.3	15.3	15.3	15.3	15.3
RELAY—INVERTER POWER	MS24166-D1	2	0.35																										
Q—FUEL AND OIL																													
PUMP—FUEL BOOST	204-060-627	2	4.75	30.0	9.5	9.5	9.5	9.5		9.5	9.5	9.5	9.5		9.5	9.5	9.5	9.5		9.5	9.5	9.5	9.5		9.5	9.5	9.5	9.5	9.5
PUMP—FUEL TRANS (FERRY)	204-060-627	1	4.75	30.0																									
VALVE—FUEL SHUT OFF	204-060-013	1	1.0	0.02	2.0	0.1	NEG													2.0	0.1	NEG			2.0	0.1	NEG		
VALVE—OIL SHUT OFF	204-060-013	1	1.0	0.02																									
SOLENOID VALVE—IGNITER		1	0.75	0.5	0.8	0.8	0.2	NEG																					
SOLENOID VALVE—GOV BYPASS		1	1.0	30.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0
ACTUATOR—GOV RPM	204-060-762	1	0.9	1.0	0.9	0.9	0.4	0.1							0.9	0.9	0.4	NEG											
SOLENOID—IDLE STOP REL	204-060-775	1	6.5	0.03																NEG					NEG				
PUMP—FUEL TRANS—(EXTERNAL)	LEAR RG8160-2F	2	3.7																										
	SHEET TOTAL—AVERAGE AMPERES				83.7	66.9	59.9	57.7		257.3	249.2	200.5	162.5		298.4	282.2	220.8	146.5		203.5	186.7	171.4	169.1		166.3	145.5	131.5	104.5	99.8

204099-31-1

Figure 1-5. UH-1B Helicopter power loading chart (Serial No. 63-8500 thru 63-12952) (Sheet 1 of 2)

A EQUIPMENT	B PART DESIGNATION	C NUMBER OF UNITS	D AMPERES PER UNIT	E OPERATING TIME-MIN.	OPERATING CONDITIONS-F									
					START & WARM UP F-2					TAKE OFF F-4				
					AMPS	AVERAGE AMPS.				AMPS	AVERAGE AMPS.			
						0.5 MIN	2.0 MIN	15.0 MIN	MIN		0.5 MIN	2.0 MIN	15.0 MIN	MIN
R—RADIO NAV & COMM														
RADIO COMPASS	AN/ARN-59	1	2.8	30.0	2.8	2.8	2.8	2.8		2.8	2.8	2.8	2.8	
MARKER BEACON RCVR	R-1041/ARN	1	0.04	30.0	NEG					NEG				
VOR RECEIVER (VHF)	AN/ARN-30E	1	2.9	30.0	2.9	2.9	2.9	2.9		2.9	2.9	2.9	2.9	
FM HOMING ADAPTER	AN/ARA-31	1	1.0											
FM AUXILIARY RCVR	AN/ARR-49 (PROV ONLY)	1	2.0	30.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0	
FM TRANSCEIVER (REC)	AN/ARC-44		4.92	30.0	4.9	4.9	4.9	4.9		4.9	4.9	4.9	4.9	
(ADDITIONAL PWR XMIT)			1.43							1.4	1.4	0.7	0.1	
FM TRANSCVR PWR RLY	MS24149D1	1	0.25	30.0	0.3	0.3	0.3	0.3		0.3	0.3	0.3	0.3	
INTERCOM RELAY	C2A-126 (HI-G INC)	2	0.02		NEG					NEG				
VHF XMTR (STANDBY)	T366/ARC	1	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5	
VHF TRANSCEIVER (REC)	AN/ARC-73	1	2.0	30.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0	
(ADDITIONAL PWR XMIT)			6.5		6.5	6.5	3.3	0.7		6.5	6.5	3.3	0.7	
UHF TRANSCEIVER (REC)	AN/ARC-51X													
(ADDITIONAL PWR XMIT)														
VHF TRANSCEIVER PWR RLY	MS24149D1	1	0.25	30.0	0.3	0.3	0.3	0.3		0.3	0.3	0.3	0.3	
SIGNAL DISTRIBUTION PNL	C-1611/AIC	3	0.2	30.0	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6	
S—RADAR														
IFF TRANSPONDER	AN/APX-44	1	4.5	30.0	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	
IFF ADAPTER	MARK-XII (PROV ONLY)	1	4.2	30.0	4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2	
RADAR ALTIMETER	AN/APN-100 (PROV ONLY)	1	3.0	30.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	
W—WARNING														
FIRE DETECTION—ENG	EDISON 227-28-5	1	0.07	30.0	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	
RPM LIMIT	205-074-001-1	1	0.5	30.0	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	
	SHEET TOTAL—AVERAGE AMPERES				3.61	3.61	32.9	30.3		37.5	37.5	33.6	30.4	
	TOTALS FROM SHEET 1				79.2	68.0	57.0	53.4		252.8	244.7	196.0	158.0	
	TOTAL—AVERAGE AMPERES				115.3	104.1	89.9	83.7		290.3	282.2	229.6	188.4	

A EQUIPMENT	CRUISE F-5					LAND F-7					EMERGENCY F-8				
	AMPS	AVERAGE AMPS.				AMPS	AVERAGE AMPS.				AMPS	AVERAGE AMPS.			
		0.5 MIN	2.0 MIN	30.0 MIN	MIN		0.5 MIN	2.0 MIN	5.0 MIN	MIN		0.5 MIN	2.0 MIN	30.0 MIN	60.0 MIN
R—RADIO NAV & COMM															
RADIO COMPASS	2.8	2.8	2.8	2.8		2.8	2.8	2.8	2.8		2.8	2.8	2.8	2.8	2.8
MARKER BEACON RCVR	NEG					NEG					NEG				
VOR RECEIVER (VHF)	2.9	2.9	2.9	2.9		2.9	2.9	2.9	2.9		2.9	2.9	2.9	2.9	2.9
FM HOMING ADAPTER	1.0	1.0	1.0	1.0											
FM AUXILIARY RCVR	2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0
FM TRANSCEIVER (REC)	4.9	4.9	4.9	4.9		4.9	4.9	4.9	4.9		4.9	4.9	4.9	4.9	4.9
(ADDITIONAL PWR XMIT)						1.4	1.4	0.7	0.3		1.4	1.4	0.7	0.1	0.1
FM TRANSCVR PWR RLY	0.3	0.3	0.3	0.3		0.3	0.3	0.3	0.3		0.3	0.3	0.3	0.3	0.3
INTERCOM RELAY	NEG					NEG					NEG				
VHF XMTR (STANDBY)	1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5	1.5
VHF TRANSCEIVER (REC)	2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0
(ADDITIONAL PWR XMIT)	6.5	6.5	3.3	0.7		6.5	6.5	3.3	0.7		6.5	6.5	3.3	0.7	0.7
UHF TRANSCEIVER (REC)															
(ADDITIONAL PWR XMIT)															
VHF TRANSCEIVER PWR RLY	0.3	0.3	0.3	0.3		0.3	0.3	0.3	0.3		0.3	0.3	0.3	0.3	0.3
SIGNAL DISTRIBUTION PNL	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6	0.6
S—RADAR															
IFF TRANSPONDER	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5
IFF ADAPTER	4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2	4.2
RADAR ALTIMETER	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0
W—WARNING															
FIRE DETECTION—ENG	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	0.1
RPM LIMIT	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5
SHEET TOTAL—AVERAGE AMPERES	37.1	37.1	33.9	31.3		37.5	37.5	33.6	31.6		37.5	37.5	33.6	30.4	30.4
TOTALS FROM SHEET 1	293.9	277.7	216.3	142.0		199.0	187.8	168.5	165.2		161.8	141.0	127.0	100.0	95.3
TOTAL—AVERAGE AMPERES	331.0	314.8	250.2	173.3		236.5	225.3	202.1	196.8		199.3	178.5	160.6	130.4	125.7

204099-31-2

Figure 1-5. UH-1B Helicopter power loading chart (Serial No. 63-8500 thru 63-12952) (Sheet 2 of 2)

A EQUIPMENT	B PART DESIGNATION	C NUMBER OF UNITS	D AMPERES PER UNIT	E OPERATING TIME - MIN.	OPERATING CONDITIONS-F: START & WARM UP F-2					TAKE OFF F-4					CRUISE F-5					LAND F-7					EMERGENCY F-8				
					AMPS	AVERAGE AMPS. 0.5 MIN	2.0 MIN	15.0 MIN	MIN	AMPS	AVERAGE AMPS. 0.5 MIN	2.0 MIN	15.0 MIN	MIN	AMPS	AVERAGE AMPS. 0.5 MIN	2.0 MIN	30.0 MIN	MIN	AMPS	AVERAGE AMPS. 0.5 MIN	2.0 MIN	5.0 MIN	MIN	AMPS	AVERAGE AMPS. 0.5 MIN	2.0 MIN	30.0 MIN	60.0 MIN
A—ARMAMENT																													
MISSILE LAUNCHING SYS	SS-11	1	15.0																										
STABILIZATION SYSTEM	AN/ASW12	1	5.0																										
SIGHT	MARK VIII	1	5.0																										
ROCKET LAUNCH SYS	XM-3	1	0.6																										
SIGHT	MARK VIII	1	5.0																										
MACHINE GUN SYSTEM	XM-6	1	45.0												45.4	45.4	22.7	1.5											
FIRE CONTROL REL.	MS25024-2	1	0.35																										
C—FLIGHT CONTROLS																													
MAGNETIC BRAKE—FORCE TRIM	AIRBORNE ACC R460M15	3	0.5	30.0	1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5	1.5
SOLENOID—HYD CONT	ADEL 52657	1	1.5																										
E—ENGINE INSTRUMENTS																													
XMSN—OIL TEMPERATURE	AERNO 61-8842 (MS28009-2)	1	0.04	30.0																									
ENGINE OIL TEMPERATURE	AERNO 61-8833 (MS28009-1	1	0.04	30.0	0.1	0.1	01	0.1		0.1	0.1	01	0.1		0.1	0.1	01	0.1		0.1	0.1	01	0.1		0.1	0.1	0.1	0.1	0.1
F—FLIGHT INSTRUMENTS																													
TURN & SLIP IND (TYPE MD-8)	AERNO 60-5704 (MS28024-3)	1	0.1	30.0																									
HEATER—PITOT TUBE	AERNO 60-9660 (AN5813-1)	1	4.0	30.0	4.9	4.9	4.9	4.9		4.9	4.9	4.9	4.9		4.9	4.9	4.9	4.9		4.9	4.9	4.9	4.9		4.9	4.9	4.9	4.9	4.9
GYRO COMPASS	TYPE J-2	1	0.6	30.0																									
POWER INTERLOCK RELAY	204-075-363	1	0.2	30.0																									
H—HEATING																													
PUMP—ROTOR DE-ICING	LEAR ROMEC P1632A (PROV ONLY)	1	2.1	30.0																									
PUMP—WINDSHIELD DE-ICING	ADEL 20093 (PROV ONLY)	1	1.0	30.0						4.3	4.3	4.3	4.3		4.3	4.3	4.3	4.3		4.3	4.3	4.3	4.3						
SOLENOID VALVE—DE-ICING	RONSON I-U-1025 (PROV ONLY)	1	1.2	30.0																									
CABIN HEATER	JANITROL S-100	1	31.1	30.0						31.1	31.1	31.1	31.1		31.1	31.1	31.1	31.1		31.1	31.1	31.1	31.1		31.1	31.1	31.1	31.1	31.1
MOTOR—BLEED AIR VALVE	204-060-444	1	2.0	0.2	2.0	0.8	0.2	NEG												2.0	0.8	0.2	0.1						
ICE DETECTOR SYS—ENGINE	COOK ELECT 575-758 & 667-20	1 EA	11.0		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9	2.9
DEFROST/AFT OUTLET VALVE	LELAND A38153-001	2	3.1	0.05	6.2	0.6	NEG	NEG												6.2	0.6	NEG	NEG						
HEATER BLANKET OUTLET	HUBBELL 7540	2	10.0	30.0						20.0	20.0	20.0	20.0		20.0	20.0	20.0	20.0		20.0	20.0	20.0	20.0						
J—ENGINE IGNITION SYS		1	1.5	0.5	1.5	1.5	0.4	NEG																					
K—ENGINE CONTROLS																													
STARTER—GENERATOR	AERNO 42-7031 TYPE STU-6/A	1																											
RELAY—STARTER	MS24172-D1	1	4.5	0.5	4.5	4.5	1.1	0.2																					
L—LIGHTING																													
DOME LIGHT—RED	MS25235R311 LAMP	3	1.28		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6	2.6
COCKPIT LIGHT	MS25231-313 LAMP	2	0.17		0.3	0.3	0.2	NEG		0.3	0.3	0.2	NEG		0.3	0.3	0.2	NEG							0.3	0.3	0.2	NEG	NEG
INSTRUMENTS & EDGE LTS	MS25237-327 LAMP	131	0.04	30.0	5.2	5.2	5.2	5.2		5.2	5.2	5.2	5.2		5.2	5.2	5.2	5.2		5.2	5.2	5.2	5.2		5.2	5.2	5.2	5.2	5.2
INSTRUMENTS SEC LTS	MS25069-1495 LAMP	4	0.34																										
FUS. LIGHTS—TOP & BOTTOM	AN3120-1047 LAMP	3	2.7	30.0																									
FUS. LIGHTS—TAIL	MS25232-1683 LAMP	1	1.15	30.0	12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6	12.6
FUS LIGHTS—SIDE	ASA 7512 LAMP	4	0.83	30.0																									
MASTER CAUTION PANEL	204-075-705	1	0.2	30.0	0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2		0.3	0.3	0.3	0.3	0.3
SEARCH LIGHT	TYPE MA-3 (MIL-L-26998)	1	17.0	5.0											17.0	17.0	17.0	2.8		17.0	17.0	17.0	17.0						
LANDING LIGHT	GRIMES G8385-1	1	16.5	5.0																16.5	16.5	16.5	16.5		16.5	16.5	16.5	2.8	1.4
ANTI-COLLISION LIGHT	GRIMES G8400A-8-24	1	3.0	30.0						3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0
FLASHER—FUS LIGHT	TYPE C-2 (MIL-F-7414)	1	0.4																										
M—MISCELLANEOUS																													
WINDSHIELD WIPER	204-070-907	2	3.5	30.0						7.0	7.0	7.0	7.0		7.0	7.0	7.0	7.0		7.0	7.0	7.0	7.0		7.0	7.0	7.0	7.0	7.0
SOLENOID—CARGO HOOK REL	EASTERN ROTORCRAFT SP4100-3	1	10.0	0.1											10.2	2.1	0.5	NEG							10.2	2.1	0.5	NEG	NEG
RELAY—CARGO HOOK REL	MS24149D1	1	0.2	0.1																									
P—POWER																													
BATTERY CHARGING	BB433A 34 AMP HR	1								129.6	129.6	81.0	43.2		97.2	97.2	60.7	22.9		32.4	32.4	20.2	16.2		32.4	32.4	20.2	7.6	4.3
RELAY—BATTERY	MS24171-D1	1	0.6	30.0	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6	0.6
REL—NON ESSENTIAL BUS	MS24171-D1	1	0.6	30.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0						
RELAY—BUS CONTROL	MS25024-2	1	0.35	30.0																									
INVERTER—MAIN	PU-543/A	1	51.1	30.0																									
INVERTER—SPARE	PU-543/A	1	15.1		15.5	15.5	15.5	15.5		15.5	15.5	15.5	15.5		15.5	15.5	15.5	15.5		15.5	15.5	15.5	15.5		15.5	15.5	15.5	15.5	15.5
RELAY—INVERTER POWER	MS24166-D1	2	0.35																										
Q—FUEL AND OIL																													
PUMP—FUEL BOOST	204-060-627	2	4.75	30.0	9.5	9.5	9.5	9.5		9.5	9.5	9.5	9.5		9.5	9.5	9.5	9.5		9.5	9.5	9.5	9.5		9.5	9.5	9.5	9.5	9.5
PUMP—FUEL TRANS (FERRY)	204-060-627	1	4.75	30.0																									
VALVE—FUEL SHUT OFF	204-060-013	1	1.0	0.02	2.0	0.1	NEG													2.0	0.1	NEG			2.0	0.1	NEG		
VALVE—OIL SHUT OFF	204-060-013	1	1.0	0.02																									
SOLENOID VALVE—IGNITER		1	0.75	0.5	0.8	0.8	0.2	NEG																					
SOLENOID VALVE—GOV BYPASS		1	1.0	30.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0
ACTUATOR—GOV RPM	204-060-762	1	0.9	1.0	0.9	0.9	0.4	0.1							0.9	0.9	0.4	NEG											
SOLENOID—IDLE STOP REL	204-060-775	1	6.5	0.03																NEG					NEG				
PUMP—FUEL TRANS—(EXT)	LEAR RG8160-2F	2	3.7																										
	PAGE 1 TOTAL—AVERAGE AMPERES				83.9	67.1	60.1	57.9		261.0	252.9	204.2	166.2		302.1	284.9	224.5	150.2		207.2	190.4	175.1	172.8		170.0	149.2	135.2	108.2	103.5

_4099-29-2

Figure 1-6. UH-1B Helicopter power loading chart (Serial No. 64-13902 thru 64-14191) (Sheet 1 of 3)

A EQUIPMENT	B PART DESIGNATION	C NUMBER OF UNITS	D AMPERES PER UNIT	E OPERATING TIME - MIN.	OPERATING CONDITIONS-F: START & WARM UP F-2 AMPS	START & WARM UP F-2 AVERAGE AMPS. 0.5 MIN	2.0 MIN	15.0 MIN	MIN	TAKE OFF F-4 AMPS	TAKE OFF F-4 AVERAGE AMPS. 0.5 MIN	2.0 MIN	15.0 MIN	MIN
R—RADIO NAV & COMM														
RADIO COMPASS	AN/ARN-59	1	2.8	30.0	2.8	2.8	2.8	2.8		2.8	2.8	2.8	2.8	
MARKER BEACON RCVR	R-1041/ARN	1	0.04	30.0	NEG					NEG				
VOR RECEIVER (VHF)	AN/ARN-30E	1	2.9	30.0	2.9	2.9	2.9	2.9		2.9	2.9	2.9	2.9	
FM TRANSCEIVER (RCVR)	AN/ARC-54	1	3.3	30.0	3.3	3.3	3.3	3.3		3.3	3.3	3.3	3.3	
(ADDITIONAL PWR XMIT)			4.2		4.2	4.2	2.1	0.4		4.2	4.2	2.1	0.4	
UHF TRANSCEIVER (RCVR)	AN/ARC-51X	1	5.8	30.0	5.8	5.8	5.8	5.8		5.8	5.8	5.8	5.8	
(ADDITIONAL PWR XMIT)			3.8		3.8	3.8	1.9	0.4		3.8	3.8	1.9	0.4	
VHF TRANSCEIVER (RCVR)	AN/ARC-73	1	2.0	30.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0	
(ADDITIONAL PWR XMIT)			6.5		6.5	6.5	3.3	0.7		6.5	6.5	3.3	0.7	
HF TRANSCEIVER (RCVR)	AN/ARC-102	1	7.5	30.0	7.5	7.5	7.5	7.5		7.5	7.5	7.5	7.5	
(ADDITIONAL PWR XMIT)			31.6		31.6	31.6	15.8	3.2		31.6	31.6	15.8	3.2	
SIGNAL DISTRIBUTION PNL	C-1611/AIC	3	0.2	30.0	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6	
VHF TRANSCEIVER PWR RLY	MS24149D1	1	0.25	30.0	0.3	0.3	0.3	0.3		0.3	0.3	0.3	0.3	
FM RECEIVER	AN/ARR-49(PROV ONLY)	1	.26	30.0	0.3	0.3	0.3	0.3		0.3	0.3	0.3	0.3	
S—RADAR														
IFF TRANSPONDER	AN/APX-44	1	4.5	30.0	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	
IFF ADAPTER	MARK XII (PROV ONLY)	1	4.2	30.0	4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2	
RADAR ALTIMETER	AN/APN-100 (PROV ONLY)	1	3.0	30.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	
W—WARNING														
FIRE DETECTION—ENGINE	EDISON 227-28-5	1	0.07	30.0	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	
RPM LIMIT	205-074-001-1	1	0.5	30.0	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	
	PAGE 2 TOTAL—AVERAGE AMPERES				43.8	43.8	39.8	36.6		43.8	43.8	39.8	36.6	
	TOTALS FROM PAGE 1				83.9	67.1	60.1	57.9		261.0	252.9	204.2	166.2	
	TOTAL—AVERAGE AMPERES				127.7	110.9	99.9	94.5		304.8	296.7	244.0	202.8	

A EQUIPMENT	CRUISE F-5 AMPS	CRUISE F-5 AVERAGE AMPS. 0.5 MIN	2.0 MIN	30.0 MIN	MIN	LAND F-7 AMPS	LAND F-7 AVERAGE AMPS. 0.5 MIN	2.0 MIN	5.0 MIN	MIN	EMERGENCY F-8 AMPS	EMERGENCY F-8 AVERAGE AMPS. 0.5 MIN	2.0 MIN	30.0 MIN	60.0 MIN
R—RADIO NAV & COMM															
RADIO COMPASS	2.8	2.8	2.8	2.8		2.8	2.8	2.8	2.8		2.8	2.8	2.8	2.8	2.8
MARKER BEACON RCVR	NEG					NEG					NEG				
VOR RECEIVER (VHF)	2.9	2.9	2.9	2.9		2.9	2.9	2.9	2.9		2.9	2.9	2.9	2.9	2.9
FM TRANSCEIVER (RCVR)	3.3	3.3	3.3	3.3		3.3	3.3	3.3	3.3		3.3	3.3	3.3	3.3	3.3
(ADDITIONAL PWR XMIT)	4.2	4.2	2.1	0.4		4.2	4.2	2.1	0.8		4.2	4.2	2.1	0.4	0.4
UHF TRANSCEIVER (RCVR)	5.8	5.8	5.8	5.8		5.8	5.8	5.8	5.8		5.8	5.8	5.8	5.8	5.8
(ADDITIONAL PWR XMIT)	3.8	3.8	1.9	0.4		3.8	3.8	1.9	0.8		3.8	3.8	1.9	0.4	0.4
VHF TRANSCEIVER (RCVR)	2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0
(ADDITIONAL PWR XMIT)	6.5	6.5	3.3	0.7		6.5	6.5	3.3	1.3		6.5	6.5	3.3	0.7	0.7
HF TRANSCEIVER (RCVR)	7.5	7.5	7.5	7.5		7.5	7.5	7.5	7.5		7.5	7.5	7.5	7.5	7.5
(ADDITIONAL PWR XMIT)	31.6	31.6	15.8	3.2		31.6	31.6	15.8	6.3		31.6	31.6	15.8	3.2	3.2
SIGNAL DISTRIBUTION PNL	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6	0.6
VHF TRANSCEIVER PWR RLY	0.3	0.3	0.3	0.3		0.3	0.3	0.3	0.3		0.3	0.3	0.3	0.3	0.3
FM RECEIVER	0.3	0.3	0.3	0.3		0.3	0.3	0.3	0.3		0.3	0.3	0.3	0.3	0.3
S—RADAR															
IFF TRANSPONDER	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5
IFF ADAPTER	4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2		4.2	4.2	4.2	4.2	4.2
RADAR ALTIMETER	3.0	3.0	3.0	3.0		3.0									
W—WARNING															
FIRE DETECTION—ENGINE	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	0.1
RPM LIMIT	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5
PAGE 2 TOTAL—AVERAGE AMPERES	43.8	43.8	39.8	36.6		43.8	43.8	39.8	37.4		43.8	43.8	39.8	36.6	36.6
TOTALS FROM PAGE 1	302.1	284.9	224.5	150.2		207.2	190.4	175.1	172.8		170.0	149.2	135.2	108.2	103.5
TOTAL—AVERAGE AMPERES	345.9	328.7	264.3	186.8		251.0	234.2	214.9	210.2		213.8	193.0	175.0	144.8	140.1

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Figure 1-6. UH-1B Helicopter power loading chart (Serial No. 64-13902 thru 64-14191) (Sheet 2 of 3)

A EQUIPMENT	B PART DESIGN	C TOTAL NO. OF UNITS	D OPERATING TIME - MIN.	ELECTRICAL REQUIREMENTS PER UNIT-E: 115 VOLTS 3 PH. VA.	115 VOLTS 3 PH. WATTS	115 VOLTS 3 PH. VARS.	115 VOLTS 1 PH. VA.	115 VOLTS 1 PH. WATTS	115 VOLTS 1 PH. VARS.	28 VOLTS 1 PH. VA.	28 VOLTS 1 PH. WATTS	28 VOLTS 1 PH. VARS.	F POWER FACTORS	G VOLTAGE REGULATION	H FREQUENCY RANGE	CONNECTED LOADS-I: PHASE A TO B WATTS	PHASE A TO B VARS	PHASE C TO A WATTS	PHASE C TO A VARS	PHASE B TO C WATTS	PHASE B TO C VARS
INVERTER—MAIN	PU-543/A			250									.80 LAG	±	390/410						
A—ARMAMENT													.95 LEAD								
ASW-12																					
ELECTRO MECH ACTUATOR	TG 78 ( )/ASW-12(V)	1	30.0				5.1	3.57	3.65				0.7	±10	360/440	3.57	3.65				
ATTITUDE REF CONTROL	C-3108 ( )/ASW-12(V)	1	30.0				13.6	9.52	9.70				0.7	±10	360/440	9.52	9.70				
ACCELEROMETER	MIX-2916 ( )/ASW-12(V)	2	30.0				6.0	4.2	4.29				0.7	±10	360/440	8.40	8.58				
CONT PNL (DIRECTIONAL)	SB1453 ( )/ASW-12(V)	1	30.0				5.0	3.5	3.58				0.7	±10	360/440	3.50	3.58				
D—INSTRUMENTS																					
INDICATOR—XMSN OIL PRESS	AERNO 61-2476 TYPE MO-2	1	30.0							1.72	0.47	1.65	0.28	±10	360/440					0.47	1.65
TRANSMITTER—XMSN OIL PRESS	AERNO 61-2497 TYPE TRU-20/A	1	30.0							2.29	0.66	2.20	0.29	±10	360/440					0.66	2.20
E—ENGINE INSTRUMENTS																					
INDICATOR—FUEL PRESSURE	AERNO 61-2461 (MS28010-1)	1	30.0							2.60	0.45	2.57	0.17	±10	360/440					0.45	2.57
TRANSMITTER—FUEL PRESSURE	AERNO 61-3008 (MS28005-1)	1	30.0							3.25	0.59	3.19	0.18	±10	360/440					0.59	3.19
INDICATOR—TORQUE PRESSURE	AERNO 61-2486 TYPE MO-3	1	30.0							1.72	0.47	1.65	0.28	±10	360/440					0.47	1.65
TRANSMITTER—TORQUE PRESSURE	AERNO 61-2487 TYPE MH-4	1	30.0							2.29	0.66	2.20	0.29	±10	360/440					0.66	2.20
INDICATOR—FUEL QUANTITY	205-061-633	1	30.0				3.50	3.50					1.0	±10	360/440	3.50					
TANK UNIT—FUEL QUANTITY	205-061-633	3	30.0																		
INDICATOR—ENG. OIL PRESSURE	AERNO 61-2476 TYPE MO-2	1	30.0							1.72	0.47	1.65	0.28	±10	360/440					0.47	1.65
TRANSMITTER ENG OIL PRESS	AERNO 61-2497 TYPE TRU-20/A	1	30.0							2.29	0.66	2.20	0.29	±10	360/440					0.66	2.20
F—FLIGHT INSTRUMENTS																					
ATTITUDE IND SYS—PILOT: INDICATOR	LEAR 4005G	1	30.0				15.00	14.10	5.10				0.94	±10	380/420	14.10	5.10				
AMPLIFIER	LEAR 5404G	1	30.0																		
CONTROL GYRO	AERNO 60-5937 TYPE MD-1	1	30.0	25.00	23.50	8.50							0.94	±10	380/420	7.80	2.80	7.80	2.80	7.80	2.80
RATE GYRO	AERNO 60-5938 TYPE MC-1	1	30.0				4.80	4.50	1.60				0.94	±10	380/420	4.50	1.60				
ATTITUDE INDICATOR—COPILOT	MIL-I-5133 TYPE J-8	1	30.0	9.00	7.70	4.70							0.85	±10	380/420	2.57	1.57	2.57	1.57	2.57	1.57
COMPASS SYS TYPE J-2: AMPLIFIER	AERNO 60-1702 TYPE A-2	1	30.0																		
CONTROL GYRO	AERNO 60-1480 TYPE S-3A	1	30.0	27.70	25.56	8.08							0.92	±10	360/440	6.61	5.49	12.00	1.21	6.95	1.38
TRANSMITTER &	AERNO 60-1483 TYPE C-2	1	30.0																		
COMPENSATOR	AERNO 60-1479	1	30.0																		
PWR INTERLOCK RLY	204-075-363-3	1	30.0	1.60	0.80	-1.39								±10	360/440	0.40	—0.69			0.40	—0.69
MASTER INDICATOR	SPERRY C-6H	1	30.0							22.50	5.30	21.90	0.24	±10	360/440					5.30	21.90
SERVO AMPLIFIER	SPERRY 1783867-1	1	30.0				17.40	14.80	9.20				0.85	±10	360/440					14.80	9.20
REPEATER INDICATOR	ID-250A/ARN	1	30.0							6.69	1.20	6.57	0.18	±10	360/440					1.20	6.57
M—MISCELLANEOUS																					
CAPACITOR—PF CORRECTION	CP53B1EF105K MIL-C-25	2	30.0				33.20		-33.20				0								-66.40
RESISTOR—LOAD BALANCING	RW20G911 MIL-R-26	1	30.0				14.50	14.50					1.0					14.50			
R—RADIO NAVIGATION																					
RMI CONVERTER	ARC TYPE B-18A	1	30.0							7.28	7.28		1.0							7.28	
X—AC POWER (WARNING)																					
AC FAILURE RELAY	AAF 32471 TYPE D1	1	30.0				13.20	0.80	13.10				0.06	±10	360/440					0.80	13.10
														TOTALS		64.47	36.38	36.87	6.58	51.53	6.74
														TOTAL LOAD		161 VA @ .95 PF (LAG)					
INVERTER—SPARE	PU-543/A	1		2.50																	

NOTE: SPARE INVERTER LOADS ARE IDENTICAL TO MAIN INVERTER LOADS

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Figure 1-6. UH-1B Helicopter power loading chart (Serial No. 64-13902 thru 64-14191) (Sheet 3 of 3)

A EQUIPMENT	B PART DESIGNATION	C NUMBER OF UNITS	D AMPERES PER UNIT	E OPERATING TIME-MIN.	OPERATING CONDITIONS-F: START & WARM UP F-2 AMPS	F-2 AVERAGE AMPS. 0.5 MIN.	F-2 2.0 MIN.	F-2 15.0 MIN.	F-2 MIN.	TAKE OFF F-4 AMPS	F-4 AVERAGE AMPS. 0.5 MIN.	F-4 2.0 MIN.	F-4 15.0 MIN.	F-4 MIN.	CRUISE F-5 AMPS	F-5 AVERAGE AMPS. 0.5 MIN.	F-5 2.0 MIN.	F-5 5.0 MIN.	F-5 MIN.	LAND F-7 AMPS	F-7 AVERAGE AMPS. 0.5 MIN.	F-7 2.0 MIN.	F-7 5.0 MIN.	F-7 MIN.	EMERGENCY F-8 AMPS	F-8 AVERAGE AMPS. 0.5 MIN.	F-8 2.0 MIN.	F-8 30.0 MIN.	F-8 60.0 MIN.
A—ARMAMENT		1	5.0																										
MISSILE LAUNCHING SYS.	XM22 (SS-11)	1	5.0																										
STABILIZATION SYSTEM	AN/ASW12	1	5.0																										
SIGHT	MARK VIII	1	0.6																										
ROCKET LAUNCH SYS.	XM-3	1	45.0																										
SIGHT	MARK VIII	1	15.0												45.4	45.4	22.7	1.5											
MACHINE GUN SYSTEM	M6 OR M16	1	0.35																										
FIRE CONTROL REL.	MS25024-2																												
C—FLIGHT CONTROLS -																													
MAGNETIC BRAKE—FORCE TRIM	AIRBORNE ACC R460M15	3	0.5	30.0	1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5	1.5
SOLENOID—HYD. CONT.	ADEL 52657	1	1.5																										
E—ENGINE INSTRUMENTS																													
XMSN OIL TEMPERATURE	AERNO 61-8842 (MS28009-2)	1	0.04	30.0																									
ENGINE OIL TEMPERATURE	AERNO 61-8833 (MS28009-1)	1	0.04	30.0	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	0.1
F—FLIGHT INSTRUMENTS																													
TURN & SLIP IND. (TYPE MD-8)	AERNO 60-5704 (MS28024-3)	2	0.2	30.0																									
HEATER PITOT TUBE	AERNO 60-9660 (AN5813-1)	1	4.0	30.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0
GYRO COMPASS	TYPE J-2	1	0.6	30.0																									
POWER INTERLOCK RELAY	204-075-363	1	0.2	30.0																									
H—HEATING																													
PUMP—ROTOR DE-ICING	LEAR ROMEC PI632A (PROV. ONLY)	1	2.1	30.0																									
PUMP—WINDSHIELD DE-ICING	ADEL 20093 (PROV. ONLY)	1	1.0	30.0						4.3	4.3	4.3	4.3		4.3	4.3	4.3	4.3		4.3	4.3	4.3	4.3						
SOLENOID VALVE—DE-ICING	RONSON 1-U-1025 (PROV. ONLY)	1	1.2	30.0																									
MOTOR—BLEED AIR VALVE	204-060-444	1	2.0	0.2	2.0	0.8	0.2	NEG												2.0	0.8	0.2	0.1						
ICE DETECTOR SYS.—ENG	COOKELECT. 575-758 & 667-20	1 EA.	11.0		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9	2.9
DEFROST/AFT OUTLET VALVE	LELAND A38153-001	2	3.1	0.05	6.2	0.6	NEG	NEG												6.2	0.6	NEG	NEG						
HEATED BLANKET OUTLET	HUBBELL 7540	2	10.0	30.0						20.0	20.0	20.0	20.0		20.0	20.0	20.0	20.0		20.0	20.0	20.0	20.0						
HEAT EXCHANGER	204-072-263	1		30.0																									
J—ENGINE IGNITION SYS		1	1.5	0.5	1.5	1.5	0.4	NEG																					
K—ENGINE CONTROLS																													
STARTER GENERATOR	AERO 42-7031 TYPE STU-6	1																											
RELAY STARTER	MS24172-D1	1	4.5	0.5	4.5	4.5	1.1	0.2																					
L—LIGHTING																													
DOME LIGHT—RED	MS25235R311 LAMP	3	1.28		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6	2.6
COCKPIT LIGHT	MS25231-313 LAMP	2	0.17		0.3	0.3	0.2	NEG		0.3	0.3	0.2	NEG		0.3	0.3	0.2	NEG							0.3	0.3	0.2	NEG	NEG
INSTRUMENTS & EDGE LTS.	MS25237-327 LAMP	131	0.04	30.0	5.2	5.2	5.2	5.2		5.2	5.2	5.2	5.2		5.2	5.2	5.2	5.2		5.2	5.2	5.2	5.2		5.2	5.2	5.2	5.2	5.2
INSTRUMENTS SEC. LTS.	MS25069-1495 LAMP	4	0.34																										
FUS. LIGHTS—TOP & BOTTOM	AN3120-1047 LAMP	3	2.7	30.0																									
FUS. LIGHTS—TAIL	MS25232-1683 LAMP	1	1.15	30.0	12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6	12.6
FUS. LIGHTS—SIDE	ASA 7512 LAMP	4	0.85	30.0																									
MASTER CAUTION PANEL	204-075-705	1	0.2	30.0	0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2		0.3	0.3	0.3	0.3	0.3
SEARCH LIGHT	TYPE MA-3 (MIL-L-26998)	1	17.0	5.0											17.0	17.0	17.0	2.8		17.0	17.0	17.0	17.0						
LANDING LIGHT	GRIMES G8385-1	1	16.5	5.0																16.5	16.5	16.5	16.5		16.5	16.5	16.5	2.8	1.4
ANTI-COLLISION LIGHT	GRIMES G8400A-8-24	1	3.0	30.0						3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0
FLASHER—FUS. LIGHT	TYPE G-2 (MS24577-2)	1	0.0																										
M—MISCELLANEOUS																													
WINDSHIELD WIPER	204-070-907	2	3.5	30.0						7.0	7.0	7.0	7.0		7.0	7.0	7.0	7.0		7.0	7.0	7.0	7.0		7.0	7.0	7.0	7.0	7.0
SOLENOID—CARGO HOOK REL	EASTERN ROTOCRAFT SP4100-3	1	10.0	0.1											10.2	2.1	0.5	NEG							10.2	2.1	0.5	NEG	NEG
RELAY—CARGO HOOK REL.	MS24149D1	1	0.2	0.1																									
P—POWER																													
BATTERY CHARGING	BB433A 34 AMP HR.	1								129.6	129.6	81.0	43.2		97.2	97.2	60.7	22.9		32.4	32.4	20.2	16.2		32.4	32.4	20.2	7.6	4.3
RELAY—BATTERY	MS24171-D1	1	0.6	30.0	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6	0.6
REL.—NON-ESSENTIAL BUS	MS24171-D1	1	0.6	30.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0						
RELAY—BUS CONTROL	MS25024-2	1	0.35	30.0																									
INVERTER—MAIN	PU-543/A	1	15.1	30.0																									
INVERTER—SPARE	PU-543/A	1	15.1		15.5	15.5	15.5	15.5		15.5	15.5	15.5	15.5		15.5	15.5	15.5	15.5		15.5	15.5	15.5	15.5		15.5	15.5	15.5	15.5	15.5
RELAY—INVERTER POWER	MS24166-D1	2	0.35																										
Q—FUEL AND OIL																													
PUMP—FUEL BOOST	204-060-627	2	4.75	30.0	9.5	9.5	9.5	9.5		9.5	9.5	9.5	9.5		9.5	9.5	9.5	9.5		9.5	9.5	9.5	9.5		9.5	9.5	9.5	9.5	9.5
PUMP—FUEL TRANS (FERRY)	204-060-627	1	4.75	30.0																									
VALVE—FUEL SHUT OFF	204-060-013	1	1.0	0.02	2.0	0.1	NEG													2.0	0.1	NEG			2.0	0.1	NEG		
VALVE—OIL SHUT OFF	204-060-013	1	1.0	0.02																									
SOLENOID VALVE-IGNITER		1	0.75	0.5	0.8	0.8	0.2	NEG																					
SOLENOID VALVE-GOV. BYPASS		1	1.0	30.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0
ACTUATOR—GOV. RPM	204-060-762	1	0.9	1.0	0.9	0.9	0.4	0.1							0.9	0.9	0.4	NEG											
SOLENOID—IDLE STOP REL.	204-060-775	1	6.5	0.03																NEG					NEG				
PUMP—FUEL TRANS—(EXT.)	LEAR RG8160-2F	2	3.7																										
	PAGE 2 TOTAL—AVERAGE AMPERES				84.0	67.2	60.2	58.0		230.0	221.9	173.2	135.2		271.1	253.9	193.5	119.2		176.2	159.4	144.1	141.8		139.0	118.2	104.2	77.2	72.5

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Figure 1-7. UH-1B Helicopter power loading chart (Serial No. 65-9416 thru 65-9564; 65-12738 thru 65-12744 and 65-12772) (Sheet 1 of 3)

A	B	C	D	E									F	G	H	I					
EQUIPMENT	PART DESIGNATION	TOTAL NO. OF UNITS	OPERATING TIME-MIN.	ELECTRICAL REQUIREMENTS PER UNIT-E									POWER FACTOR	VOLTAGE REGULATION	FREQUENCY RANGE	CONNECTED LOADS-I					
				115 VOLTS 3 PH.			115 VOLTS 1 PH.			28 VOLTS 1 PH.						PHASE A TO B		PHASE C TO A		PHASE B TO C	
				VA.	WATTS	VARS.	VA.	WATTS	VARS.	VA.	WATTS	VARS.				WATTS	VARS.	WATTS	VARS.	WATTS	VARS.
INVERTER—MAIN	PU—543/A			2.50									.80 LAG	±	390/410						
A—ARMAMENT													.95 LEAD	±							
ASW-12																					
ELECTRO MECH ACTUATOR	T.G. 78( )/ASW—12(V)	1	30.0				5.1	3.57	3.65				0.7	±10	360/440	3.57	3.65				
ATTITUDE REF. CONTROL	C—3108( )/ASW—12(V)	1	30.0				13.6	9.52	9.70				0.7	±10	360/440	9.52	9.70				
ACCELEROMETER	MX—2916( )/ASW—12(V)	2	30.0				6.0	4.2	4.29				0.7	±10	360/440	8.40	8.58				
CONT. PNL(DIRECTIONAL)	SB1453( )/ASW—12(V)	1	30.0				5.0	3.5	3.58				0.7	±10	360/440	3.50	3.58				
D—INSTRUMENTS																					
INDICATOR—XMSN OIL PRESS.	AERNO 61-2476 TYPE MO—2	1	30.0							1.72	0.47	1.65	0.28	±10	360/440					0.47	1.65
TRANSMITTER—XMSN OIL PRESS.	AERNO 61-2497 TYPE TRU—20/A	1	30.0							2.29	0.66	2.20	0.29	±10	360/440					0.66	2.20
E—ENGINE INSTRUMENTS																					
INDICATOR—FUEL PRESSURE	AERNO 61-2461 (MS28010-1)	1	30.0							2.60	0.45	2.57	0.17	±10	360/440					0.45	2.57
TRANSMITTER—FUEL PRESSURE	AERNO 61-3008 (MS28005-1)	1	30.0							3.25	0.59	3.19	0.18	±10	360/440					0.59	3.19
INDICATOR—TORQUE PRESSURE	AERNO 61-2486 TYPE MO-3	1	30.0							1.72	0.47	1.65	0.28	±10	360/440					0.47	1.65
TRANSMITTER—TORQUE PRESSURE	AERNO 61-2487 TYPE MH-4	1	30.0							2.29	0.66	2.20	0.29	±10	360/440					0.66	2.20
INDICATOR—FUEL QUANTITY	204-061-606	1	30.0				3.50	3.50					1.0	±10	360/440	3.50					
TANK UNIT—FUEL QUANTITY	204-061-606	1	30.0																		
INDICATOR—ENG. OIL PRESSURE	AERNO 61-2476 TYPE MO-2	1	30.0							1.72	0.47	1.65	0.28	±10	360/440					0.47	1.65
TRANSMITTER ENG. OIL PRESS.	AERNO 61-2497 TYPE TRU-20/A	1	30.0							2.29	0.66	2.20	0.29	±10	360/440					0.66	2.20
F—FLIGHT INSTRUMENTS																					
ATTITUDE IND. INDICATOR	TYPE IND-A5-NA-1	1	30.0				15.00	14.10	5.10				0.94	±10	380/420	14.10	5.10				
SYS.—PILOT CONTROL GYRO	AERNO 60-5937 TYPE MD-1	1	30.0	25.00	23.50	8.50							0.94	±10	380/420	7.80	2.80	7.80	2.80	7.80	2.80
RATE GYRO	AERNO 60-5938 TYPE MC-1	1	30.0				4.80	4.50	1.60				0.94	±10	380/420	4.50	1.60				
ATTITUDE INDICATOR—COPILOT	MIL-I-5133 TYPE J-8	1	30.0	9.00	7.70	4.70							0.85	±10	380/420	2.57	1.57	2.57	1.57	2.57	1.57
AMPLIFIER	AERNO 60-1702 TYPE A-2	1	30.0																		
CONTROL GYRO	AERNO 60-1480 TYPE 5-3A	1	30.0	27.70	25.56	8.08							0.92	±10	360/440	6.61	5.49	12.00	1.21	6.95	1.38
TRANSMITTER &	AERNO 60-1483 TYPE C-2	1	30.0																		
COMPASS SYS. COMPENSATOR	AERNO 60-1479	1	30.0																		
TYPE J-2 PWR. INTERLOCK RLY.	204-075-363-3	1	30.0	1.60	0.80	-1.39								±10	360/440	0.40	-0.69			0.40	-0.69
MASTER INDICATOR	SPERRY C-6H	1	30.0							22.50	5.30	21.90	0.24	±10	360/440					5.30	21.90
SERVO AMPLIFIER	SPERRY 1783867-1	1	30.0				17.40	14.80	9.20				0.85	±10	360/440					14.80	9.20
REPEATER INDICATOR	ID-250A/ARN	1	30.0							6.69	1.20	6.57	0.18	±10	360/440					1.20	6.57
M—MISCELLANEOUS																					
CAPACITOR—PIF. CORRECTION	CP53BIEF105K MIL.-C-25	2	30.0				33.20		-33.20				0								-66.40
RESISTOR—LOAD BALANCING	RW20G911 MIL.-R-26	1	30.0				14.50	14.50					1.0					14.50			
R—RADIO NAVIGATION																					
RMI CONVERTER	ARC TYPE B-18A	1	30.0							7.26	7.28		1.0							7.28	
S—RADAR																					
COMPUTER KIT	IA/TSEC	1	30.0				25.00	25.00					1.0	±10						25.00	
X—A C POWER (WARNING)																					
A C FAILURE RELAY	AAF 32471 TYPE DI	1	30.0				13.20	0.80	13.10				0.06	±10	360/440					0.80	13.10
														TOTALS		64.47	36.38	36.87	5.58	76.53	6.74
														TOTAL	LOAD	161	VA @	.95	PF (LAG)		
INVERTER—SPARE	PU-543/A	1		2.50																	
NOTE: SPARE INVERTER LOADS ARE IDENTICAL TO MAIN INVERTER LOADS.																					

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Figure 1-7. UH-1B Helicopter power loading chart (Serial No. 65-9416 thru 65-9564; 65-12738 thru 65-12744 and 65-12772) (Sheet 2 of 3)

OPERATING CONDITIONS-F

A EQUIPMENT	B PART DESIGNATION	C NUMBER OF UNITS	D AMPERES PER UNIT	E OPERATING TIME-MIN.	START & WARM UP F-2 AMPS	START & WARM UP F-2 AVERAGE AMPS. 0.5 MIN.	2.0 MIN.	15.0 MIN.	MIN.	TAKE OFF F-4 AMPS	TAKE OFF F-4 AVERAGE AMPS. 0.5 MIN.	2.0 MIN.	15.0 MIN.	MIN.
R—RADIO NAV. & COMM.														
RADIO COMPASS	AN/ARN-59 (V)	1	2.8	30.0	2.8	2.8	2.8	2.8		2.8	2.8	2.8	2.8	
MARKER BEACON RCVR.	R-1041A/ARN	1	0.04	30.0	NEG					NEG				
VOR RECEIVER (VHF)	AN/ARN-30E	1	2.9	30.0	2.9	2.9	2.9	2.9		2.9	2.9	2.9	2.9	
FM TRANSCEIVER (RCVR)	AN/ARC-54	1	3.3	30.0	3.3	3.3	3.3	3.3		3.3	3.3	3.3	3.3	
(ADDITIONAL PWR XMIT)			4.2	4	4.2	4.2	2.1	0.4		4.2	4.2	2.1	0.4	
UHF TRANSCEIVER (RCVR)	AN/ARC-51BX	1	5.8	30.0	5.8	5.8	5.8	5.8		5.8	5.8	5.8	5.8	
(ADDITIONAL PWR XMIT)			3.8	4	3.8	3.8	7.9	0.4		3.8	3.8	1.9	0.4	
VHF TRANSCEIVER (RCVR)	AN/ARC-73	1	2.0	30.0										
(ADDITIONAL PWR XMIT)			6.5	4	6.5	6.5	3.3	0.7		6.5	6.5	3.3	0.7	
HF TRANSCEIVER (RCVR)	AN/ARC-102	1	7.5	30.0	7.5	7.5	7.5	7.5		7.5	7.5	7.5	7.5	
(ADDITIONAL PWR XMIT)			31.6	4										
SIGNAL DISTRIBUTION PNL.	C-1611 ( )/AIC	4	0.2	30.0	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6	
VHFTANSCEIVER PWR. RLY.	MS24149D1	1	0.25	30.0										
EMERGENCY TRANSMITTER	T-366A/ARC	1	1.5	30.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0	
S—RADAR														
IFF TRANSPONDER	AN/APX-44	1	4.5	30.0	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	
IFF TRANSPONDER	AN/APX-68	1	1.7	30.0										
COMPUTER KIT	TA/TSEC	1	0.1	30.0										
TEST SET	TS-1843/APX	1	0.5	30.0										
W—WIRING														
FIRE DETECTION—ENGINE	EDISON 227-28-5	1	0.07	30.0	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	
RPM LIMIT	205-074-001-1	1	0.5	30.0	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	
	PAGE 3 TOTAL—AVERAGE AMPERES				44.5	44.5	37.3	31.5		44.5	44.5	37.3	31.5	
	TOTALS FROM PAGE 2				84.0	67.2	60.2	58.0		230.0	221.9	173.2	135.2	
	TOTAL—AVERAGE AMPERES				128.5	111.7	97.5	89.5		274.5	266.4	210.5	166.7	

A EQUIPMENT	B PART DESIGNATION	CRUISE F-5 AMPS	CRUISE F-5 AVERAGE AMPS. 0.5 MIN.	2.0 MIN.	30.0 MIN.	MIN.	LAND F-7 AMPS	LAND F-7 AVERAGE AMPS. 0.5 MIN.	2.0 MIN.	5.0 MIN.	MIN.	EMERGENCY F-8 AMPS	EMERGENCY F-8 AVERAGE AMPS. 0.5 MIN.	2.0 MIN.	30.0 MIN.	60.0 MIN.
R—RADIO NAV. & COMM.																
RADIO COMPASS	AN/ARN-59 (V)	2.8	2.8	2.8	2.8		2.8	2.8	2.8	2.8		2.8	2.8	2.8	2.8	2.8
MARKER BEACON RCVR.	R-1041A/ARN	NEG					NEG					NEG				
VOR RECEIVER (VHF)	AN/ARN-30E	2.9	2.9	2.9	2.9		2.9	2.9	2.9	2.9		2.9	2.9	2.9	2.9	2.9
FM TRANSCEIVER (RCVR)	AN/ARC-54	3.3	3.3	3.3	3.3		3.3	3.3	3.3	3.3		3.3	3.3	3.3	3.3	3.3
(ADDITIONAL PWR XMIT)		4.2	4.2	2.1	0.4		4.2	4.2	2.1	0.8		4.2	4.2	2.1	0.4	0.4
UHF TRANSCEIVER (RCVR)	AN/ARC-51BX	5.8	5.8	5.8	5.8		5.8	5.8	5.8	5.8		5.8	5.8	5.8	5.8	5.8
(ADDITIONAL PWR XMIT)		3.8	3.8	7.9	0.4		3.8	3.8	1.9	0.8		3.8	3.8	1.9	0.4	0.4
VHF TRANSCEIVER (RCVR)	AN/ARC-73															
(ADDITIONAL PWR XMIT)		6.5	6.5	3.3	0.7		6.5	6.5	3.3	1.3		6.5	6.5	3.3	0.7	0.7
HF TRANSCEIVER (RCVR)	AN/ARC-102	7.5	7.5	7.5	7.5		7.5	7.5	7.5	7.5		7.5	7.5	7.5	7.5	7.5
(ADDITIONAL PWR XMIT)																
SIGNAL DISTRIBUTION PNL.	C-1611 ( )/AIC	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6	0.6
VHFTANSCEIVER PWR. RLY.	MS24149D1															
EMERGENCY TRANSMITTER	T-366A/ARC	2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0
S—RADAR																
IFF TRANSPONDER	AN/APX-44	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5
IFF TRANSPONDER	AN/APX-68															
COMPUTER KIT	TA/TSEC															
TEST SET	TS-1843/APX															
W—WIRING																
FIRE DETECTION—ENGINE	EDISON 227-28-5	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	0.1
RPM LIMIT	205-074-001-1	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5
	PAGE 3 TOTAL—AVERAGE AMPERES	44.5	44.5	37.3	31.5		44.5	44.5	37.3	32.9		44.5	44.5	37.2	31.5	31.5
	TOTALS FROM PAGE 2	271.1	253.9	193.5	199.2		176.2	159.4	144.4	141.8		139.0	118.2	104.2	77.2	72.5
	TOTAL—AVERAGE AMPERES	315.6	298.4	230.8	230.7		220.7	203.9	181.4	174.7		183.5	162.7	141.4	108.7	104.0

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Figure 1-7. UH-1B Helicopter power loading chart (Serial No. 65-9416 thru 65-9564; 65-12738 thru 65-12744 and 65-12772) (Sheet 3 of 3)

A EQUIPMENT	B PART DESIGNATION	C NUMBER OF UNITS	D AMPERES PER UNIT	E OPERATING TIME-MIN.	OPERATING CONDITIONS-F: START & WARM UP F-2					TAKE OFF F-4					CRUISE F-5					LAND F-7					EMERGENCY F-8				
					AMPS	AVERAGE AMPS. 0.5 MIN.	2.0 MIN.	15.0 MIN.	MIN.	AMPS	AVERAGE AMPS. 0.5 MIN.	2.0 MIN.	15.0 MIN.	MIN.	AMPS	AVERAGE AMPS. 0.5 MIN.	2.0 MIN.	30.0 MIN.	MIN.	AMPS	AVERAGE AMPS. 0.5 MIN.	2.0 MIN.	5.0 MIN.	MIN.	AMPS	AVERAGE AMPS. 0.5 MIN.	2.0 MIN.	30.0 MIN.	60.0 MIN.
A—ARMAMENT																													
MISSILE LAUNCHING SYS.	M-22	1	15.0																										
STABILIZATION SYSTEM	AN/ASW12	1	5.0																										
SIGHT	MARK VIII	1	5.0																										
ROCKET LAUNCH SYS.	XM-3	1	0.6																										
SIGHT	MARK VIII	1	5.0																										
MACHINE GUN SYSTEM	M6 OR M16	1	45.0												45.4	45.4	22.7	1.5											
FIRE CONTROL REL.	MS25024-2	1	0.35																										
C—FLIGHT CONTROLS																													
MAGNETIC BRAKE—FORCE TRIM	AIRBORNE ACC R460M15	3	0.5	30.0	1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5		1.5	1.5	1.5	1.5	1.5
SOLENOID—HYD. CONT.	HYD. RESEARCH 88700	2	1.2																										
E—ENGINE INSTRUMENTS																													
XMSN OIL TEMPERATURE	AERNO 61-8842 (MS28009-2)	1	0.04	30.0																									
ENGINE OIL TEMPERATURE	AERNO 61-8833 (MS28009-1)	1	0.04	30.0	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	0.1
F—FLIGHT INSTRUMENTS																													
TURN & SLIP IND. (TYPE MD-8)	AERNO 60-5704 (MS28024-3)	2	0.2	30.0																									
HEATER PITOT TUBE	AERNO 60-9660 (AN5813-1)	1	4.0	30.0	5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0		5.0	5.0	5.0	5.0	5.0
GYRO COMPASS	TYPE J-2	1	0.6	30.0																									
POWER INTERLOCK RELAY	204-075-363	1	0.2	30.0																									
H—HEATING																													
MOTOR—BLEED AIR VALVE	204-060-444	1	2.0	0.2	2.0	0.8	0.2	NEG												2.0	0.8	0.2	0.1						
ICE DETECTOR SYS.—ENG	COOKELECT, 575-758 & 667-20	1 EA.	11.0		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9		11.0	2.9	2.9	2.9	2.9
DEFROST/AFT OUTLET VALVE	LELAND A38153-001	2	3.1	0.05	6.2	0.6	NEG	NEG												6.2	0.6	NEG	NEG						
HEATED BLANKET OUTLET	HUBBELL 7540	2	10.0	30.0						20.0	20.0	20.0	20.0		20.0	20.0	20.0	20.0		20.0	20.0	20.0	20.0						
HEAT EXCHANGER	204-072-263	1		30.0																									
J—ENGINE IGNITION SYS		1	1.5	0.5	1.5	1.5	0.4	NEG																					
K—ENGINE CONTROLS																													
STARTER GENERATOR	AERO 42-7031 TYPE STU-6/A	1																											
RELAY STARTER	MS24172-D1	1	4.5	0.5	4.5	4.5	1.1	0.2																					
L—LIGHTING																													
DOME LIGHT—RED	MS25235R311 LAMP	3	1.28		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6		2.6	2.6	2.6	2.6	2.6
COCKPIT LIGHT	MS25231-313 LAMP	2	0.17		0.3	0.3	0.2	NEG		0.3	0.3	0.2	NEG		0.3	0.3	0.2	NEG							0.3	0.3	0.2	NEG	NEG
INSTRUMENTS & EDGE LTS.	MS25237-327 LAMP	131	0.04	30.0	5.2	5.2	5.2	5.2		5.2	5.2	5.2	5.2		5.2	5.2	5.2	5.2		5.2	5.2	5.2	5.2		5.2	5.2	5.2	5.2	5.2
INSTRUMENTS SEC. LTS.	MS25069-1495 LAMP	4	0.34																										
FUS. LIGHTS—TOP & BOTTOM	AN3120-1047 LAMP	3	2.7	30.0																									
FUS. LIGHTS—TAIL	MS25232-1683 LAMP	1	1.15	30.0	12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6		12.6	12.6	12.6	12.6	12.6
FUS. LIGHTS—SIDE	ASA 7512 LAMP	4	0.83	30.0																									
MASTER CAUTION PANEL	204-075-705	1	0.2	30.0	0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2		0.2	0.2	0.2	0.2		0.3	0.3	0.3	0.3	0.3
SEARCH LIGHT	TYPE MA-3 (MIL-L-26998)	1	17.0	5.0											17.0	17.0	17.0	2.8		17.0	17.0	17.0	17.0						
LANDING LIGHT	GRIMES G8385-1	1	16.5	5.0																16.5	16.5	16.5	16.5		16.5	16.5	16.5	2.8	1.4
ANTI-COLLISION LIGHT	GRIMES G8400A-8-24	1	3.0	30.0						3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0
FLASHER—FUS. LIGHT	TYPE G-2 (MS24577-2)	1																											
M—MISCELLANEOUS																													
WINDSHIELD WIPER	204-070-907	2	3.5	30.0						7.0	7.0	7.0	7.0		7.0	7.0	7.0	7.0		7.0	7.0	7.0	7.0		7.0	7.0	7.0	7.0	7.0
SOLENOID—CARGO HOOK REL	EASTERN ROTOCRAFT SP4100-3	1	10.0	0.1											10.2	2.1	0.5	NEG							10.2	2.1	0.5	NEG	NEG
RELAY—CARGO HOOK REL.	MS24149D1	1	0.2	0.1																									
P—POWER																													
BATTERY CHARGING	BB433A 34 AMP HR.	1								129.6	129.6	81.0	43.2		97.2	97.2	60.7	22.9		32.4	32.4	20.2	16.2		32.4	32.4	20.2	7.6	4.3
RELAY—BATTERY	MS24171-D1	1	0.6	30.0	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6	0.6
REL.—NON-ESSENTIAL BUS	MS24171-D1	1	0.6	30.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0						
RELAY—BUS CONTROL	MS25024-2	1	0.35	30.0																									
INVERTER—MAIN	PU-543/A	1	15.1	30.0																									
INVERTER—SPARE	PU-543/A	1	15.1		15.5	15.5	15.5	15.5		15.5	15.5	15.5	15.5		15.5	15.5	[illegible]	15.5		15.5	15.5	15.5	15.5		15.5	15.5	15.5	15.5	15.5
RELAY—INVERTER POWER	MS24166-D1	2	0.35																										
Q—FUEL AND OIL																													
PUMP—FUEL BOOST	204-060-627	2	4.5	30.0	9.5	9.5	9.5	9.5		9.5	9.5	9.5	9.5		9.5	9.5	9.5	9.5		9.5	9.5	9.5	9.5		9.5	9.5	9.5	9.5	9.5
PUMP—FUEL TRANS (FERRY)	204-060-627	1	[illegible]	30.0																									
VALVE—FUEL SHUT OFF	204-060-013	1	[illegible]	0.02	2.0	0.1	NEG													2.0	0.1	NEG			2.0	0.1	NEG		
VALVE—OIL SHUT OFF	204-060-013	1	1.0	0.02																									
SOLENOID VALVE-IGNITER		1	0.75	0.5	0.8	0.8	0.2	NEG																					
SOLENOID VALVE-GOV. BYPASS		1	1.0	30.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0
ACTUATOR—GOV. RPM	204-060-762	1	0.9	1.0	0.9	0.9	0.4	0.1							0.9	0.9	0.4	NEG											
SOLENOID—IDLE STOP REL.	204-060-775	1	6.5	0.03																NEG					NEG				
PUMP—FUEL TRANS—(EXT.)	LEAR RG8160-2F	2	3.7																										
	SHEET 1 TOTAL—AVERAGE AMPERES				84.0	67.2	60.2	58.0		225.7	217.6	168.9	130.9		266.8	250.6	189.2	114.9		171.9	155.1	141.6	137.5		136.3	118.2	104.2	77.2	72.5

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Figure 1-8. UH-1B Helicopter power loading chart (Serial no. 66-491 and subsequent) (Sheet 1 of 3)

OPERATING CONDITIONS-F

A	B	C	D	E	START & WARM UP F-2					TAKE OFF F-4				
EQUIPMENT	PART DESIGNATION	NUMBER OF UNITS	AMPERES PER UNIT	OPERATING TIME-MIN.	AMPS	AVERAGE AMPS. 0.5 MIN.	2.0 MIN.	15.0 MIN.	MIN.	AMPS	AVERAGE AMPS. 0.5 MIN.	2.0 MIN.	15.0 MIN.	MIN.
R—RADIO NAV. & COMM.														
RADIO COMPASS	AN/ARN-59 (V)	1	2.8	30.0	2.8	2.8	2.8	2.8		2.8	2.8	2.8	2.8	
MARKER BEACON RCVR.	R-1041A/ARN	1	0.04	30.0	NEG					NEG				
VOR RECEIVER (VHF)	AN/ARN-30E	1	2.9	30.0	2.9	2.9	2.9	2.9		2.9	2.9	2.9	2.9	
FM TRANSCEIVER (RCVR)	AN/ARC-54	1	3.3	30.0	3.3	3.3	3.3	3.3		3.3	3.3	3.3	3.3	
(ADDITIONAL PWR XMIT)			4.2		4.2	4.2	2.1	0.4		4.2	4.2	2.1	0.4	
UHF TRANSCEIVER (RCVR)	AN/ARC-51BX	1	5.8	30.0	5.8	5.8	5.8	5.8		5.8	5.8	5.8	5.8	
(ADDITIONAL PWR XMIT)			3.8		3.8	3.8	1.9	0.4		3.8	3.8	1.9	0.4	
VHF TRANSCEIVER (RCVR)	AN/ARC-73	1	2.0	30.0										
(ADDITIONAL PWR XMIT)			6.5											
HF TRANSCEIVER (RCVR)	AN/ARC-102	1	7.5	30.0	7.5	7.5	7.5	7.5		7.5	7.5	7.5	7.5	
(ADDITIONAL PWR XMIT)			31.6											
SIGNAL DISTRIBUTION PNL.	C-1611 ( )/AIC	4	0.2	30.0	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6	
VHF TRANSCEIVER PWR. RLY.	MS24149D1	1	0.25	30.0										
EMERGENCY TRANSMITTER	T-366A/ARC	1	1.5	30.0	2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0	
RECEIVING SET	R-1297 ( )/AR	1	0.1	30.0	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	
S—RADAR														
IFF TRANSPONDER	AN/APX-44	1	4.5	30.0	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	
IFF TRANSPONDER	AN/APX-68	1	1.7	30.0										
COMPUTER KIT	1A/TSEC	1	0.1	30.0										
TEST SET	TS-1843/APX	1	0.5	30.0										
W—WARNING														
FIRE DETECTION—ENGINE	EDISON 227-28-5	1	0.07	30.0	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	
RPM LIMIT	205-074-001-1	1	0.5	30.0	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	
	SHEET 2 TOTAL—AVERAGE AMPERES				38.1	38.1	34.1	30.9		38.1	38.1	34.1	30.9	
	TOTALS FROM SHEET 1				84.0	67.2	60.2	58.0		225.7	217.6	168.9	130.9	
	TOTAL—AVERAGE AMPERES				122.1	105.3	94.3	88.9		263.8	255.7	203.0	161.8	

A	B	CRUISE F-5					LAND F-7					EMERGENCY F-8				
EQUIPMENT	PART DESIGNATION	AMPS	AVERAGE AMPS. 0.5 MIN.	2.0 MIN.	30.0 MIN.	MIN.	AMPS	AVERAGE AMPS. 0.5 MIN.	2.0 MIN.	5.0 MIN.	MIN.	AMPS	AVERAGE AMPS. 0.5 MIN.	2.0 MIN.	30.0 MIN.	60.0 MIN.
R—RADIO NAV. & COMM.																
RADIO COMPASS	AN/ARN-59 (V)	2.8	2.8	2.8	2.8		2.8	2.8	2.8	2.8		2.8	2.8	2.8	2.8	2.8
MARKER BEACON RCVR.	R-1041A/ARN	NEG					NEG					NEG				
VOR RECEIVER (VHF)	AN/ARN-30E	2.9	2.9	2.9	2.9		2.9	2.9	2.9	2.9		2.9	2.9	2.9	2.9	2.9
FM TRANSCEIVER (RCVR)	AN/ARC-54	3.3	3.3	3.3	3.3		3.3	3.3	3.3	3.3		3.3	3.3	3.3	3.3	3.3
(ADDITIONAL PWR XMIT)		4.2	4.2	2.1	0.4		4.2	4.2	2.1	0.8		4.2	4.2	2.1	0.4	0.4
UHF TRANSCEIVER (RCVR)	AN/ARC-51BX	5.8	5.8	5.8	5.8		5.8	5.8	5.8	5.8		5.8	5.8	5.8	5.8	5.8
(ADDITIONAL PWR XMIT)		3.8	3.8	1.9	0.4		3.8	3.8	1.9	0.8		3.8	3.8	1.9	0.4	0.4
VHF TRANSCEIVER (RCVR)	AN/ARC-73															
(ADDITIONAL PWR XMIT)																
HF TRANSCEIVER (RCVR)	AN/ARC-102	7.5	7.5	7.5	7.5		7.5	7.5	7.5	7.5		7.5	7.5	7.5	7.5	7.5
(ADDITIONAL PWR XMIT)																
SIGNAL DISTRIBUTION PNL.	C-1611 ( )/AIC	0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6		0.6	0.6	0.6	0.6	0.6
VHF TRANSCEIVER PWR. RLY.	MS24149D1															
EMERGENCY TRANSMITTER	T-366A/ARC	2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0		2.0	2.0	2.0	2.0	2.0
RECEIVING SET	R-1297 ( )/AR	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	0.1
S—RADAR																
IFF TRANSPONDER	AN/APX-44	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5
IFF TRANSPONDER	AN/APX-68															
COMPUTER KIT	1A/TSEC															
TEST SET	TS-1843/APX															
W—WARNING																
FIRE DETECTION—ENGINE	EDISON 227-28-5	0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1		0.1	0.1	0.1	0.1	0.1
RPM LIMIT	205-074-001-1	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5
	SHEET 2 TOTAL—AVERAGE AMPERES	38.1	38.1	34.1	30.9		38.1	38.1	34.1	31.7		38.1	38.1	34.1	30.9	30.9
	TOTALS FROM SHEET 1	266.8	250.6	189.2	114.9		171.9	155.1	141.6	137.5		136.3	118.2	104.2	77.2	72.5
	TOTAL—AVERAGE AMPERES	304.9	288.7	223.3	145.8		210.0	193.2	175.7	169.2		174.4	156.3	138.3	108.1	103.4

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Figure 1-8. UH-1B Helicopter power loading chart (Serial no. 66-491 and subsequent) (Sheet 2 of 3)

A	B	C	D	ELECTRICAL REQUIREMENTS PER UNIT-E									F	G	H	CONNECTED LOADS-I					
EQUIPMENT	PART DESIGNATION	TOTAL NO. OF UNITS	OPERATING TIME-MIN.	115 VOLTS 3 PH.			115 VOLTS 1 PH.			28 VOLTS 1 PH.			POWER FACTOR	VOLTAGE REGULATION	FREQUENCY RANGE	PHASE A TO B		PHASE C TO A		PHASE B TO C	
				VA.	WATTS	VARS.	VA.	WATTS	VARS.	VA.	WATTS	VARS.				WATTS	VARS.	WATTS	VARS.	WATTS	VARS.
INVERTER—MAIN	PU—543/A			250									.80 LAG		390/410						
A—ARMAMENT													.95 LEAD								
ASW-12																					
ELECTRO MECH ACTUATOR	T.G. 78( )/ASW—12(V)	1	30.0				5.1	3.57	3.65				0.7	±10	360/440	3.57	3.65				
ATTITUDE REF. CONTROL	C—3108( )/ASW—12(V)	1	30.0				13.6	9.52	9.70				0.7	±10	360/440	9.52	9.70				
ACCELEROMETER	MX—2916( )/ASW—12(V)	2	30.0				6.0	4.2	4.29				0.7	±10	360/440	8.40	8.58				
CONT. PNL(DIRECTIONAL)	SB1453( )/ASW—12(V)	1	30.0				5.0	3.5	3.58				0.7	±10	360/440	3.50	3.58				
D—INSTRUMENTS																					
INDICATOR—XMSN OIL PRESS.	AERNO 61-2476 TYPE MO—2	1	30.0							1.72	0.47	1.65	0.28	±10	360/440					0.47	1.65
TRANSMITTER—XMSN OIL PRESS.	AERNO 61-2497 TYPE TRU—20/A	1	30.0							2.29	0.66	2.20	0.29	±10	360/440					0.66	2.20
E—ENGINE INSTRUMENTS																					
INDICATOR—FUEL PRESSURE	AERNO 61-2461 (MS28010-1)	1	30.0							2.60	0.45	2.57	0.17	±10	360/440					0.45	2.57
TRANSMITTER—FUEL PRESSURE	AERNO 61-3008 (MS28005-1)	1	30.0							3.25	0.59	3.19	0.18	±10	360/440					0.59	3.19
INDICATOR—TORQUE PRESSURE	AERNO 61-2486 TYPE MO-3	1	30.0							1.72	0.47	1.65	0.28	±10	360/440					0.47	1.65
TRANSMITTER—TORQUE PRESSURE	AERNO 61-2487 TYPE MH-4	1	30.0							2.29	0.66	2.20	0.29	±10	360/440					0.66	2.20
INDICATOR—FUEL QUANTITY	204-061-606	1	30.0				3.50	3.50					1.0	±10	360/440	3.50					
TANK UNIT—FUEL QUANTITY	204-061-606	3	30.0																		
INDICATOR—ENG. OIL PRESSURE	AERNO 61-2476 TYPE MO-2	1	30.0							1.72	0.47	1.65	0.28	±10	360/440					0.47	1.65
TRANSMITTER ENG. OIL PRESS.	AERNO 61-2497 TYPE TRU-20/A	1	30.0							2.29	0.66	2.20	0.29	±10	360/440					0.66	2.20
F—FLIGHT INSTRUMENTS																					
ATTITUDE IND. INDICATOR	TYPE IND-A5-NA-1	1	30.0				15.00	14.10	5.10				0.94	±10	380/420	14.10	5.10				
SYS.—PILOT CONTROL GYRO	AERNO 60-5937 TYPE MD-1	1	30.0	25.00	23.50	8.50							0.94	±10	380/420	7.80	2.80	7.80	2.80	7.80	2.80
RATE GYRO	AERNO 60-5938 TYPE MC-1	1	30.0				4.80	4.50	1.60				0.94	±10	380/420	4.50	1.60				
ATTITUDE INDICATOR—COPILOT	MIL-I-5133 TYPE J-8	1	30.0	9.00	7.70	4.70							0.85	±10	380/420	2.57	1.57	2.57	1.57	2.57	1.57
AMPLIFIER	AERNO 60-1702 TYPE A-2	1	30.0																		
CONTROL GYRO	AERNO 60-1480 TYPE S-3A	1	30.0	27.70	25.56	8.08							0.92	±10	360/440	6.61	5.49	12.00	1.21	6.95	1.38
TRANSMITTER &	AERNO 60-1483 TYPE C-2	1	30.0																		
COMPASS SYS. COMPENSATOR	AERNO 60-1479	1	30.0																		
TYPE J-2 PWR. INTERLOCK RLY.	204-075-363-3	1	30.0	1.60	0.80	-1.39								±10	360/440	0.40	-0.69			0.40	-0.69
MASTER INDICATOR	SPERRY C-6H	1	30.0							22.50	5.30	21.90	0.24	±10	360/440					5.30	21.90
SERVO AMPLIFIER	SPERRY 1783867-1	1	30.0				17.40	14.80	9.20				0.85	±10	360/440					14.80	9.20
REPEATER INDICATOR	ID-250A/ARN	1	30.0							6.69	1.20	6.57	0.18	±10	360/440					1.20	6.57
M—MISCELLANEOUS																					
CAPACITOR—P.F. CORRECTION	CP53B1EF105K MIL.-C-25	2	30.0				33.20		-33.20												-66.40
RESISTOR—LOAD BALANCING	RW20G911 MIL.-R-26	1	30.0				14.50	14.50					1.0						14.50		
R—RADIO NAVIGATION																					
RMI CONVERTER	ARC TYPE B-18A	1	30.0							7.28	7.28		1.0							7.28	
S—RADAR																					
COMPUTER KIT	IA/TSEC	1	30.0				25.00	25.00					1.0	±10		25.00					
X—A C POWER (WARNING)																					
A C FAILURE RELAY	AAF 32471 TYPE D1	1	30.0				13.20	0.80	13.10				0.06	±10	360/440					0.80	13.10
														TOTALS		89.47	41.38	36.87	5.58	51.53	6.74
														TOTAL	LOAD	185.8	VA @	0.96	PF (LAG)		
INVERTER—SPARE	PU-543/A	1		250																	
NOTE: SPARE INVERTER LOADS																					
ARE IDENTICAL TO																					
MAIN INVERTER LOADS.																					

204099-36-2

Figure 1-8. UH-1B Helicopter power loading chart (Serial no. 66-491 and subsequent) (Sheet 3 of 3)

1-35. *Servicing Materials.* Basic servicing materials for the aircraft covered by this manual are as follows:

Item	Specification
JP-4 Fuel	MIL-J-5624
JP-5 Fuel	MIL-J-5624
Engine and Transmission Oil	MIL-L-7808
Hydraulic Fluid	MIL-H-5606

Other servicing materials, such as lubricants, miscellaneous cleaning materials, paint, sealing compound, etc., will be found in the Consumable Materials List in Section I. Procedural paragraphs requiring their use will refer to the appropriate item number on this list. External power requirements of 500 amperes, 28.5 volts will be supplied by an auxiliary power unit capable of delivering 650 to 800 amperes. A suitable hydraulic test unit capable of producing pressure to 2300 psig, and having a flow rate of at least six gpm, shall be used for testing the hydraulic systems. Lubrication charts and data will be found in chapter 2.

1-36. *Miscellaneous Fuel Data.* General Information regarding fuel is to be found in the following paragraphs.

1-37. *Jet Fuel Limitations.* Jet fuel, Grade JP-4 (item 1, table 1-1), is intended for use in jet aircraft under all operating conditions. Experience to date indicates that no undue difficulties will be encountered in starting and operating the helicopter's jet engine at low temperatures on Grade JP-4 fuel. Helicopters equipped with Lycoming T53-L-9A (scoopless) and T53-L-11 engines only, may use Grade JP-5 (item 1, table 1-1) jet fuel. JP-5 fuel may cause slower engine starts at low ambient temperatures. For details regarding alternate and emergency fuels refer to TB AVN 2.

1-38. Combustion Heater. Fuel filter and drain lines should be checked daily for accumulations of ice or water. During low temperature operation below 32°F water vapor in the combustion gases flowing through the drain line may condense and form ice. Water produced during combustion may collect on the fuel nozzles and ignitor plug and form ice after the heater has been turned off. This ice may be sufficient to make it difficult, if not impossible, to start the heater without preheating.

1-39. *Miscellaneous Oil Data.* General information regarding oil is to be found in the following paragraphs.

1-40. *Synthetic Base Oil, Specification MIL-L-7808.* This oil is to be used in preference to petroleum based oil because of its superior temperature characteristics. In addition to a synthetic chemical base, this oil contains oxidation inhibitors and anti-wear additives. MIL-L-7808 oil may cause swelling of O-ring seals that are designed for use in petroleum based oils.

Note

> If oil is inadvertently spilled on painted surfaces of the helicopter, those surfaces should be immediately wiped clean to avoid possible blistering and peeling of paint.

1-41. *Dusty Conditions.* More frequent oil changes are recommended for helicopters operating under unusually dusty conditions. The frequency of oil changes will depend upon the severity of the dust condition. Failure to change oil more frequently in high dust areas can result in accelerated engine wear.

1-42. *Contamination of Synthetic Base Oil.* This oil is a synthetic jet engine lubricant, and is extremely susceptible to contamination by water. In addition this oil has a limited storage life and must be tested periodically. Due to the susceptibility of this oil to contamination, it is purchased, stored and handled in hermetically sealed containers. These containers, once opened, must be emptied immediately, and not retained in opened condition for future use. When dispensing oil into aircraft, it should be filtered through a 10 micron filter to remove any lint, can sealant (metal slivers) or dirt that may have entered the oil during the canning and/or opening processes.

1-43. *Tire and Tube Data.* Tires and tubes should be stored under normal temperature conditions if at all possible. If it becomes necessary to store tubes at subnormal temperatures, partially inflate them in order to remove creases and folds. Tires and tubes should be warmed before mounting so that normal handling will not flex them to the point of cracking. When not actually in use ground handling wheels should be removed from the helicopter and placed in warm storage. If tires inadvertently become frozen to the ground they can be released by heat application or by over-inflation. Under no circumstances should the applied heat exceed a temperature of 160°F. The proper procedure should be determined by considering the individual problem. If the tires are to be released by over-inflation, the tires may be inflated to one and one-half times normal pressure, provided the following precautions are observed.

a. Careful inspection should be made before inflation for evidence of wheel cracks or breaks in the tires.

b. In order to prevent injury to personnel in case of wheel rim failure, all persons should stand in line with the tire, rather than broadside of the wheel, during inflation.

c. Heat must not be applied to over-inflated tires because of its action in further increasing tire pressure.

d. Tire pressure must be reduced to normal immediately after tires are freed.

Note

When tires are over-inflated, as described above, immediate action cannot be expected. One-half to one hour may be required before tires are free because of the slow action of the frozen casings in responding to the increased tire pressure.

1-44. *Weather or Environment Factors*. Refer to TM 55-405-1 for data regarding weather or environment factors.

1-45. *Main Rotor Grip Seal Leakage*. Should main rotor grip seal leakage occur when operating at low climatic temperatures, the shutdown procedure outlined in TM 55-1520-211-10 should be followed.

1-46. Maintenance Forms. Forms required in the performance of the prescribed maintenance operation of the aircraft are contained in the aircraft Log Book. Assignment of responsibilities and instructions for preparation and use of Log Book Forms are outlined in TM 38-750 (Army Equipment Record Procedures) and TM 55-405-9 (Army Aviation Maintenance Engineering Manual, Weight and Balance).

Section III — Aircraft General

1-47. Description. The UH-1A and UH-1B helicopters (figure 1-8) described in this handbook are utility type, compact design, aircraft which feature a low silhouette and low vulnerability to meet combat requirements. The fuselage consists of two main sections; the forward section (1) and the aft, or tail boom, section (2). The wide cabin, with large cubic foot volume, permits these helicopters to be used for transportation of personnel, special equipment and supplies. These helicopters are capable of operating from prepared or unprepared landing areas by day or night. They can also operate under instrument conditions, including light icing, and can navigate by dead reckoning or by the use of radio aids to navigation. Maximum visibility is afforded the crew by extensive use of transparent plastic panels at the top, front, bottom and sides of the cabin. Crew entrance is accomplished through two swing-hinged doors (3) located in the forward cabin area next to the pilot and copilot's station. For maximum principal dimensions refer to TM 55-1520-211-10, Chapter 2.

1-48. Entrance to the passenger-cargo area is by means of two large sliding doors (4) located one on each side of the aft cabin. The passenger-cargo area of the Model UH-1A helicopters contains a four passenger, web, seat which can be folded and stowed against the aft cabin bulkhead. In the UH-1B helicopters this is a five passenger seat. When these seats are folded and stowed a large, unrestricted loading area is available for transportation of cargo and/or equipment. Model UH-1A helicopters have provisions for a medical attendant's seat just behind the pilot and copilot. This seat faces aft. UH-1B helicopters have provisions for two individual passenger seats in this same area. For ambulance, or mercy mission service, litter rack and medical attend-

1. Forward Section
2. Aft Section
3. Crew Doors
4. Passenger - Cargo Doors
5. Engine
6. Landing Gear
7. Tail Rotor
8. Synchronized Elevator
9. Tail Skid

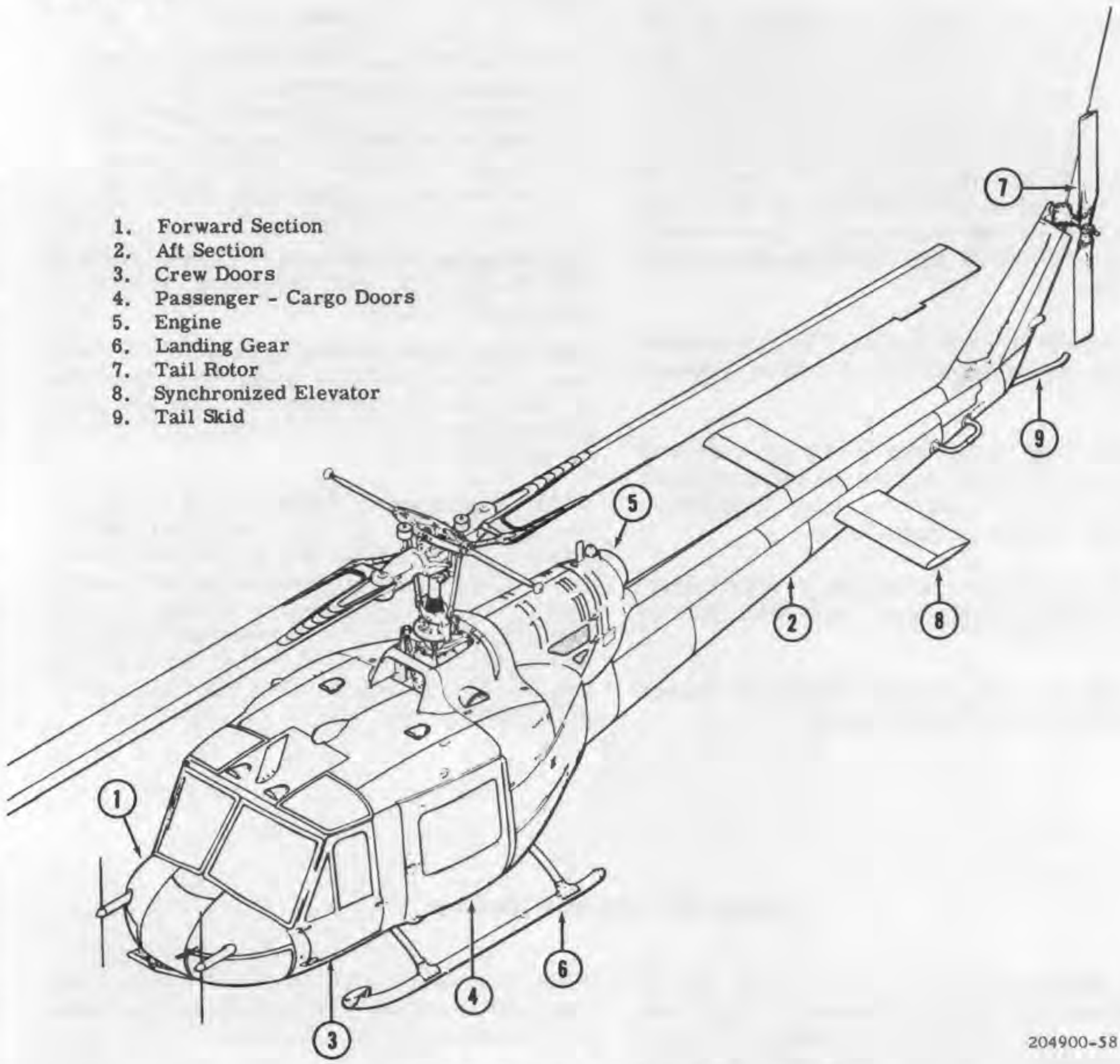


Figure 1-8. UH-1A and UH-1B helicopter

ant seat can be quickly installed. Two litter patients can be carried in Model UH-1A helicopters, while the Model UH-1B will accommodate three.

1-49. When it is not considered feasible to load cargo and/or equipment inside the helicopter, such material can be transported by means of cargo suspension. The cargo suspension assembly is attached to the under side of the pylon support at the center of gravity, and operates through an opening in the bottom of the helicopter.

1-50. The propulsion system, consisting of the engine (5) and the drive system, is located aft of the cabin, and is mounted above the fuselage on a platform which provides footing for maintenance personnel while servicing the helicopter. The engine and the drive system are enclosed by cowling that can be quickly opened, or removed, for easy access. The drive system, with its independently mounted units and quick-disconnect couplings, permits rapid servicing, repair, or replacement under combat conditions without the use of special tools or ground equipment. Maximum availablity of the helicopter for mission accomplishment is thus obtained.

1-51. Construction of the forward section of the helicopter consists, primarily, of two longitudinal beams with transverse bulkheads and metal covering. The beams act as supporting structure for the cabin sections, landing gear, fuel tanks, transmission, engine and tail boom.

1-52. The landing gear (6) is of the skid type, attached to the fuselage at four points. Ground handling wheels are provided as loose equipment and may be quickly installed for moving the helicopter on the ground. When ground handling wheels are not installed the helicopter presents a clean configuration for flight.

1-53. The aft portion of the tail boom supports the tail rotor (7), synchronized elevator (8) and the tail skid (9).

1-54. Ground Handling. The following paragraphs contain the information necessary for hoisting, jacking, leveling, mooring, parking, towing and the application of external power.

1-55. ***Hoisting.*** Hoisting the helicopter, the hub and blades, the mast controls, and/or the transmission is a simple process requiring only a suitable hoist.

a. Attach a hoisting cable or clevis (1, figure 1-9) to the main rotor retaining nut (2). Connect a suitable hoist and take up all slack in the cable or chain.

b. Station a man at the tail skid to steady the helicopter during the hoisting operation. Hoist slowly, maintaining a steady lifting force. If the helicopter is to be hoisted out of reach, tie a rope to the landing gear to steady the helicopter against excessive swinging or turning.

1-56. ***Jacking.*** All UH-1A helicopters have three jack pads (3, figure 1-9) mounted on the underside of the fuselage. UH-1B helicopters have a total of four jack pads. All helicopters have two pads mounted on the fuselage just forward of the forward landing gear cross tube. The thirl pad on UH-1A helicopters is located just left of the helicopter center line and just forward of the tail boom attachment point. UH-1B .helicopters have two aft jack pads just forward of the tail boom attachment point and to the left and right of helicopter center line. With the forward cross tube in unloaded condition, and the landing gear skid tubes ready to break ground contact, the forward jack pads on UH-1B helicopters are 18.04 inches above ground. Under the same conditions, the aft jack pads on these helicopters are 27.28 inches above ground.

1-57. ***Jacking Procedure.*** Place one hydraulic jack under each of the three, or four, jacking points, or pads, of the helicopter and raise the helicopter evenly.

Caution

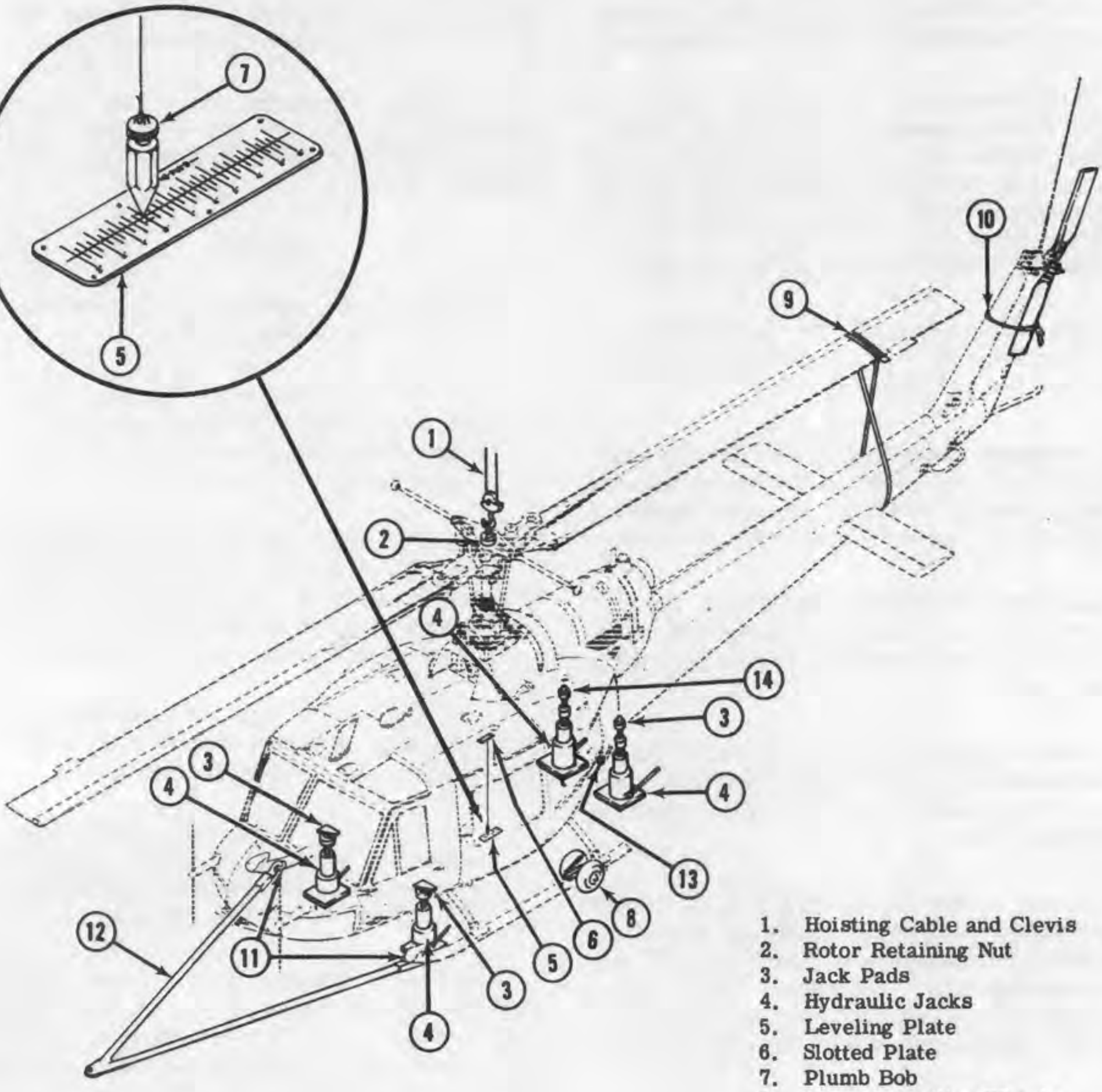
> Observe the following precautions while helicopter is on jacks:
>
> a. If helicopter is being placed on jacks preparatory to removing landing gear, take up slack with hoist. (Refer to paragraph 1-55, step 2.)
>
> b. All personnel in the immediate area shall exercise extreme caution not to bump or otherwise disturb the helicopter while it is being raised on jacks or while it is supported on jacks.
>
> c. Personnel shall not crawl into or onto the helicopter while it is being raised and/or supported by jacks.
>
> d. Rope off the area around the helicopter and prominently display warning signs to the effect that THIS HELICOPTER IS ON JACKS.

1-58. ***Mooring.*** Mooring is the process of securing the parked helicopter in such a manner that it will not be damaged during periods of high winds and/or turbulent weather. If properly spaced tie-down rings are not available, mooring kits (see figure 1-10) are to be utilized.

1-59. ***Mooring Procedure.*** Locate the helicopter on an unpaved parking area, headed in the direction from which the highest forecasted winds are expected.

Note

> Three mooring points are required on the UH-1A helicopters. Four mooring points are required on the UH-1B helicopters.



1. Hoisting Cable and Clevis
2. Rotor Retaining Nut
3. Jack Pads
4. Hydraulic Jacks
5. Leveling Plate
6. Slotted Plate
7. Plumb Bob
8. Ground Handling Wheels
9. Main Rotor Tie-down Assembly
10. Web Strap
11. Tow Ring
12. Tow Bar
13. External Power Receptacle
14. Jack Pad (UH-1B)

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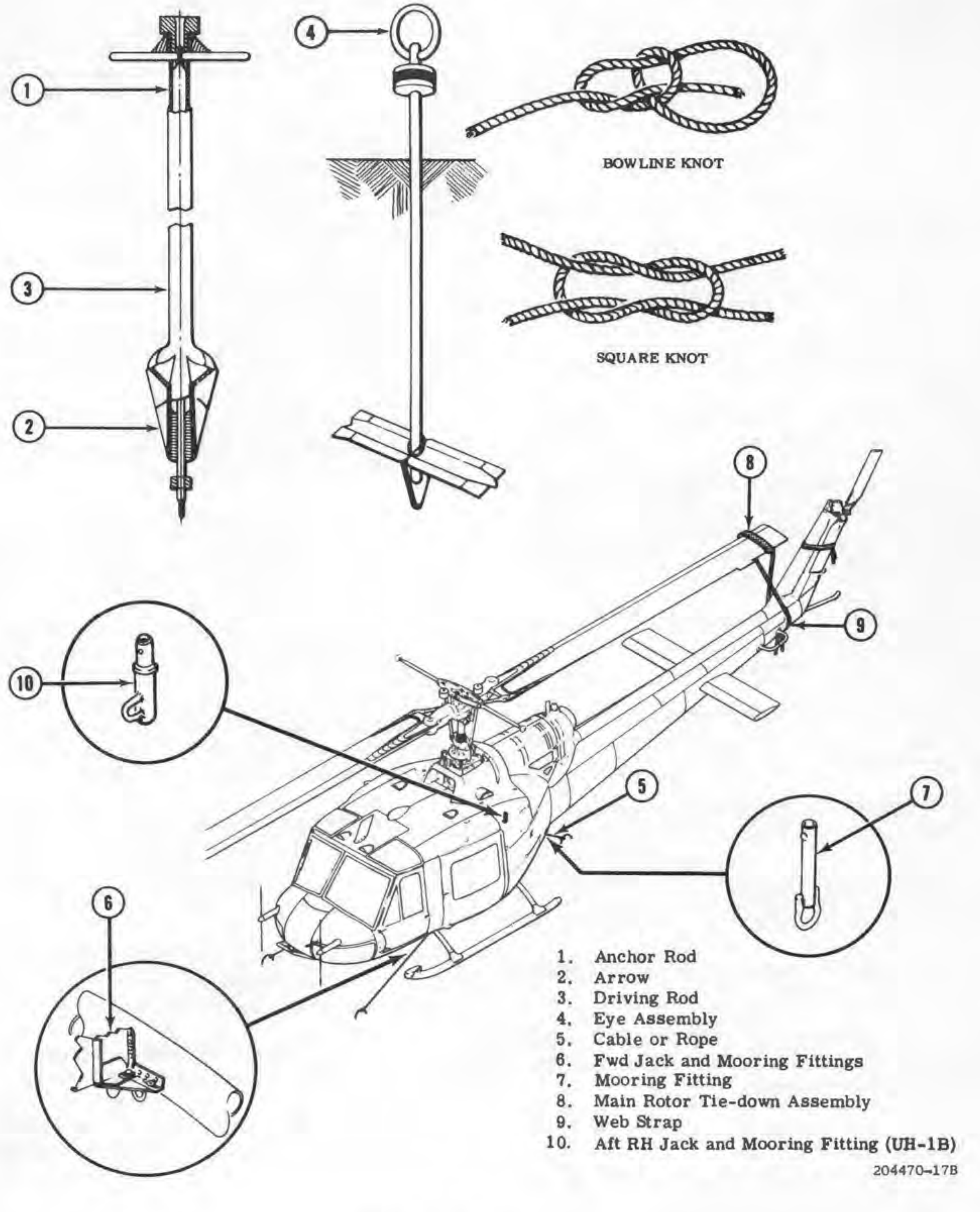
Figure 1-9. Typical ground handling



1. Anchor Rod
2. Arrow
3. Driving Rod
4. Eye Assembly
5. Cable or Rope
6. Fwd Jack and Mooring Fittings
7. Mooring Fitting
8. Main Rotor Tie-down Assembly
9. Web Strap
10. Aft RH Jack and Mooring Fitting (UH-1B)

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Figure 1-10. Typical mooring

Note

On UH-1B helicopters, Serial No. 65-9416 and subsequent, the mooring load on ring is not to exceed the following:

1000 lb	Vertically
500 lb	Laterally
500 lb	Fore/Aft

a. Screw the anchor rod (1, figure 1-10) into the arrow assembly (2).

b. Slip driving rod (3) over anchor rod (1) and into socket of arrow assembly (2).

c. Turn cam of driving rod so that prongs of arrow assembly are not spread by driving.

d. If necessary break surface of ground with ground breaking pin.

e. Position two rods approximately one foot forward of the forward landing gear cross tube and slightly inboard of the skid tubes. Other rod(s) are to be positioned approximately one foot aft of the aft tie-down ring(s).

f. Drive arrow assemblies into the ground until the driving rod handle is approximately three inches above ground surface.

g. Rotate driving rod handle approximately 90 degrees and give it a sharp blow to spread the arrow prongs.

h. Return the driving rod to the driving position and remove it from the anchor rod.

i. Align the squared socket of the eye assembly (4) with squared end of the anchor rod. Fit in place, and tighten the knurled nut.

j. Set the arrow assembly prongs by pulling up on the eye assembly.

k. Secure the helicopter with 1/4 inch cables, or one inch manila rope, in accordance with instruction in paragraph 1-63.

Note

When the anchor rods are no longer needed they may be removed by turning the eye assemblies counterclockwise, leaving the arrow assemblies in the ground.

1-60. ***Parking.*** Parking, as used in this manual, is defined as the condition in which the helicopter will be secured while on the ground. The direction of heading and location of the helicopter are normally determined by ease of maintenance and servicing, to facilitate removal of any one helicopter from the parking area, and to permit ready access of mobile fire fighting equipment within the area. Maximum velocity of surface winds which can be withstood by the helicopter, when parked in the following manner, depends on the gross weight of the helicopter.

1-61. ***General Conditions.*** Parking arrangement will vary to utilize local space facilities to the maximum degree. The following general procedure should, however, be observed under any condition.

a. Double row lateral parking, with front and rear helicopter of each double row placed tail to tail, should be accomplished.

b. Helicopter should be parked not less than 750 feet from the ends, or the center lines, of nearest run way, and not less than 250 feet from the edge of connecting taxi strips.

c. The width of fire lanes between each double row should be slightly greater than the rotor span of the parked helicopters. This spacing will greatly facilitate removal of any one helicopter from the parking area, as well as permitting greater ease of movement for mobile fire fighting equipment within the area.

d. Cross fire lanes, having a minimum width of 50 feet, should be provided. Such fire lanes should divide each lateral row of parked helicopters into isolated blocks of 10 helicopters, or less.

e. Helicopters parked on concrete ramps, or aprons, should be parked in such a manner as to utilize mooring rings when available.

f. Parked helicopters will be grounded in order to facilitate discharge of static electricity.

1-62. ***Parking Procedure — Normal Conditions.*** Position the helicopter on a level surface, whenever possible, so that the load will be balanced.

a. Retract ground handling wheels (8, figure 1-9) and allow the helicopter to rest on the skid type landing gear.

Note

If a helicopter is to remain parked for a period exceeding 14 days, suitable blocks, or shoring, should be placed under the skids. These blocks should be of sufficient height to prevent the skids from contacting the supporting surface.

b. Turn the main rotor blades until they are parallel with the center line of the helicopter, and the tail rotor blades until they are parallel with the vertical fin.

c. Attach the main rotor tie-down assembly to the aft main rotor blade, and pull the blade down until the static stop contacts the mast. Secure by firmly cross-tying the web strap of the tie-down assembly around the tail boom.

d. Attach web strap (10) to the tail rotor and secure to ring provided on vertical fin.

e. Lock all flight controls, turn off all switches, disconnect outside power (if connected) and close all windows, doors and access panels.

1-63. ***Parking Procedure — Turbulent Conditions.*** If turbulent weather conditions are anticipated, the following procedure shall be adhered to in parking the helicopter.

Caution

Structural damage can occur from turbulent surface conditions. Anchoring and/or mooring should be accomplished if wind is expected to exceed 45 knots. If at all possible, the helicopter should be evacuated to a safe weather area if a tornado, cyclone, hurricane or wind condition above 75 knots is expected.

Note

Model UH-1A and UH-1B helicopters are not adaptable to the standard 30 foot ring spacing of parking areas; therefore, if high winds are expected to reach 45 knots, and suitable rings are not available, the helicopter should be moved to an area where mooring kit can be used. Refer to paragraph 1-59 for mooring procedure.

a. Locate the helicopter over ground anchors, headed in the direction from which the highest forecasted winds are expected.

b. Complete normal parking procedures as outlined in paragraph 1-62.

c. Fill fuel tanks to capacity, if time permits.

d. Fasten a 1/4 inch cable, or a one inch manila rope (5, figure 1-10), to each of the two tie-down rings (6) located on the underside of the fuselage just forward of the forward landing gear cross tube, and secure to ground mooring rings.

e. Fasten a 1/4 inch cable, or a one inch manila rope (5) to the other mooring ring(s) (7) on the underside of the fuselage just forward of the tail boom, and secure to ground mooring ring.

f. Disconnect battery, secure all loose equipment and move all ground support equipment a safe distance from the aircraft.

Note

After high winds have subsided, check the helicopter for damage from flying objects. If the helicopter is in flyable storage, connect the battery before ground operation or flight.

1-64. ***Towing.*** A tow ring (11, figure 1-9) is located on the forward end of each landing gear skid tube. With ground handling wheels attached to the skid landing gear, a standard aircraft tow bar (12), attached to the tow rings, is used for towing the helicopter.

Caution

Model UH-1A and UH-1B helicopters equipped with three inch diameter aft cross tube may not be towed on the ground handling gear, or on unprepared surfaces, at gross weights in excess of 7400 pounds. Such action will cause permanent set in the aft cross tube. Model UH-1A helicopters equipped with the 2 3/4 inch aft cross tube may not be towed at gross weights in excess of 6000 pounds.

1-65. ***Application of External Power.*** The external power receptacle (13, figure 1-9) is mounted on a bracket just below the electrical compartment access door on the left side of the helicopter fuselage aft of the cabin bulkhead. The receptacle compartment is covered by a spring loaded access door. This receptacle is the contact point for external power application. When external power is applied the external power caution light is illuminated, and the battery switch should be in the "OFF" position. When a 28 volt, direct current, power plug from an APU delivering 650 to 800 amps is securely inserted in the receptacle, the external power relay in the helicopter's electrical system is energized, and 28 volt, direct current, electrical power is supplied to the main bus for distribution.

Note

> When battery is fully charged, external power is not required for starting the helicopter. If the battery charge is 24V or less, external power must be used to avert hot starts.

1-66. ***Leveling.*** A leveling plate (5, figure 1-9) that is graduated in increments of one quarter of a degree is located on the cabin floor just inside the left-hand cargo door. A slotted plate (6) for supporting a plumb bob is secured to the cabin roof directly above the leveling plate.

1-67. ***Leveling Procedure.*** a. Hang a plumb bob (7) from the slotted plate in the cabin roof in such a manner that the point of the plumb bob is just above the leveling plate on the cabin floor.

b. Level the helicopter, fore and aft, and laterally, by adjusting the three, or four, supporting jacks (4) (see paragraph 1-57), so as to bring the point of the plumb bob exactly over the point where the two lines cross at zero degrees on the leveling plate. (See figure 1-9.)

1-68. All Weather Covers. Heavy fabric covers are provided for all weather protection of the helicopter. These covers include one each for the nose section, forward cabin, aft cabin, main rotor blades, stabilizer bar, pylon assembly, tail rotor blades and tail rotor hub. Additional covers for the tail pipe, forward cowl and pitot tube are included in loose equipment.

1-69. Servicing. The following paragraphs completely describe all servicing procedures necessary for the helicopters covered by this manual.

1-70. ***Fuel System — Main.*** The main fuel system incorporates two interconnected fuel tanks (1, figure 1-11) for simultaneous flow and venting. Model UH-1A helicopters have one electrically operated fuel boost pump located in the left-hand fuel cell. On UH-1B helicopters both fuel cells are equipped with a sump and boost pump assembly. UH-1A and UH-1B (Serial No. 60-3546 through 64-14100) helicopters may be filled through a filler cap (4), located on the right-hand side of the helicopter, aft of the cargo door. On UH-1B helicopters (Serial No. 64-14101 and subsequent) the filler cap is located on the left-hand side of the helicopter. The fuel drain valve for UH-1A and UH-1B (Serial No. 60-3546 through 64-14100) helicopters is located in the aft electrical compartment, below the battery, left of helicopter center line. The fuel drain valve for UH-1B helicopters (Serial No. 64-14101 and subsequent) is located on the bottom of the left-hand fuel cell adjacent to the sump drain. Fuel tank pump and sump drains may be reached through an access door in the bottom of the fuselage.

1-71. ***Servicing — Main Fuel System.*** Service with specified fuel (item 1, table 1-1).

Note

> When specified fuel is not available, refer to TM 55-1520-211-10 and TB AVN-2 for information on other fuels and limitations on their use.

Warning

> Observe the following precautions in all servicing operations:
>
> a. Position auxiliary ground power units on the windward side of the helicopter.
>
> b. Do not fuel or defuel during electrical storms.
>
> c. Do not fuel or defuel while ground or aircraft radar sets are operating within 300 feet of the helicopter.
>
> d. Servicing personnel shall not wear metal taps on their shoes.

e. Be sure battery switch is in OFF position and external power is disconnected before fueling or defueling the helicopter.

f. Ground the helicopter at the receptacle located aft of and below the fuel filler cap on the right-hand side of the helicopter. On UH-1B helicopters, (Serial No. 64-14101 and subsequent), the grounding receptacle is located on the left-hand side of the helicopter.

g. Fuel truck shall be grounded. (Truck to ground and truck to nozzle.)

h. Ground the truck filler-nozzle to the helicopter before removing the helicopter fuel tank filler cap. This will equalize static electrical potential.

i. Do not use "SPLASH" filling. Fill the tanks slowly and evenly.

j. When filling fuel tanks on UH-1B helicopters Serial No. 64-14101 and subsequent DO NOT OVERFILL. Excess fuel will run along door tracks into electrical compartment and possibly create fire hazard.

k. After completion of servicing, wash down and remove any spillover of jet fuel. This fuel does not evaporate as rapidly as gasoline, and constitutes a fire hazard for a much longer time. Cleaning materials or clothing which have become saturated with jet fuel shall be disposed of well away from any aircraft or hanger.

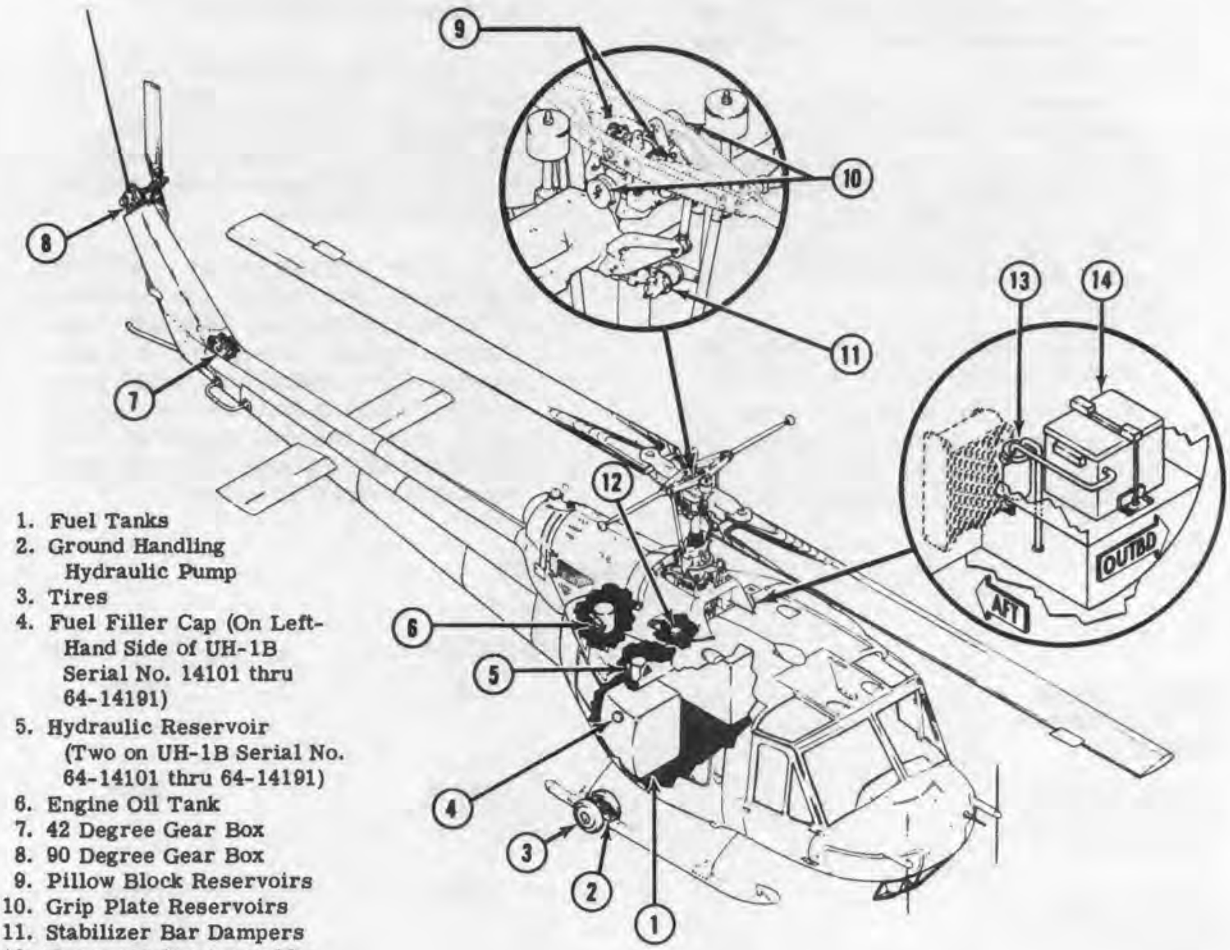
TANK CAPACITY
(U.S. Gallons)

	Normal Service	Spillover Level
UH-1A (Serial No. 58-2078 thru 58-3047)	125.0	138.0
UH-1A (Serial No. 59-1607 and Subsequent)	155.0	166.0
UH-1B (Serial No. 60-3546 thru 64-14100)	165.0	168.0
UH-1B (Serial No. 64-14101 and Subsequent	242.0	245.0

1-72. *Recording of Alternate or Emergency Fuel.* If the aircraft is serviced with fuel other than the specified fuel, the type of fuel, quantity and operating time shall be entered in Form 2408-15 (Historical Record of Aircraft). This record is for the purpose of scheduling any additional maintenance that may be required. (Refer to figure 1-12.)

1-73. *Auxiliary Fuel Systems.* Various auxiliary fuel systems are available for use on UH-1A and UH-1B helicopters to provide additional fuel for extended distance and ferry missions. A 165 gallon capacity non-sealing fuel bladder, enclosed in a metal container, may be installed in the passenger-cargo compartment of UH-1A and UH-1B helicopters. (Refer to paragraph 11-313.) A larger, 350 gallon capacity, metal enclosed fuel tank is also available for installation in the passenger-cargo compartment of UH-1B helicopters only. (Refer to paragraph 11-323.) Two 60 gallon capacity external auxiliary fuel tanks may be installed on UH-1B helicopters, Serial No. 62-1872 and subsequent. (Refer to paragraph 15-3.) Internal 50 or 60 gallon capacity, self-sealing auxiliary fuel tanks may be installed in either the forward or the aft portion of the passenger-cargo compartment of UH-1A and UH-1B helicopters. (Refer to paragraph 11-333.)

1-74. *Servicing — Auxiliary Fuel Tanks.* See figures 11-10, 11-12, 15-1 and 11-14, for appearance of auxiliary tanks and location of fuel tank filler caps.



1. Fuel Tanks
2. Ground Handling Hydraulic Pump
3. Tires
4. Fuel Filler Cap (On Left-Hand Side of UH-1B Serial No. 14101 thru 64-14191)
5. Hydraulic Reservoir (Two on UH-1B Serial No. 64-14101 thru 64-14191)
6. Engine Oil Tank
7. 42 Degree Gear Box
8. 90 Degree Gear Box
9. Pillow Block Reservoirs
10. Grip Plate Reservoirs
11. Stabilizer Bar Dampers
12. Transmission Assembly
13. Battery Sump Jar (UH-1A and UH-1B Serial No. 60-3546 thru 64-14100)
14. Battery

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Figure 1-11. Typical servicing diagram

Note

Be sure battery switch is in the "OFF" position, external power is disconnected and the helicopter is grounded before fueling or defueling the aircraft.

a. Make certain all lines and electrical leads are properly connected before servicing.

b. Service with fuel in accordance with precautions and limitations stated for main fuel system servicing.

Note

When filling the 165 and 350 gallon auxiliary fuel tanks, depress the poppet type valves in the top of each end bulkhead to release any air trapped between the cell and the fuel tank cover.

1-75. Engine Oil System. The supply tank (6, figure 1-11) for the engine oil system is located on the right-hand side of the forward engine firewall. A radiator type oil cooler is mounted in an opening through the bulkhead between the main fuselage compartment and the cargo sling compartment. Access to the engine oil tank is gained by removing cowling from the right-hand side of the transmission. The tank may be drained by opening the drain valve in the line just outboard of the tank. The oil cooler drain valve is located in the drain line routed from the lower part of the oil cooler to the aft bottom side of the cabin section. The oil level may be checked by use of the dipstick under the filler cap.

1-76. *Servicing — Engine Oil System.* Service with oil (item 2, table 1-1).

TANK DATA
U.S. GALLONS

Model	Total Capacity	Expansion Space	Normal Useful Capacity
UH-1A	3.00	1.40	1.60
UH-1B	4.05	.80	3.25

1-77. *Transmission Oil System.* The transmission has a self-contained oil supply which is carried in the sump at the bottom of the transmission assembly. (12, figure 1-11.) Oil level may be checked through a sight glass in the lower right-hand side of the transmission. A light is provided to make the sight glass visible, and can be turned on by pressing a button located on the right-hand side of the helicopter just aft of the heater access door. Access to the filler cap may be gained by opening cowling from the right-hand side of the transmission. Access to the transmission drain plug, located on the bottom of the sump, is through an access door located on the bottom of the fuselage.

1-78. *Servicing — Transmission Oil System.* Service with oil (item 2, table 1-1).

Note

Capacity of Model UH-1A helicopter transmission is 1.75 U.S. gallons. Capacity of Model UH-1B helicopter transmission is 2.25 U.S. gallons.

1-79. *Forty-two Degree Gear Box.* The 42°, or intermediate, gear box (7, figure 1-11) is located on the aft end of the tail boom, at the base of the vertical fin. Access to this gear box may be obtained by opening the tail rotor drive access cover. The gear box is serviced through a filler cap on top, and a sight glass is provided on the right-hand side for checking the oil level. Draining the gear box is accomplished by removing the complete drain plug, which is located on the lower side of the gear box. On UH-1A and UH-1B, Serial No. 60-3546 through 64-14191, helicopters the inner portion of the drain plug incorporates a magnetic plug. The outer portion of the plug contains a spring loaded valve which prevents loss of oil when pulling the magnetic plug for inspection purposes. UH-1B, Serial No. 65-9416 and subsequent, helicopters are equipped with a chip detector warning system which activates a warning light on the pedestal caution panel when excessive contamination occurs.

Note

Magnetic plug on earlier helicopters can be replaced with chip detector. When such replacement is made chip detector will not be connected to pedestal caution panel.

Caution

Do not interchange filler caps between 42° and 90° gear boxes. If filler caps are interchanged the 42° gear box will be pumped dry.

1-80. *Servicing — Forty-two Degree Gear Box.* Service with oil (item 2, table 1-1).

Note

Capacity of Model UH-1A and Model UH-1B helicopter 42° gear box is 0.375 U.S. pints.

1-81. *Ninety Degree Gear Box.* The 90°, or tail rotor, gear box (8, figure 1-11) is located on the extreme aft end of the tail boom, behind the tail rotor hub. The gear box is serviced through a filler cap on top, and a sight glass is provided on the right-hand side for checking the oil level. Draining the gear box is accomplished by removing the complete drain plug, which is located on the lower side of the gear box. On UH-1A and UH-1B, Serial No. 60-3546 through 64-14191, helicopters the inner portion of the drain plug incorporates a magnetic plug. The outer portion of the plug contains a spring loaded valve which prevents loss of oil when pulling the magnetic plug for inspection purposes. UH-B, Serial No. 65-9416 and subsequent, helicopters are equipped with a chip detector warning system which activates a warning light on the pedestal caution panel when excessive contamination occurs.

Note

Magnetic plug on earlier helicopters can be replaced with chip detector. When such replacement is made chip detector will not be connected to pedestal caution panel.

Caution

Do not interchange filler caps between 90° and 42° gear boxes. If filler caps are interchanged the 42° gear box will be pumped dry.

1-82. ***Servicing — Ninety Degree Gear Box.*** Service with oil (item 2, table 1-1).

Note

Capacity of Model UH-1A and Model UH-1B helicopter 90° gear box is 0.50 U.S. pints.

1-83. ***Rotor Head Reservoirs.*** Model UH-1A and UH-1B (Serial No. 60-3546 through 64-14100) helicopters have a reservoir (9, figure 1-11) located on the top of each main rotor hub pillow block. Two more reservoirs (10) are a part of the grip plate assemblies. These four reservoirs provide for proper lubrication of the main rotor hub. The grip plate reservoirs have a sight glass for checking oil level.

1-84. ***Servicing — Rotor Head Reservoirs.*** Service all four reservoirs with oil (item 2, table 1-1). After servicing install filler plugs and safety-wire.

Note

Fill pillow block reservoirs completely and grip plate reservoirs to the ½ level. Grip plate reservoirs on Model UH-1A helicopters will require approximately two quarts each, and those on Model UH-1B helicopters will require approximately three quarts each. Grip plate reservoirs will fill slowly.

1-85. ***Reservoir — Dampers.*** Two stabilizer bar dampers (figure 1-13) are mounted on adapters on the mast. (See 11, figure 1-11.) They are also attached to the stabilizer bar by control tubes, and the adjustment and timing of the dampers determines the following time of the stabilizer bar and the resultant controllability of the helicopter. Model UH-1A helicopters, Serial No. 58-2078 through 58-2083, are equipped with 204-010-900 dampers. Model UH-1A Serial No. 58-2084 and subsequent, and all Model UH-1B helicopters, are equipped with 204-010-937 dampers.

1-86. ***Servicing — Damper Reservoir*** (Part No. 204-010-900). These dampers cannot be filled while on the helicopter. For removal, refer to paragraph 8-27, 8-73 or 8-115.

a. Position damper with spline end down.

Caution

Clamping damper around body will seize wingshaft and damage internal parts.

b. Remove bleed valve (1, figure 1-13) and fill cavity with hydraulic oil (item 3, table 1-1).

c. Pull spool (2) out and release several times to purge air from timing section.

d. With the spool (2) held in the OUT position, oscillate the wingshaft (3) several times to purge air from the vane section. If any air remains it will cause a soft spot which will be felt when direction of rotation is changed.

e. Replace bleed valve (1) and position damper as it will be installed on the helicopter. Remove the filler plug (4) and check fluid level. Fluid level should be even with bottom of filler plug hole. Replace and safety wire filler plug.

Caution

From this point on do NOT hold damper with splined end UP for any appreciable length of time and do NOT rotate the wingshaft with the damper in the up position. If the wingshaft is rotated in this position, steps a. through e. must be repeated. Rapid rotation of the wingshaft will induce air into cavity.

f. Adjust and install dampers. (Refer to paragraph 8-31, 8-77 or 8-117.)

1-87. ***Servicing — Damper Reservoir*** (Part No. 204-010-937). These dampers may be filled while on the helicopter. Servicing, other than maintenance of fluid level, is not recommended.

TYPES OF FUEL AND PERMISSIBLE HOURS OF OPERATION ON EACH BETWEEN SCHEDULED HOT END INSPECTIONS

ENGINE MODEL	SPECIFIED FUEL	ALTERNATE FUEL Type	Hours	EMERGENCY FUEL Type	Hours
T53-L-1A	JP-4	Gasoline, All Types JP-5 Type	50 Unlimited	None	None
T53-L-5	JP-4	Gasoline, All Types	50	JP-5 Type	10
T53-L-9/9A	JP-4	Gasoline, Unleaded	50	JP-5 Type Gasoline, Leaded	10 10
T53-L-11 and Scoopless T53-L-9A	JP-4 JP-5	Gasoline, Unleaded Diesel Fuel	50 150	Gasoline, Leaded Compression Ignition Fuel	30 10

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Figure 1-12. Fuel usage chart

a. Remove filler cap (4, figure 1-13) and fill damper to full mark with hydraulic oil (item 3, table 1-1).

b. Replace and safety wire filler cap.

1-88. *Hydraulic Reservoir*. The hydraulic reservoir (5, figure 1-11) for UH-1A and UH-1B, Serial No. 60-3546 through 64-14100, helicopters is mounted on the right-hand side of the cabin aft bulkhead. Access to this reservoir is gained by opening right-hand transmission cowling. Oil level can be checked from inside cabin by means of a sight glass located on forward side of reservoir. Reservoir drain plug is located in bottom of reservoir.

Warning

To avoid contamination, do not use previously opened cans of hydraulic fluid. A new, sealed can of fluid must be opened and used.

1-89. *Servicing — Hydraulic Reservoir*. Service hydraulic reservoir for UH-1A and UH-1B, Serial No. 60-3546 through 64-14100, with hydraulic fluid (item 3, table 1-1).

HYDRAULIC CAPACITIES

Total Hydraulic Reservoir Capacity	4.0 U.S. Pints
Reservoir Refill Level	3.0 U.S. Pints
Total Hydraulic System Capacity	8.0 U.S. Pints

1-90. *Hydraulic Reservoir*. UH-1B helicopters, Serial No. 64-14101 and subsequent, are equipped with two hydraulic reservoirs (5, figure 1-11) mounted on the right-hand side of the cabin aft bulkhead. Access to these reservoirs is gained by opening right-hand transmission cowling. Outboard reservoir supplies System No. 2, and inboard reservoir supplies System No. 1. Oil level in each reservoir can be checked by means of sight glasses which are visble when right-hand transmission cowling is opened. A drain plug is located in the bottom of each reservoir.

Warning

To avoid contamination, do not use previously opened cans of hydraulic fluid. A new, sealed can of fluid must be opened and used.

Caution

On UH-1B helicopters Serial No. 66-491 and subsequent do not service reservoir with the accumulator charged hydraulically. Accumulator should be bled down.

1-91. *Servicing — Hydraulic Reservoir*. Service hydraulic reservoirs for UH-1B, Serial No. 64-14101 and subsequent, with hydraulic fluid (item 3, table 1-1).

HYDRAULIC CAPACITIES

Total System No. 1 Reservoir Capacity	3.25 U.S. Pints
Total System No. 2 Reservoir Capacity	3.25 U.S. Pints
Reservoir Refill Level	2.60 U.S. Pints
Total System No. 1 Capacity	6.60 U.S. Pints
Total System No. 2 Capacity	6.05 U.S. Pints

1-92. *Tires.* Two, six ply, tires (3, figure 1-11) are used on the helicopter ground handling gear. Those used on the Model UH-1A helicopters are 3.50 x 6; those on the Model UH-1B helicopters are 7.00 x 6.

1-93. *Servicing — Tires.* Inflate ground handling gear tires as follows:

Model Helicopter	Tire Size	Inflate To
UH-1A	3.50 x 6	75 to 80 PSI
UH-1B	7.00 x 6	38 PSI

1-94. *Ground Handling Hydraulic Pump.* A hydraulic pump (2, figure 1-11) is part of each ground handling gear. This manually activated pump facilitates raising and lowering of the ground handling wheels.

1-95. *Servicing — Ground Handling Hydraulic Pump.* a. Remove ground handling gear from helicopter and perform the following:

b. Position ground handling gear so that hydraulic pump is in vertical position with filling hole at top.

c. Remove filling screw and fill pump tank with hydraulic fluid, (item 3, table 1-1), until fluid comes out the filling hole.

d. Reinstall filling screw and tighten securely.

1-96. *Battery.* The nickel-cadmium battery (14, figure 1-11) is mounted in the lower section of the electrical compartment, and is connected to the helicopter's electrical system through a relay, which is controlled by the battery switch on the DC power panel. Two overflow, or vent, tubes extend from the battery to the underside of the fuselage. They are accessible through the lower left-hand door of the electrical compartment. The acceptable battery is a 24 volt, 34 ampere hour unit.

Caution

Battery failures and explosions may be caused by an excess of electrolyte in the cells. The specific gravity of a nickel-cadmium battery remains constant when the battery is in either a charged or discharged condition; consequently the state of charge cannot be determined by a test of the electrolyte. Neither can the state of charge be determined by a voltage test, due to the fact that the voltage remains constant over 90 percent of the discharge time. Since the state of charge cannot be determined by a check of either voltage or the electrolyte, the charging input to a completely discharged battery must be monitored in both current and time until the ampere hour capacity of the battery has been reached.

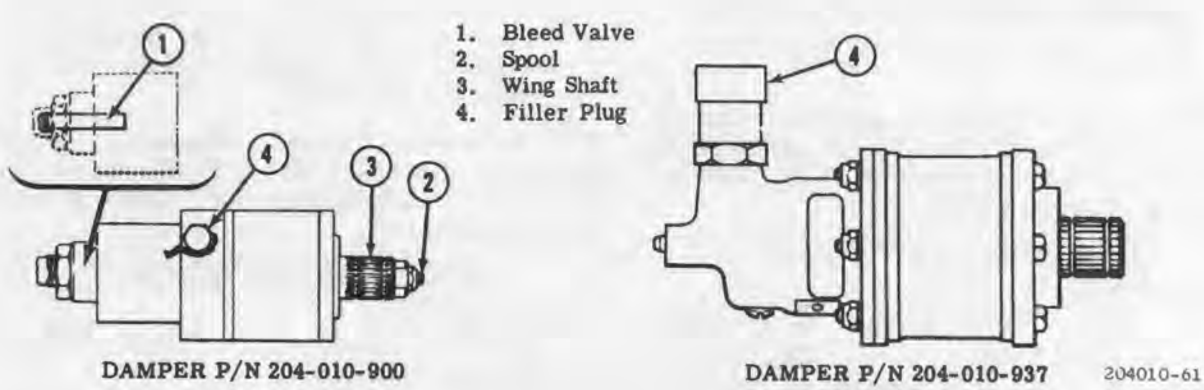


Figure 1-13. Stabilizer bar dampers

1-97. ***Servicing — Battery.*** The battery shall be removed from the helicopter (refer to paragraph 12-84) at 100 hour intervals and send to the Battery Shop for inspection, repair, charging capacity test and adjustment of electrolyte level.

1-98. ***Battery Sump Jar.*** All model UH-1A, and UH-1B helicopters Serial No. 60-3546 through 64-14100, are equipped with a battery sump jar (13, figure 1-11) mounted on the wall in the aft section of the battery compartment. The purpose of this jar is to neutralize any alkaline discharge from the battery ,and by so doing, eliminate any possibility of corrosion.

1-99. ***Servicing — Battery Sump Jar.*** Visually inspect jar for cracks and loose tube connections. Saturate battery sump jar pad with boric acid.

1-100. Cleaning. Clean aircraft and components in accordance with TM 55-405-3 unless otherwise specified. Special cleaning procedures will be covered in this manual under individual component.

1-101. Painting. Instructions for painting and paint touchup will be found in TB AVN-7. Requirements which are peculiar to UH-1A and UH-1B helicopters will be found in this manual under the applicable component.

1-102. List of Consumable Materials. Table 1-1 lists all consumable materials authorized for use by organizational maintenance personnel.

1-103. Special Tools and Equipment. Special tools and equipment authorized for use by organizational maintenance personnel will be found in TM 55-1520-211-20P.

Table 1-1. List of consumable materials (Sheet 1 of 6)

	FUELS AND LUBRICANTS	
ITEM NO.	NOMENCLATURE	SPECIFICATION
1	Jet Fuel, Grades JP-3, JP-4, and JP-5	MIL-J-5624
2	Lubricating Oil, Synthetic Base, Aircraft Turbine Engine	MIL-L-7808
3	Hydraulic Fluid, Aircraft, Petroleum Base, Missile and Ordinance	MIL-H-5606
4	Lubricating Oil, General Purpose, Low Temperature	MIL-L-7870
5	Lubricating Oil, Jet Engine	MIL-O-6081 (Grade 1010)
6	Lubricant, Corrosion Inhibiting, Solid Film Heat Cured	MIL-L-46010
7	Graphite, Lubricating	MIL-G-6711
8	Grease, Aircraft, Helicopter Oscillating Bearing	MIL-G-25537
9	Lubricant, Bell Helicopter Company	204-040-755-3
10	Corrosion Preventive, Synthetic Base, Aircraft Gas Turbine Engine	MIL-C-8188
11	Grease, Pneumatic System	MIL-G-4343
12	Calibrating Fluids, Aircraft Fuel System Components	MIL-F-7024
13	Grease, Aircraft and Instrument	MIL-G-23827
14	Petrolatum, Technical	FED. SPEC. VV-P-236

Table 1-1. List of consumable materials (Sheet 2 of 6)

FUELS AND LUBRICANTS (Cont)

ITEM NO.	NOMENCLATURE	SPECIFICATION
15	Lubriplate	FED. MFG. CODE 73219
16	Preservative, Hydraulic Fluid, Petroleum Base	MIL-H-6083 (Type II)
17	Aircraft Engine Corrosion Preventive	MIL-C-6529 (Type II)
18	Hydrogenated Vegetable Shortening	EE-S-321
19	Medicinal Castor Oil	JJJ-C-86
20	Plastilube, Moly No. 3	FED. MFG. CODE 02307

PAINTS, PRIMERS, THINNERS AND MARKING COMPOUNDS

(Note: All color numbers shall be in accordance with Federal Standard 595)

ITEM NO.	NOMENCLATURE	COLOR NO.	SPECIFICATION
100	Lacquer, Acrylic, Interior		TT-L-20
101	Lacquer, Acrylic, Gloss Marking, Inside		TT-L-32
102	Epoxy Primer (Super Koropon) DeSoto Chemical Coatings, Inc., Garland, Texas		
103	Prussian Blue Color, Thinned with Oil		TT-P-691
104	Enamel, Aluminum, Heat Resistant	XA 147	FED. MFG. CODE 77359
105	Lacquer, Acrylic, Black, Camouflage	37038	P-95 NAVY
106	Lacquer, Acrylic, Olive Drab, Camouflage	34087	P-95 NAVY
107	Lacquer, Acrylic, Olive Drab, Gloss	X14087	P-95 NAVY
108	Lacquer, Acrylic, Insignia Red, Gloss	11136	P-95 NAVY
109	Lacquer, Acrylic, Insignia Blue, Gloss	15044	P-95 NAVY
110	Lacquer, Acrylic, Insignia White, Gloss	17875	P-95 NAVY
111	Lacquer, Acrylic, Black, Gloss	17038	P-95 NAVY
112	Lacquer, Acrylic, Orange Yellow	13538	P-95 NAVY
113	Lacquer, Acrylic, Insignia Red	ANA509	P-95 NAVY
114	Lacquer, Acrylic, Orange-Yellow, Lusterless	33538	P-95 NAVY

Table 1-1. List of consumable materials (Sheet 3 of 6)

PAINTS, PRIMERS, THINNERS AND MARKING COMPOUNDS (Cont)

ITEM NO.	NOMENCLATURE	COLOR NO.	SPECIFICATION
115	Lacquer, Acrylic, Black, Lusterless	37038	P-95 NAVY
116	Lacquer, Acrylic, Bright Red, Lusterless	31136	P-95 NAVY
117	Lacquer, Non-Acrylic, Dark Gull Grey	36231	MIL-L-6805
118	Primer, Locquic, Grade Q		MIL-S-22473
119	Primer Coating, Zinc Chromate, Low Moisture Senstivity		MIL-P-8585

ADHESIVES, CEMENTS AND SEALING COMPOUNDS

ITEM NO.	NOMENCLATURE	SPECIFICATION
200	Putty, Zinc Chromate, General Purpose	MIL-P-8116
201	Sealing Compound, Anaerobic, Single Component, Retaining	MIL-S-22473 Grade Q Grade CV(4-10)
202	Anti-Seize Compound, High Temperature (Navy)	MIL-A-907
203	Lubricant, Molybdenum Disulfide Powder	MIL-M-7866
204	Sealant, Anaerobic, Retaining, AAV 15-10	MIL-R-46082
205	Sealing Compound, High Adhesion, Temperature Resistant, Integral Fuel Tanks and Fuel Cell Cavities	MIL-S-8802
206	Anti-Seize and Sealing Compound, Thread, Oxygen Systems	MIL-T-5542
207	Epoxy, Engine Grey, A. D., Component A Part No. E-2833A	FED. MFG. CODE 16193
208	Epoxy, Engine Grey, A. D., Component B Part No. E-2833A	FED. MFG. CODE 16193
209	Sealing Compound, Pressure, Cabin	MIL-S-7124
210	Sealer, RP1257-2	FED. MFG. CODE 02684
211	Cement, A6 with Activator A	FED. MFG. CODE 98911
212	Cement, A4000, Silicone Adhesive	FED. MFG. CODE 71984

Table 1-1. List of consumable materials (Sheet 4 of 6)

ADHESIVES, CEMENTS AND SEALING COMPOUNDS (Cont)

ITEM NO	NOMENCLATURE	SPECIFICATION
213	Cement, Proseal 584	FED. MFG. CODE 83527
214	Metalset, A4	FED. MFG. CODE 90414
215	2216 Adhesive (Scotch-Weld)	FED. MFG. CODE 76381
216	Epon 934	MIL-A-5090
217	Primer, A934B	FED. MFG. CODE 76500

CHEMICALS, COATINGS AND CLEANING COMPOUNDS

ITEM NO.	NOMENCLATURE	SPECIFICATION
300	Defrosting Fluid, Anti-Icing and Deicing	MIL-A-8243
301	Cleaning Compound, Aircraft Surface, Alkaline, Waterbase	MIL-C-25769
302	Solvent, Dry Cleaning	P-D-680
303	Detergent, Anionic, Synthetic (Alkyl Benzine Sulfonate)	MIL-D-26937
304	Cleaning and Polishing Compound, Transparent Plastic Aircraft Materials	MIL-C-18767
305	Ammonium Hydroxide, 10%	A-O-451
306	Trichloreothyline, Technical	O-T-634
307	Trichloreothyline, Stabilized, Degreasing	MIL-T-7003
308	Naphtha, Aliphatic	TT-N-95 Type 2
309	Methyl-Ethyl-Ketone (For use in organic coatings)	TT-M-261
310	Corrosion Inhibiter	RUST LICK 606
311	Acetone, Technical	O-A-51
312	Cleaning Compound, Biodegradable	MIL-C-18687
313	Alcohol, Methyl	O-M-230
314	Anti-Icing Fluid (Isopropyl Alcohol)	MIL-F-5566
315	Corrosion Preventive Compound, Petrolatum, Hot Application	MIL-C-11796 Class 3

Table 1-1. List of consumable materials (Sheet 5 of 6)

CHEMICALS, COATINGS AND CLEANING COMPOUNDS (Cont)

ITEM NO.	NOMENCLATURE	SPECIFICATION
316	Dessicant, Activated, Bagged, Packaging Use and Static Dehumidification	MIL D-3464
317	Chemical Films and Chemical Film Materials for Aluminum Alloys	MIL-C-5541
318	Corrosion Preventive Compound, Cold Application, Solvent Cutback	MIL-C-16173 Grade 2
319	Fingerprint Remover, Corrosion Preventive	MIL-C-15074
320	Protective Coating, Sprayable, Strippable	MIL-C-6799 Type II, Class 2
321	Sodium Dichromate	FED. SPEC. O-S-595
322	Nitric Acid	O-N-350
323	Oakite, VisStrip (Paste)	FED. MFG. CODE 44389
324	Stripper, 5-A	FED. MFG. CODE 44389
325	Nitrogen	BB-N-411

FABRICS AND TAPES

ITEM NO.	NOMENCLATURE	SPECIFICATION
400	Outing Flannel	CCC-F-466
401	Crocus Cloth, Abrasive	P-C-458
402	Adhesive Tape, Pressure Sensitive, Water-proof, For Packaging and Sealing	PPP-T-60
403	Cloth, Abrasive (Scotchbrite)	FED. MFG. CODE 76381
404	Vinyl Tape, No. 455 (Scotchcal)	FED. MFG. CODE 76381
405	Vinyl Tape, No. 472 (Scotchcal)	FED. MFG. CODE 76381

Table 1-1. List of consumable materials (Sheet 6 of 6)

ABRASIVES, PAPER, PLASTICS, AND MISCELLANEOUS		
ITEM NO.	NOMENCLATURE	SPECIFICATION
500	Wire, Carbon Steel, Round, Bare and Coated	QQ-W-461
501	Wire, Steel, Corrosion Resisting	QQ-W-423
502	Brush, Aircraft Cleaning	MIL-B-5612
503	Grain, Soft, Abrasive, for Carbon Removal	MIL-G-5634 Type III
504	Rubber Sheet, Oil Resistant, Synthetic, Solid, Molded and Extruded Shapes	MIL-R-7362 Type I Composition A
505	Aircraft Wax, Solvent Type, Waterproof	MIL W-18723
506	Barrier Material, Flexible, Greaseproofed, Waterproofed	MIL-B-121
507	Barrier Material, Flexible, Water-Vaporproof	MIL-B-131
508	Sandpaper, No. 320	
509	Sandpaper, No. 400	

CHAPTER 2
LUBRICATION INSTRUCTIONS

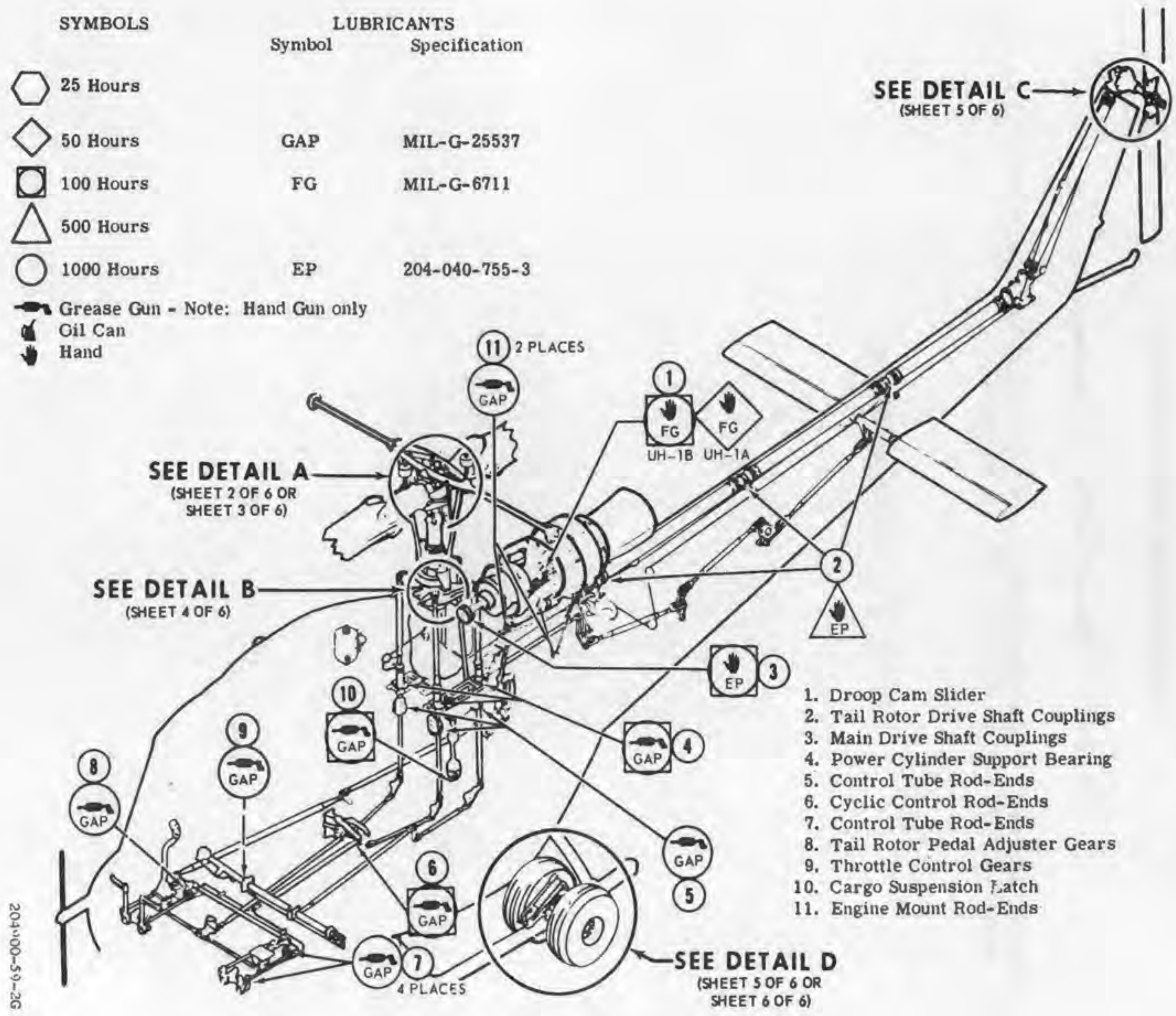
Section I — General Lubrication Requirements

2-1. General Lubrication Requirements. This chapter contains the lubrication requirements of the aircraft as shown on lubrication chart in Section II.

Section II — Lubrication Charts

SYMBOLS	LUBRICANTS Symbol	Specification
25 Hours		
50 Hours	GAP	MIL-G-25537
100 Hours	FG	MIL-G-6711
500 Hours		
1000 Hours	EP	204-040-755-3

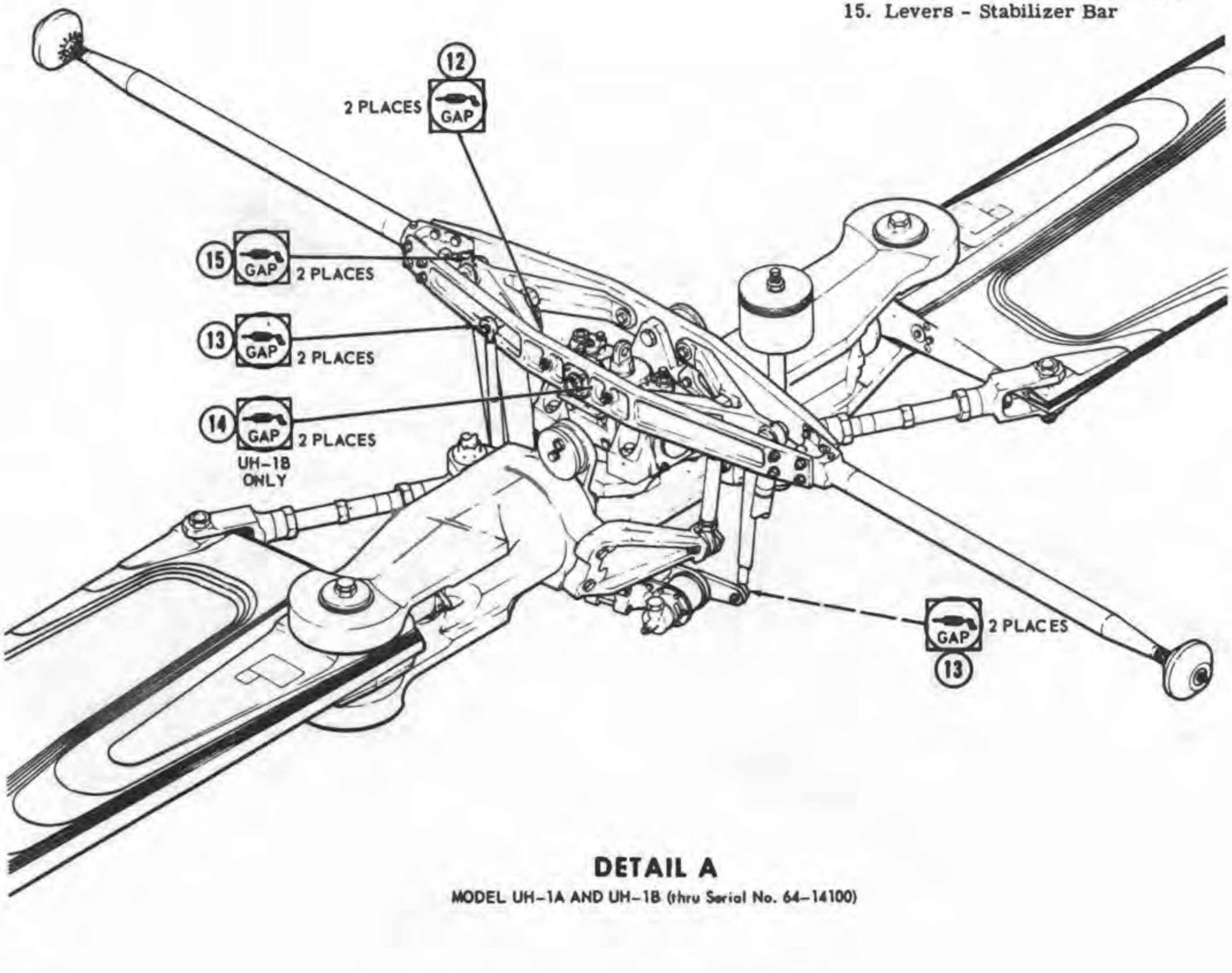
Grease Gun - Note: Hand Gun only
Oil Can
Hand



1. Droop Cam Slider
2. Tail Rotor Drive Shaft Couplings
3. Main Drive Shaft Couplings
4. Power Cylinder Support Bearing
5. Control Tube Rod-Ends
6. Cyclic Control Rod-Ends
7. Control Tube Rod-Ends
8. Tail Rotor Pedal Adjuster Gears
9. Throttle Control Gears
10. Cargo Suspension Latch
11. Engine Mount Rod-Ends

Figure 2-1. Lubrication chart (Sheet 1 of 6)

12. Universal - Main Rotor Control Link
13. Damper Tubes - Stabilizer Bar
14. Center Frame - Stabilizer Bar
15. Levers - Stabilizer Bar



DETAIL A

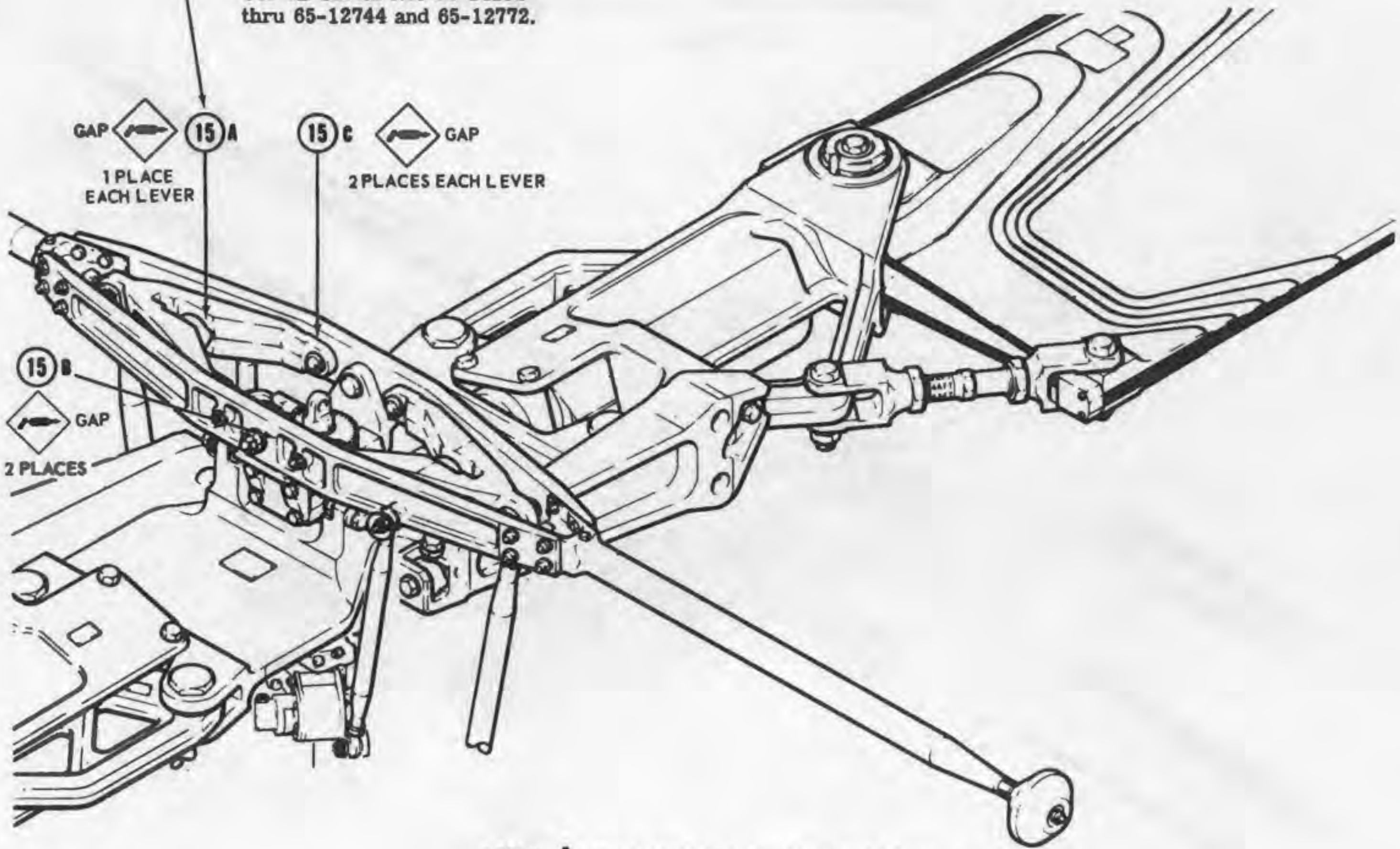
MODEL UH-1A AND UH-1B (thru Serial No. 64-14100)

Figure 2-1. Lubrication chart (Sheet 2 of 6)

15A. Universal-Main Rotor Control Link
15B. Center Frame - Stabilizer Bar
15C. Mixing Levers

Note

Lubrication also required on UH-1B Serial No. 64-14101 thru 65-12744 and 65-12772.



DETAIL A Model UH-1B Serial No. 66-491 and Subsequent.

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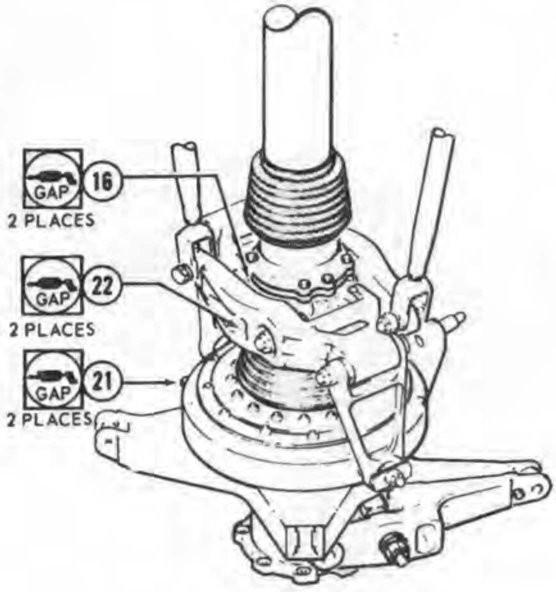
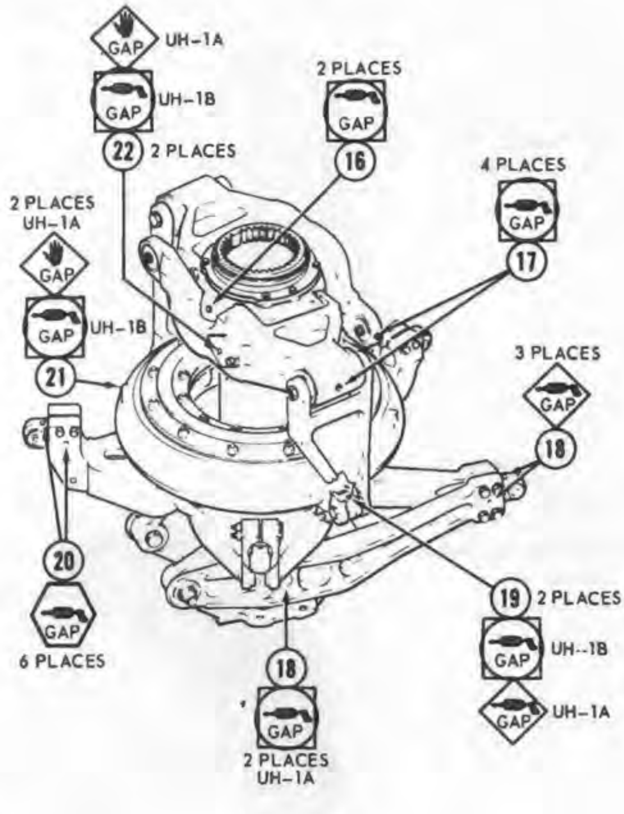
Figure 2-1. Lubrication chart (Sheet 3 of 6)

16. Hub - Scissors and Sleeve
17. Levers - Collective Scissors
18. Levers - Collective Swashplate
19. Trunnion Swashplate Outer Ring
20. Ring - Swashplate Inner
21. Ring - Swashplate Outer
22. Pivot Bearings, Scissors Trailing Side
22A. Collective Idler Link
22B. Collective Levers
22C. Collective Scissors



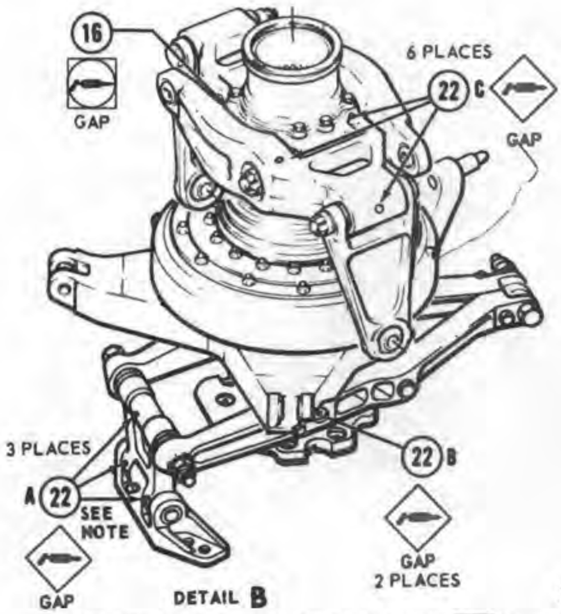
DETAIL B

MODEL UH-1B
(Serial No. 64-14101 thru 65-12744 and 65-12772)
540



DETAIL B

MODEL UH-1A AND UH-1B (thru Serial No. 64-14100)



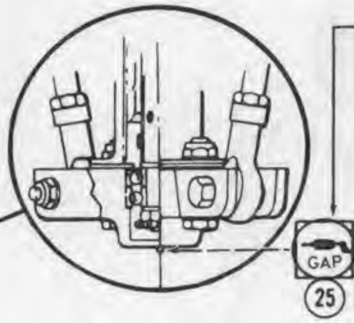
DETAIL B

MODEL UH-1B (SERIAL NO. 66-491 AND SUB) 540

Note
Make sure grease shows each side of lever attachment bolt.

204900-59-4F

Figure 2-1. Lubrication chart (Sheet 4 of 6)



Note

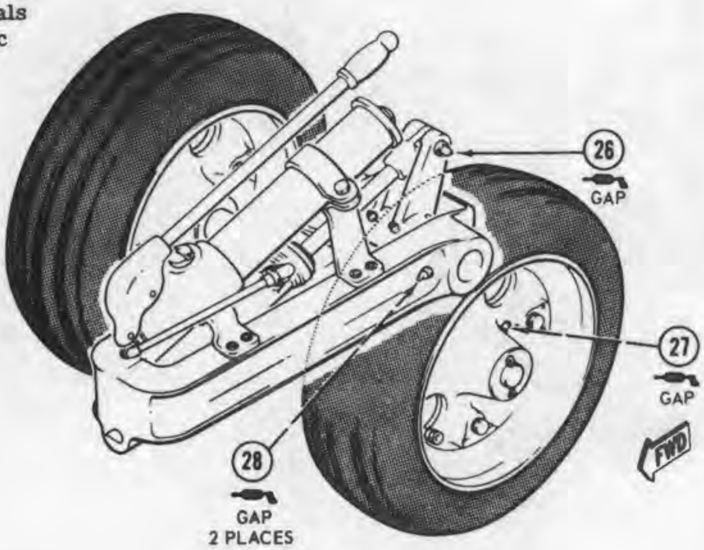
Hand pack when grease fitting is not installed. When using grease fitting limit lubrication to two shots from hand grease gun.

DETAIL C

23. Grips - Tail Rotor Hub and Blade
24. Trunnion Bearings
25. Crosshead Assembly
26. Pin-Ground Handling Gear
27. Wheel-Ground Handling
28. Cradle - Ground Handling Gear

Note

Lubricate ground handling gear at six months intervals or as required by climatic conditions.

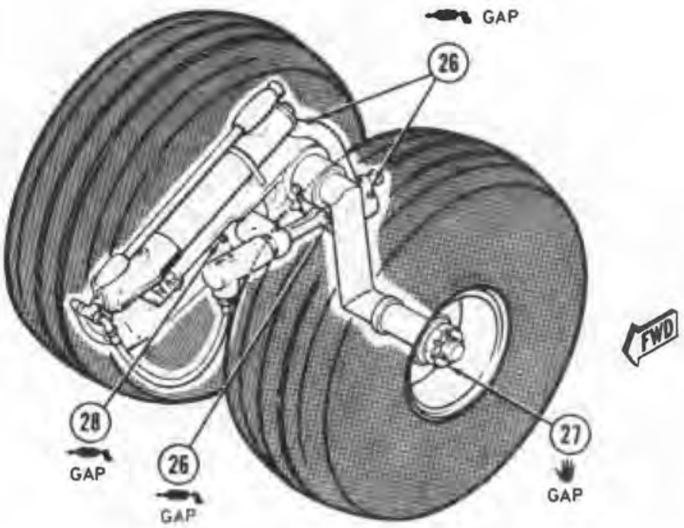


DETAIL D

MODEL UH-1A HELICOPTERS

204900-59-7

Figure 2-1. Lubrication chart (Sheet 5 of 6)

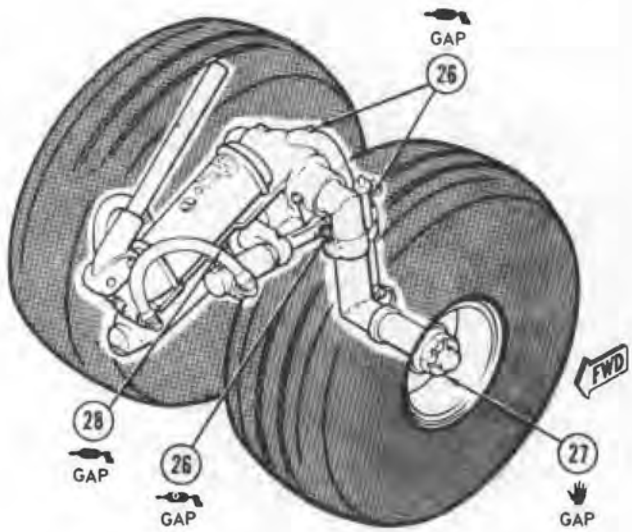


DETAIL D

MODEL UH-1B HELICOPTERS
(Serial No. 60-3546 through 61-803)

Note

Lubricate ground handling gear at six month intervals or as required by climatic conditions.



DETAIL D

MODEL UH-1B HELICOPTERS
(Serial No. 62-1872 and subsequent)

204900-59-5D

Figure 2-1. Lubrication chart (Sheet 6 of 6)

CHAPTER 3
INSPECTION REQUIREMENTS

Section I — General Information and Scope

3-1. General Information. This chapter contains complete requirements for special inspections, test flight, overhaul and retirement schedule, and standard of serviceability applicable to the aircraft. Equipment serviceability criteria applicable to the UH-1A and UH-1B aircraft are presented in TM 55-1520-211-ESC. It does not contain instructions for repair, adjustment, or other means of rectifying conditions, nor does it contain instructions for troubleshooting to find causes for malfunctioning. Applicable chapters covering the appropriate systems and higher echelon assistance should be consulted for instructions that are beyond the scope of this chapter.

3-2. Scope. The inspections prescribed in this chapter will be accomplished at specified periods by organizational maintenance activities with the assistance of direct support activities when required. The following conditions will be noted during the performance of these inspections.

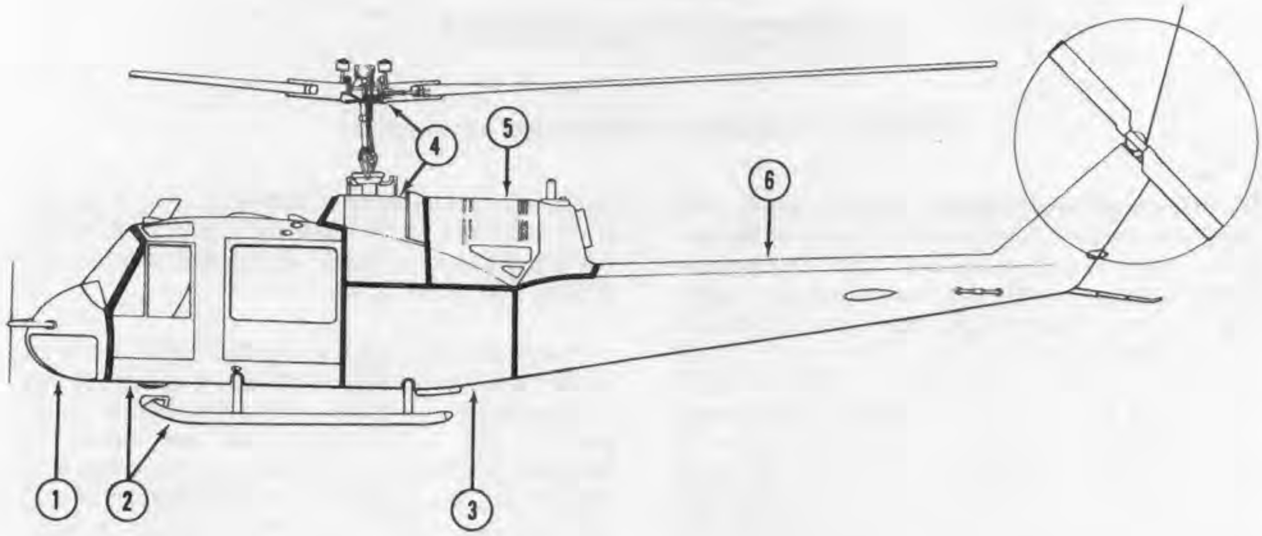
a. The inspection requirements are stated in such a manner as to establish what and when certain equipment is to be inspected and the condition to be sought. Compliance with the provisions outlined herein and with the Preventive Maintenance Inspection Checklists (TM 55-1520-211-20 PMD, -20 PMI, and -20 PMP) are required in order to assure that latent defects are discovered and corrected before malfunctioning or serious trouble results. In order to arrange inspection requirements as nearly as possible according to the manner in which work will be assigned, the requirements in each section are divided into groups under area headings. (See figure 3-1). This figure will be the same as the area diagram presented in the appropriate Preventive Maintenance Inspection Checklist. An area title indicates a specific aircraft location which may be comprised of several systems or groups of related components within this given area.

b. Inspection methods employed; environmental and geographical conditions: availability of specialized, skilled, or semi-skilled manpower; and facilities utilized are extremely variable; therefore, flexibility is provided with respect to the order of performance of the various inspections as required by efficient management of the inspection function assuring that the inspection requirements designated are adhered to and accomplished.

c. This manual pertains to all UH-1A and UH-1B series aircraft and may therefore contain inspection requirements applicable to specific equipment not installed on individual aircraft. When this situation is encountered, those requirements that are not applicable should be disregarded.

d. The inspection requirements contained herein are printed on inspection checksheets.

e. Revisions to this chapter shall be published when necessary to add, delete, revise, or change data. Frequency of revisions will be based on factual data accumulated as a result of maintenance experience. Data will be gathered by field studies, from equipment improvement recommendations, and from any other communications pertaining to this chapter and its requirements. Recommendations proposing changes to this chapter should be submitted on DA Form 2028 and forwarded to the Commanding General, U.S. Army Aviation Materiel Command, ATTN: SMOSM-M, P.O. Box 209, Main Office, St. Louis, Missouri 63166.



AREA No. 1	Nose Area	All surfaces, components, and equipment in nose compartment and on exterior ahead of crew doors.
AREA No. 2	Cabin and Landing Gear	All surfaces, components, and equipment inside cabin and on cabin exterior between forward sides of crew doors and cabin bulkhead at Station 123. Includes complete landing gear.
AREA No. 3	Center Fuselage Area	All surfaces, components, and equipment in fuselage below engine deck level, between cabin aft bulkhead and tail boom attachment bulkhead. Includes fuel cells, compartment below main transmission, and compartments accessible through side doors on fuselage.
AREA No. 4	Pylon Area	All surfaces, components, and equipment of the main rotor pylon group, from top of mast to bottom of transmission and work deck area under forward cowling. Includes main rotor, mast and rotating controls, transmission with accessories and mounts, and main (input) drive shaft.
AREA No. 5	Engine Area	All surfaces, components, and equipment associated with engine installation, located above engine work deck and within engine cowling, tailpipe fairing, and air intake area.
AREA No. 6	Tail Boom Area	All surfaces, components, and equipment located in or on the tail boom and vertical fin structure. Includes tail rotor, synchronized elevator, and control linkages; also the complete drive train of shafts and gear boxes between main transmission and tail rotor.

204900-171

Figure 3–1. Model UH-1A and UH-1B area inspection diagram

Section II — Special Inspection

3-3. Definition and General Information. This section supplements the scheduled inspections as outlined in the Preventive Maintenance Inspection Checklists in TM 55-1520-211-20 PMD, -20PMI, and -20 PMP to include inspection of items which are required to be inspected at intervals not compatible with airframe operating time or airframe inspection intervals. Typical of this type inspection items are:

a. Inspection which is contingent upon specific conditions or incidents that arise, and only because of these conditions or incidents, immediate inspection is required to insure further safe flight; such as, hard landings, overspeed, sudden stoppage, etc.

b. Inspection of components or airframe, on a calendar basis; such as, safety belts, first aid kits, weight and balance check, aircraft inventory, etc. This type inspection will be accomplished during the nearest intermediate or periodic inspection.

c. Specific definitive inspections on aircraft engines based strictly upon engine operating time.

d. When special inspection items become due and are performed, the applicable forms, records and worksheets pertaining thereto will be completed and up-dated as required (TM 38-750).

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 1	NO. OF PAGES 28
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIRE-MENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
	After Every Hard Landing			
1,2,3, 4,5,6				
2	a.	Inspect landing gear skid tubes and cross tubes for damage or more than normal deflection. (Refer to paragraph 4-244 for limits.)		
1,2, 3,4, 5,6	b.	Check all cowling and doors for proper fit and alignment. Misaligned cowling may indicate a distorted fuselage resulting in major stresses and damage to components.		
1,2,3, 4,5,6	c.	Remove all cowling necessary to perform a complete visual inspection.		
4	d.	Airframe structure with a ten-power magnifying glass at the transmission mounting points. Particular attention should be given to the rubber mount attachment points. Inspect lift link and attaching parts. Inspect aft cross tube mounting brackets and adjacent areas for structrual damage.		
6	e.	Tail skid tube and mounting for damage. Inspect tail boom internally and externally for cracks, distortion and loose rivets. Inspect the tail boom attachment points for elongated bolt holes and damaged structure.		
2,4	f.	Carefully inspect the flight control system from pilot's controls to rotor head for bent or damaged tubes, bellcranks, supports, and damaged bearings. Particular attention should be given to the mast control rods and collective sleeve assembly.		
3,4, 5	g.	Using a hydraulic test unit, pressurize hydraulic control system and check for leaks, interference or binding and satisfactory operation. (Refer to paragraph 6-5 and 6-49.)		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 2	NO. OF PAGES 28
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIRE-MENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
4	h.	On UH-1A and UH-1B Serial No. 60-3546 through 64-14100 helicopters inspect mast for indentation caused by hard contact and static stop for flattened or distorted condition. On UH-1B Serial No. 64-14101 and subsequent helicopters inspect for obvious damage to dynamic stop.		
4	i.	Main rotor blades for contact with tail boom. If damage is found, refer to inspections for minor damage main rotor, severe damage main rotor and sudden stoppage main rotor.		
6	j.	Tail rotor blades for damage. If damage is found, refer to INSPECTION FOR SUDDEN STOPPAGE — TAIL ROTOR.		
3,4, 5	k.	Fuel and oil systems for damage. Before flight, pressurize fuel and oil systems and check for leaks.		
2,3,4, 5,6	**After every hard landing: If damage to center fuselage structure or tail boom is such that a major repair, replacement or alignment is necessary, replace the following components:**			
4	a.	Main Rotor Blades and Attachments.		
4	b.	Main Rotor Hub.		
4	c.	Swashplate and Support Assembly.		
4	d.	Scissors and Sleeve Assembly.		
2,3,4	e.	All Connecting Controls and Controls Bolts.		
4	f.	Stabilizer Bar and Dampe Assembly.		
4	g.	Control Rods (Rotor to Scissors Levers).		
4	h.	Transmission and Mast Assembly.		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 3	NO. OF PAGES 28
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIRE-MENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
4,5		i. Transmission to Engine Coupling Assembly and Clamps.		
5,6		j. Tail Rotor Shafts and Clamps.		
6		k. 90° and 42° Gear Boxes.		
6		l. Tail Rotor Hub.		
4		m. Transmission Lift Link.		
4,5		n. Conduct Engine to Transmission Alignment Check.		
4,5	**After every hard landing: If excessively hard contact of main rotor hub stop against mast, replace and align the following components:**			
4		a. Main Rotor Blades and Attachments.		
4		b. Main Rotor Hub.		
4		c. Transmission and Mast Assembly.		
4		d. Transmission to Fuselage Lift Link.		
4,5		e. Conduct Engine to Transmission Alignment Check.		
2,3, 4,5	**After every hard landing: If damage is found in rotating controls, replace the following components:**			
4		a. Stabilizer Bar.		
4		b. Main Rotor Pitch Horns.		
4		c. Collective Sleeve Assembly.		
4		d. Swashplate and Support Assembly.		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 4	NO. OF PAGES 28
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
2,3,4		e. All Connecting Controls and Control Bolts.		
4,5		f. Conduct Engine-Transmission Alignment Check.		
4	**Sudden stoppage — main rotor. Replace the following:**			
4		a. Main Rotor Blades and Attachments.		
4		b. Main Rotor Hub.		
4		c. Mast.		
4		d. Mast Controls.		
4		e. Swashplate.		
4		f. Scissors and Sleeve Assembly.		
4		g. Control Tubes.		
4		h. Stabilizer and Damper Assembly.		
4		i. Control Rods (Rotor to Scissors Levers).		
4		j. Transmission.		
4	**After sudden stoppage of main rotor, no visible damage inspect the following:**			
4		a. Exterior of blades for security of all bonds and visible change. (If any, refer to Minor Damage Main Rotor.)		
4		b. On UH-1A helicopters remove tip and butt cover plates. Use well focused flashlight to inspect three internal sections, from both ends of blades, for cracks, distortion and bond separation. On UH-1B helicopters inspect blades for cracks, distortion and bond separation. (If damage is encountered, refer to Minor Damage Main Rotor.)		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 5	NO. OF PAGES 28
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
3,4,5		**Minor damage main rotor, if any damage is found, proceed to category of severe damage.**		
4	a.	Visually inspect stabilizer bar tubes and frame for distortion.		
4	b.	Main rotor hub pillow block bearings and grip bearings for freedom and security.		
3,4	c.	Flight control system, from the rotor to hydraulic boost cylinder for bent or damaged tubes.		
4	d.	Scissors levers drive links for damage.		
4	e.	Swashplate gimbal mounting for damage.		
4	f.	Control plate for damage.		
4	g.	Collective pitch sleeve for free travel.		
4	h.	Structure at transmission mounting points (use ten-power magnifying glass) for cracks.		
4	i.	Lift link and structure for damage, security, and distortion.		
5	j.	Engine in accordance with applicable publication.		
6		**After replacement of tail rotor hub and/or blades.**		
6		Balance and track tail rotor hub and blade assembly.		
4,5,6		**Severe damage main rotor or if a blade drag brace fitting is damaged or distorted inspect helicopter in accordance with steps c, d, e, f, g, h, i, and j, of minor damage main rotor and following paragraphs:**		
4,5,6	a.	Magnetic particle inspect the tail rotor shaft couplings and clamps, inspect for cracks.		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 6	NO. OF PAGES 28
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIRE-MENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
4,5,6		b. Dye penetrant inspect tail rotor shafts, inspect for cracks and concentricity. If more than minor damage is found, replace both 42° and 90° gear boxes in addition to any other component required.		
4,5,6		**Sudden stoppage — Tail rotor.**		
6		a. Remove and replace tail rotor hub and blade assembly, 90° gear box and 42° gear box.		
4,5,6		b. Magnetic particle inspect tail rotor drive shaft, couplings and clamps, inspect for cracks.		
4,5,6		c. Dye penetrant inspect tail rotor drive shafts, inspect for cracks and concentricity.		
5,6		d. Visually inspect coupling hangers and supports for cracks and distortion.		
4		e. Remove transmission tail rotor drive quill and inspect for cracks and damage.		
6		f. 90° and 42° gear box attachment points, with ten-power magnifying glass for cracks and security.		
6		g. The four tail boom attachment points for cracks, distortion, damage, and security.		
6		h. Tail boom internally and externally for cracks, distortion, and loose or missing rivets.		
4-6		**A Main rotor overspeed in excess of: 341 rpm but less than 360 rpm.**		
		B Main rotor overspeed in excess of: 339 rpm but less than 356 rpm.		
4		a. Main rotor blades for damage, bond separation and distortion.		
6		b. Tail rotor blades for damage, bond separation and distortion.		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 7	NO. OF PAGES 28
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIRE-MENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
4-6	**A Main rotor overspeed in excess of: 360 rpm.**			
4-6	**B Main rotor overspeed in excess of: 356 rpm.**			
4,6		Remove and replace main rotor hub and blade assembly and tail rotor hub and blade assembly. Return assemblies to a depot activity with details of overspeed incident.		
5	**A Exhaust gas temperature over-limits briefly, not more than five (5) seconds above 650°C and not above 760°C.**			
5	a.	Exhaust diffuser, without disassembly, inspect thoroughly for cracks, severe buckling, hot spots and burned areas.		
5	b.	Second-stage turbine blades, without disassembly, inspect thoroughly for cracks, severe buckling, hot spots and burned areas.		
5	**A Exhaust gas temperature over-limits exceeding either: Five (5) seconds at 650°C: Above 760°C.**			
5	a.	Remove combustion chamber, inspect for cracks internally.		
5	b.	Inspect listed components for cracks, severe buckling, hot spots and burned areas. (1) Liner, scoops and shroud assembly. (2) Second-stage turbine blades. (3) Second-stage turbine nozzle vanes.		
5	c.	Check power turbine blade tip clearance at eight points.		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 8	NO. OF PAGES 28
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
5		**A At military power setting when the exhaust gas temperature exceeds 1100°F (593°C).**		
5		Internal engine inspection — special attention to the following:		
5		a. First stage turbine wheel blades and slots, use a 10 power magnifying glass for nicks, cracks, burned areas, blade tip clearance and missing blades.		
5		b. Exhaust diffuser, visual and dye penetrant, fluorescent penetrant method or magnetic particle method.		
5		c. Combustion chamber housing visually for cracks and damage.		
5		d. Combustion chamber liner assembly visually and fluorescent penetrant or dye penetrant method for cracks and burned areas.		
5		e. Scoop and shroud assembly visually and penetrant methods for cracks and burns.		
5		f. Power turbine blades visually for dents, cracks, burned areas, blade tip clearance, missing blades.		
5		g. Power turbine nozzle visually and fluorescent penetrant for warpage, nicks, cracks and burned areas.		
5		**A At normal power setting and below, for continuous operation when the exhaust gas temperature exceeds 1060°F (570°C).**		
5		Internal engine inspection, special attention to the following:		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 9	NO. OF PAGES 28
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
5	a.	First stage turbine wheel blades and slots, use a 10 power magnifying glass for nicks, cracks, burned areas, blade tip clearance, and missing blades.		
5	b.	Exhaust diffuser, visual and dye penetrant, fluorescent penetrant method or magnetic particle method.		
5	c.	Combustion chamber housing visually for cracks and damage.		
5	d.	Combustion chamber liner assembly visually and fluorescent penetrant or dye penetrant method for cracks and burned areas.		
5	e.	Scoop and shroud assembly visually and penetrant method for cracks and burns.		
5	f.	Power turbine blades visually for dents, cracks, burned areas, blade tip clearance, missing blades.		
5	g.	Power turbine nozzle visually and fluorescent penetrant for warpage, nicks, cracks and burned areas.		
5	**Reported loss of power or high exhaust gas temperature condition.**			
5		Thoroughly investigate the engine inline (engine de-ice) valve for proper functioning prior to proceeding with trouble shooting procedures. (Refer to paragraph 5-30.)		
5	**B Over temperature limits.**			
5		An over temperature exists under the following conditions:		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 10	NO. OF PAGES 28
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET

a. Start.

(1) When EGT exceeds 620°C (1150°F) for more than five seconds for T53-L-5/9/9A engines, or 650°C (1200°F) for more than five seconds for T53-L-11 engine, record a hot start. A hot end inspection is required after three hot starts of T53-L-5/9/9A engines and after one hot start of T53-L-11 engines.

(2) When EGT exceeds 760°C (1400°F).

b. Acceleration.

(1) When EGT exceeds 650°C (1200°F) for more than five seconds.

(2) When EGT exceeds 760°C (1400°F).

Note

An over temperature condition, as defined in steps a. and b., requires a hot end inspection to be performed. Reference TB 55-2800-30/1.

c. Take-off. When EGT exceeds 610°C (1130°F) for T53-L-5 engine, or 640°C (1180°F) for T53-L-9/9A/11 engines.

d. Military. When EGT exceeds 600°C (1110°F) for T53-L-5 engine, or 640°C (1180°F) for T53-L-9/9A/11 engines.

e. Normal (Continuous Operation). When EGT exceeds 590°C (1100°F) for T53-L-5 engine, or 620°C (1150°F) for T53-L-9/9A/11 engines.

Note

If engine cannot be operated within temperature limits for takeoff power, military power or normal rated power, this is an indication of possible engine malfunction or instrument error. To determine cause and corrective action, refer to paragraph 5-30.

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 11	NO. OF PAGES 28
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
2,4, 5,6		**A Engine overspeed exceeding 7140 rpm power output shaft (nII) speed, but engine appears still operable.**		
2,4, 5,6		**B Engine overspeed exceeding 7180 rpm power output shaft (nII) speed, but engine appears still operable.**		

If overspeed limits are exceeded, the following inspections must be performed in addition to those outlined in Special Inspection headed "Engine overspeed reaching but not exceeding (noted) rpm power output shaft speed." The inspections described in that Special Inspection shall be used to determine engine disposition only if a fluorescent-penetrant inspection of the second stage turbine disc shows the disc has not been damaged.

a. If power turbine overspeed limits have been exceeded, a fluorescent-penetrant inspection of the second stage turbine disc must be made at the appropriate higher echelon.

b. If compressor rotor overspeed limits have been exceeded and the engine appears to be operable, the compressor must be inspected by field maintenance as follows.

(1) A check shall be made for evidence of rubbing.

(2) Compressor spacer land runout shall be measured.

(3) Compressor rotor blade tip clearance must be checked.

(4) First stage turbine face and hub runout and blade tip clearance must be measured.

c. Check engine, 42° and 90° gear boxes, and transmission magnetic chip detectors for metal chips.

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 12	NO. OF PAGES 28
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
5		**Engine overspeed exceeding three percent (3%) above gas producer (nl) rpm limit for three (3) seconds, but engine appears still operable.**		
5		a. Remove upper half of compressor housing to inspect for evidence of rubbing, compressor spacer run-out, and rotor blade tip clearance.		
5		b. Mounting flange areas of following parts for loose bolts, nuts, studs, or connections: Engine mount pads, accessory drive gear box, overspeed governer and tachometer drive gear box, fuel control, oil pump, oil filter, starter generator, tachometer generator and all other accessories.		
		Engine subjected to loadings possibly exceeding 10G vertical, 4G lateral, 3G forward, and 4G aft.		
		If it is suspected that excessive G loads have been imposed on an engine, the following inspections must be made immediately after the flight during which the excessive loads occurred.		
5		(1) Check accessory drive gear box for cracked flanges.		
5		(2) Check overspeed governor and tachometer drive for cracks, distortion and bent shafts.		
5		(3) Oil filter for loose bolts, damaged filter elements, and metal particles.		
5		(4) Oil pump for loose bolts and cracked flanges.		
5		(5) Check fuel control assembly for cracked flanges.		
5		(6) Check engine mounting pads for cracks.		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 13	NO. OF PAGES 28
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
5		(7) Check air, oil and fuel hose connections for tightness.		
5		(8) Check all accessories for loose bolts, nuts and connections.		
		Note If engine is found unsatisfactory for further operation, components must be repaired or replaced.		
4,5	**B At the first 25 hours of operation after overhaul, repair or replacement, and every periodic inspection thereafter.**			
4,5		Drive shaft (engine to transmission), visually inspect for cracks, excessive grease, leakage, security and condition.		
4,6	**B Every ten hours.**			
6	a.	Tail rotor slider, Part No. 204-010-720-1, visually inspect for condition, security and cracks. (Magnetic particle check upon reaching 50 hours.)		
4				
2,4, 5,6	**A Engine overspeed reaching but not exceeding 7090 rpm power output shaft speed.**			
5,6	**B Engine overspeed reaching but not exceeding 7180 rpm power output shaft speed.**			
	a.	Check oil filter for metal chips, lint, or other foreign material.		
4,5,6	b.	Check magnetic chip detector for metal chips.		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 14	NO. OF PAGES 28
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIRE-MENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
		Note If chips are found inspect power turbine and rear bearing housing oil strainers.		
5		c. Power turbine blades for cracks, burns, and dented or missing blades.		
5		d. Check power turbine blade tip clearance at eight (8) points.		
		Note Tip clearance shall be at least 0.025 inch.		
2,5		e. If preceding steps are satisfactory, run-up engine at various power settings, checking instruments for normal operation. Any variation from normal is cause for shut-down. Listen for unusual noises during engine coast-down.		
2,4, 5,6		f. After shut-down, repeat steps a., b., c., and d. If all engine operations are normal and inspected areas are within limits return engine to service.		
5	**Internal inspection of engine at every 300 hour engine period.**			
		Note		
5		UH-1A T53-L-1/1A Hot Section Inspection: Hot section will be inspected at each 300 operating hours. T53-L-1A engines that have not had the gas producer turbine wheel removed since overhaul are allowed to operate for 300 hours until the first hot section inspection. Units having the engine vibration		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 15	NO. OF PAGES 28
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
		kit, Part No. LTCT 484, available are allowed to continue hot section inspections at 300 hour intervals. If vibration equipment is not available, hot section inspection will then revert to 100 hour intervals until kit is received. Engines that have had the gas producer turbine wheel removed since overhaul will be limited to 100 hour hot section inspections until the vibration kit is available to run a vibration survey on that engine. At this time, hot section inspections can be extended to 300 hour intervals.		
5		Reduction Gear Inspection T53-L-1/1A: The engine reduction gear will be inspected at 300 operating hours. The planet gear bearing, clamp retainer, Part No. 1-030-038-01, and the planet gear front bearing, retainer nut, Part No. 1-030-037-01, will be disassembled only if a 0.004 inch feeler gage can be inserted between the rear face of the planet gear front bearing, retainer nut, Part No. 1-030-037-01, and the inner race of the roller bearing, Part No. 1-300-014-01. The disassembled parts must be cleaned in solvent and the threads of the planet gear bearing, clamp retainer, must be coated with Loctite Grade (AA) (Green). The planet gears will not be disassembled if the 0.004 inch feeler gage cannot be inserted between the planet gear front bearing retainer nut, and the roller bearing inner race.		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 16	NO. OF PAGES 28
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AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
5		B The thorough searching inspection and disassembly of the reduction gearing is based on excessive accumulation of chips and/or foreign matter, as defined in step c, below, on reduction gear box magnetic drain plug.		
5	a.	Air inlet ducts. Make sure no foreign objects, such as tools, parts or articles of clothing and etc., are in or near air inlet ducts.		
5	b.	Main oil filter. Inspect for foreign material; clean and reinstall.		
5	c.	Magnetic drain plug (in gear box). Remove, inspect for metal chips, clean and reinstall. ***Note*** SLIGHT ACCUMULATION of chips and/or other foreign matter in the filter or on the magnetic plug — clean the plug, oil filter and strainers for No. 2, 3 and 4 bearings. Reinstall all parts and run for FIVE MINUTES at normal rated power. Shut the engine down and reinspect. If no further accumulation of foreign material is found, engine may be considered safe for further operation as required. EXCESSIVE ACCUMULATION. Investigate and locate source. If source is found to be the engine, remove and replace. If source is found to be the airframe, drain oil		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 17	NO. OF PAGES 28
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AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
		system, flush and refill. Engine oil pump will be checked. Clean all engine oil filters. Replace oil cooler.		
5	d.	Exhaust duct. Check for burned areas or warping.		
5	e.	Inlet guide vanes. Check for oil streaks or dirt. Oil streaks indicate oil leaks around the output shaft seals or the main rotor gear box.		
5	f.	Compressor rotor blades and vane assembly. Through inlet air ducts, check for oil stains or oily dirt. Oil stains indicate leakage around No. 1 bearing seals.		
5	g.	Cockpit throttle. Check for full travel and freedom of movement.		
5	h.	Engine mounts. Check for cracks and security.		
5	i.	Engine accessories. Check for cracks in brackets, loose screws or connections.		
5	j.	Exhaust diffuser. Check for cracks, particularly in the welded area around the struts. Check for burned spots.		
5	k.	Fuel and oil lines. Check for security, chaffing, broken braids, leaks, or loose connections; replace defective lines.		
5	l.	Combustor housing. Check for cracks in the welded areas.		
5	m.	Inlet housing. Check for fillets and support pads for cracks.		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 18	NO. OF PAGES 28
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AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
5	n.	Compressor housing. Check all compressor housing flange areas for cracks.		
5	o.	Remove, clean and reinstall: strainer at inlet of the oil tube for Nos. 3 and 4 bearings, and the strainer for No. 2 bearing at the five o'clock position on the diffuser outer housing.		
5	p.	Starter generator. Check the starter cooling duct for flecks of metal or carbon dust. If metal particles are present or dust is excessive, replace the starter.		
5	q.	Exhaust thermocouple. Check the exhaust thermocouple harness for cracks and the points for deterioration. Check for continuity using jet-cal test equipment.		
5	r.	Power turbine nozzles. Check for nicks, cracks, or burned areas. Inspect nozzle air seal (asbestos ring) for deterioration.		
5	s.	On T53-L-5/9/9A engines inspect air scoops for burns and cracks.		
5	t.	Combustor curl. Inspect for cracks or burns.		
5	u.	Fuel vaporizer legs for burning or warping. Inspect for carbon deposits inside vaporizers. A small amount of carbon on the outside of the vaporizers is normal and may be removed with a stiff fiber brush. Inspect exhaust cone and fire shield for cracks, severe burning and indications of hot spots. Remove igniter nozzles and check with filtered air pressure for plugged air passages. If nozzle is plugged, replace with a new nozzle.		
5	v.	Reduction gear assembly.		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 19	NO. OF PAGES 28
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AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
		Note Perform reduction gear inspection on T53-L-1/1A engines at 300 hour intervals. T53-L-5/9/9A/11 engine reduction gear section will be disassembled only if excessive metal particles are evident on magnetic drain plug as defined in step c.	•	
5		(1) Remove from inlet housing, check (sunring) gears for wear pattern, nicks or flaking of the teeth. Check for cracks. Replace part if there is severe wear, cracks, or flaking.		
5		(2) Check the primary and secondary planet (reduction idler) gears for excessive wear. Check planet gear bearings for wear, fretting, and end float. Check sun gear for axial movement.		
5		(3) Check the carrier clamps and clamp bolts for looseness. Replace as necessary. Check torquemeter assembly for operation and proper torque of bolts.		
		w. When to accomplish engine vibration survey:		
		(1) After removal and installation of the first stage turbine rotor assembly.		
		(2) After removal and installation of the combustion section, exhaust section, or power turbine wheel.		
		(3) Any time excessive engine vibration is suspected.		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 20	NO. OF PAGES 28
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AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
(4,5,6)		**Whenever an aircraft has been subjected to a compressor stall (Surge), the following inspection shall be performed:**		
5		a. The engine inlet guide vane and first stage compressor rotor blades for evidence of severe erosion or foreign object damage. Check the root areas of compressor blades for cutback due to erosion. Check for dirty or obstructed inlet housing. ***Note*** If foreign object damage is evident, refer the engine to Direct Support and General Support Maintenance for repair.		
5		b. Perform an engine acceleration check.		
5		c. Disconnect fuel control pressure sensing line from inlet housing.		
5		d. Start engine and advance throttle, increasing collective pitch until highest power without gaining flight attitude is obtained. Operate above 80 percent nI for at least one minute, then decelerate as rapidly as possible towards flight idle by retarding throttle. When nI reaches 65 percent, advance throttle and accelerate as rapidly as possible to 80 percent nI. If no surge is evident, reconnect fuel control pressure sensing line and release aircraft for further operation.		
5		e. If compressor stall (surge) is encountered in step d., check the operation of the bleed band, bleed band actuator, fuel control, and hot air solenoid valve. If these systems are functioning properly, it should be concluded that a genuine surge has occurred and the engine should be referred to higher echelon maintenance.		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 21	NO. OF PAGES 28
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AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
		Note Momentary engine surge (stall or popping) occurring in the speed range from 5000 to 6000 nII and/or below flight idle nI speed and not in the normal operating speed range is not considered critical. These speeds are well below operating range, and the phenomenon would not be caused by compressor erosion. The systems listed in step e. should be rechecked to ensure that they are functioning properly.		
6	f.	If surge occurs below 85 percent nI speed: Check tail boom pylon (fin) for evidence of damaged skin panels and/or structure, and rivets for looseness and/or sheared heads. If inspection shows negative indications of damage, return aircraft to flight status. If positive evidence of damage, comply with the following:		
6	g.	If surge occurs at 85 percent nI speed or above: Remove and disassemble tail rotor gear box (90°) in accordance with procedures outlined in the applicable reference manual, and inspect the drive and driven gear for unusual load pattern on either the coast or drive side of gears. Inspect area of driven gear between lightening holes and gear teeth for cracks. Conduct this inspection, using a ten (10) power glass.		
6	h.	If the above outlined inspections present negative indications of damage, reassemble gear box in accordance with outlined manual procedures. Reinstall gear		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 22	NO. OF PAGES 28
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AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
		box, tail rotor hub and blade assembly, and rig tail rotor controls in accordance with procedures as outlined in the applicable referenced manual. Return helicopter to flight status.		
6		i. If, as a result of the above inspections conducted, evidence of damage is indicated, comply with the following.		
6		(1) Remove and replace with serviceable item (annotate DA Form 2410 that component has been installed on aircraft subjected to compressor stall).		
		(a) 90° gear box.		
		(b) Tail rotor hub and blade assembly.		
		(c) No. 5 tail rotor drive shaft.		
6		(2) The 42° gear box output gear for unusual load pattern on either the coast or drive side of the gear. If no evidence of damage is noted, return the gear box to service. If the above inspections reveal discrepancies, remove and replace gear box assembly and comply with (3) below.		
4		(3) Remove the tail rotor drive output quill assembly from the transmission and inspect gear for unusual load pattern on either the drive or coast side of the gear teeth. If no evidence of damage is found, replace the quill assembly and return the transmission to service.		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 23	NO. OF PAGES 28
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AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
4		j. If the above outlined inspection of the tail rotor drive output quill presents negative indications of damage, reinstall in accordance with instructions as outlined in appropriate technical manual and return helicopter to flight status. If inspection of the tail rotor output quill reveals discrepancies, remove transmission from service and return for overhaul. (Annotate DA Form 2410 as stated above.) Further, if it is found necessary to replace the transmission, conduct the following inspection of the main rotor system and the fuselage.		
4		(1) Remove inboard and outboard drag brace bolts. Check bolts for deformation, then magnaflux. If satisfactory, return to service.		
4		(2) Visually inspect the stabilizer bar outer tubes for bending. (Allowable is 0.150 inch in each tube.)		
4		(3) Remove main rotor pillow blocks from main rotor yoke and check for deformation of bushings and bushing holes in pillow blocks and yoke.		
4		(4) Perform close visual inspection of all other main rotor components.		
4		(5) If any discrepancies are noted as a result of inspection in items (1), (2), (3), and (4), remove and replace the main rotor hub and blade assembly, the stabilizer bar assembly and mast assembly. (Annotate records as stated above.)		
		k. Fuselage. (If damaged refer to step f.)		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 24	NO. OF PAGES 28
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AREA NO.	REQUIRE-MENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
6		(1) Remove the skin from the tail boom fin adjacent to the 90° gear box mounting. Inspect all support structures in this area and repair as required. Install new skin.		
6		(2) Make close visual inspection of complete tail boom structure for distortion, buckles, skin cracks, sheared or loose rivets, paying particular attention to tail boom attachment points at fuselage station 195 and adjacent fuselage to tail boom structure and the 42° gear box support structure.		
4		(3) Make close visual inspection of main rotor pylon support and engine mount attachment structure for distortion, buckles, cracks, sheared or loose rivets, etc.		
		(4) If discrepancies found during inspections, items (1), (2) and (3) cannot be repaired by standard procedure, make detailed report to: Commanding General, USAAVCOM, P. O. Box 209, Main Office, St. Louis, Missouri, 63166, for further instructions.		
3	**Overflow of battery and/or battery sump jar.**			
3	a.	Sheet metal surfaces and overlaps both internal and external for damage.		
3	b.	Rivets, bolts, screws and other hardware in area internally and externally for damage.		
3	c.	Hidden areas in vicinity of battery and sump jar for damage.		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 25	NO. OF PAGES 28
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
3		d. All metal parts throughout length of tail boom assembly for damage.		
2,5	**Post installation inspection shall be accomplished any time an engine is removed and reinstalled or replaced.**			
5		a. Check all linkage (nI and nII) for proper adjustment, alignment and damage.		
5		b. Fuel control stops.		
5		c. Calibration of power settings on fuel control with corresponding settings on cockpit power control. Check operation and calibration of the E.G.T. system with Jet-Cal tester after engine installation.		
2		d. Twist grip for flight idle detent.		
5		e. Energize the fuel boost pump and check for leaks at all connections, particularly fuel control.		
2,5		f. Energize the mater switch and check action of the air flow regulator.		
5		g. With ignition unit, starting fuel and main fuel systems disconnected, energize the starter and check for sounds which indicate interference between moving and stationary parts, indication of oil pressure and fuel flow from starting fuel line and main fuel line.		
5		h. Perform a complete Daily Inspection on engine.		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 26	NO. OF PAGES 28
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AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
5		i. Perform engine run-up with complete operational vibration check.		
5		j. Inspect the following components for chips or foreign material:		
		(1) Main fuel strainer.		
		(2) Fuel control inlet screen.		
		(3) Fuel control pump discharge screen.		
		(4) Servo filter.		
		(5) Oil filter.		
		(6) Magnetic plug.		
		(7) Externally accessible engine oil strainers.		
5		k. If oil filter and magnetic plug show excessive accumulation repeat check after five (5) minutes operation at seventy-five (75) per cent power.		
		l. Repeat check of fuel strainers, screens, and filter as follows:		
		(1) After five (5) hours operation.		
		(2) After fifteen (15) hours operation.		
		(3) If contamination exists, at fifteen (15) hour intervals until eliminated.		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 27	NO. OF PAGES 28
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AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
	(4) At twenty-five (25) hour intervals thereafter.			
	Whenever fuel cell has been punctured. Replace fuel cell.			
	Prior to every armed flight.			
		Make thorough inspection of fuel tank and fuel lines for leaks and the filler cap for proper seal, security and spillage.		
	After washing helicopter.			
1		Pitot-static system for moisture (drain plug removed).		
All Areas	**After the helicopter has been subjected to salt water or salt spray.**			
		Wash entire helicopter with fresh water, inside of engine compartment doors; wash all components which were exposed to salt water; wash engine; make a detail check of all surfaces for corrosion. Apply corrosion preventive compound to exposed non-painted, anodized or cadmium plated assemblies. (Refer to paragraph 1-100.)		
All Areas	**When available information indicates exposure to radioactivity.**			
		Accomplish the following: (Refer to TM 3-220.)		
		a. Survey helicopter for level of radioactivity.		
		b. Decontaminate helicopter as required.		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 27A	NO. OF PAGES 28
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
All Areas	**Upon transfer and upon receipt of an aircraft, upon expiration of twelve months elapsed time since last inventory, and upon placing aircraft in storage and upon removing from storage. (Aircraft need not be inventoried while in storage.)**			
		Inventory aircraft for availability of inventoriable property. (Reference DA Form 2408-17 and Appendix III.)		
All Areas	**After installation, removal or relocation of equipment and/or major modification which results in an unknown change in the basic weight and balance: After report of unsatisfactory flight characteristics.**			
		Weigh helicopter and accomplish necessary entries in the Weight and Balance Data. (DD Forms 365) (Refer to TM 55-405-9.)		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSP. (Daily, Intermediate, etc.) SPECIAL	PAGE NO. 28	NO. OF PAGES 28
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORKSHEET
2	**Every Twelve Months:**	Magnetic standby compass for discoloration for liquid and proper calibration; recompensate if necessary (TM 55-405-3). Turn in first aid kit for inspection per TB AVN10.		
All Areas	**See AR 95-16.**	Weigh helicopter and accomplish necessary entries in the Handbook of Weight and Balance Data in accordance with criteria established in AR 95-16, paragraph 3f(2). (Refer to TM 55-405-9.)		
4	**B C D After every 200 hours of main rotor hub operating time, inspect main rotor hub.**	*Note* The following inspection shall be performed by direct support personnel. a. Inspect carbon radius ring on main rotor hub extension for cracks, damage, excessive wear or bonding security. b. Inspect main rotor hub bearing housings, bearings, and seals for acceptability for continued usage. c. Inspect main rotor hub trunnion bearing housings, seals, and bearings for condition and acceptability for continued usage. d. Inspect trunnion bearing housing disks for security of bonding. e. Inspect main rotor hub trunnion spindle sleeves for security of bonding.		
2	**B Upon installation of XM16 or XM21 Weapon Subsystems.**	Inspect support beam assemblies, P/N 204-071-514-5 and 204-071-516-5, every one hundred hours per MIL-I-6866 and TM 55-405-7 in an area to include three inches on either side of the upper hardpoint attachment lugs using penetrant method.		

Section III — Test Flight

3-4. Definition and General Information. This section contains test flight inspection requirements peculiar to the UH-1A and UH-1B aircraft. Conditions requiring accomplishment of test flight shall be in accordance with TB AVN 23-16 and changes thereto. The requirements herein are established to assure a thorough inspection of the aircraft before flight, during flight, and upon completion of test flight. When a test flight is performed for the purpose of determining if specific equipment or systems are in proper operating condition, requirements not related to such equipment or systems should be disregarded.

3-5. The test flight inspection checksheets are presented in a format for local reproduction. Continuation sheets shall be used when necessary for each part. Explanation of the checksheets is as follows:

Block 1 Aircraft Model and Series

Block 2 Complete Aircraft Serial Number

Block 3 Organizational Unit Performing Test Flight

Block 4 Day, Month, and Year

Block 5 Reason Test Flight is Being Performed

Block 6 Numerical Inspection Item Identification Number

Block 7 Inspection Requirements Arranged in Chronological Order

Block 8 Instrument Minimum and Maximum Operating Ranges

Block 9 Actual Indication Entered at Time of Test Flight

Block 10 Enter satisfactory or unsatisfactory symbol (as shown in note) at time of test flight. All unsatisfactory symbols will be explained in remarks (Test Flight Checklist, Part IV).

3-6. Additional information, relative to recording of inspection on applicable forms and the use of this manual, may be obtained by consulting applicable technical directives that are listed in Appendix I of the Five Part Manual.

TEMPERATURE	SEA LEVEL	1000 FT.	2000 FT.	3000 FT.	4000 FT.	5000 FT.
50°F (10°C)	0.0	0.0	0.1	0.2	0.3	0.4
60°F (16°C)	0.0	0.1	0.2	0.3	0.4	0.5
70°F (21°C)	0.2	0.3	0.4	0.5	0.6	0.7
80°F (27°C)	0.4	0.5	0.6	0.7	0.8	0.9
90°F (32°C)	0.5	0.7	0.8	0.9	1.0	1.1
100°F (38°C)	0.7	0.8	0.9	1.0	1.1	1.2

NOTE: All time correction factors are given in seconds and must be added to time attained at standard day conditions

204060-500

Figure 3-1A. Acceleration time correction factors

UH-1A AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART I - GROUND CHECK TM 55-1520-211-20 DATED________	PAGE NO. 1	NO. OF PAGES 12

1. TYPE ACFT	2. SERIAL NO.	3. ORGANIZATION	4. DATE	PURPOSE OF TEST FLIGHT 5.

NOTE: Symbol for Block 10 (✓) Satisfactory (X) Unsatisfactory (Explain in Remarks)

6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE MIN	MAX	9. ACTUAL INDICATION	10. LEGEND (See Note)
1	Aircraft forms inspected.				
2	Daily inspection completed.				
3	Flight readiness inspection completed.				
4	Interior check.				
	a. Blade mooring block, pitot, tailpipe and intake covers and tail rotor tie-down strap stowed under passenger seat.				
	b. Adjust seat and pedals.				
	c. Safety belt adjustment.				
	d. Shoulder harness lock.				
	e. Actuate cyclic, collective pitch, and pedals through full travel.				
	f. Ignition circuit breaker.				
	g. Starter circuit breaker.				
	h. All other circuit breakers.				
	i. All electrical switches.				
	j. Inverter.				
	k. Battery.				

UH-1A AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART I - GROUND CHECK (Continued)	PAGE NO. 2	NO. OF PAGES 12

6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE MIN	MAX	9. ACTUAL INDICATION	10. LEGEND (See Note)
	l. Static position of all instruments (slippage mark and operating range limitations).				
	m. Compass slaving.				
	n. Set altimeter.				
	o. Set clock.				
	p. Fuel valve.				
	q. Boost pump (if applicable).				
	r. Oil valve.				
	s. Fuel transfer pump.				
	t. Governor.				
	u. Hydraulic boost switch.				
	v. Radio equipment.				
5	Engine starting and warm-up.				
	a. Collective pitch control.				
	b. Ignition circuit breaker.				
	c. Starter circuit breaker.				
	d. Inverter switch.				
	e. Battery.				
	f. Starter generator SET to.				
	g. Check fire warning light.				
	h. Check fuel gage.				

UH-1A AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART I - GROUND CHECK (Continued)				PAGE NO. 3	NO. OF PAGES 12
6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE MIN	MAX	9. ACTUAL INDICATION	10. LEGEND (See Note)
	i. Check caution panel warning light.				
	j. Fuel valve.				
	k. Fuel boost pump.				
	l. Oil valve.				
	m. Governor.				
	n. RPM Increase-Decrease switch. Decrease and hold.		5 sec.		
	o. Throttle.				
	p. Cyclic control.				
6	Engine starting and warm-up.				
	a. Fire guard.				
	b. Rotor blades.				
	c. Throttle.				
	d. Starter ignition switch ON and HOLD		40 sec. 28% RPM or 400°C	(EXH. TEMP whichever comes first)	
	e. Engine oil pressure. (PSI)	25			
	f. Main generator.				
	g. Return starter generator to Stand-by generator position after main generator is on line.				
	h. Radio.				
	i. Inverter.				

UH-1A AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART I - GROUND CHECK (Continued)				PAGE NO. 4	NO. OF PAGES 12
6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE MIN	MAX	9. ACTUAL INDICATION	10. LEGEND (See Note)
	j. Headset.				
	k. AC phase selector check.				
	l. Throttle.				
	m. Exhaust gas temperature.	385°C	570°C		
	n. Engine oil pressure. (PSI)	60	80		
	o. Engine oil temperature.		88°C		
	p. Transmission oil pressure. (PSI)	40	60		
	q. Transmission oil temperature.		110°C		
	r. Torque meter.				
	s. TD voltmeter — check at 28V.				
	t. Check engine fuel system operation (only after engine change, after fuel control change and during Intermediate Inspection).				
	CAUTION: To prevent possible engine damage, select maximum nII (6400 RPM) speed with the Increase-Decrease "beep" switch and with Power Lever twist grip (throttle) Full Open.				
	(1) With the fuel control selector switch in the primary (AUTO) position, back off twist grip slowly to stabilize engine instruments at 70 percent gas producer (nI) speed.				

UH-1A AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART I - GROUND CHECK (Continued)				PAGE NO. 5	NO. OF PAGES 12
6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE MIN	MAX	9. ACTUAL INDICATION	10. LEGEND (See Note)
	(2) Move the fuel control selector switch to MANUAL (EMERgency) position. Note that nI speeds drop.				
	(3) Move the fuel control selector switch to the primary (AUTO) position. Note the indicated nI speed. It should return to 70 percent and stabilize, if the throttle setting has not been moved.				
	NOTE: These instructions apply only to this operational check of the fuel control.				
	u. Operation of RPM INCREASE-DECREASE switch at 6400 RPM.	5800	6500 $\pm$50		
	v. Fuel boost pump switch (if applicable) — OFF.		30$\pm$2 sec.	(Then ON)	
	w. Hydraulic boost switch OFF, check controls, then ON.				
7	Before take-off.				
	a. Collective — minimum pitch, adjust friction.				
	b. Cyclic — neutral or slightly into wind.				
	c. Flight instruments check.				
	d. Pitot heater (if required).				
	e. Cabin heater (as required).				

UH-1A AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART I - GROUND CHECK (Continued)					PAGE NO. 6	NO. OF PAGES 12
6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE		9. ACTUAL INDICATION	10. LEGEND (See Note)	
		MIN	MAX			
	f. Throttle (advance slowly).					
	g. Tachometer (synchronization of needles).					
	h. Engine oil pressure. (PSI)	60	80			
	i. Engine oil temperature.		88°C			
	j. Transmission oil pressure. (PSI)	40	60			
	k. Transmission oil temperature.		110°C			
	l. Fuel pressure. (PSI)	5	20			
	m. Check nII operation governor.					
	n. All doors latched (if applicable).					

UH-1A AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART II - IN FLIGHT CHECK	PAGE NO. 7	NO. OF PAGES 12

1. TYPE ACFT	2. SERIAL NO.	3. ORGANIZATION	4. DATE	PURPOSE OF TEST FLIGHT 5.

NOTE: Symbol for Block 10 (✓) Satisfactory (X) Unsatisfactory (Explain in Remarks)

6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE MIN	MAX	9. ACTUAL INDICATION	10. LEGEND (See Note)
1	Take-off to hovering.				
	a. Engine for specified				
	(1) RPM (engine and rotor synchronized)				
	(Rotor)	285	314		
	(Engine)	5800	6400		
	(2) Engine oil pressure. (PSI)	60	80		
	(3) Engine oil temperature.		88°C		
	(4) Transmission oil pressure. (PSI)	40	70		
	(5) Transmission oil temperature.		110°C		
	(6) Fuel pressure (PSI).	5	20		
	(7) Tailpipe temperature.	385°C	570°C		
	(8) % RPM tachometer smooth operation in steady state.				
	b. Helicopter for control, stability and proper response to control forces.				
	(1) Cyclic response.				
	(2) Collective pitch response.				

UH-1A AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART II - IN FLIGHT CHECK (Continued)				PAGE NO. 8	NO. OF PAGES 12
6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE MIN	MAX	9. ACTUAL INDICATION	10. LEGEND (See Note)
	(3) Directional control response.				
	c. Flight characteristics.				
	(1) Hovering 360° turns left and right.				
	(2) Sidewards.				
	(3) Rearwards.				
2	In-Flight				
	a. Engine for specified				
	(1) RPM (Engine and rotor synchronized)				
	(Rotor)	285	314		
	(Engine)	6200	6400		
	(2) Engine oil pressure (PSI)	60	80		
	(3) Engine oil temperature		88°C		
	(4) Transmission oil pressure (PSI)	40	60		
	(5) Transmission oil temperature.		110°C		
	(6) Fuel pressure (PSI)	5	20		
	(7) Tailpipe temperature	385°C	570°C		
	(8) % RPM tachometer smooth operation in steady state.				
	(9) Heater on (as required)				

UH-1A AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART II - IN FLIGHT CHECK (Continued)				PAGE NO. 9	NO. OF PAGES 12
6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE MIN	MAX	9. ACTUAL INDICATION	10. LEGEND (See Note)
	b. Rotors				
	(1) RPM (engine and rotor synchronized).				
	(2) Observe tip patch for in-track condition.				
	c. Instrument check.				
	(1) Airspeed indicator.				
	(2) Compass.				
	(3) Altimeter.				
	(4) Free air temperature.				
	d. Communication equipment check.				
	(1) ARC-44 radio receiver-transmitter.				
	(2) ARC-55 UHF short wave two-way radio.				
	e. Autorotation check.				
	(KEEP TO A MINIMUM.) (RPM)	285	330		
	f. Auxiliary fuel tank operation (if installed).				
	NOTE: Main fuel cells must be below approximately 700 pounds before transfer pump will operate.				
3	Descent and pre-landing check.				
	a. Crew alerted.				

UH-1A AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART II - IN FLIGHT CHECK (Continued)				PAGE NO. 10	NO. OF PAGES 12
6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE MIN	MAX	9. ACTUAL INDICATION	10. LEGEND (See Note)
	b. Start approach and pre-landing descent.				
	c. Heater OFF.				
	CAUTION. Heater must be OFF one minute prior to landing on clean surface and two minutes prior to landing on surface of combustible materials.				
	d. Collective friction — Adjust.				
	e. Governor — AUTO.				
	f. Engine RPM.	6200	6400		
	g. Ground speed at three to six feet altitude.				
	h. Establish hovering flight.		0		
	i. Collective — slowly reduce and descend.				
	j. Landing.				

UH-1A AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART III - AFTER FLIGHT CHECK	PAGE NO. 11	NO. OF PAGES 12

1. TYPE ACFT	2. SERIAL NO.	3. ORGANIZATION	4. DATE	PURPOSE OF TEST FLIGHT 5.

NOTE: Symbol for Block 10 (✓) Satisfactory (X) Unsatisfactory (Explain in Remarks)

6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE MIN	8. RANGE MAX	9. ACTUAL INDICATION	10. LEGEND (See Note)
1	Reduce Power to Flight Idle Position Prior to Shut-down and Observe following Readings:				
	a. Gas Producer RPM	58%	62%		
	b. EXH. gas temperature	427°C	570°C		
	c. Engine oil pressure (PSI)	60	80		
	d. Engine oil temperature		88°C		
	e. Transmission oil temperature		110°C		
	f. Transmission oil pressure	40	60		
2	Engine Shut-Down				
	a. Exhaust gas temperature (stabilize).				
	b. Throttle — PUSH and HOLD idle detent button, throttle to FULL OFF.				
	c. Main fuel valve — CLOSED as soon as engine has stopped.				
	d. Observe Exhaust Gas Temperature after shut-down. (Temperature should decrease.)				
3	Note discrepancies in applicable forms.				

6. ITEM NO.	UH-1A AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART IV – REMARKS	PAGE NO. 12	NO. OF PAGES 12

TYPED OR PRINTED NAME OF PILOT	SIGNATURE
TYPED OR PRINTED NAME OF OBSERVER	**SIGNATURE**

UH-1B AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART I - GROUND CHECK TM 55-1520-211-20 DATED________				PAGE NO. 1	NO. OF PAGES 11
1. TYPE ACFT	2. SERIAL NO.	3. ORGANIZATION	4. DATE	PURPOSE OF TEST FLIGHT 5.	

NOTE: Symbol for Block 10 (√) Satisfactory (X) Unsatisfactory (Explain in Remarks)

6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE MIN	MAX	9. ACTUAL INDICATION	10. LEGEND (See Note)
1	Aircraft forms checked.				
2	Daily inspection complete.				
3	Flight readiness inspection complete.				
4	Interior inspection.				
	a. Cabin doors.				
	b. Blade tie-downs, pitot, tailpipe and intake covers, and tail rotor tie-down strap stowed under passenger seat.				
	c. Hydraulic fluid level.				
	d. Transmission oil level.				
	e. Seats adjusted.				
	f. Pedals adjusted.				
	g. Safety belts adjustment.				
	h. Shoulder harness fastened.				
	i. Operation of shoulder harness lock.				
	j. Cyclic, pitch, and pedals operation.				
	k. Circuit Breakers.				

UH-1B AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART I - GROUND CHECK (Continued)					PAGE NO. 2	NO. OF PAGES 11
6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE MIN	MAX	9. ACTUAL INDICATION	10. LEGEND (See Note)	
	l. Electrical switches.					
	m. Inverter.					
	n. Battery switch.					
	o. Static position of all instruments.					
	p. Compass slaving.					
	q. Altimeter.					
	r. Clock.					
	s. Main fuel switch.					
	t. Starting fuel switch.					
	u. Fuel transfer pump switch.					
	v. Low rpm audio switch.					
	w. Hydraulic control switch.					
	x. Force trim switch.					
	y. Radio equipment.					
5	Engine pre-start check.					
	a. Collective pitch lever.					
	b. Throttle.					
	c. Ignition system.					
	d. Starter relay circuit breaker.					
	e. Inverter switch.					
	f. Battery switch.					
	g. Starter-generator.					
	h. Main generator.					
	i. Fire warning light.					

UH-1B AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART I - GROUND CHECK (Continued)					PAGE NO. 3	NO. OF PAGES 11
6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE MIN	MAX	9. ACTUAL INDICATION	10. LEGEND (See Note)	
	j. Fuel gage.					
	k. Caution panel warning light.					
	l. Cyclic control.					
6	Engine Starting.					
	a. Fire guard.					
	b. Check rotor blades.					
	c. Battery switch.					
	d. Main fuel switch — ON.					
	e. Starting fuel switch — ON.					
	f. ENGINE GOV switch — AUTO.					
	g. Throttle — Just below ENG IDLE STOP release.					
	h. GOV RPM INCR/DECR switch — decreased to minimum rpm.					
	i. Starter switch — ON and HOLD.		40 sec.			
	j. START FUEL switch — OFF at	23% or	28% 400°C			
	k. Starter switch — Release at	35%	42%			
7	Engine warm-up.					
	a. Accelerate to FLIGHT IDLE (rpm)	56%	58%			
	b. Check oil pressure (psig) and torquemeter (some indication)	25				

UH-1B AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART I - GROUND CHECK (Continued)				PAGE NO. 4	NO. OF PAGES 11
6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE MIN	MAX	9. ACTUAL INDICATION	10. LEGEND (See Note)
	(1) Deleted.				
	(2) Deleted.				
	(3) Deleted.				
	c. Check operation of avionics equipment.				
	d. Advance throttle to full open and check the following:				
	(1) Exhaust gas temperature B-5 B-9/11	 385°C 390°C	 590°C 640°C		
	(2) Engine oil pressure (psig)	60	80		
	(3) Engine oil temperature		93°C		
	(4) Transmission oil pressure (psig)	45	55		
	(5) Transmission oil temperature		110°C		
	(6) Torquemeter (check for indication).				
	(7) DC Voltmeter (volts)		28		
	(8) Check operation of GOV RPM INCR/DECR switch through range of rpm	6000 ±50	6700 ±50		
	(9) Turn fuel boost pump switch off, allow approximately 30 seconds to purge air from system, then return switch to ON position.				
	(10) Check hydraulic servo controls for proper operation.				
	(11) Bleed air heater (check operation).				

UH-1B AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART I - GROUND CHECK (Continued)					PAGE NO. 5	NO. OF PAGES 11
6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE MIN	MAX	9. ACTUAL INDICATION	10. LEGEND (See Note)	
	e. Check engine fuel system operation. (Only after engine change, after fuel control change, and during Intermediate Inspection.)					
	(1) Set nII speed with GOV RPM INCR/DECR switch		6600			
	(2) Retard throttle to flight idle, then advance and stabilize nI rpm at 70%					
	(3) Position ENGINE GOV switch to EMER for five seconds. (Do not exceed.) Note that indicated nI speed drops as fuel solenoid valve operates					
	(4) Return ENGINE GOV switch to AUTO. Note that indicated nI speed returns and stabilizes at 70 percent.		70%			

UH-1B AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART I - GROUND CHECK (Continued)				PAGE NO. 6	NO. OF PAGES 11
6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE MIN	MAX	9. ACTUAL INDICATION	10. LEGEND (See Note)
8	Engine Acceleration Check.				
	a. Check anti-icing system by operating the hot air solenoid valve. A slight rise in egt will indicate that system is operating. Turn off system.				
	Note This check is performed only to ensure that the anti-icing system is operating satisfactorily and that the hot air solenoid valve is closed during the following engine operational checks.				
	b. Set collective pitch to minimum position (flat pitch).				
	Note On cool days, aircraft may need additional weight to prevent lift-off.				
	c. Advance throttle to full open.				
	d. Set nII rpm selector		6400		
	e. Retard nI speed and allow to stabilize.		60%		

UH-1B AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART I - GROUND CHECK (Continued)	PAGE NO. 7	NO. OF PAGES 11

6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE MIN	MAX	9. ACTUAL INDICATION	10. LEGEND (See Note)
	f. Use clock to check engine acceleration as follows:				
	(1) Rapidly open throttle and note time to 85% nI rpm.				
	(2) Retard throttle and stabilize.		60%		
	g. Compare engine performance to specified max. acceleration time (4.5 seconds for T53-L-9/9A, or 3.5 seconds for T53-L-11) with correction for elevation and ambient temperature. (See figure 3-1A.)				

UH-1B AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART II - IN FLIGHT CHECK				PAGE NO. 8	NO. OF PAGES 11
1. TYPE ACFT	2. SERIAL NO.	3. ORGANIZATION	4. DATE	PURPOSE OF TEST FLIGHT 5.	
NOTE: Symbol for Block 10	(√) Satisfactory		(X) Unsatisfactory	(Explain in Remarks)	

6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE MIN	MAX	9. ACTUAL INDICATION	10. LEGEND (See Note)
1	Take-off to hovering:				
	a. Engine for specified:				
	(1) RPM (engine and rotor synchronized)				
	(Rotor).	294	324		
	(Engine)	6000	6600		
	(2) Engine oil pressure (psig)	60	80		
	(3) Engine oil temperature		93°C		
	(4) Transmission oil pressure (psig)	30	70		
	(5) Transmission oil temperature		110°C		
	(6) Fuel pressure (psig)	5	35		
	(7) Tailpipe temperature				
	B-5	385°C	610°C		
	B-9/11	390°C	640°C		
	(8) % RPM tachometer smooth operation in steady state.				
	b. Helicopter for control, stability, proper response to control forces.				
	(1) Cyclic response.				
	(2) Collective pitch response.				

UH-1B AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART II - IN FLIGHT CHECK (Continued)				PAGE NO. 9	NO. OF PAGES 11
6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE MIN	MAX	9. ACTUAL INDICATION	10. LEGEND (See Note)
	(3) Directional control response.				
	c. Flight characteristics.				
	(1) Hovering 360 degree turns left and right.				
	(2) Sidewards.				
	(3) Rearwards.				
2	In-flight.				
	a. Engine for specified:				
	(1) RPM (engine and rotor synchronized). (Rotor) (Engine)	 294 6000	 324 6600		
	(2) Engine Oil pressure (psig)	60	80		
	(3) Engine Oil temperature		93°C		
	(4) Transmission oil pressure (psig)	30	70		
	(5) Transmission oil temperature		110°C		
	(6) Fuel pressure (psig)	5	35		
	(7) Tailpipe temperature B-5 B-9/11	 385°C 390°C	 590°C 640°C		
	(8) % RPM tachometer smooth operation in steady state.				

UH-1B AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART II - IN FLIGHT CHECK (Continued)					PAGE NO. 10	NO. OF PAGES 11
6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE MIN	MAX	9. ACTUAL INDICATION	10. LEGEND (See Note)	
	b. Rotors					
	(1) RPM (engine and rotor synchronization).					
	(2) Observe tip path for in-track condition.					
	c. Instrument check.					
	(1) Airspeed indicator.					
	(2) Compass.					
	(3) Altimeter.					
	(4) Free air temperature.					
	d. Check communication equipment for proper operation.					
	e. Autorotation check (keep to a minimum).					

UH-1B AIRCRAFT TEST FLIGHT INSPECTION CHECKSHEET PART III - AFTER FLIGHT CHECK	PAGE NO.	NO. OF PAGES
	11	11

1. TYPE ACFT	2. SERIAL NO.	3. ORGANIZATION	4. DATE	PURPOSE OF TEST FLIGHT 5.

NOTE: Symbol for Block 10 (✓) Satisfactory (X) Unsatisfactory (Explain in Remarks)

6. ITEM NO.	7. INSPECTION ITEMS	8. RANGE MIN	MAX	9. ACTUAL INDICATION	10. LEGEND (See Note)
1	Reduce Power to Flight Idle Position Prior to Shutdown and Observe the Following Readings:				
	a. Gas producer speed (rpm)				
	B-5	58%	62%		
	B-9/11	56%	58%		
	b. Exhaust gas temperature				
	B-5	385°C	590°C		
	B-9/11	427°C	±50		
	c. Engine oil pressure (psig)	25	80		
	d. Engine oil temperature		93°C		
	e. Transmission oil temperature		110°C		
	f. Transmission oil pressure				
	B-5 (psig)	40	60		
	B-9/11 (psig)	30	60		
2	Engine Shutdown.				
	a. Exhaust gas temperatures — Stabilized				
	b. Throttle — Push and hold idle detent button, throttle to full off				
	c. Main fuel valve — Closed as soon as engine has stopped				
3	Note discrepancies on applicable forms.				

Section IV — Overhaul and Retirement Schedule

3-7. Scope. This section lists units of operating equipment that are to be overhauled or retired at the period specified. Removal of equipment for overhaul may be accomplished at the inspection nearest the time when overhaul may be accomplished at the inspection nearest the time when overhaul is due unless otherwise specified in TB AVN 23-10.

3-8. Overhaul Interval. The maximum authorized operating time of parts prior to removal for overhaul at echelon authorized in accordance with the Maintenance Allocation Chart.

3-9. Retirement Schedule. a. The operating time specified for removal, condemnation, and disposal of parts in accordance with applicable directives.

b. Upon replacement of items listed in this chapter, all applicable forms, records and worksheets will be completed and updated as required (TM 38-750).

Overhaul and Retirement Schedule
Model UH-1A Helicopters

Area	Part Number	Item	Overhaul Interval	Retirement Interval
	Main Rotor			
4	204-010-051-1	Blade Assembly		1100
4	204-010-190-3, -7	Hub Assembly	600	
4	204-010-190-9	Hub Assembly	600	
4	204-010-161-1	*Grip		1200
4	204-010-173-7	*Strap Assembly		600
4	204-010-185-1	*Pitch Horn		1200
4	204-010-517-1	*Drag Brace Assembly		1200
4	204-010-133-7	Blade Retention Bolt	1200	
	Transmission			
4	204-040-001-13, -17	**Transmission Assembly	400	
4	204-040-151-9	*Planetary Spacer Case		400
4	204-040-214-1, -3	Mast Assembly	300	
4	204-040-214-5	Mast Assembly	1100	
4	204-040-136-1, -5	*Mast Bearing		300
4	204-040-005-19, -27, -31	Engine to Transmission Drive Shaft	1100	
	Tail Rotor and Drive System			
6	204-010-771-7, -9	Blade Assembly		3000
6	204-010-784-3	Hub Assembly	1100	
6	204-010-703-21	Hub Assembly	1100	
6	204-010-706-9, -11	*Grip		1100
6	204-010-710-1	*Yoke		3300
6	204-010-781-1	*Yoke		3300
6	204-040-004-19, -19A, -25, -31	****90° Gear Box	800	
6	204-040-004-33	90° Gear Box	1100	
6	204-040-003-13, -23	42° Gear Box	1100	
6	204-040-600-5, -7	Drive Shaft Hanger Assembly	1100	
6	204-010-720-1	Slider		400

Area	Part Number & Item		Overhaul Interval	Retirement Interval
	Mast Controls			
4	204-010-470-5, -9	Swashplate and Support Assembly	1100	
4	204-010-469-3, -7	Scissors and Sleeve Assembly	1100	
4	204-010-487-1, -3	Scissors and Sleeve Assembly	1100	
4	204-010-439-1	*Scissors		1100
4	204-010-440-1	*Drive Link		1100
4	204-010-370-3, -5, -7	Stabilizer Bar Assembly	400	
4	204-010-380-1	*Stabilizer Bar Tube		400
4	204-010-368-17	*Center Frame Set		1200
4	204-010-390-1	*Mixing Lever		1200
4	204-010-348-13	Control Tube		1100
4	204-010-374-7	Pitch Link		1100
	Synchronized Elevator			
6	204-030-858-25, -26, -37, -38	Elevator Assembly		1100
	Rotating Control System Bolts (See Figure 3-2)			
4	NAS1304-26D (Index No. 4)	Pitch Horn to Pitch Link		100
4	NAS1304-26D (Index No. 3)	Pitch Link to Universal		400
4	NAS1304-30D (Index No. 2)	Universal to Mixing Lever		100
4	NAS1304-30D (Index No. 9)	Drive Link to (204-010-446-3) Trunnion		400
	Power Plant			
5	T53-L-1	***Engine		1200
5	T53-L-1A	***Engine		1200

*Parts will be retired by the maintenance level overhauling the assembled component.

**400 TBO if MWO 55-1520-207-50/6 has not been complied with or if planetary spacer case 204-040-151-9 is presently installed on the transmission; otherwise, 1100 hour TBO

***Internal inspection required every 300 engine hours.

****Overhaul interval is 1100 hours if data plate is marked 50/15 CW.

Overhaul and Retirement Schedule
Model UH-1B Helicopters
Serial No. 60-3546 through 64-14100

Area	Part Number & Item		Overhaul Interval	Retirement Interval
	Main Rotor			
4	204-011-001-7	Blade Assembly		400
4	204-011-001-15	Blade Assembly		1000
4	204-011-101-1	Hub Assembly	400	
4	204-011-101-3, -5, -9	Hub Assembly	1100	
4	204-011-113-1	*Strap Assembly		1100
	Transmission			
4	204-040-009-7, -13, -19, -31	Transmission Assembly	1100	
4	204-040-366-1, -3, -5	Mast Assembly	300	
4	204-040-366-7, -9	Mast Assembly	1100	
4	204-040-136-3, -5	*Mast Bearing		300
4	204-040-136-7	*Mast Bearing		1100
4	204-040-010-3, -7	Engine to Transmission Drive Shaft	1100	
	Tail Rotor and Drive System			
6	204-011-702-11, -15	Blade Assembly		1100
6	204-011-701-7	Hub Assembly		1100
6	204-040-003-13, -23	42° Gear Box	1100	
6	204-040-012-1	90° Gear Box	600	
6	204-040-012-7	90° Gear Box	1100	
6	204-040-600-5, -7	Drive Shaft Hanger Assembly	1100	
	Mast Controls			
4	204-011-400-1, -3, -5, -7	Swashplate and Support Assembly	1100	
4	204-011-404-1, -5	*Support		3300
4	204-011-438-1	Collective Lever		3300
4	204-011-401-3, -5, -7	Scissors and Sleeve Assembly	1100	
4	204-011-326-1	Stabilizer Bar Assembly	1100	

Area	Part Number	Item	Overhaul Interval	Retirement Interval
	Synchronized Elevator			
6	204-030-858-43, -44	Elevator Assembly		3000
	Rotating Control System Bolts (See figure 3-2)			
4	NAS464-6-26 (Index No. 4)	Pitch Horn to Pitch Link		1000
4	NAS1306-31D (Index No. 4)	Pitch Horn to Pitch Link		1000
4	NAS1306-27D (Index No. 3)	Pitch Link to Universal		1000
4	NAS464-6-35 (Index No. 2)	Universal to Mixing Lever		1000
4	NAS1306-34D (Index No. 2)	Universal to Mixing Lever		1000
4	NAS464-5-27 (Index No. 1)	Mixing Lever to Scissors Tube		1000
4	NAS1305-27D (Index No. 1)	Mixing Lever to Scissors Tube		1000
4	NAS464-5-27 (Index No. 5)	Scissors Tube to Scissors		1000
4	NAS1305-27D (Index No. 5)	Scissors Tube to Scissors		1000
4	NAS464-8-90 (Index No. 6)	Scissors Pivot Bolt		1000
4	NAS464-8-69 (Index No. 7)	Scissors to Drive Link		1000
4	NAS464-5-30 (Index No. 9)	Drive Link to Swashplate		1000
4	NAS1305-30D (Index No. 9)	Drive Link to Swashplate		1000
4	AN175H16 (Index No. 8)	Cyclic Tubes to Swashplate		1000
4	AN175H16 (Index No. 8)	Collective Tube to Collective Levers		1000
	Power Plant			
5	T53-L-5	**Engine	1200	
5	T53-L-9	**Engine	1200	
5	T53-L-9A	**Engine	1200	
5	T53-L-11	**Engine	1200	

*Parts will be retired by the maintenance level overhauling the assembled components.

**Internal Inspection required every 300 engine hours.

Overhaul and Retirement Schedule

Model UH-1B Helicopter

Serial No. 64-14101 and Subsequent

Area	Part Number	Item	Overhaul Interval	Retirement Interval
	Main Rotor			
4	540-011-001-5	Main Rotor Blade Assembly		1100
4	540-011-101-3	Main Rotor Hub Assembly	1100	
4	540-011-102-5	*Yoke		2200
4	540-011-153-9	*Extension Assembly		2200
4	540-011-154-5	*Grip		2200
4	540-011-147-1	*Pitch Horn		2200
4	204-012-112-7	*Retention Straps		2200
	Transmission			
4	204-040-009-53, -57	Transmission Assembly	1100	
4	204-040-366-11	Mast Assembly	1100	
4	204-040-136-7	*Mast Bearing		1100
4	204-040-010-7	Engine to Transmission Drive Shaft	1100	
	Tail Rotor and Drive System			
6	204-011-702-17	Blade Assembly, Tail Rotor		1100
6	204-011-701-13	Tail Rotor Hub Assembly	1100	
6	204-011-706-9	*Grip		2200
6	204-010-781-9	*Yoke		2200
6	204-040-003-23, -37	42° Gear Box	1100	
6	204-040-012-7, -13	90° Gear Box	1100	
6	204-011-620-3	Drive Shaft, Tail Rotor	1100	
6	204-040-600-5	Drive Shaft Hanger Assembly	1100	

Area	Part Number & Item		Overhaul Interval	Retirement Interval
	Mast Controls			
4	540-011-450-3	Swashplate and Support Assembly	1100	
4	540-011-454-5	Collective Lever	1100	2200
4	540-011-451-1	Scissors and Sleeve Assembly	1100	
4	540-011-300-3	Stabilizer Bar Assembly	1100	
4	540-011-468-1	Stop Assembly	1100	2200
	Synchronized Elevator			
6	205-030-856-45	Elevator		3000
6	205-030-856-47	Elevator		3000
6	205-001-914-1	Horn, Elevator Control		3000
	Power Plant			
5	T53-L-11**	Engine	1200	

*Parts will be retired by the maintenance level overhauling the assembled components.

**Internal Inspection required every 300 engine hours.

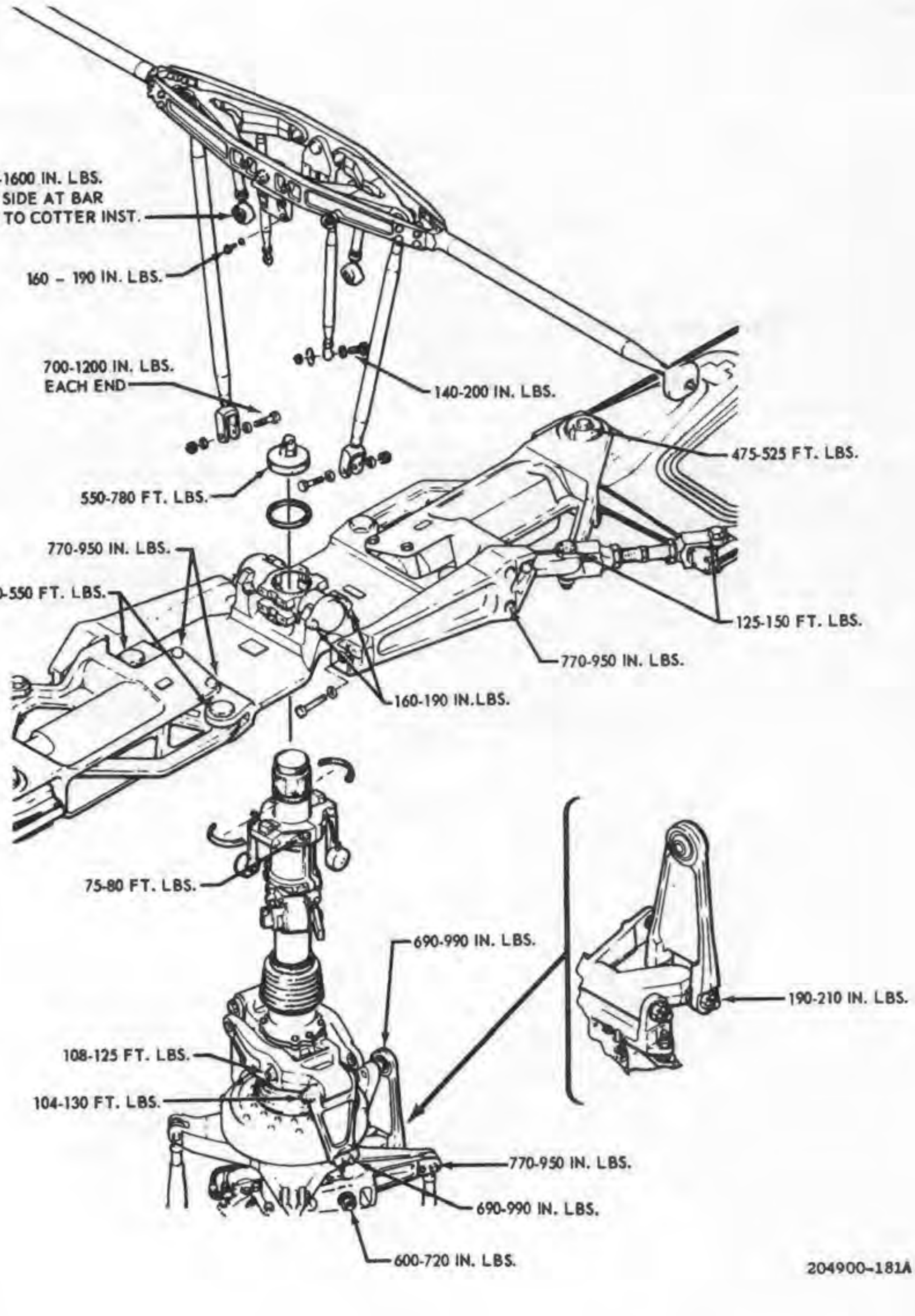


Figure 3-2A. Rotor system torque values (UH-1B serial no. 64-14101 and subsequent)

Section V — Standards of Serviceability

3-10. Purpose. This section provides a guide to all personnel engaged in the maintenance of Department of the Army aircraft in determining serviceability of aircraft.

3-11. Maintenance Functions and Inspections. The availability of serviceable aircraft is contingent upon effective maintenance management; therefore, the maximum utilization of available capabilities, faithful and timely performance of assigned maintenance functions, and conscientious performance of specified maintenance inspections augmented by careful supervision and strict quality control will enhance aircraft availability and serviceability.

3-12. Standards of Serviceability. Serviceability can be determined only by actual inspection of the aircraft and can be determined at any time throughout the life cycle of the aircraft. Wear tolerance and maximum allowable deterioration, specified in maintenance and inspection requirements, have been designed to assure a high degree of serviceability, availability, and safety. These tolerances and limits are the basic standards for serviceability and are embodied in aircraft maintenance and inspection manuals; therefore inspection for serviceability is performed during every maintenance inspection.

3-13. Degree of Serviceability. Transfer of aircraft generates administrative and technical problems for supply and maintenance management. To minimize the impact upon the receiving activity of a transferred aircraft, degrees of serviceability are established to supplement basic standards included in present maintenance and inspection requirements. The supplementary standards, contained in this section, have been designed to assure that sufficient reliable hours of flight are remaining on the aircraft and components to satisfy immediate operational and logistical requirements of the receiving activity when the aircraft is being transferred within CONUS, overseas, or into combat operations.

3-14. The degree of serviceability required for aircraft upon completion of overhaul will be to the same degree required for transfer within CONUS; except when aircraft is predetermined to be destined for overseas or into combat, in which case the overhauled aircraft will conform to the standard for the specific transfer condition.

ITEM NO.	ITEM	DEGREE OF SERVICEABILITY REQUIRED FOR TRANSFER FROM WITHIN CONUS	DEGREE OF SERVICEABILITY REQUIRED FOR TRANSFER FROM CONUS TO OVERSEAS	DEGREE OF SERVICEABILITY REQUIRED FOR TRANSFER FROM CONUS TO COMBAT OPERATION
	GENERAL			
1.	Inspection.	Perform next Intermediate Inspection; when next Periodic Inspection is due within 25 operating hours, perform next Periodic Inspection.	Perform next Periodic Inspection.	Perform next Periodic Inspection.
2.	Modification.	Accomplish all MWO or TCTM Organizational and Direct Support Maintenance Modifications.	Accomplish all MWO or TCTM Organizational through Depot Maintenance modifications which have an issue date of three months prior to date of transfer. Accomplish all Depot maintenance controlled modifications which are authorized by AMCPM-IRFO but not printed as MWOs.	Accomplish all MWO or TCTM Organizational through General Support maintenance modifications which have an issue date of one month prior to date of transfer.
3.	Mission Essential Equipment.	Assure mission essential equipment is installed.	Assure mission essential equipment is installed and is completely operational.	Assure mission essential equipment is installed and is completely operational.
	AIRCRAFT			
4.	Aircraft Paint Condition.	Touch up by area spraying as necessary to provide a protective seal on all required surfaces.	Touch up by area spraying as necessary to provide a protective seal on all required surfaces; completely repaint if condition of existing paint warrants. Paint necessary peculiar markings on aircraft required by the theater of operations.	Touch up by area spraying as necessary to provide a protective seal on all required surfaces. Paint necessary peculiar markings on aircraft required by theater of operations.
5.	COMPONENT REPLACEMENT			
	a. Items having a schedule replacement or retirement time below 500 hours.	Replace if less than 50 hours of scheduled operating time remains.	Replace if less than 100 hours of scheduled operating time remains.	Replace if less than 200 hours of scheduled operating time remains.

ITEM NO.	ITEM	DEGREE OF SERVICEABILITY REQUIRED FOR TRANSFER WITHIN CONUS	DEGREE OF SERVICEABILITY REQUIRED FOR TRANSFER FROM CONUS TO OVERSEAS	DEGREE OF SERVICEABILITY REQUIRED FOR TRANSFER FROM CONUS TO COMBAT OPERATION
	b. Items having a scheduled replacement or retirement time over 500 hours.	Replace if less than 10% of scheduled operating time remains.	Replace if less than 25% of scheduled operating time remains.	Replace if less than 50% of scheduled operating time remains.
6.	CONTROL CABLES			
	a. 7 X 7	Replace when more than three strands are broken or corroded within a one inch distance.	Replace when more than three strands are broken or corroded within a one foot distance.	Replace when more than three strands are broken or corroded within a two foot distance.
	b. 7 X 9	Replace when more than six strands are broken or corroded within a one inch distance.	Replace when more than six strands are broken or corroded within a one foot distance.	Replace when more than six strands are broken or corroded within a two foot distance.
7.	STAND-BY OR MAGNETIC COMPASS	Swing compass and recompensate at interval specified in inspection requirements.	Swing compass and recompensate.	Swing compass and recompensate.
8.	TIRES	Replace if less than 25% of tread remains.	Replace if less than 50% of tread remains.	Replace if less than 75% of tread remains.
9.	COMMUNICATION EQUIPMENT	Assure equipment is completely operational.	Assure type of equipment installed is compatible to type and system utilized at destination and equipment is fully operational.	Assure type of equipment installed is compatible to type and system utilized at destination and equipment is fully operational.
10.	ELECTRONIC NAVIGATION	Assure equipment is completely operational.	Assure type of equipment installed is compatible to type and system utilized at destination and equipment is fully operational.	Assure type of equipment installed is compatible to type and system utilized at destination and equipment is fully operational.

CHAPTER 4
AIR FRAME AND ALIGHTING GEAR

Section I — Scope

4-1. Scope. The purpose of this chapter is to provide all necessary information to maintenance personnel for the accomplishment of organizational maintenance on the complete airframe and alighting gear in accordance with the maintenance allocation chart.

Section II — Fuselage Section

4-2. Description. The fuselage of UH-1A and UH-1B helicopters consists, basically, of the cabin and the tail boom. Fuselage components and standard furnishings are described in the following paragraphs, with comprehensive instructions for their maintenance by organizational personnel.

4-3. Description — Cabin. The cabin portion of the fuselage is an integrated, structural unit, complete with doors, windows, cowling and fairings. Furnishings contained in the cabin include seats, soundproofing, blackout curtains, cargo suspension unit, litters, first aid kit, fire extinguisher, paratroop static line cable and manual emergency jettison controls.

4-4. Equipment and Electrical Compartment Access Doors. Equipment and electrical compartment doors (5, figure 4-1) are located on each side of the aft portion of the cabin. These doors are attached to the cabin structure and are secured in the closed position by means of a latch or latches.

4-5. Removal — Equipment and Electrical Compartment Access Doors. Release spring loaded latch and remove hinge pins attaching door to structure.

4-6. Inspection — Equipment and Electrical Compartment Access Doors. Inspect door latch for proper operation. Visually inspect hinges and door panel for general condition.

4-7. Repair or Replacement — Equipment and Electrical Compartment Access Doors. Replace all items which appear to be unsuitable for continued use. Repair door structure in accordance with instructions contained in TM 55-405-4.

4-8. Installation — Equipment and Electrical Compartment Access Doors. Position door in opening and insert attaching hinge pin. Close door firmly, forcing spring loaded latch to lock.

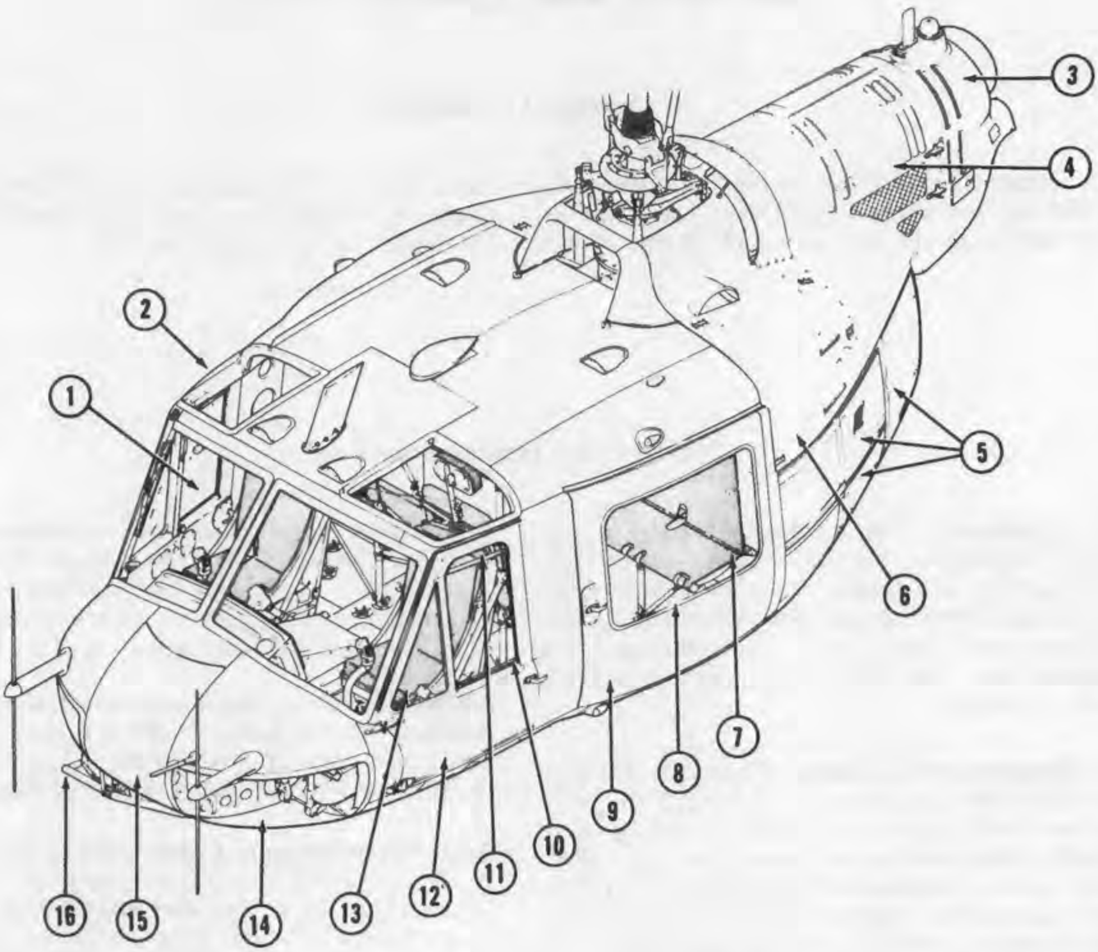
4-9. Miscellaneous Cabin Access Doors. Access to various internal areas of the cabin is provided by strategically located access doors. (See figures 4-2 and 4-3.) These doors are attached to the structure by hinges, and are secured in the closed position by means of a latch or latches.

4-10. Removal — Miscellaneous Cabin Access Doors. Refer to paragraph 4-5.

4-11. Inspection — Miscellaneous Cabin Doors. Refer to paragraph 4-6.

4-12. Installation — Miscellaneous Cabin Access Doors. Refer to paragraph 4-8.

4-13. Pilot and Copilot Door. (12, Figure 4-1.) Access to the pilot and copilot area is gained through two swinging doors, which are hinged on the forward side. A latch assembly, which may be operated from either side of each door, secures the door in the closed position. In an emergency, doors may be jettisoned



1. Windshield
2. Cabin Roof Window
3. Tailpipe Fairing
4. Engine Cowl
5. Access Doors
6. Transmission Cowl
7. Troop Seat
8. Cargo Door Window
9. Cargo Door
10. Copilot Adjustable Window
11. Copilot Upper Door Window
12. Copilot Door
13. Copilot Seat
14. Lower Forward Cabin Window
15. Cabin Nose Access Door
16. Mirror Installation

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Figure 4-1. Typical UH-1A and UH-1B cabin by pulling the "EMERGENCY RELEASE" handle on the inside of each door.

4-14. ***Removal — Pilot and Copilot Door.*** Open door, pull "EMERGENCY RELEASE" handle, and lift door from helicopter.

4-15. ***Inspection — Pilot and Copilot Door.*** a. Inspect seal strips for deterioration and damage; hinges for cracks and damage; door structure for dents, cracks and damage and latches for damage and serviceability.

b. Check door roller assemblies (8) for smoothness of operation in channel and for condition of threads.

4-16. ***Repair or Replacement — Pilot and Copilot Door.*** a. Replace damaged or unserviceable seals, hinges and latches.

b. Repair door structure in accordance with instructions contained in TM 55-405-4.

4-17. ***Installation — Pilot and Copilot Door.*** Position door on hinges and insert hinge pins.

4-18. ***Adjustment — Pilot and Copilot Door.*** a. With door handle in locked position, adjust latch tubes as follows:

(1) Adjust aft vertical latch tube so that clearance of 0.08 inch is obtained between top of door roller assembly (8, figure 4-4) and bottom of channel.

(2) Adjust forward vertical latch tube so that clearance of 0.08 inch is obtained between top of door roller assembly (8) and bottom of channel.

(3) Adjust emergency jettison hinge pins so that rounded end of pins is visible above the upper hinge and below the lower hinge.

Note

Actuate emergency jettison device to make certain that pins clear hinges and door can be properly jettisoned. If door does not jettison, readjust as necessary.

b. For final adjustment of door peel shims on upper and/or lower door hinges as necessary.

4-19. Pilot and Copilot Door Latch.

Each door is equipped with a latch assembly which may be operated from either side.

4-20. ***Removal — Pilot and Copilot Door Latch.*** a. Remove screw holding inner handle to shaft and remove handle.

b. Remove access plate and disconnect two tube assemblies from bellcrank.

c. Remove screw from outer handle and remove handle from shaft.

d. Remove escutcheon attachment screws and remove escutcheon. Lift latch from door.

4-21. ***Inspection — Pilot and Copilot Door Latch.*** Visually inspect latch assembly for ease of operation, damage and general condition.

4-22. ***Repair or Replacement — Pilot and Copilot Door Latch.*** Replace door latch if damaged, binding, or unserviceable.

4-23. ***Installation — Pilot and Copilot Door Latch.*** a. Position latch in door and install outer escutcheon plate.

b. Install outer handle on shaft.

c. Connect two tube assemblies to latch bellcrank and install access plate.

d. Install inner handle on shaft.

4-24. Cabin Nose Access Door.

(15, figure 4-1.) The cabin nose access door has two hinges on the upper side which are attached to door stays. The door is secured in the closed position by means of spring loaded latches.

4-25. ***Removal — Cabin Nose Access Door.*** a. With door in closed position, remove screws attaching hinges to top edge of door.

b. Release spring loaded latches and lift door from helicopter.

4-26. ***Inspection — Cabin Nose Access Door.*** a. Visually inspect door hinges, and structure for damage, dents, cracks; rubber seal for deterioration and security of attachment.

b. Inspect latches for proper operation and damage.

4-27. ***Repair or Replacement — Cabin Nose Access Door.*** a. Repair door structure in accordance with instructions contained in TM 55-405-4.

b. Replace rubber seal, door latches, door hinges and door stays if unserviceable or damaged.

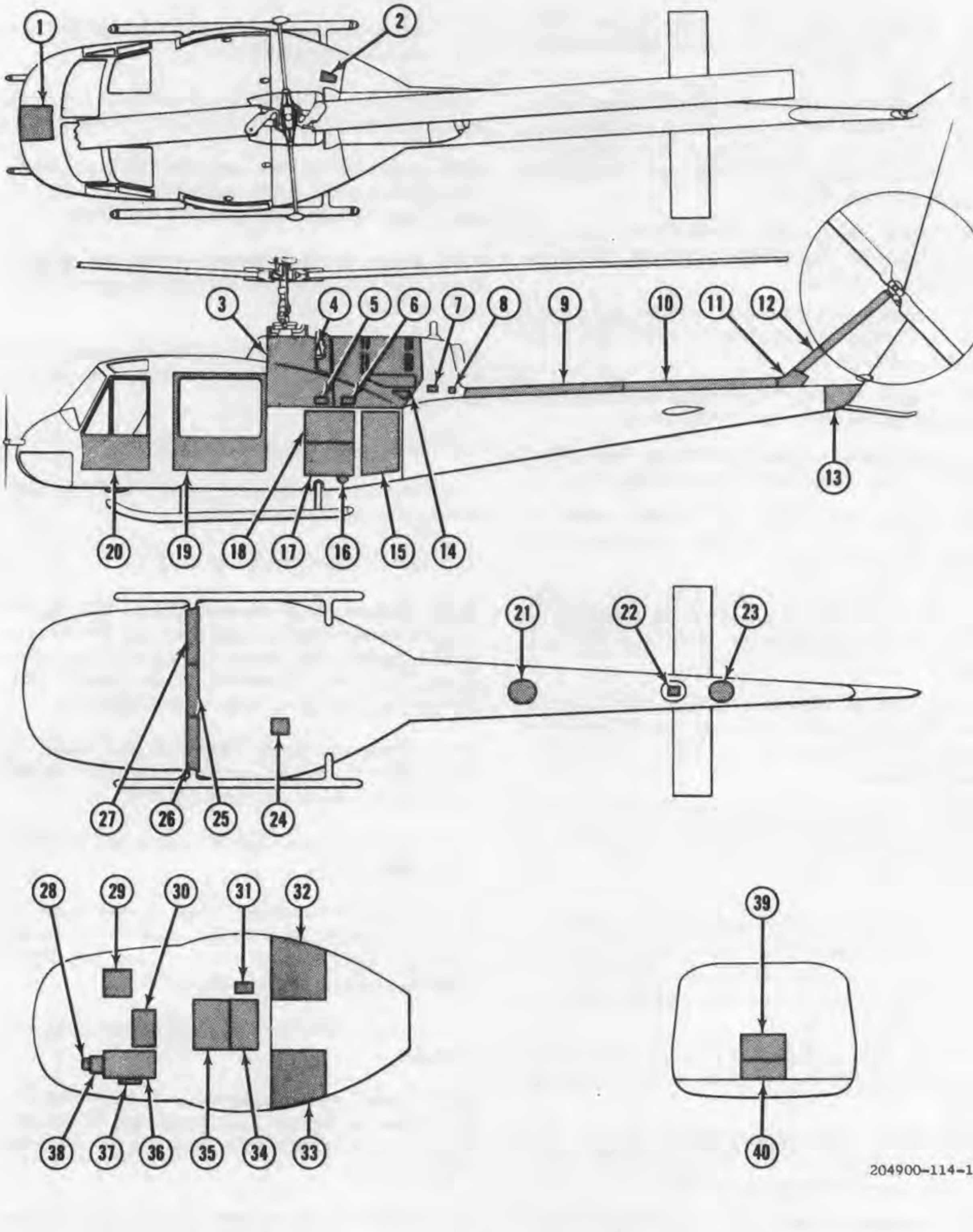

Figure 4–2. UH-1A Access and inspection provisions (Sheet 1 of 2)

1. Nose Communications Compartment Access
2. Oil Tank Filler Cap Access
3. Transmission Access
4. Engine to Transmission Driveshaft Access
5. Transmission Compartment Fire Extinguisher Nozzle Insertion and Miscellaneous Visual Inspection Access - LH
   Transmission Compartment Fire Extinguisher Nozzle Insertion and Miscellaneous Visual Inspection Access - RH
6. Engine Compartment Fire Extinguisher Nozzle Insertion and Miscellaneous Visual Inspection Access - LH
   Engine Compartment Fire Extinguisher Nozzle Insertion and Miscellaneous Visual Inspection Access - RH
7. Driveshaft Coupling Access - LH
   Driveshaft Coupling Access - RH
8. Elevator Control Cable Pulleys Access - LH
   Elevator Control Cable Pulleys Access - RH
9. Forward Tail Rotor Shaft Access
10. Aft Tail Rotor Shaft Access
11. Intermediate (42°) Gear Box Access
12. Vertical Fin Driveshaft Access
13. Tail Skid Attachment Access
14. Engine Access - LH
    Engine Access - RH
15. Baggage Compartment Door
16. External Power Access
17. Equipment Compartment Door
18. Equipment Compartment Door
19. Cargo Door
20. Crew Door
21. Elevator Controls Access
22. Elevator Access
23. General Access
24. Fuel Sump Access
25. Landing Gear Center Access
26. Landing Gear Access Cover - RH
27. Landing Gear Access Cover - LH
28. Dual Cyclic Control Stick Cover
29. Controls Access
30. Controls Access
31. Directional Control Idler Access
32. Fuel Cell Access - RH
33. Fuel Cell Access - LH
34. Auxiliary Fuel Tank Disconnects
35. Controls Access
36. Controls Access
37. Dual Collective Control Stick Cover
38. Cyclic Control Stick Electrical Access
39. Boost Cylinders Access
40. Boost Cylinders Access

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Figure 4–2. UH-1A Access and inspection provisions (Sheet 2 of 2)

4-28. *Installation — Cabin Nose Access Door.* a. Position door in opening and attach to hinges with screws.

b. Close door firmly against rubber seal, forcing spring loaded latches to lock.

4-29. *Adjustment — Cabin Nose Access Door.* Adjust door stay assemblies as necessary for proper fit and operation of door.

4-30. Cabin Inspection Plates. Inspection plates are provided wherever needed for fast, efficient inspection and maintenance of the helicopter. (See figures 4-2 and 4-3.)

4-31. *Removal — Cabin Inspection Plates.* Remove screws attaching inspection plate to structure and remove plate.

4-32. *Installation — Cabin Inspection Plates.* Position inspection plate in proper opening and attach to structure with screws.

4-33. Cargo Doors. Two sliding doors (9, figure 4-1) are provided for access to the passenger-cargo compartment. One door is located on each side of the aft cabin section, aft of the crew doors. A large plexiglas window is incorporated into each cargo door. The doors are attached to, and are operated by means of, rollers in metal tracks. On UH-1B helicopters, Serial No. 64-14035 and subsequent, the rollers are replaced by new, improved slider assemblies.

4-34. *Removal — Cargo Doors.* a. Remove cargo door holding-pin by removing three metal screws.

Note

Pin is located on upper, forward inboard side of cargo door.

b. Remove stop from aft end of lower track.

c. Slide door aft on tracks and guide rollers or sliders through cutouts at aft end of tracks.

4-35. *Inspection — Cargo Doors.* Check cargo door rollers and latch for freedom of action and smoothness of operation. Structure for dents, cracks or damage.

4-36. *Repair or Replacement — Cargo Doors.* a. Replace door rollers and latch if damaged or unserviceable.

b. Repair structure in accordance with TM 55-405-4.

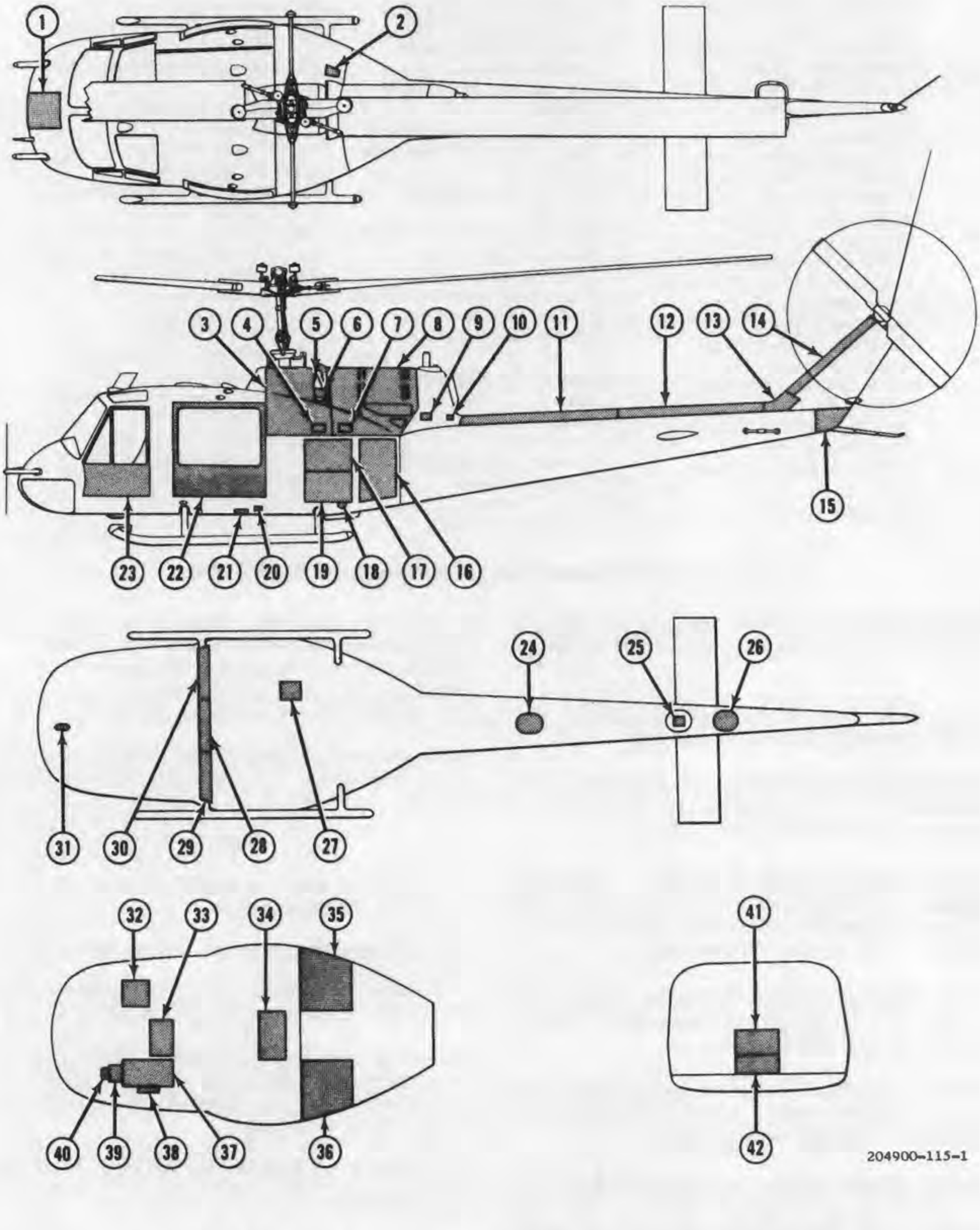

Figure 4-3. UH-1B Access and inspection provisions (Sheet 1 of 2)

1. Nose Communications Compartment Access
2. Oil Tank Filler Cap Access
3. Transmission Access
4. Transmission Compartment Fire Extinguisher Nozzle Insertion and Miscellaneous Visual Inspection Access - LH
   Transmission Compartment Fire Extinguisher Nozzle Insertion and Miscellaneous Visual Inspection Access - RH
5. Engine to Transmission Driveshaft Access
6. Induction Screen Access - LH
   Induction Screen Access - RH
7. Engine Compartment Fire Extinguisher Nozzle Insertion and Miscellaneous Visual Inspection Access - LH
   Engine Compartment Fire Extinguisher Nozzle Insertion and Miscellaneous Visual Inspection Access - RH
8. Engine Access - LH
   Engine Access - RH
9. Driveshaft Coupling Access - LH
   Driveshaft Coupling Access - RH
10. Elevator Control Cable Pulleys Access - LH
    Elevator Control Cable Pulleys Access - RH
11. Forward Tail Rotor Shaft Access
12. Aft Tail Rotor Shaft Access
13. Intermediate (42°) Gear Box Access
14. Vertical Fin Driveshaft Access
15. Tail Skid Attachment Access
16. Baggage Compartment Door
17. Equipment Compartment Door
18. External Power Access
19. Equipment Compartment Door
20. Armament Provisions Quick Disconnect Access
21. General Access
22. Cargo Door
23. Crew Door
24. Elevator Controls Access
25. Elevator Access
26. General Access
27. Fuel Sump Access
28. Landing Gear Center Access
29. Landing Gear Access Cover - RH
30. Landing Gear Access Cover - LH
31. Antenna Access Cover
32. Controls Access
33. Controls Access
34. General Access.
35. Fuel Cell Access - RH
36. Fuel Cell Access - LH
37. Controls Access
38. Dual Collective Control Stick Cover
39. Dual Cyclic Control Stick Cover
40. Cyclic Control Stick Electrical Access
41. Boost Cylinders Access
42. Boost Cylinders Access

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Figure 4-3. UH-1B Access and inspection provisions (Sheet 2 of 2)

4-37. Installation — Cargo Doors. a. Position door against helicopter with forward edge of door in line with aft end of door track.

b. Pass rollers or sliders through cutouts at aft end of door tracks. Push door forward on tracks until door is partly closed.

c. Install stop on aft end of lower track.

d. Position cargo door holding-pin and attach with three screws.

4-37A. Adjustment — Cargo Doors. a. Position cargo door in full closed and locked position.

b. Check upper door track for engagement in airframe mounted rollers or sliders. If necessary, loosen screws attaching roller or slider and raise or lower door as necessary to engage upper door track. Tighten screws.

c. Check lower door track for proper engagement in cabin door channel. Minimum engagement of 0.250 inch is required. If necessary, loosen screws attaching cabin door channel to airframe and raise or lower channel to insure maximum engagement of cargo door track and door channel without restricting door travel from full closed to full open position. Retorque door channel attaching screws with standard torque, or hand tight, as applicable to screws.

d. After door adjustment, check cargo door lock for operation and full locking engagement. If necessary, adjust door lock as required.

4-38. Cargo Door Latch. Each cargo door is equipped with a latch assembly which may be operated from either side of the door.

4-39. Removal — Cargo Door Latch. a. Remove set-screw attaching outside handle, and remove handle from spindle.

b. Remove screws attaching escutcheon plate to outside of door, and remove escutcheon plate.

c. Remove screws attaching inboard plate to door structure, and lift latch assembly from door.

4-40. Inspection — Cargo Door Latch. Visually inspect latch assembly for ease of operation, damage and general condition.

1. Acrylic Plastic Panels
2. Door Roller Assemblies
3. Aft Vertical Latch Tube
4. Door Latch
5. Lower Horizontal Latch Tube
6. Latch Release Spring
7. Bellcrank
8. Forward Vertical Latch Tube
9. Ejection Handle Assembly
10. Door Hinges
11. Striker Ejection Cable
12. Ejection Mechanism

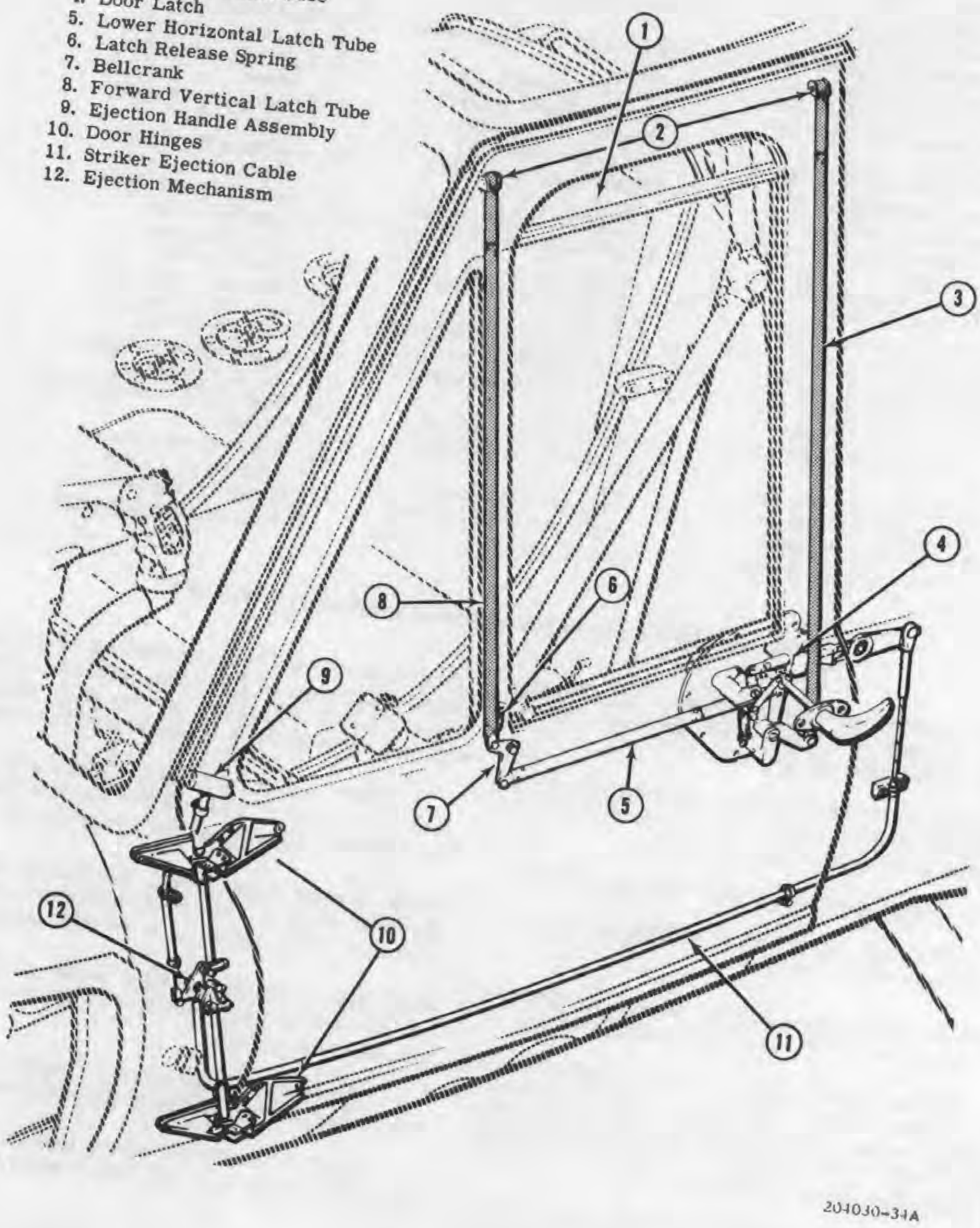

Figure 4–4. Typical pilots and copilots door assembly

4-41. ***Installation — Cargo Door Latch.*** a. Position latch assembly in door structure through opening on inboard side of door. Position inboard plate and install screws.

b. Install escutcheon plate to outside of door with screws.

c. Slide outside handle on spindle, and attach with set screw.

4-42. Engine Cowling. The engine cowling (4, figure 4-1) consists of one right-hand and one left-hand section. Each piece of cowling is mounted on two hinges attached to the aft firewall. The forward side of the engine cowling is held in position by a latch and the transmission cowling which overlaps the engine cowling.

4-43. ***Removal — Engine Cowling.*** a. Disconnect fasteners on transmission cowling and swing cowling to open position.

b. Disconnect forward fastener on engine cowling and open cowling. Pull pin from hinges on aft side of cowling and lift assembly from helicopter. Disconnect fire detector wiring.

4-44. ***Inspection — Engine Cowling.*** Inspect cowling for dents, cracks, or damage; fasteners and hinges for damage and serviceability.

4-45. ***Repair or Replacement — Engine Cowling.*** a. Repair cowling in accordance with instructions contained in TM 55-405-4.

b. Replace unserviceable hinges, latches and fasteners.

4-46. ***Installation — Engine Cowling.*** a. Position cowling on hinges and install pins. Connect fire detector wiring and close cowling.

b. Close transmission cowling and fasten latch.

4-47. Transmission Cowling. The transmission cowling (6, figure 4-1) consists of a right and a left-hand section, each providing access to the transmission area. The cowling is secured in closed position with six latches. A frame attaches the cowling to the cabin structure, and acts as a hinge to swing the cowling forward (over the aft section of the cabin) to open position.

4-48. ***Removal — Transmission Cowling.*** a. Disengage cowling latches and swing cowling to forward position.

b. Remove cotter pins, washers and pins attaching cowling to frame assembly and lift cowling from frame.

c. Remove safety pin from lower hinge point of cowling frame.

d. Rotate piano hinge approximately 90 degrees to release locking lug.

e. Pull pin outboard until frame assembly is disengaged from attaching points.

f. Lift frame assembly from platform.

Warning

Do not fly helicopter without transmission cowling installed.

4-49. ***Inspection — Transmission Cowling.*** Refer to paragraph 4-44.

4-50. ***Repair or Replacement — Transmission Cowling.*** Refer to paragraph 4-45.

4-51. ***Installation — Transmission Cowling.*** a. Position cowling over frame and attach frame to mounting points on cowling. Install pins, washers and cotter pins.

b. Position cowling and frame assembly in lugs on work platform.

c. Install piano hinge pin and rotate approximately 90 degrees to engage locking lug. Install safety pin.

d. Swing cowling aft to closed position and fasten latches.

4-52. Engine Tail Pipe Fairing. A metal fairing (3, figure 4-1) encloses the engine tailpipe and supports an antenna and anti-collision light. This fairing is attached by means of snap-fasteners.

4-53. ***Removal — Engine Tail Pipe Fairing.*** a. Open access door on left-hand side of fairing.

b. Disconnect antenna and anti-collision light wiring at deck.

c. Open forward tail rotor drive shaft access door. Disconnect snap-fasteners around edge of fairing and lift fairing from tailpipe.

4-54. ***Inspection — Engine Tail Pipe Fairing.*** Inspect fairing for cracks or damage; fasteners for damage and serviceabality.

4-55. ***Repair or Replacement — Engine Tail Pipe Fairing.*** a. Repair fairing in accordance with TM 55-405-4.

b. Replace unserviceable fasteners.

4-56. ***Installation — Engine Tail Pipe Fairing.*** a. Position fairing over tailpipe and connect snap-fasteners.

b. Connect antenna and anti-collision light wiring at deck.

c. Close access door on left-hand side of fairing.

4-57. Pilot and Copilot Seat. These seats (13, figure 4-1) are adjustable, non-reclining type, mounted on tracks fixed to the cabin floor. Adjustment lever is on the left side of the seat. The fore and aft adjustment lever is on the right of the seat. Each seat is equipped with a lap style safety belt and an inertia reel shoulder harness.

4-58. Removal — Pilot and Copilot Seat. a. Remove the stop bolts or quick release stop assembly at the aft end of the seat tracks.

b. Lift the handle located on the right side of the seat, to release the position pin, and slide the seat aft until it is clear of tracks.

4-59. Inspection — Pilot and Copilot Seat. Inspect for damage and operation.

4-60. Repair or Replacement — Pilot and Copilot Seat. a. Repair minor damage in accordance with TM 55-405-4..

b. Replace seat if unserviceable or will not operate properly.

4-61. Installation — Pilot and Copilot Seat. a. Position rollers on aft end of tracks. Lift handle on right side of seat, and slide seat forward on tracks to desired position.

b. Install stop bolts or quick release stop assembly at aft end of tracks.

4-61A. Pilot and Copilot Seat Armor. The seat armor, constructed from a composite ceramic-metal material, is designed to protect pilot and co-pilot against small arms ball and armor piercing ammunition. A segmented construction is used to permit the replacement of any damaged components.

4-61B. Removal — Pilot and Copilot Seat Armor.

Note

Retain removed hardware and serviceable parts for re-installation.

a. Remove inertia release lever from side panel.

b. Remove seat and armor from tracks in aircraft.

c. Remove twenty-three screws attaching assembled side and back assembly to bottom panel, slip assembled side and back assembly over pilot's seat.

d. Remove four nuts, washers, and bolt attaching inertia tension reel to back panel and remove inertia tension reel from panel.

e. Remove bolts and fore-aft adjustment mechanism. Tip entire seat assembly on its side to expose the bottom side of armor panel. Remove fourteen nuts, locflwashers and bolt attaching bottom armor panel to seat frame and remove armor from seat.

f. Remove six nuts attaching front panel, to seat and remove panel.

4-61C. Inspection — Pilot and Copilot Seat Armor. Inspect armor for damage, from enemy fire and other unserviceable conditions.

4-61D. Repair or Replacement — Pilot and Copilot Seat Armor. Replace any segment that is damaged or shows unserviceable condition.

4-61E. Installation — Pilot and Copilot Seat Armor. a. Install front panel to seat and secure with six nuts.

b. Slip curved lip of bottom panel under the rear horizontal tube and attach panel to seat frame with fourteen bolts, lockwashers and nuts.

Note

Do not tighten the bolts too tight; if bolts are too tight, they will prevent free movement of the seat on the tracks. A slight snugness of the bolts and nuts to the track is sufficient.

c. Install fore-aft adjustment mechanism and bolts.

d. Assemble the back sides and shoulder panels to each other. Slip completed assembly over pilot's seat and attach to bottom panel with twenty-three screws.

e. Install inertia tension reel to back panel with four bolts, lockwashers and nuts.

f. Place completed seat and armor assembly on tracks in aircraft.

g. Install inertia release lever on side panel with two washers and bolts.

4-62. Aft Cabin Troop Seats. Two troop seats (7, figure 4-1) of tubular metal construction are secured to the cabin bulkhead and floor. In UH-1A helicopters these seats are each two man capacity, while the UH-1B helicopters are equipped with one two man, and one three man capacity seats. These seats can be stowed or removed for rescue or cargo missions as required.

4-63. Removal — Aft Cabin Troop Seats. a. On UH-1A and UH-1B helicopters, Serial No. 60-3546 through 65-12772, remove nuts, bolts and washers attaching upper seat back to bulkhead fittings.

b. Slide collar of floor attachment fittings upward on each of the forward seat support legs, and release legs from floor studs.

c. Remove nuts and bolts holding clamps on rear of seat and remove seat from helicopter.

4-64. Inspection — Aft Cabin Troop Seats. Visually inspect support tubes, legs and seat fabric for damage.

4-65. Repair or Replacement — Aft Cabin Troop Seats. Repair torn fabric. Replace seat if support tubes and legs are damaged or unserviceable.

4-66. Installation — Aft Cabin Troop Seats. a. Unfold stowed seat in helicopter. On UH-1A and UH-1B helicopters, Serial No. 60-3546 through 65-12772, position seat back support tube to upper bulkhead fittings and install attaching bolts, washers and nuts.

b. Position aft seat bottom support tube in bulkhead clamps and install bolts and nuts.

c. Position forward seat support legs on floor studs. Secure legs to floor by sliding attachment fitting collar up on leg and then down as far as it will go.

4-67. Adjustment — Aft Cabin Troop Seats. Adjust seat tension by use of buckles on upper back support straps.

4-68. Stowage — Aft Cabin Troop Seats. a. Release forward seat support legs from floor studs.

b. Pull pip pins from seat leg braces and fold braces upward against seat legs. Fold seat legs aft under seat bottom.

4-69. One Man and Medical Attendant Seats. There are two additional one man seats which may be installed in UH-1B helicopters only. When installed these seats are located between, and aft of, the pilot's and copilot's seats. One man seats may be installed so that the occupant faces either outboard or aft. These seats are of tubular metal construction and can be folded for stowage. A medical attendant's seat, of the same construction as the one man seats, is provided for use when the helicopter is utilized for mercy and/or rescue missions. This seat is located on the helicopter center line, behind the pilot's and copilot's seats, and faces aft. Individual, lap type, safety belts are provided for the occupants of all seats.

4-70. Removal — One Man and Medical Attendant Seats. a. Slide collar of floor attachment fittings upward on each leg to release seat from floor.

b. Lift seat from position and remove from helicopter.

4-71. Inspection — One Man and Medical Attendant Seats. Inspect fabric, fittings, braces and leg assemblies for damage and general condition.

4-72. Repair or Replacement — One Man and Medical Attendant Seat. a. Repair torn fabric.

b. Replace seat if support tubes, legs or braces are damaged.

4-73. Installation — One Man and Medical Attendant Seats. a. Open seat back to normal position and secure support tubes at each side of the seat with quick release pins.

b. Unfold seat legs and position the seat in the helicopter with the legs over the floor studs. Press down on seat.

c. Slide the collar of each leg attachment fitting down to securely lock the legs to the floor.

d. Position diagonal leg brace tubes and secure with pip pins.

4-74. Stowage — One Man and Medical Attendant Seats. a. Pull the quick release pin attaching seat back support to each side of the seat.

b. Fold seat back forward onto seat bottom.

c. Remove pip-pins attaching diagonal braces to forward seat legs.

d. Fold each leg inboard against seat bottom.

4-75. Safety Belts. Individual, lap type, web safety belts are provided for the occupants of all seats.

4-76. Removal — Safety Belts. a. Remove nuts, washers and bolts attaching pilot and copilot seat safety belts to each side of seat and remove belt from seat.

b. Unsnap both ends of troop seat safety belts from rings, or link assembly bolts, and remove belt.

4-77. Inspection — Safety Belts. Inspect each belt and fitting for fraying, weakness of webbing and stitching; slippage of webbing through adjusters and deformation and corrosion of metal fittings.

Note

Safety belts shall be tested at a maximum interval of each six months. Seat belts which have been exposed to dampness or have been cleaned with soap and water shall be proof tested prior to further usage. (Refer to TM 55-405-3.)

4-78. Repair or Replacement — Safety Belts. Replace frayed and unserviceable seat belts. Replace unserviceable fittings.

4-79. Installation — Safety Belts. a. Position pilot and copilot safety belt end fittings on each side of seat and install bolts, washers and nuts.

b. Position troop seat safety belt on seat bottom and attach both ends of belt by snapping to rings or link assembly bolts.

Warning

Assemble each troop seat safety belt with release handle pointing left. Place belt end fittings on inner sides of eyebolt, bolts from right, and secure with nuts.

4-80. Shoulder Harness. An inertia reel shoulder harness, with manually operated lock-unlock handles located on the left-hand side of each seat, is incorporated in the pilot's and copilot's seats.

4-81. Removal — Shoulder Harness. Remove nut, bolt and washer attaching shoulder harness to inertia reel and lift harness from seat.

4-82. Inspection — Shoulder Harness. Inspect harness and end fittings for fraying, weakness of webbing and stitching; slippage of webbing through adjusters and deformation and corrosion of metal fittings.

Note

Shoulder harness shall be tested at a maximum interval of each six months. Shoulder harness which have been repaired, exposed to dampness or cleaned with soap and water shall be proof tested prior to further usage. (Refer to TM 55-405-3.)

4-83. Repair or Replacement — Shoulder Harness. Replace frayed and unserviceable shoulder harness. Replace unserviceable fittings.

4-84. Installation — Shoulder Harness. Position shoulder harness over seat back and attach harness fitting to inertia reel with bolt, washer and nut.

4-85. Inertia Reel. The inertia reel is a mechanical restraining device that is designed to hold the pilot and/or copilot in a normal position, in relation to the seat back, during any maneuver which would tend to pitch the pilot and/or copilot forward. A reel is attached to the back of each seat, and is connected to a shoulder harness with a web strap. On UH-1B helicopters, Serial No. 63-8500 and subsequent, the inertia reel is attached to fittings on the cabin floor in back of the pilot and copilot seats. An automatic locking mechanism, a webbing roller and a manual control are incorporated in each unit.

4-86. Removal — Inertia Reel. a. Remove the shoulder harness. (Refer to paragraph 4-81.)

b. Loosen manual control nut at union of control cable and inertia reel.

c. Remove four nuts, washer and bolts attaching inertia reel, and remove reel from seat back or cabin floor.

d. Disconnect control cable from the manual control assembly.

e. Remove nuts, washers and bolts that attach the manual control assembly to the left-hand side of the seat. Remove control assembly.

4-87. Inspection — Inertia Reel. a. The automatic locking mechanism is designed to lock automatically at any increment of extension of the shoulder harness webbing up to a maximum of ½ inch movement of the webbing under load. The lock must effectively and positively lock the webbing roller drum when subjected to an inertia load of two to three G's. Then the manual roller shall remain locked against further withdrawal of the webbing until unlocked. The reel shall automatically retract shoulder harness webbing when the inertia load, and the load on the shoulder harness, is released.

b. The webbing roller shall fully retract the webbing tension of not less than two pounds at the initial increment of extension and no more than six pounds at any additional increment of extension of the webbing. The roller shall lock the webbing at each ½ inch increment (or less) of extension.

c. The manual control has both "AUTO and "MANUAL" lock positions. The control lever will remain in the placed position until moved by seat occupant. Movement of the control handle forward to the "MANUAL" position locks the inertia reel, and movement aft to the "AUTO" position unlocks the reel. The reel shall be capable of being unlocked with a load of 25 pounds applied to the webbing. The "MANUAL" control shall lock the reel at any increment up to a maximum of ½ inch extension of the webbing.

4-88. ***Repair or Replacement — Inertia Reel.*** Replace inertia reel that does not meet inspection requirements above.

4-89. ***Installation — Inertia Reel.*** a. Position manual control assembly on left-hand side of seat and attach with bolts, washers and nuts.

b. Securely connect control cable to manual control assembly.

c. Position inertia reel on seat back or to fittings on floor and install four bolts, washers and nuts.

d. Attach manual control cable to inertia reel and tighten nut.

e. Attach shoulder harness to inertia reel. (Refer to paragraph 4-84.)

4-90. Windshield. The windshield (1, figure 4-1) is made of transparent plastic. It is set in weather tight sealer, and is bolted to the cabin structure.

4-91. ***Removal — Windshield.*** a. Cut lockwire, loosen socket head set screw, and lift windshield wiper blade from shaft.

b. Remove free air temperature gage.

c. Remove nuts, bolts and washers from around edge of windshield.

d. Separate windshield from sealing compound and remove windshield from helicopter.

4-92. ***Inspection — Windshield.*** Inspect for abrasions, scratches, cracks, holes or other damage. See figure 4-4A for critical areas and repair limits.

4-93. ***Repair or Replacement — Windshield.*** Repair windshield. (Refer to TM 55-405-4.)

4-94. ***Installation — Windshield.*** a. Remove old sealing compound from mounting flange with putty knife, spatula or other suitable tool.

Note

Be careful not to scratch the surface.

b. Wipe and clean mounting flange with a soft, clean cloth dampened with naptha, (item 308, table 1-1).

c. Center windshield over opening. Mark edge of windshield oversize and trim sufficient edge to permit windshield to center in position against mounting flange.

Note

Do not trim windshield to final size until all mounting holes have been drilled.

d. Center windshield in position against mounting flange and back drill two holes on each edge of windshield. Use holes in mounting flange as template. Diameter of holes shall be 0.190 to 0.196 inch in diameter.

e. Secure windshield to mounting flange with four screws, washers and nuts lightly torqued. Finish back drilling holes in windshield.

f. Determine proper edge distance, mark windshield and remove. Trim windshield edge to proper size.

g. Remove all dust and foreign matter from windshield mating area and from windshield mounting flange.

h. Apply a 1/8 inch bead of water tightness sealing compound, (item 200, table 1-1) to the mating side of the windshield mounting flange.

i. Position windshield in mounting flange, align holes and install screws, washers and nuts.

j. Remove excess sealing compound from around windshield.

k. Install windshield wiper blade and free air temperature gage.

l. Clean windshield in accordance with instructions contained in paragraph 1-100.

4-95. Pilot and Copilot Upper Door Window. The pilot and copilot upper door window (11, figure 4-1) is a transparent plastic panel which is held in place by screws, washers and nuts.

4-96. ***Removal — Pilot and Copilot Upper Door Window.*** a. Remove nuts, screws and washers securing window to door.

b. Separate window from sealing compound and remove window from door.

4-97. ***Inspection — Pilot and Copilot Upper Door Window.*** (Refer to paragraph 4-92.)

4-98. ***Repair or Replacement — Pilot and Copilot Upper Door Window.*** (Refer to paragraph 4-93.)

4-99. ***Installation — Pilot and Copilot Upper Door Window.*** (Refer to paragraph 4-94, steps a. through j.) Procedure is the same except that diameter of holes shall be 0.146 to 0.152 inch in size.

4-100. Pilot and Copilot Adjustable Door Window. The pilot and copilot adjustable door window (10, figure 4-1) is a transparent plastic panel which may be raised or lowered as desired.

4-101. ***Removal — Pilot and Copilot Adjustable Door Window.*** a. Remove screws attaching plastic handle to window.

b. Remove screws holding cover plate to bottom door channel, in door frame, below the window.

c. Guide window downward through slot in bottom of door assembly and remove from door.

4-102. ***Inspection — Pilot and Copilot Adjustable Door Window.*** (Refer to paragraph 4-92.)

4-103. ***Repair or Replacement — Pilot and Copilot Adjustable Door Window.*** Repair window. (Refer to TM 55-405-4.)

4-104. ***Installation — Pilot and Copilot Adjustable Door Window.*** a. Guide window upward through slot in bottom of door channel, and into side window channels.

Note

Check progress through opening in aft edge of door.

b. Place window in partially closed position and attach window handle and bottom door channel cover plate with screws.

4-105. Cabin Roof Window. Two transparent plastic cabin roof windows (2, figure 4-1) are located directly above the pilot and copilot seats.

4-106. ***Removal — Cabin Roof Window.*** (Refer to paragraph 4-96.)

4-107. ***Inspection — Cabin Roof Window.*** (Refer to paragraph 4-92.)

4-108. ***Repair or Replacement — Cabin Roof Window.*** Repair window. (Refer to TM 55-405-4.)

4-109. ***Installation — Cabin Roof Window.*** (Refer to paragraph 4-94, steps a. through j.)

4-110. Lower Forward Cabin Window. Two transparent plastic lower forward cabin windows (14, figure 4-1) are located in the bottom of the forward cabin below, and forward of, the pilot's and copilot's tail rotor control pedals.

4-111. ***Removal — Lower Forward Cabin Window.*** a. Remove rear view mirror (refer to paragraph 4-156.)

b. Remove window. (Refer to paragraph 4-96.)

4-112. ***Inspection — Lower Forward Cabin Window.*** (Refer to paragraph 4-92.)

4-113. ***Repair or Replacement — Lower Forward Cabin Window.*** Repair window. (Refer to TM 55-405-4.)

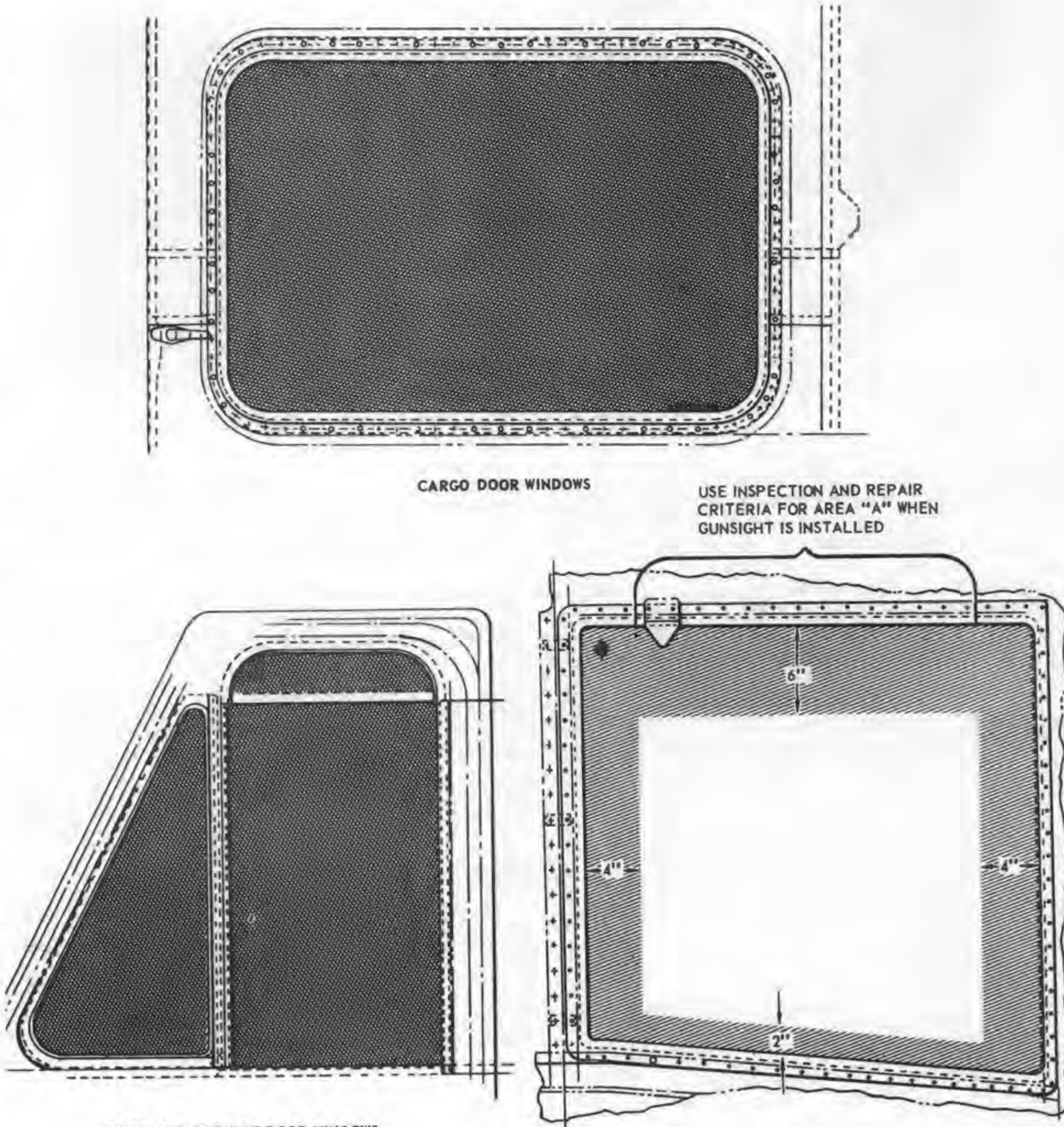

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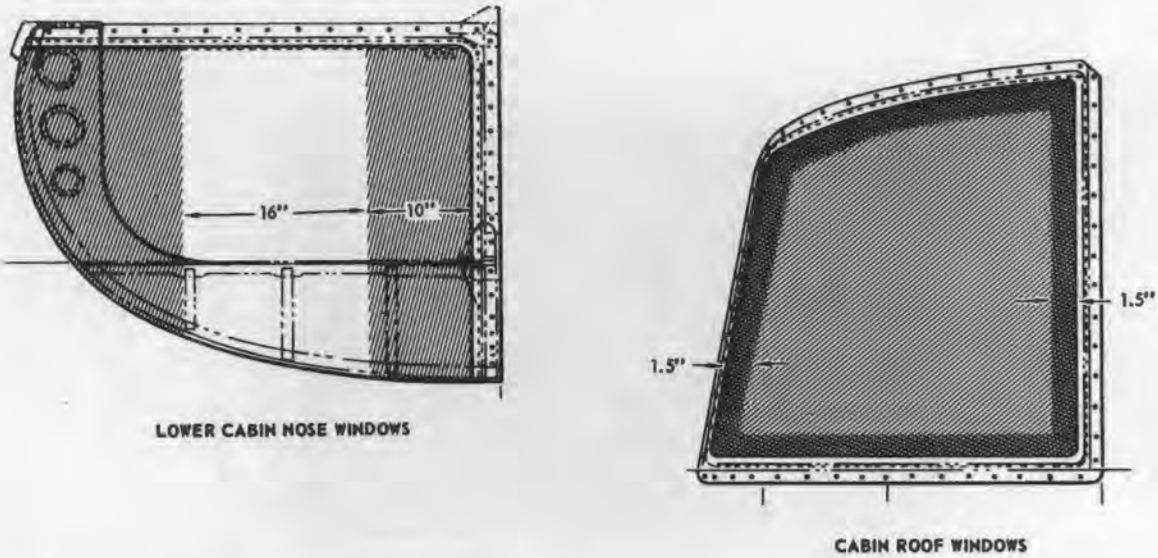
Figure 4-4A. Window critical areas diagram (Sheet 1 of 2)



Area "A": Scratches and pits may be polished out to the extent that vision is not distorted. Distortion of vision is cause for replacement. Cracks, holes or other damage may be temporarily repaired, if vision of crew members will not be impaired, by stop drilling, patching or other approved methods (refer to TM 55-405-4), but window must be replaced at the earliest opportunity.

Area "B": Scratches and pits are permitted in this area provided they are not so numerous or form such a pattern as to be objectionable to the viewer. Cracks, holes or other damage may be temporarily repaired by stop drilling, patching or other approved methods (refer to TM 55-405-4), but window must be replaced at the earliest opportunity.

Area "C": Scratches and pits are permitted in this area, providing the structural integrity of the window is not impaired. Cracks, holes or other damage may be repaired by stop drilling, patching or other approved methods provided structural integrity is not impaired (refer to TM 55-405-4).

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Figure 4-4A. Window critical areas diagram (Sheet 2 of 2)

4-114. Installation — Lower Cabin Window. a. Install window. (Refer to paragraph 4-94 steps a. through j.)

b. Install and adjust rear view mirror. (Refer to paragraph 4-157 and 4-158.)

4-115. Window — Cargo Door. A large plexiglas window (8, figure 4-1) is incorporated into each cargo door.

4-116. Removal — Cargo Door Window. (Refer to paragraph 4-96.)

4-117. Inspection — Cargo Door Window. (Refer to paragraph 4-92.)

4-118. Repair or Replacement — Cargo Door Window. Repair window. (Refer to TM 55-405-4.)

4-119. Installation — Cargo Door Window. (Refer to paragraph 4-94, steps a. through j.)

4-120. Soundproofing. The cabin interior is sound proofed to reduce noise level for the benefit of crew and passengers. Sound proof material is made into blankets cut to fit the interior of the helicopter.

4-121. Removal — Soundproofing. a. Remove screws, washers, nuts and clamps attaching roof blanket and stays to cabin roof.

b. Release snap buttons attaching roof blanket, and remove blanket.

c. Release snap buttons attaching balance of blankets to inside cabin surfaces, and remove blankets.

4-122. Inspection — Soundproofing. Visually inspect for cuts and tears in blankets and for damaged or missing buttons and sockets.

4-123. Repair or Replacement — Soundproofing. Repair damaged fabric. Replace missing snap fasteners.

4-124. Installation — Soundproofing. a. Position blankets in proper locations on vertical surfaces inside cabin, and attach by inserting snap buttons into corresponding sockets.

b. Position cabin roof blanket against roof, and attach with snap buttons, clamps, nuts, washers and screws.

4-125. Blackout Curtains. A black-out curtain is installed in the aft portion of the forward cabin section behind the pilot's and copilot's seats at station 75.00.

4-126. Removal — Black Curtains. a. Open zippers connecting top curtain assembly to right and left-hand assemblies.

b. Disconnect snap fasteners around outside edge and across bottom of curtains.

c. Remove nuts, washers and screws from attachment strips across top, and remove top curtain assembly.

4-127. Inspection — Blackout Curtains. Visually inspect blackout curtains for cuts, tears and condition of slide fasteners.

4-128. Repair or Replacement — Blackout Curtains. Repair fabric. Replace unserviceable slide fastener.

4-129. Installation — Blackout Curtains. a. Align holes in attaching strips and top curtain assembly with holes in bulkhead at station 75.00 and install screws, washers and nuts.

b. Connect fasteners on outboard sides and bottom of top curtain. Connect zippers of top curtain to corresponding zippers of lower curtains.

c. Connect outboard and bottom fasteners of lower curtains.

4-130. Work Platform. A fixed work platform is located in the upper part of the engine and transmission compartment beneath the cowling. With the engine and transmission cowling opened, or removed, this platform facilitates the performance of maintenance operations on the transmission and/or engine.

4-131. Repair — Work Platform. Minor ruptures can be repaired by filling with sealer (item 214, table 1-1) or equivalent.

4-132. Tiedown — Cargo. A quantity of combined cargo tie down ring and seat attachment stud units are located in the cabin floor panels. Their locations are such that cargo of various sizes, shapes and weights (within allowable limitations) can be accommodated and adequately secured.

4-133. Removal — Cargo Tiedown. Remove six screws from each unit, and lift unit from floor.

1. Cable Clamps
2. Clamp Assembly
3. Release Control Cable
4. Cable Connector
5. Support Bracket
6. Brush Assemblies
7. Mounting Rod-End
8. Inspection Hole
9. Main Release Cable
10. Turnbuckle
11. Pedal Assembly
12. Guard Pins
13. Guard Pin
14. Spacer
15. Pulley Bracket Tube
16. Cargo Hook Release Lever
17. Ball Terminal
18. Access Door
19. Lever
20. Clamps
21. Adapter
22. Cargo Hook
23. Pedal Stop Assembly Screw

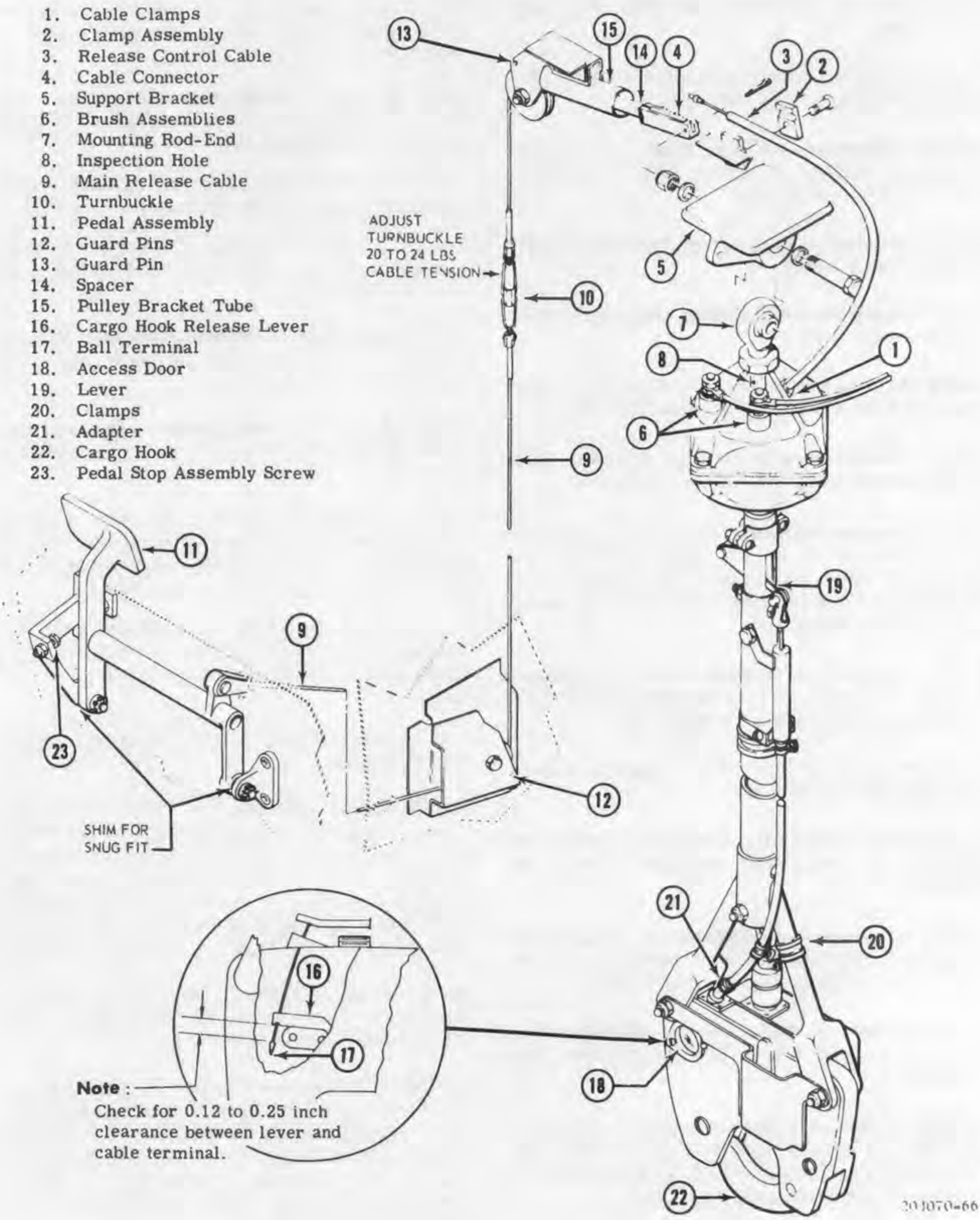
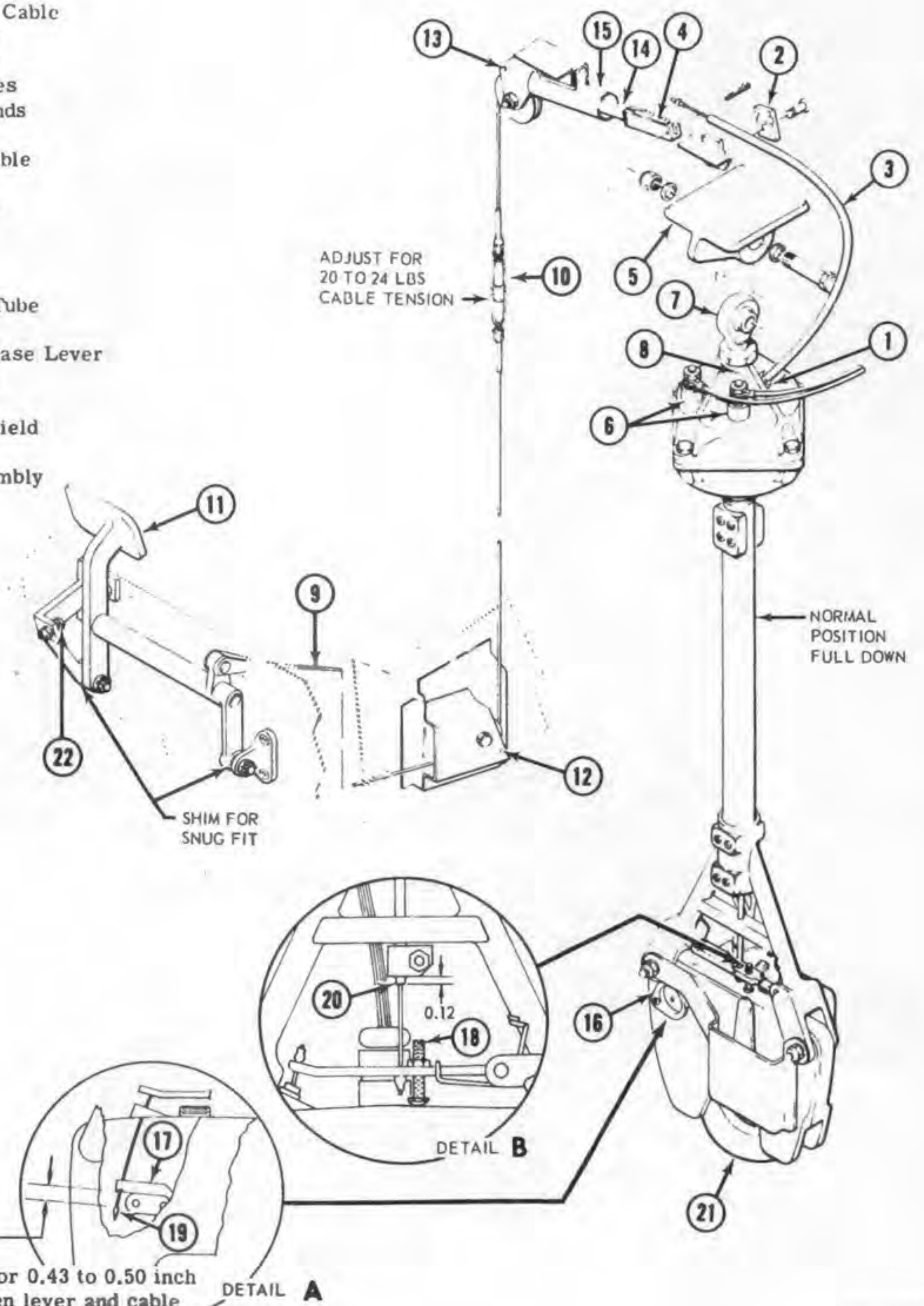


Figure 4–5. UH-1A Helicopter cargo suspension

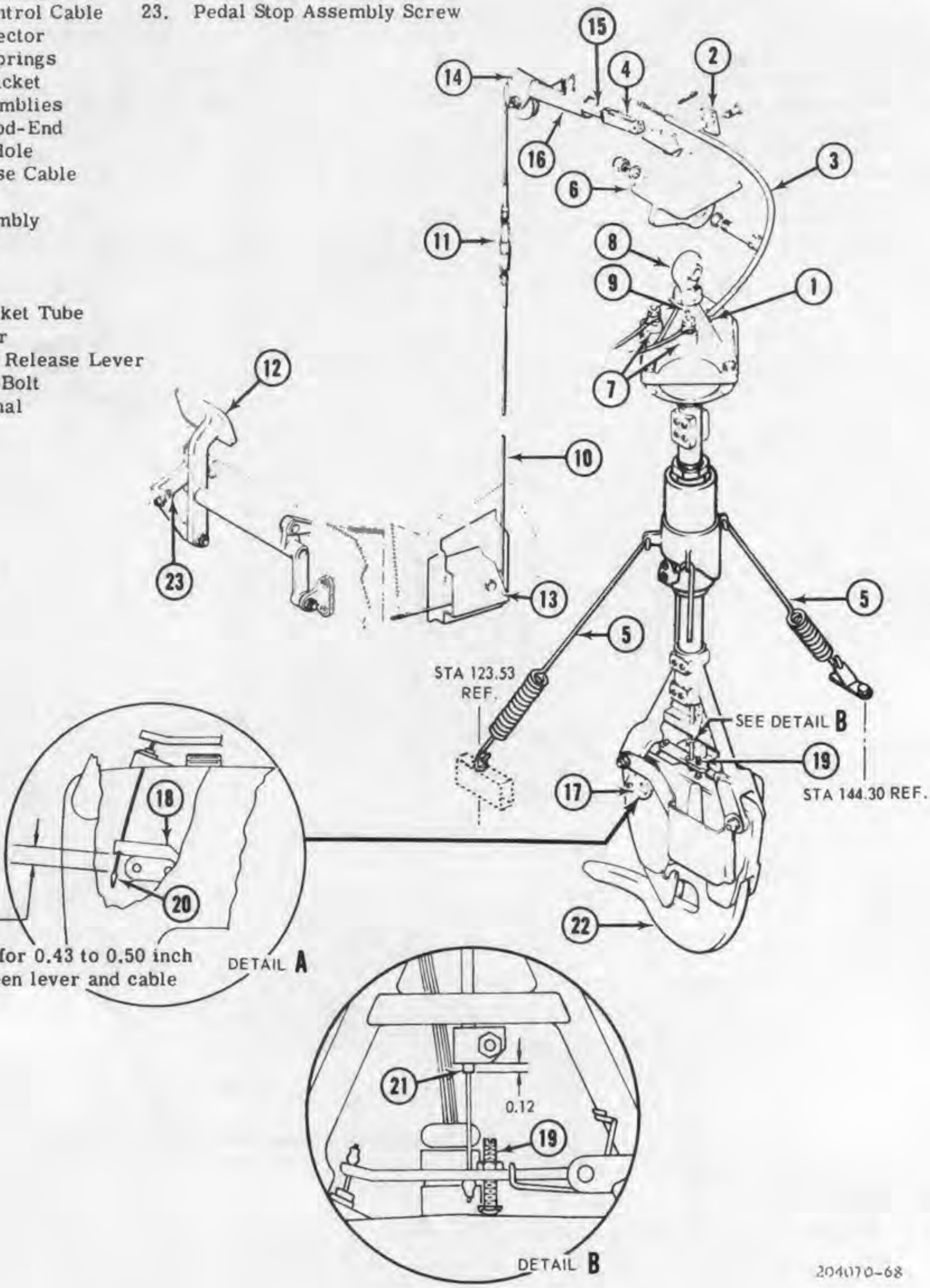
1. Cable Clamps
2. Clamp Assembly
3. Release Control Cable
4. Cable Connector
5. Support Bracket
6. Brush Assemblies
7. Mounting Rod-Ends
8. Inspection Hole
9. Main Release Cable
10. Turnbuckle
11. Pedal Assembly
12. Guard Pins
13. Guard Pin
14. Spacer
15. Pulley Bracket Tube
16. Access Door
17. Cargo Hook Release Lever
18. Adjustment Bolt
19. Ball Terminal
20. Control Cable Shield
21. Cargo Hook
22. Pedal Stop Assembly Screw



Note : Check for 0.43 to 0.50 inch clearance between lever and cable terminal.

Figure 4-6. UH-1B Helicopter cargo suspension (Serial No. 60-3546 thru 60-3619)

1. Cable Clamps
2. Clamp Assembly
3. Release Control Cable
4. Cable Connector
5. Restraint Springs
6. Support Bracket
7. Brush Assemblies
8. Mounting Rod-End
9. Inspection Hole
10. Main Release Cable
11. Turnbuckle
12. Pedal Assembly
13. Guard Pins
14. Guard Pin
15. Spacer
16. Pulley Bracket Tube
17. Access Door
18. Cargo Hook Release Lever
19. Adjustment Bolt
20. Ball Terminal
21. Control Cable Shield
22. Cargo Hook
23. Pedal Stop Assembly Screw



Note: Check for 0.43 to 0.50 inch clearance between lever and cable terminal.

Figure 4–7. UH-1B Helicopter cargo suspension (Serial No. 61-686 thru 61-803)

1. Cable Clamps
2. Clamp Assembly
3. Release Control Cable
4. Cable Connector
5. Restraint Springs
6. Support Bracket
7. Main Release Cable
8. Turnbuckle
9. Pedal Assembly
10. Guard Pins
11. Guard Pin
12. Spacer
13. Pulley Bracket Tube
14. Access Door
15. Cargo Hook Release Lever
16. Adjustment Bolt
17. Ball Terminal
18. Control Cable Shield
19. Cargo Hook
20. Pedal Stop Assembly Screw

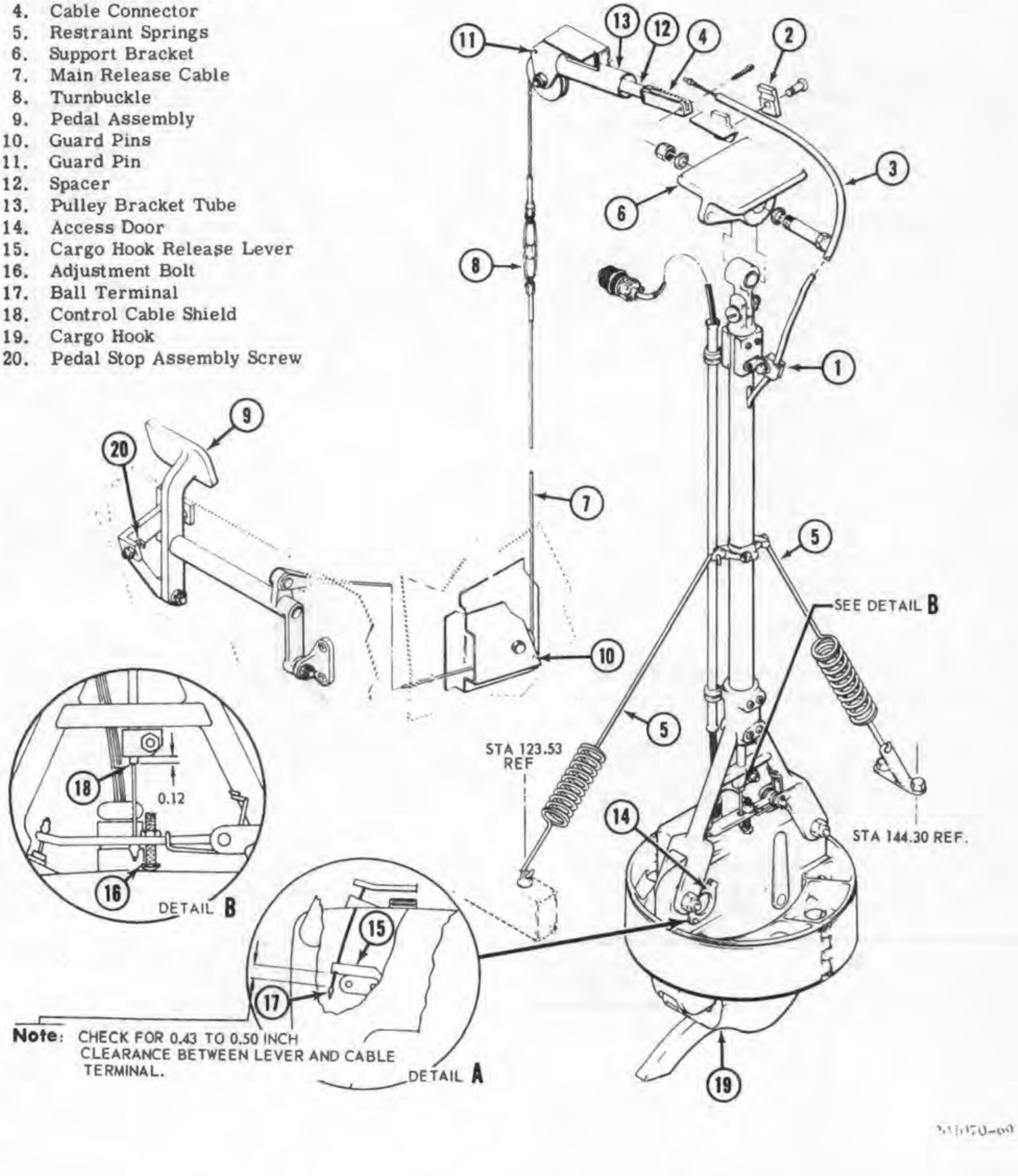


Figure 4-8. UH-1B Helicopter cargo suspension (Serial No. 62-1872 and subsequent)

4-134. ***Installation — Cargo Tiedown.*** Position unit in floor location and attach with six screws.

4-135. Cargo Suspension. The external cargo suspension assembly is attached to the lateral beam of the transmission mount at the helicopter center of gravity. The cargo suspension assembly used on UH-1A helicopters and UH-1B helicopters Serial No. 60-3546 through 61-803 is suspended on a self-aligning bearing, with the cargo hook extending through a padded opening in the outer bottom skin. The assembly used on UH-1B helicopters Serial No. 62-1872 and subsequent is a non-rotating unit. All UH-1A helicopters (see figure 4-5) and UH-1B helicopters Serial No. 3546 through 60-3619 (see figure 4-6) are equipped with a free swinging suspension assembly. UH-1B helicopters Serial No. 61-686 through 61-803, (see figure 4-7). are equipped with a suspension hook assembly which incorporates a self-centering cam assembly. The cam assembly positions the cargo hook so that the load beam always opens facing forward, thus facilitating utilization of the self-loading feature. The non-rotating unit used on UH-1B helicopters Serial No. 62-1872 and subsequent (see figure 4-8) is maintained in a fixed position with the hook assembly always facing forward.

Caution

> On the above serial numbered UH-1B helicopters equipped with a non-rotating cargo hook assembly a flexible loop or swivel device should be installed between the cargo hook and the cargo load to prevent transfer of excessive torque loads to the hook by a rotating cargo load. A recommended device for this application is: Sling, Endless, Nylon webbing, Type I, 10 inch, Part No. PD101-10.

4-136. Cargo quick release can be actuated manually from a switch located on the pilot's cyclic control stick, or through cables by depressing a foot release pedal. UH-1A helicopters also incorporate an electrically operated automatic touchdown release feature, by means of which a minimum cargo of 125 pounds is automatically released upon contact with the ground. On UH-1A helicopters the manual and automatic release circuit is activated by means of a three-position toggle switch located on the miscellaneous panel of the overhead console. This switch is labeled CARGO RELEASE, and shows the three positions as AUTO, SAFE and MANUAL. UH-1B helicopters do not incorporate the automatic release feature. A two-position toggle switch, in the same location on the overhead console, is labeled CARGO RELEASE, and shows the two-positions as OFF and ARM. Electrical power to the cargo hook release relay is furnished from the 28 volt DC essential bus. Circuit protection is provided by a circuit breaker panel.

4-137. The cargo suspension unit is attached to the main rotor system supporting structure at station 132.138 on helicopter center of gravity. It is suspended vertically through a well in the lower fuselage structure.

4-138. The emergency release control mechanism consists of a foot pedal located at the pilot's station, two steel cables connected by a turnbuckle, which is located at the right-hand side of the cargo suspension compartment, and a spring loaded cable connector. (See figure 4-5 through 4-8.)

4-139. ***Troubleshooting—Cargo Suspension.*** Trouble shoot in accordance with the following chart:

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Emergency release inoperative	Improper rigging	Check rigging. (Refer to paragraph 4-143)
	Circuit breaker	Replace circuit breaker
	Broken electrical wire or loose connections	Inspect and replace wire if necessary. Tighten connections.
Electrical release inoperative	Damaged switch	Replace switch
	Brush assemblies	Replace brush assemblies

4-140. *Operational Check — Cargo Suspension.* The mechanical cargo release on UH-1A helicopters and UH-1B helicopters Serial No. 60-3546 through 60-3619 shall be functionally checked with no less than a 20 pound weight suspended from the cargo hook (22, figure 4-5; 21, figure 4-6; 22, figure 4-7 and 19, figure 4-8). The suspended weight for checking UH-1B helicopters Serial No. 61-686 and subsequent shall be no less than ten pounds.

4-141. *Removal — Cargo Suspension Unit.* The following procedural steps are applicable to all cargo suspension units unless otherwise noted.

a. Make sure battery switch is in "OFF" position.

b. Remove center panel from aft cabin bulkhead.

c. Disconnect electrical wiring at connector at left side of cargo suspension attachment bracket and cover wire end with insulating tape.

d. Remove screw, bolt, washers and nut attaching cable clamps (1, figure 4-5 through 4-8) and clamp assembly (2) to mounting brackets. Remove cotter pin from upper end of emergency release control cable (3) and remove control cable ball end from cable connector (4).

e. On UH-1B helicopters Serial No. 61-686 and subsequent unhook three restraint springs (5, figures 4-7 and 4-8) from the cargo suspension unit, eye bolts and fitting. Remove restraint springs.

f. Remove cotter pin, bolt, washer and nut attaching cargo suspension unit to support bracket (5, figure 4-5 and 4-6; 6, figure 4-7 and 4-8) on structure, and remove suspension unit from helicopter.

4-142. *Inspection — Cargo Suspension Unit.* a. Inspect all components for damage, corrosion and general condition.

b. Inspect restraint springs for serviceability.

c. Inspect brushes for wear.

4-143. *Repair or Replacement — Cargo Suspension Unit.* a. Replace suspension unit if unserviceable.

b. Replace restraint springs if unserviceable.

c. Replace brushes if worn. (Refer to paragraph 4-145.)

4-144. *Installation — Cargo Suspension Unit.* The following procedural steps are applicable to all cargo suspension units unless otherwise noted.

Note

> On all UH-1A helicopters and UH-1B helicopters, Serial No. 60-3546 through 61-803, be sure the mounting rodend (7, figure 4-5 and 4-6; 8, figure 4-7) is aligned with web of upper housing between electrical brushes, and is screwed into the housing past the thread engagement inspection hole (8, figure 4-5 and 4-6; 9, figure 4-7). Tighten lock-nut securely.

a. Position cargo suspension unit in support bracket (5, figure 4-5 and 4-6; 6, figure 4-7 and 4-8) with electrical brushes (6, figure 4-5 and 4-6; 7, figure 4-7) and the cargo hook facing forward, and install attaching nut, washer, bolt and cotter pin.

b. On UH-1B helicopters, Serial No. 61-686 and subsequent, install restraint springs (5, figure 4-7 and 4-8) by hooking ends to fitting, eye bolts and cargo suspension unit.

c. Insert upper ball end of emergency release control cable (3, figure 4-5 through 4-8) into cable connector (4) and install cotter pin. Loosely install clamp assembly (2) and cable clamps (1) with nut, washers, bolt and screw.

d. Rig and check operation of emergency release. (Refer to paragraph 4-154.)

e. Remove insulating tape from wire ends and connect electrical wiring to connector at left side of cargo suspension attachment bracket.

f. Make certain that the emergency release control cable (3, figure 4-5 through 4-8) and the electrical wires have sufficient slack for proper operation of the cargo suspension unit, and tighten hardware attaching cable clamps (1) and clamp assembly (2).

g. Install center panel in aft cabin bulkhead.

4-145. *Removal — Cargo Suspension Unit Brush Assemblies.* a. Disconnect electrical wiring from top of brush assemblies, and cover wire ends with insulating tape.

b. Cut and remove safety wire, and unscrew brush assemblies (6, figure 4-5 and 4-6; 7, figure 4-7) from upper housing.

4-146. *Inspection — Cargo Suspension Unit Brush Assemblies.* Inspect brushes for wear or damage.

4-147. *Repair and Replacement — Cargo Suspension Unit Brush Assemblies.* Replace unserviceable or worn brush assemblies.

4-148. *Installation — Cargo Suspension Unit Brush Assemblies.* a. Screw brush assemblies into upper housing of cargo suspension unit.

b. Secure brush assemblies in place with safety wire twisted from one brush across web of the upper housing to the other brush.

c. Remove insulating tape from wire ends and connect wiring to brush assembly terminals.

Note

> Make sure that the black wire is attached to the right-hand brush assembly, and the red wire is attached to the left-hand brush assembly, as the suspension unit is installed in the helicopter.

4-149. Mechanical Cargo Release and Pedal. This feature enables pilot to release cargo by depressing a pedal in pilot's compartment. A series of cables and pulleys transmit the action to the cargo suspension unit (see figure 4-5, 4-6, 4-7, 4-8.)

4-150. *Removal — Release Cable and Pedal Assembly.* a. Remove access plates from cabin deck and lower skin to the right of center of helicopter. Remove center panel in aft cabin bulkhead.

b. Cut safety wire and disconnect aft end of main release cable (9, figure 4-5 and 4-6; 10, figure 4-7; and 7, figure 4-8) from cable adjustment turnbuckle (10, figure 4-5 and 4-6); 11, figure 4-7 and 8, figure 4-8) located in the cargo suspension unit compartment.

c. Remove cotter pin, washer and pin attaching forward end of main release cable to pedal assembly (11, figure 4-5 and 4-6; 12, figure 4-7 and 9, figure 4-8).

d. Remove guard pins (12, figure 4-5 and 4-6; 13, figure 4-7 and 10, figure 4-8) and pulleys, if necessary, from pulley brackets located under the cabin deck just aft of the release pedal assembly, just forward of the aft cabin bulkhead and at the lower forward right-hand side of the cargo suspension unit compartment.

e. Carefully pull main release cable through bulkhead grommets, and remove cable from the helicopter.

f. Remove nuts, washers, bolts, and screws attaching pedal assembly (11, figure 4-5 and 4-6; 12, figure 4-7 and 9, figure 4-8) to bulkhead, and remove pedal assembly from the helicopter.

g. Remove guard pin (13, figure 4-5 and 4-6; 14, figure 4-7 and 11, figure 4-8) and pulley, if necessary, from pulley bracket located in the upper right-hand side of the cargo suspension unit compartment.

h. Remove cotter pin from cable connector (4, figure 4-5 through 4-8) and remove aft release cable ball end from connector.

i. Remove spacer (10, figure 4-5 and 4-6; 15, figure 4-7 and 12, figure 4-8), split guide and cable tension spring from tube (15, figure 4-5 and 4-6; 16, figure 4-7 and 13, figure 4-8) of pulley bracket assembly.

j. Remove aft release cable from helicopter.

4-151. *Inspection — Release Cable and Pedal Assembly.* a. Inspect pulleys and grommets for damage and wear.

b. Pedal and supports for wear and damage.

c. Cables for fraying, broken wires and wear.

4-152. *Repair or Replacement — Release Cable and Pedal Assembly.* a. Replace worn, damaged or unserviceable pulleys, grommets, pedal and support.

b. Replace frayed, worn, and unserviceable cables.

4-153. *Installation — Release Cable and Pedal Assembly.* a. If previously removed, install pulley in pulley bracket located in the upper right-hand side of the cargo suspension unit compartment. Thread ball end of aft release cable through pulley and pulley bracket tube and install guard pin (13, figure 4-5 and 4-6; 14, figure 4-7 and 11, figure 4-8.)

b. Place cable tension spring, split guide and spacer (14, figure 4-5 and 4-6; 15, figure 4-7 and 12, figure 4-8) over cable ball end and slide into pulley bracket tube. (15, figure 4-5 and 4-6; figure 4-7 and 13, figure 4-8).

c. Position aft release cable ball end in cable connector (4, figure 4-5 through 4-8) and install cotter pin.

d. Position pedal assembly (11, figure 4-5 and 4-6; 12, figure 4-7 and 9, figure 4-8) against bulkhead and install attaching screws, bolts, washers and nuts.

e. Position clevis of main release cable (9, figure 4-5 and 4-6; 10, figure 4-7 and 7, figure 4-8) on pedal assembly and install attaching pin, washer and cotter pin.

f. Thread terminal end of main release cable through bulkhead grommets and pulley brackets to cargo suspension unit compartment.

g. If previously removed, install pulleys in pulley brackets located under the cabin deck just aft of the release pedal assembly, just forward of the aft cabin bulkhead and at the lower forward right-hand side of cargo suspension unit compartment. Install guard pins (12, figure 4-5 and 4-6; 13, figure 4-7 and 10, figure 4-8).

h. Connect aft end of main release cable to forward end of aft release cable with turnbuckle (10, figure 4-5 and 4-6; figure 4-7 and 8, figure 4-8) located in the cargo suspension unit compartment. Secure turnbuckle with safety wire.

i. Rig and check operation of emergency release. (Refer to paragraph 4-154.)

j. Install center panel in aft cabin bulkhead and access plates in cabin deck and lower skin to the right and center of helicopter.

4-154. *Adjustment — Cargo Suspension.* The following procedural steps are applicable to all cargo suspension units unless otherwise noted.

a. Check emergency release pedal assembly mounting shims for snug fit. (See figures 4-5 through 4-8.)

b. On UH-1A helicopters, only, a dimension of 0.12 to 0.25 inch must be maintained between the cargo hook release lever (16, figure 4-5) and the ball terminal (17) on the lower end of the hook release cable. The following steps are required for determination or procurement of this dimension:

(1) Open access door (18, figure 4-5) in release hook mechanism after determining that lever (19) has bottomed on slot in shaft, and apply slight downward pressure on ball terminal (17) to remove any slack in the cable. Check for 0.12 to 0.25 inch clearance between cargo hook release lever (16) and ball terminal (17).

(2) If clearance is below 0.12 inch minimum, remove nut, washers, screw and clamps (20, figure 4-5) attaching tube to yoke and turn adapter (21) clockwise to move tube out from shaft assembly. This action will obtain better alignment and will increase cable length at the measuring point.

(3) Install clamps, screw, washers and nut (20, figure 4-5) attaching tube to yoke, and close access door (18).

Note

Washers to be used as spacers between clamps (20) as required.

c. On UH-1B helicopter open access door (16, figure 4-6; 17, figure 4-7 and 14, figure 4-8) and make certain that the cargo hook release lever (17, figure 4-6; 18, figure 4-7 and 15, figure 4-8) is parallel to the plane of the yoke bolts and that the adjustment bolt (18, figure 4-6; 19, figure 4-7 and 16, figure 4-8) in contact with top of hook assembly below the bolt. Check for 0.43 to 0.50 inch clearance between cargo hook release lever and ball terminal (19, figure 4-6; 20, figure 4-7 and 17, figure 4-8). Adjust bolt and nut to obtain required clearance. (Refer to Detail A, figure 4-6 through 4-8.)

d. On UH-1B helicopters make certain that the cargo hook release lever (17, figure 4-6; 18, figure 4-7 and 15, figure 4-8) does not bottom out against the emergency release control cable shield (20, figure 4-6; 21, figure 4-7 and 18, figure 4-8). The control cable shield should extend 0.12 inch below the attaching clamps. (Refer to Detail B, figure 4-6 through 4-8.)

e. Loosen emergency release control cable (3, figure 4-5 through 4-8) in cable connector (4) by loosening cable clamps (1) and clamp assembly (2).

f. Adjust turnbuckle (10, figure 4-5 and 4-6; 11, figure 4-7 and 8, figure 4-8) to obtain 20 to 24 pounds tension on the forward and aft release cable assemblies. Safety wire turnbuckle.

g. Pull slack of emergency release control cable (3, figure 4-5 through 4-8) inboard (towards top of cargo suspension unit) until cable terminal is snug in connector (4).

h. Check emergency release control cable (3, figure 4-5 through 4-8) and electrical wiring assembly for sufficient slack to permit proper operation of the cargo suspension unit and tighten clamp assembly (2) and cable clamps (1).

i. Close cargo hook (22, figure 4-5; 21, figure 4-6; 22, figure 4-7 and 19, figure 4-8) to latched position.

j. Turn pedal stop assembly screw (23, figure 4-5; 22, figure 4-6; 23, figure 4-7 and 20, figure 4-8) full in (away) from the emergency release pedal assembly. Push the pedal forward, observing for proper action of the linkage and for unlatching of the cargo hook. Adjust the pedal stop assembly screw so the actuator arm of the pedal just fails to touch end of shaft slot when the pedal is full forward.

k. Check the following in final adjustment:

(1) That the cable spring in the pulley bracket tube (15, figure 4-5 and 4-6; 16, figure 4-7 and 13, figure 4-8) does not bottom out when the emergency release pedal is full forward against the pedal stop screw (23, figure 4-5; 22, figure 4-6; 23, figure 4-7 and 20, figure 4-8).

(2) That when the emergency release pedal (11, figure 4-5 and 4-6; 12, figure 4-7 and 9, figure 4-8) is full forward the cargo hook release lever (16, figure 4-5; 17, figure 4-6; 18, figure 4-7 and 15, figure 4-8) is full up, and not bottomed out, and that the cargo hook (22, figure 4-5; 21, figure 4-6; 22, figure 4-7 and 19, figure 4-8) is unlatched.

(3) On UH-1B helicopters that the cargo hook release lever does not bottom out against the emergency release control cable shield (20, figure 4-6; 21, figure 4-7 and 18, figure 4-8).

(4) That the emergency release cable and lever return to locking position. Observe through access door (18, figure 4-5; 16, figure 4-6; 17, figure 4-7 and 14, figure 4-8).

l. Safety wire cable turnbuckle (10, figure 4-5 and 4-6; 11, figure 4-7 and 8, figure 4-8), and check security of cable connector (4, figure 4-5 through 4-8), guard pins (12 and 13, figure 4-5 and 4-6; 13, and 14, figure 4-7 and 10 and 11, figure 4-8) and pulley brackets.

4-154A. Rescue Hoist Provisions (UH-1B Serial No. 64-13902 and subsequent). UH-1B helicopters Serial No. 64-13902 and subsequent may be equipped with permanently installed provisions to accommodate an internal rescue hoist. An overload sensing control and a relay are located on a shelf on the right-hand side of the aft electrical compartment. Three circuit breakers for rescue hoist "PWR", "CONT" and "CABLE CUT" are located on the left-hand side of the overhead console. A control panel, located on the instrument pedestal, necessary electrical wiring and floor and roof support plates are also included in these provisions.

4-155. Rear View Mirror. Model UH-1B helicopters are equipped with an adjustable rear view mirror (16, figure 4-1) located outside the forward cabin under the nose door. This mirror, when properly adjusted, enables the pilot to visually check the operation of the external cargo suspension hook. When the helicopter is employed on missions which do not require use of the external cargo suspension, the rear view mirror may be removed to present a clean configuration.

4-156. Removal — Rear View Mirror. a. Remove cover from mirror.

b. Remove spring pins from adjustment handles and remove both handles. Remove mirror.

c. Remove bolts, washer and nuts, which attach braces and support to the structure, and remove braces and support as a unit.

d. Store rear view mirror, braces and support in upper baggage compartment area, using strap, bracket and hardware provided for this purpose.

4-157. *Installation — Rear View Mirror.* a. Install braces and support to the structure, using previously removed bolts, washers and nuts.

b. Position rear view mirror and align mounting holes.

c. Screw adjustment handles through mounting holes. Adjust mirror to desired angle, tighten adjustment handles, and insert spring pin in threaded ends of handles.

d. Slide protective cover over mirror.

4-158. *Adjustment — Rear View Mirror.* a. Remove spring pins and loosen adjustment handles.

b. Manually adjust mirror to desired angle.

c. Tighten adjustment handles and insert spring pins.

4-159. Chart and Map Case. This aluminum case has a hinged cover on top and is located on the end of the lower pedestal between the pilot's and copilot's seats.

4-160. *Removal — Chart and Map Case.* Remove four screws attaching case to mounting brackets and install four attaching screws.

4-161. *Installation — Chart and Map Case.* Position case on mounting brackets and install four attaching screws.

4-162. Litters — UH-1A. Two litters, with support legs on the forward side, are available for use in UH-1A helicopters. They may be installed in the aft portion of the cabin passenger-cargo compartment parallel to, and partially attached to, the aft cabin bulkhead. These litters are arranged one above the other, with the lower litter approximately two feet above the cabin floor.

4-163. *Removal — UH-1A Litters.* a. Release catch at bottom of litter rack legs.

b. Pull pip pins from forward leg braces and fold legs inboard.

c. Pull pip pins attaching litter rack to aft cabin bulkhead fittings and remove litter rack from helicopter.

4-164. *Inspection — UH-1A Litters.* Inspect all components for obvious damage and distortion. Check fittings at bottom of leg assemblies for proper operation.

4-165. *Repair or Replacement — UH-1A Litters.* Replace litters if damaged or unserviceable.

4-166. *Installation — UH-1A Litters.* a. Position litter rack on aft cabin bulkhead fittings and install pip pins.

b. Pull legs down and secure leg braces with pip pins.

c. Position legs on floor fittings and push down to engage.

4-167. *Stowage — UH-1A Litters.* a. Release catch at bottom of litter rack legs.

b. Pull pip pins from leg braces and fold leg braces and legs inboard.

c. Pull pip pins from both link assemblies and fold the link assemblies outboard, bringing the litter channels together.

d. Secure channels with straps and the litter will rest against the aft cabin bulkhead.

4-168. Curved Stanchion Supported Litters. UH-1B helicopters Serial No. 60-3591 through 60-3619 and 61-686 through 61-803 may be equipped with three standard litters, (figure 4-9) arranged one above the other. The bottom litter rests on the cabin floor, while the other two, placed directly above it, are supported on channel rails extending between, and attached to, curved stanchions.

4-169. *Removal — Curved Stanchion Supported Litters.* a. Release litter straps (1, figure 4-9) and hook (2) securing lower litter.

b. Pull pip pins (3) securing litters to litter rails (4) and remove litters from helicopter.

c. Pull pip pins (5) which attach litter rails to adjustable rail supports (6) and remove supports from stanchion. Remove litter rails.

d. Release and disconnect forward stanchion floor fitting (7) from the floor hold-down stud (8).

e. Pull upward on each stanchion (9), releasing stanchion attachment fittings (10) from bulkhead fittings (11) and remove stanchion from helicopter.

f. Remove the strap, buckle and hook assembly (2) from the cargo hold down rings just forward of lower litter position at helicopter center line. Also remove the litter straps (1) from bulkhead brackets (12) at each lower, outboard end of aft cabin bulkhead.

g. Stow litters, and litter rack components, in loose equipment.

4-170. *Inspection — Curved Stanchion Supported Litters.* Inspect litter rails, fittings, stanchion and channels for damage and general condition. Check tie-down bolts and brackets for usability for continued service.

4-171. *Repair or Replacement — Curved Stanchion Supported Litters.* Replace litter rails fittings, brackets, stanchions or channels if damaged or unserviceable.

4-172. *Installation — Curved Stanchion Supported Litters.* a. Position stanchions (9, figure 4-9) parallel to helicopter center line with forward stanchion floor fittings (7) over floor hold-down studs (8) and aft attachment fittings (10) aligned with bulkhead fittings (11).

b. Press down on stanchions (9) to secure stanchion floor fittings (7) in floor hold-down studs (8) and lock attachment fittings (10), into bulkhead fittings (11).

c. Position adjustable litter rail supports on each stanchion at the same relative heights so that litters will ride level.

d. Align hole in each rail support (6) with relative hole through stanchion (9) and attach rail support to stanchion by inserting pip pin (5) through rail support and stanchion.

e. Place each rail (4) in position between stanchion (9), resting on top of rail supports

1. Litter Straps
2. Strap, Buckle and Hook Assembly
3. Pip Pins
4. Litter Rails
5. Pip Pins
6. Adjustable Rail Supports
7. Floor Fitting
8. Floor Hold Down Stud
9. Stanchion
10. Stanchion Attachment Fitting
11. Bulkhead Fittings
12. Bulkhead Brackets

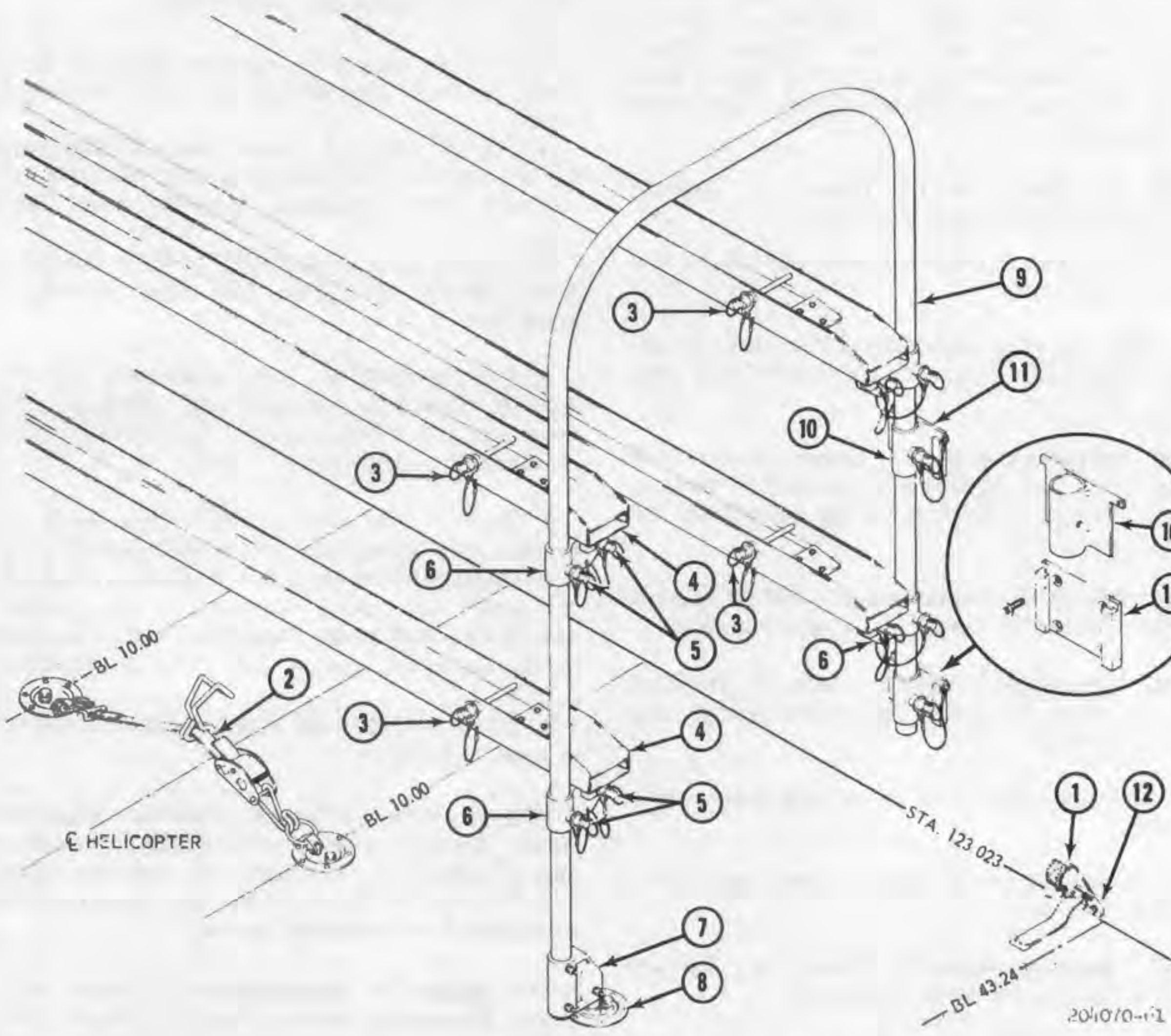


Figure 4–9. Curved stanchion supported litters

(6). Align holes in ends of rail supports with holes in angles on bottom ends of litter rail and attach by installing pip pins (5).

f. Install litter straps (1) in bulkhead brackets (12) at each lower, outboard end of aft cabin bulkhead. Attach strap, buckle and hook assembly (2) to cargo hold-down rings just forward of lower litter position on each side of helicopter center line.

g. Position litters on litter rails and secure with pip pins (3). Secure lower litter at ends with litter straps (1), and at forward center with strap, buckle, and hook assembly (2).

4-173. Vertical Stanchion Supported Litters. UH-1B helicopters Serial No. 62-1872 and subsequent may be equipped with three litters. The bottom litter in this arrangement rests on the cabin floor with the other two above it. These litters are held in adjustable brackets attached to tracks on the aft cabin bulkhead and to two vertical stanchions on the forward side.

4-174. Removal — Vertical Stanchion Supported Litters. a. Release litters from adjustable brackets (1, figure 4-10) and remove from helicopter.

b. Release and disconnect stanchion floor fitting (2) from floor hold-down studs (3). Remove stanchions (4) from receptacles (5) in cabin roof.

d. Pull pip pins (6) attaching adjustable brackets and collars (1) to stanchions (4) and slide brackets and collars off stanchions.

d. Pull pip pins (6) attaching adjustable brackets and litter tracks to brackets (7) at each lower, outboard end of aft cabin bulkhead, and remove brackets and tracks.

e. Pull four spring loaded pins (8) on each upper track assembly (9) to release track and adjustable brackets from aft cabin bulkhead brackets (10). Remove track and adjustable brackets as a unit.

f. Stow litters, and all removed items, in loose equipment.

4-175. Inspection — Vertical Stanchion Supported Litters. Visually check all components for general condition and suitability for continued service. Check litter track pin spring for a maximum load of 6.1 pounds at a compressed length of 0.41 inch.

4-176. Repair or Replacement — Vertical Stanchion Supported Litters. Replace litters, brackets, tracks or stanchion if damaged or unserviceable. Replace spring failing inspection requirement above.

4-177. Installation — Vertical Stanchion Supported Litters. a. Position upper litter track (9, figure 4-10) and adjustable bracket combination on upper aft cabin bulkhead fittings (10), and attach by inserting spring loaded pins (8) on track into receptacles in bulkhead fittings.

Note

Each track has four spring loaded pins. Be sure that all four pins, on each track, are properly seated in bulkhead fitting receptacle.

b. Position lower litter track and adjustable bracket combinations on brackets (7) at each lower, outboard end of aft cabin bulkhead, and attach by inserting pip pins (6).

c. Slide three adjustable bracket and collar combinations (1) on each stanchion (4).

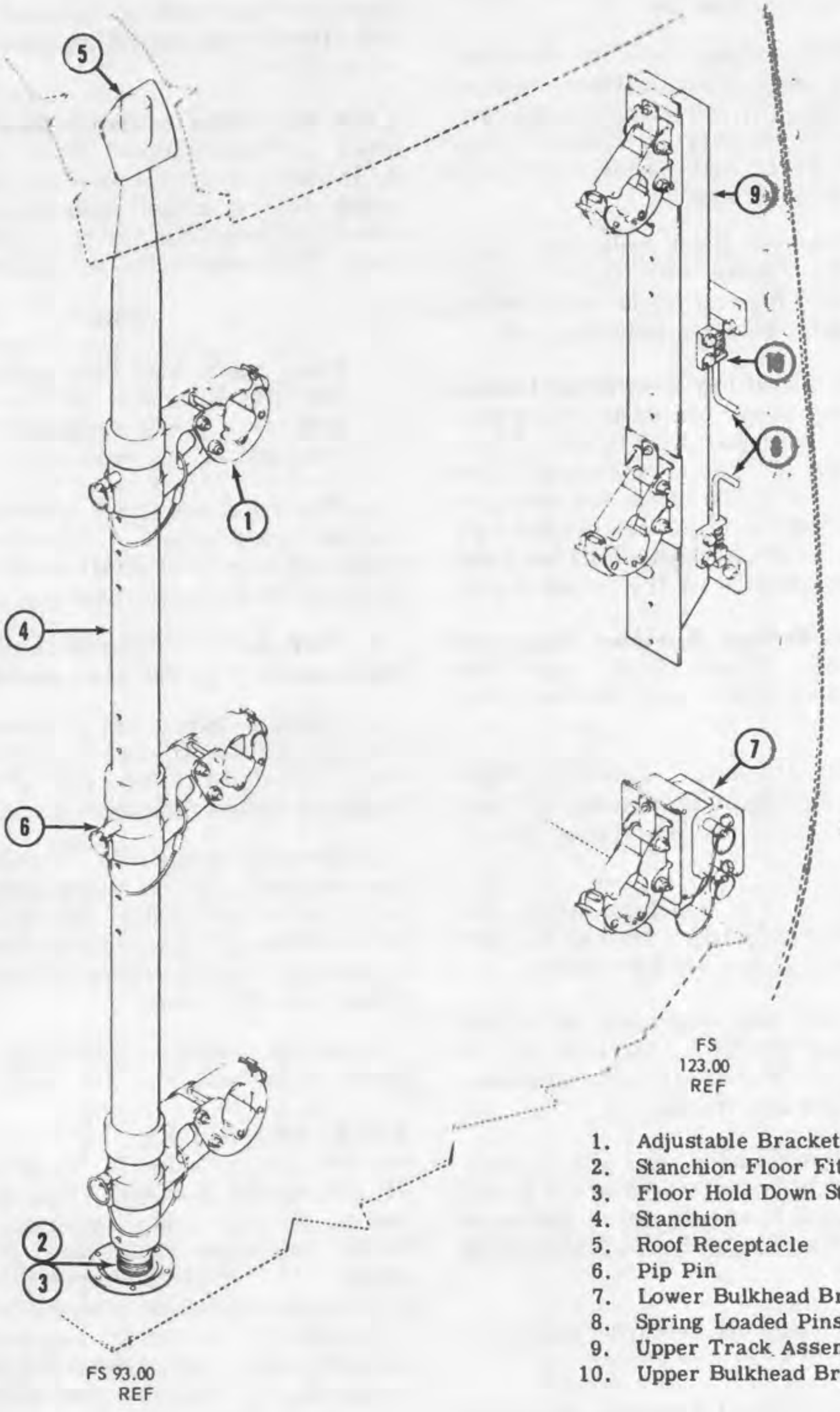
d. Position upper end of stanchions (4) in roof receptacles (5) and floor fittings (2) over floor hold-down studs (3). Press down on stanchion to lock fittings in studs.

e. Position adjustable bracket and collar combinations (1) on stanchions (4) in line with bracket and collar combinations previously installed on aft cabin bulkhead, and attach to stanchions by inserting pip pins (6) through collars and stanchions.

f. Secure litters in adjustable brackets between stanchions and aft cabin bulkhead.

4-178. First Aid Kit. Aeronautical type first aid kits are installed in the UH-1A and UH-1B helicopters. A single kit is installed at the top of the aft cabin bulkhead, at approximately helicopter center line, in UH-1A helicopters. In UH-1B helicopters three first aid kits are available for emergency use. One kit is located on the center door post. The other two are located, one each, on the left- and right-hand sides of the cabin roof above the center door posts. These kits are attached by snap type fasteners and are easily removed by pulling them from the fasteners.

4-179. Removal — First Aid Kit. Pull outward on kit to release from snap fasteners.



1. Adjustable Bracket and Collar
2. Stanchion Floor Fitting
3. Floor Hold Down Stud
4. Stanchion
5. Roof Receptacle
6. Pip Pin
7. Lower Bulkhead Bracket
8. Spring Loaded Pins
9. Upper Track Assembly
10. Upper Bulkhead Bracket

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Figure 4–10. Vertical stanchion supported litters

4-180. ***Installation — First Aid Kit.*** Position kit on snap fasteners and push to engage fasteners.

4-181. Fire Extinguisher. All helicopters are equipped with a monobromotrifluoromethane fire extinguisher pressurized with either nitrogen or air. This fire extinguisher is located in a hanger bracket which is attached to the left-hand side of the instrument pedestal.

Warning

Monobromotrifluoromethane is a solid agent, but smoke fumes are toxic. Avoid breathing fumes at all times.

4-182. ***Removal — Fire Extinguisher.*** a. Loosen retaining clamp from around upper section of the extinguisher by pulling the hinged lever aft. Tension on the extinguisher will be released so that the catch on the hinged lever will be disengaged from the attaching ring.

b. Grasp the fire extinguisher by the handle and remove from the hanger bracket.

c. Remove screws, washers and nuts attaching hanger bracket to left-hand side of instrument pedestal and remove hanger bracket.

4-183. ***Inspection — Fire Extinguisher.*** a. Pressure gage reading should be 380 psig at 86°F.

b. All fire extinguishers should be weighed every six months to determine that they are fully charged. The fully charged weight of fire extinguisher should not be less than four ounces below the gross weight stamped on the nameplate. If this weight is not met the extinguisher should be recharged.

4-184. ***Installation — Fire Extinguisher.*** a. Position hanger bracket on left-hand side of instrument pedestal, or left-hand pillar post, and install attaching nuts, washer and screws.

b. Position fire extinguisher in hanger bracket with extinguisher handle opposite bracket.

c. Hook the latch of the retaining clamp handle through ring on inboard section of the retaining clamp. Force free end of clamp handle to the left and forward. This will close the clamp and secure the fire extinguisher in the hanger bracket.

4-185. Paratroop Static Line Cable. A paratroop static line cable may be installed on the center of the aft cabin bulkhead. This installation consists of a cable (1, figure 4-11) a compression tube (2), attach plates (3), fitting (4) and attaching hardware.

4-186. ***Removal — Paratroop Static Line Cable.*** a. Remove cotter pins and washer attaching cable (1) to fitting (4) and remove cable.

b. Remove nuts, washers and bolts securing attach plates (3) to fittings (4) and remove attach plates.

c. Remove bolts and washers securing fittings (4) to aft cabin bulkhead and remove fittings and compression tube (2) from bulkhead.

d. Remove nuts (5) and washers on end of compression tube (2). Remove pins (6) from compression tube and separate tube from fittings (4).

4-187. ***Inspection — Paratroop Static Line Cable.*** Visually inspect all components for damage and general condition.

4-188. ***Repair or Replacement — Paratroop Static Line Cable.*** Replace damaged or unserviceable components.

4-189. ***Installation — Paratroop Static Line Cable.*** a. Install nut (5, figure 4-11) lock-washer and flat washer on compression tube, (2). Position fittings (4) on compression tube. Align holes in tube and fittings and insert pins (6).

b. Position static line cable (1) on pins (6) and install washers and cotter pins.

c. Install flat washer, lock-washer and nut (5) on end of compression tube.

Note

Passenger seat back tube must be removed or folded up against aft cabin bulkhead before installing paratroop static line cable.

d. Position compression tube (2) and fittings (4) to aft cabin bulkhead and install attaching washers and bolts. Tighten both nuts (5) on compression tube against fitting.

e. Position attach plates (3) to fittings (4) and install bolts, washers and nuts.

4-190. Manual Emergency Jettison Controls. A series of cables, actuated by a manually

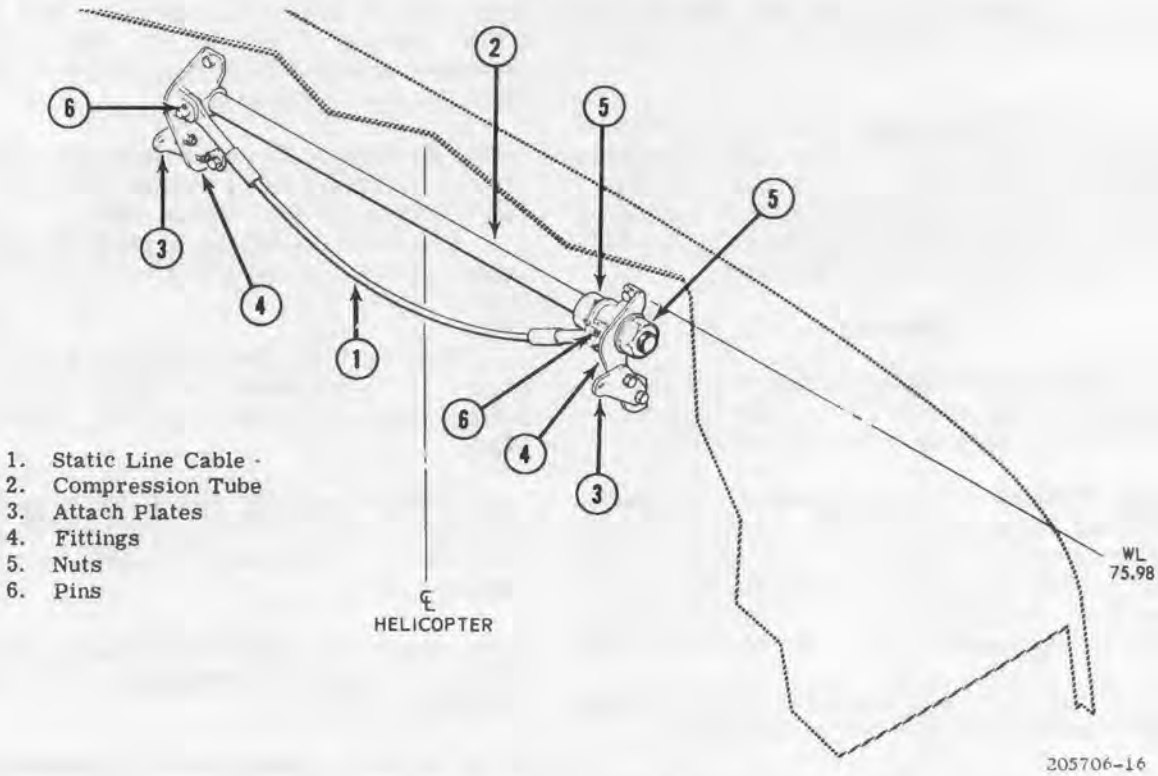


Figure 4–11. Paratroop static line cable

operated jettison lever located beside the pilot's seat, enables the pilot to mechanically jettison externally carried kits and equipment. Both left-hand and right-hand equipments are jettisoned simultaneously. These cables are equipped with adjustable fittings which facilitate final rigging and adjustment.

4-191. ***Operational Check — Manual Emergency Jettison Controls.*** a. Place emergency release lever assembly (13, figure 4-12) in full forward position.

b. Make certain that the mechanical release actuating lever is in the full down (locked) position.

c. Loosen attaching parts of upper guard tube (5) and slide guard tube down over lower guard tube (6) to expose barrel (7).

d. Adjust cable barrels to obtain a 1.30 inches dimension between the inside edge of lower helicopter skin and center of the terminal on the inboard end of the lower cable assembly (1). (See View A.)

Note

The 1.30 inches dimension is to be held when the system is in full locked (armed) position.

e. Safety wire all cable barrels.

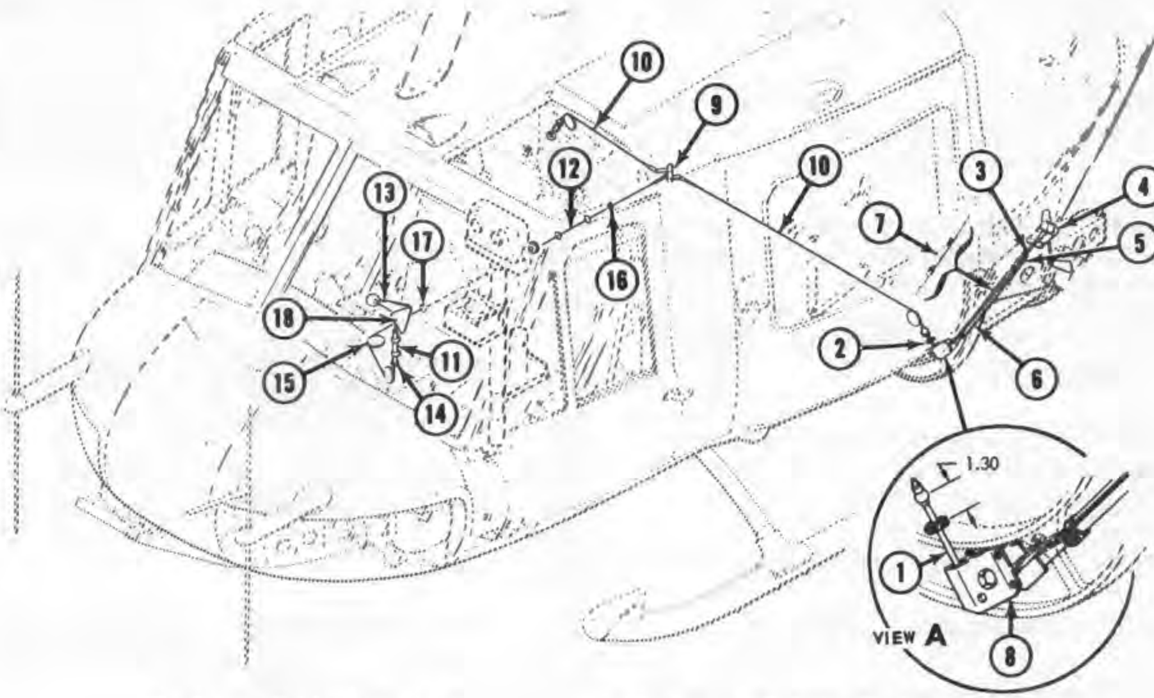
f. Slide upper guard tube (5) up from lower guard tube (6) and tighten attaching parts.

4-192. ***Removal — Manual Emergency Jettison Controls.*** a. Remove access plate from lower fuselage skin below external stores forward support beam.

b. Disconnect inboard end of lower cable assembly (1, figure 4-12) from quick disconnect on outboard end of emergency jettison cable assembly.

c. Remove grommet (2) from fuselage skin and pull lower cable assembly (1) outboard.

d. Remove cotter pin, washer and flat head pin attaching cable assembly (3) to mechanical release actuating lever.



1. Lower Cable Assembly
2. Grommet
3. Cable Assembly
4. Pulley Brackets
5. Upper Guard Tube
6. Lower Guard Tube
7. Barrel
8. Lateral Release Cable Pulleys
9. Bellcrank
10. Lateral Release Cable Assemblies
11. Cable Guard
12. Longitudinal Release Cable Assembly
13. Emergency Release Lever Assembly
14. Grommet
15. Longitudinal Release Cable Pulleys
16. Fairlead
17. Grommets
18. Support Assembly

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Figure 4–12. Manual emergency jettison controls

e. Remove cotter pins, pins, nuts, washers and bolts holding pulleys in pulley brackets (4) and remove pulleys.

f. Remove nuts, washers, screws and clamps attaching upper (5) and lower (6) guard tubes and remove guard tubes.

g. Remove cable assemblies and cut safety wire at barrel (7) to separate.

h. Remove cotter pins, pins, nuts, washers and bolts holding lateral release cable pulleys (8) in pulley brackets and remove pulleys.

i. Remove three cotter pins, washers and flat head pins attaching cable assemblies to bellcrank (9). Remove two lateral release cable assemblies (10) and cut safety wire on barrels.

j. Remove cotter pin, nut, washer and screw attaching bellcrank (9) and remove bellcrank.

k. Remove nuts, washers, spacers, screws and clamps attaching cable guard (11) to pedestal. Remove cotter pin and pin attaching longitudinal release cable (12) to emergency release lever assembly (13). Remove cable guard and grommet (14).

l. Remove cotter pins, pins, nuts, washers and bolts holding longitudinal release cable pulleys (15) in pulley brackets and remove pulleys.

m. Remove fairlead (16) and six grommets (17) which guide longitudinal release cable (12) and remove release cable.

n. Remove cotter pin, nut, washer and clevis bolt attaching lever assembly (13) to support assembly (18).

o. Remove three nuts, washers and bolts attaching support assembly (18) to pedestal and remove support assembly.

4-193. ***Inspection — Manual Emergency Jettison Controls.*** Visually inspect all pulleys and grommets for excessive wear and damage; all cables for broken or frayed wires and other components for general condition and suitability for continued service.

4-194. ***Repair or Replacement — Manual Emergency Jettison Controls.*** a. Replace worn or damaged pulleys and grommets.

b. Replace frayed and unserviceable cables.

c. Replace unserviceable components.

4-195. ***Installation — Manual Emergency Jettison Controls.*** a. Position support assembly (18, figure 4-12) on pedestal and install three attaching bolts, washers, and nuts.

b. Position emergency release lever assembly (13) on support assembly (18) and install attaching clevis bolt, washer, nut and cotter pin.

c. Thread longitudinal release cable (12) through bulkhead openings and install fairlead (16) and grommets (17).

d. Position longitudinal release cable pulleys (15) and cable (12) in pulley brackets and install attaching bolts, washers, nut, pins and cotter pins.

e. Thread forward end of longitudinal release cable (12) through cable guard (11) and attach to emergency release lever assembly (13) by installing pin and cotter pin.

f. Position cable guard (11) and install grommet (14) and attaching clamps, screws, spacers, washers and nuts.

g. Position bellcrank (9) and install attaching screw, washer, nut and cotter pin.

h. Position aft end of longitudinal release cable (12) and inboard end of lateral release cable assemblies (10) on bellcrank (9), and attach with flat head pins, washers and cotter pins.

i. Position lateral release cable pulleys (8) and cable (10) in pulley brackets and install attaching bolts, washers, nuts, pins and cotter pins.

j. Position upper (5) and lower (6) guard tubes and install attaching clamps, screws, washers and nuts.

k. Connect external support cable assemblies (1 and 3) by means of barrel (7) and thread through guard tubes (5 and 6).

l. Position external support cable pulleys and cables (1 and 3) in pulley brackets (4) and install attaching bolts, washers, nuts, pins and cotter pins.

m. Connect cable assembly (3) to mechanical release actuating lever by installing flat head pin, washer and cotter pin.

n. Thread inboard end of lower cable assembly (1) through opening in fuselage skin and install grommet (2).

o. Connect inboard end of lower cable assembly (1) to quick disconnect on outboard end of emergency jettison cable assembly.

4-196. Tail Boom. The tail boom is attached to the forward fuselage, at station 193.00, by four bolt, washer, nut combinations. Components of the tail boom, which require consideration by organizational personnel, include the tail rotor drive shaft doors, access doors and inspection plates, synchronized elevator, vertical fin fairing and the tail skid.

4-197. ***Inspection — Tail Boom.*** Inspect tail boom for damaged skin, fittings and general condition.

4-198. ***Repair or Replacement — Tail Boom.*** Repair tail boom skin (refer to TM 55-405-4.)

4-199. Miscellaneous Tail Boom Access Doors. Access to various internal areas of the tail boom is provided by strategically located access doors. (See figure 4-2 and 4-3.) These doors are attached to the structure by hinges, and are secured in the closed position by means of a latch or latches.

4-200. ***Removal — Miscellaneous Tail Boom Access Doors.*** Release latch, or latches, and remove hinge pins attaching door to structure.

4-201. ***Inspection — Miscellaneous Tail Boom Access Doors.*** Inspect doors, hinges and latches for wear or damage.

4-202. ***Repair or Replacement — Miscellaneous Tail Boom Access Doors.*** Replace damaged hinges, latch and doors.

4-203. ***Installation — Miscellaneous Tail Boom Access Doors.*** Position door in opening and insert attaching hinge pin. Close door firmly, forcing latch to lock.

4-204. Drive Shaft Doors. The tail rotor drive shaft is enclosed by three doors, (1, figure 4-13) two of which are located between the tailpipe fairing and the 42 degree gear box. The third door encloses the drive shaft between the 42 degree gear box and the 90 degree gear box. These doors are hinged along the right-hand side, and are secured, in the closed position, by snap fasteners on the left-hand side.

4-205. ***Removal — Drive Shaft Doors.*** a. Disconnect snap-fasteners along left side of door, and swing door to open position.

b. Pull hinge pin on right side of door, and remove door from tail boom.

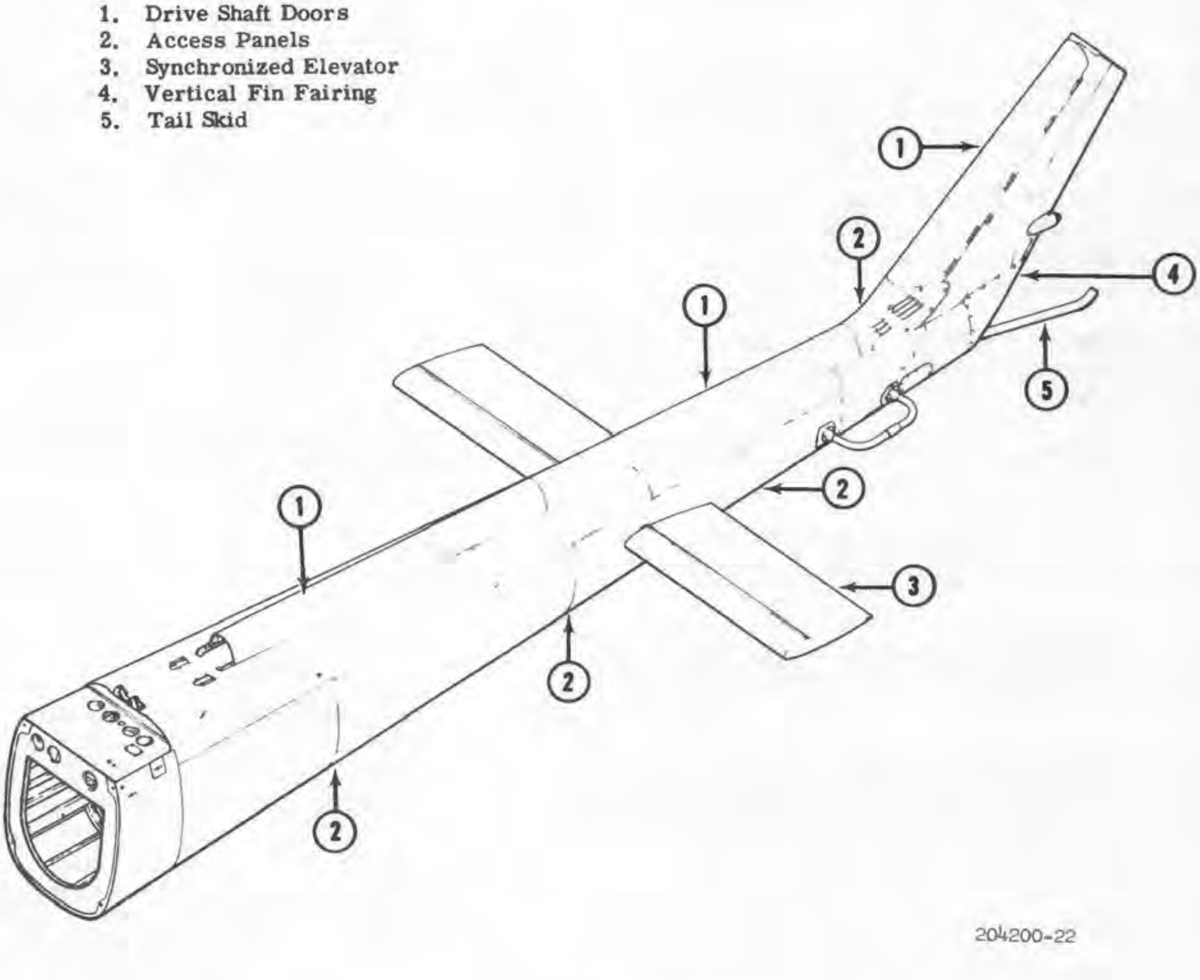


Figure 4–13. Typical tail boom

4-206. *Inspection — Drive Shaft Doors*. Inspect doors for cracks, dents or damage; hinges and fasteners for wear and damage.

4-207. *Repair or Replacement — Drive Shaft Doors*. Replace worn or damaged hinges and fasteners. Repair doors. (Refer to TM 55-405-4.)

4-208. *Installation — Drive Shaft Doors*. a. Position door on tail boom and install hinge pin on right-hand side.

b. Close door and secure snap fasteners.

4-209. Tail Boom Inspection Plates. Inspection plates are provided as necessary in the tail boom for fast, efficient inspection and maintenance of the helicopter.

4-210. *Removal — Tail Boom Inspection Plates*. Remove screws attaching inspection plate to structure and remove plate.

4-211. *Installation — Tail Boom Inspection Plates*. Position inspection plate in proper opening and attach to structure with screws.

4-212. Vertical Fin Fairing. The vertical fin fairing is located at the junction of the vertical fin and tail boom, and provides access to the tail skid attachment point.

4-213. *Removal — Vertical Fin Fairing*. Remove screws attaching fairing, and remove fairing from helicopter.

4-214. *Inspection — Vertical Fin Fairing*. Inspect fairing for cracks and damage.

4-215. *Repair or Replacement — Vertical Fin Fairing*. Repair fairing in accordance with TM 55-405-4.

4-216. *Installation — Vertical Fin Fairing*. Position fairing on helicopter and install attaching screws.

4-217. Synchronized Elevator. (UH-1A and UH-1B Serial No. 60-3546 through 64-14100.) The synchronized elevator is mounted near the aft end of the tail boom. It is controlled through a series of bellcranks and control tubes, which are joined to the fore and aft cyclic control system by a bellcrank located on the aft side of the transmission. The fore or aft movement of the cyclic control stick changes the angle of attack of the elevator, which aids in controlling the stability of the helicopter.

4-218. *Removal — Synchronized Elevator* (UH-1A and UH-1B Serial No. 60-3546 through 64-14100.) Remove synchronized elevator as follows:

Note

> Holes in elevator section tubes (6, figure 4-14) must be aligned and drilled on assembly, using pre-drilled holes in the horn assembly (3) as guides. Only one elevator section (4) will be replaced at a time, as new section must be aligned with remaining section. Removal procedure for both elevator sections is the same.

a. Remove screws attaching larger access panel to tail boom, below elevator assembly, and detach access panel.

b. Disconnect elevator control tube from elevator horn assembly (3).

c. Remove eight bolts that secure support bearing housings (5) to tail boom structure.

d. Remove two nuts, washers and bolts (1) that attach horn assembly (3) to elevator section (4).

e. Remove four bushings (2) from horn assembly (3).

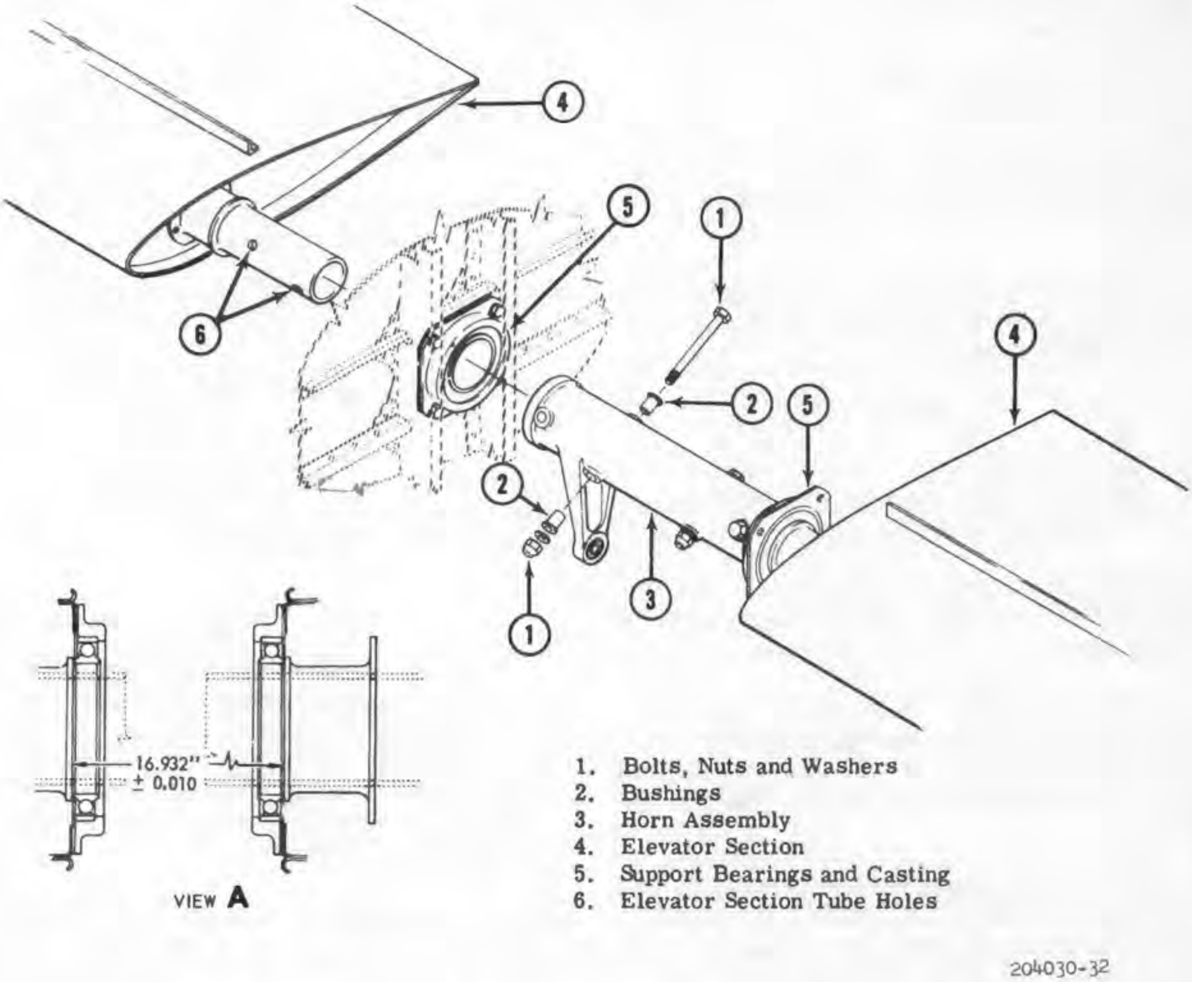
Note

> Inside of bushing flange is tapped to receive a $\frac{3}{8}$ x 24 thread bolt to be used for pulling bushing.

f. Pull loosened elevator section (4) outboard from horn assembly (3) and support bearing housing (5).

Note

> An exceptionally good bond of Loctite between elevator section tube bearing surfaces and support bearing (5) may result in difficulties in removing elevator section (4). In such cases, the use of a soft drift pin (micarta or brass) of appropriate size may be required. Release of bearing housing (5) from tail boom structure will allow a sufficient amount of play in elevator for pressure to be exerted outboard, horizontally, or vertically as required.



1. Bolts, Nuts and Washers
2. Bushings
3. Horn Assembly
4. Elevator Section
5. Support Bearings and Casting
6. Elevator Section Tube Holes

Figure 4-14. Synchronized elevator (UH-1A and UH-1B Serial No. 60-3546 thru 64-14100)

g. Place drift pin against inner race of support bearing and tap drift pin firmly with hammer equally all around bearing. Elevator section tube will then slip out of bearing.

Caution

Exercise care to avoid damage to surrounding tail boom skin, structural support, support bearing or shims between bearing housing and structural support.

Note

Steady horn assembly (3) inside tail boom as elevator section tube is slipped out of horn assembly.

Note

Removal of old Loctite from parts may be accomplished by using a soft, nonabrasive scraper and wiping parts clean with a soft cloth.

4-219. *Inspection — Synchronized Elevator* (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). a. Inspect elevator support bearing for roughness and wear.

b. Inspect skin for dents, damage and cracks.

c. Inspect elevators for dents, cracks and damage.

4-220. ***Repair or Replacement — Synchronized Elevator.*** (UH-1A and UH-1B Serial No. 60-3546 through 64-14100) a. Replace unserviceable support bearings.

b. Replace elevator if damaged.

4-221. ***Installation — Synchronized Elevator*** (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). Installation of both elevator sections is the same.

a. Insert the tube of the new elevator section (4, figure 4-14) through the support bearing (5) and horn (3).

Note

The minimum gap between inboard edge of elevator section and outside skin of tail boom shall be 0.18 inch.

b. Suspend trailing edge of both elevator sections (4) downward and align with a straight edge.

c. Maintain 16.932 inches (plus or minus 0.010 inch) dimension between support bearings (5) (refer to View "A", figure 4-14) by shimming equally between bearing fittings and support.

d. Place two bushings (2) opposite each other in horn assembly (3). Drill 0.265 to 0.272 inch holes through each side of the elevator section tube, using the bushings as a guide. Remove the bushings. Drill and line ream the holes in the elevator section tube to a finish dimension of 0.477 to 0.500 inch.

e. Remove elevator section (4) from horn assembly (3). Treat inner race of the AN200-KP47B bearing and bearing surface on tube of elevator section with Locquic Primer, (item 118, table 1-1). Apply with a swab and allow to dry. This agent is an accelerator which will substantially reduce curing time, but is not considered mandatory.

f. Apply Loctite (item 204, table 1-1) to the inner race of the bearing. Insert elevator section tube into the support bearing (5) but leave bearing surface of elevator section tube exposed. Apply Loctite to bearing surface of elevator section tube and complete insertion of tube through support bearing (5) and into horn assembly (3).

g. Insert bushings (2) in finished holes, and install bolts, washers and nuts (1).

Note

After completion of step g., above, remove excess Loctite compound by wiping with a soft, clean cloth.

h. Check that elevator has no end play, but does have freedom of travel.

i. Attach control tube to elevator horn assembly.

j. Check elevator rigging. (Refer to paragraph 9-75.)

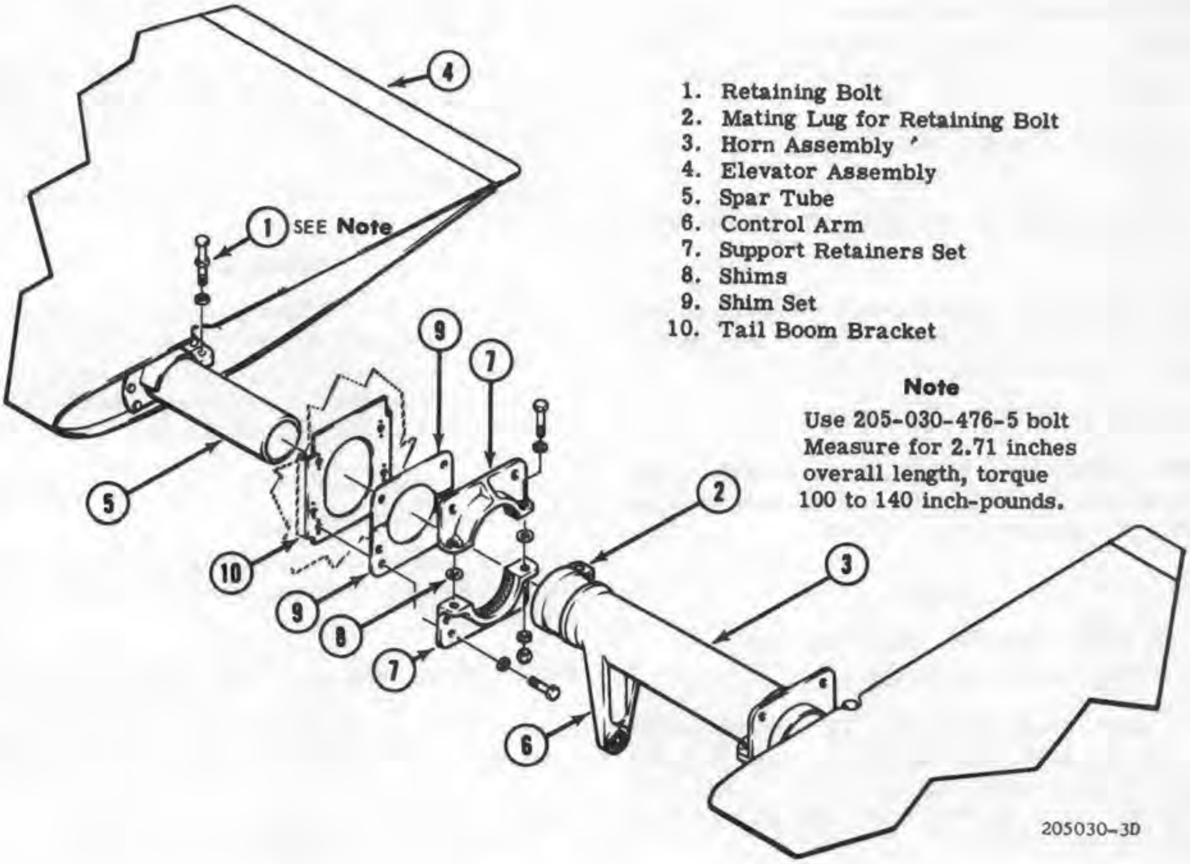
k. Position access panel on bottom of tail boom, below the elevator assembly, and install attaching screws and washers.

Note

Loctite curing time when Locquic Primer, (item 118, table 1-1) has been used is approximately 30 minutes, at 75 degrees. Loctite curing time when Locquic Primer (item 118, table 1-1) has not been used is from 10 to 12 hours at 75 degrees.

4-222. Synchronized Elevator (UH-1B Serial No. 64-14101 and subsequent). Synchronized elevator installation on UH-1B helicopters, Serial No. 64-14101 and subsequent, consists of two elevator assemblies, a horn assembly, two support sets and attaching hardware. Horn assembly is mounted horizontally through sides of tail boom, and is secured to structure by support sets which serve as bearings for rotational movement. Linkage from fore and aft cyclic control system on swashplate connects to control arm on horn assembly. Each elevator is a horizontal airfoil section built up on a spar tube which is inserted into a projecting end of horn assembly and is secured by a special retaining bolt.

4-223. ***Removal — Synchronized Elevator*** (UH-1B Serial No. 64-14101 and subsequent). a. To remove either elevator; Remove special retaining bolt (1, figure 4-15) and washer to detach elevator fitting from lug (2) on horn assembly (3). Withdraw elevator (4) straight outboard until spar tube (5) is pulled free.



1. Retaining Bolt
2. Mating Lug for Retaining Bolt
3. Horn Assembly
4. Elevator Assembly
5. Spar Tube
6. Control Arm
7. Support Retainers Set
8. Shims
9. Shim Set
10. Tail Boom Bracket

Note

Use 205-030-476-5 bolt Measure for 2.71 inches overall length, torque 100 to 140 inch-pounds.

Figure 4–15. Synchronized elevator (UH-1B serial no. 64-14101 and subsequent)

Note

Horn assembly (3) may be left in place unless replacement of components is necessary.

b. To remove horn assembly (3) after removal of both elevators, proceed as follows:

(1) Remove bolts and washers attaching access door to bottom of tail boom below elevator and remove access door.

(2) Disconnect control tube from arm (6) on horn assembly (3).

(3) At each end of horn assembly (3) inside tail boom, remove nuts, washers, and bolts holding upper and lower retainers of support sets (7) together.

Note

Carefully remove support set shims (8) from between upper and lower retainers and save for re-installation.

(4) Remove bolts and washers attaching support sets (7) and shim sets (9) to tail boom bracket (10). Carefully remove support sets (7) and keep in sets with support set shims (8) and shim sets (9).

Note

Use extreme care in removing upper and lower retainers of support sets (7) to avoid damage to inner bushings which are dry bearing material bonded in place.

(5) Remove horn assembly (3) through access opening.

4-224. *Inspection — Synchronized Elevator (UH-1B Serial No. 64-14101 and subsequent).* a. Inspect inner bushings of support sets for roughness and wear.

b. Inspect elevator for dents, cracks, and damage.

c. Visually inspect all components for general condition.

4-225. *Repair or Replacement — Synchronized Elevator (UH-1B Serial No. 64-14101 and subsequent).* a. Replace unserviceable bearings.

b. Replace elevators if damaged.

4-226. *Installation — Synchronized Elevator (UH-1B Serial No. 64-14101 and subsequent).* Install synchronized elevator as follows:

Note

If horn assembly (3) was not removed, proceed to step e.

a. Insert horn assembly (3, figure 4-15) into tail boom through access opening. Position assembly with ends through support brackets (10), and with control arm (6) at right of center pointing down.

b. Position shim sets (9) and support sets (7) against tail boom bracket (10) and install attaching washers and bolts. Peel shims as required to obtain 0.005 to 0.030 inch lateral chuck of horn assembly (3).

Note

Use extreme care in handling retainers of support set (7) to avoid damage to bearing surfaces of bushings.

c. Install bolts, washers, support set shims (8) and nuts in support sets (7). Install a thin aluminum washer under head of each bolt and under nut. Install shims (8) between upper and lower retainers of support set.

d. Adjust support set shims (8) to provide 50 to 70 inch-pounds drag on horn assembly (3).

e. Disassemble items installed in step c. and install additional shims (3) to increase diameter of each support set (7) by 0.0015 to 0.0030 inch and obtain a slight, even drag on horn assembly (3) rotation without chatter or binding.

f. Connect elevator control tube to arm (6) of horn assembly (3).

g. Position spar tube (5) of each elevator in end of horn assembly (3). Align elevator fitting hole with hole in horn assembly lug (2) and install attaching washer and special retaining bolt (1). Torque bolt 100 to 140 inch-pounds.

Warning

Be sure to use special retaining bolt, Part Number 205-030-476-5. Measure bolt for over-all length of 2.71 inches. Use of incorrect bolt may result in loss of elevator during flight.

h. Check synchronized elevator rigging. (Refer to paragraph 9-75.)

i. Position access door to bottom of tail boom below elevator and install attaching washers and bolts.

4-227. Tail Skid. A tubular steel tail skid is attached to the bottom aft section of the tail boom. The purpose of the tail skid is to warn the pilot of a tail low attitude when landing.

4-228. *Removal — Tail Skid.* a. Remove two inspection plates from side of tail boom.

b. Remove nut, bolt and washer attaching forward end of tail skid tube, and pull tube out through support block.

4-229. *Inspection — Tail Skid.* Inspect tail skid for nicks, scratches, dents, cracks and local permanent buckles.

4-230. *Repair or Replacement — Tail Skid.* a. Minor nicks, scratches or dents may be polished out.

b. Replace cracked or permanently buckled tail skid.

4-231. *Installation — Tail Skid.* a Insert tail skid tube through support block, align holes and install attaching bolt, washer and nut.

b. Position and attach inspection plates.

4-232. Minor Sheet Metal Repair. Minor Sheet metal repair consists only of repairs that do not offset the structural integrity or the performance of the helicopter. Repair shall be in accordance with TM 55-405-4.

Section III — Empennage Section

(Not Applicable)

Section IV — Pylon Section

(Not Applicable)

Section V — Wing Section

(Not Applicable)

Section VI — Alighting Gear

4-233. Alighting Gear. The skid type landing gear (figure 4-16) consists of two lateral mounted, arched cross tubes, which are attached to two formed longitudinal skid tubes provided with removable skid shoes. The landing gear structural members are made of formed aluminum alloy tubing. The gear assembly is attached to the fuselage structure with four clamps, and is easily removed or replaced. Two manually retractable, and quickly removable, wheel assemblies have been provided to facilitate ground handling.

4-234. Landing Gear Skid Shoes. Each landing gear skid tube is equipped with replaceable skid shoes, (1, 5 and 6, figure 4-16) the purpose of which are to absorb the wear caused by normal ground contacts of the helicopter. The use of skid shoes, therefore, prolongs the life of the skid tubes. The skid tubes on Model UH-1A helicopters each have a forward and rear skid shoe (1, figure 4-16). Each skid tube used on Model UH-1B helicopters is equipped with a short, forward skid shoe (5) as well as a long, full length shoe (6) which completely protects the bottom of the skid tube. Skid shoes are not repairable components. Skid shoes which are worn or damaged to such an extent that they no longer protect the skid tubes should be replaced.

4-235. ***Removal — Landing Gear Skid Shoes.*** a. Raise helicopter until skid shoes are clear of the ground. (Refer to paragraph 1-57 and figure 1-9.)

b. Remove bolts and washers which secure skid shoes to skid tube.

c. Remove skid shoes.

4-235A. ***Inspection — Landing Gear Skid Shoes.*** Inspect landing gear skid shoes for damage, wear and suitability for continued service.

4-235B. ***Repair or Replacement — Landing Gear Skid Shoes.*** Replace landing gear skid shoes which are considered unserviceable due to damage or wear.

4-236. ***Installation — Landing Gear Skid Shoes.*** a. Position skid shoes on skid tube and attach with bolts and washers.

b. Lower helicopter to ground by use of hydraulic jacks.

c. Remove jacks.

4-237. Landing Gear Skid Tubes. The landing gear skid tubes (2, figure 4-16) are formed of heavy aluminum alloy tubing and provide stable support for the helicopter when not in flight.

4-238. ***Removal — Landing Gear Skid Tubes.*** a. Elevate helicopter from ground.

b. Remove bolts and washer, which attach skid tube saddles to cross tubes, and remove skid tubes.

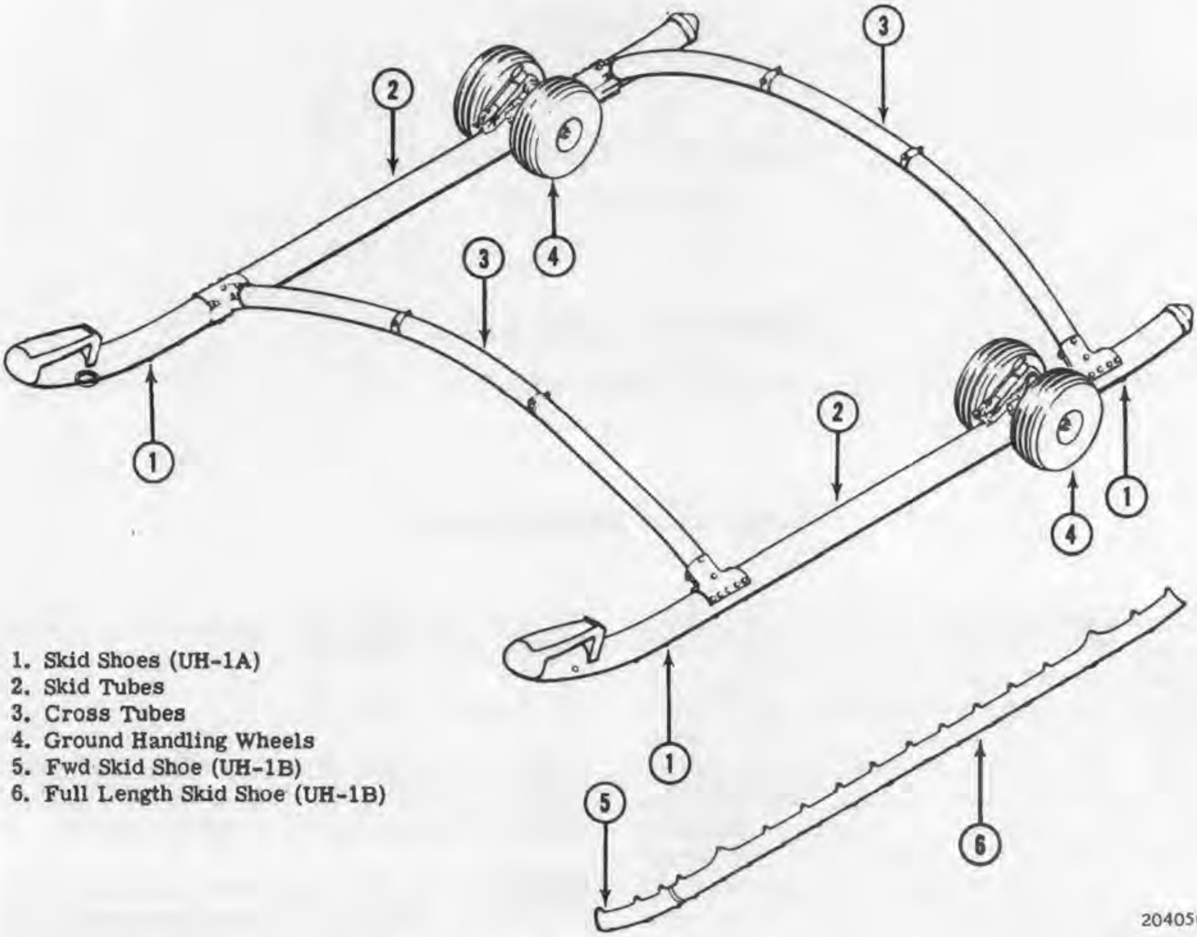


Figure 4–16. Typical skid landing gear

4-239. *Inspection — Landing Gear Skid Tubes.* a. Inspect landing gear skid tubes for slight scratches, scuffs, nicks and dents.

b. Inspect skid tubes in area between cross tube saddles for scratches, dents and holes.

Note

> Smooth dents, not exceeding 0.25 inch in depth and 1.0 to 1.2 inches in diameter, between the cross tube saddles may be disregarded. Scratches, dents and holes in the skid tubes forward of forward cross tube saddle and aft of aft cross tube saddle may be repaired at discretion of local maintenance officer.

4-240. *Repair or Replacement — Landing Gear Skid Tubes.* a. Scratches up to 0.03 inch deep and 1.0 to 1.2 inches long, running directly across top of tube between cross tube saddles may be polished out.

b. Scratches more than 0.03 inch deep and 1.0 to 1.2 inches long running directly across top of skid tube shall be repaired by direct support personnel.

c. Dents over 0.25 inch deep and 1.0 to 1.2 inches in diameter between the cross tube saddles shall be repaired by direct support personnel.

d. Holes in skid tubes shall be repaired by direct support personnel.

e. Replace skid tubes which show excessive wear or damage.

4-241. ***Installation — Landing Gear Skid Tubes.***
a. Position skid tube saddles onto corresponding cross tubes.

b. Align bolt holes in cross tube and saddles, and install attaching bolts and washers.

c. Lower helicopter to ground and remove lifting equipment.

4-242. Landing Gear Cross Tubes. The landing gear cross tubes (3, figure 4-16) are formed of heavy aluminum alloy tubing. Each cross tube is attached to the underside of the helicopter fuselage in two places by means of fitting assemblies. The outer ends of the cross tubes are attached to the landing gear skid tubes. Some Model UH-1 and UH-1A helicopters may be equipped with the Model UH-1B, three inch diameter, aft cross tube. Some Model UH-1B helicopters, Serial No. 60-3546 through 60-3619 may be equipped with the 3.25 inch diameter aft cross tube. Model UH-1B helicopters Serial No. 61-686 and subsequent will all be equipped with the 3.25 inch diameter cross tube.

4-243. ***Removal — Landing Gear Cross Tubes.*** Removal and installation is the same for either cross tube.

a. Elevate the helicopter clear of ground by use of hoist, if available (refer to paragraph 1-54), or by use of hydraulic jacks. (Refer to paragraph 1-56.)

Caution

Observe the following precautions while helicopter is on jacks:

(1) Preparatory to removing landing gear take up slack with hoist. (Refer to paragraph 1-55, a.)

(2) All personnel in the immediate area shall exercise extreme caution not to bump or otherwise disturb the helicopter while it is being raised on jacks and/or while it is supported on jacks.

(3) Personnel shall not crawl into or onto the helicopter while it is being raised and/or supported on jacks.

(4) Rope off the area around the helicopter and prominently display warning signs to the effect that this HELICOPTER IS ON JACKS.

b. Remove nuts, washers, bolts and fitting assemblies, at four points where landing gear is attached to fuselage structure, and lower landing gear to the ground.

c. Remove bolts and washers attaching defective cross tube to upper part of skid tube saddles, and remove cross tube.

4-244. *Inspection — Landing Gear Cross Tubes.* a. Inspect cross tubes for light scratches, scuffs, nicks, cracks, dents or damage.

b. Inspect cross tube bearing plates for looseness.

c. Inspect rubber bumper pad on landing gear retention cap assemblies for looseness.

d. With landing gear installed on helicopter, inspect cross tubes for proper deflection, as follows: (See figure 4-17.)

(1) Position the helicopter on a smooth surface.

(2) Raise the helicopter off the surface with hydraulic jacks (refer to paragraph 1-56) removing all weight from the landing gear.

(3) Level the helicopter, as described in paragraph 1-66.

(4) Measure the distance between the cross tube bearing plates, and divide that distance to determine the helicopter's center line.

(5) Drop a plumb line from helicopter center line to ground, or floor, surface. (See figure 4-17.) Measure from plumb line to the center line of each skid tube at cross tube locations.

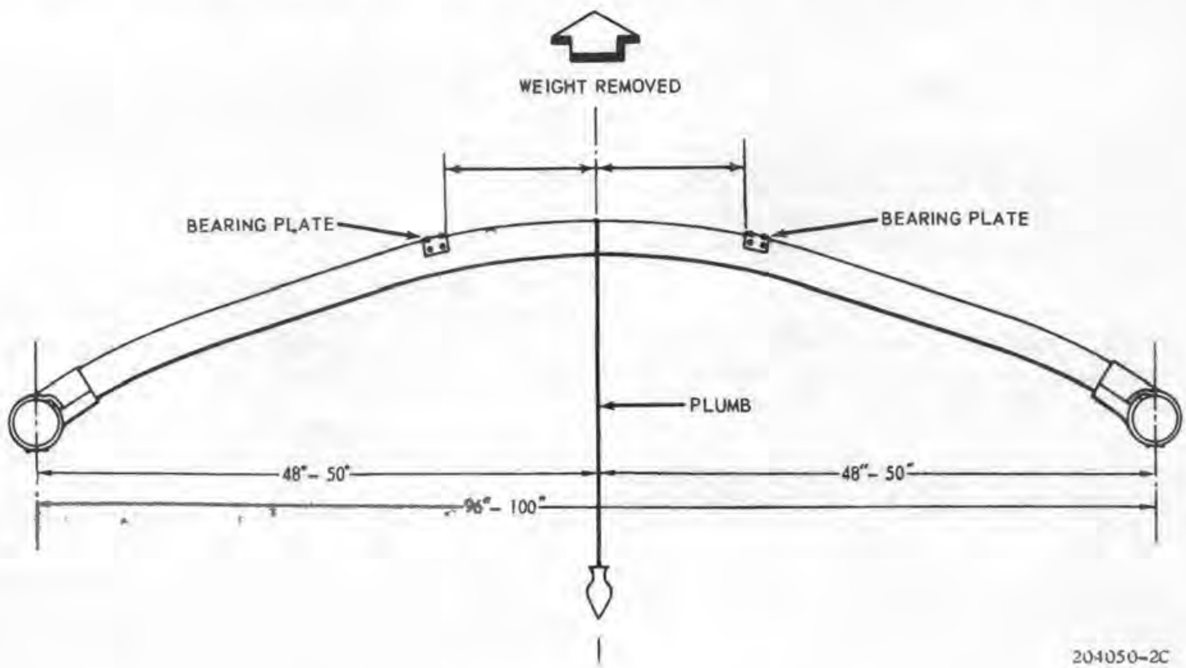


Figure 4–17. Landing gear cross tube deflection

Note

Distance should be 48 inches from center line of skid tube to plumb line. If distance exceeds 50 inches from either cross tube, replace cross tubes.

(6) Lower helicopter to surface and remove hydraulic jacks.

4-245. ***Repair or Replacement — Landing Gear Cross Tubes.*** a. Minor scratches, scuffs and nicks may be polished out to depth of damage, but not to exceed 10 percent of cross tube wall thickness.

b. All other damage requires replacement of cross tubes.

c. Replace cross tubes if deflection dimension exceeds inspection requirements.

4-246. ***Installation — Landing Gear Cross Tubes.*** a. Position aft cross tube assembly mounting opening in upper part of aft saddle on left-hand skid tube.

b. Use a 5/16 inch drift punch to align holes in aft skid tube saddle with holes in cross tube and install five washers and bolts.

Note

Do not install the lower inside washer and bolt at this time. These items will be installed later as attaching parts securing the skid shoe to the skid tube.

c. Repeat steps a., and b., above to attach the right-hand end of the aft cross tube to the aft saddle on the right-hand skid tube.

d. Repeat steps a., b., and c. above to attach the forward cross tube to the forward skid tube saddles.

e. Install landing gear skid shoes. (Refer to paragraph 4-236.)

f. Raise the landing gear and position the cross tube bearing straps in the four support fittings on the underside of the fuselage.

g. Position a cap assembly across each of the four support fittings. The pad of the cap assembly must be facing upward, against the underside of the cross tube, with the indentured radius of the pad outboard. Install four washers and bolts into permanently installed nut plates. Install two bolts, washers and nuts, one set on each side next to cross tube.

Note

Tighten bolts through cap assemblies to a snug fit while aircraft is in a hoisted position. Lower aircraft to ground; tow forward to settle gear, then tighten bolts to proper torque.

4-247. Ground Handling Wheels. Two manually retractable, and quickly removable, wheel assemblies (4, figure 4-16) have been provided to facilitate ground handling of the helicopter.

4-248. ***Removal — Ground Handling Wheels.*** a. Release valve on side of wheel assembly to retract wheels.

b. Press aft pin from eyebolt and lift wheel assembly from skid gear.

4-249. ***Inspection — Ground Handling Wheels.*** Inspect all parts for damage, wear and/or distortion.

4-250. ***Repair or Replacement—Ground Handling Wheels.*** a. Repair punctured tires and tubes in accordance with TM 55-405-2 and TM 55-405-3. Inflate in accordance with paragraph 1-93.

b. Replace damaged wheels.

4-251. ***Installation — Ground Handling Wheels.*** a. Position wheel assembly on skid tube. Position forward pin in eyebolt; press forward on handle of aft pin, and lock in place.

b. Close valve and actuate pump to lower wheels, and lift skid gear clear of surface.

4-252. Ground Handling Wheel Actuating Mechanism. The ground handling wheel actuating mechanism consists of a manually actuated hydraulic pump assembly, a flexible hose assembly and two ram assemblies. Actuation of the hydraulic pump assembly operates the ram assembly clevis to move the ram arm which is attached to the handling wheel axle. (See figure 4-18.)

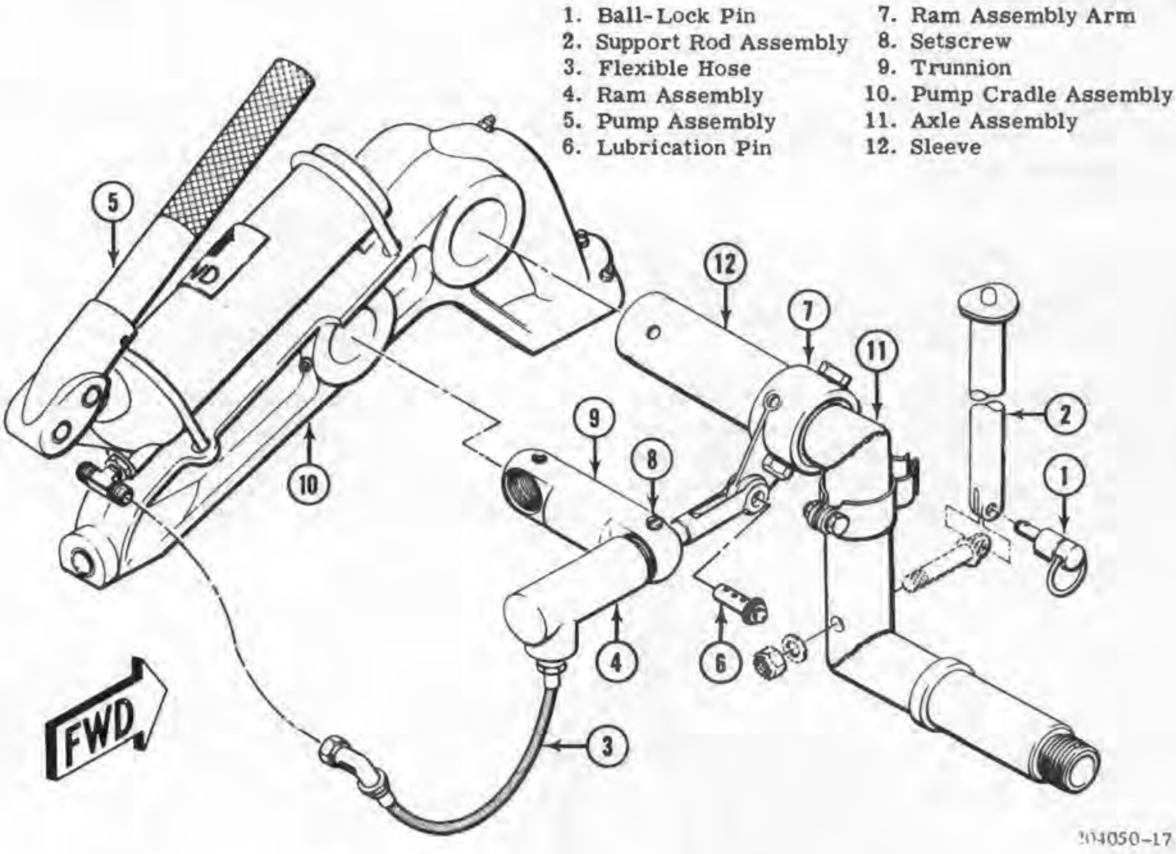


Figure 4–18. Ground handling wheel actuating mechanism

4-253. ***Removal — Ground Handling Wheel Actuating Mechanism.*** a. Remove ball-lock pin (1, figure 4-18) and support rod assembly (2) from handling wheel axle.

b. Remove ground handling wheel with tire and tube. Refer to paragraph 4-248.

c. Disconnect flexible hoses (3) from ram assemblies (4) and tees on pump assembly (5). Remove hoses.

d. Remove cotter pin, washer and lubrication pin (6) attaching ram assembly arms (7) to clevis of ram assemblies (4).

e. Back out setscrews (8) and remove ram assemblies (4) from trunnion (9). Remove clevis from ram assemblies.

f. Remove trunnion (9) from pump cradle assembly (10). Remove cradle assembly, with pump assembly (5), from axle assembly (11).

4-254. ***Inspection — Ground Handling Wheel Actuating mechanism.*** a. Inspect flexible hose (3, figure 4-18) for fraying, breaks, abrasions and general condition. Check internal threads.

b. Inspect all components, including lubrication fittings, for damage, wear and suitability for continued service.

4-255. ***Repair or Replacement — Ground Handling Wheel Actuating Mechanism.*** a. Replace unserviceable hose and fittings.

b. Replace damaged or leaking actuating mechanism.

4-256. ***Installation — Ground Handling Wheel Actuating Mechanism.*** a. Insert trunnion (9, figure 4-18) in cradle assembly (10) with threaded openings facing aft.

Note

To prepare a new pump assembly (5) and ram assembly (4) for installation, remove pipe plug on each and drain original fluid.

b. Install ram assembly (4) on each end of trunnion (9) to bottom out in hole. Back off until hydraulic outlet is directed down. Secure ram assemblies (4) with setscrews (8).

c. Position ram assembly arm (7) on sleeve (12). Insert axle assembly (11) and secure with bolts. Insert sleeve and axle combination through cradle assembly (10) and install ram assembly arm on opposite end.

Note

Ram assembly arm (7) must be 1.98 inches forward of axle center line. (See figure 4-19.)

d. Install ram assembly clevis. With ram fully extended, adjust clevis to hold 1.48 inches dimension. (See figure 4-19.)

e. Position support rod assembly (2) on clevis pin and install ball lock pin (1).

f. Connect flexible hoses (3) to ram assemblies (4) and tees on pump assembly (5).

g. Service in accordance with instructions contained in paragraph 1-95.

h. Install ground handling wheels with tires and tubes. (Refer to paragraph 4-251.)

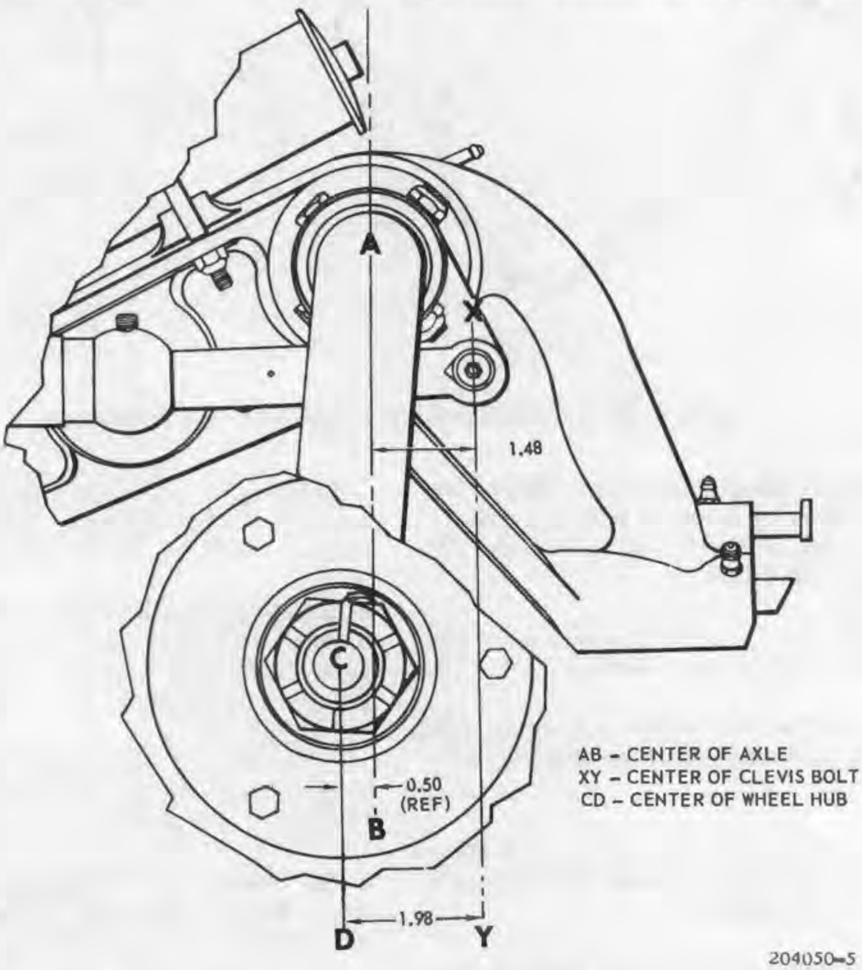


Figure 4–19. Positioning ground handling wheel and ram clevis

CHAPTER 5

POWER PLANT AND RELATED SYSTEMS

Section I — Scope

5-1. Scope. The purpose of this chapter is to provide all essential information for maintenance personnel to accomplish organizational maintenance on the complete power plant and related systems. This information includes a detail description and chronological instructions as to methods and procedures. It also includes the special tools and equipment required for accomplishment of these maintenance phases in accordance with the Maintenance Allocation Chart. Special tools required for performance of organizational maintenance will be found in TM 55-1520-211-20P, Repair Parts and Special Tools List.

Section II — Power Plant

5-2. Power Plant. Power plant installation consists of a shaft turbine engine, horizontally mounted above a service deck behind main rotor pylon, with adapting parts and connections to fuel, oil, electrical, instrument, and engine control systems. (Figures 5-1, 5-2, and 5-3.) A hinged cowling panel at each side provides access to engine compartment between forward and rear firewalls. Exhaust area, at rear end, is covered by a removable fairing. Air intake and drive shaft to main transmission are under forward cowling, and are also protected by an induction baffle and screen which have removable sections for access. Hoses and electrical cables between engine and fuselage have quick-disconnect couplings. Other connections, such as control linkages, firewalls, drive shaft couplings and engine mounts, have simple and rapid means of attachment so that engine with its fittings can be considered a quick-change assembly.

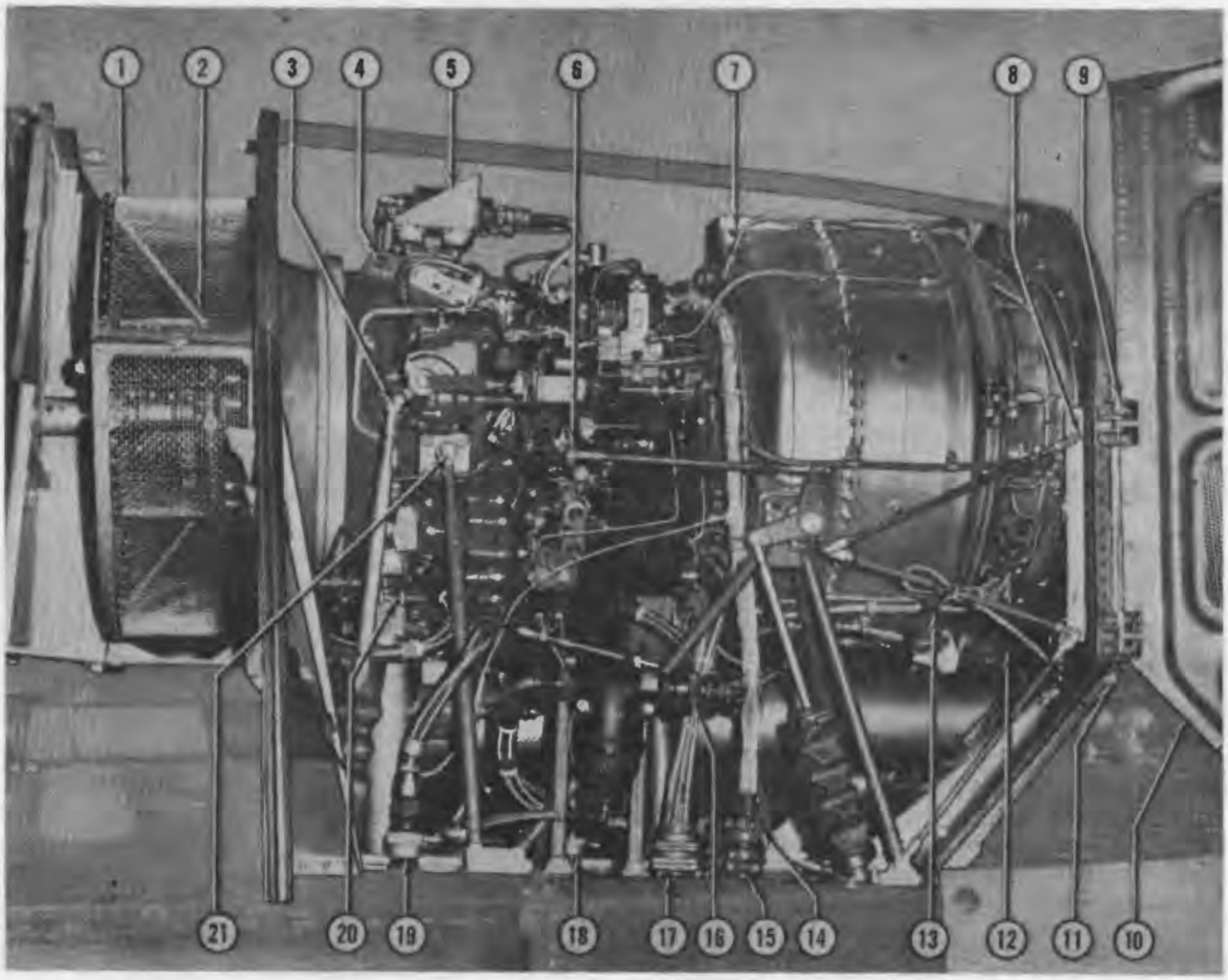
5-3. Engine. Five engine models are used on helicopters covered by this manual. UH-1A helicopters are equipped with T53-L-1A engines. UH-1B helicopters are equipped with T53-L-5, T53-L-9, T53-L-9A, or T53-L-11 engines.

Note

The suffix "A" after the engine serial number identifies T53-L-11 engines that have the improved output reduction carrier and gear assembly.

5-4. Engine Orientation. (See figures 5-4 and 5-5.) All directions and locations of equipment on or around the engine will be stated as viewed from rear of engine looking forward. General size, shape, main sections arrangement, and output shaft rotation are alike for all engine models. The T53-L-1A engine differs from other models as to size and design of inlet housing, reduction gearing, arrangement of external parts, and internal parts of the combustion section. The four engine models used on UH-1B are successively improved versions of a single basic configuration, but differ in some aspects of performance and in certain internal and external details. Where such differences affect maintenance procedures, detailed information is provided in instructions.

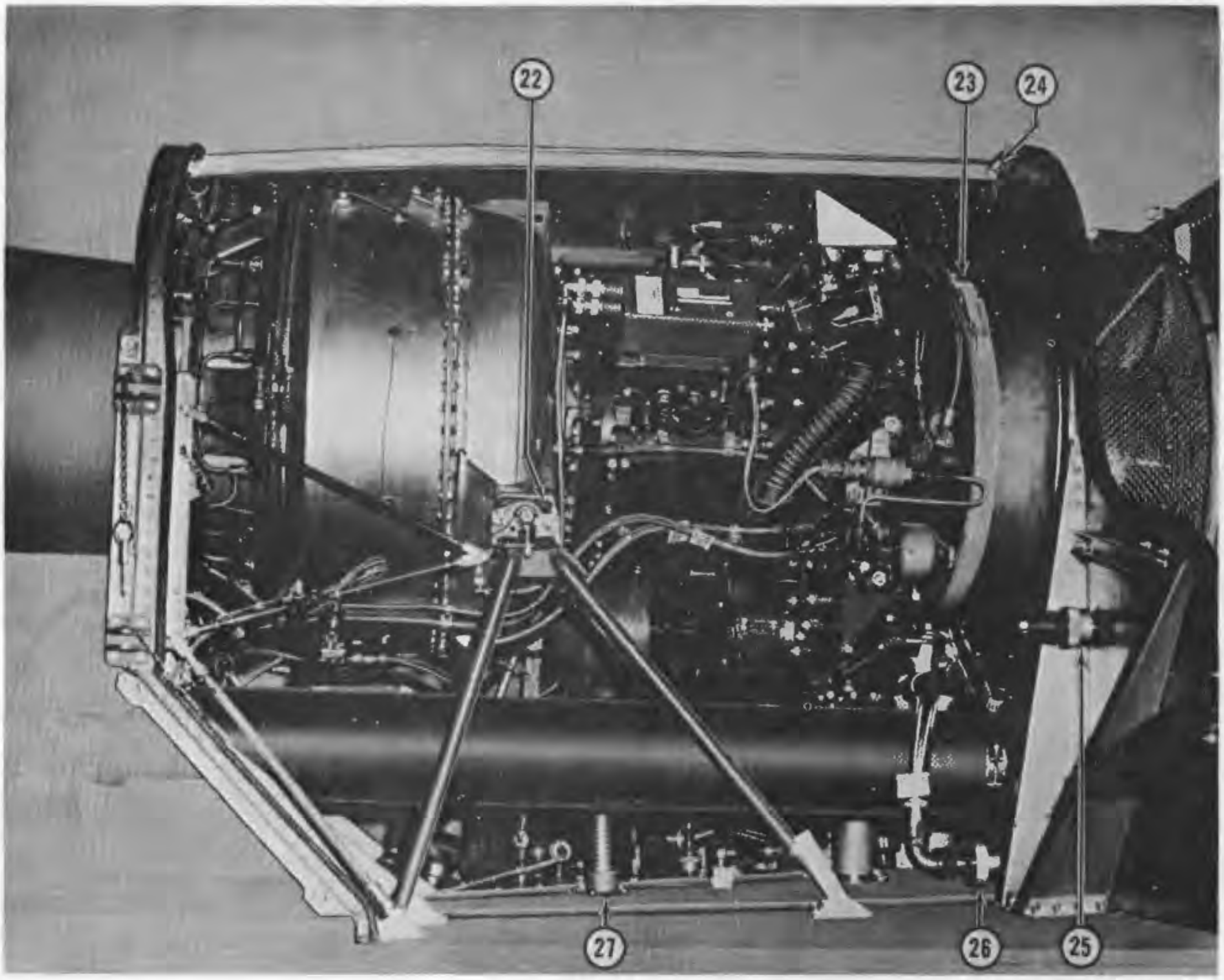
5-5. Engine Description. Basic engine consists of an inlet housing and reduction gear section, an axial-centrifugal compressor, a diffuser, a combustion chamber, a first-stage turbine driving the compressor, a second-stage turbine driving a power shaft, and an exhaust diffuser. Fuel control, starting and ignition, lubrication, and air systems are separately discussed in detail. Considered functionally the engine is made up of two mechanically independent groups: The gas producer turbine and associated components, commonly designated as nI on charts and other references; and the power turbine and associated components, designated as nII.



204200-18

1. Intake Screen Fasteners
2. Access to Drive Shaft Coupling
3. Droop Compensator Control Tube Bolt
4. Forward Hoist Point
5. Transmitter Support Assembly
6. Power Lever Control Rod Bolt
7. Rear Hoist Point
8. Firewall Brace Rod Pins
9. Cowling Hinge Pins
10. Access to Tailpipe Hose Coupling, Anti-Collision Light and Antenna Connectors
11. Tailpipe Fairing Fasteners
12. Upper Firewall Fasteners
13. Fire Detector Wiring Connectors
14. Combustor Drain Valve and Fuel Control Seal Drain Hose Coupling
15. Main Electrical Cable Connector
16. Fuel Control Inlet Hose Coupling
17. Starter Cable Connector
18. Starter Pad Seal Drain Hose Coupling
19. Oil Pump Return Hose Coupling
20. Oil Cooler Fan Drive Shaft Coupling
21. Forward Mount Tube Bolt

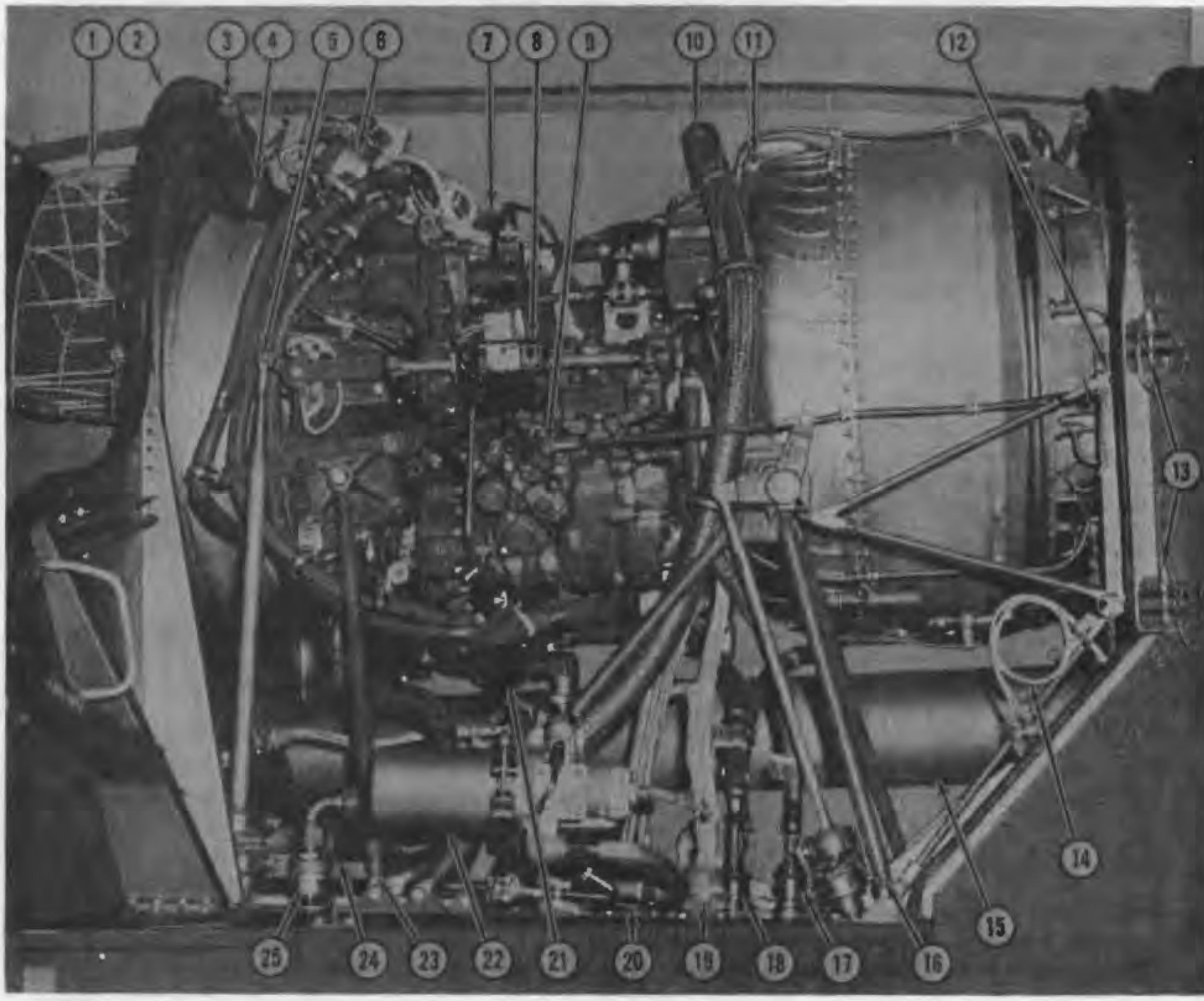
Figure 5-1. UH-1A Power plant installation — LH side (typical (Sheet 1 of 2)



204200-17

22. Mount Trunnion Bearing Cap
23. V-Band Coupling
24. Firewall Beam Pins
25. Accessory Gear Box Breather Hose Coupling
26. Oil Pump Inlet Hose Coupling
27. Starter Cooling Duct Coupling

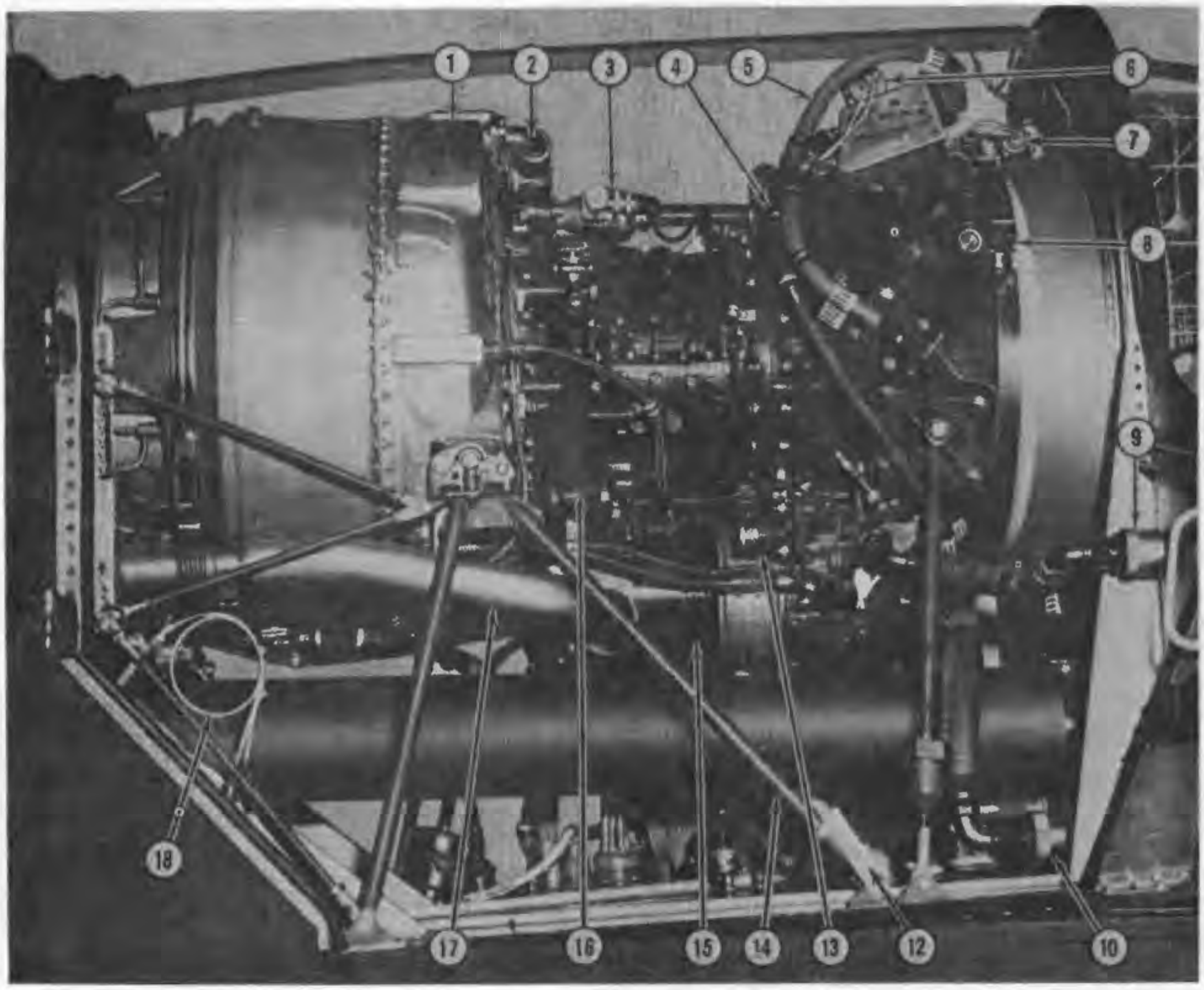
Figure 5-1. UH-1A Power plant installation — RH side (typical) (Sheet 2 of 2)



204200-53

1. Intake Screen
2. Forward Firewall
3. Firewall Beam Pins
4. Ice Detector
5. Droop Compensator Control Tube Bolt
6. Differential Fuel Pressure Switch
7. Forward Hoist Point
8. Linear Actuator
9. Power Lever Shaft Arm Bolt
10. Bleed Air Hose
11. Aft Hoist Point
12. Firewall Brace Rod Pins
13. Engine Cowl Door Hinge Pins
14. Fire Detector Wiring
15. Tail Rotor Drive Shaft Tunnel
16. Tripod Engine Mount
17. Fuel Control Vent Hose Coupling
18. Fuel Control Seal and Combustion Chamber Drain Hose Coupling
19. Main Wiring Harness Connection
20. Starter Wiring Harness Connection
21. Fuel Inlet Hose Coupling
22. Main Fuel Filter
23. Support Tube
24. Bleed Air Hose Coupling
25. Oil Return Hose Coupling

Figure 5-2. UH-1B Power plant installation — LH side (typical)



204200-34

1. Engine Diffuser
2. Bleed Air Connecting Manifold
3. Inline Valve
4. Accessory Gear Box Pressure Hose to Torque Pressure Transmitter
5. Torque Pressure Hose
6. Low Oil Pressure Warning Switch
7. Ice Detector Wiring Connector
8. Engine Inlet Housing to Bellmouth Coupling
9. Engine Breather Hose Coupling
10. Engine Oil "IN" Hose Coupling
11. Safety Leg
12. Support Spring
13. Tachometer Generator (Ng)
14. Bipod Engine Mount
15. Starter Generator
16. Air Bleed Actuator
17. Starter Generator Cooling Air Exhaust Duct
18. Fire Detector Wiring

Figure 5-3. UH-1B Power plant installation — RH side (typical)

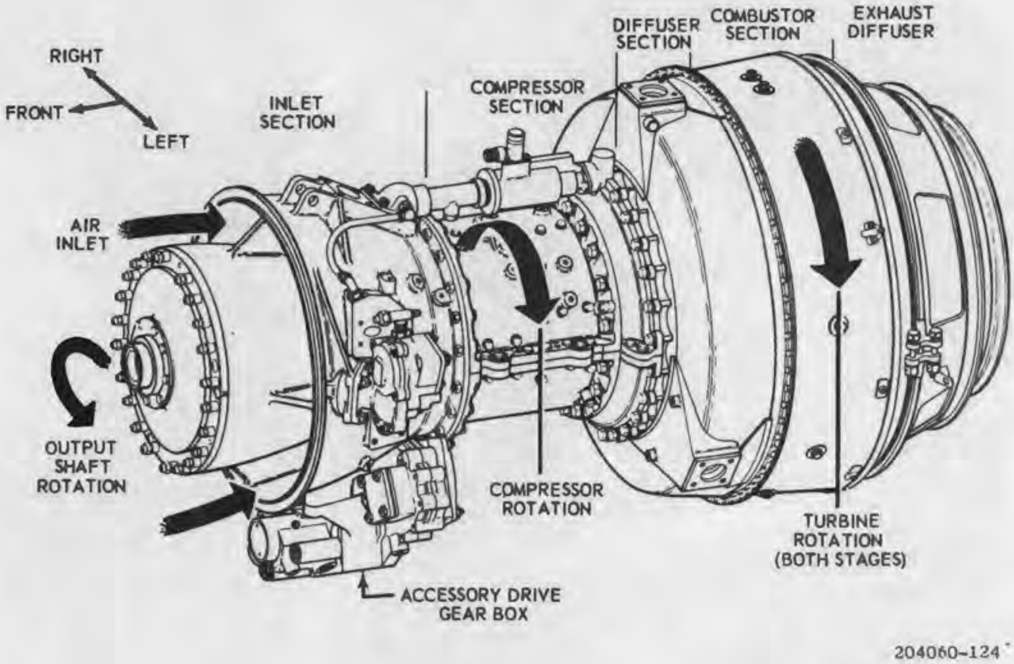


Figure 5-4. Engine orientation and main sections diagram T53-L-1A

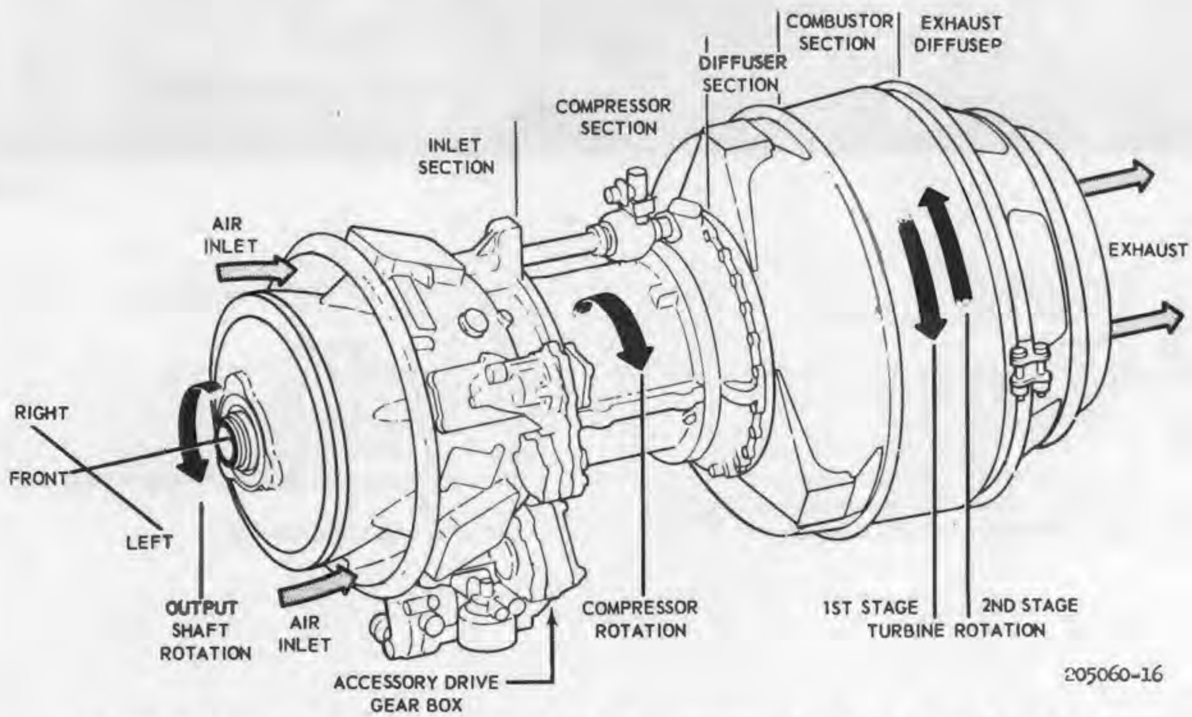


Figure 5-5. Engine orientation and main sections diagram — T53-L-5, T53-L-9, T53-L-9A and T53-L-11 series

5-6. *Gas Producer Group.* Gas producer (nI) components include air inlet housing, gas producer or compressor rotor assembly (first-stage turbine and compressor which are joined to form a rotating unit), diffuser assembly, combustion chamber assembly, and accessory drive gear box as a driven unit. Speed of gas producer rotor is indicated in percent rpm by means of a tachometer generator mounted on accessory drive gear box.

5-7. Air inlet housing is a one-piece magnesium casting formed as an inner housing and an outer shell with six hollow connecting struts. Inner housing contains all reduction gears of power train, output bearing support, the torquemeter assembly, and power take-off gears. Outer shell diffuses intake air to compressor and provides mounting for external components. Connecting struts provide passages for anti-icing hot air, oil scavenge return, and enclose shafts for gear trains to external components. Entire housing is a main support structure, having pads for engine mounting and an eye for engine hoisting.

5-8. Gas producer rotor consists of five axial-flow compressor rotor stages, a centrifugal impeller, and a driving turbine, all mechanically joined to form a rotating assembly. Axial compressor is made up of disc and blade assemblies alternating with spacers on a rotor sleeve, supported at front end by No. 1 main bearing and attached at rear to centrifugal impeller. Axial compressor blades turn between vane assemblies attached in two halves of a cylindrical cast magnesium housing. Centrifugal impeller has integral blades, and turns within a two-piece cast magnesium housing. Diffuser housing between centrifugal impeller and combustor section, is of low alloy steel and functions to slow air leaving compressor. Compressor outlet pressure ratio is 6:1 with air inlet pressure. Gas producer turbine is a single-stage axial-flow assembly, formed of hollow steel blades secured in rim of a steel disc, attached to compressor and supported by No. 2 main bearing.

5-9. Combustion chamber is formed of stainless steel liner, shroud, and deflector assemblies supported in cylindrical combustor and diffuser housings. Chamber so formed is termed an external-annular reverse flow type, chosen to allow compact design of the engine.

5-10. Accessory drive gear box, which contains all of accessory gear train, is mounted on underside of inlet housing and driven through bevel gears from front end of compressor rotor. Drive pads are provided on rear of gear box for fuel control regulator, starter-generator, and gas producer (nI) tachometer generator. Front of gear box provides mounting for oil pump, and has an unused drive pad with connection for vent line from torquemeter pressure transmitter. All drive shaft gears turn clockwise, viewed facing drive pad. Gear box also serves as a scavenge oil collector sump, kept practically empty by pump.

5-11. *Power Turbine Group.* The second-stage turbine, exhaust diffuser, power shaft, and output reduction gearing constitute the power turbine (nII) group. This turbine is supported by No. 3 and 4 main bearings in exhaust diffuser housing and consists of a steel wheel with tip-shrouded blades secured in its rim. Power turbine is splined to a power shaft extending co-axially through open center of compressor rotor to drive reduction gears and power output gearshaft at front end of engine. An external gear box, mounted at upper left on inlet housing and driven from power shaft, drives an overspeed governor of fuel control assembly which regulates speed of power turbine. A tachometer generator on governor drive gear box provides indication in rpm on dual tachometer.

5-12. Output reduction gearing, contained in inner portion of inlet housing, incorporates a torquemeter assembly which is the means of providing continuous gage indication of torque applied on output gearshaft. This device is a grooved plate and ball system working with oil pressure, varied according to torque, to an external pressure transmitter. On UH-1A, oil supply to torquemeter inlet is at system pressure; but on UH-1B, oil supply pressure is increased by a boost pump on overspeed governor drive gear box.

5-13. *Engine Principles of Operation.* (See figure 5-6 or 5-7.) Air entering through inlet housing is drawn through axial and centrifugal stages of the compressor, which is turned initially by the starter through the accessory gear box, then by the first-stage turbine in normal operation. Compressed air is directed through vanes of the diffuser, with reduction of velocity and swirling of air flow to increase its pressure, then enters combustion chamber to mix with vaporized fuel and form a combustible mixture. Initially, fuel is supplied through nozzles of the starting fuel system and combustion occurs when two igniter plugs are energized. Thereafter, the starting system is manually deacti-

1. Inlet Housing
2. Axial Compressor
3. Centrifugal Compressor
4. Diffuser Housing
5. Combustion Chamber
6. Louvers
7. Fuel Vaporizing Tube
8. Igniter Nozzle
9. 1st Stage Turbine Nozzle
10. 1st Stage Turbine
11. 2nd Stage Turbine Nozzle
12. 2nd Stage Turbine
13. Power Shaft
14. Planetary Sun Gear
15. Torquemeter Assembly
16. Ring Gear Output Shaft
17. Exhaust Diffuser

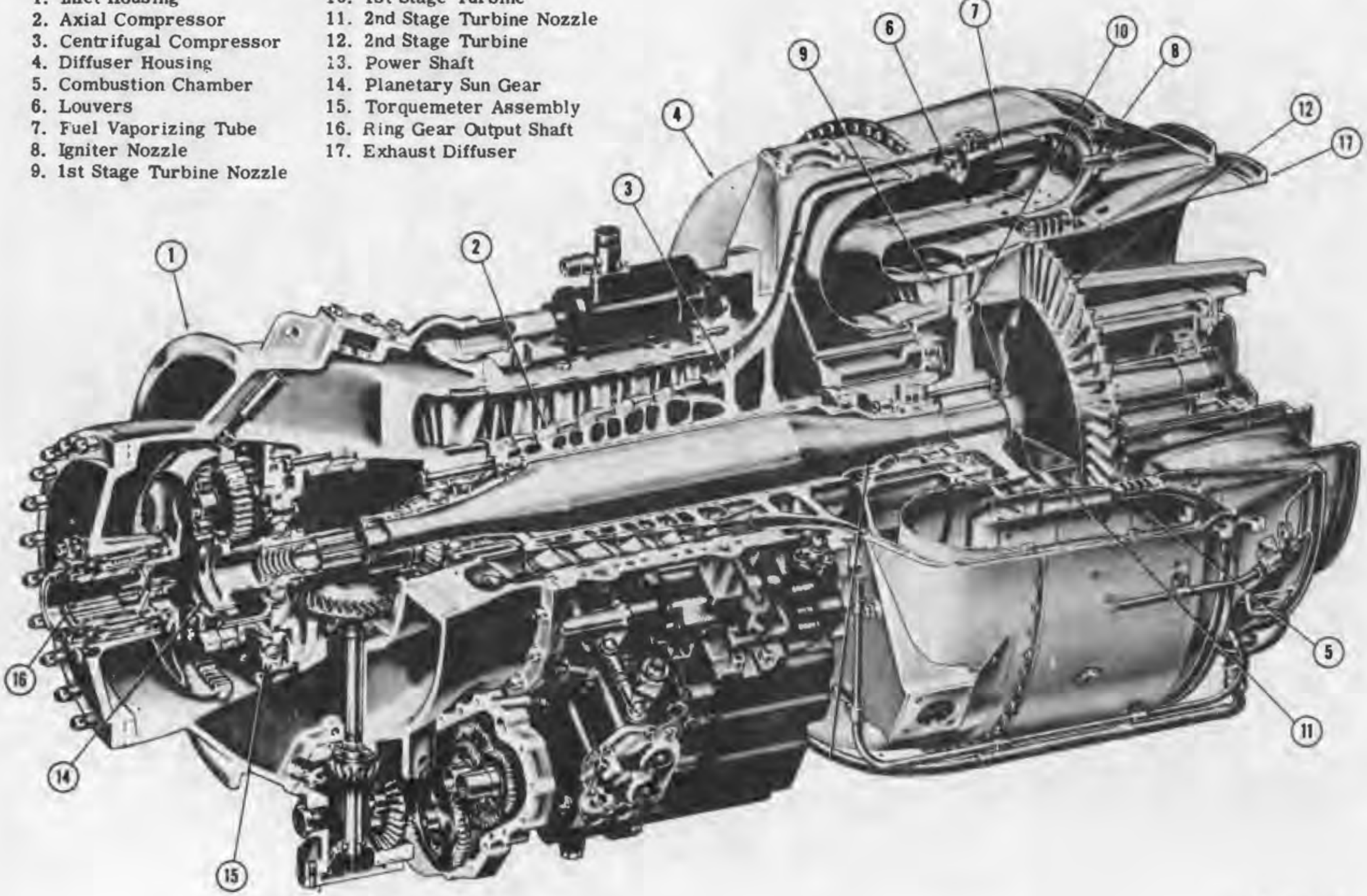
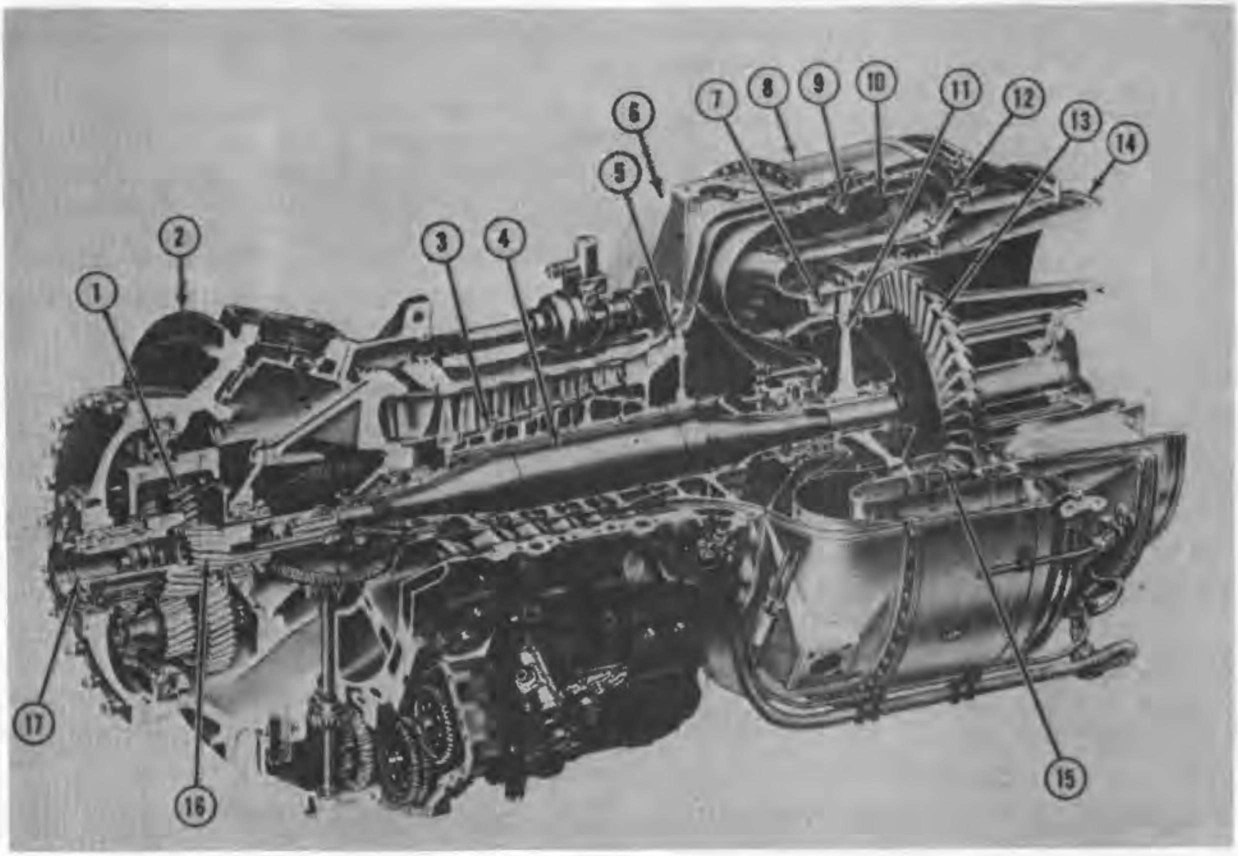


Figure 5-6. Engine cutaway — T53-L-1A



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1. Output Reduction Gears
2. Inlet Housing
3. Axial Compressor Rotor Disc
4. Power Shaft
5. Centrifugal Compressor Impeller
6. Diffuser Housing
7. First Stage Turbine Nozzle
8. Combustion Chamber Housing
9. Scoops
10. Fuel Vaporizers
11. First Stage Turbine
12. Igniter Nozzles
13. Second Stage Turbine
14. Exhaust Diffuser
15. Second Stage Turbine Nozzle
16. Sun Gearshaft
17. Output Gearshaft

Figure 5-7. Cutaway of typical UH-1B engine vated and combustion is sustained by fuel supplied by main fuel system through eleven fuel vaporizers in combustion chamber. Expanding gases are directed through first-stage nozzle and turbine blades, then through second-stage nozzle and power turbine, and out of engine through exhaust diffuser. Approximately two-thirds of the gas energy passing through the first-stage turbine is used to drive the compressor rotor assembly, the rest is used by the second-stage turbine to drive the power shaft. Other engine equipment and features are discussed elsewhere in this section, with systems to which they pertain.

5-14. *Engine Maintenance Precautions.* When performing maintenance on engine, the following precautions shall be observed.

Warning

Do not use cadmium plated tools for any procedures outlined in this chapter. Cadmium plating will chip. If any of these chips enter the engine they will contaminate the lubrication system and cause deterioration of magnesium engine parts.

Warning

Lubricating oil (item 2, table 1-1) contains an additive which is poisonous and readily absorbed through skin. Do not allow oil to remain on skin longer than necessary.

a. On removal or disassembly of engine components, exercise care to prevent dirt or other foreign matter entering engine. Caps, plugs or temporary covers shall be used to close all exposed openings.

Note

Do not use tape to seal fuel or oil openings. Tape adhesive is soluble in fuel or oil and can cause contamination.

b. Protect engine from dust and inclement weather. When possible, perform maintenance in a sheltered area.

c. Before removing engine components, disconnect the wiring harness at the ignition exciter and ground the ignition leads.

d. Carefully inspect condition of all parts to be installed on engine.

e. Replace removed lockwire, cotter pins, tab-washers, lock-pins, lock-washer, gaskets and packing rings with serviceable parts.

f. In removal of external lines and components, brackets will be left in place whenever possible to facilitate reinstallation.

g. When removing or installing engine fuel, oil, or air hoses, do not apply torque to the narrow hex nut of the sleeve and nipple. Apply torque to the wide hex nut only. When loosening or tightening the wide hex nut, hold the nipple or sleeve to prevent twisting of the hose.

h. When disconnecting electrical connectors, or hose and tube fittings, remove clamps on brackets as required to gain slack and avoid damage to connectors and fittings.

5-15. *Torque Values.* a. Apply special torque values wherever stated or shown in maintenance instructions.

b. For general applications other than engine parts, use standard torque values for aircraft structural hardware.

c. On engine only, where no special torque is given, use the following table of torque values provided by engine manufacturer.

ENGINE HARDWARE TORQUE VALUES
(inch-pounds)

SIZE	HEX BOLTS AND NUTS	SLOT HEAD SCREWS
10-32	40-45	18-20
7/32-24	65-70	22-25
1/4 -28	70-95	30-35
5/16-24	120-165	40-45
3/8 -24	250-325	55-60
7/16-20	400-475	80-90
1/2 -20 or -13	500-700	100-110
9/16-18	750-1000	
5/8 -18	1000-1400	

PIPE THREAD PLUGS

	SQUARE OR INTERNAL HEX HEAD	SLOT HEAD	
SIZE	STEEL	BRASS OR ALUMINUM	STEEL
1/16	35-40	10-15	20-25
1/8	75-125	30-40	35-50
1/4	200-250	70-85	60-90
3/8	300-375	95-110	100-140
1/2	400-500	140-160	150-200
3/4	500-600	175-200	200-250
1	600-700	230-260	250-300

STRAIGHT THREAD PLUGS

(Torqued with sealing compound or lubricant)

SIZE	HEX HEAD	SLOT HEAD
1/4 -28	75-80	75-80
5/16-24	90-100	90-100
3/8 -24	110-125	110-125
7/16-20	125-140	125-140
1/2 -20	145-160	145-160
9/16-18	160-175	160-175
5/8 -18	175-200	
3/4 -16	215-240	
7/8 -14	250-275	
1 -14	300-325	
1 1/8 -12	325-350	
1 1/4 -12	350-400	
1 3/8 -12	400-450	
1 1/2 -12	425-475	
1 5/8 -12	475-525	
1 3/4 -12	500-550	
1 7/8 -12	550-600	
2 -12	600-650	

Note

Fittings being tightened to prescribed torque should have dry, clean threads.

FLARED TUBING "B" NUTS

TUBING OUTSIDE DIAMETER	ALUMINUM TUBING	STEEL TUBING
3/16 Inch		90 to 100
1/4 Inch	40 to 65	135 to 150
5/16 Inch	60 to 80	180 to 200
3/8 Inch	75 to 125	270 to 300
1/2 Inch	150 to 250	450 to 500
5/8 Inch	200 to 350	650 to 700
3/4 Inch	300 to 500	900 to 1000
1 Inch	500 to 700	1200 to 1400

HOSE "B" NUTS

SIZE	TORQUE
3	70 to 100
4	70 to 120
5	85 to 180
6	100 to 250
8	210 to 420
10	300 to 480
12	500 to 850
16	700 to 1150

5-16. *Engine Stud Torque Values.* For engine studs, use care in determining exact thread size on both ends. Select proper torque value for stud type and size. (See figure 5-8.)

5-17. *Lubricants and Sealing Compounds.* Unless instructions recommend use of special compounds for a particular installation, only those listed below shall be used in assembly of engine.

a. Petrolatum (item 14, table 1-1) for lubricating fuel system packing rings.

b. Lubriplate (item 15, table 1-1) for low temperature applications other than packing rings.

c. Anti-seize compound (item 202, table 1-1) for high temperature applications.

d. Molybdenum disulfide powder (item 203, table 1-1) as an alternate for anti-seize compound.

e. Sealing and retaining compound, Loctite Grade A, Red (item 204, table 1-1).

f. Hydrogenated vegetable shortening (item 18, table 1-1) or medicinal castor oil (item 19, table 1-1) for lubricating oil system packing rings.

g. Pneumatic system grease (item 11, table 1-1) for lubricating pneumatic system packing rings.

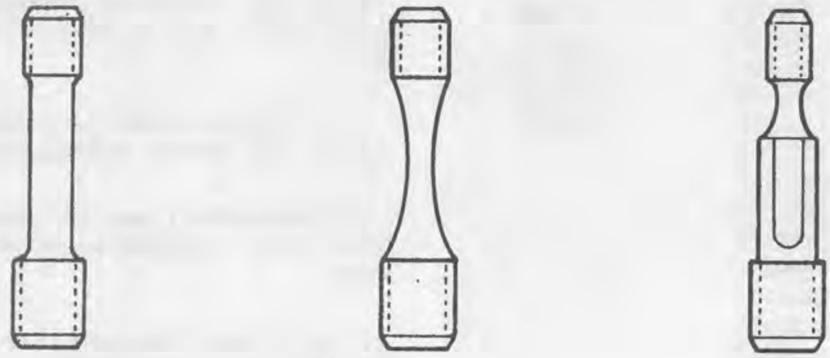
h. Plastilube, Moly No. 3 (item 20, table 1-1) as a lubricant for dry splines.

5-18. *Cleaning — Engine Assembly.* a. Exterior of engine and attached components can be cleaned, when thoroughly cool, with dry cleaning solvent (item 302, table 1-1). Dry parts thoroughly after cleaning.

b. When sprayed solvents or compressed air are used on or around engine, take suitable precautions to avoid forcing dirt, solvent, or moisture into engine openings, bearings, or electrical units or connections.

5-19. *Engine Internal Cleaning to Remove Salt Deposits.* When an engine has operated in areas where air is salt-laden, remove all deposits as soon after engine operation as possible.

STUDS



TYPE X TYPE Y TYPE Z

STEPPED STUD TORQUE VALUES
(POUND-INCHES)

THREAD SIZE				
NUT END	STUD END	TYPE X	TYPE Y	TYPE Z
0.190-32	0.250-20	25 to 30		
0.250-28	0.3125-18	50 to 110	50 to 75	50 to 165
0.3125-24	0.375-16	100 to 240	100 to 160	100 to 350
0.375-24	0.4375-14	175 to 475	175 to 325	175 to 600
0.4875-20	0.500-13	250 to 725	250 to 525	250 to 1000
0.500-20	0.5625-12	400 to 1150	400 to 825	400 to 1500
0.5625-18	0.625-11	600 to 1650	600 to 1150	600 to 2100
0.625-18	0.6875-11	900 to 2400	900 to 1700	900 to 3100

STRAIGHT STUD TORQUE VALUES
(POUND-INCHES)

THREAD SIZE				
NUT END	STUD END	TYPE X	TYPE Y	TYPE Z
0.112-48	0.112-40	3 to 7		
0.138-40	0.138-32	8 to 14		
0.164-36	0.164-32	18 to 25		
0.190-32	0.190-24	25 to 35		
0.250-28	0.250-20	50 to 95	50 to 95	50 to 105
0.3125-24	0.3125-18	100 to 225	100 to 225	100 to 250
0.375-24	0.375-16	175 to 375	175 to 375	175 to 400
0.4375-20	0.4375-14	250 to 650	250 to 400	250 to 700
0.500-20	0.500-13	400 to 1000	400 to 700	400 to 1100
0.5625-18	0.5625-12	600 to 1450	500 to 1050	600 to 1600
0.625-18	0.625-11	900 to 2000	700 to 1400	900 to 2200

204060-30

Figure 5-8. Engine stud torque values

a. Open engine cowling. Ground igniter plugs or disconnect 28-volt DC input lead from ignition exciter unit.

B b. Disconnect fuel control pressure sensing hose from fitting on inlet housing.

B c. Disconnect interstage airbleed hose from fitting on right side of engine diffuser housing. Cap open fitting.

d. Open or remove forward cowling to allow access to engine air intake. Check that engine is sufficiently cool for internal spraying.

e. With fuel switches off, use starter to motor engine in accordance with operating instructions. During engine motoring, spray fresh water into engine inlet housing at 1½ to 2½ gallons per minute until all visible deposits have been removed. Distribute spray so that it washes inlet housing struts and water enters all inlet duct areas leading to compressor section. Allow engine to coast down until combustion chamber drain valve opens and water drains out.

Note

> If temperature is below freezing, use anti-detonating injection fluid containing a 40 percent methanol and 60 percent water mixture instead of fresh water.

f. Motor engine again for 15 to 20 seconds, to rid combustor of water vapor.

g. Reconnect ignition and operate engine at idle speed to dry out engine.

h. During engine coastdown, use suitable spray nozzle and associated equipment with filtered air at 90 psi pressure to spray approximately one-half gallon of corrosion inhibitor (item 310, table 1-1) or equivalent, into the entire engine inlet. If inhibitor is not available, use one pint of corrosion-preventive oil (item 10, table 1-1).

i. With engine stopped, use nozzle through exhaust tailpipe to spray power turbine rotor with enough corrosion-preventive oil (item 10, table 1-1) to cover blades.

$\boxed{B}$ j. Reconnect interstage airbleed hose to fitting on engine diffuser housing, and fuel control pressure sensing hose to fitting on inlet housing.

k. Reinstall or close cowling.

5-20. Removing Missile or Rocket Exhaust Deposits from Engine. When engine has operated in areas subjected to missile or rocket exhaust, remove all deposits as soon as possible.

a. Prepare engine for treatment according to paragraph 5-19, steps a. through d.

b. Remove engine intake screen. Wipe the air inlet surfaces, all accessible external surfaces and all accessible blades in engine with a clean cloth dampened with cleaning solvent (item 302, table 1-1).

c. Spray the engine inlet and compressor with corrosion inhibitor or corrosion-preventive oil according to paragraph 5-19, step h. Hold spray nozzle 18 to 20 inches from inlet housing to apply spray while motoring engine with starter to 12 percent nI speed, then allowing it to coast down to two percent nI speed. Repeat cycle as necessary.

d. With engine stopped, spray power turbine blades with corrosion-preventive oil according to paragraph 5-19, step i.

e. Reconnect engine hoses and reinstall intake screen and cowling when treatment of engine is completed.

5-21. Removing Extinguishing Agent Residue From Engine. When an engine has been exposed to corrosive type fire extinguishing agents, such as chlorobromomethane or soda-acid, the residue shall be immediately removed from the engine.

Note

> Non-corrosive dry chemical or foam deposits should be removed as soon as practical, using clean water.

a. Prepare engine for treatment according to paragraph 5-19, steps a. through d.

Note

> If cleaning procedures would damage other equipment or components of aircraft engine, should be removed for cleaning on a stand, using a suitable cranking device to turn engine.

b. Prepare a mild alkaline solution, using eight ounces sodium bicarbonate to five gallons water.

c. Spray or pour alkaline solution into engine inlet while motoring engine with starter.

d. With a portion of alkaline solution, wash all external engine surfaces affected by the extinguishing agent. Wash off solution with clean water.

e. Flush engine internally with about five gallons of water introduced through inlet while motoring engine with starter, then dry the engine and apply corrosion preventives to compressor and power turbine. (Refer to paragraph 5-19, steps e. through i.)

f. Reconnect engine hoses and install cowling.

5-22. Engine Internal Cleaning with Walnut Shell Grit. Use walnut shell grit to clean engine compressor when high exhaust gas temperatures or power loss is observed.

Caution

> Tests have shown that walnut shell material may collect behind the turbine segment seal ring and ignite and

burn with a resulting local temperature high enough to anneal the seal spring and reduce the effectiveness of the asbestos seal. If this condition occurs, it can be readily observed by steady state exhaust gas temperatures in excess of limits. No power loss will result. Instead, a slight increase in output shaft power will accompany the high exhaust gas temperature.

Note

A turbine cylinder seal, Part No. 1-300-052-01, has been approved for field retrofit of T53-L-5/9/9A/11 engines. This seal is less susceptible to deterioration than the previously used part, due to more effective sealing characteristics at lower spring pressure.

a. Provide 2.5 to 3 pounds of walnut shell grit (item 503, table 1-1). Remove any foreign object that might damage engine.

b. Remove forward cowling and access section of engine air intake screen. Remove cowling doors at both sides of engine.

c. Detach fuel control sensing element and cover from left side of engine inlet housing.

B d. On UH-1B, disconnect fuel control pressure sensing hose from fitting on inlet housing. Cap open fitting.

e. Disconnect fitting of bleed air hose, which supplies engine air to air-frame-mounted equipment, from impeller housing port (on T53-L-1A/5/9 engines) or from exit port of adapter on impeller housing (on T53-L-9A/11 engines). Install a cover on open port. Connect an external source of compressed air, regulated at 50 psi, to inlet of oil cooler blower in order to operate blower during engine operation.

B f. On UH-1B, disconnect interstage airbleed hoses and prepare for closing of bleed band after engine is started.

(1) On T53-L-5/9/9A engine, disconnect air-bleed valve hose from fitting on inlet housing. Cap hose and fitting on housing.

(2) On T53-L-11 engine disconnect fuel control sensing hose from upper fitting on airbleed actuator. Cap actuator fitting.

(3) On any UH-1B engine, disconnect actuator pressure hose from fitting on engine diffuser housing. Cap diffuser fitting. Connect a source of clean compressed air, regulated to not more than 50 psi pressure, to that airbleed hose which is normally connected to diffuser pressure.

g. Start and run engine at flight idle speed. Be sure that oil cooler blower is being operated by compressed air to keep engine oil temperature within limits. Close interstage airbleed band by compressed air applied to actuator.

Warning

Keep away from drive shaft and other moving parts.

h. Slowly feed approximately one-half pound of cleaning grit into engine inlet housing between two struts. Allow engine to clear itself, in approximately one minute.

i. Repeat step h. at each of the other openings between inlet housing struts.

Note

A power check shall be made after engine cleaning with walnut shell grit. If maximum allowable exhaust gas temperature is not exceeded, this will confirm that no secondary damage to the asbestos seal has resulted.

j. Shut down engine and allow it to cool. Remove external sources of compressed air.

k. With a flashlight, visually inspect inlet guide vanes and first-stage of compressor rotor through front of inlet housing. If vanes are not completely clean, swab with a cloth wet with trichlorethylene (item 307, table 1-1). Reinstall intake screen section.

l. Remove protective caps and covers from engine ports and fittings, clean out any accumulated grit residue, and connect engine hoses. Attach fuel control temperature sensing element on inlet housing.

m. Install cowling.

5-23. *Spot-Painting On Engine.* Scratches or exposed painted areas shall be spot-painted to prevent surface corrosion.

5-24. *Aluminum — Painted Surfaces.* a. Lightly sandpaper the area to be spot-painted.

b. Clean area with trichlorethylene (item 307, table 1-1) and air dry.

c. Spot-paint exposed area with heat-resistant aluminum enamel (item 104, table 1-1) or equivalent.

d. Air dry, or use heat lamp to force-dry in humid conditions.

5-25. *Magnesium-Base Alloy Surfaces.* The following procedure may be used to remove corrosion and to touch-up all magnesium engine parts that have been previously treated. No distinction shall be made between areas coated with engine gray and areas coated with clear epoxy sealant.

a. Blend nicks, scratches, or reworked areas with surrounding metal surface, using a smooth stone or crocus cloth (item 401, table 1-1). The blend shall be smooth and continuous to prevent possible stress-concentration areas.

b. Thoroughly clean area to be treated with methyl-ethyl-ketone (item 309, table 1-1), or acetone (item 311, table 1-1).

c. With a cotton swab, locally apply chrome pickle solution (1.5 pounds sodium dichromate (item 321, table 1-1) and 1.5 pints nitric acid (item 322, table 1-1), specific gravity 1.42, to one gallon of water) to exposed area. Allow solution to remain on surface two to five minutes, then rinse well with clean water.

Warning

> Chrome pickle solution is poisonous. Do not allow solution to touch skin, as its entry through cuts or bruises may cause serious illness. Wash any traces of solution from skin with soap and water.

d. Dry part with clean cloth, then with 500-watt heat lamps or equivalent for 5 to 10 minutes.

e. Prepare engine gray A.D. epoxy (items 207 and 208, table 1-1) or equivalent, by mixing equal parts of components A and B. Apply one brush coat of mixture over the exposed area.

f. Using 500-watt heat lamps or equivalent, dry part for two hours. Air dry part, at least 24 hours, until paint is no longer tacky.

B **5-26. *Replacing Miscellaneous Seals.*** a. If leak occurs at pinion bearing housing (1, figure 5-9) at bottom of accessory drive gear box: Open engine cowling doors. Drain trapped oil by removing chip detector plug (3). Remove three bolts and pull housing from gear box. Replace packing (2) and install housing, tighten and lockwire bolts.

b. Replace packing (4) on chip detector; install in gear box port and lockwire.

c. To correct a leak at pad cover (5): Disconnect torquemeter transmitter vent hose. Remove nuts and washers and pull cover from studs. Replace gasket (6). Install cover. Connect hose to fitting on cover.

d. To correct leak at plug (7): Remove plug and replace packing (8). Install and lockwire plug.

e. To correct leaks at oil pump, replace parts in accordance with applicable instructions. (Refer to paragraph 5-189 or 5-192.)

B **5-27. *Replacing Starter Drive Pad Seal.*** (See figure 5-9.) a. Open right engine cowling. Remove starter-generator. (Refer to paragraph 5-247.) Leave gaskets (13 and 15) and support (14) in place.

b. Remove lockwire and six bolts at flange of oil seal housing (16). Use two 10-32 puller screws to remove housing. Remove screws. Remove packing (17).

c. Place seal housing on an arbor press, and use tool LTCT100 to press out seal (19) and packing (18).

d. Dip new seal in oil (item 2, table 1-1). Place packing (18) and seal in housing and press into place. Install new packing (17) on seal housing (16).

e. Install seal housing assembly into gear box drive pad, using tool LTCT511, and secure with six bolts. Lockwire bolts.

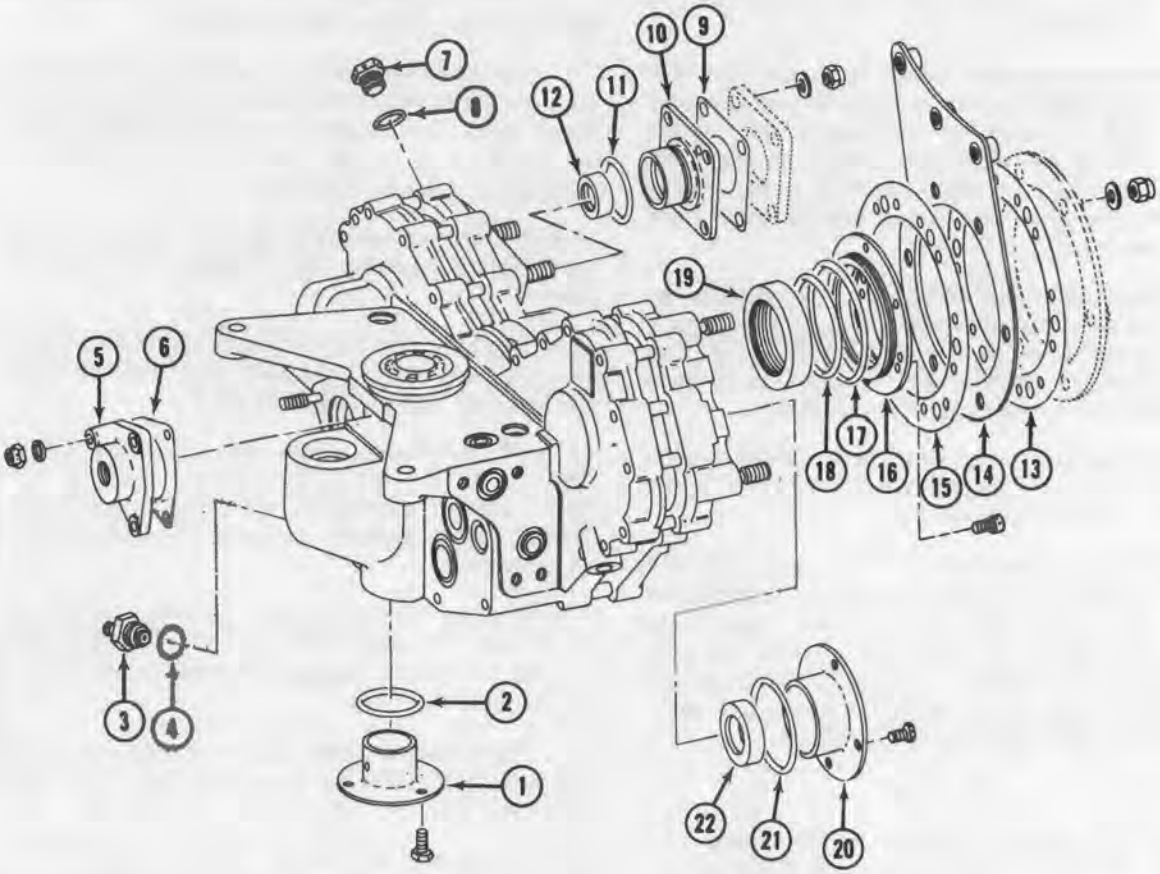
f. Install starter-generator. (Refer to paragraph 5-248.) Close cowling.

B **5-28. *Replacing Tachometer Drive Pad Seal.*** a. Open right engine cowling. Remove gas producer tachometer generator by disconnecting electrical connector and removing nuts and washers which secure unit and gasket (9, figure 5-9) on drive pad studs.

b. With two puller 10-32 screws, remove flange (10). Remove screws and packing (11).

c. Place flange assembly on an arbor press. Use tool LTCT101 to remove seal (12).

d. Dip new seal in oil (item 2, table 1-1) and press into flange using tool LTCT501. Place new packing on flange.



1. Pinion Bearing Housing
2. Packing
3. Chip Detector
4. Packing
5. Pad Cover
6. Gasket
7. Plug
8. Packing
9. Gasket
10. Tachometer Drive Flange
11. Packing
12. Seal
13. Gasket
14. Support
15. Gasket
16. Oil Seal Housing
17. Packing
18. Packing
19. Seal
20. Fuel Control Drive Liner
21. Packing
22. Seal

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Figure 5-9. Accessory drive gear box seals (T53-L-5/9/9A/11 engines)

e. Install flange assembly over mounting studs and into drive pad.

f. Install gasket and tachometer generator, secured by four nuts and washers. Connect lockwire electrical connector. Close cowling.

B 5-29. *Replacing Fuel Control Drive Pad Seal.* (See figure 5-9.) If fuel control assembly has been removed, the drive pad seal is then accessible for replacement.

a. Remove bolts that secure flange of fuel control drive liner (20). Use 10-32 puller screws to remove liner. Remove screws and packing (21).

b. Place liner on an arbor press, and use tool LTCT100 to press out seal (22).

c. Dip new seal in oil (item 2, table 1-1), and press seal into liner, using tool LTCT100.

d. Install packing and liner into drive pad, secured with bolts. Lockwire bolt heads.

5-30. *Trouble Shooting — Engine.* A chart of possible engine troubles, causes, and remedial action is included below. Power plant malfunctions may be obvious, or may be of nature which is not obvious but which can cause considerable damage to engine if not detected. Therefore, it is essential that maintenance personnel have thorough knowledge of exhaust gas temperatures, fuel pressures, lubricating oil pressures, and other important details of normal engine performance in order to recognize power plant troubles quickly when they occur. Having recognized trouble, the mechanic must then isolate it by a process of elimination of possible causes, beginning with those most probable and most readily checked. Thorough check of fuel and ignition systems should be made for possible leaks and defective wiring. Accuracy of exhaust gas temperature indication system should be checked at once in case of engine operating troubles, in which abnormal readings occur, using a Jetcal tester in accordance with its instructions to test thermocouple harness and exhaust gas temperature indicator. Correction of trouble may require simple repair of faulty installation, replacement of an accessory or part, or removal of engine assembly for inspection and repair by a high maintenance level. Certain corrective actions in chart are beyond the scope of organizational maintenance, but are included to preserve continuity of the trouble shooting task.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
1. Failure to crank	Low voltage; battery defective	Replace battery; use auxiliary power
	Faulty electrical system	Check circuits, repair connections or replace faulty units
	Starter motor faulty or shaft sheared	Replace starter-generator
2. Cranking difficulty or failure	Compressor rotor seized by icing	Duct hot air into inlet
	Internal seizing of compressor or first-stage turbine	Internal inspection and repair of engine compressor or combustor sections
3. Failure to start		
a. Igniter plugs not firing; no crackling sound when starting system is energized	Weak battery or faulty airframe electrical system	Check for 14 volts minimum input to ignition exciter. Replace battery or repair electrical circuit if required
	Faulty ignition exciter	If plugs still do not fire, replace ignition exciter
	Faulty igniter plugs	Disconnect leads from plugs if still failing to fire. Attach plugs known to be good on leads and let hang free. Energize system. If spark occurs now, replace old plugs.
	Faulty ignition leads	If still no spark, replace ignition leads.
b. No starting fuel; no rise in exhaust gas temperature	Starting fuel nozzles or manifold clogged or damaged	With ignition disconnected, disconnect starting fuel line from manifold. Simulate a start to check for flow at open line. If there is flow, clean or replace starting nozzles or manifold
	Inoperative boost pumps or system shut-off valve	If no fuel flow in previous test, check fuel supply system operation. Repair circuits or replace faulty units.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
	Starting fuel solenoid valve inoperative	Disconnect starting fuel line at valve inlet. If there is flow from fuel control, replace solenoid valve or repair connections
	Clogged strainers in fuel control	If still no flow, clean fuel control strainers and replace servo filter
	Faulty fuel control	If still no starting fuel flow, replace fuel control
c. No main fuel; engine stabilizing at 100°C exhaust gas temperature and about 15 percent nI rpm	Faulty fuel supply system	Check fuel service. Check operation of boost pumps and system shut-off valve, repair circuits or replace faulty units. Clean main strainer or replace filter element
	Clogged strainers in fuel control, manifold or line	Check all fuel strainers and lines for restrictions
	Faulty fuel control	With ignition disconnected, disconnect main fuel line from manifold. Motor engine at 12 to 16 percent nI rpm to check for fuel flow. If no flow, replace fuel control
d. In cold weather	Wrong fuel	Service with correct fuel
	B When using JP-5 fuel on a T53-L-11 engine and scoopless T53-L-5/9/9A engines, wrong starting fuel port of fuel control being used for temperature below 10°F	Connect starting fuel line to elbow-type fitting of alternate (unscheduled) starting fuel port of fuel control. Cap banjo fitting on normal (scheduled) port
4. Excessive time in starting	Refer to item 3	Refer to item 3
5. Hung start; engine fails to accelerate beyond approximately 30 percent nI rpm and exhaust gas temperature rapidly rises toward over-temperature limit	Excessive fuel used for start	Shut down engine. If necessary, motor engine to stabilize exhaust temperature. Use proper starting procedure
6. Hot start; exhaust gas temperature limits exceeded	Weak battery	Replace battery
	Wrong starting procedure	Use correct procedure
	Starting fuel solenoid valve fails to shut off	Check operation: Disconnect starting fuel line from manifold. Motor engine with main fuel switch on, starting fuel switch off. If fuel flows, replace valve
	Air inlet obstructed	Clear air inlet
	Faulty fuel control	Replace fuel control

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
7. Torching start: flames shoot from exhaust	Wrong procedure: late introduction of starting fuel	Use correct procedure
	Fuel accumulation in tail-pipe or combustion chamber	Check tailpipe and combustion chamber drain lines for obstruction. Remove and inspect combustion chamber drain valve. Replace faulty parts
8. Flame-out during start	Insufficient starting fuel	Maintain starting fuel longer in next start
9. Idle speed low	ENGINE GOV switch at EMER position, or not wired properly, or faulty transfer solenoid valve	Check operation with switch at AUTO; repair circuit or replace faulty solenoid and valve
	Wrong idle speed setting	Adjust rigging trim as required
	Fuel flow restricted	Check fuel strainers and lines
10. Idle speed high	Power lever control linkage rigged incorrectly	Rig power lever control linkage
	Wrong idle speed setting	Adjust rigging trim as required
11. Actual nI speed higher than computed speed at maximum power lever setting	Computation error	Check calculations, ambient temperature, use of correct engine data sheet and chart of allowable deviation due to temperature
	Faulty tachometer	Replace tachometer or generator
	Wrong maximum speed setting on fuel control	Adjust rigging trim as required
	Faulty fuel control	Replace fuel control
12. Actual nI speed lower than computed speed at maximum power lever setting	Computation error	Check as in item 11.
	ENGINE GOV switch in EMER position	With speed retarded to 60 percent switch to AUTO; speed should increase. If defective, repair circuit or replace solenoid
	Faulty tachometer system	Replace tachometer or generator
	Power lever control linkage rigging incorrect	Check and correct power lever control rigging
	Fuel flow restricted	Check all fuel strainers
	Wrong maximum speed setting on fuel control	Adjust fuel control trim as required
	Faulty fuel control	Replace fuel control
	Air leakage and high exhaust gas temperature	Refer to item 16.
13. Low nII speed	Aircraft maximum gross weight exceeded	Correct loading
	Wrong governor control rigging	Correct rigging of linkage to governor control arm
	Low nI speed	Refer to item 12.
	Faulty overspeed governor	Replace governor

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
14. Excessive droop of nII speed	Aircraft maximum gross weight exceeded	Correct loading
	Droop compensator adjustment wrong	Adjust droop compensator cam setting and check rigging of linkage
	Low nI speed	Refer to item 12
15. Overspeed nII	Faulty overspeed governor	Replace governor
	ENGINE GOV switch in EMER position or faulty transfer solenoid	Refer to item 9
16. High exhaust gas temperature during steady-state operation	High setting of nI speed	Refer to item 11.
	Air inlet obstructed	Clear air inlet
	Anti-icing valve staying open; external loss of air	With anti-icing switch at closed position and engine operating, check for flow of hot air from vent holes at forward engine mounts. Air flow means valve is open. Repair electrical circuit or replace faulty valve
	Faulty interstage airbleed band; external loss of air	Inspect band for severe bends, damage to teflon, teflon separating from band, and adjustment for proper closure. Repair or replace band if necessary
	Combustion chamber drain valve fails to close; external loss of air	With engine operating, place finger over end of drain line. If air is felt, valve is open; repair or replace
	Low air flow; dirty compressor	Clean engine internally with walnut shell grit
	Faulty exhaust gas temperature gaging system	Check system with Jet-Cal tester; repair or replace faulty wiring or units
	Internal loss of air; damaged first stage turbine nozzle or leaking asbestos seal	Internal inspection and repair of engine combustion section
	Fuel control not properly adjusted	Refer to item 11
17. High exhaust gas temperature during acceleration	All probable causes for same condition in steady-state operation	Refer to item 16
	ENGINE GOV switch in EMER position, or transfer solenoid faulty	Refer to item 9
18. Exhaust gas temperature fluctuating or not indicating	Faulty indicating system	Check indicating system with Jet-Cal tester. Repair wiring or replace faulty units

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
19. Fluctuating exhaust gas temperature, nI and nII speeds, and torquemeter pressure	Faulty overspeed governor	Replace governor
	Faulty fuel control	Replace fuel control
	Faulty indicating system	Check separate indicating systems; repair or replace faulty parts
20. Slow acceleration	Refer to item 17	Refer to item 17
	Faulty fuel control	Replace fuel control
	Improperly adjusted fuel control	On T53-L-11 engines replace fuel control; on all other engines adjust fuel control
21. Engine surge during acceleration	ENGINE GOV switch in EMER position, or transfer solenoid faulty	Refer to item 9
	Fuel control faulty or not correctly adjusted	Adjust or replace fuel control
	Interstage airbleed malfunction	Check operation. Clear any restriction in air lines. Replace faulty units
22. Low torquemeter indication	Faulty pressure indicator or transmitter	Check by using direct reading pressure gages at torquemeter and vent connections on engine. Replace faulty units.
	Low nI speed	Refer to item 12
	B Low torquemeter boost oil pump pressure	Check and adjust torquemeter boost oil pump pressure, by instructions for oil system
	Damaged torquemeter sealing ring	Internal inspection and repair of engine reduction gear section
23. High torquemeter indication	Faulty pressure transmitter or indicator	Refer to item 22
	B Torquemeter valve fails to close	Try to reseat valve by use of compressed air at engine ports, by procedure in oil system instructions. If this fails internal inspection and repair of engine will be required
	High nI speed	Refer to item 11
	Main drive shaft binding	Align drive shaft
24. Torquemeter response slow	Clogged torquemeter filter	Remove and clean filter
25. No oil pressure	Loose hose connections	Check oil system for leaks
	Oil tank empty or shut-off valve closed	Fill tank. Test valve operation, replace if faulty
	Faulty oil pressure gage system	Try direct reading gage at pressure tap on engine oil filter. If pressure is indicated, repair circuit or replace units of gage system
	Oil pump coupling sheared	Replace pump coupling

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
26. Low oil pressure	Low oil level	Service tank
	Faulty oil pressure gage system	Refer to item 25
	Clogged oil filter	Clean filter
	Oil pump inlet fitting incorrectly installed	Install fitting correctly
	Oil pump relief valve setting wrong	Adjust oil pressure, or replace faulty pump
27. High oil pressure	Faulty oil pressure gage system	Refer to item 25
	Oil pressure lines restricted	Check lines for restrictions
	Clogged oil filter, bypass valve open	Clean filter
	Oil pump relief valve setting wrong	Adjust oil pressure, or replace faulty pump
28. High oil temperature	Low oil supply	Fill tank
	Oil cooler blower inoperative	Repair or replace faulty air line or blower
	Obstructed or faulty cooler or thermal valve	Clear oil cooler air flow. Replace faulty cooler or valve
	Restriction in oil system	Clean oil filter and check all lines for restrictions
29. Excessive oil consumption.	a. Excessive oil in aircraft oil tank.	a. Drain to proper level. Refer to airframe manual.
	b. Seals, fittings and lines	b. Tighten or replace fittings or lines. Replacement of internal seals will be required of overhaul.
	c. Output shaft seal damaged.	c. Replace output shaft seal. Request assistance from field maintenance.
	d. Number one main bearing seal leaking.	d. Check for indications of oil leakage on inlet guide vanes, compressor bleed band holes, or mating surfaces of compressor housings. If evident, engine shall be forwarded to overhaul for seal replacement.
	e. Number three main bearing seal leaking.	e. Check for smoke from tailpipe and oil stains on rear face of power turbine disc. Replacement of the second stage turbine rotor seal is required, if such indications are evident. Request assistance from field maintenance.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
	f. Number two bearing aft seal leaking. Request assistance from field maintenance. Check for smoke from tail-pipe and oil stains on the forward face of first turbine rotor and curl. Replacement of seal is necessary if such indications are evident.	
	g. Cracked pressure or scavenge oil tubes in air diffuser. Indications are same as (f), above. Brazing of tubes will be required. Request assistance from field maintenance.	
30. Engine fails to shut-off	Faulty fuel system control circuits	Check operation of circuits, replace faulty switches or units
31. Coastdown time of compressor rotor too short	Internal binding	Motor engine to check for noise and signs of binding. Refer to item 2.

5-31. ***Engine Over-Limits Conditions.*** a. In any case where engine is operated over normal limits, be sure exact circumstances are recorded properly on DA Form 2408-13 (Pilot's and Mechanic's Remarks column).

b. Notify proper authority to initiate action for special inspections, when required, to be accomplished by qualified personnel.

c. Fuel specified for normal use for each engine model is designated in fuel servicing instructions. (Refer to paragraph 1-71.) For alternate and emergency fuels refer to TM 55-1520-211-10 and TB AVN 2.

5-32. Engine Mounts. (See figure 5-10.) Engine is suspended at three points by supports made of steel tubing which are attached to fittings on service deck. Bipod at right and tripod at left have pillow blocks with hinged caps to hold bearings of two trunnion fittings installed on mounting pads at each side of engine diffuser housing. Left pillow block has a bracket for a bellcrank in power lever control system, and rear firewall brace rods attach on pillow blocks and aft deck fittings. A forward support tube is bolted to a trunnion fitting on left side of engine inlet housing. On UH-1A forward support tube and front leg of tripod are on a single deck fitting; on UH-1B, two separate deck fittings are provided at this location. On both models, a flat spring is installed to hold bipod upright when engine is removed.

5-33. ***Inspection — Engine Mounts.*** a. Inspect engine mount adapters for security, cracks and general condition.

b. Inspect all support arms, brace rods, bipod and tripod assemblies for bent, cracked or damaged tubes. Inspect rod end bearings and end fittings for suitability for continued service.

c. Inspect shock mounts for deterioration and separation. Inspect housing and retainer nut for damaged threads.

d. Inspect engine mount trunnion for security and scored or damaged shaft. Check

1. Support Spring
2. Bipod
3. Pillow Block
4. Latching Eyebolt
5. Bearing
6. Trunnion
7. Bearing Cap
8. Bellcrank Bracket
9. Rear Firewall Brace Rods
10. Tripod
11. Support Tube
12. Forward Mount Fitting (UH-1A)
13. Forward Mount Fitting (UH-1B)
14. Cambox Bracket (UH-1B)

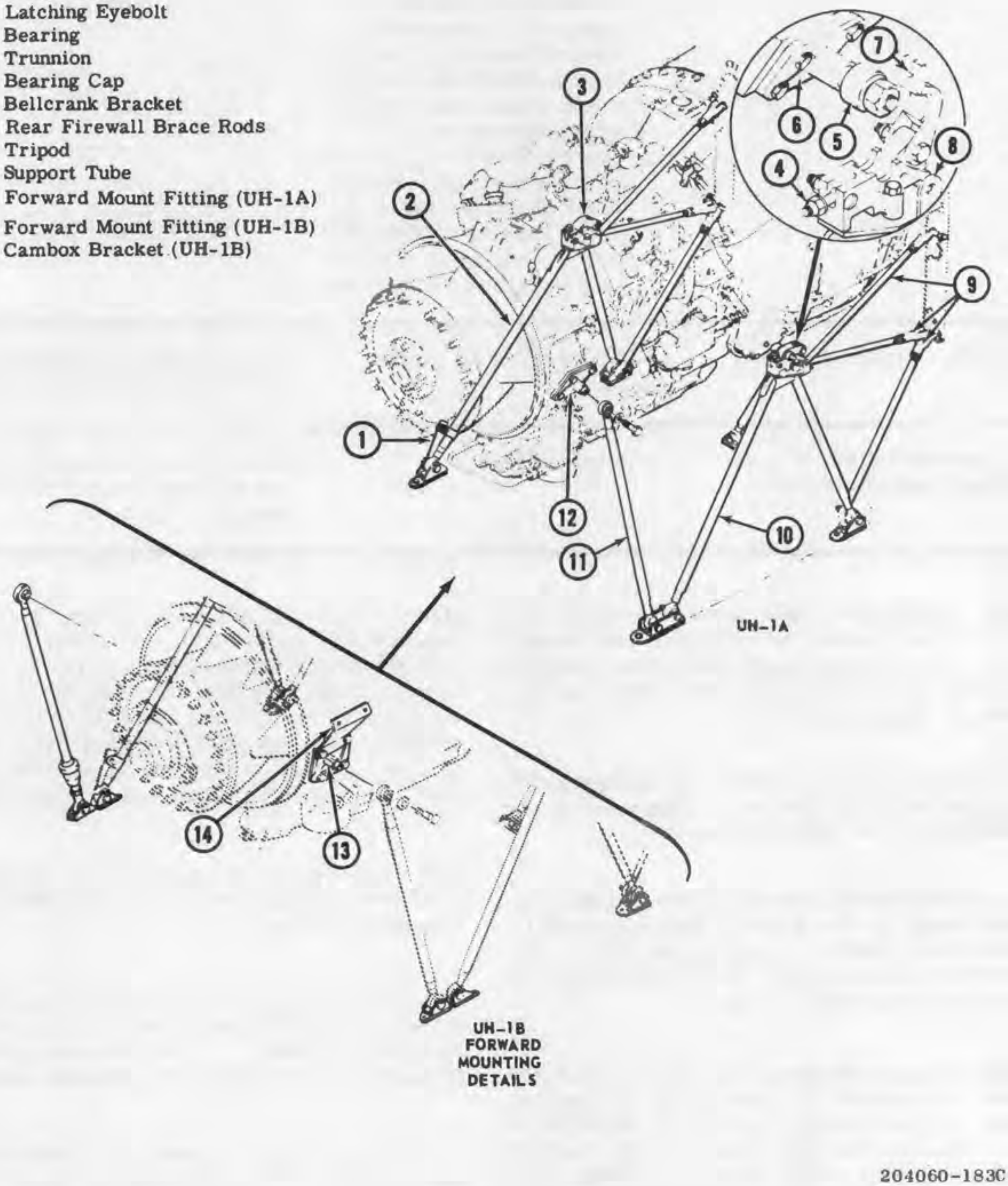


Figure 5-10. Engine mounts

trunnion bearing assembly for suitability for continued service. Inspect trunnion bearing cap and bellcrank bracket for security and damage.

e. Inspect all engine floor mount attaching brackets and all fittings for security, cracks and general condition.

f. Inspect aft trunnion bearing (5, figure 5-10) and upper rod-end bearing on forward support tube (11) for maximum allowable radial wear of 0.003 inch and maximum allowable axial wear of 0.006 inch.

5-33A. *Repair or Replacement — Engine Mounts*. Replace all parts which do not meet inspection requirements. (Refer to paragraph 5-33.)

B 5-34. Interstage Airbleed System — UH-1B. On UH-1B an interstage airbleed system is provided on the engine to aid acceleration of compressor rotor by automatic release of some compressed air through bleed holes around exit end of axial compressor housing. A bleed band over these holes is operated by a piston-type actuator, spring-loaded to open position. Closing of band occurs when air pressure taken from engine diffuser, is applied to actuator piston.

B 5-35. On T53-L-5/9/9A engines, the airbleed actuator is controlled by a valve assembly which senses the ratio of compressor discharge air pressure to inlet air pressure, through hoses connected to the diffuser and to the inlet housing. (Figure 5-11.) With this system, bleed band is open during start and acceleration until approximately 74 percent nI rpm is reached. At this point, the bleed band closes tightly over bleed holes and remains closed during operation at higher power settings.

B 5-36. On T53-L-11 engine, the airbleed actuator incorporates a relay valve with an air pressure connection to the diffuser housing and a sensing connection to a controlling valve in the engine fuel control assembly. (Figure 5-12.) In this system the bleed band is open not only at speeds below approximatetly 70 percent nI rpm, but also in response to transient acceleration demands at higher speeds, as directed by sensors in the engine fuel control assembly.

B III 5-37. *Operational Check of Interstage Airbleed on T53-L-11 Engine*. Whenever a fuel control or an airbleed actuator has been replaced on a T53-L-11 engine, perform this procedure to determine proper opening and closing operation of bleed band.

Note

Comparable procedures for T53-L-5/9/9A engines are not performed in Organizational Maintenance.

a. Start engine and stabilize at flight idle.

b. Advance throttle twist-grip gradually until bleed band is seen to close by an observer stationed near engine. Note speed at which closing occurs shall be within limits shown on figure 5-13.

Note

If throttle control movement is too rapid, fuel control will sense acceleration and will delay bleed band closing to a higher nI rpm.

c. Be sure bleed band is closed, then rapidly accelerate (jam throttle) to obtain 80 percent nI rpm. Observe that bleed band opens during acceleration, then closes when speed is stabilized.

d. Return throttle very slowly until bleed band opens. Note nI speed at which band opens. This shall be within 2 to 8 percent of speed at which band closed during acceleration. (See figure 5-13) Example: During deceleration on a 40°F day, bleed band should not open before 70.5 percent, but must open before 64.5 percent nI rpm.

Note

If throttle movement is too rapid, the fuel control will sense a deceleration and will delay bleed band opening to a lower nI speed.

e. If bleed band does not operate within specified limits, proceed with corrective action as required, in the following sequence:

(1) Disconnect compressor pressure hose (6, figure 5-12) from air-bleed actuator. Check that hose is free of restrictions. Blow clean compressed air through hose to be sure that port in engine diffuser is clear. Reconnect hose. Repeat steps a. through d.

(2) Disconnect fuel control sensing hose (3) from actuator. Check hose for restrictions. With hose connected to fuel control, blow air through line to determine that air is bled off through fuel control without restrictions. Reconnect hose. Repeat steps a. through d.

Note

Be sure all connections are tight.

(3) If trouble still exists, replace airbleed actuator. Repeat steps a. through d.

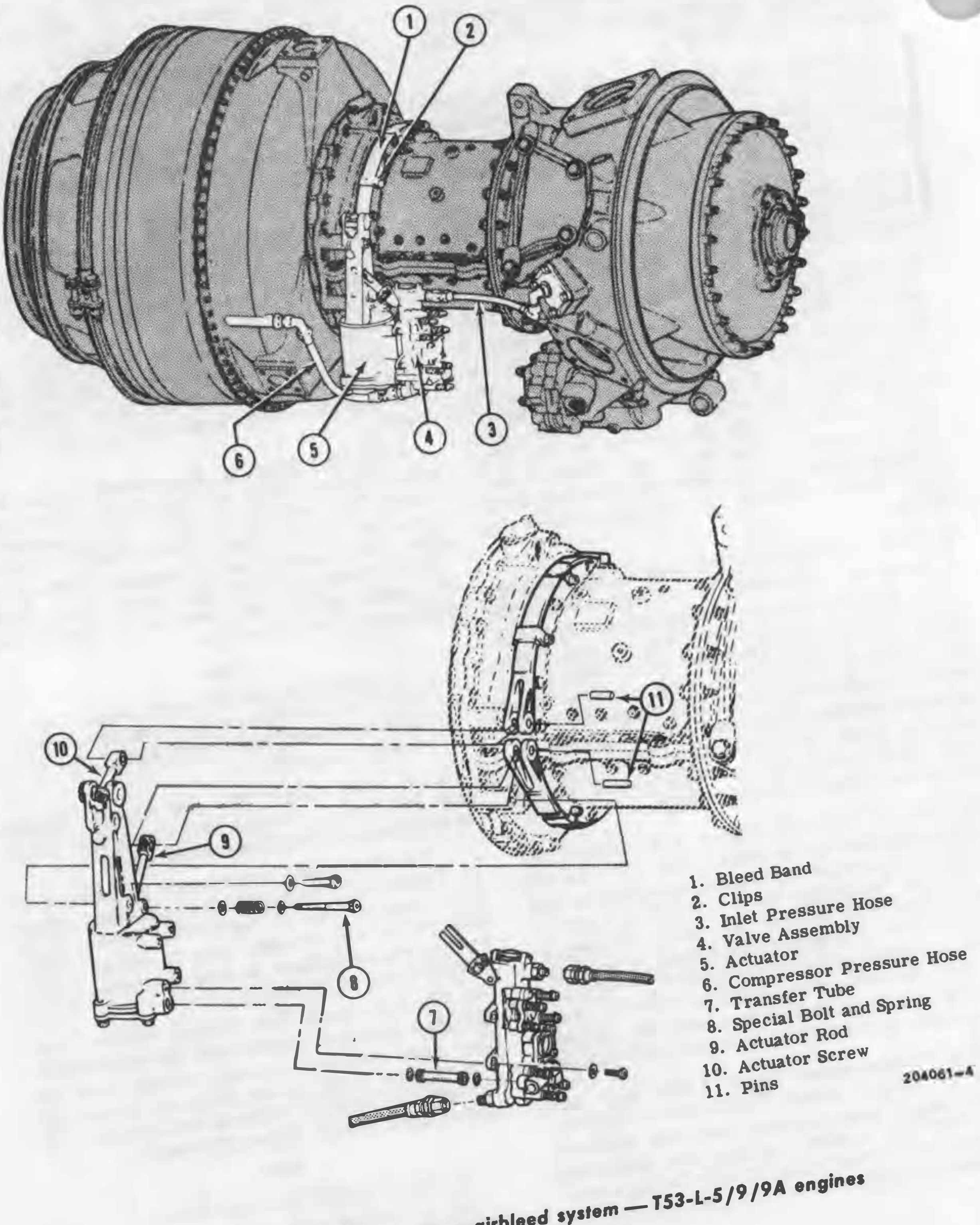


Figure 5-11. Interstage airbleed system — T53-L-5/9/9A engines

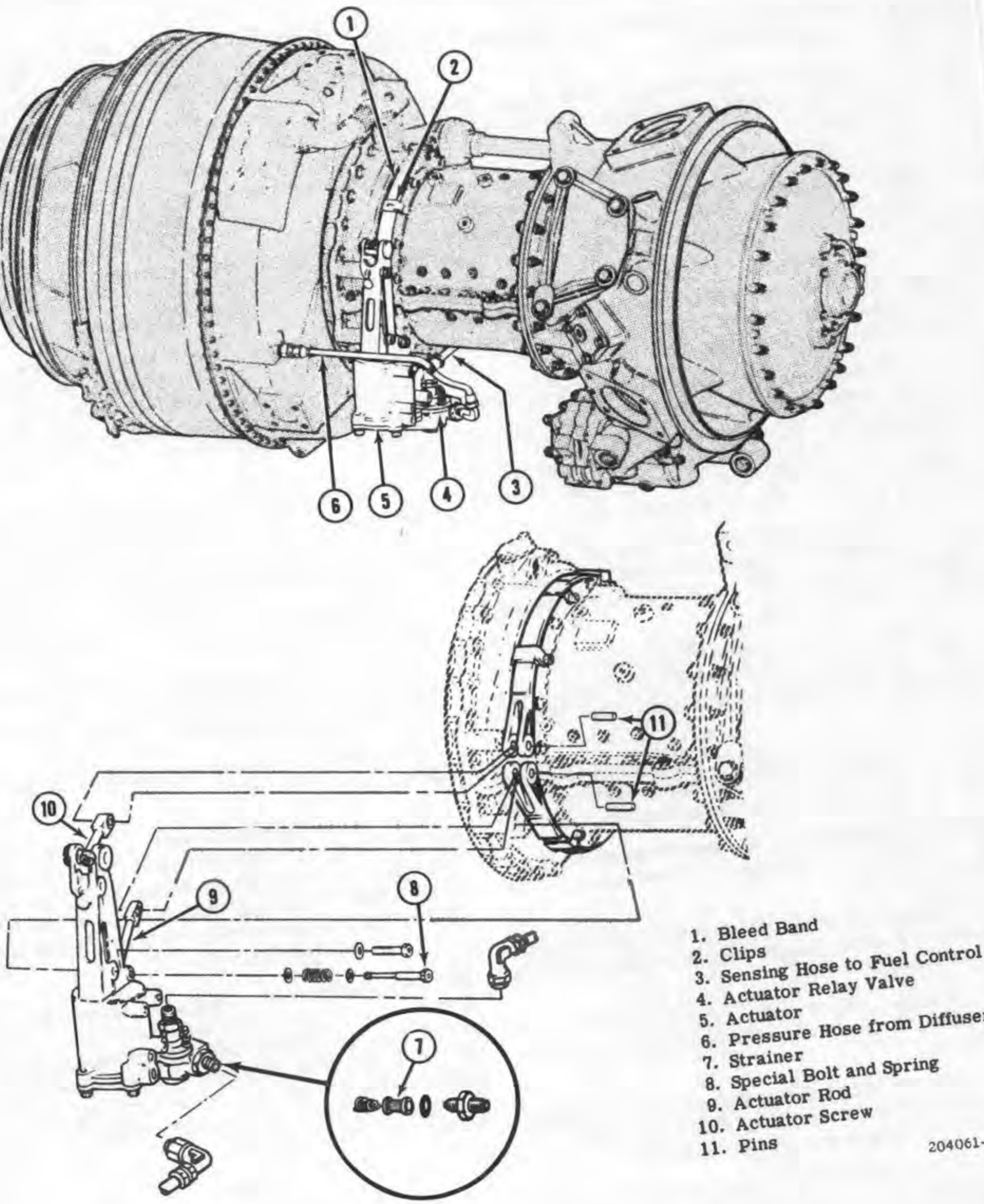


Figure 5-12. Interstage airbleed system — T53-L-11 engine

(4) If further corrective action is necessary, fuel control will be replaced. Repeat steps a. through d. to determine that bleed band operates normally.

B 5-38. *Removal — Airbleed Assemblies.* a. Open engine cowling.

b. Disconnect and remove both hoses from interstage airbleed assembly. Cap open fittings and hoses.

(1) On T53-L-5/9/9A engines, disconnect hoses from unions on airbleed valve assembly, from elbow on inlet housing, and from union on diffuser housing. (See figure 5-11.)

(2) On T53-L-11 engine, disconnect pressure hose between engine diffuser and airbleed actuator, and sensing hose between actuator and fuel control (See figure 5-12.)

c. If necessary to remove airbleed valve assembly separately on T53-L-5/9/9A engine, support the valve assembly (4, figure 5-11) while removing four bolts and washers which secure it to actuator (5). Carefully remove valve, transfer tube (7) and packings.

d. Support the actuator. Remove two bolts and washers at upper and lower outboard attachment points, and remove inboard bolt with washers and spring.

e. Pull actuator outward to expose ends of bleed band connected to actuator rod and screw. Remove two pins to detach bleed band. Remove actuator.

f. Remove nut, washer, and screw to separate two sections of bleed band. Remove band by sliding each section out through clips.

B 5-39. *Inspection — Airbleed Assemblies.* a. Inspect hoses and fittings for deterioration and damage.

b. Inspect airbleed actuator for cracks, nicks, burrs and wear. Inspect springs for distortion and rods for bending.

c. Inspect teflon tape on upper and lower bleed bands for tears, cuts and separation from bands.

d. Inspect bleed bands for worn or elongated bushings and for bending that may cause improper seating on compressor housing.

e. Inspect screw that joins upper and lower bleed bands to make sure that it can be installed flush with or below the surface of the inside diameter of the bleed band assembly.

B 5-40. *Repair or Replacement — Airbleed Assemblies.* a. Replace all hoses and fittings unsuitable for continued service.

b. If tape separation occurs on either section, remove tape from both sections to allow use without tape. Proceed as follows:

(1) Loosen end of tape from band with a knife. Grasp end of tape with suitable pliers. Carefully hold band so as to avoid deforming while rolling back tape until removed.

Warning

Use protective garments and avoid prolonged breathing of vapors when using stripping compounds.

(2) Remove epoxy resin adhesive residue from band by applying paste stripping compound, (item 232, table 1-1) or equivalent, with a brush. Allow paste to remain at least 20 minutes or until adhesive has loosened completely.

(3) As an alternate method of removing adhesive, immerse band sections in a stripping solution, (item 324, table 1-1) or equivalent, for 20 minutes or until adhesive is loosened.

(4) Wash band in hot water to remove all residue. Air dry.

(5) After reinstalling airbleed assemblies, adjust for proper fit of bleed band to compressor housing. (Refer to paragraph 5-42.)

c. Replace bleed band assembly if band is damaged.

d. If screw joining upper and lower bleed bands cannot be installed flush with or below the surface of the inside diameter of the bleed band assembly reduce thickness of screw head and height of countersink in lower bleed band. (See figures 5-13A and 5-14.)

B 5-41. *Installation — Airbleed Assemblies.* a. Insert bleed band sections through clips from right side of engine compressor housing. At left side, lap end of upper section over lower section, align holes and insert flathead screw from inside band. Hold screw while installing washer and nut.

Note

Make sure that flathead screw is installed flush with, or below, surface of inside diameter of bleed band assembly.

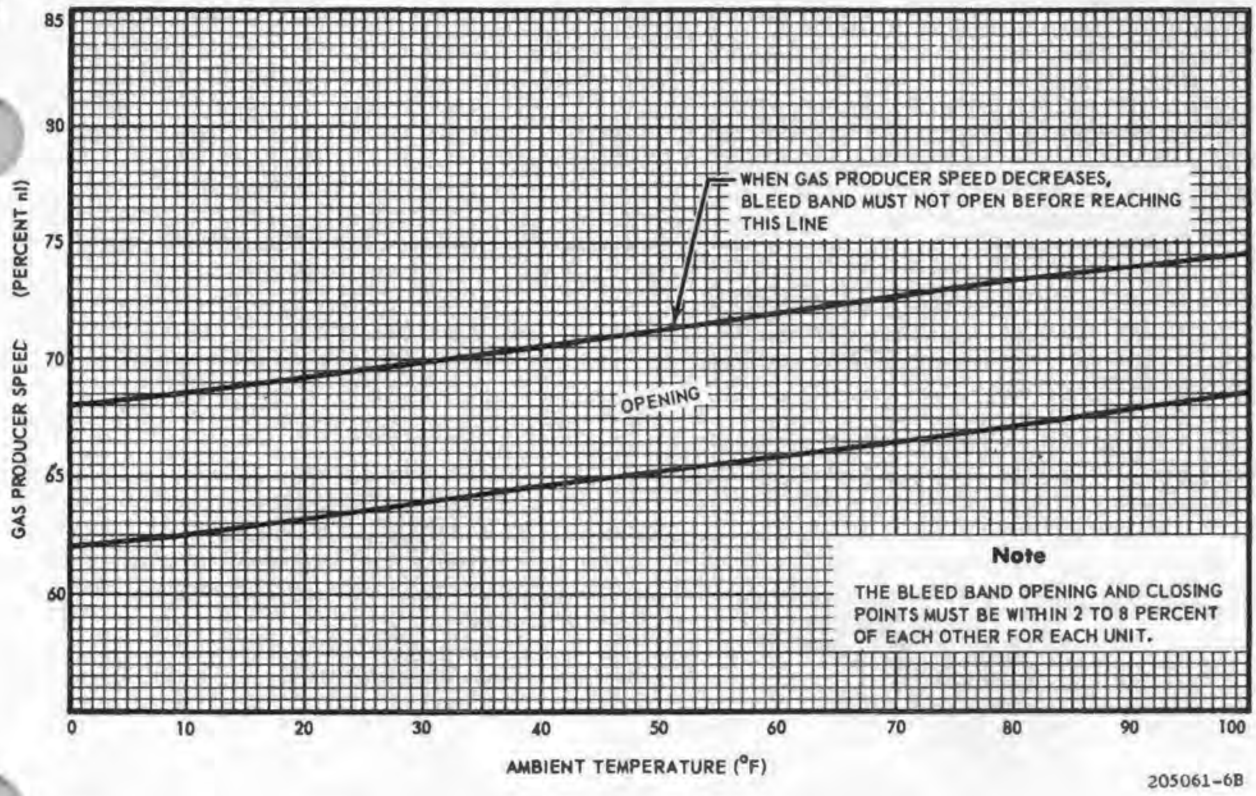


Figure 5-13. Bleed band open — close limits — T53-L-11 engine

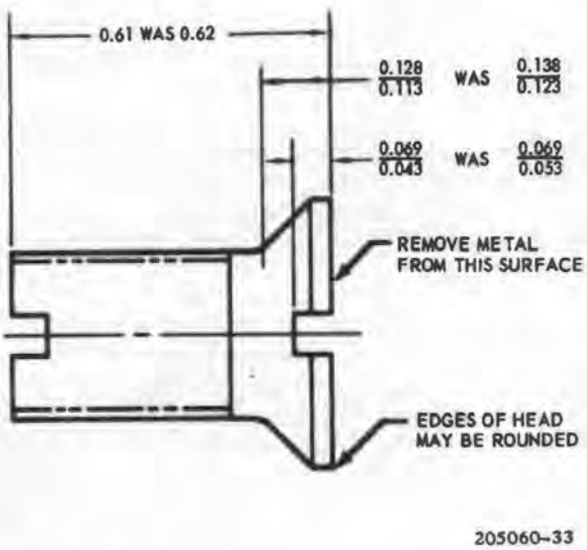


Figure 5-13A. Bleed band screw rework

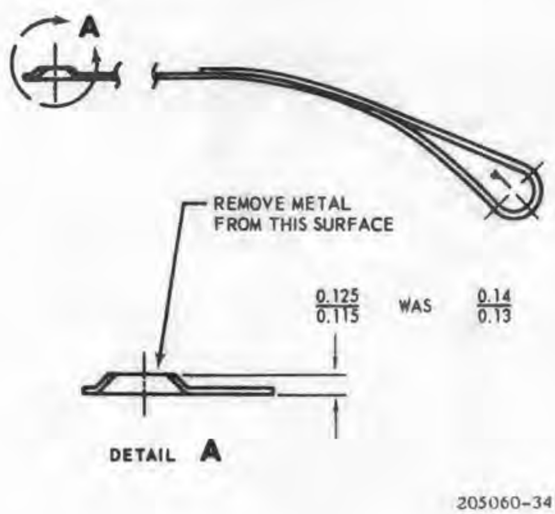


Figure 5-14. Bleed band and screw rework

b. Hold actuator at mounting position while attaching ends of bleed band to actuator rod and actuator screw with pins.

c. Align actuator to mounting bosses, making sure that actuator rod and screw with attached ends of bleed band are properly within actuator housing. Install two bolts, with washers, in lower outboard and upper mounting holes. Finger tighten bolts.

d. Place spring, with a washer at each end, on special bolt and insert in lower inboard mounting hole of actuator. Bottom spring-loaded bolt in tapped hole.

e. Tighten upper and lower outboard bolts. Lockwire all bolt heads.

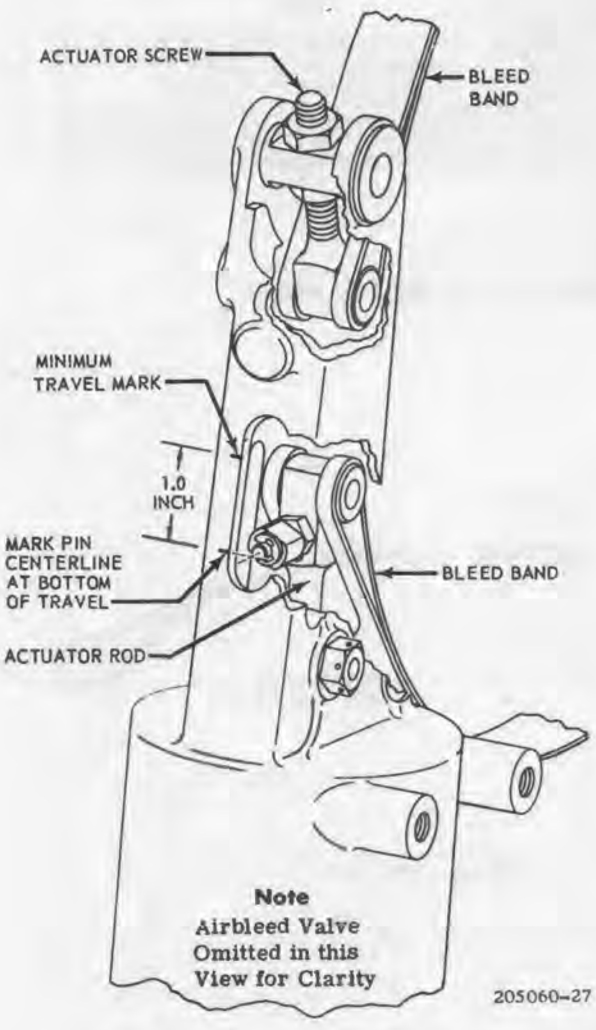


Figure 5-15. Adjusting bleed band

f. On T53-L-5/9/9A engine, install airbleed valve assembly (if separated from actuator) and connect hoses as follows:

(1) Place packings on each end of transfer tube (7, figure 5-11) and insert tube into actuator port.

(2) Hold airbleed valve assembly (4) to mounting position against actuator, with transfer tube inserted into valve body.

(3) Guide forked lever of valve onto sleeve of controller drive pin, located on actuator rod.

(4) Secure valve assembly to actuator lockwire bolts.

(5) Connect hose (3) between elbow on engine inlet housing and union on upper front of valve. Connect hose (6) between unions on engine diffuser housing and on lower rear of valve assembly.

g. On T53-L-11 engine connect hoses to actuator as follows:

(1) Connect hose (3, figure 5-12) from fitting on rear of fuel control to union on upper side of actuator relay valve (4).

(2) Be sure sediment strainer (7) is installed under reducer at front of actuator relay valve housing. Connect hose (6) from fitting on engine diffuser housing.

h. When a new airbleed actuator is installed on T53-L-11 engine, perform an operational check. (Refer to paragraph 5-37.)

B 5-42. *Adjusting Bleed Band.* Travel of airbleed actuator piston and tightness of bleed band should be checked and adjusted after any replacement of bleed band or actuator assembly.

a. With engine not operating, observe piston rod through slot in actuator housing. Place a mark on actuator housing at horizontal center line of controller drive pin (on T53-L-5/9/9A engine) or open tapped hole (on T53-L-11 engine). For minimum travel limit place another mark exactly one inch higher. (See figure 5-15.)

b. Disconnect both hoses from airbleed assembly. Connect a source of dry compressed air, regulated at 35 to 60 psig, to fitting that is normally connected to pressure hose from engine diffuser.

c. Back off outer nut to end of actuator screw, leaving at least one full thread showing beyond nut.

d. Actuate piston rod to full travel by placing finger over open upper fitting of airbleed control valve. Check travel of rod to be not less than 1.0 inch nor more than 1.2 inch.

e. Tighten outer nut on actuator screw until bleed band is snug against compressor housing, as indicated by an increase of torque on nut.

f. Release finger from valve fitting. Tighten inner nut on screw.

g. Repeat step d. If rod travel is still within limits, proceed to step j.

h. If rod travel is below 1.0 inch minimum, replace band or actuator assembly, as required, and repeat preceding steps.

i. If rod travel is more than 1.2 inches, continue to tighten outer nut on actuator screw until travel is within limits at 35 to 37 psig applied air pressure.

j. Place finger over valve fitting and increase air pressure to 60 psig.

k. Check clearance with a feeler gage between compressor housing and bleed band at each clip and where band sections join. Clearance shall be 0.001 inch loose to 0.002 inch drag fit.

l. Adjust nuts on actuator screw as necessary to obtain required bleed band clearance.

(1) To tighten band, loosen outer nut and tighten inner nut.

(2) To loosen band, loosen inner nut and tighten outer nut.

(3) After last adjustment, be sure opposite nut is tight for locking. Lockwire nuts together.

m. Release pressure and disconnect regulated pressure air hose. Connect engine hoses to airbleed assembly.

5-43. Accessory Drive Gear Box. The accessory drive gear box contains the accessory gear train. It is mounted on the underside of the inlet housing and is driven through bevel gears from the front end of compressor rotor. This gear box also serves as a scavenge oil collector sump, kept practically empty by pump.

5-44. Removal — Accessory Drive Gear Box. a. Disconnect hose assemblies (1 and 2, figure 5-16) from gear box.

b. Remove three bolts (3) and washers (4) that secure support to rear flange of inlet housing assembly.

1. Hose Assembly
2. Hose Assembly
3. Bolts
4. Washers
5. Accessory Drive Gear Box
6. Shouldered Bolt
7. Bolt
8. Bolt
9. Washer
10. Washer
11. Washer
12. Accessory Drive Shaft
13. Packing

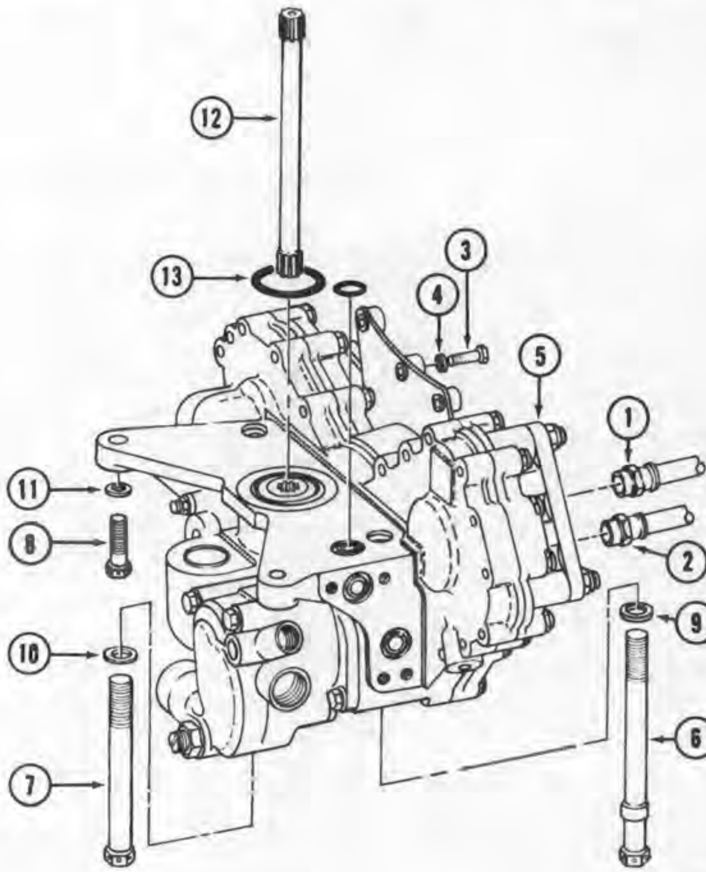


Figure 5-16. Accessory drive gear box — removal and installation

c. Support gear box (5) and remove shouldered bolt (6), bolts (7 asd 8) and washers (9, 10 and 11) that secure gear box to inlet housisg.

d. Remove accessory drive gear box (5) and accessory drive shaft (12) from inlet housing.

5-45. *Inspection — Accessory Drive Gear Box.* Visually inspect accessible seals for evidence of leakage.

5-46. *Repair or Replacement — Accessory Drive Gear Box.* Replace accessible seals when leakage is evident. (Refer to paragraph 5-26.)

5-47. *Installation — Accessory Drive Gear Box.* a. Place new packing (13, figure 5-16) in groove around accessory drive of gear box.

b. Insert accessory drive shaft into accessory drive carrier asembly. Use a suitable drift to support shaft.

c. Position accessory drive gear box on engine. Be sure that drive shaft drops and meshes with the shaft gear assembly.

d. Place washers (9, 10 and 11) on bolts (6, 7 and 8). Insert bolts and tighten finger-tight.

e. Use holding fixture LTC-T115 to turn gear box outer driven gear while checking through inlet housing to be sure that compressor rotor is turning. This indicates proper meshing of drive shaft.

f. Place washers (4) on bolts (3). Insert bolts and tighten finger-tight.

g. Tighten bolts (6 and 7) to 400 to 475 inch-pounds torque.

h. Tighten bolts (8) to 250 to 235 inch-pounds torque.

i. Tighten bolts (3) to 100 to 120 inch-pounds torque.

j. Lockwire all bolts.

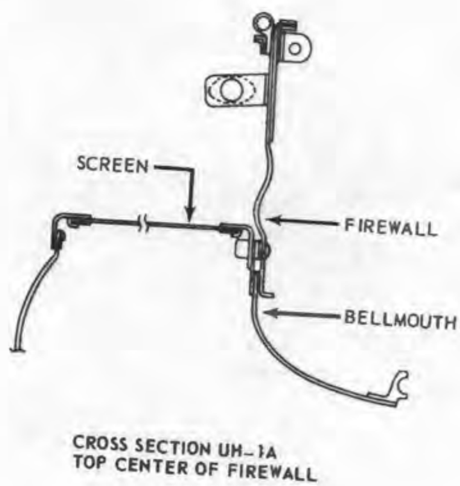
k. Connect hose assemblies (1 and 2) to accessory drive gear box.

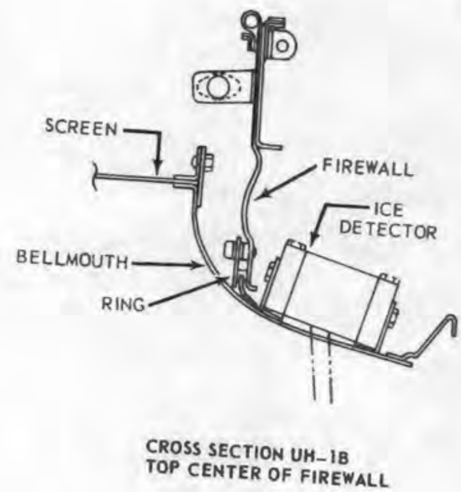
Section III — Air Induction System

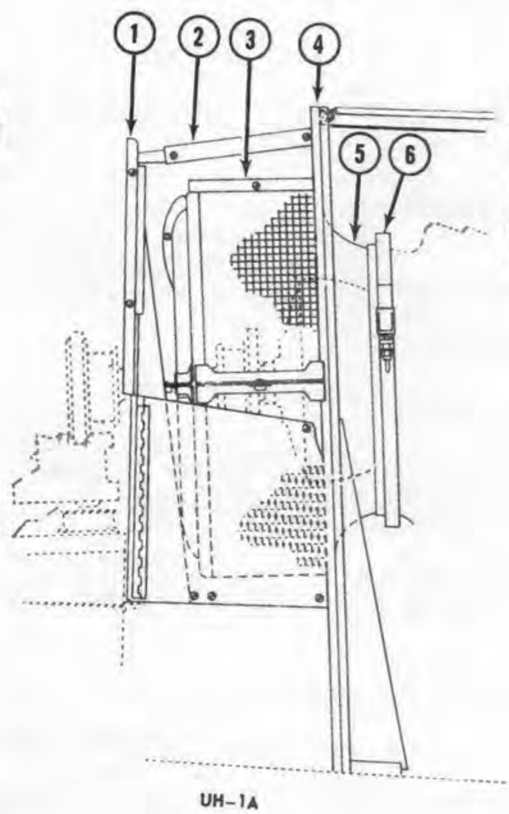
5-48. Air Induction System. (See figure 5-17.) Engine intake air enters through inlets at top of forward cowling into an induction baffle, consisting of panels assembled to form a box partially enclosing area between rear of pylon supports and forward firewall around inlet opening. A ring-shaped intake screen of coarse wire mesh covers front end of an intake bellmouth, which is mounted in central opening of forward firewall and clamped on outer flange of engine inlet housing. A gasketed flange on bellmouth forms a slip-joint seal with firewall. On UH-1A, screen is mounted on front and bellmouth on rear of firewall. On UH-1B, bellmouth extends forward through firewall, has mounting brackets for ice detector, and screen is attached directly on its front end flange.

5-49. *Engine Internal Airflow.* (See figure 5-18.) Air entering engine passes through compressor and is routed to several paths for different uses: (1) Anti-icing air is diverted at exit from centrifugal impeller into an annular chamber in its housing, to flow forward to inlet housing area. (2) Internal cooling and seal pressurization air is supplied from diffuser manifold and directed by baffles, deflectors, and internal passages to cool power shaft, compressor rotor sleeve, both faces of first-stage turbine wheel, and front face of second-stage turbine wheel. This air also is routed to pressurize controlled-gap carbon or positive contact seals which are located behind No. 1 main bearing, at both sides of No. 2 main bearing on compressor rotor, and ahead of No. 3 bearing on power turbine shaft. (3) Main portion of air flow from diffuser manifold surrounds combustion chamber and enters it through a complex pattern of scoops, louvers, slots and holes to combine with fuel in combustion, to act as a flame-fence, and for sufficient cooling to prolong service life of parts.

5-50. Atmospheric air, entering between exhaust diffuser and support cone, passes through hollow struts of exhaust diffuser to cool No. 3 and 4 bearing housing and rear face of second-stage turbine wheel.







1. Induction Baffle
2. Baffle Brace
3. Intake Screen
4. Forward Firewall
5. Intake Bellmouth
6. V-Band Clamp
7. Ice Detector (UH-1B)

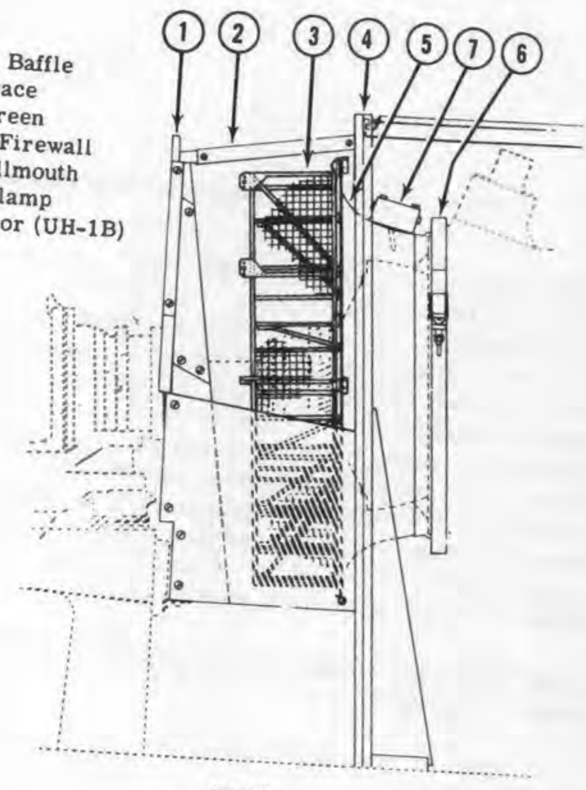


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Figure 5-17. Engine air induction areas

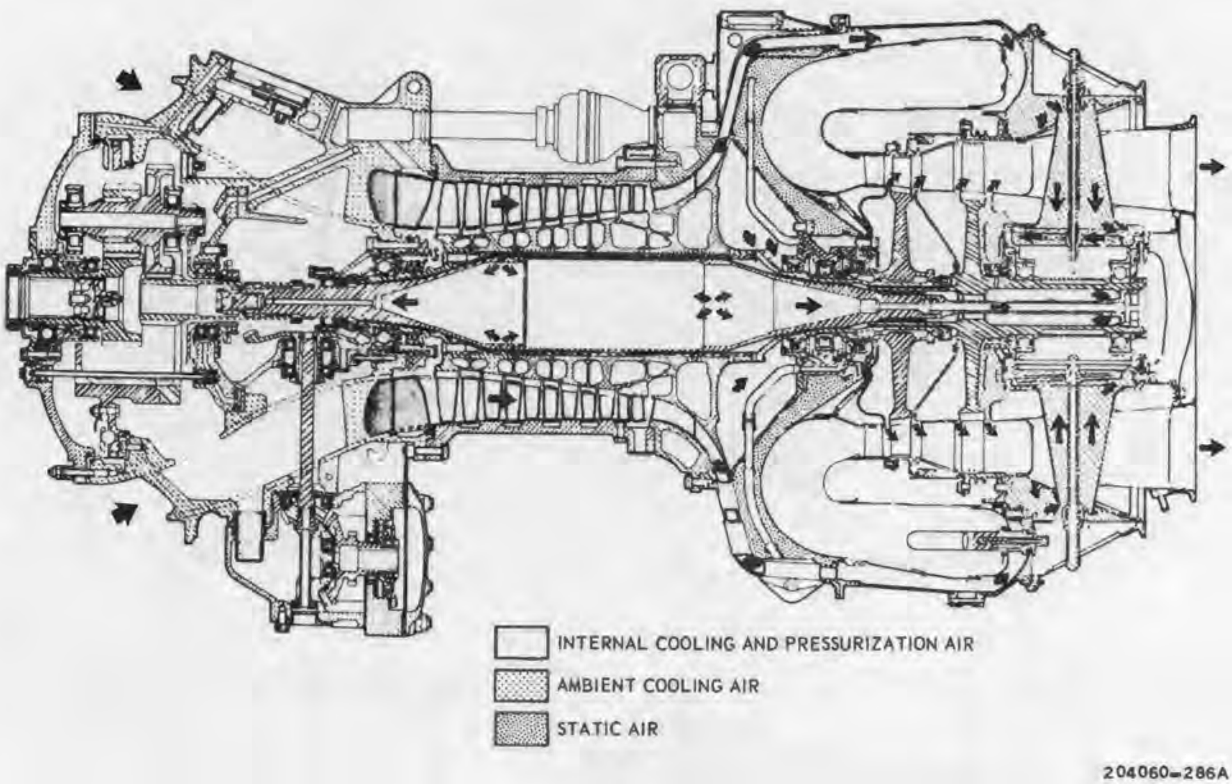


Figure 5-18. Engine internal air flow diagram

5-51. Portions of engine compressor air are also used for other purposes, which are more fully discussed in instructions for applicable systems. In brief: (1) Anti-icing air is diverted, when needed, to flow forward through an external valve and tube to inlet housing area. (2) Bleed air is taken off through an external hose to drive the oil cooling system blower. (3) On UH-1B, an interstage or acceleration airbleed system allows regulated escape of some air through ports at last stage of axial compressor during certain phases of engine operation.

5-52. Removal — Intake Baffles, Screens, and Bellmouth. (See figure 5-17.)

a. Open or remove forward cowling and engine cowling.

b. Remove access sections at upper left of intake screen and forward induction baffle panel by releasing fasteners.

c. Remove main drive shaft between engine and transmission. (Refer to paragraph 7-8.)

d. Remove induction baffle brace and panels by releasing fasteners from brackets on firewall and pylon supports.

e. Remove intake screen.

A (1) On UH-1A: Remove 18 screws around bellmouth at aft side of firewall to remove screen assembly from front of firewall.

B (2) On UH-1B, remove screws to detach screen assembly from front end of intake bellmouth.

f. Remove intake bellmouth.

A (1) On UH-1A: Remove V-band clamp which secures bellmouth to flange of engine inlet housing. Withdraw bellmouth from front side of firewall.

B (2) On UH-1B: Disconnect and remove ice detector. (Refer to paragraph 11-293.) Remove V-band clamp to release bellmouth from engine inlet housing. Remove screws with washers from back of firewall to release retainer ring and bellmouth. Lift bellmouth and tilt lower flange forward to withdraw assembly forward out of firewall.

g. Install protective covers on engine inlet.

5-52A. ***Inspection — Intake Bellmouth, Screen and Baffles.*** a. Use a strong light beam to visually inspect inlet air ducts for oil streaks, foreign material, foreign object damage, cleanliness and oil seal leaks.

Caution

Look for accumulations of dirt conforming to contour of air inlet. Build-up of foreign material may escape the attention of inexperienced personnel because of windswept contour it assumes.

b. Visually inspect inlet guide vane through air inlet ducts for foreign material and foreign object damage.

Note

In critical environment areas where operational experience shows grass and foliage blockage to be a problem, it is recommended that this inspection be performed before each flight.

5-52B. ***Repair or Replacement—Intake Bellmouth, Screen and Baffles.*** Remove all deposits, dirt and obstructions. Replace severely damaged components.

5-53. ***Installation — Intake Bellmouth, Screen and Baffles.*** a. Check condition of flanges, gaskets and seals on intake bellmouth and screen.

b. Remove protective covers from engine inlet.

c. Insert bellmouth through firewall from front, align to mating flange on engine inlet housing, and secure temporarily with V-band clamp. On UH-1B, position ice detector mounting provisions at top.

d. Attach bellmouth and screen.

A (1) On UH-1A: Position screen, with access opening at upper left, on front of firewall. Install 18 screws from back of firewall.

B (2) On UH-1B: Position bellmouth ring on front of firewall. Install screws, with thin washers under heads, from back of firewall. Position screen, with access opening at upper left, on front flange of bellmouth and secure with screws.

(3) On all models, before fully tightening screws, loosen V-band clamp and make sure bellmouth is properly aligned on inlet housing flange. Tap around clamp with soft mallet, from middle toward each end, to seat securely while tightening with 40 to 50-inch-pounds torque on clamp bolt nut. Lockwire nut. Complete tightening of screws through firewall.

e. Assemble and install induction baffle panels, securing fasteners to brackets on firewall and pylon supports. Install brace between top of forward panel and firewall.

f. Install engine-to-transmission drive shaft. (Refer to paragraph 7-12.) Install access sections of baffle and screen.

B g. On UH-1B, install and connect ice detector. (Refer to paragraph 11-295.)

h. Close cowling.

Section IV — Exhaust System

5-54. Exhaust System. Engine exhaust diffuser has inner and outer housings, separated by hollow struts across exhaust passage. Inner housing, which supports turbine assembly, is capped either by a tailcone on UH-1A through Serial No. 58-3047 or by a cover plate on UH-1A Serial No. 59-1607 and subsequent, and all UH-1B helicopters. (See figure 5-19.) A tailpipe, clamped on outer diffuser flange, directs hot exhaust gases aft and slightly up away from tail boom. Pipe has a drain hose from lowest point and, on UH-1B only, a flanged inlet on right side for connection of starter cooling air discharge duct. A support cone, around diffuser, provides mounting for rear firewall.

5-55. ***Removal — Exhaust Tailpipe.*** a. Through small access door at lower left on tailpipe fairing, disconnect antenna and anti-collision light wiring at deck connectors. Open section of drive shaft access door which overlaps end of tailpipe fairing. Release fasteners and remove fairing.

b. Disconnect drain hose at coupling on tail boom.

B c. On UH-1B, detach starter cooling duct from flanged neck on right side of tailpipe by removing V-band clamp.

d. Remove V-band clamp from mating flanges of engine exhaust diffuser and tailpipe. Lift off tailpipe.

e. To remove tailcone or cover plate from inner housing flange, cut lockwire and remove eight bolts.

f. Protect exhaust diffuser opening with fabric cover normally used on tailpipe.

5-56. *Inspection — Exhaust Tailpipe.* Inspect exhaust tailpipe for damage. Allowable damage is limited to small dents, shallow scratches, and small cracks which are away from connecting flange and which do not allow exhaust gasses to leak through and overheat structure. Overheated structure can be detected by discoloration.

5-57. *Repair or Replacement — Exhaust Tailpipe.* Replace tailpipe if damage exceeds inspection limits.

5-58. *Installation — Exhaust Tailpipe.* a. Remove protective cover from engine exhaust diffuser.

b. Position tailcone or cover plate over center opening of diffuser. Install eight bolts through cone or cover into captive nuts of mounting flange, using anti-seize compound

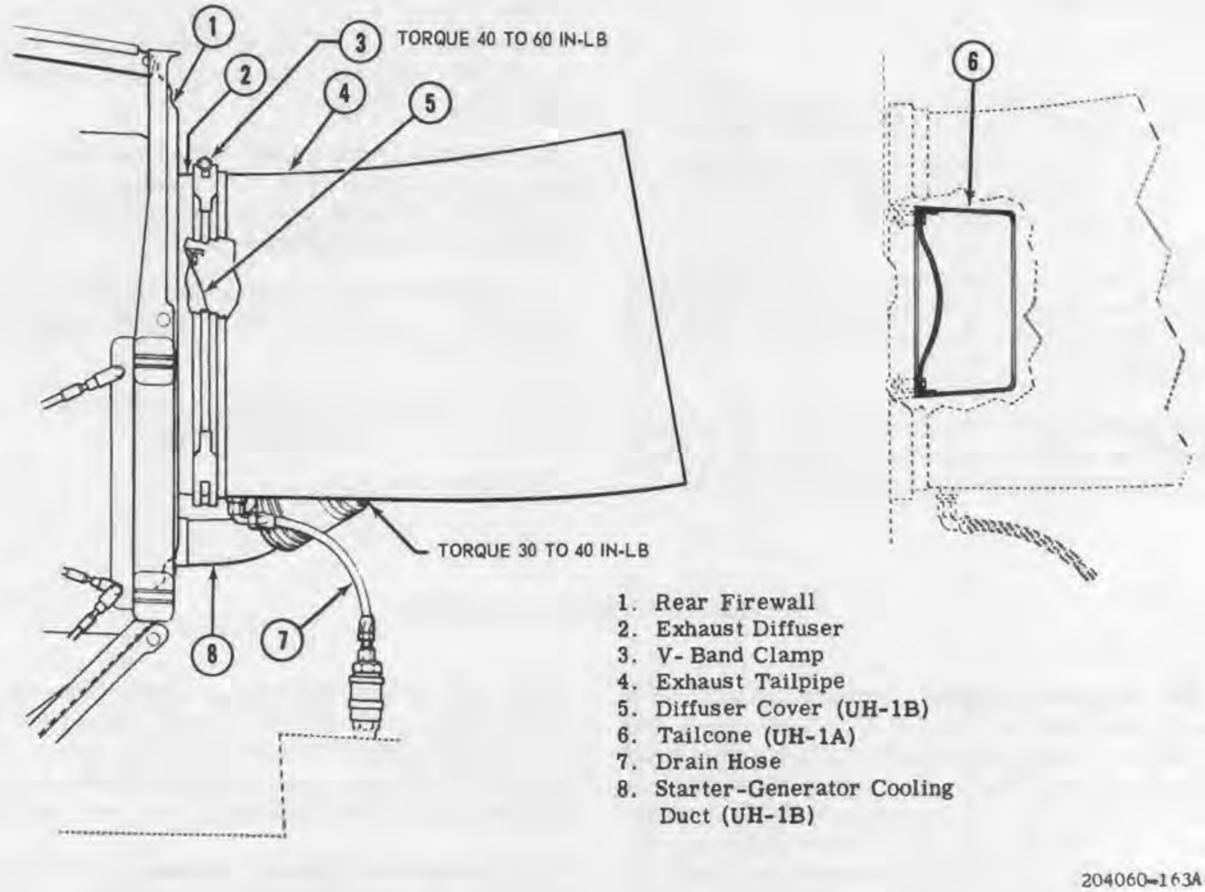


Figure 5-19. Exhaust tailpipe installation

suitable for high temperature. (Refer to paragraph 5-17.) Lockwire bolt heads.

c. Position tailpipe on outer flange of diffuser, with drain fitting down and locating dowels engaged. Make sure inside of pipe is aligned with exhaust diffuser. Secure with V-band clamp around flanged joint. Seat clamp by tapping with soft mallet from middle toward ends, while tightening both nuts on clamp bolts with 40 to 60 inch-pounds torque. Repeat this procedure at least twice to insure proper seat and torque application. Check torque again after test flight or engine ground check.

d. Connect drain hose from tailpipe to coupling on tail boom.

B e. On UH-1B, attach starter-generator cooling duct with V-band clamp to flanged port on right side of tailpipe. Tighten clamp nut with 30 to 40 inch-pounds torque.

f. Install tailpipe fairing, connecting antenna and anti-collision light wiring at deck connectors. Close drive shaft access door.

g. Place protective cover on tailpipe.

5-59. Exhaust Thermocouples. Three thermocouple probes, on rigid harness with a flexible cable connection to exhaust gas temperature indicator, are inserted into diffuser ahead of tailpipe.

5-60. Removal — Exhaust Thermocouple. a. Remove exhaust tailpipe. (Refer to paragraph 5-55.)

b. Remove upper section of rear firewall.

(1) Disconnect fire detector leads and pull leads and pull hinge pins to remove engine cowling doors.

(2) Remove brace between tops of front and rear firewalls by pulling out pin at each end.

(3) Disconnect brace rods by pulling two pins at each side of rear firewall.

(4) Disconnect exhaust temperature indicator circuit leads at connector on right front of rear firewall.

B (5) On UH-1B, disconnect starter-generator cooling exit duct by removing V-band clamp at right side ahead of rear firewall.

(6) Unlatch five fasteners which secure upper to lower sections of rear firewall.

(7) Remove lockwire and open-V-band clamp which secures adapter ring of rear firewall to support cone flange of engine.

(8) Carefully remove firewall assembly and clamp from engine.

c. Remove six nuts which secure three flanges of thermocouple assembly on exhaust diffuser studs.

d. Remove thermocouple assembly, working probes carefully out of exhaust diffuser with least possible flexing or bending of rigid conduit.

5-61. Inspection — Exhaust Thermocouple. Make functional and continuity checks of thermocouple harness with standard test equipment. Inspect rigid and flexible sheaths and connector for visible damage.

5-62. Repair or Replacement — Exhaust Thermocouple. Replace damaged or unserviceable thermocouple and harness.

5-63. Installation — Exhaust Thermocouple. a. Place thermocouple assembly on exhaust diffuser carefully to avoid excessive flexing of conduit or damage to probes. Insert probes in three mounting ports, with flexible cable to lower right. Install three pairs of nuts to secure mounting flanges on studs.

b. Reinstall upper section of rear firewall.

(1) Place V-band clamp on exhaust difuser support cone.

(2) Place upper firewall assembly over end of exhaust diffuser. Seat clamp over mating flanges of support cone and firewall adapter ring, securing clamp bolts temporarily.

(3) Attach brace rods to sides of firewall with pip-pins.

(4) Secure upper to lower firewall with five fasteners.

(5) Install brace between tops of front and rear firewalls, secured by pin at each end.

(6) Loosen 16 screws around adapter ring to permit alignment.

(7) Position V-band clamp so that end loops will not touch ends of screws, and to clear fuel manifolds. Seat clamp securely by tapping with soft hammer from middle of each section toward ends, while tightening nuts with 40 to 50 inch-pounds torque. Lockwire.

(8) Tighten 16 screws around firewall adapter ring.

(9) Connect exhaust temperature indicator circuit wiring at connector on right front of firewall.

B (10) On UH-1B, connect starter-generator cooling exit duct. (Refer to paragraph 5-243.)

(11) Reinstall engine cowling doors on firewall hinges. Connect fire detector wiring.

c. Install exhaust tailpipe. (Refer to paragraph 5-58.)

Section V — Fuel System

A 5-64. Fuel System — Model UH-1A. (See figure 5-20.) Fuel supply on Model UH-1A is from two rubber cells, located in fuselage at each side of cargo sling compartment, interconnected by two crossover tubes and a vent line. Filling is through right-hand cell, and both cells can be emptied through a defueling valve on aft crossover tube. Left-hand cell has a fuel quantity gage tank unit, a float switch for 20 MINUTE FUEL caution panel light, a sump with drain valve, and an electrically operated boost pump with external poppet drain valve and seal drain tube. Pump discharges through a submerged hose to an outlet connection on left wall of cargo sling compartment. Main fuel line extends from this tank outlet aft through a shut-off valve in main fuselage compartment, up through service deck to main fuel strainer, then through a quick-disconnect hose to inlet of engine fuel control unit. A thermal relief valve accommodates expansion of fuel trapped above shut-off valve. Fuel pressure gage transmitter, pressure switch for caution panel light, and fuel supply line to heater are connected to main fuel line below deck. On Serial No. 59-1607 and subsequent, right-hand fuel cell is provided with a sump assembly having a manual drain valve. When modified by MWO 55-1520-207-20/23, system includes a fuel control vent line extending from an engine deck coupling to a connection on fuel cell forward crossover tube. This line has a check valve and during operation, carries a continuous return flow from a hose tap on overspeed governor housing to rid system of any trapped air which might cause engine flame-out.

B 5-65. Fuel System — Model UH-1B (Serial No. 60-3546 through 64-14100.) (See figure 5-21.) Fuel supply system on UH-1B helicopters (Serial No. 60-3546 through 64-14100) also has two interconnected cells, filled from right side and drained through defueling valve at left. Each cell is equipped with a sump and boost pump assembly, a float switch for 20 MINUTE FUEL caution panel light, and a fuel quantity gage tank unit. Both pumps are electrically operated and controlled by MAIN FUEL switch. Pump outlet lines are separate branches to main supply line tee on rear wall of cargo sling compartment, each line having a check valve to prevent reverse flow and a pressure switch to light one of two caution panels if a pump failure should occur. Either pump alone can maintain normal fuel flow and pressure. A shut-off valve, connected to MAIN FUEL switch, controls supply line flow through main fuel strainer to a quick-disconnect coupling for engine fuel control inlet hose. Two thermal pressure relief valve lines are provided to relieve expansion of fuel trapped in upper part of system. A branch line from strainer outlet tee serves a pressure gage transmitter, provides a connection for heater fuel supply, and has a trap drain valve and line. Fuel control vent line piping, with a directional check valve, is installed between a quick-disconnect coupling on engine deck and a connection on fuel cell forward crossover tube. With T53-L-9, -L-9A or -L-11 engines, or with any T53-L-5 engine modified to have a fuel control vent hose from a tap on governor housing, this line carries a continuous return flow from fuel control to rid system of any trapped air which might cause engine flameout.

Note

> Model UH-1B helicopters have a fuel low level warning light which warns the pilot when there is enough fuel remaining for approximately 20 minutes flight time at cruise power. If either fuel boost pump fails and the fuel low level light illuminates, flight time is reduced to five minutes.

B 5-66. Fuel System—Model UH-1B. (Serial No. 64-14101 and subsequent.) (See figure 5-22.) Fuel supply system on Model UH-1B helicopters, Serial No. 64-14101 and subsequent, has two interconnected, self-sealing type, fuel tanks which are filled through the top of the left-hand tank. Additional fuel may be transferred into the main fuel tanks from internal auxiliary fuel tank(s) through the lower crossover assembly (11), and from external auxiliary fuel tanks through sump fittings (21). Both main fuel tanks are equipped with a sump assembly and a fuel boost pump (17). A fuel pump drain valve (20) and pump seal drain line (25) facilitate draining the system. A sump drain valve is incorporated in the external auxiliary fuel fitting (21). A gravity defuel valve (22) is located in the bottom of the left-hand fuel tank sump assembly, and a trap drain valve (24) is to be found at mid-point of the lower crossover assembly (11). The left-hand fuel tank also contains the fuel low-level warning switch (19), the fuel quantity transmitter (18) and the high level auxiliary fuel float switch (15). Both main fuel tanks are vented. A siphon breaker valve (12), located on top of the left-hand tank, prevents siphoning through the vent lines. Fuel flows from boost pumps (17, in the main fuel tanks to a manifold assembly (7) which contains check valves, pressure switches and thermal relief provisions. Fuel then passes through the motor operated shutoff valve (5), which contains a thermal relief valve and through the fuel filter (2) into the engine fuel system. A fuel pressure transmitter (4) senses fuel pressure at fuel filter outlet and transmits this pressure to pressure gage in pilot's compartment.

5-67. *General Maintenance — Fuel System*. Organizational maintenance will consist of visual inspections, ground operational checks, cleaning of filters and strainers, specified adjustments of control linkage systems and fuel control unit as required, and replacement of piping, fittings, seals, and units which are accessible without extensive disassembly. Procedures for replacing or adjusting principal components are provided in the paragraphs which follow. Observe these general notes and precautions:

a. Conduct any defueling or drainage of fuel in accordance with applicable directives, and with extreme care to avoid fire hazards.

b. For defueling, use valve connected to aft crossover tube and accessible through door of largest compartment on left side of fuselage. Disconnect battery before defueling. Use sump drain valves to empty cells of fuel trapped below level of crossover tubes.

c. To drain trapped fuel in upper parts of system, use main strainer drain valve and trap drain valve which is located in main fuselage compartment opposite door.

d. For electrical circuits of boost pumps, shut-off valve, transmitters, pressure switches, and float switches, see applicable wiring diagrams. (Refer to paragraph 12-125).

e. Before removing any line or hose, be sure it is properly identified and its route understood for replacement in same manner. Cap or cover all openings at once to protect fuel system from contamination.

5-68. *Self-Sealing Fuel Cell Maintenance*. Fuel cells are self-sealing, except in upper areas, and will be maintained in accordance with instructions and serviceability limits contained in TM 55-405-3. Instructions for removal and installation of sump and boost pump, upper cell door, fuel quantity gage tank unit, and replacement of seals at fuel cell fittings are provided in this manual.

Note

> If a fuel cell is punctured, it shall be replaced as soon as possible. The sealant between inner and outer fabric layers of self-sealing cell wall is caused to congeal and swell by contact with fuel, filling the hole and usually being extruded on the inner wall. If left for long without repair, the sealant plug may begin to deteriorate and the particles will contaminate the fuel.

a. If fuel quantity system is found inaccurate when checked with known quantity of fuel at periodic inspection, and further investigation reveals a defective quantity gage tank unit, the fuel cells should be thoroughly cleaned by the following procedure.

b. Remove deck panels, upper doors, and sumps for access to interior of fuel cells. (Refer to paragraph 5-76 and 5-140.) Remove fuel quantity tank unit. (Refer to paragraph 5-95.)

c. Mix a solution of cleaner (item 312, table 1-1), using four ounces of cleaner to each gallon of water. Use cleaning solution with a stiff bristle brush to clean fuel cell interior thoroughly. Wipe dry after scrubbing.

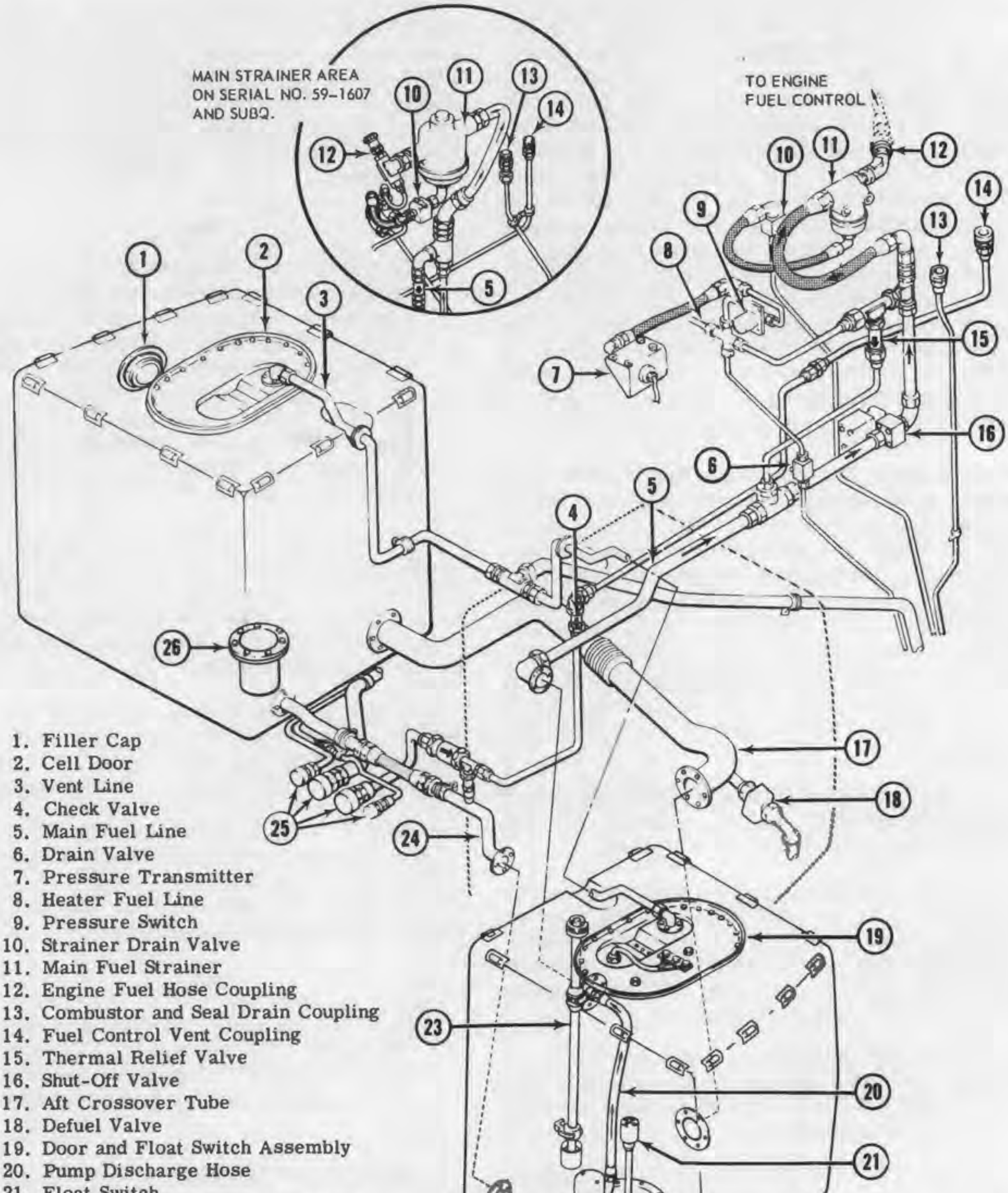
Note

> It is not necessary to remove crossover lines between cells, but care should be used to prevent cleaning solution and water from entering fuel lines.

d. Saturate a clean cloth with water and remove all traces of cleaning solution. Wipe all surfaces dry with a clean cloth.

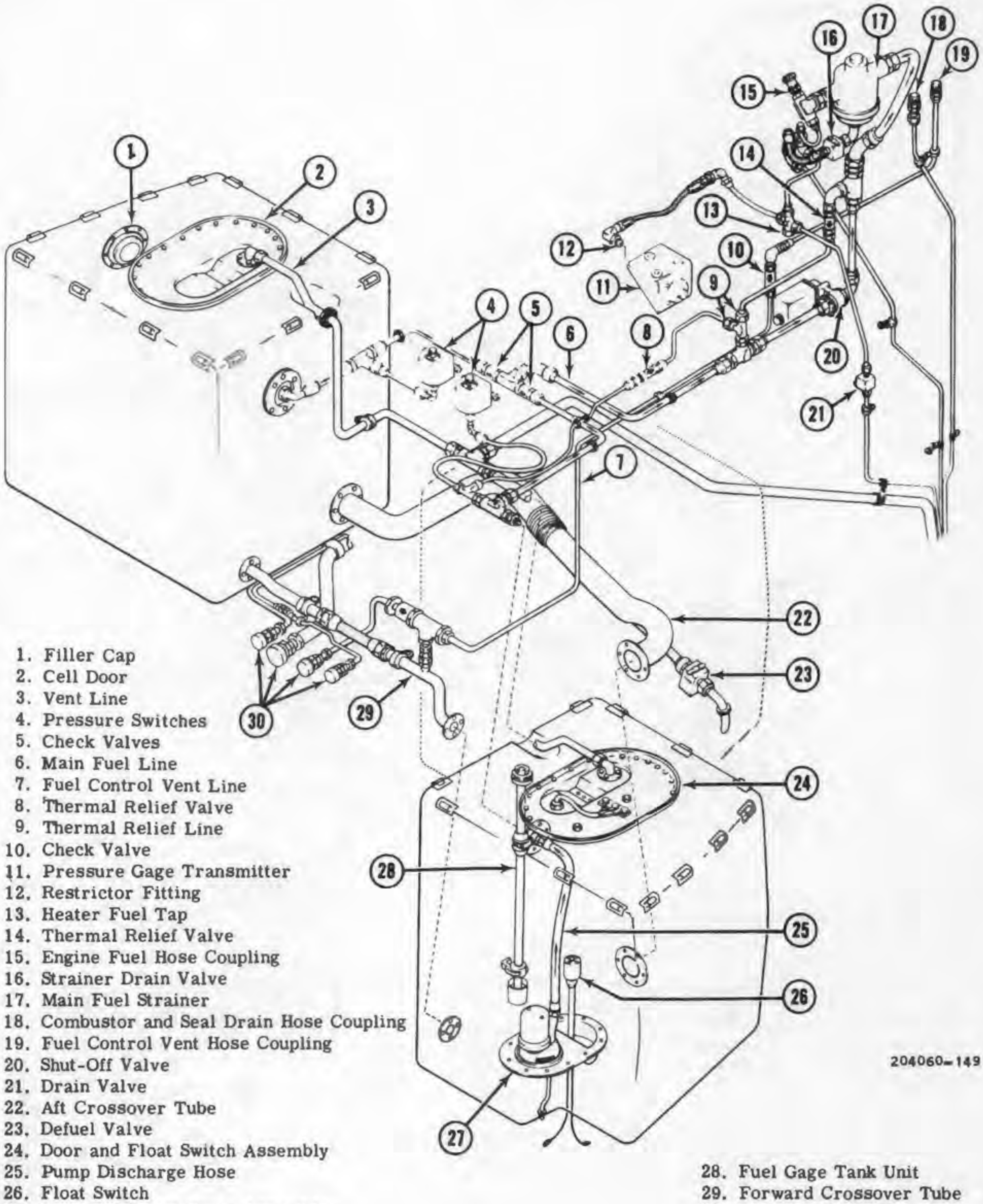
e. Inspect cell for lint and fibers from wiping cloths.

f. Spray cell interior with methyl alcohol (item 313, table 1-1), or anti-icing fluid (item 314, table 1-1).



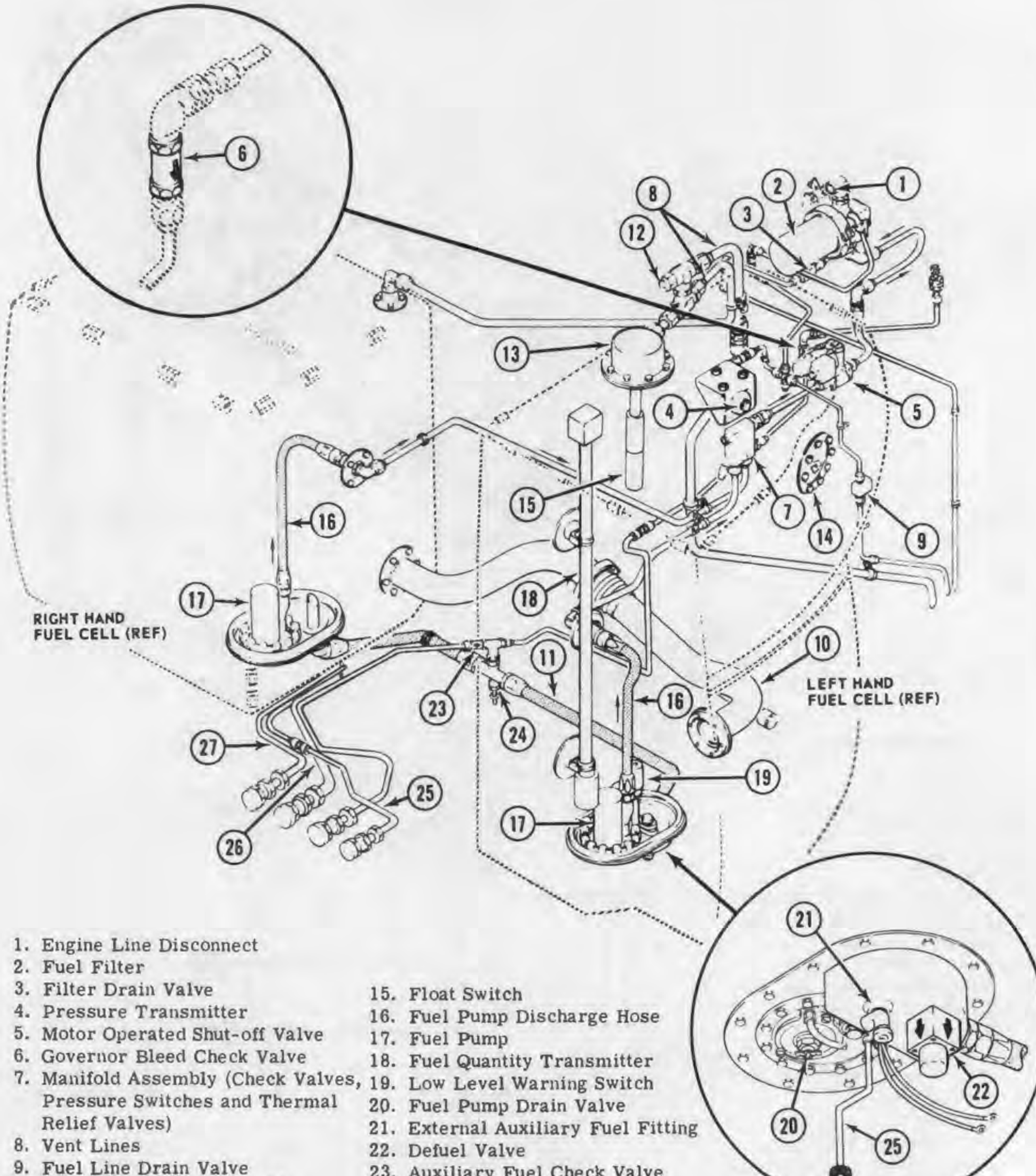
1. Filler Cap
2. Cell Door
3. Vent Line
4. Check Valve
5. Main Fuel Line
6. Drain Valve
7. Pressure Transmitter
8. Heater Fuel Line
9. Pressure Switch
10. Strainer Drain Valve
11. Main Fuel Strainer
12. Engine Fuel Hose Coupling
13. Combustor and Seal Drain Coupling
14. Fuel Control Vent Coupling
15. Thermal Relief Valve
16. Shut-Off Valve
17. Aft Crossover Tube
18. Defuel Valve
19. Door and Float Switch Assembly
20. Pump Discharge Hose
21. Float Switch
22. Sump and Boost Pump Assembly
23. Fuel Gage Tank Unit
24. Forward Crossover Tube
25. Auxiliary Fuel Couplings
26. Sump Assembly

Figure 5-20. Fuel supply system — UH-1A (typical)



1. Filler Cap
2. Cell Door
3. Vent Line
4. Pressure Switches
5. Check Valves
6. Main Fuel Line
7. Fuel Control Vent Line
8. Thermal Relief Valve
9. Thermal Relief Line
10. Check Valve
11. Pressure Gage Transmitter
12. Restrictor Fitting
13. Heater Fuel Tap
14. Thermal Relief Valve
15. Engine Fuel Hose Coupling
16. Strainer Drain Valve
17. Main Fuel Strainer
18. Combustor and Seal Drain Hose Coupling
19. Fuel Control Vent Hose Coupling
20. Shut-Off Valve
21. Drain Valve
22. Aft Crossover Tube
23. Defuel Valve
24. Door and Float Switch Assembly
25. Pump Discharge Hose
26. Float Switch
27. Sump and Boost Pump Assembly
28. Fuel Gage Tank Unit
29. Forward Crossover Tube
30. Auxiliary Tank Couplings

Figure 5-21. Fuel supply system — UH-1B (typical) (Serial No. 60-3546 thru 64-14100)



1. Engine Line Disconnect
2. Fuel Filter
3. Filter Drain Valve
4. Pressure Transmitter
5. Motor Operated Shut-off Valve
6. Governor Bleed Check Valve
7. Manifold Assembly (Check Valves, Pressure Switches and Thermal Relief Valves)
8. Vent Lines
9. Fuel Line Drain Valve
10. Upper Crossover Assembly
11. Lower Crossover Assembly
12. Siphon Breaker Valve
13. Cover
14. Filler Cap
15. Float Switch
16. Fuel Pump Discharge Hose
17. Fuel Pump
18. Fuel Quantity Transmitter
19. Low Level Warning Switch
20. Fuel Pump Drain Valve
21. External Auxiliary Fuel Fitting
22. Defuel Valve
23. Auxiliary Fuel Check Valve
24. Trap Drain Valve
25. Pump Seal Drain Line
26. Vent Line
27. Sump and Pump Drain Line

Figure 5-22. Fuel supply system — UH-1B (Serial No. 64-14101 and subsequent)

Note

Do not wipe cell after spraying.

g. Install fuel quantity tank unit. (Refer to paragraph 5-96.) Install sumps, cell doors and deck panels. (Refer to paragraphs 5-77 and 5-143.)

5-69. ***Purging — Fuel System.*** Purge fuel cells in accordance with instructions contained in TM 55-405-3. Purge fuel lines in accordance with instructions contained in TM 55-405-7.

5-70. Fuel System on Engine. (See figure 5-23 and 5-24.) Basic engine is equipped with a fuel control unit and two separate sub-systems, starting fuel and main fuel, for delivering regulated flow of vaporized fuel into combustion chamber. A pressure actuated valve, at bottom of combustor housing, drains away any unburned fuel in combustion chamber when engine stops. Adapting parts added to engine include fuel control inlet hose, seal drain tube and hose, combustor drain hose, a differential pressure switch with hoses from sump pressure taps on fuel control to provide caution panel indication if one element of dual pump should fail, and linkages for engine control systems. A fuel control vent hose is also used on engines equipped with overspeed governor which has such a connection.

5-71. Starting fuel system consists of external fuel lines (and air purge line on UH-1A only), a solenoid valve connected in starter-ignition circuit, a starting fuel manifold, and igniter nozzles. Solenoid valve is opened as starter is energized, allowing fuel at pump pressure to be injected through nozzles and ignited in combustion chamber by two igniter plugs. When starter trigger switch is released, solenoid valve closes to shut off starting fuel flow.

5-72. Main fuel system includes an external fuel line, a manifold, and eleven fuel vaporizers through which flow is established as soon as engine speed provides sufficient fuel pressure from dual-element pump of fuel control unit.

5-73. Fuel Cell Fittings. Externally accessible fittings on fuel cells include filler cap adapter, two crossover tubes, and tank outlet. Each cell port has an integral fitting with an O-ring seal groove and threaded inserts for attachment bolts.

5-74. ***Repair or Replacement — Fuel Cell Fittings.*** a. Replace defective O-ring seal under any fuel cell port fitting by general procedure outlined below.

b. Drain fuel to level below cell port to be opened.

c. Disconnect attached lines or clamps to allow fitting to be moved enough to expose O-ring.

d. Remove O-ring. Check that seal groove and mating face of fitting are clean and free of burrs or nicks.

e. Install serviceable O-ring in seal groove.

f. Reinstall fitting. Tighten bolts evenly with 45 to 50 inch-pounds torque.

g. Reconnect any lines or clamps as necessary.

5-75. Fuel Cell Door. Removable sections of service deck between cabin and engine firewall will give access to a large door in top of each cell. Door provides connection for tank vent line, and electrical connectors for fuel quantity gage tank unit. Left cell door also includes an assembly of two float switches for the auxiliary fuel transfer pump circuit.

5-76. ***Removal — Fuel Cell Door.*** a. Defuel cells. (Refer to paragraph 5-67.)

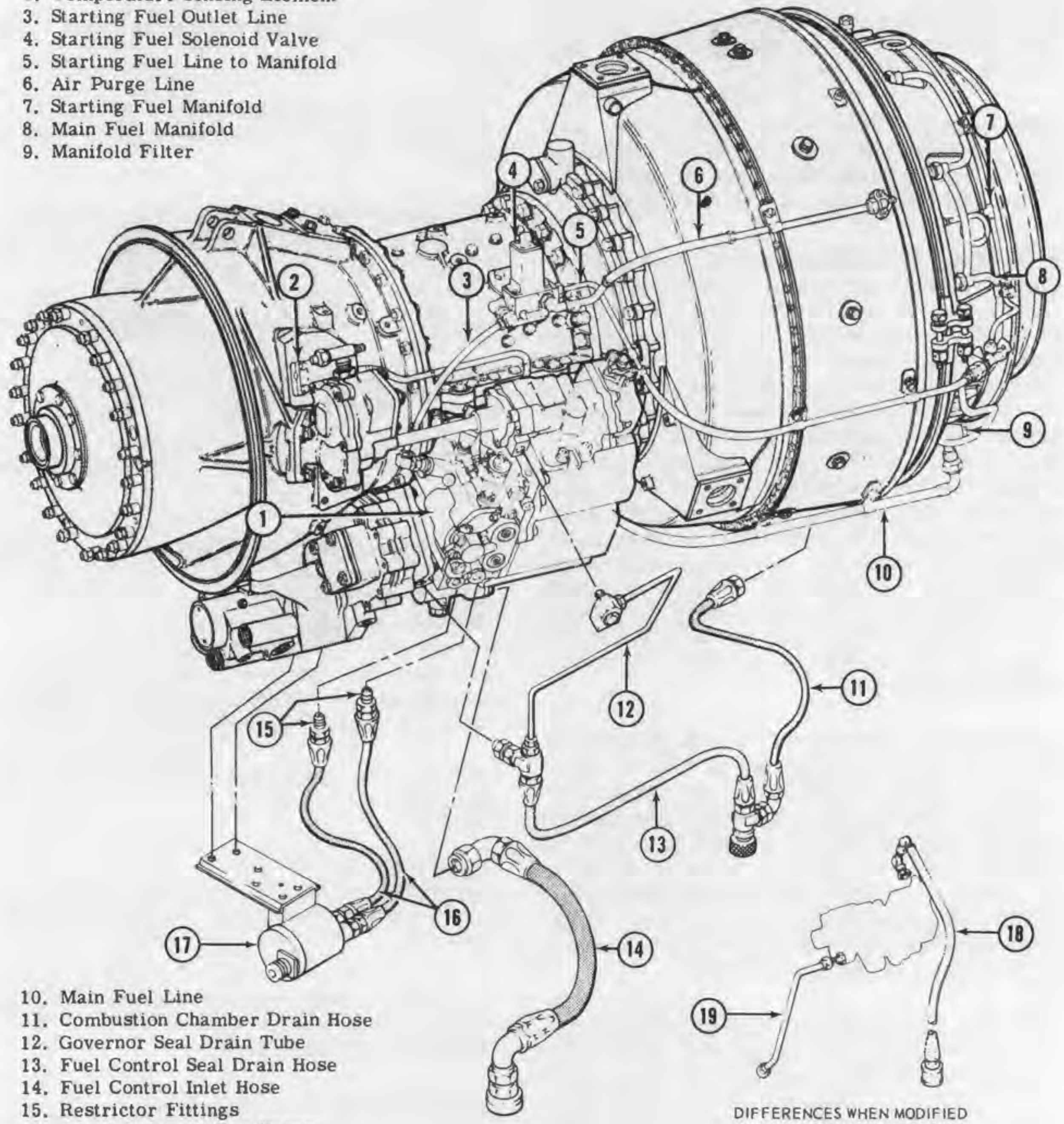
b. Remove section of transmission cowling with support frame by removing lock-pin and rod to detach from deck fittings and roller track.

c. Remove screws around edge of deck panel above fuel cell, leaving fittings attached where possible. Lift off deck panel.

d. Disconnect vent tube from tee in cargo sling compartment and from elbow on cell door. Pull tube inboard through bulkhead grommet until clear of door.

e. Disconnect fuel quantity gage circuit leads from connectors on door. On left cell door, also disconnect auxiliary fuel transfer circuit leads from terminal block.

1. Fuel Control
2. Temperature Sensing Element
3. Starting Fuel Outlet Line
4. Starting Fuel Solenoid Valve
5. Starting Fuel Line to Manifold
6. Air Purge Line
7. Starting Fuel Manifold
8. Main Fuel Manifold
9. Manifold Filter



10. Main Fuel Line
11. Combustion Chamber Drain Hose
12. Governor Seal Drain Tube
13. Fuel Control Seal Drain Hose
14. Fuel Control Inlet Hose
15. Restrictor Fittings
16. Pump Pressure Tap Hoses
17. Differential Pressure Switch
18. Fuel Control Vent Hose
19. Seal Drain Tube (Alternate for 12)

Figure 5-23. Fuel system on engine — UH-1A (typical)

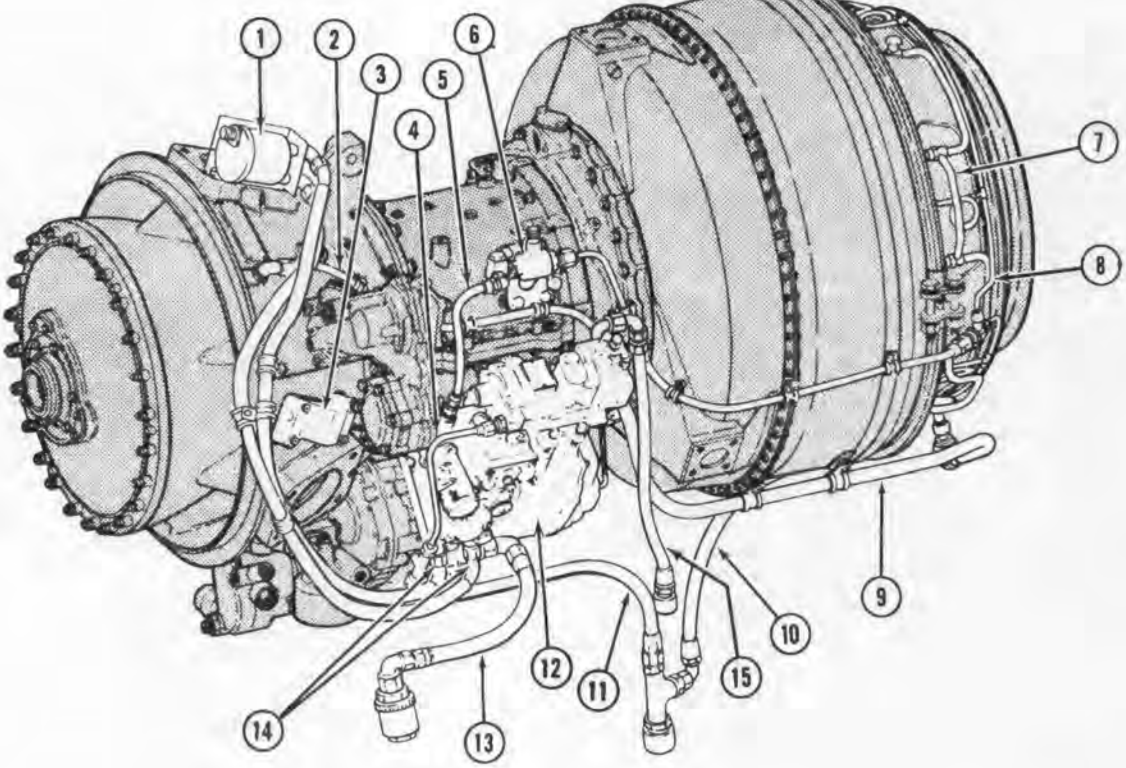
f. Remove 20 bolts and lift cell door. Disconnect fuel quantity transmitter leads from connectors on underside. Remove door (with attached float switch assembly, if left cell). Keep door opening covered when not in use.

5-77. *Installation — Fuel Cell Door.* a. Check that seal groove and face of door are clean and free of burrs or nicks. Install O-ring in groove.

b. Position door assembly on cell opening, with vent fitting pointing inboard. (If on left cell, float switch assembly will be at forward end of door.)

c. Raise door as necessary to connect quantity gage transmitter leads to connectors on underside of door. (Refer to paragraph 12-125.)

d. Secure door with bolts and thin aluminum alloy washers. Tighten bolts evenly with 45 to 50 inch-pounds torque.



1. Differential Pressure Switch
2. Inlet Air Pressure Sensing Line
3. Temperature Sensing Element
4. Governor Seal Drain Line
5. Starting Fuel Line
6. Solenoid Valve
7. Main Fuel Manifold
8. Starting Fuel Manifold
9. Main Fuel Line
10. Combustor Drain Hose
11. Fuel Control Seal Drain Hose
12. Fuel Control Assembly
13. Fuel Inlet Hose
14. Pump Tap Restrictor Fittings
15. Fuel Control Vent Hose

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Figure 5-24. Fuel system on engine — UH-1B (typical)

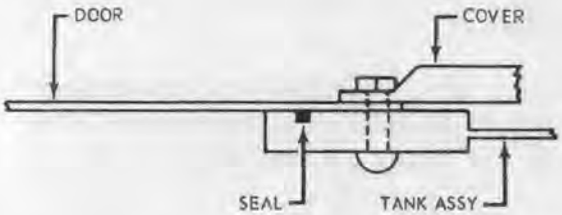


Figure 5-25. Correct installation of fuel cell access doors

e. Connect vent line tube to fitting on door.

f. Connect quantity gage circuit leads between connectors on cell door and at aft inboard corner of cell compartment. (Refer to paragraph 12-125.)

g. Reinstall deck section over cell compartment, sealing edges fumetight with a bead of sealing compound, (item 209, table 1-1). Reinstall cowling and support frame assembly.

A 5-78. Main Fuel Strainer. (UH-1A through Serial No. 58-3047.) (See figure 5-24.) A main strainer in fuel supply line to engine is mounted on a bracket above service deck at left side of engine. Unit consists of a housing body with a removable bowl, enclosing a screen element. A bypass valve in strainer body assures continued flow if screens should become clogged. Connections are inlet hose, outlet quick-disconnect coupling for hose to fuel control, and strainer drain line hose with manual valve.

A 5-79. Removal — Main Fuel Strainer. (UH-1A through serial No. 58-3047.) a. Disconnect fuel control inlet hose from coupling on strainer outlet.

b. Drain trapped fuel from strainer by opening valve located inboard on deck.

c. Disconnect drain hose and inlet hose from fittings on strainer. Cap lines and fittings.

d. Detach strainer from bracket by removing two bolts, with spacers and nuts.

A 5-80. Disassembly — Main Fuel Strainer (UH-1A through Serial No. 58-3047.) (See figure 5-26.) a. Hold strainer body securely. Remove lockwire and use wrench on square shoulder to unscrew and remove strainer bowl, with O-ring.

b. Cut lockwire and remove nut, retainer cup, and screen element, with gaskets and O-rings, from tube.

c. Unscrew and remove tube, with O-ring, from strainer body.

A 5-81. Cleaning — Main Fuel Strainer. (UH-1A through Serial No. 58-3047.) Wash strainer parts with cleaning solvent (item 302, table 1-1). Use a soft bristle brush as necessary on screen. Dry with filtered compressed air.

A. 5-82. Inspection — Main Fuel Strainer. (UH-1A through Serial No. 58-3047.) Inspect screen element for suitability for continued service. Check threads on body, bowl and nut. Inspect gaskets and O-ring for deterioration.

A 5-83. Repair or Replacement — Main Fuel Strainer (UH-1A through Serial No. 58-3047.) Replace unserviceable parts.

A 5-84. Reassembly — Main Fuel Strainer (UH-1A through Serial No. 58-3047.) a. Install tube, with O-ring on threaded end, in strainer body. Tighten with 60 to 90 inch-pounds torque.

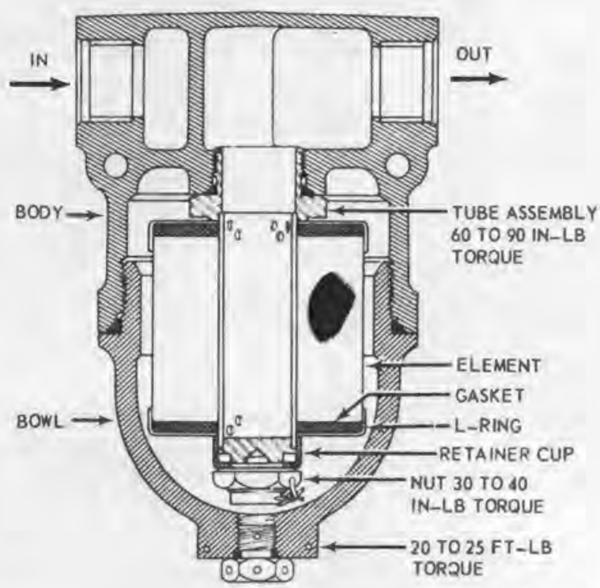


Figure 5-26. Fuel strainer cross-section — UH-1A thru Serial No. 58-3047

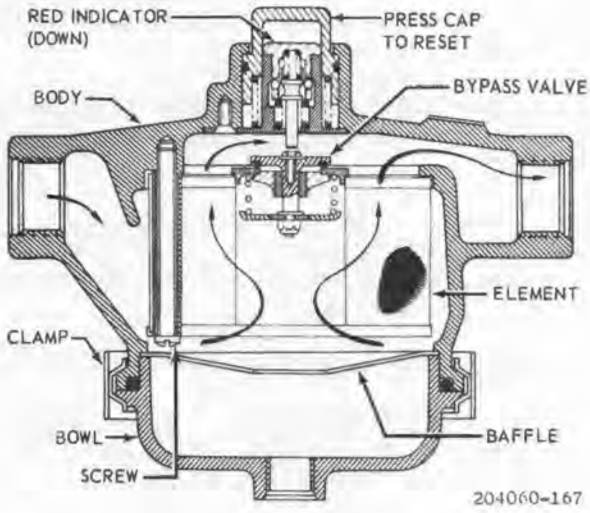


Figure 5-27. Fuel strainer cross-section — UH-1A thru No. 59-1607 and subsequent

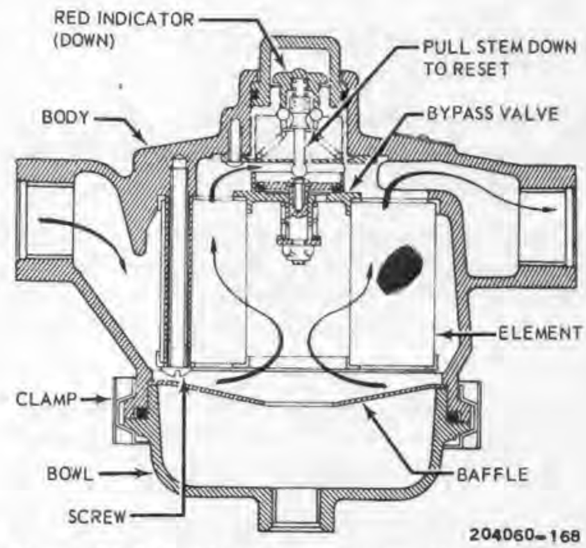


Figure 5-28. Fuel strainer cross-section — UH-1B

b. Assemble a gasket and O-ring on each end of screen. Install screen assembly, retainer cup, and nut on tube. Tighten nut 30 to 40 inch-pounds, and lockwire to end of tube.

c. Place O-ring on bowl. Screw bowl into strainer body, tighten 20 to 25 foot-pounds (240 to 300 inch-pounds), and lockwire from square shoulder at lower end to pierced lug on either side of body.

A 5-85. ***Installation — Main Fuel Strainer (UH-1A through Serial No. 58-3047.)*** a. Position strainer on bracket. Insert two bolts, with aluminum alloy washers under heads, through bracket and ends of brace tubes, and secure with washers and nuts.

b. Connect fuel supply line hose to strainer inlet fitting, and drain line hose to fitting on bottom of bowl. Connect fuel control inlet hose to quick-disconnect coupling on strainer outlet.

5-86. Main Fuel Strainer (UH-1A Serial No. 59-1607 and subsequent, and UH-1B.) (See figure 5-27 and 5-28.) A main strainer equipped with a bypass indicator is mounted on a bracket above service deck at left side of engine. Strainer is a cylindrical unit with a detachable sump bowl, connected to a drain line through a manual valve. In normal flow, fuel enters through line from shutoff valve and passes through a stainless steel wire cloth screen element before delivery through outlet tee fitting, to engine fuel control inlet hose and to secondary lines of fuel system. If strainer element becomes clogged, flow is through an internal bypass valve which pushes a red indicator up into a transparent plastic dome for visual warning of faulty condition. On UH-1A strainer bypass indicator can be reset without disassembly, by pressing down on plastic dome, but will be tripped again if screen is still clogged when fuel flow begins during engine start. On UH-1B strainer the bypass indicator can only be manually reset when strainer element is removed as for cleaning or replacement.

5-87. Removal — Main Fuel Strainer (UH-1A Serial No. 59-1607 and subsequent, and UH-1B.) Refer to paragraph 5-77.

5-88. Disassembly — Main Fuel Strainer (UH-1A Serial No. 59-1607 and subsequent and UH-1B.) a. Disconnect fuel control inlet hose at coupling on strainer outlet tee. Drain strainer by opening valve.

b. Remove V-band clamp to detach sump bowl, with O-ring seal, from strainer. Either place sump out of way on deck with drain hose remaining attached, or disconnect drain hose to remove sump completely.

c. Remove three screws and withdraw screen element, with bypass valve, from strainer housing.

Caution

Do NOT attempt to change setting of bypass valve.

5-89. Cleaning — Main Fuel Strainer (UH-1A Serial No. 59-1607 and subsequent and UH-1B.) Refer to paragraph 5-81.

5-90. Inspection — Main Fuel Strainer (UH-1A Serial No. 59-1607 and subsequent and UH-1B.) Inspect filter element for suitability for continued service. Check threaded parts for damage.

5-91. Repair or Replacement—Main Fuel Strainer. (UH-1A Serial No. 59-1607 and subsequent and UH-1B.) Replace unserviceable parts.

5-92. Reassembly — Main Fuel Strainer. (UH-1A Serial No. 59-1607 and subsequent and UH-1B.) a. Reset bypass indicator.

A (1) On UH-1A strainer, press down on plastic dome to set indicator. (See figure 5-27.) This can be done after assembly if necessary.

B (2) On UH-1B strainer, reach through bottom of strainer housing to pull down indicator stem projecting downward from dome. (See figure 5-28.) This indicator cannot be reset with strainer assembled.

b. Insert indicator, with bypass valve up, into strainer housing. Secure with three screws. Check that bypass indicator remains in normal position.

c. Place O-ring on lip of sump. Seat sump in bottom of strainer and secure with V-band clamp. Lockwire clamp.

d. Connect drain hose, if disconnected, to sump drain valve. Connect fuel control inlet hose to coupling on strainer outlet tee.

5-93. Installation — Main Fuel Strainer (UH-1A Serial No. 59-1607 and subsequent and UH-1B.) Refer to paragraph 5-85.

5-94. Quantity Gage Tank Unit. Fuel quantity gage tank unit is located in the left-hand fuel cell. UH-1B helicopters Serial No. 60-3546 through 64-14100 have a tank unit in both the right and left-hand fuel cell.

5-95. Removal — Quantity Gage Tank Unit. a. Remove fuel cell door. (Refer to paragraph 5-76.)

b. Disconnect grounding jumper of fuel quantity gage tank unit from support clip screw on outlet fitting.

c. Detach transmitter unit from upper and lower spring clips. Remove unit through top cell door.

5-96. Installation — Quantity Gage Tank Unit. a. Place fuel quantity gage tank unit, with connector leads at top, in cell through top door opening.

b. Engage tank unit in lower support clip.

c. Connect bonding jumper on one screw of upper support clip. Lockwire screw heads together. Secure tank unit in upper clip.

5-97. Fuel Pressure Transmitter. On all models a pressure transmitter, electrically connected to fuel system pressure gage, is mounted in a bracket at top of main fuselage compartment. On UH-1A through Serial No. 58-3047 transmitter pressure line taps main fuel line between shut-off valve and main strainer inlet. On all other UH-1A and UH-1B, transmitter pressure line taps main fuel line at main strainer outlet.

5-98. Removal — Fuel Pressure Transmitter. a. Disconnect engine fuel control inlet hose from main strainer outlet coupling.

b. Open drain valve, located on left wall in main fuselage compartment opposite door, to empty pressure transmitter line.

c. Disconnect battery. Disconnect electrical cable connector from fuel pressure transmitter.

d. Disconnect hose from elbow on fuel pressure transmitter. Cap open line and fitting.

e. Remove four mounting screws to detach transmitter from bracket.

5-99. Installation — Fuel Pressure Transmitter. a. Check installation of plug with gasket in "V" connection, and elbow with nut and gasket in "P" connection on case of pressure transmitter.

b. Position transmitter in bracket (in aft hole of bracket on UH-1A). Secure with four mounting screws.

c. Align elbow pointing aft, and connect fuel line hose.

d. Connect electrical cable connector to transmitter.

e. Reconnect engine fuel control hose. Check operation of fuel pressure gage system during next ground run-up.

5-100. Auxiliary Float Switch. (UH-1B Serial No. 64-14101 and subsequent.) The auxiliary float switch on UH-1B helicopters, Serial No. 64-14101 and subsequent is located beneath the cover (13, figure 5-22) on top of left-hand fuel tank. The purpose of this switch is to help avoid overfilling of main fuel tanks when transferring auxiliary fuel.

5-101. ***Removal — Auxiliary Float Switch. (UH-1B Serial No. 64-14101 and subsequent.)*** (See figure 5-22. a. Disconnect vent lines (8) at vent and siphon breaker valve (12).

b. Remove cover (13) and disconnect electrical wiring from float switch (15).

c. Lift fuel vent plate and float switch (15) from left-hand fuel tank.

5-102. ***Installation — Auxiliary Float Switch (UH-1B Serial No. 64-14101 and subsequent.)*** (See figure 5-22.) a. Position float switch (15) and fuel vent plate in opening in top of left-hand fuel tank.

b. Connect electrical wiring to float switch (15) and install cover (13).

c. Connect siphon breaker valve (12) and vent lines (8).

Note

On UH-1B helicopters, Serial No. 63-8500 through 64-14100, fuel cell access doors must be installed as shown in figure 5-25 to assure complete sealing of tanks.

A 5-103. Fuel Pressure Switch (UH-1A). On Model UH-1A, a pressure switch electrically connected to a caution panel light is located in top of main fuselage compartment at Station 173. Switch is connected into same fuel line as pressure transmitter.

A 5-104. ***Removal — Fuel Pressure Switch (UH-1A).*** a. Disconnect engine fuel control hose from strainer outlet, and open drain valve on left wall of fuselage compartment to empty fuel line leading to pressure switch and transmitter.

b. Disconnect battery. Disconnect electrical cable connector from fuel pressure switch.

c. Disconnect fuel line tubes from tee on pressure switch.

d. Remove mounting bolts, nuts and washers to detach pressure switch from web of structural beam.

e. Cap or cover open lines and fittings.

A 5-105. ***Installation — Fuel Pressure Switch (UH-1A).*** a. Check installation of tee fitting with nut and gasket in end of pressure switch, horizontal in relation to mounting studs.

b. Position switch assembly to mounting holes from front side of structural beam web at fuselage Station 173 just ahead of door in main fuselage compartment. Secure with washers and nuts on studs.

c. Connect fuel line tubes to tee on switch.

d. Connect electrical cable connector to front end of switch.

e. Reconnect engine fuel control inlet hose to main strainer outlet coupling. Check that drain valve is closed.

B 5-106. Fuel Pressure Switch. (UH-1B Serial No. 60-3546 through 64-14100.) Two pressure switches, electrically connected to caution panel lights, monitor cell outlet pressures from both boost pumps of fuel supply system. Switches are mounted at upper center on aft wall in cargo sling compartment.

B 5-107. ***Removal — Fuel Pressure Switch (UH-1B Serial No. 60-3546 through 64-14100.)*** a. Drain fuel in cells to a level below tank outlets. (Refer to paragraph 5-67.)

b. Disconnect battery. Disconnect electrical cable connector from switch to be removed.

c. Disconnect fuel line tube from elbow on pressure switch, using a suitable container to catch trapped fuel.

d. Remove two mounting screws, nuts, and washers to detach switch assembly from bulkhead.

B **5-108.** ***Installation — Fuel Pressure Switch (UH-1B Serial No. 60-3546 through 64-14100).*** a. Check installation of elbow with nut and gasket on pressure switch.

b. Position switch assembly, with electrical connector up and elbow fitting pointing outboard, to mounting holes of bulkhead. Install two mounting screws, washers, and nuts.

c. Connect tube from outlet line to elbow on switch.

d. Connect electrical cable connector to receptacle on switch.

5-109. Thermal Relief Valves. A thermal pressure relief valve is incorporated in a bypass line connected across shutoff valve of main fuel line. On UH-1B helicopters Serial No. 60-3546 through 64-14100, a second valve and line bypasses main line check valves. Thermal relief provisions on UH-1B helicopters, Serial No. 64-14101 and subsequent, are contained in a manifold assembly module (7, figure 5-22). The provisions allow small return flow to relieve excessive pressure due to heat expansion of fuel in main line.

5-110. ***Removal — Thermal Relief Valves.*** a. Drain trapped fuel to extent necessary.

(1) Disconnect fuel control inlet hose from strainer outlet coupling.

A (2) On UH-1A, open shut-off valve manually to allow main line fuel to drain back into cell through pump.

A (3) On UH-1A through Serial No. 58-3047, line above thermal relief valve can be drained through valve from cross-fitting in main fuselage compartment.

B (4) On UH-1B helicopters (Serial No. 60-3546 through 64-14100) use suitable container to catch trapped fuel when disconnecting thermal relief line.

b. Remove valve by disconnecting from tube and elbow, or from two tubes as applicable.

5-111. ***Installation — Thermal Relief Valves.*** a. Install valve with flow arrow toward fuel cells. Use a serviceable gasket on valve connected to tee or elbow.

b. Check for leaks at next ground run-up.

B **5-112. Main Fuel Line Check Valves (UH-1B Serial No. 60-3546 through 64-14100).** Two directional flow check valves are located on aft firewall of cargo sling compartment at each side of tee where tank outlet lines join main fuel line. Check valves on UH-1B helicopters, Serial No. 64-14101 and subsequent, are contained in a manifold assembly module (7, figure 5-22). Valves keep fuel line full by preventing reverse flow when boost pumps are inoperative, and would also allow normal operation on either pump if opposite pump should fail.

B **5-113.** ***Removal—Main Fuel Line Check Valves (UH-1B Serial No. 60-3546 through 64-14100).*** a. Disconnect battery. Defuel cells to a level below outlet ports. Disconnect fuel control hose from strainer outlet coupling.

b. Enter cargo sling compartment for access to check valves on aft bulkhead.

c. Provide a suitable container to catch trapped fuel to flow back into cell as air enters connection.

d. Completely disconnect tank outlet tube from check valve.

e. Remove check valve with gasket from tee fitting.

f. Install check valve, with serviceable gasket, on tee. Be sure flow arrow is toward tee.

g. Reconnect tank outlet tube to inlet of check valve.

h. Check for leaks at next ground run-up.

5-114. Manifold Assembly. (UH-1B Serial No. 64-14101 and subsequent.) UH-1B helicopters, Serial No. 64-14101 and subsequent, are equipped with a fuel valve manifold assembly located in the left-hand bulkhead in the fuselage compartment. This unit incorporates thermal relief provisions, check valves and pressure switches to furnish visual indication of boost pump malfunction on the caution panel. These switches are of snap action type and are normally closed. Ascending actuating pressure will break contact before eight psig; descending pressure will make contact between four and five psig.

5-115. Removal — Manifold Assembly (UH-1B Serial No. 64-14101 and subsequent.) a. Disconnect battery. Drain fuel to extent necessary.

b. Disconnect electrical leads from pressure switches.

c. Disconnect fuel lines from inlet and outlet fittings on manifold assembly. Cap or cover lines and fittings to prevent entrance of foreign material.

d. Remove nuts, spacers, washers and bolts attaching manifold assembly to bulkhead and remove manifold assembly.

5-116. Installation — Manifold Assembly (UH-1B Serial No. 64-14101 and subsequent.) a. Position manifold assembly on bulkhead and install attaching bolts, washers, spacers and nuts.

b. Remove caps or covers from fuel lines and manifold assembly fittings and connect fuel lines to manifold assembly.

c. Connect electrical leads to pressure switches.

d. Check for leaks and operation.

5-117. Starting Fuel Solenoid Valve. (See figure 5-23 or 5-24.) An electrically operated solenoid valve, on left side of engine compressor housing, is connected in starting fuel line between fuel control and starting fuel manifold.

5-118. Removal — Starting Fuel Solenoid Valve. a. Disconnect electrical harness connector from valve.

b. Disconnect fuel lines from valve fittings. On UH-1A, also disconnect air purge line. Cap open lines and fittings.

A c. Remove two screws, washers and nuts to detach valve from mounting bracket.

B d. Remove two screws to detach valve from mounting bracket.

e. Remove solenoid valve, leaving bracket on compressor housing.

5-119. Inspection — Starting Fuel Solenoid Valve. Inspect starting fuel solenoid valve inlet port filter for cleanliness and damage to filter mesh.

5-120. Repair or Replacement — Starting Fuel Solenoid Valve. Clean filter if necessary; replace if screen is damaged or unserviceable.

Note

If it is necessary to install a new filter, use the rubber eraser end of a pencil to insert the filter into the valve.

5-121. Installation — Starting Fuel Solenoid Valve. **A** a. Position solenoid valve to mounting bracket on compressor housing. Secure with two screws, washers and nuts.

B b. Position solenoid valve to mounting bracket on compressor housing. Secure with two screws.

c. Connect starting fuel line hoses from fuel control to valve inlet fitting, and from starting fuel manifold to valve outlet union. On UH-1A, connect air purge line to elbow on outboard side valve.

d. Connect electrical harness connector to solenoid. On UH-1B, make certain that adequate clearance exists between cable and hold-down clamp of ignition unit. (See figure 5-29.) Lockwire connector.

B 5-122. Electrical Indicator Type Main Fuel Filter. On UH-1B beginning with Serial No. 63-8500 (and on earlier helicopters if so modified), the main fuel filter has a micronic type element and electrical means of indicating any impeding bypass condition which may occur. Filter is a cylindrical unit, horizontally

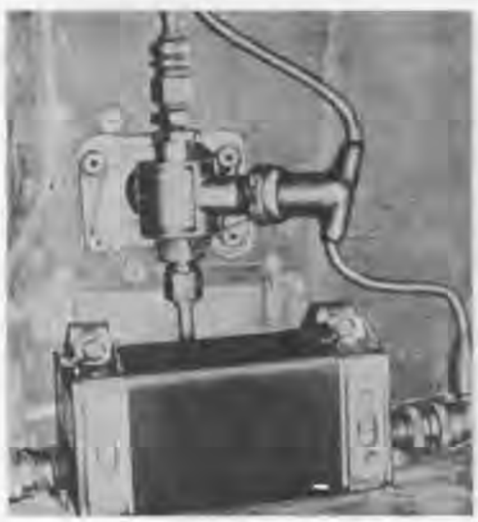


Figure 5-29. Starting fuel solenoid valve and ignition unit — UH-1B

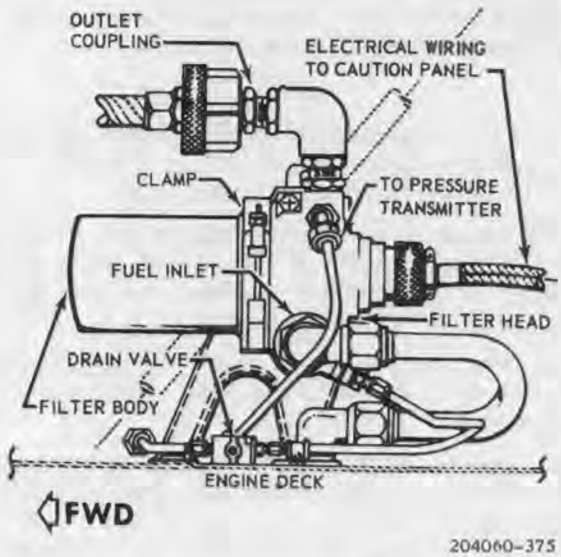


Figure 5-30. Fuel filter — electrical bypass indicator type — UH-1B

mounted on a support bracket attached on forward leg of engine mount tripod at left side of engine deck. (See figure 5-30.) Piping connections to the filter head include an inlet from the fuel shut-off valve of the supply system, an outlet coupling for engine fuel control hose, a drain line with a manual valve, and a line to the pressure gage transmitter. Filter element and other parts, except head assembly and O-rings, are interchangeable with those used in external filter of the transmission oil system. If a clogging condition should develop in filter element, a normally-open switch would be closed by differential pressure, lighting FUEL FILTER caution panel as warning that further clogging may cause fuel to flow through bypass valve without filtration.

B **5-123.** ***Removal — Electrical Indicator Type Main Fuel Filter.*** a. Open left-hand engine compartment cowling.

b. Disconnect fuel hose from outlet coupling on filter. Manually open drain valve to drain fuel from filter.

Note

Use suitable tool to depress self-closing valve in filter outlet coupling to admit some air and facilitate drainage.

c. Disconnect electrical cable plug and all piping from filter head. Remove bolts attaching filter to support bracket and remove filter.

B **5-124.** ***Disassembly — Electrical Indicator Type Main Fuel Filter.*** a. Open V-band clamp.

b. Remove filter body and element from filter head.

c. Separate element and O-rings from filter body.

B **5-125.** ***Cleaning — Electrical Indicator Type Main Fuel Filter.*** Clean filter body and head with dry cleaning solvent (item 302, table 1-1), and dry with filtered compressed air. Protect electrical connections when cleaning the filter head.

B **5-126.** ***Inspection — Electrical Indicator Type Main Fuel Filter.*** Inspect filter element for contamination to determine if any corrective action is needed beyond replacement of element and O-rings.

B **5-127.** ***Repair or Replacement — Electrical Indicator Type Main Fuel Filter.*** Replace unserviceable filter and O-rings.

B **5-128.** ***Reassembly — Electrical Indicator Type Main Fuel Filter.*** a. Place O-ring on boss in bottom of filter body.

b. Position clean filter element in body, firmly seated on boss.

c. Install O-ring around upper lip of filter body next to flange.

d. Place O-ring around center boss in filter head.

e. Install body assembly into filter head. Press firmly into place to seat.

f. Install V-band clamp around mating flanges of filter head and body assembly. Tighten nut with 50 inch-pounds torque.

B **5-129.** ***Installation — Electrical Indicator Type Main Fuel Filter.*** a. Position filter head to support bracket and install bolts, washers and nuts, using thin washers under bolt head and under nuts.

b. Connect fuel line tube to inlet fitting, transmitter line to pressure tap fitting, and drain line to fitting at bottom of head. Connect and lockwire electrical cable plug.

c. Connect hose from engine fuel control inlet to outlet coupling on filter.

d. During next ground run-up, check fuel filter and connections for leaks. Also check that FUEL FILTER caution panel does not light.

5-130. Combustion Chamber Drain Valve. A pressure actuated drain valve, located on lowest point of engine combustion section, is automatically open whenever engine is not in operation. Excess fuel, or any other fluid, is drained overboard through a hose, deck coupling and drain tube through fuselage.

5-131. ***Removal — Combustion Chamber Drain Valve.*** a. Disconnect drain hose from valve.

b. Remove lockwire and four bolts to detach valve and gasket from combustion housing. Cover opening.

5-131A. ***Cleaning — Combustion Chamber Drain Valve.*** a. Thoroughly clean the drain valve in dry-cleaning solvent (item 302, table 1-1).

b. Air dry.

5-131B. ***Inspection — Combustion Chamber Drain Valve.*** a. Inspect mating surface for unevenness and cracks.

b. Check valve by depressing plate. If valve is functioning properly, plate should return to original position.

5-131C. ***Repair or Replacement — Combustion Chamber Drain Valve.*** Replace valve if inspection requirements are not met. (Refer to paragraph 5-131B.)

5-132. ***Installation — Combustion Chamber Drain Valve.*** a. Position gasket and drain valve, with threaded nipple forward, in opening at bottom of engine combustion housing. Install four bolts, and lockwire heads.

b. Connect drain hose to valve.

5-133. Fuel Shut-Off Valve. A motor-operated gate valve in main fuel supply line, located in main fuselage compartment on left bulkhead opposite door, is electrically controlled by a switch on cabin pedestal. Switch is marked FUEL VALVE on UH-1A; MAIN FUEL on UH-1B. Valve has a manual override handle which also serves as a visual position indicator when used in ground maintenance. A guard is provided for valve handle on UH-1B.

5-134. ***Removal — Fuel Shut-Off Valve.*** a. Open shut-off valve manually. Defuel system. (Refer to paragraph 5-67.)

b. Disconnect electrical leads at connector on valve.

c. Disconnect fuel line tubes from valve inlet and outlet fittings. Catch trapped fuel in suitable container.

d. Remove four bolts to detach valve, guard (on UH-1B), outlet elbow, and gaskets from support bracket.

5-135. ***Installation — Fuel Shut-Off Valve.*** a. Position valve with inlet fitting through bracket from aft side, with actuator at right and electrical connector forward.

b. Insert four bolts through bracket and valve. Assemble gasket and outlet elbow, pointing up on bolts at aft side of valve body.

A (1) On UH-1A, secure with nuts and washers on bolts.

B (2) On UH-1B, place an aluminum alloy washer on each bolt. Place guard, extending to right, over end of elbow and secure with thin aluminum alloy washer and nuts on bolts.

c. Connect fuel line tubes to valve inlet and outboard fittings.

d. Connect electrical cable connector to valve actuator.

e. Close valve manually. Before refueling, check electrical operation of valve.

5-136. Fuel Boost Pump. An electrical operated boost pump is mounted through plate of a sump assembly in bottom of left fuel cell on UH-1A; or in each cell on UH-1B. Pump is equipped with a drain valve, a seal drain tube, an intake screen, a discharge fitting inside cell, and a plugged discharge port outside cell.

5-137. ***Removal — Fuel Boost Pump.*** a. Disconnect battery. Defuel cells. (Refer to paragraph 5-67.)

b. Remove access plate under fuel cell sump. Disconnect seal drain tube from pump fitting. Drain trapped fuel through pump and sump drain valves.

c. Disconnect pump electrical leads from terminal block at aft side of access opening.

d. Remove bolts and washers around pump mounting flange. Lower pump through opening in sump plate until discharge hose connection is exposed. Disconnect hose from fitting. Remove pump and gasket. Cover sump opening immediately.

5-138. ***Installation — Fuel Boost Pump.*** a. At pump mounting hole in sump plate, check for proper installation of flange ring and split gasket at inner side, secured by two countersunk screws through plate.

b. Place gasket on pump flange. Hold pump slightly below sump plate opening, with discharge port fitting aft and 30 degrees inboard. Connect hose from cell outlet to pump fitting.

c. Secure pump flange and gasket to sump plate with bolts and washers. Tighten bolts evenly with 45 to 50 inch-pounds torque.

d. Connect pump electrical leads to terminal block at aft side of access opening.

e. Attach seal drain tube to pump fitting. Install access plate, inserting drain tube through grommet.

5-139. Fuel Sump Assembly. Sump assembly has a drain valve and a float switch for fuel-low caution light. Right cell sump on UH-1A, Serial No. 59-1607 and subsequent, has no equipment except a drain valve.

5-140. ***Removal — Fuel Sump Assembly.*** a. Proceed as for removal of boost pump, which may either be separately removed or remain mounted to sump plate. (Refer to paragraph 5-137.) Disconnect float switch electrical leads at terminal block.

b. Remove bolts and washers around sump plate. Lower sump assembly and withdraw from cell, disconnecting pump discharge hose if pump was not separately removed. Remove O-ring from mounting port groove. Cover opening immediately.

5-141. ***Inspection — Fuel Sump Assembly.*** a. Inspect sump O-ring, drain valve and gasket for leakage.

b. Inspect pump gasket, fittings and O-rings for continued serviceability.

c. Inspect float switch and gasket on sump standpipe for general condition and continued serviceability.

5-142. ***Repair or Replacement — Fuel Sump Assembly.*** Replace unserviceable parts, O-rings and gaskets.

5-143. ***Installation — Fuel Sump Assembly.*** a. Check that O-ring groove around sump mounting port is clean and free of nicks and burrs. Also check mating face of sump plate. Place O-ring in groove.

b. Position sump assembly under port, with float switch aft. If pump is mounted on sump plate, connect hose to outlet fitting. (Refer to paragraph 5-138.)

c. Raise sump assembly into place. Secure with bolts and washers. Tighten bolts evenly with 45 to 50 inch-pounds torque.

5-144. Fuel Manifolds and Starting Nozzles. Starting and main fuel manifolds are bracketed together and mounted around exhaust diffuser ahead of rear firewall. Main manifold delivers fuel to eleven vaporizers, and has a strainer at its inlet on T53-L-5/9/9A engines. On T53-L-11 engine the strainer is located in the main fuel line. The starting manifold is of smaller tubing and serves the starting nozzles.

5-145. ***Removal — Fuel Manifolds and Starting Nozzles.*** a. Remove upper section of rear firewall from engine.

b. Disconnect main and starting fuel hoses from inlet fittings of fuel manifolds. Cap or plug open fittings and hoses.

Caution

> To prevent cracking the manifolds, loosen nuts evenly and progressively.

c. Remove lockwire and disconnect main fuel manifold fitting nuts from 11 fuel vaporizers at aft side of engine fireshield.

d. Remove lockwire and disconnect starting fuel manifold nuts from starting nozzles.

e. Remove main and starting fuel manifolds as an assembly.

f. Install protective caps on exposed ends of fuel vaporizers and manifold fittings.

g. Remove starting nozzles as necessary for cleaning or replacement. Do not attempt removal of fuel vaporizers, since this requires disassembly of engine combustion section.

5-146. *Cleaning — Fuel Manifolds and Starting Nozzles*. a. Clean fuel manifolds and associated lines with solvent (item 302, table 1-1).

b. On T53-L-1A/5/9/9A engines wash strainer on plug located in main manifold near inlet in solvent (item 302, table 1-1).

c. On T53-L-11 engine wash bypass filter element in clean fuel (item 1, table 1-1) and air dry.

d. Clean starting fuel nozzles with calibrating fluid (item 12, table 1-1).

5-147. *Inspection — Fuel Manifolds and Starting Nozzles.* a. Inspect fuel manifolds and associated lines for cracks or other damage.

b. Inspect strainers for cleanliness and condition as scheduled in Inspection Requirements, or whenever contaminated or restricted fuel flow is suspected.

c. On T53-L-1A/5/9/9A engines inspect strainer on plug located in main manifold near inlet for cleanliness and damage.

d. On T53-L-11 engine inspect bypass filter element, spring and plug for general condition and continued serviceability.

e. Using a pressure source of dry filtered air, check starting fuel nozzles for clogged condition.

5-148. *Repair or Replacement — Fuel Manifolds and Starting Nozzles.* a. Replace all unserviceable parts.

b. On T53-L-1A/5/9/9A engines, wnen replacing strainer on plug located in main manifold near inlet, coat a new packing with petrolatum (item 14, table 1-1) and place on strainer.

c. On T53-L-11 engine, when replacing bypass filter plug, place new packing on plug and lubricate threads with oil (item 5, table 1-1).

d. If starting fuel nozzles remain clogged after cleaning, replace nozzles.

5-149. *Installation — Fuel Manifolds and Starting Nozzles.* a. Install starting nozzles into combustion chamber ports.

(1) On T53-L-1A/5/9/9A engines with scoop type combustor place a lock-nut on each of three starting nozzles. Install nozzles in combustion chamber housing ports at 10, 12, and 2 o'clock locations. Tighten nozzles and nuts, and lockwire. Install remaining two nozzles into mounts at 4 and 8 o'clock locations, tighten and lockwire.

(2) On T53-L-11 engine and T53-L-5/9/9A engines with scoopless type combustor install two starting nozzles through mounting pads on fireshield at approximately 4 and 8 o'clock locations. Secure each nozzle with two lock-wired screws.

b. Position the assembled starting and main fuel manifolds on rear support cone of engine. Place a washer on starting manifold inlet, insert nipple through bracket located at lower left on support cone.

c. Connect main and starting fuel manifold coupling nuts to vaporizers and starting nozzles. Start and tighten all nuts evenly and progressively to prevent cracking manifolds, and hold manifolds to prevent twisting. Tighten starting manifold nuts with 150 to 175 inch-pounds torque. Use tool LTCT219 or LTCT2051 to tighten main manifold nuts with 350 to 400 inch-pounds torque. Lockwire nuts.

d. Install nut on starting manifold inlet. Connect starting and main fuel hoses to inlet fittings of manifolds.

e. Install upper section of rear firewall.

f. Check for fuel leaks during next ground runup of engine.

5-150. *Adjustment — Fuel Manifolds and Starting Nozzles.* Use following instructions if fuel leaks occur at main fuel manifold connections to vaporizers.

a. Check torque of main fuel manifold nuts on fuel vaporizers. If leak continues, remove fuel manifolds. (Refer to paragraph 5-145.)

b. Check for leaks as follows:

(1) Connect hose from a regulated source of compressed air to inlet of main fuel manifold.

(2) Pressurize manifold with 30 to 100 psi air pressure.

(3) Apply liquid soap around fuel manifold connection to fuel vaporizer and check for bubbles indicating leakage.

c. Check for fuel leaks during next ground runup of engine.

d. If leaks continue after above checks, replacement of fuel vaporizers is required. However, if a normal seal is indicated on seating surface of fuel vaporizer but leak continues, replace fuel manifold.

5-151. Auxiliary Fuel Provisions. Permanently installed provisions for use of internally installed auxiliary fuel tanks include drain, vent and fuel transfer lines with quick-disconnect couplings. (See figure 5-20, 5-21, and 5-22.) Comparable provisions for use of externally installed auxiliary fuel tanks include interconnecting air lines between the tanks, and fuel lines which are connected to each fuel tank. (See figure 5-31.) A stowed transfer pump relay circuit with flow switch in the left-hand main fuel tank limits fuel level during transfer.

Section VI — Oil System

A 5-152. Engine Oil System — UH-1A. (See figure 5-32.) Oil is supplied from an external tank, on right side of deck ahead of forward firewall. An electrically operated shutoff valve controls flow through a quick-disconnect hose to an engine driven pump, located on front of accessory gear box. Pump is equipped with a pressure relief valve and a thermobulb for oil-in temperature gage, and delivers oil to a filter for distribution through engine lubrication system. Oil pressure gage transmitter and a pressure switch for ENGine OIL PRESsure LOW caution panel light, mounted at top and right on inlet housing, are connected by external lines to a pressure tap on filter. Torquemeter pressure transmitter, at top of engine, is connected to torquemeter tap on right side of inlet housing. On Serial No. 59-1607 and

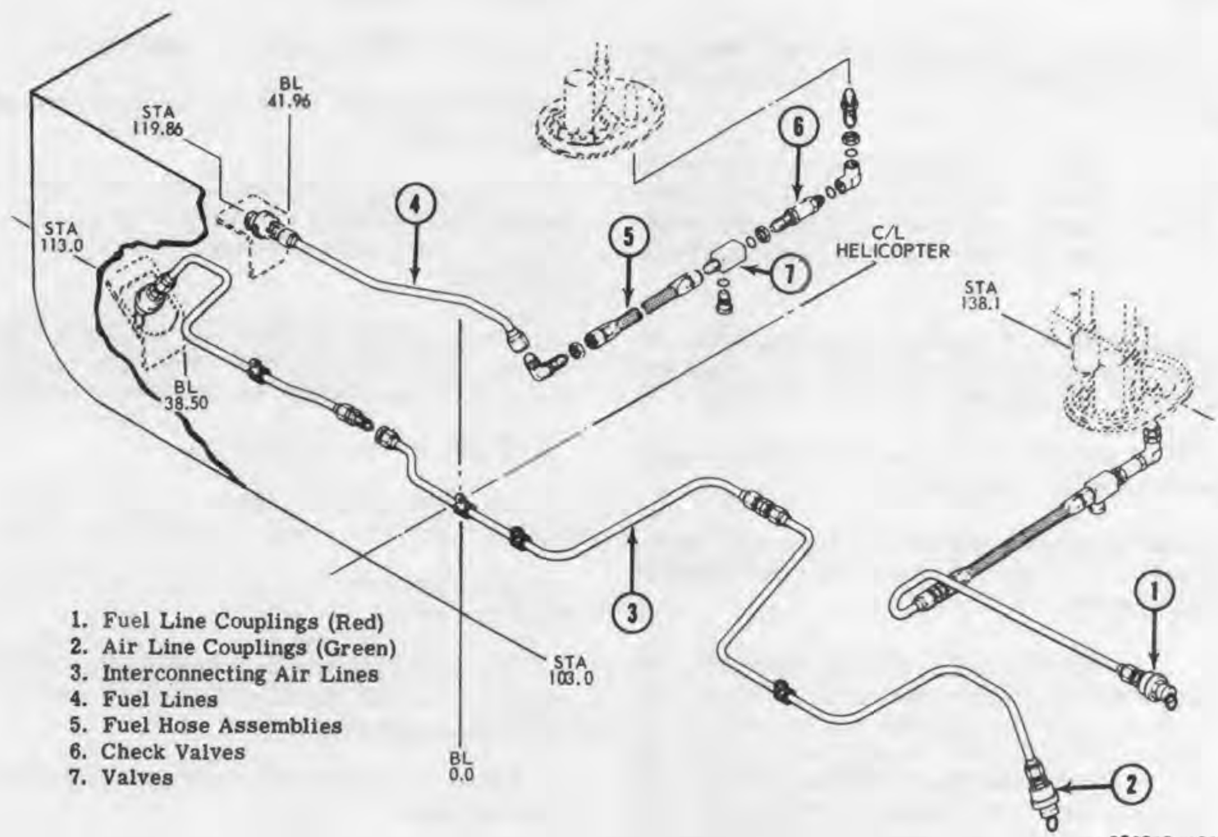
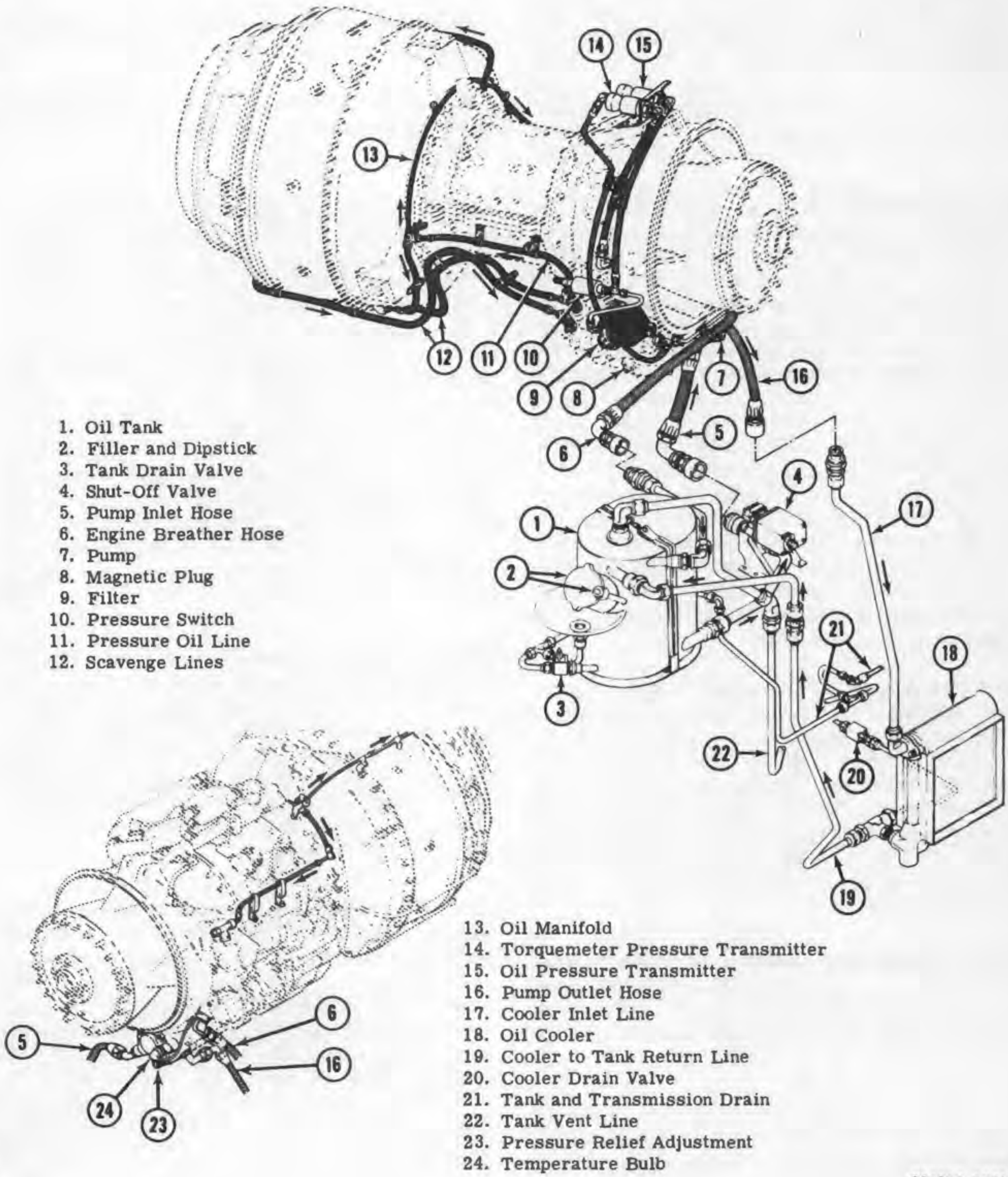


Figure 5-31. Permanently installed fuel lines — external auxiliary tanks (typical — UH-1B serial No. 62-1872 and subsequent)



1. Oil Tank
2. Filler and Dipstick
3. Tank Drain Valve
4. Shut-Off Valve
5. Pump Inlet Hose
6. Engine Breather Hose
7. Pump
8. Magnetic Plug
9. Filter
10. Pressure Switch
11. Pressure Oil Line
12. Scavenge Lines
13. Oil Manifold
14. Torquemeter Pressure Transmitter
15. Oil Pressure Transmitter
16. Pump Outlet Hose
17. Cooler Inlet Line
18. Oil Cooler
19. Cooler to Tank Return Line
20. Cooler Drain Valve
21. Tank and Transmission Drain
22. Tank Vent Line
23. Pressure Relief Adjustment
24. Temperature Bulb

Figure 5-32. Engine oil system — UH-1A (typical) subsequent, torquemeter transmitter is also vented by an external line to accessory drive gear box, at cover of an unused drive pad on right front side. A breather hose from left front of accessory gear box is vented into tank through a quick-disconnect coupling. A quick-disconnect hose from scavenge pump outlet returns oil from engine through external piping and a cooler to supply tank. Tank and cooler have separate drain lines with manual valves.

A 5-153. ***Engine Lubrication — UH-1A.*** (See figure 5-31.) Oil under pump pressure is delivered through internal passages to filter on right side of accessory gear box. From filter, oil takes two main routes; through internal passages into engine inlet housing, and through external lines to rear end and left side of engine. Oil flow to inlet housing is distributed through passages, transfer tubes, and nozzles to lubricate reduction and accessory drive gears, shaft bearings, and splines. This sub-system also provides pressure oil to the torquemeter incorporated in support mounting of planetary reduction gears. Oil leaving filter through external line flows to a manifold tube from which it is distributed through branch lines to No. 2 main bearing inlet strainer, No. 3 and 4 main bearings strainer, and a tee strainer on overspeed governor drive gear.

A 5-154. ***Engine Oil Scavenge — UH-1A.*** All engine scavenge oil returns to accessory drive gear box, by drainage from inlet housing and by external lines from aft end of engine and fan drive gear box, passing through a course strainer in gear box throat. Gear box sump has a magnetic drain plug and is kept nearly empty during operation by scavenge element of engine driven pump, which delivers oil to external return lines.

5-155. ***General Maintenance — Engine Oil System.*** a. Replace any unserviceable external lines, hose, fittings, units, gaskets, and seals which are accessible without unauthorized disassembly.

b. Before removing any tube or hose, be sure it is properly identified and its route understood for replacement in same manner. When possible, leave supporting brackets in place to simplify reinstallation.

c. Cap or cover openings immediately when disconnected, and take all possible precautions to prevent contamination or dirt entering oil system.

d. Follow procedures below for replacement and adjustment of units in oil system.

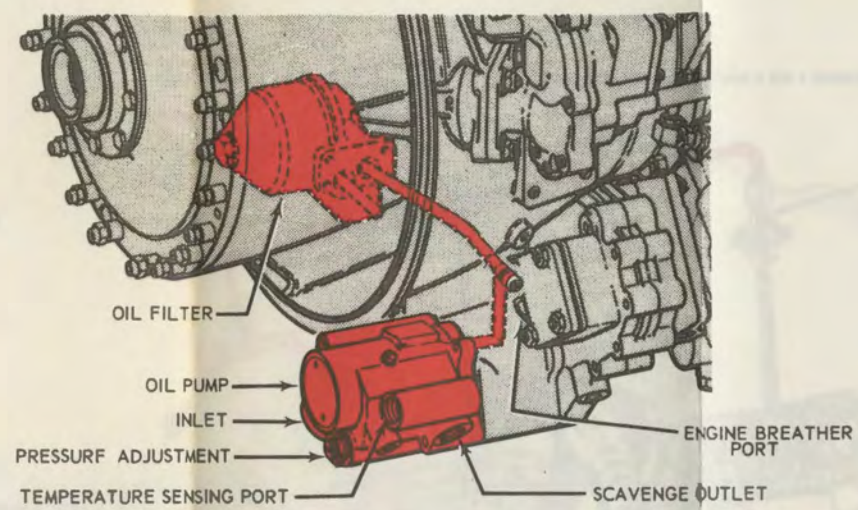
e. Follow schedules in Inspection Requirements for inspection and cleaning of filter and strainers.

B 5-156. Engine Oil System — UH-1B.

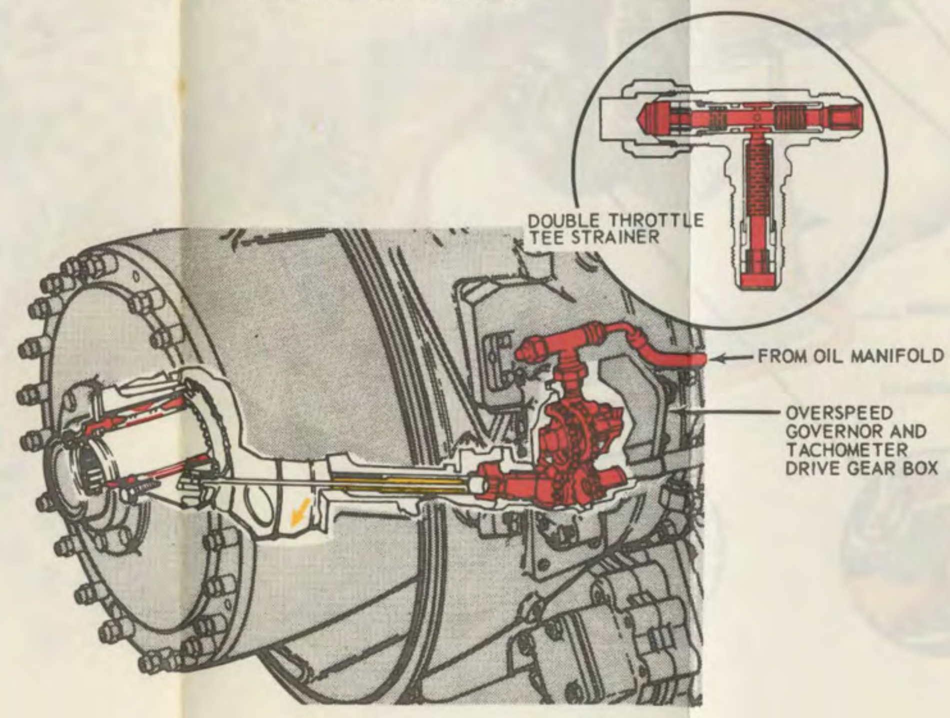
(See figure 5-32.) Oil is supplied from an external tank, mounted ahead of forward firewall at right side of service deck, and flows through a shut-off valve and a quick-disconnect hose to inlet of engine driven dual-element pump on front of accessory gear box. Pump is equipped with a pressure relief valve and a thermobulb for oil-in temperature gage, and delivers oil through internal passages to a filter on left side of accessory gear box for distribution through engine lubrication system. Oil pressure gage transmitter and pressure switch, for ENGine OIL PRESSure LOW caution panel light, are mounted at top of engine inlet housing and connected by external hose to pressure tap on filter.

B 5-157. ***Engine Lubrication — UH-1B.*** Filtered oil is distributed through internal passages and transfer tubes to lubricate gears and bearings at forward end of engine, and through external hoses and oil manifold to strainers lubricating main bearings at aft end of engine. (See figure 5-35.) Main bearing areas are provided with carbon seals and with paddle-pump slingers to assist oil scavenge.

B 5-158. ***Torquemeter Pressure System — UH-1B.*** The torquemeter, incorporated in reduction gearing to provide continuous gage readings of engine output torque, requires oil at higher than normal pressure. A rotary pump, on overspeed governor and tachometer drive, supplies oil to torquemeter through internal passages at 150 psi (plus or minus 10) regulated by an adjustable bypass valve. A second element of rotary pump scavenges oil from governor drive assembly. Torque gage transmitter, mounted at top of inlet housing, has two hose connections: From pressure port of transmitter to torquemeter tap above right mount pad of inlet housing; and from vent port to a tap on cover of an unused drive pad at right front on accessory gear box.



OIL PUMP AND FILTER DETAIL



GOVERNOR DRIVE GEAR BOX LUBRICATION DETAIL

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Figure 5-33. Engine lubrication — UH-1A (Sheet 1 of 3)

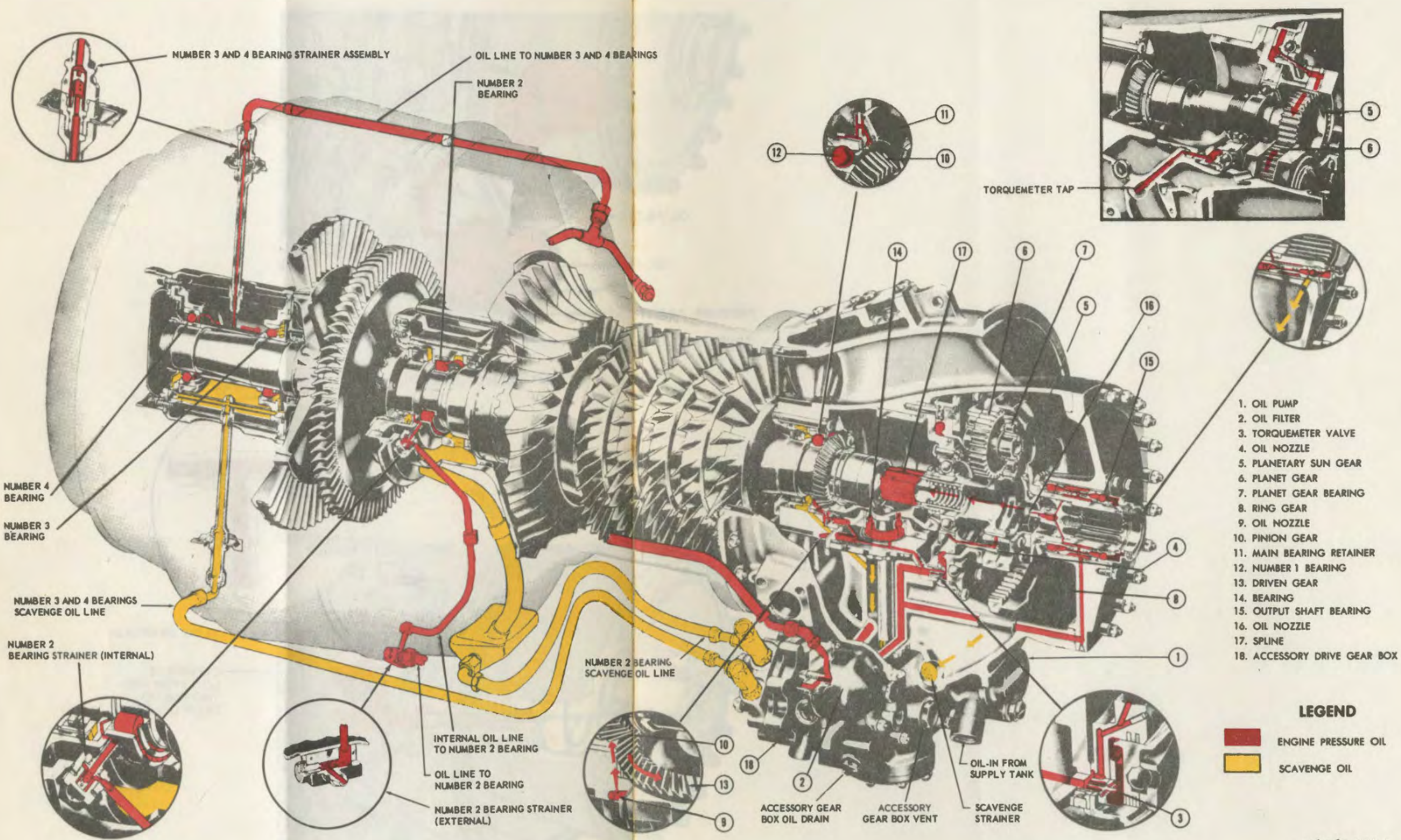


Figure 5-33. Engine lubrication — UH-1A (Sheet 2 of 3)

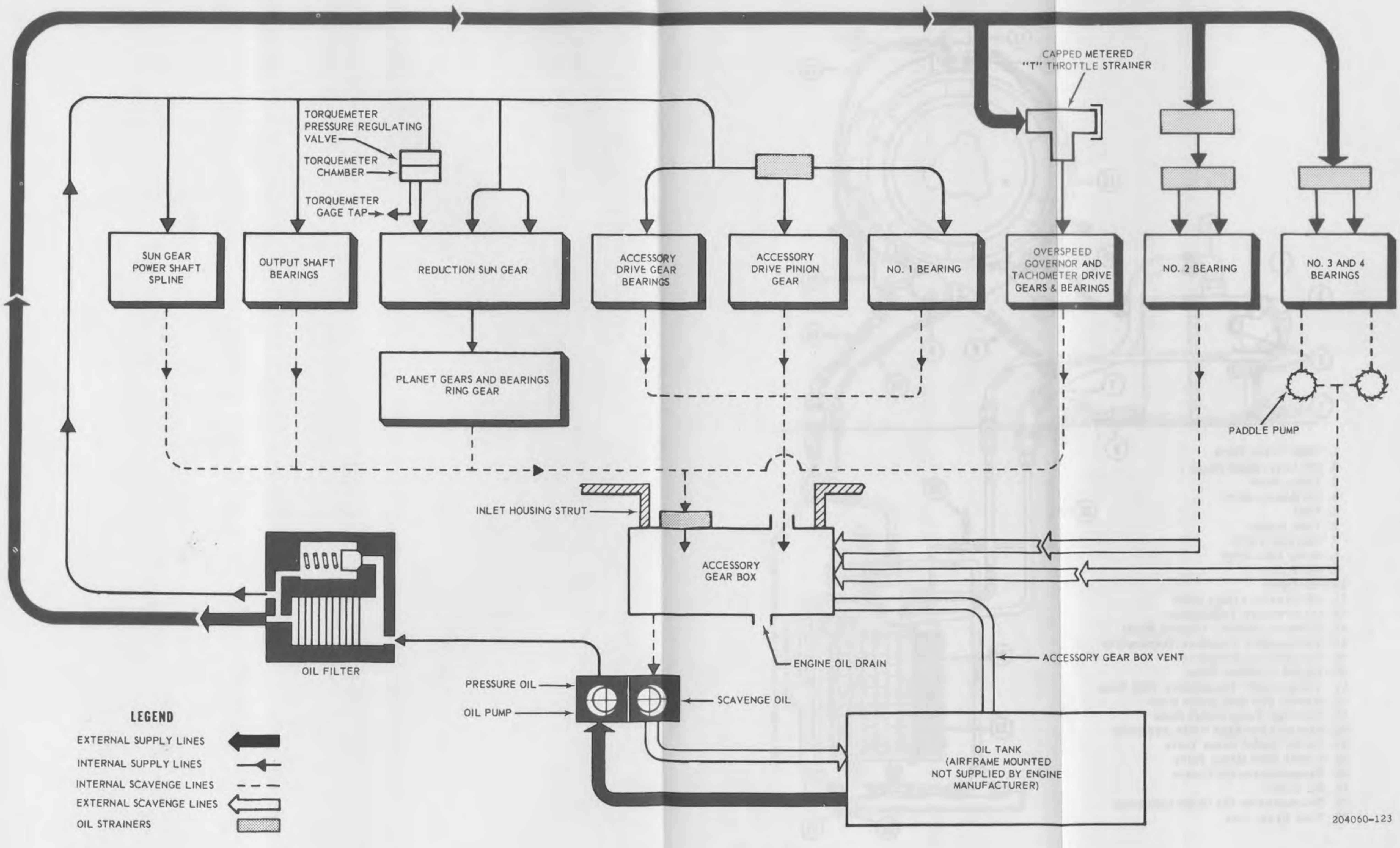
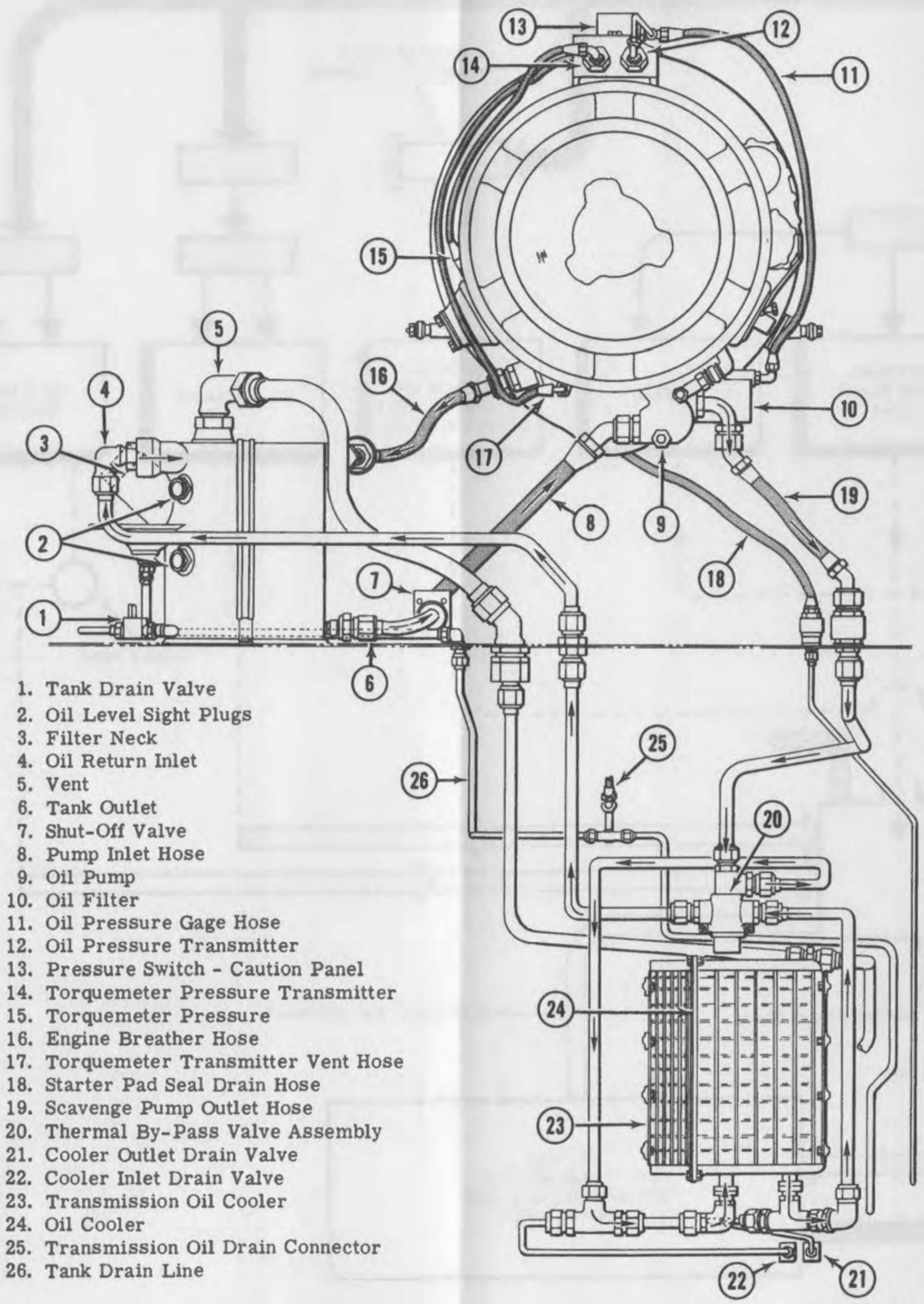


Figure 5-33. Engine lubrication — UH-1A (Sheet 3 of 3)



1. Tank Drain Valve
2. Oil Level Sight Plugs
3. Filter Neck
4. Oil Return Inlet
5. Vent
6. Tank Outlet
7. Shut-Off Valve
8. Pump Inlet Hose
9. Oil Pump
10. Oil Filter
11. Oil Pressure Gage Hose
12. Oil Pressure Transmitter
13. Pressure Switch - Caution Panel
14. Torquemeter Pressure Transmitter
15. Torquemeter Pressure
16. Engine Breather Hose
17. Torquemeter Transmitter Vent Hose
18. Starter Pad Seal Drain Hose
19. Scavenge Pump Outlet Hose
20. Thermal By-Pass Valve Assembly
21. Cooler Outlet Drain Valve
22. Cooler Inlet Drain Valve
23. Transmission Oil Cooler
24. Oil Cooler
25. Transmission Oil Drain Connector
26. Tank Drain Line

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Figure 5-34. Engine oil system — UH-1B (typical)

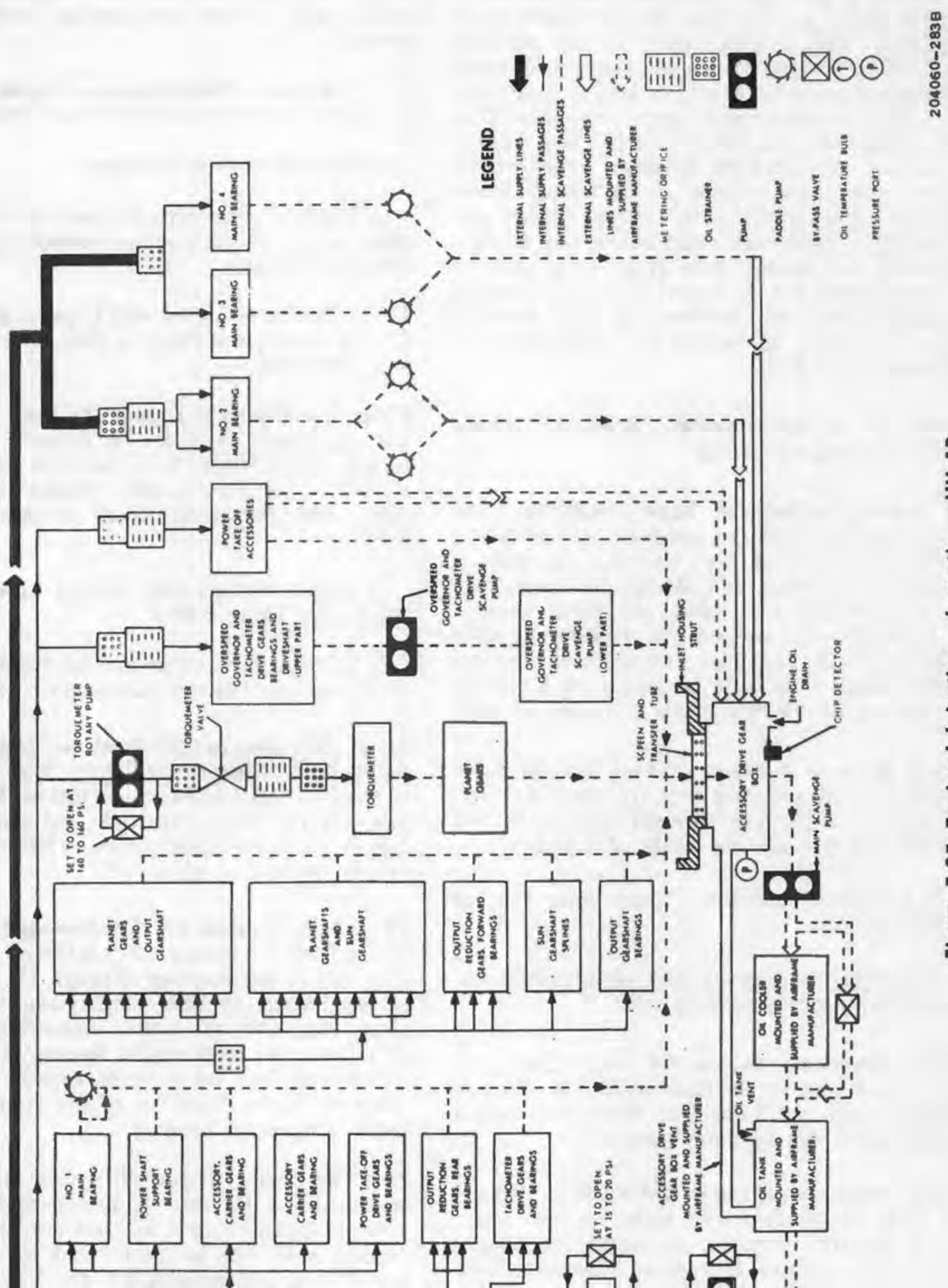


Figure 5-35. Engine lubrication schematic — UH-1B

B 5-159. *Engine Oil Scavenge and Return — UH-1B.* Scavenge oil drains into accessory gear box from inlet housing and through external lines from aft end of engine, passing through a coarse strainer in gear box throat. Scavenge element of engine driven pump circulates this oil through external lines to a thermal bypass valve and oil cooler, in fuselage compartment below deck, and returns it to supply tank. Separate drain lines, with manual valves, are provided at cooler inlet and outlet and at supply tank. A breaker hose from right side of accessory gear box is vented into tank through a quick-disconnect coupling. A chip detector type drain plug is located at lower right on accessory gear box.

5-160. *General Maintenance — Engine Oil System.* Refer to paragraph 5-151.

A 5-161. Engine Oil Tank — UH-1A. Engine oil supply tank is a welded metal container equipped with filler neck and cap, dipstick, a scupper with drain, and fittings for connection of outlet, return, vent, drain, and engine breather lines. Internal screens are provided at filler neck and vent, and inlet fittings have internal baffles. Tank is secured by straps on a padded support at right forward side of engine firewall.

5-162. *Removal — Engine Oil Tank.* a. Open right forward cowling. Drain tank by opening valve, located below scupper, in drain line which discharges at left aft underside of fuselage.

b. Disconnect all lines from tank. Cap or cover openings.

c. Cut lockwire, loosen tank strap turnbuckle, and remove tank from support.

5-163. *Cleaning — Engine Oil Tank.* Clean exterior and interior of tank with dry cleaning solvent (item 302, table 1-1). Drain thoroughly and dry with filtered compressed air.

5-164. *Inspection — Engine Oil Tank.* a. Inspect oil tank for punctures or leaks, torn or punctured internal screens, damaged threads at ports or on fittings, and for any damage affecting capacity or function.

b. Inspect pads on tank straps and support for deterioration or damage. Inspect tank straps for damage and general condition.

B c. On UH-1B helicopters inspect oil level sight gage glasses for damage and internal stains.

5-165. *Repair or Replacement — Engine Oil Tank.* a. Replace unserviceable fittings and O-rings.

b. Replace tank if damaged.

c. Replace unserviceable pads on tank straps and support. Replace support assembly if straps are unserviceable.

B d. Faulty oil level sight gage glasses on UH-1B helicopters shall be cleaned or, if necessary, replaced.

5-166. *Installation — Engine Oil Tank.* a. Check that pads are in place on support base and straps. Open straps to place tank on support, with filler neck outboard. Connect straps over tank, with turnbuckle loose to permit alignment.

b. Install fittings and connect tubes to tank ports. (See figure 5-32.)

c. Tighten tank strap turnbuckle with 10 to 14 inch-pounds torque. Lockwire turnbuckle.

B 5-167. Engine Oil Tank — UH-1B. (See figure 5-34.) Engine oil supply tank is similar to that on UH-1A, except it has oil level sight gages rather than a dipstick, and can be maintained by same instructions. (Refer to paragraphs 5-162 through 5-166.)

A 5-168. Engine Oil Cooler—UH-1A. (See figure 5-36.) A cooler for engine oil system is mounted in an opening through the bulkhead between main fuselage compartment and cargo-sling compartment, and is connected into the oil return line from engine to tank. Cooling air flow is provided by a turbo blower driven by bleed air taken from top of the engine centrifugal compressor housing.

A 5-169. The UH-1A oil cooler installation was modified in service to incorporate the same type of cooling blower as that used on UH-1B. Maintenance can be performed by applicable portions of instructions for the UH-1B installation. (Refer to paragraphs 5-166 through 5-171.) The following differences on UH-1A must be considered:

a. No transmission oil cooler.

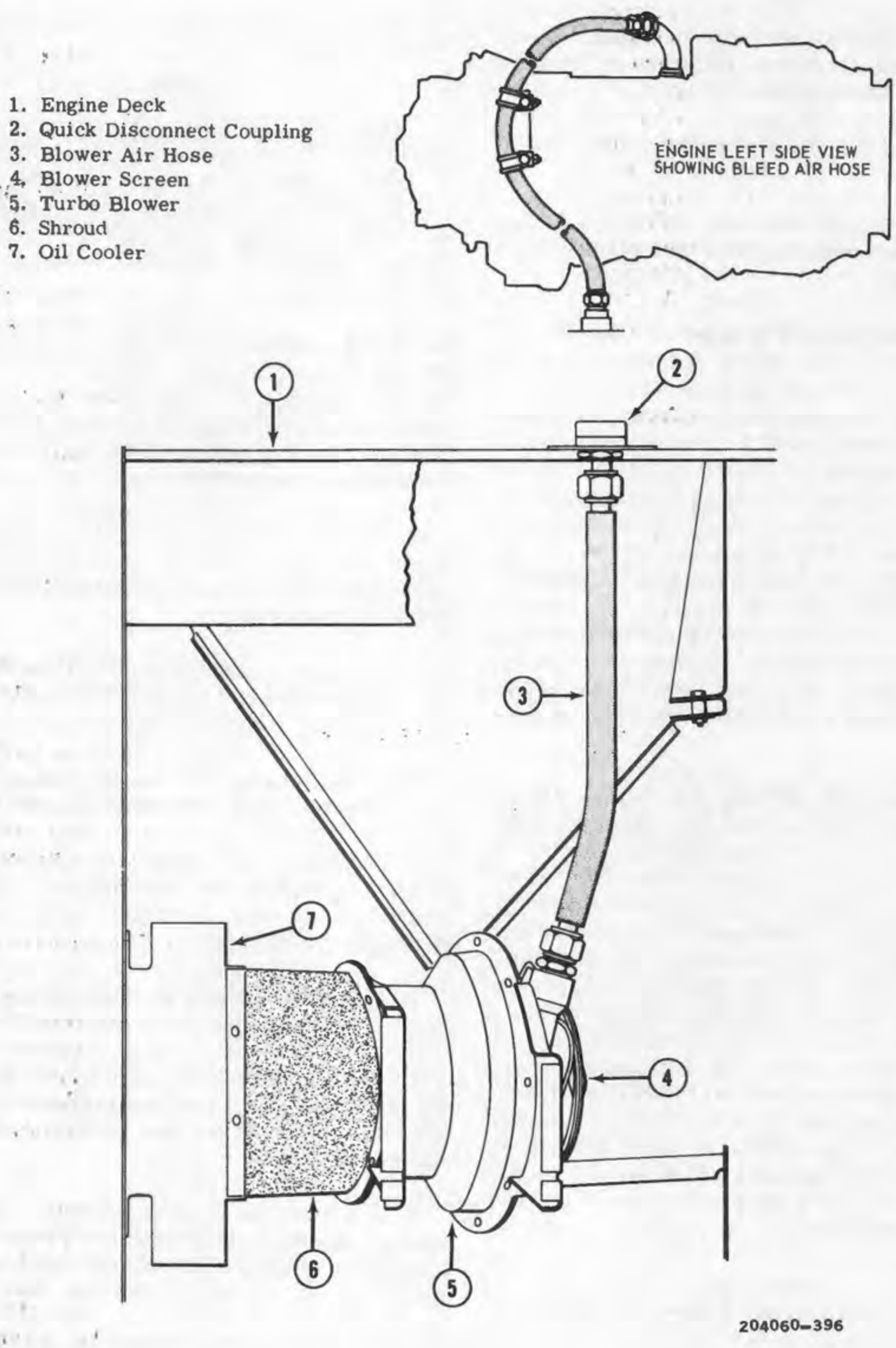


Figure 5-36. Engine oil cooler installation — UH-1A

b. Thermal bypass valve is in cooler rather than a separate unit.

c. A fabric shroud, instead of a metal duct, connects blower to cooler. There is no connection for starter-generator cooling.

d. Different structural supports for blower are used.

e. Bleed air supply hose has different routing on engine, and connects to a quick-disconnect fitting on deck.

B 5-170. Engine Oil Cooler — UH-1B. (See figure 5-37.) A cooler for engine oil is mounted in an opening through the bulkhead between main fuselage compartment and cargo-sling compartment, and is connected into oil return line through a thermal bypass valve mounted on the same bulkhead. Cooling air flow is provided by a turbo blower driven by bleed air taken from engine at an adapter on top of the centrifugal compressor housing. A starter-generator cooling duct is connected to top of the duct between blower and oil cooler. Another cooler, for transmission oil, is mounted side by side with engine oil cooler, but there is no functional connection between the two oil systems.

B 5-171. *Bleed Air Fittings for Engine Model Change on UH-1B.* The bleed air source on T53-L-9A/11 engines provides compressed air in greater volume and at higher temperature than on T53-L-5/9 engines. To avoid overspeed of oil cooler blower, it is necessary to use a more restricted inlet fitting on blower with an engine model which takes air from the diffuser housing than with an engine which supplies air directly from the centrifugal compressor housing. A similar situation exists as to a fitting on selector valve of the bleed air heater-defroster system. An alternate set of two fittings is stowed in a bracket on the engine forward firewall at left side, for use in event of an engine model change in accordance with an adjacent placard which reads as follows:

Warning

Install 204-060-494-1 fitting in turbo fan inlet housing and 204-061-410-1 fitting in bleed air heater outlet housing with T53-L-9A or T53-L-11 engine installation.

Install AN919-23D fitting in turbo fan inlet housing and 204-060-453-1 fitting in bleed air outlet housing with T53-L-5 or T53-L-9 engine installation.

Stow removed fitting in clip provided.

Note

If a T53-L-9A/11 engine is to replace a T-53-L-5/9 engine on an aircraft not yet modified in accordance with MWO-55-1520-211-20/24, a part number 500516-16C adapter will be required to connect the bleed air hose to the new engine.

B 5-172. *Removal — Engine Oil Cooler — UH-1B.* a. Enter fuselage compartment through door at right-hand side. Disconnect bleed air hose from blower. Cap or cover line and blower inlet fitting. Detach and remove blower screen from base as necessary.

b. Remove eight bolts to detach blower flange from duct. Keep shims for reinstallation. Remove bolts at left side to detach blower from support bracket.

c. Disconnect starter-generator cooling duct. Detach forward end of duct from support plates of cooler by removing mounting bolts.

d. Drain engine oil cooler and connecting lines through inlet and outlet drain valves.

e. Disconnect oil tubes from thermal valve fittings. Remove two mounting screws, with nuts and washers to detach valve and spacer plate from bulkhead.

f. Disconnect oil tube from cooler inlet fitting, and drain line from cooler outlet tee.

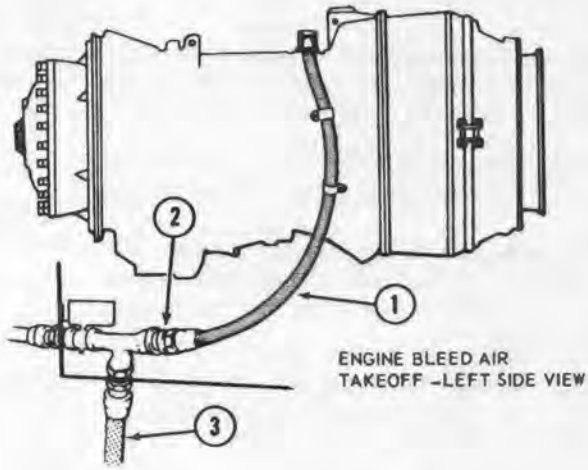
g. Detach engine oil cooler from transmission oil cooler by removing two upper and two lower bolts, with nuts and washers, at mating flanges of coolers.

h. Remove four bolts through engine oil cooler support plate and left side mounting flange on front of bulkhead. Remove cooler assembly aft through fuselage compartment.

i. When replacing cooler, detach elbow and tee assemblies from studs of cooler inlet and outlet by removing nuts and washers.

j. Cap all open lines and fittings to prevent contamination.

1. Bleed Air Hose
2. Quick Disconnect Coupling
3. Blower Air Hose
4. Intake Screen
5. Turbo Blower
6. Support Bracket
7. Cooler Drain Valves
8. Shims
9. Cooler Duct
10. Engine Oil Cooler
11. Starter Duct Connection
12. Cooler Outlet Line
13. Spacer
14. Thermal Valve Assembly
15. Oil Line from Engine
16. Cooler Inlet Line
17. Return Line to Tank
18. Bulkhead (Station 149)
19. Transmission Oil Cooler



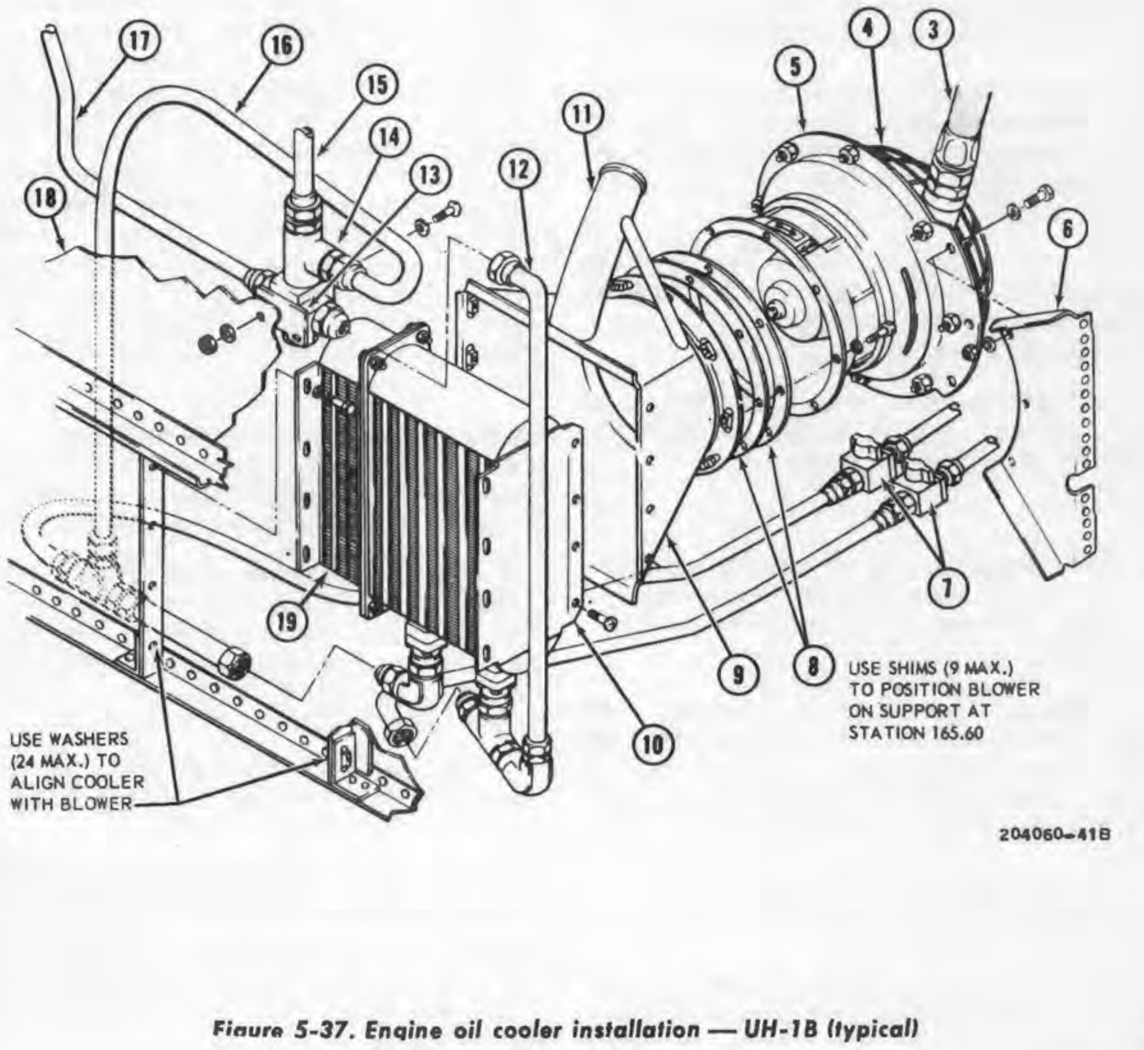


Figure 5-37. Engine oil cooler installation — UH-1B (typical)

B 5-173. *Inspection — Engine Oil Cooler — UH-1B.* a. Inspect all fittings, lines and mounting parts for damage and general condition.

b. Inspect air passages of oil cooler core in accordance with inspection requirements or as frequently as operating conditions warrant.

c. Inspect blower, screen, duct, oil cooler and thermal valve for damage and proper operation.

B 5-174. *Repair or Replacement — Engine Oil Cooler — UH-1B.* a. Replace unserviceable fittings, lines, gaskets, O-ring seals and mounting parts as required.

b. Replace blower, screen, duct, oil cooler or thermal valve as assemblies in event of damage or malfunction.

c. In event of engine internal failure, replace oil cooler and oil shut-off valve. Thoroughly flush out all connecting lines and fittings.

B 5-175. *Installation — Engine Oil Cooler — UH-1B.* a. Assemble gasket, elbow, and fitting on cooler inlet, secured by nuts and washers on four studs. Assemble fittings on cooler outlet in same manner.

b. Position engine oil cooler in bulkhead opening from aft side. Align mating flanges of two coolers and install two upper and two lower bolts, with nuts and washers.

c. Install four bolts, with thin washer, to secure support plate of engine oil cooler to plate-nuts of bulkhead flange.

Note

> When required to align cooler to blower, use not more than 24 washers on bolts between cooler and bulkhead flange.

d. Position thermal valve assembly and spacer plate on aft face of bulkhead above oil cooler. Install two screws, with thin aluminum alloy washers under heads, through valve body and bulkhead. Secure with nuts and aluminum washers.

e. Connect oil lines to valve and cooler, and drain lines to cooler.

f. Install duct on aft side of cooler, secured with four screws through each support plate-nuts of duct.

g. Position blower mounting flange on aft side of support bracket, and secure with three bolts. Insert shims, not to exceed nine, as required in gap between blower and duct for alignment. Also realign cooler in bulkhead opening as necessary. Secure blower to duct with eight bolts and thin washers.

h. Connect bleed air hose to blower.

i. Install turbo blower screen (4, figure 5-37) with bolts, grommets, nuts and 12 washers.

j. Connect starter-generator cooling duct to exit neck at top of cooler duct.

A 5-176. Engine Oil Strainers — UH-1A. Oil strainers which can be removed for inspection and cleaning are at pressure oil inlet to No. 2 main bearing on lower right side of engine diffuser housing, and at pressure oil inlet to No. 3 and 4 main bearings on top of engine exhaust diffuser. (See figure 5-33.) These strainers will be inspected at initial installation of engine, after initial engine run if chips or foreign matter are found on oil filter or magnetic plug, and thereafter at normal period for external inspection of engine unless required sooner because of evidence of oil system contamination. Double throttle tee strainer, on overspeed governor drive gear box, should not be disassembled unless facilities exist for flow testing strainer after reassembly. Complete tee strainer assembly will be replaced if necessary.

A 5-177. *Removal — Engine Oil Strainers — UH-1A.* a. Cut lockwire and remove strainer and gasket from top of No. 2 bearing oil inlet fitting at lower right side of engine diffuser housing.

b. Disconnect flexible oil line from No. 3 and 4 bearing inlet fitting at top of exhaust diffuser. Cut lockwire between strainer housing and adapter only. Hold adapter with wrench to prevent turning, while using another wrench to remove strainer housing with gasket.

c. Carefully withdraw strainer and nozzle assembly straight upward out of adapter and transfer tube, without twisting.

A 5-178. *Disassembly — Engine Oil Strainers — UH-1A.* Separate strainers, gaskets and nozzles.

A 5-179. *Cleaning — Engine Oil Strainers — UH-1A.* Clean all parts with dry cleaning solvent (item 302, table 1-1), and a soft wire brush. Air dry parts.

A 5-180. ***Inspection — Engine Oil Strainers — UH-1A.*** Inspect strainers and gaskets for suitability for continued service. Be sure all passages and openings are clear.

A 5-181. ***Repair or Replacement — Engine Oil Strainers — UH-1A.*** Replace unserviceable parts.

A 5-182. ***Reassembly — Engine Oil Strainers — UH-1A.*** Insert strainers in nozzles. Use new O-ring packing in groove around upper end of nozzle.

A 5-183. ***Installation — Engine Oil Strainers — UH-1A.*** a. Install strainer and gasket in top of No. 2 bearing oil inlet fitting at lower right side of engine diffuser housing. Lockwire.

b. Carefully insert nozzle through adapter into transfer tube at top of exhaust diffuser. Turn nozzle very gently to find position where locating lands on lower end seat in mating grooves.

c. Install strainer housing, with new O-ring packing. Hold adapter with wrench to prevent turning. Use second wrench to tighten strainer housing. Lockwire housing to adapter.

d. Connect flexible oil line from oil manifold to strainer housing.

B 5-184. Engine Oil Strainers — UH-1B. Oil strainers on engine which are accessible without major disassembly are located at external pressure line connection on lower right side of engine diffuser housing for No. 2 main bearing, at external pressure line connection on top right of exhaust section for No. 3 and 4 main bearings.

B 5-185. ***Removal — Engine Oil Strainers — UH-1B.*** a. Cut lockwire and remove strainer and gasket from top of No. 2 bearing oil inlet at lower ring on engine diffuser housing.

b. Disconnect flexible oil line from oil strainer housing at top left on engine ahead of rear firewall.

c. Cut lockwire between strainer housing and adapter only. Hold adapter against any turning with one wrench, while removing strainer housing with another wrench.

d. Carefully withdraw strainer and nozzle assembly, straight upward without twisting, from adapter and tube.

B 5-186. ***Disassembly — Engine Oil Strainers — UH-1B.*** Separate strainers, gaskets and nozzles.

B 5-187. ***Cleaning — Engine Oil Strainers — UH-1B.*** Refer to paragraph 5-179.

B 5-188. ***Inspection — Engine Oil Strainers — UH-1B.*** Refer to paragraph 5-180.

B 5-189. ***Repair or Replacement — Engine Oil Strainers — UH-1B.*** Refer to paragraph 5-181.

B 5-190. ***Reassembly — Engine Oil Strainers — UH-1B.*** Refer to paragraph 5-182.

B 5-191. ***Installation — Engine Oil Strainers — UH-1B.*** a. Install strainer and gasket in top of No. 2 bearing oil inlet at lower ring on engine diffuser housing and lockwire.

b. Insert nozzle for No. 3 and 4 bearing strainer carefully into adapter and tube. Turn gently to find position where locating lands on lower end of nozzle seat in mating grooves.

c. Disassemble strainer and nozzle for inspection and cleaning, by unscrewing slotted cap and separating parts.

d. Reassemble strainer and nozzle after cleaning.

e. Insert nozzle carefully into adapter and tube, turning it gently to find position where locating lands on lower end of nozzle seat in mating grooves.

f. Install strainer housing, with packing. Hold adapter with wrench while tightening strainer housing 80 to 100 inch-pounds torque with another wrench. Lockwire housing to adapter.

g. Clean thread of oil strainer housing and connector nut of flexible oil line with trichlorethylene (item 307, table 1-1).

h. On upper half only of threads on strainer housing, carefully apply sealing and retaining compound (item 204, table 1-1).

Caution

Be sure no sealant enters housing to result in clogging of strainer.

i. Connect oil line on strainer housing. Hold housing with wrench while tightening connector nut with 50 to 75 inch-pounds torque.

A 5-192. Engine Oil Pump — UH-1A. Engine-driven oil pump is mounted at front of accessory drive gear box. External features are inlet and outlet connections, pressure relief valve adjustment and a temperature bulb.

A 5-193. *Removal — Engine Oil Pump — UH-1A.* a. Open engine cowling. Place suitable vessel to catch trapped oil.

b. Disconnect electrical harness connector from oil temperature bulb. When required, remove temperature bulb and gasket.

c. Disconnect hoses from pump inlet and outlet fittings.

d. Remove lockwire and four bolts to detach pump from accessory drive gear box. Remove pump, coupling shaft assembly with snap-ring, and three packings at shaft and two oil passages.

e. Cover openings to prevent contamination.

A 5-194. *Installation — Engine Oil Pump — UH-1A.* a. Install snap-ring on coupling shaft. Insert shaft into middle opening of pump mounting pad on accessory drive gear box.

b. Install oil pump, with three packings in place, meshing pump shaft with coupling shaft. Secure pump to gear box with four bolts. Lockwire bolt heads.

c. Install 45 degree elbow with O-ring and nut in pump inlet, with open end pointing right. Attach hose assembly on elbow, and connect to shut-off valve outlet coupling.

d. Install elbow with O-ring and nut in pump outlet, with open end pointing aft. Attach hose assembly on elbow, and connect to return line coupling on deck.

e. Install oil temperature bulb with gasket in port at upper left on pump. Connect electrical harness connector to oil temperature bulb.

A 5-195. *Adjustment — Engine Oil Pump — UH-1A.* a. Before making any oil pump pressure adjustment, thoroughly check other elements of oil system, including pressure indication system.

(1) Oil pressure should not change during normal engine service.

(2) Check oil filter for cleanliness, since dirty filter discs can cause low oil pressure.

(3) Be sure operating checks of oil pressure are made according to normal procedures of engine operation, with oil temperature stabilized in normal range. (Refer to TM 55-1520-211-10.)

Caution

Do not make pressure adjustments during engine operation.

b. Adjust engine oil pressure, when necessary, at adjusting screw on front of oil pump housing.

(1) Loosen adjusting screw lock-nut.

(2) Turn adjusting screw clockwise to increase oil pressure or counter-clockwise to reduce pressure. One full turn will change oil pressure approximately ten psi.

(3) Tighten adjusting screw lock-nut with eight to ten foot-pounds torque.

(4) Recheck indicated oil pressure during engine operation.

B 5-196. Engine Oil Pump — UH-1B. An oil pump, mounted on front of accessory drive gear box, has pressure and scavenge elements on same drive shaft. External features on pump are inlet and outlet hose connections, pressure relief valve adjustment screw and lock-nut, and a thermobulb for oil temperature indicator.

B 5-197. *Removal — Engine Oil Pump — UH-1B.* a. Disconnect electrical harness connector from thermobulb. Remove thermobulb and gasket when necessary.

b. Disconnect hoses from pump inlet reducer fitting and outlet elbow fitting. Remove fittings with gaskets when necessary.

c. Remove lockwire and four through bolts which secure pump to gear box. Remove pump, three packings, and coupling shaft with snap-ring from mounting pad.

d. Cover openings to prevent contamination.

B 5-198. ***Installation — Engine Oil Pump — UH-1B.*** a. Install snap-ring on coupling shaft. Insert shaft into middle opening of pump mounting pad on accessory drive gear box.

b. Install oil pump, with three packings in place, meshing pump shaft with coupling shaft. Secure pump to gear box with four bolts. Lockwire bolt heads.

c. Install reducer fitting with gasket in pump inlet port. Connect hose.

d. Install elbow fitting with gasket in pump outlet port. Align elbow to point straight down. Tighten fitting and lock-nut with 300 to 325 inch-pounds torque. Connect hose.

e. Install thermobulb with gasket in port at upper left on pump housing. Connect electrical harness connector to thermobulb.

B 5-199. ***Adjustment — Engine Oil Pump — UH-1B.*** Refer to paragraph 5-195.

B 5-200. Torquemeter Rotary Pump — UH-1B. A dual element pump is mounted on front of overspeed governor drive gear box. Pressure element supplies oil to torquemeter at 140 to 160 psi, regulated by an adjustable bypass valve. Other element of pump aids circulation and scavenging of oil in governor drive gear box and to accessory mounting pad (unused) or right upper side of inlet housing.

B 5-200A. ***Removal — Torquemeter Rotary Pump —UH-1B.*** a. Remove mounting bolts and washers that secure rotary pump to the overspeed governor and tachometer drive assembly.

b. Remove rotary pump and discard packing.

B 5-201. ***Inspection — Torquemeter Rotary Pump.*** Inspect seal for leaks or damage. Inspect pump for proper operation.

B 5-202. ***Repair or Replacement — Torquemeter Rotary Pump — UH-1B.*** a. Replace seal which is accessible without disassembly of pump or valve.

b. Replace pump assembly in event of malfunction. Carefully note position of pump when removing, after removal of six mounting bolts, and align its ports to internal passages of mounting pad when reinstalling.

c. Use an accurate test gage, connected at port provided (9, figure 5-37), for checking or adjusting rotary pump pressure to 140 to 160 psi at bypass valve (11) during a ground run. Remove gage and reinstall plug in port after adjustment.

B 5-202A. ***Installation — Torquemeter Rotary Pump — UH-1B.*** a. Establish proper end float of overspeed governor drive shaft.

b. Install shims on either end of overspeed governor drive shaft, as required.

c. Install packing in rotary pump housing.

d. Mount rotary pump on overspeed governor and tachometer drive housing, mating its splined shaft with internal spline of overspeed governor drive shaft.

e. Secure pump with mounting bolts and washers. Tighten bolts. Lockwire.

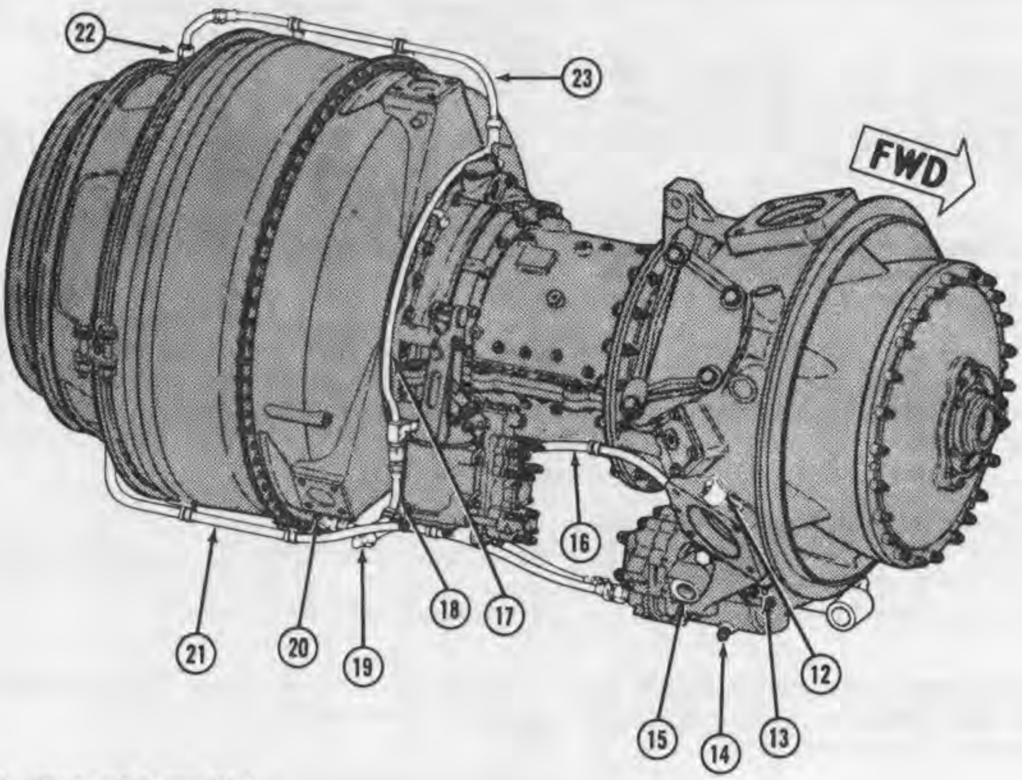
B 5-203. ***Adjustment – Torquemeter Rotary Pump — UH-1B.*** Torquemeter oil pressure may be adjusted as follows: (See figure 5-39.)

a. Remove plug from overspeed governor and tachometer drive and install a pressure gage that provides readings of 0 to 200 psi.

b. Operate engine and check torquemeter oil pressure.

Note

Normal pressures at test connection should be 150 (plus or minus 10) psi



1. Pressure Pump Inlet
2. Pressure Relief Valve Adjustment
3. Thermobulb Location
4. Scavenge Pump Outlet
5. Main Filter
6. Oil Pressure Tap
7. Filter By-Pass Valve
8. Torquemeter Boost Pump
9. Test Gage Connection
10. Strainer and Metering Cartridge
11. Boost Pump Pressure Adjustment
12. Torquemeter Pressure Tap
13. Accessory Gear Box Pressure Tap
14. Magnetic Chip Detector Plug
15. Accessory Gear Box Breather Port
16. Pressure Oil Line
17. Oil Manifold
18. Oil Line to No. 2 Bearing
19. Scavenge Line - No. 2 Bearing
20. Inlet Strainer - No. 2 Bearing
21. Scavenge Line - No. 3 and 4 Bearings
22. Inlet Strainer - No. 3 and 4 Bearings
23. Pressure Oil Line

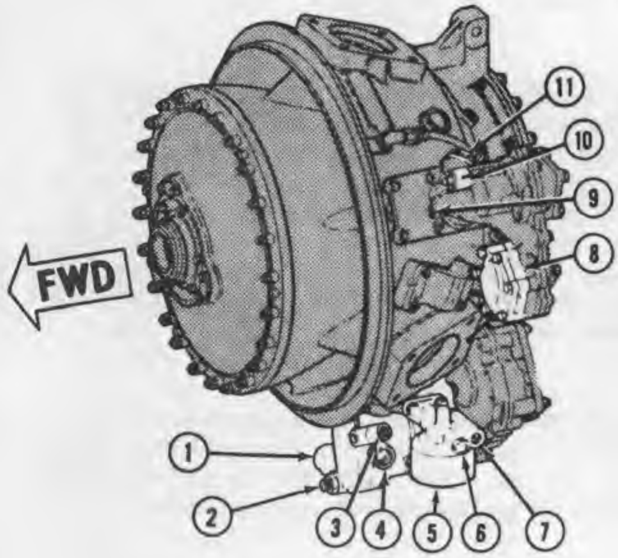


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Figure 5-38. Oil system components — T53-L-9/9/11 series engines at flight idle with main rotor turning. Reading should be taken after oil pressure and temperature have stabilized.

c. Shut down engine and make the following adjustments.

(1) Straighten tang on key-washer.

(2) Loosen adjusting screw locknut, using face spanner socket wrench LTCT215.

Note

It will be necessary to displace air pressure sensing hose when using wrench.

(3) Turn adjusting screw clockwise to increase pressure, or counterclockwise to reduce pressure. One full turn will change pressure approximately 10 psi.

(4) Tighten adjusting screw locknut to 70 to 80 inch-pounds torque using socket wrench LTCT215.

(5) Bend tang on key-washer.

(6) Restart engine. Recheck oil pressure and repeat step (3) if necessary.

d. Remove pressure gage and install plug.

A 5-204. Engine Oil Shut-Off Valve — UH-1A. A motor operated gate-type valve is mounted on a deck bracket at forward side of engine firewall; its outlet on aft side of firewall is fitted with a quick-disconnect coupling for engine oil pump inlet hose. An OIL VALVE OPEN-CLOSE toggle switch on cabin pedestal operates valve electrically, but cannot close oil valve while fuel shutoff remains open. Valve has a manual override handle and position indicator for use in ground maintenance when electric power is not available.

A 5-205. Removal—Engine Oil Shut-Off Valve—UH-1A. a. Open engine and forward cowling at right side.

b. Disconnect engine oil inlet hose from shut-off valve outlet coupling at firewall. (See figure 5-32.)

c. Drain oil tank by opening valve in drain line which discharges at left aft underside of fuselage.

d. At aft side of firewall, cut lockwire and remove four bolts and washers at flange of shut-off valve outlet connector. Remove outlet assembly and gasket. When required, disassemble coupling, nut and O-ring from outlet connector.

e. Disconnect electrical leads at valve receptacle.

f. Disconnect tank outlet tube from inlet connector of shut-off valve. Remove valve assembly and gasket from bracket.

g. When required, detach inlet connector and gasket from valve body by removing lockwire, four bolts and washers.

A 5-206. Installation — Engine Oil Shut-Off Valve — UH-1A. a. Assemble connector and gasket on inlet of valve body, secured by four bolts and washers. Lockwire bolt heads.

b. Assemble coupling, nut, and O-ring with outlet connector.

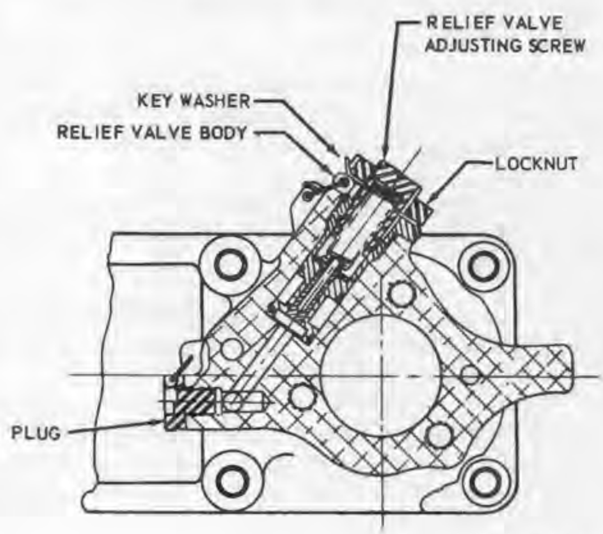


Figure 5-39. Torquemeter oil pressure adjustment — UH-1B

c. Place outlet connector, with gasket, to mounting holes from aft side of firewall. Insert four bolts, with thin washers under heads, through connector flange, gasket firewall, and bracket. Place gasket on bolts next to bracket.

d. Position valve body to bolts, with actuator at top. Start and tighten bolts into body. Lockwire bolt heads.

e. Connect tube from tank outlet to valve inlet connector.

f. Connect engine pump inlet hose to valve outlet coupling.

g. Connect electrical leads to receptacle on valve actuator.

B 5-207. Engine Oil Shut-Off Valve — UH-1B. Model UH-1B helicopters Serial No. 60-3546 through 64-14100 are equipped with a motor operated, gate type, shut-off valve essentially the same as that used on UH-1A helicopters. This unit can be maintained by use of instructions contained in paragraphs 5-204 through 5-206.

A 5-208. Engine Oil Filter — UH-1A. Oil filter on T53-L-1A engine is on right side of inlet housing. Cartridge consists of screen discs on a perforated tube enclosed by a removable container. Filter body has two external outlets and a bypass valve to assure oil flow if screens become clogged.

A 5-209. Removal — Engine Oil Filter — UH-1A. a. Open cowling at left-hand side of engine Position suitable container to catch oil.

b. Remove bolts (12, figure 5-40) and washers (13) attaching oil filter to engine and remove plug.

c. Open right-hand engine cowling to gain access to accessory gear box magnetic plug. Cut lockwire and remove plug.

A 5-210. Disassembly — Engine Oil Filter—UH-1A. a. Cut lockwire, remove seat nut (1, figure 5-40) and O-ring (2). Pull off filter container (3) and O-ring (4).

b. Remove nut (5) from stud (10). Pull off cartridge assembly. Separate retainer cup (6), seven filter discs (7), and six spacers (8) from tube (9).

A 5-211 Cleaning—Engine Oil Filter—UH-1A. Engine oil filter and accessory gear box magnetic plug shall be cleaned at the following intervals: At initial installation of engine; after first ground run-up; after first five hours of operation; after first 15 hours of operation, then after each 25 hours of operation.

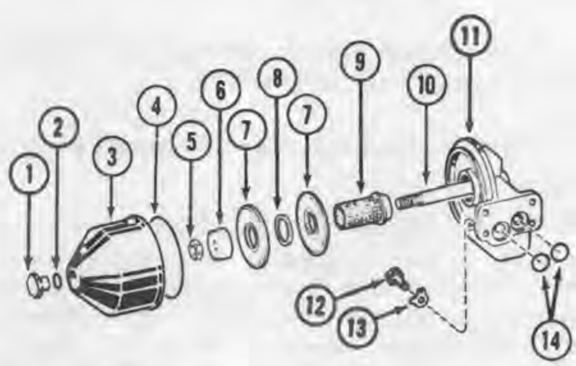
a. Clean all parts with dry cleaning solvent (item 302, table 1-1) and dry with filtered, compressed air.

b. Use a soft bristle brush as necessary to remove accumulated metal chips and foreign material.

A 5-212. Inspection—Engine Oil Filter—UH-1A. Engine oil filter and accessory gear box magnetic plug shall be inspected at the following intervals: At initial installation of engine; after first ground run-up; after first five hours of operation; after first 15 hours of operation, then after each 25 hours of operation.

a. Inspect screens for accumulation of metal chips, foreign material and tears, breaks or other damage.

b. Inspect seal nut (1, figure 5-40) and filter tube (9) for suitability for continued use.



1. Seal Nut	8. Spacers (6 Reqd)
2. O-Ring Packing	9. Filter Tube
3. Container	10. Stud
4. O-Ring Packing	11. Filter Body
5. Jam Nut	12. Bolts (4 Reqd)
6. Retainer Cup	13. Tabwashers (4 Reqd)
7. Filter Discs (7 Reqd)	14. O-Ring Packings

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Figure 5-40. Engine oil filter — UH-1A

c. Inspect container (3), stud (10) and filter body (11) for damage and general condition.

d. Inspect magnetic plug for accumulation of metal chips and foreign material. Check condition of threads.

A 5-213. *Repair or Replacement — Engine Oil Filter — UH-1A.* a. If accumulation of metal chips and foreign material on screens is excessive replace screens and immediately investigate source to determine corrective action.

b. If accumulation of metal chips and foreign material on magnetic plug is excessive immediately investigate source to determine corrective action. If threads are damaged replace magnetic plug.

c. Replace packings and unserviceable parts as necessary.

A 5-214. *Reassembly—Engine Oil Filter—UH-1A.* a. Assemble seven screens, six spacers, and retainer cup on filter cartridge tube. Place cartridge assembly on stud. Secure with jam nut, tighten so that parts will not rotate.

b. Place O-ring and container on filter body, aligning pierced lugs for lockwire. Install seal nut with packing. Tighten with 70 to 90 inch-pounds torque. Lockwire nut to container, and container to filter body.

Caution

Do not attempt to correct oil leakage between packing and container by increasing torque on seal nut. If leak occurs, check mating surfaces and install new packings.

Warning

Do not allow oil to remain on skin longer than necessary, since it contains a toxic additive which is readily absorbed through skin.

A 5-215. *Installation—Engine Oil Filter—UH-1A.* a. Position oil filter on engine with new O-ring packings (14, figure 5-40).

b. Install attaching washers (13) and bolts (12).

c. Install magnetic plug, with new packing, and lockwire.

d. Close and secure engine cowling.

B 5-216. Engine Oil Filter — UH-1B. Oil filter on T53-L-5, -L-9, or -L-11 engines is located at left side of inlet housing. Filter element is reusable wafer disc type, enclosed in a cylindrical housing equipped with a bypass valve preset to open at 15 to 20 psi differential pressure for continued oil flow if screens should become clogged. Flow to and from filter is through internal passages. A pressure line from a tap on filter housing connects to oil pressure gage transmitter and pressure switch for caution panel light.

B 5-217. *Removal — Engine Oil Filter — UH-1B.* a. Open cowling at left-hand side of engine. Position suitable container to catch oil.

b. Remove bolts, washers, tab washers and brackets attaching filter to engine. Remove filter and packings.

c. Open right hand engine cowling to gain access to accessory gear box chip detector. Cut lockwire and remove chip detector.

B 5-218. *Disassembly — Engine Oil Filter—UH-1B.* Loosen screw that secures cover and element in bottom of filter housing and remove cover and element assembly from housing.

B 5-219. *Cleaning—Engine Oil Filter—UH-1B.* Engine oil filter and accessory gear box chip detector shall be cleaned at the following intervals: At initial installation of engine; after first ground run-up; after first five hours of operation; after first 15 hours of operation, then after 25 hours of operation.

a. Place cleaning fixture SPT 107 on screw of filter and turn it down until fitted snugly against end plate. Cap fixture nipple.

b. Immerse filter and fixture assembly in solvent and soak until contaminants are removed from external surfaces of element.

c. Attach an air line to nipple of cleaning fixture. Continue rinsing in solvent until there is no discoloration.

d. Remove cleaning fixture from filter screw. Dry cover with clean compressed air. Protect filter from contamination while removed.

e. Wash filter housing and chip detector with solvent (item 302, table 1-1).

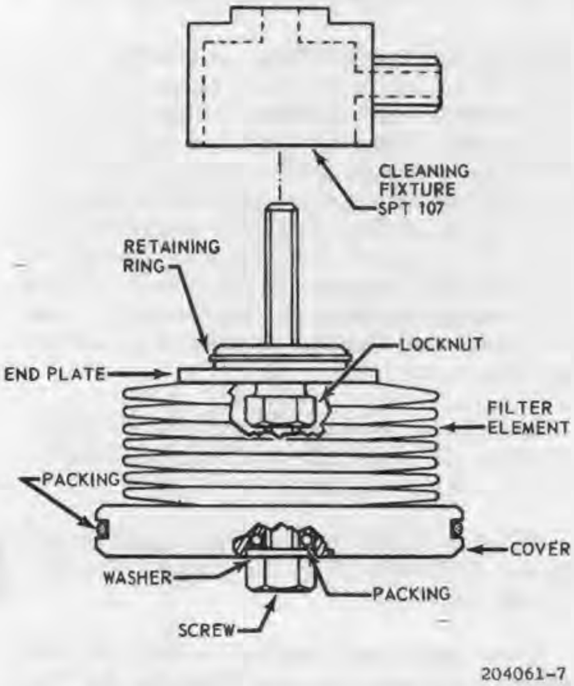


Figure 5-41. Engine oil filter, cover assembly and cleaning fixture — UH-1B

B 5-220. *Inspection—Engine Oil Filter—UH-1B.* Engine oil filter and accessory gear box chip detector shall be inspected at the following intervals: At initial installation of engine; after first ground run-up; after first five hours of operation; after first 15 hours of operation, then after each 25 hours of operation.

a. Inspect filter element and chip detector for accumulation of metal chips and foreign material. Check for tears, breaks or other damage.

b. Inspect filter screw, cover, end plate and housing for damage and serviceability.

c. If cover is disassembled for any reason measure thickness of filter element at inner ring. Thickness shall be 0.126 to 0.136 inch. If not within limits, replace element.

B 5-221. *Repair or Replacement—Engine Oil Filter — UH-1B.* a. If accumulation of metal chips and foreign material on filter element is excessive immediately investigate source to determine corrective action.

b. If accumulation of metal chips and foreign material on chip detector is excessive internal inspection of reduction gears and bearings may be necessary.

c. Replace packings and unserviceable parts as necessary.

d. Replace filter element if required dimensions are not met. (Refer to paragraph 5-220, step c.)

B 5-222. *Reassembly—Engine Oil Filter—UH-1B.* Insert cover and element assembly into bore of housing and engage screw in threads. Tighten screw with 25 to 35 inch-pounds torque. Lockwire head to hole in chamfered edge of housing.

B 5-223. *Installation—Engine Oil Filter—UH-1B.* a. Position oil filter on engine with new O-ring packings.

b. Install attaching brackets, tab washers, washers and bolts.

c. Install chip detector, with new packing, in accessory gear box port and lockwire.

d. Remove drainage vessel. Close and secure engine cowling.

Warning

Do not allow oil to remain on skin longer than necessary, since it contains a toxic additive which is readily absorbed through skin.

A 5-224. Oil Pressure Transmitters and Switch — UH-1A. (See figure 5-32.) Pressure switch for engine oil pressure caution light is mounted on right side of inlet housing just above oil filter, with a connecting line from filter pressure tap. Transmitters for engine oil pressure and torque indicators are mounted on a bracket at top of inlet housing. Through Serial No. 58-3047, transmitters are in a shock-mounted bracket, with all oil connections on front ends. On Serial No. 59-1607 and subsequent, bracket is secured directly to engine pad, a different type of transmitter is used, and torquemeter transmitter has a vent line hose to accessory drive gear box.

A 5-225. *Removal — Oil Pressure Transmitters and Switch — UH-1A.* a. Open right-hand engine cowling and position suitable container to catch oil.

b. Disconnect electrical leads and oil lines from pressure switch. Cap or cover openings in lines to prevent entrance of foreign material.

c. Cut lockwire, remove bolts and washers and lift switch from engine.

d. Disconnect oil lines and electrical cable from transmitter. Cap or cover lines to prevent entrance of foreign material.

e. Remove mounting screws or nuts to detach transmitter from bracket and remove transmitter.

A 5-226. *Installation—Oil Pressure Transmitters and Switch — UH-1A.* a. Position pressure switch on bracket and secure with washers, bolts and lockwire.

b. Use tee fitting in replacement switch. Uncap or uncover openings in oil lines and connect oil lines and electrical leads to pressure-switch. Lockwire connector.

c. Transfer fittings to replacement filter. Check that plug with orifice is installed in "V" connection on either transmitter through aircraft Serial No. 58-3047, or on oil pressure gage transmitter only on aircraft Serial No. 59-1607 and subsequent.

d. Position transmitter in bracket and install mounting screws or nuts.

e. Uncap or uncover openings in oil lines and electrical cable to transmitter. Lockwire connector.

f. Remove drainage vessel. Close and secure engine cowling.

B 5-227. Oil Pressure Transmitters and Switch — UH-1B. (See figure 5-34.) Transmitters for engine oil pressure and torque indicators are mounted in a support at top of inlet housing. Pressure switch for engine oil pressure caution light is mounted on top of same support assembly.

B 5-228. *Removal — Oil Pressure Transmitters and Switch — UH-1B.* a. Open engine cowling doors and position suitable container to catch oil.

b. Disconnect electrical cable connector from pressure switch. Disconnect oil pressure line hose and tube from tee fitting on switch and cap or cover openings to prevent entrance of foreign material.

c. Remove two bolts to detach switch from top of support assembly and remove switch.

d. Cut lockwire and disconnect electrical cable connector from oil pressure transmitter. Disconnect oil tube and remove elbow, nut, gasket and large retaining nut at front end of transmitter. Cap or cover openings in oil tube to prevent entrance of foreign materials. Remove transmitter from support.

e. Cut lockwire and disconnect electrical cable connector from torquemeter transmitter. Disconnect vent line hose from rear of transmitter and remove union and gasket. Cap or cover openings in hose to prevent entrance of foreign material.

f. Disconnect pressure line hose from front of transmitter and remove elbow, gasket, nut and large retaining nut. Cap or cover opening in hose to prevent entrance of foreign material. Remove transmitter from support.

B 5-229. *Installation—Oil Pressure Transmitter and Switch — UH-1B.* a. Install tee fitting with nut and gasket on replacement pressure switch. Align tee nipples to point forward and to left when switch is in place.

b. Position switch on top of support assembly and install two mounting bolts.

c. Uncap or uncover oil lines and connect oil tube between oil pressure transmitter elbow and forward nipple of switch tee. Connect oil pressure hose from filter to switch tee. Connect and lockwire electrical cable connector.

d. Check that oil pressure transmitter plug with orifice is installed in "V" port of transmitter. Position transmitter in support.

e. Install fittings in front end of transmitter. Uncap or uncover opening in oil tube and connect to front end. Connect electrical cable connector to rear end. Lockwire connector.

f. Position torquemeter transmitter in bracket and install retaining nuts.

g. Install fittings and gaskets. Uncap or uncover openings in hoses and connect hoses to transmitter.

h. Connect electrical cable and lockwire connector. Lockwire retaining nut to oil pressure transmitter retaining nut.

B 5-229A. *Reseating — Torquemeter Valve — UH-1B*. Abnormally high torquemeter gage indication may be caused by torquemeter valve in engine failing to close. This malfunction can be checked and possibly corrected as follows:

a. Disconnect torquemeter transmitter hose from pressure tap port (12, figure 5-38) or right side of engine inlet housing.

b. On left side of engine, remove plug from test gage connection port (9) at front of overspeed governor drive gear box. Install a suitable fitting in port and apply air pressure at 100 psig.

c. Check for air flow from open port on right side of inlet housing.

(1) If there is no air flow, torquemeter valve in engine is operating properly.

(2) If there is air flow, valve is sticking open. Detach air pressure source from gear box port, and apply pressure to port on right side of engine. This should free valve of any foreign matter and allow it to operate properly. Repeat check for proper closing with air applied at gear box port.

d. If the above procedure fails to seat the valve, request assistance from higher maintenance level.

e. When valve operation is satisfactory, reinstall plug in port on gear box and reconnect torque pressure transmitter.

Section VII — Ignition System

5-230. Ignition System. Starter - generator and other electrical units on engine connect into 28 volt DC system of airframe at two large receptacles on engine deck at left side. Main cable bundle is routed from outboard receptacle to main connector of engine electrical harness, and has branching leads to units on power plant. (See figure 5-42, typical installation for UH-1B.) Inboard receptacle accommodates starter-generator cables. Fire detector wiring on engine cowling doors connects at smaller receptacles on each side of deck. Circuit details are contained in Wiring Diagrams. (Refer to paragraph 12-125.)

5-231. A harness assembly, furnished by engine manufacturer and mounted on compressor housing, provides connectors for fuel control changeover solenoid, starting fuel solenoid, ignition system exciter unit, oil inlet temperature bulk, anti-icing valve or other units, and for gas producer (nI) and power turbine (nII) tachometer generators. (See figures 5-43 and 5-44.)

5-232. Ignition system is a capacitor discharge type, and consists of an ignition exciter unit, output leads, and two surface-gap igniter plugs. (See figures 5-43 and 5-44.) System is activated simultaneously with starting fuel system. Imput from 28 volt DC electrical system is stepped up in ignition unit to 2500 volt output, discharged through igniter plugs in combustion chamber at a spark rate of two to eight per second, depending on input voltage.

5-233. General Maintenance — Ignition System. a. Visually inspect harness and cable for damaged insulation, connectors for signs of corrosion and damaged threads. Remove any corrosion fom pin sockets and terminals by wire brushing or light rubbing with crocus cloth (item 401, table 1-1). Minor thread damage may be repaired to make connectors serviceable.

b. Be sure connectors are clean and dry. Check continuity of circuits, when required, in accordance with wiring diagrams. (Refer to paragraph 12-125.)

c. Replace harness or cable as assemblies when unserviceable.

d. Replace unserviceable starter-generator, ignition system components.

e. Ignition exciter unit, leads, and igniter plugs are not repairable or adjustable, and must be replaced when inoperative.

Caution

It is imperative that input lead to ignition exciter box shall be disconnected whenever any maintenance is being performed on engine combustor section.

A **5-234. Ignition Unit — UH-1A.** (See figure 5-43.) The ignition unit is located on the right-hand side of the engine. The purpose of this unit is to step up 28 volt DC current to 2500 volts and dischage it through the igniter plugs into the engine combustion chamber.

A ***5-235. Removal — Ignition Unit — UH-1A.*** a. Disconnect input lead (11, figure 5-43) and two output leads (13) from connectors on ignition unit.

b. Remove four nuts and screws at corners of mounting flanges to detach ignition unit from support brackets and remove unit.

c. Reinstall screws and nuts temporarily to hold anti-icing interpreter.

Warning

The ignition exciter contains a very small amount of radioactive material (Cesium-Barium 137) and normally requires no handling precautions. However, heavily damaged units that have been broken open must be handled with forceps or gloves and disposed of in accordance with AR 755-380, Disposal of Supplies and Equipment.

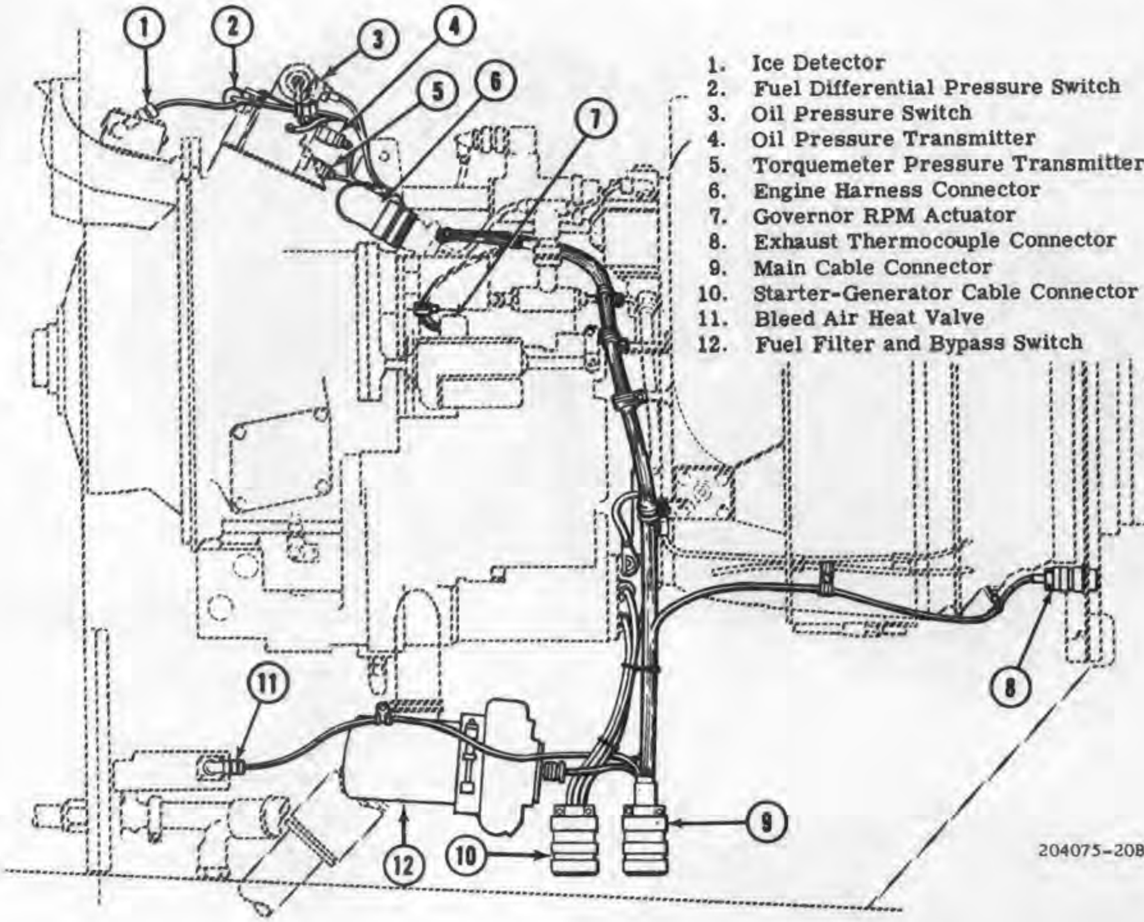


Figure 5-42. Power plant electrical cables — UH-1B (typical)

A ***5-236. Installation—Ignition Unit—UH-1A.*** a. Remove temporarily installed screws and nuts holding anti-icing interpreter in place and position ignition unit on support brackets with single connector forward. Install attaching screws and nuts.

b. Check condition of all connectors on ignition leads. Connect left ignition lead to aft lower connector and right ignition lead to aft upper connector.

c. Connect DC input lead to connector on forward end of ignition unit. Lockwire all connectors.

B **5-237. Ignition Unit — UH-1B.** The ignition unit on UH-1B helicopters is located on the left-hand side of the engine.

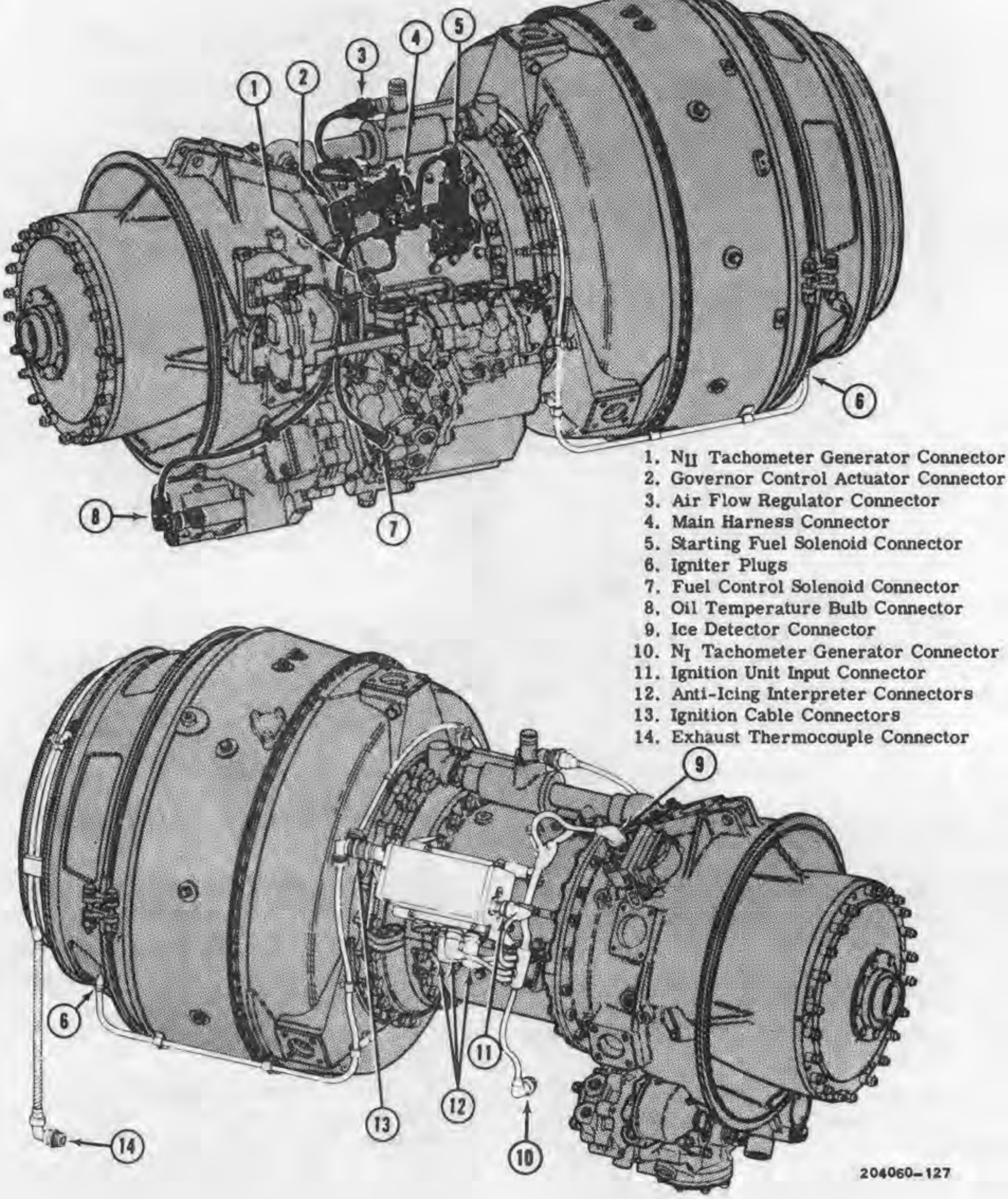
B ***5-238. Removal — Ignition Unit — UH-1B.*** a. Disconnect input lead (5, figure 5-44) and output lead assemblies from connectors on ignition unit (6).

b. Remove two screws and nuts from ends of loop clamps around ignition unit.

c. Raise clamps until slots clear positioning lugs on ignition unit. Remove unit, leaving clamps and bracket in place.

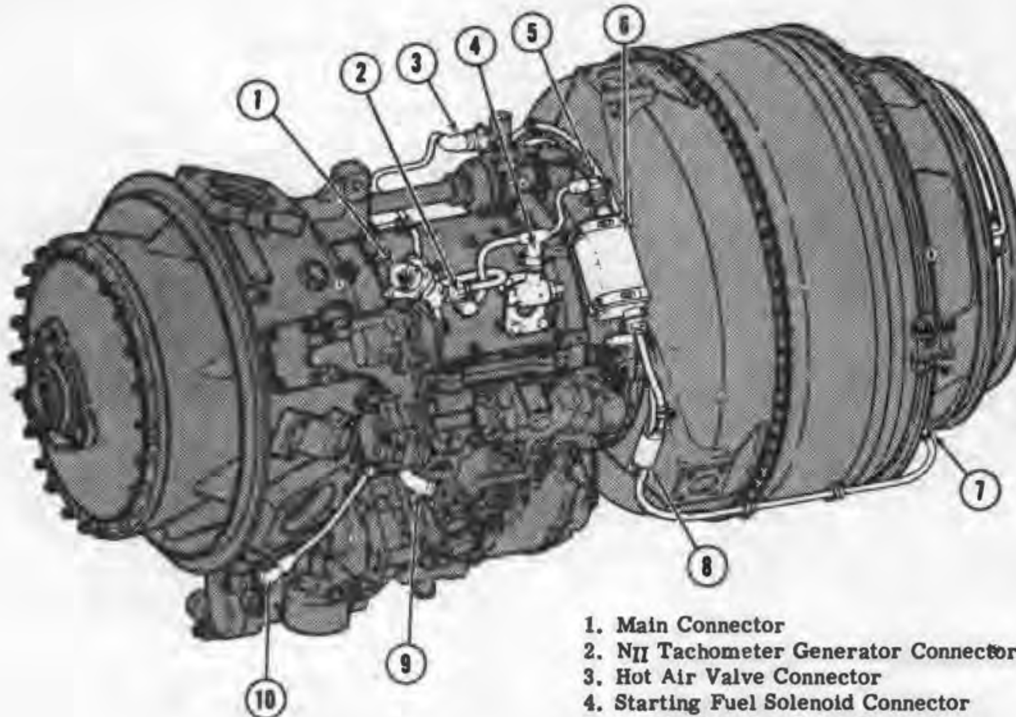
Warning

The ignition exciter contains a very small amount of radioactive material (Cesium-Barium 137) and normally requires no handling precautions. However, heavily damaged units that have been broken open must be handled with forceps or gloves and disposed of in accordance with AR 755-380, Disposal of Supplies and Equipment.



1. N_{II} Tachometer Generator Connector
2. Governor Control Actuator Connector
3. Air Flow Regulator Connector
4. Main Harness Connector
5. Starting Fuel Solenoid Connector
6. Igniter Plugs
7. Fuel Control Solenoid Connector
8. Oil Temperature Bulb Connector
9. Ice Detector Connector
10. N_I Tachometer Generator Connector
11. Ignition Unit Input Connector
12. Anti-Icing Interpreter Connectors
13. Ignition Cable Connectors
14. Exhaust Thermocouple Connector

Figure 5-43. Engine electrical harness and units — T53-L-1A engine



1. Main Connector
2. N_{II} Tachometer Generator Connector
3. Hot Air Valve Connector
4. Starting Fuel Solenoid Connector
5. Ignition Exciter Input Connector
6. Ignition Unit
7. Igniter Plugs
8. Ignition Leads and Coil Assembly
9. Fuel Control Changeover Solenoid Connector
10. Oil Temperature Bulb Connector
11. N_I Tachometer Generator Connector
12. Exhaust Thermocouple Connector

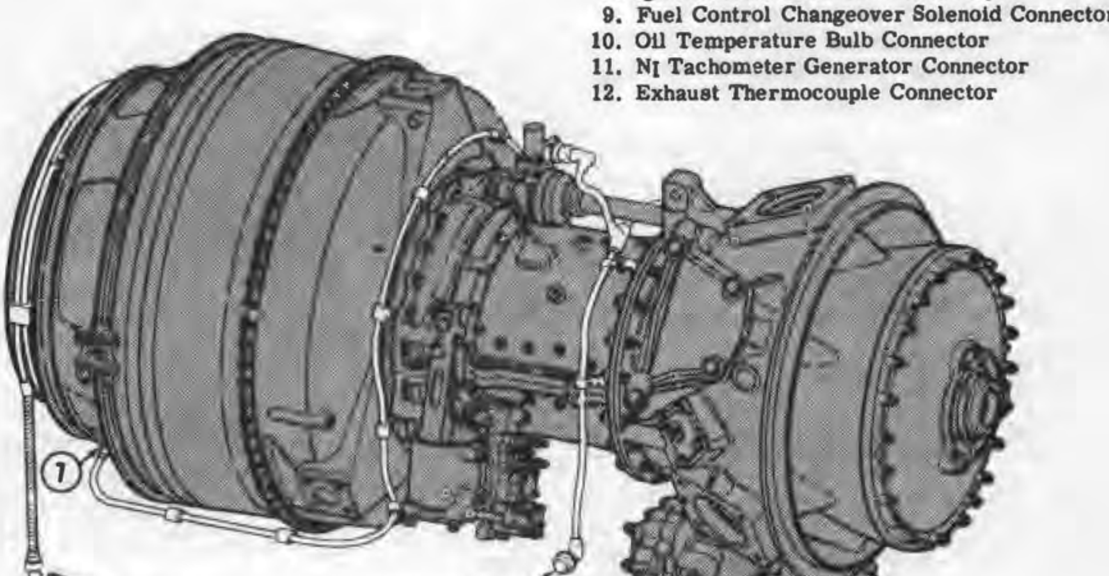


Figure 5-44. Engine electrical harness and units — T53-L-5/9/11 series engines

B *5-239. Installation—Ignition Unit—UH-1B.* a. Position ignition unit on mounting bracket and fit slots of loop clamps over lugs on unt. Secure clamp ends with screws and units.

b. Check condition of all connectors on ignition leads. Connect spark-splitter coil lead to output connector on lower end of ignition unit.

c. Connect electrical harness lead from starting fuel solenoid to input connector on upper end of ignition unit. Make sure lead cannot chafe against clamp on unit. Lockwire all connectors.

5-240. Igniter Plugs or Leads. Two igniter plugs (6, figure 5-43; 7, figure 5-44) discharge electrical current into the engine combustion chamber.

5-241. Removal—Igniter Plugs or Leads. a. Disconnect ignition unit input lead as safety precaution.

b. Disconnect leads from igniter plugs.

c. Remove igniter plugs from mount plates on rear side of engine combustion chamber. Cap or cover ends of plugs and open ports in engine to prevent entrance of foreign material.

5-242 Installation — Igniter Plugs or Leads. a. Uncap or uncover igniter plug ends and ports in engine.

b. Position washer on each of two igniter plugs.

c. Screw igniter plugs into combustion chamber at approximately 5 and 7 o'clock positions. Tighten to 85 to 95 inch-pounds torque. Lockwire to adjacent vaporizer locking nut.

d. Connect igniter plug connectors to igniter plugs.

e. Connect input lead to ignition unit.

A 5-243. Starter-Generator — UH-1A. A starter-generator, mounted to a drive pad on right rear side of accessory drive gear box and connected to 28 volt DC electrical system serves to drive compressor rotor during engine starting cycle and also functions as an engine driven stand-by generator at normal engine speeds. Cooling air is circulated through starter-generator by ducts and shrouds. A seal drain hose from starter drive pad connects to a drain line coupling at left side of deck.

A *5-244. Removal—Starter-Generator — UH-1A.* a. Open engine cowling doors. Disconnect starter-generator cable (17, figure 5-1) at deck connector.

b. Pull end of flexible duct (27, figure 5-1) from inlet on starter blast cap. Cover open end of duct.

c. Pull ends of flexible exit duct from elbow on right side of engine inlet housing, and from outlet of air collector on starter.

d. Detach collector outlet tube support clamp from engine flange bolt. Loosen two clamping bolts at right side of air collector. Slip collector aft on starter.

e. Loosen six nuts on starter mounting studs. Turn starter-generator counterclockwise, and carefully pull assembly aft to remove.

f. Disconnect cable from starter - generator terminals. Remove four screws to detach blast cap. Remove air collector.

g. When required, remove elbow with four bolts and gasket from engine inlet housing. Cover opening.

A *5-245. Installation — Starter-Generator — UH-1A.* a. Place air collector on starter-generator, aft of brush opening and with outlet pointing up and right. Tighten two clamping bolts temporarily.

b. Install blast cap on rear end of starter-generator, with inlet pointing down at left, secured with four screws. Coat male splines with plastilube Moly No. 3 (item 20, table 1-1) and pack female splines ⅔ full.

c. Lift starter to position on studs, meshing shaft splines. turn clockwise and tighten mounting nuts.

d. Slip air collector forward to normal position, over brush area, and align clamping joint at right on horizontal center line of starter. Attach support clamp of outlet under head of bolt through engine housing flanges. Tighten collector bolts.

e. Place an O-ring packing on each end of flexible exit duct. Insert one end in air collector outlet, other end in elbow. Position elbow and gasket on mounting port at right side of engine inlet housing. (See figure 5-1.) Secure elbow to housing with four bolts, lockwired in pairs.

f. Place O-ring packing on end of flexible inlet duct (27, figure 5-1). Insert duct end in blast cap inlet.

g. Connect cable to starter - generator terminals. (Refer to paragraph 12-125.) Connect cable at deck connector (17, figure 5-1). Close cowling.

B 5-246. Starter-Generator — UH-1B. (See figure 5-45.) A starter-generator unit, mounted to right rear side of accessory drive gear box and connected to the 28 volt electrical system, serves to drive compressor during engine starting cycle and also functions as an engine-driven stand - by generator at normal engine speeds. Cooling air from oil cooler blower is circulated through starter-generator by ducts and shrouds, and is discharged into exhaust tailpipe. A seal drain hose from starter drive mounting pad leads to deck coupling of a discharge line at left side.

B 5-247. Removal—Starter-Generator — UH-1B. a. Remove cover (8, figure 5-45) and disconnect electrical leads at aft end of starter-generator. Insulate wire terminals.

b. Disconnect air ducts from flanged necks on forward and aft cooling shrouds by removing V-band clamps (2 and 12). Loosen two clamping bolts at right side of forward shroud (12), and slide shroud aft to expose starter mounting studs.

c. Loosen nuts and washers on six mounting studs. Turn starter-generator counterclockwise, and pull carefullly straight aft until free of studs and drive shaft engagement. Cover mounting pad.

d. Detach shroud from aft end of starter by removing two locating screws at top and two clamping bolts at joint on left side. Remove forward shroud.

B 5-248 Installation — Starter-Generator — UH-1B. a. On a new starter, remove manufacturer's brush cover from aft end, keeping two small locating screws for installation of cooling shroud.

Note

Turn starter so these two screw-holes are at top center for correct position when installed.

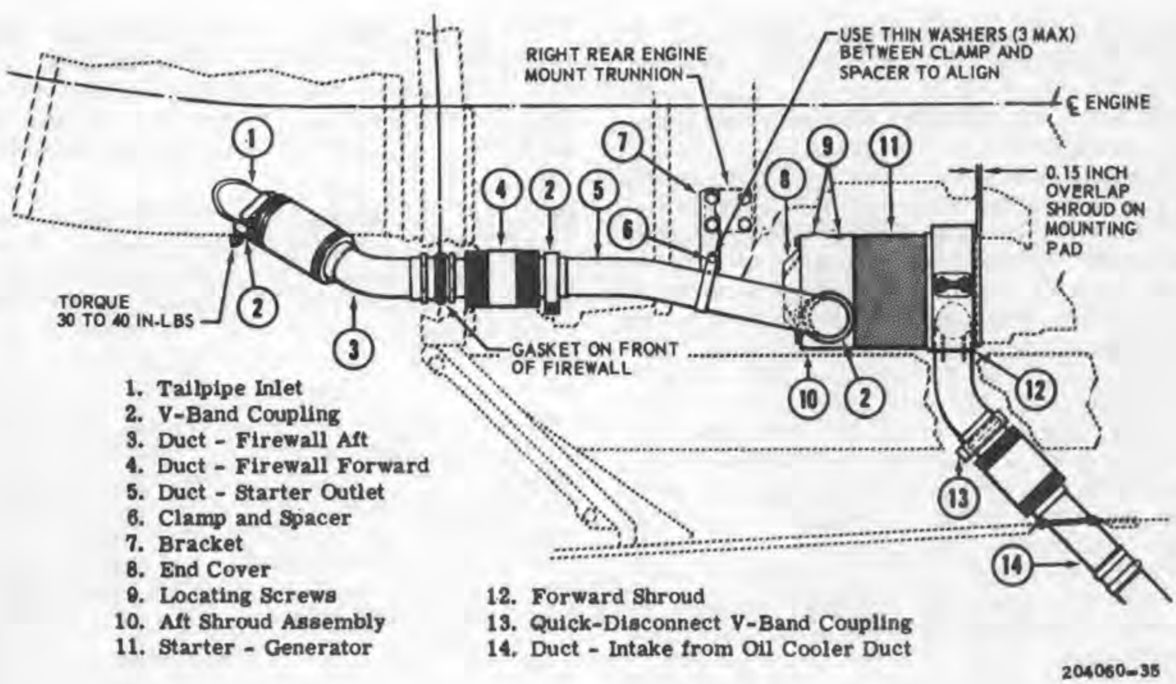


Figure 5-45. Starter generator and cooling ducts — UH-1B

b. Place forward shroud around starter, far enough aft to allow access to mounting flange and with clamping joint on right-hand side.

c. Install aft shroud with two locating screws and washers, and two bolts with washers tightened in clamping joint at left side. Lockwire screws. Coat male splines with Plastilube Moly No. 3 (item 20, table 1-1) and pack female splines ⅔ full.

d. Lift starter to position on studs, meshing shaft splines, turn clockwise and tighten mounting nuts.

e. Slide forward shroud to position, overlapping 0.15 inch on mounting pad. Align intake neck to flange of duct, above deck at left of drive shaft tunnel, and install V-band clamp with nut tightened 30 to 40 inch-pounds. Tighten two bolts in shroud clamping joint.

f. Secure exit air duct to outlet of aft shroud with V-band clamp, tightened 30 to 40 inch-pounds. Install cover on aft end of starter with six screws and washers. Lockwire screw heads.

g. Connect electrical leads from cable connector on deck at left side to terminals on starter-generator. (Refer to paragraph 12-125.)

Section VIII — Cooling System

(Not Applicable)

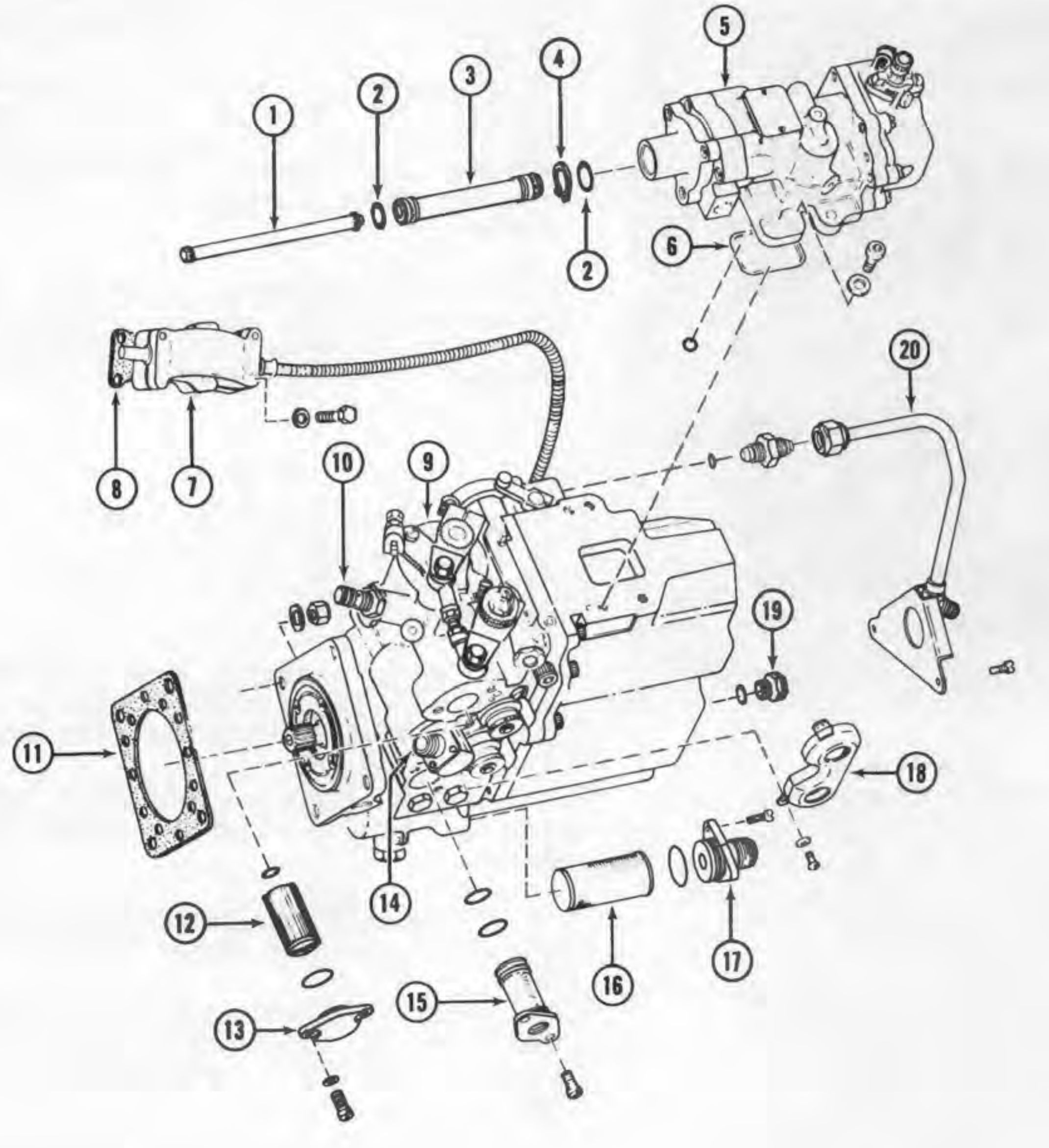
Section IX — Fuel Control

5-249. Fuel Control. (See figure 5-46, 5-47, or 5-48.) Engine fuel control is a hydro-mechanical mechanism made up of a fuel regulator assembly and an overspeed governor assembly. Fuel regulator is mounted on a drive pad at left rear side of accessory drive gear box, driven through a gear train by compressor rotor and first-stage (nI) turbine. With solenoid operated changeover valve in AUTOmatic position for normal operation, a dual-element pump supplies fuel at high pressure through a strainer to main metering valve, bypassing excess fuel through main pressure regulator, then through a manually-controlled stop cock valve to main discharge port and external line. Fuel flow rate is determined by computer mechanisms in relation to first-stage turbine speed, air pressure, inlet air temperature (through an external sensing element) and power lever settings manually selected by means of linkage to twist-grip control. Overspeed governor, mounted on regulator and driven through gear train from power output shaft, acts through regulator to limit fuel flow when power turbine (nII) rpm tends to exceed speed selected by means of external control system.

5-250. In starting cycle of T53-L-1A and T53-L-5/9/9A engines without scheduled fuel, fuel flow is through servo filter directly to starting fuel discharge port and external line, and is controlled only by the starting fuel solenoid valve.

B 5-251. In starting cycle of T53-L-11 and T53-L-5/9/9A engines with scheduled fuel, starting fuel for normal conditions is a scheduled flow from the fuel regulator to a port with a banjo-type fitting to which the starting fuel solenoid hose is connected. There is also another port with an elbow fitting, which is capped in normal conditions and is called the unscheduled starting fuel port because it is not subject to flow control by the fuel regulator scheduling devices. When JP-5 fuel is being used and cold weather starting is difficult, the unscheduled starting fuel port may be connected instead of the scheduled port, which would then be capped.

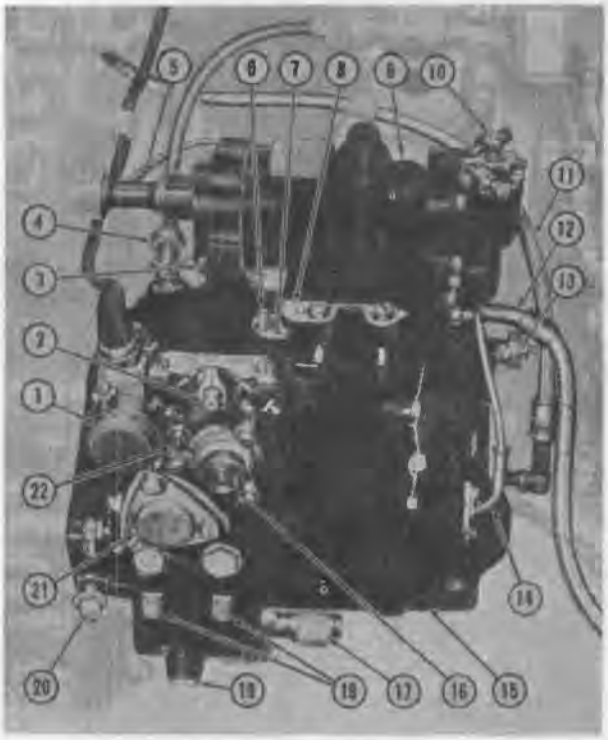
5-252. An emergency fuel metering system is incorporated in fuel regulator, to allow bypassing of automatic flow regulator in case of malfunction. With solenoid operated changeover



1. Governor Drive Shaft
2. Packings
3. Shaft Tube
4. Retaining Ring
5. Overspeed Governor Assy
6. Governor Seal
7. Temperature Sensing Element Housing
8. Gasket
9. Fuel Regulator
10. Starting Fuel Outlet
11. Gasket
12. Filter Puller
13. Filter Cover
14. Changeover Solenoid
15. Fuel Strainer
16. Fuel Inlet Strainer
17. Inlet Fitting
18. Pressure Regulator Shield
19. Pressure Sensing Port Plug
20. Fuel Discharge Tube

204060-135

Figure 5-46. Fuel control unit — T53-L-1A engine



1. Changeover Solenoid
2. Power Lever Control Shaft
3. Governor Seal Drain Tap
4. Starting Fuel Outlet
5. Governor Drive Shaft
6. Maximum nI Speed Trim
7. Adjustment Locking Screw
8. Idle nI Speed Trim (Hidden)
9. Overspeed Governor Assembly
10. Governor Control Shaft
11. Air Pressure Sensing Line
12. Main Fuel Outlet
13. Maximum Fuel Stop
14. Air Temperature Sensing Line
15. Fuel Regulator Assembly
16. Main Pressure Regulator
17. Fuel Inlet
18. Dual Pump Pressure Taps
19. Inlet Pressure Tap (not used)
20. Seal Drain Fitting
21. Discharge Strainer and Filter
22. Emergency Fuel Stop

204060-44C

Figure 5-47. Fuel control unit — T53-L-5/9/9A engines (typical)

valve in EMERgency position, fuel from pump flows to an emergency metering valve, which is positioned by power lever under manual control by means of twist-grip control linkage. An emergency pressure regulating valve maintains pressure proportional to metering valve area. This system must be used with extreme caution since there are no automatic safeguards against exceeding engine limits and causing serious damage.

B 5-253. *Interchangeability — Part No. 70800 Engine Fuel Control.* The following procedures are necessary to convert a Part No. 70800 engine fuel control for use on either a T53-L-5 or T53-L-9/9A engine.

Note

> All Part No. 70800 engine fuel controls shipped from the engine manufacturer are adjusted for use on T53-L-9/9A engines.

a. To convert a Part No. 70800 engine fuel control from usage on a T53-L-9/9A engine to usage on a T53-L-5 engine proceed as follows:

(1) Adjust maximum fuel stop (13, figure 5-47) six serrations clockwise to decrease fuel flow.

(2) Adjust emergency fuel stop (2) one-half turn clockwise to decrease fuel flow.

b. To convert a Part No. 70800 engine fuel control from usage on a T53-L-5 engine to usage on a T53-L-9/9A engine proceed as follows:

(1) Adjust maximum fuel stop six serrations counterclockwise to increase fuel flow.

(2) Adjust emergency fuel stop one-half turn counterclockwise to increase fuel flow.

c. Lockwire adjusting screws.

d. Record conversion data on engine Form 2408-16.

Note

> An engine run-up check must be made after change of fuel control.

B 5-254. *General Maintenance—Fuel Control — UH-1B*. a. Check fuel regulator for corrosion and contamination every time strainers and filter are cleaned and inspected. Also inspect regulator at any time such conditions may be indicated or suspected.

Note

> Corrosion is a rust-like deposit on surfaces of internal parts exposed when overspeed governor is separated from fuel regulator assembly. Contamination is any foreign matter found in fuel or clinging to surfaces of internal parts.

b. If corrosion is found, fuel control assembly must be replaced.

c. Flush fuel control with clean fuel whenever necessary. The following procedure shall be utilized in flushing.

(1) Disconnect main and starting fuel hoses at manifold connections. Connect hoses to drain fuel regulator into a clean container.

(2) Disconnect electrical harness at ignition unit.

(3) Connect a source of clean fuel to inlet port of fuel regulator.

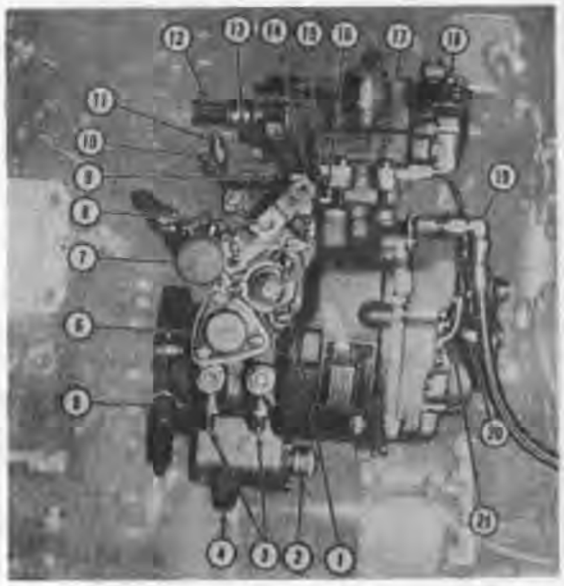
(4) Motor engine at 13 to 15 percent gas producer rpm, without exceeding starter limitations. (Refer to TM 55-1520-211-10.)

(5) While motoring engine, operate engine control linkages to simulate engine starting and running.

(6) Check for contamination of fuel flushed into container.

(7) Replace fuel control if it cannot be flushed clean in three 30-second motoring operations.

d. When an engine no-start condition occurs, and cause seems to be associated with fuel system, establish systematic, trouble shooting technique. (Refer to paragraph 5-30.)



1. Main Pressure Regulator
2. Fuel Inlet
3. Pump Pressure Taps
4. Inlet Pressure Tap (not used)
5. Seal Drain Fitting
6. Strainer and Filter Cover
7. Changeover Solenoid
8. Power Lever Control Shaft
9. Part-Power Plunger
10. Alternate Starting Fuel Outlet
11. Starting Fuel Outlet
12. Governor Drive Shaft Cover
13. Governor Seal Drain Fitting
14. Maximum nI RPM Trim
15. Trim Locking Screw
16. Idle nI RPM Trim
17. Overspeed Governor
18. Governor Control Shaft
19. Main Fuel Outlet
20. Airbleed Sensing Line
21. Air Temperature Sensing Line

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Figure 5-48. Fuel control unit — T53-L-11 engine

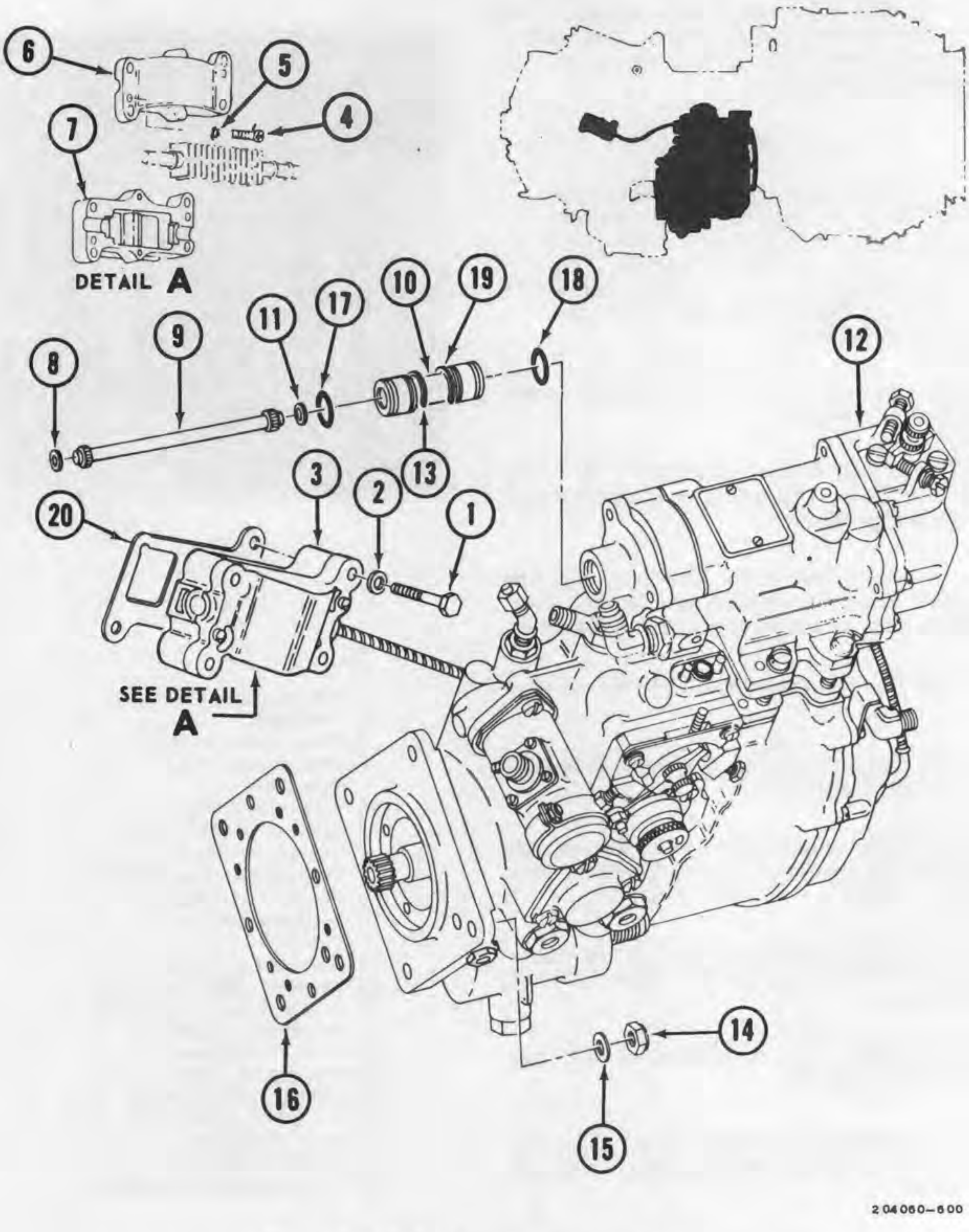

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Figure 5-48A. Fuel control unit— UH-1B.

B 5-254A. ***Removal — Fuel Control — UH-1B.*** a. Disconnect and tag all fuel, air, mechanical and electrical connections.

Warning

Ensure that all electrical power is disconnected.

b. Remove bolts (1, figure 5-48A) and washers (2) that secure temperature sensing element housing (3) to the inlet housing.

Caution

Exercise extreme care in removing and handling the temperature sensing assembly. Nicks, dents or sharp bends may destroy the capillary action of the tube.

c. Remove screws (4) and washers (5) that secure upper temperature housing (6) to lower temperature housing (7). Mark position of element fins in lower temperature housing.

Caution

Use care not to damage packings on element.

Note

The curved ends of the fins form scoops that must be in correct position within lower temperature housing for the element to function properly.

d. Remove torquemeter rotary pump. (Refer to paragraph 5-200A.)

e. Remove shims (8), if any, from forward end of overspeed governor driveshaft (9) and record thickness.

f. Using a rod at least six inches long and 1/4 inch or less in diameter, with one end sized and threaded 8-32 for 1/4 inch of length, pull the overspeed governor drive shaft through driveshaft tube (10).

g. Using same rod, remove aft shims (11), if any, from overspeed governor (12). Record thickness of shims.

h. Slide forward retaining ring (13) aft, toward center of tube (10), and push tube forward into overspeed governor and tachometer drive housing.

i. Support the fuel control assembly and remove nuts (14) and washers (15).

j. Withdraw the fuel control assembly, keeping it as level as possible to prevent damage or distortion to driveshaft. Remove gasket (16).

B 5-254B. ***Cleaning — Fuel Control — UH-1B.*** Thoroughly clean driveshaft, mounting flange, overspeed governor driveshaft port and all threaded areas with dry-cleaning solvent (item 302, table 1-1).

B 5-254C. ***Inspection — Fuel Control — UH-1B.*** a. Inspect all fittings for damaged or crossed threads.

b. Inspect fuel control driveshaft for chipped or worn splines.

c. Inspect mounting flange for elongated mounting holes and warpage.

d. Inspect solenoid valve for security of mounting, bent or broken contact pins and damaged insulator.

e. Inspect temperature sensing assembly housing for cracks, warpage and elongation of mounting holes.

f. Inspect temperature sensing cable for security of installation, fraying, cracks, dents and sharp bends.

g. Inspect overspeed governor for security of installation.

h. Inspect fuel control for corrosion and contamination.

Note

Corrosion is a rust-like deposit on surface of internal parts that are exposed when main fuel regulator and overspeed governor are separated. Contamination is any foreign matter found in fuel or clinging to surfaces of internal parts that are exposed when main fuel regulator and overspeed governor are separated.

B 5-254D. *Repair or Replacement— Fuel Control — UH-1B*. a. If corrosion is found, replace fuel control.

b. Replace damaged parts.

B 5-254E. *Installation — Fuel Control — UH-1B*. Install fuel control in accordance with the following instructions.

Caution

The capillary tube of the temperature sensing assembly is connected to the fuel control. Use extreme care to avoid damage to the tube. Do not separate the tube from the fuel control.

Note

If a new fuel control is being installed, an end float check of the overspeed governor shaft is required. (Refer to paragraph 5-276.)

a. Slide overspeed governor driveshaft (9, figure 5-48A) into the overspeed governor shaft tube (10).

b. Place new packings (17 and 18) in grooves at both ends of the shaft tube.

c. Insert shim(s) (8 and 11), if required, into overspeed governor housing (12).

d. Insert overspeed governor shaft and shaft tube into overspeed governor and tachometer assembly, mating the spline of the shaft with the overspeed governor shaftgear.

Note

The splines on both ends of the overspeed governor driveshaft are identical. Either end may be inserted into the overspeed governor and tachometer drive housing.

e. Install shims, if required, at forward end of overspeed governor driveshaft.

f. Position new gasket on fuel control pad of accessory drive gearbox.

g. Place fuel control on accessory drive gearbox. Carefully insert exposed spline of overspeed governor shaft into overspeed governor.

Caution

Use caution when installing fuel control to prevent damage to the driveshaft carbon seal.

Note

To mesh the splines of the fuel regulator with the fuel regulator drive shaftgear, remove tachometer generator and using a 1/4 inch drive extension and ratchet, turn tachometer drive gear until fuel regulator drive shaftgear splines mesh with splines on fuel regulator. Reinstall tachometer generator. To mesh splines of overspeed governor driveshaft with spline in overspeed governor, slowly rotate power turbine.

h. Secure fuel control to studs on accessory drive gearbox with washers (15) and nuts (14). Tighten nuts to between 125 and 140 inch-pounds torque.

i. Slide shaft tube aft into overspeed governor.

j. Position retaining rings (13 and 19) into grooves on both ends of tube. Adjust tube to allow retaining rings to position properly.

k. Assemble upper and lower temperature housings (6 and 7) and secure with washers (5) and screws (4).

Caution

Do not damage packings on element within lower temperature housing.

Note

Ensure that element is installed in same position as when removed. The curved ends of the fins at forward end of tube should face inboard.

l. Using a new gasket (20), position temperature sensing element housing (3) on inlet housing.

m. Secure the temperature sensing element housing with washers (2) and bolts (1).

n. Install torquemeter rotary pump. (Refer to paragraph 5-202A.)

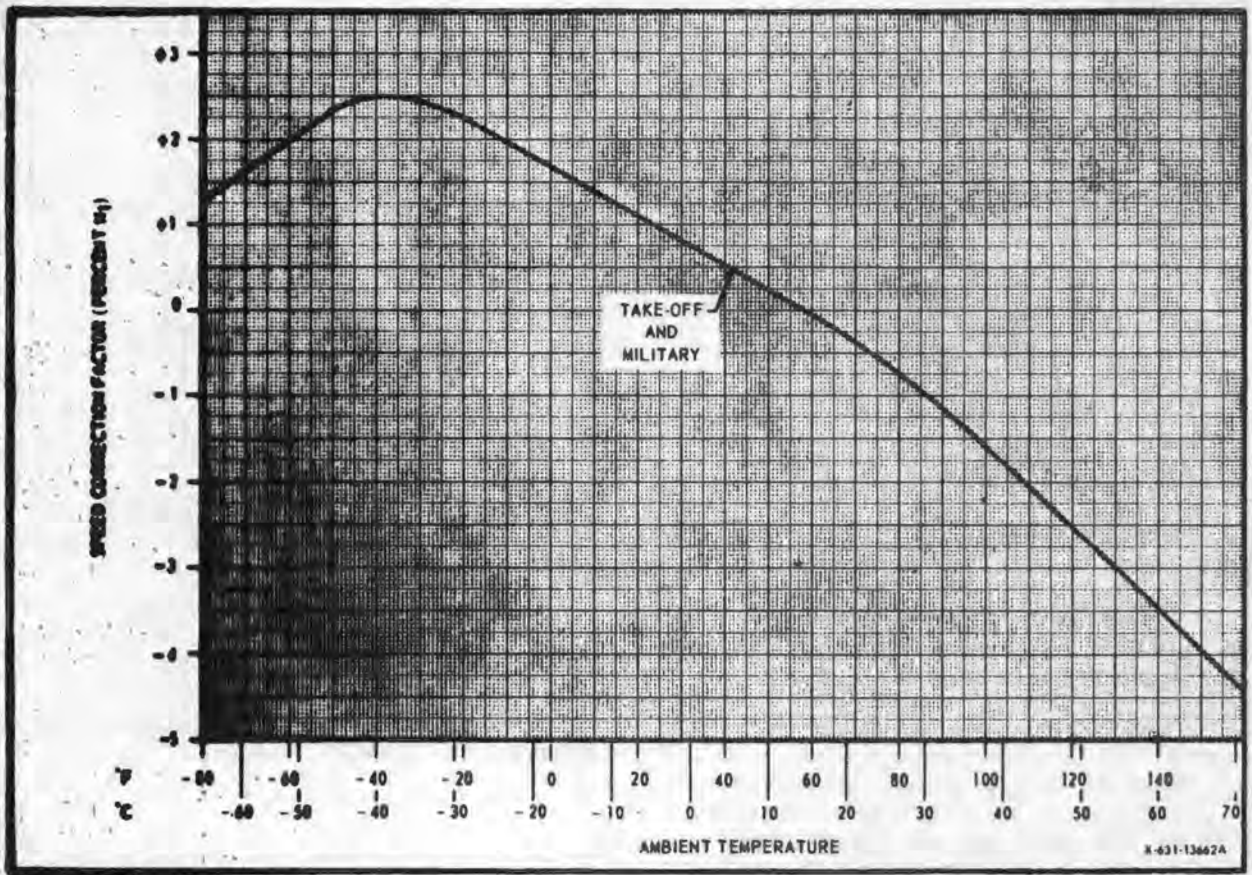

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Figure 5-48B. Deviation in regulated gas producer speed vs ambient temperature.

o. Connect all fuel, air, mechanical and electrical connections.

p. Prime fuel control.

5-254P. *Adjustment — Fuel Control — UH-1B.* The fuel control trim shall be checked and adjusted at installation of a new engine, installation of a new fuel control, or when incorrect adjustment is suspected. Adjustment of the fuel control installed on an engine is limited to ground idle rpm and takeoff rpm.

Warning

Adjustments to the fuel control may affect safety-of-flight. Only designated and qualified personnel will be permitted to perform the adjustments. Record original fuel control settings before making any adjustment.

a. Computation of take-off gas producer (nI) speed for a given ambient temperature is performed as follows:

Note

The engine data sheet (log), assigned to each engine, records the percent of nI speed required to obtain take-off horsepower at standard day, sea level conditions (59°F or 15°C) for that particular engine.

(1) Note the required percent nI speed for take-off power from engine data sheet.

(2) Determine the nI speed correction factor for the local ambient temperature at the time of the check run. (See figure 5-48B.) Add or subtract factor, as required, to the nI speed noted in preceding step (1).

(3) The result of step (2) is the computed nI speed required to develop take-off power for this temperature.

b. Ground idle rpm adjustment is accomplished as follows:

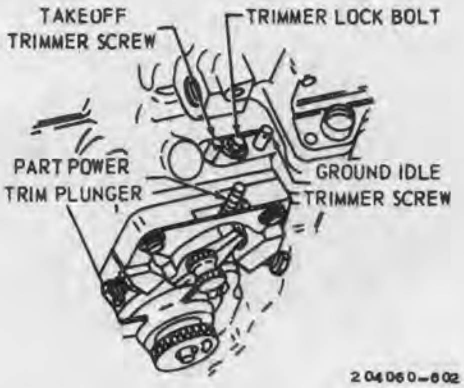

Figure 5-48C. Fuel control adjustment.

(1) Loosen trimmer lock bolt. (See figure 5-48C.)

(2) Adjust ground idle trimmer to obtain 40 to 44 percent nI speed at 23 to 26 degrees fuel control throttle lever position.

Note

One-half turn of ground idle trimmer will change the nI speed by approximately seven percent. Turn trimmer counterclockwise to increase nI speed.

(3) Tighten trimmer lock bolt.

c. Take-off rpm trim adjustment is accomplished as follows:

Note

The use of part power permits the adjustment of the fuel control for take-off power at a predetermined power setting below computed take-off power (16.6 percent) and eliminates the necessity of a tiedown facility or airborne checks.

(1) Compute the required take-off gas producer (nI) speed. (Perform step a.)

(2) Subtract 16.6 percent from computed nI speed. The result is the maximum nI speed that the engine should develop with the part power plunger in the engaged position.

(3) Start the engine.

(4) Slowly open cockpit throttle twist-grip until part power plunger can be engaged by pushing plunger into shaft.

Warning

Maintain a flat collective pitch (full down) while opening throttle.

(5) After part power plunger has been engaged, slowly raise the collective pitch stick.

Note

Ensure that plunger remains engaged.

(6) Observe the maximum nI speed obtainable after nII speed starts to drop off. Record nI speed.

(7) Compare reading recorded in preceding step (2) with indication obtained in step (6).

(8) Lower collective pitch control lever and retard throttle.

(9 Loosen trimmer lock and adjust take-off rpm trim. (See figure 5-48C.)

Note

One-eighth of a turn of the take-off trim will produce approximately one percent change in nI speed.

(10) Repeat preceding steps (4) through (9) until adjustment is correct.

(11) Tighten trimmer lock bolt and lock-wire both take-off trimmer and ground idle trimmer to lock bolt.

d. Perform acceleration check as follows:

(1) Position aircraft, facing upwind, on smooth flat surface.

Note

Wind velocity should not exceed 15 mph during check.

(2) Start engine and operate at flight idle for five minutes to stabilize temperatures. Check anti-icing system by operating the hot air solenoid valve. A slight rise in egt will indicate that the system is operating. Turn off system.

Note

This check is performed only to ensure that the anti-icing system is operating satisfactorily and that the hot air solenoid valve is closed during the following engine operational checks.

(3) Set collective pitch to minimum position (flat pitch).

Note

On cool days, aircraft may need additional weight to prevent lift-off.

(4) Advance power lever until highest power, without gaining flight attitude, is obtained (between 80 and 85 percent nI). Set nII rpm selector at 6400 rpm.

(5) Retard nI speed to 60 percent and allow to stabilize.

(6) Using airframe clock, time acceleration from 60 percent nI to 85 percent nI.

Note

Power lever movement shall be made in one second or less.

(7) Acceleration time should not exceed 3.5 seconds. Perform check three times.

Note

Leave power lever fully open until acceleration time has been measured before returning to 60 percent nI speed.

Note

Maximum allowable acceleration time varies with ambient temperatures and field elevation. For acceleration time correction, see figure 5-48D. If acceleration is slow, check airframe linkage for proper adjustment. If aircraft rigging adjustment is within limits and acceleration time compromises aircraft operation, replace fuel control.

TEMPERATURE	SEA LEVEL	1000 FT.	2000 FT.	3000 FT.	4000 FT.	5000 FT.
50°F (10°C)	0.0	0.0	0.1	0.2	0.3	0.4
60°F (16°C)	0.0	0.1	0.2	0.3	0.4	0.5
70°F (21°C)	0.2	0.3	0.4	0.5	0.6	0.7
80°F (27°C)	0.4	0.5	0.6	0.7	0.8	0.9
90°F (32°C)	0.5	0.7	0.8	0.9	1.0	1.1
100°F (38°C)	0.7	0.8	0.9	1.0	1.1	1.2
NOTE: All time correction factors are given in seconds and must be added to time attained at standard day conditions.						

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Figure 5–48D. Acceleration time correction factors.

A 5-255. Fuel Control Strainers and Filter — UH-1A. Engine fuel control is provided with an inlet strainer, a pump discharge strainer, and a servo supply filter. Strainers are made of wire cloth and can be cleaned for repeated use. Filter is pleated-paper type and is replaced at scheduled inspections. On UH-1A, servo filter and bypass are under separate covers on face of fuel control. (See figure 5-46.) Inlet strainer on all models is located at bottom of fuel regulator housing and covered by an inlet fitting.

A 5-256. *Removal — Fuel Control Strainers and Filter — UH-1A.* a. Open left-hand engine cowling door. Position suitable container to catch fuel drainage.

b. Remove inlet strainer as follows:

(1) Disconnect fuel supply hose from fuel control inlet fitting (17, figure 5-46). Cap or cover opening in hose to prevent entrance of foreign material.

(2) Cut lockwire and remove three attaching screws and remove inlet fitting. Remove packing from fitting. Remove strainer (16) from port. Cap or cover port to prevent entrance of foreign material.

c. Cut lockwire and remove two screws attaching pump discharge strainer (15) to fuel ontrol. Pull strainer from fuel control. Cap or cover port to prevent entrance of foreign material.

d. Cut lockwire and remove two screws and washers attaching servo supply filter cover (13). Remove cover.

e. Use wire handle provided to withdraw filter puller assembly (12) from fuel control port. Cap or cover port to prevent entrance of foreign material.

A 5-257. *Cleaning — Fuel Control Strainers and Filter — UH-1A.* a. Clean and inspect fuel control inlet strainer and pump discharge strainer and replace servo filter as required, at following intervals: Initial installation of engine, at end of initial ground run-up, after first five hours operation, and after first 15 hours operation.

b. If contamination is found on strainer or filter after first 15 hours of operation, inspect each 15 hours thereafter until contamination is eliminated.

c. When strainer and filter are free of contamination after 15 hours interval, inspection period shall be extended to 25 hours operation.

d. If contamination persists due to adverse climatic conditions, local authorities may determine inspection periods.

e. Clean all parts with dry cleaning solvent (item 302, table 1-1) and dry with filtered compressed air.

A 5-258. *Inspection — Fuel Control Strainers and Filter — UH-1A.* a. Refer to paragraph 5-257, steps a. through d.

b. Visually inspect strainers and filter for damage and general condition.

c. Visually inspect inlet fitting (17, figure 5-46), filter cover (13) and screws for damage and stripped threads.

A 5-259. *Repair or Replacement — Fuel Control Strainers and Filter — UH-1A.* Replace all parts unsuitable for continued service.

A 5-260. *Installation — Fuel Control Strainers and Filter — UH-1A.* a. Uncap or uncover fuel inlet strainer port in fuel control.

b. Install new packing on inlet fitting (17, figure 5-46).

c. Carefully insert inlet strainer (16) into inlet port. Install fitting (17) and secure with three lockwired screws.

d. Uncap or uncover opening in fuel hose and connect hose to inlet fitting.

e. Install two new packings on pump discharge strainer (15).

f. Uncap or uncover pump discharge port and carefully insert strainer into fuel control housing. Secure with two lockwired screws.

g. Uncap or uncover servo supply filter (12) port. Install new packing on inner end of new filter and carefully insert filter into port.

h. Place new packing on cover (13) and install cover over port, securing with washers and lockwired screws.

i. Remove drainage vessel. Close and secure engine cowling door.

B 5-261. Fuel Control Strainers and Filter — UH-1B. Refer to paragraph 5-255. Description is the same, with the exception that on UH-1B helicopters the servo filter and bypass are attached on inner end of pump discharge strainer. (See figure 5-49.) On UH-1B aircraft the inlet strainer has a spring, and on T53-L-11 engines it is also enclosed in a retainer.

B 5-262. ***Removal — Fuel Control Strainers and Filter — UH-1B.*** a. Open left-hand engine cowling door. Position suitable container to catch fuel drainage.

b. Disconnect fuel inlet hose (1, figure 5-49) from inlet fitting (2) and cap or cover opening in hose to prevent entrance of foreign material.

c. Cut lockwire and remove three screws attaching inlet fitting. Remove inlet fitting.

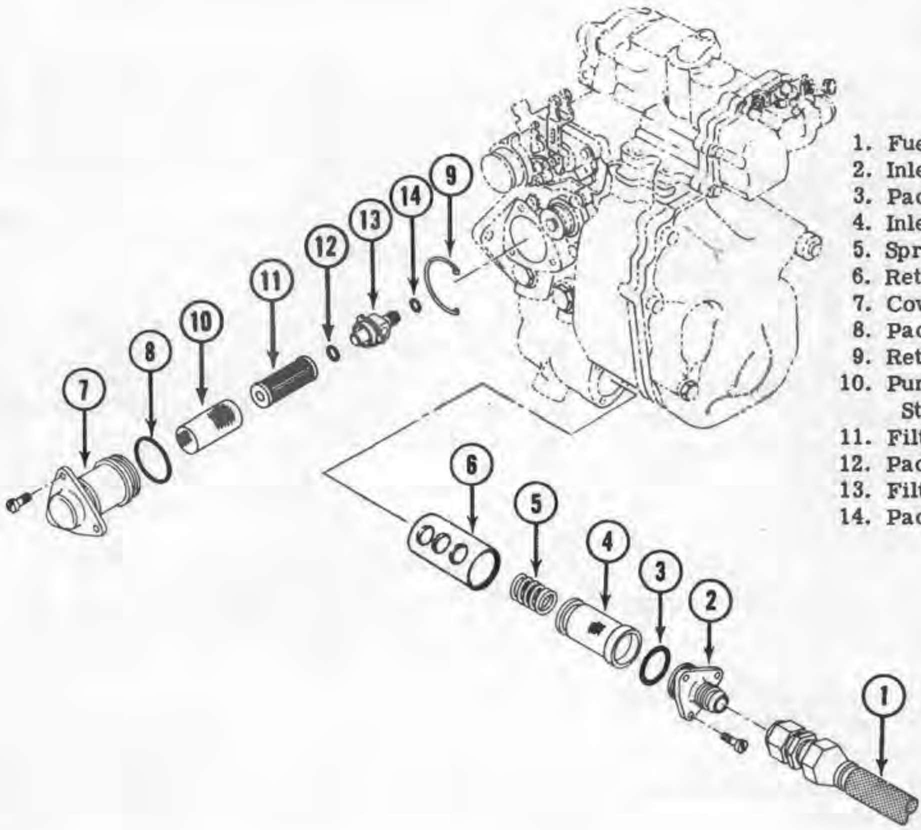
d. On T53-L-5/9/9A engines remove strainer (4) and spring (5) from port.

e. On T53-L-11 engines remove retainer (6) from port, then carefully remove strainer and spring from retainer.

f. Cap or cover port to prevent entrance of foreign material.

g. Cut lockwire and remove three screws attaching pump discharge strainer and servo supply filter cover (7). Remove cover and strainer assembly from fuel control port. Cap or cover port to prevent entrance of foreign material.

h. Remove retainer ring (9). With a twisting motion carefully pull filter and reinforcement strainer group from cover and strainer assembly.



1. Fuel Inlet Hose
2. Inlet Fitting
3. Packing
4. Inlet Strainer
5. Spring
6. Retainer (T53-L-11)
7. Cover
8. Packing
9. Retainer Ring
10. Pump Discharge Strainer (T53-L-9 & -9A)
11. Filter Element
12. Packing
13. Filter Housing
14. Packing

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Figure 5-49. Fuel control strainers and filter — UH-1B (typical)

i. Slide reinforcement strainer (10) from filter element (11). Separate element from housing (12).

B 5-263. *Cleaning — Fuel Control Strainers and Filter — UH-1B.* Refer to paragraph 5-257.

B 5-264. *Inspection — Fuel Control Strainers and Filter — UH-1B.* a. Refer to paragraph 5-257, steps a. through d.

b. Visually inspect strainers and filter for damage and general condition.

c. Visually inspect all ports, including screws, for damage and stripped threads.

B 5-265. *Repair or Replacement — Fuel Control Strainers and Filter — UH-1B.* Refer to paragraph 5-259.

B 5-266. *Installation—Fuel Control Strainers and Filter—UH-1B.* a. Uncap or uncover fuel inlet strainer port in fuel control.

b. Place new packing on inlet fitting (2, figure 5-49).

c. On T53-L-5/9/9A engines place spring and strainer into fuel control inlet port. Insert a phenolic rod, 0.25 inch diameter and six inches long, against bottom of strainer and press inward against spring until bottomed. To be sure strainer is not binding, check for 0.375 inch measurement from end of strainer to face of housing. Install inlet fitting over end of rod, keeping pressure against spring until fitting is secured with three screws. Remove rod. Lockwire screws.

d. On T53-L-11 engines carefully install spring and strainer into retainer. Insert retainer into fuel control port. Install inlet fitting, secured by three lockwired screws.

e. Uncap or uncover opening in fuel inlet hose and connect hose to fuel inlet fitting.

f. Place new packings on servo supply filter housing and install a new element.

g. Place new packing on cover and pump discharge strainer. Install reinforcement strainer into cover, then use a twisting motion to install filter element and housing. Secure in cover with retaining ring.

h. Uncap or uncover port. Install cover and strainer assembly in fuel control port and secure with three lockwired screws.

i. Remove drainage vessel. Close and secure engine cowling door.

A 5-267. Fuel Control Overspeed Governor — UH-1A. The overspeed governor is mounted on the fuel control regulator and is driven through a gear train from the power output shaft. It acts through the regulator to limit fuel flow when power turbine rpm tends to exceed speed selected by means of external control system.

A 5-268. *Removal — Fuel Control Overspeed Governor — UH-1A.* Paragraphs 5-268 through 5-271 apply only to T53-L-1A engines.

a. Remove linear actuator and governor control lever. (Refer to paragraph 5-287.)

b. Disconnect and remove governor seal drain tube, with fitting. Also remove fuel control vent hose and fitting, if so equipped. Install plugs and caps in open ports and fittings.

c. Remove two snap-rings at ends of tube covering overspeed governor drive shaft.

d. Remove lockwire and four screws with three washers that secure overspeed governor to fuel regulator housing. Temperature sensing line support clamp will also be detached from one of inboard screws.

Caution

> Overspeed governor must be kept as level as possible during removal, to prevent damage to the drive shaft between governor and fuel control regulator.

e. Carefully lift governor assembly above locating pins, then pull aft until free. Remove governor drive shaft and cover tube.

A 5-269. *Inspection — Fuel Control Overspeed Governor — UH-1A.* Check internal condition of governor and fuel regulator through exposed openings. Protect both assemblies from contamination.

A 5-270. ***Installation — Fuel Control Overspeed Governor — UH-1A.*** a. Remove and discard governor seal and packing ring. If governor is not to be reinstalled accomplish preservation as required.

b. Check stop setting of replacement governor. (Refer to paragraph 5-277.)

c. Remove shipping cover and gasket from replacement governor. Coat a new seal and packing ring lightly with petrolatum (item 14, table 1-1) and install on governor.

d. Place one shim (part number 1-160-589-02) and the governor drive shaft into opening at front of governor.

Note

Do not install cover tube on governor drive shaft at this time.

e. Install governor and drive shaft assembly. To assist meshing spline of drive shaft in governor drive gear box, the power turbine can be manually rotated through rear end of engine. Secure governor temporarily on fuel control with four screws.

f. Refer to paragraph 5-271 and perform step a. Upon completion continue as follows.

g. Coat two new packings with petrolatum (item 14, table 1-1) and place on ends of drive shaft cover tube. Insert drive shaft and cover tube into governor drive gear box. Install a snap-ring in each end of tube.

h. Engage governor on shaft and tube while sliding it forward to seat over locating pins on fuel control regulator. Install washers and screws. Tighten screws evenly with 30 to 40 inch-pounds torque and lockwire heads.

Note

All screw fasteners on the fuel control shall be secured with appropriate safetying method.

i. Install governor seal drain tube and fuel control vent hose.

j. Install governor control lever and linear actuator (refer to paragraph 5-290) and adjust in accordance with instructions in paragraph 5-291, step b.

A 5-271. ***Adjustment — Fuel Control Overspeed Governor — UH-1A.*** a. Measure end play of governor drive shaft by the following procedure.

(1) Mount a small C-clamp at a convenient location on governor drive shaft.

(2) Set up a dial indicator, on any convenient mounting, to contact the clamp and indicate end play of shaft.

(3) Move the shaft axially and note total indicated end play. Maximum allowable is 0.280 inch.

(4) Remove governor assembly and drive shaft.

(5) If total end play exceeds maximum allowable limit, add two more shims in front of governor assembly (in addition to the shim installed in step d., paragraph 5-270) and also place two shims into the shaft opening in the governor drive gear box.

b. Rig in conjunction with power turbine governor RPM controls as outlined in paragraph 5-291.

B 5-272. Fuel Control Overspeed Governor — UH-1B. Refer to paragraph 5-267. Description is the same.

B 5-273. ***Removal — Fuel Control Overspeed Governor — UH-1B.*** a. Remove linear actuator and governor control lever. (Refer to paragraph 5-287.)

b. Disconnect and remove governor seal drain tube and fitting and fuel control vent hose and fitting. Install plugs and caps in open ports and fittings.

c. Remove torquemeter rotary oil pump and packing from front of overspeed governor drive gear box by removing six mounting bolts and washers.

d. Remove shims if any, from forward end of overspeed governor drive shaft, and record thickness. (See figure 5-50.)

e. Using a rod at least six inches long and $\frac{1}{4}$ inch or less in diameter, with one end sized and threaded 8-32 for $\frac{1}{4}$ inch of length, pull governor drive shaft through governor drive gear box.

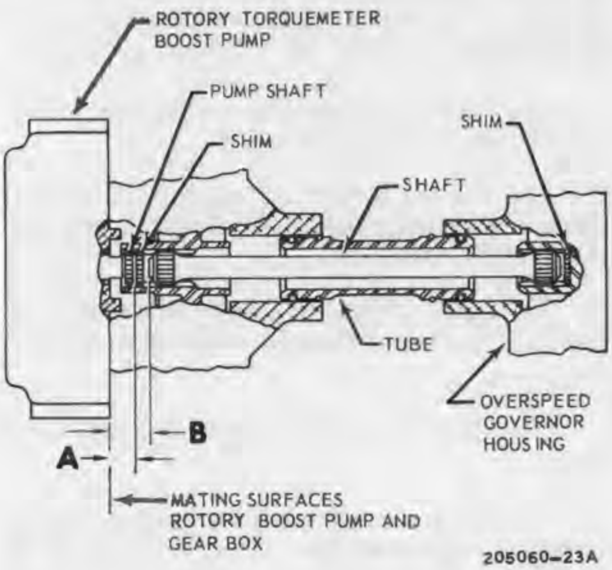


Figure 5-50. Governor drive shaft end play — UH-1B

f. Using same rod, remove aft shims, if any, from overspeed governor. Record thickness of shims.

g. Disengage snap-ring from groove at forward end of drive shaft cover tube and move ring toward middle of tube. Push tube forward into gear box housing.

h. Remove screws and washers that secure overspeed governor to fuel regulator housing.

Caution

To prevent damage to drive shaft between governor and fuel regulator, the governor must be kept as level as possible while being removed.

i. Carefully lift governor assembly above locating pins, then pull aft until free. Remove shaft cover tube and packings.

B ***5-274. Inspection — Fuel Control Overspeed Governor — UH-1B.*** Refer to paragraph 2-269.

B ***5-275. Installation — Fuel Control Overspeed Governor — UH-1B.*** a. Check stop setting of replacement governor. (Refer to paragraph 5-277.)

b. Coat a new seal and packing ring with petrolatum (item 14, table 1-1) and install on governor assembly.

c. Install new packings on drive shaft cover tube, and check that two snaprings are loosely on middle of tube. Insert tube into governor drive gear box and push forward into opening.

d. Position governor over splined shaft in fuel control. Install four attaching screws and three washers, with temperature sensing line support clamp under head of inboard rear screw. Tighten screws evenly, and secure with lockwire.

e. Position snap-ring in aft groove on cover tube, and pull tube aft into governor housing until stopped by ring. Secure tube with second snap-ring in forward groove on tube.

f. Coat splines of governor drive shaft with grease (item 8, table 1-1). Use threaded rod (refer to paragraph 5-273, step e.) to install drive shaft through front of governor drive gear box shaft into cover tube and governor housing. Mesh splines by manually rotating power turbine through rear of engine, and remove rod.

g. Refer to paragraph 5-276 and perform steps a. through f. Upon completion continue as follows.

h. Install torquemeter rotary oil pump on front of governor drive gear box. (Refer to paragraph 5-202.)

i. Install fittings and connect governor seal drain tube and fuel control vent hose.

j. Install governor control lever and linear actuator (refer to paragraph 5-290) and adjust in accordance with instructions in paragraph 5-291, step g.

B ***5-276. Adjustment — Fuel Control Overspeed Governor — UH-1B.*** a. Check end play of governor drive shaft, and adjust by installing shims if required, by following steps.

Note

End play of governor drive shaft must be established whenever a governor, a complete fuel control, or a torquemeter rotary oil pump is being installed. Excessive end play can cause wear of shaft splines and may lead to malfunction or failure of the overspeed governor.

b. Measure and record dimension, in thousandths of an inch, from mounting face of torquemeter rotary pump to end of pump shaft. (See dimension A, figure 5-50.)

c. With governor drive shaft bottomed at rear end, measure with a depth micrometer and record dimension from front end of shaft to face of pump mounting pad on front of gear box. (See dimension B, figure 5-50.)

d. Subtract dimension A from B to obtain total existing end play.

e. If end play is less than 0.090 inch, do not shim the drive shaft. Continue installation procedure. (Refer to paragraph 5-270, step g.)

Note

No minimum end play is established. However, it is important that some end play shall exist to avoid jamming the drive shaft solidly between rotary pump and governor.

f. If end play exceeds 0.090 inch, install shims (part number 1-160-589-02) according to the following requirements.

(1) If end play is between 0.090 and 0.280 inch, install one shim behind rear end of shaft.

(2) If end play is more than 0.280 inch, install a total of four shims, placing two at each end of shaft.

(3) Use threaded rod, as described in paragraph 5-273, step e. to remove and install shaft and shims.

g. Rig in conjunction with power turbine governor RPM controls as outlined in paragraph 5-291.

5-277. Checking Stop Setting — Fuel Control Overspeed Governor. Replacement fuel control overspeed governors, part number 87000-B4 through 87000-B7, are usable on both UH-1A and UH-1B (except not on T53-L-11 engines), but may have either of two basic stop settings: 0° to 60° for T53-L-1A engine on UH-1A; of 12° and 72° for T53-L-5/9/9A engines on UH-1B. Therefore, it is essential to check markings on a spare governor of this type and, if necessary to change settings of stop screws to obtain the correct nII speed range for engine model on which it is to be used.

Note

Do not interchange overspeed governor used on T53-L-11 engine with governors used on any of the other engine models.

a. Examine governor assembly for decal or other marking to determine whether stops are correctly set for engine.

Ab. If governor is set for use on UH-1B (T53-L-5/9/9A engines) but is to be installed on UH-1A (T53-L-1A engine), change stop setting as follows:

(1) Measure length of high rpm (upper) stop screw extending from inner face of mounting boss. Record dimension for reference if any doubt should occur during adjustment.

(2) Cut lockwire and loosen jam nut on high rpm stop screw. Turn stop in exactly four turns (clockwise) to lower setting by 12°. Stop is now set at 60° (plus or minus 2°). Secure stop by tightening jam nuts.

(3) Measure and record length of low rpm stop screw from inner face of mounting boss. Adjust in same manner as for upper stop, except back screw out exactly four turns (counterclockwise). Stop will now be at 0° setting. Tighten jam nut.

(4) Measure and record length of stops at new setting.

(5) Change markings on governor as required.

(6) Lockwire stops when adjustment is complete.

Note

Further adjustment of governor stops may be required in rigging and operational checks of power turbine governor rpm controls.

B c. If governor is set for use on UH-1A (T53-L-1A engine) but is to be installed on UH-1B (T53-L-5/9/9A engines), change stop settings in accordance with rigging procedure. (Refer to paragraph 5-284.)

B d. If governor stop setting is unknown on UH-1B, proceed according to rigging procedure as in step c. above.

A e. If governor stop setting is unknown on UH-1A, apply most suitable of following procedures:

(1) Check length of stops by comparison with those on another governor (87000-B4) on an engine of same model. Record facts of situation clearly so that all personnel concerned will regard settings as tentative until checked in rigging and operational test.

(2) If other components of governor control linkage system are considered to be properly rigged, adapt normal rigging procedure to determine tentative settings of governor stops. (Refer to paragraph 5-284.)

(a) Install control lever on serrated shaft of governor as nearly as possible at right angle to center line of shaft stop arm.

(b) Place controls in extreme high rpm position, with collective stick full up and actuator fully retracted by use of governor rpm switch held to "increase".

(c). Adjust high rpm governor stop to have 0.010 inch clearance with stop-arm when control lever is connected to actuator jackshaft.

(d) Adjust low rpm governor stop according to rigging procedure.

(e) Make final adjustments as required by operational tests.

Caution

First run-up of engines must be performed with care to avoid possible overspeed.

Section X — Power Controls

5-278. Power Controls. (See figures 5-51 and 5-52.) A mechanical linkage system actuated by twist-grips on collective pitch control sticks provides manual control of power lever on fuel control unit, modulating engine from zero to full power by controlling gas producer (nI) turbine rpm. Power lever shaft is serrated and grooved to accept a control arm, and has a quadrant marked with power settings in travel range between stops pre-adjusted by engine manufacturer or overhaul facility. Linkage is a series of control rods, bellcranks, and a torque tube, with adjustable tubes at each end of series and between control sticks. On UH-1B Serial No. 61-686 and subsequent, first bellcrank aft of collective pitch control stick as adjustable to change total travel of linkage.

5-279. An adjustable stop, on bellcrank below engine deck, contacts plunger of solenoid to arrest travel of control linkage at flight idle position when power is reduced from higher settings. Release is accomplished by use of ENGINE IDLE STOP RELease push-button switch, on pilot's collective stick, to retract solenoid plunger.

5-280. Power Lever Control Linkage. Refer to paragraph 5-281 for description.

5-281. ***Removal — Power Lever Control Linkage.*** Parts of control system can be removed as necessary for inspection, lubrication, or replacement. To facilitate reinstallation, identify removed parts as to location and keep attaching parts in place or in sets.

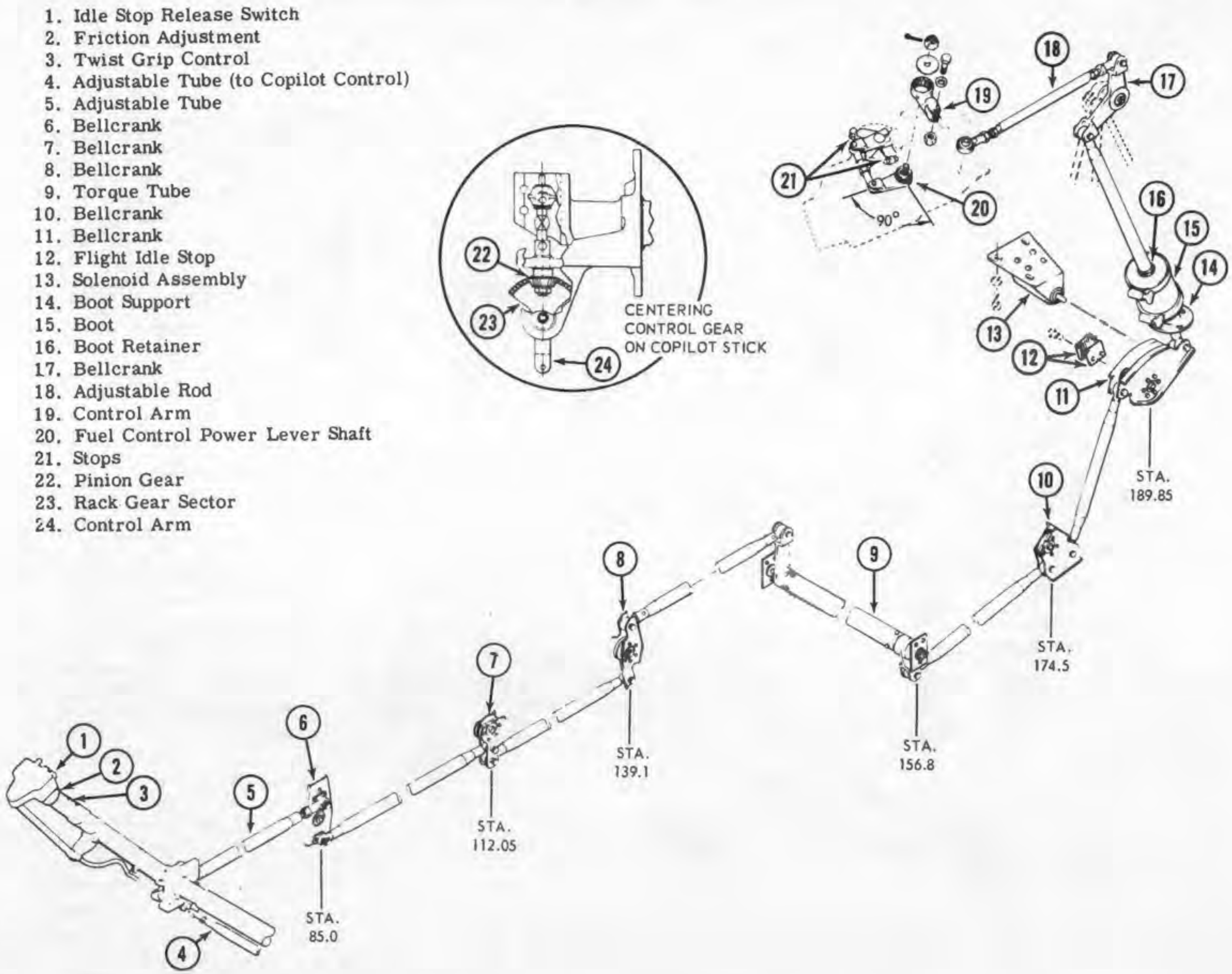


Figure 5-51. Power lever controls — UH-1A (typical)

1. Idle Stop Release Switch
2. Friction Adjustment
3. Twist Grip Control
4. Adjustable Tube (to Copilot Control)
5. Adjustable Tube
6. Bellcrank
7. Bellcrank
8. Bellcrank
9. Torque Tube
10. Bellcrank
11. Solenoid Assembly
12. Flight Idle Stop
13. Bellcrank Assembly
14. Boot Support
15. Boot
16. Boot Retainer Assembly
17. Bellcrank
18. Adjustable Rod
19. Control Arm
20. Fuel Control Power Lever Shaft and Stops
21. Adjustable Bellcrank
22. Spacer
23. Serrated Plate

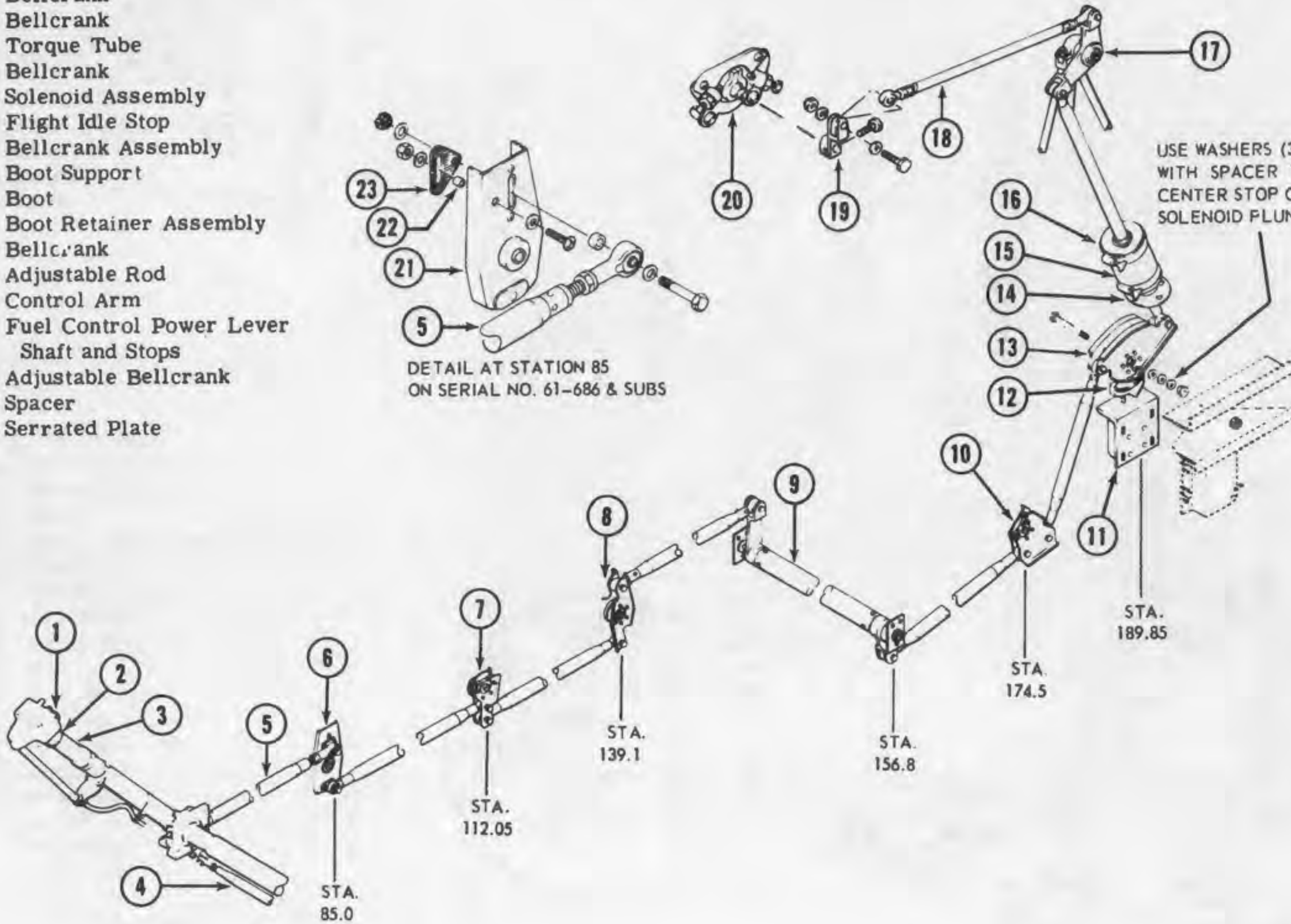


Figure 5-52. Power lever controls — UH-1B (typical)

a. In cabin, remove access plates along center of deck and boots on collective pitch control sticks as necessary to disconnect and remove push-pull tubes. When removing bellcrank (6, figure 5-51 or 5-52), open access plate in lower skin, at right side aft of landing gear cross-tube, to reach outboard end of bellcrank pivot bolt. In removing bellcrank (7), open plate at right on cargo deck.

b. Enter cargo-sling compartment to remove bellcrank (8) or attached push-pull tubes. Remove plate at right underside of fuselage for pivot bolt access.

c. Enter fuselage compartment through door at right to disconnect and remove push-pull tubes. To remove torque tube (9), detach each bearing plate (10) from support bracket by removing three bolts. Observe that bearing retaining nut and washer are used only on left end of torque tube. At right-hand end, keep any existing shims for reinstallation between bearing plate and bracket.

d. When removing bellcranks in fuselage compartment, obtain access to bellcrank pivot bolts by opening electrical compartment door at left aft on fuselage.

e. Open left engine cowling to disconnect and remove push-pull tube through service deck, loosening lower boot clamp so that boot (15) is removed with tube.

(1) Disassemble upper boot retainer (16) from tube, when necessary, by removing snap-ring and split bushing.

(2) Boost support (14) can be detached from deck by removing four screws.

f. Remove bolt at each end to detach control rod (18). Remove bellcrank (17) with bolt, washer, spacer and nut from bracket on engine mount pillow block.

g. Remove control arm from power lever shaft on fuel control unit.

A (1) On UH-1A, remove cotter pin, retaining nut, and washer from end of serrated shaft protruding upward from fuel control regulator below forward end of overspeed governor. Remove lockwire and loosen clamping screw, and pull upper control arm (19, figure 5-51) from shaft. Reinstall retaining nut and washer, which are supplied with engine.

Caution

Do NOT remove lower lever on same shaft, throttle lever on adjacent inboard shaft, link-rod between levers, on throttle lever stops. These parts are pre-set and furnished with fuel control unit.

B (2) On UH-1B, remove lockwire and clamping screw to pull control arm (19, figure 5-52)from power lever shaft on fuel control unit.

Caution

Do NOT remove or change setting of power lever stops.

5-282. ***Inspection — Power Lever Control Linkage.*** a. Inspect bearings for wear and roughness.

b. Inspect parts for wear, elongated bolt holes, cracks, nicks and surface damage.

5-283. ***Installation — Power Lever Control Linkage.*** a. Install bellcrank (6, figure 5-51 or 5-52) with slotted arm up at station 85 under cabin deck, on bracket at inboard side of right main beam. Secure with bolt, nut, cotter pin, and washers. Use thin washer between bellcrank bearing and nut or bolt head, and use oversize (3/8) thin or standard washers for fillers if required.

b. Install bellcranks (7) under cargo deck and (8) on right wall of cargo sling compartment in manner similar to preceding step except use a spacer between each bellcrank and bracket. Install connecting push-pull tubes.

c. Assemble support bearings on each end of torque tube (9), with retaining washer and nut on threaded left end. Position torque tube across forward end of fuselage compartment and attach each bearing support to bracket with three bolts, washers and nuts. Use shims (maximum of five on UH-1A, or eight on UH-1B) at right end between bracket and support bearing to maintain 0.03 to 0.06 inch clearance between bearing inner race and torque tube. Install push-pull tube from right (longest) arm through bulkhead to bellcrank (8).

d. Install bellcrank (10) on bracket at lower side of fuselage compartment, in manner similar to step b. Install push-pull tube between lower arm of bellcrank and left arm of torque tube.

e. Install bellcrank on bracket at upper left aft corner of fuselage compartment.

A (1) On UH-1A, installation is similar to step b.

B (2) On UH-1B, use washers to maximum of three with spacer between bellcrank and bracket to center idle stop over plunger of solenoid.

(3) Install push-pull tube between bellcranks.

f. Install bellcrank (17) on pillow block of engine mount tripod.

(1) Place spacer between tripod pillow block and bracket located on outboard side. Insert bolt from outboard side through pillow block, spacer and bracket.

A (2) On UH-1A through Serial No. 58-3047, position bellcrank on bolt with longest arm down and forward.

A (3) On UH-1A Serial No. 59-1607 and subsequent, position bellcrank on bolt with longest arm up.

B (4) On UH-1B, position bellcrank (17) on bolt with long arm down and forward.

(5) Install washer, nut and cotter pin on bolt.

g. Install push-pull tube and boot assembly.

(1) Install boot support (14) over hole in deck, slanting forward and secured by four bolts with washers.

(2) Assemble boot retainer (16) on control tube, inserting split bushing from lower side of retainer and securing with retaining ring at upper side.

(3) Insert control tube through boot (15) and down through boot support to connect on bellcrank (13).

(4) Connect control tube to bellcrank (17).

(5) Secure boot on retainer and support with clamps.

h. Install adjustable control tubes, control arm, and idle stop according to rigging procedures which follow.

5-284. *Adjustment — Power Lever Control Linkage*. a. Rig power lever control linkage as follows. (See figures 5-51 and 5-52.)

(1) Be sure idle stop is removed or arranged so as not to make contact with solenoid plunger, and that upper control rod is not connected to fuel control unit.

(2) Set twist-grip (3) at mid-travel, plus or minus three degrees.

(3) Install tube (5) adjusted to hold bellcrank (6) vertical. Actuate linkage through full travel, checking for any interference or binding.

(4) Install control arm on power lever shaft of fuel control unit.

A (a) On UH-1A: Remove retaining nut and washer from outboard serrated shaft of throttle linkage on fuel control. Place lever on shaft, flat side down and with center line of holes as nearly as possible to 90 degrees to that of existing lever under it on same shaft. Install with retaining washer and nut. Tighten nut finger-tight, then back off to first usable slot to install cotter pin.

B (b) On UH-1B: Position control arm on power lever shaft of fuel control, as nearly parallel to shaft stop-arm as serrations permit. Install retaining screw through control arm, engaged in groove around shaft. Lockwire screw head.

(5) Attach rod (18) to bellcrank on engine mount. Hold arm on fuel control alternately against each stop, and actuate control linkage to corresponding travel limits. Check and adjust rod for equal over-travel of free rod-end past control arm at both extreme positions. After adjustment connect rod to control arm and tighten rod-end jam nut.

A (a) On UH-1A through Serial No. 58-3047, total travel of airframe mounted control linkage was set at initial installation by location of a riveted doubler on upper arms of bellcrank (6, figure 5-51). If linkage travel should be found inadequate, make sure that adjustable tubes are correct parts for this series of helicopters and that available adjustments have been used to best effect. If necessary, replace bellcrank at Station 85. Using undrilled bellcrank (204-060-7281), locate doubler on slotted arm so as to provide 2.83 inches travel measured on vertical control tube where it passes through boot support. Rivet doubler when travel is correct. If undrilled bellcrank is not available, use bellcrank assembly (204-060-728-7) with doubler riveted to provide 1.95 inch dimension between bolt hole and bearing, center to center.

B (b) On UH-1B Serial No. 61-686 and subsequent, which are equipped with adjustable bellcrank (21, figure 5-52) adjust serrated attachment for control tube (5) so that power lever shaft on engine fuel control bottoms out approximately five degrees short of extreme positions of twist-grips.

A b. Adjust UH-1A idle stop and solenoid as follows.

(1) Check solenoid assembly (13, figure 5-51) for any binding where plunger passes through end of bracket. If required for alignment, shim on four screws between solenoid and bracket.

(2) Position solenoid to mounting holes with threaded inserts at underside of engine deck inboard of bellcrank (11). Provide proper clearance between tip of fully extended solenoid plunger and face of bellcrank before tightening three bolts, with washers, through slotted holes of bracket.

A (a) On UH-1A through Serial No. 58-2093, set solenoid plunger 0.25 inch from bellcrank face. This installation can be recognized by chamfered tip of solenoid plunger and nearly square, non-recessed stops attached by countersunk screws.

A (b) On UH-1A Serial No. 58-3017 and subsequent, set solenoid plunger 0.150 inch from bellcrank face. Solenoid plunger tip is rounded and chromium plated; stop is recessed at area of contact and is attached with roundhead screws.

(3) For preliminary approximate adjustment, place power lever controls at operational idle position, as shown on fuel control quadrant. Loosen two attachment screws on stop. Set slotted stop against solenoid plunger and tighten screws.

(4) Prior to engine run-up, check that solenoid plunger will move clear of stop when actuated by idle stop release switch on control stick.

(5) In initial ground run-up, make final adjustment of idle stop as required for prescribed gas producer tachometer indication. (Refer to TM 55-1520-211-10.)

B c. Adjust UH-1B idle stop on solenoid as follows. (See figure 5-53.)

(1) Check that solenoid plunger operates freely through bushing of mounting bracket. If necessary for alignment, shim on four screws between solenoid and bracket.

(2) Check attachment of solenoid assembly with four bolts through slotted holes of bracket into nut-plates of support below bellcrank. Be sure idle stop, attached to bellcrank assembly by two bolts with washers, is centered laterally over solenoid plunger. (Refer to paragraph 5-283, step e.)

(3) Position solenoid so that fully extended plunger tip is 0.12 to 0.16 inch below stop surface as shown. Tighten four bolts so that serrated faces of solenoid bracket and support engage securely.

(4) For preliminary approximate adjustment, place power lever control at operational idle position, as shown on fuel control quadrant. Loosen two bolts in slotted holes of stop. Set stop against solenoid plunger and tighten bolts. Be sure serrations of washers and stop are matched.

(5) Prior to engine run-up, check that solenoid plunger will move clear of stop when actuated by idle stop release switch on control stick.

(6) In initial ground run, make final adjustment of idle stop as required for prescribed gas producer tachometer indication. (Refer to TM 55-1520-211-10.)

5-285. *Connecting Control Sticks — Power Lever Control Linkage.* a. Remove access plate at left side on lower cabin skin, in line with gear and sector on lower end of copilot's collective pitch control stick.

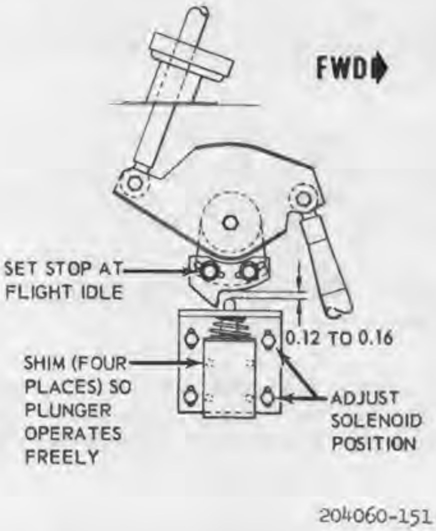


Figure 5-53. Adjusting idle stop — UH-1B

b. Position tube (4, figure 5-51 or 5-52) under floor, with adjustable end toward pilot's stick.

c. Set pilot's twist-grip so that pinion gear on lower end is centered on mating gear sector.

d. Set copilot's twist-grip to center its pinion on gear sector. (See figure 5-51.)

e. Adjust and connect tube between control arms of sticks.

5-286. Power Turbine Governor Actuator and Control Lever. (See figures 5-54 and 5-55.) An electrically operated linear actuator, remotely controlled by a GOVernor RPM INCRease-DECRease switch on each collective pitch stick moves a lever on overspeed governor of fuel control unit to accomplish settings of power turbine (nII) rpm, indicated on dual tachometer. Droop compensation to stabilize rpm as engine load fluctuates with changes in main rotor pitch, is provided by mounting actuator to a cambox which is mechanically linked to a bellcrank in collective pitch control system. Compensator linkage consists of two push-pull tubes and a torque tube, which has a shear pin in its forward arm to assure unhindered operation of collective pitch controls if compensator linkage should become fouled.

5-287. Removal — Power Turbine Governor Actuator and Control Lever. a. Open engine cowling at left side.

b. Remove terminal cover with attaching screws from top of linear actuator. Disconnect and stow electrical leads. Reinstall cover.

c. Detach actuator jackshaft rod-end from control lever on overspeed governor by removing bolt, with nut, cotter pin, and washer.

d. Detach actuator front end-fitting from cam box slider by removing bolt, with nut, cotter pin, and washer.

B (1) On UH-1B, avoid loss of spring washer installed between cambox slider and actuator end-fitting clevis.

(2) On either model, cambox slider bolt hole may have a bushing which is light press fit. Avoid loss of bushing.

e. Remove lockwire and retaining bolt to pull lever from serrated shaft at top of overspeed governor. Keep bolt with lever.

5-288. Inspection — Power Turbine Governor Actuator and Control Lever. a. Inspect actuator shaft rod-end for continued serviceability.

b. Check to be sure that actuator and governor control lever are correctly aligned.

c. If actuator is inoperative, remove screws attaching rear cover to motor. Remove motor cover and inspect for corrosion. Check motor shaft for freedom of rotation.

d. If electrical malfunction is suspected, check electrical connections. (Refer to paragraph 12-125.)

5-289. Repair or Replacement — Power Turbine Governor Actuator and Control Lever. a. Replace actuator shaft rod-end if unserviceable.

B *Note*

> In some instances a satisfactory field repair can be made to the linear actuator with the actuator installed, in accordance with the following procedure.
> 1. Remove four screws used to secure top cover of actuator.

2. Remove four screws used to secure motor to actuator assembly.
3. Move motor aft to disengage drive spline, being careful not to damage motor wiring.
4. Lubricate worm gear liberally with graphite (item 7, table 1-1).
5. Extend and retract actuator by rotating gears to distribute lubricant.
6. Re-engage motor and secure with four screws.
7. Electrically retract and extend actuator shaft.
8. Secure top cover of actuator.

b. Check rigging and operation after replacement of any parts. (Refer to paragraph 5-280.)

5-290. ***Installation — Power Turbine Governor Actuator and Control Lever.*** a. Place control lever, without retaining bolt, on governor control shaft according to rigging instructions. Install retaining bolt, with washer, from aft side into lever and through shaft groove. After rigging, lockwire bolt head to shank of lever.

b. Attach actuator front end-fitting clevis on end of cambox slider.

(1) Install bolt from top, secured with nut, washer, and cotter pin.

B (2) On UH-1B, install washer on bolt between clevis and underside of slider.

c. Attach actuator shaft rod-end in clevis of governor control lever with bolt, washer and nut. Omit cotter pin until rigging is complete.

Note

Do not add shim washers between clevis and actuator governor arm. Clearance is necessary for proper operation.

d. Remove actuator terminal cover with three screws. Connect electrical leads on terminals. (Refer to paragraph 12-125.) Reinstall terminal cover.

5-291. ***Adjustment — Power Turbine Governor Actuator and Control Lever.*** a. Rigging for various configurations will be in accordance with the following instructions.

A b. Model UH-1A helicopters equipped with 80300 series overspeed governor shall be rigged as follows. (See figure 5-54.)

Note

These instructions apply for all UH-1A, except those modified by MWO 55-1520-211-20/24. (Perform step c. if governor is Part No. 87000-B4.)

(1) Be sure collective pitch control system is rigged before proceeding.

(2) Open engine cowling on left side. Disconnect actuator shaft from governor control lever, and support actuator assembly so as to permit free movement as required.

(3) Check and adjust cambox and linkage:

(a) If cambox is Part No. 204-060-741 series, set cam adjustment for maximum compensation: Loosen lock-nut and set-screw. Raise bellcrank to place screw in serration nearest cam slot. Tighten set-screw and lock-nut.

(b) If cambox is Part No. 204-060-777 series, set cam at middle of adjustment: Loosen nut on cam adjustment bolt to disengage serrated washer from cam serrations. Position bolt at middle of its slot and tighten nut. Be sure washer serrations seat with those on cam face.

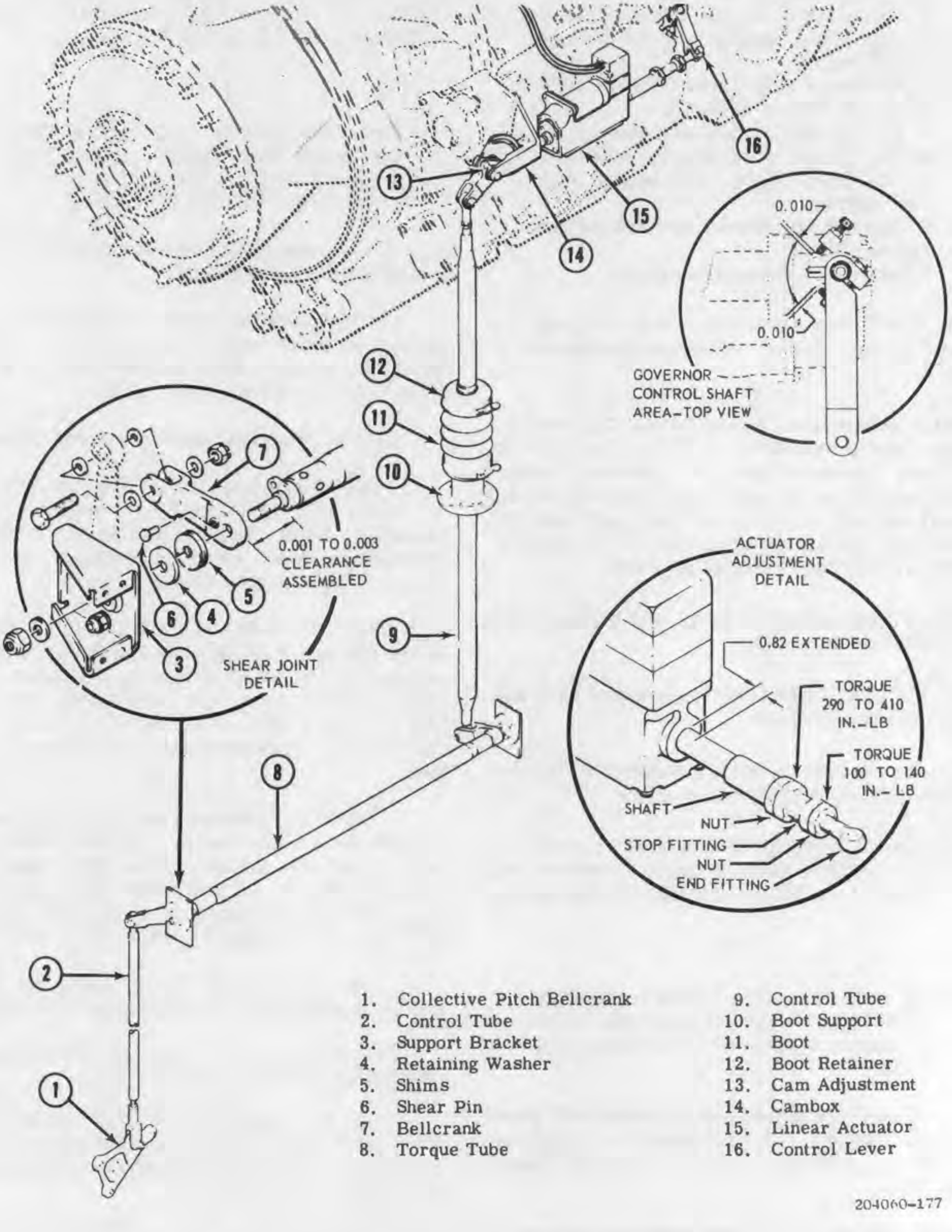
(c) With collective pitch stick full down, be sure that cam follower does not bottom in end of cam slot. Adjust control tube connected to cam bellcrank, if necessary. Also check in same manner for clearance at opposite end of cam slot, with collective pitch stick full up.

(d) Check both control tubes for safe thread engagement of adjustable rod-ends.

(4) Check control lever for correct initial position on governor control shaft.

(a) On Serial No. 58-2078 through 58-3047: With shaft stop arm midway between stops, lever should extend outboard perpendicular to long axis of engine.

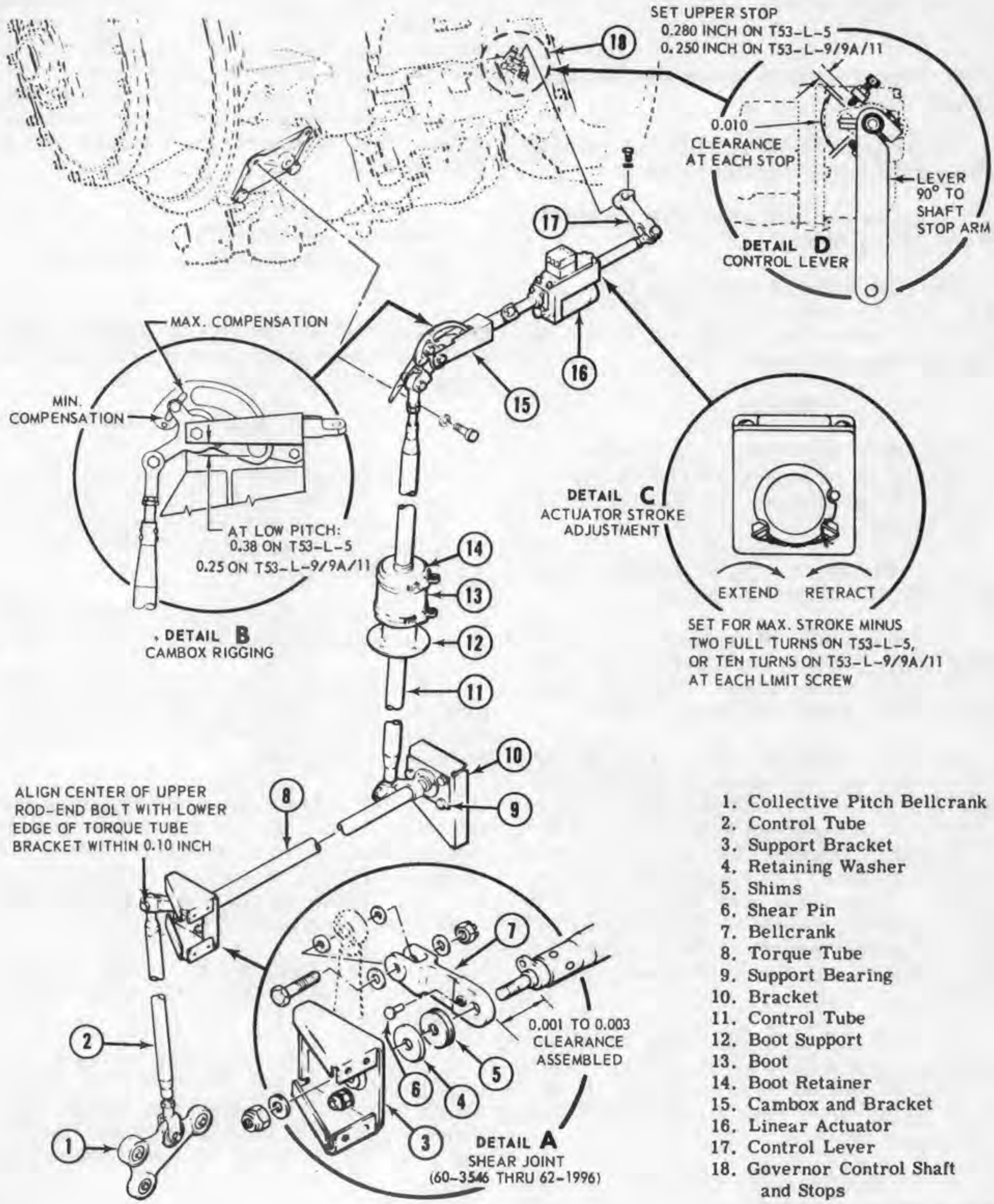
(b) On Serial No. 59-1607 and subsequent: With shaft stop arm midway between stops, lever should be approximately 17 degrees aft of perpendicular to engine axis.



1. Collective Pitch Bellcrank
2. Control Tube
3. Support Bracket
4. Retaining Washer
5. Shims
6. Shear Pin
7. Bellcrank
8. Torque Tube
9. Control Tube
10. Boot Support
11. Boot
12. Boot Retainer
13. Cam Adjustment
14. Cambox
15. Linear Actuator
16. Control Lever

204060-177

Figure 5-54. Power turbine governor RPM controls — UH-1A



1. Collective Pitch Bellcrank
2. Control Tube
3. Support Bracket
4. Retaining Washer
5. Shims
6. Shear Pin
7. Bellcrank
8. Torque Tube
9. Support Bearing
10. Bracket
11. Control Tube
12. Boot Support
13. Boot
14. Boot Retainer
15. Cambox and Bracket
16. Linear Actuator
17. Control Lever
18. Governor Control Shaft and Stops

204060-173C

Figure 5-55. Power turbine governor RPM controls — UH-1B

(c) If serrations do not permit exact alignment, install lever on next serration clockwise.

(5) Adjust actuator jackshaft for total stroke of 0.82 inch.

(a) Extend actuator fully by holding GOVernor RPM switch to DECRease.

(b) Measure and pencil-mark jackshaft 0.82 inch from actuator body.

(c) Cut lockwire and loosen large jam nut on shaft, to permit adjustment of "retract" stop fitting. Screw stop fitting out enough to avoid premature bottoming.

Caution

Hold shaft with wrench on hexagon shoulder when adjusting stop fitting, to avoid damaging anti-rotation device in actuator.

(d) Electrically retract actuator shaft until pencil mark aligns with housing.

(e) Screw stop fitting in to contact with internal stop. Tighten large jam nut with 290 to 410 inch-pounds torque. Recheck shaft stroke. Lockwire jam nut to end of shaft.

(6) Lock collective pitch stick full up. Fully retract actuator shaft by holding GOV ernor RPM switch to INCRease. Move governor control lever to high rpm position, with 0.010 inch clearance between stop arm and upper stop screw by use of a thickness gage. Cut lockwire and loosen small jam nut on actuator shaft, and adjust rod-end to connect on control lever at position described. When connected, center rod-end in clevis, tighten jam nut and lockwire.

(7) Place collective pitch stick full down. Extend actuator to full decrease position. Check for 0.010 inch clearance at lower stop. If necessary, adjust lower stop screw, tighten and lockwire jam nut.

(8) On initial ground run, with collective pitch stick held full down, check for minimum to maximum rpm range controlled by GOVernor RPM switch. If necessary, readjust actuator stroke and length to obtain required range, repeating clearance checks and adjustments of governor stop screws.

(9) Make final adjustment of droop compensator cam as required by ground run and test flights. Set cam to maintain 6400 rpm from full low pitch to red line torque or full power available, whichever occurs first. If rpm droop occurs, move cam up toward maximum compensating setting. If adjustment cannot be made on cam, shorten control tube attached to cam bellcrank.

Note

Readjust governor stop screws for proper clearance after any change in rigging.

A c. Model UH-1A helicopters equipped with 87000-B4 overspeed governor shall be rigged as follows. (See figure 5-52.)

Note

These instructions apply for UH-1A when modified to use governor Part No. 87000-B4 and associated components, in accordance with MWO 55-1520-207-20/24.

(1) Be sure collective pitch control system is rigged before proceeding.

(2) Open engine cowling at left side. Disconnect actuator jackshaft from governor control lever. Support actuator to permit free movement as required.

(3) Set cambox for maximum compensation: Loosen nut on cam adjustment bolt to free serrated washer from cam face. Move bolt clockwise in slot, to position nearest end of cam slot. Tighten nut on bolt so that serrated washer engages last serrations of cam.

(4) Check that governor stops are correctly set for use on T53-L-1A engine. (Refer to paragraph 5-277.)

(5) Set actuator shaft stop-fitting to 1.04 inch length from end of shaft, and rod-end fitting to 1.25 inch length from face of stop-fitting to center of rod-end bolt hole. (See figure 5-56.) Tighten but do not lockwire jam nuts.

(6) Fully retract actuator shaft by holding GOVernor RPM to INCRease. Loosen rod-end jam nut slightly to allow alignment. Place 0.010 inch thickness gage against upper governor stop screw, and hold governor shaft stop

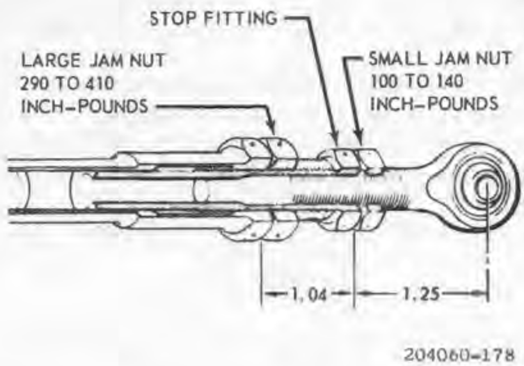


Figure 5-56. Actuator shaft dimensions — UH-1A with 87000 B4 overspeed governor

arm against gage. With collective pitch stick held full up, install control lever on serrated shaft of governor, so aligned as to allow connection of actuator shaft to lever. Turn shaft rod-end to enter lever clevis, and install bolt with washers, nut and cotter pin.

(7) Check for 0.010 inch clearance at lower governor stop with collective pitch stick full down and actuator extended to full decrease position. Readjust lower stop screw if necessary. Secure all adjustments, with lockwire where applicable.

(8) Make final checks and adjustments in ground run and after flight tests. (Perform sub-steps (8) and (9) of step b.)

B d. Model UH-1B helicopters shall be rigged as follows. (See figure 5-53.)

(1) Be sure collective pitch control system is rigged.

(2) Lock collective stick in full down position.

(3) Adjust control tube (2) to align center of upper rod-end bolt with lower edge of torque tube bracket (3) within 0.10 inch.

(4) Set cam adjustment bolt at middle of slot. (See Detail B.)

(5) Adjust control tube (11) to obtain required position of cam, by measurement of cam slot exposed below cambox housing. (See Detail B.)

B5 (a) On T53-L-5 engine, bottom of cam slot should be 0.38 inch below housing.

B9 B11 (b) On T53-L-9 and T53-L-11 series engines, bottom of cam slot should be 0.25 inch below housing.

(6) Check installation of governor control lever, as nearly at 90° to stop arm as serration alignment will permit. (See Detail D.)

(7) Adjust upper governor stop screw by length measured from inner side of mounting boss. (See Detail D.) Remove and discard lead seal on lockwire, if existing.

B5 (a) On T53-L-5 engine, upper stop screw should extend 0.280 inch from inner side of boss.

B9 B11 (b) On T53-L-9 and T53-L-11 series engines, upper stop screw should extend 0.250 inches from inner side of boss.

Caution

Never shorten either upper or lower stop screw to less than 0.060 inch length from inner side of boss.

(8) Disconnect actuator shaft from governor control lever by removing bolt.

(9) Electrically position actuator shaft to approximate midpoint of stroke. Turn both adjusting screws to obtain maximum stroke. (See Detail C.) Reduce stroke by turning each screw away from maximum adjustment, according to engine on which installed.

B5 (a) On T53-L-5 engine, turn each screw two full turns.

B9 B11 (b) On T53-L-9 and T53-L-11 series engines, turn each screw ten full turns.

(10) Fully retract actuator shaft by holding GOVernor RPM switch to INCRease. Lock collective stick in full up position.

(11) Reinstall bolt connecting actuator to governor control lever, adjusting actuator shaft rod-end to obtatin 0.010 inch clearance between governor stop arm and upper stop screw, measured with a thickness gage. (See Detail D.) If necessary, reposition control lever one serration on governor shaft to accomplish this adjustment while keeping safe thread engagement of rod-end.

Note

When tightening jam nut on actuator shaft, center rod-end in clevis of lever so that self-aligning bearing will absorb any rotation of shaft. Do not add shim washers between clevis and actuator governor arm. Clearance is necessary for proper operation.

(12) Fully extend actuator shaft by holding GOVernor RPM switch to DECRease. Lock collective pitch control stick in full down position.

(13) Adjust lower stop screw for 0.010 inch clearance with governor shaft stop arm, measured with a thickness gage. Remove and discard seal on lockwire, if existing. Observe minimum length limitation. (Refer to CAUTION, under step (7) (b).

(14) Check security of all adjustments and connections, installing lockwire where applicable.

(15) On initial ground run, with collective pitch control stick full down, check for 6000 to 6700 rpm range controlled by GOVernor RPM switch. If necessary, readjust actuator stroke and length to obtain required range, repeating clearance checks and adjustment at both governor stop screws.

(16) Make final adjustments of droop compensator cam as required by flight checks. Set cam to maintain 6700 rpm (plus or minus 50) from full low pitch to full power. If rpm droop occurs, rotate cam counterclockwise toward maximum compensation. If maximum compensation does not correct droop, adjust control tube rod-end attached to cambox bellcrank. (Refer to step (5).)

(a) If cambox assembly is Part No. 204-060-787-5, shorten control tube to reduce amount of cam slot showing below housing. Be sure roller does not bottom in cam slot.

(b) If cambox assembly is Part No. 204-060-787-7, lengthen control tube to increase amount of cam slot showing below housing, not to exceed 0.31 inch.

Note

Readjust governor stop screws for clearance after any change in rigging.

5-292. Power Turbine Governor Cambox and Linkage. (Refer to paragraph 5-286.)

5-293. Removal — Power Turbine Governor Cambox and Linkage. a. Disconnect control tube rod-end from bellcrank of cambox by removing bolt with nut and washer.

b. Remove cambox and bracket as an assembly. (If Part No. 204-060-741 series, cambox housing has integral bracket.)

A (1) On UH-1A, remove two nuts and washers which secure cambox assembly on tachometer generator mounting studs. Reinstall nuts on studs temporarily.

B (2) On UH-1B, cut lockwire and remove two bolts which secure cambox bracket on top of forward engine mount trunnion. Reinstall bolts temporarily.

c. Loosen clamps to detach boot from support or retainer. Disconnect push-pull tube by removing bolt from arm of torque tube in fuselage compartment. Pull tube up through deck. Remove snap-ring and push split bushing down out of retainer, remove retainer from either end of tube. Remove four screws to detach boot support from deck.

d. In cargo-sling compartment, disconnect push-pull tube by removing bolts at torque tube bellcrank and collective pitch bellcrank.

e. To remove torque tube: Detach forward support bracket from bulkhead by removing four screws. Remove retaining nut, bracket assembly, washer, shims shear pin, and bellcrank from forward end of tube. Keep attaching parts together for reinstallation. Enter fuselage compartment. Pull tube forward out of rear bearing then aft through hole in bulkhead. Rear bearing can be detached from bracket by removing three bolts.

5-294. Inspection — Power Turbine Cambox and Linkage. Inspect the following items as noted.

a. Shims on cambox bellcrank pivot bolt at each side of bearing should center cam in slot, and should provide 0.001 to 0.003 inch total clearance before nut is tightened on pivot bolt.

A b. On UH-1A cambox Part No. 204-060-777 series, nut on bellcrank pivot bolt should be fingertight plus one castellation.

A c. On UH-1A cambox Part No. 204-060-741 series, slider guide screw should be tightened enough to engage slot in slider and prevent turning movement, but should not bind slider in linear movement. When setting is satisfactory, threads should be upset to keep screw secure.

d. Check slider bolt hole for elongation, or for security of bushing if so equipped.

5-295. *Repair or Replacement — Power Turbine Cambox and Linkage*. a. Replace all items considered unsuitable for continued service.

b. Check rigging and operation after replacement of any parts. (Refer to paragraph 5-291.)

5-296. *Installation — Power Turbine Cambox and Linkage*. a. Install cambox and bracket assembly (or cambox with integral bracket, if Part No. 204-060-741 series).

A (1) On UH-1A, attach bracket on two outer mounting studs of tachometer generator on overspeed governor drive gear box, securing with nuts and washers. If required to align actuator shaft to governor control lever, one thin washer may be added under bracket, on either top or bottom stud.

B (2) On UH-1B, install cambox bracket on two upper bolts of left forward engine mount trunnion. Re-install thin steel washers, or standoff clips for fuel differential pressure switch hose support clamps, as required. Lockwire bolt heads together.

Note

Lower forward bolt hole of bracket is oversize for alignment of actuator to governor control lever. Accomplish final tightening and lockwiring of bracket mounting bolts after connecting actuator to lever.

b. In fuselage compartment, install rear support bearing for torque tube on face of bracket located on left beam near top and 16.5 inches behind forward bulkhead. Secure bearing plate with three bolts, heads forward.

c. Insert forward end of torque tube, without bellcrank, through bulkhead into cargo-sling compartment. Engage opposite end through rear support bearing.

d. Enter cargo-sling compartment. Place bellcrank on torque tube and install shear pin, with head flush in counter-bore on front side. Assemble shims, retainer washer, support bearing and bracket assembly, and retaining nut with washer on torque tube. Check that shims provide 0.001 to 0.003 inch clearance between bellcrank and tube fitting. Secure bracket with four screws, in holes provided with anchor nuts, on left beam.

e. Install control tube between lever arm and collective pitch control bellcrank directly below.

f. Attach boot support over hole in service deck with four screws. Insert fixed end of control tube down through deck and attach to torque tube. Place boot over tube, and clamp to support. Place boot retainer on tube, install split bushing from lower side and secure with snap-ring at upper side of retainer. Secure boot on retainer with clamp. Attach tube rod-end to cambox bellcrank. Adjust control tubes in rigging procedure.

CHAPTER 6

HYDRAULIC AND PNEUMATIC SYSTEMS

Section I — Scope

6-1. Scope. The purpose of this chapter is to provide essential information for maintenance personnel to accomplish organizational maintenance on the hydraulic systems. Pneumatic systems are not applicable to Model UH-1A and UH-1B helicopters.

Section II — Hydraulic System

6-2. Hydraulic System (UH-1A and UH-1B Serial No. 60-3546 through 64-14100.) Hydraulic power is supplied by single hydraulic system to reduce the operational loads of the cyclic, collective and directional control systems. The system consists of a variable delivery axial piston pump, reservoir, servo cylinders, irreversible valves, relief, check and solenoid valve and connecting hardware. The pump is mounted on the transmission lower case and furnishes hydraulic pressure to the servo cylinders which are connected to the mechanical linkage of the flight control system. The irreversible valves are installed on the servo cylinders to prevent main rotor feedback in the event of hydraulic system malfunction. The pressure required for the system operation is preset to supply the demand.

B 6-3. On Model UH-1B helicopter the armament hydraulic power source consists of an electrically operated hydraulic power shut-off valve, a check valve, a filter and necessary fittings, lines, hoses and attaching hardware. The shut-off valve is located on the upper, aft side of the cabin aft bulkhead just left of helicopter center line, and is actuated from the control panel on the instrument pedestal. Actuation of this unit permits operation of the armament hydraulic system. The check valve is located on the upper, aft side of the cabin aft bulkhead slightly to the right and aft of the hydraulic shut-off valve. The purpose of this valve is to prevent loss of hydraulic fluid due to a failure of lines and fittings in armament system. The filter is attached to the aft side of the flight controls hydraulic filter. Common attaching parts mount both filters to the aft side of the cabin aft bulkhead approximately 17.5 inches to the right of helicopter center line and 43.0 inches up from cabin deck line. Hydraulic fluid is filtered through this unit before returning to the reservoir. Fluid is furnished this system from the flight controls hydraulic reservoir and pressure is provided by the transmission hydraulic pump.

6-4. Operation — Hydraulic System (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). (See figure 6-1.) Hydraulic fluid is supplied to the pump from the two-quart reservoir, through the inlet line (9). The variable delivery pump furnishes pressure to the system at 1000 psi at no flow to 950 psi at full flow. From the pump the fluid passes through the filter to the relief valve, which is set to relieve at 1100 to 1200 psi. Fluid then passes to the three way solenoid valve (7). The solenoid valve is a normally open valve from the pressure side to the boost cylinder. When the solenoid is energized the pressure port is closed and the valve is open from cylinders to reservoir return. Fluid pressure from the solenoid valve energizes the pressure switch (8) which is set to break the circuit to the pressure warning light at 800 psi plus or minus 100 psi on increasing pressure and to close the circuit to the light at 500 psi plus or minus 100 psi on decreasing pressure. From the solenoid valve, fluid is furnished to the main rotor power cylinders through the irreversible and servo valves and to the tail rotor servo cylinder.

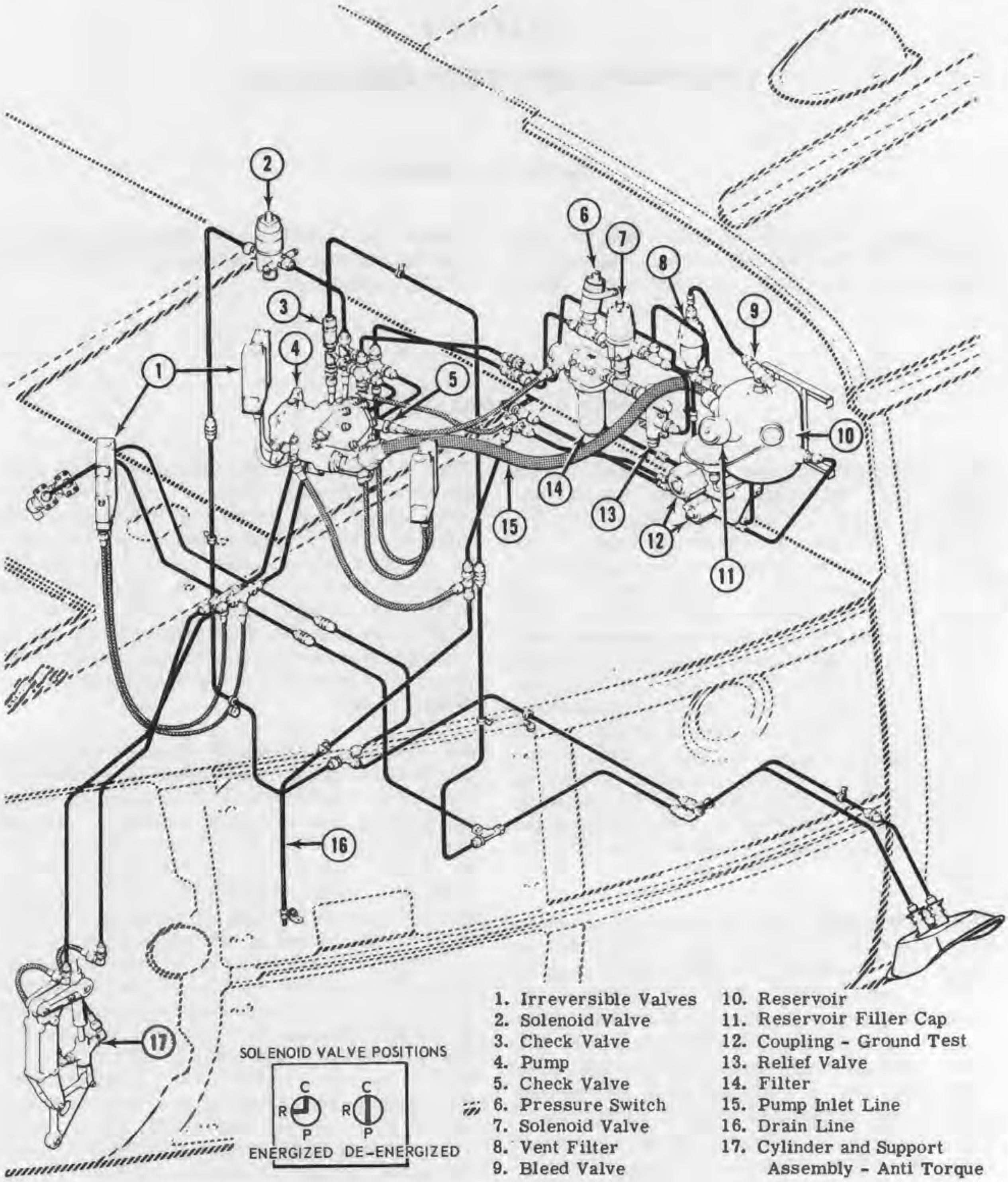


Figure 6-1. Hydraulic installation (typical) (UH-1A and UH-1B serial no. 60-3546 thru 64-14100)

6-5. Testing — Hydraulic System (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). The test stand equipment required consists of a portable hydraulic testing unit, thoroughly cleaned for use with hydraulic oil (item 3, table 1-1). The test stand includes a 10 micron filter used to filter all fluid at the stand. The unit must be capable of providing pressure to 1500 psi and have a flow rate of six gpm. A calibrated pressure gage with a minimum of 1500 psi capacity is required. The test stand should be set to relieve at 1300 psi.

a. Prepare the system for testing as follows:

(1) The complete system must be thoroughly clean.

(2) Fill the helicopter reservoir to capacity and keep filling during tests.

(3) On the initial test of newly installed system, to prevent entry of foreign material to power cylinder, disconnect hoses from irreversible valves, and from the tail rotor control boost cylinder. Connect hoses together using MS219196D5-4 reducers. Cap ports to boost cylinder valves to prevent entry of dirt.

(4) Connect hydraulic test stand hoses to inlet and outlet test fittings on the right side of the helicopter.

(5) Inspect the complete hydraulic system for attachment and security of components.

(6) Set the test stand to provide a minimum flow rate of six gpm for five minutes, to flush out the system.

(7) Throughout operation observe all portions of system for evidence of external leakage.

(8) Shut down test stand and connect hoses to the irreversible valves and cylinders.

(9) Set test stand pressure relief valve for a cracking pressure of 1300 psi and set pump for six gpm output.

b. Perform functional test by accomplishing the following steps.

(1) Apply 1000 to 1100 psi to hydraulic system and maintain for 15 minutes. While pressure is maintained check the following:

(a) Leakage: Observe all portions of system for evidence of leakage. Correct cause of leaks.

(b) Clearance: Slowly cycle all controls to limits and observe movement of power cylinders. Clearance should be such that fouling cannot occur. Check flexible connections to ensure that pinching of hoses does not occur and that vibration does not loosen attaching fittings.

(c) Bleeding: Cycle the cyclic controls, collective control and tail rotor control pedals through a full stroke at least ten times to bleed air from system.

(d) Warning Lights: Apply pressure to the hydraulic system. Slowly increase pressure and check the warning light. The light should be OFF when pressure reaches 700 to 900 psi. Slowly decrease the pressure. The light should be ON when pressure decreases to 600 to 400 psi.

(e) By-Pass: With the system pressure at 1000 to 1100 psi, operate the solenoid valve, the warning light should be ON. Operate the cyclic, collective and directional pedals, they should require more force to operate.

(f) Relief Valve: Slowly increase the pressure until the relief valve opens between 1100 and 1200 psi. The opening of the relief valve can be determined by feeling and listening to the valve.

(g) Irreversible Valve: Slowly increase the pressure until it can be determined that the control system is functioning with power. This should occur at 500 psi minimum. Reduce pressure to zero psi and check for irreversibility by grasping the extension tube of the servo cylinder and attempting to move the tube with approximately a 50 pound force. The cylinder should not move.

(2) Reduce to zero psi the pressure to irreversible valves. Maintain zero psi for three minutes and then examine irreversible valves and cylinder servo valves for leakage.

c. Upon completion of the test, completely drain the helicopter hydraulic system and replace filter elements. Disconnect test unit and close test ports. Refill system with hydraulic fluid (item 3, table 1-1), and with helicopter running and boost ON, bleed system. (Perform step b. (1) (c).)

6-6. *Trouble Shooting — Hydraulic System (UH-1A and UH-1B Serial No. 60-3546 through 64-14100).* Trouble shooting data for the hydraulic system is as follows.

INDICATION OF TROUBLE	PROBABLE CAUSE	CHECK FOR TROUBLE	CORRECTIVE ACTION
Hydraulic oil leaks	Worn gaskets or seals		Replace gaskets or seals
	Caution Do not tighten leaky flareless fittings.		
	Leaky fittings	Disconnect tube assembly having leaky flareless fitting. Inspect for evidence of improper tightening, presence of foreign matter, or defective part.	Replace with new tube assembly if nut, sleeve, or tubing is defective. Clean and remove all foreign matter. Tighten fitting nut with wrench until a sharp increase in torque is noted. ***Note*** If there is any doubt that the point of sharp torque increase has been reached, rapidly loosen and tighten the nut several times (use light torque), until certain that increase in torque is due to the sleeve and tube touching the fitting seat, and is not due to thread friction. Tighten nut an additional 1/6 of a turn (one hex flat), from point of sharp torque increase. If leak is present, tighten nut additional 1/6 of a turn (one hex flat). If leak still persists, remove tube assembly, and install new tube assembly.
Hydraulic warning light on	Hydraulic system turned OFF		Turn system ON
	Low hydraulic pressure	Loss of hydraulic fluid. Check for leak	Replace faulty gasket, fitting, tube assembly valve or component. Fill system with hydraulic oil (item 3, table 1-1).
		Relief valve locked open	Replace
		or	
		Pump not producing pressure	Replace

INDICATION OF TROUBLE	PROBABLE CAUSE	CHECK FOR TROUBLE	CORRECTIVE ACTION
	Solenoid not operating properly		Replace
	Electrical wiring to warning light or solenoid valve not correct	Check for proper wiring hookup	Make proper hookup or replace wiring.
	Check valve located at hydraulic pump pressure port installed backward		Remove and install properly
Hydraulic control switch ineffective	Circuit breaker not pushed in		Close circuit
	Solenoid valve not connected		Connect wiring
	Improper electrical wiring		Repair or replace
	Solenoid valve not functioning properly		Replace with new solenoid valve
	Check valve located at hydraulic pump pressure port installed backward		Remove and install properly
Excessive feedback	Air in servo actuator or System has not been bled		Turn hydraulic system ON and cycle the cycle controls, collective control, and tail rotor through a full stroke at least ten times to bleed air from system.
	Improperly adjusted rotor.	Refer to paragraph 8-7	
	Internal leakage past piston rings of servo actuator, or internal leak of irreversible valve	*Reduce pressure to zero. One person will hold control stick lightly. Another person will grasp extension tube of servo cylinder and attempt to move tube, using a (push-pull) force of approximately 50 pounds. Apply force in opposite direction from position of servo valve. If valve is in UP position push toward cylinder, and if valve is in DOWN position pull tube up from cylinder. The cylinder should not move.	Replace irreversible valve and/or servo valve until faulty unit is found

INDICATION OF TROUBLE	PROBABLE CAUSE	CHECK FOR TROUBLE	CORRECTIVE ACTION
Collective stick will not stay in position	204-076-1921-1 Spring located on collective servo actuator is missing or is not adjusted to balance controls		Replace missing spring. Adjust pressure of spring by bending upward, with a pair of pliers, the tab to which the upper end of spring is attached. When spring pressure is adjusted to overcome weight of collective stick and stick will stay in position, adjustment has been accomplished
Controls do not operate smoothly	Sticky servo control valve		Replace faulty servo
	Servo valve requires more than 12 ounces to operate		Replace servo actuator
Hydraulic system too hot	Relief valve cracking pressure set lower than system pressure	Check with hydraulic test stand	Set to relief at 1100 to 1200 psi. Replace defective valve with new valve.
	Pump generates excessive pressure, higher than relief valve cracking pressure		Replace pump
	The check valve in irreversible valve is blocked open	*Same as above	Replace valve
Problems — Specifically noted when using Ground Hydraulic Test Unit			
Oil flow from top of reservoir through vent filter when controls are operated	Suction line to test stand too long and too small or Using test stand reservoir instead of helicopter's reservoir		Use helicopter reservoir
Servo actuators chatter when moving controls	Air in servo actuators		Cycle controls through full stroke 10 times with more than 700 psi pressure applied to eliminate air. Some chatter is normal in the directional servo actuator when rotor is not rotating.
	Servo actuator mounting bearings loose		Adjust bearings

6-7. Hydraulic Pump (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). The hydraulic pump is a variable delivery axial piston pump. The pump is mounted on the transmission lower case and furnishes hydraulic pressure to the servo cylinders which are connected to the mechanical linkage on the flight control system.

6-8. Removal — Hydraulic Pump (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). a. Drain hydraulic oil supply from hydraulic reservoir.

b. Disconnect suction line from hydraulic pump and drain oil from line. Disconnect remaining lines to pump and cover openings.

c. Remove four nuts which mount pump to transmission gear box and lift pump from helicopter.

6-9. Installation — Hydraulic Pump (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). a. Position hydraulic pump on mounting bolts. Align splines on pump shaft with splines in transmission gear box and install mounting bolts.

b. Remove covers from hydraulic lines and connect lines to pump.

c. Service hydraulic reservoir.

d. Bleed hydraulic system. (Refer to paragraph 6-5 and perform step b. (1) (c).

6-10. Fluid Pressure Filter Element (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). The fluid pressure vent filter shall be replaced when and as necessary.

6-11. Removal — Fluid Pressure Filter Element (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). Cut lockwire and unscrew cap, with element, from filter (14, figure 6-1.)

6-12. Installation — Fluid Pressure Filter Element (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). a. Insert clean element into filter cap and place new O-ring on cap.

b. Screw cap into filter body. Tighten and lockwire.

6-13. Reservoir Vent Filter Element (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). Replace the reservoir vent filter element when, and as, necessary.

6-14. Removal — Reservoir Vent Filter Element (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). a. Disconnect lines from top and bottom of filter (8, figure 6-1). Cap or cover openings in lines to prevent entrance of foreign material.

b. Cut lockwire and unscrew two halves of filter.

6-15. Installation — Reservoir Vent Filter Element (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). a. Insert clean element into filter. Screw two halves of filter together and install lockwire.

b. Uncap or uncover openings in hydraulic lines and connect lines to filter.

6-16. Hydraulic Reservoir (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). The hydraulic reservoir is mounted on the cabin bulkhead and has a capacity of four pints. A sight gage, which can be seen from inside the cabin indicates "FULL and REFILL" requirements. Some models of UH-1B helicopters have sight glass mounted on top aft side of reservoir and it is necessary to open the right side of transmission cowl to read quantity of fluid in reservoir.

Caution

Careful inspection must be made of oil level sight gages to be sure that they are not oil stained internally and are giving erroneous indications of proper oil level. Upon inspection faulty stained glasses should be cleaned or, if necessary, replaced.

6-17. Removal — Hydraulic Reservoir (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). a. Drain hydraulic fluid by removing the drain plug from the bottom of the reservoir.

b. Disconnect inlet, outlet, scupper drain and by-pass lines from tank. Cap lines immediately after removal.

c. Remove four nuts which mount reservoir to bulkhead and remove reservoir.

6-18. ***Cleaning — Hydraulic Reservoir (UH-1A and UH-1B Serial No. 60-3546 through 64-14100).*** a. Thoroughly wash and clean all fittings and inside and outside of reservoir with dry cleaning solvent (item 302, table 1-1). Dry with compressed air.

b. Flush reservoir with hydraulic fluid (item 3, table 1-1).

6-19. ***Inspection — Hydraulic Reservoir (UH-1A and UH-1B Serial No. 60-3546 through 64-14100).*** a. Inspect filler cap screen for rust, corrosion and breaks.

b. Inspect sight glass for scratches, cracks, discoloration or other damage which would impair visual or structural function.

c. Inspect mating parts for damage and crossed threads.

6-20. ***Repair or Replacement — Hydraulic Reservoir (UH-1A and UH-1B Serial No. 60-3546 through 64-14100).*** Replace all components which inspection (refer to paragraph 6-19) indicates are unsuitable for continued service.

6-21. ***Installation — Hydraulic Reservoir (UH-1A and UH-1B Serial No. 60-3546 through 64-14100).*** a. Position tank in place on bulkhead and install nuts and bolts.

b. Install lines and fittings. Refer to paragraph 6-46 for installation methods of hydraulic fittings. Replace all seals on reassembly. Install and lockwire drain plug.

c. Refill, bleed and test system (refer to paragraph 6-5).

6-22. Collective Pitch Control Hydraulic Cylinder (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). The collective pitch control hydraulic cylinder (1, figure 6-2) reduces operational loads on the collective pitch control system and facilitates pilot control of the helicopter.

6-23. ***Removal — Collective Pitch Control Hydraulic Cylinder (UH-1A and UH-1B Serial No. 60-3546 through 64-14100).*** a. Disconnect control tube (2, figure 6-2) from hydraulic cylinder (1). Disconnect control rod (3) from collective pitch control lever (4).

b. Remove irreversible valve (5). (Refer to paragraph 6-40.)

c. Remove nuts and washers attaching cylinder to support assembly (7) and remove cylinder assembly from support.

6-24. ***Inspection — Collective Pitch Control Hydraulic Cylinder (UH-1A and UH-1B Serial No. 60-3546 through 64-14100).*** a. Inspect all parts for damage, corrosion or pitting, and check threads for distortion.

b. Inspect piston rod for nicks, scratches, or scoring, and check for smooth operation within cylinder. A friction drag of approximately 25 pounds is considered normal for the cylinder assembly.

c. Inspect bearing support area for looseness or wear. There must be no signs of bearing bind. Adjust nut assembly (15, figure 6-2) so that 25 to 50 inch-pounds of force is required to move bearing through its travel.

d. Inspect the cylinder assembly for leaks at all connections and fittings. Seepage around piston rod seals is permissible, but not to exceed one drop for every 20 cycles.

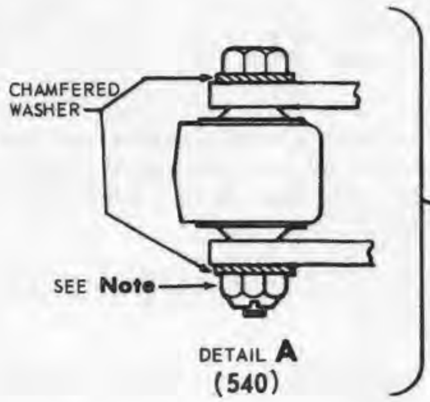
6-25. ***Repair or Replacement — Collective Pitch Control Hydraulic Cylinder (UH-1A and UH-1B Serial No. 60-3546 through 64-14100).*** Replace cylinders that fail to meet inspection requirements. (Refer to paragraph 6-24.)

6-26. ***Installation — Collective Pitch Control Hydraulic Cylinder (UH-1A and UH-1B Serial No. 60-3546 through 64-14100).*** a. Adjust cylinder and rod assembly before installation. (Refer to paragraph 6-27. Perform step a.)

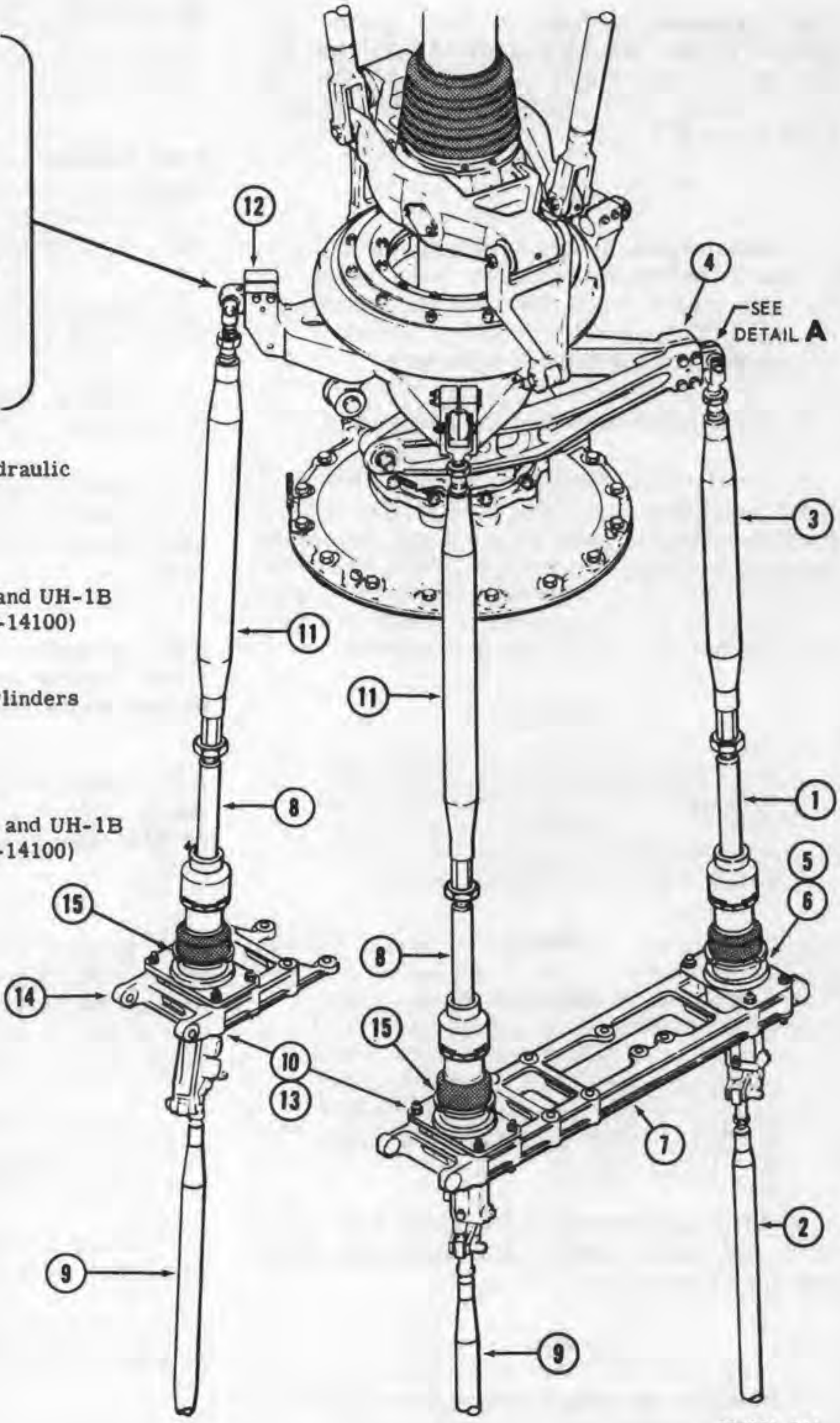
b. Position cylinder assembly (1, figure 6-2) on studs of support assembly (7) and install attaching washers and nuts.

c. Install irreversible valve (5). (Refer to paragraph 6-41.)

d. Connect control rod (3) to pitch control lever (4) and control tube (2) to hydraulic cylinder (1).



1. Collective Pitch Control Hydraulic Cylinder
2. Control Tube
3. Control Tube
4. Pitch Control Lever
5. Irreversible Valve (UH-1A and UH-1B Serial No. 60-3546 thru 64-14100)
6. Servo Control Valve
7. Support Assembly
8. Cyclic Control Hydraulic Cylinders
9. Control Tubes
10. Servo Control Valves
11. Control Tubes
12. Swashplate Horns
13. Irreversible Valves (UH-1A and UH-1B Serial No. 60-3546 thru 64-14100)
14. Support Assembly
15. Nut Assembly



Note

Torque nuts 700 to 1200 inch-pounds

Figure 6-2. Typical hydraulic cylinders removal and installation

e. Check rigging of collective pitch control system. (Refer to paragraph 9-17 or 9-22.)

6-27. ***Adjustment — Collective Pitch Control Hydraulic Cylinder. (UH-1A and UH-1B Serial No. 60-3546 through 64-14100.)*** a. Adjust cylinder and rod assembly with clevis set at 2.53 inches. (See figure 6-3.)

Note

Lost motion develops due to normal wear between the servo valve spool and pilot's input lever. (See figure 6-4.) This condition may be corrected by performing steps b. through e.

b. Break safetywire and loosen jam nut.

c. Insert 0.002 inch feeler gage in orifice in power cylinder and hold gently but firmly against bottom of spool valve. Carefully adjust screw in to reduce lost motion. Preferred clearance is 0.002 inch. Minimum clearance is plus 0.001 inch with a maximum of 0.004 inch permissible before adjustment is required.

Caution

Use extreme care in adjusting screw. After obtaining preferred clearance of 0.002 inch, 1/4 additional turn of screw will break horseshoe washer and collective will lock in full up position.

Note

Care must be exercised when adjustments are made on a badly brinelled screw, as a side force on the servo valve may result in excessive servo valve wear and a higher valve operating force. Valve should operate freely, with no binding.

d. After adjustment is complete, lock screw with jam nut, recheck valve operating force and safety-wire screw.

Note

If screw is being replaced, exercise care as ball is not secured to screw.

e. Final adjustments of hydraulic cylinder will be made concurrent with rigging. (Refer to paragraph 9-17 or 9-22.)

6-28. Cyclic Control Hydraulic Cylinders. (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). The cyclic control hydraulic cylinders (8, figure 6-2) reduce operational loads on the cyclic control system and facilitate pilot control of the helicopter.

6-29. ***Removal — Cyclic Control Cylinders (UH-1A and UH-1B Serial No. 60-3546 through 64-14100).*** a. Disconnect control tubes (9, figure 6-2) from control valves (10).

b. Disconnect control tubes (11) from swashplate horns (12).

c. Remove irreversible valves (13). (Refer to paragraph 6-40.)

d. Remove nuts and washers attaching cylinders (8) to support assemblies (7 and 14) and remove cylinder assemblies (8) from supports.

6-30. ***Inspection — Cyclic Control Hydraulic Cylinders (UH-1A and UH-1B Serial No. 60-3546 through 64-14100).*** (Refer to paragraph 6-24.)

6-31. ***Repair or Replacement — Cyclic Control Hydraulic Cylinders (UH-1A and UH-1B Serial No. 60-3546 through 64-14100).*** (Refer to paragraph 6-25.)

6-32. ***Installation — Cyclic Control Hydraulic Cylinders (UH-1A and UH-1B Serial No. 60-3546 through 64-14100).*** a. Adjust cylinder and rod assemblies before installation. (Refer to paragraph 6-27. Perform step a.)

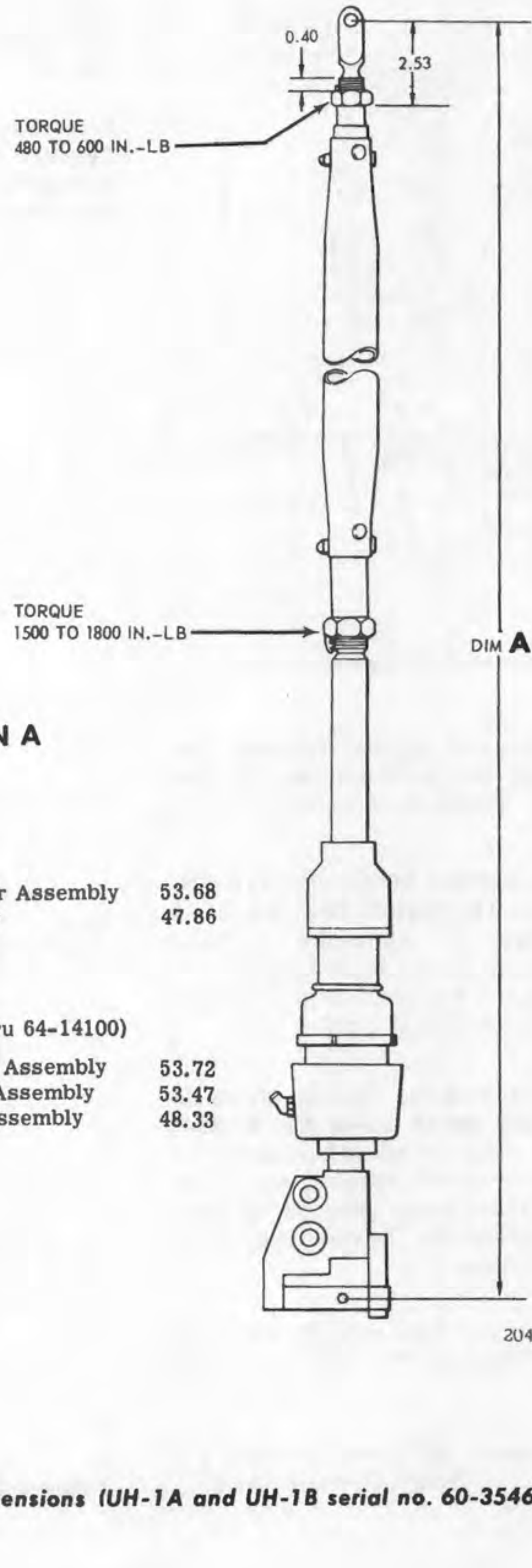
b. Position cylinder assemblies (8, figure 6-2) on studs of support assemblies (7 and 14) and install attaching washers and nuts.

c. Install irreversible valves (13). (Refer to paragraph 6-41.)

d. Connect upper control tubes (11) to swashplate horns (12).

e. Connect lower control tubes (9) to control valves (10).

f. Check rigging of cyclic control system. (Refer to paragraph 9-38 or 9-44.)



DIMENSION A

UH-1A

Right and Left Cyclic Cylinder Assembly	53.68
Collective Cylinder Assembly	47.86

UH-1B

(Serial No. 60-3546 thru 64-14100)

Right Cyclic Cylinder Assembly	53.72
Left Cyclic Cylinder Assembly	53.47
Collective Cylinder Assembly	48.33

Figure 6-3. Cylinder assembly dimensions (UH-1A and UH-1B serial no. 60-3546 thru 64-14100)

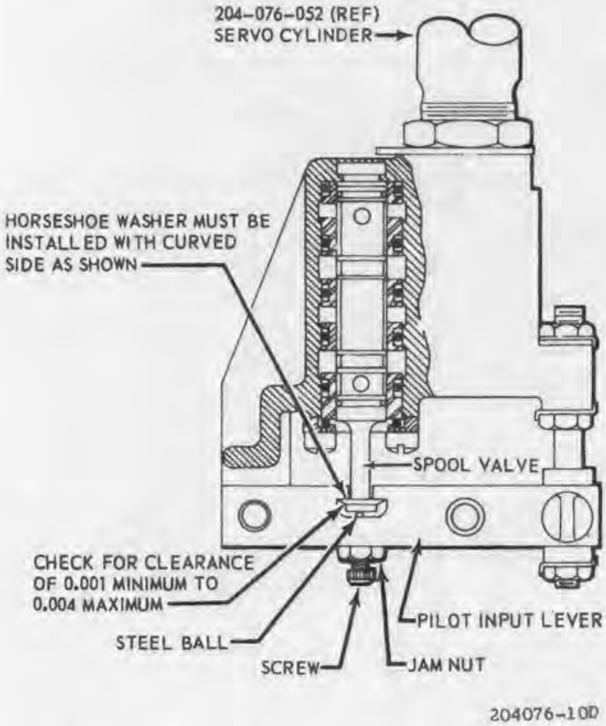


Figure 6-4. Adjustment of power cylinders

6-33. Adjustment— Cyclic Control Hydraulic Cylinders (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). (Refer to paragraph 6-27.)

6-34. Tail Rotor Control Hydraulic Cylinder (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). A hydraulic cylinder mounted in the tail rotor control system reduces effort required for control and reduces feed-back forces from the tail rotor.

6-35. Removal — Tail Rotor Control Hydraulic Cylinder (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). The tail rotor hydraulic cylinder and mount may be removed as an assembly or the cylinder alone may be removed from the support assembly. To remove cylinder observe steps a. through c.

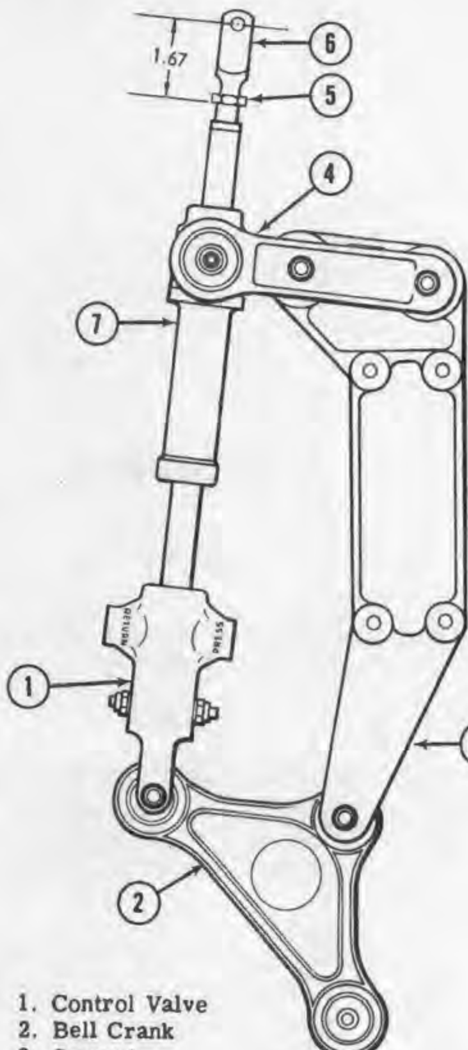
a. Disconnect and cap hydraulic pressure and return lines at cylinder control valve (1, figure 6-5).

b. Disconnect clevis (6) from cylinder (7) and control valve (1) from bellcrank (2).

c. Remove arm (4) from support (3) and remove cylinder (7).

d. Disconnect lower end of bellcrank (2) from control tube. Remove four bolts attaching support to structure and remove support assembly.

6-36. Inspection — Tail Rotor Control Hydraulic Cylinder (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). a. Inspect bearing for wear and roughness.



1. Control Valve
2. Bell Crank
3. Support
4. Arm Set (Matched)
5. Nut
6. Clevis
7. Cylinder Assembly

204001-2A

Figure 6-5. Tail rotor control cylinder and support

b. Inspect parts for wear, elongated bolt holes, cracks, nicks and surface damage.

c. Inspect cylinder for damage, evidence of leakage, freedom of operation of servo control valve.

6-37. ***Repair or Replacement — Tail Rotor Control Hydraulic Cylinder (UH-1A and UH-1B Serial No. 60-3546 through 64-14100).*** Replace parts that do not meet inspection requirements. (Refer to paragraph 6-36.)

6-38. ***Installation — Tail Rotor Control Hydraulic Cylinder (UH-1A and UH-1B Serial No. 60-3546 through 64-14100).*** a. Install clevis (6, figure 6-5) to link-rod of cylinder assembly (7) as illustrated and secure with nut (5).

b. Position cylinder assembly (7) on arm (4) with pressure and return ports located as illustrated. Install matched arm (4) over cylinder trunnion. Install bolts through arms and support. Install washers and nuts.

c. Check trunnion for freedom in supports.

d. Attach servo control valve (1) to bellcrank (2).

e. Adjust clevis (6) on link-rod of cylinder assembly (7) as illustrated and lock with nut (5).

f. Attach control tube to lower end of bellcrank.

g. Attach pressure and return line to respective fittings on cylinder (1).

h. Check control valve and cylinder for tightness or binding. Servo control valve should be free to move on shaft. Check to determine that hydraulic lines do not restrict movement of valve.

6-39. Irreversible Valves (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). One irreversible valve is attached to the pressure side of servo control valve of each servo cylinder in the cyclic control system. The irreversible valve permits hydraulic fluid to flow only toward the servo cylinder. Irreversibility is obtained independent of boost pressure. The valve prevents flight induced loads (feed back forces) from being transmitted back to pilot's control stick. The irreversible valve provides the pilot with safe control of helicopter in the event of hydraulic system failure.

6-40. ***Removal — Irreversible Valves (UH-1A and UH-1B Serial No. 60-3546 through 64-14100).*** a. Disconnect hose assemblies from valve.

b. Cap hoses to retain hydraulic fluid if system has not been drained.

c. Cut lockwire and unscrew valve attachment bolts.

d. Remove irreversible valve from servo control valve.

6-41. ***Installation — Irreversible Valves (UH-1A and UH-1B Serial No. 60-3546 through 64-14100).*** a. Place gasket on valve attachment bolts in groove next to head.

b. Insert bolts through valve.

c. Hold head of each bolt firmly against valve and install a gasket on threaded end of bolt. Work gasket back on bolt into groove.

d. Place valve in place against servo cylinder, and tighten screws.

Caution

> Exercise care to avoid damage of O-rings between valve bodies.

e. Attach hoses.

f. Bleed system and check for leaks as in paragraph 6-5.

g. Install lockwire.

6-42. Power Cylinder Servo Valves (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). Control linkage can be divided into pilot-operated linkage and hydraulically-operated linkage. The pilot-operated linkage terminates at the power cylinder servo valves (6 and 10, figure 6-2) when hydraulic power is ON. These valves are supplied with and are a part of the power cylinder assemblies. Overhaul of the valves is not authorized for organizational maintenance; however, servo valves on power cylinders of the same part number are interchangeable. Consequently, individual replacement of servo valves is authorized when replacement of the entire cylinder assembly and rigging of the system would otherwise be required.

6-43. Removal — Power Cylinder Servo Valves. (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). a. Remove irreversible valve. (Refer to paragraph 6-40.)

b. Remove piston rod stop from collective cylinder only.

c. Disconnect control tube (2 or 9, figure 6-2) from servo valve lever.

d. Loosen jam nut sufficiently to lift cover assembly and lock-tab washer out of recess on top of servo valve. Unscrew valve from piston.

6-44. Installation — Power Cylinder Servo Valves (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). a. Place cover assembly and lock-tab washer on piston rod. Screw servo valve onto piston rod until rod bottoms in valves. Back valve off one-half to one and one-half turns as necessary to align servo valve with lock-tab washer.

b. Align cover assembly and tighten jam nut to 200 to 225 inch-pounds torque.

c. Install piston rod stop on collective cylinder only to safety jam nut.

d. Connect control tube (2 or 9, figure 6-2) to servo valve lever.

e. Install irreversible valve. (Refer to paragraph 6-41.)

6-45. Hydraulic Components (UH-1A and UH-1B Serial No. 60-3546 through 64-14100). a. The various components of the hydraulic power assembly may be removed and replaced in a similar manner by disconnecting lines and removing mounting bolts. Disconnect electric plugs from solenoid valve and pressure switch when necessary for removal. When installing components replace large diameter washers between component and bulkhead. Refer to figure 6-1 to determine direction of flow of hydraulic fluid and to paragraph 6-46 for "Installation Method — Hydraulic Fittings."

b. Refill, bleed and test system after removal and installation of a component (refer to paragraph 6-5). If hydraulic leaks are present refer to "Trouble Shooting" for corrective action.

6-46. Installation Method — Hydraulic Fittings. (See figure 6-6.) The following basic information is to be considered as standard practice for the installation of hydraulic fittings. a. Coat male threads of fitting, ring and gasket sparingly with petrolatum, (item 14, table 1-1), or hydraulic fluid and assemble as illustrated in View A. Work ring into counterbase of nut, then turn the nut down until the gasket is pushed firmly against the lower threaded section of the fitting.

b. Install fitting into boss, and at the same time keep the nut turning with the fitting until the gasket contacts the boss (View B). This point can be determined by a sudden increase in torque. With the fitting in this position, put a wrench on the nut to prevent its turning and at the same time, turn the fitting in $1\frac{1}{2}$ turns. Position fitting by turning not more than one additional turn.

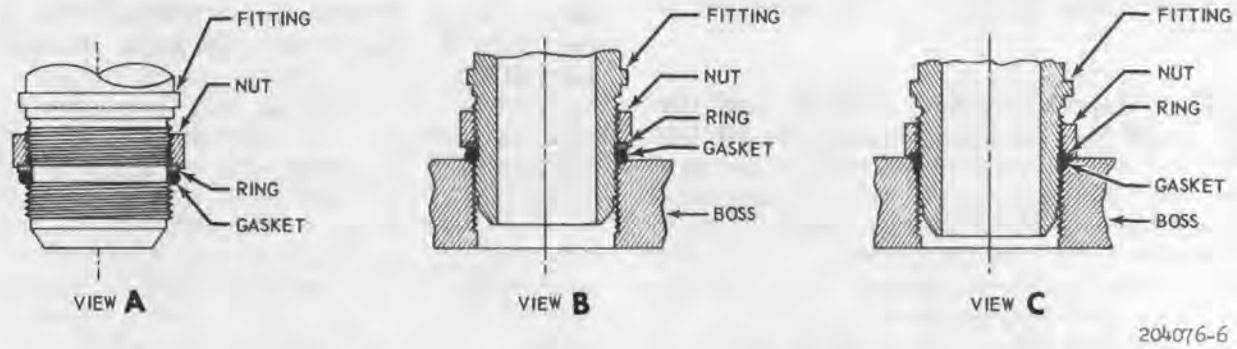


Figure 6-6. Installation method — hydraulic fittings

c. Hold fitting and turn nut down tightly against boss. Slight extrusion of the ring is not detrimental.

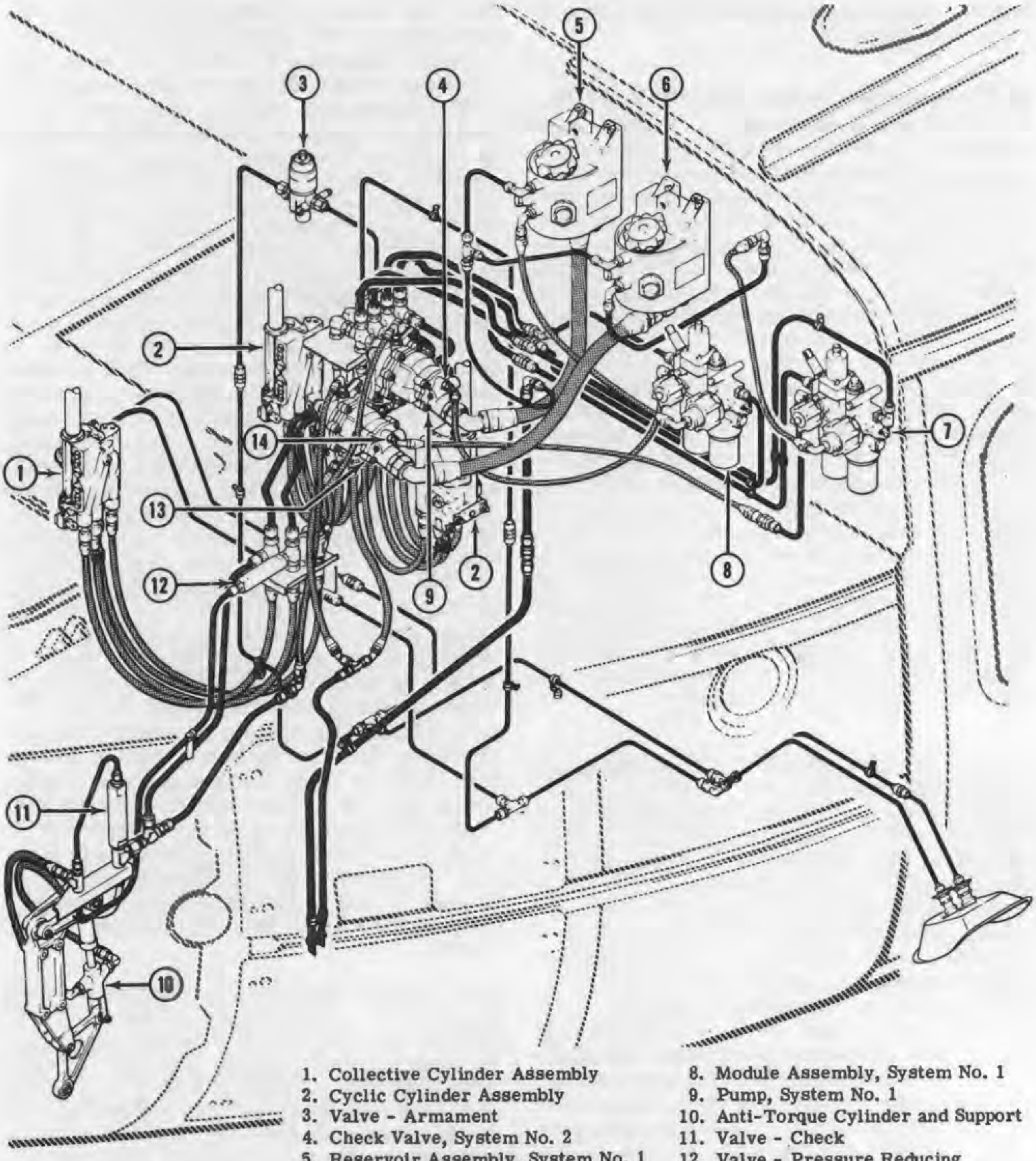
6-47. Hydraulic Systems (UH-1B Serial No. 64-14101 and subsequent). Model UH-1B helicopters, Serial No. 64-14101 and subsequent, are equipped with a dual hydraulic system (figure 6-7) to reduce the operational loads required to activate the cyclic, collective and directional control systems. The dual system used in these helicopters provides greater safety of flight. Failure of one system leaves hydraulic power still available through the other system. Each system consists of a reservoir; a variable delivery, pressure compensated pump; a module assembly containing a solenoid valve, relief valve, pressure switch, pressure and return filters and magnetic type differential pressure indicators; control cylinders which incorporate irreversible features, and necessary attaching hardware. The reservoirs are mounted on the cabin aft bulkhead just to the right of helicopter centerline. The pumps are mounted on the transmission lower case and furnish hydraulic pressure to the control cylinders through the module assemblies, which are attached to the right-hand side of the cabin aft bulkhead. Pressure required for system operation is preset on each pump to supply demand.

6-47A. The dual hydraulic systems installed on UH-1B helicopters Serial No. 66-491 and subsequent incorporate the added feature of an emergency collective (accumulator) system on System No. 1. This added system maintains collective control hydraulic pressure for four control strokes minimum in the event both hydraulic systems fail. This emergency collective system also adds total irreversibility to the collective control system. An accumulator, pressure operated lock-out valve, nitrogen charging valve, pressure gage, drain valve, drain hose and drain valve coupling halves, with necessary tubes and fittings, constitute the added equipment required to obtain the above characteristics. System No. 1 also includes an emergency cyclic control (accumulator) system which serves to pressurize and lock out the cyclic actuators, as well as increase the amount of irreversibility in the cyclic system, if both hydraulic systems should fail. Components of this cyclic emergency system include a pressure operated lock-out valve and a small, spring loaded accumulator, with necessary fittings, tubing and check valves.

6-48. Operation — Hydraulic Systems (UH-1B Serial No. 64-14101 and subsequent). Hydraulic fluid is supplied to the pumps from the two-quart capacity reservoirs by means of hoses. The variable delivery pumps furnish fluid, under 1500 psi pressure, to their respective module assemblies. Operation of both module assemblies is the same. Fluid passes through the module pressure filter to the solenoid valve which is open when de-energized. A pressure relief valve limits system pressure, cracking at 1626 psi, with a full flow pressure of 2140 psi. Pressure line and return line filters both have differential pressure indicators which sense pressure on both sides of the filter. An indicator pin extends if inlet pressure exceeds outlet pressure by more than 70 psi differential. Fluid pressure from the solenoid valve energizes a pressure switch which is set to break the circuit to the pressure warning light on the caution panel at 800 psi. Pressure fluid is furnished to the cyclic and collective control cylinders from the solenoid valve of both sub-systems. Pressure fluid to the directional control cylinder is furnished only from hydraulic sub-system No. 2 solenoid valve on UH-1B helicopters Serial No. 64-14101 through 65-12744 and 65-12772. On UH-1B helicopter Serial No. 66-491 and subsequent this function is performed by the solenoid valve in sub-system No. 1. Return fluid from control cylinders passes through the module assembly return filters. With the solenoid valve energized the return fluid passage is connected to the system passage, with pressure passage blocked. Pump idles at system pressure with no flow. Armament hydraulic power is supplied from system No. 1 only, on UH-1B helicopters Serial No. 64-14101 through 65-12744 and 65-12772. On UH-1B Serial No. 66-491 and subsequent armament hydraulic power is supplied by system No. 2.

6-49. Testing — Hydraulic Systems (UH-1B Serial No. 64-14101 through 65-12744 and 65-12772). The test equipment shall consist of a thoroughly clean portable hydraulic test unit, serviced to use hydraulic oil (item 3, table 1-1). The test unit shall include a ten micron filter to filter all oil leaving the test unit. The unit shall be capable of producing pressure to 2300 psig, and shall have a flow rate of at least six gpm. A calibrated pressure gage with a minimum of 2500 psig capacity shall be provided on the test unit. The test unit shall have provisions in the pressure and return lines for connecting to both hydraulic systems for simultaneous operation.

a. Prepare the systems for testing as follows:



1. Collective Cylinder Assembly
2. Cyclic Cylinder Assembly
3. Valve - Armament
4. Check Valve, System No. 2
5. Reservoir Assembly, System No. 1
6. Reservoir Assembly, System No. 2
7. Module Assembly, System No. 2
8. Module Assembly, System No. 1
9. Pump, System No. 1
10. Anti-Torque Cylinder and Support
11. Valve - Check
12. Valve - Pressure Reducing
13. Pump, System No. 2
14. Check Valve, System No. 1

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Figure 6-7. Hydraulic installation (UH-1B serial no. 64-14101 thru 65-12744 and 65-12772)

(1) The complete system shall be thoroughly cleaned to assure removal of all foreign matter from lines and components.

(2) Fill hydraulic reservoirs to capacity and keep filled during tests.

(3) On initial test of newly installed system, disconnect hoses from cyclic and collective cylinders. Connect hose ends together with unions. Cap or cover ports in cylinders to prevent entry of dirt.

(4) Connect test unit hoses to System No. 2 through ground test fittings, located on right-hand side of helicopter in outboard module assembly.

(5) Visually inspect complete hydraulic system to insure that all components and lines are securely attached and appear capable of satisfactory operation.

(6) Set test unit to a minimum flow rate of six gpm. Use test unit pressure setting sufficient to maintain six gpm flow through hydraulic system for at least five minutes. Use test unit reservoir for this flushing procedure.

(7) Disconnect test unit hoses from System No. 2 and connect to System No. 1 through ground test fitting located on right-hand side of helicopter in inboard module assembly. Repeat step (6) above.

Note

Throughout performance of steps (6) and (7) above, observe all portions of system for external leakage. Appropriate action shall be taken to correct any cause of leakage.

(8) Upon completion of steps (6) and (7) above, test unit shall be shut down and cyclic and collective hoses shall be connected to cylinders.

(9) Connect left and right-hand hydraulic armament system pressure and return lines.

(10) Set test unit to a minimum flow rate of at least three gpm. Use test unit pressure setting sufficient to maintain three gpm flow through system for at least five minutes. Activate test unit and flush system for at least five minutes.

Note

Throughout performance of step (10) above, observe all portions of system for external leakage. Appropriate action shall be taken to correct any cause of leakage.

(11) Shut down test unit and disconnect left- and right-hand hydraulic armament system pressure and return lines. Cap lines.

(12) Disconnect hoses from tail rotor cylinder and connect hose ends together with reducer. Cap or cover ports in cylinder to prevent entry of dirt.

(13) Disconnect test unit hoses from System No. 1, and connect to System No. 2. (Refer to step (4).)

(14) Accomplish step (10) above, including note.

(15) Upon completion of step (14) above, test unit shall be shut down and hydraulic system hoses shall be reconnected to cylinder.

(16) Set test unit pressure relief valve for a cracking pressure of 2100 psig and set pump so that it is capable of at least six gpm flow. Set pressure compensation at 1475 to 1525 psig. System No. 1 and System No. 2 shall both be connected to the test unit at the ground test connections.

b. Perform functional tests by accomplishing the following steps. Tests shall be performed after successful completion of step a., above.

(1) Apply 1475 to 1525 psig to the hydraulic systems for at least 15 minutes. While pressure is maintained, accomplish the following:

(a) Observe all portions of both systems for external leakage. Appropriate action shall be taken to correct any cause of external leakage.

(b) Slowly cycle all controls to limits and observe movement of power cylinders. Clearance shall be such that fouling of adjacent parts cannot occur. Check flexible connections to ensure that pinching of hoses does not occur and that vibration does not loosen attaching fittings.

(c) Cycle the cyclic controls, collective control and tail rotor control pedals through full stroke at least ten times to bleed air from system.

(2) Apply pressure to the hydraulic systems. Slowly increase pressure and check warning lights. Lights should go OFF when pressure

reaches 700 to 900 psig. Slowly decrease pressure. Lights should come ON when pressure reaches 600 to 400 psig.

(3) Test single system operation as follows:

(a) With pressure in systems at 1475 to 1525 psig, shut off System No. 1 by use of switch on console. System No. 1 warning light shall come ON.

(b) Operate cyclic, collective and tail rotor controls. Operation shall be smooth and positive.

(c) Shut off System No. 2 by use of switch on console. System No. 1 warning light shall go OFF and System No. 2 warning light shall come ON.

(d) Operate cyclic and collective controls. Operation shall be fully powered, smooth and positive.

Note

When testing System No. 1 tail rotor controls are not powered by hydraulic pressure and will require more force to operate.

(4) Connect System No. 1 to test unit and slowly increase pressure until relief valve on System No. 1 module opens. Relief valve shall open between 1626 and 2140 psig.

(5) Repeat step (4) above, for System No. 2.

(6) Disconnect hydraulic systems from ground test unit and remove ground test unit.

(7) Test system pressure by connecting calibrated (0 to 3000) gages to both hydraulic systems at pressure ground test fittings. With rotor turning at 285 to 314 RPM, hydraulic pressure shall be 1475 to 1525 psig on each system, with cyclic, collective and tail rotor controls fixed.

c. Upon completion of tests, replace filter element in both module assemblies. Refill hydraulic systems, using test unit. Bleed systems in accordance with instructions in paragraph 6-49, step b. (1) (c). Disconnect and remove test unit. Close all test ports on unit and on hydraulic systems. Connect hydraulic reservoirs to module assemblies and lockwire quick disconnect couplings. Service reservoirs in accordance with instructions contained in paragraph 1-91.

6-49A. Testing — Hydraulic Systems (UH-1B Serial No. 66-491 and subsequent). The test equipment shall consist of a thoroughly clean portable hydraulic test unit, serviced to use hydraulic oil (item 3, table 1-1). The test unit shall include a ten micron filter to filter all oil leaving the test unit. The unit shall be capable of producing pressure to 2300 psig, and shall have a flow rate of at least six gpm. A calibrated pressure gage with a minimum of 2500 psig capacity shall be provided on the test unit. The test unit shall have provisions in the pressure and return lines for connecting to both hydraulic systems for simultaneous operation.

a. Prepare the systems for testing as follows:

(1) The complete system shall be thoroughly cleaned to assure removal of all foreign matter from lines and components.

(2) Fill hydraulic reservoirs to capacity and keep filled during tests.

Caution

Do not service reservoir with the accumulator charged hydraulically. Accumulator should be bled down.

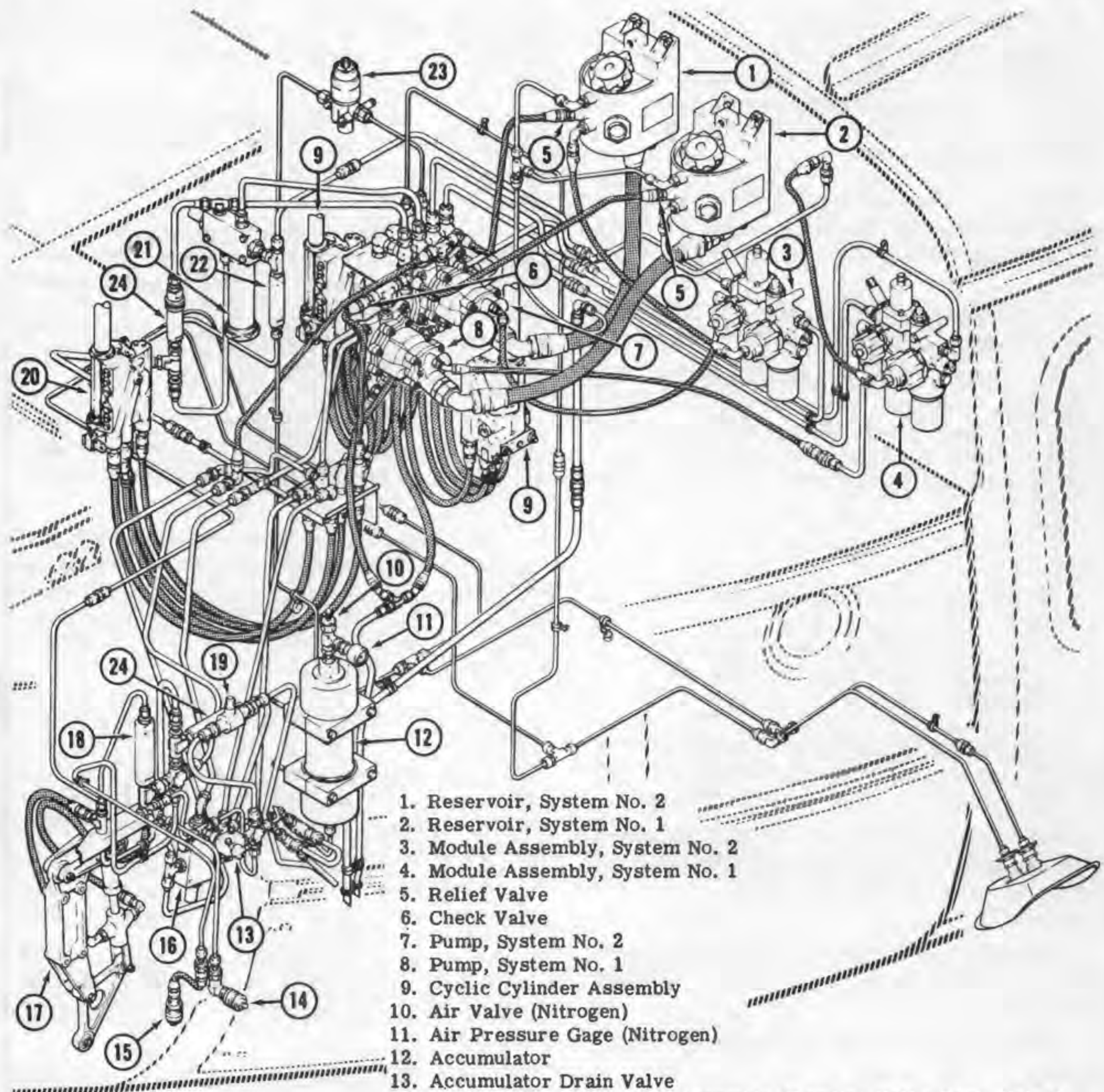
(3) On initial test of newly installed system, disconnect hoses from cyclic and collective cylinders. Connect hose ends together with unions. Cap or cover ports in cyilnders to prevent entry of dirt.

(4) Connect test unit hoses to System No. 1 through ground test fittings, located on right hand side of helicopter in inboard module assembly.

(5) Visually inspect complete hydraulic system to insure that all components and lines are securely attached and appear capable of satisfactory operation.

(6) Set test unit to a minimum flow rate of six gpm. Use test unit pressure setting sufficient to maintain six gym flow through hydraulic system for at least five minutes. Use test unit reservoir for this flushing procedure.

(7) Disconnect test unit hoses from System No. 1 and connect to System No. 2 through ground test fitting located on right-hand side of helicopter in outboard module assembly. Repeat step (6) above.



1. Reservoir, System No. 2
2. Reservoir, System No. 1
3. Module Assembly, System No. 2
4. Module Assembly, System No. 1
5. Relief Valve
6. Check Valve
7. Pump, System No. 2
8. Pump, System No. 1
9. Cyclic Cylinder Assembly
10. Air Valve (Nitrogen)
11. Air Pressure Gage (Nitrogen)
12. Accumulator
13. Accumulator Drain Valve
14. Nipple and Pressure Cap Assembly (Coupling Half - Drain Valve)
15. Sock and Plug Assembly (Coupling Half - Reservoir)
16. Pressurized Lock Out Valve
17. Anti-Torque Cylinder and Support
18. Relief Valve
19. Solenoid Valve
20. Collective Cylinder Assembly
21. Valve and Accumulator Assembly
22. Relief Valve
23. Valve - Armament
24. Relief Valve

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Figure 6-7A. Hydraulic installation (UH-1B serial no. 66-491 and subsequent)

Note

Throughout performance of steps (6) and (7) above, observe all portions of system for external leakage. Appropriate action shall be taken to correct any cause of leakage.

(8) Upon completion of steps (6) and (7) above, test unit shall be shut down and cyclic and collective hoses shall be connected to cylinders.

(9) Connect left and right- hand hydraulic armament system pressure and return lines.

(10) Set test unit to a minimum flow rate of at least three gpm. Use test unit pressure setting sufficient to maintain three gpm flow through system for at least five minutes. Activate test unit and flush system for at least five minutes.

Note

Throughout performance of step (10) above, observe all portions of system for external leakage. Appropriate action shall be taken to correct any cause of leakage.

(11) Shut down test unit and disconnect left- and right-hand hydraulic armament system pressure and return lines. Cap lines.

(12) Disconnect hoses from tail rotor cylinder and connect hose ends together with reducer. Cap or cover ports in cylinder to prevent entry of dirt.

(13) Disconnect test unit hoses from System No. 2, and connect to System No. 1 (Refer to step (4).

(14) Accomplish step (10) above, including note.

(15) Upon completion of step (14) above, test unit shall be shut down and hydraulic system hoses shall be reconnected to cylinder.

(16) Set test unit pressure relief valve for a cracking pressure of 2100 psig and set pump so that it is capable of at least six gpm flow. Set pressure compensation at 1475 to 1525 psig. System No. 1 and System No. 2 shall both be connected to the test unit at the ground test connections.

b. Perform functional tests by accomplishing the following steps. Tests shall be performed after successful completion of step a., above.

(1) Apply 1475 to 1525 psig to the hydraulic systems for at least 15 minutes. While pressure is maintained, accomplish the following:

(a) Observe all portions of both systems for external leakage. Appropriate action shall be taken to correct any cause of external leakage.

(b) Slowly cycle all controls to limits and observe movement of power cylinders. Clearance shall be such that fouling of adjacent parts cannot occur. Check flexible connections to ensure that pinching of hoses does not occur and that vibration does not loosen attaching fittings.

(c) Cycle the cyclic controls, collective control and tail rotor control pedals through full stroke at least ten times to bleed air from system.

(2) Apply pressure to the hydraulic systems. Slowly increase pressure and check warning lights. Lights should go OFF when pressure reaches 700 to 900 psig. Slowly decrease pressure. Lights should come ON when pressure reaches 600 to 400 psig.

(3) Test single system operation as follows:

(a) With pressure in systems at 1475 to 1525 psig, shut off System No. 1 by use of switch on console. System No. 1 warning light shall come ON.

(b) Operate cyclic and collective controls. Operation shall be smooth and positive.

(c) Shut off System No. 2 by use of switch on console. System No. 1 warning light shall go OFF and System No. 2 warning light shall come ON.

(d) Operate cyclic, collective and tail rotor controls. Operation shall be fully powered, smooth and positive.

Note

When testing System No. 2, tail rotor controls are not powered by hydraulic pressure and will require more force to operate.

(4) Connect System No. 1 to test unit and slowly increase pressure until relief valve on System No. 1 module opens. Relief valve shall open between 1626 and 2140 psig.

(6) Disconnect hydraulic systems from ground test unit and remove ground test unit.

(7) Bleed emergency collective (accumulator) system by moving collective control stick through approximately six strokes. When stick can no longer be moved, accumulator has been depleted.

(8) Check accumulator (12, figure 6-7A) for proper pressure as follows:

(a) Connect reservoir drain hose coupling half (15) to drain valve coupling half (14).

(b) Depress drain valve (13) to drain oil from accumulator. Hold for 30 seconds minimum.

Caution

DO NOT depress drain valve (13) with rotor running or with auxiliary power on. If coupling half connections cannot be made, refer to trouble shooting, paragraph 6-50, for corrective action.

(c) Check pressure gage (11). Indicator on dial shall be in green area for correct accumulator air pressure.

(d) If indicator is in yellow area, BELOW green area, accumulator must be charged with nitrogen (item 325, table 1-1) to correct pressure, using 650 psig to 850 psig supply pressure.

(e) If indicator is in yellow area, ABOVE green area, drain excess pressure until indicator is in green area.

Caution

Precharge accumulator during heat of the day, only, to prevent overcharging due to thermal expansion.

(f) After correct pressure has been obtained, disconnect reservoir drain hose coupling half (15) from drain valve coupling half (14).

(9) Test system pressure by connecting calibrated (0 to 3000) gages to both hydraulic systems at pressure ground test fittings. With rotor turning at 285 to 314 RPM, hydraulic pressure shall be 1475 to 1525 psig on each system, with cyclic, collective and tail rotor controls fixed.

c. Upon completion of tests, replace filter element in both module assemblies. Refill hydraulic systems, using test unit. Bleed systems in accordance with instructions in paragraph 6-49A, step b. (1) (c). Disconnect and remove test unit. Close all test ports on unit and on hydraulic systems. Connect hydraulic reservoirs to module assemblies and lockwire quick disconnect couplings. Service reservoirs in accordance with instructions contained in paragraph 1-91.

6-50. *Trouble Shooting — Hydraulic Systems (UH-1B Serial No. 64-14101 and subsequent).* Trouble shooting data for the hydraulic systems is as follows. Items peculiar to UH-1B helicopters Serial No. 66-491 and subsequent will be found at the end of the following chart.

INDICATION OF TROUBLE	PROBABLE CAUSE	CHECK FOR TROUBLE	CORRECTIVE ACTION
Hydraulic oil leaks	Worn gaskets or seals		Replace gaskets or seals
	Caution Do not tighten leaky flareless fittings.		
	Leaky fittings	Disconnect tube assembly having leaky flareless fitting. Inspect for evidence of improper tightening, presence of foreign matter or defective part	Replace with new tube assembly if nut, sleeve, or tubing is defective Clean and remove all foreign matter Tighten fitting nut with wrench until a sharp increase in torque is noted

INDICATION OF TROUBLE	PROBABLE CAUSE	CHECK FOR TROUBLE	CORRECTIVE ACTION
			Note If there is any doubt that the point of sharp torque increase has been reached rapidly loosen and tighten the nut several times (use light torque), until certain that increase in torque is due to the sleeve and tube touching the fitting seat, and is not due to thread friction.
			Tighten nut an additional 1/6 of a turn (one hex flat), from point of sharp torque increase
			If leak is present, tighten nut additional 1/6 of a turn (one hex flat)
			If leak still persists, remove tube assembly and install new tube assembly
Hydraulic warning light on	Hydraulic system turned OFF		Turn system ON
	Low hydraulic pressure	Loss of hydraulic fluid. Check for leak	Replace faulty gasket, fitting, tube assembly valve or component. Fill system with hydraulic oil (item 3, table 1-1).
		Relief valve locked open	Replace valve
		Pump not producing pressure	Replace pump
	Solenoid not operating properly		Replace solenoid
	Electrical wiring to warning light or solenoid valve not correct	Check for proper wiring hookup	Make proper hookup or replace wiring
	Check valve located at hydraulic pump pressure port installed backward	Remove and install properly	

INDICATION OF TROUBLE	PROBABLE CAUSE	CHECK FOR TROUBLE	CORRECTIVE ACTION
	Module pressure switch inoperative		Replace pressure switch.
Collective stick will not stay in position	Springs on collective servo actuator mislocated		204-076-318-1 spring is a heavier spring and shall be located in top position between clip and nut. Adjust in accordance with instructions in paragraph 9-17 or 9-22
Controls do not operate smoothly	Sticky servo control valve		Replace faulty servo actuator
	Servo valve requires more than 12 ounces to operate		Replace servo actuator
Hydraulic system too hot	Pump generates excessive pressure, higher than relief valve cracking pressure		Replace pump
Relief valve cracking pressure set lower than system pump pressure	Check with hydraulic test stand		Replace module
Servo actuators chatter when moving controls	Air in servo actuators		Cycle controls through full stroke 10 times with more than 850 psi pressure applied to eliminate air. Some chatter is normal in the directional servo actuator when rotor is not rotating
	Servo actuator mounting bearings loose		Adjust bearings
	Any looseness in hydraulic cylinders		Replace cylinder
Hydraulic control switch ineffective	Circuit breaker not pushed in		Close circuit

INDICATION OF TROUBLE	PROBABLE CAUSE	CHECK FOR TROUBLE	CORRECTIVE ACTION
	Solenoid valve not connected		Connect wiring
	Improper electrical wiring		Repair or replace
	Solenoid valve not functioning properly		Replace with new solenoid valve
	Check valve located at hydraulic pump pressure port installed backward		Remove and install properly
Excessive feedback	Air in servo actuator or System has not been bled		Turn hydraulic system ON and cycle the cyclic controls, collective control, and tail rotor through a full stroke at least ten times to bleed air from system
	Improperly adjusted rotor	Refer to paragraph 8-7.	

Note: The following items are peculiar to the hydraulic system incorporated in UH-1B helicopters Serial No. 66-491 and subsequent:

INDICATION OF TROUBLE	PROBABLE CAUSE	CHECK FOR TROUBLE	CORRECTIVE ACTION
Coupling halves in drain circuit cannot be connected	Drain valve button has been depressed prematurely (before coupling halves were connected)		Open bleed valve in line between drain valve and drain valve coupling half to relieve pressure
Accumulator will not hold pressure in green band of gage	Accumulator piston seal leaking	If accumulator will not hold nitrogen pressure after charging	Replace accumulator
Less than four full strokes of collective control available	Improper nitrogen precharge in accumlator	Check accumulator pressure gage for proper precharge	Properly charge accumulator with nitrogen
	Improper hydraulic fluid charge in accumulator		Use hydraulic cart to charge accumulator
		Note: If hydraulic cart is not available, qualified personnel may run-up helicopter to provide necessary hydraulic power.	
	Pressure operated shut-off valve defective	When checking accumulator precharge, it is evident that fluid is remaining in the accumulator after collective stick becomes inoperative	Replace valve
Four full strokes, minimum, still not obtainable on collective control	Faulty accumulator		Replace accumulator and charge with nitrogen and hydraulic fluid

6-51. Hydraulic Pumps (UH-1B Serial No. 64-14101 and subsequent). Two variable delivery hydraulic pumps (9 and 13, figure 6-7; 7 and 8, figure 6-7A) are mounted on the transmission lower case. Access to these units is gained by opening the right-hand transmission cowling. On UH-1B helicopters Serial No. 64-14101 through 65-12744 and 65-12772 the forward pump furnishes hydraulic pressure to System No. 1; the aft pump furnishes pressure to System No. 2. On UH-1B helicopters Serial No. 66-491 and subsequent the forward pump furnishes hydraulic pressure to System No. 2; the aft pump furnishes pressure to System No. 1.

6-52. Removal — Hydraulic Pumps (UH-1B Serial No. 64-14101 and subsequent). Removal of both hydraulic pumps is the same. a. Drain hydraulic reservoir.

b. Disconnect and drain all lines connected to hydraulic pump. Immediately cap or cover all openings in lines and pump to prevent entrance of foreign matter.

c. Remove nuts and washers which mount pump to transmission drive quill. Disengage pump from drive quill and remove pump and gasket.

6-53. Installation — Hydraulic Pumps (UH-1B Serial No. 64-14101 and subsequent). Installation of both hydraulic pumps is the same.

a. Position pump, with new gasket, on mounting studs. Align splines of pump shaft with splines of transmission quill and install washres and nuts.

b. Uncap or uncover openings in lines and pump and connect hydraulic lines to pump. Refer to paragraph 6-46 for installation methods of hydraulic fittings.

Note

> Make sure hydraulic reservoirs are full in order to completely fill reservoir to pump line and pump case drain port. If pump case drain port and reservoir to pump line are not completely filled, before connecting line to pump, air will be trapped in pump. Excessive bleeding procedures will then be necessary.

c. Refill, bleed and test hydraulic systems. (Refer to paragraph 6-49 or 6-49A.)

6-54. Hydraulic Module Assemblies (UH-1B Serial No. 64-14101 and subsequent). Two hydraulic module assemblies are attached to the right-hand side of the cabin aft bulkhead. Access to these units is gained by opening the right-hand transmission cowling. On UH-1B helicopters Serial No. 64-14101 through 65-12744 and 65-12772 the outboard module is a part of System No. 2, and the inboard unit is used with System No. 1. On UH-1B helicopters Serial No. 66-491 and subsequent the outboard module is a part of System No. 1, and the inboard is used with System No. 2. Each module contains a two position, three way, solenoid operated hydraulic valve (1, figure 6-8), a relief valve (2), return and pressure filters (4 and 5), with differential pressure indicators (3 and 6), and a pressure switch (7).

6-55. Removal — Hydraulic Module Assemblies (UH-1B Serial No. 64-14101 and subsequent). Removal of both module assemblies is the same.

a. Open right-hand transmission cowling.

b. Disconnect electrical wiring from module assembly.

c. Disconnect all lines and hoses from module assembly. Cap to retain hydraulic fluid if system has not been drained. Cap openings in module to prevent entrance of foreign matter.

d. Remove three bolts and washers attaching module assembly to cabin aft bulkhead, and remove module.

6-56. Cleaning — Hydraulic Module Assemblies (UH-1B Serial No. 64-14101 and subsequent). a. Clean electrical components with dry, filtered compressed air. Clean all other parts, including inside and outside of module, with dry cleaning solvent (item 302, table 1-1).

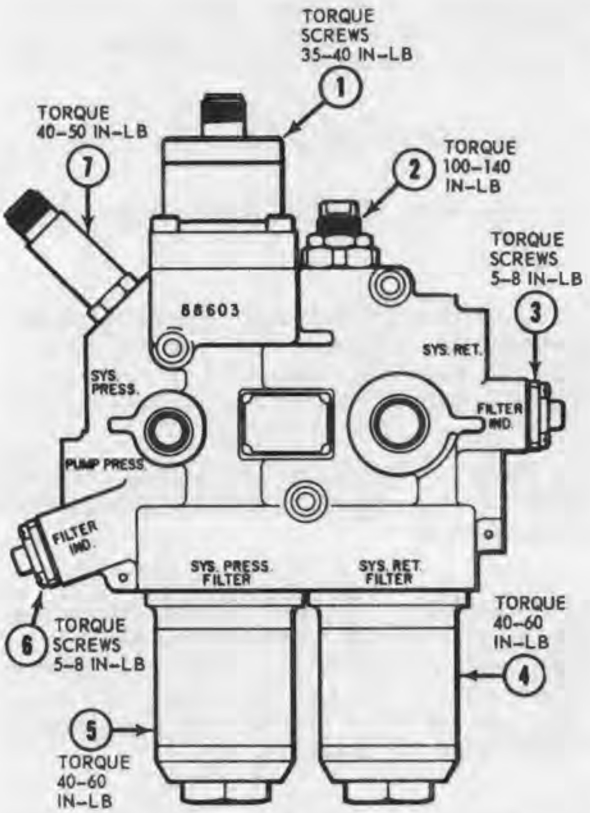
b. Flush module assembly with hydraulic fluid (item 3, table 1-1).

6-57. Inspection — Hydraulic Module Assemblies (UH-1B Serial No. 64-14101 and subsequent). Visually inspect solenoid valve (1, figure 6-8), relief valve (2), filter indicators (3 and 6) and pressure switch (7) for cleanliness, damage and evidence of malfunction.

6-58. ***Repair or Replacement — Hydraulic Module Assemblies (UH-1B Serial No. 64-14101 and subsequent).*** Replace parts which do not meet inspection requirements. (See figure 6-8.) Replace module if unserviceable. (Refer to paragraph 6-57.)

6-59. ***Installation — Hydraulic Module Assemblies (UH-1B Serial No. 64-14101 and subsequent).*** Installation of both module assemblies is the same.

a. Position module assembly to cabin aft bulkhead and install attaching washers and bolts. Uncap or uncover all hoses, lines and openings in module assembly. Connect lines and hoses to module. Refer to paragraph 6-46 for installation methods of hydraulic fittings.



1. Solenoid Valve
2. Relief Valve
3. Return Filter Indicator
4. Return Filter
5. Pressure Filter
6. Pressure Filter Indicator
7. Pressure Switch

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Figure 6-8. Hydraulic module assembly (UH-1B serial no. 64-14101 and subsequent)

b. Connect electrical wiring to module assembly.

c. Refill, bleed and test hydraulic system. (Refer to paragraph 6-49 or 6-49A.)

6-60. Filter Elements (UH-1B Serial No. 64-14101 and subsequent). Each hydraulic module is equipped with two filters (4 and 5, figure 6-8) which screw into the module. Elements are of the pleated paper type.

6-61. ***Removal — Filter Elements (UH-1B Serial No. 64-14101 and subsequent).*** Cut lockwire and remove filter from module. Remove element from filter.

6-62. ***Inspection — Filter Elements (UH-1B Serial No. 64-14101 and subsequent).*** a. Apply power to hydraulic systems and operate controls.

b. Observe position of module assembly filter indicators (3 and 6, figure 6-8).

c. Manually push indicators in, if extended. If indicators stay in, filter elements do not require replacement.

Note

Ignore extension of filter indicators if hydraulic fluid temperature is below plus 20°F.

6-63. ***Repair or Replacement — Filter Elements (UH-1B Serial No. 64-14101 and subsequent).*** Replace filter elements when inspection requirements are not met. (Refer to paragraph 6-62.)

Caution

When replacing filter element be sure to replace existing filter element O-ring with new O-ring, Part No. MS-28775-212.

6-64. ***Installation — Filter Elements (UH-1B Serial No. 64-14101 and subsequent).*** Insert element in filter and screw filter, with new O-ring, into module. Lockwire filter.

6-65. Hydraulic Reservoirs (UH-1B Serial No. 64-14101 and subsequent). Two reservoirs are mounted on the cabin aft bulkhead just to the right of helicopter center line. Access to these units is gained by opening the right-hand transmission cowling. On UH-1B helicopters

Serial No. 64-14101 through 65-12744 and 65-12772 the outboard reservoir is part of System No. 2, and the inboard unit supplies System No. 1. On UH-1B helicopters Serial No. 66-491 and subsequent the outboard reservoir is part of System No. 1, and the inboard unit supplies System No. 2. Each reservoir has a total capacity of four U.S. pints, and is equipped with a sight gage which is visible when the right-hand transmission cowling is open. Drain plugs are located in the bottom of each reservoir, and a screened vent is located at the top of each unit.

6-66. *Removal — Hydraulic Reservoirs (UH-1B Serial No. 64-14101 and subsequent).* Removal of both reservoirs is the same. a. Open right-hand transmission cowling.

b. Drain hydraulic fluid by cutting lockwire and removing drain plug from bottom of reservoir.

c. Disconnect all lines and hoses from reservoir. Cap or cover openings in lines, hoses and reservoir immediately to prevent entrance of foreign matter.

d. Remove bolts, brackets, and washers attaching reservoir to cabin aft bulkhead and remove reservoir.

6-67. *Cleaning—Hydraulic Reservoirs (UH-1B Serial No. 64-14101 and subsequent).* a. Thoroughly wash and clean all fittings and inside and outside of reservoir with dry cleaning solvent (item 302, table 1-1). Dry with filtered compressed air.

b. Flush reservoir with hydraulic fluid (item 3, table 1-1).

6-68. *Inspection — Hydraulic Reservoirs (UH-1B Serial No. 64-14101 and subsequent).* a. Visually inspect filler cap strainer screen for rust, corrosion and breaks.

b. Inspect sight plug glass for scratches, cracks, checks or marring which are sufficient to impair visual or structural function.

Caution

Careful inspection must be made of oil level sight gages to be sure that they are not oil stained internally and are giving erroneous indications of proper oil level. Upon inspection, faulty glasses should be cleaned, or, if necessary, replaced.

c. Inspect vent screen for cleanliness, rust, corrosion, or breaks.

d. Inspect mating parts for damage and crossed threads.

6-69. *Repair or Replacement — Hydraulic Reservoirs (UH-1B Serial No. 64-14101 and subsequent).* a. Replace filler cap strainer if inspection shows any signs of rust, corrosion or breaks.

b. Replace sight plug if inspection requirements are not met. Replace packing when installing new sight plug.

c. Replace vent screen if considered necessary after inspection. Vent screen must be point staked in three places.

d. Replace any mating part which has been damaged or has crossed threads.

e. Replace reservoir if damaged or unserviceable.

6-70. *Installation — Hydraulic Reservoirs (UH-1B Serial No. 64-14101 and subsequent).* Installation of both reservoirs is the same.

a. Position reservoir to cabin aft bulkhead and install attaching brackets, washers and bolts. Washers are to be placed under brackets.

b. Uncap or uncover openings in lines, hoses and reservoir and connect lines and hoses to reservoir. Refer to paragraph 6-46 for installation methods of hydraulic fittings.

c. Install drain plug, with new packing, in bottom of reservoir and lockwire.

d. Refill, bleed and test hydraulic systems. (Refer to paragraph 6-49.)

6-70A. Air Valve — (UH-1B Serial No. 66-491 and subsequent). This high pressure air valve (10, figure 6-7A) is used to charge the system accumulator (12) with nitrogen.

6-70B. *Removal — Air Valve (UH-1B Serial No. 66-491 and subsequent).* a. Connect coupling halves (14 and 15, figure 6-7A).

b. Relieve fluid pressure from accumulator by depressing button on drain valve (13).

c. Remove cap from top of air valve (10) and relieve pressure.

Caution

Open valve very slowly and allow pressure to escape. Be sure all pressure is relieved.

d. Unscrew air valve from tee on top of accumulator (12). Cap or cover openings.

6-70C. ***Inspection — Air Valve (UH-1B Serial No. 66-491 and subsequent).*** Inspect valve for leaks, damage and malfunction.

6-70D. ***Repair or Replacement — Air Valve (UH-1B Serial No. 66-491 and subsequent).*** Replace valve if inspection requirements are not met. (Refer to paragraph 6-70C.)

6-70E. ***Installation — Air Valve (UH-1B Serial No. 66-491 and subsequent).*** a. Uncap or uncover openings in tee and valve.

b. Screw air valve into tee on top of accumulator (12).

c. Disconnect coupling halves (14 and 15, figure 6-7A).

d. Refill, bleed and test hydraulic systems. (Refer to paragraph 6-49A.) Install air valve cap.

6-70F. Air Pressure Gage — (UH-1B Serial No. 66-491 and subsequent). Pressure contained in accumulator (12, figure 6-7A) is measured by this gage (11).

6-70G. ***Removal — Air Pressure Gage (UH-1B Serial No. 66-491 and subsequent).*** a. Connect coupling halves (14 and 15, figure 6-7A).

b. Relieve fluid pressure from accumulator (12) by depressing button on top of drain valve (13).

c. Remove cap from top of air valve (10) and relieve pressure.

Caution

Open valve very slowly and allow pressure to escape. Be sure all pressure is relieved.

d. Unscrew pressure gage (11) from tee on top of accumulator (12). Cap or cover openings.

6-70H. ***Inspection — Air Pressure Gage (UH-1B Serial No. 66-491 and subsequent).*** Inspect gage for leaks, damage and malfunction.

6-70J. ***Repair or Replacement — Air Pressure Gage (UH-1B Serial No. 66-491 and subsequent).*** Replace gage if inspection requirements are not met. (Refer to paragraph 6-70H.)

6-70K. ***Installation — Air Pressure Gage (UH-1B Serial No. 66-491 and subsequent).*** a. Uncap or uncover openings in tee and gage.

b. Screw gage onto tee on top of accumulator (12).

c. Disconnect coupling halves (14 and 15, 6-7A)

d. Refill, bleed and test hydraulic systems. (Refer to paragraph 6-49A.) Install air valve (10) cap.

6-70L. Accumulator — (UH-1B Serial No. 66-491 and subsequent). Hydraulic fluid contained in this accumulator (12, figure 6-7A) temporarily maintains pressure throughout the collective control system for emergency use in the event both hydraulic systems fail.

6-70M. ***Removal — Accumulator (UH-1B Serial No. 66-491 and subsequent).*** a. Connect coupling halves (14 and 15, figure 6-7A).

b. Relieve fluid pressure from accumulator (12) by depressing button on top of drain valve (13).

c. Remove cap from top of air valve (10) and relieve pressure.

d. Remove air valve (10) (refer to paragraph 6-70B) and air pressure gage (11) (refer to paragraph 6-70G).

Caution

Open valve very slowly and allow pressure to escape. Be sure pressure is relieved.

e. Disconnect line from bottom of accumulator. Cap or cover openings in line and accumulator.

f. Remove four atttaching bolts and washers and remove supports and accumulator.

6-70N. Inspection — Accumulator (UH-1B Serial No. 66-491 and subsequent). Inspect accumulator for leaks, damage and malfunction.

6-70P. Replacement or Repair — Accumulator (UH-1B Serial No. 66-491 and subsequent). Replace accumulator if inspection requirements are not met. (Refer to paragraph 6-70N.)

6-70Q. Installation — Accumulator (UH-1B Serial No. 66-491 and subsequent). a. Position accumulator and supports and install attaching washers and bolts.

b. Uncap or uncover openings in line and accumulator and connect line to accumulator.

c. Install air pressure gage (11) (refer to paragraph 6-70K) and air valve (10) (refer to paragraph 6-70E).

d. Refill, bleed and test hydraulic systems. (Refer to paragraph 6-49A.) Install air valve (10) cap.

6-70R. Accumulator Drain Valve — (UH-1B Serial No. 66-491 and subsequent). The accumulator drain valve (13, figure 6-7A) is set for an operating pressure of 1500 psig. Pressure on hydraulic fluid in the accumulator (12) may be relieved by depressing the button on this valve.

6-70S. Removal — Accumulator Drain Valve (UH-1B Serial No. 66-491 and subsequent). a. Connect coupling halves (14 and 15, figure 6-7A).

b. Relieve fluid pressure from accumulator (12) by depressing button on drain valve (13).

c. Disconnect lines from valve and cap or cover opening in lines and valves.

d. Remove attaching nuts, washers and bolts and remove drain valve.

6-70T. Inspection — Accumulator Drain Valve (UH-1B Serial No. 66-491 and subsequent). a. Visually inspect valve for evidence of external leakage.

b. Inspect button on valve for proper operation.

c. Inspect valve for obvious damage.

6-70U. Repair or Replacement — Accumulator Drain Valve (UH-1B Serial No. 66-491 and subsequent). a. Replace valve if inspection requirements are not met. (Refer to paragraph 6-70T.)

b. Repair of valve is the responsibility of direct support activity.

6-70V. Installation — Accumulator Drain Valve (UH-1B Serial No. 66-491 and subsequent). a. Position valve and install attaching bolts, washers and nuts.

b. Uncap or uncover openings in lines and valve and connect lines to valve.

c. Disconnect coupling halves (14 and 15, figure 6-7A).

d. Refill, bleed and test hydraulic systems. (Refer to paragraph 6-49A.)

6-70W. Pressurized Lock Out Valve — Collective System (UH-1B Serial No. 66-491 and subsequent). The pressurized lock out valve (16, figure 6-7A) blocks off return line and retains fluid in collecive actuator in event of failure of #1 hydraulic system.

6-70X. Removal — Pressurized Lock Out Valve. (UH-1B Serial No. 66-491 and subsequent). a. Connect coupling halves (14 and 15, figure 6-7A).

b. Remove fluid pressure from system by depressing button on top of drain valve (13).

c. Disconnect lines from lock out valve and cap or cover holes in lines and valves.

d. Remove attaching hardware and detach valve.

6-70Y. ***Inspection — Pressurized Lock Out Valve (UH-1B Serial No. 66-491 and subsequent).*** Inspect lock out valve for leaks, damage and malfunction.

6-70Z. ***Repair or Replacement — Pressurized Lock Out Valve (UH-1B) Serial No. 66-491 and subsequent).*** Replace lock out valve (16) if inspection requirements are not met. (Refer to paragraph 6-70Y).

6-70AA. ***Installation—Pressurized Lock Out Valve (UH-1B Serial No. 66-491 and subsequent).*** a. Install valve with attaching hardware.

b. Remove caps or covers from openings in lines or valves.

c. Attach lines to lock out valve.

d. Disconnect coupling halves (14, and 15, figure 6-7A).

e. Refill, bleed and test hydraulic systems. (Refer to paragraph 6-49A.)

6-70AB. Solenoid Valve (UH-1B Serial No. 66-491 and subsequent). The solenoid valve (19, figure 6-7A) permits the flow of fluid from accumulator to servo cylinder.

6-70AC. ***Removal — Solenoid Valve (UH-1B Serial No. 66-491 and subsequent).*** a. Disconnect cannon plug from solenoid valve. Cover electrical connection.

b. Connect coupling halves (14 and 15, figure 6-7A).

c. Release pressure from system by depressing button on drain valve (13).

d. Disconnect lines from solenoid valve. Cap or cover openings in lines and valve.

6-70AD. ***Inspection — Solenoid Valve (UH-1B Serial No. 66-491 and subsequent).*** Inspect solenoid valve for damage or malfunction.

6-70AE. ***Repair or Replacement — Solenoid Valve (UH-1B Serial No. 66-491 and subsequent).*** Replace valve if inspection requirements are not met. (Refer to paragraph 6-70AD.)

6-70AF. ***Installation — Solenoid Valve (UH-1B Serial No. 66-491 and subsequent).*** a. Remove caps or covers from openings in valve and lines and cover from electrical connections.

b. Attach lines to valve.

c. Attach electrical plug.

d. Disconnect coupling halves (14 and 15, figure 6-7A).

e. Refill, bleed and test hydraulic systems. (Refer to paragraph 6-49A.)

6-70AG. Valve and Accumulator Assembly (UH-1B Serial No. 66-491 and subsequent). The valve and accumulator assembly (21, figure 6-7A) provides pressurized irreversibility in event of failure of the #1 hydraulic sytsem.

6-70AH. ***Removal — Valve and Accumulator Assembly (UH-1B Serial No. 66-491 and subsequent).*** a. Connect coupling halves (14 and 15, figure 6-7A).

b. Relieve pressure from the system by depressing the button on top of the drain valve (13).

c. Disconnect lines from the pressurized lock out valve, tee fitting and relief valve. Cap or cover openings in valves and lines.

d. Remove attaching hardware and detach valve and accumulator assembly, tee fitting and relief valve.

e. Remove tee fitting and relief valve from valve and accumulator assembly.

6-70AI. ***Inspection — Valve and Accumulator Assembly (UH-1B Serial No. 66-491 and subsequent).*** Inspect valve and accumulator assembly for damage, leaks or malfunction.

6-70AJ. ***Repair or Replacement — Valve and Accumulator Assembly (UH-1B Serial No. 66-491 and subsequent).*** Replace valve and accumulator assembly if inspection requirements are not met. (Refer to paragraph 6-70AI.)

6-70AK. ***Installation — Valve and Accumulator Assembly (UH-1B Serial No. 66-491 and subsequent).*** a. Install tee fitting and relief valve on pressurized lock out valve.

b. Install valve and accumulator assembly and secure with previously removed hardware.

c. Attach lines to pressurized lock out valve, relief valve and tee fitting.

6-71. Collective Pitch Control Hydraulic Cylinder (UH-1B Serial No. 64-14101 and subsequent). The collective pitch control hydraulic cylinder (1, figure 6-2) reduces operational loads on the collective pitch control system and facilitates pilot control of the helicopter.

6-72. Removal — Collective Pitch Control Hydraulic Cylinder (UH-1B Serial No. 64-14101 and subsequent). a. Disconnect control tube (2, figure 6-2) from hydraulic cylinder (1). Disconnect control rod (3) from collective pitch control lever (4)

b. Disconnect hydraulic lines from control valve (6) and cap or cover openings to prevent entrance of foreign material.

c. Remove nuts and washers attaching cylinder to support assembly (7) and remove cylinder assembly from support.

6-73. Inspection—Collective Pitch Control Hydraulic Cylinder (UH-1B Serial No. 64-14101 and subsequent). (Refer to paragraph 6-24.)

6-74. Repair or Replacement — Collective Pitch Control Hydraulic Cylinder (UH-1B Serial No. 64-14101 and subsequent). (Refer to paragraph 6-25.)

6-75. Installation — Collective Pitch Control Hydraulic Cylinder (UH-1B Serial No. 64-14101 and subsequent). a. Adjust cylinder and rod assembly before installation. (Refer to paragraph 6-76, perform step a.)

b. Position cylinder assembly (1, figure 6-2) on studs of support assembly (7) and install attaching washers and nuts.

c. Uncap or uncover hydraulic lines and connect to control valve (6).

d. Connect control rod (3) to collective pitch control lever (4). Install one chamfered washer under bolt head and one under nut. (See View "A", figure 6-2.)

e. Connect control tube (2) to hydraulic cylinder (1).

f. Check rigging of collective pitch control system. (Refer to paragraph 9-17 or 9-22.)

6-76. Adjustment — Collective Pitch Control Hydraulic Cylinder (UH-1B Serial No. 64-14101 and subsequent). a. Adjust cylinder and rod assembly with clevis set at 2.19 inches. (See figure 6-9). Adjust spring tension with 0.12 inch of threads showing above spring adjustment nut. (See View A, figure 6-9.)

Note

Lost motion develops due to normal wear between the servo valve spool and pilot's input lever. (See figure 6-4.) This condition may be corrected as follows:

b. Break safetywire and loosen jam nut.

c. Insert 0.002 inch feeler gage in orifice in power cylinder and hold gently but firmly against bottom of spool valve. Carefully adjust screw in to reduce lost motion. Preferred clearance is 0.002 inch. Minimum clearance is plus 0.001 inch with a maximum of 0.004 inch permissible before adjustment is required.

Caution

Use extreme care in adjusting screw. After obtaining preferred clearance of 0.002 inch, 1/4 additional turn of screw will break horseshoe washer and collective will lock in full up position.

Note

Care must be exercised when adjustments are made on a badly brinelled screw, as a side force on the servo valve may result in excessive servo valve wear and a higher valve operating force. Valve should operate freely, with no binding.

d. After adjustment is complete, lock screw with jam nut, recheck valve operating force and safetywire screw.

Note

If screw is being replaced, exercise care as ball is not secured to screw.

e. Final adjustments of hydraulic cylinder will be made concurrent with rigging. (Refer to paragraph 9-17 or 9-22.)

6-77. Cyclic Control Hydraulic Cylinders (UH-1B Serial No. 64-14101 and subsequent). The cyclic control hydraulic cylinders (8, figure 6-2) reduce operational loads on the cyclic control system and facilitate pilot control of the helicopter.

6-78. Removal — Cyclic Control Hydraulic Cylinders (UH-1B Serial No. 64-14101 and subsequent). a. Disconnect lower control tubes (9, figure 6-2) from control valves (10).

b. Disconnect upper control tubes (11) from swashplate horns (12).

c. Disconnect hydraulic lines from control valves (10) and cap or cover openings to prevent entrance of foreign material.

d. Remove nuts and washers attaching cylinders (8) to support assemblies (7 and 14) and remove cylinder assemblies from supports.

6-79. Inspection — Cyclic Control Hydraulic Cylinders (UH-1B Serial No. 64-14101 and subsequent). (Refer to paragraph 6-24.)

6-80. Repair or Replacement — Cyclic Control Hydraulic Cylinders (UH-1B Serial No. 64-14101 and subsequent). (Refer to paragraph 6-25.)

6-81. Installation — Cyclic Control Hydraulic Cylinders. (UH-1B Serial No. 64-14101 and subsequent). a. Adjust cylinder and rod assemblies before installation. (Refer to paragraph 6-76. Perform step a.)

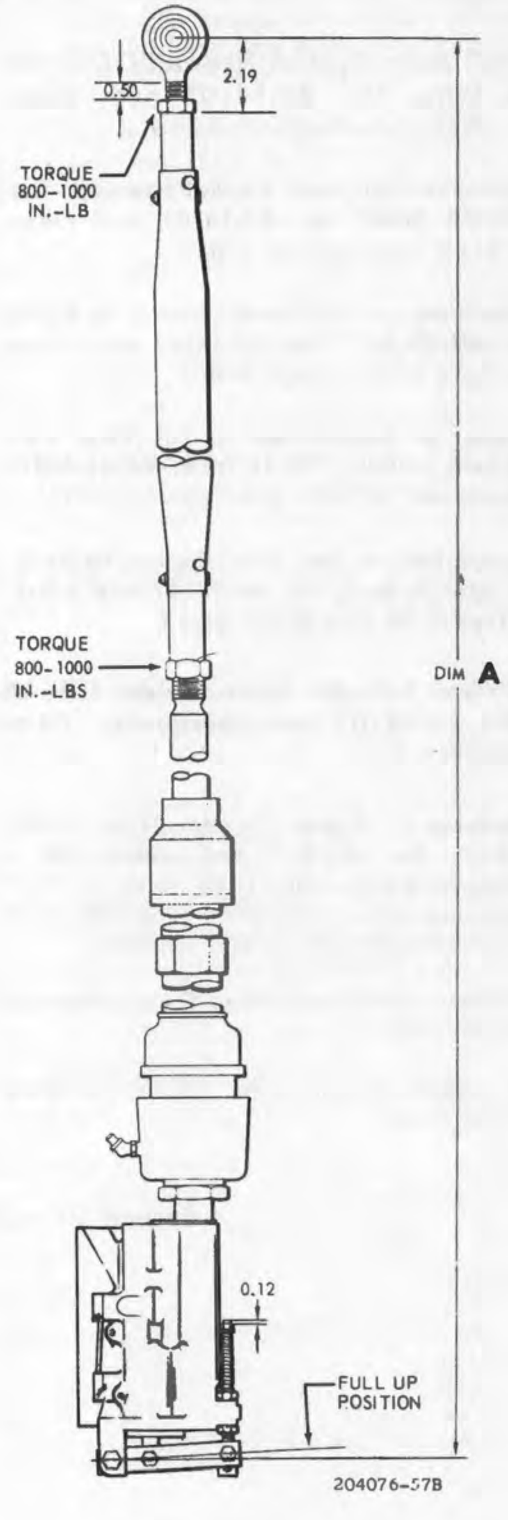
b. Position cylinder assemblies (8 figure 6-2) on studs of support assemblies (7 and 14) and install attaching washers and nuts.

c. Uncap or uncover openings in hydraulic lines and connect lines to control valves (10).

d. Connect upper control tubes (11) to swashplate horns (12). Install one chamfered washer under bolt head and one under nut. Chamfered side of washer towards rod-end. (See View A, figure 6-2.)

e. Connect lower control tubes (9) to control valves (10).

f. Check rigging of cyclic control system. (Refer to paragraph 9-38 or 9-44.)



DIMENSION A

Right Cyclic Cylinder Assembly	55.20
Left Cyclic Cylinder Assembly	54.95
Collective Cylinder Assembly	49.70

Figure 6-9. Cylinder assembly dimensions (UH-1B serial no. 64-14101 and subsequent)

6-82. Adjustment — Cyclic Control Hydraulic Cylinders (UH-1B Serial No. 64-14101 and subsequent). (Refer to paragraph 6-76.)

6-83. Tail Rotor Control Hydraulic Cylinder (UH-1B Serial No. 64-14101 and subsequent). (Refer to paragraph 6-34.)

6-84. Removal—Tail Rotor Control Hydraulic Cylinder (UH-1B Serial No. 64-14101 and subsequent). (Refer to paragraph 6-35.)

6-85. Inspection — Tail Rotor Control Hydraulic Cylinder (UH-1B Serial No. 64-14101 and subsequent). (Refer to paragraph 6-36.)

6-86. Repair or Replacement — Tail Rotor Control Hydraulic Cylinder (UH-1B Serial No. 64-14101 and subsequent). (Refer to paragraph 6-37.)

6-87. Installation — Tail Rotor Control Hydraulic Cylinder (UH-1B Serial No 64-14101 and subsequent). (Refer to paragraph 6-38.)

6-88. Power Cylinder Servo Valves (UH-1B Serial No. 64-14101 and subsequent). (Refer to paragraph 6-42.)

6-89. Removal — Power Cylinder Servo Valves (UH-1B Serial No. 64-14101 and subsequent). a. Disconnect hydraulic lines from servo valve (6 and 10, figure 6-2) and cap or cover openings to prevent entrance of foreign material.

b. Remove piston rod stop from collective cylinder (6) only.

c. Disconnect control tube (2 or 9) from servo valve lever.

d. Loosen jam nut sufficiently to release lock-tab washer from recess on top of servo valve. Unscrew valve from piston.

6-90. Installation — Power Cylinder Servo Valves (UH-1B Serial No. 64-14101 and subsequent). a. Place lock-tab washer on piston rod. Screw servo valve onto piston rod until rod bottoms in valve. Back valve off one-half to one and one-half turns as necessary to align servo valve with lock-tab washer.

b. Tighten jam nut to 200 to 225 inch-pounds torque.

c. Install piston rod stop (on collective cylinder only) to safety jam nut.

d. Connect control tube (2 or 9, figure 6-2) to servo valve lever.

e. Uncap or uncover openings in hydraulic lines and connect lines to servo valve.

6-91. Hydraulic Components (UH-1B Serial No. 64-14101 and subsequent). a. Various components of the hydraulic systems may be removed and replaced in a similar manner by disconnecting lines and removing attaching hardware. Disconnect electrical plugs from electrical units when necessary. When installing components place large diameter washers between component and bulkhead. Refer to paragraph 6-46 for installation methods for hydraulic fittings.

b. Refill, bleed and test hydraulic systems after removal and installation of any component. (Refer to paragraph 6-49.) If hydraulic leaks are detected refer to paragraph 6-50 for corrective action.

Section III — Pneumatic System

(Not Applicable)

CHAPTER 7
POWER TRAIN SYSTEM

Section I — Scope

7-1. Scope. The purpose of this chapter is to provide all the essential information for maintenance personnel to accomplish organizational maintenance on the complete power train system. This information includes a detailed description and chronological instructions as to methods and procedures. It also includes special tools and equipment required for accomplishment of those maintenance phases in accordance with the Maintenance Allocation Chart. Special tools required for performance of organizational maintenance can be found in TM 55-1520-211-20P.

7-2. Power Train. (See figure 7-1.) The power train is a system of shafts and gear boxes through which the engine drives main rotor, tail rotor, and accessories such as DC generator and hydraulic pump. The system consists of a main drive shaft, a main transmission which includes input and output drives and the main rotor mast, and a series of drive shafts with two gear boxes through which the tail rotor is driven.

7-3. Trouble Shooting — Power Train. The following chart is a brief summary of power train troubles which may be encountered in organizational maintenance. Conditions and possible causes listed have been limited to those reasonably probable (though not necessarily frequent in normal service) which could become known through pilot reports or by inspection methods applicable in organizational maintenance, and which would be subject to some evaluation by organizational maintenance personnel, although final corrective action by a higher level of maintenance might be required in some instances. Conditions involving obvious major damage are omitted, as are those caused by accident or an unusual chain of events which would require evaluation by a competent authority.

7-4. Notes below provide additional information to that available in trouble shooting chart and in maintenance instructions for systems and components of power train.

a. In transmission trouble shooting, observe the following:

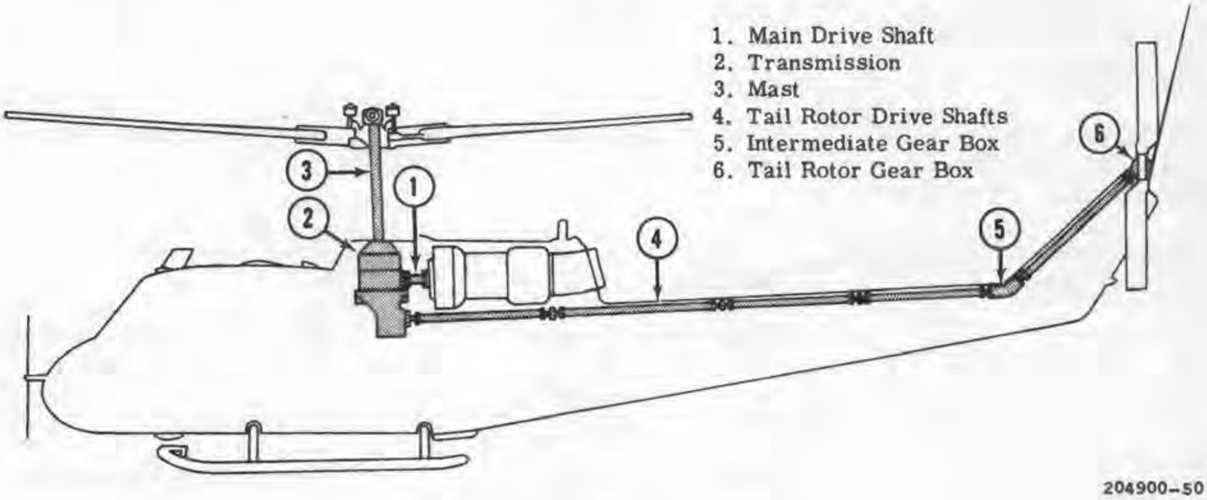


Figure 7-1. Power train diagram

(1) Low oil level will not cause a low oil pressure indication, provided sump contains enough oil to cover pump inlet. Oil temperature might rise, however.

(2) Effects of an oil leak will depend on its location in system and rate of leakage. An external leak can eventually allow sump to be pumped dry, causing internal failure of transmission. While oil remains to supply pump, the pressure relief valve would tend to maintain normal system pressure, compensating for leakage. This applies especially to leaks located between pump and relief valve. Leaks occurring beyond relief valve could cause some indication of low oil pressure. Leakage to interior of transmission, while not affecting oil level, could starve lubrication areas beyond the leak and might affect indicated oil pressure and temperature.

(3) Cumulative clogging of oil filter screens will not be shown by a gradual drop of indicated oil pressure, as it may on some other aircraft or automobile oil systems. Pressure relief valve would maintain normal system pressure even if filter screens became so clogged as to force oil flow through filter bypass valve.

(4) "Use of wrong oil" is omitted from causes of trouble on chart because any such event would be a special problem as to possible damage and corrective action. As to detecting such a condition, little can be said except that most oils which might be available to use by error would tend to cause high oil pressure and high oil temperature indications, or excessive seal leakage.

b. For main drive shaft trouble shooting, apply the following:

(1) Trouble conditions of main driveshaft can seldom be detected in operation, since there are no reliable indications except possibly in an extreme condition. "Suspected vibration" is only partially accurate as a term for such conditions as dynamic out-of-balance or faulty coupling action. Vibration would result, as well as abnormal stresses and wear, but would be absorbed in structure and pylon mounts or effectively masked by normal vibrations of the helicopter, providing no distinct indication to pilot.

(2) Drive shaft trouble indications are, therefore, usually those revealed by careful inspection.

(3) Principal causes of drive shaft trouble are faulty installation procedures and inadequate or improper lubrication of spherical tooth couplings.

c. For tail rotor drive system trouble shooting, apply same principles as for main drive shaft.

d. Indication of trouble, probable causes and corrective action are as follows:

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
TRANSMISSION:		
Low oil pressure (1) On caution panel or pressure gage, but not both	Faulty caution panel or gage circuit or unit	Repair electrical circuit or replace faulty valve
(2) Shown by both caution panel and gage	Pressure relief valve malfunction	Adjust or replace valve
	Clogged pump screen	Clean screen, check oil for chips or contamination
	Faulty oil pump	Replace pump
	Leakage or restriction between pressure relief valve and transmitter	Repair oil line connections or replace seals

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
No oil pressure (1) With normal oil level	Faulty gage or transmitter or circuit	Repair circuit or replace faulty unit
	Oil pump failure	Replace transmission, or replace pump only if transmission is not damaged internally
(2) No oil supply	Leak in system or failure to service	B Replace transmission. Also replace cooler, flush and repair external lines if so equipped
High oil pressure	Faulty gage or transmitter or circuit	Repair circuit or replace faulty unit
	Pressure relief valve malfunction	Adjust or replace valve
High oil temperature (1) On caution panel or	Faulty caution panel or gage	Repair circuit or replace faulty unit
(2)Shown on both caution panel and gage	Obstructed air flow around transmission	Clear cowl openings and sump area
	Clogged oil jets	Clean or replace jets, or replace transmission if internally damaged
	Seized bearings or other internal transmission failure	B Replace transmission. Also replace cooler, if so equipped, and flush external oil lines
	B Oil cooler clogged or obstructed	Clean cooler core air passages. Replace cooler if internally clogged, and flush oil lines. Check transmission filters, pump screen, and magnetic plug
	B Cooler bypass valve malfunction	Replace valve
	B Oil cooling blower malfunction (if engine oil temperature also high)	Replace blower or repair bleed air connection
Metal chips on magnetic sump plug or pump screen	Internal transmission failure of gears or bearings	B Replace transmission. If so equipped, replace oil cooler and flush piping
Excessive pylon motion (approx. 1/2/rev.)	Pylon mounts worn or installed wrong	Repair or replace mounts
	B Faulty pylon mount dampers	Replace friction dampers

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
MAIN DRIVE SHAFT:		
Grease leakage	Cut or torn O-ring seal	Replace O-ring, assemble with care
Abnormal coupling wear	Faulty lubrication or wrong lubricant	Clean and lubricate coupling, or replace drive shaft
Lubricant breakdown in forward coupling	Misalignment or wrong lubricant	Align engine and transmission, replace drive shaft and associated parts as required
Suspected vibration	Coupling clamps loose, improperly installed, or not matched	Install clamps sets by instructions
	Loose engine adapter	Replace adapter and any worn associated parts
Grease leakage	Cut or torn "O" ring seal	Replace O-ring seal. Assemble with care
TAIL ROTOR DRIVE SYSTEM:		
Suspected vibration	Loose clamps	Torque or replace clamps
	Worn hanger bearings or couplings	Replace hanger assembly
	Shaft balance weights lost or shaft bent	Replace shaft section ***Caution*** Remove clamps from both ends of shaft before removing either end from its mating curvic face
Binding or roughness when manually checked	Dry or faulty bearing	Isolate faulty hanger by disconnecting shafts, replace hanger assembly
	Defective gear box	Check gear boxes, replace defective unit
	Faulty lubrication of couplings	Replace hanger, gear box, or gear quills
Metal chips on gear box magnetic plug	Internal failure of gears or bearings	Replace gear box

7-5. *Metal Particles Contamination of Gear Boxes.* Metal particles found on gear box oil strainer screens, oil filters or magnetic plugs may indicate failure of an internal part of the gear box. The presence of metal particles, however, is not necessarily an indication that the gear box is no longer serviceable. The quantity, source, form and type of metal found, together with the service history of the particular gear box, must be taken into consideration. The time accumulated since the gear box was new or overhauled, previous failures and the type of operation are important factors in determining the further serviceability of the unit. The particles found may be steel, tin, lead, cadmium, aluminum, magnesium, copper (bronze) or phenolic in various shapes and quantities. For a detailed explanation of the action made necessary by the presence of each of the possible types of particles in the gear box see figure 7-2.

Warning

> When any particles found are readily identifiable as fragments of gear box parts, such as gears, nuts, bearings, oil slingers, thrust washers, snaprings, safety wire or other components, replace gear box.

7-6. *Identification of Metal Particles.* (See figure 7-2.) A visual inspection of color and hardness will occasionally suffice to identify the particles. When visual inspection does not positively identify the particle, the kind of particle present may be determined by a few simple tests. Equipment to perform tests includes a permanent magnet, an electric soldering iron, concentrated hydrochloric (muriatic) acid and concentrated nitric acid. Proceed as follows:

a. Steel. Isolate steel particles with permanent magnet.

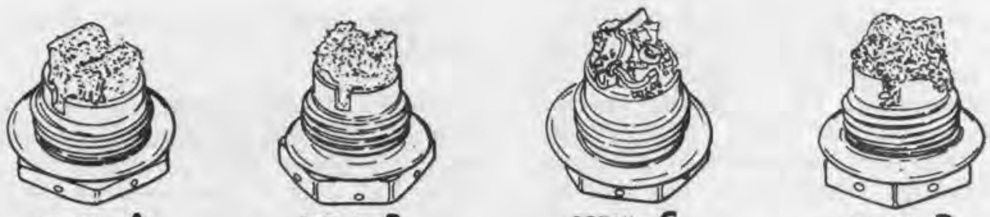
b. Tin and Lead. Distinguish tin and lead by their low melting points. Clean soldering iron; heat it to about 500°F; then tin it with 50-50 solder (50 percent lead and 50 percent tin). Wipe off excess solder. Tin or lead particles dropped onto hot, tinned, soldering iron will melt and fuse with solder. Do not overheat iron.

c. Aluminum. Determine aluminum particles by their reaction to hydrochloric acid. When a particle of aluminum is dropped into hydrochloric (muriatic)acid it will fizz with a rapid emission of bubbles. The particles will gradually disintegrate and form a black residue.

Note

> Since magnesium and aluminum react similarly in hydrochloric acid, when in doubt drop particle into nitric acid. Aluminum does not react noticeably in nitric acid.

d. Copper or Bronze and Magnesium. Differentiate copper or bronze and magnesium by their respective reactions to nitric acid. When a particle of copper or bronze is dropped into nitric acid it forms a bright green cloud in the acid. When a particle of magnesium is dropped into nitric acid it fizzes with a rapid emission of bubbles. Phenolic and aluminum do not react noticeably to nitric acid.



METAL PARTICLES CONTAMINATION-GEAR BOX OIL

KIND OF METAL	QUANTITY AND/OR SIZE	ACTION REQUIRED	NOTES
Steel	Fuzz, fine hair-like particles. (See detail A.)	None	Result of normal wear. May have exaggerated appearance because of oil.
	Particles in splinter or granular form. (See details B and C.)	**Disassemble gear box, as required,to determine extent of damage. Replace gear box if necessary	Usually indicates failure.
	Thin flakes not exceeding 1/64 (0.015) inch in thickness and 1/16 (0.060) inch in length. Quantity not to exceed 10 flakes. (See detail D.)	**Disassemble gear box, as required,to determine extent of damage.	Small quantity may not indicate bearing failure.
	More than 10 flakes not exceeding 1/64 (0.015) inch in diameter and 1/16 (0.060) inch in length; and quantity of flakes exceeding the above dimensions.	**Disassemble gear box, as required,to determine extent of damage. Replace gear box if necessary.	Usually indicates failure. May be bearing in one of accessory quills.
Aluminum or Magnesium	Particles in granular form, or like miniature lathe turnings.	**Disassemble gear box, as required.to determine extent of damage.	May be result of use of these materials as mallets or drifts during assembly. May indicate wear of oil pump interior surfaces or abnormal interference.
Copper (Bronze)	Particles in granular form.	**Disassemble gear box, as required, to determine extent of damage. Replace gear box if necessary.	May indicate excessive wear of bearing cages as result of bearing failure.
Phenolic		None	Result of the use of mallets and drifts during assembly or same as Copper (Bronze) above.

** Disassembly of drive quills is third maintenance level function.

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Figure 7-2. Identification of metal particles

Section II — Main Drive Shaft

7-7. Main Drive Shaft. (See figure 7-3.) A main drive shaft with crowned tooth couplings is installed between an adapter on engine output shaft and the freewheel coupling of transmission input drive quill. Two coupling clamp sets, of split V-band type, hold mating curvic faces of couplings in secure contact. Flexibility of couplings is provided by crowned tooth coupling sliding in splined teeth of outer coupling to accommodate movement of transmission on pylon mounts. On UH-1B, a spring in each coupling assists centering of shaft during operation, and tends to hold shaft assembly in place if clamps are removed during maintenance.

7-8. Removal — Main Drive Shaft. (See figure 7-3.) a. Open cowling on left side of pylon. Remove upper left sections of engine air intake baffle (14), and screen (15).

b. Remove coupling clamps (1) at each end of shaft, keeping parts together as sets after removal.

c. Push shaft (6) toward either end to shift one coupling inward and disengage coupling at opposite end. Remove shaft assembly.

Note

On Model UH-1B, apply enough force to compress springs in couplings.

d. To remove engine shaft adapter: Remove lockwire, retaining bolt (7), and washer (8). Pull adapter (9) out of engine output shaft.

7-9. Cleaning — Main Drive Shaft. a. Clean shaft assembly, adapter, and attaching parts by wiping with clean cloth. For external parts and surfaces only, cloth can be moistened with cleaning solvent (item 302, table 1-1).

Note

Do not use cleaning solvent (item 302, table 1-1) inside shaft couplings.

b. Remove all grease from inner and outer couplings.

7-10. Inspection and Lubrication — Main Drive Shaft Couplings. (See figures 7-3, 7-4 and 7-5, 7-6 and 7-7.) Check and lubricate couplings on main drive shaft at prescribed inspection interval.

a. Place shaft assembly in a suitable cradle.

b. Open either coupling by removing spiral lock-ring (2, figure 7-3) and retainer (3) with O-ring seal (4). On UH-1B, hold retainer against pressure of spring (5) while removing lock-ring, then remove retainer and spring.

c. Move outer coupling inward on shaft until male-splined inner coupling is disengaged and clear of outer coupling. Take necessary precautions to avoid surface damage to shaft while coupling is disassembled.

d. Remove all old grease from inner and outer couplings.

e. Inspect each spline tooth of inner coupling for excessive wear. (See figure 7-4 for UH-1A or figure 7-5 for UH-1B.) If coupling is worn beyond acceptable limits as illustrated, replace drive shaft and tag unserviceable assembly for overhaul by higher maintenance level.

f. Check to see if the lock spring can be seen in one of the aligning holes. Check the nut for security. (See figure 7-6, detail A.)

g. If coupling is in serviceable condition, check that inner and outer couplings are clean before reassembly. Also check area on outer coupling over which O-ring must pass to reach its groove, and remove any burrs or sharp edges by careful use of a fine Arkansas hand stone. (See figure 7-6, detail B.)

h. Apply a thin layer of grease on inboard surface of male (inner) coupling, using lubricant (item 9, table 1-1). (See figure 7-6, detail C.) Mate parts and move outer coupling to full outward position, with inner coupling bottomed. (See figure 7-6, detail D.)

i. Place a new O-ring seal (4, figure 7-3) in groove around retainer (3). Apply a coating of grease on O-ring. (See figure 7-6, details I and J.)

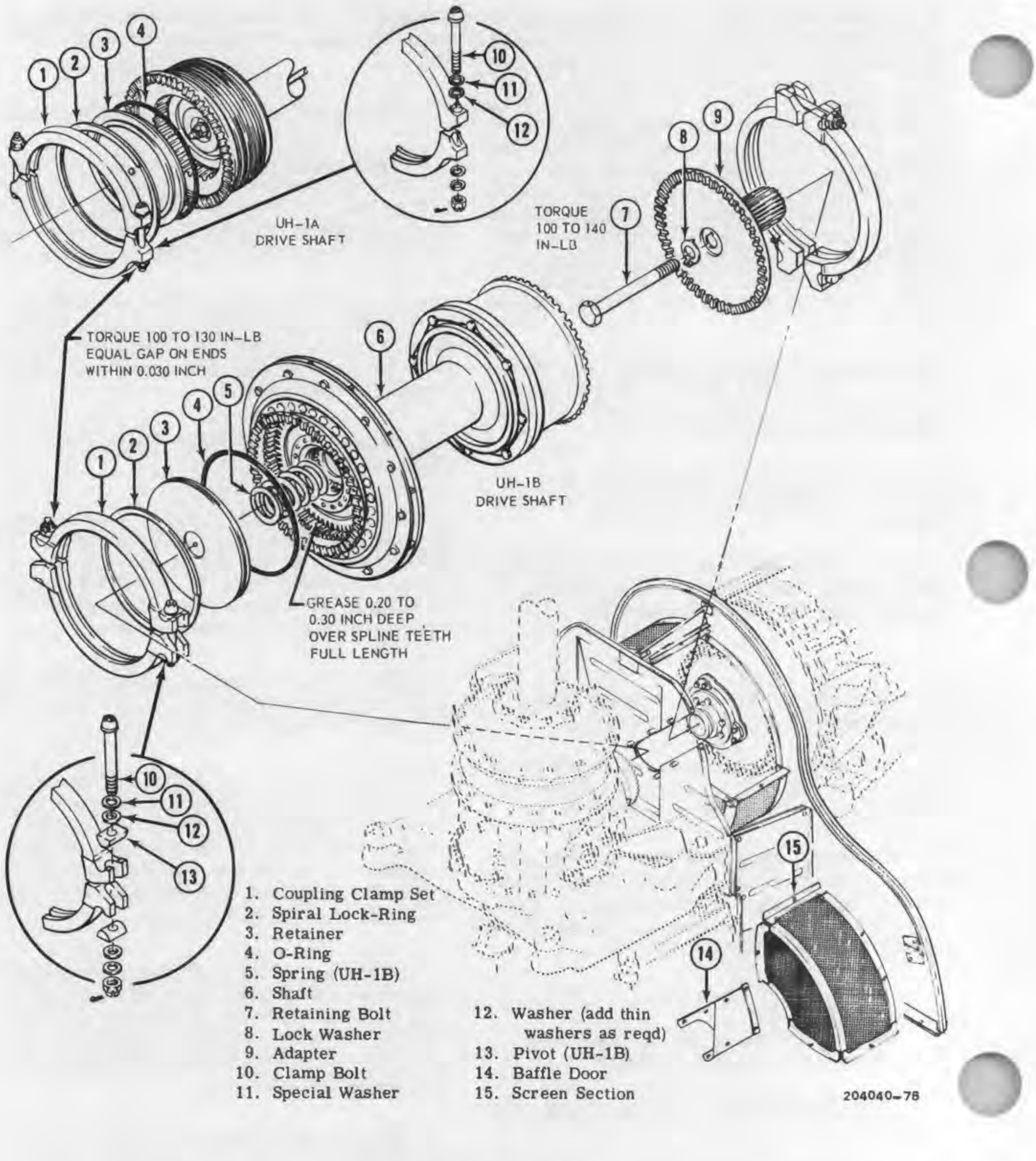
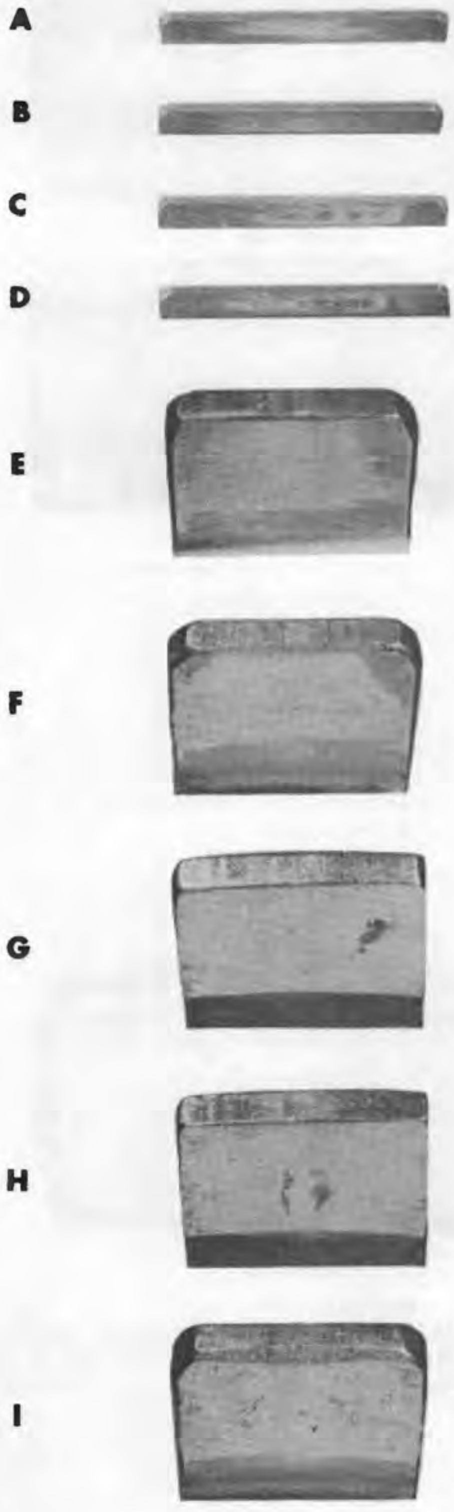


Figure 7-3. Main drive shaft



Examples A and B show typical acceptable patterns of wear on teeth of female couplings. Patterns will vary due to differences in time in service, alignment, and operating power.

Examples C and D show unacceptable patterns of wear on teeth of female couplings.

Examples E and F show typical acceptable patterns of wear on spherical teeth of male coupling. Patterns will vary due to differences in time in service, alignment, and operating power.

Examples G or H are acceptable on not more than three consecutive teeth or six teeth total.

Condition I is not acceptable and warrants replacement of female coupling, as well as male coupling. Check kind and amount of grease. This condition usually results from use of wrong grease.

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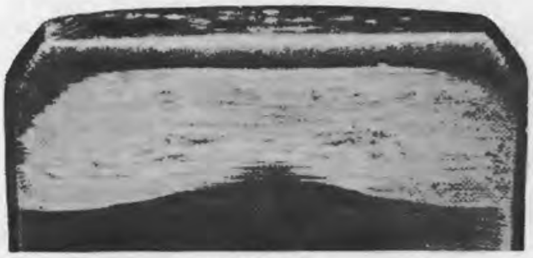
Figure 7-4. Inspection criteria for UH-1A main shaft coupling



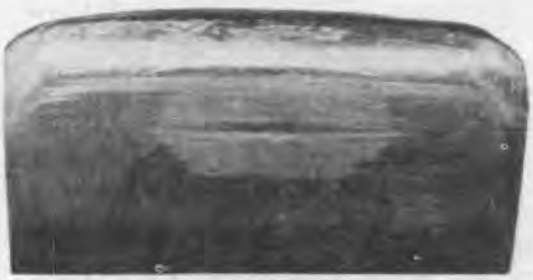
DETAIL A

DETAIL B

Details A and B show typical acceptable patterns of wear on spherical teeth of male coupling. Patterns will vary due to differences in time in service, alignment, and extent of operation at high power.

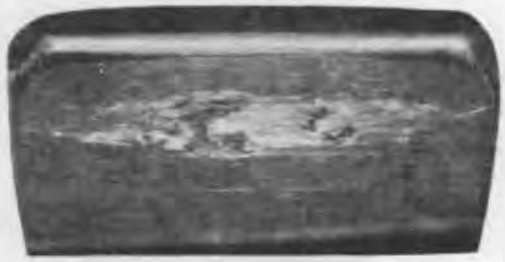
DETAIL C

Small defects as shown in Detail C can occur in either Detail A or B. This type of defect is not detrimental to the coupling.



DETAIL D

Grooves, as shown in Detail D, of any length are acceptable on not more than twelve consecutive teeth or twenty-four teeth total.



DETAIL E

DETAIL F

Condition as shown in Detail E or F are acceptable on not more than five consecutive teeth or twelve teeth total.

Note

When male coupling is replaced for defects like Detail E or F, female coupling may require honing to remove any build-up of transferred metal.

DETAIL G

Defects as in Detail G which cover over 1/2 the tooth length and 1/2 the tooth depth are to be rejected. Care should be taken in inspection of the female. If metal build-up is not excessive it may be honed down.

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Figure 7-5. Inspection criteria for UH-1B main shaft coupling (Sheet 1 of 2)

DETAIL H

DETAIL I

Conditions shown in Detail H or I are not acceptable. This type of failure has only been found when an improper lubricant had been used. These photos show that the entire tooth surface has been spalled. All or at least 30 of the 60 teeth will exhibit this failure. Check for the proper kind of lubricant, and be sure the proper amount of lubricant is installed.

Normally if the male coupling is as shown in Details H, I, or J the surface of the female will be damaged and should be scrapped.

DETAIL J

Detail J shows a group of teeth from a coupling which was run with an improper lubricant. The type of failure as shown in Details H and I.

204040-83F-2

Figure 7-5. Inspection criteria for UH-1B main shaft coupling (Sheet 2 of 2)

j. Hand pack exposed female splines of outer coupling with approved grease to provide a 0.20 to 0.30 inch coating. (See figure 7-6, details E, F, and G, and figure 7-7.)

B k. On UH-1B, place spring (5, figure 7-3) in recess of inner coupling retaining nut, and engage outer end of spring on pilot at center of inner face of retainer (3). (See figure 7-6, detail H.)

l. Carefully press retainer into outer coupling, using steady and even hand pressure as O-ring slides over the chamfered splines to normal position in outer coupling. (See figure 7-6, detail K.) Holding retainer in place, check that no rubber slivers are present to indicate that O-ring was damaged.

Note

> A sliver from a cut O-ring as shown in figure 7-6, detail M, makes it necessary to remove the plate and install a new O-ring as outlined in preceding steps I through L.

m. If there are no indications of a cut or damaged O-ring secure retainer with spiral lock-ring (2, figure 7-3 and figure 7-6, detail L).

Note

> Before installing lock-ring, carefully clean the entire groove where lock-ring will be installed, using a small screwdriver or similar item. Look carefully for any small slivers from the O-ring. If the O-ring was cut, the sliver should be found in this manner. (See figure 7-6, detail L).

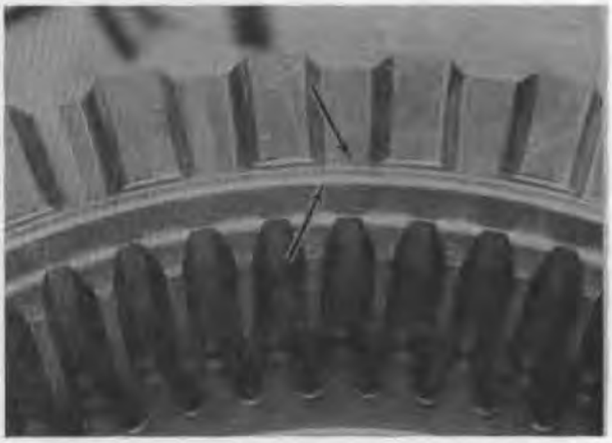
n. Inspect and lubricate opposite end coupling in the same manner.

o. Wipe all grease from exterior of shaft assembly, and install lock-ring. (See figure 7-6, detail N.)

7-11. Inspection and Repair — Main Drive Shaft.

a. Inspect the outer surface of the main drive shaft for nicks and scratches to the following limits:

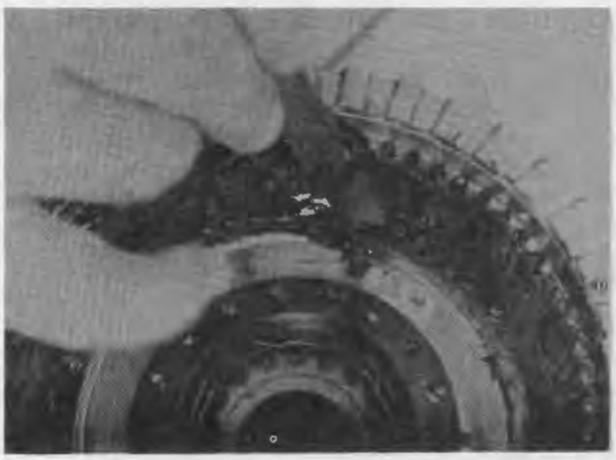
DETAIL **A**



DETAIL **B**

DETAIL **C**

DETAIL **D**



DETAIL **E**

DETAIL **F**

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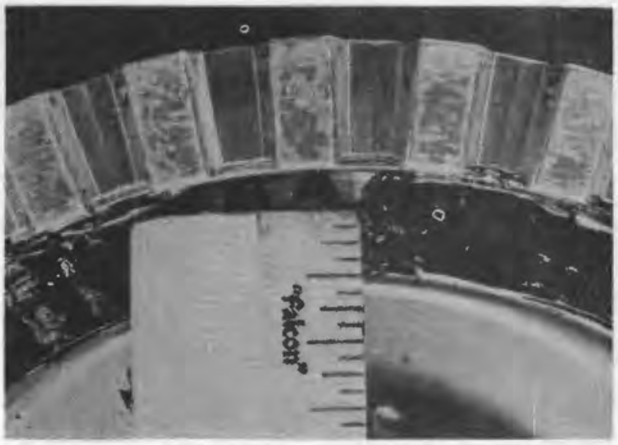
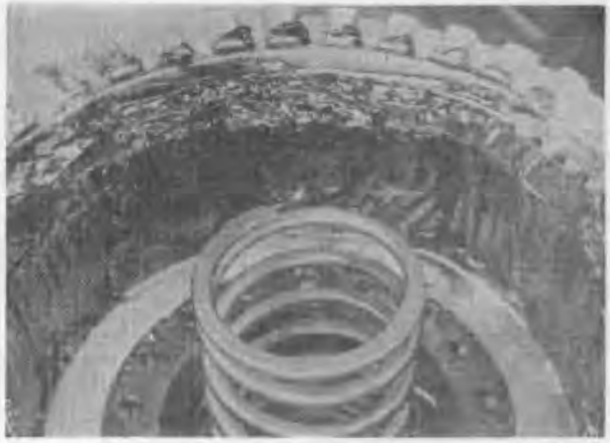
Figure 7–6. Inspection and lubrication main drive shaft (Sheet 1 of 4)



DETAIL G



DETAIL H

DETAIL I

DETAIL J

DETAIL K

DETAIL L

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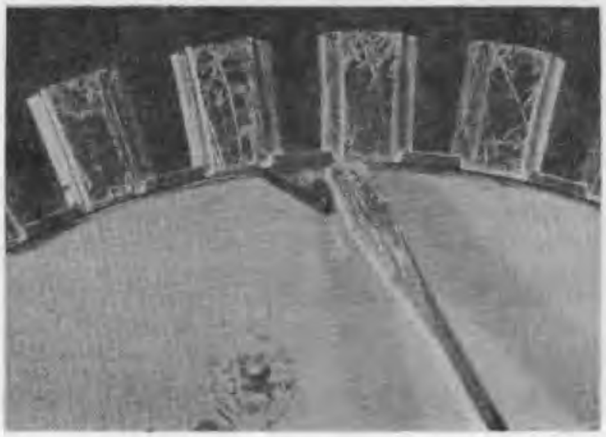
Figure 7–6. Inspection and lubrication main drive shaft (Sheet 2 of 4)



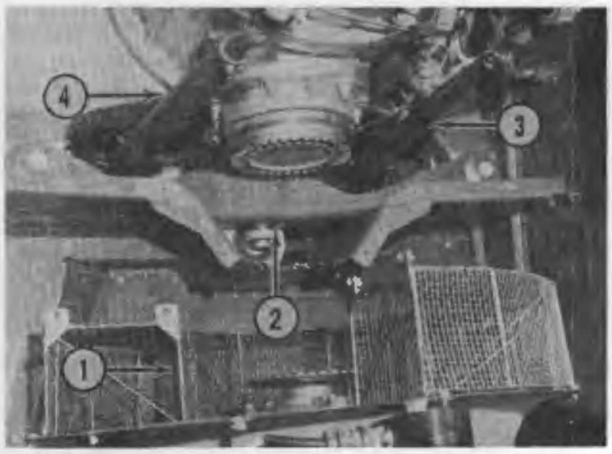
DETAIL **M**

DETAIL **N**

DETAIL **O**

DETAIL **P**

DETAIL **Q**



DETAIL **R**

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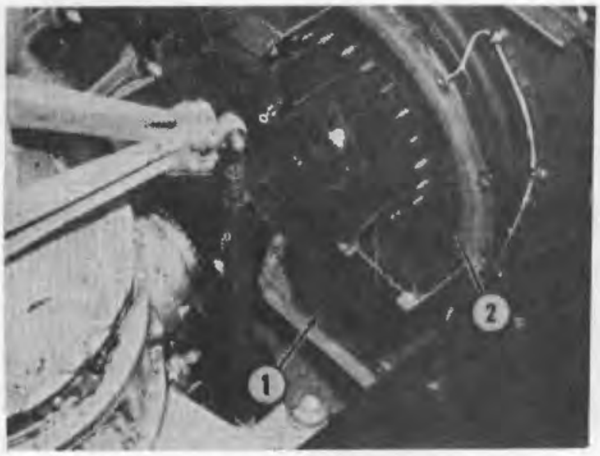
Figure 7-6. Inspection and lubrication main drive shaft (Sheet 3 of 4)



DETAIL S

DETAIL T

DETAIL U

DETAIL V

DETAIL W

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Figure 7–6. Inspection and lubrication main drive shaft (Sheet 4 of 4)

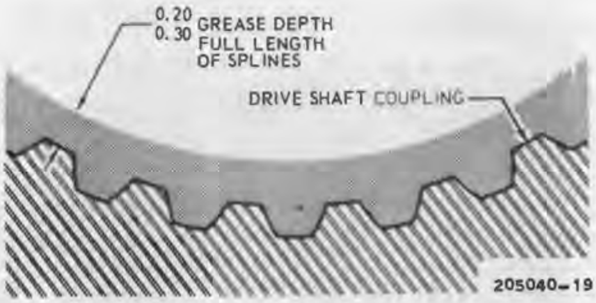


Figure 7-7. Drive shaft coupling

(1) Nicks and scratches, running within 15 degrees of shaft axis, which are not in excess of 0.005 inch in depth are permissible without polishing out.

(2) Nicks and scratches, running within 15 degrees of shaft axis, which are not in excess of 0.010 inch in depth are permissible if polished out provided total polished area does not exceed 20 percent of circumference of shaft at any point.

(3) Nicks and scratches not running within 15 degrees of shaft axis must be polished out. A maximum depth of 0.005 inch may be polished out on 100 percent of shaft circumference. A maximum depth of 0.010 inch may be polished out provided the total polished area does not exceed 20 percent of shaft circumference at any point.

b. A minimum radius of ½ inch should be used in polishing out nicks and scratches. Polished areas must be refinished with two coats of zinc chromate primer, (item 119, table 1-1).

7-12. *Installation — Main Drive Shaft.* Install main drive shaft as follows:

Note

Before installing drive shaft CAREFULLY wipe clean the area surrounding the drive shaft, especially the intake screen, fifth mount beam, synchronized elevator tube and collective tube. (See figure 7-6, details R and S.)

a. Coat shaft splines of adapter (9, figure 7-3) and pack female splines of engine output shaft ⅔ full with Plastilube, Moly No. 3 (item 20, table 1-1). Insert adapter into engine shaft. Install retaining bolt (7, figure 7-3) and key washer (8), with short tab of washer in adapter slot. Tighten bolt with 100 to 140 inch-pounds torque, and lockwire head to outer tab of washer.

Caution

When installing driveshaft, be sure that coupling with cooling fins is at forward end, to reduce possibility of damage due to overheating in operation.

b. Place drive shaft assembly, with cooling fins at forward end, between engine adapter and transmission input drive coupling (see figure 7-6, detail T). Do not compress shaft couplings more than necessary, as this will tend to force grease past the micarta inboard seal rings.

c. Install clamp sets (1, figure 7-3) to secure each end of shaft as follows:

(1) Carefully wipe inside grooves clean of all traces of grease, (See figure 7-6, detail O and P) and fit clamp halves around coupling joint, checking that serial numbers on both halves are alike and on same side (see figure 7-6, detail Q). Clamp halves should fit snugly and hold themselves in place without bolts.

Note

On UH-1A, both serialized and non-serialized coupling sets may be used. DO NOT mismatch serialized coupling halves.

(2) Install clamp bolts (10, figure 7-3) with heads toward shaft rotation.

A (a) On UH-1A, use two washers (11) on each bolt with countersunk sides next to bolt head and nut. Additional washers may be used, equal on both sides for balance.

B (b) On UH-1B, install each bolt with two half-round pivot spacers (13) next to clamp ends with flat sides out, a steel washer next to bolt head and another next to nut. Thin washers can be added under nut as required, using equal amount on opposite bolt to maintain balance.

(3) Position two clamp sets with slots at 90 degrees around shaft from each other.

(4) Tighten bolts evenly with 100 to 130 inch-pounds torque, keeping equal gaps at ends of clamp set within 0.030 inch. Tap around outside of clamp for good seating, and recheck bolt torque. Secure nuts with cotter pins.

d. Carefully wipe any grease from shaft exterior, intake screen, and areas around forward coupling. Reinstall upper left sections of air intake screen (15) and baffle (14). Close cowling.

e. After first ground run-up or flight, inspect areas around both main drive shaft couplings, in line with coupling clamps, for evidence of grease slinging. (See figure 7-6, details U. V and W.) If there are signs of grease leakage, investigate as follows:

(1) Remove clamp sets to check for grease in grooves.

(2) If no grease is found, reinstall clamps. Watch for further evidence of leakage in next run-up.

(3) If grease is found in clamp grooves, remove shaft and inspect couplings for lubrication and proper installation of O-rings. (Refer to paragraph 7-10.)

7-13. Preparation for Storage or Shipment—Main Drive Shaft. a. Clean and dry main drive shaft in accordance with Specification MIL-P-116.

b. Apply corrosion - preventive compound, (item 315, table 1-1), to unplated steel surfaces.

c. Wrap assembly in grease-proof barrier material, (item 506, table 1-1) and secure with pressure-sensitive tape, (item 402, table 1-1). Shape wrapper to contour of assembly.

d. Place drive shaft into contoured bottom cushion of metal container, and align to fit contour.

e. Align top contoured cushion to fit drive shaft and lower into container.

f. Place 10 eight-unit bags (total 80 units) of dessicant, (item 316, table 1-1) in container.

g. Place rubber gasket on lower half of container and install container lid.

h. Install locking ring over lip of container lid and container and secure with bolt and nut. Tighten nut sufficiently to insure a moisture-vapor proof closure.

Section III — Clutches

(Not Applicable)

Section IV — Main Transmission

7-14. Transmission. (See figure 7-8.) The transmission is located directly ahead of engine and is suspended by pylon-isolating mounts on structural supports extending above service deck. The unit is coupled to the engine through a short drive shaft and provides drive angle change and speed reduction, through a train of spiral bevel gears and two-stage planetary gears, to drive the main rotor mast. A freewheel clutch in the input drive quill coupling disengages to allow main rotor and gear train to turn freely when engine is stopped or is idling below rotor-driving speed, as in autorotational descent. Secondary gear trains drive tail rotor shaft, DC generator, rotor tachometer generator, hydraulic pump, and transmission oil pump.

7-15. Output reduction ratios, expressed as revolutions of each driven unit per engine ouput revolution are as follows:

Main Rotor Mast	0.0491
DC Generator	1.0
Tail Rotor Drive Shaft	0.6516
Hydraulic Pump	0.6516
Tachometer Generator (UH-1A)	0.6878
Tachometer Generator (UH-1B)	0.6516
Oil Pump	0.6274

Note

After further reduction in 90 degree gear box, tail rotor turns at 0.25 engine rpm.

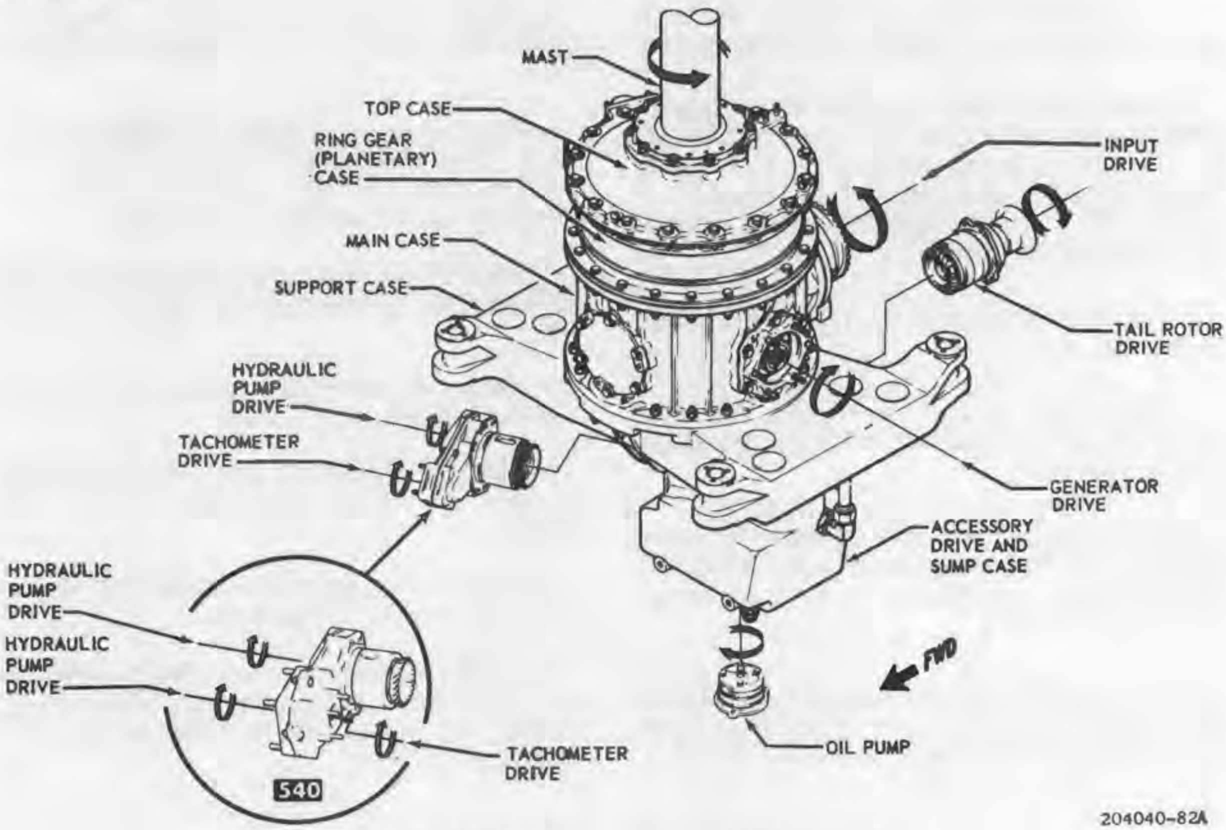


Figure 7-8. Typical transmission (UH-1B shown)

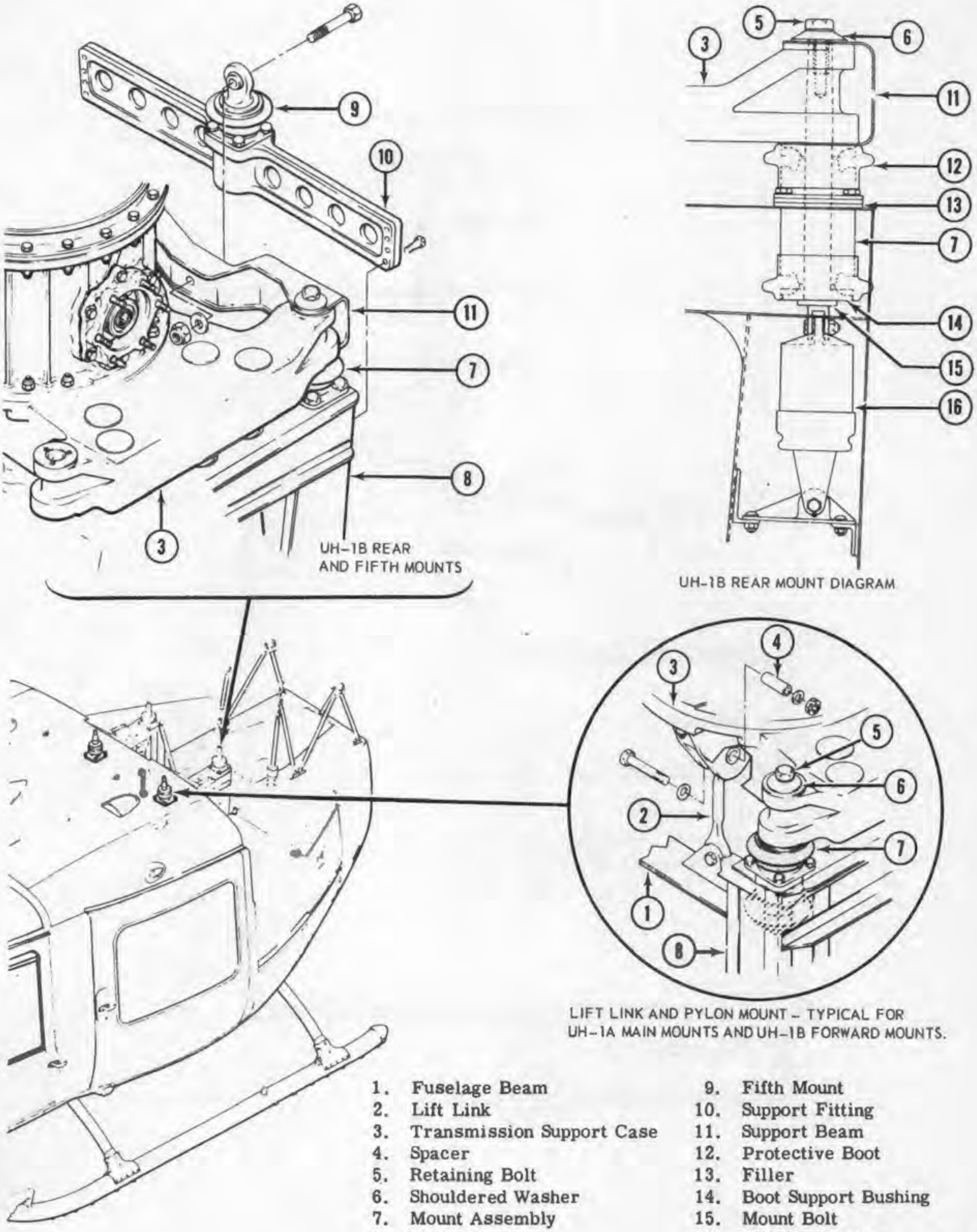
7-16. Transmission Mounts. (See figure 7-9.) A lift-link and pylon isolation mounts are used to attach transmission to the helicopter fuselage. Lift-link is of forged steel with self-aligning end bearings, and is connected between forward underside of transmission support case and a fuselage beam directly below. Four isolation mounts are located on pylon supports under corners of transmission support case. Each consists of a cylindrical molded rubber core bonded between steel outer and inner sleeves, with outer sleeve flange secured on pylon support by four bolts. A large mount bolt extends up through mount inner sleeve to seat in tapered bushing of transmission support case leg, and is secured by a retaining bolt installed from top through a broad special washer and threaded into tapped upper end of mount bolt. Silicone rubber protective boots, with supporting bushings, cover both ends of mount.

Note

It is important to note that a properly installed boot will extend the service life of the mount by keeping it free and clean of oil contamination. Any boot that is ripped or cut should be replaced.

B 7-17. On UH-1B, because of longer mast and increased engine power, two aft pylon isolation mounts are restrained by friction dampers and a fifth isolation mount is used. Friction dampers are cylindrical units connected between lower ends of aft main mount bolts and fittings on deck structure. Fifth isolation mount is similar to four main mounts, and is located at center aft of pylon on a support fitting bridged across rear side of pylon supports. Mount bolt has a self-aligning bearing at upper end, which is attached by a bolt to middle of a welded beam extending between aft legs of transmission support case.

7-18. Transmission Oil System. (See figure 7-10.) Transmission oil system is self-contained and entirely separate from that of engine. Oil supply in sump case is delivered under pressure from a mechanically driven pump through a filter to a series of internal passages, external tubes, and manifolds which constitute an oil pressure line. Distribution is through jets and internal channels to lubricate bearings and gears inside transmission, where oil drains back to sump. An adjustable relief valve regulates system pressure at 50 (plus or minus 5) psi. Oil temperature and pressure gage indications are provided by a thermobulb and a pressure transmitter. A thermoswitch and a pressure switch will light caution panels



1. Fuselage Beam
2. Lift Link
3. Transmission Support Case
4. Spacer
5. Retaining Bolt
6. Shouldered Washer
7. Mount Assembly
8. Pylon Support
9. Fifth Mount
10. Support Fitting
11. Support Beam
12. Protective Boot
13. Filler
14. Boot Support Bushing
15. Mount Bolt
16. Friction Damper

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Figure 7-9. Transmission pylon mounts and lift link

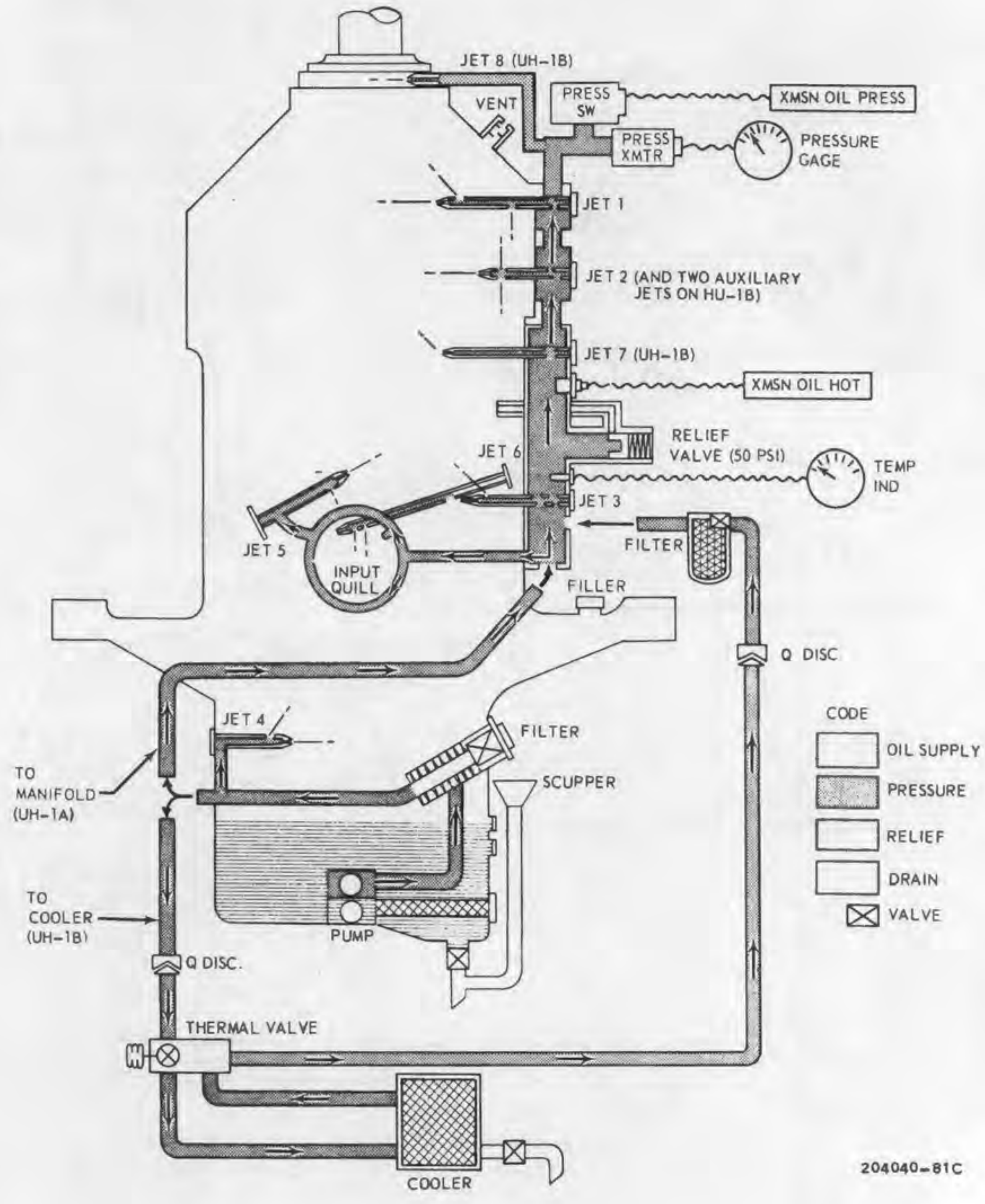


Figure 7–10. Transmission oil system schematic

lettered "XMSN OIL HOT" or "XMSN OIL PRESS" (low) if these conditions occur. Oil system servicing and drain provisions are mainly accessible from right side of transmission. Oil level sight gages on sump case can be checked from outside right transmission cowling through fire access door, using nearby push-button switch for lighting. Open cowling for access to oil filter on support case, or to oil filter, pump screen, and magnetic plug on sump case. Transmission drain valve is under sump, discharging overboard at left aft under fuselage. Transmission oil cooler drain valve on UH-1B helicopters is located in bottom of main fuselage compartment and can be reached through door at right aft below engine. Transmission oil systems for all models are essentially similar in operation and arrangement. (See figure 7-11 and 7-12.) Additional oil jets are provided on UH-1B, as well as an external oil cooling system with a second oil filter.

Note

Do not mistake internal passage plug (24, figure 7-11) for drain plug. Do not remove internal passage plug.

7-19. Transmission Primary Oil Filter. All models are provided with an oil filter located in upper right aft corner of transmission sump case. Filter assembly consists of a stack of wafer-disc screens assembled with spacers on a perforated tube, attached on a body which incorporates a bypass valve to allow continued oil flow in event screens become clogged. Filter is mounted into a sump case pocket with inlet and outlet through internal passages. A cast scupper on sump case is located below filter mounting pad and connected to overboard oil drain line to dispose of any oil spilled when servicing filter.

7-20. Removal — Transmission Primary Oil Filter. a. Remove nuts and washers from four mounting studs at corners of filter body.

b. Pull filter from sump case pocket. Allow excess oil to drain through scupper, into suitable container placed under overboard drain outlet at left underside of fuselage.

7-21. Cleaning — Transmission Primary Oil Filter. Wash oil filter in dry cleaning solvent (item 302, table 1-1). If necessary, disassemble screens and spacers from tube by removing retaining nut and tab washer. Wash parts in dry cleaning solvent, (item 302, table 1-1). Dry thoroughly with filtered compressed air. Reassemble screens, spacers, tab washer and retaining nut on tube of filter body. Tighten until screens do not turn on tube, and bend washer tab against side of nut.

7-22. Inspection — Transmission Primary Oil Filter. Inspect gasket for damage, leakage, and distortion.

7-23. Repair or Replacement—Transmission Primary Oil Filter. Replace gasket if leaking, damaged or distorted.

7-24. Installation — Primary Oil Filter. Insert filter into sump case pocket. Secure with thin aluminum alloy washer next to filter body, thin steel washer, and nut on each mounting stud. Tighten nuts evenly.

B 7-25. Transmission External Oil Filter. A second oil filter is installed in conjunction with transmission oil cooler on UH-1B helicopters. (See figure 7-12.) This filter is bracket-mounted at right side of transmission main case, and is connected to external oil line between cooler and pressure relief valve manifold. Unit contains a pleated-paper type filter element, and incorporates a bypass valve set to open at 18 to 22 psi to assure oil flow if filter element should become clogged.

B 7-26. Removal—Transmission External Oil Filter. a. Open cowling at right side of transmission.

b. Remove filter element for inspection or replacement.

Note

Replace external filter element every 100 hours.

(1) Place suitable container below filter to catch trapped oil.

(2) Open V-band clamp.

(3) Remove filter body downward.

(4) Remove filter element.

c. When necessary, remove filter head assembly or head and mounting bracket.

(1) Disconnect inlet hose and outlet tube from fittings of filter head, draining trapped oil into container. Cap open lines.

(2) Remove lockwire and four bolts with washers to detach filter head from bracket.

(3) If necessary to replace bracket, detach by removing four bolts with nuts and washers at flange of ring gear case.

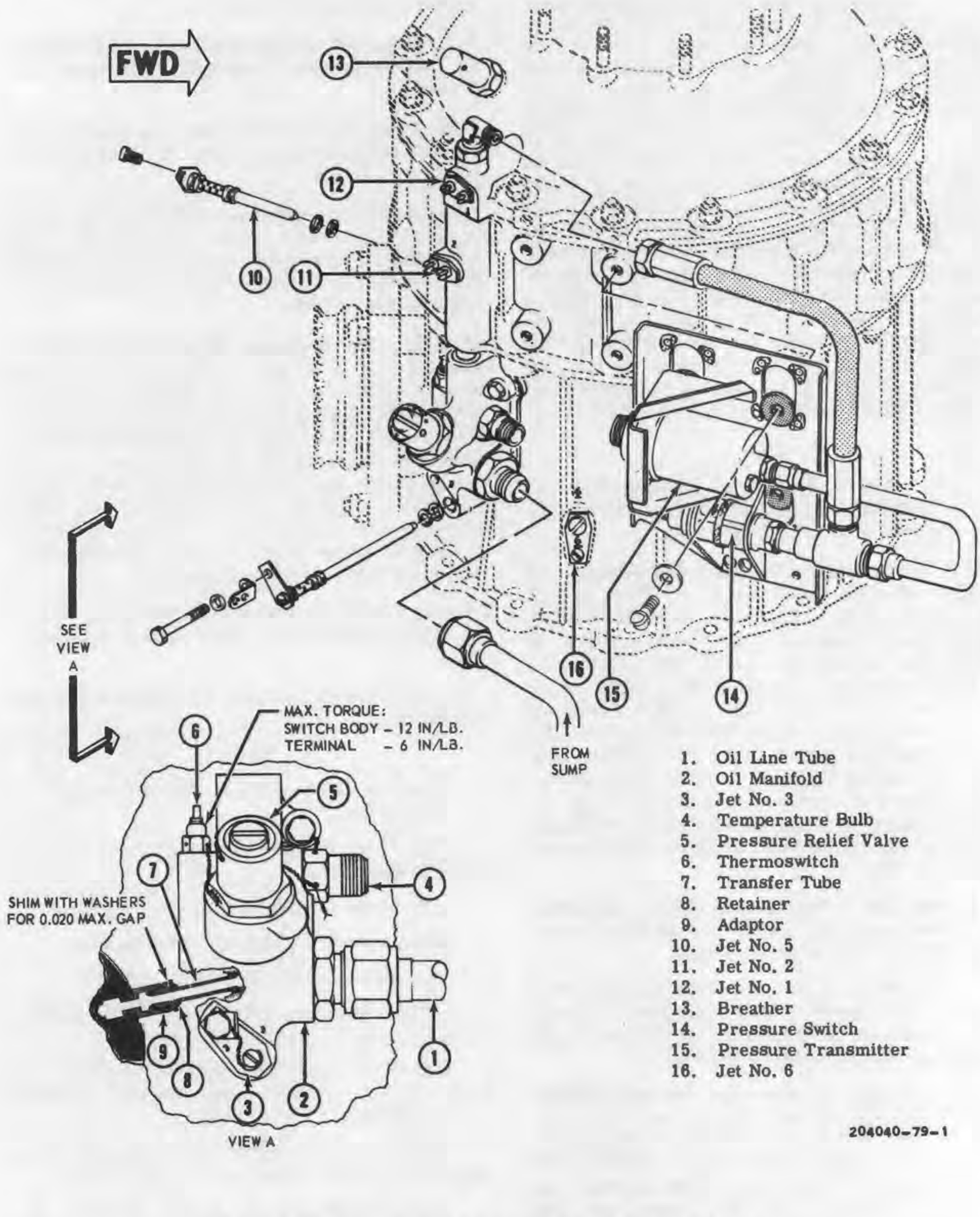
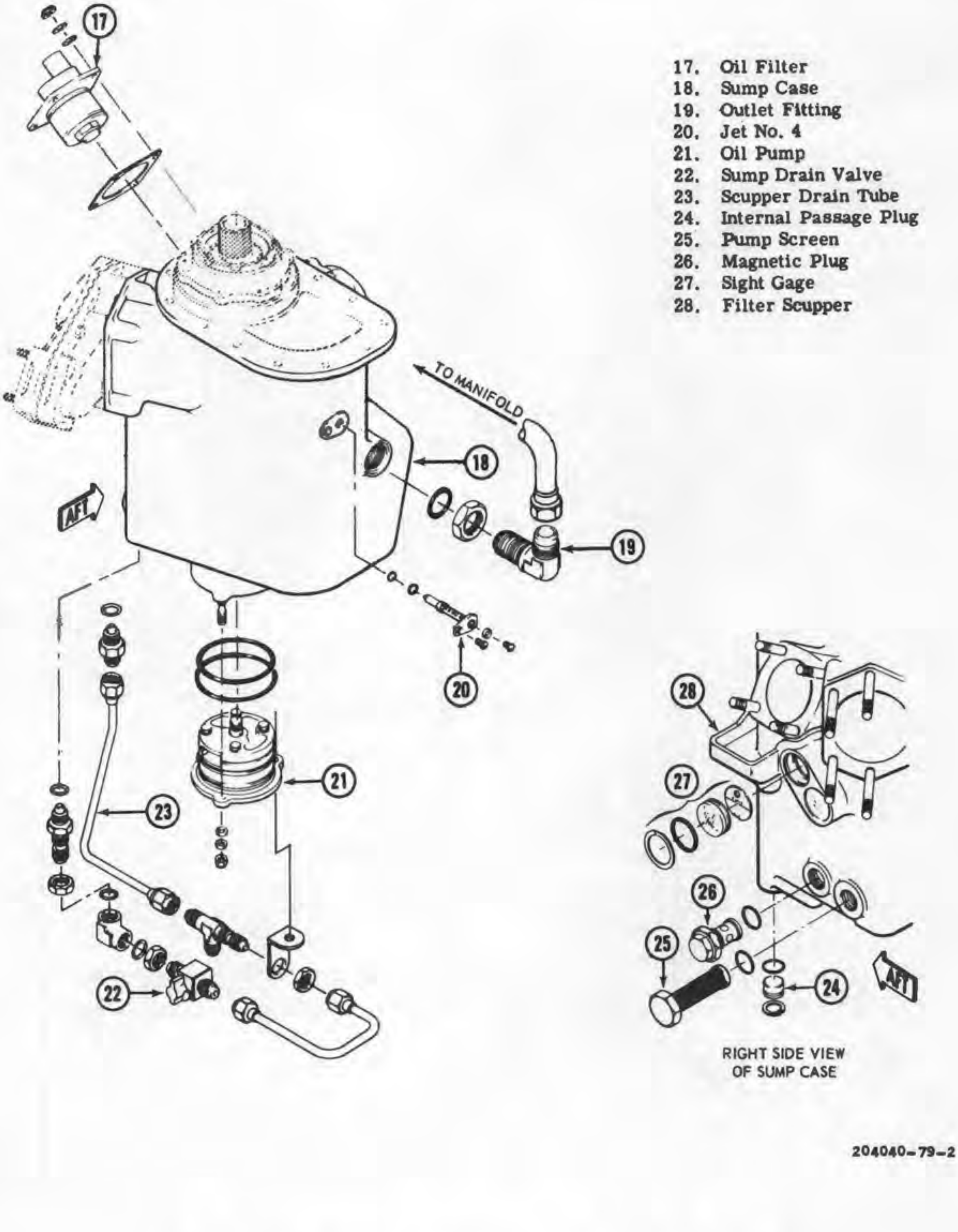


Figure 7–11. Transmission oil system UH-1A (Sheet 1 of 2)



17. Oil Filter
18. Sump Case
19. Outlet Fitting
20. Jet No. 4
21. Oil Pump
22. Sump Drain Valve
23. Scupper Drain Tube
24. Internal Passage Plug
25. Pump Screen
26. Magnetic Plug
27. Sight Gage
28. Filter Scupper

Figure 7–11. Transmission oil system UH-1A (Sheet 2 of 2)

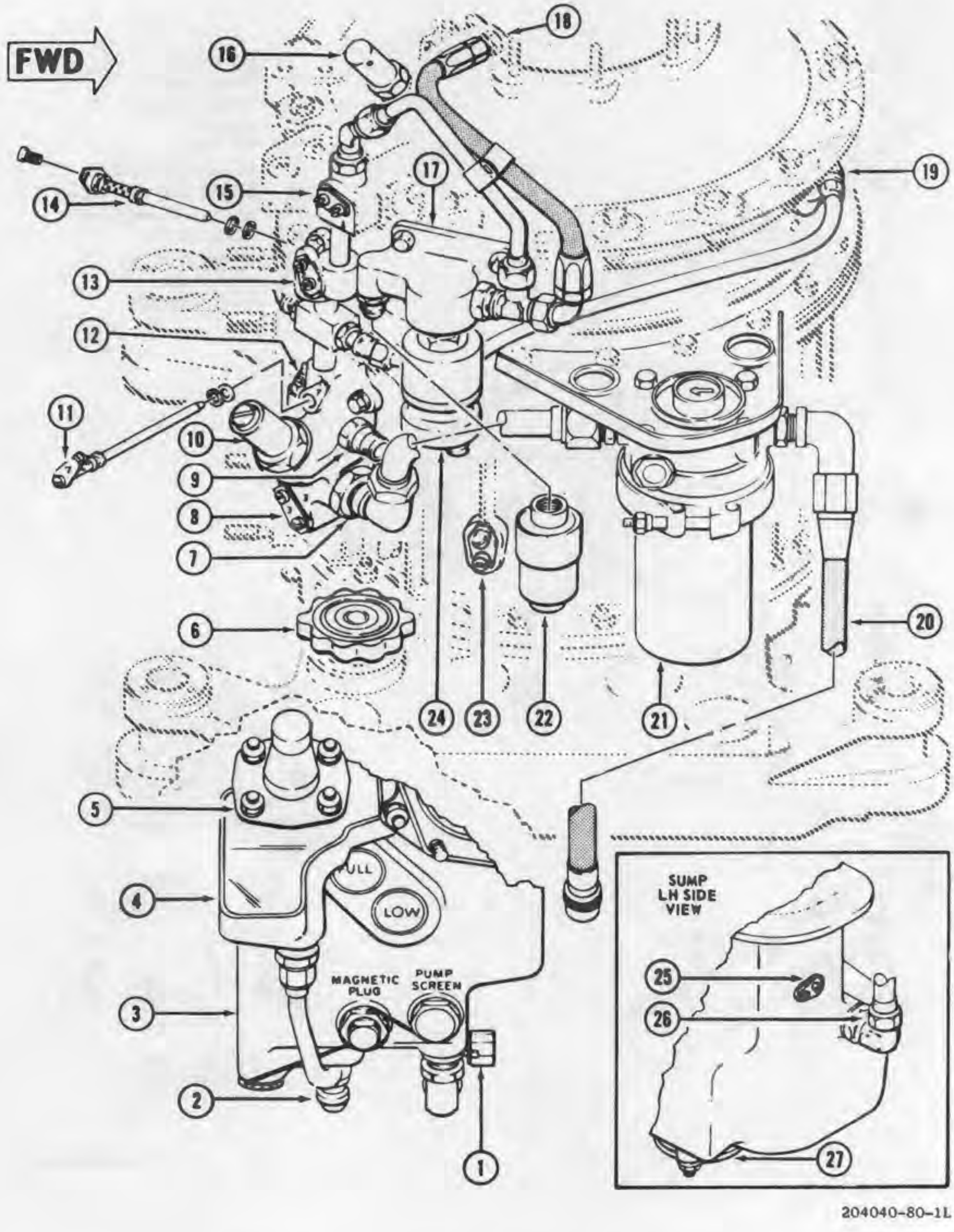
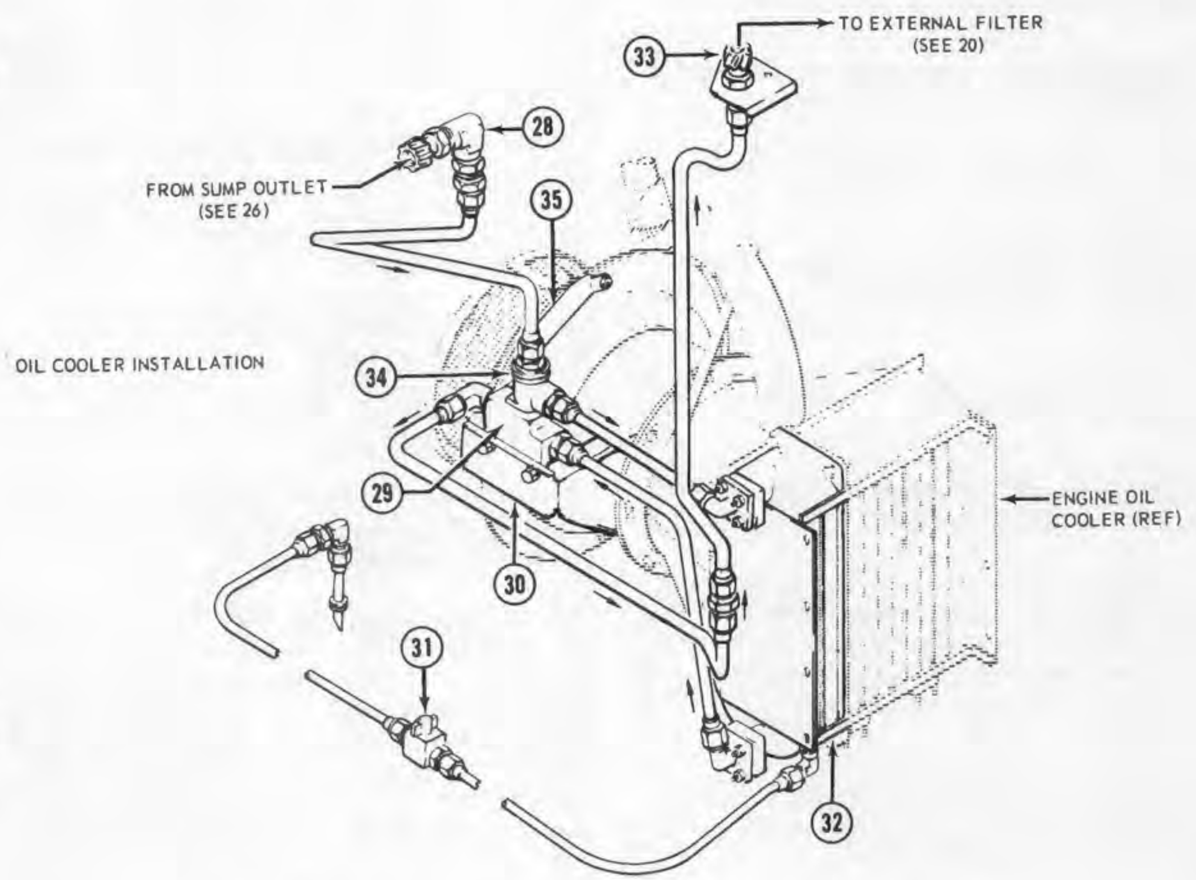


Figure 7–12. Transmission oil system UH-1B (Sheet 1 of 2)



1. Drain Valve
2. Drain Coupling
3. Sump
4. Scupper
5. Filter
6. Filler Cap
7. Mainifold Inlet
8. Jet No. 3
9. Temperature Bulb
10. Pressure Relief Valve
11. Jet No. 7
12. Thermoswitch
13. Jet No. 2
14. Jet No. 5
15. Jet No. 1
16. Breather
17. Pressure Tap Manifold
18. Jet No. 8
19. Auxiliary Jet No. 2
20. Filter Inlet Hose (to 33)
21. External Filter
22. Pressure Switch
23. Jet No. 6
24. Pressure Transmitter
25. Jet No. 4
26. Sump Outlet
27. Oil Pump
28. Coupling (Station 154 at deck)
29. Thermal Valve Assembly
30. Bracket
31. Cooler Drain Valve
32. Transmission Oil Cooler
33. Coupling (Station 140 on Right-hand Pylon Support)
34. Clamp
35. Stiffener Bracket

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Figure 7-12. Transmission oil system UH-1B (Sheet 2 of 2)

B 7-27. *Cleaning — External Oil Filter.* Clean filter body, and head assembly if removed, with dry cleaning solvent (item 302, table 1-1). Dry thoroughly with filtered compressed air.

7-28. *Inspection — External Oil Filter.* a. Inspect mounting bracket for cracks or damage.

b. Inspect O-rings for damage or deterioration.

7-29. *Repair or Replacement — External Oil Filter.* a. Replace mounting bracket if cracked or damaged.

b. Replace O-rings that are damaged or deteriorated.

B 7-30. *Installation — External Oil Filter.* a. Reinstall bracket and filter head, if removed.

(1) Attach bracket on ring gear case flange at right side by installing four bolts. Use thin aluminum alloy washer next to main case flange on each bolt, and thin steel washers under bolt head, between bracket and case, and next to nut.

(2) Position filter head under bracket, with outlet aft, and install four bolts with washers. Lockwire heads in parts.

(3) Connect hose between coupling on right pylon support and inlet elbow on filter head. Connect tube between filter head outlet union and inlet elbow on pressure relief valve manifold.

b. Install filter element and body.

(1) Install O-ring on boss in bottom of filter body.

(2) Place filter element in body, seated firmly on boss.

(3) Install O-ring around upper lip of body, next to flange.

(4) Install O-ring around center boss in underside of filter head.

(5) Install body assembly into filter head, pressing upward to seat.

(6) Install V-band clamp around mating flanges of filter head and body. Tighten nut with 50 inch-pounds torque.

7-31. Transmission Oil Jets. (See figures 7-11 and 7-12.) Jet assemblies are installed from exterior of transmission at various points, passing through walls of internal passages which carry oil under pressure, and extend inside transmission case to deliver aimed sprays of oil on gears and bearings. Each jet is identified to its mounting port by matching stamped numerals, and attaching screw hole indexes the jet spray direction. The first four jets are numbered in order of location from top downward on transmission, others were numbered as added by design modifications.

JET	LOCATION AND FUNCTION
No. 1	At right aft on top case. Sprays mast upper bearing, mast driving spline area, and upper-stage planetary pinion bearings.
A No. 2	On UH-1A, at right aft on planetary spacer case. Sprays pinion bearings and gears of both planetary stages.
B No. 2	On UH-1B, on housing at right aft on ring gear case, with two auxiliary jets fed by external tubes and located 120 degrees apart on ring gear case. Same functions as on UH-1A.
No. 3	On bottom of oil manifold at right aft on main case. Sprays input bevel gears (leaving mesh) and delivers oil to No. 6 jet inside case.

JET	LOCATION AND FUNCTION
No. 4	On left side of sump case. Lubricates accessory drive gears and tail rotor drive quill.
No. 5	Left aft on main case, beside input drive quill. Lubricates input quill gears entering mesh.
No. 6	Right side on main case, near oil manifold. Receives oil from No. 3 jet inside case. Sprays inboard of input drive quill, and through end of gear to lubricate bearings of freewheel coupling.
B No. 7	On UH-1B Serial No. 61-686 and subsequent, top of oil manifold at right aft on main case. Lubricates bearings of internal gear quill which is driven by input drive gear quill.

Note

On UH-1B Serial No. 60-3546 through 60-3619, an oil tube serves same function as No. 7 jet. However, this tube extends only through inner wall of oil manifold and is not externally visible or accessible with manifold in place.

B No. 8	Right rear side of upper mast bearing retainer plate. Provides additional lubrication for upper mast bearing assembly and mast driving spline area.

7-32. *Removal — Transmission Oil Jets.* a. Remove any jet, except No. 7 or auxiliary jets of No. 2, as follows:

Caution

Pull jet from case using care to avoid damage to jet. Do not pry jet from case.

(1) Cut lockwire between two screw heads on jet. Loosen both screws, but remove only the one screw which secures mounting plate of jet to case.

(2) Pull jet tube, with O-ring seals, from case. Exercise care to avoid bending. Cover open port to prevent contamination.

B b. On UH-1B Serial No. 61-686 and subsequent, remove auxiliary jet of No. 2 as follows:

(1) Disconnect oil tube from jet. Cap open end of tube.

(2) Remove lockwire and screw through jet mounting plate.

(3) Pull jet, with O-ring, from housing. Cover open port.

B c. Remove No. 7 jet as follows:

(1) Remove pressure relief valve from oil manifold. (Refer to paragraph 7-38.)

(2) Remove jet as in step a. above.

B d. Remove No. 8 jet as follows:

(1) Disconnect tube assembly from jet and cap or cover open end of tube.

(2) Cut lockwire and remove screw from jet mounting plate.

(3) Remove jet and O-ring from port and cover opening.

7-33. Cleaning — Transmission Oil Jets. a. Remove O-ring seals. Also remove screw, with seal, from outer end of jet (except auxiliary No. 2 jets on UH-1B, Serial No. 61-686 and subsequent) to permit thorough cleaning, drainage and inspection.

b. Wash in dry cleaning solvent, (item 302, table 1-1). A suitable brush can be used. Drain and dry with filtered compressed air. Be sure all nozzle openings are clear.

c. Install screw, with seal, in outer end of tube.

7-34. Inspection — Transmission Oil Jets. a. Inspect O-rings for damage and serviceability.

b. Inspect jets for serviceability.

7-35. Repair or Replacement — Transmission Oil Jets. Replace damaged or unserviceable O-rings; unserviceable jets.

7-36. Installation—Transmission Oil Jets. a. Uncover mounting port. Check matching numerals beside port and on jet.

b. Install O-ring seals on jet tube in grooves at each side of inlet slot.

c. Insert jet, align lug, and secure to case with screw. Lockwire with head of screw installed in end of jet tube.

(1) For No. 3 jet, use bolt for attachment, with bracket for electrical harness clamp installed under bolt head.

B (2) On UH-1B Serial No. 61-686 and subsequent, connect oil tubes to auxiliary No. 2 jets. Lockwire attaching screw to elbow fitting next to tube connector nut.

7-37. Transmission Oil Manifold Assembly.

(See figures 7-11 and 7-12.) An oil manifold assembly on right aft side of transmission main case is provided with a relief valve to regulate system pressure, a thermobulb for oil temperature indicator and a thermoswitch for caution panel. An external line from sump delivers oil into manifold to be distributed through various outlets. Pressure relief valve, which is adjustable spring loaded type, allows some oil to bypass through a port on inner face of manifold into main case interior. An outlet at top of manifold delivers oil through an external tube to upper part of system. No. 3 oil jet is mounted through lower end of manifold. On UH-1A an external tube delivers oil to input drive quill area. On UH-1B, a second port on inner face of manifold supplies internal passages leading to input drive quill bearings. Also on UH-1B, manifold has either a hidden oil tube or No. 7 oil jet extending into main case.

7-38. Removal – Pressure Relief Valve. Cut lockwire and unscrew relief valve from oil manifold assembly.

7-39. Inspection Pressure Relief Valve. a Check relief valve for malfunction. (Refer to paragraphs 7-3 and 7-4.)

b. Inspect O-rings for damage and serviceability.

c. Check threads for damage.

7-40. Repair or Replacement – Pressure Relief Valve. a. Adjust pressure relief valve as necessary. (Refer to paragraph 7-54.)

b. Replace relief valve if malfunctioning or adjustment cannot be made.

7-41. Installation – Pressure Relief Valve. a. Install O-ring on valve.

b. Install valve in oil manifold.

c. Lockwire separately from valve to thermoswitch.

7-42. Removal — Thermobulb. a. Remove lockwire and disconnect electrical connector.

b. Remove two lockwires and unscrew thermobulb from oil manifold. Remove gasket.

7-43. Inspection – Thermobulb. a. Check thermobulb for damage and serviceability.

b. Inspect gasket for damage and serviceability.

7-44. Repair or Replacement – Thermobulb. a. Replace thermobulb if damaged or unserviceable.

b. Replace gasket if damaged or unserviceable.

7-45. Installation – Thermobulb. a. Lubricate threads and gasket with transmission oil and install gasket on thermobulb.

b. Install thermobulb in oil manifold. Lockwire to adjacent bolt head on manifold and to pressure relief valve.

c. Connect and lockwire electrical connector.

7-46. Removal – Thermoswitch. a. Disconnect electrical leads from thermoswitch terminal.

b. Remove lockwire and unscrew thermoswitch from oil manifold. Remove gasket.

7-47. Inspection — Thermoswitch. a. Check thermoswitch for damage and serviceability.

b. Inspect gasket for serviceability.

7-48. Repair or Replacement — Thermoswitch. a. Replace thermoswitch if damaged or unserviceable.

b. Replace gasket if damaged or unserviceable.

7-49. Installation – Thermoswitch. a. Lubricate threads and gasket with transmission oil, and place gasket on lower end of thermoswitch.

b. Install thermoswitch in top of oil manifold, using not more than 12 inch-pounds torque on hexagon shoulder of switch body.

c. Connect electrical leads, using not more than six inch-pounds torque on terminal stud nut.

7-50. Removal — Oil Inlet Fitting. a. Disconnect oil line tube from fitting.

b. Unscrew oil inlet fitting from oil manifold assembly. Remove gasket.

7-51. Inspection – Oil Inlet Fitting. a. Inspect threads of oil inlet fitting for damage.

b. Inspect gasket for damage and serviceability.

7-52. Repair or Replacement – Oil Inlet Fitting. a. Replace oil inlet fitting if unserviceable.

b. Replace gasket if damaged or unserviceable.

7-53. Installation – Oil Inlet Fitting. a. Install gasket on fitting.

b. Install fitting in oil manifold.

c. Attach hose to oil inlet fitting.

7-54. Adjustment – Transmission Oil Pressure. Spring-loaded bypass relief valve which regulates transmission oil pressure is readily accessible on manifold at right aft side of main case.

a. If transmission oil pressure indication is unsatisfactory during operation with transmission oil temperature stabilized in normal range, see trouble shooting chart for possible causes. (Refer to paragraph 7-3.)

b. When required, adjust pressure relief valve.

(1) Remove cotter pin passing through holes at top of valve body and slot of valve adjusting screw or back off jam nut on end of adjusting screw.

(2) Turn adjusting screw in to increase, or out to reduce, indicated oil pressure.

(3) Align screw slot with nearest set of holes and install cotter pin after adjustment, or tighten jam nut.

(4) Recheck oil pressure in operation.

c. Replace valve assembly if adjustment cannot be made satisfactory.

(1) Remove lockwire. Use wrench on hexagon shoulder of valve body to loosen and remove valve assembly, with O-ring.

(2) Check that threads of replacement valve are clean and undamaged. Lubricate threads and O-ring with transmission oil, and place O-ring on valve.

(3) Install valve in manifold. Lockwire separately from valve body to thermobulb and thermoswitch.

(4) Recheck oil pressure in operation.

7-55. Transmission Oil Pump. (See figure 7-8) Transmission oil pump is mounted in bottom of sump case. Pump is driven by a splined shaft from an accessory drive gear train, and turns clockwise as viewed from drive end.

7-56. ***Removal – Transmission Oil Pump.*** a. Place suitable container under outlet of transmission oil drain line at left underside of fuselage. Drain oil by opening valve under transmission sump.

b. Disconnect drain tubes from valve and tee. Provide a container to catch trapped oil when pump is removed.

c. Remove nuts, washers, and drain tee bracket from three pump mounting studs.

d. Pull pump from sump and splined drive shaft. When necessary, use threaded puller in 1/4-28 UNF tapped hole in boss at center of pump body.

Caution

Threaded hole is for attaching puller to pump. It is not for jack screw.

7-57. ***Cleaning—Transmission Oil Pump.*** Wash assembled pump in dry cleaning solvent (item 302, table 1-1). Drain thoroughly and dry with filtered compressed air.

7-58. ***Installation – Transmission Oil Pump.*** Install transmission oil pump as follows:

Note

If length of spline on oil shaft is 3/8 inch, proceed as follows. If length of spline is 7/8 inch, omit steps a., e., and g.

a. Remove tail rotor drive quill. (Refer to paragraph 7-107.)

b. Replace O-rings in two grooves around oil pump housing, and coat O-rings with oil.

c. Insert pump into sump, engaging shaft in splined drive and assist shaft into position by inserting hand through tail rotor drive quill mounting port. Install studs through housing flange.

Caution

During installation of the main transmission oil pump it cannot be positively determined that the drive shaft is engaged inasmuch as the drive shaft is loosely mounted in the drive quill and can move off center while installing pump. During installation of the main transmission oil pump the main rotor should be rotated slowly until positive engagement of the pump drive shaft is made.

d. Install washers and nuts on studs, with drain tee bracket on forward stud.

e. Check through the tail rotor drive quill mounting port to verify that retaining ring is still seated in groove of oil pump drive shaft.

f. Connect drain line tube to valve and tee.

g. Install rotor drive quill. (Refer to paragraph 7-111.)

7-59. Transmission Oil Pump Screen. Intake screen for transmission oil pump is a wire mesh cylinder attached to a threaded plug, externally accessible at a marked location on lower right of sump case.

7-60. ***Removal — Transmission Oil Pump Screen.*** a. Drain oil sump as when removing pump. (Refer to paragraph 7-56.)

b. Remove lockwire from hexagonal plug head below cast legend "PUMP SCREEN." Remove screen assembly with gasket.

7-61. ***Cleaning – Transmission oil Pump Screen.*** Wash with dry cleaning solvent, (item 302 table 1-1). Dry with filtered compressed air.

7-62. ***Inspection – Transmission Oil Pump Screen.*** Check for metallic particles or other material collected on pump screen as indication of oil contamination or internal failure of transmission. Inspect screen for holes or other damage.

Note

Refer to paragraph 7-4 and 7-5 for additional information.

7-63. ***Repair or Replacement – Transmission Oil Pump Screen.*** Replace screen if torn or damaged.

7-64. ***Installation – Transmission Oil Pump Screen.*** a. Place new gasket on screen assembly next to plug head.

b. Insert screen in sump case. Tighten plug head 30 to 50 inch-pounds. Lockwire to adjacent sump plug.

7-65. Transmission Magnetic Sump Plug. A plug with a magnetic insert located in lower right side of sump case, provides means of inspection for metal particles in transmission oil. This plug is not normally used to drain oil from sump, and is self-closing by means of a spring-loaded valve which seats when magnetic insert is removed.

7-66. Removal — Transmission Magnetic Sump Plug. Cut lockwire from head of small plug which is threaded into a larger plug below raised identification legend on sump. Unscrew and remove smaller plug only.

7-67. Inspection — Transmission Magnetic Sump Plug. a. Check for accumulated metal particles on magnet end, as indication of possible excessive wear or parts failure in transmission. If such particles are present, further investigation may be indicated to determine need for replacement or corrective action.

Note

Refer to paragraph 7-4 and 7-5 for additional information.

b. Inspect O-ring for damage or distortion.

c. Inspect threads on plug for damage.

7-68. Repair or Replacement — Transmission Magnetic Sump Plug. a. Replace O-ring on magnetic insert if damaged or distorted.

b. Replace sump plug if threads are damaged.

7-69. Installation — Transmission Magnetic Sump Plug. a. Reinstall magnetic insert in sump plug.

b. Tighten to 30 to 50 inch-pounds and lockwire to sump plug.

7-70. Chip Detector. UH-1B helicopters Serial 65-9416 and subsequent, are equipped with chip detectors located in the transmission sump, 42° gear box and the 90° gear box. Each chip detector consist of a single pole of a permanent magnet. These units are connected to the caution panel segment through a three position selector switch. Moving the switch to the desired position illuminates the caution panel segment if sufficient metal chip have been attracted to the magnetic pole of the chip detector to complete the circuit between the pole and ground.

Note

Magnetic plug on earlier helicopters can be replaced with chip detector. When such replacement is made, chip detector will not be connected to pedestal caution panel.

7-71. Transmission Oil Level Sight Gages. Visual indication of oil level in transmission is provided by two small transparent plastic plugs set into right side of sump case, backed by indicator discs with FULL and LOW markings.

7-72. Removal — Transmission Oil Level Sight Gage. a. Drain oil below gage level.

b. Remove spiral retaining ring, sight glass, O-ring, and indicator disc.

7-73. Inspection Oil Level Sight Gage. a. Check sight gage plastic plugs for oil stain internally, cracks or excessive scratches.

b. Inspect O-ring for damage, deterioration or distortion.

c. Check sight gage for correct indication of fluid level.

7-74. Repair or Replacement — Transmission Oil Level Sight Gages. a. Replace sight glass if badly oil stained, cracked, excessively scratched or if giving erroneous indication of proper oil level.

b. Replace O-ring if damaged, deteriorated or distorted.

7-75. Installation — Transmission Oil Level Sight Gage. a. Insert correctly marked indicator disc in port, with indexing tab in notch of inner lip. Install new O-ring in groove around sight glass. Insert glass with flat side out. Install retaining ring.

b. Fill sump with oil. Check for leaks.

B 7-76. Transmission Oil Cooler Installation. (See figure 7-12.) Oil cooler installation in transmission oil systetm, on UH-1B helicopters, consists of a radiator-type cooler connected through a thermal bypass valve into the external line which delivers oil under pressure from transmission sump case outlet to oil manifold on main case. Cooler is mounted beside engine oil cooler, in bulkhead between cargo-sling well and main fuselage compartment. Thermal bypass valve, which directs oil flow past cooler during warm-up or through cooler during normal operation, is mounted to brackets on right side of a turbo blower which is driven by engine compressor bleed air and provides air flow through both oil coolers. A cooler drain line with manual valve is provided. A second oil filter, externally mounted on transmission ahead of oil manifold, is used with this oil system.

B ***7-77. Removal – Transmission Oil Cooler and Valve.*** (See figure 7-12.) a. Open door at right side of main fuselage compartment for access.

b. Place suitable container under transmission cooler drain line at left underside of fuselage. Operate valve, in bottom of fuselage compartment, to drain trapped oil from cooler.

Note

> Because thermal valve will remain closed, lines above valve will contain trapped oil after draining cooler. Also, cooler may not be fully drained until connecting lines are opened. Take precautions to dispose of trapped oil when disconnecting lines.

c. Disconnect oil tubes from transmission oil cooler and bypass valve. Cap open lines and fittings.

d. Remove two bolts with nuts and washers and remove screw with nut and washer from clamp to detach bypass valve body from bracket. Remove valve assembly.

e. Remove turbo blower and duct of engine oil cooler installation.

f. Remove two pairs of bolts which secure transmission oil cooler to engine oil cooler at top and bottom flanges.

g. Enter cargo-sling well to remove four bolts with washers which secure transmission oil cooler to right side flange of bulkhead opening. Tilt cooler aft and remove from bulkhead.

7-78. Cleaning — Transmission Oil Cooler and Valve. Clean air passages of oil cooler core, removing duct as necessary, in accordance with inspection requirements or as frequently as operating conditions warrant.

7-79. Inspection — Transmission Oil Cooler and Valve. a. Inspect lines, fittings and gaskets for damage and serviceability.

b. Inspect support for damage.

c. Inspect oil cooler and thermal valve for damage or malfunction.

d. Inspect air passages of oil cooler core for cleanliness or clogging.

B ***7-80. Repair or Replacement — Transmission Oil Cooler and Valve.*** a. Replace unserviceable lines, fittings, gaskets, or support if damaged or unserviceable.

b. Replace oil cooler or thermal valve as assemblies for damage or malfunction.

Note

> In event of transmission internal failure, replace cooler and flush out all connecting lines and fittings thoroughly, using solvent, (item 302, table 1-1). Dry with filtered compressed air.

c. Replace unions, elbow and reducer connected to the valve body and the O-ring packing at the elbow connected to the bottom of the oil cooler.

B ***7-81. Installation — Transmission Oil Cooler and Valve.*** (See figure 7-12.) Install transmission oil cooler and valve as follows:

Note

> When reinstalling the transmission oil cooler and valve, replace the unions, elbow and reducer connected to the valve body, as well as the O-ring packing which acts as a seal at the elbow connected to the bottom of the oil cooler. (Refer to paragraph 7-80.)

a. Install fittings on oil cooler.

(1) Assemble gasket, flange, and elbow pointing aft on inlet at upper right side of cooler, secured by nuts and washers on four studs.

(2) Assemble gasket, flange, and elbow pointing up and aft on outlet at lower right side of cooler in same manner.

(3) Install elbow, with nut and packing, in drain port at bottom of cooler with elbow pointing to right.

b. Position cooler in bulkhead opening from aft side. Secure to engine oil cooler with two pairs of bolts, nuts and washers at top and bottom of mating flanges.

c. Install four bolts, with thin washers under heads, through slotted holes of forward cooler flange in plate-nuts of bulkhead flange.

d. Reinstall turbo blower and duct.

e. Check installation of thermal valve support bracket (30) on bolts through flanges of cooling fan at upper right side.

f. Install thermal valve assembly (29) and connect oil lines as follows:

(1) Position valve assembly (29) with valve at bottom and flat side of valve body against support bracket (30).

(2) Install two bolts from right-hand side through support bracket (30) and valve body. Use thin aluminum alloy washers next to valve body on each side. Loosely install nuts.

Note

Elongated mounting holes in support bracket (30) permit slight movement of the valve assembly (29) to facilitate connection of oil lines.

(3) Install oil line between cooler outlet elbow and lower fitting on front of valve assembly (29).

(4) Install oil line between upper fitting on front of valve assembly and inlet elbow on top, right-hand side of oil cooler (32).

(5) Position clamp (34) on inlet fitting at top of valve assembly (29).

(6) Install oil line between deck fitting at left forward corner of compartment above oil cooler (32) and inlet fitting on top of valve assembly (29).

(7) Connect oil line extending through bulkhead at right of oil cooler (32) to outlet elbow on aft side of valve assembly (29).

(8) Tighten bolt, washers, nut combination securing valve assembly (29) to support bracket (30).

(9) Position valve assembly stiffener bracket (35) between clamp (34) and cooling fan with elongated hole in bracket positioned to clamp. Attach bracket to cooling fan with existing hardware. Attach stiffener bracket (35) to clamp (34) with screw, washer and nut.

Note

Elongated holes in thermal valve support bracket (30) and valve assembly stiffener bracket (35) permit necessary adjustment to insure a non-stressed positioning of parts.

g. During first ground run after installing cooler, check for oil leaks and for need to add oil because of filling empty lines and cooler.

Caution

Cooler and long vertical connecting lines should be filled with oil to extent possible during reinstallation. Shut down and check oil after short period of operation, to avoid possibility of sump oil supply being taken into an unfilled external system.

7-82. Main Rotor Mast. (See figure 7-13). The main rotor mast assembly is a tubular steel shaft fitted with two bearings, which support it vertically in the transmission. Mast driving splines are engaged with transmission upper stage planetary gear providing counterclockwise rotation as viewed from above. Splines on upper portion of mast provide mounting for main rotor and control assemblies.

7-83. Removal — Main Rotor Mast Assembly. a. Open right and left forward cowl sections to latched positions above cabin roof.

b. Erect maintenance hoist on left side of service deck, with legs secured by pins through deck fittings.

A (1) On UH-1A, use T101399, T101410, T-101411 or T101412 hoist.

B (2) On UH-1B, use T101411 hoist.

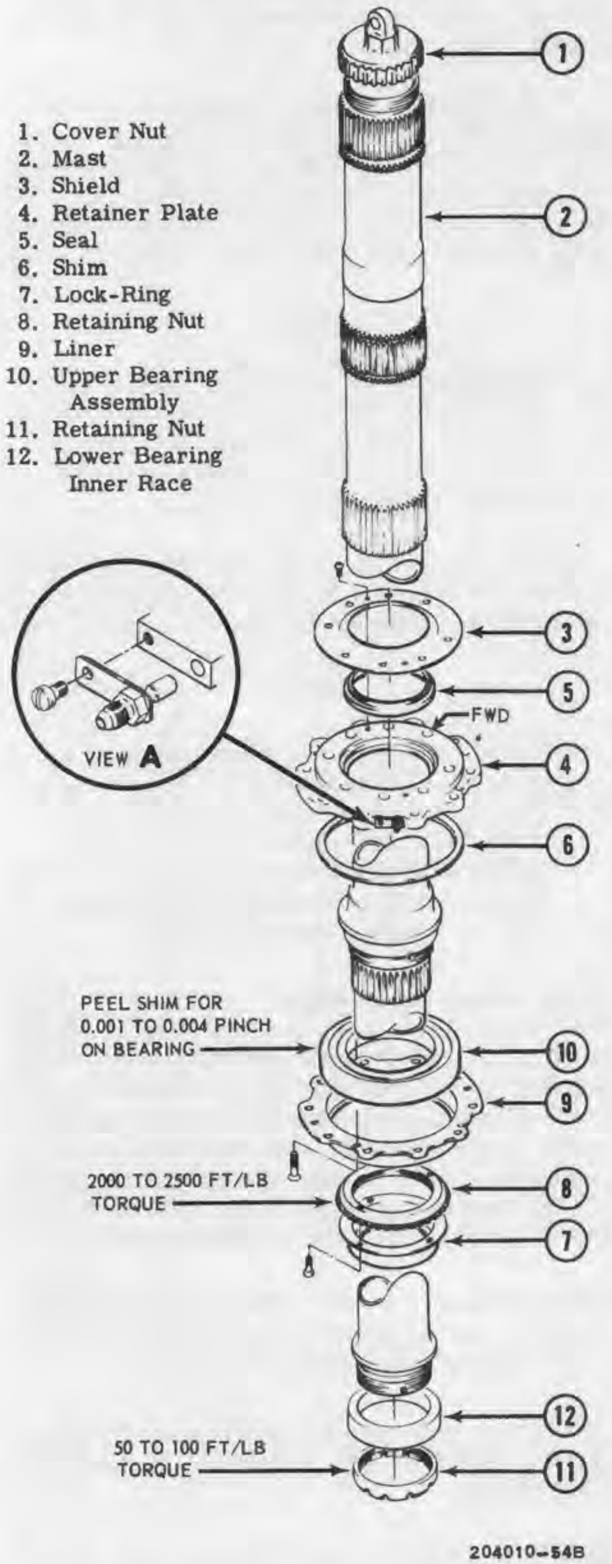

Figure 7-13. Disassembled view of mast assembly (UH-1B serial no. 63-8500 and subsequent)

c. Remove UH-1A dynamic components as follows:

(1) Stabilizer bar assembly (refer to paragraph 8-22).

(2) Main rotor hub and blade assembly (refer to paragraph 8-6).

(3) Stabilizer bar dampers (refer to paragraph 8-28).

(4) Swashplate and support assembly (refer to paragraph 8-35).

d. Remove UH-1B, Serial No. 60-3546 through 64-14100 dynamic components as follows:

(1) Stabilizer bar (refer to paragraph 8-69).

(2) Main rotor hub and blade assembly (refer to paragraph 8-51).

(3) Stabilizer bar dampers (refer to paragraph 8-74).

(4) Swashplate and support assembly (refer to paragraph 8-81).

e. Remove UH-1B, Serial No. 64-14101 and subsequent (540 rotor) dynamic components as follows:

(1) Stabilizer bar (refer to paragraph 8-106).

(2) Main rotor hub and blade assembly (refer to paragraph 8-97).

(3) Dynamic stops (refer to paragraph 8-111).

(4) Stabilizer bar dampers (refer to paragraph 8-116).

(5) Scissors and sleeve assembly and friction collet (refer to paragraph 8-120).

(6) Swashplate and support assembly (refer to paragraph 8-123).

f. Reinstall nut on top on mast, and attach hoist.

g. Remove nuts and washers which secure mast upper bearing retaining plate on 10 studs of transmission top case.

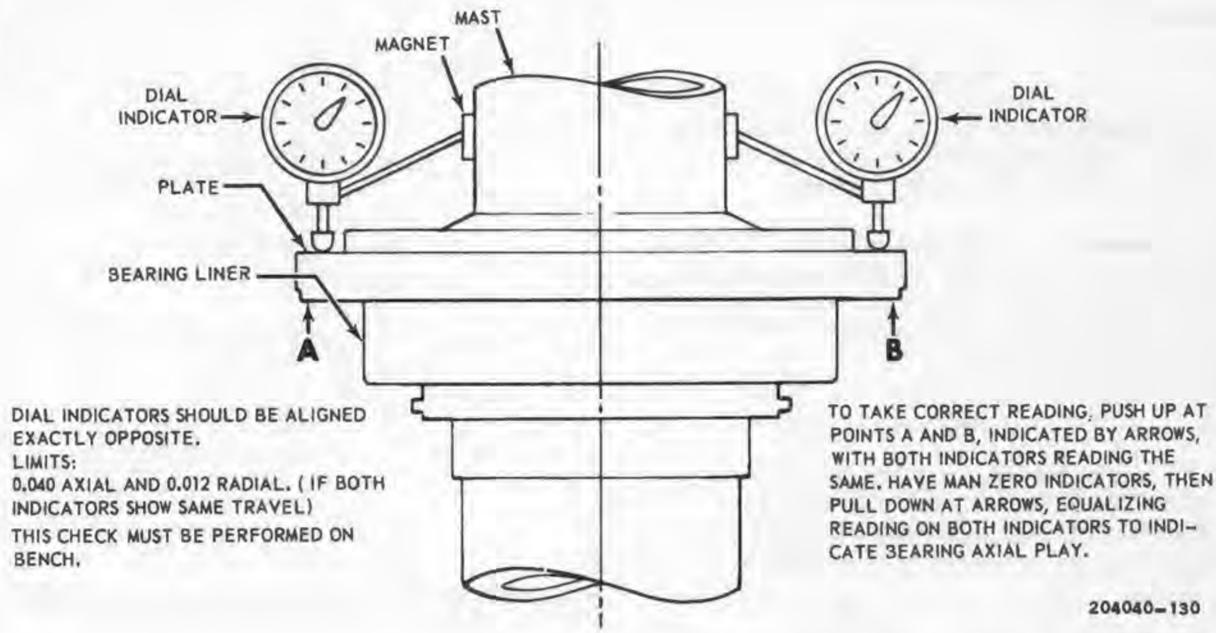

Figure 7-14. Mast bearing axial play check

Note

All ships that have completed MWO 55-1520-211-34/25 and UH-1B ships No. 63-8500 and subsequent must disconnect oil line from pressure manifold to No. 8 jet before lifting mast from transmission.

h. Lift and guide mast carefully out of transmission. Immediately install a cover on top of transmission.

i. Place mast assembly in suitable stand.

7-84. Checking — Upper Bearing On Mast Assembly. With mast assembly removed from transmission and set up on a bench or suitable support, the upper bearing should be checked for axial and radial play within tolerances and by methods stated below. No deviation is permissible from these tolerances on an installed bearing.

a. Determine part number of bearing from maintenance records.

b. Measure total axial play of bearing by using two suitable dial indicators. To make this measurement accurately, at least two persons are required.

(1) Set up two dial indicators in contact with flange of bearing retainer plate 180 degrees apart on mounting hole circle. (See figure 7-14.)

(2) Apply pressure in one direction parallel to mast at both indicator locations on retainer plate, keeping indicator readings equal. While holding equal pressure, zero indicators.

(3) Apply pressure in opposite direction keeping indicators equal.

(4) Record total indicated axial play, which shall not exceed 0.026 inch if mast is equipped with 204-040-136-5 bearing or 0.040 inch with -7 bearing.

c. Measure radial play by using one dial indicator. Maximum allowable is 0.008 inch for 204-040-136-5 bearing or 0.012 for -7 bearing.

7-85. *Cleaning — Mast Assembly.* Wash all parts of mast assembly with cloth moistened in dry cleaning solvent (item 302, table 1-1). Do not allow solvent to contact seal. Dry with filtered compressed air.

Note

Use sharp edged plastic tool to scrape the pro-seal from retainer plate (4, figure 7-13). Do not scratch plate.

7-86. *Inspection — Mast Assembly* a. Visually inspect mast for wear or damage and condition of bearings. Inspect retainer plate for corrosion in area of seal seat. Any pitting corrosion is reason for replacement.

Note

All ships that have completed MWO 55-1520-211-34/25 and UH-1B ships No. 63-8500 and subsequent, inspect oil jet and oil passage of the retainer plate.

b. Inspect mast parts for circumferential and transverse scratches, with particular attention to mast radius just above upper bearing assembly and to tapered section between thrust bearing and lower bearing inner race. Scratches exceeding 0.010 depth will require replacement of the assembly.

7-86A. *Inspection — Sleeve Assembly (UH-1B Serial No. 64-14101 and subsequent).* a. Remove safetywire securing boot above collective sleeve friction assembly. Slide boot up mast to clear work area.

b. Disconnect collective system boost cylinder to collective lever push-pull tube. Move collective levers to expose sleeve.

c. Use soft carbon pencil to lay out reference marks 90° apart, four places, along entire length of sleeve.

d. Use standard three to four inch micrometer to check sleeve for taper and out-of-round over full length using reference marks. Maximum allowable taper or out-of-round is 0.007 inch in areas shown on figure 7-14A.

7-86B. *Repair or Replacement — Sleeve Assembly (UH-1B Serial No. 64-14101 and subsequent).* If allowable tolerances permitted in paragraph 7-86A are exceeded, replace mast assembly.

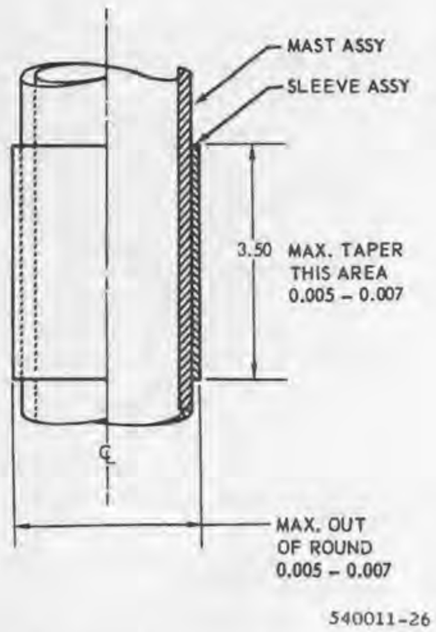

Figure 7-14A. Sleeve assembly inspection criteria

7-87. *Repair or Replacement — Mast Assembly.* a. Dress splines with fine India stone, if necessary to blend out burrs, small nicks or scratches.

b. Polish out scratches, not exceeding 0.010 inch depth, with crocus cloth (item 401 table 1-1), blending repair area with surrounding area.

c. On areas above bearing, apply spray coat of zinc chromate primer (item 119, table 1-1) to repair area, followed by a thin coat of aluminum lacquer.

d. Replace all unserviceable parts.

e. Keep parts of upper bearing in matched set by serial number etched on outer race and on both halves of inner race. Lower bearing is not serialized and parts may be interchanged between sets.

7-88. *Lubrication—Mast Assembly.* Lubricate all bearings and surfaces of mating parts on reassembly with oil (item 2, table 1-1). Use corrosion preventive compound (item 315, table 1-1) on mating threads of dissimiliar metals.

7-89. Installation — Mast Assembly. (See figure 7-15.) a. Prior to installing mast assembly into the transmission, a dimensional check between the upper surface of the case and the upper surface of the adapter shall be performed. Dimensions must conform to dimensions shown in figure 7-16 to preclude the possibility of damage to the planetary assemblies during mast installation.

b. Perform dimensional check by placing a straight edge, such as a 12 inch scale, across the opening in the top case. Measure from the bottom surface of the straight edge to top surface of the adapter. (See figure 7-16.)

c. If dimensions are less than those specified, (2.677 minimum for UH-1A and 2.570 inch minimum for UH-1B), examine upper lower sun gear in planetary assemblies to determine if the tangs of the planetary support liner are disengaged from mating slots in liner.

d. If the tangs are disengaged, a gap between these two items of approximately 3/16 inch will exist. If gap exists, re-index these two liners by inserting the hands into adapter, palms outboard, lift the adapter slightly and rotate until the liners are correctly indexed.

Warning

Exercise caution during re-indexing to prevent injury to finger tips.

e. Check that mast is clean and that bearing assemblies are serviceable and properly secured.

f. Install nut on top of mast and attach hoist.

g. Uncover opening at top of transmission.

h. Lift mast to position directly over transmission opening. Lower carefully, guiding lower end into bearing. Turn upper bearing retaining plate, before engaging on studs and dowels of transmission case, to correct position according to "FWD" arrow etched on plate.

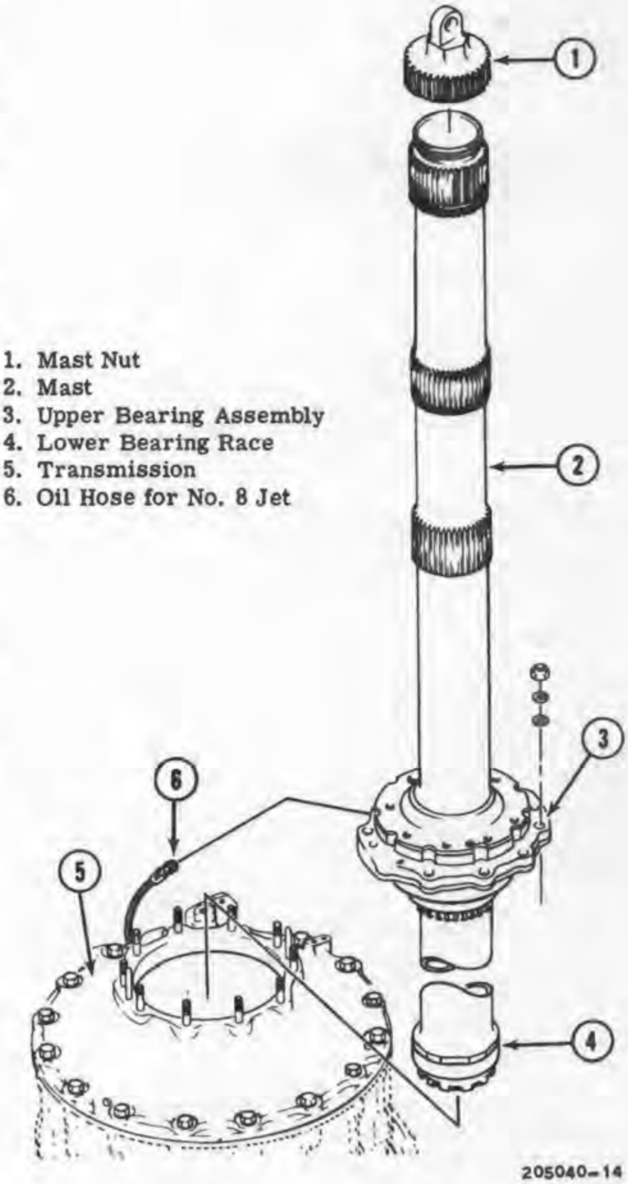

Figure 7-15. Mast assembly (UH-1B Serial No. 63-8500 thru 64-14100)

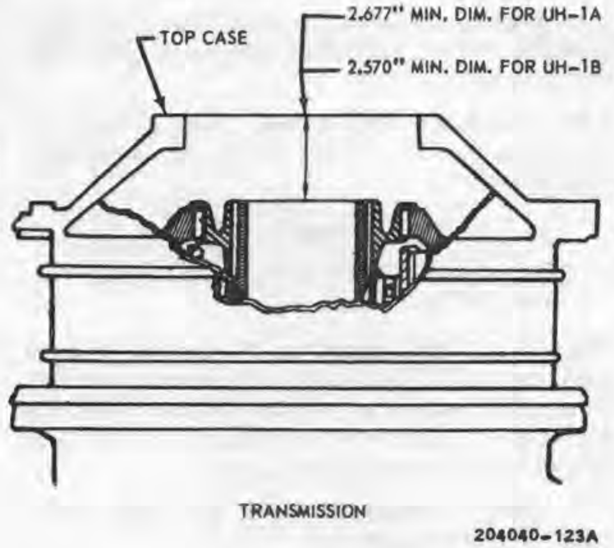

Figure 7-16. Seating of upper planetary assemblies

i. Install a thin aluminum alloy washer, a thin steel washer, and nut on each of ten studs. Tighten nuts evenly.

Note

> All ships that have completed MWO 55-1520-211-34/25 and UH-1B ships No. 63-8500 and subsequent, attach oil line from pressure manifold to No. 8 jet.

j. After completion of the mast installation, the transmission should be rotated by hand to make sure that there is no binding or unusual noise.

7-90. Packaging Mast Assembly for Storage or Shipping. a. Clean and dry mast assembly in accordance with MIL-P-116.

b. Apply corrosion-preventive compound (item 315, table 1-1), to all exposed exterior steel surfaces.

c. Apply a coat of oil, (item 17, table 1-1) to interior surface of mast.

d. Wrap assembly in grease proof barrier material, (item 506, table 1-1) and secure with pressure-sensitive tape (item 402, table 1-1). Shape wrapper to contour of assembly.

e. Place wrapped assembly in metal container, and align to fit bottom contoured cushion.

f. Place 15 eight-unit bags and one four-unit bag (total 124 units) of desiccant, (item 316, table 1-1) in container.

g. Attach top half of container in place, aligning top contoured cushion with mast assembly.

h. Bolt top securely so as to obtain a moisture vapor proof closure.

7-91. Input Drive Quill. (See figure 7-17.) An input drive quill equipped with a freewheel coupling is located on aft side of transmission main case section. Engine torque is transmitted through main drive shaft to this input quill, which drives transmission gear trains. Freewheel clutch in drive quill coupling operates automatically, engaging to allow engine to drive rotor or disengaging the idling engine during autorotational descent.

7-92. Removal — Input Drive Quill. (See figure 7-17.) a. Open forward cowling at left side of transmission. Remove access sections at upper left side of air intake baffle and screen.

b. Remove main drive shaft. (Refer to paragraph 7-8.)

c. Remove nuts and washers from mounting studs around flange of input drive quill.

d. Pull input drive quill from transmission case, using T101308 jackscrews as necessary through three tapped holes in mounting flange.

Note

> After removing quill, secure seal housing ring to mounting flange to avoid damage in handling. On quills supplied as spares, three short screws are installed in jackscrew holes for this purpose.

B e. On UH-1B, remove oil tube installed at lower left of input drive mounting port to connect internal passages in quill flange and in main case.

7-93. Inspection — Input Drive Quill. a. Inspect O-ring packings on drive quill sleeve and oil tube for leakage, damage and serviceability.

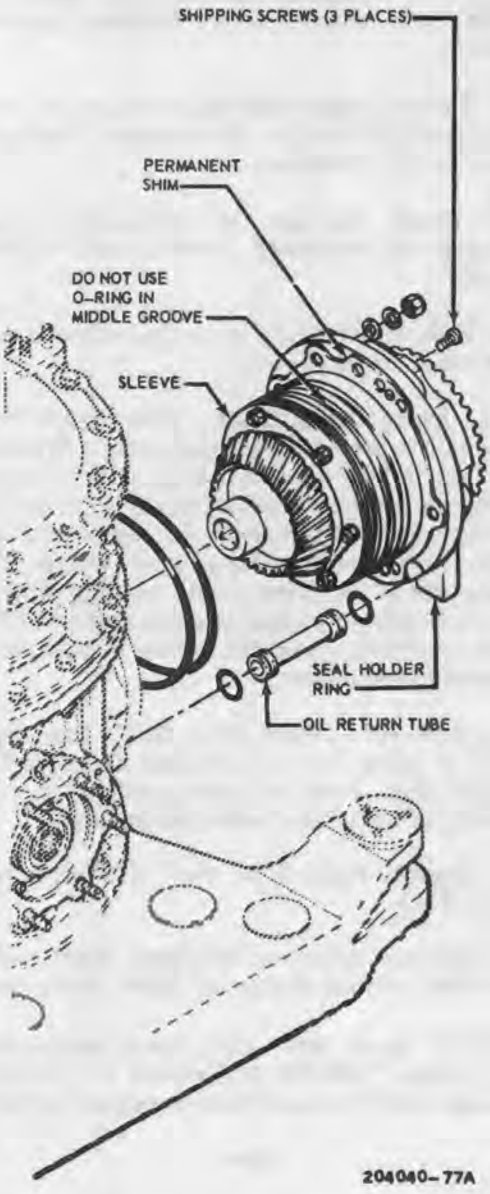

Figure 7-17. Typical input drive quill (UH-1B shown)

b. Inspect quill assembly for excessive wear, chipped teeth or corrosion.

7-94. Repair or Replacement – Input Drive Quill. a. Replace O-ring packings on drive quill sleeve as necessary to prevent oil leakage. On UH-1B, also replace O-ring packings as necessary on oil tube.

b. Replace input drive quill as a complete assembly when quill does not meet inspection requirements.

7-95. Installation – Input Drive Quill. a. Uncover mounting port on aft side of transmission main case section.

Note

Be sure that mating surfaces of case and quill are clean.

B b. On UH-1B, install an O-ring packing on each end of oil tube, and one in each of the two outside external grooves on the sleeve. Insert end of tube into main case at lower left side of input drive mounting pad.

c. Remove generator and generator drive quill. (Refer to paragraph 7-97.)

d. Cut a rubber plug slightly larger than the diameter of the roller bearing inner race on the inboard end of the input pinion. Insert a 3/32 inch cotter pin through center of rubber plug and through a washer. Bend legs of cotter pin back against washer and plug. Attach a piece of light chain, or 1/8 inch nylon cord, approximately two feet long, to the eye of the cotter pin.

e. Position the rubber plug in the roller bearing, from the inside of the transmission, in such a manner that the rollers are held out against the outer bearing outer race. Chain, or nylon cord, to extend outside transmission through generator quill port.

Note

When inserting input drive quill exercise care to engage gear teeth properly to avoid damage.

f. Heat the main case at the input drive quill mounting port with a heat lamp until quill can be installed.

g. Exercise care to engage gear teeth and to align nose of pinion into roller bearings as quill is installed.

Note

Do not tap on freewheeling race.

h. Insert input drive quill into mounting port and remove rubber plug through generator drive quill mounting port. On UH-1B, carefully insert end of oil tube into mating hole of seal ring while guiding mounting studs through sleeve flange.

i. Install washers and nuts on mounting studs and tighten evenly. Use thin aluminum washer next to seal ring flange, and standard steel washer next to each stud.

Note

Check for backlash between mating teeth by slight back and forth movement of quill coupling until metal to metal contact is felt and heard. Backlash must be evident.

j. Install generator drive quill and generator. (Refer to paragraph 7-100.)

B k. On UH-1B, fill cavity between oil tube and case with suitable putty to prevent possible trapping of water and dirt.

7-96. Generator Drive Quill. Drive quill for 28 volt DC electrical system generator is located on left side of transmission main case. (See figure 7-8.) This quill is driven from input bevel gear train, at same speed as input to transmission.

7-97. Removal — Generator Drive Quill. a. Open cowling at left side of transmission.

b. Remove generator.

c. Remove lockwire and six bolts, with washers, around flange of drive quill sleeve. Use three T100929 jacking screws through tapped holes of flange to pull drive quill from transmission case port. Cover port immediately.

7-98. Inspection — Generator Drive Quill. a. Inspect O-ring packing for damage and serviceability.

b. Inspect quill for damage, chipped teeth, or corrosion.

7-99. Repair or Replacement — Generator Drive Quill. a. Replace O-ring packing on quill sleeve if damaged or unserviceable.

b. Replace drive quill as a complete assembly when quill does not meet inspection requirements.

7-100. Installation—Generator Drive Quill. a. Install O-ring packing in groove around quill sleeve.

Note

When inserting generator drive quill exercise care to engage gear teeth properly to avoid damage.

b. Uncover mounting port at left-hand side of transmission main case. Heat main case at mounting port for generator drive quill with a heat lamp until drive quill can be installed. Insert generator drive quill, and secure with six bolts through sleeve flange into threaded inserts of case. Use thin aluminum washer next to flange, and standard steel washer next to each bolt head.

Note

Check for backlash between mating teeth by slight back and forth movement of quill coupling until metal to metal contact is felt and heard. Backlash must be evident.

c. Install generator.

7-101. Hydraulic Pump and Tachometer Drive Quill. (See figure 7-8.) This drive quill is located on right side of transmission sump case and is driven by an accessory gear train. On UH-1A and UH-1B (Serial No. 60-3546 through 64-14100) helicopters the gear shaft of this quill directly drives the single hydraulic system pump. It also drives the rotor tachometer generator by means of a chain-and-sprocket offset drive. The quill used on UH-1B helicopters Serial No. 64-14101 and subsequent is also located on the right side of transmission sump case and is driven by an accessory gear train. The gear shaft of this drive quill activates a gear train, rather than a chain-and-sprocket type drive. The gear train drives the two hydraulic system pumps used on these helicopters as well as the rotor tachometer generator.

7-102. Removal — Hydraulic Pump and Tachometer Drive Quill. a. Open cowling at right side of transmission.

b. Remove rotor tachometer generator by disconnecting electrical connector and removing nuts and washers from four mounting studs.

c. Detach hydraulic pump, or pumps, from four mounting studs by removing nuts and washers. Leave hoses connected, except seal drain hose at lower side next to mounting flange. Stow pump, or pumps, on service deck.

Caution

Do not kink hoses.

d. Remove nuts and washers from two remaining studs through flange of drive quill. Use T101308 jackscrews to pull quill from transmission. Cover case port immediately.

7-103. ***Inspection — Hydraulic Pump and Tachometer Drive Quill.*** a. Inspect O-ring packing on drive quill sleeve for damage and leakage.

b. Inspect case for cracks, leaks and damage, teeth for excessive wear chipping and corrosion.

7-104. ***Repair or Replacement — Hydraulic Pump and Tachometer Drive Quill.*** a. Replace O-ring packing on drive quill sleeve when necessary to prevent oil leakage.

b. Replace drive quill as a complete assembly when quill does not meet inspection requirements.

7-105. ***Installation — Hydraulic Pump and Tachometer Drive Quill.*** a. Install O-ring packing in groove around quill sleeve.

Note

When inserting drive quill exercise care to engage gear teeth properly to avoid damage.

b. Uncover mounting pad at right-hand side of transmission sump case. Heat sump case at drive quill mounting pad with a heat lamp until drive quill can be installed. Insert drive quill, engaging studs through mounting flange.

c. Install washers and nuts on two shortest studs, at top and bottom of drive quill flange. Use thin aluminum washer next to flange, and standard steel washer next to each nut. Tighten nuts evenly.

Note

Check backlash between mating teeth by slight back and forth movement of quill coupling until metal to metal contact is felt and heard. Backlash must be evident.

d. Install hydraulic pump, or pumps, on studs, engaging pump shaft in drive quill. Secure with nuts and washers. Connect hydraulic hoses as required.

e. Install rotor tachometer generator, with electrical connector 45 degrees up, secured by nuts and washers on four studs. Connect and lockwire electrical cable connector.

7-106. Tail Rotor Drive Quill. Tail rotor drive shaft is driven from a transmission output quill located in aft side of sump case. (See figure 7-8.) This quill is driven by an accessory gear train, and is provided with a flexible splined coupling.

7-107. ***Removal — Tail Rotor Drive Quill.*** a. Open cowling at either side of transmission.

b. Remove forward section of tail rotor drive shaft. (Refer to paragraph 7-113.)

c. Drain oil as necessary to level below quill mounting port.

d. Remove nuts, washers, and spacers from six mounting studs around quill flange. Use T100929 jackscrews through three tapped holes in flange to pull drive quill from sump case. Cover port immediately.

7-108. ***Inspection — Tail Rotor Drive Quill.*** a. Inspect O-ring packing for damage and serviceability.

b. Inspect quill for damage, cracks, or corrosion.

c. Check for excessively worn or chipped teeth.

7-109. ***Replacement — Tail Rotor Drive Quill.*** a. Replace O-ring on drive quill sleeve as necessary to prevent oil leakage.

b. Replace tail rotor drive quill as a complete assembly when quill does not meet inspection requirements.

7-110. ***Lubrication — Tail Rotor Drive Quill Coupling.*** Internal splines of coupling on tail rotor drive quill are packed with grease during assembly. If need occurs between normal overhaul periods, coupling splines can be repacked as described below. This procedure can be accomplished with drive quill in place on transmission, with drive shaft dsconnected.

a. Remove spiral lock-ring from coupling, while holding seal plate against spring pressure.

b. Remove seal plate and spring.

c. Hold coupling at full outward position. Remove all old grease and clean coupling splines thoroughly.

Note

If solvent is used for cleaning make sure that couplings are thoroughly dry before repacking.

d. Hand pack grease to 0.12 inch deep over top of internal spline teeth. Use lubricant, (item 9, table 1-1.)

e. Keeping coupling at full outward position, reinstall springs, seal plate, and spiral lock-ring.

7-111. ***Installation — Tail Rotor Drive Quill.*** a. Install O-ring packing in groove around quill sleeve.

b. Uncover mounting port on aft side of transmission sump case.

Note

When inserting tail rotor drive quill exercise care to engage gear teeth properly to avoid damage.

c. Heat sump case at tail rotor drive quill mounting port with a heat lamp until drive quill can be installed. Insert tail rotor drive quill into case and engage studs through mounting flange. Assemble thin aluminum washer, spacer, thin steel washer and nut on each of six studs. Tighten nuts evenly.

Note

Check for backlash between mating teeth by slight back and forth movement of quill coupling until metal tc metal contact is felt and heard. Backlash must be evident.

d. Install forward section of tail rotor drive shaft, secured by clamps to couplings of drive quill and first bearing hanger. (Refer to paragraph 7-117.)

e. Fill sump to proper level. Close cowling.

Section V — Tail Rotor Drive Shaft

7-112. Tail Rotor Drive Shafts. (See figure 7-1.) Five identical drive shaft sections are incorporated in power train between transmission tail rotor drive quill, three bearing hanger assemblies and an intermediate gear box on tail boom, and a tail rotor gear box on the vertical fin. Each shaft section is an anodized aluminum alloy tube with a curvic coupling riveted to each end, and is statically balanced by metal strips bonded near middle on tube surface, with an identification plate showing part and serial numbers. Forward shaft section extends through a tunnel between engine firewalls, with ends connected by V-band clamps to mating curvic couplings on transmission tail rotor drive quill and on forward bearing hanger. Other shaft sections are mounted in similar manner along tail boom and vertical fin between hangers and gear boxes.

7-113. Removal — Tail Rotor Drive Shafts. a. Open hinged access doors along top of tail boom and vertical fin by releasing fasteners on left side. Also remove tailpipe fairing, and vented cover over intermediate gear box, as necessary.

b. Remove clamp set from coupling at each end of shaft. Push shaft against flexible coupling to disengage opposite end, and lift out shaft. Remove other shafts aft of forward bearing hanger in same manner.

Caution

Clamp set should be removed from both ends of shaft before removing either end of shaft from its mating curvic coupling to avoid coupling tooth or bearing damage.

c. To remove forward shaft, also open cowling at either side of transmission to remove clamp set from tail rotor drive quill coupling. With tailpipe fairing removed and shaft disconnected from forward hanger coupling, disengage and remove shaft carefully rearward and to right through firewall tunnel.

7-114. Cleaning — Tail Rotor Drive Shafts. Clean all shaft surfaces with dry cleaning solvent (item 302, table 1-1) with care to avoid marring anodized surfaces.

7-115. Inspection — Tail Rotor Drive Shafts. a. Replace shaft for any of the following conditions:

(1) Any crack.

(2) Any sign of rivet failure.

(3) Total indicated run-out, using dial indicator and V-blocks, in excess of 0.050 inch at any area on shaft. No straightening procedures are prescribed.

(4) Loss or partial detachment of balance strips which are bonded on tube near center.

Note

Do not mistake a single empty imprint, in bonding material next to balance strip, as an indication of a missing balance strip. This spot results from removal of a test coupon to inspect for bonding voids.

(5) Damaged or excessively worn coupling splines. There should be no radial play or backlash when shaft coupling is meshed with mating coupling and manually checked.

(6) Grooves worn by V-band clamp on shaft coupling to extent that such wear prevents proper clamping.

(7) Surface damage of shaft tube exceeding limits in b. below.

b. Classify surface damage on shaft tube as acceptable, repairable, or excessive by following limits. Define "Area A" as central portion of shaft, and "Area B" as portions within 14 inches of ends. (See figure 7-18.)

(1) Any damage to anodized finish requires anti-corrosion treatment in accordance with TM 55-405-4.

(2) Nicks or scratches aligned within 15 degrees of spanwise axis are acceptable without repair to maximum depth of 0.002 inch in "Area A" or 0.004 inch in "Area B."

(3) Other nicks or scratches must be polished out with fine abrasive cloth, provided depth of material removed does not exceed 0.008 inch in "Area A" or 0.012 inch in "Area B."

Note

Shaft must be checked for balance if total worked surface area of one side exceeds eight square inches, when compared with other side.

(4) Sharp dents are permissible to maximum depth of 0.010 inch in "Area A" and 0.015 inch in "Area B."

(5) Nonsharp dents are permissible to maximum depth of 0.020 inch in "Area A" and 0.030 inch in "Area B."

Note

All dents should be carefully inspected for cracks, nicks, and scratches. No cracks permitted. Nicks or scratches shall be within limits. Total depth of defect shall not exceed limits for dents.

7-116. ***Repair or Replacement — Tail Rotor Drive Shafts.*** a. Replace shaft if dented or bent or failure to meet inspection requirements (Refer to paragraph 7-115).

b. Replace shaft for loss or partial detachment of balance strips which are bonded on tube near middle.

c. Replace shaft if damaged or excessively worn curvic coupling teeth are found.

d. Replace unserviceable clamp sets, bolts or nuts that fail to meet inspection requirements (refer to paragraph 7-115).

7-117. ***Installation — Tail Rotor Drive Shafts.*** a. Engage shaft couplings with mating and flexible couplings. Install clamp sets at each end, with nuts trailing direction of rotation, and with bolted joints indexed 90 degrees to those of adjacent clamps for balance in operation.

b. Tighten clamp bolts evenly. Use 20 to 25 inch-pounds torque for tee bolt type clamps, or 30 to 35 inch-pounds for through bolt type. Tap around outer surface to seat clamp and recheck torque.

c. Install tailpipe fairing or gear box cover as required. Close access doors and cowling.

7-118. Drive Shaft Hangers.

Three hanger assemblies connect and support tail rotor drive shafts along top of tail boom. Each assembly consists of couplings on a short, splined shaft, mounted through a single-row sealed ball bearing in a ring-shaped hanger equipped with two mounting lugs for attachment on a support fitting.

7-119. ***Removal — Drive Shaft Hangers.*** a. Open hinged access doors along top of tail boom by releasing fasteners on left side.

b. Remove tail rotor drive shafts from each side of hanger. (Refer to paragraph 7-113.)

c. Remove bolt, with nut and washers, at each side to detach any hanger assembly from its support fitting.

7-120. ***Cleaning — Drive Shaft Hangers.*** Clean exterior surfaces by wiping with cloth moistened with dry cleaning solvent, (item 302, table 1-1).

Caution

Do not permit solvents or dirt to be forced into bearing or flexible coupling by use of compressed air for drying or cleaning.

7-121. ***Inspection — Drive Shaft Hangers.*** a. Check hanger assemblies for excessive bearing wear, roughness or binding.

b. Inspect hanger ring and attachment lugs for cracks, elongated bolt holes, or other visible damage.

c. Inspect couplings for damage or excessive wear using same standards as for couplings on drive shaft. (Refer to paragraph 7-115.)

d. Inspect bearing seal for leakage.

e. Inspect hanger support fitting, in place on tail boom for security of attachment and evidence of cracks or other damage.

Caution

Do not attempt to remove or change shims under fittings.

7-122. *Lubrication — Drive Shaft Hanger Bearings*. Bearings may be lubricated in the field as follows:

Caution

The drive shaft hanger bearings are single row, double sealed ball bearings packed with grease by the bearing manufacturer. No attempt should be made to repack these sealed bearings.

Note

These instructions do not constitute, by defintion, a bearing repack.

Note

Prior to lubrication of bearing, drive train must be disconnected from each side of hanger assembly.

a. Wipe bearing seal area clean as possible using a clean dry cloth.

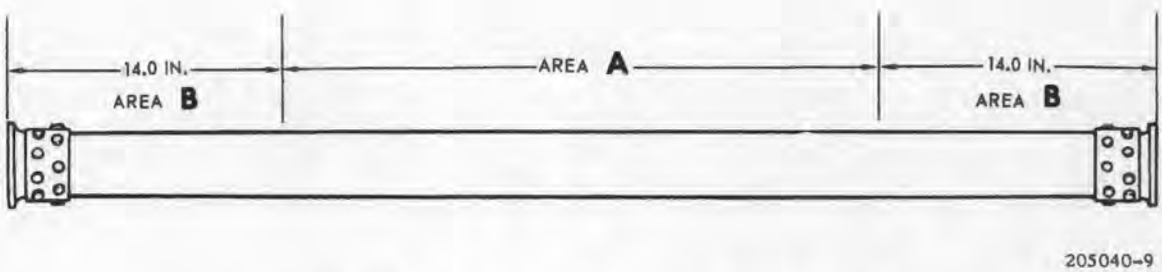

Figure 7-18. Tail rotor drive shaft inspection diagram

b. Using a hypodermic syringe (Leur Lok, manufactured by Becton, Dickinson Company, or equivalent) 10 cc capacity, fitted with a No. 16 gage needle, one and one-fourth long, filled with grease (item 8, table 1-1), carefully insert tapered portion of needle under lip of bearing seal.

Note

Avoid damage to bearing seal. Any damage to seal is cause for rejection of bearing.

c. Inject 2 cc's of grease at three locations, 120° apart.

d. Wipe off all excess grease.

Note

Lubricate as necessary as required by environmental conditions (100 to 300 hours).

7-123. Repair or Replacement — Drive Shaft Hangers. a. Replace hanger assemblies for excessive bearing wear, roughness or binding.

b. Replace hanger ring or attachment lugs if cracked, holes are elongated or other visible damage exists.

c. Replace couplings if they fail to meet inspection requirements. (Refer to paragraph 115.)

7-124. Installation — Drive Shaft Hangers. a. Position hanger assembly, with flexible coupling forward, on support fitting.

b. Install bolt at each side, with thin aluminum alloy washers next to hanger and fitting, and thin steel washers next to bolt head and nut. Tighten bolts evenly with 50 to 70 inch-pounds torque.

c. Install drive shafts. (Refer to paragraph 7-117.)

Section VI — Intermediate Gear Box

7-125. Intermediate Gear Box. An intermediate gear box is located on tail boom, at base of vertical fin. (See figure 7-1.) This gear box provides a 42 degree change in direction of tail rotor drive shaft, with no speed change. Gear box assembly consists of a case with a gear quill in each end. On UH-1A and UH-1B, Serial No. 60-3546 through 64-14191 helicopters, the case is fitted with an oil filler cap, a vent breather, an oil level sight gage and a drain plug equipped with a magnetic insert. On UH-1B, Serial No. 65-9416 and subsequent helicopters, a chip detector warning system, which activates a warning light on the pedestal caution panel when excessive contamination occurs is used in place of the magnetic plug. Input and output quills have flexible couplings for attachment of drive shafts. Access is provided by a vented cover with quick-release fasteners.

Note

Magnetic plug in earlier helicopters can be replaced with chip detector. When such replacement is made chip detector will not be connected to pedestal caution panel.

7-126. Removal — Intermediate Gear Box. a. When replacing any gear box, unless condition prevents operation, accomplish preservation before removal as follows: Drain oil and service gear box with corrosion-preventive oil, (item 10, table 1-1). Ground run at least ten minutes. Do not drain gear box.

b. Remove gear box cover and open tail rotor drive shaft access doors.

c. Disconnect shafts from gear box input and output couplings. (Refer to paragraph 7-113.)

Caution

To avoid damage to drive shaft hanger bearing or coupling either remove clamp set from both ends of drive shaft before removing either end of shaft from its mating curvic coupling, or support unattached end of shaft to hold shaft aligned on normal operating axis while gear box is removed.

d. Remove lockwire and four bolts, with washers, which secure gear box on tail boom. Lift off gear box assembly. DO NOT attempt to remove shims from mounting points.

e. Remove oil level sight gage retaining ring, glass, O-ring, and indicator disc as required to clean, inspect, or replace parts.

f. On UH-1B, Serial No. 65-9416 and subsequent helicopters, disconnect electrical wiring and remove chip detector.

7-127. *Cleaning — Intermediate Gear Box.* a. Clean removed parts and exterior of gear box assembly with dry cleaning solvent, (item 302, table 1-1).

Caution

Do not permit dirt or solvent to be forced into bearings or flexible couplings by use of compressed air.

b. Clean oil level sight glass.

7-128. *Inspection — Intermediate Gear Box.* a. Inspect gear box case for cracks, damage or leakage.

b. Inspect oil filler cap for damage and serviceability.

c. Check O-ring packings for leakage or damage, and vent breather and gasket for damage and serviceability.

d. Inspect sight gage for damage or stain.

e. Inspect magnetic insert for steel particles as indication of gear or bearing wear.

f. On UH-1B, Serial No. 65-9416 and subsequent helicopters, inspect chip detector for excessive accumulation of metal particles.

Note

Refer to paragraph 7-4 and 7-5 for additional information.

g. Check condition and security of shims at gear box location on tail boom just ahead of vertical fin.

Caution

Do NOT attempt to remove or change shims installed on tail boom under gear box, as any resulting misalignment could cause excessive stresses, vibration, wear, and possibly eventual failure of components in tail rotor drive train.

7-129. *Repair or Replacement — Intermediate Gear Box.* a. If cracks are suspected in the intermediate gear box case, replace the gear box.

b. Replace oil filler cap, O-ring packings, vent breather or gasket if damaged or unserviceable.

Note

Do not interchange filler caps of 42 degree gear box and 90 degree gear box.

(1) Secure chain of cap by safety pin through drilled hole in case rib at right of filler neck.

(2) Lockwire breather to drilled hole in case rib just ahead.

c. To replace other gear box fittings, drain oil by removing drain plug from right side of gear box.

d. Place O-rings on magnetic insert plug or chip detector and gasket on drain plug, as required. Install plug or chip detector.

e. When installed, lockwire magnetic plug to drain plug, and drain plug to head of right forward gear box attachment bolt.

f. Position sight gage indicator disc in port with indexing tab in notch of inner lip, place O-ring groove around glass, install glass with flat side out, and secure with spiral retaining ring.

7-130. *Lubrication — Intermediate Gear Box.* Fill gear box to sight gage level with oil, (refer to paragraph 1-80.) Splined couplings are lubricated at assembly with handpacked lubricant, (item 9, table 1-1), to 0.12 inch deep over internal spline teeth, in same manner as for tail rotor drive quill coupling. (Refer to paragraph 7-110.)

7-131. *Installation — Intermediate Gear Box.* a. Position intermediate gear box, with oil service fittings at right side, on tail boom shims.

b. Install four bolts through corners of gear box base into plate nuts in tail boom. Use thin aluminum alloy washers next to gear case and thin steel washers next to bolt heads. Tighten bolts evenly and lockwire in pairs at each side.

c. Install drive shafts. (Refer to paragraph 7-117.)

d. On UH-1B, Serial No. 65-9416 and subsequent helicopters, connect electrical wiring to chip detector.

e. Service gear box with oil.

7-132. ***Packaging Intermediate Gear Box.*** a. Clean and dry gear box in accordance with Specification MIL-P-116.

b. Flush gear box with corrosion-preventive compound, (item 10, table 1-1).

c. Wrap assembly in grease proof barrier material, (item 506, table 1-1), and secure with pressure-sensitive tape, (item 402, table 1-1). Shape wrapper to contour of gear box.

d. Place gear box in contoured bottom cushion of metal container.

e. Align top contoured cushion to fit gear box and lower in place in container.

f. Place 10 eight-unit bags (total 80 units) of desiccant, (item 316, table 1-1).

g. Install lid (with rubber gasket in place) on lower half of container.

h. Place locking ring on lip of container lid and secure with bolt and nut. Tighten nut sufficiently to insure a moisture-vapor proof closure.

Section VII — Tail Rotor Gear Box

7-133. Tail Rotor Gear Box. A gear box at top of tail boom vertical fin provides 90 degree change in direction of drive and 2.6:1 speed reduction between input drive shaft and its output shaft on which tail rotor is mounted. Gear box consists of mating input and output gear quill assemblies set into a gear case provided with a breather type oil filler cap, an oil level sight gage, and a drain plug which has a magnetic insert plug. UH-1B, Serial No. 65-4916 and subsequent helicopters, are equipped with a chip detector warning system instead of a magnetic insert plug. This system activates a warning light on the pedestal caution panel when excessive contamination occurs. Tail rotor gear box input quill has a flexible coupling for attachment of drive shaft.

Note

Magnetic plug in earlier helicopters can be replaced with chip detector. When such replacement is made chip detector will not be connected to pedestal caution panel.

7-134. ***Removal — Tail Rotor Gear Box.*** a. When replacing any gear box, unless condition prevents operation, accomplish preservation before removal: Drain oil and service gear box with corrosion-preventive oil, (item 10, table 1-1).

b. Remove tail rotor hub and blade assembly. (Refer to paragraph 8-6, 8-50, or 8-96.)

c. Remove pitch control mechanism; or detach cover from fin structure and chain from control cables if replacement of gear box or output gear quill is not required.

d. Remove drain plug at aft underside of gear box to drain oil.

e. Open hinged access door on front of vertical fin and remove or disconnect drive shaft from input coupling of gear box. (Refer to paragraph 7-113.)

f. On UH-1B, Serial No. 65-9416 and subsequent helicopters, disconnect electrical wiring and remove chip detector.

g. Detach gear box from support casting on vertical fin by removing nuts and washers from six mounting studs around input coupling. Lift off gear box assembly.

h. Install nuts with suitable spacers on two opposite studs to secure input gear quill in case during handling or shipping.

i. Remove oil level sight gage retaining ring, glass, O-ring, and indicator disc as required to clean, inspect, or replace parts.

7-135. *Cleaning — Tail Rotor Gear Box.* a. Clean exterior of gear box assembly, or removed parts, with dry cleaning solvent (item 302, table 1-1).

Caution

Do not permit solvent or dirt to be forced into flexible coupling by use of compressed air.

7-136. *Inspection — Tail Rotor Gear Box.* a. Inspect gear box case for cracks and damage.

b. Check oil filler cap and O-ring packings for serviceability.

c. Inspect magnetic insert for steel particles as indication of gear or bearing wear.

d. On UH-1B, Serial No. 65-9416 and subsequent helicopters, inspect chip detector for excessive accumulation of metal particles.

Note

Refer to paragraphs 7-4 and 7-5 for additional information.

7-137. *Repair or Replacement — Tail Rotor Gear Box.* a. Replace gear box if cracks are found in the tail rotor gear box case.

b. Replace unserviceable oil filler cap or O-ring packing as required.

Note

Never interchange filler caps of intermediate gear box and tail rotor gear box.

c. Secure cap chain by safety pin through drilled hole in filler neck boss of case.

d. To replace other gear box fittings, drain oil by removing drain plug.

e. Place O-rings on magnetic plug or chip detector, and gasket on drain plug, as required. Install magnetic plug or chip detector.

f. When installed, lockwire magnetic plug to drain plug, and drain plug to adjacent drilled hole in boss of case.

7-138. *Lubrication — Tail Rotor Gear Box.* Fill gear box to sight gage level with oil. Splined input coupling is lubricated at assembly with lubricant (item 9, table 1-1), handpacked to 0.12 inch deep over internal spline teeth, in same manner as for tail rotor drive quill coupling. (Refer to paragraph 7-110.)

7-139. *Installation — Tail Rotor Gear Box.* a. Remove nuts and shipping spacers from studs at input gear quill flange.

b. Position gear box with studs engaged through support casting at top of vertical fin. Install thin aluminum alloy washer, thin steel washer, and nut on each stud. Tighten nuts evenly with 50 to 70 inch-pounds torque.

c. Install drive shaft, connected to input coupling of gear box. (Refer to paragraph 7-117.)

d. Install pitch control mechanism. (Refer to paragraph 9-63.)

e. Install and rig tail rotor. (Refer to paragraph 9-69.)

f. On UH-1B, Serial No. 65-9416 and subsequent helicopters, connect electrical wiring to chip detector.

g. Service gear box with oil.

7-140. *Packaging Tail Rotor Gear Box.* a. Clean and dry gear box in accordance with Specification MIL-P-116.

b. Flush gear box with corrosion-preventive compound, (item 10, table 1-1).

c. Wrap assembly in grease-proof barrier material, (item 506, table 1-1), and secure with pressure-sensitive tape, (item 402, table 1-1). Shape wrapper to contour of gear box.

d. Place gear box in bottom contoured cushion of container.

e. Align top contoured cushion to fit gear box and lower into container.

f. Place 12 eight-unit bags (total 96 units) of desiccant, (item 316, table 1-1), in container.

g. Install lid (with rubber gasket in place) on lower half of container.

h. Place locking ring on lip of container lid and secure with bolt and nut. Tighten nut sufficiently to insure a moisture-vapor proof closure.

CHAPTER 8
MAIN AND TAIL ROTOR GROUPS

Section I — Scope

8-1. Scope. The purpose of this chapter is to provide all essential information for maintenance personnel to accomplish organizational maintenance on the complete main and tail rotor groups. This information includes a detailed description and chronological instructions as to methods and procedures. It also includes special tools and equipment required for accomplishment of those maintenance phases as are applicable on the Maintenance Allocation Chart. Special tools required for performance of Organizational Maintenance can be found in TM 55-1520-211-20P.

Section II — Main Rotor Hub and Blade

8-2. Main Rotor Hub and Blade Assembly (UH-1A). The main rotor assembly is a two bladed, semi-rigid type employing preconing and underslinging to insure smooth operation. The assembly consists of two all metal bonded blades with corrosion and scuff resistant leading edges, connected to a common yoke through blade grips. The rotor assembly is attached to the mast through a trunnion mounted in pillow blocks to provide a flapping axis and is secured to the mast with a screw type cap. Blade pitch change is accomplished by changing the angle of the blade grips equally and simultaneously with the collective pitch lever. Tilting the rotor, to provide directional control, is accomplished by changing the pitch of each grip independently by means of the cyclic controls. The all metal rotor blades consist of four major sections, the main spar, a core, a trailing edge extrusion and a nose block extrusion all bonded to the skin, with an adhesive applied under heat and pressure.

8-3. Operation Check — Main Rotor Hub and Blade Assembly (UH-1A). Runup shall be performed by personnel authorized in accordance with AR95-13.

a. Operate engine at 6400 rpm with a collective setting less than required to become airborne (about 15 psi). Note torque pressure reading.

b. Set engine speed at 4700 rpm and collective the same as for the 6400 rpm. Check blade track.

c. From the track marks determine which blade is high at 4700 rpm. Roll the high blade down by lengthening its pitch link. One flat of rotation of pitch link barrel is equivalent to 3/8 inch of track (for all rpm). Blade trim tabs have no effect on track at 4700 rpm. The correct amount of roll can therefore be determined when trim tabs are improperly set. Once the blades have been rolled into track at 4700 rpm further rolling is not required.

d. Increase engine speed to 6400 rpm with collective positioned as in step b. Check blade track. If the track changes from 4700 to 6400 rpm one blade is climbing with rpm. This blade would also climb with increased airspeed in flight. To prevent blade from climbing bend tab on opposite blade up. One degree of tab is equivalent to 1/16 inch of track at 6400 rpm. If more than eight degrees of tab differential is required the diving blade tab should be set up to eight degrees and the climbing blade tab should be bent down the remaining amount. Use T101422 tool when adjusting trim tabs.

e. After the proper tab setting has been achieved based on ground track fly helicopter

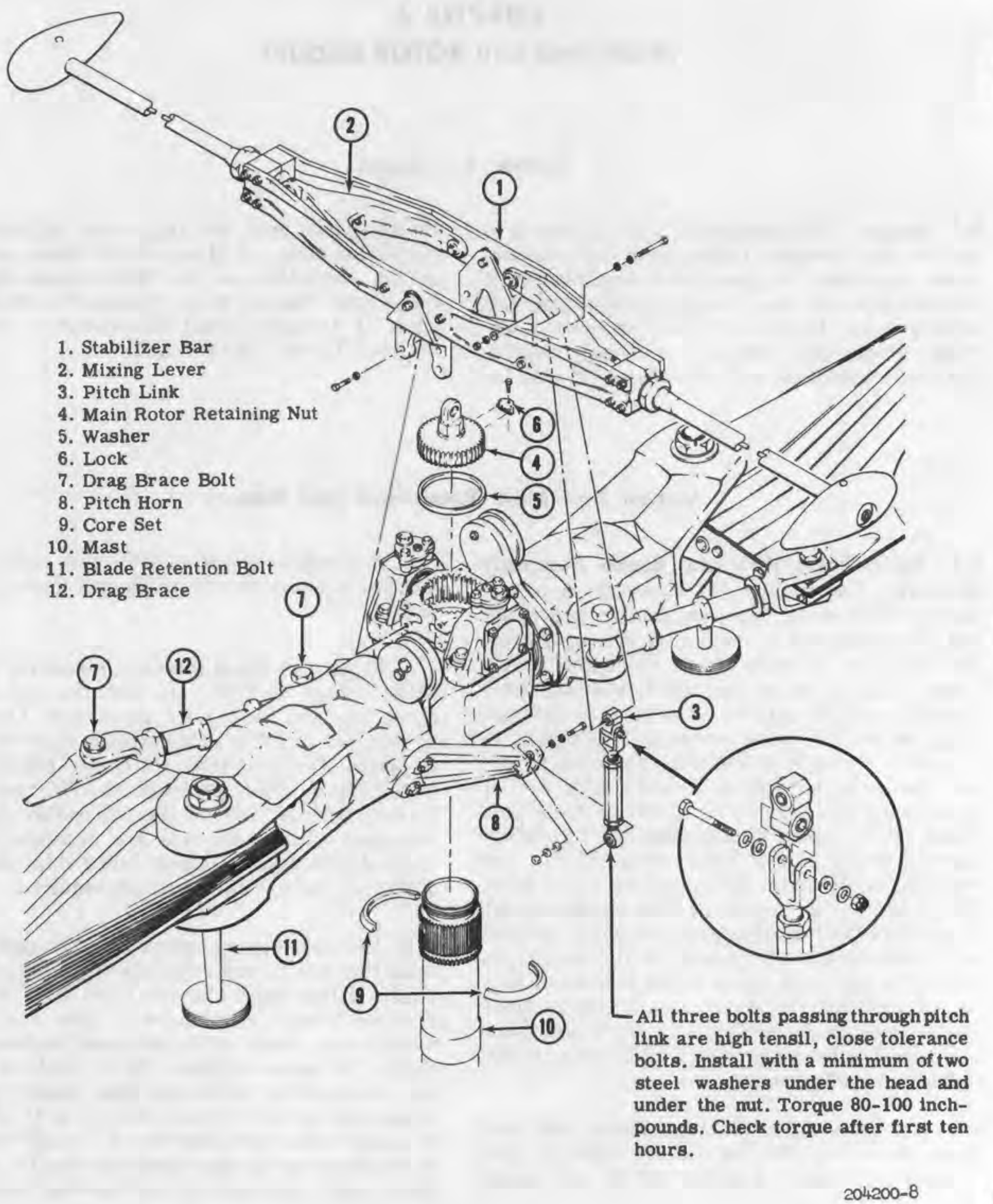

Figure 8-1. Main rotor assembly (UH-1A)

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Figure 8-2. Tracking main rotor blades (UH-1A)

through the operational speed range. If a vertical 1/rev. vibration is encountered at high speeds (the vibration will get progressively worse as speed increases) it will be necessary to refine the trim tab settings. Either an increase or decrease in the amount of tab differential will be required. Above 100 knots as little as one-half degree change in tab settings can be significant.

f. Check rotor balance through full airspeed range.

Warning

At no time will the acorn nut, P/N 204-011-116-1 or 204-010-525-1, be adjusted or tampered with.

g. Correct spanwise balance by installing two-inch masking tape on blade tip. If balance condition becomes worse remove tape and install on opposite blade. Balance to the best one-half wrap of tape.

h. When the correct amount of tape has been determined remove it and replace with lead installed in the blade retention bolt on the same side. One wrap of tape is equivalent to 3.1 ounces in the blade bolt.

i. Correct chordwise balance by selecting one drag brace and sweep blade aft by one full turn on the drag brace.

j. If improvement is noted continue sweeping selected blade aft until rotor is operating smoothly. Adjustment up to two flats is permissible on the A rotor which normally exceeds requirements.

k. If the condition becomes worse after making adjustment return blade to its original position and make similar adjustment to the opposite blade.

8-4. *Checking Main Rotor Counterweight Adjustment (UH-1A).* At approximately 60 knots I.A.S. in cruise flight with hydraulic boost off the collective control should have a neutral or light force between 15 and 20 pounds of engine torque. Above 20 pounds torque collective shall become increasingly negative and below 15 pounds torque it shall become increasingly positive but should not be unmanageable. If applied force is greater when increasing collective pitch more counterweight is required and conversely if applied force is greater when decreasing collective pitch, less counterweight is required. Refer to paragraph 8-5 for allowable counterweight limits.

Note

Due to the irreversible valves incorporated in the boost system improperly adjusted counterweights may not be evident for fixed collective control positions.

8-5. Counterweight Limits (UH-1A). A maximum of 20 counterweight washers are used on hub assemblies Part No. 204-010-190-1 and -5. A maximum of 76 counterweight washers are used on hub assemblies Part No. 204-010-190-3, -7 and -9.

8-6. Removal — Main Rotor Hub and Blade Assembly (UH-1A). a. Remove pitch links and install grip positioning links, T101348, to hold grips and blades in position. (See figure 8-3.)

b. Remove stabilizer bar assembly (1, figure 8-1). (Refer to paragraph 8-23.)

c. Cut safety wire and remove bolt and lock (6).

d. Remove retaining nut (4) using wrench T101358.

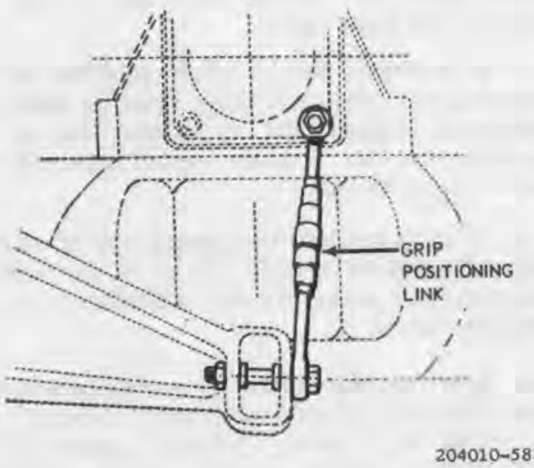


Figure 8-3. Grip position links installed (UH-1A)

e. Install blade tie-down block to guide rotor while removing.

f. Install hoisting sling and using hoist T101413, lift off hub and blade assembly. Place hub on a stand and support blades. Remove split cones (9) from mast.

8-7. Installation — Main Rotor Hub and Blade Assembly (UH-1A). Installation of the main rotor hub and blade assembly shall be accomplished as follows.

Caution

All three bolts passing through the pitch link (3, figure 8-1) are high tensile close tolerance bolts. Install with a minimum of two steel washers under the head and two steel washers under the high castle nut and torque 80 to 100 inch pounds.

a. Install grip positioning links T101348 on grips. Install hoisting sling on hub assembly and with T101413, position rotor assembly over mast.

b. Lubricate splines with oil (item 8, table 1-1). Install cones (9) in groove in upper set of splines on mast with bevel side up to mate with bevel in hub trunnion.

c. Align mast and hub master splines and lower rotor onto mast and split cones.

Caution

Rotor must be aligned directly over mast to prevent damage to threads on mast.

d. Install washer (5) and nut (4). Torque nut 520 to 780 foot-pounds using wrench T101358.

e. Install lock (6) and lockwire bolt to hole in trunnion.

f. Install stabilizer bar. (Refer to paragraph 8-26.)

g. Remove grip positioning links. Adjust pitch links (3) to 8.80 inches between upper hole in universal fitting and lower hole in link assembly. Torque jam nuts on link assembly to 480 to 600 inch-pounds.

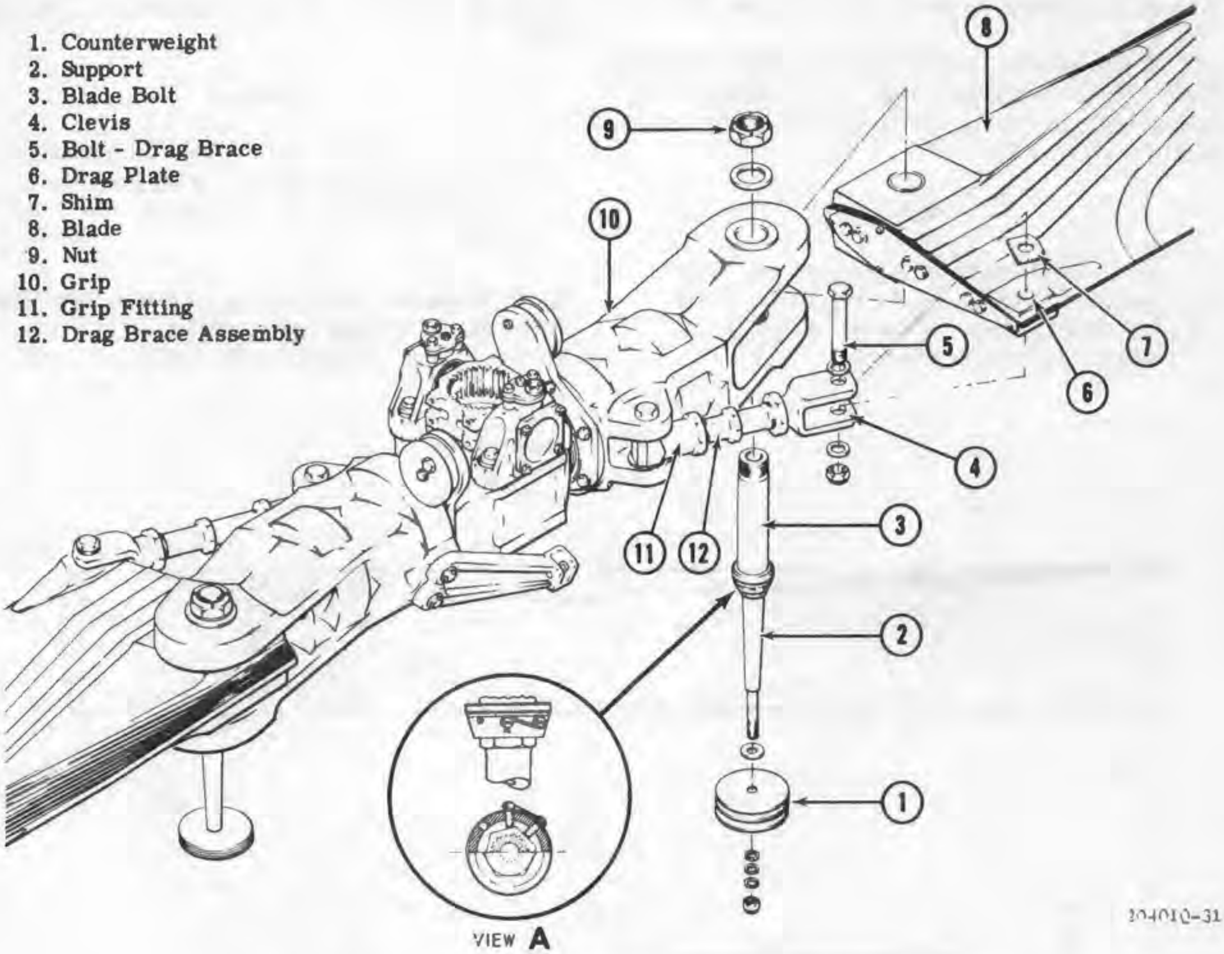


Figure 8-4. Main rotor hub and blade assembly (UH-1A)

h. Check low pitch position of grips for a plus reading of ten degrees, plus or minus one-half degree, by placing a protractor chordwise on the outboard machined surface of the blade grip. Set blade in above position and hold in place while taking a protractor reading on the opposite blade. Adjust pitch change links equally until a total reading of twenty degrees, plus or minus one-half degree is obtained. Torque jam-nuts on link assembly 480 to 600 inch-pounds.

Note

If rotor overspeeds in autorotation shorten links equally. If rotor underspeeds, lengthen links equally. Normal rpm range is 285 to 314 (refer to TM 55-1520-211-10).

8-8. Main Rotor Blades (UH-1A). The two main rotor blades are of all metal bonded construction with corrosion and scuff resistant leading edges.

8-9. Removal — Main Rotor Blades (UH-1A). a. Support hub assembly on a stand. Support blades so that leading edge is straight.

Note

If blade bolt (3, figure 8-4) and counterweight support (2) require disassembly for replacement of either, they must be disassembled before removal of blade bolt. For disassembly refer to following paragraph b.

b. Cut safety wire and remove lock screws (View A). Screw support out of blade bolt.

c. Remove drag brace bolt (5). Remove nut from blade retention bolt (3). Secure drag brace bolt to clevis on drag brace for reassembly.

Note

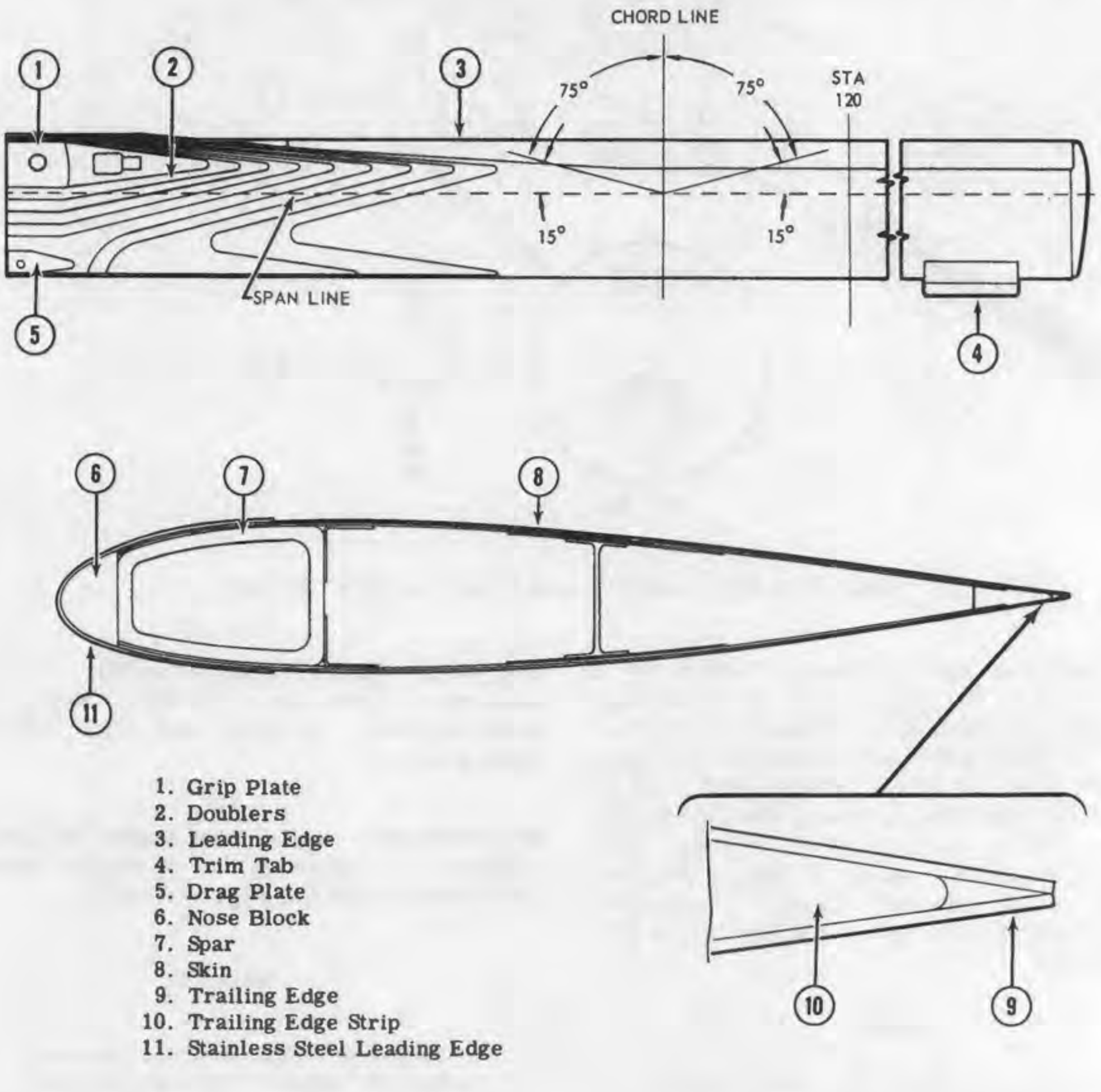
Do not change adjustment of drag braces. Identify blade retention bolts for installation in same grips from which they were removed.

d. Raise tip of blade until blade retention bolt (3) can be removed. Remove blade from grip.

Caution

Reason for lifting blades is because blades are preset to a 4 degree cone, and elevation is necessary to free bolts.

8-10. *Inspection and Repair — Main Rotor Blades (UH-1A).* a. Inspect grip plates (1, figure 8-5) for fretting corrosion. If depth of corrosion



1. Grip Plate
2. Doublers
3. Leading Edge
4. Trim Tab
5. Drag Plate
6. Nose Block
7. Spar
8. Skin
9. Trailing Edge
10. Trailing Edge Strip
11. Stainless Steel Leading Edge

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Figure 8-5. Main rotor blade (UH-1A)

exceeds 0.020 inch and fifty percent of any quadrant formed by intersection of chordwise and spanwise axis through center of retention bolt hole, polish out with abrasive cloth and fair edges of repair into surface contour.

b. All nicks and scratches in the skins, doublers, or grip and drag plates which are within the limits listed below are acceptable if polished out with aluminum wool. Lightly sandpaper the painted surface around the polished area, and touch-up paint per paragraph 8-12. Limits of nicks and scratches which are repairable are as follows:

Caution

Damage exceeding the following limits will require replacement of blade.

(1) Inboard of station 120 and running within zero and 15 degrees of the spanline and not in excess of 0.012 inch in depth.

(2) Inboard of station 120 and running within zero and 75 degrees of chordline and not in excess of 0.008 inch in depth.

(3) Outboard of station 120, all nicks and scratches that do not go through outer skin.

c. Nicks, scratches and tears on the stainless steel abrasive strip within the limits listed below are acceptable.

(1) Inboard of station 120, nicks and scratches must be polished out. If holes or other discontinuities exist, the blade must be replaced.

(2) Outboard of station 120, nicks and scratches are acceptable provided no holes are in the abrasive strip. If holes or other discontinuities exist, the blade must be replaced.

Note

The allowable limit for wrinkles in a main rotor blade skin should not exceed 0.020 inch on upper skin and 0.050 inch on lower skin when measured "PEAK TO VALLEY" with blade lying supported in a flat position.

d. Nicks, scratches, tears and notches in the trailing edge may be repaired by removing metal on a minimum 2.0 inch radius. It is not permissible to cut deeper than 0.120 inch chordwise or to cut into the trailing edge strip. If a cavity is present between the skins and the aft edge of the trailing edge strip, fill the cavity with zinc chromate paste.

e. Inspect the rotor blade for dents. Dents in excess of 0.015 inch in the trailing edge, that do not extend forward into the trailing edge strip, may be lightly worked back into contour. Dents which are not in excess of the following limits may be repaired by lightly polishing with aluminum wool, cleaning with trichloroethylene and filling with (item 210, table 1-1). After (item 210, table 1-1) has thoroughly dried, work to a smooth finish and touch-up in accordance with instructions in paragraph 8-12. Limits and locations of permissible dents are as follows:

Caution

Dents should be closely inspected for nicks, scratches and cracks. If nicks or scratches exist in dents and the total depth of the scratch and dent is in excess of items (1) through (4), below, the blade should be replaced. If nicks and/or scratches exist in a dent and are in excess of limits permitted in step b. (1) through (3) or step d., above, the blade should be replaced. If cracks exist anywhere the blade should be replaced.

(1) Sharp dents inboard of station 120 which do not exceed 0.020 inch in depth.

(2) Non sharp dents inboard of station 120 which do not exceed 0.060 inch in depth.

(3) Sharp dents outboard of station 120 which are not in excess of 0.060 inch in depth and/or outboard of station 200 not in excess of 0.120 inch.

(4) Non sharp dents outboard of station 120 which are not in excess of 0.120 inch in depth and/or 0.250 inch in depth outboard of station 200.

(5) From station 230 outboard any dent that does not tear skin, produce a void detectable when tapping with a coin or affect flight characteristics is acceptable.

f. The trailing edge trim tab may be straightened and aligned by using trim tab bending tool, T101422, and bending gage, T101417. The trailing edge of the trim tab may also be straightened by using a heavy back-up block and a plastic head mallet. If the trim tab cannot be straightened, is cracked, or is separated from the blade, replace the blade.

g. A void is defined as an un-bonded area that normally should be bonded. Any of the following conditions require blade replacement. All acceptable edge voids should be sealed with adhesive, (item 211, table 1-1) or adhesive (item 210, table 1-1).

(1) Edge voids in any one bond line of the doublers, grip plates or drag plates with a total length in excess of 15 percent of the total length of the bond line.

(2) Any one edge void in a doubler, a grip plate or a drag plate in excess of 0.090 inch in depth or 2.24 inches in length.

(3) Any edge void in the outboard three inches of a doubler, the outboard three inches of a grip plate or the outboard one inch of a drag plate.

(4) Edge voids in stainless steel leading edge in excess of six inches in length or a total of 24 inches on a side or in excess of 0.180 inch in depth. Any edge void in excess of 0.030 inch in depth within the inboard five inches of the leading edge.

(5) Any edge void which extends forward to the bond between the skin and trailing edge strip.

8-11. *Repair—Covering Leading Edge with Plastic Tape (UH-1A).* When operating in regions where abnormal erosion is encountered, vinyl tape (item 404, table 1-1) should be applied to the leading edge of the main rotor blade. Apply tape as follows:

Note

Tape may be applied in widths from two to four inches to a maximum length of six feet on the outboard end of the blades. In any event the length and width of tape applied must be equal on both blades.

a. Smooth and clean area to be covered. (Remove existing tape if installed.) Sand off rough edges, using sandpaper (item 508 or 509, table 1-1) and wipe off dust or foreign material. Clean painted surfaces with a cloth dampened with naphtha or any approved cleaning agent, and wipe dry with a clean cloth.

b. Cut tape (two inch width recommended) to desired length, (maximum six feet). Remove paper backing and place tape on a cardboard or similar smooth surface with adhesive side up.

c. Apply adhesive activator to adhesive side of tape, using a dampened felt squeegee or cheesecloth applicator, with parallel strokes from end to end of strip. (Adhesive activator and applicator are furnished with plastic film by manufacturer.) Avoid excessive use of activator solvent which will result in puckering and wrinkling of the film.

d. Fasten the center of the strip to the leading edge of blade, starting at one end and rubbing with hand to insure positive contact and freedom from air bubbles. Using thumbs, press tape in place, working from leading edge toward trailing edge. Be sure all areas of tape are fastened. If air pockets are trapped, tape may be lifted back to air pocket, reactivated if necessary, and reapplied.

Note

If tape (item 404, table 1-1) is not available, pressure sensitive tape (item 405, table 1-1) may be installed. Install pressure sensitive tape in accordance with following steps.

1. Lightly sand leading edge with sandpaper (item 508 or 509, table 1-1) and wipe off dust and other foreign material, using a clean cloth dampened with naphtha or any approved cleaning agent. Wipe dry after cleaning.

2. Select or cut tape (two inch width desirable; four inch width acceptable) to desired length (maximum of six feet). Apply tape along center line of leading edge, overlapping an equal amount on top and bottom of blade. Use fingers to press tape in place.

8-12. *Painting — Minor Refinish — Main Rotor Blades (UH-1A).* Minor refinishing of main rotor blades containing bare spots, paint cracks, crazing, blisters or other such minor defects which do not show evidence of pitting or damage to the blade shell. Use the least amount of paint possible to adequately protect the blade and to disturb the blade balance as little as possible.

a. Degrease with aliphatic naphtha (item 308, table 1-1) or any good degreasing solvent.

Caution

Do not use solvent which damages paint finish.

b. Sand aged paint areas, using an abrasive grit which will not show marks in final finish. Remove dust with cloth dampened with naphtha or with filtered compressed air.

Caution

Do not sand areas of bare metal.

c. Remove all surface oxides and all aged chemical conversion coatings from areas to be refinished, using abrasive cloth (item 403, table 1-1).

d. Repair adhesive fairing (adhesive squeeze-out along the trailing edge of stainless steel leading edge strip) with resin paste (item 210, table 1-1) after removal of all paint finish. Remove damaged fairing only.

e. Wash blades with soap detergent (item 312, table 1-1). Achieve water-break-free surface which will be evident by continuous unbroken film of water on the surface after thoroughly rinsing off soap.

Note

From completion of this step through final paint, do not touch prepared surfaces with bare hands.

f. Brush or spray on chemical conversion coating (item 317, table 1-1). If not available, use commercial metal-prep (alcoholic-phosphoric acid) or a 10 percent solution of chromic acid.

g. Dry and clean prepared surfaces thoroughly.

h. Apply one light coat (0.0003 to 0.0005 inch) of catalyzed epoxy primer (item 102, table 1-1). Air dry a minimum of 45 minutes or a maximum of 24 hours.

i. Apply finish coats of acrylic lacquer, Navy Formula P-95, in colors specified below (Federal Standard 595). Allow one hour drying time between coats. Use additional coats as required for full coverage and for a total film thickness (primer and lacquer) of 2.5 to 3.5 mils (0.0025 to 0.0035 inch).

(1) On upper surface of blade, apply two coats camouflage olive drab, (item 106, table 1-1).

(2) On lower surface of blade, apply two coats of camouflage black (item 105, table 1-1).

(3) On outer six inches (top and bottom) of blade, apply one coat of gloss orange-yellow (item 112, table 1-1).

(4) On one blade tip and outer two inches, apply one coat of gloss white (item 110, table 1-1).

(5) On opposite blade tip and outer two inches, apply one coat of gloss red (item 108, table 1-1).

j. Air dry blades a minimum of 48 hours before use.

8-13. *Installation—Main Rotor Blades (UH-1A).* Installation of the main rotor blades shall be accomplished as follows.

Note

Main rotor blades are interchangeable in sets of the same P/N only and shall not be installed in sets of mixed numbers on the same aircraft.

If drag braces are once properly adjusted, blades are interchangeable without further adjustment. To avoid disturbing rotor balance, install blade retention bolts in grips from which they were removed.

After installing new blades, it may be necessary to zero trim tabs before tracking.

a. Apply corrosion preventive compound (item 315, table 1-1) to blade retention bolt bushings in rotor grip and blade and to drag brace and drag plate bushing. Support hub assembly on a stand. Insert blade into grip, observing color coding. Align bolt holes and insert blade retention bolt (3, figure 8-4) through grip and blade assembly. Gently moving tip of the blade up and down while inserting bolt will facilitate alignment of bolt holes.

Note

Foreign material or misalignment of bolt holes will result in damaged parts.

b. Support end of installed blade. Install nut on blade retention bolt. Align drag brace clevis hole and blade drag plate hole. Install shims between clevis and drag plate to take up clearance not to exceed 0.000 to 0.005 inch loose. Install clevis bolt with one washer next to nut and one washer next to bolt head.

c. Install second blade in the same manner. Torque nuts on drag brace bolts 100 to 120 foot-pounds.

d. Torque nuts on blade retention bolts (11) 260 to 300 foot-pounds using tool T101358.

e. Screw counterweight support (2) into blade bolt (3). Torque support 300 to 400 foot-pounds using wrench T101358. Install lock screws as illustrated in View A and secure with lockwire.

8-14. Preparation for Storage or Shipment—Main Rotor Blades (UH-1A). The following instructions cover storage or shipment of main rotor blades in either cardboard or metal containers.

Caution

Immediately upon removal of a blade or blades, the assembly must be thoroughly cleaned, oiled, the retention and drag brace bolt holes coated with grease, rust-preventive compound or cosmoline. The blade areas contacting the metal container cushions must be wrapped with water repellant paper and the blade/blades placed in the proper container, along with the historical records.

a. Clean and dry each blade assembly in accordance with Specification MIL-P-116.

b. Apply corrosion preventive compound (item 315, table 1-1) to hub, retention bolt hole and drag brace bolt holes.

c. Wrap blade assembly with grease proof barrier material (item 506, table 1-1) at all locations where the contoured supports contact the blade and secure with pressure sensitive tape (item 402, table 1-1).

d. For storage or shipment in a cardboard container proceed as follows:

(1) Secure contours to blade assembly.

(2) Place blade assembly and contours in container with 12 eight unit bags and one four unit bag (total 100 units) of desiccant (item 316, table 1-1).

(3) Band container shut with one-half inch steel bands.

e. For storage or shipment in a metal container proceed as follows:

(1) Secure blade assembly to shock mounted support in container in such a manner that all protruding components are completely protected from any possible damage.

(2) Place 12 eight unit bags and one four unit bag (total 100 units) of desiccant (item 316, table 1-1) in container.

Note

Blades should not be in direct contact with contours at any time during storage or shipment.

(3) Install top half of container (with top cushions attached) on lower half of container and secure in place with cam lock fasteners.

8-15. Main Rotor Hub (UH-1A). The main rotor hub is a common yoke which attaches the main rotor blades, through the blade grips, to the main rotor mast.

8-16. Removal—Main Rotor Hub (UH-1A). a. Remove main rotor hub and blade assembly. (Refer to paragraph 8-6.)

b. Remove main rotor blades. (Refer to paragraph 8-9.)

8-17. Inspection — Main Rotor Hub (UH-1A). a. Maximum allowable play in pitch link universal assembly bearings is 0.017 inch in the axial direction and 0.0085 inch in the radial direction.

b. Maximum allowable play in pitch link rod end bearing is 0.020 inch in the axial direction and 0.020 in the radial direction.

c. Inspect blade retaining bolts for loss of dry film lubricant (bare metal exposed), pitting, and fretting corrosion. If inspection of blade retaining bolts reveals damaged areas, replace bolts.

d. Dimensions of damaged areas on drag brace bolts, after polishing and cleanup, shall not exceed 1/4 of the bolt circumference. Bolts shall be replaced if the outside diameter (in inches) is less than the values specified below.

(1) Inboard drag brace 0.7473

(2) Outboard drag brace 0.7473

e. Some seepage from the main rotor grip seal is normal. Seepage may be considered objectionable when loss of oil is equivalent to the amount contained in the reservoir during a flight of two hours duration. When helicopter is in a static position and seepage of oil in a 24 hour period results in not being able to obtain reading from sight gage, main rotor grip seal must be replaced.

f. Maximum allowable dimensions of main rotor grip bushing holes after polishing are as follows: (1 and 2, figure 8-6.)

Main Retention	1.7540
Drag Brace	0.7510

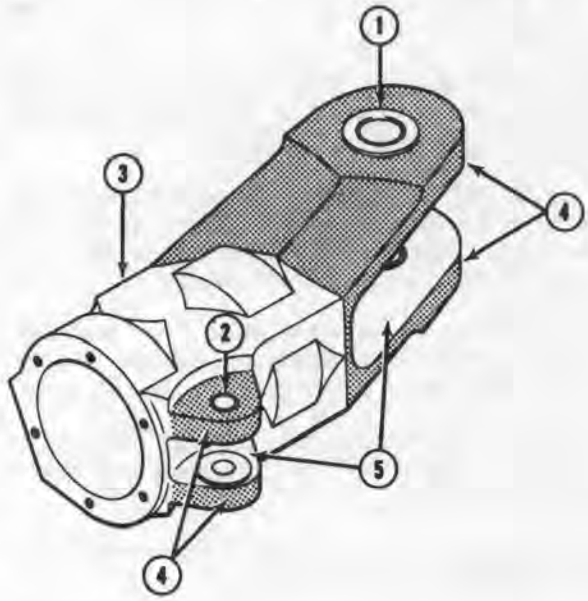
Score marks on the inner surface of bushings made during removal of bolts may not exceed 0.010 inch, maximum, in depth. Such score marks may be polished out. The area of cleanup should cover a maximum of 1/4 of the bushing circumference. Bushings are to be replaced if the inside diameter dimensions specified above are exceeded.

g. The following criteria define the limits of damage that are allowable on the external surfaces of the main rotor grips. (See figure 8-6.) Damaged surfaces in all areas of the grip should be improved by polishing out the area locally and blending edges of the damage into the surrounding surface with a smooth contour. Grips with discrepancies in excess of specified limits should undergo fifth echelon inspection.

(1) Damage to the barrel (3, figure 8-6) shall not exceed a maximum depth of 0.060 inch, up to 3.5 inches in length.

(2) Damage to the outside surface of blade tangs and drag brace tangs (4, figure 8-6) shall not exceed a maximum depth of 0.060 inch. Lengths shall not exceed 1/2 of maximum tang width inboard of bolt hole; 1/2 of edge distance between bushing and edge of tang, and/or 1/2 of dimension between inside and outside tang surfaces.

(3) Damage to the inside surface of blade tangs and drag brace tangs (5, figure 8-6) shall not exceed a maximum depth of 0.020 inch. Length inboard of bolt hole shall not exceed a maximum of 1/2 of tang width. Damage in bolt hole area should not exceed a maximum of 1/2 of edge distance between bushing and edge of tang.



1. Main Retention Bushing
2. Drag Brace Bushing
3. Barrel
4. Outside Surface - Blade and Drag Brace Tangs
5. Inside Surface - Blade and Drag Brace Tangs.

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Figure 8-6. Allowable damage — main rotor grips (UH-1A)

8-18. ***Repair or Replacement — Main Rotor Hub (UH-1A).*** Replace all parts that do not meet inspection requirements. (Refer to paragraph 8-17.)

8-19. ***Installation — Main Rotor Hub (UH-1A).*** a. Install main rotor blades. (Refer to paragraph 8-13.)

b. Install main rotor hub and blade assembly. (Refer to paragraph 8-7.)

8-20. ***Preparation for Storage or Shipment — Main Rotor Hub (UH-1A).*** a. Clean and dry hub assembly in accordance with Specification MIL-P-116.

b. Apply corrosion-preventive compound (item 315, table 1-1) to bushings and exposed non-plated steel surfaces.

c. Place hub in container, and lower onto frame center block.

d. Secure frame end brackets over each end of hub and around hub bolt attached to frame.

e. Install washer and nut. Tighten nut securely.

f. Place 12 eight unit bags and one four unit bag (total 100 units) of desiccant (item 316, table 1-1), in desiccant container.

g. Lower top half of shipping container into place and secure in place with bolts, washers, and nuts. Tighten nuts sufficiently so as to obtain a moisture vapor proof closure.

8-21. ***Placing in Service — Main Rotor Hub (UH-1A).*** a. Remove bolts to remove top half of shipping container.

b. Remove attachments and lift hub out of container. Blade bolts are balanced and should not be exchanged.

c. Clean and dry hub assembly in accordance with Specification MIL-P-116.

Note

> The main rotor hub container may be used as a build-up stand for attachment of main rotor blades. Remove eight bolts and lift out frame of container. Relocate frame 90 degrees to container and secure with four camlock fasteners. Position rotor hub 90 degrees to frame and tighten center nut. Attach main rotor blades.

8-22. Stabilizer Bar (UH-1A). The stabilizer bar is attached to the mast at the main rotor hub trunnion. The bar is connected into the main rotor system in such a manner that the inherent inertia and gyroscopic action of the bar is induced into the rotor system and provides a measure of stability for all flight conditions. If, while hovering, the helicopter is disturbed, the bar, due to its gyroscopic action, tends to remain in its present plane. The relative movement between the bar and the mast causes the hub and blade assembly to feather and return the rotor to near its original plane of rotation. If the bar were completely unrestrained it would remain in its original plane of rotation and would induce stability to the point of removing all control from the pilot. Due to restraining and dampening action the bar possesses a mast following characteristic. This following time is regulated by two hydraulic dampers connected to the bar in such a manner that a movement of the mast is transmitted to the bar through the dampers at a rate determined by the adjustment of the dampers. A compromise is met in which the bar provides the desired amount of stability and still allows the pilot complete responsive control of the helicopter.

8-23. ***Removal — Stabilizer Bar (UH-1A).*** a. Disconnect pitch links (3, figure 8-1) from pitch horns (8) and install grip positioning links T101348 to hold grips and blades in position.

b. Disconnect damper links from damper arms.

c. Disconnect tube assemblies from scissors levers. Secure control rods to bar with tape.

d. Remove four bolts from each stabilizer support and lift bar off rotor.

8-24. ***Inspection — Stabilizer Bar (UH-1A).*** a. Inspect centerframes and supports for scratches, dents and burnish marks within 1.0 inch either side of bolt hole center line. Depth of damage shall not exceed 0.010 inch. Inspect mixing levers to criteria shown on figure 8-6A.

b. Burnish marks from sockets are permitted on the outboard attachment bolt holes of tube to centerframes. These marks shall have no depth and only be of a polished nature.

c. Inspect outboard 4.0 inches of centerframes for scratches which have no depth, but do remove the protective coating. Such scratches are permitted, but shall be treated for corrosion. (Refer to paragraph 8-25.)

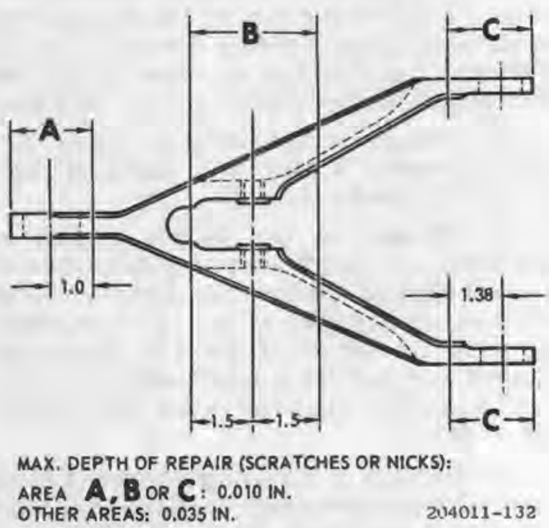


Figure 8-6A. Stabilizer bar mixing lever limits (UH-1A)

d. Inspect for scratches which have a maximum depth of 0.002 inch. Such scratches are permitted, but shall be treated for corrosion protection. (Refer to paragraph 8-25.)

Note

If a burr is present on the end of a scratch, it shall be removed, without causing any damage to the surface of the centerframe, before the scratch is given corrosion protective treatment.

e. Inspect the corner edges of the outboard 4.0 inches of the centerframes for dents which do not exceed a maximum depth of 0.010 inch and a maximum length of 0.5 inch.

f. Inspect all other areas of the centerframes, mixing levers and supports for scratches and dents. Maximum depth of such damage shall not exceed 0.035 inch.

g. Inspect all bearings for damage and freedom in race.

8-25. Repair or Replacement—Stabilizer Bar (UH-1A). a. Round edges of repairable dents, keeping radius as small as possible.

b. Burnish out all repairable damage to a smooth finish.

c. Treat all repaired areas for corrosion protection as follows:

(1) Clean surface with aliphatic naptha (item 308, table 1-1).

(2) Scrub area to be treated with biodegradeable compound (item 312, table 1-1) and rinse thoroughly.

(3) Apply brush alodine (item 317, table 1-1) to bare area only. Keep surface wet one to three minutes.

(4) Remove solution with clean cheesecloth saturated with water. Dry with compressed air or clean, dry cheesecloth.

d. If bearings are considered unsatisfactory for continued usage, replace component.

8-26. Installation — Stabilizer Bar (UH-1A). a. Position stabilizer bar supports in place over trunnion, observing color code. Install four bolts with washers, in each support. Safety wire bolts in pairs vertically.

b. Remove grip positioning tool and attach pitch links (3, figure 8-1) to pitch horns (8) and stabilizer bar mixing levers (2).

Caution

All three bolts passing through the pitch link (3, figure 8-1) are high tensile, close tolerance bolts. Install with a minimum of two steel washers under the head and two steel washers under the high castle nut. Torque 80 to 100 inch-pounds.

c. Attach control tubes to scissors levers

d. Attach damper control tube to damper arm. Refer to paragraph 8-33 for instructions relative to adjusting damper control tube.

8-27. Stabilizer Bar Dampers (UH-1A). The stabilizer bar dampers are mounted on adapters on the mast. The adjustment and timing of the dampers determines the following time of the stabilizer bar and the resultant controllability of the helicopter.

8-28. Removal — Stabilizer Bar Dampers (UH-1A). a. Disconnect control tubes from lever arms.

b. Remove retainer ring adapter bolts (2, figure 8-7) and slide damper and adapter assembly from mast.

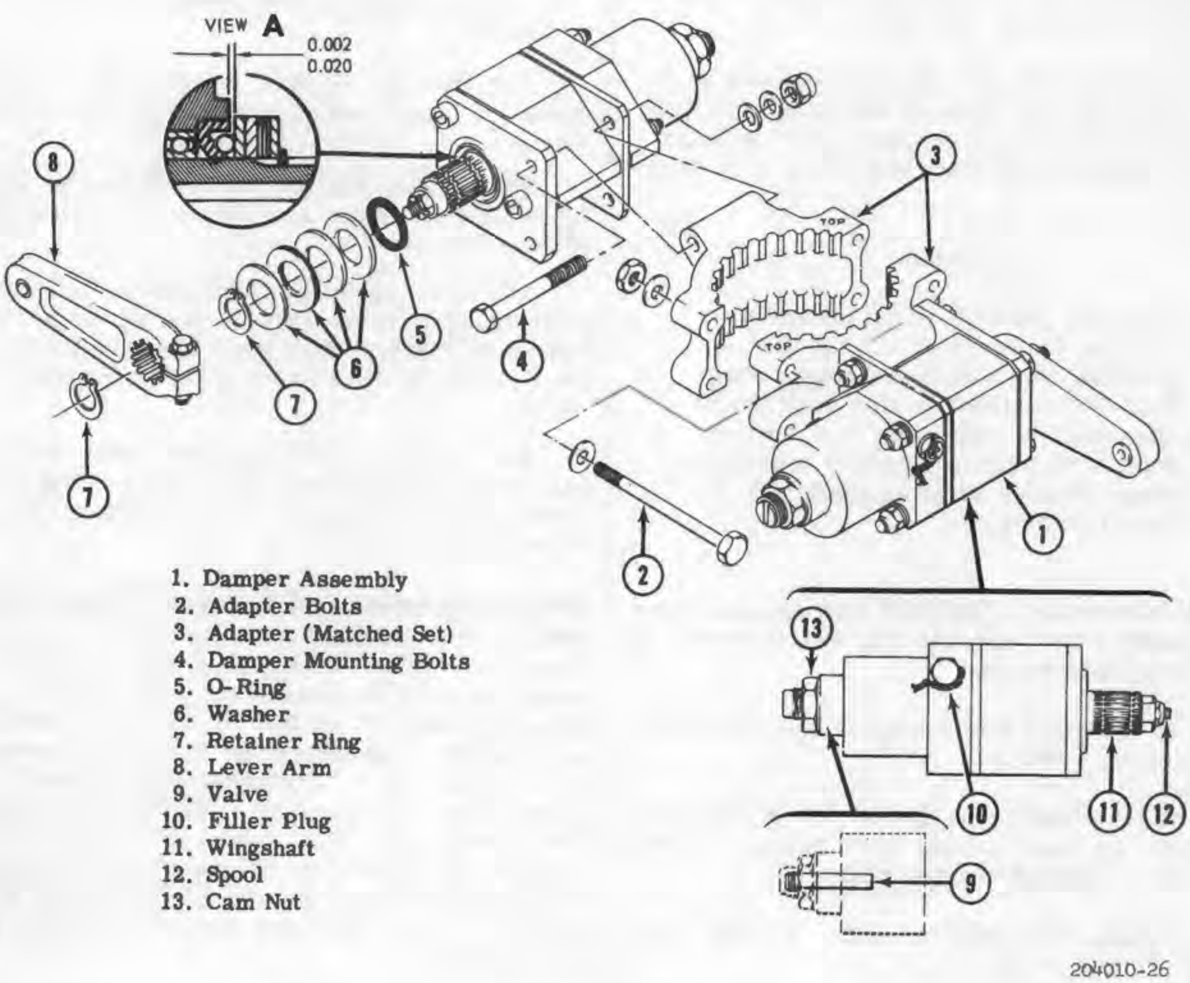
Caution

Refer to CAUTION notes, paragraph 8-31 on handling dampers after removal.

8-29. Inspection — Stabilizer Bar Dampers (UH-1A). Inspect dampers for damage, security, leakage and proper timing.

8-30. Repair or Replacement — Stabilizer Bar Dampers (UH-1A). a. Replace all dampers that do not meet inspection requirements. (Refer to paragraph 8-29.)

b. Replace dampers that cannot be adjusted. (Refer to paragraph 8-33.)



1. Damper Assembly
2. Adapter Bolts
3. Adapter (Matched Set)
4. Damper Mounting Bolts
5. O-Ring
6. Washer
7. Retainer Ring
8. Lever Arm
9. Valve
10. Filler Plug
11. Wingshaft
12. Spool
13. Cam Nut

Figure 8-7. Stabilizer damper and adapter assembly (UH-1A)

8-31. Servicing — Stabilizer Bar Dampers (Part No. 204-010-900) (UH-1A). a. Position damper with spline end down.

Caution

> Clamping damper around body will seize wing-shaft and damage internal parts.

b. Remove valve (9, figure 8-7) and fill cavity with hydraulic oil (item 3, table 1-1).

c. Pull spool (12) out and release several times to purge air from timing section.

d. With spool held in OUT position, oscilate the wing-shaft several times to purge air from the vane section. If any air remains it will cause a soft spot which will be felt when direction of rotation is changed.

e. Replace valve (9). Position damper as installed on the ship. Remove filler plug and check fluid level. Fluid level should be even with bottom of plug hole. Replace and safety wire plug.

Caution

> From this point on do not hold damper with the splined end UP for any appreciable time and do not rotate wing-shaft with damper in this position. If wing-shaft is rotated in this position steps a. through e. must be repeated. Rapid rotation of wing-shaft will induce air into cavity.

8-32. Installation — Stabilizer Bar Dampers (Part No. 204-010-900) (UH-1A). Use two dampers of the same part number.

a. If adjusting and timing is required refer to paragraph 8-33.

b. Slide adapter and damper assemblies into position on mast splines with master splines aligned and install retainer ring.

c. Install four adapter bolts, washers and nuts. Torque evenly.

d. Attach control tubes to lever arms (8, figure 8-7). Refer to paragraph 8-33 for adjustment of tubes.

8-33. Adjustment — Stabilizer Bar Dampers (Part No. 204-010-900) (UH-1A). a. Bottom stabilizer bar on its static stop in either direction and adjust damper cam nut (13, figure 8-7) to obtain a 0.170 (11/64) inch space between the orifice spool nut (12) and the end of the wing-shaft. Bottom stabilizer bar on its static stop. Return stabilizer bar square to mast and observe orifice spool return time. Adjust orifice timing at valve (9) to obtain a three to six second full travel to equal to each other within one second.

Caution

> Do not adjust nut on lever end of damper. Do not bottom adjusting screw because this will cause damage to plastic needle valve (9).

b. Adjust stabilizer bar damper control tubes as follows:

(1) Position damper wing-shafts in the center of travel and square stabilizer bar with mast.

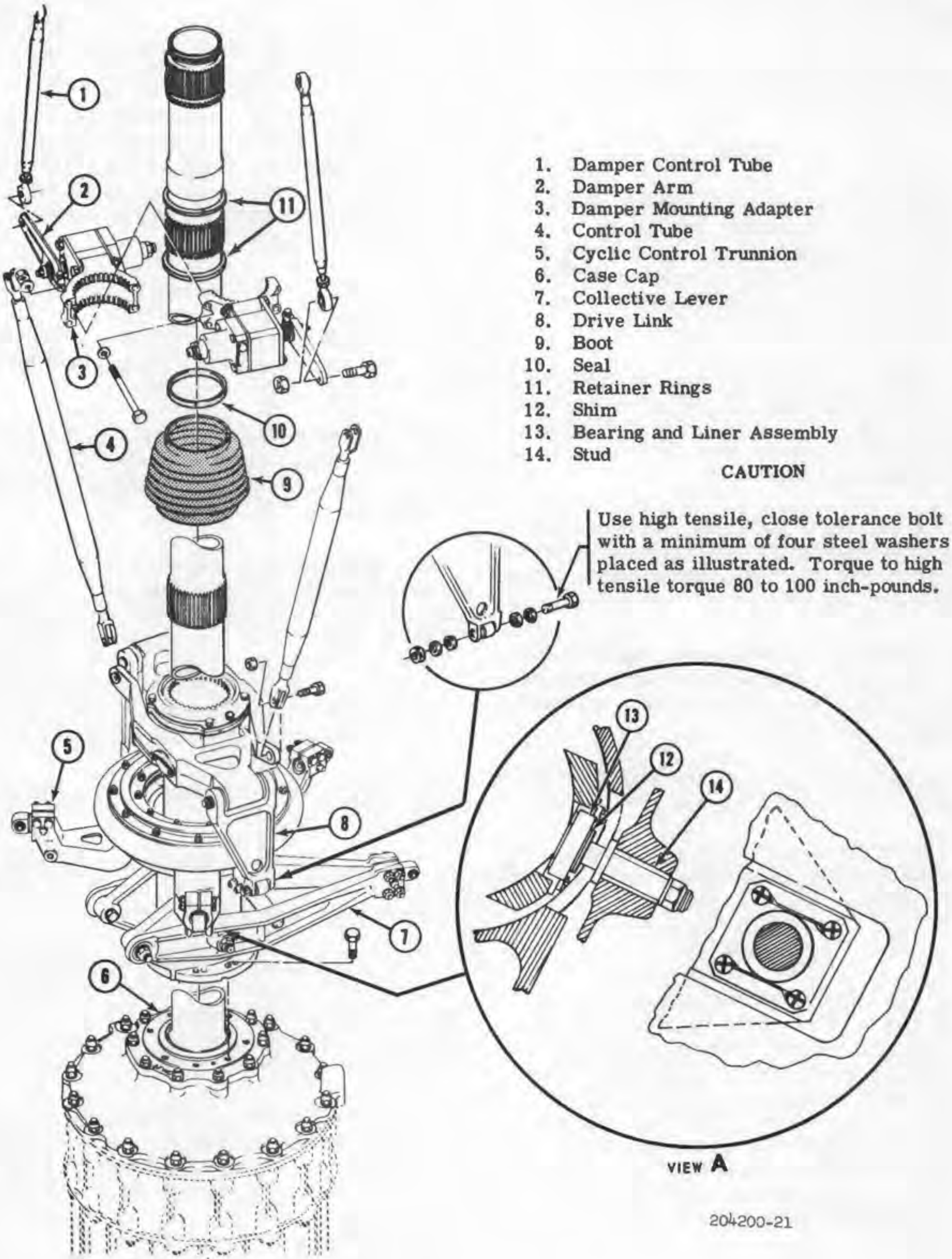
(2) Attach damper control tubes to stabilizer bar and lever arms (8) with lubrication fittings outboard.

(3) With stabilizer bar square to mast position lever arms (8) on nearest matching splines of damper wing-shaft. Refer to View A, for installation of O-ring and washers on wing-shaft.

(4) Adjust damper control tubes to obtain equal orriffice spool (12) travel when stabilizer bar is bottomed on its static stop in either direction.

8-34. Swashplate and Collective Sleeve (UH-1A). The swashplate and collective sleeve assembly encircles the mast at the top of the transmission. The swashplate is mounted on a universal support so that it may be tilted in any direction. Movement of the cyclic control stick results in a corresponding tilt of the swashplate, and through a system of linkage the position of the rotor is mechanically changed. A movement of the collective pitch lever actuates the collective sleeve within the swashplate and transmits collective control to the rotor hub.

8-35. Removal — Swashplate and Collective Sleeve (UH-1A). a. Remove main rotor hub and blade assembly. (Refer to paragraph 8-6.)



1. Damper Control Tube
2. Damper Arm
3. Damper Mounting Adapter
4. Control Tube
5. Cyclic Control Trunnion
6. Case Cap
7. Collective Lever
8. Drive Link
9. Boot
10. Seal
11. Retainer Rings
12. Shim
13. Bearing and Liner Assembly
14. Stud

CAUTION

Use high tensile, close tolerance bolt with a minimum of four steel washers placed as illustrated. Torque to high tensile torque 80 to 100 inch-pounds.

Figure 8-8. Mast controls (UH-1A)

b. Remove stabilizer bar dampers and adapter. (Refer to paragraph 8-28.)

c. Cut safety wire and remove boot (9, figure 8-6) and seal (10).

d. Disconnect control tube from trunnion of collective pitch lever (7).

Note

If only the scissors and sleeves assembly is to be removed proceed as outlined in paragraph 8-41. The following steps are required for removal of the swashplate and collective sleeve assembly as a complete unit.

e. Disconnect the cyclic and elevator control tubes from trunnions (5) on the swashplate. Insert a piece of folded paper or cardboard into each of the four gimbal support clevises to prevent damage while handling.

f. Remove eight bolts and washers securing swashplate support to transmission case cap (6) and carefully lift the swashplate and collective sleeve assembly from the mast.

8-36. *Inspection — Swashplate and Collective Sleeve (UH-1A).* a. Inspect for maximum allowable wear looseness across gimbal ring bearings and bolts of 0.010 inch.

b. Inspect support and inner and outer rings for nicks, burrs and scratches.

c. Inspect trunnion bearings (5, figure 8-8) for allowable axial chuck of 0.020 inch and general condition.

Note

The trunnion bearings are somewhat different than other bearings which normally can be "feel checked" for roughness and ease of rotation. The trunnion bearings are preloaded into the cylinder portion of the trunnion with a 0.0005 inch tight to 0.0005 inch loose tolerance. They are the roller type, having two separated roller cases and angular faced inner and outer races.

The normal feel of this assembly is one of tightness, due mainly to the 0.0005 inch tight tolerance. The feeling of roughness is due to the preload and the angular faces of the inner and outer races. When grease (item 8, table 1-1) is applied to the assembly as required, the normal bearing feel does not exist.

The conditions described are inherent in the trunnion bearing assembly. Checking the bearing assembly for tightness should be accomplished by hand movement only of the barrel and the crosshead.

Caution

Should swashplate trunnion bearings require replacement torque retaining bolts 50 to 70 inch-pounds.

8-37. *Repair or Replacement — Swashplate and Collective Sleeve (UH-1A).* Replace all parts that do not meet inspection requirements. (Refer to paragraph 8-36.)

8-38. *Installation — Swashplate and Collective Sleeve (UH-1A).* The swashplate and support assembly and the scissors and sleeve assembly can be installed as an assembled unit, or as separate assemblies. The following steps cover procedure for installation of the assembled unit. For installation of the scissors and sleeve as a separate assembly, refer to paragraph 8-44.

a. Lubricate splines with grease (item 8, table 1-1).

b. Carefully lower the assembled unit over the mast until swashplate support rests on transmission case cap (6, figure 8-8).

c. Align holes and install eight bolts, with aluminum alloy washers under heads, through support flange into case cap (6). Use two longest bolts between pivots of collective lever. Safetywire bolt heads in pairs.

d. Connect collective pitch control tube to collective lever. Connect cyclic and elevator control tubes to swashplate trunnions. Make certain lubrication fittings on trunnions are up.

e. Slide boot (9, figure 8-8) down over flange at top of sleeve assembly and secure with safetywire. Position seal (10) around mast and under top edge of boot (9). Safetywire seal.

f. Install stabilizer bar dampers and adapters. (Refer to paragraph 8-32.)

g. Install main rotor hub and blade assembly. (Refer to paragraph 8-7.)

h. Connect control tubes and links.

8-39. *Preparation for Storage or Shipment — Swashplate and Collective Sleeve (UH-1A).* The following steps cover procedure for installing swashplate and collective sleeve in metal container.

a. Clean and dry swashplate and support assembly in accordance with Specification MIL-P-116.

b. Apply corrosion preventive compound (item 315, table 1-1), to bushings and exposed non-plated steel surfaces not in contact with bearings.

c. Apply grease (item 13, table 1-1), to all bearings and grease fittings.

d. Wrap assembly in grease proof barrier material (item 506, table 1-1) and secure with pressure sensitive tape (item 402, table 1-1). Shape wrapper to contour of assembly.

e. Place wrapped assembly into contoured bottom cushion of metal container, and align to fit the contour.

f. Align top contoured cushion to fit assembly and lower into place.

g. Place 19 eight unit bags (total 152 units) of desiccant, (item 316, table 1-1) in desiccant container.

h. Place rubber gasket on lower half of container and lower lid of container into place. Install locking ring over lip of lid and body.

i. Install bolt and nut in locking ring and tighten sufficiently so as to obtain a moisture-vapor proof closure.

8-40. Scissors and Sleeve Assembly (UH-1A). The collective sleeve, which is contained within the swashplate, is actuated by movement of the collective pitch lever. By this action collective control is transmitted to the main rotor hub.

8-41. *Removal — Scissors and Sleeve Assembly (UH-1A).* a. Refer to paragraph 8-35. Perform steps a. through d.

b. Remove nuts, washers, spacer (3, figure 8-8) and bolts attaching collective pitch levers (1) to swashplate support (6) and to each other. Keep all loose parts, including shims (5) together for use in reassembly.

c. Cut safetywire and remove four screws attaching each bearing and housing assembly (8, figure 8-8) to lower end of collective sleeve (7).

d. Remove nuts, washers and bolts and disconnect link from swashplate trunnions.

e. Carefully lift the scissors and sleeve assembly upward and remove from mast.

8-42. *Inspection — Scissors and Sleeve Assembly (UH-1A).* Clamp dial indicator to mast with plunger resting on the collective boot flange attaching bolt head. Rotate sleeve assembly and measure amount of play present. Maximum radial play allowed between mast and collective sleeve drive plate is 0.040 inch at point of measurement.

8-43. *Repair or Replacement—Scissors and Sleeve Assembly (UH-1A).* If inspection requirements (refer to paragraph 8-42) are not met request assistance from higher maintenance level.

8-44. *Installation — Scissors and Sleeve Assembly (UH-1A).* The following steps cover installation of scissors and sleeve assembly as a separate assembly.

a. Lubricate splines of collective sleeve (7, figure 8-9) and carefully lower scissors and sleeve assembly over mast and into swashplate support (6).

b. Attach drive links (8, figure 8-8) to trunnion bearings on swashplate outer ring. Make certain lubrication fittings are down and bolt heads toward rotation.

Caution

> Use high tensile, close tolerance bolts with a minimum of four steel washers positioned as shown in figure 8-8. Torque to high tensile torque of 80 to 100 inch-pounds and check torque after first ten hours of operation.

c. Position bearing and housing assemblies (8, figure 8-9) to lower end of collective sleeve (7) and install attaching screws. Safetywire screws in vertical pairs.

d. Check wear between lever bearing and liner (9, figure 8-9). If wear exceeds 0.001 inch, perform step e. If wear exceeds 0.005 inch, bearing must be replaced.

e. Clean bore of liner bushing and outer race of bearing. Coat both surfaces with primer (item 118, table 1-1). Allow to dry. Coat both surfaces with sealant (item 201, table 1-1). Wipe off excess sealant and allow to dry.

f. Assemble collective pitch levers (1, figure 8-9) on swashplate support (6) with pins inserted into bearings on collective sleeve (7). Position trunnion (4) between collective pitch levers (1) and install bolts, washers and nuts. Torque bolts. Use feeler gage to measure clearance between shoulder on pin and bearing inner race at each side. Add two feeler gage clearances and divide by two to determine thickness of shims (12, figure 8-8) required. Prepare two shims to this dimension, equal to each other within 0.005 inch.

g. Remove levers (7, figure 8-8) install shims (12) and reassemble. Check for no end play of pins in bearings and for freedom of bearing rotation. Installation should be 0.000 to 0.002 inch tight.

8-45. *Preparation for Storage or Shipment — Scissors and Sleeve Assembly (UH-1A).* The following steps cover procedure for installing scissors and sleeve assembly in metal container.

a. Clean and dry scissors and sleeve assembly in accordance with Specification MIL-P-116.

b. Apply corrosion preventive compound (item 315, table 1-1) to bushings and exposed non-plated steel surfaces not in contact with bearings.

c. Apply grease (item 13, table 1-1) to all bearings and grease fittings.

d. Wrap assembly in grease proof barrier material (item 506, table 1-1) and secure with pressure sensitive tape (item 402, table 1-1). Shape wrapper to contour of assembly.

e. Place wrapped assembly into contoured bottom cushion of metal container, and align to fit the contour.

f. Align top contoured cushion to fit assembly and lower into place.

g. Place 12 eight unit bags and one four unit bag (total 100 units) of desiccant (item 316, table 1-1) in desiccant container.

h. Place rubber gasket on lower half of container and lower lid on container into place. Install locking ring over lip of lid and container body.

i. Install bolt and nut in locking ring and tighten sufficiently so as to obtain a moisture-vapor proof closure.

8-46. Control Tubes. The following steps cover general information and minor repair to both rotating and non-rotating control tubes.

a. Minor damage to both rotating and non-rotating control tubes in the form of scratches may be polished out.

Note

> No limitations apply to length or direction of scratches. Scratches should be blended out to extend over a minimum two inch area.

b. Scratches in all control tubes above the swashplate not in excess of 0.005 inch in depth may be polished out in accordance with step d.

c. Scratches, below and aft of the swashplate not in excess of 0.010 inch in depth may be polished out in accordance with step d.

d. Remove all scratches that are within limitations with wet or dry type sand paper, (item 508, table 1-1) or finer, to obtain a smooth scratch free surface. Apply two coats of zinc chromate primer (item 119, table 1-1) to repaired area.

e. Allowable wear limits for the damper control tube (1, figure 8-8) bearings permit a maximum of 0.005 inch radial play and 0.030 axial play. Some of these tube assemblies may be equipped with alternate rod end bearings, 47-140-252-5. Tube assemblies so equipped have 0.012 inch radial and 0.012 inch axial maximum allowable wear limits.

f. Tail rotor pitch change link bearings have 0.020 inch radial and 0.020 inch axial maximum allowable wear limits.

1. Levers-Collective
2. Pin
3. Spacer
4. Trunnion
5. Shim
6. Swashplate Support
7. Collective Sleeve
8. Bearing and Housing
9. Lever Bearing and Liner

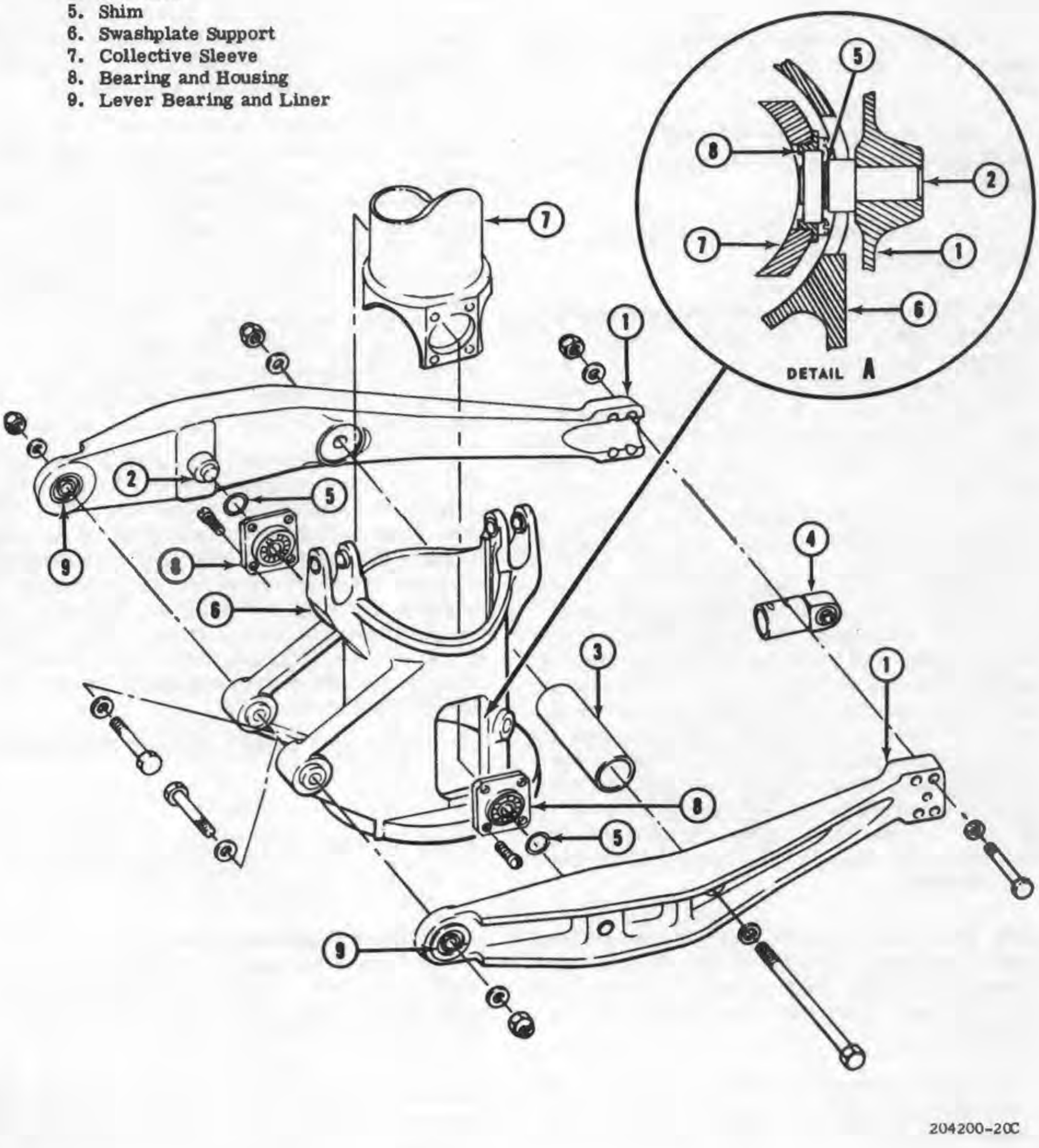


Figure 8-9. Collective pitch levers (UH-1A)

g. Bearing end of pitch change links (3, figure 8-1) have 0.020 inch radial and 0.020 inch axial maximum allowable wear limits. Universal end of the pitch change links have 0.0085 inch radial and 0.017 inch axial maximum allowable wear limits.

h. Maximum allowable elongation to a bushing or clevis hole in the control system is 0.003 inch.

i. Any wear in excess of limits shown in steps e. through h., above, is cause for replacement.

j. For replacement of control system bolts refer to paragraph 3-7.

8-47. Main Rotor Hub ana Blade Assembly (UH-1B Serial No. 60-3546 through 64-14100). The main rotor assembly is a two bladed, semi-rigid type employing preconing and underslinging to insure smooth operation. The assembly consists of two all metal bonded blades with corrosion and scuff resistant leading edges, connected to a common yoke through blade grips. The rotor assembly is attached to the mast through a trunnion mounted in pillow blocks to provide a flapping axis and is secured to the mast with a screw type cap. Blade pitch change is accomplished by changing the angle of the blade grips equally and simultaneously with the collective pitch lever. Tilting the rotor, to provide directional control, is accomplished by changing the pitch of each grip independently by means of the cyclic controls. The all metal rotor blades consist of four major sections, the main spar, a honeycomb core, a trailing edge extrusion and a nose block extrusion all bonded to the skin, with an adhesive applied under heat and pressure.

8-48. Operational Check — Main Rotor Hub and Blade Assembly (UH-1B Serial No. 60-3546 through 64-14100). Run-up shall be performed by personnel authorized in accordance with AR95-13.

a. Operate engine at 6600 rpm with a collective setting less than required to become airborne (about 15 psi). Note torque pressure reading.

b. Set engine speed at 4700 rpm and collective the same as for 6600 rpm. Check blade track.

c. From the track marks determine which blade is high at 4700 rpm. Roll the high blade down by lengthening its pitch link. One flat of rotation of pitch link barrel is equivalent to 3/8 inch of track (for all rpm). Blade trim tabs have no effect on track at 4700 rpm. The correct amount of roll can therefore be determined when trim tabs are improperly set. Once the blades have been rolled into track at 4700 rpm further rolling is not required.

d. Increase engine speed to 6600 rpm with collective positioned as in step b. Check blade track. If the track changes from 4700 to 6600 rpm one blade is climbing with rpm. This blade would also climb with increased airspeed in flight. To prevent blade from climbing bend tab on opposite blade up. One degree of tab is equivalent to 1/16 inch of track at 6600 rpm. If more than eight degrees of tab differential is required the diving blade tab should be set up to eight degrees and the climbing blade tab should be bent down the remaining amount. Use T101422 tool when adjusting trim tabs.

e. After the proper tab setting has been achieved based on ground track fly helicopter through the operational speed range. If a vertical 1/rev. vibration is encountered at high speeds (the vibration will get progressively worse as speed increases) it will be necessary to refine the trim tab settings. Either an increase or decrease in the amount of tab differential will be required. Above 100 knots as little as one-half degree change in tab settings can be significant.

f. Check rotor balance through full airspeed range.

Warning

At no time will the acorn nut, P/N 204-011-116-1 or 204-010-525-1, be adjusted or tampered with.

g. Correct spanwise balance by installing two-inch masking tape on blade tip. If balance condition becomes worse remove tape and install on opposite blade. Balance to the best one-half wrap of tape.

h. When the correct amount of tape has been determined remove it and replace with lead installed in the blade retention bolt on the same side. One wrap of tape is equivalent to 3.1 ounces in the blade bolt.

i. Correct chordwise balance by selecting one drag brace and sweep blade aft by one full turn on the drag brace.

1. Stabilizer Bar
2. Mixing Lever
3. Pitch Link
4. Pitch Horn
5. Mast
6. Core Set
7. Main Rotor Assembly
8. Washer
9. Retaining Nut
10. Lock - Retaining Nut

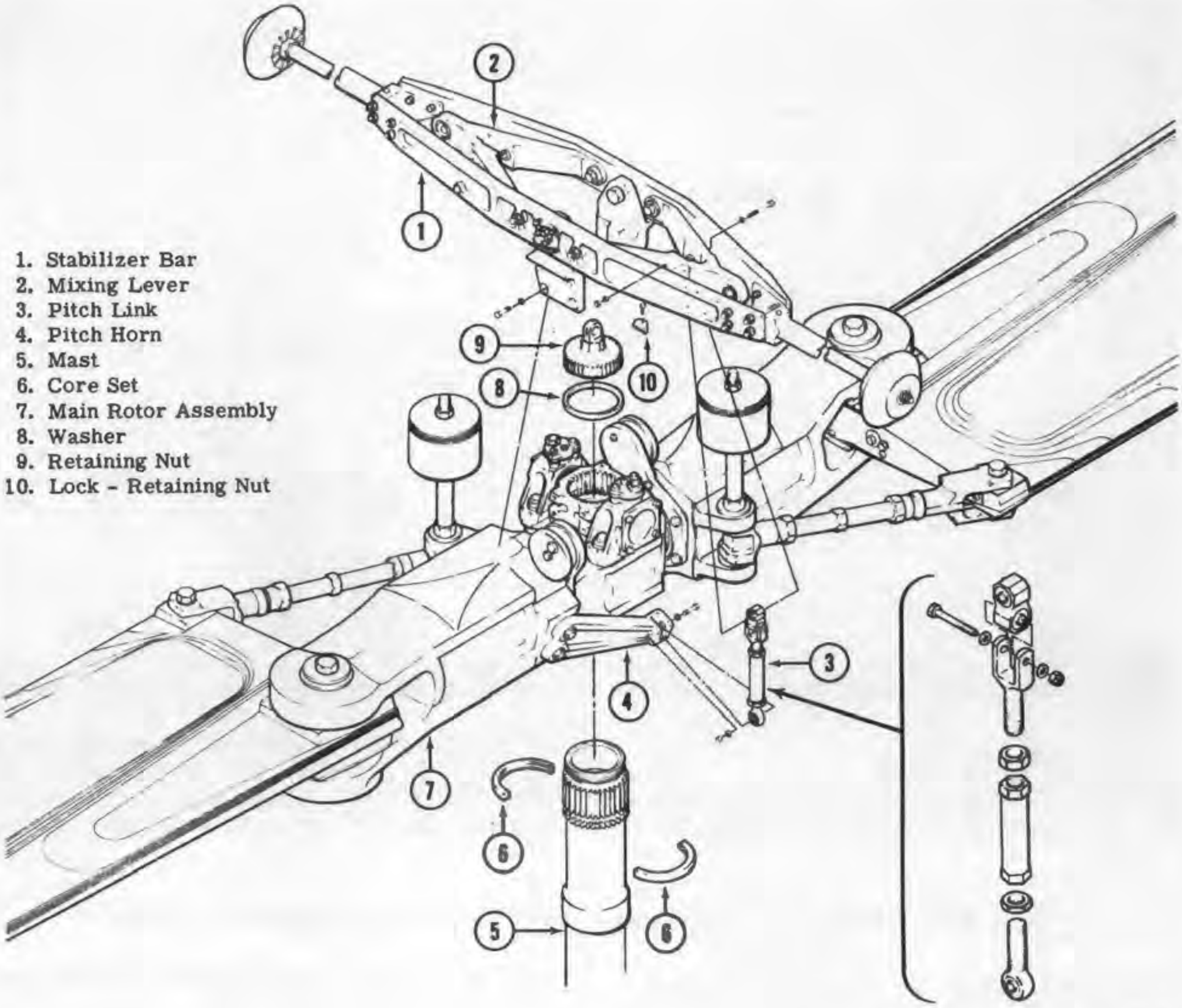


Figure 8-10. Main rotor assembly (UH-1B Serial No. 60-3546 thru 64-14100)

Note

Both ends of the drag brace are fitted with right-hand threads. Drag brace length is changed when rotating the barrel because one end has National Course threads and the other end has National Fine threads. Turn jam nuts to the left to loosen and turn barrel down as viewed from the trailing edge of the blade to sweep blade aft.

j. If improvement is noted continue sweeping selected blade aft until rotor is operating smoothly. Adjustment up to two turns is permissible on the B rotor and two flats on the A rotor which normally exceeds requirements.

k. If the condition becomes worse after making adjustment return blade to its original position and make similar adjustment to the opposite blade.

8-49. *Checking Main Rotor Counterweight Adjustment (UH-1B Serial No. 60-3546 through 64-14100).* At approximately 60 knots I. A. S. in cruise flight with hydraulic boost off the collective control should have a neutral or light force

Figure 8-11. Tracking main rotor blades (UH-1B Serial No. 60-3546 thru 64-14100)

between 14 and 15 pounds of engine torque. Above 15 pound torque collective shall become increasingly negative and below 14 pounds torque it shall become increasingly positive. Collective boost "OFF" forces in autorotation should be such that the collective pitch control can be lowered complete. To accomplish this it may be necessary to reduce the amount of weight originally determined. If applied force is greater when increasing collective pitch more counterweight is required and conversely if applied force is greater when decreasing collective pitch less counterweight is required. Refer to paragraph 8-50 for allowable counterweight limits.

Note

Due to irreversible valves incorporated in the boost system improperly adjusted counterweight may not be evident for fixed collective control positions.

8-50. Counterweight Limits (UH-1B Serial No. 60-3546 through 64-14100). When using 204-011-154 counterweight bolts a maximum of one 204-011-155-3 counterweight and thirteen washer type weights may be used on each side. When using the 204-011-172-1 counterweight bolt a maximum of one 204-011-173-1 counterweight and nine washer type weights may be used on each side. Use AN960-1016 washers as required between counterweight and retaining nut. Torque counterweight retaining nut 300 to 400 inch-pounds.

8-51. Removal — Main Rotor Hub and Blade Assembly (UH-1B Serial No. 60-3546 through 64-14100). a. Remove pitch links and install grip positioning links, T101402, to hold grips and blades in position. (See figure 8-12.)

b. Remove stabilizer bar assembly (1, figure 8-10). (Refer to paragraph 8-69.)

c. Cut lockwire and remove bolt and lock (10).

d. Remove retaining nut (9) using wrench T101358.

e. Install blade tie-down block to guide rotor while removing.

f. Install hoisting sling and with T101411 or other suitable hoist, lift off hub and blade assembly. Place hub on a stand and support blades. Remove split cones (6) from mast.

Caution

Be sure that grip positioning links are installed after pitch links have been disconnected.

8-52. *Installation — Main Rotor Hub and Blade Assembly (UH-1B Serial No. 60-3546 through 64-14100).* Installation of the main rotor hub and blade assembly shall be accomplished as follows.

a. Install grip positioning links T101402 on grips. Install hoisting sling on hub assembly and with T101411 or other suitable hoist, position rotor assembly over mast.

b. Lubricate splines with grease (item 8, table 1-1). Install cones (6, figure 8-10) in groove in upper set of splines on mast, with bevel side up to mate with bevel in hub trunnion.

c. Align mast and hub master splines and lower rotor onto mast and split cones.

Note

Rotor must be aligned directly over mast to prevent damage to threads on mast.

d. Install washer (8) and nut (9). Torque nut 520 to 780 foot-pounds using wrench T101358.

e. Install lock (10) and lockwire bolt to safetywire hole in trunnion.

f. Install stabilizer bar. (Refer to paragraph 8-72.)

g. Remove grip positioning links. Adjust overall length of pitch links between upper hole in universal fitting and lower hole in link assembly (3) to 10.2 inches and attach pitch horns (4).

Note

Install pitch horn to pitch link attaching hardware with nut facing in direction of rotation.

h. Check low pitch position of grips for a plus reading of seven and one-half degrees, plus or minus one-fourth degree, by placing a protractor chordwise on the outboard machined surface of the blade grip. Set blade in above position and hold in place while taking a protractor reading on the opposite blade. Adjust pitch change links equally until a total reading of fifteen degrees, plus or minus one-half degree is obtained. Tighten and lockwire barrel and nuts.

Note

If rotor overspeeds in autorotation shorten links equally. If rotor underspeeds, lengthen links equally. Normal rpm range is 294 to 324 (refer to TM 55-1520-211-10).

8-53. Main Rotor Blades (UH-1B Serial No. 60-3546 through 64-14100). The two main rotor blades are of all metal bonded construction with corrosion and scuff resistant leading edges.

8-54. *Removal — Main Rotor Blades (UH-1B Serial No. 60-3546 through 64-14100).* a. Support hub assembly on a stand. Support blades so that leading edge is straight.

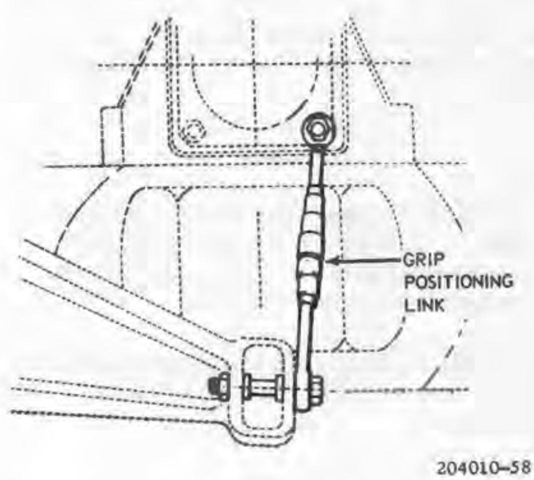


Figure 8-12. Grip positioning links installed (UH-1B Serial No. 60-3546 thru 64-14100)

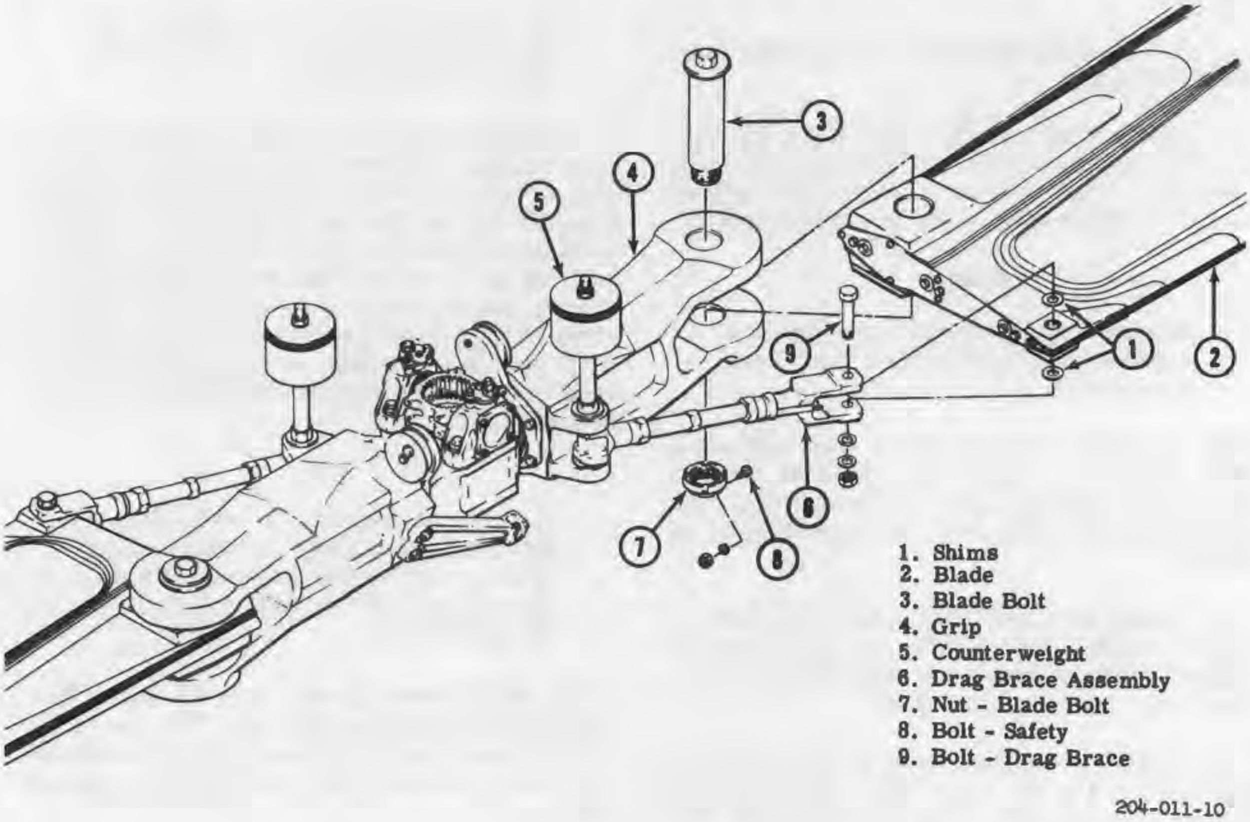


Figure 8-13. Main rotor hub and blade assembly (UH-1B Serial No. 60-3546 thru 64-14100)

b. Remove drag brace bolt (9, figure 8-13). Remove lock-bolt (8) that passes through blade bolt (3) and nut (7). Remove nut (7) from blade bolt. Secure shim (1) to either blade or clevis on drag brace (6) for reassembly.

Note

Do not change adjustment of drag braces. Identify blade retention bolts for installation in same grips from which they were removed.

c. Gently raise tip of blade until blade bolt (3) can be readily removed. Remove blade from grip.

Caution

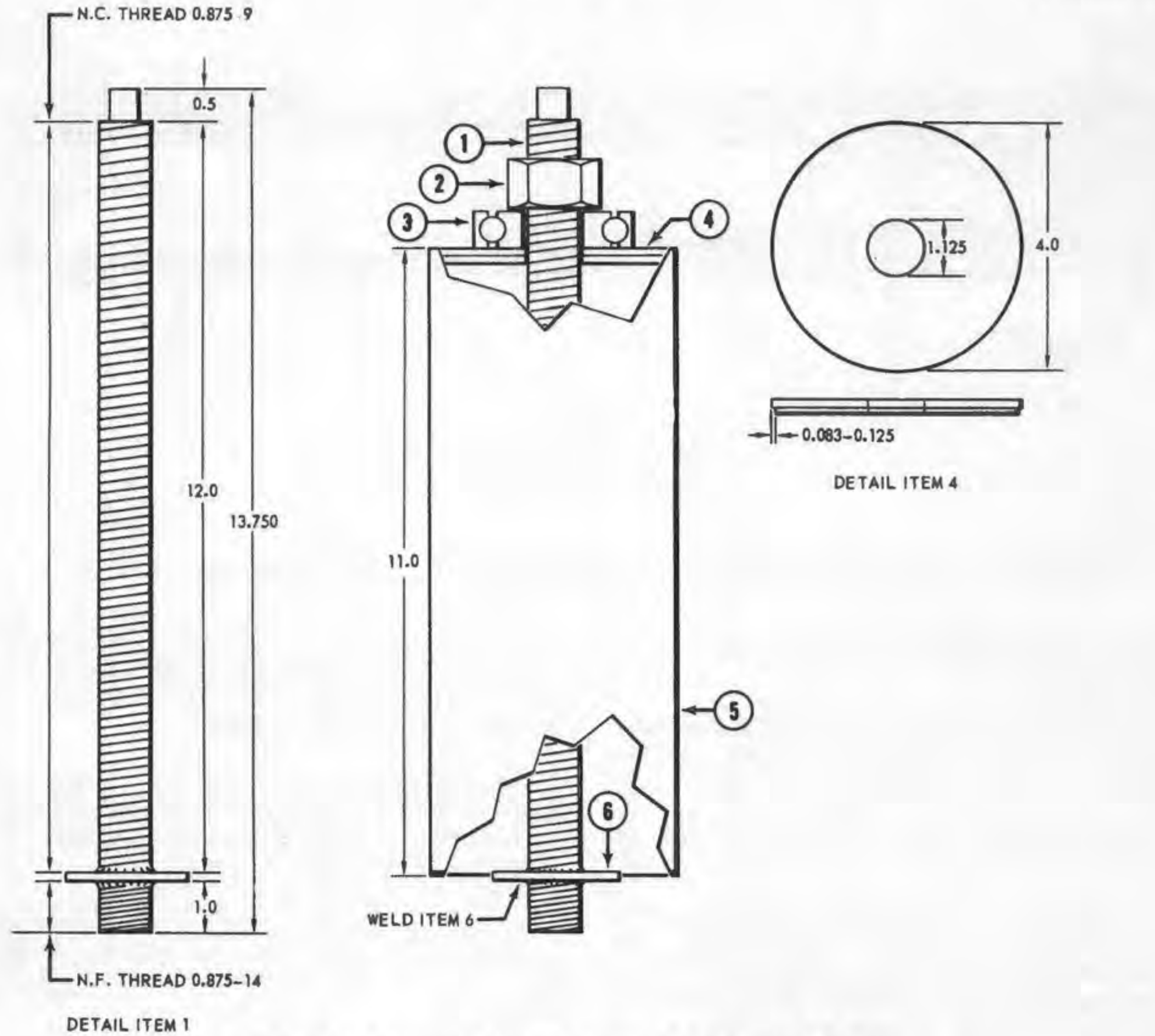
Reason for lifting blades is because blades are pre-set to 4 degree cone, and elevation is necessary to free bolts. If difficulty is still encountered in removing bolts, use Main Rotor Blade Retention Bolt Extracting Fixture Assembly, which may be locally fabricated as shown on figure 8-14.

d. Repeat procedure on opposite blade.

8-55. Inspection and Repair — Main Rotor Blades (UH-1B Serial No. 60-3546 through 64-14100). The following criteria covers organizational inspection and repair of main rotor blades used on UH-1B helicopters Serial No. 60-3546 through 64-14100.

a. Main rotor blades damaged to the following extent should be "condemned, demilitarized and locally scrapped" rather than returned to an overhaul facility.

(1) Any penetration in the natched area as indicated on figure 8-15.



1. Puller Rod Assembly 4130 (or better), 1.0 O.D. - 13.750 Long
2. Hex Nut 0.875 NC (9) Thread
3. Bearing (Thrust) Inner Race I.D. 0.080 - 0.093
4. Plate, Steel or Aluminum, 4.0 O.D., 0.375 Thick
5. Tube, Steel or Aluminum, Wall Thickness 0.083 - 0.125
6. Steel Flat Washer, 2.0 O.D. - 0.875 I.D.

204011-89

Figure 8-14. Main rotor blade retention bolt extracting fixture (UH-1B Serial No. 60-3546 thru 64-14100)

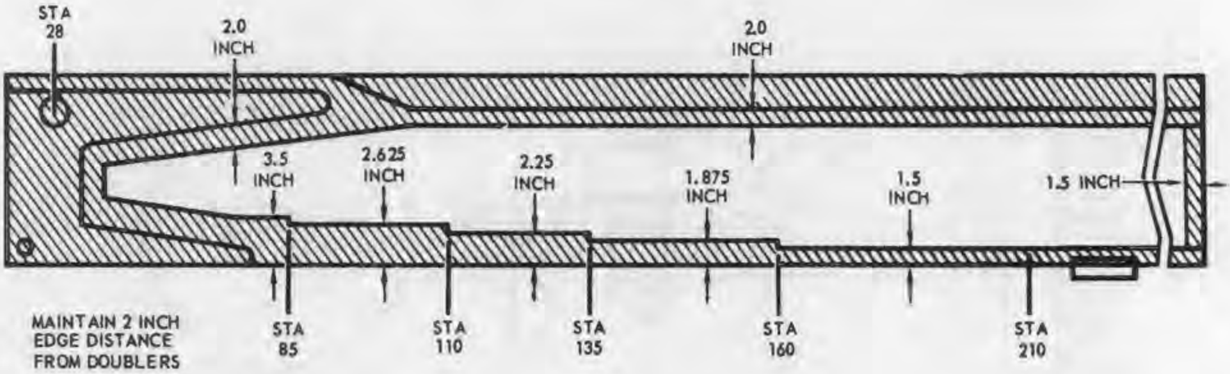
(2) Skin penetration in any area larger than 2.0 inches in diameter or length.

(3) Water in the honeycomb core.

(4) Voids between the skin and honeycomb larger than ten square inches.

(5) Edge voids deeper than 1.0 inch at the tip end of any of the root end doublers or grip plates.

(6) Edge voids in the leading edge or trailing edge of the doublers that are 0.50 inch or more in depth and show indications of corrosion in the voids.



Note

No Penetration Repair Permitted In Hatched Area

204011-113C

Figure 8-15. Areas of repair — main rotor blades (UH-1B Serial No. 60-3546 thru 64-14100)

(7) Any corrosion that penetrates entirely through the skin.

(8) Any blade that has reached maximum service life (1000 hours) or which has less than 100 hours remaining service time.

b. Normal inspection and repair criteria are as follows:

(1) Inspect grip plates (1, figure 8-16) for fretting corrosion. If depth of corrosion exceeds 0.020 inch and fifty percent of any quadrant formed by intersection of chordwise and spanwise axis through center of retention bolt hole, polish out with abrasive cloth and fair edges of repair into surface contour.

(2) Nicks and scratches within the limits below are acceptable if repaired. In aluminum parts, the paint around the defect should be removed by light sanding, and the nick or scratch polished out with aluminum wool. The area should then be repainted per paragraph 8-58. On the stainless steel leading edge, the nicks or scratches may be polished out by sanding or with steel wool; however, steel wool must not be allowed to touch the aluminum parts.

Caution

Damage exceeding the following limits will require replacement of blade.

(a) In the skin, inboard of station 165 and the inboard abrasion strip, running within zero and 15 degrees of the spanline and not in excess of 0.006 inch in depth.

(b) In the skin, inboard of station 165 and the inboard abrasion strip, running within zero and 75 degrees of the chordline and not in excess of 0.003 inch in depth.

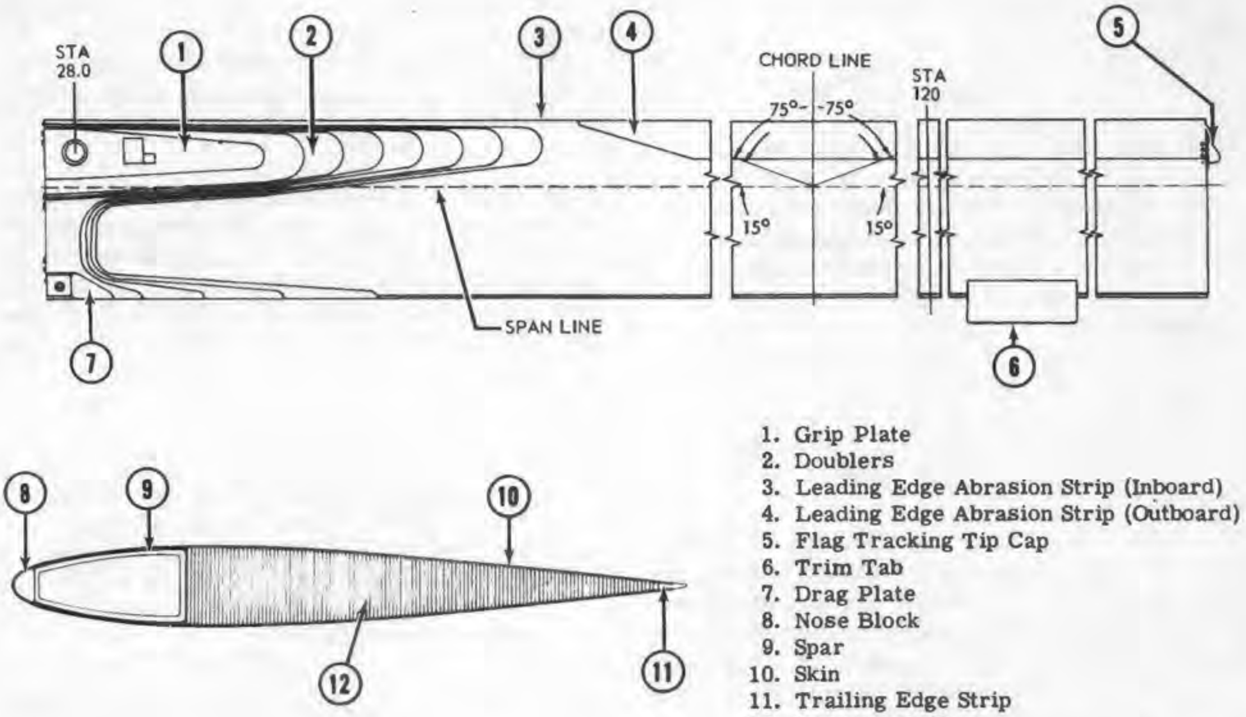
(c) In the skin, outboard of station 165, running within zero and 75 degrees of the chordline and not in excess of 0.004 inch in depth.

(d) In the skin, outboard of station 165, running within zero and 15 degrees of the spanline and not in excess of 0.008 inch in depth.

(e) In the outboard abrasion strip, inboard of station 165, not in excess of 0.003 inch in depth.

(f) In the outboard abrasion strip, outboard of station 165, running within zero and 15 degrees of the spanline and not in excess of 0.006 inch in depth.

(g) In the outboard abrasion strip, outboard of station 165, running within zero and 75 degrees of the chordline and not in excess of 0.004 inch in depth.



1. Grip Plate
2. Doublers
3. Leading Edge Abrasion Strip (Inboard)
4. Leading Edge Abrasion Strip (Outboard)
5. Flag Tracking Tip Cap
6. Trim Tab
7. Drag Plate
8. Nose Block
9. Spar
10. Skin
11. Trailing Edge Strip
12. Honeycomb Core

204010-43

Figure 8-16. Main rotor blade (UH-1B Serial No. 60-3546 thru 64-14100)

(h) In the doublers, grip and drag plates running within zero and 15 degrees of the spanline and not in excess of 0.005 inch in depth.

(i) In the doublers, grips and drag plates running within zero and 75 degrees of the chordline and not in excess of 0.0025 inch in depth.

Note

The allowable limit for wrinkles in main rotor blade skin, caused by accident or overspeed, is 0.020 inch when measured "PEAK to VALLEY" with blade lying supported in a flat position.

(3) Nicks and scratches on the upper and lower surfaces of the trailing edge strip not in excess of the limits stated below are acceptable if repaired by polishing out. Notches on the trailing edge not in excess of 0.120 inch deep chordwise are acceptable if repaired by removing material on a 2.0 inch minimum radius. Repair may not extend more than 0.120 inch deep chordwise. Touch-up refinishing per paragraph 8-58 should be accomplished after repair.

(a) In the upper and lower surface of the trailing edge strip, running within zero and 15 degrees of the spanline and not in excess of 0.005 inch in depth.

(b) In the upper and lower surface of the trailing edge strip, running within zero and 75 degrees of the chordline and not in excess of 0.003 inch in depth.

(4) Inspect the rotor blade for dents. Dents not in excess of the following limits may be repaired by lightly polishing with aluminum wool, cleaning with trichloroethylene and filling with sealer (item 210, table 1-1). After sealer has thoroughly dried, sand smooth and touch-up in accordance with instructions in paragraph 8-58. If dents are in excess of

limits below, the blade must be replaced. Limits and locations of permissible dents are as follows:

Caution

> Dents should be closely inspected for nicks, scratches and cracks. If nicks or scratches exist in dents and the total depth of the scratch and dent is in excess of items (a) and (b), below, the blade should be replaced. If nicks and/or scratches exist in a dent and are in excess of limits permitted in step (2) (a) through (i) or step (3) (a) and (b) above, the blade should be replaced. If cracks exist anywhere the blade should be replaced.

(a) Sharp dents in the skin, doublers, grip and drag plates and abrasion strips, inboard of station 165 which are not in excess of 0.016 inch in depth and/or outboard of station 165 which are not in excess of 0.030 inch in depth, and/or outboard of station 200 which are not in excess of 0.100 inch.

(b) Non-sharp dents in the skins, doublers, grip and drag plates and abrasion strips, inboard of station 165 which are not in excess of 0.030 inch in depth and/or outboard of station 165 which are not in excess of 0.060 inch in depth and/or outboard of station 200 which are not in excess of 0.180 inch.

(c) From station 230 outboard any dent that does not tear the skin, produce a void detectable when tapping with a coin, or affect flight characteristics is acceptable.

(5) The trailing edge trim tab may be straightened and aligned by using trim tab bending tool, T101422, and bending gage, T101417. The trailing edge of the trim tab may also be straightened by using a heavy back-up block and a plastic head mallet. If the trim tab cannot be straightened, is cracked, or is separated from the blade, replace the blade.

(6) A void is defined as an unbonded area that is supposed to be bonded. Edge voids in the grip plate, drag plate and doublers up to 0.060 inch deep are acceptable if the total lengths of the voids in a bond line does not exceed 10 percent of the length of the bond line and no single void exceeds 2.0 inches in length. No edge voids are acceptable in the outboard 7.0 inches of the doublers, the outboard 3.0 inches of the grip plates, and the outboard 1.5 inches of the drag plate. Acceptable voids must be sealed with sealer (item 210, table 1-1). Unacceptable voids require blade replacement.

8-56. *Repair — Covering Leading Edge with Plastic Tape (UH-1B Serial No. 60-3546 through 64-14100).* When operating in regions where abnormal erosion is encountered, vinyl tape (item 404, table 1-1) should be applied to the leading edge of the main rotor blade. Apply tape as follows:

Note

> Tape may be applied in widths from two to four inches to a maximum length of six feet on the outboard end of the blades. In any event the length and width of tape applied must be equal on both blades.

a. Smooth and clean area to be covered. (Remove existing tape if installed.) Sand off rough edges, using sandpaper (item 508 or 509, table 1-1) and wipe off dust or foreign material. Clean paintetd surfaces with a cloth dampened with naptha or any approved cleaning agent, and wipe dry with a clean cloth.

b. Cut tape (two inch width recommended) to desired length, (maximum six feet). Remove paper backing and place tape on a cardboard or similar smooth surface with adhesive side up.

c. Apply adhesive activator to adhesive side of tape, using a dampened felt squeegee or cheesecloth applicator, with parallel strokes from end to end of strip. (Adhesive activator and applicator are furnished with plastic film by manufacturer.) Avoid excessive use of activator solvent which will result in puckering and wrinkling of the film.

d. Fasten the center of the strip to the leading edge of blade, starting at one end and rubbing with hand to insure positive contact and freedom from air bubbles. Using thumbs, press tape in place, working from leading edge toward trailing tdge. Be sure all areas of tape are fastened. If air pockets are trapped, tape may be lifted back to air pocket, reactivated if necessary, and reapplied.

Note

If tape (item 404, table 1-1) is not available, pressure sensitive tape (item 405, table 1-1) may be installed. Install pressure sensitive tape in accordance with following steps.

1. Lightly sand leading edge with sandpaper (item 508 or 509, table 1-1) and wipe off dust and other foreign material, using a clean cloth dampened with naptha or any approved cleaning agent. Wipe dry after cleaning.

2. Select or cut tape (two inch width desirable; four inch width acceptable) to desired length (maximum of six feet). Apply tape along center line of leading edge, overlapping an equal amount on top and bottom of blade. Use fingers to press tape in place.

8-57. Emergency Repairs — Main Rotor Blades (UH-1B Serial No. 60-3546 through 64-14100). Main rotor blades receiving damage within the following limits may be repaired and returned to service.

Note

Permanent repair or disposition of main rotor blades shall be accomplished at the earliest opportunity.

a. Any damage penetrating the skin or in excess of manual limits and at least 2.0 inches from the spar, the trailing edge of the blade and doublers may be repaired provided the repair does not exceed 2.0 inches in diameter. "REPAIRS INBOARD OF STATION 210 MUST BE INSPECTED FOR CRACKS DAILY".

b. If the blade is damaged within the limits of step a., above, it may be repaired in accordance with the following instructions.

(1) Draw a circle around the damaged area just large enough to encompass damage.

(2) Remove skin just inside the circled area, disturbing the honeycomb as little as possible.

(3) Deburr edges of hole, making sure skin is free of scratches and nicks.

(4) Remove paint from repair area with methyl-ethyl-ketone (item 309, table 1-1). Dry with a clean cloth.

(5) Prepare a patch to cover the hole that will overlap by 0.75 inch. Patch may be fabricated from 0.016 or 0.020 2024ST T3 aluminum, Specification QQ-A-355-T3 or QQ-A-283-T6. Deburr and blend out edges. Sand the bond area of the patch and blade with 400 grit paper (item 509, table 1-1).

(6) Clean bond area on patch and blade with methyl-ethyl-ketone (item 309, table 1-1). Dry with a clean cloth.

Note

Area must be clean, dry and free of grease, oil and wax.

(7) Apply adhesive (item 214 or 216, table 1-1) to patch and area around hole. Apply patch to blade, moving patch slightly under pressure to make sure voids in bond are expelled. Blend out excessive adhesive.

(8) Patch may be held in place while curing with rubber bands made from inner tube. Allow to cure at 60°F or above until completely firm. (Adhesive will resist fingernail penetration.) Overnight curing is usually sufficient. To accelerate curing time apply heat to area with a 200 watt lamp, 12 inches from patch. Heat should be applied until adhesive is completely firm. (Adhesive will resist fingernail penetration.)

(9) Refinish patch and adjacent area in accordance with touch-up procedures called out in paragraph 8-58.

c. One or more cracks developing and extending from a previously repaired area are cause for immediate local scrappage of blade.

8-58. Painting — Minor Refinish — Main Rotor Blades (UH-1B Serial No. 60-3546 through 64-14100). Minor refinishing or main rotor blades consists of reworking small areas containing bare spots, paint cracks, crazing, blisters or other such minor defects which do not show evidence of pitting or damage to the blade shell. Use the least amount of paint possible to adequately protect the blade and to disturb the blade balance as little as possible.

a. Degrease with aliphatic naptha (item 308, table 1-1) or any good degreasing solvent.

Caution

Do not use solvent which damages paint finish.

b. Sand aged paint areas, using an abrasive grit which will not show marks in final finish. Remove dust with cloth dampened with naptha or with filtered compressed air.

Caution

Do not sand areas of bare metal.

c. Remove all surface oxides and all aged chemical conversion coatings from areas to be refinished, using abrasive cloth (item 403, table 1-1).

d. Repair adhesive fairing (adhesive squeeze-out along the trailing edge of stainless steel leading edge strip) with resin paste (item 210, table 1-1) after removal of all paint finish. Remove damaged fairing only.

e. Wash blades with soap detergent (item 312, table 1-1). Achieve water-break-free surface which will be evident by continuous unbroken film of water on the surface after thoroughly rinsing off soap.

Note

From completion of this step through final paint, do not touch prepared surfaces with bare hands.

f. Brush or spray on chemical conversion coating (item 317, table 1-1). If not available, use commercial metal-prep (alcoholic-phosphoric acid) or a 10 percent solution of chromic acid.

g. Dry and clean prepared surfaces thoroughly.

h. Apply one light coat (0.0003 to 0.0005 inch) of catalyzed epoxy primer, (item 102, table 1-1). Air dry a minimum of 45 minutes or a maximum of 24 hours.

i. Apply finish coats of acrylic lacquer, Navy Formula P-95, in colors specified below (Federal Standard 595). Allow one hour drying time between coats. Use additional coats as required for full coverage and for a total film thickness (primer and lacquer) of 2.5 to 3.5 mils (0.0025 to 0.0035 inch).

(1) On upper surface of blade, apply two coats camouflage olive drab, (item 106, table 1-1).

(2) On lower surface of blade, apply two coats of camouflage black, (item 105, table 1-1).

(3) On outer six inches (top and bottom) of blade, apply one coat of gloss orange-yellow (item 112, table 1-1).

(4) On one blade tip and outer two inches, apply one coat of gloss white (item 110, table 1-1).

(5) On opposite blade tip and outer two inches, apply one coat of gloss red, (item 108, table 1-1).

j. Air dry blades a minimum of 48 hours before use.

8-59. Installation — Main Rotor Blades (UH-1B Serial No. 60-3546 through 64-14100). Installation of the main rotor blades shall be accomplished as follows.

Note

If drag braces are once properly adjusted, blades are interchangeable without further adjustment. To avoid disturbing rotor balance, install blade bolts in grips from which they were removed.

After installing new blades, it may be necessary to zero trim tabs before tracking.

a. Apply corrosion preventive (item 315, table 1-1) to blade retention bolt bushings in rotor grip and blade and to drag brace and drag plate bushing. Support hub assembly on a stand. Insert blade (2, figure 8-13) into grip, observing color coding. Align bolt holes and insert bolt (3) through grip and blade assembly from top side. Gently moving tip of the blade up and down while inserting bolt will facilitate alignment of bolt holes.

Note

Foreign material or misalignment of bolt holes will result in damaged parts.

b. Support end of installed blade. Install nut (7), on blade bolt. Align drag brace clevis hole and blade drag plate hole. Install shims (1), between clevis and drag plate to take up clearance, not to exceed 0.000 to 0.005 inch. Install clevis bolt with two washers next to nut.

c. Install second blade in the same manner. Torque nuts on drag brace bolts 100 to 120 foot-pounds.

d. Torque nuts (7) on blade bolts (3) 260 to 300 foot-pounds using tool T101414. Safety nut (7) by installing a bolt through nut and blade bolt.

e. Torque lower nut on counterweight bolt 125 to 150 foot-pounds.

8-60. *Preparation for Storage or Shipment — Main Rotor Blades (UH-1B Serial No. 60-3456 through 64-14100).* The following instructions cover storage or shipment of main rotor blades in either cardboard or metal containers.

Caution

Immediately upon removal of a blade or blades, the assembly must be thoroughly cleaned, oiled, the retention and drag brace bolt holes coated with grease, rust-preventive compound or cosmoline. The blade areas contacting the metal container cushions must be wrapped with water repellant paper and the blade/blades placed in the proper container, along with the historical records.

a. Clean and dry each blade assembly in accordance with Specification MIL-P-116.

b. Apply corrosion preventive compound (item 315, table 1-1) to hub, retention bolt hole and drag brace bolt holes.

c. Wrap blade assembly with grease proof barrier material (item 506, table 1-1) at all locations where the contoured supports contact the blade and secure with pressure sensitive tape (item 402, table 1-1).

d. For storage or shipment in a cardboard container proceed as follows:

(1) Secure contours to blade assembly.

(2) Place blade assembly and contours in container with 12 eight unit bags and one four unit bag (total 100 units) of dessicant (item 316, table 1-1).

(3) Band container shut with one-half inch steel bands.

e. For storage or shipment in a metal container proceed as follows:

(1) Secure blade assembly to shock mounted support in container in such a manner that all protruding components are completely protected from any possible damage.

Note

Blades should not be in direct contact with contours at any time during storage or shipment.

(2) Place 12 eight unit bags and one four unit bag (total 100 units) of dessicant (item 316, table 1-1) in container.

(3) Install top half of container (with top cushions attached) on lower half of container and secure in place with cam lock fasteners.

8-61. Main Rotor Hub (UH-1B Serial No. 60-3546 through 64-14100). The main rotor hub is a common yoke which attaches the main rotor blades, through the blade grips, to the main rotor mast.

8-62. *Removal — Main Rotor Hub (UH-1B Serial No. 60-3546 through 64-14100.)* a. Remove main rotor hub and blade assembly. (Refer to paragraph 8-51.)

b. Remove main rotor blades. (Refer to paragraph 8-54.)

8-63. *Inspection — Main Rotor Hub (UH-1B Serial No. 60-3546 through 64-14100).* a. Maximum allowable play in pitch link universal assembly bearings is 0.017 inch in the axial direction and 0.0085 inch in the radial direction.

b. Maximum allowable play in pitch link rod end bearing is 0.020 inch in the axial direction and 0.020 in the radial direction.

c. Inspect blade retaining bolts for loss of dry film lubricant (bare metal exposed), pitting, and fretting corrosion. If inspection of blade retaining bolts reveals damaged area, replace bolts.

d. Dimensions of damaged areas on drag brace bolts, after polishing and cleanup, shall not exceed ¼ of the bolt circumference. Bolts shall be replaced if the outside diameter (in inches) is less than the values specified below.

(1) Inboard drag brace 0.8730

(2) Outboard drag brace 0.8721

e. Some seepage from the main rotor grip seal is normal. Seepage may be considered objectionable when loss of oil is equivalent to the amount contained in the reservoir during a flight of two hours duration. When helicopter is in a static position and seepage of oil in a 24 hour period results in not being able to obtain reading from sight gage, main rotor grip seal must be replaced.

f. Maximum allowable dimensions of main rotor grip bushing holes after polishing are as follows: (1 and 2, figure 8-17.)

Main Retention	2.5040
Drag Brace	0.8760

Score marks on the inner surface of bushings made during removal of bolts may not exceed 0.010 inch, maximum, in depth. Such score marks may be polished out. The area of cleanup should cover a maximum of 1/4 of the bushing circumference. Bushings are to be replaced if the inside diameter dimensions specified above are exceeded.

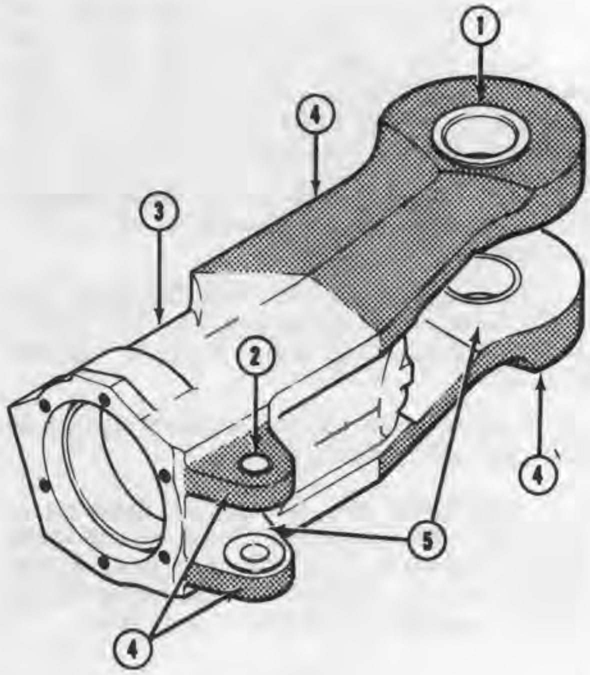
g. The following criteria define the limits of damage that are allowable on the external surfaces of the main rotor grips. (See figure 8-17.) Damaged surfaces in all areas of the grip should be improved by polishing out the area locally and blending edges of the damage into the surrounding surface with a smooth contour. Grips with discrepancies in excess of specified limits should undergo fifth echelon inspection.

(1) Damage to the barrel (3, figure 8-17) shall not exceed a maximum depth of 0.060 inch, up to 3.5 inches in length.

(2) Damage to the outside surface of blade tangs and drag brace tangs (4, figure 8-17) shall not exceed a maximum depth of 0.060 inch. Lengths shall not exceed 1/2 of maximum tang width inboard of bolt hole; 1/2 of edge distance between bushing and edge of tang, and/or 1/2 of dimension between inside and outside tang surfaces.

(3) Damage to the inside surface of blade tangs and drag brace tangs (5, figure 8-17) shall not exceed a maximum depth of 0.020 inch. Length inboard of bolt hole shall not exceed a maximum of 1/2 of tang width. Damage in bolt hole area should not exceed a maximum of 1/2 of edge distance between bushing and edge of tang.

8-64. *Repair or Replacement — Main Rotor Hub (UH-1B Serial No. 60-3546 through 64-14100).* Replace all parts that do not meet inspection requirements. (Refer to paragraph 8-63.)



1. Main Retention Bushing
2. Drag Brace Bushing
3. Barrel
4. Outside Surface - Blade and Drag Brace Tangs
5. Inside Surface - Blade and Drag Brace Tangs

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Figure 8-17. Allowable damage—main rotor grips (UH-1B Serial No. 60-3546 thru 64-14100)

8-65. *Installation — Main Rotor Hub (UH-1B Serial No. 60-3546 through 64-14100).* a. Install main rotor blades. (Refer to paragraph 8-59.)

b. Install main rotor hub and blade assembly. (Refer to paragraph 8-52.)

8-66. *Preparation for Storage or Shipment — Main Rotor Hub (UH-1B Serial No. 60-3546 through 64-14100).* a. Clean and dry hub assembly in accordance with Specification MIL-P-116.

b. Apply corrosion-preventive compound (item 315, table 1-1) to bushings and exposed nonplated steel surfaces.

c. Place hub in container, and lower onto frame center block.

d. Secure frame end brackets over each end of hub and around hub bolt attached to frame.

e. Install washer and nut. Tighten nut securely.

f. Place 12 eight unit bags and one four unit bag (total 100 units) of desiccant (item 316, table 1-1) in desiccant container.

g. Lower top half of shipping container into place and secure in place with bolts, washers, and nuts. Tighten nuts sufficiently so as to obtain a moisture vapor proof closure.

8-67. Placing in Service — Main Rotor Hub (UH-1B Serial No. 60-3546 through 64-14100). a. Remove bolts to remove top half of shipping container.

b. Remove attachments and lift hub out of container. Blade bolts are balanced and should not be exchanged.

c. Clean and dry hub assembly in accordance with Specification MIL-P-116.

Note

> The main rotor hub container may be used as a build-up stand for attachment of main rotor blades. Remove eight bolts and lift out frame of container. Relocate frame 90 degrees to container and secure with four camlock fasteners. Position rotor hub 90 degrees to frame and tighten center nut. Attach main rotor blades.

8-68. Stabilizer Bar (UH-1B Serial 60-3546 through 64-14100). The stabilizer bar is attached to the mast at the main rotor hub trunnion. The bar is connected into the main rotor system in such a manner that the inherent inertia and gyroscopic action of the bar is induced into the rotor system and provides a measure of stability for all flight conditions. If while hovering, the helicopter is disturbed the bar due to its gyroscopic action tends to remain in its present plane. The relative movement between the bar and the mast causes the hub and blade assembly to feather and return the rotor to near its original plane of rotation. If the bar were completely unrestrained it would remain in its original plane of rotation and would induce stability to the point of removing all control from the pilot. Due to restraining and dampening action the bar possesses a mast following characteristic. This following time is regulated by two hydraulic dampers connected to the bar in such a manner that a movement of the mast is transmitted to the bar through the dampers at a rate determined by the adjustment of the dampers. A compromise is met in which the bar provides the desired amount of stability and still allows the pilot complete responsive control of the helicopter.

8-69. Removal — Stabilizer Bar (UH-1B Serial No. 60-3546 through 64-14100).

a. Disconnect pitch links (3, figure 8-10) from pitch horns (4) and install grip positioning links T101402 to hold grips and blades in position.

b. Disconnect damper links from damper arms.

c. Disconnect tube assemblies from scissors levers. Secure control rods to bar with tape.

d. Remove four bolts from each stabilizer support and lift bar off rotor.

8-70. Inspection — Stabilizer Bar (UH-1B Serial No. 60-3546 through 64-14100). a. Inspect centerframes and supports for scratches, dents and burnish marks within 1.0 inch either side of bolt hole center line. Depth of damage shall not exceed 0.010 inch. Inspect mixing levers to criteria shown on figure 8-17A.

b. Burnish marks from sockets are permitted on the outboard attachment bolt holes of tube to centerframes. These marks shall have no depth and only be of a polished nature.

c. Inspect outboard 4.0 inches of centerframes for scratches which have no depth, but do remove the protective coating. Such scratches are permitted, but shall be treated for corrosion protection. (Refer to paragraph 8-71.)

d. Inspect for scratches which have a maximum depth of 0.002 inch. Such scratches are permitted, but shall be treated for corrosion protection. (Refer to paragraph 8-71.)

Note

If a burr is present on the end of a scratch, it shall be removed, without causing any damage to the surface of the centerframe, before the scratch is given corrosion protective treatment.

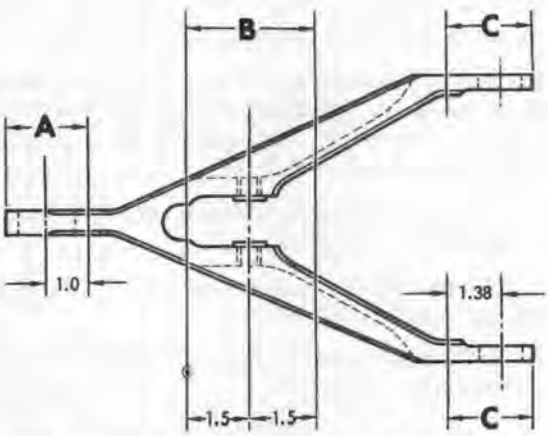


Figure 8-17A. Stabilizer bar mixing lever repair limits (UH-1B serial no. 60-3546 thru 64-14100)

e. Inspect the corner edges of the outboard 4.0 inches of the centerframes for dents which do not exceed a maximum depth of 0.010 inch and a maximum length of 0.5 inch.

f. Inspect all other areas of the centerframes, mixing levers and supports for scratches and dents. Maximum depth of such damage shall not exceed 0.035 inch.

g. Inspect all bearings for damage and freedom in race.

8-71. Repair or Replacement — Stabilizer Bar (UH-1B Serial No. 60-3546 through 64-14100). a. Round edges of repairable dents, keeping radius as small as possible.

b. Burnish out all repairable damage to a smooth finish.

c. Treat all repaired areas for corrosion protection as follows:

(1) Clean surface with aliphatic naptha (item 308, table 1-1).

(2) Scrub area to be treated with biodegradeable compound (item 312, table 1-1) and rinse thoroughly.

(3) Apply brush alodine (item 317, table 1-1) to bare area only. Keep surface wet one to three minutes.

(4) Remove solution with clean cheesecloth saturated with water. Dry with compressed air or clean, dry cheesecloth.

d. If bearings are considered unsatisfactory for continued usage, replace component.

8-72. Installation — Stabilizer Bar (UH-1B Serial No. 60-3546 through 64-14100). a. Position stabilizer bar supports in place over trunnion observing color code. Install four bolts with washers in each support. Lockwire bolts in pairs vertically.

b. Remove grip positioning tool and attach pitch links (3, figure 8-10) to pitch horns (4) and stabilizer bar mixing levers (2).

c. Attach control tubes to scissors levers.

d. Attach damper control tube to damper arm. Refer to paragraph 8-79 for instructions relative to adjusting damper control tube.

8-73. Stabilizer Bar Dampers (UH-1B Serial No. 60-3546 through 64-14100). The stabilizer bar dampers are mounted on adapters on the mast. The adjustment and timing of the dampers determines the following time of the stabilizer bar and the resultant controllability of the helicopter.

8-74. Removal — Stabilizer Bar Dampers (UH-1B Serial No. 60-3546 through 64-14100.) a. Disconnect tubes from lever arms.

b. Remove retainer ring (3, figure 8-18) adapter bolts (2), and slide dampers and adapter assembly from mast.

8-75. Inspection — Stabilizer Bar Dampers (UH-1B Serial No. 60-3546 through 64-14100). Inspect dampers for damage, security, leakage and proper timing.

8-76. Repair or Replacement — Stabilizer Bar Dampers (UH-1B Serial No. 60-3546 through 64-14100). a. Replace all dampers that do not meet inspection requirements. (Refer to paragraph 8-75.)

b. Replace dampers that cannot be adjusted. (Refer to paragraph 8-79.)

8-77. Servicing — Stabilizer Bar Dampers (UH-1B Serial No. 60-3546 through 64-14100). Remove filler cap and fill dampers to full mark with hydraulic oil, (item 3, table 1-1).

8-78. Installation — Stabilizer Bar Dampers (UH-1B Serial No. 60-3546 through 64-14100). Use two dampers of the same part number.

a. Slide adapter and damper assemblies into position on mast splines with master splines aligned and install retainer ring (3, figure 8-18).

b. Install four adapter bolts (3, figure 8-18), washers and nuts and torque evenly.

c. Install lever arms. (Refer to paragraph 8-79.)

d. Attach control tubes to lever arms. (Refer to paragraph 8-79 for adjustment of tubes.)

8-79. Adjustment —Stabilizer Bar Dampers (UH-1B Serial No. 60-3546 through 64-14100). a. To adjust damper lever and wingshaft of damper, Part No. 204-010-937, position wingshaft to line up pin (11, figure 8-18) with mark on cam (10) outside diameter as seen through window. Assemble lever (6) to wing-shaft horizontal to closest spline tooth. Connect damper links to stabilizer bar and damper lever. Position stabilizer bar perpendicular to mast. Adjust control tubes as required to line pins up with mark on outside diameter of cam while bar is square to mast.

b. To adjust dampening of damper, Part No. 204-010-937-1, position stabilizer bar against its limit stops while observing pin in window of damper. Rapidly return stabilizer bar to neutral position and measure the time required for the pin to return and contact the flat surface of the cam. Time for the above must measure five plus or minus one second. Adjust needle valve (9) in end of damper as required to accomplish above. Damper (Part Number 204-010-937-5) cannot be adjusted.

Note

If damper (Part Number 204-010-937-5) does not operate within the specified time limit (5 ±1 second) replace the damper.

8-80. Swashplate and Collective Sleeve (UH-1B Serial No. 60-3546 through 64-14100). The swashplate and collective sleeve assembly encircles the mast at the top of the transmission. The swashplate is mounted on a universal support so that it may be tilted in any direction. Movement of the cyclic control sticks results in a corresponding tilt of the swashplate, and through a system of linkage the position of the rotor is mechanically changed. A movement of the collective pitch lever actuates the collective sleeve within the swashplate and transmits collective control to the rotor hub.

8-81. Removal—Swashplate and Collective Sleeve (UH-1B Serial No. 60-3546 through 64-14100). a. Remove main rotor hub and blade assembly. (Refer to paragraph 8-51.)

b. Remove stabilizer bar dampers and adapter. (Refer to paragraph 8-74.)

c. Cut safetywire and remove boot (9, figure 8-19) and seal (10).

d. Disconnect control tube from trunnion of collective pitch lever (7).

Note

If only the scissors and sleeve assembly is to be removed proceed as outlined in paragraph 8-87. The following steps are required for removal of the swashplate and collective sleeve assembly as a complete unit.

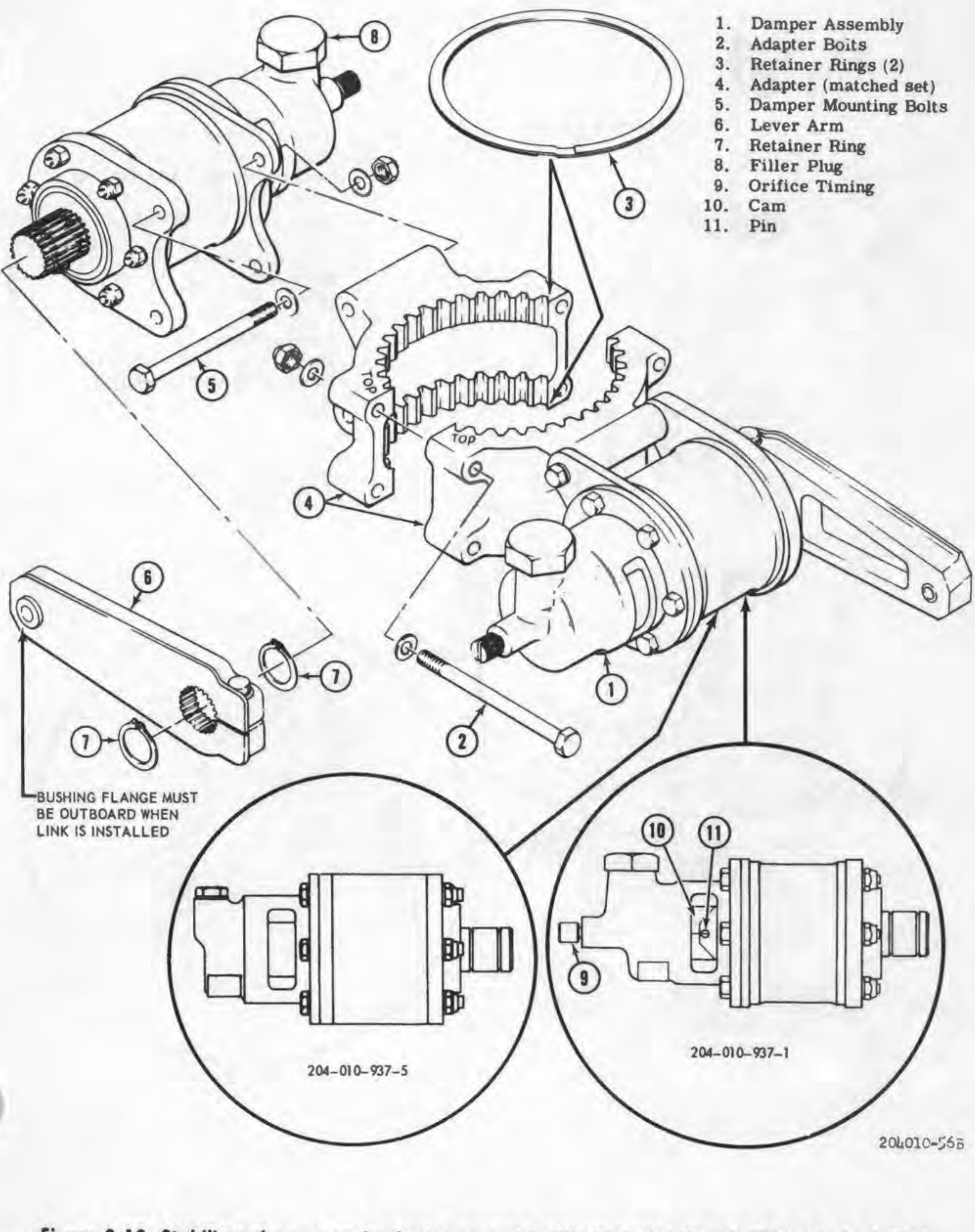
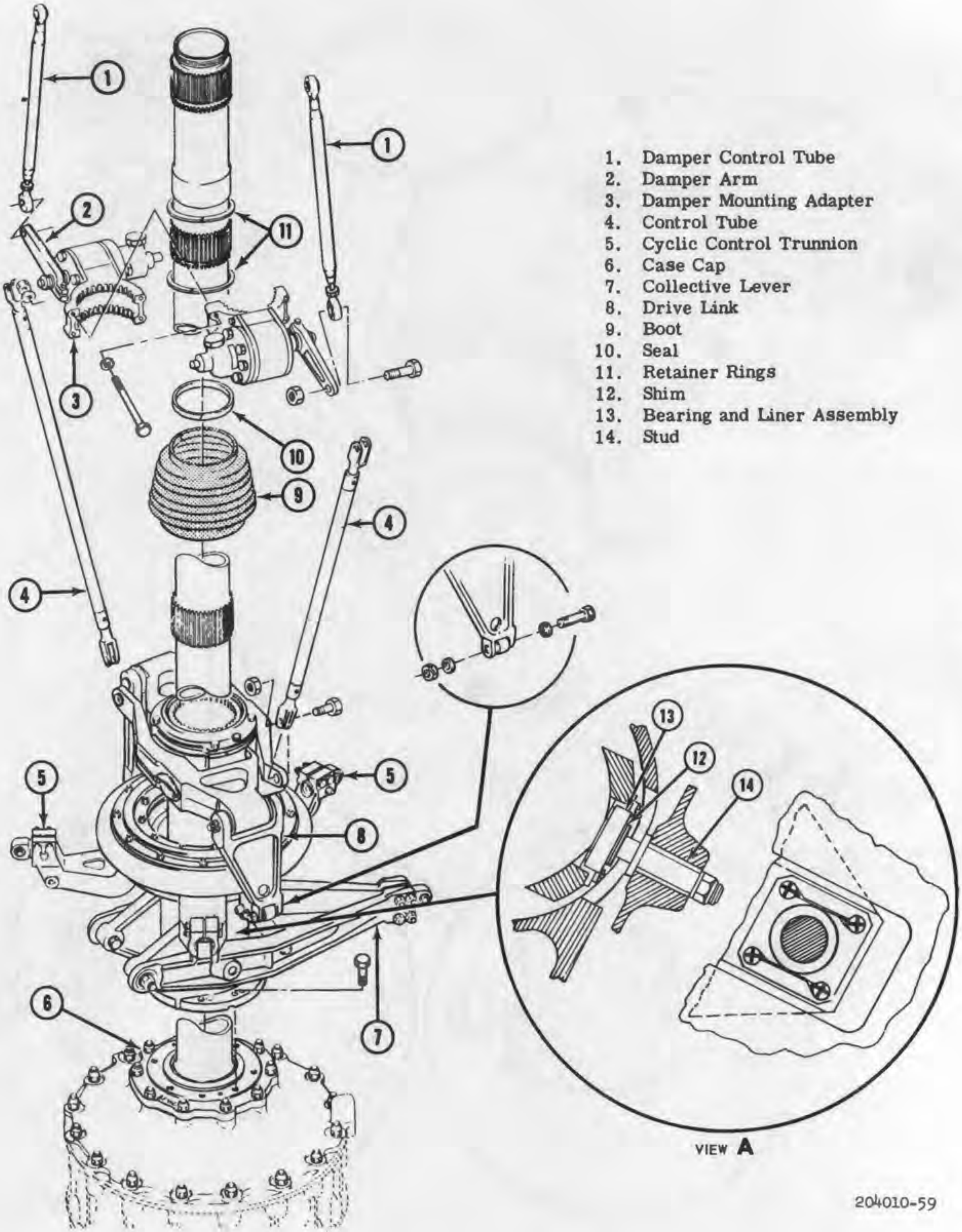


Figure 8-18. Stabilizer damper and adapter assembly (UH-1B Serial No. 60-3546 thru 64-14100)



1. Damper Control Tube
2. Damper Arm
3. Damper Mounting Adapter
4. Control Tube
5. Cyclic Control Trunnion
6. Case Cap
7. Collective Lever
8. Drive Link
9. Boot
10. Seal
11. Retainer Rings
12. Shim
13. Bearing and Liner Assembly
14. Stud

Figure 8-19. Mast controls (UH-1B Serial No. 60-3546 thru 64-14100)

e. Disconnect the cyclic and elevator control tubes from trunnions (5) on the swashplate. Insert a piece of folded paper or cardboard into each of the four gimbal support clevises to prevent damage while handling.

f. Remove eight bolts and washers securing swashplate support to transmission case cap (6) and carefully lift the swashplate and collective sleeve assembly from the mast.

8-82. ***Inspection — Swashplate and Collective Sleeve (UH-1B Serial No. 60-3546 through 64-14100).*** a. Inspect for maximum allowable wear looseness across gimbal ring bearings and bolts of 0.010 inch.

b. Inspect support and inner and outer rings for nicks, burrs and scratches.

c. Inspect trunnion bearings (5, figure 8-19) for allowable axial chuck of 0.020 inch and general condition.

Note

> The trunnion bearings are somewhat different than other bearings which normally can be "feel checked" for roughness and ease of rotation. The trunnion bearings are preloaded into the cylinder portion of the trunnion with a 0.0005 inch tight to 0.0005 inch loose tolerance. They are the roller type, having two separated roller cases and angular faced inner and outer races.
>
> The normal feel of this assembly is one of tightness, due mainly to the 0.0005 inch tight tolerance. The feeling of roughness is due to the preload and the angular faces of the inner and outer races. When grease (item 8, table 1-1) is applied to the assembly as required, the normal bearing feel does not exist.
>
> The conditions described are inherent in the trunnion bearing assembly. Checking the bearing assembly for tightness should be accomplished by hand movement only of the barrel and the crosshead.

Caution

> Should swashplate trunnion bearings require replacement, torque retaining bolts 50 to 70 inch-pounds.

8-83. ***Repair or Replacement — Swashplate and Collective Sleeve (UH-1B Serial No. 60-3546 through 64-14100).*** Replace all parts that do not meet inspection requirements. (Refer to paragraph 8-82.)

8-84. ***Installation — Swashplate and Collective Sleeve (UH-1B Serial No. 60-3546 through 64-14100).*** The swashplate and support assembly and the scissors and sleeve assembly can be installed as an assembled unit, or as separate assemblies. The following steps cover procedure for installation of the assembled unit. For installation of the scissors and sleeve as a separate assembly, refer to paragraph 8-90.

a. Lubricate splines with grease (item 8 table 1-1).

b. Carefully lower the assembled unit over the mast until swashplate support rests on transmission case cap (6, figure 8-19).

c. Align holes and install eight bolts, with aluminum alloy washers under heads, through support flange into case cap (6). Use two longest bolts between pivots of collective lever. Safetywire bolt heads in pairs.

d. Connect collective pitch control tube to collective lever. Connect cyclic and elevator control tubes to swashplate trunnions. Make certain lubrication fittings on trunnions are up.

e. Slide boot (9, figure 8-19) down over flange at top of sleeve assembly and secure with safetywire. Position seal (10) around mast and under top edge of boot (9). Safetywire seal.

f. Install stabilizer bar dampers and adapters. (Refer to paragraph 8-78.)

g. Install main rotor hub and blade assembly. (Refer to paragraph 8-52.)

h. Connect control tubes and links.

8-85. ***Preparation for Storage or Shipment — Swashplate and Collective Sleeve (UH-1B Serial No. 60-3546 through 64-14100).*** The following steps cover procedure for installing swashplate and collective sleeve in metal container.

a. Clean and dry swashplate and support assembly in accordance with Specification MIL-P-116.

b. Apply corrosion preventive compound (item 315, table 1-1), to bushings and exposed nonplated steel surfaces not in contact with bearings.

c. Apply grease (item 13, table 1-1) to all bearings and grease fittings.

d. Wrap assembly in grease proof barrier material (item 506, table 1-1) and secure with pressure sensitive tape (item 402, table 1-1). Shape wrapper to contour of assembly.

e. Place wrapped assembly into contoured bottom cushion of metal container, and align to fit the contour.

f. Align top contoured cushion to fit assembly and lower into place.

g. Place 19 eight unit bags (total 152 units) of desiccant, (item 316, table 1-1) in desiccant container.

h. Place rubber gasket on lower half of container and lower lid of container into place. Install locking ring over lip of lid and container body.

i. Install bolt and nut in locking ring and tighten sufficiently so as to obtain a moisture-vapor proof closure.

8-86. Scissors and Sleeve Assembly (UH-1B Serial No. 60-3546 through 64-14100). The collective sleeve, which is contained within the swashplate, is actuated by movement of the collective pitch lever. By this action collective control is transmitted to the main rotor hub.

8-87. Removal — Scissors and Sleeve Assembly (UH-1B Serial No. 60-3546 through 64-14100). a. Refer to paragraph 8-81. Perform steps a. through d.

b. Remove nuts, washers, spacers (3, figure 8-20) and bolts attaching collective pitch levers (1) to swashplate support (6) and to each other. Keep all loose parts, including shims (5), together for use in reassembly.

c. Cut safteywire and remove four screws attaching each bearing and housing assembly (8, figure 8-20) to lower end of collective sleeve (7).

d. Remove nuts, washers and bolts and disconnect links from swashplate trunnions.

e. Carefully lift the scissors and sleeve assembly upward and remove from mast.

8-88. Inspection — Scissors and Sleeve Assembly (UH-1B Serial No. 60-3546 through 64-14100). Clamp dial indicator to mast with plunger resting on the collective boot flange attaching bolt head. Rotate sleeve assembly and measure amount of play present. Maximum radial play allowed between mast and collective sleeve drive plate is 0.040 inch at point of measurement.

8-89. Repair or Replacement—Scissors and Sleeve Assembly (UH-1B Serial No. 60-3546 through 64-14100). If inspection requirements (refer to paragraph 8-88) are not met request assistance from higher maintenance level.

8-90. Installation — Scissors and Sleeve Assembly (UH-1B Serial No. 60-3546 through 64-14100). The following steps cover installation of scissors and sleeve assembly as a separate assembly.

a. Lubricate splines of collective sleeve (7, figure 8-20) and carefully lower scissors and sleeve assembly over mast and into swashplate support (6).

b. Attach drive links (8, figure 8-19) to trunnion bearings on swashplate outer ring. Make certain lubrication fittings are down and bolt heads toward rotation.

Caution

> Use high tensile, close tolerance bolts with a minimum of four steel washers positioned as shown in figure 8-19. Torque to high tensile torque of 80 to 100 inch-pounds and check torque after first ten hours of operation.

c. Position bearing and housing assemblies (8, figure 8-20) to lower end of collective sleeve (7) and install attaching screws. Safetywire screws in vertical pairs.

1. Levers-Collective
2. Pin
3. Spacer
4. Trunnion
5. Shim
6. Swashplate Support
7. Collective Sleeve
8. Bearing and Housing
9. Lever Bearing and Liner

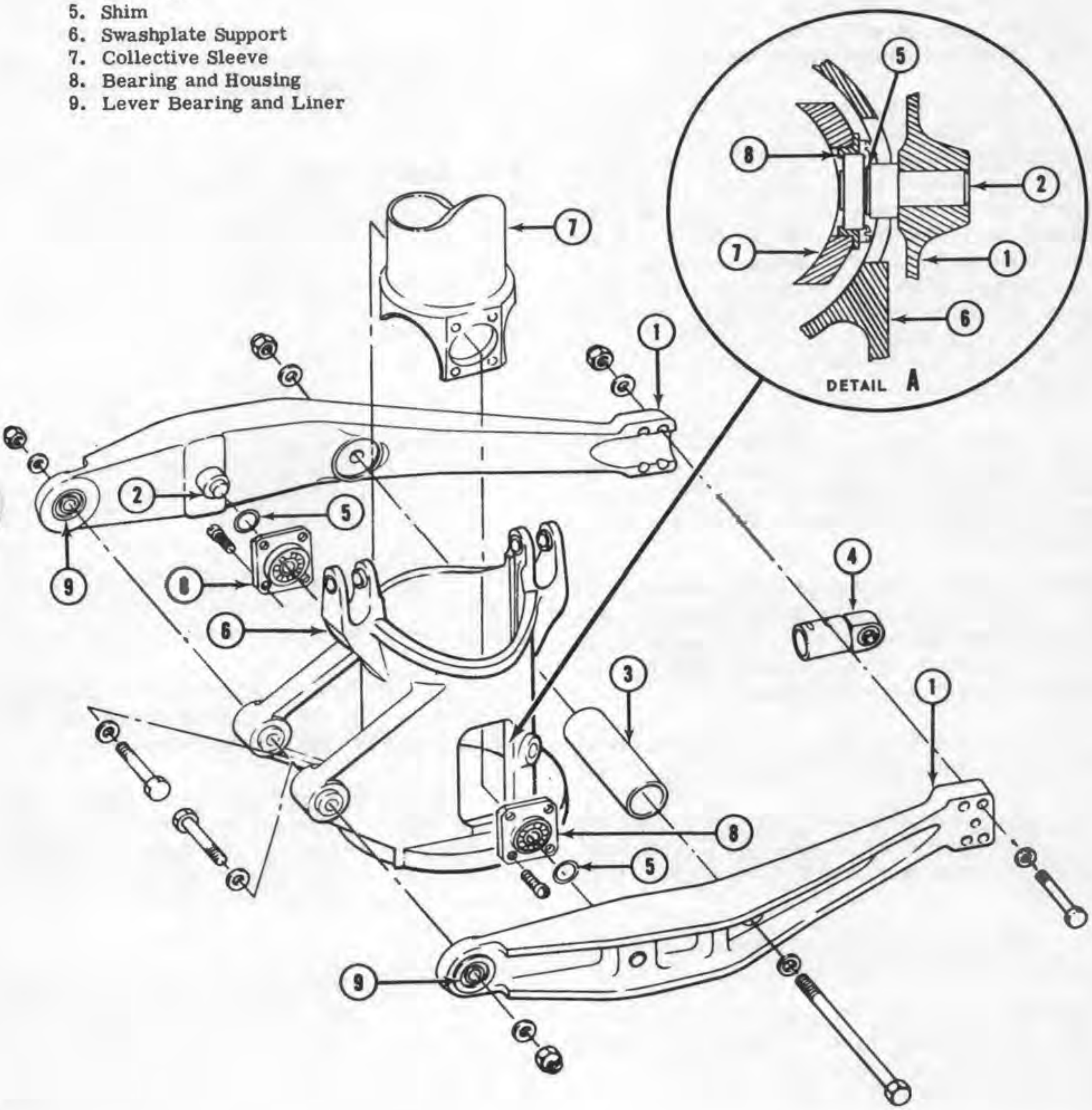


Figure 8-20. Collective pitch levers (UH-1B Serial No. 60-3546 thru 64-14100)

d. Check wear between lever bearing and liner (9, figure 8-20). If wear exceeds 0.001 inch, perform step e. If wear exceeds 0.005 inch, bearing must be replaced.

e. Clean bore of liner bushing and outer race of bearing. Coat both surfaces with primer (item 118, table 1-1). Allow to dry. Coat both surfaces with sealant (item 201, table 1-1). Wipe off excess sealant and allow to dry.

f. Assemble collective pitch levers (1, figure 8-20) on swashplate support (6) with pin inserted into bearings on collective sleeve (7). Position trunnion (4) between collective pitch levers (1) and install bolts, washers and nuts. Torque bolts. Use feeler gage to measure clearance between shoulder on pin and bearing inner race at each side. Add two feeler gage clearances and divide by two to determine thickness of shims (12, figure 8-19), required. Prepare two shims to this dimension, equal to each other within 0.005 inch.

g. Remove levers (7, figure 8-19) install shims (12) and reassemble. Check for no end play of pins in bearings and for freedom of bearing rotation. Installation should be 0.000 to 0.002 inch tight.

8-91. *Preparation for Storage or Shipment — Scissors and Sleeve Assembly (UH-1B Serial No. 60-3546 through 64-14100).* The following steps cover procedure for installing scissors and sleeve assembly in metal container.

a. Clean and dry scissors and sleeve assembly in accordance with Specification MIL-P-116.

b. Apply corrosion preventive compound (item 315, table 1-1) to bushings and exposed nonplated steel surfaces not in contact with bearings.

c. Apply grease (item 13, table 1-1) to all bearings and grease fittings.

d. Wrap assembly in grease proof barrier material (item 506, table 1-1) and secure with pressure sensitive tape (item 402, table 1-1). Shape wrapper to contour of assembly.

e. Place wrapped assembly into contoured bottom cushion of metal container, and align to fit the contour.

f. Align top contoured cushion to fit assembly and lower into place.

g. Place 12 eight unit bags and one four unit bag (total 100 units) of desiccant (item 316, table 1-1) in desiccant container.

h. Place rubber gasket on lower half of container and lower lid on container in place. Install locking ring over lip of lid and container body.

i. Install bolt and nut in locking ring and tighten sufficiently so as to obtain a moisture-vapor proof closure.

8-92. Control Tubes. The following steps cover general information and minor repair of both rotating and non-rotating control tubes.

a. Minor damage to both rotating and non-rotating control tubes in the form of scratches may be polished out.

Note

> No limitations apply to length or direction of scratches. Scratches should be blended out to extend over a minimum two inch area.

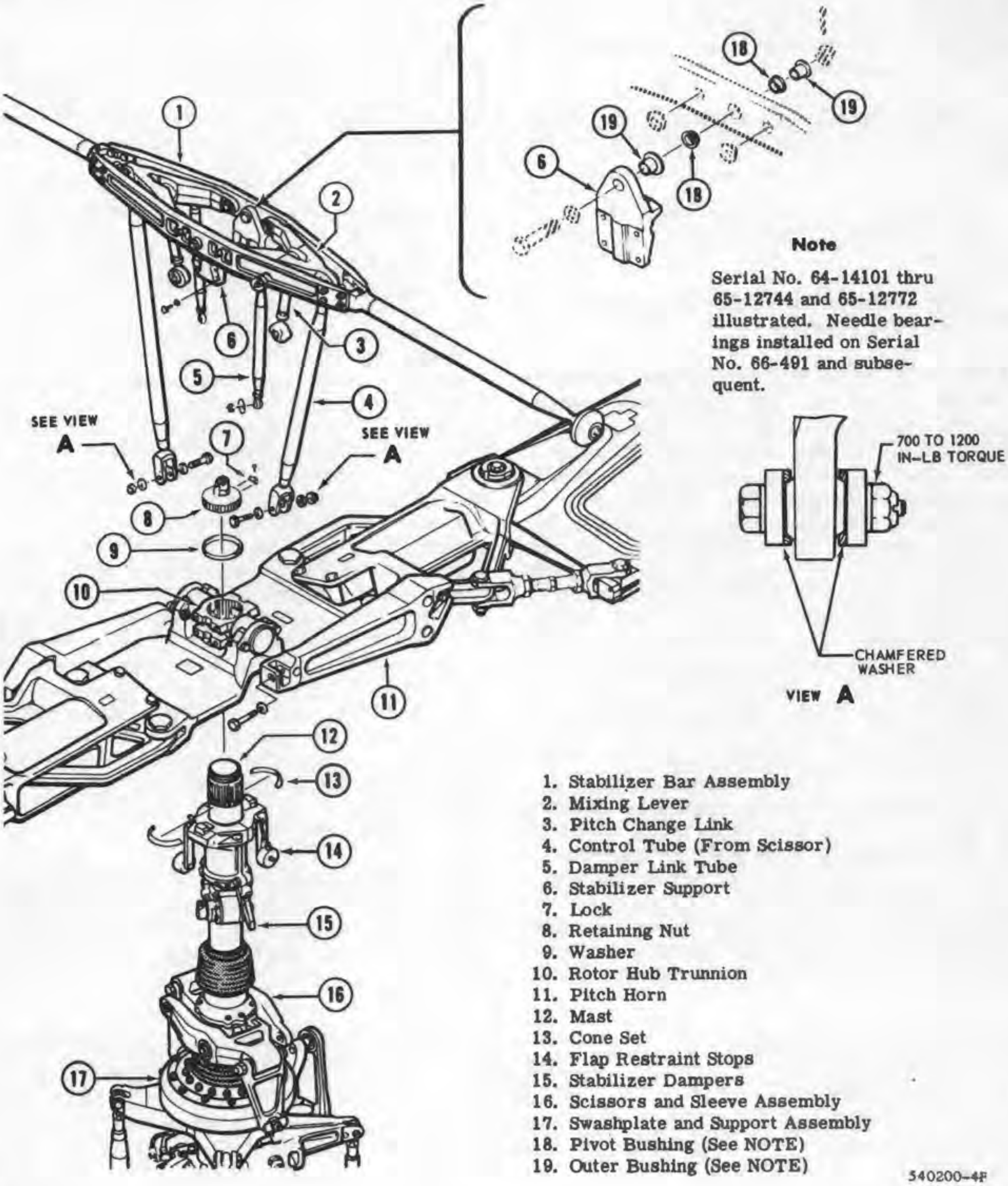
b. Scratches in all control tubes above the swashplate not in excess of 0.005 inch in depth may be polished out in accordance with step d.

c. Scratches, below and aft of the swashplate not in excess of 0.010 inch in depth may be polished out in accordance with step d.

d. Remove all scratches that are within limitations with wet or dry type sand paper (item 508, table 1-1) or finer, to obtain a smooth scratch free surface. Apply two coats of zinc chromate primer (item 119, table 1-1) to repaired area.

e. Allowable wear limits for the damper control tube (1, figure 8-19) bearings permit a maximum of 0.005 inch radial play and 0.030 axial play. Some of these tube assemblies may be equipped with alternate rod end bearings, 47-140-252-5. Tube assemblies so equipped have 0.012 inch radial and 0.012 inch axial maximum allowable wear limits.

f. Tail rotor pitch change link bearings have 0.020 inch radial and 0.020 inch axial maximum allowable wear limits.



Note

Serial No. 64-14101 thru 65-12744 and 65-12772 illustrated. Needle bearings installed on Serial No. 66-491 and subsequent.

1. Stabilizer Bar Assembly
2. Mixing Lever
3. Pitch Change Link
4. Control Tube (From Scissor)
5. Damper Link Tube
6. Stabilizer Support
7. Lock
8. Retaining Nut
9. Washer
10. Rotor Hub Trunnion
11. Pitch Horn
12. Mast
13. Cone Set
14. Flap Restraint Stops
15. Stabilizer Dampers
16. Scissors and Sleeve Assembly
17. Swashplate and Support Assembly
18. Pivot Bushing (See NOTE)
19. Outer Bushing (See NOTE)

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Figure 8-21. Main rotor assembly (UH-1B serial no. 64-14101 and subsequent

g. Bearing end of pitch change links, (3, figure 8-10) have 0.020 inch radial and 0.020 inch axial maximum allowable wear limits. Universal end of the pitch change links have 0.0085 inch radial and 0.017 inch axial maximum allowable wear limits.

h. Maximum allowable elongation to a bushing or clevis hole in the control system is 0.003 inch.

i. Any wear in excess of limits shown in steps e. through h., above, is cause for replacement.

j. For replacement of control system bolts refer to paragraph 3-7.

8-93. Main Rotor Hub and Blade Assembly (UH-1B Serial No. 64-14101 and subsequent). (See figure 8-21) Main rotor group, on UH-1B 64-14101 and subesequent includes a main rotor hub and blade assembly, a stabilizer bar, with dampers, flap restraint stops, a scissors and sleeve assembly, a swashplate and support assembly, interconnecting linkage and attaching parts. All assemblies are generally similar in function to corresponding assemblies on earlier helicopter of this series, but are different in design and performance. Rotor hub trunnion is mounted on splines at top of mast, supported by a cone set and secured by a retaining nut which also serves as a lifting eye. Hub yoke is underslung on trunnion through teflon-lined bearing housings, placed chordwise to the rotor to form a flapping axis on which the rotor tilts. Two metal blades are attached in grips which are pivoted on teflon bearings on yoke extensions along an axis spanwise to the rotor, to allow blade feathering and pitch change. Control horns on trailing sides of blade grips are connected by linkage through stabilizer bar, scissors and sleeve, and swashplate assemblies to cyclic and collective pitch control systems. In operation, cyclic control stick changes plane of rotation and collective control changes pitch of blades. Stabilizer bar tends to resist sudden change in plane of rotation, but this tendency is modified by hydraulic dampers to allow change with a slight time lag for improved stability and controllability under all flight conditions. Flap restraint stops are kept disengaged by rotating weights at normal operating rpm.

8-94. Main rotor assembly, on UH-1B Serial No. 64-14101 and subsequent, is a semi-rigid type with underslung feather axis and consists of a hub assembly and two blades. Hub assembly includes trunnion and yoke, extensions, blade grips, pitch horns, drag braces and attaching parts. (See figure 8-22.) Yoke is of flat steel plate form, with two integral mounting bosses for trunnion bearing housings and a center hole to accommodate the mast. Extensions are bolted on ends of yoke; each has a spanwise cylindrical member with two journals on which a blade grip is mounted through teflon bearings. A wire-wrapped retention strap secures each blade grip and transfers centrifugal loads to extension and yoke. Each blade is an all-metal bonded 27-inch chord airfoil section, secured in hub blade grip by a retaining bolt and held in alignment by an adjustable drag brace between trailing edge and grip. Blade is formed of spar and trailing edge structural members, inertia weights at tip and midspan, honeycomb core with metal skins, leading edge abrasive strips, butt cover plate, reinforcing doublers, grip and drag plates with bushings, tip cover and cap, and a ground-adjustable trim tab.

8-95. Troubleshooting — Main Rotor Hub and Blade Assembly (UH-1B Serial No. 64-14101 and subsequent). A chart of possible main rotor troubles, causes and remedial action is included below.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Lateral vibration	Rotor spanwise unbalance	Balance dynamically with weight in blade bolt
	Rotor chordwise unbalance	Balance dynamically by adjusting drag brace (sweeping blade)
	Stabilizer bar unbalance	Balance stabilizer bar

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Vertical 1:1 vibration	Rotor blade out of track	Track blades
Steady or intermittent 1:1 vertical	Loose collective friction collet	Check for broken lockwire and retorque. Check for worn or damaged spring. Check concentricity of collet sleeve on mast if friction cannot be maintained.
	*Worn collective lever to collective sleeve bearing	Replace if radial play exceeds 0.010
	*Worn collective lever pivot bearing	Replace if radial play exceeds 0.010
	*Worn collective lever idler link pivot pin bearing	Replace if radial play exceeds 0.010
	Worn pitch change rod end bearings	Replace if wear exceeds 0.010 axial or 0.008 radial
	Worn stabilizer bar pivot bushings	Replace if radial play exceeds 0.010
	Worn mixing lever pivot bushings	Replace if radial play exceeds 0.010
	Worn self-align bearings (outboard end of mixing lever)	Replace if radial play exceeds 0.020
	Swashplate unibal torque incorrect	Check torque of inboard row of retaining nuts. Re-shim to obtain 17 to 21 pounds force to tilt swashplate.
	Worn scissors pivot bushing (short lug)	Replace if radial play exceeds 0.020
	Worn scissors bushings (drive link end)	Replace if radial play exceeds 0.020
	Scissors self-align bearings worn	Replace if radial play exceeds 0.020
	Worn or missing insert on extension radius rings	Replace ring if excessively worn or damaged
	Damaged extension seal	Replace seal
	Worn or deteriorated inboard or outboard extension and/or grip bearings in main rotor hub assembly	Replace bearings
Sticking or inoperative dynamic stops	Incorrect weight spring adjustment	Readjust weight spring tension
	Sheared roll pin between lever and shaft or shaft and stop	Replace roll pin

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
Collective stick light or heavy in downstroke	Balance spring on collective cylinder out of adjustment	Adjust spring on servo valve to provide equal force to move collective either direction
Slow control response	Internal leakage in servo cylinder	Replace cylinder or seals as necessary
High frequency vibration	Loose elevator linkage at swashplate support	Check for worn bushings. Replace if wear exceeds 0.020 or evidence of metal to metal contact
	Loose elevator	Re-shim bearing
Pylon rock	Defective fifth mount	Replace mount
	Defective or dirty pylon dampers	Clean pylon dampers. If damaged, replace.
	Mount bolts bottomed or stripped	Replace bolts
	Fifth mount	Inspect mount and forging for damage

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
2:1 Vibration, approximately ten per second	Pylon mounts deteriorated	Replace mounts
Rotor rpm high or low in autorotation	Low pitch blade angle incorrect	Adjust both pitch change links equally

* Tests indicate that wear at one bearing or combined wear at these locations significantly contribute to vibration.

1. Main Rotor Blade
2. Drag Brace
3. Drag Brace Bolt
4. Shims
5. Locking Screw
6. Nut
7. Washer
8. Blade Retaining Bolt
9. Washer
10. Locating Pin
11. Grip
12. Extension
13. Yoke
14. Trunnion
15. Bearing Housing
16. Pitch Horn

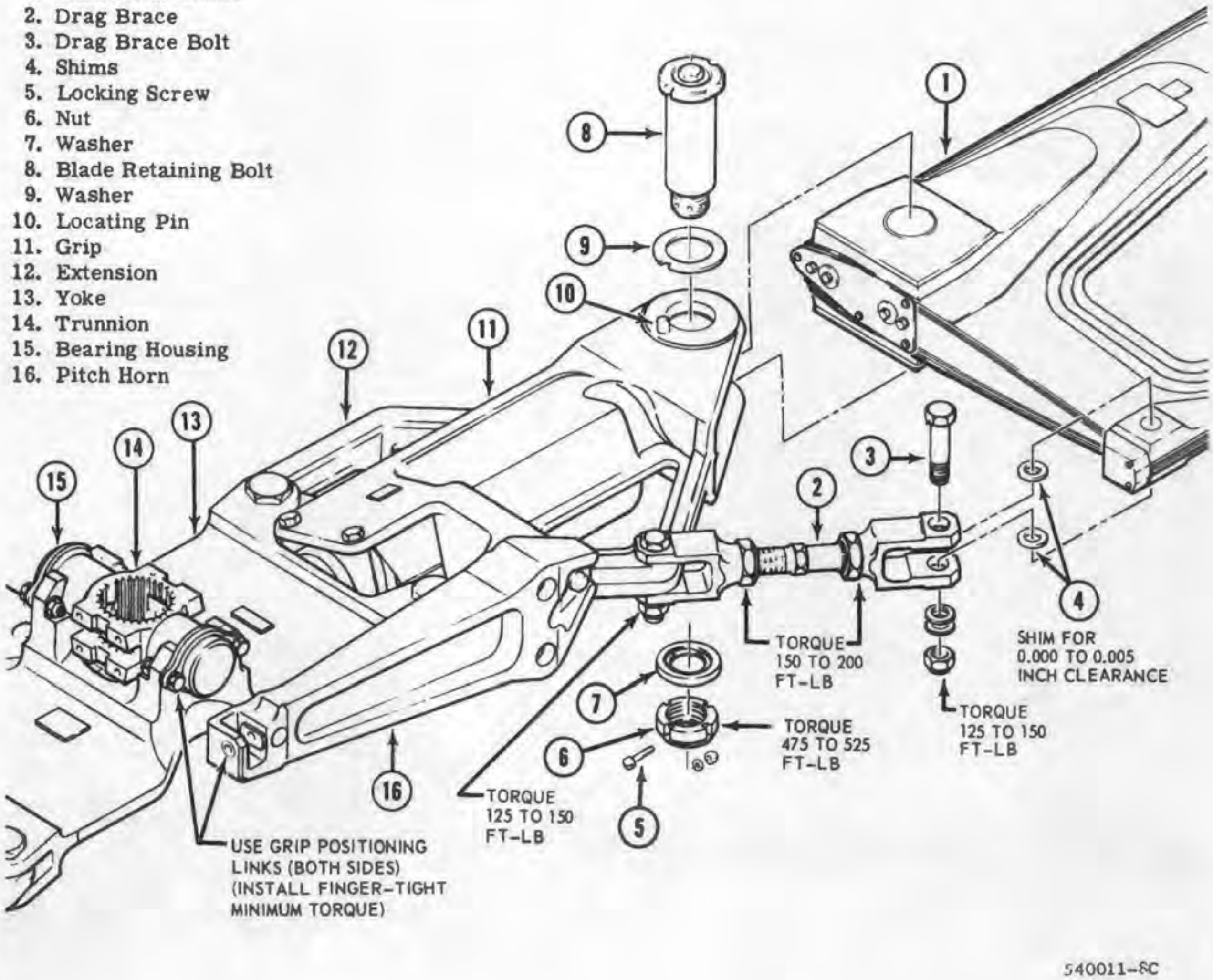


Figure 8-22. Main rotor hub and blade assembly (UH-1B serial no. 64-14101 and subsequent)

8-96. *Operational Check — Main Rotor Hub and Blade Assembly (UH-1B Serial No. 64-14101 and subsequent).* Run-up shall be performed by personnel authorized in accordance with AR95-13.

a. Operate at 6600 engine rpm, with collective pitch setting low enough to avoid becoming airborne. Note torque reading.

b. Reduce engine speed to approximately 4700 rpm, with same collective setting. Perform a blade tracking check. (See figure 8-23.)

c. Make correction for any low-speed out-of-track by shortening pitch change link of high blade. Turning pitch link barrel one flat will change blade track approximately 3/8 inch. Tighten jam nuts on link with 650 to 800 inch-pounds torque, and lockwire barrel to hole in banjo of each rod-end. Repeat check and make further adjustment until low-speed track is correct.

d. Perform a tracking check at 6600 rpm, with collective setting as in step a.

e. Make correction for any high-speed out-of-track by adjusting blade trim tabs with T101397 bender and T101484 bending gage. Change tab angle by one degree for each 1/8 inch (approximate) track correction required, raising tab on low blade or lowering tab on high blade or adjusting in a combination which keeps both tabs nearest zero (trail) position. Repeat check and adjustment until track is correct in ground operation.

f. Test for smooth operation in flight. If a vertical one-per-revolution vibration occurs, make further adjustments to refine trim tab settings.

g. Check for lateral vibrations due to rotor balance through full airspeed range.

h. Correct spanwise balance by wrapping two-inch width masking tape around one blade tip as a trial weight. If condition becomes worse, change tape to opposite blade. Balance to best one-half wrap of tape. Remove tape and install lead as weight in blade retaining bolt,

Figure 8-23. Tracking main rotor blades (UH-1B Serial No. 64-14101 and subsequent)

inserted through plugged hole at top. Use 2.4 ounces in bolt for each wrap of tape.

i. Correct chordwise balance by adjusting drag brace to sweep one blade aft. Loosen jam nuts enough to turn brace barrel one flat AFT, as shown by decal arrows, and tighten nuts with 150 to 200 foot-pounds torque. Record adjustment. If condition becomes worse, restore blade to original position and adjust opposite blade. If condition improves, continue adjusting by small amounts until rotor operates smoothly. Maximum permissible adjustment is two full turns, which exceeds normal requirements.

Note

If chordwise balance cannot be accomplished with the above limits, remove rotor hub and re-align.

j. Check rotor rpm in autorotation. (Refer to TM 55-1520-211-10.) If rotor overspeeds, lengthen both pitch change links equally. If rotor underspeeds, shorten both links equally.

8-97. Removal — Main Rotor Hub and Blade Assembly (UH-1B Serial No. 64-14101 and subsequent). a. Remove stabilizer bar (1, figure 8-21) disconnecting lower ends of pitch change link (3), control tube (4) and damper link tube (5), and removing bolts at each support (6). (Refer to paragraph 8-106.) When disconnecting a pitch change link, install a T101466 grip positioning link with eyebolt in a bolt hole of trunnion bearing housing and lower end attached to pitch horn. (See figure 8-24.)

b. Remove lockwire, bolt and lock (7, figure 8-21). Use T101358 adapter wrench to remove retaining nut (8), with washer (9).

c. Install T101460 maintenance hoist, or position other suitable hoist directly above mast. Attach hoist to main rotor hub with suitable lifting slings.

d. Attach a tie-down assembly to rotor blade to guide and steady rotor. Lift hub clear of mast (12). Remove cone set (13).

e. Place rotor hub on a stand, T101356, and suitable supports under blades.

Caution

Do not apply corrosion preventive compound, cosmoline or any type of

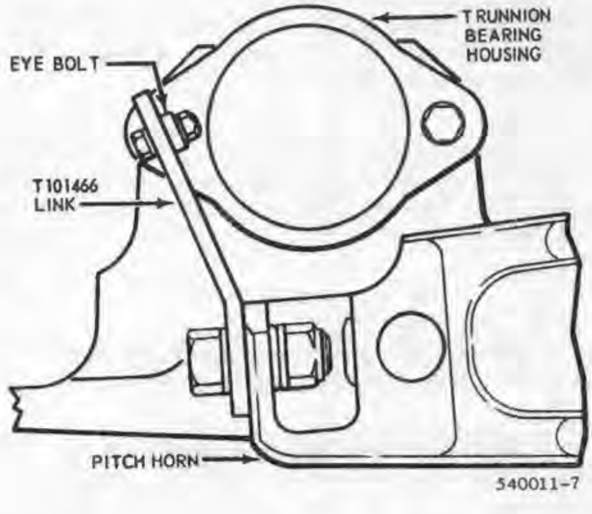


Figure 8-24. Grip positioning link (UH-1B Serial No. 64-14101 and subsequent)

grease to the teflon bearings or in the area of the bearings on the 540 rotor configuration helicopters. This instruction will apply, regardless of the ship status, operational, in storage or in preparation for overseas movement. Assemblies affected are: stabilizer bar, main rotor hub, scissors and sleeve, swashplate and support, collective levers and elevator idler pivot bushings located on the aft side of the swashplate support.

8-98. Installation — Main Rotor Hub and Blade Assembly (UH-1B Serial No. 64-14101 and subsequent). a. Erect T101460 maintenance hoist on right side of engine deck, or provide other suitable hoist.

Caution

T101460 maintenance hoist has a steel support leg and is required for lifting 540 components.

b. Check that T101466 grip positioning links are installed at pitch horns to hold blades at normal position until control linkage is connected. (See figure 8-24.)

c. Attach suitable hoisting slings and lift main rotor to position with hub directly above mast. Rotor tie-down tool can be used to guide and steady rotor during handling.

d. Coat splines of mast (12, figure 8-21) and rotor hub trunnion (10) with corrosion preventive compound, (item 315 or 318, table 1-1). Place cone set (13) in groove of mast upper splines with bevel side up.

e. Align master splines and lower the rotor carefully on mast until trunnion is seated on cone set. Remove excess corrosion preventive compound.

Note

Rotor hub must be aligned carefully to avoid damaging mast threads.

f. Install washer (9) and retaining nut (8) on mast. Use T101358 wrench adapter to tighten nut to a torque of 550 to 780 foot-pounds. Install lock (7) engaged with nut splines and secured to hub trunnion by a bolt. Lockwire bolt head to hole provided in trunnion.

g. Lift stabilizer bar assembly (1) to position, observing color code markings, and attach supports (6) to rotor hub trunnion. Connect control tubes (4) and damper link tubes (5). (Refer to paragraph 8-109.)

Note

All close tolerance, high tensile bolts in main rotor linkage require high-strength washers with internal chamfer to accommodate radius at bolt head.

h. Remove T101466 grip positioning links, replacing each eyebolt with original bolt in trunnion bearing housing flange. Connect pitch change links (3) between stabilizer bar mixing levers (2) and pitch horns (11) according to applicable procedures below:

(1) If connecting pitch change links known to be satisfactory in adjustment: Check that rod-end with right-hand thread is attached to mixing lever by a bolt installed from leading side, with washers under head and nut, and with nut secured by cotter pin. Check that nut and retainer are in recess of pitch horn. Align lower end of link in horn and install bolt with washer next to head. Lockwire bolt head to hole provided in horn.

(2) If using new pitch change links or if rigging is doubtful: Set each link to 9.64 inches between bearing centers, with rod-ends aligned and exposed thread areas equal at both ends within 0.03 inch. Tighten jam nuts with 650 to 800 inch-pounds torque. Lockwire barrel to hole in banjo of rod-end. Install links as in (1) above.

(3) With controls at low pitch position, check for blade angle of plus 6 to 7 degrees as follows: Place protractor chordwise on machined surface of one blade grip near blade retaining bolt, then on opposite blade grip. Total reading for both blades should be 15 (plus or minus ½) degrees. If any adjustment is required, adjust both links equally.

Note

Further adjustment of pitch change links may be required in operational checks.

8-99 Main Rotor Blades (UH-1B Serial No. 64-14101 and sebsequent). Each main rotor blade is an all-metal bonded 27 inch chord airfoil section. They are secured in main rotor hub blade grip by a retaining bolt and are held in alignment by adjustable drag braces between trailing edge and grip.

8-100. ***Removal—Main Rotor Blades (UH-1B Serial No. 64-14101 and subsequent).*** a. Support main rotor hub on a stand. Support each blade (1, figure 8-22) so leading edge is straight.

b. Detach drag brace (2) from blade by removing bolt (3) with nut, washers, and shims (4). Keep shims for reassembly.

Note

Do not change drag brace adjustment.

c. Remove locking screw (5) with nut and washer. Use T101414 wrench to remove nut (6) and washer (7) from blade retaining bolt (8).

d. Remove retaining bolt and washer (9), raising blade tip as necessary to find position of best alignment which allows bolt removal without binding and possible damage. Leave pin (10) in place. Be sure bolt is identified for reassembly in same location.

e. Remove blade from grip (11).

f. Remove opposite blade in the same manner.

8-101. *Inspection and Repair—Main Rotor Blades (UH-1B Serial No. 64-14101 and subsequent).* The following criteria covers organizational inspection and repair of main rotor blades used on UH-1B helicopters Serial No. 64-14101 and subsequent.

a. Main rotor blades damaged to the following extent should be "condemned, demilitarized and locally scrapped" rather than returned to an overhaul facility.

(1) Any penetration in the hatched area as indicated on figure 8-24A.

(2) Skin penetration in any area larger than 2.0 inches in diameter or length.

(3) Water in the honeycomb core.

(4) Voids between the skin and honeycomb larger than ten square inches.

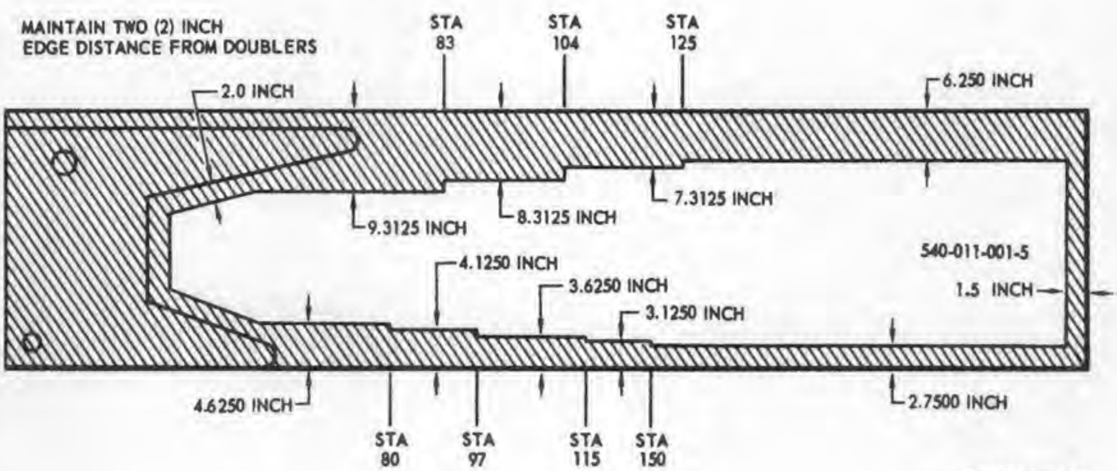
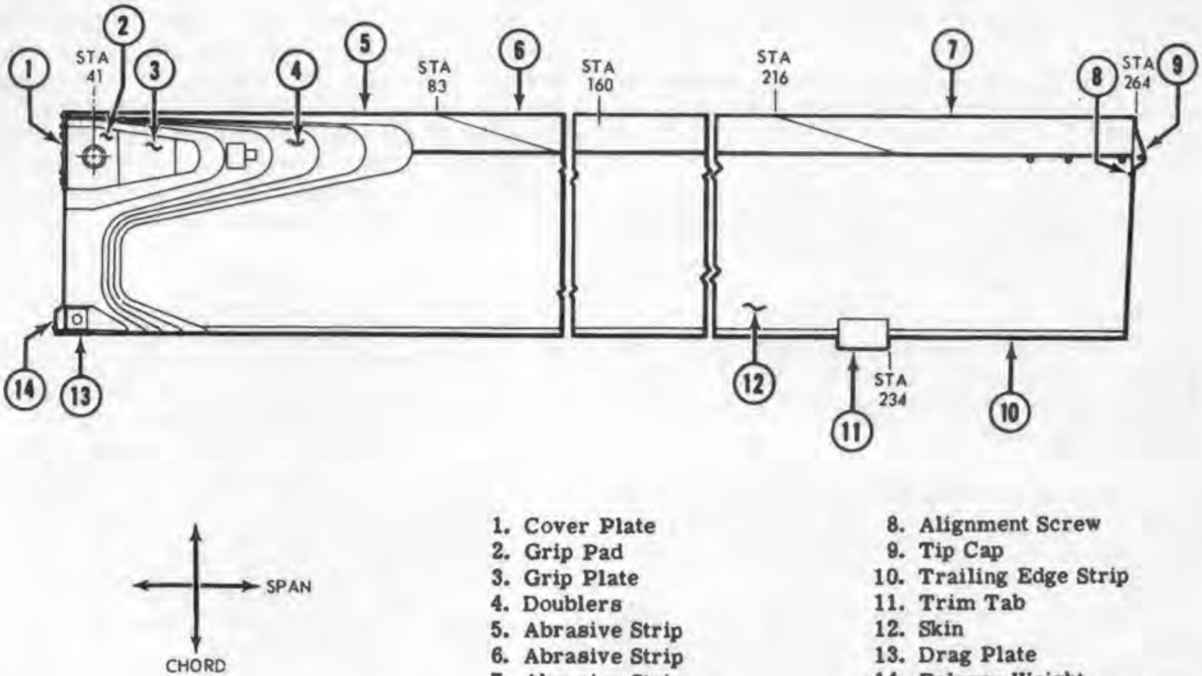


Figure 8-24A. Main rotor blade repair criteria (UH-1B serial no. 64-14101 and subsequent)



1. Cover Plate
2. Grip Pad
3. Grip Plate
4. Doublers
5. Abrasive Strip
6. Abrasive Strip
7. Abrasive Strip
8. Alignment Screw
9. Tip Cap
10. Trailing Edge Strip
11. Trim Tab
12. Skin
13. Drag Plate
14. Balance Weight

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Figure 8-25. Main rotor blade (UH-1B Serial No. 64-14101 and subsequent)

(5) Edge voids deeper than 1.0 inch at tip end of any of the root end doublers or plates.

(6) Edge voids in the leading edge, trailing edge of the doublers that are 0.50 or more in depth and show indications of corrosion in the voids.

(7) Any corrosion that penetrates entirely through the skin.

(8) Any blade that has reached maximum service life or which has less than 100 hours remaining service time.

b. Normal inspection and repair criteria are as follows:

(1) Inspect grip plates (3, figure 8-25) for fretting corrosion. If depth of corrosion exceeds 0.020 inch and fifty percent of any quadrant formed by intersection of chordwise and spanwise axis through center of retention bolt hole, polish out with abrasive cloth and fair edges of repair into surface contour.

(2) Nicks and scratches within the limits below are acceptable if repaired. In aluminum parts, the paint around the defect should be removed by light sanding, and the nick or scratch polished out with aluminum wool. The area should then be repainted per paragraph 8-102. On the stainless steel leading edge, the nicks or scratches may be polished out by sanding or with steel wool; however, steel wool must not be allowed to touch the aluminum parts.

Caution

Damage exceeding the following limits will require replacement of blade.

(a) In the skin, inboard of station 160 and the inboard abrasion strip, running within zero and 15 degrees of the spanline and not in excess of 0.006 inch in depth.

(b) In the skin, inboard of station 160 and the inboard abrasion strip, running within zero and 75 degrees of the chordline and not in excess of 0.003 inch in depth.

(c) In the skin, outboard of station 160, running within zero and 75 degrees of the chordline and not in excess of 0.004 inch in depth.

(d) In the skin, outboard of station 160, running within zero and 15 degrees of the spanline and not in excess of 0.008 inch in depth.

(e) In the outboard abrasion strip, inboard of station 160, not in excess of 0.003 inch in depth.

(f) In the outboard abrasion strip, outboard of station 160, running within zero and 15 degrees of the spanline and not in excess of 0.006 inch in depth.

(g) In the outboard abrasion strip, outboard of station 160, running within zero and 75 degrees of the chordline and not in excess of 0.004 inch in depth.

(h) In the doublers, grip and drag plates running within zero and 15 degrees of the spanline and not in excess of 0.005 inch in depth.

(i) In the doublers, grips and drag plates running within zero and 75 degrees of the chordline and not in excess of 0.0025 inch in depth.

Note

The allowable limit for wrinkles in main rotor blade skin, caused by accident or overspeed, is 0.020 inch when measured "PEAK to VALLEY" with blade lying supported in a flat position.

(3) Nicks and scratches on the upper and lower surfaces of the trailing edge strip not in excess of the limits stated below are acceptable if repaired by polishing out. Notches on the trailing edge not in excess of 0.120 inch deep chordwise are acceptable if repaired by removing material on a 2.0 inch minimum radius. Repair may not extend more than 0.120 inch deep chordwise. Touch-up refinishing per paragraph 8-102 should be accomplished after repair.

(a) In the upper and lower surface of the trailing edge strip, running within zero and 15 degrees of the spanline and not in excess of 0.005 inch in depth.

(b) In the upper and lower surface of the trailing edge strip, running within zero and 75 degrees of the chordline and not in excess of 0.003 inch in depth.

(4) Inspect the rotor blade for dents. Dents not in excess of the following limits may be repaired by lightly polishing with aluminum wool, cleaning with trichloroethylene and filling with sealer (item 210, table 1-1). After sealer has thoroughly dried, sand smooth and touch-up in accordance with instructions in paragraph 8-102. If dents are in excess of limits below, the blade must be replaced. Limits and locations of permissible dents are as follows:

Caution

Dents should be closely inspected for nicks, scratches and cracks. If nicks or scratches exist in dents and the total depth of the scratch and dent is in excess of items (a) and (b), below, the blade should be replaced. If nicks and/or scratches exist in a dent and are in excess of limits permitted in step (2) (a) through (i) or step (3) (a) and (b) above, the blade should be replaced. If cracks exist anywhere the blade should be replaced.

(a) Sharp dents in the skin, doublers, grip and drag plates and abrasion strips, inboard of station 165 which are not in excess of 0.016 inch in depth and/or outboard of station 165 which are not in excess of 0.030 inch in depth, and/or outboard of station 200 which are not in excess of 0.100 inch.

(b) Non-sharp dents in the skins, doublers, grip and drag plates and abrasion strips, inboard of station 165 which are not in excess of 0.030 inch in depth and/or outboard of station 165 which are not in excess of 0.060 inch in depth and/or outboard of station 200 which are not in excess of 0.180 inch.

(c) From station 230 outboard any dent that does not tear the skin, produce a void detectable when tapping with a coin, or affect flight characteristics is acceptable.

(5) The trailing edge trim tab may be straightened and aligned by using trim tab bending tool, T101422, and bending gage, T101417. The trailing edge of the trim tab may also be straightened by using a heavy back-up block and a plastic head mallet. If the trim tab cannot be straightened, is cracked, or is separated from the blade, replace the blade.

(6) A void is defined as an unbonded area that is supposed to be bonded. Edge voids in

Caution

Do not sand areas of bare metal.

c. Remove all surface oxides and all aged chemical conversion coatings from areas to be refinished, using abrasive cloth (item 403, table 1-1) or equivalent.

d. Repair adhesive fairing (adhesive squeeze-out along the trailing edge of stainless steel leading edge strip) with resin paste (item 210, table 1-1) after removal of all paint finish. Remove damaged fairing only.

e. Wash blades with soap detergent (item 312, table 1-1). Achieve water-break-free surface which will be evident by continuous unbroken film of water on the surface after thoroughly rinsing off soap.

Note

From completion of this step through final paint, do not touch prepared surfaces with bare hands.

f. Brush or spray on chemical conversion coating (item 317, table 1-1). If not available, use commercial metal-prep (alcoholic-phosphoric acid) or a 10 percent solution of chromic acid.

g. Dry and clean prepared surfaces thoroughly.

h. Apply one light coat (0.0003 to 0.0005 inch) of catalyzed epoxy primer (item 102, table 1-1). Air dry a minimum of 45 minutes or a maximum of 24 hours.

i. Apply finish coats of acrylic lacquer, Navy Formula P-95, in colors specified below (Federal Standard 595). Allow one hour drying time between coats. Use additional coats as required for full coverage and for a total film thickness (primer and lacquer) of 2.5 to 3.5 mils (0.0025 to 0.0035 inch).

(1) On upper surface of blade, apply two coats camouflage olive drab, (item 106, table 1-1).

(2) On lower surface of blade, apply two coats of camouflage black, (item 105, table 1-1).

(3) On outer six inches (top and bottom) of blade, apply one coat of gloss orange-yellow, (item 112, table 1-1).

(4) On one blade tip and outer two inches, apply one coat of gloss white, (item 110, table 1-1).

(5) On opposite blade tip and outer two inches, apply one coat of gloss red, (item 108, table 1-1)

j. Air dry blades a minimum of 48 hours before use.

8-103. ***Installation — Main Rotor Blades (UH-1B Serial No. 64-14101 and subsequent).*** a. Support main rotor hub on a stand. Check that pin (10, figure 8-22) is installed in upper surface of each grip (11) at inboard side of retaining bolt hole.

b. Insert a blade (1) in grip, matched by color code markings. Place washer (9) on retaining bolt (8). Align bolt holes carefully and insert bolt from top, through grip and blade, raising blade tip as necessary to find alignment position which allow bolt to pass through without binding. Seat bolt with notches of washer and head over pin in top of grip.

c. Support end of installed blade. Assemble washer (7), with counterbore up, and nut (6) on retaining bolt. Do not fully tighten nut.

d. Align clevis of drag brace (2) on bolt hole of blade drag plates. Install shims (4) between clevis and upper and lower drag plates to obtain 0.000 to 0.005 inch clearance. Insert bolt (3) and secure with two washers and nut on lower end. Tighten nut with 125 to 150 foot-pounds torque.

e. Use T101414 wrench to tighten nut on blade retaining bolts to a torque of 475 to 525 foot-pounds. Align a notch of nut with a hole in bolt and install locking screw (5), secured by a nut and washer at inner wall of bolt.

Note

After installing new blades, it may be necessary to zero trim tabs before tracking.

f. Install opposite blade in the same manner.

8-104. ***Preparation for Storage or Shipment—Main Rotor Blades (UH-1B Serial No. 64-14101 and subsequent.*** The following instructions cover storage or shipment of main rotor blades in either cardboard or metal containers.

Caution

Immediately upon removal of a blade or blades, the assembly must be thoroughly cleaned, oiled, the retention and drag brace bolt holes coated with grease, rust-preventive compound or cosmoline. The blade areas contacting the metal container cushions must be wrapped with water repellant paper and the blade/blades placed in the proper container, along with records.

a. Clean and dry each blade assembly in accordance with Specification MIL-P-116.

b. Apply corrosion preventive compound (item 315, table 1-1) to hub, retention bolt hole and drag brace bolt holes.

c. Wrap blade assembly with grease proof barrier material (item 506, table 1-1) at all locations where the contoured supports contact the blade and secure with pressure sensitive tape (item 402, table 1-1).

d. For storage or shipment in a cardboard container proceed as follows:

(1) Secure contours to blade assembly.

(2) Place blade assembly and contours in container with 12 eight unit bags and one four unit bag (total 100 units) of dessicant (item 316, table 1-1).

(3) Band container shut with one-half inch steel bands.

e. For storage or shipment in a metal container proceed as follows:

(1) Secure blade assembly to shock mounted support in container in such a manner that all protruding components are completely protected from any possible damage.

Note

Blades should not be in direct contact with contours at any time during storage or shipment.

(2) Place 12 eight unit bags and one four unit bag (total 100 units) of dessicant (item 316, table 1-1) in container.

(3) Install top half of container (with top cushions attached) on lower half of container and secure in place with cam lock fasteners.

8-104A. *Main Rotor Hub (UH-1B Serial No. 64-14101 and subsequent).* The main rotor hub is a common yoke which attaches the main rotor blades to the main rotor mast. The three major components of the main rotor hub are the blade grips, yoke extensions and the hub yoke.

8-104B. *Removal — Main Rotor Hub (UH-1B Serial No. 64-14101 and subsequent).* a. Remove main rotor hub and blade assembly. (Refer to paragraph 8-97.)

b. Remove main rotor blades. (Refer to paragraph 8-100.)

8-104C. *Inspection — main Rotor Hub (UH-1B Serial No. 64-14101 and subsequent).* a. Inspect bolt holes for score marks as follows:

(1) Score marks in bore surfaces of pitch horn attachment bolt holes which do not exceed a maximum depth of 0.0005 inch may be repaired.

(2) Score marks in bore surfaces of inboard bearing housing attachment bolt holes which do not exceed a maximum depth of 0.005 inch may be repaired.

(3) Score marks in any other bolt holes which do not exceed a maximum depth of 0.010 inch may be repaired.

b. Inspect bolt holes in grips for the following maximum inside dimensions:

BORE	MAX. ID
Main Retention	2.5040
Drag Brace Attachment	0.8760
Pitch Horn Attachment	0.8740
Inboard Bearing Housing Attachment	0.5030

c. Inspect the several similar bushings in the yoke and yoke extension for a maximum inside diameter of 1.2510 inch.

d. Inspect all external surfaces which mate with another part for damage. Damage up to a maximum depth of 0.020 inch may be repaired.

e. Inspect all mating parts for proper mating, cocking, misalignment and ability to obtain correct bolt torque.

f. Inspect non-mating surfaces of outboard grip tangs (1, figure 8-25A) for damage. Damage up to a maximum depth of 0.040 inch may be repaired.

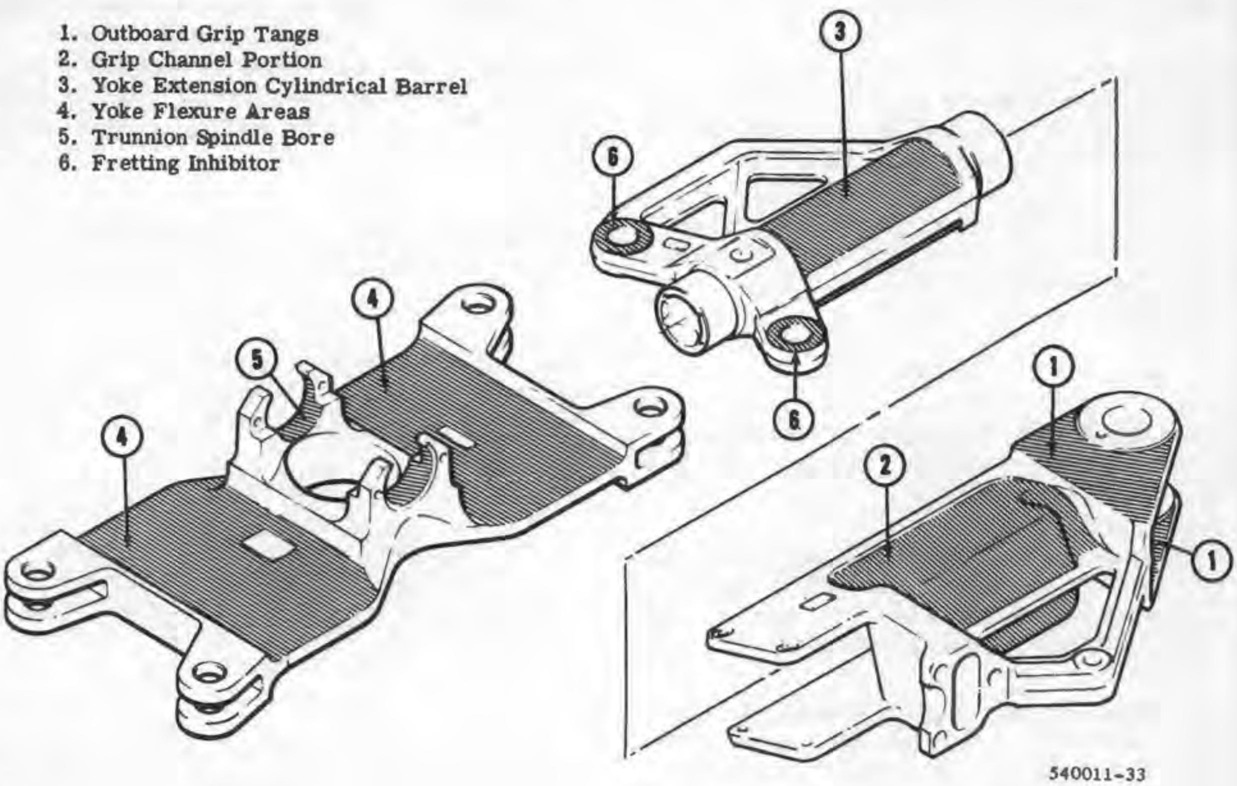


Figure 8-25A. Damage areas — main rotor hub (UH-1B serial No. 64-14101 and subsequent)

g. Inspect grip tangs for a minimum thickness of 0.280 inch.

Note

The five inch diameter boss around the main rotor blade retention bolt hole is specifically excluded from this minimum thickness requirement.

h. Inspect the walls of the channel portion of the grip (2, figure 8-25A) for a minimum thickness of 0.090 inch.

i. Inspect inboard bearing housing attachment holes for damage within 0.50 inch of edges of holes.

j. Inspect cylindrical barrel of yoke extension (3, figure 8-25A) for damage. Damage up to a maximum depth of 0.020 inch may be repaired.

k. Inspect barrel wall for minimum thickness of 0.100 inch.

l. Inspect cloth fretting inhibiters (6, figure 8-25A) for tears, scuffing or other damage.

m. Inspect non-mating surfaces of yoke clevis lugs for damage. Damage up to a maximum depth of 0.020 inch may be repaired.

n. Inspect yoke flexure areas (4, figure 8-25A) for damage. Damage up to a maximum depth of 0.005 inch may be repaired.

o. Inspect yoke trunnion spindle bore (5, figure 8-25A) for a maximum allowable inside diameter of 3.254 inches.

8-104D. ***Repair or Replacement — Main Rotor Hub (UH-1B Serial No. 64-14101 and subsequent).*** a. Replace all parts that do not meet inspection requirements. (Refer to paragraph 8-104C).

b. Forward all repairable parts to direct support activity for repair.

8-104E. ***Installation — Main Rotor Hub (UH-1B Serial No. 64-14101 and subsequent).*** a. Install main rotor blades. (Refer to paragraph 8-103.)

b. Install main rotor hub and blade assembly. (Refer to paragraph 8-98.)

8-104F. ***Preparation for Storage or Shipment — Main Rotor Hub (UH-1B Serial No. 64-14101 and subsequent).*** a. Clean and dry hub assembly in accordance with Specification MIL-P-116.

b. Apply corrosion-preventive compound (item 315, table 1-1) to bushings and exposed nonplated steel surfaces of trunnion and open bolt holes.

Caution

Do not apply or permit corrosion-preventive compound to come in contact with teflon bearings.

c. Wrap barrier material (item 506, table 1-1) around all areas to which corrosion-preventive compound has been applied, and secure with adhesive tape (item 402, table 1-1).

d. Remove upper contours from shipping container and position hub on cushion and lower contours. Position upper contours over hub.

e. Position container top and secure with No. 4 Klimp fasteners.

f. Band outside of container at contour locations with ¾ inch flat steel banding.

8-105. Stabilizer Bar (UH-1B Serial No. 64-14101 and subsequent). (See figure 8-21). The stabilizer bar is a weighted rotating unit, mounted above and across the main rotor, pivoted for seesaw movement on two supports which are bolted on the rotor hub trunnion. Each side of the bar frame is connected through a link tube to a hydraulic damper on the mast. Two mixing levers on the bar are connected into the main rotor control linkage, by control tubes from scissor levers and by links to pitch horns on the rotor hub. On UH-1B helicopters Serial No. 64-14101 through 65-12744 and 65-12772 all bearings in the stabilizer bar are teflon bearings and require no lubrication. On UH-1B helicopters Serial No. 66-491 and subsequent needle bearings replace the teflon bearings and the bar assembly must be lubricated in accordance with instructions shown on the Lubrication Chart. (See figure 2-1.)

8-106. ***Removal — Stabilizer Bar (UH-1B Serial No. 64-14101 and subsequent).*** a. Disconnect pitch change links (3, figure 8-21) at lower ends by removing bolt at each pitch horn of rotor hub. Install T101466 grip positioning links to hold blade grips at normal position. (See figure 8-24.)

b. Disconnect lower ends of control tubes (4, figure 8-21) from scissors, and link tubes (5) from damper levers by removing bolts, nuts, and washers. Secure free ends of tubes to stabilizer bar with suitable tape.

Caution

If stabilizer bar is to be reinstalled, a piece of cloth or other protective material should be used when taping control tubes to stabilizer bar to prevent damage to control tubes.

c. Detach each support (6) from rotor hub trunnion by removing lockwire and four bolts with washers. Lift off stabilizer bar assembly (1).

d. If stabilizer bar is not to be reinstalled, remove links and control tubes with attaching parts.

8-107. ***Inspection — Stabilizer Bar (UH-1B Serial No. 64-14101 and subsequent).*** a. On UH-1B helicopters Serial No. 64-14101 through 65-12744 and 65-12772 inspect center frame pivot bushing (18, figure 8-21) for security of bonding.

b. On UH-1B helicopters Serial No. 66-491 and subsequent inspect center frame pivot needle bearing for binding and wear.

c. On UH-1B helicopters Serial No. 64-14101 through 65-12744 and 65-12772 inspect teflon bearings in inboard ends of mixing levers for security of bonding and wear.

d. On UH-1B helicopters Serial No. 66-491 and subsequent inspect needle bearings in inboard ends of mixing levers for binding and wear.

e. Inspect mixing levers for score marks caused by upper end of control tube (4).

8-108. Repair or Replacement — Stabilizer Bar (UH-1B Serial No. 64-14101 and subsequent). a. If pivot bushing (18, figure 8-21) is not securely bonded to center frame on helicopters Serial No. 64-14101 through 65-12744 and 65-12772 repair as follows:

(1) Remove cotter pin, nut, washer and bolt attaching support assembly (6) to center frame. Remove support assembly.

(2) Remove outer (19) and inner (18) bushings from center frame.

(3) Rough inside of center frame hole and mating surface of inner pivot bushing (18) with 280 grit paper. Clean both surfaces with methyl-ethyl-ketone (item 309, table 1-1) or equivalent.

(4) Prime both surfaces with primer (item 217, table 1-1) and air dry for 30 minutes.

(5) Apply metalset (item 214, table 1-1) to both surfaces and insert bushing (18) into center frame. Cure at room temperature for 24 hours.

Note

On flanged bushings leave adhesive squeeze-out fillet around flange outside diameter.

(6) Assemble outer bushing (19) to center frame.

(7) Install support assembly (6) on center frame with bolt, washer, nut and cotter pin.

b. Replace special alignment limiting washers on lower end of control tube (4) if mixing levers are scored. (See figure 8-21, View A.)

c. Replace stabilizer bar if other inspection requirements are not met. (Refer to paragraph 8-107.)

Deleted

8-109. ***Installation — Stabilizer Bar (UH-1B Serial No. 64-14101 and subsequent).*** a. Lift stabilizer bar assembly (1, figure 8-21) to position above main rotor hub, observing color code markings. Attach each support (6) to hub trunnion (10) with four bolts and washers, using longest bolts in upper holes. Lockwire bolt heads in vertical pairs.

b. Connect control tubes (4) from mixing levers (2) to scissors (16). Use special alignment-limiting washers between clevis of tube and both sides of bearing on scissor, and install bolt from trailing side with internally-chamfered washers facing bearing. Torque nuts 700 to 1200 inch-pounds.

c. Remove T101466 grip positioning links and attach pitch change links (3) from mixing levers to pitch horns (11) of rotor hub. (Refer to paragraph 8-98.)

d. Connect damper link tubes (5) from stabilizer bar to trailing sides of levers on dampers (15), installing bolt with washer under head from leading side through lever and bearing. Secure bolt with safety washer (tapered side toward bearing), nut and cotter pin.

8-110. Dynamic Stops (UH-1B Serial No. 64-14101 and Subsequent). (See figure 8-26.) Two dynamically-retractable stop assemblies and two rotary hydraulic dampers for stabilizer bar are mounted below main rotor on a pair of supports secured on a splined area of mast by bolts and spiral retaining rings. Stops are metal blocks pivoted on shafts fitted with weighted, spring-restrained levers. At normal operating rpm, rotating weights hold stops at retracted position. When rotor slows, weights and springs turn stops to extended position where they act as bumpers to limit rotor flapping movement.

8-111. ***Removal — Dynamic Stops (UH-1B Serial No. 64-14101 and subsequent).*** a. Remove two bolts through upper ends of stop assemblies (1, figure 8-26) with nuts, washers and shims (2). Remove two lower through-bolts with nuts and washers.

b. Detach each stop support (4) by removing lockwire, bolt and washer from lower flange. Lift off stop assemblies.

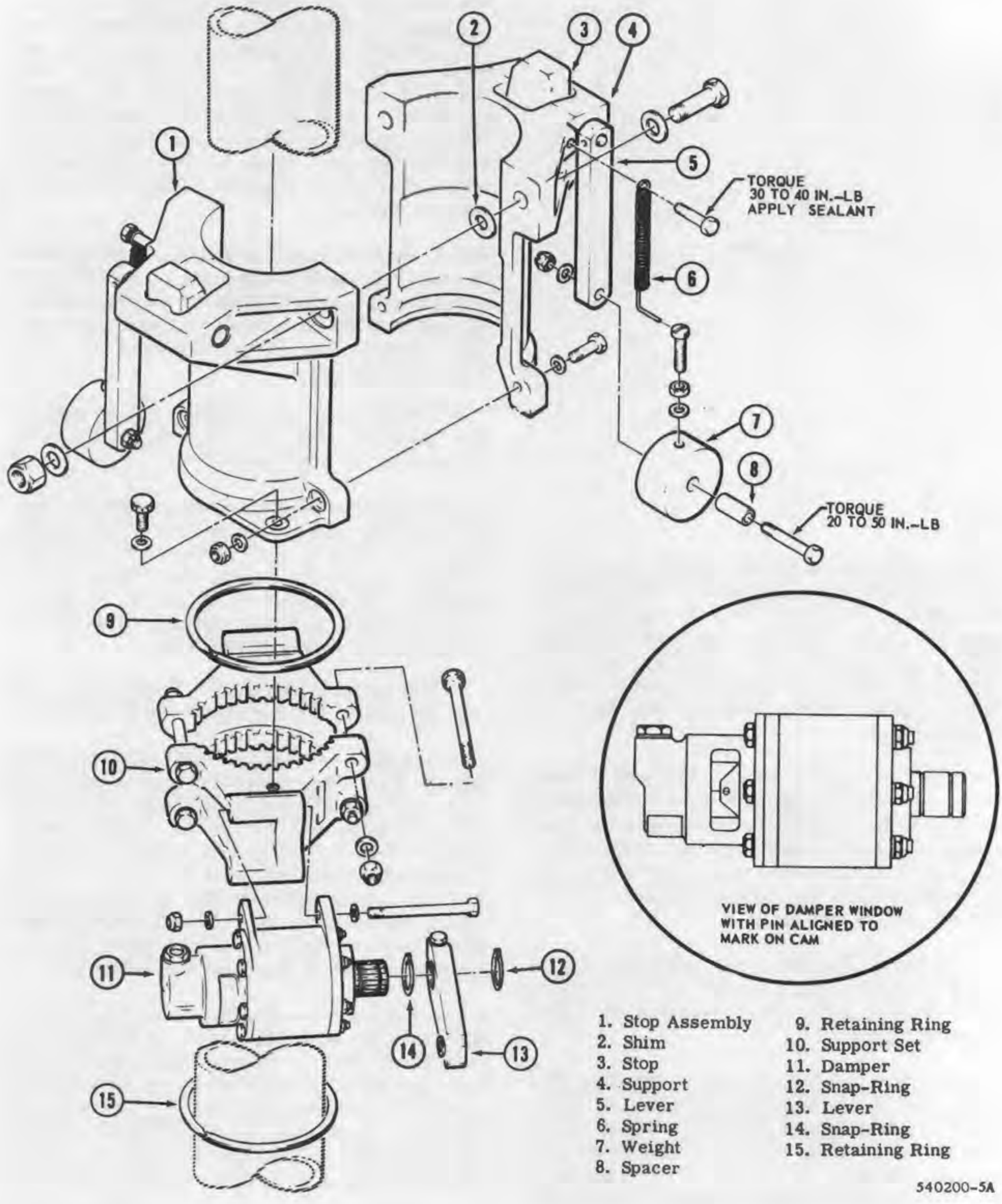
8-112. ***Inspection — Dynamic Stops (UH-1B Serial No. 64-14101 and subsequent).*** a. Check spring tension by holding stop assembly with mating surfaces up and horizontal. (See figure 8-27.) Assembly is satisfactory if 16 to 17 ounces (added weight or force) applied on center of weight starts movement of lever.

b. Check that weight (7, figure 8-26) will turn on spacer (8) for alignment in operation.

8-113. ***Repair or Replacement — Dynamic Stops (UH-1B Serial No. 64-14101 and subsequent).*** Make spring adjustments by turning screw in to increase tension, or out to reduce tension. Tighten jam nut after adjustment. If spring is replaced, bend lower end to 0.1 inch radius to secure on screw head. Bolt at upper end of spring requires 30 to 40 inch-pounds torque, followed by sealant, (item 201, table 1-1) applied on threads to hold against loosening.

8-114. ***Installation — Dynamic Stops (UH-1B Serial No. 64-14101 and subsequent).*** a. Position two stop assemblies (1, figure 8-26) around mast with mounting flanges resting on damper supports (10). Attach stop supports (4) together with two lower and two upper bolts installed from direction of rotation, with washers under heads and nuts. Do not fully tighten nuts.

b. Align holes in stop support flanges with tapped holes in damper supports. Install two locating bolts, with washers. Do not fully tighten.



1. Stop Assembly
2. Shim
3. Stop
4. Support
5. Lever
6. Spring
7. Weight
8. Spacer
9. Retaining Ring
10. Support Set
11. Damper
12. Snap-Ring
13. Lever
14. Snap-Ring
15. Retaining Ring

Figure 8-26. Stabilizer damper and stop assembly (UH-1B serial no. 64-14101 and subsequent)

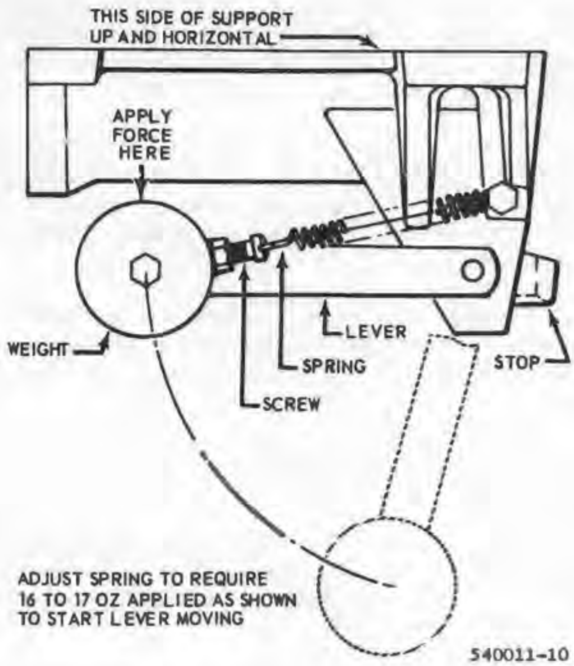


Figure 8-27. Checking spring tension on stop assembly (UH-1B Serial No. 64-14101 and subsequent)

means of an indicator pin and a cam mark, or for fluid level. Filler plugs are provided for replenishment of fluid lost by minor leakage.

8-116. ***Removal — Stabilizer Bar Dampers (UH-1B Serial No. 64-14101 and subsequent).*** a. To remove a damper assembly: Disconnect link tube from damper lever (13, figure 8-26) by removing bolt with cotter pin, nut, safety washer and standard washer. Detach damper (11) from support (10) by removing two bolts with nuts and washers.

b. To remove lever from damper: Remove snap-ring (12) from outer groove of damper wingshaft. Loosen nut on bolt at inboard end of lever (13). Pull lever from shaft. Remove snap-ring (14).

c. To remove damper support set: Remove dynamic stop assemblies (1). (Refer to paragraph 8-111.) Remove retaining ring (9) from mast groove above support (10). Detach support set from mast by removing four clamping bolts. Remove lower retaining ring (15) when necessary.

8-117. ***Inspection — Stabilizer Bar Dampers (UH-1B Serial No. 64-14101 and subsequent).*** a. If level shows slightly below top of damper window, fill with hydraulic fluid (item 3, table 1-1) at filler plug provided. Thereafter, check damper frequently for leakage.

b. If fluid level falls more than 1/8 to 3/16 inch below top of window, satisfactory filling without trapped air may not be possible and replacement of damper may be necessary.

c. Check damper timing as required to determine serviceability.

(1) Hold stabilizer bar against limit stops while observing indicator pin through damper window.

(2) Rapidly return bar to neutral position, and check time required for pin to return to flat surface of cam.

(3) Time required should be five (plus or minus one) seconds.

(4) Replace damper if unsatisfactory.

8-118. ***Installation — Stabilizer Bar Dampers (UH-1B Serial No. 64-14101 and subsequent).*** a. Coat splines of support set (10, figure 8-26) and mast with corrosion preventive compound (item 315 or 318, table 1-1). Install retaining ring (15) in lower groove of mast splines.

b. Position matched halves of support on mast according to master splines and TOP markings, and secure with four bolts installed from direction of rotation, with washers under heads and nuts. Install retaining ring (9) in mast groove above support.

c. Position damper (11) on support, with wingshaft toward rotation. Secure with two bolts, installed from direction of rotation, with washers under heads and nuts.

d. Install snap-ring (14) in inboard groove on damper shaft. Turn shaft to align pin with mark on cam, visible through damper window.

e. Place lever (13) on shaft, horizontal to nearest serration, with bushing at outboard end on trailing side. Tighten nut on clamp bolt at inboard end of lever. Install snap-ring (12) in outer groove of shaft.

f. Position stabilizer bar (1, figure 8-21) perpendicular to mast. Connect link tube (5), with adjustable end down, between trailing sides of bar and damper lever, adjusting length to keep bar and lever at specified positions. Install bolt from leading side, with washers next to head. Use safety washer with tapered side against trailing side of rod-end bearing, and secure with nut and cotter pin.

8-119. Scissors and Sleeve Assembly and Friction Collet Assembly (UH-1B Serial No. 64-14101 through 65-12744 and 65-12772). The scissors and sleeve assembly consists of a rotating hub, splined to the mast and carrying two horizontally-pivoted scissor levers, mounted through ball thrust bearings on upper end of a non-rotating collective sleeve. The collective sleeve operates vertically between the swashplate support and the mast, actuated by the collective lever attached to its lower end. Outboard ends of scissors are connected to the swashplate outer ring by two drive links. Inboard ends of scissors are connected to stabilizer bar mixing levers by two control tubes, continuously transmitting collective and cyclic control settings to the main rotor. Alignment of collective sleeve in vertical movement is aided by a teflon guide bearing in the swashplate support, and by pivoting the collective lever on an offset idler link. An extension on top of the hub carries a friction collet which bears on a friction sleeve bonded around the mast.

8-120. ***Removal — Scissors and Sleeve Assembly and Friction Collet Assembly (UH-1B Serial No. 64-14101 through 65-12744 and 65-12772).*** a. Remove stabilizer bar, main rotor, dynamic stops, and damper and support assemblies from upper part of mast.

b. Cut lockwire and remove spacer (1, figure 8-28) and upper boot (2).

c. Cut lockwire and use suitable spanner wrench to remove clamping nut (3), spring (4), and retaining nut (5). Separate and remove halves of friction collet set (6).

Note

On UH-1B helicopters, Serial No. 65-9416 and subsequent, spring (4) is replaced by a two piece, matched spring set. Be sure to keep both halves of set together for re-installation.

d. Disconnect control rod from collective lever assembly. Remove three bolts, with nuts and washers, which secure two levers (7) together. Remove cotter pin, nut, washer, and bushing (8) at each side and pull levers from idler and collective sleeve bearings.

e. Cut lockwire and remove bolt and washer attaching idler link and pivot pin to mounting boss on swashplate support. Remove pivot pin (9), idler link (10) and two thrust washers (11) from boss.

f. Remove cotter pin, nut and safety washer (12) to detach a drive link (13) and shoulder washer (14) from each of two pins on swashplate.

g. Cut lockwire to detach lower boot (15) from collective sleeve.

h. Remove lockwire, four screws, and a bearing and liner assembly (16) from each side of collective sleeve, accessible through openings in swashplate support.

i. Lift scissors and sleeve assembly (17) free of swashplate assembly and remove over top of mast, with care to avoid damage when passing over friction sleeve (18) and upper mast splines.

j. If swashplate is not being removed, leave lower boot attached to swashplate and secure upper end to mast with lockwire to protect pivot bearings and ball from dirt and foreign material.

8-120A. ***Removal — Scissors and Sleeve Assembly and Friction Collet Assembly (UH-1B Serial No. 66-491 and subsequent).*** a. Remove stabilizer bar, main rotor, dynamic stops and damper and support assemblies from upper part of mast.

b. Cut lockwire and remove spacer (1, figure 8-28A) and upper boot (2).

c. Remove nuts, washers and bolts to release three clamps (3). Remove clamps and keep together as a set.

d. Cut lockwire and use wrench, AN8516-1, to back off friction nut (4). Remove rubber ring (5), retainer ring (6), collet set (7) and friction nut (4) from top of extension (8). Keep collet halves together for reinstallation.

e. Disconnect control rod from collective lever assembly. Remove nut, washer and bolt connecting outboards ends of collective levers (9) together.

f. Remove cotter pin, nut, washer and bolt attaching collective levers to link assembly (10).

g. Remove nut, washer, bolt and spacer (11) attaching collective levers. Carefully remove collective levers (9) and thrust washer (12) from sleeve bearing assembly (13). Remove steel thrust washers (14) and low friction thrust washers (15) from between collective levers (9) and link assembly (10).

h. Remove cotter pin, nut and washer to detach drive link (16) from each of two pins on swashplate.

i. Cut lockwire, to detach lower boot (17) from collective sleeve.

j. Remove lockwire, four screws and bearing assembly (13) from each side of collective sleeve. Remove through openings in swashplate support.

k. Lift scissors and sleeve assembly (18) free of swashplate assembly and remove over top of mast, using care to avoid damage when passing over mast friction sleeve (19) and upper mast splines.

l. If swashplate is not being removed, leave lower boot (17) attached to swashplate and secure upper end of boot to mast with lockwire to protect pivot bearings and ball from dirt and foreign material.

8-120B. ***Inspection — Scissors and Sleeve Assembly and Friction Collet Assembly (UH-1B Serial No. 64-14101 and subsequent).*** a. Inspect upper and lower boots for tears and deterioration.

b. On UH-1B helicopters Serial No. 64-14101 through 65-12744 and 65-12772 inspect bearing and liner (16, figure 8-28) for security of bonding and damage.

c. On UH-1B helicopters Serial No. 66-491 and subsequent inspect bearing assembly (13, figure 8-28A) for binding and wear.

d. On UH-1B helicopters Serial No. 66-491 and subsequent inspect rubber ring (5, figure 8-28A) for deterioration and damage.

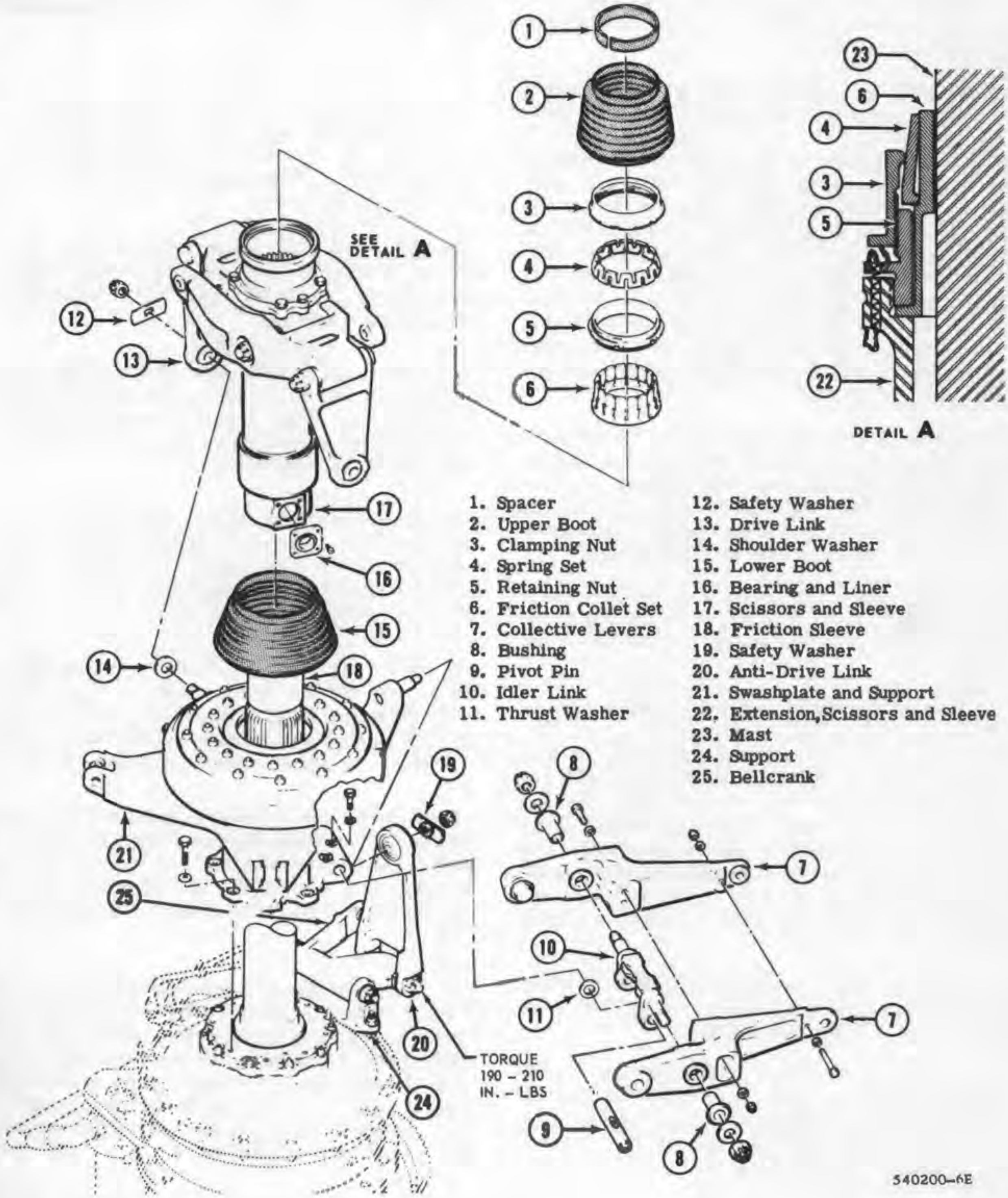
8-120C. ***Repair or Replacement — Scissors and Sleeve Assembly and Friction Collet Assembly (UH-1B Seiral No. 64-14101 and subsequent).*** Replace all items that do not meet inspection requirements. (Refer to paragraph 8-120B.)

8-121. ***Installation — Scissors and Sleeve Assembly and Friction Collet Assembly (UH-1B Serial No. 64-14101 through 65-12744 and 65-12772).*** a. Coat mating splines on mast and in scissors and sleeve assembly (17, figure 8-28) with grease, (item 8, table 1-1).

b. Lift scissors and sleeve assembly over top of mast. Lower assembly carefully past two upper sets of splines and friction sleeve (18) on mast. Insert end of collective sleeve down through lower boot (15) and top of swashplate support. Use care to avoid damaging teflon-lined bearing inside support. Engage spline plate of hub on mast splines.

c. Turn collective sleeve so that two bearing mounting bosses at lower end are aligned with openings in swashplate support. Install a bearing liner assembly (16) on each boss, with bearing cup facing out and flange secured by four screws lockwired in pairs.

d. Assemble two thrust washers (11) and idler link (10) over ends of boss with coated sides of washers next to link. Insert pivot pin (9) through link, washers and boss.



1. Spacer
2. Upper Boot
3. Clamping Nut
4. Spring Set
5. Retaining Nut
6. Friction Collet Set
7. Collective Levers
8. Bushing
9. Pivot Pin
10. Idler Link
11. Thrust Washer
12. Safety Washer
13. Drive Link
14. Shoulder Washer
15. Lower Boot
16. Bearing and Liner
17. Scissors and Sleeve
18. Friction Sleeve
19. Safety Washer
20. Anti-Drive Link
21. Swashplate and Support
22. Extension, Scissors and Sleeve
23. Mast
24. Support
25. Bellcrank

Figure 8-28. Mast controls (UH-1B serial no. 64-14101 thru 65-12744 and 65-12772

Caution

Position pivot pin (9) with deep notch on bottom for clearance with transmission guide pin.

e. Install bolt, with washer under head, through boss and pivot pin (9). Lockwire bolt.

f. Insert a bushing (8) into pivot bearing of each collective lever (7) from outboard side. Raise idler link upright. Assemble levers on link pins, with lever pins in bearing liners on collective sleeve. Secure levers together with two bolts installed from right in recessed holes, and one bolt from left through aft end, using washers under bolt heads and nuts. Install a washer and nut on each link pin, tighten with 600 to 720 inch-pounds torque and secure with cotter pins.

g. Place a shoulder washer (14), with chamfer outboard, on one of two pins extending from swashplate outer ring. Connect a drive link (13) from scissors to pin, and install safety washer (12) and nut secured by cotter pin. Install opposite link in same manner.

h. Slip ends of lower boot on lip of swashplate shield and grooved ring on collective sleeve below hub. Secure each end with lockwire.

i. Check that friction sleeve on mast is clean of any grease or dirt. Assemble halves of friction collet set (6) around mast sleeve and seated in top of collective sleeve extension. Install retaining nut (5), with largest threaded diameter down, over mast and collet. Start threads into collective sleeve extension and tighten to 140 to 180 foot-pounds torque with standard spanner wrench. Align holes in retaining nut (5) with holes in collective sleeve extension.

j. Install 0.041 lockwire through aligned holes in nut (5) and extension (22). Lockwire two places 180 degrees apart.

k. Install spring, or spring set (4), with largest diameter down, over mast to seat on shoulder of collet. Install clamping nut (3), with spanner flange down and inner lip against tapered surface of spring, and start on upper threads of collet retaining nut.

l. Apply a suitable spring scale at clevis of collective control lever, and operate lever while adjusting friction of collet on mast sleeve. Adjust clamping nut on tapered spring until a measured load of 125 to 135 pounds is required on lever to move collective sleeve, and lockwire.

Note

Do not exceed 140 foot-pounds torque on clamping nut. If correct friction cannot be obtained within this limit, investigate for grease on mast sleeve or defective parts.

m. After friction adjustment, connect control rod from collective system hydraulic cylinder to clevis of collective lever with bolt, washers, nut and cotter pin.

n. Install upper boot (2). Secure lower end on grooved lip of collective sleeve extension with lockwire. Place spacer (1) around mast above friction sleeve and inside upper end of boot, and secure with lockwire.

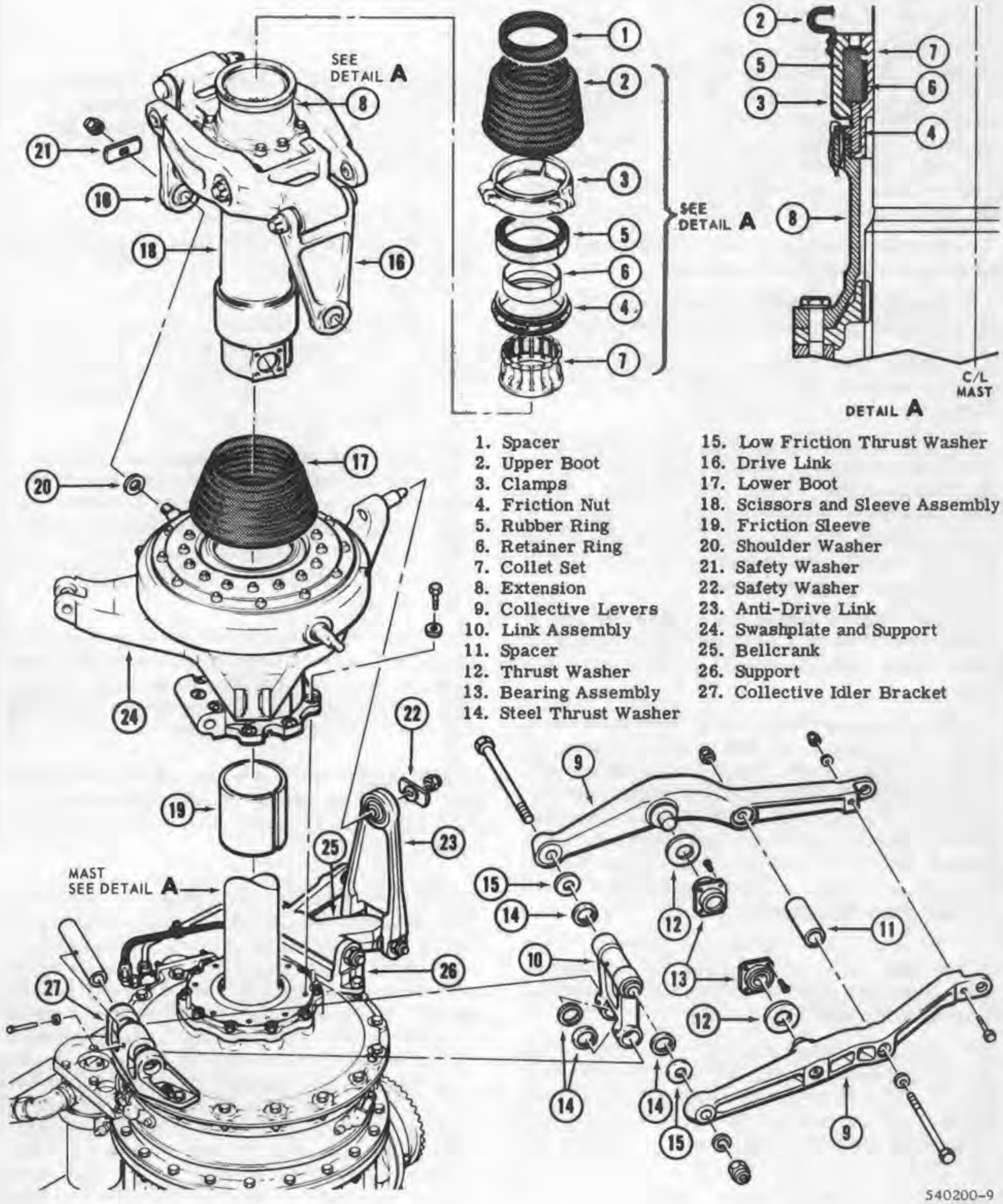
o. Install dampers, stops, main rotor, and stabilizer bar. Connect control tubes from stabilizer bar mixing levers to scissors with bolts installed from leading sides, washers, and nuts secured by cotter pins.

p. After first flight following installation, disconnect control tubes from scissors and from collective lever. Repeat step l. to check friction setting and readjust if necessary due to seating of parts. Reconnect control tubes.

8-121A. ***Installation — Scissors and Sleeve Assembly and Friction Collet Assembly (UH-1B Serial No. 66-491 and subsequent).*** a. Coat mating splines on mast and in scissors and sleeve assembly (18, figure 8-28A) with grease (item 8, table 1-1).

b. Lift scissors and sleeve assembly over top of mast. Carefully lower assembly past two upper sets of splines and friction sleeve (19) on mast. Insert lower end of collective sleeve down through lower boot (17) and top of swashplate support. Use care to avoid damaging teflon lined bearing inside support. Engage spline plate of hub on mast splines.

c. Turn collective sleeve so that the two bearing mounting bosses at lower end are aligned with openings in swashplate support. Position a bearing assembly (13) on each boss with



1. Spacer
2. Upper Boot
3. Clamps
4. Friction Nut
5. Rubber Ring
6. Retainer Ring
7. Collet Set
8. Extension
9. Collective Levers
10. Link Assembly
11. Spacer
12. Thrust Washer
13. Bearing Assembly
14. Steel Thrust Washer
15. Low Friction Thrust Washer
16. Drive Link
17. Lower Boot
18. Scissors and Sleeve Assembly
19. Friction Sleeve
20. Shoulder Washer
21. Safety Washer
22. Safety Washer
23. Anti-Drive Link
24. Swashplate and Support
25. Bellcrank
26. Support
27. Collective Idler Bracket

Figure 8-28A. Mast controls (UH-1B serial no. 66-491 and subsequent)

bearing cup facing out. Install four attaching screws and torque 20 to 25 inch pounds. Lockwire screws in pairs.

d. Position collective levers (9) and thrust washers (12) to bearing assembly (13) with low friction thrust washer (15) and steel thrust washer (14) between collective levers and link assembly (10). Install steel thrust washer under bolt head and under nut. Install bolt through washers, levers and link. Install tension washer and nut on end of bolt. Tighten nut finger-tight.

e. Install spacer (11), bolt, washer and nut. Torque nut 160 to 190 inch pounds.

f. Torque nut installed finger-tight in step d. 1250 to 1550 inch pounds and install cotter pin.

g. Install bolt, washer and nut connecting outboard ends of collective levers (9) together. Torque nut 50 to 70 inch-pounds.

h. Place a shoulder washer (20), with chamfer facing outboard, on one of two pins extending from swashplate outer ring. Connect a drive link (16) from scissors to pin, and install a safety washer (21) and nut. Torque nut 770 to 950 inch-pounds and install cotter pin. Install opposite link in same manner.

i. Slip ends of lower boot (17) on lip of swashplate shield and grooved ring on collective sleeve below hub. Secure each end with lockwire.

j. Check that friction sleeve (19) on mast is clean of any grease or dirt. Position halves of friction collet set (7) around mast sleeve and seated in top of collective sleeve extension (8). Install friction nut (4), with largest threaded diameter down, over mast and collet set. Start threads into extension and tighten 140 to 180 foot-pounds torque. Align holes in friction nut (4) with holes in extension (8).

k. Make sure there is no gap between teflon on friction collet set (7) and friction sleeve (19). Lockwire friction nut (4) in two places approximately 180 degrees apart.

l. Position retainer ring (6) and rubber ring (5) around collet set (7) and on top of friction nut (4). Place three matched clamps (3) around rubber ring (5) and install nuts, washers and bolts with washer under each nut and each bolt head.

m. Apply a suitable spring scale at input end of collective levers (9) and operate levers while adjusting friction of collet on mast sleeve. Torque clamp bolts evenly until a measured load of 125 to 135 pounds is required to move sleeve assembly.

Note

> Do not exceed 130 inch-pounds torque on clamp bolts. If correct friction cannot be obtained within this limit, investigate for grease on mast sleeve or defective parts.

n. After friction adjustment, connect control rod from collective system hydraulic cylinder to collective levers (9) with bolt, washers, nut and cotter pin.

o. Install upper boot (2). Secure lower end of boot on grooved lip of collective sleeve extension with lockwire. Place spacer (1) around mast above friction sleeve and inside upper end of boot and secure with lockwire.

p. Install dampers, dynamic stops, main rotor and stabilizer bar. Connect control tubes from stabilizer bar mixing levers to scissors with bolts, washers and nuts. Install tension washer under bolt heads and plain washer under nuts. Torque nuts 700 to 1200 inch-pounds and install cotter pins.

q. After first flight following installation, disconnect control tubes from scissors and from collective lever. Repeat step m. to check friction setting and readjust if necessary due to seating of parts. Reconnect control tubes.

8-121B. ***Adustment — Friction Collet Assembly (UH-1B Serial No. 64-14101 and subsequent).*** Refer to paragraph 8-121, step l., or paragraph 8-121A, step m.

8-122. Swashplate and Support Assembly (UH-1B Serial No. 64-14101 and subsequent). The swashplate support is an open cylinder with a mounting flange at lower end and a spherical surface at upper end. Side openings and a horizontally-drilled boss are provided to accommodate a lever which actuates the collective sleeve. The swashplate inner ring is clamped on the pivot ball of the support by upper and lower sets of contoured teflon-lined bearings, so as to tilt in any direction when actuated by cyclic control rods connected on two clevis-type horns at forward side of the ring. A pin-type horn at rear connects to a link which holds the ring from rotating and also transmits control motions to the elevator linkage. The swashplate outer ring tilts with the inner ring but rotates with the mast, being mounted on the inner ring through a duplex ball thrust bearing and connected by two drive links to scissors on the collective sleeve.

8-123. *Removal — Swashplate and Support Assembly (UH-1B Serial No. 65-14101 and subsequent).* a. After removal of scissors and sleeve assembly (17, figure 8-28; 18, figure 8-28A) remove boot (15, figure 8-28; 17, figure 8-28A).

b. Remove cotter pin, nut and safety washer (19, figure 8-28; 22, figure 8-28A) to detach anti-drive link (20, figure 8-28; 23, figure 8-28A) from pin at rear on swashplate inner ring.

c. Disconnect cyclic control cylinder rods from two control horns at front of swashplate inner ring.

d. Remove lockwire, bolts and washers from bottom flange of swashplate support.

e. Lift off swashplate and support assembly (21, figure 8-28; 24, figure 8-28A) over top of mast, using care to avoid damaging splines and friction sleeve.

8-123A. *Inspection — Swashplate and Support Assembly (UH-1B Serial No. 64-14101 and subsequent).* Inspect inner surface of swashplate control horn clevises that are contacted by boost cylinder rod end bearing housing for maximum allowable wear of 0.060 inch.

8-123B. *Repair or Replacement—Swashplate and Support Assembly (UH-1B Serial No. 64-14101 and subsequent).* If inspection requirements are not met, replace swashplate with like, serviceable item.

8-124. *Installation — Swashplate and Support Assembly (UH-1B Serial No. 64-14101 and subsequent).* a. Lift swashplate and support assembly (21, figure 8-28; 24, figure 8-28A) over top of mast. Carefully lower assembly until resting on mast bearing plate.

Note

On UH-1B helicopters Serial No. 64-14101 through 65-12744 and 65-12772 make sure that swashplate support is aligned so aft locating pin on transmission case enters hole in bottom of collective idler mounting boss.

b. Install eight bolts, with washers, through support flange into mast bearing plate. Lockwire in pairs.

c. Turn swashplate inner ring to align pin-type control horn straight aft. Connect anti-drive link (20, figure 8-28; 23, figure 8-28A) from elevator control bellcrank to control horn pin, attached by safety washer (19, figure 8-28; 22, figure 8-28A) with AFT side out, and nut. Torque nut 690 to 990 inch-pounds. Install cotter pin.

d. Connect two control rods from cyclic system hydraulic cylinders to clevis-type control horns at front of swashplate inner ring, using bolts, washers, nuts and cotter pins.

e. Place lower boot (15, figure 8-28; 17, figure 8-28A) over mast and loosely on top of swashplate in preparation for installation of scissors and sleeve assembly.

8-124A. *Anti-Drive Link Assembly.* The anti-drive link assembly (20, figure 8-28; 23, figure 8-28A) connects to a pin-type horn on swashplate (21, figure 8-28; 24, figure 8-28A) and prevents rotation of the ring. It also transmits control motion to the elevator linkage through the bellcrank (25, figure 8-28 and 8-28A).

8-124B. *Removal — Anti-Drive Link Assembly.* a. Disconnect the anti-drive link assembly (20, figure 8-28; 23, figure 8-28A) from the swashplate horn.

b. Remove bolt through elevator bellcrank (25, figure 8-28 and 8-28A) and anti-drive link (20, figure 8-28; 23, figure 8-28A). Detach anti-drive link.

c. Remove bolt through elevator control tube clevis and elevator bellcrank arm.

d. Remove bolt through support (24, figure 8-28; 26, figure 8-28A) and elevator bellcrank (25, figure 8-2 8and 8-28A) and detach bellcrank from support.

e. Remove nuts and washers securing support assembly (24, figure 8-28; 26, figure 8-28A) to transmission.

8-124C. *Inspection — Anti-Drive Link Assembly.* a. Check clearance between leg of anti-drive link (20, figure 8-28; 23, figure 8-28A) and elevator bellcrank (25, figure 8-28 and 8-28A). Maximum allowable is 0.015 inch.

b. Inspect bearing in anti-drive link (20, figure 8-28; 23, figure 8-28A) for wear or damage.

c. Inspect bushings in elevator bellcrank (25, figure 8-28 and 8-28A) for wear and serviceability.

d. Inspect bushings in support assembly (24, figure 8-28; 26, figure 8-28A) for wear and serviceability.

8-124D. *Repair or Replacement — Anti-Drive Link Assembly.* a. Replace anti-drive link (20, figure 8-28; 23, figure 8-28A) and bushing in elevator bellcrank (25, figure 8-28 and 8-28A) if clearance between bushing shoulder in elevator bellcrank and anti-drive link exceeds 0.015 inch.

b. Replace bushings in elevator bellcrank (25, figure 8-28 and 8-28A) if worn or unsuitable for continued usage.

c. Replace bushings in support assembly (24, figure 8-28; 26, figure 8-28A) if worn or unsuitable for continued usage.

8-124E. *Installation — Anti-Drive Link Assembly.* a. Position support assembly (24, figure 8-28; 26, figure 8-28A) on transmission and install washers and nuts.

b. Install bolt, with washer under head, through support assembly (24, figure 8-28; 26, figure 8-28A) and inboard end of elevator bellcrank (25, figure 8-28 and 8-28A). Install nut and cotter pin.

c. Install bolt, with washer under head, through legs of anti-drive link (20, figure 8-28; 23, figure 8-28A) and elevator bellcrank (25, figure 8-28 and 8-28A). Install nut and torque 190 to 210 inch-pounds.

d. Install end of anti-drive link (20, figure 8-28; 23, figure 8-28A) on horn of swashplate (21, figure 8-28; 24, figure 8-28A). Install washer and nut. Torque nut 690 to 990 inch-pounds. Install cotter pin.

e. Install bolt, with washer under head, through elevator control rod and arm of elevator control link. Install washer, nut and cotter pin.

8-124F. *Collective Idler Link and Bracket (UH-1B Serial No. 66-491 and subsequent).* The inboard ends of the collective levers (9, figure 8-28A) are attached to an idler link (10) which is mounted in a bracket (27) attached to the top transmission case by four bolts, washers and nuts. This pivot point arrangement reduces loads in the control system and improves vibration characteristics.

8-124G. *Removal — Collective Idler Link and Bracket (UH-1B Serial No. 66-491 and subsequent).* a. Remove scissors and sleeve assembly (18, figure 8-28A). (Refer to paragraph 8-120A.)

b. Remove cotter pin, washer and straight pin (1, figure 8-28B) attaching idler link (2) to pivot shaft (3) through mounting bracket (4).

c. Withdraw shaft (3) from idler link and mounting bracket and remove link (2).

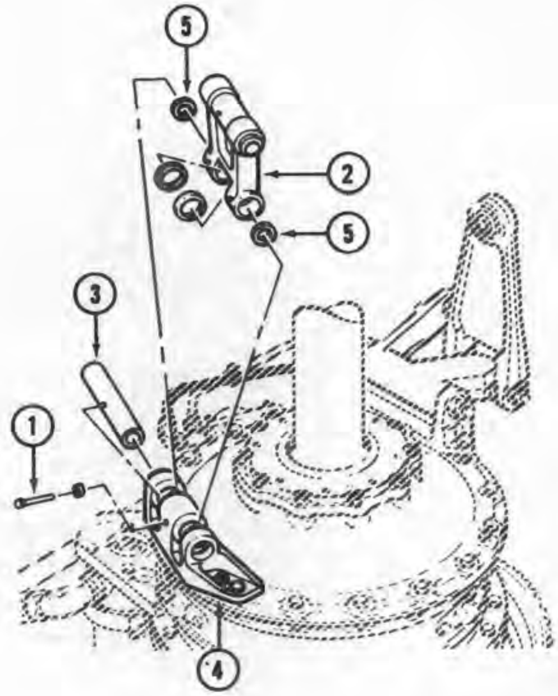
d. Remove four nuts, washers and bolts attaching mounting bracket (4) to top transmission case and remove mounting bracket.

8-124H. *Inspection — Collective Idler Link and Bracket (UH-1B Serial No. 66-491 and subsequent).* a. Inspect three lubrication fittings in idler link (2, figure 8-28B) for cleanliness and damage.

b. Inspect idler link bearing seals (5) for damage and needle bearings for binding and wear.

c. Inspect pivot shaft (3) for scoring and hole elongation.

d. Inspect four bushings in mounting bracket (4) for damage and wear.



1. Straight Pin
2. Idler Link
3. Pivot Shaft
4. Mounting Bracket
5. Bearing Seals

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Figure 8-28B. Collective idler link and mounting bracket (UH-1B serial no. 66-491 and subsequent)

8-124J. Repair or Replacement — Collective Idler Link and Bracket (UH-1B Serial No. 66-491 and subsequent). Replace all items that do not meet inspection requirements. (Refer to paragraph 8-124H.)

8-124K. Installation — Collective Idler Link and Bracket (UH-1B Serial No. 66-491 and subsequent). a. Position mounting bracket (4, figure 8-28B) to top transmission case and install attaching bolts, washers and nuts. Install one washer under each bolt head and one under each nut. Torque nuts 160 to 190 inch-pounds.

b. Position idler link (2) in mounting bracket (4). Carefully insert pivot shaft (3) through mounting bracket and idler link.

c. Align hole in pivot shaft with holes in idler link and install straight pin (1) washer and cotter pin.

Section III — Tail Rotor Hub and Blade

8-125. Tail Rotor Hub and Blade Assembly (UH-1A). A single two blade controllable pitch tail rotor is located on the left side of the tail rotor gear box. It is composed of two assemblies, the blades and the hub, and is driven through the tail rotor gear box. The tail rotor hub is hinge mounted to provide automatic equalization of thrust on advancing and retreating blades. Control links provide equal and simultaneous pitch change to both blades. The tail rotor counteracts torque of the main rotor and provides directional control.

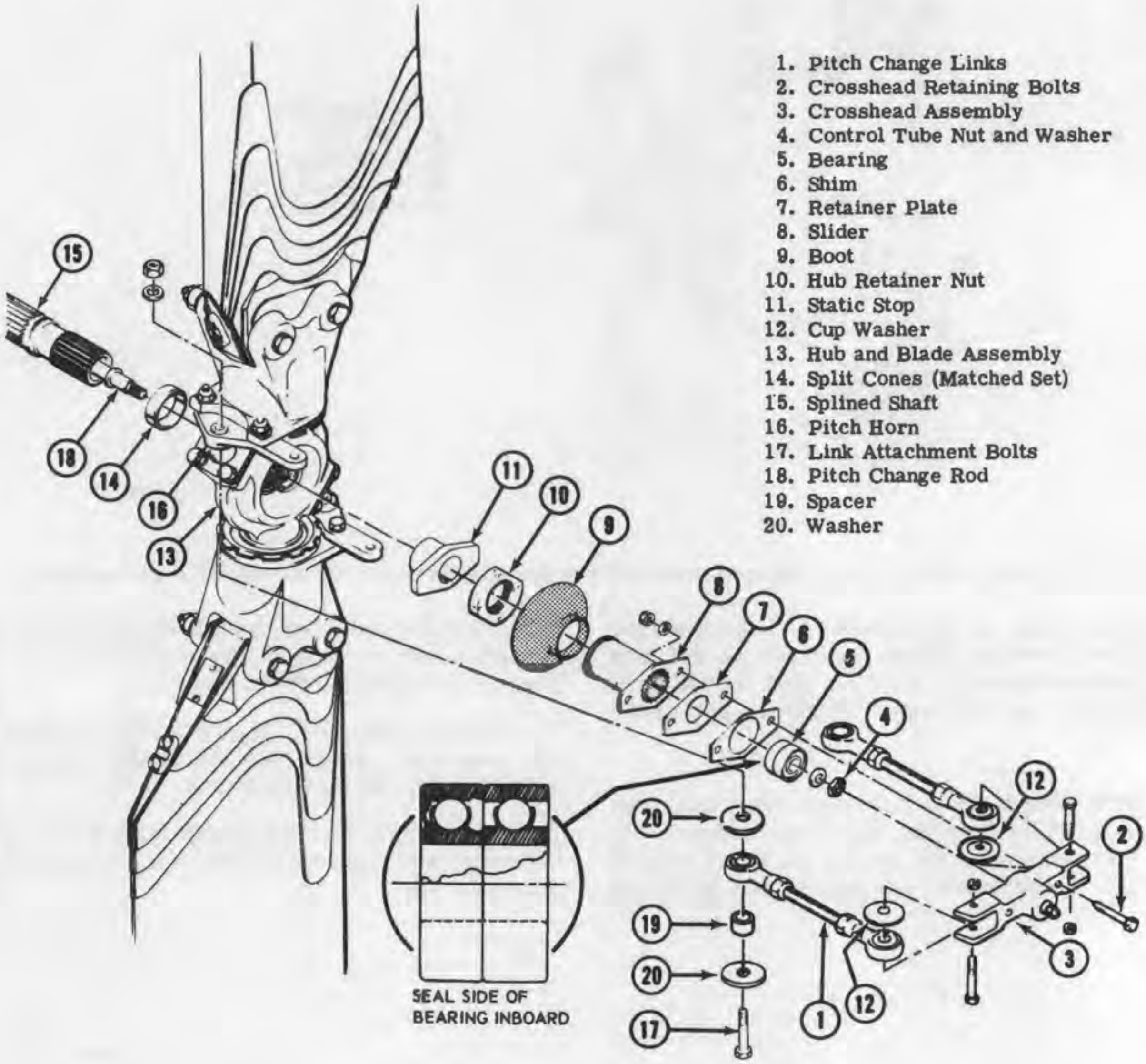

Figure 8-29. Tail rotor hub and blade assembly (UH-1A)

8-126. *Trouble Shooting — Tail Rotor Hub and Blade Assembly (UH-1A).* A chart of possible tail rotor hub and blade assembly troubles, causes and remedial actions is included below.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
High Frequency Vibration	Tail rotor blades out of track	Track tail rotor blades
	Tail rotor blades out of balance	Balance tail rotor blades
	Worn or loose hinge mounting	Replace hub assembly
	Loose retaining nut	Torque nut
	Bent pitch change link	Replace pitch change links
	Loose grip bearing	Replace hub assembly
	Loose pitch change link bearings	Replace pitch change links
	Worn or loose pitch change rod duplex bearings	Replace bearings
	Worn or loose pitch change slider	Replace slider
Inability to make normal right and left turns in flight.	Blade angles not set properly	Check pitch settings and system rigging

8-127. *Operational Check — Tail Rotor Hub and Blade Assembly (UH-1A).* Following replacement or installation of the tail rotor hub, blades or pitch change systems, check the tail rotor system rigging and track the tail rotor blades. (See figure 8-30.)

a. Attach a small piece of sponge rubber 1/8 to 1/4 inch thick to end of a 1/2x1/2 inch pine stick or any other flexible device, and cover sponge rubber with Prussian blue, (item 103, table 1-1), or similar type of coloring thinned with oil.

Note

The run-up shall be performed by personnel authorized in accordance with AR95-13.

b. Start engine. Run engine at 6400 rpm with pedals in neutral position. Rest marking device on under side of tail boom assembly. Slowly move marking device into disc of tail rotor just far enough to mark near blade approximately one inch from tip.

c. When near blade is marked, stop engine and allow rotor to stop. Shorten pitch control link of marked blade and recheck track of blades.

8-128. *Removal — Tail Rotor Hub and Blade Assembly (UH-1A).* a. Disconnect pitch change links (1, figure 8-29) at pitch horn (16).

Note

Maximum allowable wear looseness of pitch change links is 0.020 inch for both axial and radial play. Wear in excess of this dimension is cause for replacement.

Figure 8-30. Tracking — tail rotor blades (UH-1A)

b. Cut safety wire wrapped around boot (9).

c. Remove bolts (2) from crosshead assembly (3) and remove assembly.

d. Remove cotter pin, nut and washer (4) from pitch change rod (18). Remove bearings (5), shim (6), retainer plate (7) slider (8) and boot (9).

e. Cut safety wire and using spanner wrench, remove nut (10). Remove static stop (11) and washer (12).

f. Tap hub assembly off shaft and hold split cones (14) as they are released by hub trunnion.

8-129. ***Inspection — Tail Rotor Hub and Blade Assembly (UH-1A).*** a. Inspect for wear between pitch change links and bushing; between bushing and bolt, and between ball and socket in pitch change links. Inspection must be completed on both ends of pitch change links.

b. Use a dial indicator to inspect for maximum allowable play in either the radial or axial direction of 0.020 inch at each end of the pitch change link.

c. Measured total play beyond 0.020 inch shall be cause for replacement of the applicable parts.

Note

Procedures used in measuring wear between the parts of the pitch change link assembly shall be determined by the activities performing the inspection.

8-130. ***Repair or Replacement — Tail Rotor Hub and Blade Assembly (UH-1A).*** Replace parts which do not meet inspection requirements. (Refer to paragraph 8-129.)

8-131. ***Installation — Tail Rotor Hub and Blade Assembly (UH-1A).*** Install tail rotor hub and blade assembly in accordance with the following instructions.

Caution

The only authorized combinations of hub assemblies, cone set and static stops are listed below. Failure to install the appropriate cone sets and static stop in conjunction with hub assembly could result in a safety of flight condition.

Hub Assembly	Cone Set	Static Stop
204-010-784-3	204-010-724-5	204-010-774-7
204-010-703-21	204-010-724-1	204-010-774-3

Note

Two each cone halves (204-010-724-3) comprise a single cone set (204-010-724-1). Two each cone halves (204-010-724-7) comprise a single cone set (204-010-724-5). Cone sets are matched companion halves; therefore cones must be replaced as sets only.

a. Observe color coding on installation.

b. Position split cones (14, figure 8-29) in place on shaft (15) with bevel edge positioned to mate with bevel in trunnion.

c. Align master splines and slide trunnion on shaft with bearing bosses on hub inboard and flat side outboard.

d. Install static stop (11) and nut (10). Torque nut 300 to 400 inch-pounds. Hold assembly at hub when torquing nut. Safety wire nut to static stop. Slide boot (9) on shaft.

Note

Retorque nut after five hours of operation.

e. Temporarily install bearings (5) in cap (3) and secure with slider (8) retainer plate (7) and two bolts with nuts. Tighten bolts sufficiently to secure assembly without distortion. Measure gap with a feeler gage between retainer plate and crosshead. Prepare a shim to measured thickness less 0.002 to 0.004 inch pinch of retainer plate against bearing.

f. Install slider (8) on shaft and into boot. Position retainer plate (7) and shim (6) next to slider. Install bearings (5) on pitch change rod (18) with machined surfaces together and retainer plate facing inboard. Install washer and nut (4) on rod. Torque nut 60 to 85 inch-pounds and secure with cotter pin.

g. Fill cavity of crosshead (3) with grease, (item 8, table 1-1). Position crosshead assembly (3) over bearings and insert bolts through crosshead shim (6), retainer plate (7), and slider (8). Install washers and nuts.

h. Attach pitch change links (1) to pitch horns (16) with spacers and washers positioned as illustrated.

i. Install washers next to nuts and torque 85 to 95 inch-pounds. Install cotter pin through nut.

j. Install safety wire around each end of boot.

k. Check assembly for free flapping and pitch change in all positions.

l. Check rigging and rig if necessary.

m. Track blades. (Refer to paragraph 8-127.)

8-132. Tail Rotor Blades (UH-1A). Tail rotor blades are of all-metal bonded construction.

8-133. *Removal — Tail Rotor Blades (UH-1A).* Remove blade retention bolts, washers and nuts (identify bolts to grip and hole from which removed).

8-134. *Inspection and Repair — Tail Rotor Blades (UH-1A).* The following steps cover normal procedures for the inspection and repair of tail rotor blades. (See figure 8-31.)

Caution

Damage exceeding the following limits will require replacement of blade.

a. Polish out all nicks and scratches within the following limits in the skin, doublers, grip plates, abrasive strip and trailing edge, inboard of station 25.0.

(1) Nicks and scratches running within zero to 15 degrees of the span line and not in excess of 0.006 inch deep.

(2) Nicks and scratches running within zero to 75 degrees of the chordline and not in excess of 0.004 inch deep.

(3) Nicks and scratches in the trailing edge up to 0.020 inch deep chordwise are permissible if polished to a smooth surface finish.

(4) Sharp dents which are not in excess of 0.010 inch in depth are permissible.

(5) Non-sharp dents which are not in excess of 0.030 inch in depth are permissible.

b. Polish out all nicks and scratches within the following limits in the skins and trailing edges, outboard of station 25.

(1) Nicks and scratches which are not in excess of 0.010 inch in depth.

(2) Sharp dents which are not in excess of 0.030 inch in depth are permissible.

(3) Non-sharp dents which are not in excess of 0.060 inch in depth are permissible.

(4) Nicks and scratches in the trailing edge up to 0.020 inch deep chordwise are permissible if polished to a smooth surface finish.

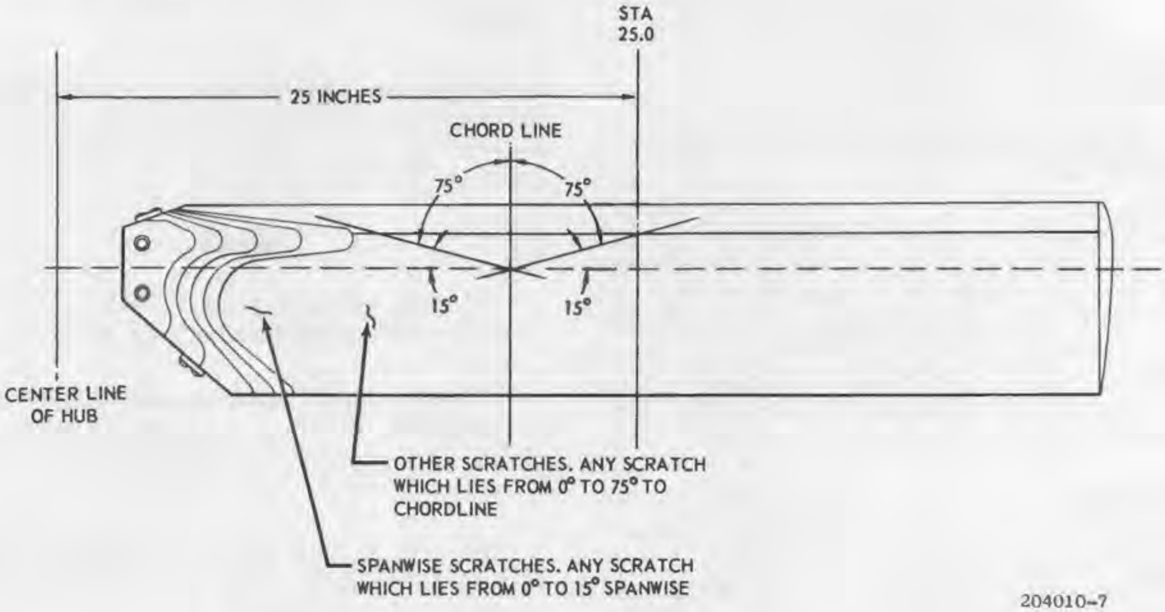

Figure 8-31. Inspection and repair — tail rotor blades (UH-1A)

Caution

If a crack exists in any location, the blade should be replaced. All dents should be closely inspected for nicks, scratches and cracks. If nicks or scratches exist in dents and the total depth is in excess of that permitted for dents alone (paragraph a. (4), (5) and b. (2), (3), above, the blade must be replaced. The depth of the nicks and scratches may not exceed the allowables (paragraph a. (1), (2) and b. (1).

c. Polish out all nicks and scratches within the following limits in the abrasive strip outboard of station 25.

(1) Nicks and scratches running within zero to 15 degrees of the span line that are 0.006 inch deep but less than 0.015 inch deep.

(2) Nicks and scratches running within zero to 75 degrees of the chordline that are 0.004 inch deep but less than 0.010 inch deep.

(3) Sharp dents which are not in excess of 0.030 inch deep are permissible.

(4) Non-sharp dents which are not in excess of 0.040 inch deep are permissible.

Caution

If a crack exists in any location, the blade should be replaced. All dents should be closely inspected for nicks, scratches, and cracks. If nicks or scratches exist in dents and the total depth is in excess of the maximum depths permitted (paragraph c. (3), (4), the blade should be replaced.

d. Inspect blades for edge voids. Replace blade if following limits are exceeded.

(1) Edge voids in any one bond line of the doublers or grip plates with total length in excess of 15 percent of the total length of the bond line.

(2) Any one edge void in a doubler or grip plate in excess of 0.060 inch in depth or 0.75 inch in length.

(3) Any edge void in the outboard 1.00 inch of a doubler or a grip plate (either finger).

e. Inspect blades for the following conditions which require blade or blades replacement.

(1) Looseness of retention bolt hole bushing or inside diameter larger than 0.3755.

(2) Overspeed, sudden stoppage, or hard landing.

(3) Bond separation anywhere on blade.

(4) Movement of tip or root weights.

(5) If one of the blades of a pair has been damaged badly enough that metal has been torn or any bond lines have separated, both blades must be replaced.

f. Repair and touch-up blades using the following methods:

(1) Burnish out any scratches which are within limits by using aluminum wool and/or very fine abrasive paper or equivalent on the aluminum surfaces; and coarser abrasive paper on the stainless steel leading edge. Rinse with clear water and dry blade.

(2) Brush bright aluminum areas, where yellow colored pre-treatment is fading, with alodine chemical film pre-treatment or equivalent per MIL-C-5541, or by keeping area wet for five minutes with a ten percent solution of chromic acid.

(3) Rinse with clear water; check surface for water break and dry. Reclean and reapply chemical film if surface shows water break.

(4) Plug the retention bolt holes to prevent entry of finishing materials and apply one light coat of catalyzed epoxy primer, TA-862 or equivalent to the touch-up areas and allow to dry a minimum of 30 minutes and a maximum of 24 hours. Apply two coats of acrylic lacquer (item 113, table 1-1) to touch-up red areas. Allow 45 minutes air dry between coats. Apply two coats of acrylic lacquer (item 110, table 1-1) to touch-up white area. Allow 45 minutes air dry between coats. The same procedure is used to apply lacquer (item 111, table 1-1) to black areas.

Note

Several thin coats of lacquer may be used; however, use as little as possible just to touch-up burnished and worn areas so that the blade balance will be disturbed as little as possible.

(5) Air dry blade for three hours before handling and for a total of 48 hours before flying. Remove plugs from retention bolt holes and apply corrosion preventive compound (item 315, table 1-1) to inside surface of bushings.

8-135. *Emergency Repairs—Tail Rotor Blades (UH-1A).* Damage to tail rotor blades exceeding limits shown in steps a. and b., below, and limits shown in paragraph 8-134, should be condemned, demilitarized and locally scrapped" rather than returned to an overhaul facility. Tail rotor blades receiving damage within the following limits may be repaired and returned to service.

Note

Permanent repair or disposition of tail rotor blades shall be accomplished at the earliest opportunity.

a. Repairable damage limits shall not exceed the following: Any damage penetrating the skin or in excess of limits defined in paragraph 8-134 may be repaired in the area outboard of station 34.0, 1.75 inches inboard of blade tip, 1.0 inch aft of stainless steel abrasion strip and 1.0 inch forward of the trailing edge. (See figure 8-32.) Damage must not exceed 1.50 inches in diameter after cleanup.

b. Limits and repair abrasion strip outboard at station 34.0 shall not exceed the following: Dents must fall inside a 1.0 inch diameter. Holes and cracks must fall inside 0.25 inch diameter. Cracks will be stop drilled at each end using 0.040 drill.

c. Repair damaged blade, except for leading edge, as follows:

(1) Dress the hole by straightening and deburring the edge, follow the perimeter of the hole with a cutter having a minimum diameter of 0.25 inch. Remove an absolute minimum of metal as the finished hole must not extend outside a 1.50 inch diameter circle. The finished hole must have a spanwise dimension as great as or greater than the chordwise dimension.

(2) Cut a patch from 0.016 or 0.020 24ST T53 aluminum to the same general shape as the hole but maintaining an overlap of 0.8 to 1.0 inch outside the hole. The patch, like the hole, must have a spanwise dimension as great as or greater than the chordwise dimension.

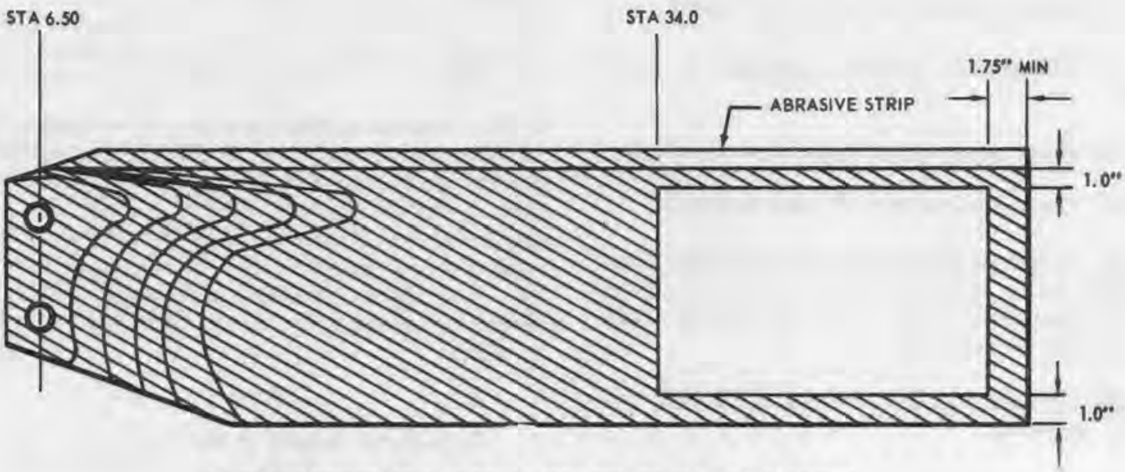

Figure 8-32. Emergency repair area — tail rotor blades (UH-1A)

Caution

Do not use a scribe on either the blade or the patch under any circumstances. Polish out scratches.

(3) Clean the blade and patch by lightly sanding the bonding faces with 120 grit cloth. Wipe both surfaces with methyl-ethyl-ketone (item 309, table 1-1) until all indications of dirt and grime are removed. Wipe dry and air for 15 minutes.

(4) Apply adhesive (item 216 or 214, table 1-1) to patch and to blade, bond and allow to set (three to six hours). Fill around edge of patch with adhesive (item 216, table 1-1) and allow to air dry for 24 hours total time. Sand smooth and paint.

(5) Patches are to be no closer together than 6.0 inches. Balance hub and blade assembly. (Refer to Appendix II.) Record in log book and on 2410 form so that the weight may be removed at blade change.

d. Repair abrasion strip as follows.

(1) Clean the area to be repaired by sanding lightly with 120 grit cloth. Wipe area with methyl-ethyl-ketone (item 309, table 1-1) until all indications of dirt and grime are removed. Wipe dry and air dry for 15 minutes.

(2) Fill the damaged area with adhesive (item 210, table 1-1) or any suitable epoxy. Allow to air dry for 24 hours. Blend filler and balance hub and blade assembly. (Refer to Appendix II.)

e. Inspect all repaired areas DAILY for evidence of cracks.

8-136. Replacement — Link Assembly 204-011-762 (UH-1A). a. Link assembly, 204-011-762, is furnished as a replacement for link assembly, 204-010-777. The 204-011-762 link assembly provides a radial type rod end .bearing with greater bearing area and will provide increased service life.

b. Refer to figure 8-33 for the combination of bolts, nuts, washers, spacers and cottetr pins used with the 204-011-762 link assembly. Discard 204-010-792 and AN960-1416L washers when replacing existing 204-010-777 link assemblies.

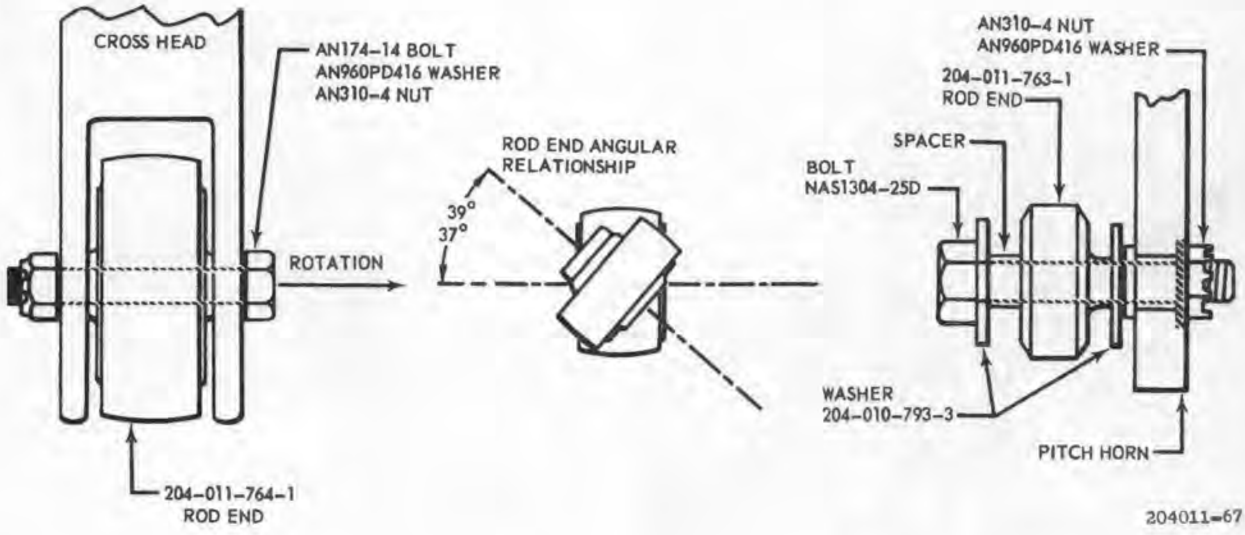

Figure 8-33. Link assembly installation (UH-1A)

c. The following maintenance procedures will be performed after installing 204-011-762 link assemblies.

(1) Check for interference between rod end and cross head with full right and full left pedal.

(2) Check rigging. Rig, if necessary.

(3) It is mandatory to retrack the tail rotor blades in accordance with instructions contained in paragraph 8-127.

8-137. Installation — Tail Rotor Blades (UH-1A). Tail rotor blade attaching bolts may be installed with bolt heads either inboard or outboard, but all four bolt heads must be installed the same.

a. Installation of same blades.

(1) Same blades without repair, or same blades with allowable minor repair or minor touchup, may be installed without balancing of hub and blade assembly.

(2) Install blade with previously removed bolts, washers and nuts, and with bolts in same grip and hole from which previously removed. Torque nuts 120 to 150 inch-pounds.

b. Installation of new blades.

(1) New blades cannot be installed in same or new hubs at second echelon level due to requirement for balancing tail rotor hub and blade assembly as a complete assembly. This function must be performed at direct support facility.

(2) Installation of the balanced tail rotor hub and blade assembly may then be performed by organizational personnel.

Caution

Track blades after every installation.

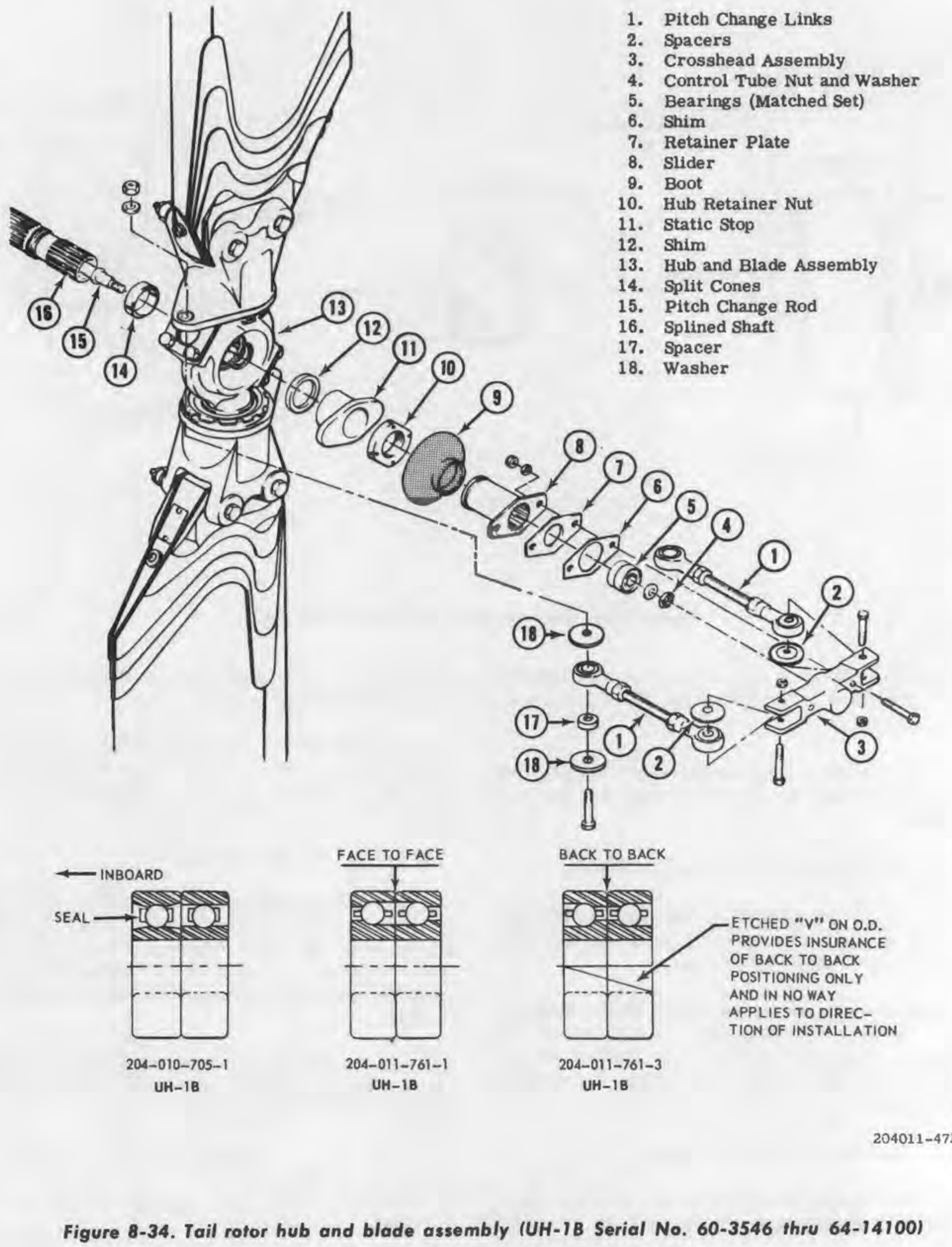

Figure 8-34. Tail rotor hub and blade assembly (UH-1B Serial No. 60-3546 thru 64-14100)

8-138. Tail Rotor Hub and Blade Assembly (UH-1B Serial No. 60-3546 through 64-14100). A single two blade controllable pitch tail rotor is located on the left side of the tail rotor gear box. It is composed of two assemblies, the blades and the hub, and is driven through the tail rotor gear box. The tail rotor hub is hinge mounted to provide automatic equalization of thrust on advancing and retreating blades. Control links provide equal and simultaneous pitch change to both blades. The tail rotor counteracts torque of the main rotor and provides directional control.

8-139. Troubleshooting. Tail Rotor Hub and Blade Assembly (UH-1B Serial No. 60-3546 through 64-14100). A chart of possible troubles, causes and remedial actions is included below.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
High frequency vibration	Tail rotor blades out of track	Track tail rotor blades
	Tail rotor blades out of balance	Balance tail rotor blades
	Worn or loose hinge mounting	Replace hub assembly
	Loose retaining nut	Torque nut
	Bent pitch change link	Replace pitch change links
	Loose grip bearing	Replace hub assembly
	Loose pitch change link bearings	Replace pitch change links
	Worn or loose pitch change rod duplex bearings	Replace bearings
	Worn or loose pitch change slider	Replace slider
Inability to make normal right and left turns in flight	Blade angles not set properly	Check pitch settings and system rigging

8-140. Operational Check — Tail Rotor Hub and Blade Assembly (UH-1B Serial No. 60-3546 through 64-14100). Following replacement or installation of the tail rotor hub, blades or pitch change systems, check the tail rotor system rigging and track the tail rotor blades. (See figure 8-35.)

a. Attach a small piece of sponge rubber 1/8 to 1/4 thick to end of a 1/2 x 1/2 inch pine stick or any other flexible device, and cover sponge rubber with Prussian blue (item 103, table 1-1) or similar type of coloring thinned with oil.

Note

The run-up shall be performed by personnel authorized in accordance with AR95-13.

b. Start engine. Run engine at 6600 rpm with pedals in neutral position. Rest marking device on under side of tail boom assembly. Slowly move marking device into disc of tail rotor just far enough to mark near blade approximately one inch from tip.

Figure 8-35. Tracking tail rotor blades (UH-1B Serial No. 60-3546 thru 64-14100)

c. When near blade is marked, stop engine and allow rotor to stop. Shorten pitch control link of marked blade and recheck track of blades.

8-141. *Removal — Tail Rotor Hub and Blade Assembly (UH-1B Serial No. 60-3546 through 64-14100).* a. Disconnect pitch change links (1, figure 8-34) at pitch horn.

Note

Maximum allowable wear looseness of pitch change links is 0.020 inch for both axial and radial play. Wear in excess of this dimension is cause for replacement.

b. Cut lockwire wrapped around boot (9).

c. Remove bolts from crosshead assembly (3) and remove assembly.

d. Remove cotter pin, nut and washer (4) from pitch change rod (15). Remove bearings (5), shim (6), retainer plate (7), slider (8), and boot (9).

e. Cut lockwire and remove nut (10). Remove static stop (11) and shim (12).

f. Tap hub assembly off shaft and hold split cones (14) as they are released by hub trunnion.

8-142. *Inspection — Tail Rotor Hub and Blade Assembly (UH-1B Serial No. 60-3546 through 64-14100).* a. Inspect for wear between pitch change links and bushings; between bushing and bolt, and between ball and socket in pitch change links. Inspection must be completed on both ends of pitch change links.

b. Use a dial indicator to inspect for maximum allowable play in either the radial or axial direction of 0.020 inch at each end of the pitch change link.

c. Measured total play beyond 0.020 inch shall be cause for replacement of the applicable parts.

Note

Procedures used in measuring wear between the parts of the pitch change link assembly shall be determined by the activities performing the inspection.

8-143. *Repair or Replacement — Tail Rotor Hub and Blade Assembly (UH-1B Serial No. 60-3546 through 64-14100).* Replace parts which do not meet inspection requirements. (Refer to paragraph 8-142.)

8-144. *Installation — Tail Rotor Hub and Blade Assembly (UH-1B Serial No. 60-3546 through 64-14100).* Install tail rotor hub and blade in accordance with the following instructions.

Caution

Install cones, 204-010-724-7, of cone set, 204-010-724-5, with static stop, 204-010-774-11 (or 204-010-774-9 which has been modified by MWO 55-1520-208-34/18 at a field maintenance facility).

a. Observe color coding on installation.

b. Position split cones (14, figure 8-34) in place on shaft (15) with bevel edge positioned to mate with bevel in trunnion.

c. Align static stop (11), shim (12), and nut (10). Torque nut 300 to 400 inch-pounds. Hold assembly at hub when torquing nut. Lockwire nut to static stop. Slide boot (9) on shaft. Retorque nut after five hours of operation.

Note

Shim (12) should be of sufficient thickness as to allow 2.50 to 3.50 inches clearance between trailing edge and fin with edge of blade closest to fin in rigging condition. Use only bonded laminated shims.

d. Temporarily install bearings (5) in cap (3) and secure with slider (8), retainer plate (7) and two bolts with nuts. Tighten bolts sufficiently to secure assembly without distortion. Measure gap with a feeler gage between retainer plate and crosshead. Prepare a shim to measured thickness, less 0.002 to 0.004 inch. Assemble parts with prepared shim in place. Shim will provide a 0.002 to 0.004 inch pinch of retainer plate against bearing.

e. Install slider (8) on shaft and into boot. Position retainer plate (7) and shim (6) next to slider. Install bearings (5) on pitch change rod (15) with machined surfaces together and retainer plate facing inboard. Install washer and nut (4) on rod. Torque nut 60 to 85 inch-pounds and secure with a cotter pin.

Note

Use 204-010-721-3 retainer plate with the 204-011-761-1 bearing assembly.

f. Fill cavity of crosshead (3) with grease (item 8, table 1-1). Position crosshead assembly (3) over bearings and insert bolts through crosshead, shim (6), retainer plate (7) and slider (8). Install washers and nuts.

g. Install pitch change links (1) on crosshead (3) with spacers and washers positioned as illustrated. (Refer to figure 8-34.)

Note

The maximum allowable wear looseness of tail rotor pitch change links is 0.020 inch which applies to both axial and radial play. Wear greater than 0.020 inch is cause for replacement.

h. Attach pitch change links (1) to pitch horns with spacers and washers positioned as illustrated.

i. Install washers next to nuts and torque 80 to 90 inch-pounds. Install cotter pin through nut.

j. Install safety wire around each end of boot.

k. Check asssembly for free flapping and pitch change in all positions.

l. Check rigging and rig if necessary.

m. Track blades. (Refer to paragraph 8-138.)

8-145. Tail Rotor Blades (UH-1B Serial No. 60-3546 through 64-14100). Tail rotor blades are of all-metal bonded construction.

8-146. Removal — Tail Rotor Blades (UH-1B Serial No. 60-3546 through 64-14100). Remove blade retention bolts, washers and nuts (identify bolts to grip and hole from which removed).

8-147. Inspection and Repair — Tail Rotor Blades (UH1B Serial No. 60-3546 through 64-14100). The following steps cover normal procedures for the inspection and repair of tail rotor blades. (See figure 8-36.)

Caution

Damage exceeding the following limits will require replacement of blade.

a. Polish out all nicks and scratches within the following limits in the skins, doublers, grip plates, abrasive strip and trailing edge, inboard of station 25.0.

(1) Nicks and scratches running within zero to 15 degrees of the span line and not in excess of 0.006 inch deep.

(2) Nicks and scratches running within zero to 75 degrees of the chordline and not in excess of 0.004 inch deep.

(3) Nicks and scratches in the trailing edge up to 0.020 inch deep chordwise are permissible if polished to a smooth surface finish.

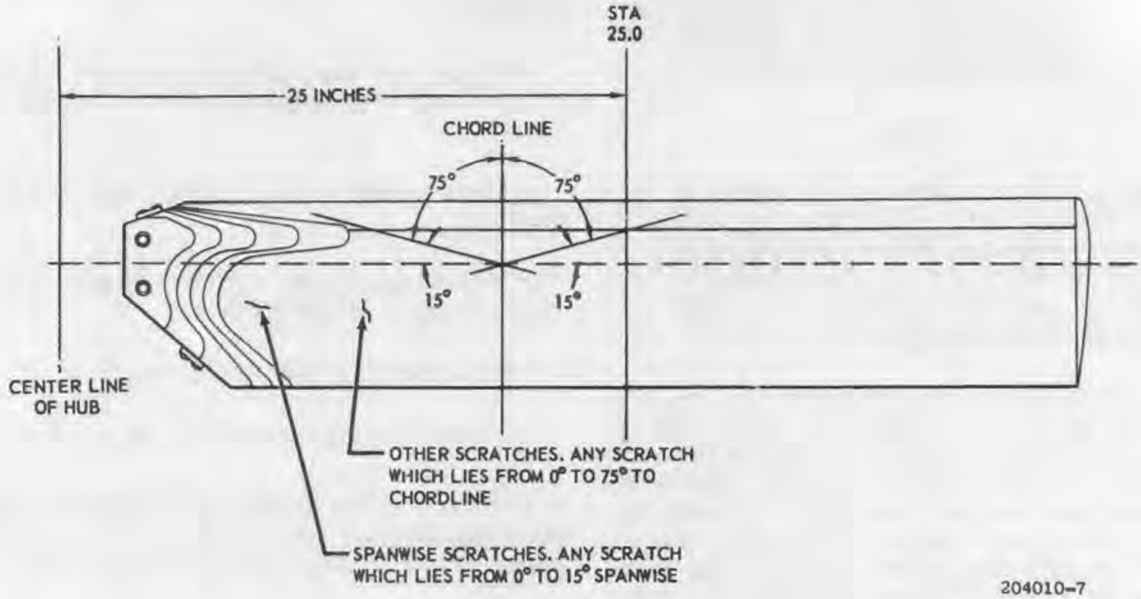

Figure 8-36. Inspection and repair — tail rotor blades (UH-1B Serial No. 60-3546 thru 64-14100)

(4) Sharp dents which are not in excess of 0.010 inch in depth are permissible.

(5) Non-sharp dents which are not in excess of 0.030 inch in depth are permissible.

b. Polish out all nicks and scratches within the following limits in the skins and trailing edges, outboard of station 25.

(1) Nicks and scratches which are not in excess of 0.010 inch in depth.

(2) Sharp dents which are not in excess of 0.030 inch in depth are permissible.

(3) Non-sharp dents which are not in excess of 0.060 inch in depth are permissible.

(4) Nicks and scratches in the trailing edge up to 0.020 inch deep chordwise are permissible if polished to a smooth surface finish.

Caution

If a crack exists in any location, the blade should be replaced. All dents should be closely inspected for nicks, scratches and cracks. If nicks or scratches exist in dents and the total depth is in excess of that permitted for dents alone (paragraph a. (4), (5) and b. (2), (3), above) the blade must be replaced. The depth of the nicks and scratches may not exceed the allowables (paragraph a. (1), (2) and b. (1).

c. Polish out all nicks and scratches within the following limits in the abrasive strip outboard of station 25.

(1) Nicks and scratches running within zero to 15 degrees of the span line that are 0.006 inch deep but less than 0.015 inch deep.

(2) Nicks and scratches running within zero and 75 degrees of the chordline that are 0.004 inch deep but less than 0.010 inch deep.

(3) Sharp dents which are not in excess of 0.030 inch deep are permissible.

(4) Non-sharp dents which are not in excess of 0.040 inch deep are permissible.

Caution

If a crack exists in any location, the blade should be replaced. All dents should be closely inspected for nicks, scratches and cracks. If nicks or scratches exist in dents and the total depth is in excess of the maximum depths permitted (paragraph c. (3), (4), the blade should be replaced.

d. Inspect blades for edge voids. Replace blade if following limits are exceeded.

(1) Edge voids in any one bond line of the doublers or grip plates with total length in excess of 15 percent of the total length of the bond line.

(2) Any one edge void in a doubler or grip plate in excess of 0.060 inch in depth or 0.75 inch in length.

(3) Any edge void in the outboard 1.00 inch of a doubler or a grip plate (either finger).

e. Inspect blades for the following conditions which require blade or blades replacement.

(1) Looseness of retention bolt hole bushing or inside diameter larger than 0.3755.

(2) Overspeed, sudden stoppage, or hard landing.

(3) Bond separation anywhere on blade.

(4) Movement of tip or root weights.

(5) If one of the blades of a pair has been damaged badly enough that metal has been torn or any bond lines have separated, both blades must be replaced.

f. Repair and touch-up blades using the following methods:

(1) Burnish out any scratches which are within limits by using aluminum wool and/or very fine abrasive paper or equivalent on the aluminum surfaces; and coarser abrasive paper on the stainless steel leading edge. Rinse with clear water and dry blade.

(2) Brush bright aluminum areas, where yellow colored pre-treatment is fading, with alodine chemical film pre-treatment or equivalent per MIL-C-5541, or by keeping areas wet for five minutes with a ten percent solution of chromic acid.

(3) Rinse with clear water; check surface for water break and dry. Reclean and reapply chemical film if surface shows water break.

(4) Plug the retention bolt holes to prevent entry of finishing materials and apply one light coat of catalyzed epoxy primer, TA-862 or equivalent to the touch-up areas and allow to dry a minimum of 30 minutes and a maximum of 24 hours. Apply two coats of acrylic lacquer (item 113, table 1-1) to touch-up red areas. Allow 45 minutes air dry between coats. Apply two coats of acrylic lacquer (item 110, table 1-1) touch-up white areas. Allow 45 minutes air dry between coats. The same procedure is used to apply lacquer (item 111, table 1-1) to black areas.

Note

Several thin coats of lacquer may be used: however, use as little as possible just to touch-up burnished and worn areas so that the blade balance will be disturbed as little as possible.

(5) Air dry blade for three hours before handling and for a total of 48 hours before flying. Remove plugs from retention bolt holes and apply corrosion preventive compound (item 315, table 1-1) to inside surface of bushings.

8-148. *Emergency Repairs — Tail Rotor Blades (UH-1B Serial No. 60-3546 through 64-14100).* Damage to tail rotor blades exceeding limits shown in steps a. and b, below, and limits shown in paragraph 8-147, should be "condemned, demilitarized and locally scrapped" rather than returned to an overhaul facility. Tail rotor blades receiving damage within the following limits may be repaired and returned to service.

Note

Permanent repair or dispostion of tail rotor blades shall be accomplished at the earliest opportunity.

a. Repairable damage limits shall not exceed the following: Any damage penetrating the skin or in excess of limits defined in paragraph 8-145 may be repaired in the area outboard of station 34.0, 1.75 inches inboard of blade tip, 1.0 inch forward of the trailing edge. (See figure 8-37.) Damage must not exceed 1.50 inches in diameter after cleanup.

b. Limits and repair for abrasion strip outboard at station 34.0 shall not exceed the following: Dents must fall inside a 1.0 inch diameter. Holes and cracks must fall inside 0.25 inch diameter. Cracks will be stop drilled at each end using 0.040 drill.

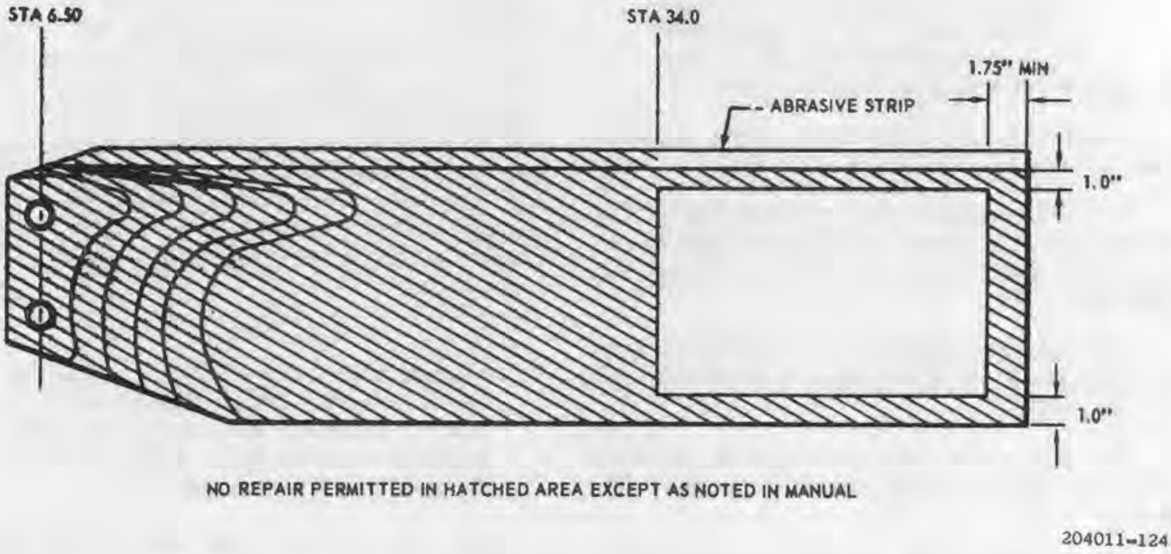

Figure 8-37. Emergency repair area — tail rotor blades (UH-1B Serial No. 60-3546 thru 64-14100)

c. Repair damaged blade, except for leading edge, as follows:

(1) Dress the hole by straightening and deburring the edge, follow the perimeter of the hole with a cutter having a minimum diameter of 0.25 inch. Remove an absolute minimum of metal as the finished hole must not extend outside a 1.50 inch diameter circle. The finished hole must have a spanwise dimension as great as or greater than the chordwise dimension.

(2) Cut a patch from 0.016 or 0.020 24ST T53 aluminum to the same general shape as the hole but maintaining an overlap of 0.8 to 1.0 inch outside the hole. The patch, like the hole, must have a spanwise dimension as great as or greater than the chordwise dimension.

Caution

Do not use a scribe on either the blade or the patch under any circumstances. Polish out scratches.

(3) Clean the blade and patch by lightly sanding the bonding faces with 120 grit cloth. Wipe both surfaces with methyl-ethyl-ketone (item 309, table 1-1) until all indications of dirt and grime are removed. Wipe dry and air for fifteen minutes.

(4) Apply adhesive (item 216, table 1-1) to patch and to blade, bond and allow to set (three to six hours). Fill around edge of patch with adhesive (item 216, table 1-1) and allow to air dry for 24 hours total time. Sand smooth and paint.

(5) Patches are to be no closer together than 6.0 inches. Balance hub and blade assembly. (Refer to Appendix II.) Record in log book and on 2410 form so that the weight may be removed at blade change.

d. Repair abrasion strip as follows:

(1) Clean the area to be repaired by sanding lightly with 120 grit cloth. Wipe area with methyl-ethyl-ketone (item 309, table 1-1) until all indications of dirt and grime are removed. Wipe dry and air dry for 15 minutes.

(2) Fill the damaged area with adhesive (item 210, table 1-1) or any suitable epoxy. Allow to air dry for 24 hours. Blend filler and balance hub and blade assembly. (Refer to Appendix II.)

e. Inspect all repaired areas DAILY for evidence of cracks.

8-149. *Replacement — Link Assembly 204-011-762 (UH-1B Serial No. 60-3546 through 64-14100).* a. Link assembly, 204-011-762, is furnished as a replacement for link assembly, 204-010-777. The 204-011-762 link assembly provides a radial type rod end bearing with a great bearing area and will provide increased service life.

b. Refer to figure 8-38 for the combination of bolts, nuts, washers, spacers and cotter pins used with the 204-011-762 link assembly. Discard 204-010-792 washers when replacing existing 204-010-777 link assemblies.

c. The following maintenance procedures will be performed after installing 204-011-762 link assemblies.

(1) Check for interference between rod end and cross head with full right and full left pedal.

(2) Check rigging. Rig, if necessary.

(3) It is mandatory to retrack the tail rotor blades in accordance with instructions contained in paragraph 8-140.

8-150. *Installation — Tail Rotor Blades (UH-1B Serial No. 60-3546 through 64-14100).* Tail rotor blade attaching bolts may be installed with bolt heads either inboard or outboard, but all four bolt heads must be installed the same.

a. Installation of same blades.

(1) Same blades without repair, or same blades with allowable minor repair or minor touch up, may be installed without balancing of hub and blade assembly.

(2) Install blade with previously removed bolts, washers and nuts, and with bolt in same grip and hole from which previously removed. Torque nuts 120 to 150 inch-pounds.

b. Installation of new blades.

(1) New blades cannot be installed in same or new hubs at second echelon level due to requirement for balancing tail rotor hub and blade assembly as a complete assembly. This function must be performed at direct support facility.

(2) Installation of the balanced tail rotor hub and blade assembly may then be performed by organizational personnel.

Caution

Tracks blades after every installation.

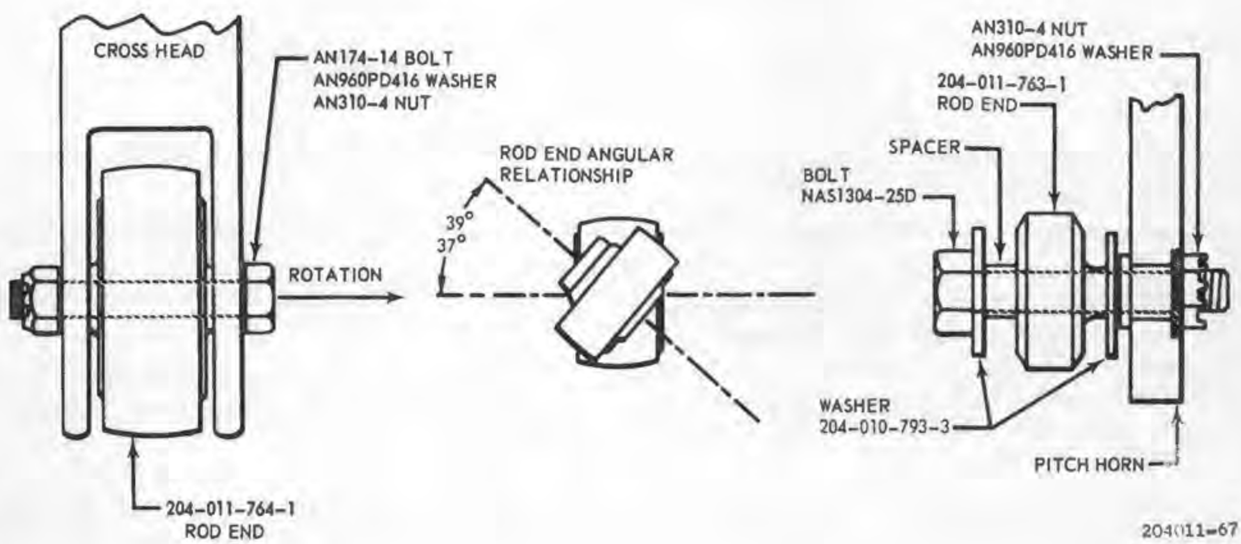

Figure 8-38. Link assembly installation (UH-1B Serial No. 60-3546 thru 64-14100)

8-151. Tail Rotor Hub and Blade Assembly (UH-1B Serial No. 64-14101 and subsequent). (See figure 8-39.) Tail rotor, on UH-1B Serial No. 64-14101 and subsequent, is a two-blade controllable — pitch hub and blade assembly, mounted on gear box shaft at left side of tail boom vertical fin and connected to control system by means of a crosshead assembly and pitch change links. All parts are similar to those used on earlier helicopter of this series, but rotor blades are stronger construction and linkage allows greater range of blade pitch to compensate for increased main rotor torque.

8-152. Troubleshooting — Tail Rotor Hub and Blade Assembly (UH-1B Serial No. 64-14101 and subsequent). A chart of possible tail rotor hub and blade assembly troubles, causes and remedial action is included below.

INDICATION OF TROUBLE	PROBABLE CAUSE	CORRECTIVE ACTION
High frequency vibration	Tail rotor out of track	Track tail rotor
	Tail rotor out of balance	Remove tail rotor for balance on fixture.
	Worn or loose hinge mounting	Replace rotor
	Loose retaining nut	Torque nut.
	Bent pitch change link	Replace pitch change link
	Loose pitch change link bearings	Replace pitch change link
	Worn or loose pitch change rod duplex bearings	Replace bearings
	Worn or loose pitch change slider	Replace slider
Inability to make normal right and left turns in flight	Blade angles not set properly	Check pitch settings and rigging

8-153. Operational Check — Tail Rotor Hub and Blade Assembly (UH-1B Serial No. 64-14101 and subsequent). Following replacement or installation of the tail rotor hub, blades or pitch change systems, check the tail rotor system rigging and track the tail rotor blades.

a. Attach a small piece of sponge rubber 1/8 to 1/4 inch thick to end of a 1/2 x 1/2 inch pine stick or any other flexible device, and cover sponge rubber with Prussian blue (item 103, table 1-1) or similar type of coloring thinned with oil.

Note

The run-up shall be performed by personnel authorized in accordance with AR95-13.

b. Start engine. Run engine at 6600 rpm with pedals in neutral position. Rest marking device on under side of tail boom assembly. Slowly move marking device into disc of tail rotor just far enough to mark near blade approximately one inch from tip.

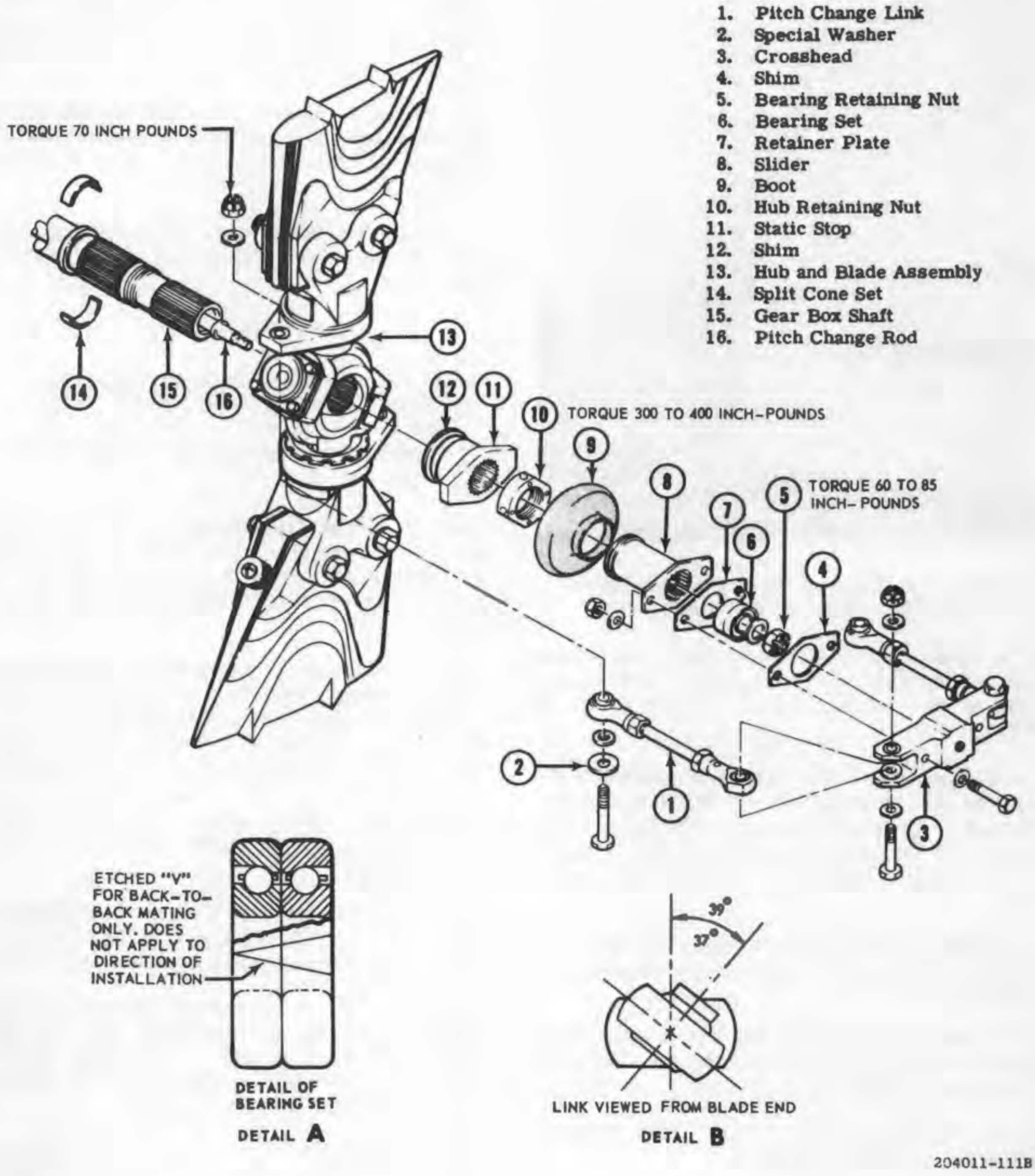

Figure 8-39. Tail rotor hub and blade assembly (UH-1B Serial No. 64-14101 and subsequent)

Figure 8-40. Tracking tail rotor blades (UH-1B Serial No. 64-14101 and subsequent)

c. When near blade is marked, stop engine and allow rotor to stop. Shorten pitch control link of marked blade and recheck track of blades.

8-154. *Removal — Tail Rotor Hub and Blade Assembly (UH-1B Serial No. 64-14101 and subsequent).* a. Disconnect pitch change link (1, figure 8-39) for each tail rotor blade grip horn by removing nut, washer, bolt and special washer (2).

b. Remove crosshead assembly (3) and shim (4) by removing two attaching bolts with nuts and washers.

c. Remove cotter pin, nut (5), washer, bearing set (6) and retainer plate (7). Cut lockwire and remove slider (8) and boot (9).

d. Cut lockwire and remove hub retaining nut (10). Remove static stop (11) and shim (12).

e. Move tail rotor hub (13) outboard on splines, and remove cone set (14) as it is released. Remove tail rotor over end of gear box shaft (15) and pitch change rod (16).

8-155. *Inspection — Tail Rotor Hub and Blade Assembly (UH-1B Serial No. 64-14101 and subsequent).* a. Inspect for wear between pitch change links and bushing; between bushing and bolt, and between ball and socket in pitch change links. Inspection must be completed on both ends of pitch change links.

b. Use a dial indicator to inspect for maximum allowable play in either the radial or axial direction of 0.020 inch at each end of the pitch change link.

c. Measured total play beyond 0.020 inch shall be cause for replacement of the applicable parts.

Note

> Procedures used in measuring wear between the parts of the pitch change link assembly shall be determined by the activities performing the inspection.

8-156. *Repair or Replacement — Tail Rotor Hub and Blade Assembly (UH-1B Serial No. 64-14101 and Subsequent).* Replace parts which do not meet inspection requirements. (Refer to paragraph 8-155.)

8-157. *Installation — Tail Rotor Hub and Blade Assembly (UH-1B Serial No. 64-14101 and subsequent).* a. Position tail rotor assembly (13, figure 8-39) at end of shaft (15), with bearing bosses of hub inboard and flat side outboard. Be sure internal bevel of hub trunnion is inboard. Align master splines and slide hub on shaft until trunnion is just started on second set of splines.

b. Place cone set (14) with bevel outboard in groove between splines and shoulder on shaft. Slide hub inboard to seat trunnion on cones.

c. Place shim (12) on shaft against trunnion. Install static stop (11) and hub retaining nut (10). Hold rotor at hub while tightening nut with 300 to 400 inch-pounds torque. Lockwire nut to stop. Slip boot (9) on shaft.

d. Determine thickness of shim (4) required for a clamp-up of 0.002 to 0.004 inch on pitch change rod bearings as follows:

(1) With shim omitted, temporarily assemble crosshead (3), bearings (6), retainer plate (7), and slider (8) secured together by

two bolts with nuts and washers. Tighten nuts snug without distortion of assembly.

(2) With a feeler gage, measure gap between crosshead and retainer plate. Peel shim 0.002 to 0.004 inch thinner than this measurement. Disassemble parts.

e. Place slider on shaft and into boot. Assemble retainer plate, bearing set, washer and nut (5) on end of pitch change rod (16). Check that bearings are properly matched together according to V-mark etched on outer races. (See detail on figure 8-39.) Tighten nut with 60 to 85 inch-pounds torque and secure with cotter pin.

f. Fill cavity of crosshead with grease, (item 8, table 1-1). Place shim (prepared in step d.) and crosshead over bearings. Align parts and install two bolts, with washers under heads, through crosshead, shim, retainer plate, and flange of slider. Secure with washers and nuts.

Note

Observe color code markings on parts during installation.

g. Check that pitch change links (1) are a like pair in serviceable condition and are properly installed in crosshead, with bolt heads toward rotation. Bolts must be of same length, with a washer under each bolt head and nut (if length requires, add a thin washer under each nut). Observe the following points:

(1) Maximum allowable wear tolerance for rod-end bearings of pitch change links is 0.020 inch, either axial or radial play. Replace parts if worn to exceed these limits.

(2) Nominal length of new pitch change links is 5.42 inches between bearing centers, with rod-ends aligned at 37 to 39 degrees. (See detail on figure 8-39.) However, this length is approximate and may be varied in operational checks (one link may be shortened to obtain track, and both links may be shortened or lengthened to obtain proper performance in autorotation and in sideward flight to right).

h. Align a pitch change link rod-end with extended side of bearing inner race against pitch horn of tail rotor blade grip. Place special washer (2) and steel washer on bolt. Insert bolt through rod-end and horn, and install washer and nut tightened with 50 to 70 inch-pounds torque. Secure with cotter pin, tightening nut to next castellation if required. Connect opposite link in the same manner.

i. Lockwire ends of boot on gear box shaft and slider.

j. Check tail rotor for free flapping and pitch change action. Check and adjust rigging as necessary.

k. Check for 2.50 to 3.50 inch clearance between tail boom vertical fin and nearest edge of tail rotor at full right pedal position in rigged condition. If necessary, change thickness of shim installed between rotor hub trunnion and static stop for proper clearance. Use face-bonded laminated shims only.

l. Track tail rotor. (Refer to paragraph 8-153.)

Note

After first five hours operation, check torque on tail rotor retaining nut.

8-158. Tail Rotor Blades (UH-1B Serial No. 64-14101 and subsequent). Tail rotor blades are of all metal bonded construction.

8-159. Removal — Tail Rotor Blades (UH-1B Serial No. 64-14101 and subsequent). Remove blade retention bolts, washers and nuts (identify bolts to grip and hole from which removed).

8-160. Inspection and Repair — Tail Rotor Blades (UH-1B Serial No. 64-14101 and subsequent). The following steps cover normal procedures for the inspection and repair of tail rotor blades. (See figure 8-41.)

Caution

Damage exceeding the following limits will require replacement of blade.

a. Polish out all nicks and scratches within the following limits in the skins, doublers, grip plates, abrasive strip and trailing edge, inboard of station 25.0.

(1) Nicks and scratches running within zero to 15 degrees of the span line and not in excess of 0.006 inch deep.

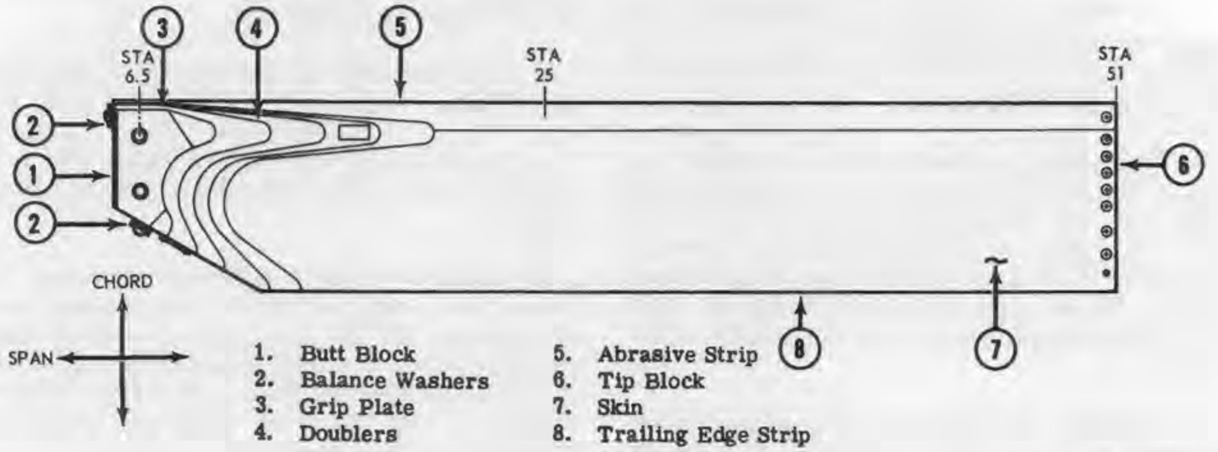

Figure 8-41. Inspection and repair — tail rotor blades (UH-1B serial no. 64-14101 and subsequent)

(2) Nicks and scratches running within zero to 75 degrees of the chordline and not in excess of 0.004 inch deep.

(3) Nicks and scratches in the trailing edge up to 0.020 inch deep chordwise are permissible if polished to a smooth surface finish.

(4) Sharp dents which are not in excess of 0.010 inch in depth are permissible.

(5) Non-sharp dents which are not in excess of 0.030 inch in depth are permissible.

b. Polish out all nicks and scratches within the following limits in the skins and trailing edges, outboard of station 25.

(1) Nicks and scratches which are not in excess of 0.010 inch in depth.

(2) Sharp dents which are not in excess of 0.030 inch in depth are permissible.

(3) Non-sharp dents which are not in excess of 0.030 inch in depth are permissible.

(4) Nicks and scratches in the trailing edge up to 0.020 inch deep chordwise are permissible if polished to a smooth surface finish.

Caution

If a crack exists in any location, the blade should be replaced. All dents should be closely inspected for nicks, scratches and cracks. If nicks or scratches exist in dents and the total depth is in excess of that permitted for dents alone (paragraph a. (4), (5) and b. (2), (3), above, the blade must be replaced. The depth of the nicks and scratches may not exceed the allowable (paragraph a. (1), (2) and b. (1).

c. Polish out all nicks and scratches within the following limits in the abrasive strip outboard of station 25.

(1) Nicks and scratches running within zero to 15 degrees of the span line that are 0.006 inch deep but less than 0.015 inch deep.

(2) Nicks and scratches running within zero to 75 degrees of the chordline that are 0.004 inch deep but less than 0.010 inch deep.

(3) Sharp dents which are not in excess of 0.030 inch deep are permissible.

(4) Non-sharp dents which are not in excess of 0.040 inch deep are permissible.

Caution

If a crack exists in any location, the blade should be replaced. All dents should be closely inspected for nicks, scratches and cracks. If nicks or scratches exist in dents and the total depth is in excess of the maximum depths permitted (paragraph c. (3), (4), the blade should be replaced.

d. Inspect blades for edge voids. Replace blade if following limits are exceeded.

(1) Edge voids in any one bond line of the doublers or grip plates with total length in excess of 15 percent of the total length of the bond line.

(2) Any one edge void in a doubler or grip plate in excess of 0.060 inch in depth or 0.75 inch in length.

(3) Any edge void in the outboard 1.00 inch of a doubler or a grip plate (either finger).

e. Inspect blades for the following conditions which require blade or blades replacement.

(1) Looseness of retention bolt hole bushing or inside diameter larger than 0.3755.

(2) Overspeed, sudden stoppage, or hard landing.

(3) Bond separation anywhere on blade.

(4) Movement of tip or root weights.

(5) If one of the blades of a pair has been damaged badly enough that metal has been torn or any bond lines have separated, both blades must be replaced.

f. Repair and touch-up blades using the following methods:

(1) Burnish out any scratches which are within limits by using aluminum wool and/or very fine abrasive paper or equivalent on the aluminum surfaces; and coarser abrasive paper on the stainless steel leading edge. Rinse with clear water and dry blade.

(2) Brush bright aluminum areas, where yellow colored pre-treatment is fading, with alodine chemical film pre-treatment or equivalent per MIL-C-5541, or by keeping area wet for five minutes with a ten percent solution of chromic acid.

(3) Rinse with clear water; check surface for water break and dry. Reclean and reapply chemical film if surface shows water break.

(4) Plug the retention bolt holes to prevent entry of finishing materials and apply one light coat of catalyzed epoxy primer, TA-862 or equivalent to the touch-up areas and allow to dry a minimum of 30 minutes and a maximum of 24 hours. Apply two coats of acrylic lacquer (item 113, table 1-1) to touch-up red areas. Allow 45 minutes air dry between coats. Apply two coats of acrylic lacquer (item 110, table 1-1) to touch-up white area. Allow 45 minutes air dry between coats. The same procedure is used to apply lacquer (item 111, table 1-1) to black areas.

Note

Several thin coats of lacquer may be used; however, use as little as possible just to touch-up burnished and worn areas so that the blade balance will be disturbed as little as possible.

(5) Air dry blade for three hours before handling and for a total of 48 hours before flying. Remove plugs from retention bolt holes and apply corrosion preventive compound (item 315, table 1-1) to inside surface of bushings.

8-161. ***Emergency Repairs — Tail Rotor Blades (UH-1B Serial No. 64-14101 and sebsequent).*** Damage to tail rotor blades exceeding limits shown in steps a. and b., below, and limits shown in paragraph 8-160, should be "condemned, demilitarized and locally scrapped" rather than returned to an overhaul facility. Tail rotor blades receiving damage within the following limits may be repaired and returned to service.

Note

Permanent repair or disposition of tail rotor blades shall be accomplished at the earliest opportunity.

a. Repairable damage limits shall not exceed the following: Any damage penetrating the skin or in excess of limits defined in paragraph 8-160 may be repaired in the area outboard of station 34.0, 1.75 inches inboard of blade tip, 1.0 inch forward of the trailing edge. (See figure 8-42.) Damage must not exceed 1.50 inches in diameter after cleanup.

b. Limits and repair for abrasion strip outboard at station 34.0 shall not exceed the following: Dents must fall inside a 1.0 inch diameter. Cracks will be stop drilled at each end using 0.040 drill.

c. Repair damaged blade, except for leading edge, as follows:

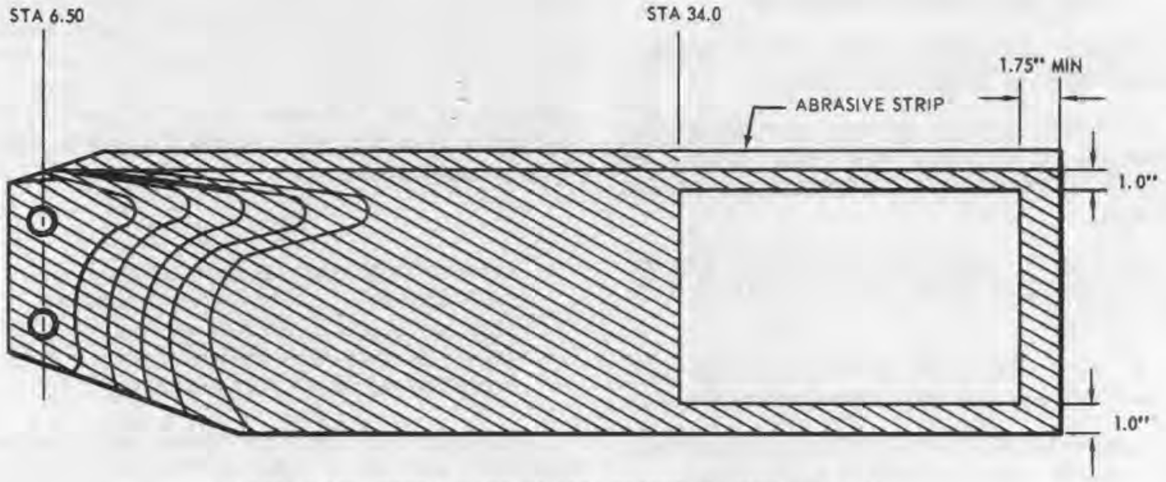

Figure 8-42. Emergency repair area — tail rotor blades (UH-1B Serial No. 64-14101 and subsequent)

(1) Dress the hole by straightening and deburring the edge, follow the perimeter of the hole with a cutter having a minimum diameter of 0.25 inch. Remove an absolute minimum of metal as the finished hole must not extend outside a 1.50 inch diameter circle. The finished hole must have a spanwise dimension as great as or greater than the chordwise dimension.

(2) Cut a patch from 0.016 or 0.020 24ST T53 aluminum to the same general shape as the hole but maintaining an overlap of 0.8 to 1.0 inch outside the hole. The patch, like the hole, must have a spanwise dimension as great as or greater than the chordwise dimension.

Caution

Do not use a scribe on either the blade or the patch under any circumstances. Polish out scratches.

(3) Clean the blade and patch by lightly sanding the bonding faces with 120 grit cloth. Wipe both surfaces with methyl-ethyl-ketone (item 309, table 1-1) until all indications of dirt and grime are removed. Wipe dry and air for fifteen minutes.

(4) Apply adhesive (item 216, table 1-1) to patch and to blade, bond and allow to set (three to six hours). Fill around edge of patch with adhesive (item 216, table 1-1) and allow to air dry for 24 hours total time. Sand smooth and paint.

(5) Patches are to be no closer together than 6.0 inches. Balance hub and blade assembly. (Refer to Appendix II.) Record in log book and on 2410 form so that the weight may be removed at blade change.

d. Repair abrasion strip as follows:

(1) Clean the area to be repaired by sanding lightly with 120 grit cloth. Wipe area with methyl-ethyl-ketone (item 309, table 1-1) until all indications of dirt and grime are removed. Wipe dry and air dry for 15 minutes.

(2) Fill the damaged area with adhesive (item 210, table 1-1) or any suitable epoxy. Allow to air dry for 24 hours. Blend filler and balance hub and blade assembly. (Refer to Appendix II.)

e. Inspect all repaired areas DAILY for evidence of cracks.

8-162. Installation — Tail Rotor Blades (UH-1B Serial No. 64-14101 and subsequent). Tail rotor blade attaching bolts may be installed with bolt heads either inboard or outboard, but all four bolt heads must be installed the same.

a. Installation of same blades.

(1) Same blades without repair, or same blades with allowable minor repair or minor touch up, may be installed without balancing of hub and blade assembly.

(2) Install blade with previously removed bolts, washers and nuts, and with bolts in same grip and hole from which previously removed. Torque nuts 120 to 150 inch-pounds.

b. Installation of new blades.

(1) New blades cannot be installed in same or new hubs at second echelon level due to requirement for balancing tail rotor hub and blade assembly as a complete assembly. This function must be performed at direct support facility.

(2) Installation of the balanced tail rotor hub and blade assembly may then be performed by organizational personnel.

Caution

Track blades after every installation.