TM 55-1520-214-23

TECHNICAL MANUAL

AVIATION UNIT AND INTERMEDIATE MAINTENANCE MANUAL

HELICOPTER, OBSERVATION OH-6A

This manual supersedes TM 55-1520-214-20, dated 3 May 1974 and TM 55-1520-214-34, dated 17 May 1974, including all changes.

This copy is a reprint which includes current pages from Changes 1 through 39.

HEADQUARTERS, DEPARTMENT OF THE ARMY
31 DECEMBER 1976

WARNING PAGE

Personnel performing instructions involving operations, procedures, materials, and practices which are included or implied in this technical manual shall observe the following instructions. Disregard of these warning and precautionary information can cause serious injury or death. Refer to FM 21-11 for first aid data to treat injuries resulting from working on the helicopter.

Warnings, cautions, and notes emphasize important and critical instructions.

WARNING

An operating procedure or practice which, if not correctly followed, will result in personnel injury or loss of life.

CAUTION

An operating procedure or practice which, if not strictly observed, will result in damage or destruction of equipment.

NOTE

An operating procedure or condition which it is essential to highlight.

STARTING AIRCRAFT

Minimum rotor clearance is low enough to cause injury to personnel. Coordinate all cockpit actions with ground observer. Ensure that rotor and blast areas are clear and fire guard is posted. Secure safety belts and shoulder harness in unoccupied seats to prevent fouling controls.

GROUND OPERATION

The engine will be started and operated only by authorized personnel. Refer to AR 95-1.

GROUNDING AIRCRAFT

All metal apparatus shall be grounded to avoid the danger to igniting test fluid fumes or creating electrical shock.

HIGH VOLTAGE

Before removing igniter, be sure ignition system has been OFF for at least 5 minutes. Dissipate all energy stored in the condenser by grounding the igniter lead to the engine using an insulated screwdriver. Be sure all electrical power is OFF before disconnecting static inverters, radio equipment or other electrical components.

Electrical Equipment Maintenance. Do not wear rings, watches, or metal jewelry when working around electrical equipment. Serious burns can result.

Dangerous Voltages Exist in the Electronic Equipment. Be careful when working on the 150- and 300-volt dc circuits and on the ac generator 115- and 200-volt ac outputs. Serious burns can result.

Dangerous Voltages may Exist at Antenna Terminals. Be careful when working near the antenna or the antenna terminals. Radio-frequency (rf) high voltages exist at these points when transmitters are operating. Contact with radiating antennas cause serious rf burns.

HANDLING HYDRAULIC FLUID (MIL-H-5606)

When handling hydraulic fluid (MIL-H-5606) observe the following:
— Prolonged contact with liquid or mist can irritate eyes and skin.
— After any prolonged contact with skin, immediately wash contact area with soap and water. If liquid contacts eyes, flush them immediately with clear water.
— If liquid is swallowed, do not induce vomiting; get immediate medical attention.
— Wear rubber gloves when handling liquid. If prolonged contact with mist is likely, wear an appropriate respirator.
— When fluid is decomposed by heating, toxic gases are released.

HANDLING FUEL

Dangerous Fuel Handling. Incorrect fuel handling causes fire hazards. Ground the helicopter when fueling or defueling.

ACIDS

DANGEROUS CHEMICALS ARE USED IN NICKEL-CADMIUM BATTERIES. The electrolyte used in nickel-cadmium batteries contains potassium hydroxide (KOH), which is a caustic chemical agent. Serious and deep burns of body tissue will result if the electrolyte comes in contact with the eyes or any part of the body. Use rubber gloves, rubber apron, and protective eye covering when handling the battery. If accidental contact with the electrolyte is made, use ONLY clean water and immediately (seconds count) flush contaminated area. Continue flushing with large quantities of clean water. Seek medical attention immediately. Before removing or installing the battery, insure that the battery switch is off and the battery has cooled down if overheated. Removal or installation of the battery connector while the battery is under load may result in explosion, electrical arcing and possible severe burns to personnel.

Acids and Alkalines. Do not add water to acids. A violent action will result. Acids should be added to water in small quantities. Ruststripper is an alkaline solution. Avoid contact with the skin. Wear protective clothing. Wash thoroughly after using.

ROTOR BLADES

Before approaching empennage, be certain to notify operator at controls of helicopter that personnel will be in the tail rotor area. Approach the empennage from the horizontal stabilizer side only.

NOISE LEVEL

Sound pressure levels in this aircraft during some operating conditions exceed the Surgeon General's hearing conservation criteria, as defined in TB MED 251. Hearing protection devices, such as the aviator helmet or ear plugs, are required to be worn by all personnel in and around the aircraft during its operation.

RADIATION

Some instruments contain radioactive material. (See TB 55-1500-314-25.) Do not try to disassemble these instruments. They present no radiation hazard unless seal is broken. If you think seal is broken, do not remove instrument from aircraft until you consult Base Radioactive Protection Officer (AR 40-15). Use a beta-gamma rad ac meter AN/PDR-27 or equivalent to determine if instrument contains radioactive material (radium).

FIRE EXTINGUISHER

Avoid repeated or prolonged exposure to high concentration of bromochloromethane (CB) or decomposition products. CB is a narcotic agent of moderate intensity but prolonged duration. It is less toxic than carbon tetrachloride, methylbromide, or products of combustion. Take normal precautions while using bromochloromethane. Use oxygen masks when available.

Monobromotrifluoromethane (CF3Br) is highly volatile but is not easily detected by its odor. Although toxic, it is about the same as other freons and carbon dioxide, causing danger to personnel primarily by reduction of oxygen available for proper breathing. Do not allow the liquid to come into contact with your skin. It may cause frostbite or low temperature burns.

ARMAMENT

Loaded weapons, or weapons being loaded or unloaded, shall be pointed in a direction which offers the least exposure to personnel or property in the event of accidental firing. Personnel should remain clear of hazardous area of all loaded weapons.

ANY ROTATION OF THE GUN ARMAMENT SUBSYSTEM BARRELS WILL CAUSE THE GUN TO FIRE. Upon landing, immediately alert personnel to probable presence of live rounds in the gun. Summon armament repairman to clear weapon.

CARBON MONOXIDE

Toxic carbon monoxide fumes may be present inside the helicopter whenever the APU or engines are operating with the cargo ramp open. Ventilate the cockpit.

TOXIC CHEMICALS

Solvent and Cleaning Solutions. These materials are generally toxic and many (toluene, benzene, xylene, methylethyl-ketone, perchlorethylene, naphtha, trichloroethylene) are highly flammable. Work in a well-ventilated area away from open flames. Avoid inhaling fumes and prolonged contact with the skin. Wear protective clothing and goggles. Wash thoroughly after using.

Windshield Repellant. Do not let windshield rain repellant contact open flame. Deadly hydrogen fluoride gas could be generated. Wash hands with soap and water after handling repellant.

Antiseize Compounds. Some antiseize compounds are irritants. Avoid inhaling fumes and contact with the skin. Wear protective clothing. Wash thoroughly after using.

Paints, Varnishes, Dopes, Thinners, Lubricants, and Fuels. These materials are generally highly flammable and may be irritants. Work in a well-ventilated area away from open flames. Avoid inhaling fumes and prolonged contact with the skin. Wash thoroughly after using.

Epoxy Resins, Cements, and Adhesives. These materials may contain toxic or irritating substances. They may also be flammable. Work in a well ventilated area away from open flames. Wear protective clothing. Avoid contact with the skin. Wash thoroughly after using.

COMPRESSED AIR

Do not use more than 30 psi compressed air for cleaning purposes. Debris trajected under pressure can cause injury to eyes. Use source of compressed air under 30 psi and eye protection to prevent injury to personnel.

FOREIGN OBJECTS

Make sure area is clear of foreign objects before closing access doors, panels and fairings. If the area is not cleared, damage to components and systems could result in personal injury or death.

USE OF ALCOHOL

The use of any alcohol in cleaning components which contact hydraulic fluids is prohibited. Formation of a polymeric residue can result which could impair mechanical operations of the component.

TECHNICAL MANUAL
NO. 55-1520-214-23

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 31 DECEMBER 1976

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the provedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) direct to: Commander, US Army Aviation Systems Command, ATTN: AMSAV-MMD, 4300 Goodfellow Boulevard, St. Louis, MO 63120-1798. A reply will be furnished to you.

Aviation Unit and Intermediate Maintenance Manual

HELICOPTER, OBSERVATION OH-6A

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PREFACE

P-1. GENERAL.

P-2. Contents. a. This manual is the official document for Aviation Unit and Intermediate Maintenance of Army Model OH-6A Helicopters.

b. The purpose of this manual is to familiarize you with the maintenance functions to be performed at the Aviation Unit and Intermediate Maintenance levels. The Table of Contents for this manual is provided to assist in determining the chapter in the manual in which individual functions are covered. This manual provides all essential information for personnel to accomplish Aviation Unit and Intermediate Maintenance on the complete airframe, its components, and systems, excluding armament and avionics subsystem as indicated for Aviation Unit and Intermediate Maintenance activities in the Maintenance Allocation Chart (MAC). (Refer to Appendix B.)

P-3. QUALITY ASSURANCE.

P-4. Quality Assurance/Quality Control (QA/-QC). Personnel will assure proper maintenance has been performed by verifying dimensions and tolerances contained throughout this technical manual have been complied with.

P-5. DESCRIPTION-ARMY MODEL OH-6A HELICOPTER.

P-6. General Features. The Army Model OH-6A Helicopter is a turbine powered rotary-wing aircraft constructed primarily of aluminum alloy. The main rotor is a four-bladed, fully articulated type and the tail rotor is a two-bladed anti-torque rotor of the semi-rigid type. The missions for which the aircraft are employed include visual observation, target acquisition, reconnaissance, and command and control. The aircraft is readily adaptable to utility tasks at the combat company level without the use of special kits or special attachments. The aircraft consists of two main structural sections, the fuselage and the tailboom. See figure P-1 for major components.

P-7. Fuselage. The fuselage (incorporating a central framework consisting of a mast support structure, two bulkheads, and a center beam) is a semi-monocoque structure that is divided into three main sections. The forward section includes a pilot compartment and a cargo and/or passenger compartment. The pilot compartment is normally equipped with seating for the pilot and copilot/observer. The seat on the right side of the pilot's compartment (when looking forward) is the pilot's seat (command position). The cargo compartment in back of the pilot compartment contains provisions for installation of two additional passenger seats. The cargo compartment seats may be easily folded out of the way or completely removed for the accommodation of cargo. Standard torso range-extension tanks may be installed in the cargo compartment seats. The aft section includes the structure for tailboom attachment and houses the engine. The lower section is divided by the center beam and provides a housing for the two fuel cells.

P-8. Tailboom. The tailboom is a monocoque structure of aluminum alloy skin. The tailboom serves as the supporting structure to which the horizontal stabilizer, the upper and lower vertical stabilizers, and the tail rotor transmission and tail rotor are attached. In addition, the tailboom houses the tail rotor transmission drive shaft, and the tail rotor blade angle control rod.

P-9. Main Rotor Group. The main rotor group consists of four rotor blades, a fully articulated main rotor hub assembly that incorporates offset flapping hinges, a scissors assembly, and a swashplate and associated mixer control mechanisms. The main rotor blades are secured to the rotor hub assembly by quick-release lever type pins that permit easy and fast removal of the blades.

P-10. Landing Gear. The landing gear is the horizontal, skid-type gear, attached to the fuselage at 12 points. The landing gear is nonretractable. The struts, from the fuselage to the skids, are covered with aerodynamic fairings. Hydraulic dampers, between the struts and structure, act as shock absorbers to cushion landings.

P-11. HELICOPTER SERIES NUMBERS.

P-12. Explanation of Helicopter Series Numbers. *a.* Although all OH-6A aircraft are functionally similar, physical differences in avionics equipment, electrical harnesses and panels, instrument panel, engine air intake filters, etc, occasionally require separate maintenance instructions and illustrations for each of the alternate arrangements or configurations.

b. To readily distinguish between the various equipment configurations without repetitious review of helicopter serial number listings, the manufacturing series numbers (or production lot numbers) are included in paragraph titles, figure titles and/or table titles where necessary to highlight applicability of the information.

c. If no aircraft series or serial number limitations are included in a given paragraph, figure or table, and the differences are not obvious, the information shall be considered applicable for all aircraft. Minor differences not relative to all aircraft in a series are separately noted where they apply.

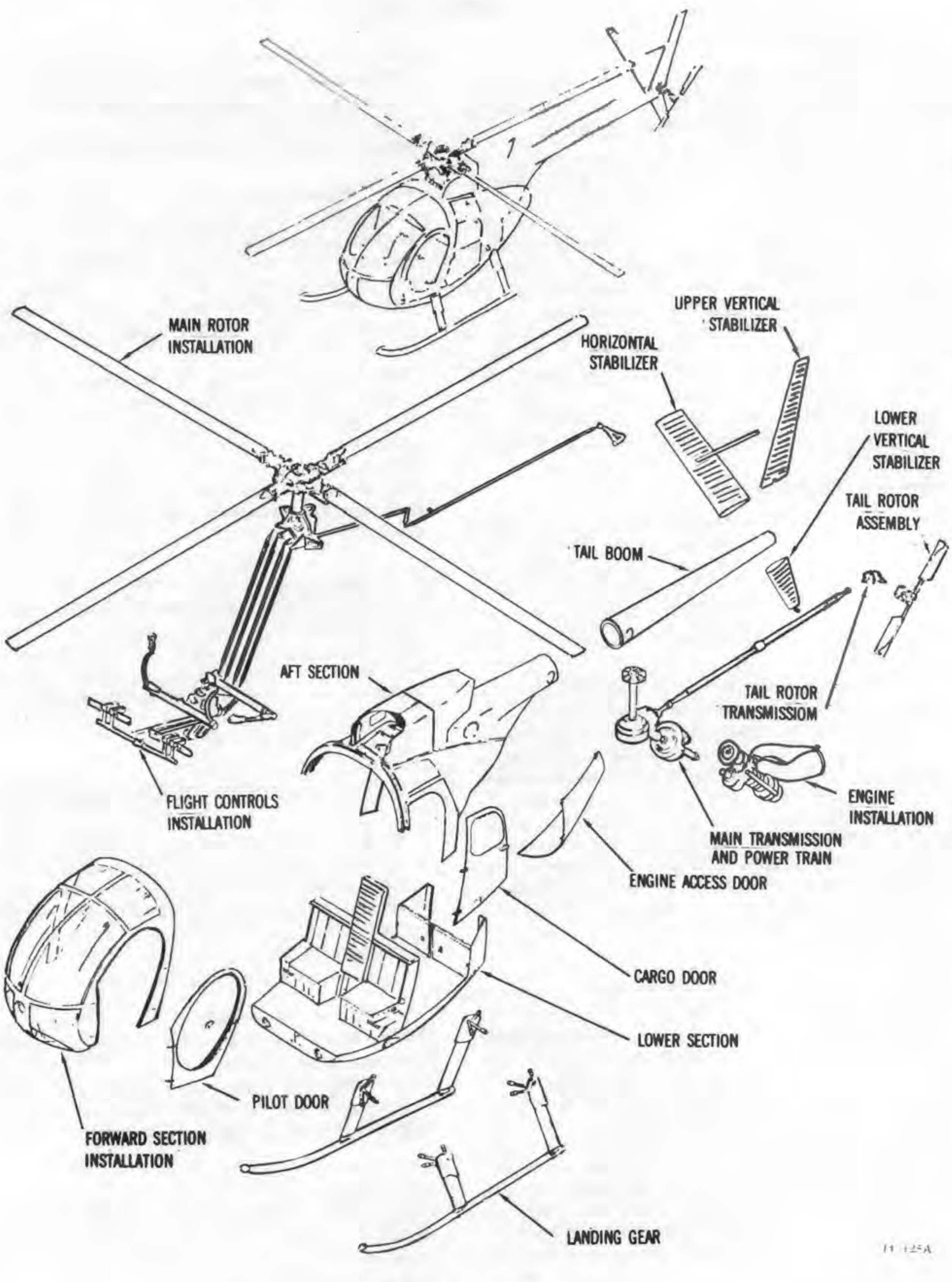


Figure P -1. Major Components

d. The following list provides a cross-index of OH-6A serial numbers with the corresponding aircraft series numbers used throughout the manual.

Aircraft Serial No.	Aircraft Series
65-12916 thru 65-13003	1
66-7775 thru 66-7899	1
66-7900	2
66-7901 thru 66-7920	1
66-7921 thru 66-7924	2
66-7925 thru 66-7938	1
66-7939	2
66-7940 thru 66-7942	1
66-14376 thru 66-14419	1
66-17750	2
66-17751 thru 66-17833	1
67-16000 thru 67-16126	1
67-16127 thru 67-16686	2
68-17140 thru 68-17369	3
69-15960 thru 69-16075	3

P-13. REPORTING OF ERRORS.

P-14. Recommended Changes.

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedure, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Aviation Systems Command, ATTN: AMSAV-MMD, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. A reply will be furnished direct to you.

P-15. DESTRUCTION TO PREVENT ENEMY USE.

P-16. Destruction Procedures. Refer to TM 750-244-1-5 for procedures dealing with the destruction of aircraft and associated equipment to prevent enemy use.

P-17. MAINTENANCE OF FORMS AND RECORDS.

P-18. Record Keeping. Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed in and prescribed by DA PAM 738-751 and TB 55-1500-307-24.

P-19. AUTHORITY FOR SUBSTITUTION.

P-20. Substitution Control. Substitution or interchange of items of materiel for maintenance of Department of the Army aircraft shall not be authorized, nor shall orders be issued for shipment. Substitution or interchangeability shall be authorized only by U.S. Army Aviation Systems Command.

P-21. SPECIAL TOOLS AND EQUIPMENT.

P-22. Special Tools and Equipment Lists. Aviation Unit (AVUM) and Intermediate maintenance (AVIM) special tools and equipment will be found in TM 55-1520-214-23P RPSTL manual. Special tools and test equipment used in accomplishing complex tasks are listed in this manual.

P-23. CALIBRATION.

P-24. Calibration Checks. Aircraft components, accessories, and instruments requiring calibration are listed in the Maintenance Allocation Chart (MAC), appendix B. Special tools and test equipment shall be calibrated as specified in TB 750-25.

P-25. STORAGE.

P-26. Storage Procedures. Storage of aircraft and equipment shall be accomplished as specified in TM 740-90-1, Appendix E for storage of aircraft.

P-27. DESIGNATOR SYMBOLS.

P-28. Designator System. Designator symbols are not used. Effectivity of equipment configurations is denoted according to aircraft series, as listed in paragraph P-11.

P-29. EXPLANATION OF CHANGE SYMBOLS.

P-30. Use of Change Symbols. Changes, except as noted below, to the text and tables, including new material on added pages, are indicated by a vertical line in the outer margin extending close to the entire area of the material affected; exception: pages with emergency markings, which consist of black diagonal lines around three edges, may have the vertical lines or change symbol placed along the inner margins. Symbols show current changes only. A miniature pointing hand symbol is used to denote a change to an illustration. However, a vertical line in the outer margin, rather than miniature pointing hands, is utilized when there have been extensive changes made to an illustration. Change symbols are not utilized to indicate changes in the following:

a. Introductory material.

b. Indexes and tabular data where the changes cannot be identified.

c. Blank space resulting from the deletion of text, an illustration, or a table.

d. Correction of minor inaccuracies, such as spelling, punctuation, relocation of material, etc., unless such correction changes the meaning of instructive information and procedures.

P-31. EXPLANATION OF MAINTENANCE LEVELS AND PERSONNEL TITLES.

P-32. Maintenance Level Limitations. Unless otherwise noted by an "(AVIM)" at start of paragraph, all procedures apply to Aviation Unit Maintenance. All procedures can be accomplished by an airframe mechanic (MOS 67V) unless otherwise noted in a pre-maintenance table.

P-33. Engineering Authorization. All requests for engineering authorization, when required by this manual will be forwarded to USAAVSCOM, ATTN: AMSAV-MEC, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. Urgent requests shall be clearly identified to insure priority handling and response. The requests shall include detailed information on the problem, e.g., sketches, photographs, dimensional data, etc., to assist in the evaluation and prompt reply.

CHAPTER I

AIRCRAFT GENERAL

SECTION I SERVICING

1-1. SERVICING.

1-2. General — Servicing. Servicing of the aircraft includes replenishing of fuel, changing or replenishment of oil, and other such maintenance functions. Fuels, oils and other servicing materials are listed in table 1-1 and TM 55-1520-214-10. The locations of servicing points are shown in figure 1-1.

CAUTION

Use extreme care when applying any type of lubricant (grease, oil, dry-film, etc) in the vicinity of teflon bearings. Most lubricants will form a dirt retaining film or have otherwise detrimental effects that can cause rapid deterioration of the bearing surfaces.

1-3. FUEL SYSTEM.

1-4. General — Servicing Fuel System. The fuel system has two fuel cells that are interconnected for simultaneous flow and venting. The fuel gravity filler cap is on the right side of the fuselage aft of the cargo compartment door. On aircraft with a crash-resistant (CR) fuel system, a closed circuit fuel filler cap is located directly under the forward end of the right cargo compartment door sill. On these aircraft, the gravity fill cap must be removed and the attaching cable hooked into a notched tab to hold open a flapper valve in the filler neck prior to fueling.

1-5. Servicing Precautions.

CAUTION

Turn off electrical switches and disconnect external power from the aircraft.

a. The aircraft must be electrically grounded prior to defueling. The possibility of static discharge (from difference in electrical potential) and presence of fuel vapors always present fire and explosion hazards.

b. The refueling vehicle should be parked a minimum of 20 feet from the aircraft during the fueling operation. Before starting the fueling operation, always ground the fueling nozzle or fuel truck to the GROUND HERE receptacle (fig. 1-1) or to another bare metal location.

c. Refuel aircraft with correct fuel (C51) as soon after landing as possible to prevent moisture condensation and to keep the aircraft as heavy as possible in case of winds.

d. Keep fueling nozzle free of all foreign matter.

e. Check filler cap(s) for security after fueling.

1-6. Filling — Gravity Fuel System. *a.* Remove filler cap aft of right cargo compartment door.

b. If required, pull filler cap cable and notch to open flapper valve.

c. Refuel aircraft.

1-7. Filling — Closed Circuit Fuel System. *a.* Remove filler cap below right cargo compartment door sill.

b. Refuel aircraft using equipment with compatible hose connections.

NOTE

The fuel venting system may cause an air pressure buildup in the fuel cells resulting in damage to the cargo decks or a short fuel load (one which does not fully fill both fuel cells before the closed-circuit fuel nozzle turns off). When fueling into the closed-circuit receiver, one of two procedures must be used; either remove the gravity fill cap and assure that the flapper valve is open or run the fuel nozzle in increments of 30 seconds on and 30 seconds off until the fuel cells are full.

c. Reinstall filler cap. Be sure that the cap retention cable is coiled and positioned inside the receiver well so that no interference with locking mechanism and sealing ring occurs when the cap is installed.

1-8. Draining — Fuel System. Fuel draining should be accomplished with the aircraft as level as possible. The fuel system may be defueled in two ways. One

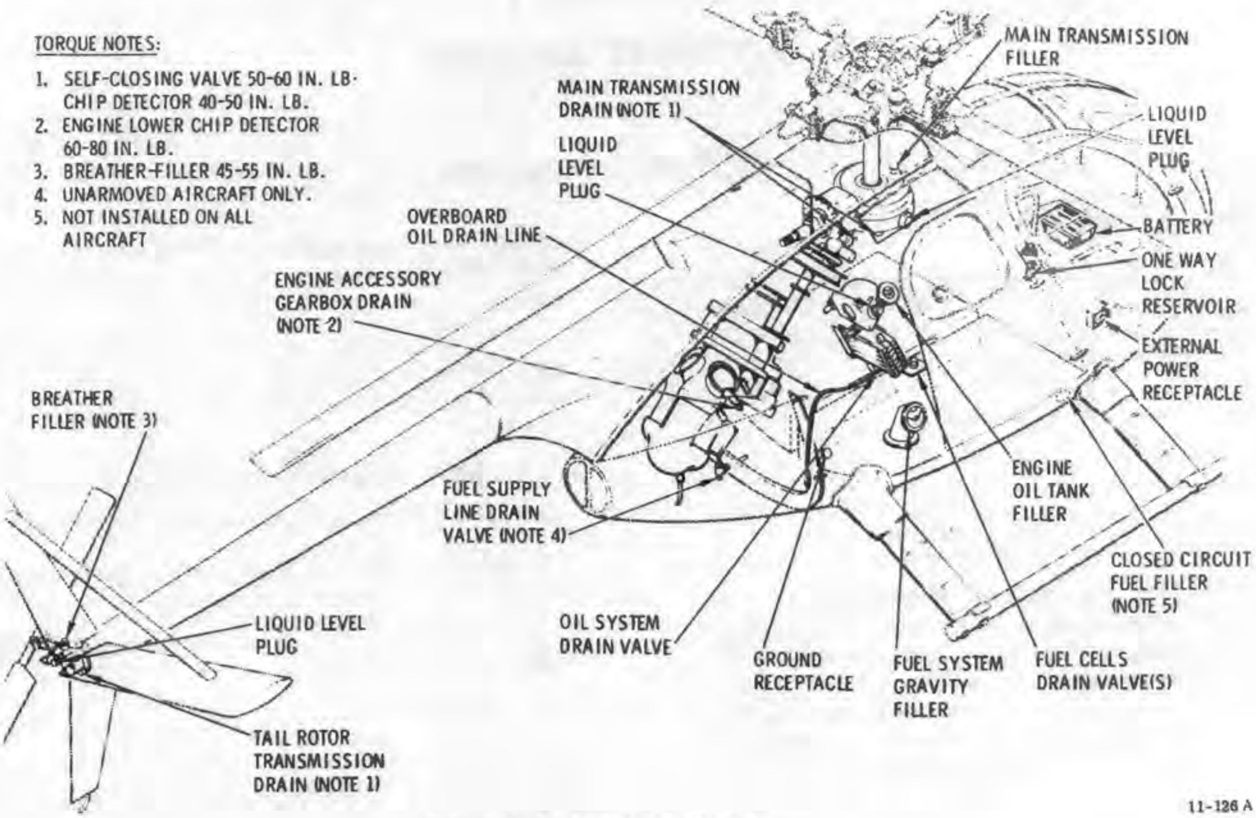


Figure 1-1. Servicing Points.

method is to defuel through the filler port by using a pump. The second method is to open the system drain valves (fig. 1-1).

a. On aircraft without closed circuit refueling provisions, the drain valves are located on the fuselage underside and in the engine compartment. (Armored aircraft have only the main fuel cells drain valve.) The drain valves are spring-loaded in the closed position. The valves are opened by depressing the plunger with a screw driver and rotating the plunger either clockwise or counter-clockwise to the stop. Be sure to close and lockwire the drain valves after defueling.

b. On aircraft with closed circuit refueling provisions, two adjacent drain valves (left and right fuel cell) are located on the fuselage underside. The valves are spring-loaded in the closed position. Rotate the valve center slot counter-clockwise and hold open for drainage.

NOTE

For rapid drainage, remove the drain valves and preformed packings (O-rings), using a wide-blade screwdriver. Reinstall drain valves with new O-rings. Lubricate valve threads and O-ring with petrolatum (C73) before installation.

1-9. ENGINE OIL SYSTEM.

1-10. Filling — Engine Oil System. The engine oil filler cap is on the right side of the fuselage. A liquid level plug for checking the oil level in the tank is visible through a transparent window near the filler.

a. Check the oil level.

b. Replenish with correct oil (C67) until the level reaches FULL on the plug.

c. Make certain that the oil tank filler cap is securely tightened immediately after servicing.

1-11. Draining — Engine Oil System. *a.* Remove sound insulation from cargo compartment aft bulkhead right access door and remove the door.

b. Place a suitable container under the overboard oil drain line where it exits the fuselage underside at the firewall.

c. Remove cap from oil tank filler (fig. 1-1). Pull out knurled spring-loaded button to open valve in engine oil drain line just below engine oil cooler. Rotate button and valve poppet so that locking pin rests on shoulders of pin slot.

d. After draining the oil from the tank, reinstall the filler cap and close oil drain valve; ensure that poppet pin is in stop slot.

e. Install access door and sound insulation.

f. To drain approximately 1/2 pint of residual oil from engine accessory gearbox, remove wiring plug and the lower chip detector (fig. 1-1). Use a suitable container to catch the oil. Check that detector packing is serviceable (replace if necessary), reinstall detector **(60 TO 80 INCH-POUNDS TORQUE)**, reconnect wiring plug and secure with 0.032-inch lockwire (C57).

NOTE

The engine oil filter should be cleaned whenever the oil is changed (TM 55-2840-231-23.) If the two oils are mixed refer to TM 55-2840-231-23 for oil changeover procedures.

Lubricating oil made to MIL-L-7808 by Shell Oil Company under their part number 307, qualification number 7D-1 shall NOT be used in OH-6A engine or aircraft systems. It contains additives which are harmful to seals in the system.

1-12. Combining MIL-L-23699 and MIL-L-7808 Oils — Engine Oil System.

CAUTION

Do not mix MIL-L-23699 oil with MIL-L-7808 oil except in case of an emergency. Operation is limited to 6 hours.

If the two oils are mixed refer to TM 55-2840-231-23 for oil changeover procedure.

1-13. MAIN TRANSMISSION.

1-14. Filling — Main Transmission. Transmission (gearbox) oil should be replaced with new oil whenever it is drained from the gearbox.

a. Check transmission oil level in liquid level plug (fig. 1-1).

b. Replenish with correct oil (C67) until the level reaches full mark on the plug.

c. Fill main transmission by lifting breather-filler cap and inserting spout of oil can into opening. Check that spring-loaded cap closes when oil can spout is removed.

1-15. Draining — Main Transmission. *a.* Remove, in order, sound insulation, transmission access cover (para 2-11), transmission drain assembly (para 2-14) and main transmission cover (para 2-20).

b. Position a suitable (minimum 4-quart/4-liter) container under chip detectors (fig. 1-1).

c. Remove wire leads, lockwire, chip detectors, and self-closing valves.

d. If damaged, replace packings used with chip detectors and self-closing valves.

e. After oil has drained, install self-closing valves **(50 TO 60 INCH-POUNDS TORQUE)** and chip detectors **(40 TO 50 INCH-POUNDS TORQUE)**. Secure valve to gearbox and detector to valve with 0.032-inch lockwire (C57). Reconnect wire leads.

f. Remove, inspect, clean and reinstall transmission oil filter (chapter 6).

g. Reinstall, in order, the main transmission cover, the drain assembly, the main gearbox access cover, and the sound insulation.

1-16. TAIL ROTOR TRANSMISSION.

1-17. Filling — Tail Rotor Transmission. Tail rotor transmission oil should be replaced with new oil whenever it is drained from the gearbox.

a. Check tail rotor transmission oil level in liquid level plug (fig. 1-1).

b. Replenish with correct oil (C67) until the oil level reaches the full mark on the liquid level plug.

c. Fill tail rotor transmission by removing lockwire, unscrewing breather-filler (fig. 1-1) and pouring oil into transmission. Check that filler O-ring packing is serviceable (replace if necessary), reinstall breather-filler **(45 TO 55 INCH-POUNDS TORQUE)**, and secure with 0.032-inch lockwire (C57).

NOTE

Breather-filler plugs that have the threaded insert are installed with the breather hole rearward (chapter 6).

1-18. Draining — Tail Rotor Transmission. *a.* Position suitable container under the chip detector (fig. 1-1).

b. Remove wire lead, lockwire, chip detector, and self-closing valve.

c. If damaged, replace packings used with chip detector and self-closing valve.

d. After oil has drained, install self-closing valve (**50 TO 60 INCH-POUNDS TORQUE**) and chip detector (**40 TO 50 INCH-POUNDS TORQUE**). Lockwire valve to gearbox and detector to valve with 0.032-inch lockwire (C57). Reconnect wire lead.

e. Wipe dry any oil spillage with a clean cloth moistened by solvent (C94).

1-19. ONE-WAY LOCK.

WARNING

Prolonged contact with hydraulic fluid (MIL-H-5606) liquid or mist can irritate eyes and skin. After any prolonged contact with skin, immediately wash contacted area with soap and water. If liquid contacts eyes, flush immediately with clear water. If liquid is swallowed, do not induce vomiting; get immediate medical attention. Wear rubber gloves when handling liquid. If prolonged contact with mist is likely, wear an appropriate respirator. When fluid is decomposed by heating, toxic gases are released.

1-20. Servicing - One-Way Lock. Remove the screws and washers from the pilot's collective stick cover and lift cover to check the oil level. If oil level in reservoir (fig. 1-1) is low, lift filler cap and add oil (C48) as needed. Reinstall pilot's collective stick cover.

NOTE

If oil level is consistently found to be low, the one-way lock should be replaced.

1-21. BATTERY.

1-22. Handling and Servicing Precautions - Battery.

WARNING

The electrolyte used in nickel-cadmium batteries contains potassium hydroxide, a caustic chemical agent. Serious burns will result if the electrolyte contacts the skin. Explosive gasses may be released from the battery during charging. Before removing the battery from the aircraft, make sure that the power selector switch is at the OFF position. Removal or installation of the battery connector while the battery is under load may result in explosion, electrical arcing and possible severe burns to personnel.

WARNING

Attempts to remove the battery immediately following a battery overtemperature condition may result in serious burns to the hands or possible explosion hazards. Battery overtemperature may be identified by electrolyte spewing or heavy fumes. If this condition is detected, allow the battery to thoroughly cool (approximately one hour) prior to removal.

a. Nickel-cadmium batteries provide numerous advantages over lead-acid batteries. However, because of important handling and servicing differences between nickel-cadmium batteries and the more familiar lead-acid batteries it is extremely important to understand and observe the following precautions before performing any nickel-cadmium battery handling or servicing operations.

b. Satisfactory battery operation is largely dependent upon proper operation of the aircraft voltage regulator. Battery problems may often be prevented or eliminated by maintaining the voltage regulator setting at the precise voltage specified. Refer to inspection requirements in this chapter.

c. Nickel-cadmium batteries contain an electrolyte mixture of potassium hydroxide and distilled water. Chemically, this is just the opposite of an acid. Take every possible step to keep the nickel-cadmium battery as far away as possible from the lead-acid type of battery. Do not use the same tools and materials (screwdrivers, wrenches, syringes, gloves, apron, etc.) for both types of batteries. Anything associated with the lead-acid battery, even the air, must never come in contact with the nickel-cadmium battery or its electrolyte. Even a trace of sulphuric acid fumes from a lead-acid battery may result in damage to the nickel-cadmium battery.

d. A low electrolyte level does not necessarily indicate that water must be added to the cells. The electrolyte level in the cells will vary, depending upon the battery's state of charge. Refer to 1-23 below before adjusting the electrolyte level.

e. During operation of the battery, some water is lost from the electrolyte as a result of normal gassing, venting or overcharging. This loss should be replaced with pure distilled water only; do not use potassium hydroxide solution. Refer to 1-23 below before adding distilled water.

f. The state of charge of a nickel-cadmium battery cannot be determined by either the specific gravity of the electrolyte or the battery voltage. The specific gravity will remain the same whether the battery is charged or discharged, and the voltage will not change appreciably until the battery is almost completely discharged.

g. If sulphuric acid has inadvertently mixed with the electrolyte in the battery, the upper areas of the cells will appear greenish in color. In such cases, the battery must be replaced.

1-23. Servicing — Battery. Battery servicing consists of replenishing any electrolyte water that may have been lost through normal gassing, venting or overcharging. The lost water should be replaced with pure distilled water only. Never use potassium hydroxide solution.

CAUTION

The electrolyte level should be checked only after the battery has been fully charged and then allowed to rest (stand idle) for a period of 30 to 60 minutes. If the aircraft has operated continuously for a minimum of 1 hour or more the battery may be considered fully charged.

a. Set power selector switch at OFF.

b. Raise pilot compartment floor left door and remove battery cover (fig. 1-1).

c. Inspect and service battery in accordance with TM 11-6140-203-15-2.

NOTE

The battery does not have to be removed for servicing at the weekly or 25-hour special inspection interval.

d. Reinstall filler vent caps.

e. Reinstall battery cover, mounting screws and washers; close and latch access door.

1-24. CLEANING.

1-25. General — Cleaning. General cleaning of oil and dirt deposits from the aircraft and its components may be accomplished by using dry-cleaning solvent (C94), or a solution of detergent soap (C35) and water. (Refer to TM 55-1500-204-25/1 and TM 55-1500-333-24 for additional information.) Any exceptions that must be observed are specified in the following cleaning paragraphs.

1-26. Cleaning — Fuselage Interior and Upholstery. *a.* Clean dirt or dust accumulations from floors and other metal surfaces with a vacuum cleaner or small hand brush.

b. Sponge soiled upholstery with a mild soap and lukewarm water solution. Avoid complete soaking of the upholstery. Wipe solution residue from upholstery with a cloth dampened by clean water.

c. Remove imbedded grease or dirt from upholstery by sponging or wiping with an upholstery cleaning solvent.

1-27. Cleaning — Airframe Exterior and Rotor Blades.

CAUTION

Use care to prevent scratching of the aluminum skin when cleaning main rotor blades. Never use volatile solvents or abrasive materials. Never apply bending loads to blades or blade tabs during the cleaning process.

a. Wash the aircraft exterior, including fiberglass components and rotor blades, when necessary by using a solution of clean water and mild soap.

NOTE

Avoid directing water toward the engine air intake area and the instrument static port in the aft fairing. Use covers, as necessary.

b. Clean those surfaces that are stained with fuel or oil by initial wiping with a soft cloth dampened by solvent (C94) followed by washing with clean water and mild soap.

c. Rinse washed areas with clean water and dry with a soft cloth.

1-28. Cleaning — Transparent Plastic.

CAUTION

Do not use naphtha on polycarbonate canopy. Use of this material will cause damage to the canopy.

a. Clean the outside surfaces of plastic panels by rinsing with clean water and rubbing lightly with palm of hand.

b. Use a detergent (C35) and water solution to remove oil spots and similar residue.

CAUTION

Never attempt to dry plastic panels with a dry cloth. To do so will cause any abrasive particles lying on the plastic to scratch or dull the surface. Wiping with a dry cloth will also build up an electrostatic charge that will attract dust particles from the air. Use care when cleaning around the metal

foil tape elements of the fm homing antenna.

c. After dirt is removed from surface of plastic, rinse with clean water and air-dry, or dry with a soft, damp chamois.

d. Clean the inside surfaces of plastic panels by dusting the surfaces with a soft, clean cloth, saturated with clean water. DO NOT USE DRY CLOTH, wipe carefully with a soft, damp cloth or sponge. Keep the cloth or sponge free from grit by rinsing frequently in clean water.

1-29. Cleaning — Fiberglass Components. Cleaning of fiberglass components is performed the same as for the aircraft exterior (para 1-26).

1-30. Cleaning — Battery and Electrolyte Spillage. *a.* Set the power selector at OFF.

WARNING

Electrolyte is a strong alkaline solution and is harmful to the skin and clothing. Wear protective clothing that is used exclusively for servicing nickel-cadmium batteries. Neutralize and flush electrolyte from the skin or hands as described below.

Where there is evidence of spewed or spilled battery electrolyte, flush off the surface immediately with water (cold if possible); then neutralize with citric acid solution mixed 14 parts water to one part citric acid (C23). Follow by flushing with chromium triox (C22); then thoroughly flush with clean water (cold if possible).

b. Unlatch and raise pilot compartment floor left side access door. Remove four screws and washers securing battery cover and remove cover.

c. Use a clean cloth dampened by clean water to remove any accumulation of dust, dirt, or white powder (potassium carbonate).

d. If battery is unusually dirty or shows evidence of caked crystals around the cells it should be removed from the aircraft for further cleaning with a nylon (or other non-metallic) brush and clean running water. For additional cleaning instructions refer to TM 11-6140-203-14-2.

e. Dry the top of the battery thoroughly with a clean cloth.

f. Reinstall battery cover, mounting screws and washers.

g. Lower and latch the floor access door.

1-31. CORROSION CONTROL.

1-32. General — Corrosion Control. The airframe is fabricated mainly of aluminum and some magnesium alloys, with selective use of stainless steel and titanium, and should be checked regularly for any signs of corrosion, especially at points of dissimilar and overlapping metal contact. Corrosion of dissimilar metals is the result of several conditions; lack of sufficient insulation in the areas of metal contact, tears or punctures in the metal itself, and areas where the protective finishes have been scuffed, scratched, chipped, or worn away. Inspections and maintenance precautions that should be performed to inhibit the start of corrosive action are outlined in paragraph 1-33. Common types of corrosion that may be encountered are described in paragraphs 1-39 through 1-41. Restoration procedures for marred but uncorroded surfaces, as well as surfaces on which corrosion is found, are given in paragraph 1-42.

Refer to TM 55-1500-204-25/1 for additional information.

1-33. STANDARD PRACTICES FOR CORROSION PREVENTION.

1-34. Corrosion Inspection — Interior Metal Surfaces. *a.* Inspect primer-painted surfaces for scratches and other damage.

b. Inspect finish-painted (color coated) surfaces for condition of finish.

c. Inspect areas of metal overlap (faying surfaces) for evidence of corrosion.

d. Inspect the attachment area of bolts, screws, and other fasteners for corrosion.

1-35. Corrosion Inspection — Exterior Metal Surfaces. *a.* Inspect finish for scratches, cracks, peeling, fading, or other damage, particularly around bolts, screws, and other fasteners.

b. Inspect normally sealed seams and joints for loose or missing sealing compound.

c. Inspect exposed skin edges for condition of corrosion-protective finish or sealing compound and for evidence of corrosion.

d. Inspect areas of metal overlap for evidence of corrosion.

1-36. Insulation — Magnesium Alloys Against Corrosion. To prevent galvanic corrosion between magnesium and any dissimilar metals:

a. Coat contacting surfaces with a layer of sealing compound (C89), in addition to the primer (C78) or (C79).

CAUTION

Do not use steel washers during the following step:

b. Apply primer (C79) on the attaching hardware before installation.

1-37. Application — Sealing Compound. Use sealing compound (C89) to replace loose or missing sealant on exterior surfaces. Sealant is used to fill seams and joints that might trap water. Apply sealant as follows:

a. Check that seam or joint is clean and free of foreign matter and moisture.

b. Apply sealant with a putty knife or similar tool.

c. Force the sealant well down into the seam to eliminate any air pockets.

d. Fillet the sealant to give the joint or seam a smooth appearance.

1-38. Removal — Salt Deposits. To inhibit corrosion, aircraft operating over salt water and those that come in contact with salt water or spray should be washed with fresh water as frequently as possible.

1-39. Corrosion on Magnesium Alloys.

CAUTION

Bare magnesium alloys, when exposed to salt-laden air, will corrode very rapidly. Adequate protective finishes must at all times be maintained on magnesium.

Corrosion will not normally be present on painted, treated or protected surfaces. Corrosion will attack magnesium when nicks or scratches through the surfact protection expose the metal to moisture or air. Corrosion is present if the following conditions are in evidence:

a. Whitish powdered deposits.

b. Zinc chromate discoloration over an area.

c. Blistering or cracking of the finish coating.

1-40. Corrosion of Aluminum Alloys. Corrosion will not normally be present on aluminum surfaces that have a chemical protective finish; however, because moisture can permeate paint that is nicked or scratched, corrosion might attack the metal even though it is painted. In such cases, the affected areas will generally be characterized by:

a. A scaly or blistered appearance of the finish surface.

b. A dulling and pitting of the area.

c. Whitish powdered deposits.

1-41. Corrosion on Alloy Steels. Corrosion (rust) will not normally be present on steel surfaces that have been painted; however, surfaces may corrode where moisture has permeated the paint. Such corrosion will be characterized by:

a. A reddish or brownish blistered appearance in the corroded area.

b. Blistering of the painted surfaces.

1-42. CORROSION TREATMENT.

1-43. Temporary Anti-corrosion Measures. The temporary anti-corrosion measures outlined here are to be used only in cases where the proper materials or equipment are not available.

WARNING

These temporary anti-corrosion measures apply to the airframe only. If a part of the structure is corroded too badly to withstand normal loads before the aircraft can reach a repair station, metal patches will have to be installed before the aircraft is flown.

a. Examine part of area in question for extent of corrosion.

b. Remove loose paint and powdery products of corrosion by scraping with a sharp phenolic scraper, or brushing the area with a heavy fiber brush.

c. Wash off the affected areas with mild soap and clean fresh water; rinse thoroughly.

d. If protective paint coatings are not available, liberally apply corrosion-preventive compound (C30) or any available grease to affected areas.

1-44. Exterior Surface Corrosion Touchup Treatment — Magnesium Alloy. *a.* Wash affected area with a solution of mild soap and clean fresh water. Rinse area with clean water and wipe dry by using a clean soft lint-free cloth.

b. Use thinner (C108) on damaged area to remove any grease and old paint.

c. Apply chrome pickle solution (C21) by swabbing exposed area for 3 to 10 minutes.

d. Using a clean cloth soaked in clean fresh water, thoroughly rinse area where solution was applied. Allow area to thoroughly dry.

e. Apply paint finish touchup (para 1-47).

1-45. Exterior Surface Corrosion Touchup Treatment — Aluminum Alloy.

NOTE

If there is any question of whether or not the protective coating is removed, it should always be assumed that bare metal is exposed.

a. Wash affected area with a solution of mild soap and fresh water. Rinse area with clean water and wipe dry with a clean soft lint-free cloth.

b. Using a swab, liberally apply chemical film solution (C20).

c. Allow solution to remain on surface for 1 to 3 minutes, or until surface becomes amber to brown in color.

NOTE

Avoid letting the chemical mixture dry on the surface. If it has dried, rewet the surface with the solution.

d. Rinse treated surface thoroughly with clean water. After rinsing, wipe off excess moisture with a clean lint-free cloth. If dry compressed air is available, blow any moisture from joints or crevices and allow to dry completely at room temperature for approximately 1 hour.

e. Apply paint finish touchup (para 1-47).

1-46. Exterior Surface Corrosion Touchup Treatment — Steel Alloy. *a.* Remove loose paint and corrosion products by scraping area with a sharp phenolic scraper, brushing with a heavy fiber brush, and light sanding with grade 400 or finer abrasive paper (C3) and (C4).

b. Wash off the area with mild soap and clean fresh water; rinse thoroughly.

c. Treat surface with surface cleaner (C74) or equivalent.

d. Allow solution to remain on surface for approximately 5 minutes. Keep surfaces wet.

e. Rinse thoroughly with clean water. Dry with a clean lint-free cloth and then allow to air-dry completely.

f. Apply paint finish touchup (para 1-47).

1-47. PAINT FINISH.

1-48. General — Paint Finish. All surfaces of the aircraft are prime-painted with one coating of yellow epoxy primer, and finish-painted with either one or two color coats of acrylic lacquer. Nonvisible interior surfaces have only one finish coat of acrylic lacquer that is green in color. Personnel areas, visible interior areas, and the exterior have two color coats. Refer to TB 746-93-2 for touchup and complete painting procedures.

CAUTION

If paint remover is used in the vicinity of drive shaft couplings, be sure the couplings are completely masked and covered. If paint remover contacts the coupling diaphragms, rust spots will develop and coupling replacement will be required.

1-49. LIST OF CONSUMABLE MAINTENANCE SUPPLIES AND MATERIALS.

1-50. General — List of Consumable Maintenance Supplies and Materials. Consumable maintenance supplies and materials are listed in table 1-1 in alphabetical order. Each consumable also has an item number assigned for ease of location and reference. When an item number is unknown, you may locate any consumables used within this manual through its alphabetical arrangement. When an item number is referenced in the manual, you may locate the item through its C designator and item number. C designators are used only with consumable maintenance supplies and material. Consumable maintenance supplies and materials tables are found only in this chapter, therefore the table number will not be referenced in the text.

1-51. NATIONAL SUPPLY CLASS (NSC) REFERENCE.

1-52. General — NSC Reference. National supply class references are listed in table 1-2.

1-53. SPECIAL TOOLS AND TEST EQUIPMENT.

1-54. General — Special Tools and Test Equipment. Special tools and test equipment are listed in table 1-3 in alphanumeric order. Each tool or piece of test equipment has an item number assigned for ease of location and reference. When an item number is unknown, you may locate special tools and test equipment through alphanumeric arrangement within the table. When an

Table 1-1. Consumable Maintenance Supplies and Materials.

The supplies and materials listed in this table are required for maintenance support of this equipment and are authorized to be requisitioned by SB700-50.

Item No.	Description	Ref. No. & (FSCM)	NSN
1	ABRASIVE PAPER, SILICON CARBIDE, grade 180	P-P-101	5350-00-721-8117
2	ABRASIVE PAPER, SILICON CARBIDE, grade 280	P-P-101	5350-00-224-7205
3	ABRASIVE PAPER, SILICON CARBIDE, grade 400	P-P-101	5350-00-224-7201
4	ABRASIVE PAPER, SILICON CARBIDE, grade 600	P-P-101	5350-00-224-7215
5	ADHESIVE	RTV 731	8040-00-933-9563
5A	ADHESIVE	MMM-A-132 TY I, CL I	8040-00-833-9563
6	ADHESIVE	MMM-A-138	8040-00-145-0303
7	ADHESIVE	8089ABX	8040-00-828-4936
8	ADHESIVE	MIL-A-8576	8040-00-266-0815
9	ADHESIVE	MMM-A-134 Ty 2	8040-00-691-1322
9A	ADHESIVE	EC2216 B/A	8040-00-145-0019
10	ADHESIVE, BONDING, VULCANIZED (Synthetic rubber to seal)	MMM-A-121	8040-00-165-8614
11	ADHESIVE, POLYURETHANE	U136 Stabond AC AAAA	8040-00-224-4673
12	DELETED		
13	ADHESIVE, SILICONE RUBBER	Silastic 140 RTV	8040-00-701-9546
14	ANTI-SEIZE COMPOUND	MIL-T-83483	8030-00-087-8630
15	BARRIER MATERIAL, grease proof	MIL-B-121 Ty 1, Gr A, CL2	8135-00-753-4661
16	BARRIER MATERIAL, WATER VAPORPROOF, flexible	MIL-B-131 CL1	8135-00-282-0565
17	BRAZING ALLOY, SILVER BASE	QQ-B-654 No. 7	
18	CELLULOSE TAPE	MIL-T-18833	1375-00-609-2421
19	CEMENT, RUBBER	MMM-A-1617	8040-00-152-0063
20	CHEMICAL FILM	MIL-C-5541 Ty II, Gr B, CL1	8030-00-811-3723
21	CHROME PICKLE SOLUTION	D0WN01	8030-00-050-9043
22	CHROMIUM TRIOX	OC 303 Ty 2	6810-00-264-6517
23	CITRIC ACID	OA 76	6810-00-275-1215

Table 1-1. Consumable Maintenance Supplies and Materials. (cont)

Item No.	Description	Ref. No. & (FSCM)	NSN
24	CLOTH, ABRASIVE, ALUMINUM OXIDE (gr 200)	P-C-451	5350-00-246-0330
24A	CLOTH, ABRASIVE, ALUMINUM OXIDE (gr 400)	PC 451	5350-00-865-5700
25	CLOTH, ABRASIVE, crocus gr	P-C-458	5350-00-221-0872
26	Deleted		
27	COMPOUND, ALKALINE WATERBASE	MIL-C-25769	6850-00-935-0995
28	COMPOUND, ANTI-SEIZE, LEAD PLATE NO. 250	MIL-A-907	8030-00-597-5367
29	CORROSION PREVENTIVE COMPOUND	MIL-C-11796 Cl 3	8030-00-231-2353
30	CORROSION PREVENTIVE COMPOUND	MIL-C-16173 Gr 1	8030-00-231-2345
31	CORROSION PREVENTIVE COMPOUND	LPS3	8030-00-118-0666
32	CORROSION PREVENTIVE CONCENTRATE	Brayco 599	6850-00-142-9582
32A	CORROSION REMOVING COMPOUND	MIL-C-10578 Type II	6850-00-174-9672
33	CUSHIONING MATERIAL, PACKAGING, cellulose wadding, water resistant, low absorbency	PPP-C-843, Ty II, C1 B	8135-00-664-6958
34	CORD, NYLON, 12, NATURAL	MIL-C-5040 Ty 1	4020-00-240-2154
35	DETERGENT, GENERAL PURPOSE	MIL-D-16791 Ty 1	7930-00-985-6911
36	DETERGENT, SURFACE CLEANER	MIL-D-26549	6850-00-597-1528
37	DIELECTRIC COMPOUND, SILICONE BASE, HIGH TEMPERATURE	MIL-S-8660	6850-00-880-7616
38	DICHLOROMETHANE, technical	MIL-D-6998 Gr B	6810-00-244-0290
39	FIBERGLASS REPAIR KIT	S1607-7021	1560-00-856-9222
39A	FIBERGLASS	MIL-C-9084	8305-00-530-0109
40	DELETED		
41	FILLER, RESIN	RP1257-3A (02684)	8030-00-891-3113
42	FLUX, BRAZING PASTE	O-F-499 Ty B	3439-00-640-3713
43	FUEL CELL REPAIR KIT	RK10-34	2910-00-437-0588
44	GASKET MATERIAL (adhesive one side only)	4304 (76381)	9330-00-242-6229
45	GREASE, AIRCRAFT HIGH TEMPERATURE	MIL-G-25537	9150-00-478-0055

Table 1-1. Consumable Maintenance Supplies and Materials (cont)

Item No.	Description	Ref. No. & (FSCM)	NSN
46	GREASE, AIRCRAFT AND INSTRUMENT	MIL-G-23827	9150-00-985-7245
47	GREASE, BALL AND ROLLER BEARING	DOD-G-24508A	9150-01-117-2928
48	HYDRAULIC FLUID, PETROLEUM BASE	MIL-H-5606	9150-00-252-6383
49	INSULATION SLEEVING, ELECTRICAL, (size as applicable)	MIL-I-631, Ty F, Form U, Gr A, CL 1, Cat 1	5970-00-078-5977
50	INSULATION SLEEVING, ELECTRICAL, FIBERGLASS (size as applicable)	MIL-L-3190 C1 HA-1	5920-00-250-3026
51	JET FUEL, GRADE JP-4	MIL-T-5624	9130-00-256-8617
52	LACING CORD, HIGH TEMPERATURE	Warren Wire Co T-3333	4020-00-807-4491
53	LACQUER	TT-L-32	8010-00-166-3164
54	LACQUER, GULL GRAY, FED STD 595, COLOR NO. 36231	MIL-L-19538	8010-00-526-3296
55	LACQUER, WHITE, FED STD 595, COLOR NO. 17875	MIL-L-81352	8010-00-935-6608
56	LOCKWIRE, CRES, 0.020 IN. DIA	QQ-W-423, Comp 302, Cond A	9505-00-596-5101
57	LOCKWIRE, CRES, 0.032 IN. DIA	QQ-W-423, Comp 302, Cond A	9505-00-293-4208
58	LOCKWIRE, CRES, 0.042 IN. DIA	QQ-W-423, Comp 304, Cond A	9505-00-804-3814
59	DELETED		
60	LUBRICANT	VV-G-632 Gr 2	9150-00-753-4649
61	LUBRICANT, CORROSION INHIBITING	VV-L-800	9150-00-231-6689
62	LUBRICANT, GRAPHITE	SS-G-659	9620-00-233-6712
63	LUBRICANT, GREASE, WTR	MIL-G-81322	9150-00-944-8953
63A	LUBRICANT, GREASE	MOBILE GREASE 28 77988	9150-00-117-8953
64	LUBRICANT, SOLID FILM	Electrofilm, Inc., Lubri-Bond A (85932)	9150-00-754-0064
65	LUBRICANT, SOLID FILM	MIL-L-46010	9150-00-948-6912
66	LUBRICANT, SOLID FILM	MIL-L-8937	9150-00-985-7255
67	LUBRICATING OIL, AIRCRAFT TURBINE ENGINE, SYNTHETIC	MIL-L-23699	9150-00-985-7099
68	LUBRICATING OIL, jet engine	MIL-L-6081 GR 1010	9150-00-273-2388
68A	METAL CONTAINER	MIL-C-10578 Ty 1	6850-00-174-9672
69	METHYL ETHYL KETONE, TECHNICAL	TT-M-261	6810-00-281-2785

Table 1-1. Consumable Maintenance Supplies and Materials (cont)

Item No.	Description	Ref. No. & (FSCM)	NSN
70	NAPHTHA, ALIPHATIC	TT-N-95	6810-00-238-8119
71	NITRIC ACID, TECHNICAL	O-N-350	6810-00-222-9655
72	PAINT REMOVER	TT-R-248	8010-00-515-2258
73	PETROLATUM, TECHNICAL	VV-P-236	9150-00-250-0926
74	DELETED		
75	POLISHING KIT, PLEXIGLASS	P-P-560	7930-00-634-5340
76	PRESERVATIVE OIL, HYDRAULIC	MIL-H-6083	9150-00-159-4472
77	PRIMER	EXB 576-6	8040-00-104-5263
78	PRIMER, CATALYZED EPOXY (YELLOW)	MIL-P-23377	8010-00-082-2450
79	PRIMER COATING	MIL-P-8585	8010-00-297-0593
80	PRIMER, EPOXY (YELLOW)	MIL-P-23377	8010-00-082-2450
81	PRIMER, SILICONE	MIL-S-8660	6850-00-880-7616
81A	PRIMER, ZINC CHROMATE	MIL-P-8585A	8030-00-297-0593
82	PROPANOL 2, TECHNICAL (ISOPROPYL ALCOHOL)	TT-I-735 Gr B	6810-00-855-6160
83	PUTTY, ZINC CHROMATE	MIL-P-8116	8030-00-664-4968
83A	RELEASE AGENT	TC7-527 EPD Industries, Long Beach, CA	
84	DELETED		
85	ROD, WELDING	Armco Steel 21-6-9	3439-00-134-9209
86	ROD, WELDING	QQ-R-566 CFL-S-RA12	3439-00-268-9654
87	RUST INHIBITOR, SPRAY	WD 40 Rocket Chem Corp	8030-00-838-7789
87A	SEALANT	MIL-S-8802	8030-00-753-5006
88	Use C5		
89	SEALING COMPOUND	MIL-S-8802	8030-00-753-4596
90	SEALING, LOCKING AND RETAINING COMPOUNDS; single component	MIL-S-22473 Gr A	8030-00-081-2338
91	SEALING, LOCKING AND RETAINING COMPOUNDS; SINGLE COMPONENT (surface primer)	MIL-S-22473 Gr T	8030-00-082-2508
92	SOAP, TOILET	P-S-620, Type II	8520-00-531-6484

Table 1-1. Consumable Maintenance Supplies and Materials (cont)

Item No.	Description	Ref. No. & (FSCM)	NSN
93	SOLDER, TIN ALLOY	QQ-S-571	3439-00-224-3567
94	SOLVENT, DRY CLEANING	P-D-680 Ty 1	6850-00-264-9038
95	SOLVENT, TOLUENE	TT-T-548	6810-00-281-2002
96	SOLVENT, TRICHLOROETHYLENE	O-T-620	6810-00-664-0387
97	SOLVENT, XYLENE	TT-X-916	6810-00-598-6600
98	TAPE	850	7510-00-194-6643
99	TAPE, ALUMINUM FOIL	425	7510-00-864-8803
100	TAPE, PLASTIC ELECTRICAL	MIL-I-24391	5970-00-419-4291
101	TAPE, PRESSURE SENSITIVE	471	7510-00-142-9840
102	TAPE, PRESSURE SENSITIVE	PPP-T-60 Cl 4	8130-00-181-7610
103	TAPE, PRESSURE SENSITIVE	PPP-T-66 Ty 1, Cl B	7510-00-145-0002
104	TAPE, PRESSURE SENSITIVE ADHESIVE (MASKING)	PPP-T-42	7510-00-266-6712
105	TAPE, PRESSURE SENSITIVE ADHESIVE, WATER RESISTANT	PPP-T-76	7510-00-297-6655
106	TAPE, PRESSURE SENSITIVE	P-306	7510-01-009-8023

Table 1-1. Consumable Maintenance Supplies and Materials. (cont)

Item No.	Description	Ref. No. & (FSCM)	NSN
107	TAPE, PRESSURE SENSITIVE, WATERPROOF, FOR PACKING	PPP-T-60 Ty I, Cl 1	7510-00-266-5006
108	THINNER, ACRYLIC-NITROCELLULOSE LACQUER	MIL-T-19544	8010-00-160-5789
109	THINNER, PAINT, MINERAL SPIRITS	TT-T-291	8010-00-242-2089
110	THREAD COMPOUND, ANTI-SEIZE AND SEALING	MIL-T-5542	8030-00-530-5234
111	TRICHLOROETHYLENE, TECHNICAL	O-T-634 Ty 2	6810-00-184-4800
112	TWINE, NYLON	MIL-T-713 Ty P, Cl 2	4020-00-202-1924
113	VARNISH	MIL-V-173 Comp I	8010-00-180-6343
114	WEIGHT, LEAD PACKING (NO. 66C38599)	MIL-W-27888	1670-00-375-9134

item is referenced in the manual, you may locate the item through its T designator and item number. T designators are used only with special tools and test equipment. The special tools and test equipment table is found only within this chapter; therefore the table number will not be referenced within the text. A complete listing of all special tools and test equipment authorized for use to perform maintenance on OH-6A aircraft/accessories are contained in the aircraft parts manual.

1-55. SUPPORT EQUIPMENT.

1-56. General — Support Equipment. Support equipment is listed in table 1-4 in alphanumeric order. Each item of support equipment has an item number assigned for ease of location and reference. When an item number is unknown, you may locate support equipment through alphanumeric arrangement within the table. When an item is referenced in the manual, you may locate the item through its S designator and item number. S designators are used only with support equipment. The support equipment table is found only within this chapter; therefore the table number will not be referenced within the text.

Table 1-2. National Supply Class Reference.

Nomenclature	National Supply Class	Nomenclature	National Supply Class
Abrasives, grain, cloth, paper	5350	Inspection penetrant remover	6850
Acid	6810	Insulating compound, electrical	5970
Adhesives	8040	Lacquer and enamel	8010
Aluminum or steel wool	5350	Layout dye	6850
Anti-icing fluid	6850	Lubricating oil	9150
Antiseize compounds	8030	Paint	8010
Bags	8105	Paint remover and thinner	8010
Beeswax	9610	Paraffin	9160
Carbon removing compound	6850	Petrolatum	9150
Castor oil	9150	Plastic molding material and compounds	9330
Cement	8040	Plexiglas repair kit	1560
Chemicals	6810	Polishing cloths	7920
Cleaning cloths	7920	Polishing compounds	7930
Cleaning Compounds	6850	Preservative compounds	8030
Cleaning compounds	7930	Primer, coating and paint	8010
Core material	5680	Rags, wiping	7920
Corrosion preventives	6850	Sacks	8510
Corrosion removing compounds	6850	Sealing compounds	8030
Deodorant, general purpose	6840	Soap, toilet	8520
Desiccant	6850	Solder	3439
Detergent	7930	Steel plate, sheet and strip	9515
Distilled water	6810	Tape, electrical	5970
Dopes	8010	Tape, identification	7690
Dry cleaning solvent	6850	Tape, luminous and reflective	9390
Dyes	6820	Tape, paper, acetate fiber and gummed	8135
Fiberglass repair kit	1560	Tape, pressure-sensitive adhesive	7510
Fuel oils	9140	Tape, rubber, adhesive and cloth-coated	9320
Gases, compressed and liquefied	6830	Towel, paper and machinery wiping	7920
Graphite	9620	Varnish	8010
Greases	9150	Varnish, electrical insulating	5970
Hydraulic fluid	9150	Walkway compounds, nonslip	5610
Inhibitors	6850	Water repellant kit	6850
Ink	7510	Wax, microcrystalline	9160
Inspection penetrant kit	6850		

Table 1-3. Special Tools and Test Equipment.

ITEM No.	Part No.	Nomenclature	Usability Code Calibration	Figure Reference
1	BH112JA36	Cal Analyzer	T/AD	
2	MIL-S-6180B (NSN 5130-00-712-4855)	Tool Kit	RP	
3	PN-901	Voltmeter (0.5% full scale accuracy)	T/AD	
4	TS-352 B/U	Multimeter	T/AD	
5	TS-443/u	Voltmeter (0.25% full scale accuracy)	T/AD	
6	VS5236	Wrench	R/IN	
7	369A1400-30202	Damper Assembly Holding Fixture	T/AD	5-10
8	369A2000-80902	Build-up Aligning Tool	I	4-5
9	369A5002	Lifting Bracket	R/IN	1-3
10	369A6001-50506	Drill jig	RP	
11	369A8009	Engine Hoist	R/IN	
12	369A8100-80902-206	Spanner Wrench	R/IN	
13	369A8100-80902-9	Spanner Wrench	R/IN	
14	369A9825	Pivot Bearing Adapter Wrench	R/IN	
15	369A9904	Adapter Assembly	R/IN	
16	369A9920	Bracket Assembly-Accelerometer MTG, Tail Rotor Balancing	I/AD	5-25
17	369A9925	Light, Strobe Strobe Light Instl &	I/AD	5-24
18	369A9926	Assy, High Intensity-Blade Tracking	I/AD	5-24
19	369A9927	Collective Rigging Fixture	I/AD	11-2
20	369A9928-5	Cyclic Lateral Rigging Fixture	I/AD	11-2
21	369A9929-5	Cyclic Longitudinal Rigging Fixture	I/AD	11-2
22	369A9930	Master Rigging Plate	I/AD	11-2
23	369A9931	Tail Rotor Swashplate Rigging Tool	I/AD	11-25
24	369A9932	Hub Puller, Main Rotor	R/IN	5-4
25	369A9933	Main Rotor Hub Driver	IN	
26	369A9934	Main Rotor (Face Socket) In Wrench	R/IN	
27	369A9936	Collective Bungee Installation Tool	R/IN	11-9, 11-12
28	369A9937	Torque Wrench Adapter Torque	R/IN	5-21
29	369A9949	Wrench Adapter	R/IN	
30	369A9957	Torque Wrench Adapter	R/IN	6-3
31	369A9958	Tool Assembly, Tab Binding	AD	5-2,5-14
32	369A9968	Pitot Tube Angularity Template	I/AD	8-5
33	369A9979	Protractor Assy, Tail Rotor Balancing	I/AD	
34	369A9985	Bungee Compression Tool (Rod and Channel)	R/IN	
35	369A9993-601	Main Rotor (Face Socket) Wrench	R/IN	

Table 1-3. Special Tools and Test Equipment. (cont)

ITEM No.	Part No.	Nomenclature	Usability Code Calibration	Figure Reference
36	369A9998	Bearing Installation and Removal Tool	R/IN	2-26
37	369A9999	Tail Rotor Balance Kit, Assy	I/AD	5-24
38	6795579	**Engine Turnover Stand**	R/IN	4-2
39	6796943	**Engine Assembly Lift**	R/IN	
40	**B4591**	**Kit, Vibrex Balancing**	**IN/AD**	**5-14A**
41	**10ARAX6**	**Wrench Torque**	**R/IN**	
42	**STW-03-D**	**Engine Jack**	**R**	

USABILITY CODES

R – Removal
D – Disassembly
I – Inspection
RP – Repair/Replace
T – Testing
A – Assembly
IN – Installation
AD – Adjustment
S/P – Storage/Preservation

Table 1-4. Support Equipment.

Item No.	Part No.	Nomenclature	Figure Reference
1	AN 8015-2	Mooring kit	1-7
2	369ASK1970	Exhaust stack cover	1-7
3	369A2010	Jack Fitting	1-3, 1-7
4	369A4023	Rotor hub and engine inlet cover	1-7
5	369A4025	Blade cover	1-5
6	369A4026	Pitot tube cover, nonheated pitot tube	1-7
7	369A4027	Blade sock Main rotor maintenance plat-	1-5
8	369A9810	**Main rotor maintenance platform**	1-4
9	369A9905	Ground handling wheels	1-6
10	369A9906	Jack handle	1-6
11	369A9918	Blade rack	1-5
12	369H4009	Pitot tube cover, heated pitot tube	1-7
13	A338	Fuel cell leak check manometer	

SECTION II. LUBRICATION

1-57. LUBRICATION.

1-58. General - Lubrication. All lubrication of the aircraft is accomplished through servicing (section I) or during maintenance of disassembled components.

CAUTION

Use extreme care when applying any type of lubricant (grease, oil, dry-film, etc.) in the vicinity of teflon bearings. Most lubricants will form a dirt retaining film or have otherwise detrimental effects that can cause rapid deterioration of the bearing surfaces.

SECTION III. HANDLING, JACKING, MOORING, HOISTING AND SLING LOADING

1-59. GROUND HANDLING.

1-60. General - Ground Handling. Ground handling procedures for the aircraft include hoisting, jacking, installing round handling wheels, towing, parking, mooring and leveling procedures. The following information will aid ground handling personnel.

Table 1-5. Premaintenance Requirements for General Handling of Aircraft.

Condition	Requirements
Special Tools	(T15)
Support Equipment	(S1) (S2)(S3) (S4) (S5) (S6) (S7) (S8) (S9) (S10) (S11) (S12)
Minimum Personnel Required	Two
Consumable Materials	(C33) (C45) (C105)

1-61. Aircraft Dimensions. The principal dimensions of the aircraft are shown in figure 1-2.

1-62. Leveling. Leveling (fig. 1-3) is accomplished by causing a plumb bob to intersect register marks enscribed on the target plate located on the cargo compartment floor.

a. Suspend plumb bob from a line attached to the support clip located on the upper right edge of the controls tunnel (fig. 1-3).

b. Raise the aircraft from the ground (para 1-71).

c. Adjust side jacks to obtain lateral level. Adjust tailboom jack to obtain longitudinal level.

d. Recheck lateral and longitudinal levels until the plumb bob exactly intersects the register marks enscribed on the target plate.

1-63. Main Rotor Maintenance Platform. A main rotor maintenance platform (S58) can be used on aircraft equipped with a fitting installed in the aft edge of the cargo door frame (fig. 1-4). The platform support arm mounts in the aircraft jack fitting. When not in use, the platform and support arm may be stowed and secured with a lockpin.

1-64. Folding Main Rotor Blades.

a. Locate aircraft slightly more than rotor span from other aircraft or vehicles, parking the aircraft on the most level ground available so that the load is balanced as much as possible.

CAUTION

During blade folding, use adequate covering over engine air inlet fairing opening to prevent entry of foreign objects into air intake. Install exhaust covers (S2) on aircraft with upward exhausts.

b. Disconnect wire antenna (as applicable) at boom attach fitting and coil while blades are folded.

c. Attach blade rack (S11) to the tailboom (fig. 1-5).

d. Position main rotor so that one blade is centered fore and aft over the tailboom.

e. Wrap a 4-inch strip of cushioning material (C33) around each rotor blade at the point where vibration absorbers contact blade when absorber is moved fully upward. Lift vibration absorbers upward to contact the cardboard, wrap tape (C105) or equivalent, around absorbers and the cardboard wrapped blade to hold absorbers.

f. Install four blade covers (S5).

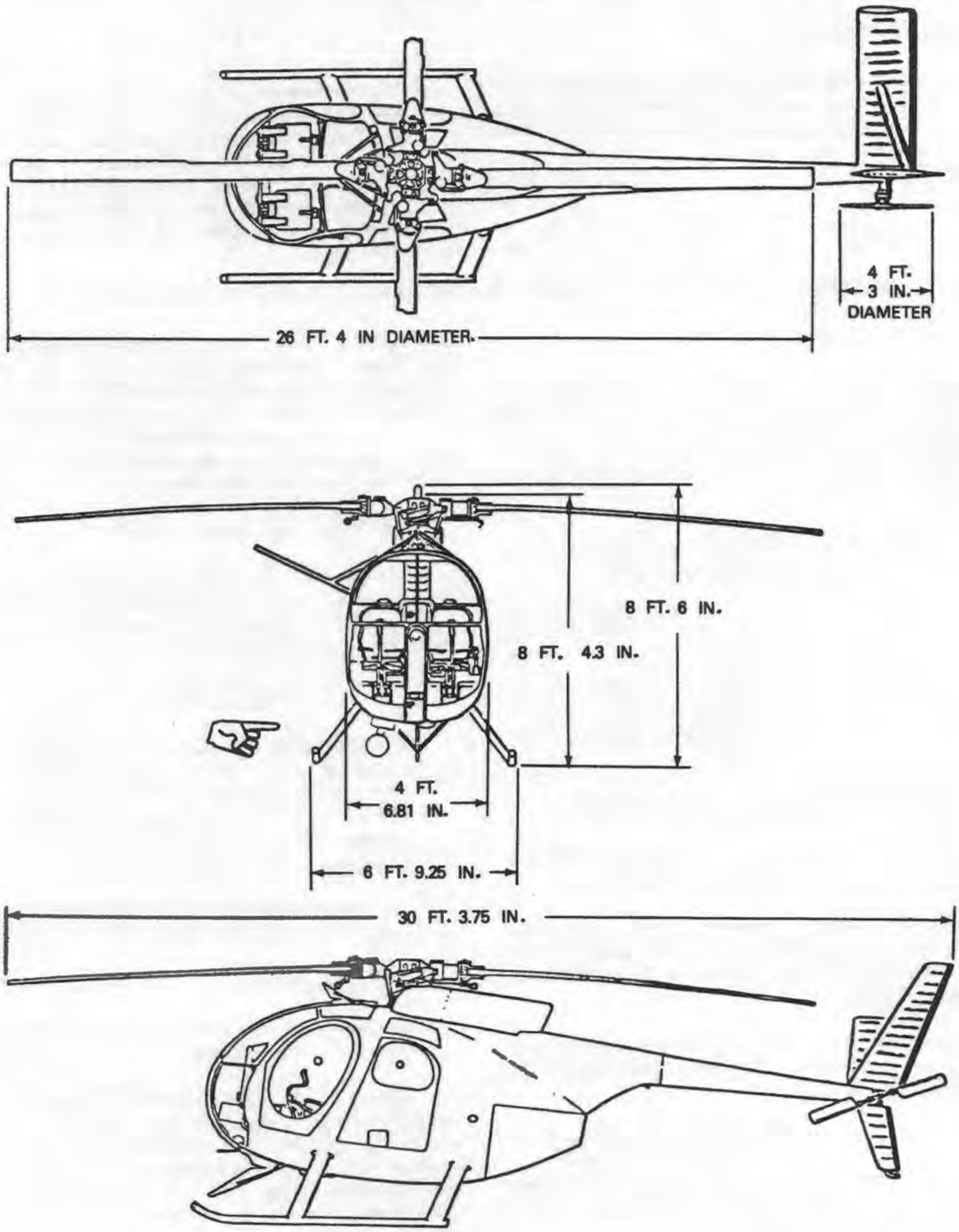


Figure 1-2. Principal Dimensions

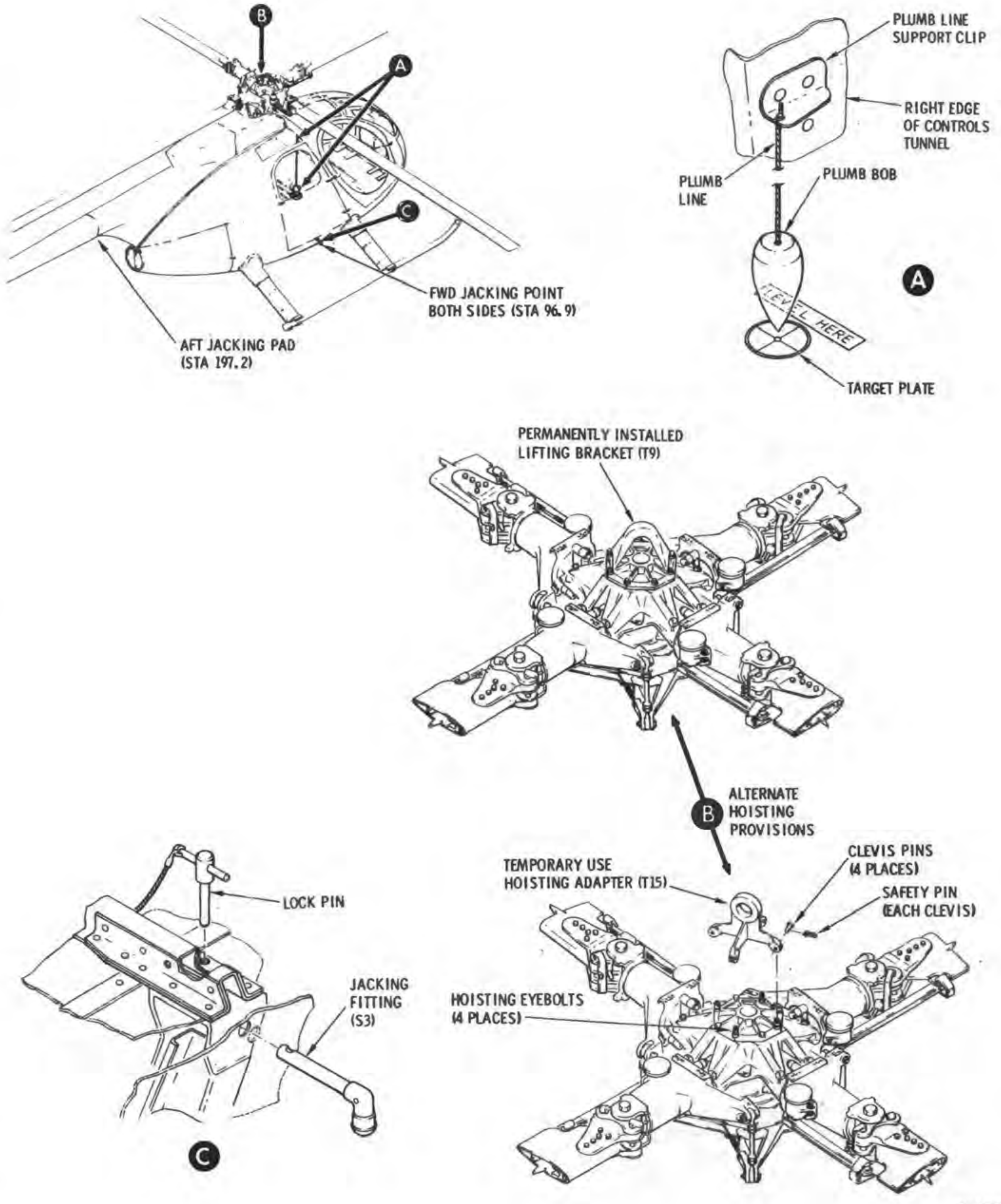


Figure 1-3. Hoisting, Jacking and Leveling.

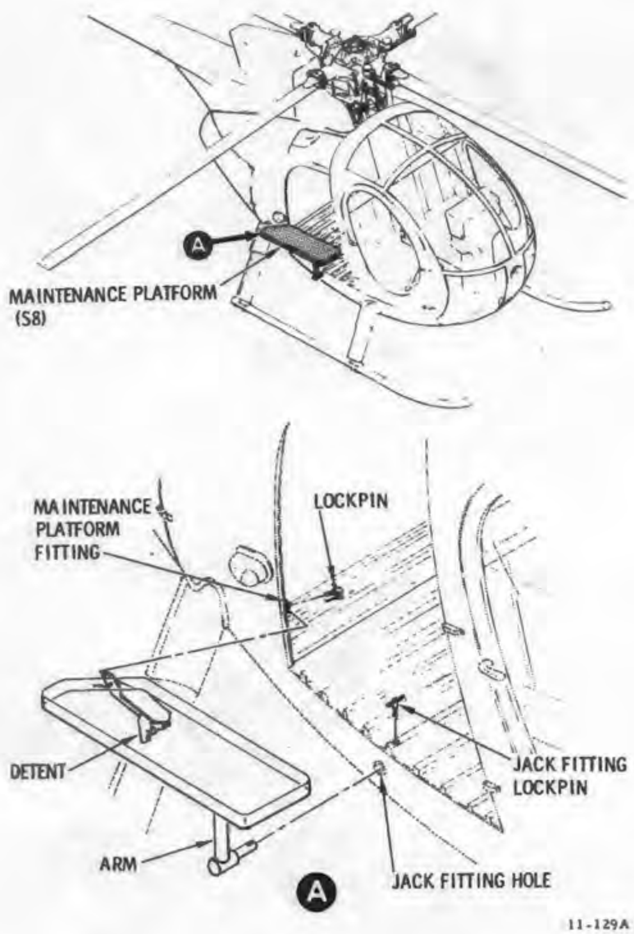


Figure 1-4. Main Rotor Maintenance Platform.

g. Lock control sticks (by applying friction) in the following positions:

(1) Collective pitch — mid position.

(2) Longitudinal cyclic — full aft.

(3) Lateral cyclic — two-thirds of total stick travel from full left toward full right.

CAUTION

During blade folding, continually monitor stick positions to make sure no change occurs. Serious blade damage can result from improper stick placement.

h. Secure trailing blade to blade rack central holddown position.

CAUTION

When folding a main rotor blade, use care to prevent scratching of the blade by the blade attaching pins securing other blades. Avoid abrading blades against one another or against any other surfaces during the folding procedure. During the folding operation, have an assistant positioned at the outboard end of the blade.

i. Fold left blade as follows:

(1) Remove attach pin from damper arm and move the arm away from the blade; replace pin in damper arm.

(2) Remove blade attach pin from trailing edge of blade at lead-lag link.

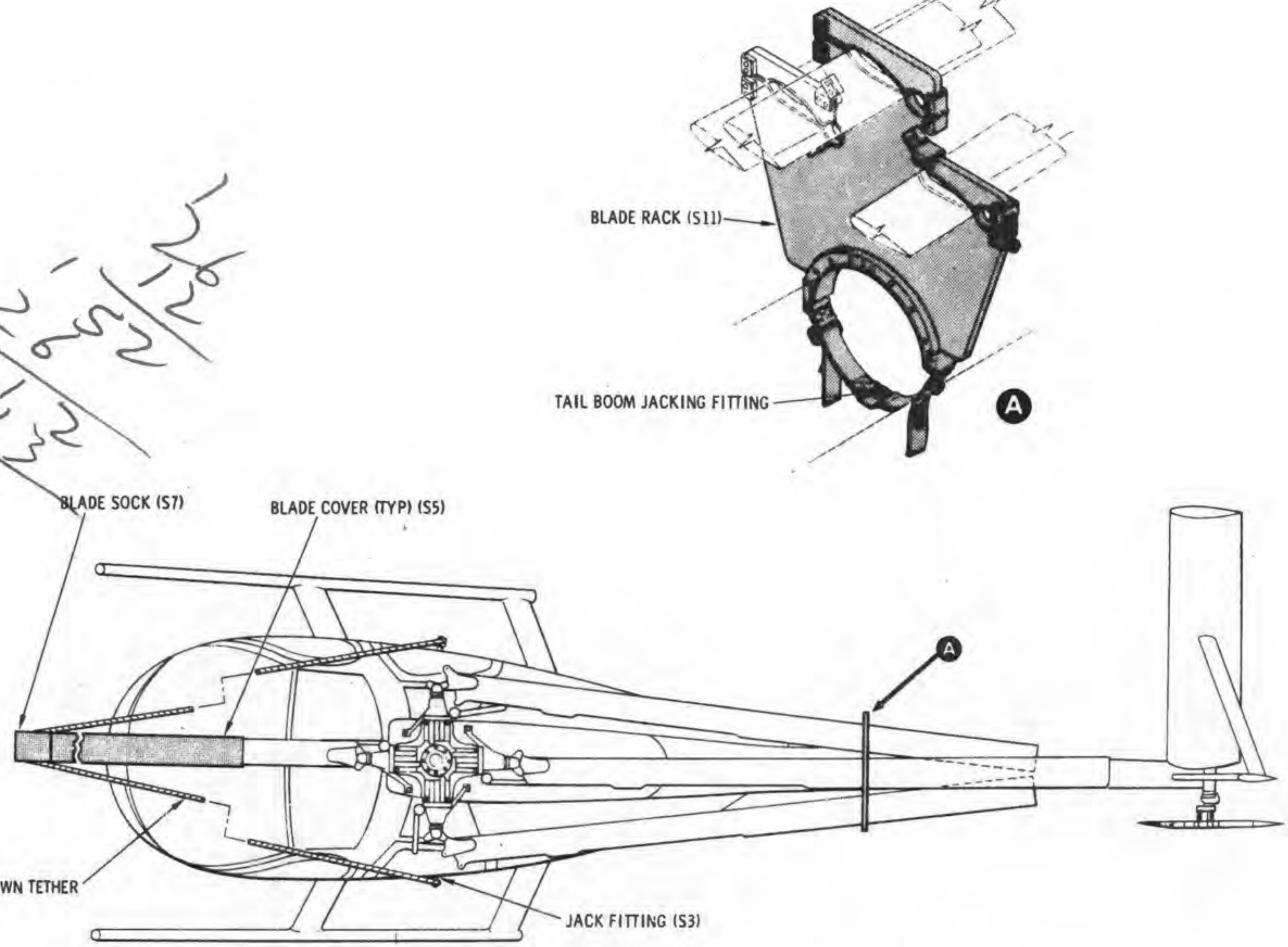


Figure 1-5. Folding and Stowing of Main Rotor Blades.

CAUTION

When performing the next step, unlock but do not remove the blade attach pin that secures the leading edge of the blade to the main rotor hub.

(3) Unlock the trailing edge blade, attach pin that secures the blade to the lead-lag link and position the cam handle vertically above the pin.

(4) Have the assistant rotate the blade to the proper rack position (toward tailboom); secure blade to blade rack. Reinstall blade attach pin to its original position in the lead-lag link on the main rotor hub.

j. Install padding between the damper arms and blades to prevent marring of the blades. Tape or tie padding in place.

k. Secure the forward blade with a blade sock (S7) as shown in figure 1-5.

NOTE

If the main rotor blades are to remain folded for a considerable length of time, the main rotor hub should be covered with a suitable weather-resistant cover (S4).

1-65. Unfolding Main Rotor Blades. *a.* Locate aircraft on most level ground available so that the load is balanced as much as possible.

CAUTION

During blade unfolding, use adequate covering over engine air inlet fairing opening to prevent entry of foreign objects into air intake. Install exhaust covers (S2) on aircraft with upward exhausts.

b. Remove padding between damper arms and blades.

c. Check that the locked positions of the control sticks are as follows:

(1) Collective pitch — mid position.

(2) Longitudinal cyclic — full aft.

(3) Lateral cyclic — two thirds of the total stick travel from full left toward full right.

CAUTION

During blade unfolding, continually monitor stick positions to make sure no change occurs. Serious blade damage can result from improper stick placement. Use care to prevent any scratching or marring of the blades by the blade attaching pins securing other blades. Avoid abrading blades against one another or against any other surface during the unfolding procedure. During unfolding operation, have an assistand positioned at outboard end of the blade.

d. Unfold right blade as follows:

(1) Release blade from rack (fig. 1-5).

(2) Remove blade attach pin from leading edge of lead-lag link for right blade.

(3) Lift right blade and rotate it forward to engage lead-lag link.

(4) Lift blade to align link and blade fitting holes and insert blade attach pin.

(5) Remove attach pin from damper arm, engage damper arm with trailing edge of right blade and insert attach pin.

e. Unfold left blade as follows:

(1) Release blade from rack (fig. 1-5).

(2) Remove blade attach pin from trailing edge of lead-lag link for left blade.

(3) Lift left blade and rotate it forward to engage lead-lag link. Lift blade to align link and blade fitting holes, and insert blade attach pin.

(4) Remove attach pin from damper arm, engage damper arm with trailing edge of left blade and insert attach pin.

f. Lock all attaching pins and check that the locking force is correct. **APPROXIMATE FORCE REQUIRED TO CLOSE HANDLE IS 25 — 35 POUNDS (MAXIMUM HAND PRESSURE).** Adjust pins having incorrect locking force.

(1) Remove pin and adjust by turning small nut at pin end. Do not adjust nut with pin installed.

(2) Reinstall and check locking action until handle closing is the maximum at which the safety latch can be forced over the nut **(25 — 35 POUNDS).**

g. Release trailing blade from blade rack; then remove blade rack from tailboom.

h. Remove blade sock and blade covers.

i. Reinstall any disconnected antennas.

j. Remove tape and cardboard from vibration absorber and check absorber for freedom of movement.

k. Loosen friction on the controls and check movement of controls through complete range of travel.

1-66. Towing. The aircraft may be towed either manually or by a vehicle.

CAUTION

If aircraft is to be towed or transported with the blades folded, the vibration pendulums must be secured with tape or cord to prevent them from striking adjacent blades as a result of bouncing.

Aircraft must not be towed unless flight control access door and fuel cell access doors are securely installed.

1-67. Installation — Ground Handling Wheels. (See fig. 1-6.) *a.* Position ground handling wheel assembly (S9), over the skid tube at the location of the skid fittings.

b. With ground handling wheels in the retracted position, align and engage the skid fittings.

c. Install jack handle (S10) in the wheel assembly socket, install lock pin, and rotate handle downward to lower the wheels and raise the aircraft.

WARNING

Hold downward pressure on jack handle until extended lock snaps into locked position.

d. Check that the extend lock is engaged, release downward pressure and remove jack handle.

e. Install second ground handling wheel assembly on the other skid tube.

NOTE

Ground handling wheel tire pressure should be checked at regular intervals for 80-90 psi and the wheel bearing lubricated with grease (C45).

1-68. Manual Towing. Once the ground handling wheels are installed (para 1-67 above), the aircraft may be moved by hand; balance at the tailboom and push from the rear fuselage portion of the airframe.

1-69. Tug (vehicle) Towing.

CAUTION

The aircraft must be towed at a slow speed, not exceeding 5 mph, except under extreme emergency conditions. Do not allow the front end of the skid tubes to drag on the ground. Avoid sudden stops and starts and short turns which could cause the aircraft to turn over. Allow the inside wheel to rotate (not pivot) while aircraft is being turned. The proper minimum turning radius is approximately 20 feet.

a. Install ground handling wheels (para 1-67 above).

b. Have an assistant lower the tailboom slightly.

c. Position and secure a tow bar at the front end fittings of the wheel jacks.

d. Connect the tow bar to a suitable vehicle.

1-70. Removal — Ground Handling Wheels. *a.* Install jack handle in the wheel assembly socket and install the lock pin. Apply a downward pressure on the jack handle and manually release the extend lock.

WARNING

Keep a firm grip on the jack handle and keep all parts of the body clear of jack handle path of movement.

b. Apply an upward pressure; then rotate jack handle to raise the wheels and lower the aircraft.

c. Remove the ground handling wheel assembly from each skid fitting.

1-71. Jacking.

CAUTION

Aircraft must not be jacked unless flight control access door and fuel cell access doors are securely installed.

a. Provisions for jacking the aircraft (fig. 1-3) are provided by two forward (side) jacking point fittings (S3) and an aft jacking pad.

b. Install jacking fittings (S3) in the fuselage jacking points (fig. 1-3). Secure the jacking fittings with the locking pins that are secured to the fuel cell access doors.

c. Place suitable jacks under jacking fittings, and under aft jacking pad.

d. Raise the aircraft to the desired height.

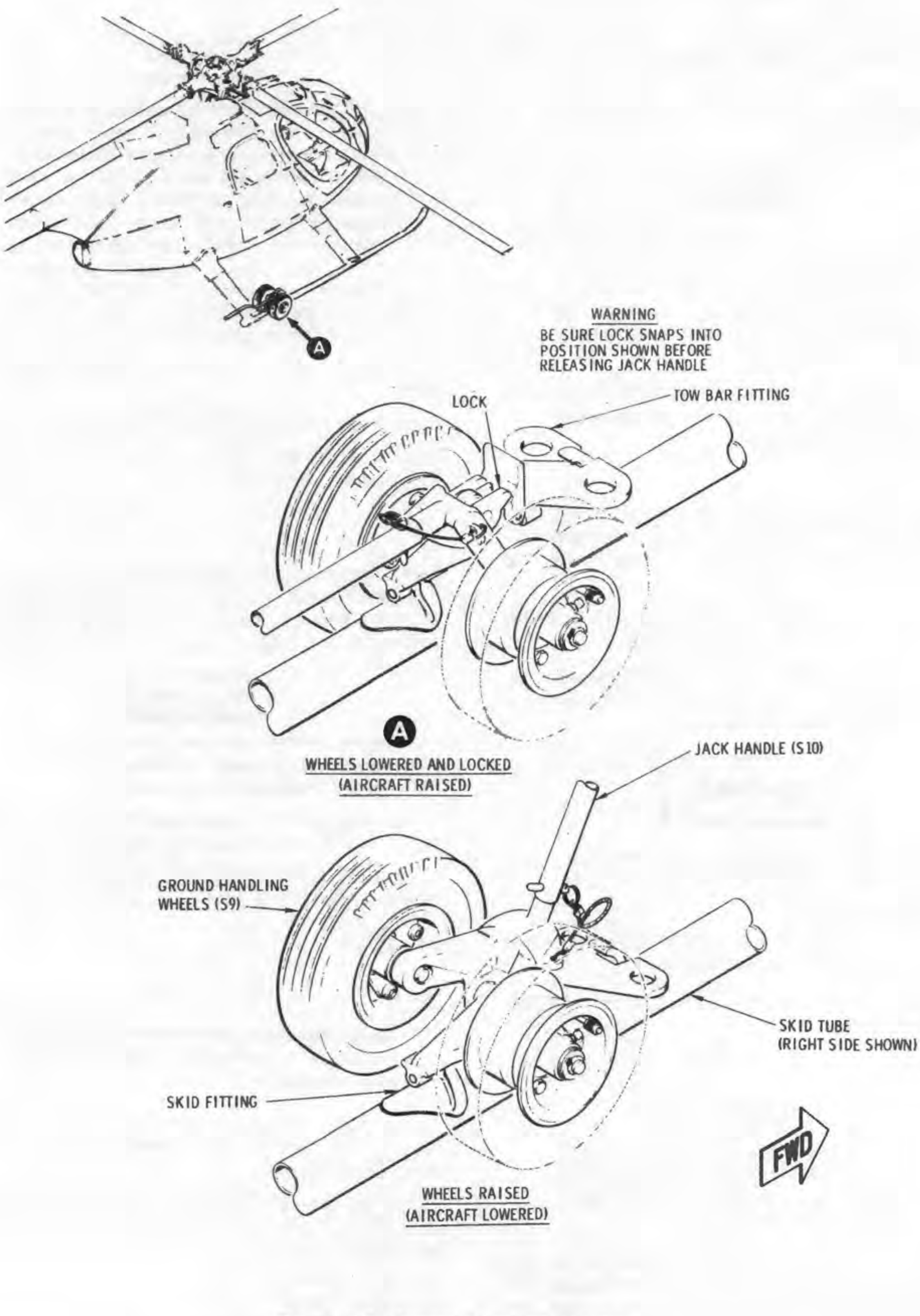


Figure 1-6. Ground Handling Wheels.

CAUTION

When the aircraft is jacked from one side only, a cushioned saddle-type support should be placed under the tailboom at the boom jacking location for extra stability. The landing gear skid on the lifted side should not be more than 6 inches off the ground. Take precautions to avoid bumping or dislodging the aircraft while it is being supported by jacks.

1-72. Parking. To park the aircraft for short periods (for example, between closely scheduled flights), proceed as follows:

CAUTION

To prevent rotor damage from blade flapping (droop stop pounding) as a result of air turbulence from other aircraft landing, taking off, or taxiing, or sudden wind gusts, rotor blades should be secured whenever aircraft is parked.

a. Locate the aircraft slightly more than rotor span from nearby objects, and on the most level ground available.

b. Apply friction to lock the cyclic stick so that the friction control knob is positioned on the lateral and longitudinal travel stop guides as follows: neutral laterally (center of slot), and one-third from rear of longitudinal slot.

NOTE

If not already accomplished, apply index paint marks on guide edges as permanent neutral position locator.

c. Secure the rotor blades as follows:

(1) Turn main rotor blades until they are at a 45-degree angle to the fuselage centerline (fig. 1-7).

(2) Install blade socks (S7) on all blades (fig. 1-7).

CAUTION

Take up slack in tethers but do not exert bending loads on blades.

(3) Secure blade sock tethers to fuselage jacking fittings.

d. Attach static ground wire to GROUND HERE receptacle as shown in figure 1-1.

1-73. Mooring. Local regulations or procedures supplement the following instructions. It is a command responsibility to provide maximum security for the aircraft consistent with actual weather and climatic conditions that prevail. Mooring is defined as a condition under which the aircraft is secured to the ground in the parked condition. The aircraft may be moored with the main rotor blades either extended or folded, depending on environmental requirements.

a. Secure all fuselage doors.

b. Install pitot tube cover (S6) or (S12) on pitot tube.

c. Install exhaust covers (S2) on aircraft with upward exhausts.

d. To moor with main rotor blades extended: Secure the blades to the jacking fittings as shown in figure 1-7, and anchor the aircraft by using standard Army mooring kit (S1).

e. To moor with main rotor blades folded: Fold main rotor blades (para 1-64) and anchor aircraft by using standard Army mooring kit (S1).

f. When wind velocities exceed 25 knots (or are forecasted to exceed 25 knots) accomplish the following additional mooring procedures:

(1) Fill fuel tank.

(2) Apply friction to lock the cyclic and collective sticks.

g. Evacuate the aircraft to a safe area, such as a hanger or windbreak, whenever adverse or extreme weather conditions are forecasted or anticipated.

CAUTION

Whenever severe storm conditions (hurricanes, etc), or wind velocities higher than 40 knots are forecast, the aircraft should be evacuated to a safer area, if possible. The omission of additional references to specific precautions in this manual shall not be construed as relieving personnel of the

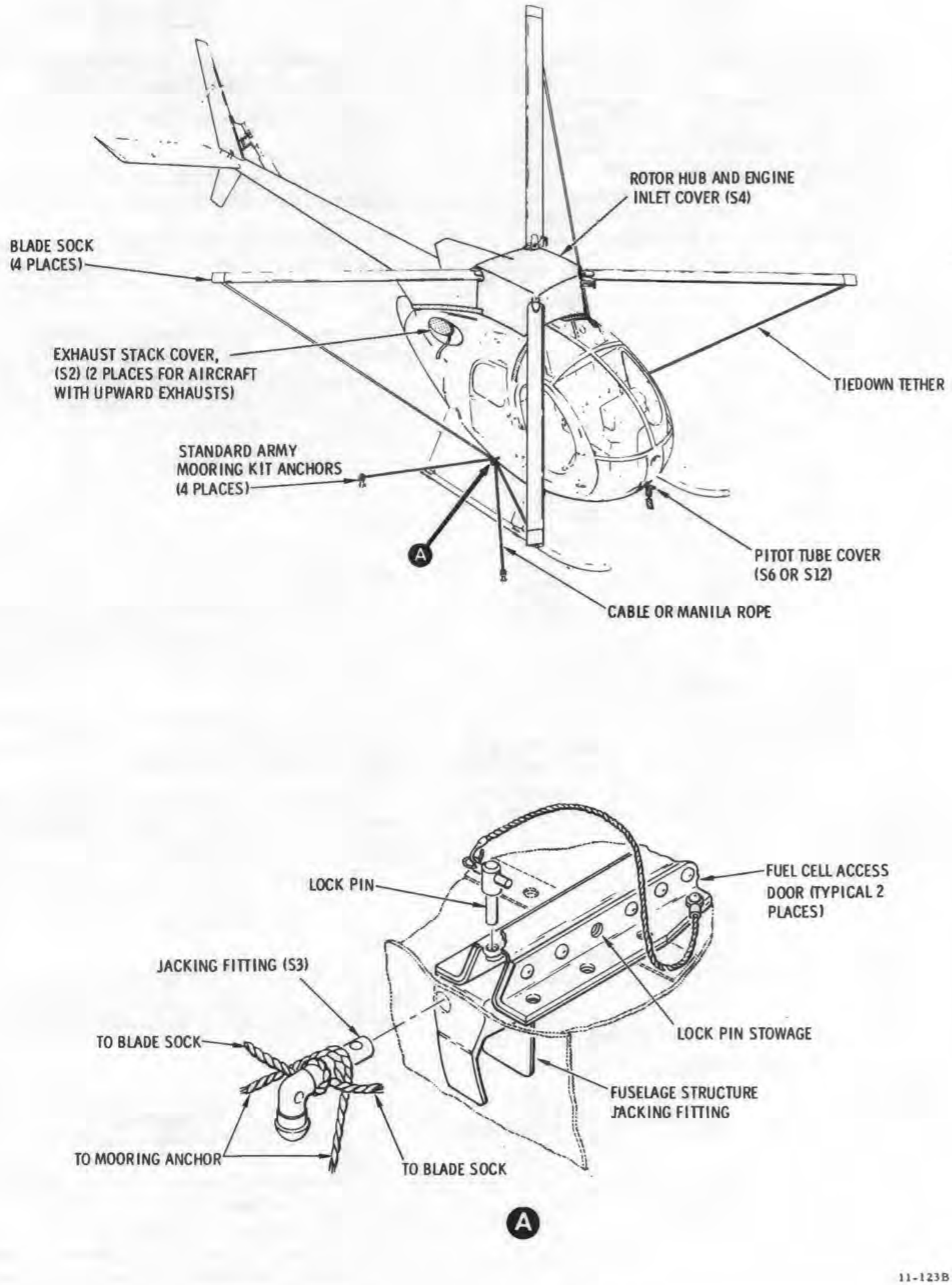


Figure 1-7. Securing Main Rotor Blades.

responsibility for performing any operation deemed necessary to provide maximum security for the aircraft.

1-74. Hoisting. Observe the following precautions (para 1-75) during any hoisting operation.

1-75. Hoisting Precautions. *a.* Use a hoist of no less than 3500-pound capacity when hoisting the complete helicopter.

b. Use hoisting equipment of sufficient capacity (minimum twenty-percent over-rate) to hoist the heavier components if handled separately. (Table 1-6 lists approximate weights.)

CAUTION

Any time work is being performed near the engine air inlet, use care to prevent entry of foreign objects. On aircraft without a filter installed, tape covers of cardboard or other suitable material in place over the engine inlet screen. Plug the oil cooler air inlets. Do not remove covers until work is completed and any debris is thoroughly cleaned out of the area. After removing covers, verify that area around base of mast, inlet plenum, and entire plenum chamber is free of foreign material and reinstall plenum access doors.

1-76. Hoisting Operation.

Table 1-6. Approximate Hoisting Weights of Components.

Tailboom	14 lb
Main Rotor hub	56 lb
Main transmission	78 lb
Engine (built up)	180 lb
Aircraft (less engine)	980 lb
Aircraft (less main rotor hub, swashplate, scissors, and rotor blades)	970 lb
Aircraft (complete)	1160 lb

NOTE

On aircraft equipped with permanently installed lifting bracket illustrated in figure 1-3, special tool (T15) is not required, and steps a and b below are unnecessary.

a. Install hoisting adapter (T15) on main rotor hub so that the hoisting eyebolts fit into the slots on the hoisting adapter (fig. 1-3).

b. Install the four clevis pins.

c. Attach cable from overhead hoist to the adapter eye.

d. Secure a line to the tailboom. Have an assistant hold the line to keep the aircraft from swinging.

e. Hoist slowly and smoothly to maintain a steady lifting force.

1-77. Sling Loading (Airlift Recovery). For airlift recovery of the aircraft, use the belly band procedure described in ST 55-413-2 until publication of FM 55-413.

CAUTION

Lifting bracket (T9) shown in figure 1-3 shall not be used for aircraft (airlift) recovery.

1-78. Application of External Power. An external power receptacle is located at the right side of the pilot's compartment seat structure (fig. 1-1). A source of external power capable of 350 to 450 amperes and 28 volts is recommended for starting the engine; however, limits of 300 to 750 amperes and 28 volts are allowable for starting the engine.

CAUTION

Before connecting external power, make certain that the aircraft main electrical power selector switch is at the OFF position. After power is connected to the receptacle, the power switch must be at EXT position to connect external power to the aircraft electrical system.

NOTE

External power units with ampere ratings less than that specified above must be used with a battery (24 v) wired in parallel to provide amperage required. The positive (+) and negative (-) voltage terminals are clearly marked on the base of the receptacle to prevent reversing of polarity if a standard auxiliary power plug is not available.

SECTION IV INSPECTION REQUIREMENTS

1-79. INSPECTION REQUIREMENTS.

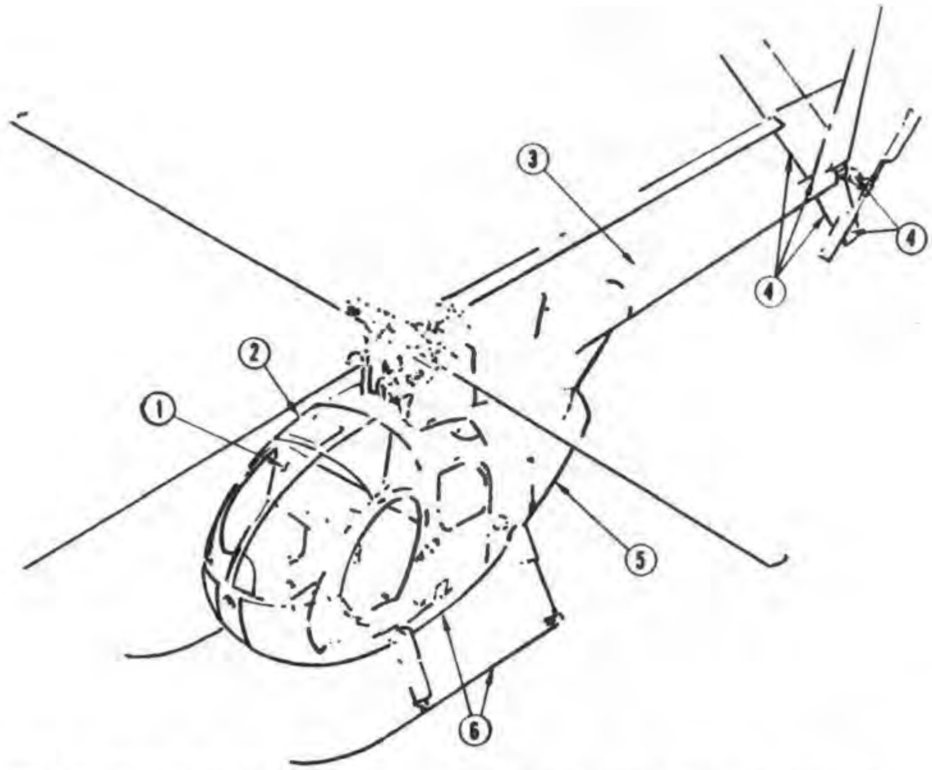
1-80. General — Inspection Requirements. This section contains complete requirements for special inspections, overhaul and retirement schedule, and standards of serviceability applicable to the OH-6A aircraft. The inspections prescribed in this section shall be accomplished at specified periods by aviation unit maintenance activities with the assistance of intermediate maintenance activities when required. Complete Daily, Intermediate, and Periodic inspections are contained in Preventive Maintenance Services checklists (TM 55-1520-214-PMS). In order to arrange inspection requirements as nearly as possible according to the manner in which work will be assigned, requirements are divided into groups under area headings (fig. 1-8). This manual pertains to all OH-6A series aircraft, and may therefore contain inspection requirements applicable to specific equipment not installed in individual aircraft. When this situation is encountered, requirements that are not applicable should be disregarded. Refer to TM 38-750 for applicable forms, records, and work sheets.

NOTE

During inspection of teflon lined bearings, refer to TM 55-1500-322-24 (Maintenance of Aeronautical Antifriction Bearings).

1-81. Standards of Serviceability. Standards of serviceability to be utilized in the day-to-day inspection and maintenance of the aircraft can be found as fits, tolerances, wear limits, and specifications in the aircraft maintenance manuals. Standards of serviceability for transfer of aircraft are contained in TM 55-1500-326-24.

1-82. Special Inspection. This supplements the scheduled inspections as outlined in the Preventive Maintenance Services, TM 55-1520-214 PMS, to include inspection of items which are required to be inspected at intervals not compatible with airframe operating time or airframe inspection intervals. Special inspection is as follows:



AREA NO. 1 CANOPY AND PILOTS COMPARTMENT

AREA NO. 2 RH FUSELAGE (FORWARD CENTER AND AFT SECTIONS) FRONT PART OF A - FRAME (TUNNEL AREA) RH MAIN ROTOR AND RH LANDING GEAR

AREA NO. 3 FUSELAGE BOOM

AREA NO.4 STABILIZER TAIL ROTOR TRANSMISSION AND TAIL ROTOR

AREA NO. 5 ENGINE COMPARTMENT

AREANO. 6 LH FUSELAGE (FORWARD CENTER AND AFT SECTIONS) FRONT PART OF A - FRAME (TUNNEL AREA) LH MAIN ROTOR AND LH LANDING GEAR

Figure 1-8. Area Diagram.

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AREA NO.	SPECIAL INSPEC-TION NO.	REQUIRE-MENT EVERY	ITEM	STATUS	RECORD-ED ON WORK SHEET
	1,		**HARD LANDING OR AFTER MAJOR DAMAGE**		
			Accomplish the following:		
5			a. Visually inspect engine mounts, mounting pads and firewall for damage and distortion. Inspect all suspected parts by the magnetic particle or flourescent penetrant methods, as applicable.		
2 & 6			b. Inspect landing gear and landing gear components and attaching areas for breaks, cracks, or other damage or distortion.		
2 & 6			c. Inspect fuselage fittings for bends and cracks.		
2.5 & 6			d. Inspect fuel cells, supports, tubing, hoses and breakaway fittings for leaks, cracks and security.		
5			e. Inspect engine chip detectors for metal particles (TM 55-2840-231-23).		
5			f. Inspect engine oil tank, supports, tubing and hoses for leaks, cracks and security.		
2 & 6			g. Inspect main transmission chip detectors for metal particles. Inspect main transmission drive shaft for distortion, breaks, cracks or other damage. Perform an alignment check of the main transmission drive shaft.		
5			h. Inspect engine accessory drive housing for cracks (TM 55-2840-231-23).		
5			i. Check all engine accessories for cracked flanges, loose bolts and nuts, connections, and general condition.		
2 & 6			j. Inspect tunnel area A-frame for distortion buckling or any other damage.		
3 & 4			k. Inspect tail boom, tail rotor drive shaft couplings and damper (shaft removed), tail rotor transmission and tail rotor for distortion, loose mounts or attaching parts, buckling, breaks, or other damage.		
2 & 5			l. Inspect transmission oil filter and engine oil and fuel filters for loose bolts and damaged filter elements (TM 55-2840-231-23).		
5			m. Check air, oil and fuel hose connections for tightness.		
All Areas			n. Inspect all flight and engine control system push-pull tubes, links, bell-cranks, and bearings for bends, cracks, security, and freedom of movement.		
2 & 6			o. If hard landing is made to low rpm inspect rotor blades for bending, cracks, or wrinkles.		
2 & 6			p. Inspect rotor blade droop stops for damage.		
2 & 6			q. Inspect accessible areas of main rotor mast assembly and transmission attachment area.		
1, 2, 5 & 6			r. On aircraft equipped with armor, inspect armor for security of attachment, buckling, and distortion.		
2			s. Inspect keep beam in cargo compartment for buckling, loose or missing rivets, and tears or cracks in web or stiffeners.		

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1			t. Inspect WSPS as follows: (1) Inspect upper and lower cutter assemblies and windshield deflector assembly for obvious damage. (2) Inspect attachment areas for damage. (3) Check security of lower cutter breakaway tip.		

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AREA NO.	SPECIAL INSPECTION NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORK SHEET
			NOTE **Sudden stoppage is defined as an abnormal deceleration of the drive system caused by the main rotor or tail rotor blades striking something which causes rapid deceleration.** **Sudden stoppage could be further defined as an instantaneous shock load applied to the drive train and rotor system. Shock loads result from blades striking an object.**		
2 & 6	2.		**MAIN ROTOR BLADE STRIKE (MAJOR VISIBLE DAMAGE) OR AFTER SUDDEN STOPPAGE.**		
			Inspect the following:		
			a. If the main rotor blades contact an object while rotating, inspect the rotor blades for security of all bonds and visible damage. If the bond is separated in any area, or dents and scratches are in excess of allowable limits, replace blades.		
5			b. Inspect engine mounts for security, cracks or misalignment.		
2 & 6			c. Inspect transmission oil filter and each chip detector for metal particles.		
			d. Inspect compressor rotor and stator blades and turbine blades (TM 55-2840-231-23) for foreign object damage.		
2 & 5			e. On aircraft without engine air filter, inspect engine air inlet for foreign objects; then motor engine and check for unusual noise.		
2, 5 & 6			f. Reinspect chip detectors after 8 hours of engine operation.		
2, 3, 4			g. Inspect all power train drive shafts and drive shaft couplings (tail rotor drive shaft removed).		
4			h. Inspect tail rotor assembly.		
2 & 6			i. Inspect complete main rotor assembly for evidence of damage.		
	3.		**TAIL ROTOR BLADE STRIKE**		
			Accomplish the following:		
			a. Inspect tail rotor transmission and main transmission chip detectors for metal particles.		
2, 4, & 6			b. Inspect tail rotor drive shaft (shaft removed), damper and couplings for distortion, breaks, cracks or other damage. Shaft or damper distortion is cause for replacement of tail rotor transmission.		
4			c. Inspect tail rotor transmission for TIR of output level pinion gear shaft cracks (5 power magnifying glass required) in mounting flanges and output shaft housing support junction area.		

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4			d. Inspect aft frame of tail boom for cracks and boom skin for loosened or popped rivets.		
	4.		**POWER TRAIN SUDDEN STOPPAGE**		
			Accomplish the following:		
			NOTE: Power train sudden stoppage will be indicated by signs of impact between main rotor lead-lag arms and lag stop or by compression damage to trailing edge of rotor blades immediately outboard of damper attachment point.		
2 & 6			a. If damper arm has contacted damper stop, replace main rotor hub, main rotor drive shaft, main drive shaft, and main transmission; inspect tail rotor drive shaft and couplings (shaft removed) for damage.		
2 & 6			b. If damper arm has not contacted damper stop, visually inspect main rotor hub for damage, paying particular attention to droop stop mechanism and strap packs.		
3			c. Inspect aircraft structure forward of tailboom attachment for evidence of sheet metal yielding or buckling, paying particular attention to signs of buckling at right-hand side of aircraft forward of tailboom attachment.		
5			d. Inspect engine mounts for security, cracks, or alignment.		
2 & 5			e. Inspect compressor rotor and stator blades and turbine blades (TM 55-2840-231-23) for foreign object damage.		
2 & 5			f. On aircraft without engine air filter, inspect engine inlet for foreign objects, then motor engine and check for unusual noise.		
2, 5, & 6			g. Reinspect chip detectors after 8 hours of engine operation.		
4			h. Inspect tail rotor assembly.		
			i. Inspect overrunning clutch subassembly for damage.		
2	5.		**MAIN ROTOR OVERSPEED IN EXCESS OF LIMIT SPECIFIED**		
			(TM 55-1520-214-10.) Accomplish the following:		
			a. If overspeed is between 514 and 540 rpm:		
			(1) Remove main rotor blades: Inspect for visible damage and distortion; vibration absorbers and tip caps for security; all bond lines for evidence of separation; root doublers and attachment fittings for security. Replace any blade with visible bond line separation.		
			(2) Inspect tail rotor blades and hub for visible damage; freedom of movement and security.		
			(3) Refer to main transmission overspeed inspection requirements		
			b. If overspeed is over 540 rpm.		
			(1) Remove main rotor hub assembly and tail rotor assembly and tag for overhaul.		
			(2) Replace main rotor blades.		
			(3) Refer to main transmission overspeed inspection requirements.		

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AREA NO.	SPECIAL INSPEC-TION NO.	REQUIRE-MENT EVERY	ITEM	STATUS	RECORD-ED ON WORK SHEET
2	6.		**MAIN TRANSMISSION OVERSPEED IN EXCESS OF 514 AND 540 ROTOR RPM** Accomplish the following: a. If overspeed is between 514 and 540 rpm: Inspect main rotor transmission and tail rotor transmission chip detectors for metal particles. b. If overspeed is over 540 rpm: (1) Remove main transmission and tag for overhaul. (2) Remove tail rotor transmission and tag for overhaul.		
2	7.		**MAIN TRANSMISSION OVERTORQUE** (TM 55-1520-214-10.) Accomplish the following: a. If overtorque does not exceed transient limits: Inspect main rotor transmission chip detectors for metal particles. b. If overtorque exceeds transient limits: Remove main transmission and tag for overhaul.		
4	8.		**UPON REPLACEMENT OF TAIL ROTOR** Inspect the following: Tail rotor control assembly.		
5	9.		**IF ENGINE OIL TEMPERATURE EXCEEDS 225°F WITHOUT ANY CHANGE IN NORMAL OIL PRESSURE** Refer to TM 55-2840-231-23 a. Ground run aircraft for 10 minutes. Obtain as high a power level as possible without liftoff. b. Reinspect the chip detectors. If the chip detectors are free of particles, reinspect after 5 hours of operation.		
5	10.		**IF ENGINE OIL TEMPERATURE EXCEEDS 225°F WITH A CHANGE IN NORMAL OIL PRESSURE.** Refer to TM 55-2840-231-23.		
5	11.		**FUEL FILTER CAUTION LIGHT INDICATION** Accomplish the following: a. Replace fuel pump filter element. b. Clean fuel control filter assembly (see TM 55-2840-231-23).		
2, 4, 5 & 6	12.		**CHIP DETECTOR LIGHT INDICATION** Accomplish the following: a. On series 1 and 2 aircraft, remove chip detector leads, in turn, or use chip detector switch (as applicable) to determine which chip detector caused the light to go on.		

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			b. Remove and inspect the applicable engine (TM 55-2840-231-23) or transmission chip detector for metal particles.		
			c. Clean the engine oil filter if an engine detector caused the light (TM 55-2840-231-23).		
			d. Clean transmission oil filter if transmission chip detector caused light to go on.		
			e. Request special oil analysis in accordance with TB 43-0106.		
2 & 5	13.		**ENGINE OVERSPEED OR OVERTORQUE IN EXCESS OF LIMITS SPECIFIED (TM 55-1520-214-10)** Accomplish the following: Remove the engine and tag for overhaul (TM 55-2840-231-23).		
2	14.		**AFTER EMERGENCY FUEL USAGE** Emergency fuel usage is limited to an accumulative total of 6 hours. When this limit is exceeded, remove the engine and return it for overhaul. Any mixture of emergency fuel to regular fuel greater than 1% of emergency fuel must be considered emergency fuel usage. Defuel the tank completely. Open the tank sump and drain the remaining fuel into a suitable container. No hot end inspection or operational check is required.		
	15.		**AFTER COMPRESSOR STALL** Refer to TM 55-2840-231-23 and TM 55-2840-241-23.		
5	16.		**ENGINE CHANGE OR REINSTALLATION** Accomplish the following:		
			a. Inspect all fuel and oil system components, lines, hoses and connections for leaks, chafing, and security. Inspect metal line for dents and cracks.		
			b. Pull back or remove insulation sleeving from engine oil inlet line and inspect for kinked or twisted conditions.		
			c. Perform test adjustment of TOT indicating system.		
			d. Engine vibration test required.		
4	17.		**ENGINE PERFORMANCE CHECK REQUIRED** Refer to TM 55-1520-214-MTF.		
			a. After installation of engine.		
			b. Any time poor performance is noted.		
			c. Removal, replacement, repair, or adjustment of fuel control, governor, double check valve, accumulators, throttle linkage, N2 linear actuator, compressor, or combustor.		

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			NOTE Adjustment of fuel control refers to rigging and max speed screw adjustment in accordance with appropriate engine manual. An engine performance check is not required for idle speed adjustment or start derichment adjustments.		
			d. Anytime the torque or TOT indicating system components are adjusted or replaced for error.		
			e. Replacement of FAT gauge for error.		
			f. Anytime a fuel control air line is loosened or replaced.		
			NOTE Fuel control air lines are the air lines between the fuel control and governor, ie. PY, PR, PG, and PC, from tee fitting on governor to fuel control.		

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AREA NO.	SPECIAL INSPEC-TION NO.	REQUIRE-MENT EVERY	ITEM	STATUS	RECORD-ED ON WORK SHEET
5	18.		**INSTALLATION OF AN ENGINE, ENGINE COMPONENTS, MAIN TRANSMISSION OR TAIL ROTOR TRANSMISSION** Accomplish the following: a. Operate engine and check for leaks. b. Shut down and recheck for leaks. c. Inspect firewall bulkhead for damage and distortion evidenced by buckling, cracks, etc.		
2 & 5	19.		**ENGINE CHANGE AS A RESULT OF INTERNAL ENGINE FAILURE** Accomplish the following: a. Remove, clean, and reinstall oil tank, replace oil cooler. b. Flush all lines, fittings and components.		
5	20.		**OVERTEMPERATURE OPERATION** Inspection according to TM 55-2840-231-23 is required. NOTE: Perform adjustment/test of temperature system prior to any engine maintenance action. a. If temperature exceeded 749°C for more than 10 seconds any time during start. b. If temperature was above 927°C any time during start. c. If temperature was 749°C for more than 6 seconds or exceeded 843°C any time during power transient. d. If temperature exceeded 693°C for 5 minutes or more continuous operation.		
	21.		**SUSPECTED FOREIGN OBJECT DAMAGE** Accomplish the following:		
2 & 5			a. Inspect compressor rotor blades and stator vanes and turbine blades (TM 55-2840-231-23).		
5			b. Motor engine and listen for unusual noises. Observe starter limitations.		
5	22.		**ENGINE FLAMEOUT DUE TO POSSIBLE SNOW, ICE, OR WATER IN INGESTION** Accomplish the following according to TM 55-2840-231-23. a. Obtain access to the compressor inlet and inspect vanes of compressor front support and first stage compressor blades for mechanical damage, distortion, or bending. b. Remove and replace compressor if damage noted above is found.		

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5	23.		**IF AIRCRAFT HAS BEEN SUBJECTED TO SALT WATER, SALT WATER SPRAY OR OPERATED WITHIN 10 MILES OF SALT WATER** Accomplish the following: a. Wash engine internally using the procedures outlined in the Compressor Cleaning to Remove Salt Water Contamination section of TM 55-2840-231-23. b. Wash entire aircraft as prescribed by TM 55-1500-333-24.		
	23.1		**IF AIRCRAFT HAS BEEN OPERATED WITHIN 10 MILES OF SALT WATER OR 200 MILES OF VOLCANIC ACTIVITY** Accomplish the following: Clean water wash turbine engine after the last operation of the day (TM 55-2840-231-23).		
2 & 4	24.		**FIRST FLIGHT FOLLOWING ENGINE, MAIN TRANSMISSION, OR TAIL ROTOR TRANSMISSION CHANGE OR REINSTALLATION** Accomplish the following after the first flight as applicable: a. Inspect fuel and oil lines for leakage and security. b. Inspect chip detectors for metal particles. c. Inspect electrical connections for security. d. Inspect all components and engine mounting points for security.		
	25.		**WHEN EQUIPMENT REPLACEMENT, RELOCATION OR MODIFICATION MIGHT RESULT IN COMPASS DEVIATION** Accomplish the following: Check magnetic standby and remote compass indicators for a correct reading on all cardinal headings. If necessary, recompensate.		

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	26.		**AIRCRAFT AIRSPEED BEYOND 10% ABOVE VNE LIMITS** (TM 55-1520-214-10) Accomplish the following:		
2 & 6			a. Remove main rotor blades. Inspect for visible damage and distortion; vibration absorbers and tip caps for security; all bond lines for evidence of separation; root doublers and attachment fittings for security. Replace any blade with visible bond line separation.		
4			b. Inspect tail rotor blades and hub for visible damage; freedom of movement and security.		
4			c. Inspect horizontal and vertical stabilizers; mounting fittings for cracks; retorque mounting bolts; skin for damage and loose rivets; strut fittings lugs for cracks, strut for obvious damage and security.		
3			d. Inspect tail boom for visible deformation, loose or missing rivets, cracks and security, attaching points to fuselage for cracks and security.		
1			e. Inspect canopy glass for security.		

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1	27.		INSTALLATION OF NEW BATTERY Every time a new nickel-cadmium battery is installed, the following will be performed before installation: Prepare for service according to TM 11-6140-203-14-2.		
2 & 6	28.		MAIN TRANSMISSION DRIVE SHAFT REMOVAL (Not required on P/N 369A5100-615). Accomplish the following: a. Check oil level in overrunning clutch. b. When main transmission oil is drained for any reason, remove sight GAGE, rotate main rotor and using an adequate light visually inspect to determine that all sixteen (16) ring gear bolts and securing lockwire are intact and that no cracks are evident on visible areas of the ring gear or gear shaft.		
2 & 6	29.		NEW OR REPLACEMENT MAIN ROTOR HUB INSTALLATION Accomplish the following: a. After installation of the main rotor blades inspect the blade droop angle. b. Inspect under flexible boot for excessive grease that could contaminate teflon bearing after 5 to 10 hours of flight.		
2	30.		DELETED.		
2 & 6	31.		WHEN MAIN ROTOR BLADES HAVING RESTRICTED SERVICE REPAIRS ARE INSTALLED Accomplish the following: a. Perform a daily inspection of all repaired areas for cracks. Replace any blade that has cracks progressing from a repaired area. b. Perform a fluorescent penetrant inspection, as required.		
All Areas	32.		INVENTORY AIRCRAFT 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 AIRCRAFT FROM STORAGE. (Aircraft need not be inventoried while in storage.)		
All Areas	33.		AFTER AN AIRCRAFT HAS BEEN IDLE FOR SEVEN CONSECUTIVE DAYS AND ALL SEVEN CONSECUTIVE DAY PERIODS THEREAFTER, PERFORM A DAILY INSPECTION.		

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AREA NO.	SPECIAL INSPECTION NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORK SHEET
All Areas	34.		**LIGHTNING STRIKE INSPECTION** a. General Requirement whenever the aircraft is struck by lightning: (1) Inspect the fuselage interior and exterior, the landing gear, the rotor systems and ground wire connection for burn marks, cracks, pitting or other signs of high temperature stress, to determine the lightning entry and exit points. (2) Trace the path of the lightning strike to the extent possible using a magnetometer. (3) Check the magnetic compass for accuracy (the degree of inaccuracy may serve as an indicator of the severity of the strike). (4) Inspect all wiring. (5) Inspect antenna for burns and pitting. (6) Inspect all electrically operated components and lighting systems for damage. (7) Inspect communications and navigation equipment for damage. (8) If the preceding steps (1) through (7) reveal major damage has occurred, proceed as follows: (a) Bench test all avionics and electrical systems and components. (b) Perform a continuity check on all wiring and cables. (c) Perform a Voltage Standing Wave Ratio (VSWR) check on all antennas, antenna cables, and connectors. (9) Perform specific inspections/replacements as required. (10) Perform a ground run operational check on the aircraft. Functionally check the flight control system, and all avionics, electrical, lighting, communication, and navigation systems. (11) Repair any damage and replace damaged components as required using standard maintenance practices. b. Specific Requirements whenever lightning strike is evident on main rotor system: (1) Inspect blades for damage such as burns, pitting, skin separation, etc. If damage is evident, locally scrap damaged blade(s). (2) Remove hub assembly and return for overhaul. (3) Inspect all bearings in the fixed and rotating control system located on the main rotor mast.		

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		(4) Remove transmission assembly and return for overhaul.			
		(5) Inspect Main Rotor Mast and drive shaft for evidence of burns.			
		(6) Check drive shafts for residual magnetism. If magnetized or damaged, replace drive shafts and remove engine and return for overhaul.			
		c. Specific Requirements whenever lightning strike is evident on tail rotor system:			
		(1) Inspect blades for damage such as burns, pitting, skin separation, etc. If damage is evident, locally scrap damaged blade(s).			
		(2) Tail rotor assembly return to overhaul.			
		(3) Remove and condemn pitch change links, and pitch change assembly.			
		(4) Inspect bellcrank and control rod for any indications of arcing. Replace as necessary.			
		(5) Remove tail rotor gearbox and return for overhaul.			
		(6) Inspect tail rotor driveshaft and driveshaft dampner for magnetism and/or burns.			
		(7) Check Oil Cooler Blower Assembly, Overrunning Clutch, and Tail Rotor Driveshaft Couplings for residual magnetism. Replace as necessary.			
		(8) Inspect Oil Cooler Assembly for damage. Replace as necessary.			
		(9) If previous drive train items show magnetism, remove transmission and return for overhaul.			
		(10) If the Overrunning Clutch Assembly shows magnetism remove Engine Assembly and return for overhaul.			
		(11) Inspect engine mounts, and fittings for damage. Replace as necessary.			
1	35.	25 ± 2.5 HOURS OR 30 DAYS, WHICHEVER OCCURS FIRST Accomplish the following:			
		a. Perform preventive maintenance checks and services on the nickel-cadmium battery. (Refer to TM 11-6140-203-14-2).			
		b. If two main rotor strap failures are noted, inspect main rotor retention straps.			
		c. Deleted.			

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5	36.	**50 ± 5 HOURS, ACCOMPLISH THE FOLLOWING**		
		Clean engine compressor (TM 55-2840-231-23).		
5	37.	**EVERY 90 DAYS**		
		Accomplish the following: Inspect Power Coupling Nut on all T63-700/5A Engines in accordance with TM 55-2840-231-23. This inspection is not required if nut part number 6890531 is installed. Engines having this nut installed will be identified with a suffix "C" after the serial number. (Example AE400100ABC, AE402603BC.)		
2	38.	**100 ± 10 HOURS**		
		Accomplish the following:		
2 & 6		Every 100 hours, remove controls support Bracket Assembly and penetrant inspect critical area of bracket and matching cap for cracks. Inspect inboard collective torque tubebearing for binding or roughness. This inspection not required on aircraft verified to have steel strap installed on serviceable bracket assembly per MWO 55-1520-214-30-18. When steel strap is installed, visually inspect every 300 hours.		
	39.	**100 ± 10 HOURS OR 120 CALENDAR DAYS, WHICHEVER OCCURS FIRST**		
		Accomplish the following:		
		a. Perform preventive maintenance checks and services on the nickel-cadmiumbattery (TM 11-6140-203-14-2).		
		b. Check voltage regulator setting; adjust for temperature as required. Refer to TM 55-1500-204-25/1.		
5	40.	**REQUIREMENT EVERY 150 HOURS ± 15 HOURS, ACCOMPLISH THE FOLLOWING:**		
		a. Remove, inspect, clean and reinstall engine oil filter (TM 55-2840-231-23). Drain oil system and refill. (Refer to paragraph 1-10.)		

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			b. (Applicable to aircraft with armor provisions installed.) Perform an operational check of oil cooler bypass switch and solenoid valve according to paragraph 4-169.		
			c. Apply a film of lubricant (C63) to starter-generator drive shaft splines.		
			d. Perform an engine deceleration check (TM 55-2840-231-23).		
			NOTE		
			Above check is only required when using alternate fuel.		
			e. Remove landing gear strut fairings and inspect struts for cracks or loose rivets. (Not applicable to one piece struts.)		
			f. Inspect and repack overrunning clutch bearings. (Refer to paragraph 6-30.1.)		
			g. Inspect tail rotor pedal to bellcrank connecting link for cracks.		
			REQUIREMENT EVERY 150 HOURS ± 15 HOURS OR 12 CALENDAR MONTHS, WHICHEVER OCCURS FIRST.		
			a. Remove, clean and inspect transmission oil filter. (Refer to paragraph 1-15).		
2 & 6			b. Drain oil from transmission and refill (refer to para 1-13). When main transmission oil is drained for any reason, remove sight gage, rotate Main Rotor and using an adequate light, visually inspect to determine that all sixteen (16) Ring Gear Bolts and securing lockwire are intact and that nc cracks are evident on visible areas of the Ring Gear or Gearshaft.		
			c. Drain oil from tail rotor transmission and refill. (Refer to paragraph 1-16).		

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AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	SPECIAL INSPECTION NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORK SHEET
			REQUIREMENT EVERY 150 HOURS ± 15 HOURS OR 6 CALENDAR MONTHS; WHICHEVER OCCURS FIRST.		
			Remove main rotor blades (Refer to paragraph 5-4) and accomplish the following:		
			a. Visually inspect for excessive wear, evidence of corrosion or cracking. Any evidence of excessive wear, corrosion or cracking requires replacement of the attach pin.		
			b. Using a 5X magnifying glass, inspect area of cam locking lever at top attaching point for cracks. Any evidence of cracking requires replacement of the attach pin.		
			c. Accomplish corrosion control lubrication of pivoting surface.		
			d. Visually inspect the exposed portion of the attachment lugs of the main rotor blade root fittings, 369A1100-501, -503, -505, -601; and of the exposed portions of the attachment lugs of the main rotor hub and lead-lag links, 369A1203, 369A1203-3, -11, 369H1203, 369H1203-11, -21 for cracked lugs, corrosion or other damage to the lug areas.		
			e. Do not remove bushings or corrosion inhibiting sealer.		
			f. Visually inspect area around attach pin hole bushings in the lugs using a bright light and 5X magnifying glass.		
			g. If visual inspection indicates cracked lug in main rotor blade upper or lower root fittings, confirm indication with fluorescent dye penetrant inspection per MIL-I-25135. If crack is noted, replace main rotor blade before further flight.		
			gA. Inspect the main rotor retention straps. (Refer to page 5-9, paragraph 5-9k).		
			h. If visual inspection indicates cracked lug in main rotor lead-lag links, confirm indication with fluorescent dye penetrant inspection per MIL-I-25135. If crack is noted, main rotor hub must be removed and replaced.		
			i. If corrosion inhibiting sealer is not already installed or becomes loose, clean and then seal all junctions between all the steel bushing and the attachment lugs with a light film of primer coating (C79), NSN 8010-00-297-0593, without removing the bushings.		
			j. Install main rotor blades. (Refer to paragraph 5-72).		

AIRCRAFT INSPECTION CHECKSHEET			TYPE OF INSPECTION SPECIAL	PAGE NO.	NO. OF PAGES
AIRCRAFT AND SERIAL NO.			INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	SPECIAL INSPEC-TION NO.	REQUIRE-MENT EVERY / ITEM	STATUS	RECORD-ED ON WORK SHEET
1	41.	**6 MONTHS** Accomplish the following: Inspect portable fire extinguisher (TM 55-1500-204-25/1).		
5	42.	**EVERY 300 ± 30 HOURS OR 24 CALENDAR MONTHS, WHICHEVER OCCURS FIRST.** Engine Compressor Liner. Refer to TM 55-2840-231-23. Accomplish the following: a. Replace the fuel pump filter element. b. Clean the fuel control filter assembly. c. Inspect Vibration Absorber bracket for cracks and breaks.		
2 & 6		d. Free air temperature gauge - Inspect for obvious damage and test in accordance with TM 55-1500-204-25/1, or replace if required.		
1	43.	**12 MONTHS** Accomplish the following: Check magnetic standby compass for discoloration of liquid and proper calibration. If necessary, recompensate. (Refer to TM 55-1500-204-25/1.) Check remote compass indicator for calibration. If necessary, recompensate. (Refer to TM 55-1500-204-25/1.)		
1	44.	**24 MONTHS OR NEAREST SCHEDULED INSPECTION** Accomplish the following: a. Perform functional check of pitot static system and instruments. b. For encoding altimeters, after the 24 month test or replacement of the altimeter, check mode C (altitude) test using the appropriate transponder test procedure in TM 11-6625-667-12 or TM 11-4920-296-14&P. c. Replace nylon cloth, Raschel Knit, seat covers (pilot and co-pilot). Refer to TM 55-1500-204-25/1.		
All	45.	**24 MONTHS** Weigh aircraft and perform weight and balance records check. (Refer to TM 55-1520-214-10 and TM 55-1500-342-23.)		
1	46.	**36 MONTHS** Accomplish the following: Inspect crashworthy fuel cells. (Refer to paragraph 10-2A.)		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSPECTION SPECIAL	PAGE NO.	NO. OF PAGES
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	SPECIAL INSPECTION NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORK SHEET
	47.		**PITOT STATIC FUNCTION CHECK** A functional check of Pitot Static System and Pitot Instruments will be performed following any opening and closing of the Pitot Static System, except for the use of system drain.		
1	48.		**AFTER KNOWN OR PROBABLE WIRE STRIKE** Accomplish the following: a. Inspect for damage to aircraft structural surfaces and external components. Inspection should include fuselage, landing gear, main rotor and tail rotor assemblies, flight controls, engine inlet and exhaust, main transmission, external instruments and accessories. b. Inspect condition and security of WSPS upper and lower cutter assemblies and windshield deflector assembly. Minor nicks and scratches to components except to sawtooth and cutter blades, may be dressed out. Components showing evidence of any cracks or deformation must be replaced. Replace loose or damaged fasteners. c. Inspect sawtooth blades and cutter blades for any deformation, nicks, scratches, cracks or gouges. Blades showing evidence of any type of damage must be replaced. Damaged or missing rubber coating may be repaired using approved sealant.		
1	49.		**LOWER WSPS GROUND CONTACT** Accomplish the following: a. Inspect lower cutter assembly for visible damage and security. Components showing evidence of any cracks or deformation must be replaced. b. Inspect attachment area for damage and security. Replace loose or damage fasteners. c. Replace lower cutter breakaway tip assembly.		

AIRCRAFT INSPECTION CHECKSHEET	TYPE OF INSPECTION SPECIAL	PAGE NO.	NO. OF PAGES
AIRCRAFT AND SERIAL NO.	INSPECTION NO.	DATE OF INSPECTION	

AREA NO.	SPECIAL INSPECTION NO.	REQUIREMENT EVERY	ITEM	STATUS	RECORDED ON WORK SHEET
2 & 6	50	**EVERY 600 HOURS**	Accomplish the following: a. Regrease the swashplate bearing assembly. b. After initial flight, remove all grease from uniball and wipe excess grease from the swashplate bearing assembly. c. Inspect main rotor retention straps (paragraph 5-9).		
All Areas	51	**AFTER AN AIRCRAFT HAS BEEN IDLE FOR 14 CONSECUTIVE DAYS AND ALL 14 CONSECUTIVE DAY PERIODS THEREAFTER**	Perform an engine run-up.		

SECTION V OVERHAUL AND RETIREMENT SCHEDULE

1-83. OVERHAUL AND RETIREMENT SCHEDULE.

WARNING

TM 55-1500-328-25 should be refered to concerning mutilation/destruction of items when they have reached the established life expectancy (finite life) before the items are forwarded for property disposal.

1-84. General - Overhaul and Retirement Schedule. This section lists (table 1-7) 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 is due unless otherwise specified in TM 55-1500-328-25. Upon replacement of items listed in this chapter, all applicable forms, records and worksheets will be completed and updated as required (TM 38-750).

1-85. Overhaul Interval. The maximum authorized operating time of parts prior to removal for overhaul at level authorized in accordance with the Maintenance Allocation Chart.

1-86. Retirement Interval. The operating time specified for removal, condemnation, and disposal of parts in accordance with applicable directives.

Table 1-7. Overhaul and Retirement Schedule.

Area (fig. 1-8)	Overhaul Interval (hr)	Retirement Interval (hr)	Item	Part Number
2	750		Main transmission assy	369A5100
				369A5100-601
				369A5100-603
				369A5100-605
				369A5100-607
	On condition			369A5100-609
				369A5100-615
2	On condition		Transmission lube pump	369A5264
2		1,200	Swashplate control bearing assy	369A7003
	1,200	2,400		369A7003-3
2 & 6		5,760	Main rotor blade attach pin	369A1004
				369A1004-3
2 & 6		1,570	Main rotor blade assy	369A1100
		1,570		369A1100-601
2 & 6		5,710	Main rotor mast assy	369A2014
				369A2014-106
2 & 6		1,990	Main rotor drive shaft	369A5520
		3,900		369A5500
2 & 6		3,700	Interconnect center shaft	369A5510
2 & 6	1,200		Main rotor hub assy	369A1200
				369A1200-3
				369A1200-615
				369A1200-617
3		8,730	Tail rotor drive shaft assy	369A5518
				369A5518-601
3		2,177	Tail boom assy	369A3500
				369A3500-601
				369A3500-603
				369A3500-605
				369A3500-615
				369A3500-617
				369A3500-619
4		3,000	Horizontal stabilizer assy	369A3600
				369A3600-601
				369A3600-603
				369A3600-605
4		3,170	Upper vertical stabilizer assy	369A3625
				369A3625-601
				369A3625-603
4	500		Tail rotor transmission	369A5400
	500			369A5400-601
	1,500			369A5400-605
	750			369A5400-607
4	600		Tail rotor assy	369A1600-3
				369A1600-5
				369A1600-7
				369A1600-9

Table 1-7. Overhaul and Retirement Schedule. (cont)

Area (fig. 1-8)	Overhaul Interval (hr)	Retirement Interval (hr)	Item	Part Number
	600		Hub and Blade Assy	369A1600-21
	600			369A1600-907
	1200			369A1620-603
	2400			369A1620-609
	2400			369A1620-611
4		7,080	Tail rotor shaft coupling	369A5501 19E111-1A
5	750		Turboshaft engine (Allison)	6852600
	750			6874201
5	1,000		Turboshaft engine (Suffix "B" serial numbers only) (Allison)	6874201
4		5600	Tail Rotor Blade Assy	369A1613-9
4		5100	Tension-Torsion Stray Assy	369A1706 369A1706-5d

CHAPTER 2

AIRFRAME

SECTION I FUSELAGE

2-1. FUSELAGE.

2-2. Description — Fuselage. The fuselage is divided into three major sections; forward section, lower section, and aft section.

a. Forward Section. The fuselage forward section includes the canopy installation and pilot's door frames.

b. Lower Section. The fuselage lower section includes the pilot's seat support structure, pilot's compartment floor, cargo compartment floor, underfloor electronics compartments and battery area, floor and seat support bulkheads and associated structure, the center beam assembly, landing gear fittings, and the fuel tank support structure.

c. Aft Section. The fuselage aft section includes the main rotor mast support structure, cargo door frames, engine compartment, engine air inlet (plenum chamber) installation, engine inlet aft fairing, firewall installation, and the boom fairing.

2-3. NON-STRESSED ACCESS DOORS AND COVERS.

2-4. Description — Non-Stressed Access Doors and Covers. Removable access doors and covers (fig. 2-1, sh 1 thru 4) are provided for servicing, inspection, removal, installation, and adjustment of components. Except for stress areas, the access provisions provided in the outer fuselage, the pilot's compartment, the cargo compartment and aft bulkhead stations have turnlock type quick-opening fasteners. Screws are used to secure access doors in stress areas. Liquid level plugs allow "sight" inspection of the lubricant levels of the main transmission, engine oil tank, and tail rotor transmission.

CAUTION

Any time maintenance work is to be performed near the engine air inlet, use care to prevent entry of foreign objects that might later be sucked into the compressor. On aircraft without a barrier filter installed, tape covers of cardboard or other suitable material in place over engine inlet screen in the plenum chamber. Plug the oil cooler air inlets. Covers should not be removed until work is completed and debris is thoroughly cleaned out of the area.

2-5. Inspection — Non-Stressed Access Doors and Covers. Inspect non-stressed access doors and covers for the following:

a. Cracks and other visible damage.

b. Turnlock fasteners and receptacles for proper fastening.

c. Cover gaskets, if applicable, for deterioration or missing sections.

2-6. Repairs — Non-Stressed Access Doors and Covers. Refer to paragraph 2-7.

2-7. Repair and Replacement — Non-Stressed Sheet Metal Damage. Non-stressed sheet metal members consist primarily of hinged covers, access covers and doors (except the fuel cell access and controls access doors which are stressed). Guidelines defining repair of damage are described in paragraph 2-269 and as follows.

2-8. Negligible Damage — Non-Stressed Sheet Metal. Small dents, scratches, nicks, and light corrosion deposits are considered negligible damage. Cracks that do not exceed 0.25 inch in length, are less than one-fourth the width of the damaged component, are removed at least 1 inch from the end of the damaged component or an attachment point, may also be considered negligible damage.

a. Replace defective rivets, nutplates, or fasteners.

b. Replace defective gaskets, as applicable.

c. Smooth-countour dents that do not exceed 0.12-inch depth do not require repair if they will not damage or deform mating structure.

2-9. Patch or Insertion Repair — Non-Stressed Sheet Metal. Holes and cracks in non-stressed sheet metal may be patched if they do not exceed the following percentages of total surface area:

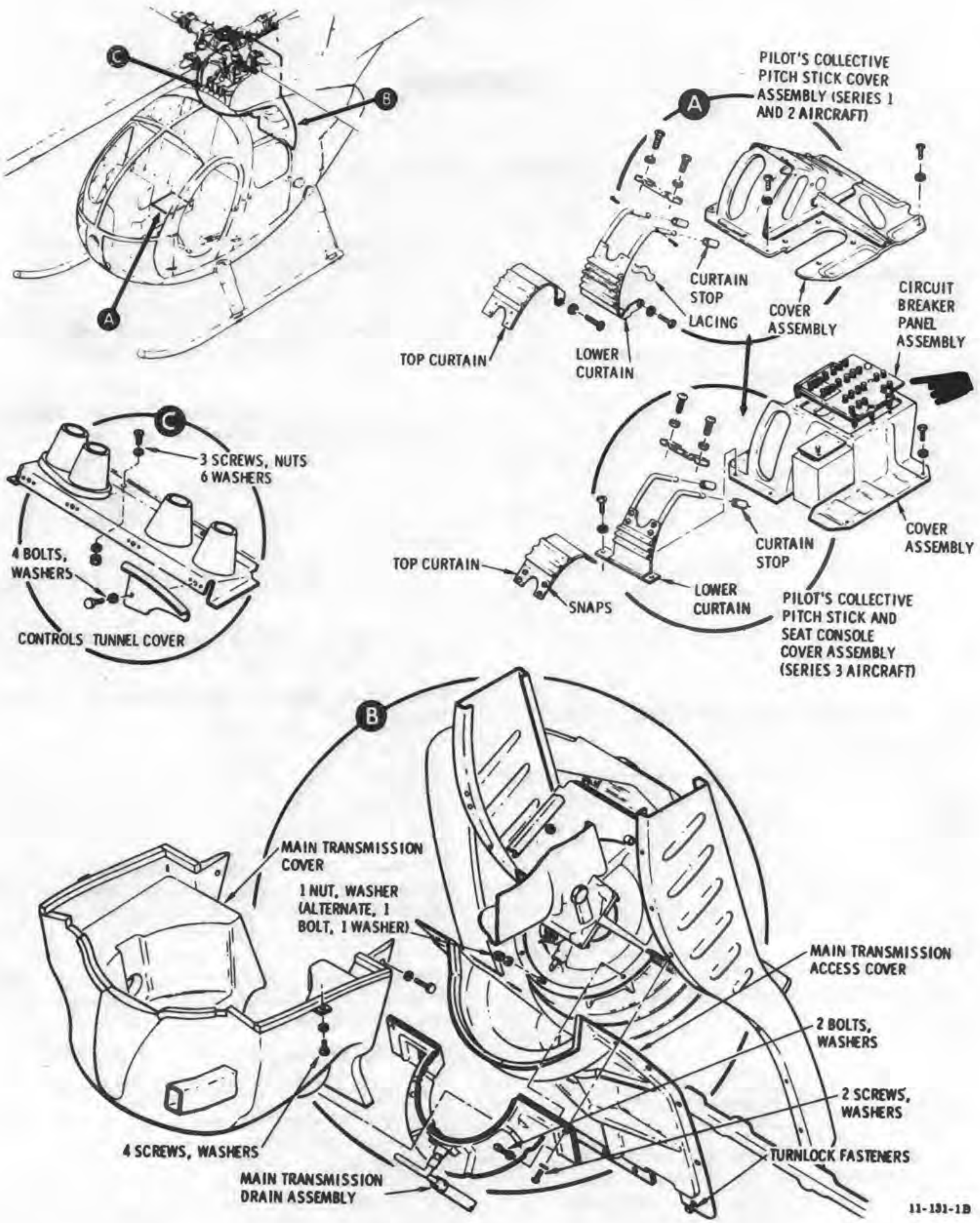


Figure 2-1. Access and Inspection Provisions (Sheet 1 of 4)

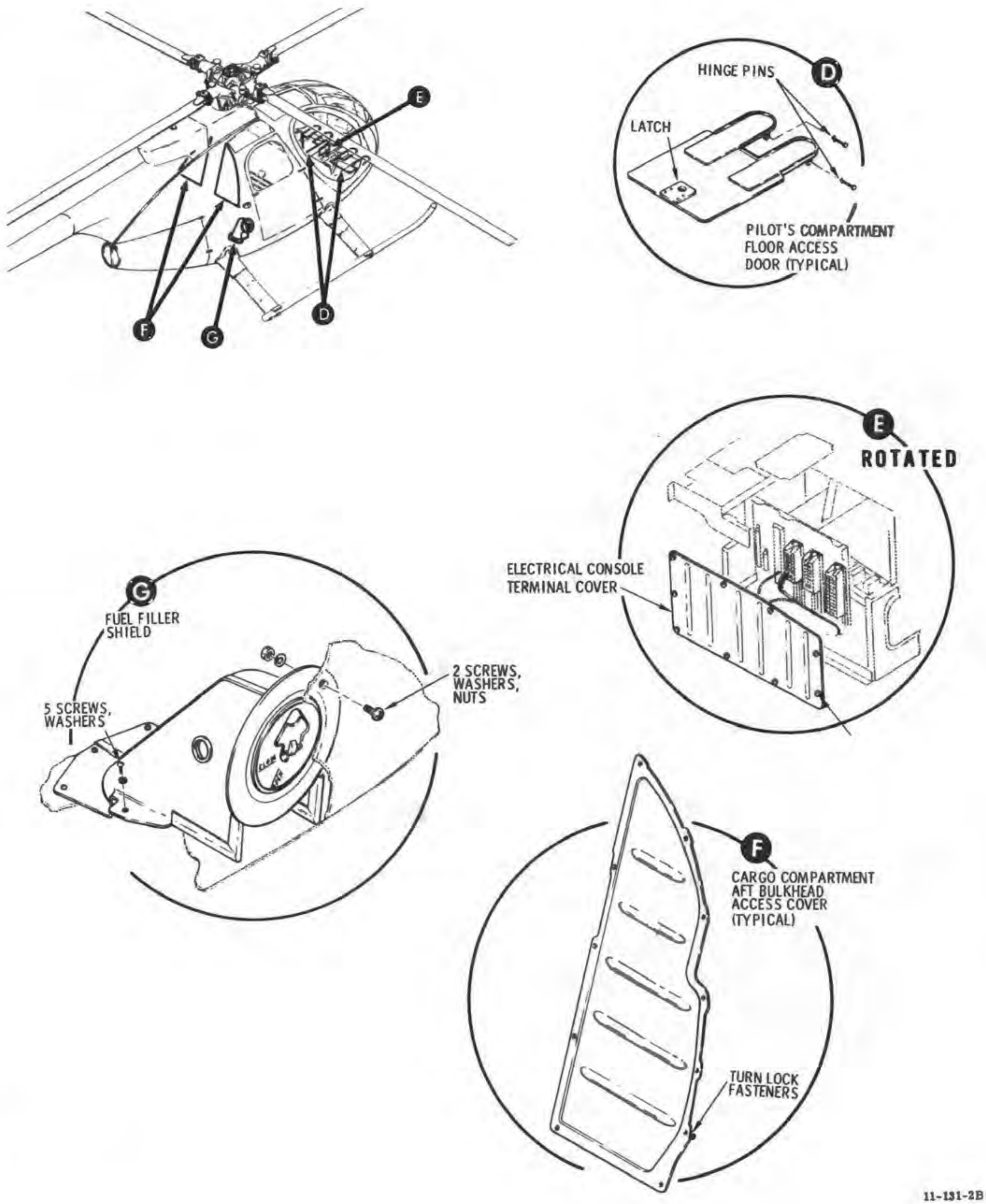


Figure 2-1. Access and Inspection Provisions. (sheet 2 of 4)

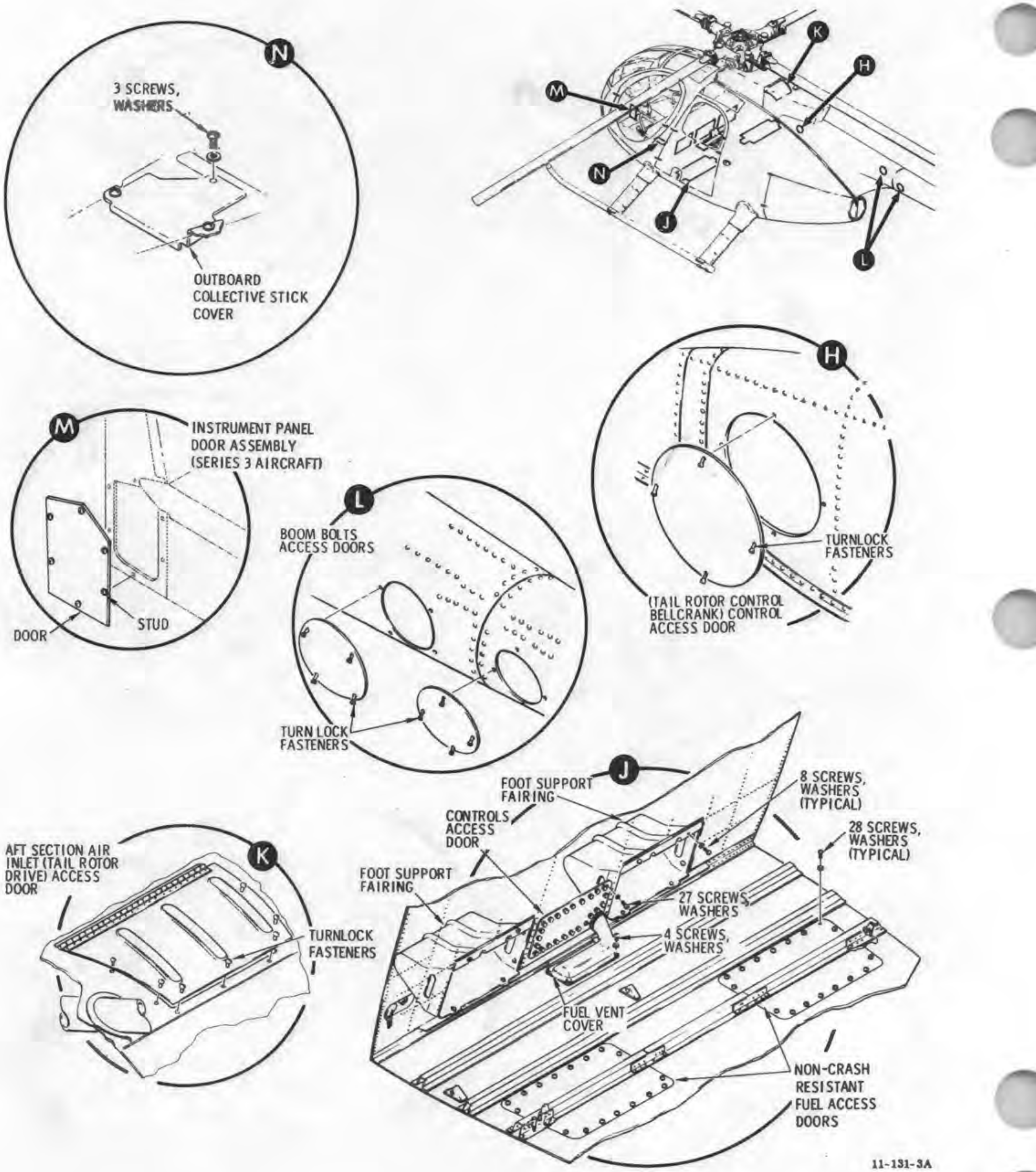


Figure 2-1. Access and Inspection Provisions. (sheet 3 of 4)

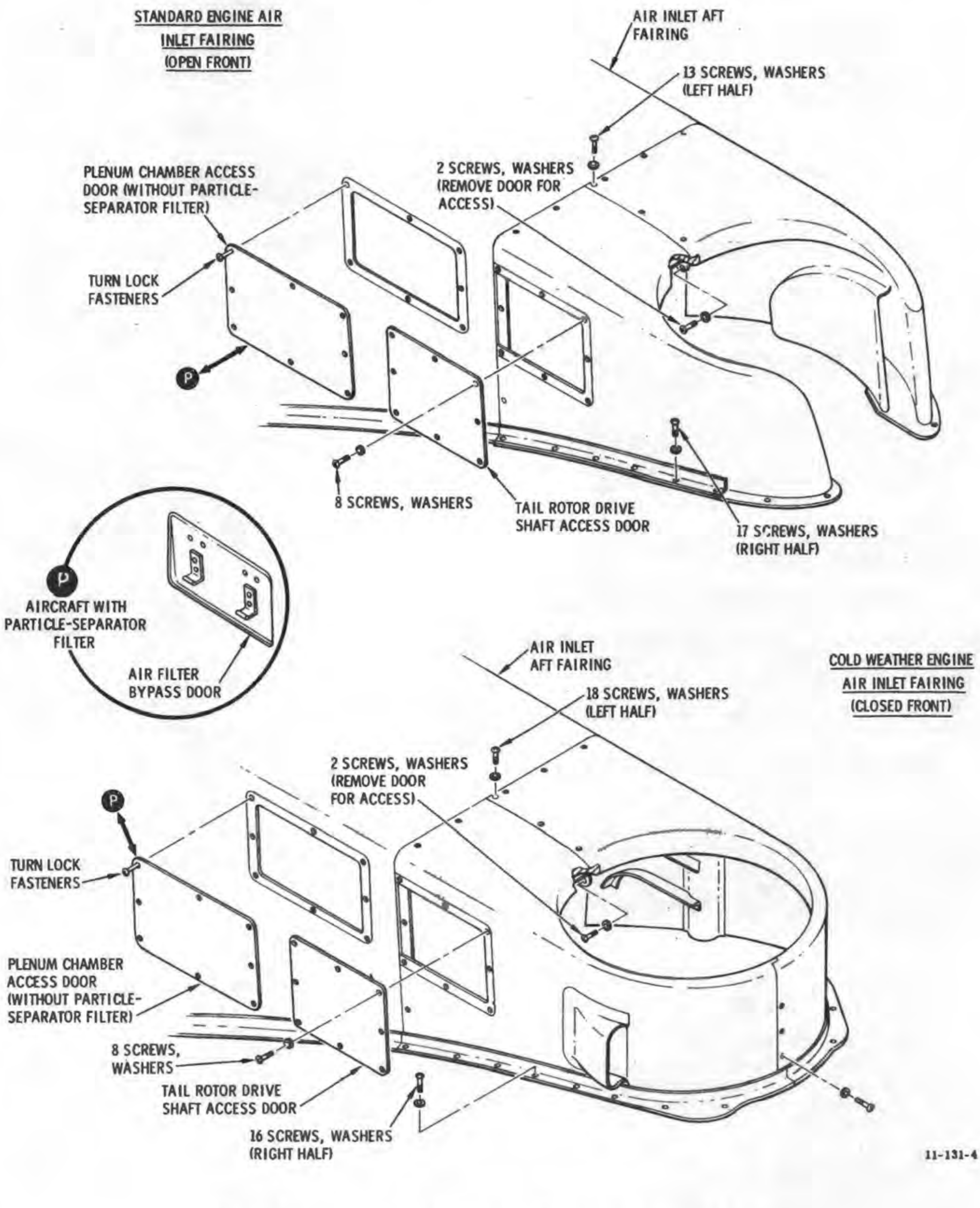


Figure 2-1. Access and Inspection Provisions. (sheet 4 of 4)

a. A total of 10 percent of parts with less than 40 square inches.

b. A total of 15 percent of parts with less than 400 square inches and more than 40 square inches.

c. A total of 25 percent of parts with more than 400 square inches.

2-10. Replacement — Non-Stressed Sheet Metal. Damage that exceeds the limits for repair by patch or insertion requires replacement of the part.

2-11. MAIN TRANSMISSION ACCESS COVER.

2-12. Description — Main Transmission Access Cover. The main transmission access cover (fig. 2-1, sh 1) provides access to the main transmission, oil cooler blower and engine-to-transmission drive shaft. A silicone rubber-sponge gasket along the upper edge of the fiberglass cover provides a water and dust seal. Turnlock fasteners secure the cover to the structure. The cover must be removed before the main transmission drain assembly or the transmission cover can be removed.

2-13. Removal — Main Transmission Access Cover. *a.* Remove insulation (para 2-175).

b. Disengage turnlock fasteners and remove cover.

2-14. Inspection — Main Transmission Access Cover. *a.* Inspect cover for cracks or other visible damage.

b. Inspect turnlock fasteners and receptacles for proper fastening action.

c. Inspect cover gasket for deterioration or missing sections.

2-15. Repair — Main Transmission Access Cover. *a.* Refer to TM 55-1500-204-25/1 for replacement of turnlock fasteners, and patching of plastic sections.

b. Replace silicone rubber gaskets according to paragraph 2-171.

NOTE

Before installing replacement turnlock fastener studs and washers, ensure that the aluminum reinforcing strip is securely bonded to the external side of the access door at the stud hole.

c. Seam separations or small areas of rip damage may be repaired by cleaning the damaged area with naptha (C70), injecting dichloromethane (C38) into the void area and clamping together under light pressure.

d. Replace the defective turnlock fastener reinforcing strips according to steps *e* through *g* below.

e. Ensure mating surfaces of reinforcing strip and access door are fitted to make full surface contact.

f. Lightly abrade mounting surface on access door with grade 180 abrasive paper (C1).

g. Install replacement reinforcing strips (para 2-173).

h. Repair cracks in polycarbonate material as follows:

(1) Stop drill at each end of crack using a number 40 drill.

(2) Lightly sand-area to be repaired with sandpaper (C3) about 0.750 inch beyond crack for adhesive application.

(3) Wipe area with dry, clean cloth to remove residue.

(4) Cut section of fiberglass (39A) to extend a minimum of 0.500 inch around crack or area to be repaired.

(5) Apply one brush coat of urelane adhesive (C7) to repair area and lay fiberglass over repair area.

(6) Rub patch lightly to assure adhesion to repair area and brush another coat of adhesive over area.

(7) Allow to cure for 48 hours. (Handling strength is developed in 24 hours). Accelerated cure time will be two hours under a heat lamp at 71°C (160°F).

2-16. Installation — Main Transmission Access Cover. (With main transmission cover and drain assembly already installed.) *a.* Position access cover and secure by engaging turnlock fasteners.

b. Reinstall insulation (para 2-175).

2-17. MAIN TRANSMISSION DRAIN ASSEMBLY.

2-18. Description — Main Transmission Drain Assembly. The main transmission drain assembly (fig. 2-1, sh 1) is a clear polycarbonate plastic yoke-type collector that provides an overboard drain for water or oil entering the main transmission cover, and for any oil seepage from the transmission input pinion oil seal. Foam gaskets cushion and seal the mounting edges. The drain assembly must be removed before the main transmission cover can be removed.

2-19. Removal — Main Transmission Drain Assembly. (With main transmission access cover removed; para 2-8.) *a.* Remove the two screws, two bolts and washers securing the drain assembly to the structure, transmission shroud mount and blower scroll.

b. Remove the bolt and washer (or the one nut and washer from the scroll stud) under the drain outlet tube. Lift drain assembly from shroud mount.

c. Unless replacing drain assembly, leave drain hose lockwired and attached.

2-20. Inspection — Main Transmission Drain Assembly. Inspect drain assembly for cracks, gaskets for deterioration, and outlet tube for internal obstruction.

2-21. Repair — Main Transmission Drain Assembly. Refer to paragraph 2-15.

2-22. Installation — Main Transmission Drain Assembly. (With main transmission cover already installed.) *a.* Position drain assembly on the transmission shroud. Check that the short plastic drain tube from the transmission input pinion seal drain port enters the drain assembly outlet tube port.

b. Install the two screws, three bolts (or two bolts and nut) and washers that secure the drain assembly to the structure, shroud and scroll (fig. 2-1, sh 1). **DO NOT OVERTIGHTEN THE BOLTS AND/OR NUT (10 INCH-POUNDS MAXIMUM).**

c. If drain assembly is a replacement, connect the flexible drain hose and secure it with two wraps of lockwire.

2-23. MAIN TRANSMISSION COVER.

2-24. Description — Main Transmission Cover. The main transmission cover (fig. 2-1, sh 1) is a polycarbonate plastic form that essentially matches the transmission housing contour. The plastic form has a permanently bonded insulation blanket cover with a fiberglass core and flexible vinyl exterior. Plastic foam gaskets cushion the cover surfaces that mate with the adjacent structure. When installed, there is space between the cover and transmission to allow inlet air flow for transmission cooling. A yoke-type drain assembly fits around the lower end of the cover. A flexible hose connects to the drain assembly outlet tube and pipes overboard any water or oil that collects in the cover.

2-25. Removal — Main Transmission Cover. *a.* Detach the main transmission drain assembly (para 2-17).

b. Release nylon fastener tape hook from mating nylon fastener tape pile at aft edges of cover.

c. Remove four screws and washers from cover.

d. Remove bolt from heater duct flange at lower left aft inside corner of cover if heating system ducting is installed; then lower the cover to remove it.

2-26. Inspection — Main Trainsmission Cover. Inspect foam gaskets and cover blanket for deterioration, and plastic cover for cracks.

2-27. Repair — Main Transmission Cover. Refer to paragraph 2-15.

2-28. Installation — Main Transmission Cover. *a.* Position cover over transmission.

b. Install heater duct bolt at lower left aft inside corner of cover if heating system ducting is installed.

c. Install the four screws and washers fingertight. Check cover for proper fit and that liquid level plug is visible.

d. Tighten screws.

e. Set the nylon fastener tape hook to the mating fastener tape pile by using hand pressure.

f. Attach the main transmission drain assembly (para 2-17).

2-29. CARGO COMPARTMENT AFT BULKHEAD ACCESS COVERS.

2-30. Description — Cargo Compartment Aft Bulkhead Access Covers. The cargo compartment aft bulkhead access covers (fig. 2-1, sh 2) enclose openings to the fuselage spaces at either side of the engine air inlet plenum chamber. The right side cover provides access to the oil tank, oil cooler and oil system drain valve. The left side cover provides access to elements of the cabin heating installation. Turnlock fasteners secure the outer edge of each cover to the structure.

2-31. Removal — Cargo Compartment Aft Bulkhead Access Covers. *a.* Remove insulation (para 2-175).

b. Release turnlock fasteners and lift cover from structure.

2-32. Inspection — Cargo compartment Aft Bulkhead Access Covers. *a.* Inspect turnlock fasteners and receptacles for condition.

b. Inspect cover for corrosion and cracks.

2-33. Repair — Cargo Compartment Aft Bulkhead Access Covers. Refer to paragraph 2-7.

2-34. Installation — Cargo Compartment Aft Bulkhead Access Covers. *a.* Position the cover over the opening in the structure and engage the turnlock fasteners.

b. Reinstall insulation (para 2-175).

2-35. CARGO COMPARTMENT FOOT SUPPORT FAIRINGS.

2-36. Description — Cargo Compartment Foot Support Fairings. The two foot support fairings (fig. 2-1, sh 3) are fiberglass assemblies, each having two small polycarbonate plastic windows. The outboard windows provide a means for inspection of the forward landing gear damper assemblies without removal of the fairings. The inboard windows (as installed) are not for inspection but permit left and right side interchangeability of the fairings. Removal of the fairings permits access to the forward landing gear struts and dampers, lower elements of the underseat installation of the engine and flight control systems, and portions of the electrical wiring routed beneath the pilot's seat structure.

2-37. Removal — Cargo Compartment Foot Support Fairings. Remove eight screws and washers to release each foot support fairing.

2-38. Inspection — Cargo Compartment Foot Support Fairings. Inspect for cracks, breaks, and separation of the plastic windows.

2-39. Repair — Cargo Compartment Foot Support Fairings. Refer to paragraph 2-244.

2-40. Installation — Cargo Compartment Foot Support Fairings. Position each support fairing and secure with screws and washers.

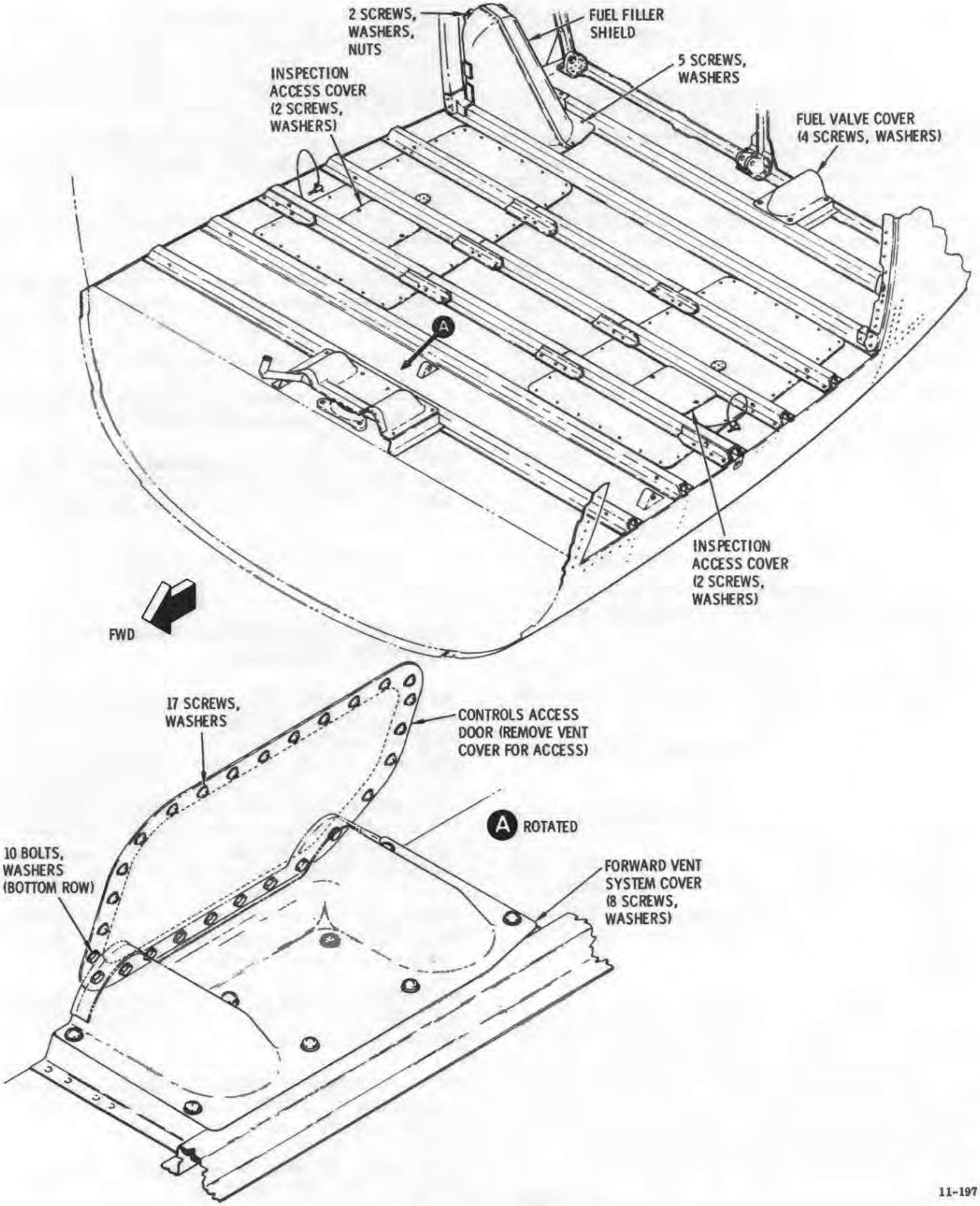


Figure 2-2. Access and Inspection Provisions (Crash-resistant Fuel System).

2-41. FUEL FILLER SHIELD.

2-42. Description — Fuel Filler Shield. The polycarbonate plastic fuel filler shield (fig. 2-1, sh 2 or fig. 2-2) protects the right fuel cell filler extension against possible damage from cargo impact, and also covers the cargo floor opening for the filler.

2-43. Removal — Fuel Filler Shield. *a.* Remove five screws and washers that secure the fuel filler shield base to the cargo floor.

b. Remove the two nuts, screws and washers that secure the shield tabs to the fuselage skin and fuel filler cap to release the shield.

NOTE

Use care not to dislodge or damage the sealing grommet (if installed) that fits around the LONG-RANGE TANK CONN fitting opening in the shield.

2-44. Inspection — Fuel Filler Shield. Inspect shield for cracks and breaks and condition of grommet.

2-45. Repair — Fuel Filler Shield. Refer to paragraph 2-15.

2-46. Installation — Fuel Filler Shield. *a.* Position the fuel filler shield and install the two screws, washers and nuts that secure the shield tabs to the fuselage skin and fuel filler cap; do not tighten.

b. Install the five screws and washers that secure the shield base and tighten screws.

c. Tighten nuts that secure shield tabs.

d. Check that the LONG-RANGE TANK CONN fitting grommet (if installed) provides a tight seal between the shield and fitting. Replace grommet if deteriorated.

2-47. FUEL VENT COVER.

2-48. Description — Fuel Vent Cover. The formed aluminum fuel vent cover (fig. 2-1, sh 3, or fig. 2-2) provides access to the fuel cell vent system crossover fitting that interconnects the two cells.

2-49. Removal — Fuel Vent Cover. Remove either four or six screws and washers to release the fuel vent cover.

2-50. Inspection — Fuel Vent Cover. Check for cracks and other visible damage.

2-51. Repair — Fuel Vent Cover. Refer to paragraph 2-7.

2-52. Installation — Fuel Vent Cover. Check that area to be covered is clean. Position cover and secure with screws and washers.

2-53. FUEL VALVE COVER (CRASH-RESISTANT FUEL SYSTEM).

2-54. Description — Fuel Valve Cover (Crash-Resistant Fuel System). The fuel valve cover (fig. 2-2) protects the fuel outlet valve used with crash resistant fuel systems. The aluminum cover is located on the cargo compartment floor at the left rear bulkhead. Removal of the cover provides access to the fuel outlet valve and allows for inspection of the left fuel cell aft vent fitting.

2-55. Removal — Fuel Valve Cover (Crash-Resistant Fuel System). Remove four screws and washers to release cover.

2-56. Inspection — Fuel Valve Cover (Crash-Resistant Fuel System). Check for cracks and other visible damage.

2-57. Repair — Fuel Valve Cover (Crash-Resistant Fuel System). Refer to paragraph 2-7.

2-58. Installation — Fuel Valve Cover (Crash-Resistant Fuel System). Position cover and secure with four screws and washers.

2-59. PILOT'S COMPARTMENT FLOOR ACCESS DOORS.

2-60. General — Pilot's Compartment Floor Access Doors. The pilot's compartment floor access doors (fig. 2-1, sh 2) are fiberglass with stainless steel heel strips bonded in place. A flush-mounted latch and hinges secure each door in place.

2-61. Removal — Pilot's Compartment Floor Access Doors. Remove either floor access door by releasing the flush-mounted latch and removing the two hinge pins that secure the door hinges at the forward end.

2-62. Inspection — Pilot's Compartment Floor Access Doors. *a.* Inspect doors for cracks and other visible damage.

b. Check security of heel strip bonding.

2-63. Repair — Pilot's Compartment Floor Access Doors. Refer to paragraph 2-7.

2-64. Installation — Pilot's Compartment Floor Access Doors. Position door and install hinge pins through hinges and antitorque pedal mounting bracket.

2-65. PILOT'S COLLECTIVE PITCH STICK COVER.

2-66. Description — Pilot's Collective Pitch Stick Cover. The pilot's collective pitch stick cover (fig. 2-1, sh 1) provides primary access to the upper elements of the underseat installation of engine and flight controls systems. The cover supports the circuit breaker assembly and forms a protective guard for the collective friction mechanism on the collective pitch stick. A flexible, two-part curtain enclosure on the cover is cord-laced or snap-fastened around the stick to prevent foreign matter from entering the underseat controls area. The stick cover is made of formed and spot-welded sheet aluminum and attached to the seat structure with five screws.

2-67. Removal — Pilot's Collective Pitch Stick Cover. *a.* Set the power selector switch at OFF.

b. Unfasten the circuit breaker assembly and tie it out of the way.

c. Untie or unsnap upper curtain from lower curtain and slide curtains away from the stick (fig. 2-1, sh1).

d. Remove the five cover attaching screws and washers to release the cover from the seat structure.

e. If required, remove the flexible closure from the cover according to *f* and *g* below.

f. Remove support tube clamp and four screws and washers that attach closure to cover; remove closure from cover.

g. Remove top curtain, then lower curtain, from curtain support tubes.

2-68. Inspection — Pilot's Collective Pitch Stick Cover. *a.* Inspect cover for obvious damage.

b. Inspect the flexible closure for cuts, holes, deterioration, defective cord or snap fasteners, and freedom of movement on curtain support tubes.

2-69. Repair — Pilot's Collective Pitch Stick Cover. Refer to paragraph 2-7.

2-70. Installation — Pilot's Collective Pitch Stick Cover. *a.* Set the power selector switch at OFF.

b. Position the cover over the collective pitch stick. Locate circuit breaker assembly wiring in cutout and secure cover to structure with five screws and washers. The longer screw is used at the front (fig. 2-1, sh 1).

c. If removed, reinstall the flexible cover according to *d* through *f* below.

d. Place lower curtain, then top curtain, on curtain support tubes.

e. Install curtain stops, cotter pins, lower curtain and then upper curtain on curtain support tubes.

f. Place enclosure on cover; secure enclosure to cover with support tube clamp and four screws and washers. Bottom edge of lower curtain must be tucked under support.

CAUTION

Closure lacing cord must be tight so that curtains will not fold inward through full travel of the collective stick. Folding inward can result in entanglement with the collective stick friction gear mechanism.

g. Close upper and lower curtains around pitch stick and connect the curtains together with the cord lacing or snap fasteners. Lacing (1/8 by 4-inch braided nylon) cords must be tied in a square knot.

h. Position and fasten circuit breaker assembly.

2-71. OUTBOARD COLLECTIVE STICK COVER.

2-72. Description — Outboard Collective Stick Cover. The small cover installed at the left side of the seat structure (fig.2-1, sh 3) keeps the left side seat belt from fouling the aft end of the collective stick, and shields the electrical wiring where it connects to the auxiliary circuit receptacles mounted in the left corner of the bulkhead.

2-73. Removal — Outboard Collective Stick Cover. Remove three screws and washers to release cover.

2-74. Inspection — Outboard Collective Stick Cover. Check for cracks and other visible damage.

2-75. Repair — Outboard Collective Stick Cover. Refer to paragraph 2-7.

2-76. Installation — Outboard Collective Stick Cover. Check that there are no foreign objects in the area shielded by the cover, position cover and secure with screws and washers.

2-77. ELECTRICAL CONSOLE TERMINAL BLOCK ACCESS COVER.

2-78. General — Electrical Console Terminal Block Access Cover. The terminal block access cover (fig. 2-1, sh 2) provides access to the electrical console terminal blocks for inspection and repair.

2-79. Removal — Electrical Console Terminal Block Access Cover. Release turnlock fasteners and lift access covers from console.

2-80. Inspection — Electrical Console Terminal Block Access Cover. Inspect turnlock fasteners and receptacles for proper fastening action.

2-81. Repair — Electrical Console Terminal Block Access Cover. Refer to paragraph 2-7.

2-82. Installation — Electrical Console Terminal Block Access Cover. Position access cover over receptacles and engage turnlock fasteners.

2-83. CONTROLS TUNNEL COVER.

2-84. Description — Controls Tunnel Cover. Four tunnel-routed control rods exit the tunnel area through a cover mounted at the top of the station 78.50 canted frame. The cover or cover boots must be removed before any of the control rods are removed. The cover has four naugahyde boots, two of which are sewed together while the other two are individual. All boots are secured to the cover with self-clinching nylon straps. (See fig. 2-1, sh 1.)

2-85. Removal — Controls Tunnel Cover. The right and left engine air inlet forward fairings (fig. 2-1, sh 4) should be removed (para 2-101) for best access to the controls tunnel cover.

a. Remove the three screws, nuts and six washers, and the four bolts and washers from controls cover.

b. Remove the cotter pin, nut, bolt and washers that secure the upper end of each tunnel-routed control rod. Disengage the rod ends from the bellcranks.

c. Lift controls cover over rod ends.

2-86. Inspection — Controls Tunnel Cover. *a.* Check boots for control biriding.

b. Check for tears, breaks, and damaged or missing straps.

c. Inspect for damaged or loose boot stitching.

2-87. Repair — Controls Tunnel Cover. *a.* Repair all loose or damaged stitching on boots by hand-stitching with nylon cord (C34).

b. Remove damaged boots by loosening nylon strap. Replace damaged or defective straps.

c. Install naugahyde boots over flared end of tubular mounts on cover shelf. Secure with straps.

2-88. Installation — Controls Tunnel Cover. *a.* Place controls tunnel cover over the four control rods, with double boot section fitting over the two right-hand control rods.

b. Attach each control rod end to its bellcrank with bolt (head to left), two washers, nut and cotter pin.

c. Install controls tunnel cover with the three screws, nuts and six washers aft, and the four bolts and washers forward. Tighten bolts and screws evenly.

d. If removed, reinstall right and left engine inlet fairings (para 2-101).

e. Check that control rods move freely in the cover boots.

2-89. FAIRING ACCESS DOORS AND AFT SECTION AIR INLET ACCESS DOOR.

2-90. Description — Fairing Access Doors and Aft Section Air Inlet Access Door. Two removable doors are installed on the right side of the air inlet front and aft fairings (fig. 2-1, sh 4). On aircraft equipped with an inertial particle-separator air filter, the aft fairing contains a filter bypass door (fig.2-1, sh 4). The aft section air inlet (tail rotor drive) access door (fig. 2-1, sh 4) is hinge-mounted to the structure and is constructed of aluminum. The door provides access to the front end of the tail rotor drive shaft, and limited access to the accessories mounted on the aft end of the main transmission. On aircraft equipped with a barrier filter, the tail rotor drive shaft access door is accessible when the filter element is removed and the hinged filter bypass door and frame assembly is moved forward. The plenum chamber access and tail rotor drive shaft doors installed on fairings of series 1 and 2 aircraft are made of fiberglass and reinforced with polyurethane-foam-filled stiffeners. The filter bypass door installed on the aft fairing of series 3 aircraft is hinge-mounted and latched to the aft fairing, and is opened with the BYPASS AIR CONTROL release handle located overhead in the flight compartment.

2-91. Removal — Fairing Access Doors and Aft Section Air Inlet Access Door. *a.* Release turnlock fasteners and lift plenum chamber access (aft) door from fairing.

b. Remove the eight screws and washers and lift tail rotor drive access (forward) door from fairing.

c. Release turnlock fasteners and raise hinged aft section air inlet door for access. On aircraft equipped with an engine barrier filter, remove filter element (chapter 4) and fold filter bypass door and frame portion of filter assembly forward to expose access door.

d. On series 3 aircraft, open filter bypass door on aft fairing by pulling BYPASS AIR CONTROL release handle forward.

2-92. Inspection — Fairing Access Doors and Aft Section Air Inlet Access Door. *a.* Inspect turnlock fasteners and receptacles for proper fastening action.

b. Inspect fiberglass doors for structural damage such as cracked or frayed glass cloth surfaces.

c. Inspect interior door for proper fit when closed, and hinge halves for security.

2-93. Repair — Fairing Access Doors and Aft Section Air Inless Access Door. Refer to paragraph 2-7 for repair of aluminum doors and paragraph 2-244 for repair of fiberglass doors.

2-94. Installation — Fairing Access Doors and Aft Section Air Inlet Access Door.

CAUTION

Check that all areas of the air inlet are clean, that all debris is removed and that all protective covers are removed. Engine damage could result if these precautions are not always taken.

a. Close hinged aft section air inlet access door and engage the turnlock fasteners. On aircraft equipped with an engine barrier filter, fold filter bypass door and frame into place and install filter element.

b. Position plenum chamber access door and engage turnlock fasteners.

c. Position tail rotor drive shaft access door and secure with screws and washers.

d. Secure particle separator air filter bypass door by using door pulls to close and latch door on aft fairing.

2-95. BOOM BOLTS ACCESS DOORS AND TAIL ROTOR CONTROL BELLCRANK ACCESS DOOR.

2-96. Description — Boom Bolts Access Doors and Tail Rotor Control Bellcrank Access Door. The forward and aft boom bolts access door (fig. 2-1, sh 3) provide access to the bolts that secure the tailboom to the fuselage aft section. These doors are also removed for access to perform removal and installation of the tail rotor drive shaft and/or tailboom (tail rotor blade angle) control rod, and to check drive shaft damper friction or replace the damper. The tail rotor control bellcrank access door provides primary access to the station 142 bellcrank link between the station 100 tail rotor control rod and the tailboom control rod.

2-97. Removal — Boom Bolts Access Doors and Tail Rotor Control Bellcrank Access Door. Release turnlock fasteners and lift boom bolts or controls access door from fuselage.

2-98. Inspection — Boom Bolts Access Doors and Tail Rotor Control Bellcrank Access Door. Inspect turnlock fasteners and receptacles for proper fastening action.

2-99. Repair — Boom Bolts Access Doors and Tail Rotor Control Bellcrank Access Door. Refer to paragraph 2-7.

2-100. Installation — Boom Bolts Access Doors and Tail Rotor Control Bellcrank Access Door. Position boom bolts or controls access door and engage turnlock fasteners.

2-101. ENGINE AIR INLET FRONT FAIRINGS.

2-102. Description — Engine Air Inlet Front Fairings. Ambient air enters the engine inlet and the engine oil cooler through the removable engine air inlet front fairings (fig. 2-1, sh 4). The fairings are in two halves constructed of fiberglass. The fairings provide access to the main rotor mixer controls, the main rotor mast, its base and supporting structure, and the engine air filter (when installed). Either one of two fairing types may be installed on the aircraft: the standard open-front fairing; or the closed-front fairing, as part of the snow ingestion/cold weather kit.

2-103. Removal — Engine Air Inlet Front Fairings. Either half of the fairing may be independently removed. For the standard open-front fairings, a total of 33 screws with washers secure the fairing halves together, and to the structure. For the closed-front fairings, a total of 36 screws with washers secure the fairing halves together, and to the structure. Both the open-front and the closed-front fairings have an access door in the right half, secured by eight screws and washers (three of which secure the front fairing to the aft fairing).

a. Remove the eight screws and washers from the access door, and remove the door.

b. Remove the screws and washers that join the two fairing halves together.

c. Remove the screws and washers that attach the fairing halves (each, or both, as necessary) to the fuselage and aft fairing. Remove front fairing halves.

NOTE

Either the standard open-front or the closed front fairings have been fitted to the particular aircraft as a matched set and should be so identified.

2-104. Inspection — Engine Air Inlet Front Fairings. Inspect the engine air inlet fairings for structural damage.

2-105. Repair — Engine Air Inlet Front Fairings. Refer to paragraph 2-7 for sheet metal repairs and to paragraph 2-224 for repair of fiberglass.

2-106. Installation — Engine Air Inlet Front Fairings. *a.* Position the engine air inlet fairings on the fuselage and align attachment holes on fuselage and aft fairing.

b. Install attaching washers and screws in mounting flanges and at fairing mating attachments.

2-107. ACCESS DOORS AND COVERS — STRESSED (GENERAL).

2-108. Description — Access Doors and Covers — Stressed (General). The fuel cell access doors and the controls access door (fig. 2-1, sh 3 or fig. 2-2) are stressed sheet metal. Removal, inspection, repair and installation of these doors are covered in paragraphs 2-109 through 2-122 below.

2-109. FUEL CELL ACCESS DOORS (NON-CRASH RESISTANT FUEL SYSTEM ONLY).

2-110. Description — Fuel Cell Access Doors (Non-Crash Resistant Fuel System Only). The fuel cell access doors (fig. 2-1, sh 3) are stiffener-reinforced aluminum plates that form a portion of the cargo floor. The left access door provides access to the fuel quantity transmitter (tank unit) and fuel shutoff valve, and the fuel cell cover (for access to the engine starting pump) as well as the left fuel cell. A quick-release lock pin is secured with a four-inch lanyard to the outboard edge of each door. The pins retain the removable jacking fittings that are used for jacking, parking, and mooring the aircraft.

CAUTION

These are stressed doors. The aircraft must never be flown jacked or towed with either door removed.

2-111. Removal — Fuel Cell Access Doors (Non-Crash Resistant Fuel System Only). Remove the 28 retaining screws and washers and lift out door.

2-112. Inspection — Fuel Cell Access Doors (Non-Crash Resistant Fuel System Only). Refer to paragraph 2-264.

2-113. Repair — Fuel Cell Access Doors (Non-Crash Resistant Fuel System Only). Refer to paragraph 2-264 for general repairs. Replace a defective or broken lanyard as follows:

a. Disengage lanyard from ring or lockpin.

b. Remove rivet that secures lanyard to door stiffener.

c. Rivet replacement lanyard to clip and reinforcement of plate.

d. Attach ring of lockpin to replacement lanyard.

2-114. Installation — Fuel Cell Access Doors (Non-Crash Resistant Fuel System Only). *a.* Position door over opening and secure in place with retaining screws and washers.

b. Stow quick-release lock pin in its hole.

2-115. FUEL CELL ACCESS DOORS (CRASH-RESISTANT FUEL SYSTEM ONLY).

2-116. Description — Fuel Cell Access Doors (Crash-Resistant Fuel System Only). The CR fuel cell access doors (fig. 2-2) are essentially the same as the NCR doors described in paragraph 2-109 except that the doors are larger. In addition, a small covered inspection/access hole is provided. Because the CR fuel cells are attached to the doors, door removal and installation is accomplished according to access door removal procedures in chapter 10. Refer to paragraph 2-113 for door repair.

2-117. FUEL CELLS INSPECTION ACCESS COVER (CRASH-RESISTANT FUEL SYSTEM ONLY).

2-118. Description — Fuel Cells Inspection Access Cover (Crash-Resistant Fuel System Only). The CR inspection access cover (fig. 2-2) is a square aluminum plate located near the center of each fuel cell access door used with crash-resistant fuel systems. The right cover is removed for visual inspection of the right fuel cell upper surfaces. The left cover is removed for inspection of the left cell cover area and for adjustment of fuel shutoff control rigging.

2-119. Removal — Fuel Cells Inspection Access Cover (Crash-Resistant Fuel System Only). Remove two screws and washers and remove cover.

2-120. Inspection — Fuel Cells Inspection Access Cover (Crash-Resistant Fuel System Only). Refer to paragraph 2-7 for inspection and repair.

2-121. Installation — Fuel Cells Inspection Access Cover (Crash-Resistant Fuel System Only). Position cover over round inspection hole and attach with two screws and washers.

2-122. CONTROLS ACCESS DOOR.

2-123. Description — Controls Access Door. The controls access door (fig. 2-1 or 2-2) is an aluminum plate that provides primary access to the lower end of the tunnel-routed flight control push rods as well as other elements of the control system.

CAUTION

The controls access door is a stressed door. The aircraft must never be flown, jacked or towed with this door removed.

2-124. Removal — Controls Access Door. *a.* On aircraft with non-crash-resistant fuel system (fig. 2-1, sh 3) remove 27 screws and washers to release cover.

b. On aircraft with crash-resistant fuel system (fig. 2-2) remove forward vent system cover (para 2-47); then remove 17 upper screws, 10 lower bolts and washers to release cover.

2-125. Inspection — Controls Access Door. Refer to paragraph 2-264.

2-126. Repair — Controls Access Door. Refer to paragraph 2-264.

2-127. Installation — Controls Access Door. *a.* On aircraft with crash-resistant fuel system (fig. 2-2) position door (bevel at lower right corner) and install 10 lower bolts and washers and 17 upper screws and washers as shown in figure 2-2; then reinstall forward vent system cover (para 2-47).

b. On aircraft with non-crash-resistant fuel system (fig. 2-1, sh 3), position door (bevel at lower right corner) and install 27 screws and washers.

2-128. ENGINE ACCESS DOORS.

2-129. Description — Engine Access Doors. The engine access doors are stamped and bonded aluminum alloy structures that form the fuselage contour below the aft section engine compartment. Figure 2-3 shows series 1 and 2 aircraft access doors having original hinge and latching configuration. Figure 2-4 shows access doors with adjustable door hinges and latches that are installed on all series 3 aircraft and on series 1 and 2 aircraft that have been modified. Figure 2-5 shows engine access doors used on aircraft with the upward exhaust system. These doors are closed at the aft end with a cone shaped fairing, one-half of which is attached to each door. A fourth latch is added at the aft end of the cone. Vertical adjustment can be made to the doors by positioning of washers at the hinge points. Fore and aft adjustment of the doors is made possible by slotted holes in the hinges and serrated mating surfaces between the hinges and doors. Lateral adjustment is obtainable by installing laminated shims under the door hinges. Door alignment is provided by V-type striker blocks riveted to the door frames next to the lower latch.

2-130. Inspection — Engine Access Doors. *a.* Check hinges and latch hardware for looseness, cracks or damage.

b. Check the outside edge of door for security of bond between outer and inner skin. Any separation requires repair.

c. Inspect the door for corrosion, distortion, breaks or cracks, and condition of abrasion strip tape along upper inside edge of door.

d. On aircraft with upward exhausts, inspect tail cone seals.

2-131. Latch Adjustment — Engine Access Doors. On series 3 aircraft and series 1 and 2 aircraft with the modified engine access doors, adjust the latches as follows: (See fig. 2-4.)

a. Remove lockwire from threaded (adjustment) end of hooks.

b. Loosen all hooks until striker blocks will engage in light contact with no door deflection when the hooks are latched.

c. Unlatch the doors and tighten all hooks four to five turns. Check door latching and make additional minor adjustments as required.

d. Install 0.032-inch lockwire (C57) in hook threaded end in a manner to permit latching and unlatching without interference.

2-132. Door Position Adjustment (Series 3 and Modified Series 1 and 2 Aircraft) — Engine Access Door. Adjust door position by loosening the three screws in aft hinge halves and changing hinge position on serrated plate as required. Tighten hinge screws.

2-133. Removal (Unmodified Series 1 and 2 Aircraft) — Engine Access Door. *a.* Release all door latches.

b. Remove door hinge pivot bolts (fig. 2-3) and lift door from fuselage hinge halves.

2-134. Removal (Series 3 and Modified Series 1 and 2 Aircraft) — Engine Access Door. *a.* Release all door latches.

b. Index mark the shim plate, serrated plate, aft hinge halves and door (fig. 2-4) so that doors can be replaced in the same position.

c. Remove three screws and washers in the aft hinge halves. Two nuts and one rivnut are used. Tie parts together at each hinge point so that they do not become mixed.

NOTE

The hinges pivot on steel spacers and nylon shims which are not as easily removed as the entire aft hinge halves.

d. Lift doors free of fuselage.

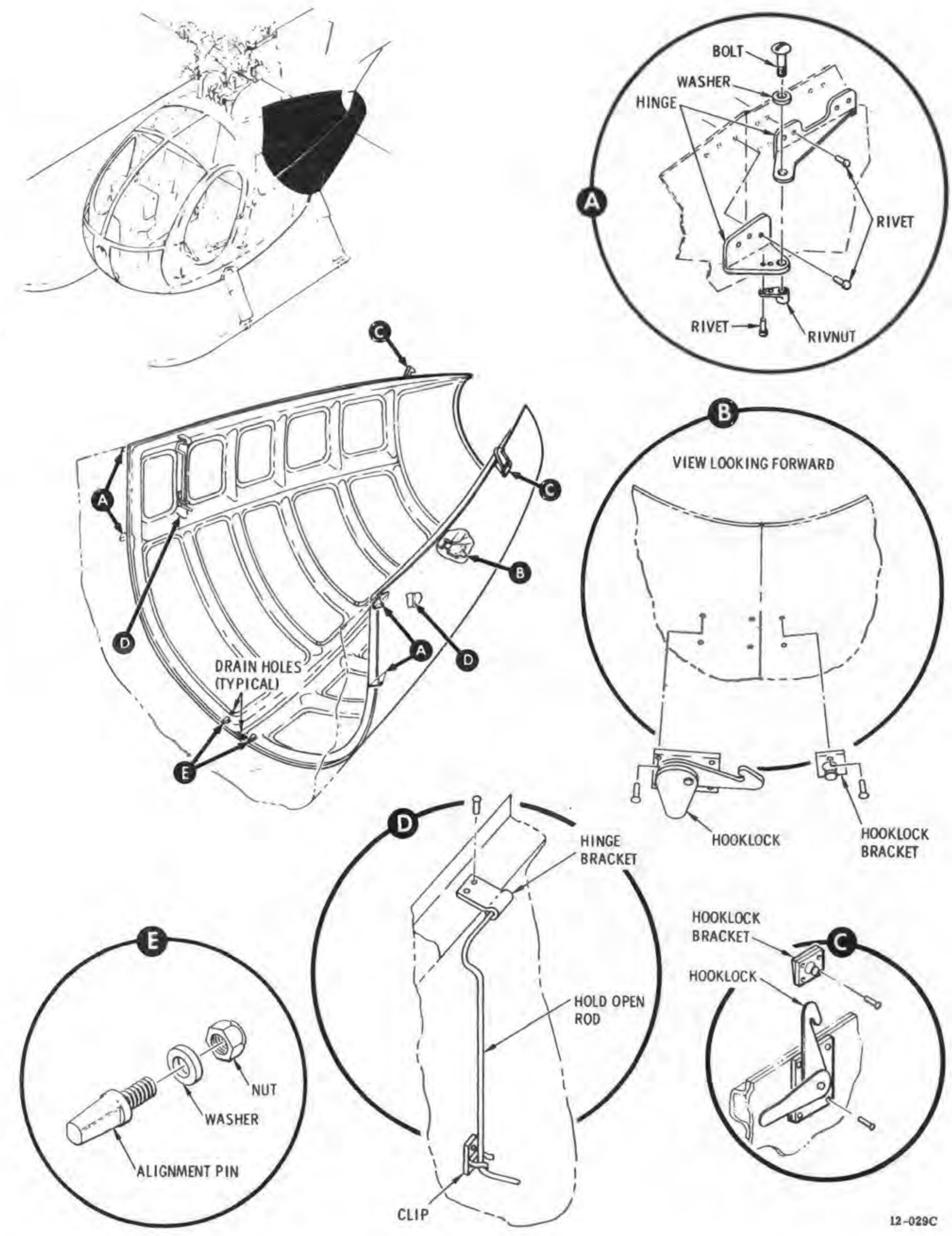


Figure 2-3. Engine Access Doors (Unmodified Series 1 and 2 Aircraft).

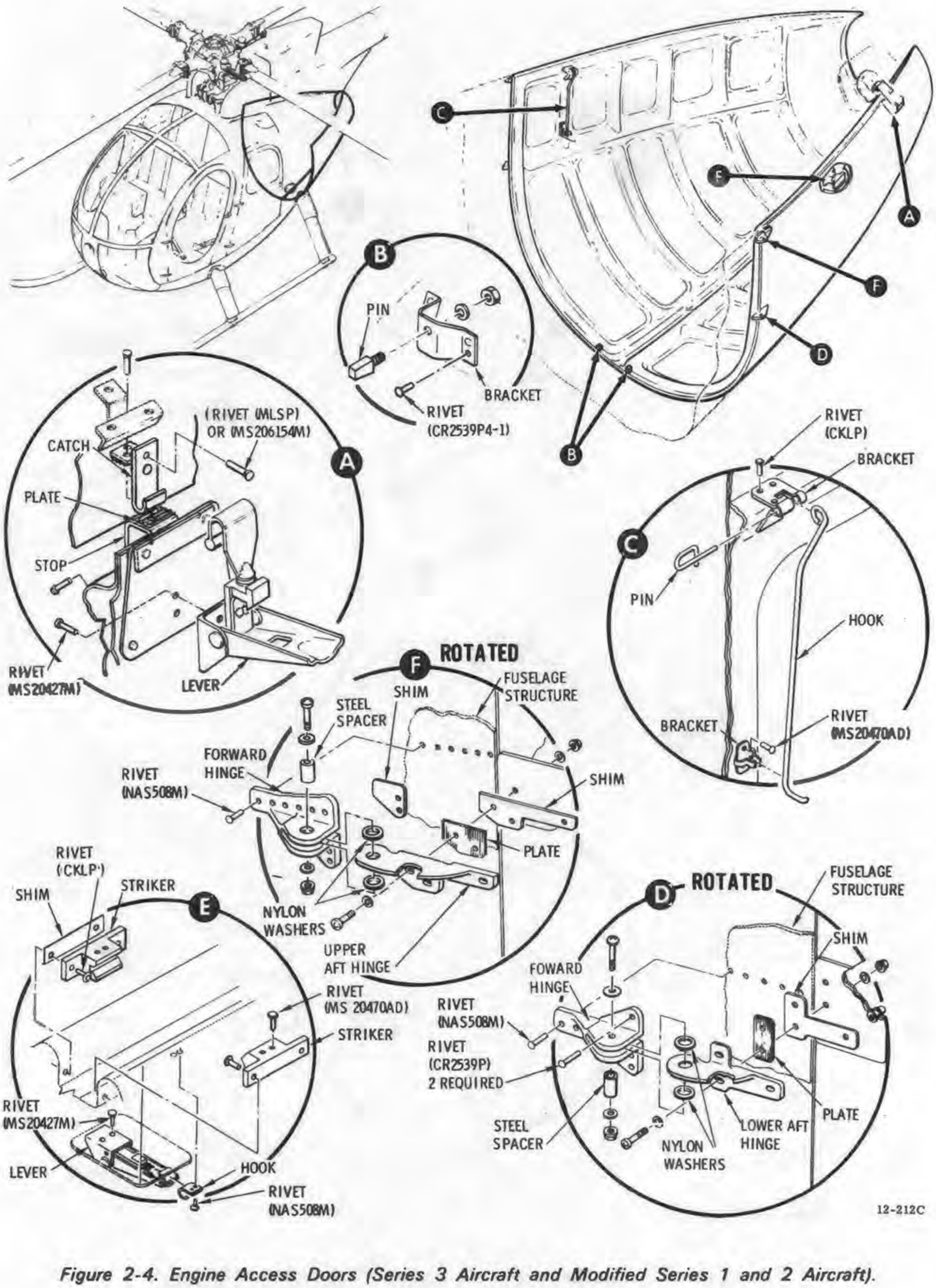


Figure 2-4. Engine Access Doors (Series 3 Aircraft and Modified Series 1 and 2 Aircraft).

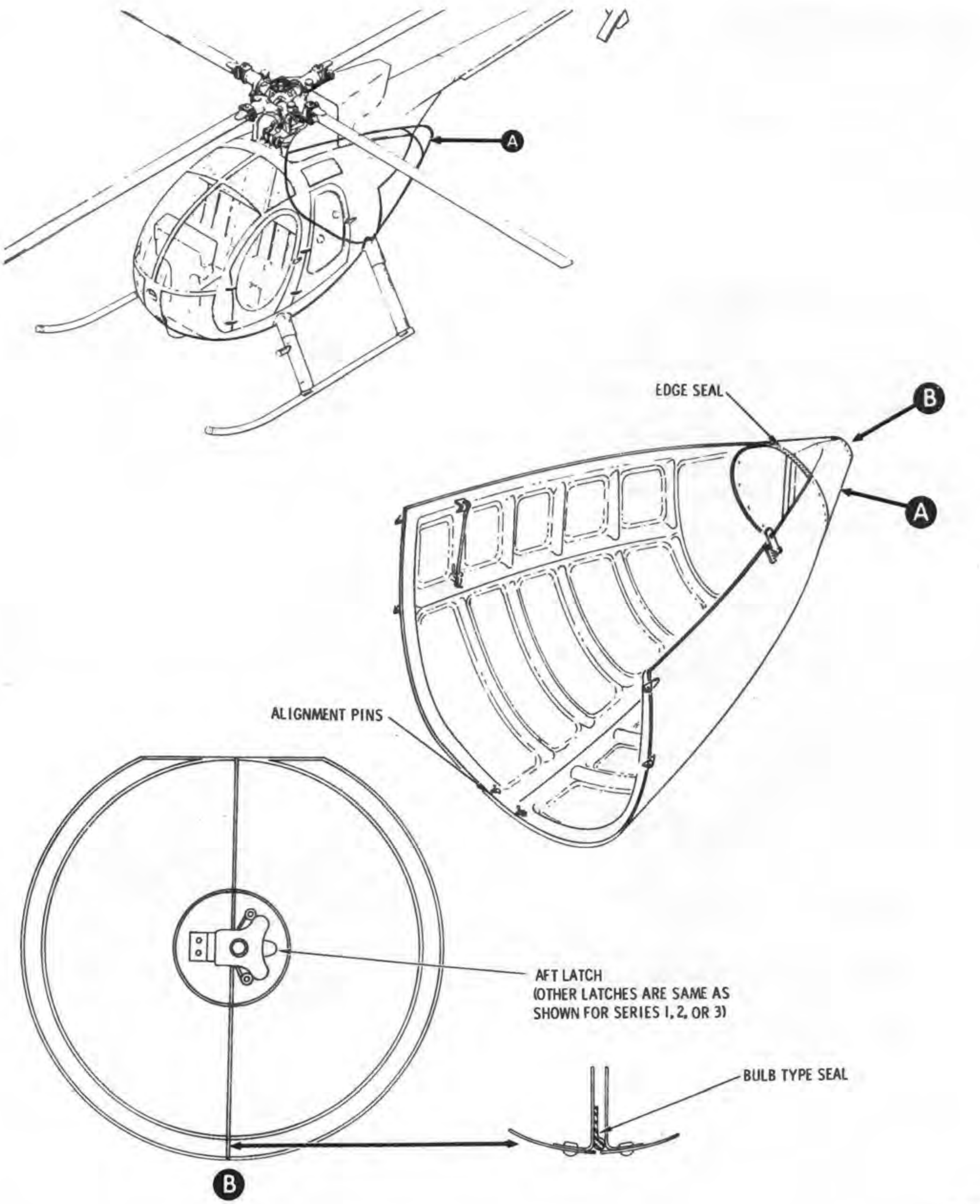


Figure 2-5. Engine Access Doors for Aircraft with Upward Exhausts.

2-135. Repair — Engine Access Door. *a.* Refer to paragraph 2-7 for patch and insertion repair procedures. Refer to table 2-3 for repair material.

b. (See fig. 2-3.) Improved fit of doors on aircraft without adjustable hinges may be obtained by shimming as follows:

(1) Remove engine access doors from fuselage (para 2-133).

CAUTION

Rivets must be carefully drilled out. Removing by the standard method of drilling and drift punching could result in damage to the internal structural bonding and surrounding material.

(2) Remove lower left and right hinges from engine access doors. Do not remove upper hinges.

(3) Remove all four fuselage hinges.

NOTE

Installation of shims must be accomplished as a full set (under each hinge indicated in (2) and (3) above) to provide proper alignment.

(4) Locate rivet holes in shims by using removed hinges as templates; drill and deburr.

(5) Paint mating surfaces with primer (C79). Use NAS508M4 rivets to install hinges, with shims between hinge and skin.

(6) Install engine access doors and check for fit and no preloading at hinge attach points.

2-136. Replacement — Engine Access Door Hinges. On aircraft engine access doors equipped with adjustable door hinges, replace hinges halves as follows:

a. Remove access door from fuselage structure (para 2-134).

CAUTION

Rivets must be carefully drilled out. Removal by the standard method of drilling and drift punching could result in damage to the internal structure and surrounding material.

b. Remove attaching hardware that secures defective hinge half to door. Drill out rivets that secure defective half to fuselage structure. (See fig. 2-4.)

c. Install replacement hinge half on engine access door and temporarily locate hinge serrated surface on hinge adjustable plate. Install hinge attaching hardware but do not tighten.

d. Locate existing rivet holes in fuselage structure for replacement hinge half. Match hole pattern in replacement hinge and drill out holes. Install hinge and shim on fuselage structure and secure with replacement rivets (details D and F, fig. 2-4).

e. Mount door on fuselage structure and install hinge pin hardware. Close all door latches. Check door for alignment and preloading at hinge points.

f. Complete the installation as follows. Make vertical adjustments to obtain proper door fit by installing shimming washers, as required, at hinge pinning points. Install shim(s) under door hinge to obtain lateral adjustment. Use slotted holes in hinge and serrated surfaces to obtain forward and aft adjustment. When adjustments are completed, tighten screws that secure hinge to access door.

g. Refinish area according to chapter 1.

2-137. Replacement — Engine Access Door Latches. On engine access doors having adjustable door latches, replace defective latches or latch hooks as follows:

CAUTION

Rivets must be carefully drilled out. Removal by the standard method of drilling and drift punching could result in damage to the internal structure and surrounding material.

a. Drill out rivets and remove defective latch or latch hook from engine access door or fuselage structure (fig. 2-4). Replace defective door stops or serrated adjustment plates, if required, by drilling out attaching rivets. Refer to paragraph 2-7 for patch and insertion repair procedures.

b. Locate existing rivet holes and install replacement latch, latch hook, door stop, or adjustment plate. Secure with replacement rivets (details A and E, fig. 2-4).

c. Adjust latches as required for proper tension of of latch lever to hook without deflecting the door (para 2-131).

d. Refinish area (except latch lever assembly) according to chapter 1.

2-138. Replacement — Engine Access Door Abrasion Strip and Seals. *a.* Replace worn abrasion strip tape by cleaning the contact area with naphtha (C70). Allow to air-dry a minimum of 30 minutes.

b. Install a 0.50 x 40.0 inch strip of polyurethane pressure tape (C106) to the clean dry surface. Apply hand pressure to ensure firm contact and trim as required. Replace worn and broken tail cone.

c. Repair seals according to procedure in paragraph 2-168.

2-139. Installation (Unmodified Series 1 and 2 Aircraft) — Engine Access Door. *a.* Lift engine access door into position and install hinge pivot bolts (fig. 2-3).

b. Close and latch doors. Check for firm fit and check that there is no door deflection when the hooks are latched.

c. For doors with adjustable latches, adjust as required (para 2-131).

2-140. Installation (Series 3 and Modified Series 1 and 2 Aircraft) — Engine Access Door. *a.* Lift door into position and assemble the marked aft hinge half parts (fig. 2-4).

b. Align index marks on shim, serrated plate, and hinge with marks on door and then tighten the attaching screws.

c. Close and latch doors. Check for firm fit without deformation of doors.

d. Adjust door latches or door position according to para 2-131 or 2-132, if required.

2-141. CARGO DOORS.

2-142. Description — Cargo Doors. The two cargo doors are similar except for an armament door at the lower edge of the left door. (See fig. 2-6.) Each cargo door is a bonded aluminum alloy frame containing a large polycarbonate plastic window. The door latching mechanism consists of four lever-type latches that are cable interconnected. A drain hole is located in the forward lower corner of the door outer skin panel. The outward swing of the door is limited by a rubber stop within each hinge bracket in the fuselage structure. Each door is equipped with a jettison mechanism for emergency jettisoning of the complete door assembly. Extruded rubber seals or an extruded aluminum alloy seal depressor on the fuselage door frame provide a weatherstrip seal with mating extruded rubber seals bonded on the door inner frames. If so modified each cargo door is equipped to lock from the inside and snap vents are reworked to prevent removal. (See fig. 2-7.) A short looped cable, secured at one end, may be pushed up on one locking lever to prevent rotation of all levers to the unlocked position. Snap vents are equipped with an aluminum tube that extends beyond the vent diameter to prevent removal.

NOTE

If cargo door handle cannot be rotated, the door lock may be in place. Open pilot's door; then reach over compartment rear bulkhead and slip looped cable down on upper forward locking lever.

2-143. Inspection — Cargo Door. *a.* Inspect plastic windows for cracks, scratches, crazing, and discoloration that would render the window unserviceable.

b. Inspect skins for cracks, wrinkled areas, dents, scratches, signs of corrosion, and general condition of painted surfaces.

c. Ensure that drain holes in lower corners of the outer skin panel are open.

d. Inspect door handles, latch levers, striker plates and jettison mechanisms for overall wear. Check lever actuating cable assembly for proper tension. Inspect visible portions of cable for excessive wear.

e. Inspect door hinges for secure attachment to door and for cracks.

f. Inspect all stricker plates for excessive wear. Inspect door frame for dents and deformation.

g. Inspect weatherstrip compression seal for cuts, wear, deterioration, and for secure bond to door frame. (Refer to para 2-168 for repair or replacement of rubber door seals.)

h. Inspect door frame anti-chafing tape for serviceability. Remove defective tape where necessary, clean frame surface with methyl ethyl ketone (C69), and replace with new tape (C106).

i. If installed, check door locking cable for condition, check locking adjustment, para 2-146.

2-144. Adjustment (Operational Check) — Cargo Door Latching. *a.* Open door and check for smooth operation of handles and latch mechanism. Check that decals indicate correct direction, check condition, and security. Check that door stop and springs function properly.

NOTE

When opening door, apply light inward force on the door. This will reduce wear of the latching mechanism by overcoming the door seal pressure.

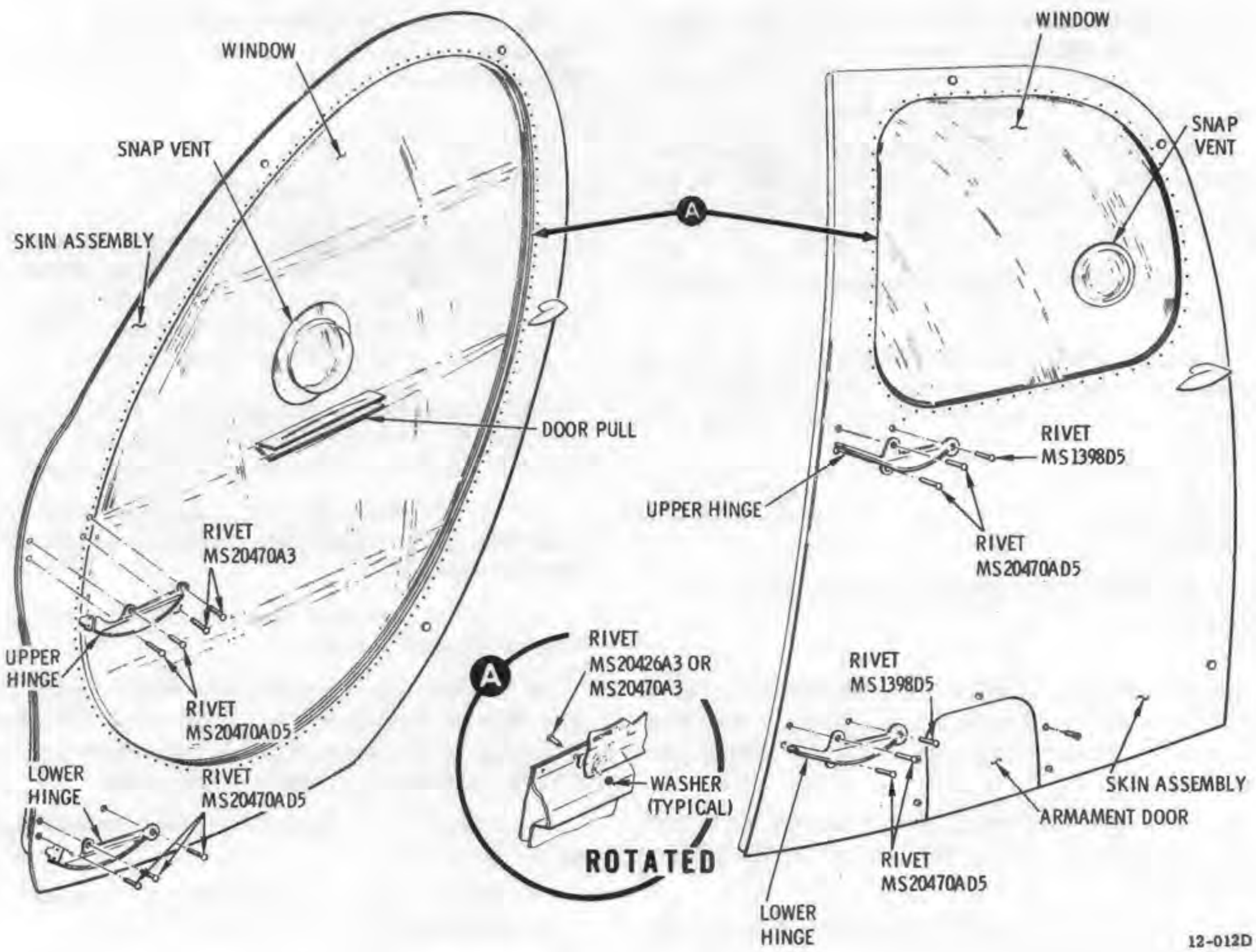


Figure 2-6. Pilot and Cargo Doors.

b. Close door from inside and check latching mechanism. (See fig. 2-6.) Check for lack of tension in cable assembly that actuates the three secondary latch levers. Remove slack by the tension adjustor.

c. Inspect the primary latch lever on the inside latch handle to ensure that it is within the detent position of the main striker plate.

2-145. Adjustment (Operational Check) — Cargo Door Seal Compression. *a.* Open door.

b. Hold a strip of heavy paper against the door seal so that the strip extends approximately 0.25 inch beyond the seal toward the outside of the doorway.

c. While holding the paper strip in place, close and latch the door.

d. Attempt to pull the paper strip from between the door frame and the seal. The strip should not pull out with less than a moderately heavy pull.

NOTE

Where the strip can be withdrawn with a light pull, the fit of the door against the frame is not tight enough to provide an adequate seal. This condition may be due to deterioration of the weatherstrip compression seal, deformation of the door frame, worn hinges, or bent hinge pins.

e. Repeat *a* through *d* at approximately 1-foot increments along the length of the door seal.

2-146. Adjustment (Operational Check) — Cargo Door Locks. *a.* Close and latch the door.

b. Inside the cargo compartment, loop the cable over the upper forward locking lever.

c. Check that the door handle cannot be rotated and the cable remains tight and in place.

d. Slip looped cable up; then open door and check

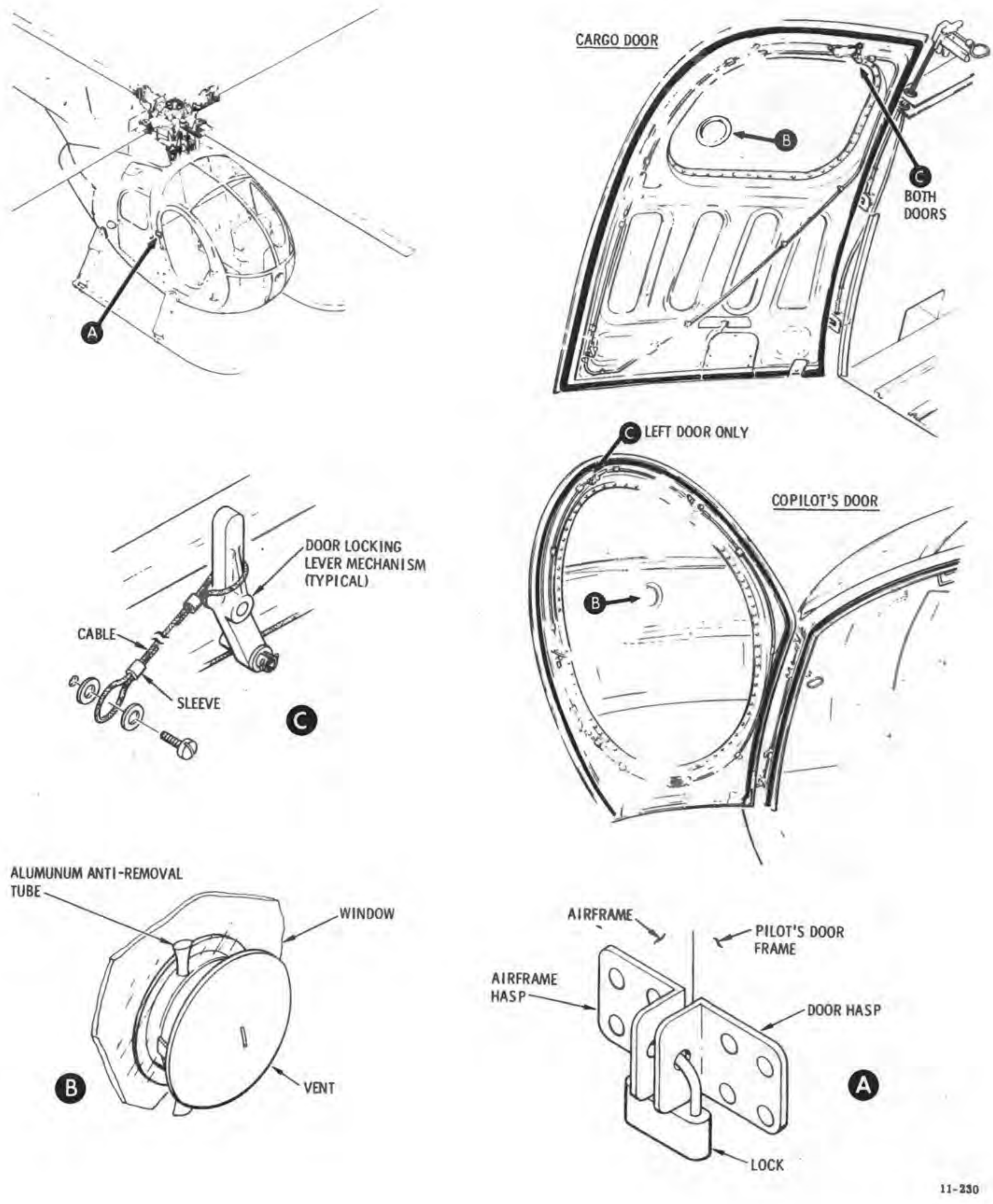


Figure 2-7. Door Locking Devices.

that the cable is free and does not interfere with door operation.

e. If cable is loose, remove loop sleeve and readjust using a new swedged sleeve or replace the cable.

2-147. Removal — Cargo Door. (See fig. 2-6.) *a.* Open the door and pull the hinge pins by the pin tabs.

b. Hold door in alignment so that hinges do not bind, and slide door hinges from hinge sockets to remove door.

2-148. Repair — Cargo Door Frame. Replace complete door frame if repair cannot be performed according to paragraph 2-269. Refer to table 2-3, items 2 and 8 for repair materials.

2-149. Repair — Cargo Door Hinges. (See fig. 2-6.) Replace damaged door hinges. Disassemble only as required for repair or replacement of parts.

a. Remove the door and drill out hinge attaching rivets.

b. Position replacement hinges at basic body attach points and secure with door hinge pins.

c. With damaged hinges removed, install door in closed position. Retain in place by latching the door.

d. Mark the hinge rivet attachment locations through the existing holes in the bonded door skin. Locate and mark the blind rivet attachment points (cargo door only).

e. Remove the door hinges and check for proper edge distance.

f. Drill out the located holes. Use a No. 41 drill at the aft rivet points of the pilot's door upper hinge. Use a No. 21 drill at all other hinge rivet points.

g. On pilot's door, install window attaching rivets with washers under bucked heads.

h. Install two mechanically expanded rivets at cargo door hinge aft attachment points.

i. Install rivets at remaining attachment points.

j. Paint as required.

k. Install doors and perform an operational check (para 2-144).

2-150. Repair — Cargo Door Windows. Refer to paragraph 2-228 for serviceability criteria and repair of plastics. Replace window if damaged beyond practical repair. Replace window as follows:

a. If a snap vent anti-removal device is installed, remove the tube. Use soft-nosed pliers and form one tube end into a round shape; then carefully withdraw the tube.

b. Squeeze snap vent into oval shape and remove from window.

c. Drill out rivets that attach window to door structure and remove window.

d. If door frame or window is to be reused, carefully scrape off sealant around edge of window frame by using a wooden or plastic scraper.

e. Clamp replacement window in position in door frame and drill No. 42 rivet holes using holes in door frame for pattern.

f. Remove window and spread a continuous bead of sealing compound (C89) around frame.

g. Install window with rivets. Use washers, as required, between formed rivet heat and plastic window.

h. Squeeze snap vent into oval shape and reinstall.

i. If snap vents are so modified, install anti-removal tube. Use soft-nosed pliers and form both tube ends into an oval shape to prevent tube removal.

2-151. Repair — Cargo Door Handle and Locking Mechanism. Replace loose lock lever bushings (6 and 9, fig. 2-8). Replace complete cable (15) and conduit as an assembly if either is damaged. Disassemble only as required for repair or replacement of parts.

a. Remove cotter pins (12) from cable retaining bushings (8) at each of the four locking levers (10 and 16). Remove spacers (21) and disengage cable.

b. Drill out rivets in all clips (22) that attach cable (15) and nylon conduit assembly to door frame.

c. Push out roll pin(s) (7), remove inner door handle (14), outer door handle (17), and locking lever (16). Retain associated hardware.

d. Push out roll pin(s) (7) in each of the three remaining locking levers (10) and remove by withdrawing pins (5 and 13).

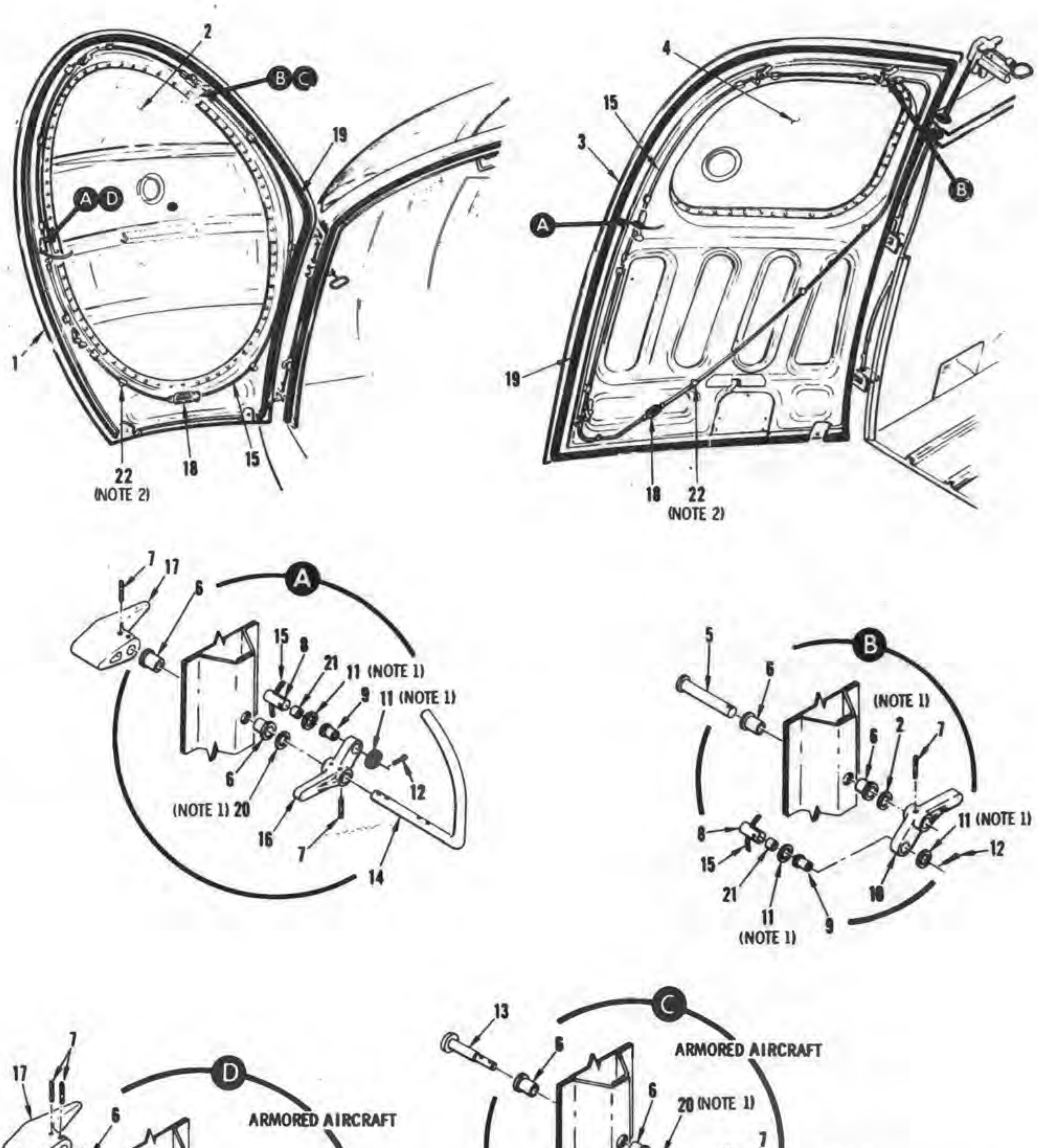
e. Remove bushings (6) from door frame, and bushing (9) from locking levers (10).

f. Install bushings (6) in door frame and install three locking levers (10) with pins (5) or (13) and roll pins (7). Shim with washers (20) to get free rotation and minimum end play between bushing (6) and locking lever (10).

g. Install inner door handle (14), outer door handle (17), and locking lever (16) with four roll pins (7). Using washers (20) between locking lever (16) and bushing (6), shim to get free rotation with minimum end play.

h. Install replacement conduit and cable assembly (15) with mechanically expanded rivets through clips (22). See figure 2-8 for rivet type and location. Use existing holes in old door frame.

i. Position all locking levers (10 and 16) and door handle in unlatched positions and install cable (15), retaining bushings (8), and washers (11). Use washers



NOTES:

1. SHIM AS REQUIRED TO OBTAIN MINIMUM END PLAY WITH FREE ROTATION OF THE CABLE RETAINING BUSHING AND LOCKING LEVER.
2. CKLP4F RIVET (CR2249-4-3 ALT)

12-021-1B

Figure 2-8. Pilot and Cargo Door Details.

(11) to obtain minimum end play with free rotation of the cable retaining bushing. Install spacers (21) and cotter pin (12).

j. Check latch assembly for free movement and locking levers for proper positioning. Adjust cable tension at turnbuckle (18) as required.

k. If used, reinstall door locking cable as shown in figure 2-7.

l. Install door and perform an operational check (para 2-144 through 2-146).

2-152. Replacement — Cargo Door Latch Cable. If cable and conduit assembly cannot be obtained, cable (15, fig. 2-8) may be replaced as follows:

a. Remove pilot/cargo door from aircraft.

b. Remove cotter pins (12) and washers (11) from cable retaining bushing (8) at each of the four locking levers (10 and 16). Remove spacers (21) and disengage cable. Retain the associated hardware.

c. Do not remove rivets, clips (22) or conduit from door frame when replacing cable.

d. Remove cable (15) from conduit by cutting cable (15) at several points. Pull cable from plastic conduit. Do not cut conduit during cable removal.

e. Install new cable (MIL-C-5424) by threading end into conduit. Stop at each latch to thread on a ball.

NOTE

Do not swage balls on cable at this time.

f. Continue threading cable through conduit until cable and unswaged balls are positioned around the circumference of the door frame.

g. Mark the position on cable for each ball where the door latches will close on the striker plates of the door frame.

h. At position marked on cable in step *g* swage balls with swaging tool kit (T2) or an equivalent tool.

i. Pull cable tight around door.

j. Swage both ends of cable together with terminal splice (swedged sleeve).

k. Position all locking levers (10 and 16) and door handle in unlatched positions and reinstall retained associated hardware from step *b* onto cable (15). Use washers (11) to obtain minimum end play with free rotation of the cable retaining bushing (8). Install spacers (21) and cotter pins (12).

l. Check latch assembly for free movement and locking levers for proper positioning. Adjust cable tension at turn-buckle (18) as required.

m. Install door and perform operational check (para 2-144 through 2-146).

2-153. Repair — Cargo Door Seals. Refer to paragraph 2-168.

2-154. Repair — Rubber Cargo Door Stop. Replace door stop if damaged. Remove and re-bond if partially separated.

a. Remove partially separated or damaged door stops (fig. 2-9) by carefully prying bonded rubber stop out of the body hinge recess.

b. Bond the stop horizontally on the forward side of the hinge recess. (Refer to paragraph 2-173 for application of general use non-structural bonding adhesive.)

2-155. Replacement — Emergency Release Cargo Door Jettison Assembly. No repair of cable is permitted.

a. Drill out handle support rivets (fig. 2-9).

b. Carefully pull away rubber door seal aft of the center clip and drill out all remaining upper and lower clip rivets.

c. Work release handle through the bulkhead and remove grommets.

d. Remove the emergency release assembly. Remove clips and straighten tubes as required.

e. Install the replacement emergency release assembly by feeding the jettison door pins through the bulkhead channel. Feed the handle through the station 75 bulkhead.

f. Install two grommets and form the tubes to contour.

g. Install clips and brackets as shown in figure 2-9.

h. Install rivets at clip locations as shown in figure 2-9.

i. Reseal cargo door. (Refer to paragraph 2-168 for repair or replacement of extruded rubber seals.)

j. Install door and perform operational check of the door release mechanism.

2-156. Replacement — Cargo Door Hinge Spring. No repair of hinge spring is permitted.

a. Remove the door (para 2-147).

b. Remove two cotter pins (fig. 2-9), and pins located on the body hinge recess.

c. Remove stop spring.

d. Replace the stop spring with its longest flat area outboard and aft in the body hinge recess.

e. Install pins and cotter pins. Pins may be installed with heads down if interference prevents installation with cotter pin hole down.

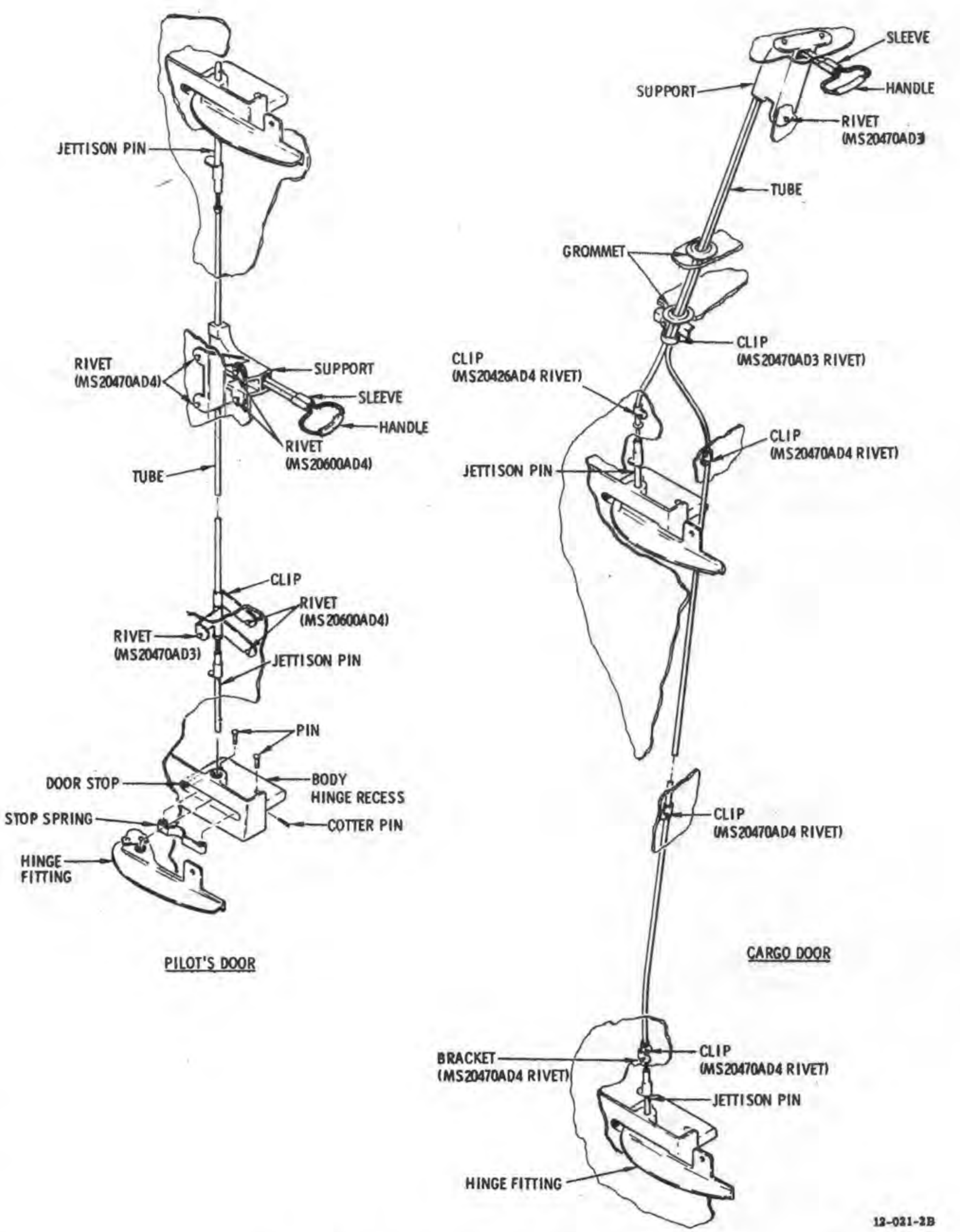


Figure 2-9. Pilot and Cargo Door Jettison Mechanism.

f. Cover exposed sharp edges of cotter pins with sealer (C89).

2-157. Installation — Cargo Door. (See fig. 2-9.) *a.* Lift door into position so that hinges are aligned, and engage door hinges with fuselage hinge sockets.

NOTE

Door must be held open while inserting hinge pins to keep pin holes aligned for pin insertion.

b. Insert pins through upper and lower hinges until spring-loaded ball detent in pin emerges past the lower side of the hinge socket. Close and latch the door.

2-158. ARMAMENT DOOR.

2-159. Description — Armament Door. The aluminum alloy armament door (fig. 2-6) is mounted in the lower edge of the left cargo door. A stiffener clips to the cargo door frame. A section of rubber door seal is bonded to the lower edge.

2-160. Removal — Armament Door. (See fig. 2-6.) *a.* Open the left cargo door.

b. Remove five screws and washers that secure armament door to cargo door.

c. Push the armament door stiffener to unclip from cargo door and remove armament door.

d. Close the cargo door.

2-161. Inspection — Armament Door. *a.* Inspect for corrosion, distortion, or cracks.

b. Check for loose rivets or nutplates.

c. Inspect stiffener for condition of weld.

d. Inspect door seal and anti-chafing tape for serviceability.

2-162. Repair — Armament Door Nutplate/Rubber Seal Strip. Replace a defective nutplate or rubber seal strip as follows:

a. Remove defective seal strip and nutplates from door as required. Replace plastic tape seal strip, if installed, when necessary.

b. Clean door surface with solvent (C94), and dry (with low pressure compressed air, if available).

c. Use MS20426AD3 rivets to replace nutplate.

d. Cut holes through replacement seal strip to match existing holes and install strip. (Refer to paragraph 2-168 for repair or replacement of extruded rubber seals.)

2-163. Installation — Armament Door. (See fig.2-6.) *a.* Open cargo door.

b. Position armament door against inside of the cargo door. Clip stiffener to cargo door frame and secure with screws and washers.

c. Close cargo door.

2-164. PILOT'S DOORS.

2-165. Description — Pilot's Doors. Each pilot's door is a bonded aluminum alloy frame containing a large polycarbonate plastic window with three lateral plastic stiffeners. (See fig.2-6.) The door latching mechanism consists of four lever-type latches that are cable interconnected. The inside latch handle is normally located at the rear edge of the door. On aircraft with armor installed, the inside latch handle is located at the upper forward edge of the door frame and a plastic door pull is bonded to the middle stiffener of the window. If so modified, the copilot's door is equipped to lock from the inside the same as the cargo doors. (See fig. 2-7.) The pilot's door is equipped with an external locking device consisting of two flanges, one on the door and one on the door frame, to accommodate a padlock. The door window snap vents on both pilot's doors are equipped with the anti-removal device the same as that on the cargo doors. Installation and jettisoning features of both doors are comparable to those of the cargo doors. Refer to paragraph 2-141 for operational check, removal, inspection, and installation.

2-166. Repair — Pilot's Doors. (See fig. 2-8 and 2-9.) The emergency release jettison mechanism, the latching system, and the adjustment of the latch actuating cable are comparable to that of the cargo doors (para 2-141). Except for replacement of the jettison release, repair of the pilot's doors and windows is outlined under cargo door information (para 2-141). (Refer to table 2-3, items 3 and 8 for repair material.)

2-167. Replacement — Emergency Release Pilot's Door Jettison Assembly. No repair of cable is permitted.

a. Drill out four rivets that attach the door jettison handle support (fig.2-9).

b. Drill out three rivets that attach the tube support clip.

c. Remove the handle, support tube and clip as a unit.

d. Install by placing emergency release assembly in position with jettison pins inserted in door hinge pivot holes.

e. Align the jettison handle support with existing holes and install two rivets, bucked head inboard, and two mechanically expanded rivets as shown in figure 2-9.

f. With the tube firmly seated in the jettison handle support, position the clip at the lower flared end of the tube. Check for matching door frame hole alignment.

NOTE

If tube clip mounting holes fall approximately 2 inches above the existing door frame holes, proceed with h below.

g. Position clip as described in *f* above. Install rivet with manufactured head inboard. Install mechanically expanded rivets as shown in figure 2-9.

h. Lay a straightedge across the center line. Position the clip at the lower flared end of the tube. Locate and mark the clip mounting holes on the centerline. Drill two No. 30 holes for inboard rivets and one No. 41 hole for the outboard rivet.

i. Proceed with *g* above.

j. Plug any open holes with rivets.

k. Install door and perform operational check of the door release mechanism.

2-168. REPAIR OR REPLACEMENT — RUBBER EXTRUSION SEALS.

2-169. Replacement — Rubber Extrusion Seals. *a.* Carefully pull or scrape away damaged seal and remove all traces of adhesive from seal mounting surface by using a cloth dampened with methyl ethyl ketone (C69).

b. Restore chemical film protection to any base metal exposed during cleaning process by using chemical film (C20).

c. Clean the seal contact area with naphtha (C70) and allow to air-dry a minimum of 30 minutes.

d. Remove all traces of talc, grease, oil, and dust from rubber seal by using naphtha (C70). Allow to air-dry a minimum of 30 minutes prior to application of adhesive primer.

e. Thoroughly mix primer (C77). Brush a thin coat of primer on the rubber bonding surfaces and air-dry for a minimum of 30 minutes.

f. Cure primer-coated seal in a circulating air oven for 50-70 minutes at 145-175°F (63-79° C).

g. Thoroughly stir the adhesive (C10).

h. Apply one uniform brush coat of adhesive to the seal contact area rubber seal.

NOTE

Do not overbrush. Allow to air-dry for a minimum of 20 minutes.

i. Apply a second uniform brush coat to the seal contact area and rubber seal. Allow to dry approximately 5 minutes. Test tack with a knuckle. Adhesive is ready for mating when adhesive no longer transfers.

j. Carefully align seal with the mounting surface and press firmly together. Allow adhesive to cure a minimum of 4 hours before applying any load.

2-170. Repair — Partially Separated Rubber Extrusion Seals. *a.* Clean the separated area with naphtha (C70) and allow to dry for a minimum of 20 minutes.

b. Thoroughly stir adhesive (C10).

c. Apply one uniform brush coat of adhesive to both the rubber seal and mating surface contact area. Allow to dry for 5 minutes and press mating surfaces together.

2-171. REPAIR OR REPLACEMENT OF SILICONE RUBBER GASKETS.

2-172. Repair or Replacement — Silicone Rubber Gaskets. *a.* Carefully pull or scrape away damaged gasket.

b. Remove all cement and foreign material from gasket mounting surface with a cloth dampened by methyl ethyl ketone (C69).

c. Using masking tape (C10), mask area to restrict cement to mounting surface.

d. Evenly spread a thin layer of adhesive (C13) on one of the surfaces to be bonded.

e. Carefully align gasket with mounting surface and press firmly and evenly to displace any air bubbles. Do not force adhesive out of the joint.

f. Allow bond to set up for 24 hours at room temperature. Maximum bond strength will be reached in 72 hours.

2-173. APPLICATION OF GENERAL NON-STRUCTURAL BONDING ADHESIVE.

2-174. General — Application of General Non-Structural Bonding Adhesive. Except as noted otherwise, this method may be utilized at all levels of maintenance as a general purpose replacement for repair of rubber and non-structural bonded materials.

a. Clean mating surfaces with a cloth dampened by methyl ethyl ketone (C69).

b. Restore chemical film protection to any base metal exposed during cleaning process by using chemical film (C20).

NOTE

When mixing adhesive, use a wax-free cup.

c. Using equal parts by volume of adhesive parts A and B (C7), prepare a mixture of adhesive. Mix until color becomes uniform light green.

d. Apply an even, thin coating of adhesive to mating surfaces.

e. Carefully position surfaces to be mated. Apply sufficient pressure to assure good contact until bonding cures; 8 hours at ambient (room) temperature, or 2 hours at 150°F (66°C).

2-175. SOUND INSULATION BLANKETS.

2-176. Description — Sound Insulation Blankets. Sound insulation blankets are installed across the aft section of the passenger-cargo compartment at station 124.00 (fig. 2-10). The insulation is removed by sections to permit removal of the main gearbox access cover and cargo compartment left and right side aft bulkhead access covers. The blanket sections consist of a double fiberglass core backed with netting and faced with vinyl-coated nylon fabric. The blankets are attached to the compartment structure with nylon fastener tape hook and pile devices located on mating surfaces. Cutouts are provided in the lower section for troop seat attach fittings, the cargo compartment heat duct, and for avionics components (on Series 3 aircraft). The main transmission insulation cover is bonded to and removed with the main transmission cover. Head pads, web pads and pad fillets are bonded to the upper aft section of the cargo compartment structure. Additional insulation blankets are nested on the inside of each aft bulkhead channel.

2-177. Removal — Sound Insulation Blankets. (See fig. 2-10.) *a.* Remove troop seats from cargo compartment (para 2-196).

b. Remove nylon fastener tape by pulling from adjoining sections.

c. Carefully separate nylon fastener tape hook and pile and release tape edging as required to free insulation blanket sections.

d. Remove non-fixed plugs.

e. Remove main transmission cover (with bonded insulation) blanket) as an assembly (para 2-23).

f. Remove upper and lower (non-fixed) insulation blankets from inner frames.

NOTE

Pads and piping are bonded to the airframe and should not require removal.

2-178. Inspection — Sound Insulation Blankets. *a.* Inspect blankets for holes, tears, cuts and serviceability.

b. Check binding and doublers for loose or torn fabric.

c. Inspect blankets and mating surfaces for loose, torn or missing hook and pile fastener tape.

d. Inspect heat pads and piping for security of bond to structure and for tears, etc.

2-179. Repair — Sound Insulation Blankets. *a.* Patch holes, tears, and cuts with general purpose adhesive-backed cloth tape.

b. Repair loose bindings, doublers, padding and nylon fastener tape according to *c* through *f* below.

c. Remove all dirt, dust, oil and grease by wiping with a cloth dampened by isopropyl alcohol (C82).

NOTE

Loosened nylon fastener tape might be reactivated for adhesion by wiping the original adhesive film with methyl ethyl ketone (C69).

d. Apply a thin even coat of cement (C19) to each mating surface.

e. Allow to dry from 3 to 5 minutes until the cement has strong tack.

f. Align the mating surfaces and press together.

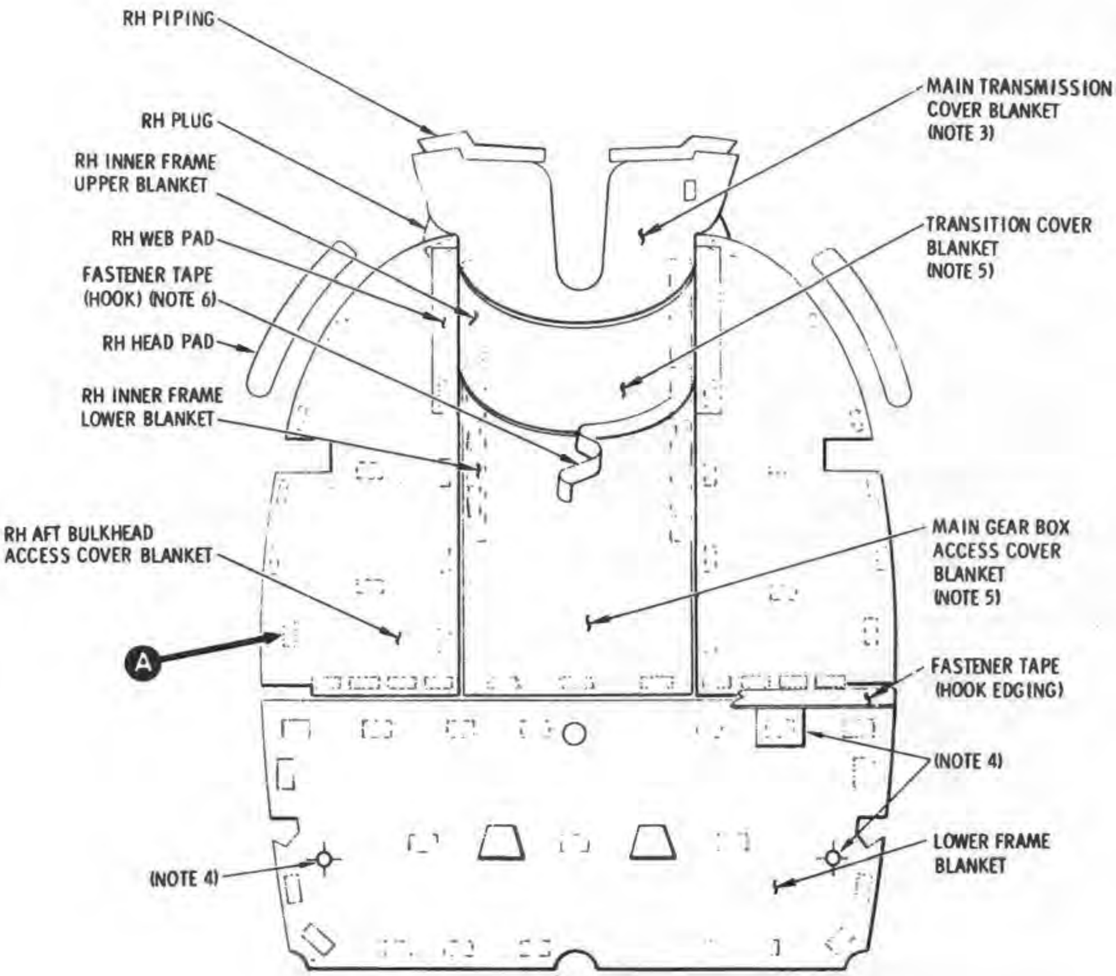
g. Defective nylon fastner tape may be replaced using the removed velcro fastener as a pattern. Cut new hook and pile fastener tape to size, activate adhesive backing by wiping with methyl-ethyl-ketone (C69) and press in place. Allow 3 to 5 minutes for drying time before installing insulation blanket to aircraft.

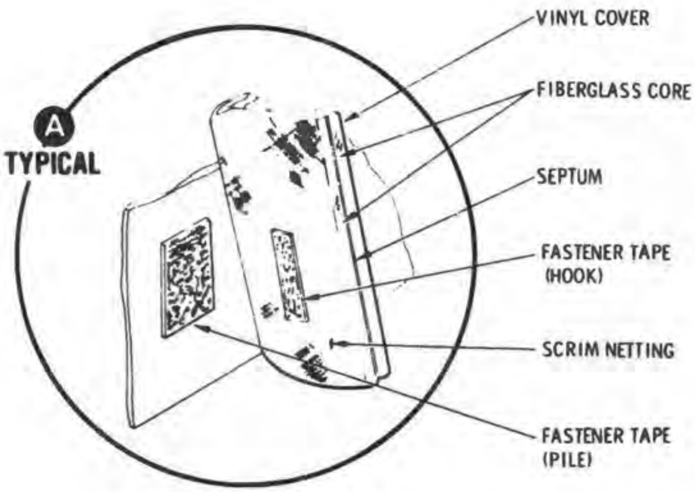
2-180. Installation — Sound Insulation Blankets. (See fig. 2-10.)

CAUTION

Check that all nylon fastener tape is clean and not clogged with foreign matter. Clean as necessary. Replace fastener tape (pile) that does not provide positive attachment.

a. Install main transmission cover (para 2-23).





NOTES:
1. USE INSULATION BLANKET AS A TEMPLATE FOR LOCATION OF LOOSE OR MISSING BULKHEAD FASTENERS.
2. RIGHT SIDE (RH) DETAILS IDENTIFIED ARE TYPICAL OF LEFT SIDE DETAILS.
3. PART OF MAIN TRANSMISSION COVER.
4. CUTOUTS FOR RADIO WIRE HARNESS ON SERIES 3 AIRCRAFT ONLY.
5. TRANSITION AND MAIN GEAR BOX ACCESS COVER BLANKETS ARE A ONE-PIECE ASSEMBLY IN ALTERNATE CONFIGURATION.
6. NOT REQUIRED WITH ONE-PIECE BLANKET ASSEMBLY.

11-132B

Figure 2-10. Sound Insulation Blankets.

b. Install upper and lower (non-fixed) insulation blankets into inner frames.

c. Press insulation blanket sections into place on the bulkhead tape piles.

d. Install nylon fastener tape (hook and pile), and set with hand pressure.

e. Install troop seats (para 2-196).

2-181. PILOT'S SEATS AND SEAT ARMOR

2-182. Description — Pilot's Seats and Seat Armor. Two-part seats are installed in the pilot's compartment. (See fig. 2-11.) Each two-part seat consists of aluminum tubing (0.80-inch-diameter) with nylon mesh covering and rubber pads cemented to the frame mounting plates. Seat bottoms are secured to the top of the pilot's seat structure. On aircraft without armor installed, the seatbacks are mounted on the station 78.50 canted bulkhead. On aircraft requiring armor installation, the seatback is replaced by a reinforced ceramic tile, winged plate. The plate is mounted to bulkhead attaching lugs with four straight pins and cotter pins. The pilot's armor wing rests on a support cushion at its lower forward edge. Seatback cushions are attached to the plate with velcro hook and pile fasteners.

2-183. Removal — Pilot's Seats and Seat Armor. (See fig. 2-11.) *a.* Clear seat of seat belt and shoulder harness.

b. On aircraft without armor installed, remove attaching screws, seatback, and seat bottom.

WARNING

If the aircraft is to be operated with part or all of the seatback armor panels removed, the engine fuel controls armor may also have to be removed. A weight and balance check must always be made to ensure that center of gravity limits will not be exceeded.

c. On aircraft with armor installed, remove seat bottom as above. Remove cotter pins, straight pins and seatback armor.

d. Release nylon fastener tape and remove backrest cushions.

2-184. Inspection — Aircraft Pilot's Seats Without Armor Installation. *a.* Inspect seat mounting plates and nutplates for security and rubber pads for excessive wear.

b. Inspect seat frame tube members for distortion, cracks, corrosion, and paint deterioration.

c. Inspect nylon mesh webbing for damage or excessive wear and installation date (TM 55-1500-204-25/1).

d. Inspect nutplates and rivets for security.

2-185. Inspection — Aircraft Pilot's Seats With Armor Installation. *a.* Inspect seat bottoms (para 2-184).

b. Inspect armor mounting pins and attach fittings for security and condition.

c. Inspect armor for bullet and shrapnel strikes.

d. Inspect armor mounting brackets for breaks, cracks and distortion.

e. Inspect backrest cushion for cuts, tears and security of attachment. (Refer to para 2-179 for repairs.)

f. Inspect pilot armor rubber edge guard for condition and security of attachment. (Refer to para 2-168 for repair or replacement of rubber seals.)

g. Inspect pilots armor wing support bracket for cracks, security of attachment and distortion.

2-186. Repair — Pilot's Seats Armor. (See fig. 2-11.) *a.* Replace damaged seatback armor panels. No repairs are permitted on armor panels other than replacement of attaching fittings.

b. Replace damaged or distorted armor bracket (detail B, sh 1) or armor attach fitting (details E, F, G, sh 2).

c. Replace damaged armor attach fitting nutplates.

2-187. Repair — Pilot's Seats. (See fig. 2-11.) *a.* Remove damaged rubber pads from seat leg mounting plate.

b. Clean seat leg mounting plate with solvent (C94).

c. Apply cement (C19) and attach new rubber pad to seat leg mounting plate.

d. Repair frayed or torn nylon webbing or replace if damaged beyond repair. (Refer to TM 55-1500-204-25/1.)

e. Remove minor faults and imperfections in tube members by polishing to restore original finish. Repair any damage not removable by light polishing by splicing of damaged tube sections (TM 55-1500-204-25/1).

2-187A. Replacement — Raschel Knit Seat Covers. *a.* Remove nylon cord securing bottom seat cover. Remove cover from seat support.

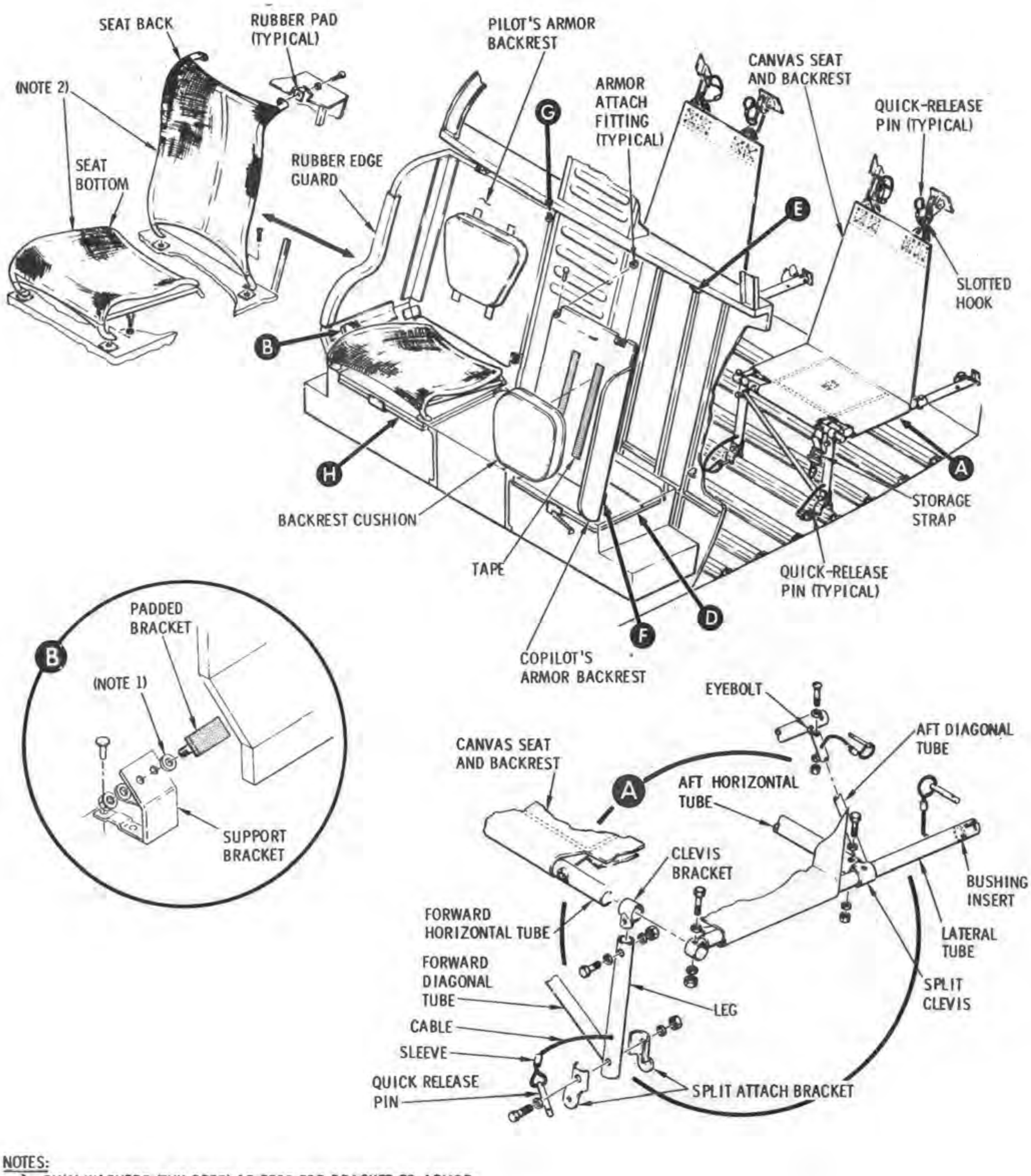
b. Install cover on seat support and secure with new nylon cord laced through reinforcing eyes, tighten to desired tension.

c. The seat shall not deflect more than 2.0 inches with a load of approximately 166 pounds acting downward and uniformly distributed over the top panel. This may be accomplished by using an occupant, shot bags, or other high density material. Care should be taken when using shot bags or other high density material to place them in such a manner as to represent an occupant.

NOTE

Raschel covers may stretch after initial installation. Seat cover tension must be maintained to ensure support for occupant.

2-188. Installation — Aircraft Pilot's Seats Without Armor Installation. (See fig. 2-11) *a.* Clear seat structure and bulkhead mounting areas of seat shoulder harness and any foreign material.



NOTES:

1. SHIM WASHERS (THK CRES) AS REQD FOR BRACKET-TO-ARMOR CONTACT: FOUR MAXIMUM PER STUD.
2. INSTALLATION DATE STENCIL (1/2 INCH LETTERING) ON NYLON CLOTH UNDER OUTBOARD SIDE PARALLEL WITH SEAT TUBING. INSPECT WITH MIRROR.

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Figure 2-11. Seats and Seat Armor. (sheet 1 of 2)

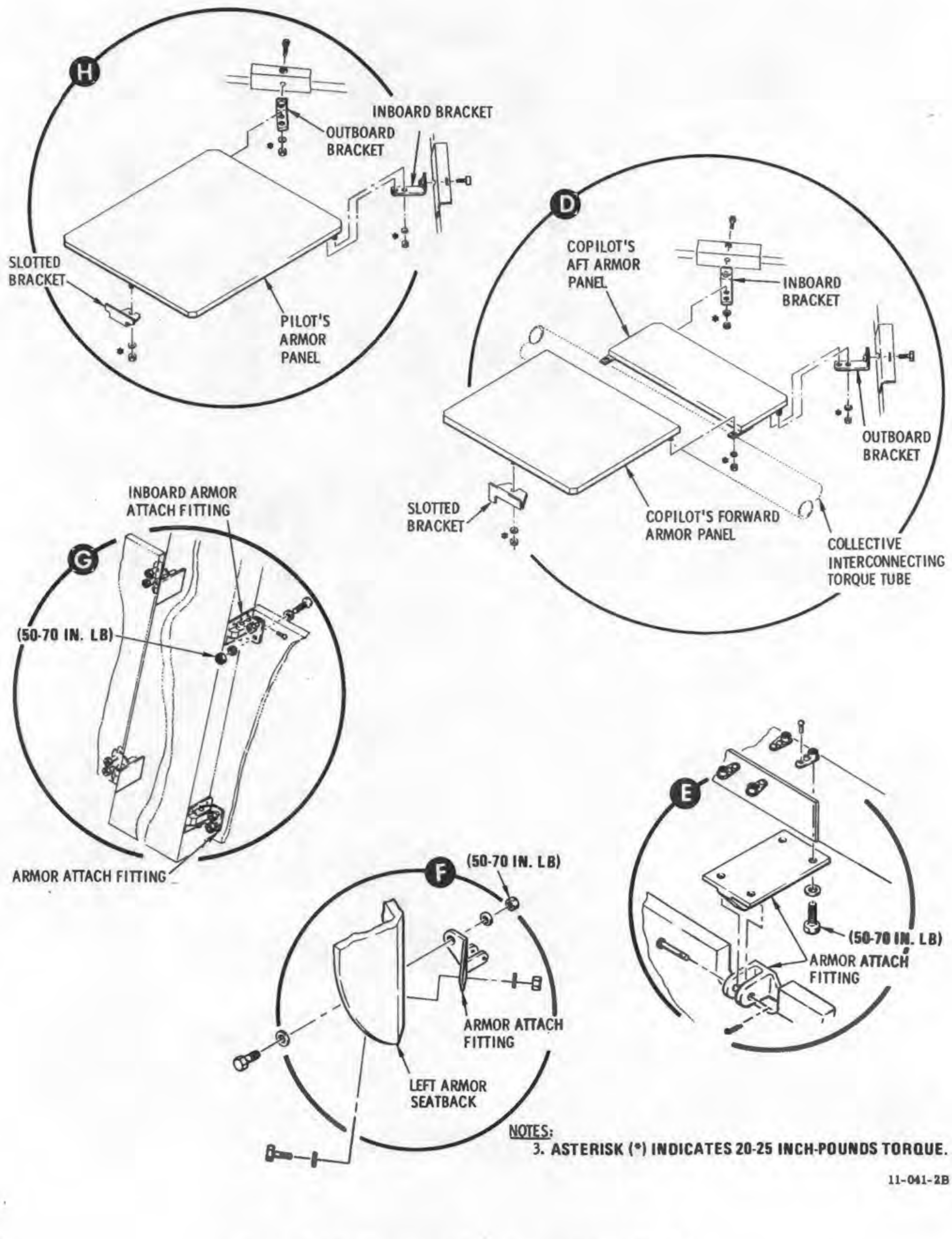


Figure 2-11. Seats and Seat Armor. (sheet 2 of 2)

b. Install six screws and firmly secure seat bottom and seatback.

2-189. Installation — Aircraft Pilot's Seats With Armor Installation. (See fig. 2-11.)

WARNING

If the aircraft is to be operated with part or all of the seatback armor panels installed, the engine fuel controls armor may also have to be installed. A weight and balance check must always be made to ensure that center of gravity limits will not be exceeded.

a. Position armor seatback panel. Install four straight pins and secure with cotter pins.

NOTE

Tilting copilot's seatback armor forward provides greater access for attachment of fittings at lower outboard side. These fittings are to be attached first. Tilting also requires temporary removal of two inertia reel control clamps to allow clearance in the armor tilt path.

b. Observe and note fit of pilot's seatback armor between lower wing and padded bracket.

c. Use washers as required (four thick washers maximum) to position padded bracket for contact with underside of lower armor wing. Install two washers and locking nuts to secure padded bracket.

NOTE

Shimming washers may be used in place of the two nuts next to the bracket pad when these nuts do not allow enough downward adjustment. No more than four shimming washers are to be used on each stud of the bracket for upward adjustment.

d. Position backrest cushions and firmly press mating nylon fastener tape (hook and pile) together.

e. Install seat bottom.

2-190. PILOT'S UNDERSEAT ARMOR.

2-191. Description — Pilot's Underseat Armor. On aircraft requiring armor installation, aluminum alloy armor support brackets (fig. 2-11) are riveted to the seat support structure beneath the pilot and copilot positions to support arm panels.

2-192. Removal — Pilot's Underseat Armor Panels. (See fig. 2-11.)

WARNING

If the aircraft is to be operated with part or all of the underseat armor removed, the engine fuel controls armor may also have to be removed. A weight and balance check must always be made to ensure that center of gravity limits will not be exceeded.

a. Remove foot support fairings (para 2-35) as applicable.

b. For copilot's armor removal, lay enough padding on collective interconnecting torque tube (fig.2-11) to prevent damage of tube.

c. Remove nut and washer at forward slotted bracket. Armor panel will remain supported by slotted brackets.

d. Support armor panel and remove bolts and washers from aft (inboard and outboard) mounting brackets.

e. On copilot's armor panel only, remove the two nuts and washers that join the forward and aft panel sections. Raise the forward panel far enough to get clearance and remove the aft panel.

f. Remove armor panel supported by slotted bracket.

g. Remove attaching nuts and washers to remove aft mounting brackets, as required.

h. Remove torque tube padding.

2-193. Inspection — Pilot's Underseat Armor Panels. *a.* Inspect armor panel for bullet and shrapnel strikes, and for loose or damaged mounting studs.

b. Inspect armor panel for secure attachment, and mounting brackets for breaks, cracks and distortion.

2-194. Repair — Pilot's Underseat Armor Panels. No repairs are permitted on armor panels other than replacement of attaching fittings.

2-195. Installation — Pilot's Underseat Armor Panels. (See fig. 2-11.)

WARNING

If the aircraft is to be operated with

part or all of the underseat armor installed, the engine fuel controls armor may also have to be installed. A weight and balance check must always be made to ensure that center of gravity limits will not be exceeded.

a. Remove foot support fairing (para 2-35) as applicable.

b. When installing copilot's armor, lay enough padding on collective interconnecting torque tube to prevent damage to tube.

c. If not already installed, attach aft mounting brackets to armor panel with nuts and washers. **TORQUE NUTS TO 20 — 25 INCH-POUNDS.**

d. Insert armor panel through foot fairing opening so that single mounting stud is down and in front. Place forward stud into slotted bracket.

e. On copilot side only, insert armor panel aft section so that panel joint brackets are forward and install two new nuts with washers. **TORQUE NUTS TO 20 — 25 INCH-POUNDS.**

f. Align the two aft (inboard and outboard) mounting brackets with mating holes in structure bracket and install two bolts with washers.

NOTE

Check that each aft corner of armor panel clears end of mounting bracket bolts by a minimum of 0.12 inch. Ensure that armor does not contact underseat equipment such as collective interconnecting torque tube, electrical units and wiring.

g. Secure panel to slotted bracket with washer and new nut. **TORQUE NUT TO 20 — 25 INCH-POUNDS.**

h. Remove torque tube padding and reinstall foot support fairings.

2-196. TROOP SEATS.

2-197. Description — Troop Seats. Two troop seats are installed side by side in the cargo compartment and are fastened by quick-release pins to fittings on the station 124.00 bulkhead. (See fig. 2-11.) Each troop seat consists of a tubular frame that supports the seat portion of the canvas seat and backrest, two legs, mounting brackets, two backrest attach fittings, and six quick-release pins. Each troop seat can be folded to allow use of the entire cargo floor space.

2-198. Removal — Troop Seats. Pull out six quick-release pins and remove troop seat from fuselage.

2-199. Disassembly — Troop Seats. (See fig. 2-11.) Disassemble (seat removed) only as required to remove or replace defective parts.

a. Remove bolts that attach forward diagonal tube (detail A, sh 1) to legs.

b. Remove bolt that attaches legs to clevis brackets.

c. Remove bolts that attach split attach brackets to legs.

d. Remove bolts from forward horizontal tube; then rotate tube and slide it out of canvas seat loop.

e. Remove aft diagonal tube attaching bolts.

f. Spread left and right tubes and slip split clevis out of aft lateral tube. Slowly withdraw tubes from seat loops.

g. Slide aft horizontal tube out of seat loop.

h. Remove quick-release pin sleeve and disconnect cable and quick-release pin.

2-200. Inspection — Troop Seats. *a.* Inspect clevis brackets and split support bracket for security, cracks and corrosion. Inspect quick-release pins for distortion, corrosion, or any visible damage.

b. Inspect horizontal and lateral tubes and forward and aft diagonal tubes for security of all members. Inspect for distorted, cracked, broken, and corroded members, and paint deterioration.

c. Inspect canvas seat and bracket for damage and excessive wear (TM 55-1500-204-25/1).

d. Inspect backrest slotted hooks for breaks, cracks, or distortion, and security.

e. Inspect troop seat brackets for wear. (Refer to para 2-201 for repair of brackets.)

2-201. Repair — Troop Seats and Brackets. (See fig. 2-11 and 2-12.) *a.* Rework all worn areas to remove a sharp edge. Reworked areas should be well radiused into the surrounding area.

b. Brackets not within the limits shown on figure 2-12 after rework must be replaced.

c. Replace defective quick-release pins.

d. Replace warped tubes.

e. Replace cracked, broken, deformed, corroded, or otherwise damaged brackets, clevises, or slotted hooks.

f. Replace canvas seat and backrest, if damaged beyond repair.

g. Remove minor faults and imperfections in tube members by polishing to restore original finish. Repair any damage not removable by light polishing by splicing of damaged tube sections (TM 55-1500-204-25/1).

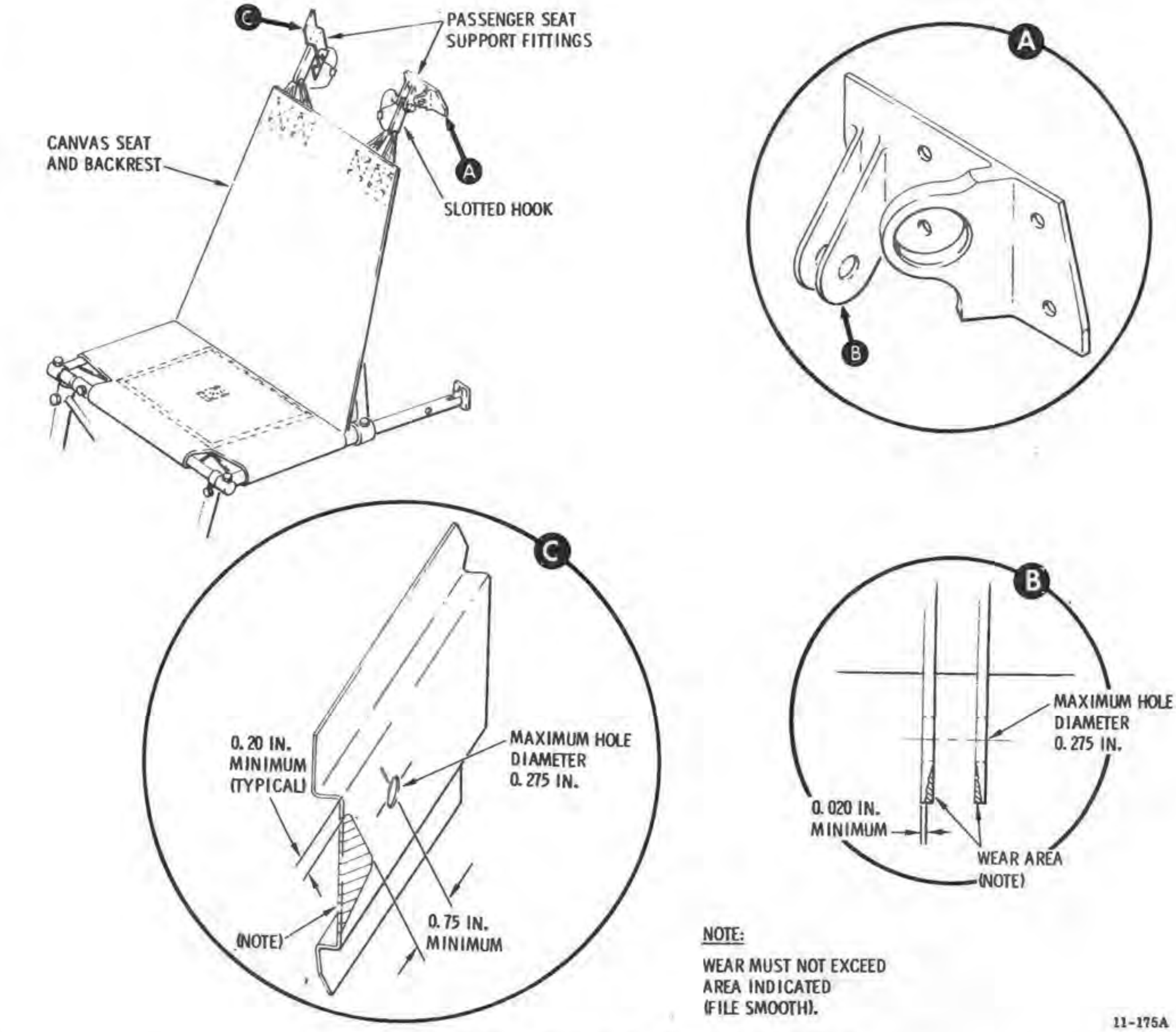


Figure 2-12. Repair Limits for Troop Seat Brackets.

2-202. Reassembly — Troop Seats (See fig. 2-11.) *a.* Slide aft horizontal tube into aft seat loop.

b. With clevis installed on horizontal tube, slip left and right lateral tubes into corresponding seat loops and seat clevises in aft horizontal tube. Install bolts.

c. Slide forward horizontal tube through lateral tube, forward clevis and forward seat loop.

d. Assemble legs, forward diagonal tube and split attach brackets. Install bolts.

e. Mount legs to clevises and install bolts.

f. Install upper slotted hooks to mounting straps of canvas seat back.

g. Install seat.

2-203. Installation — Troop Seats. *a.* Using two quick-release pins, secure horizontal tubes to fittings on the station 124.00 bulkhead.

b. With two quick-release pins, secure backrest slotted hooks to fittings on the station 124.00 canted frame.

c. Using quick-release pins, secure leg brackets to channel on the cargo compartment floor.

2-204. SEAT BELTS, SHOULDER HARNESSES, AND CRASH PADS.

2-205. Description — Seat Belts, Shoulder Harnesses, and Crash Pads. Seat belts and shoulder harnesses are provided for the pilot, copilot, and two

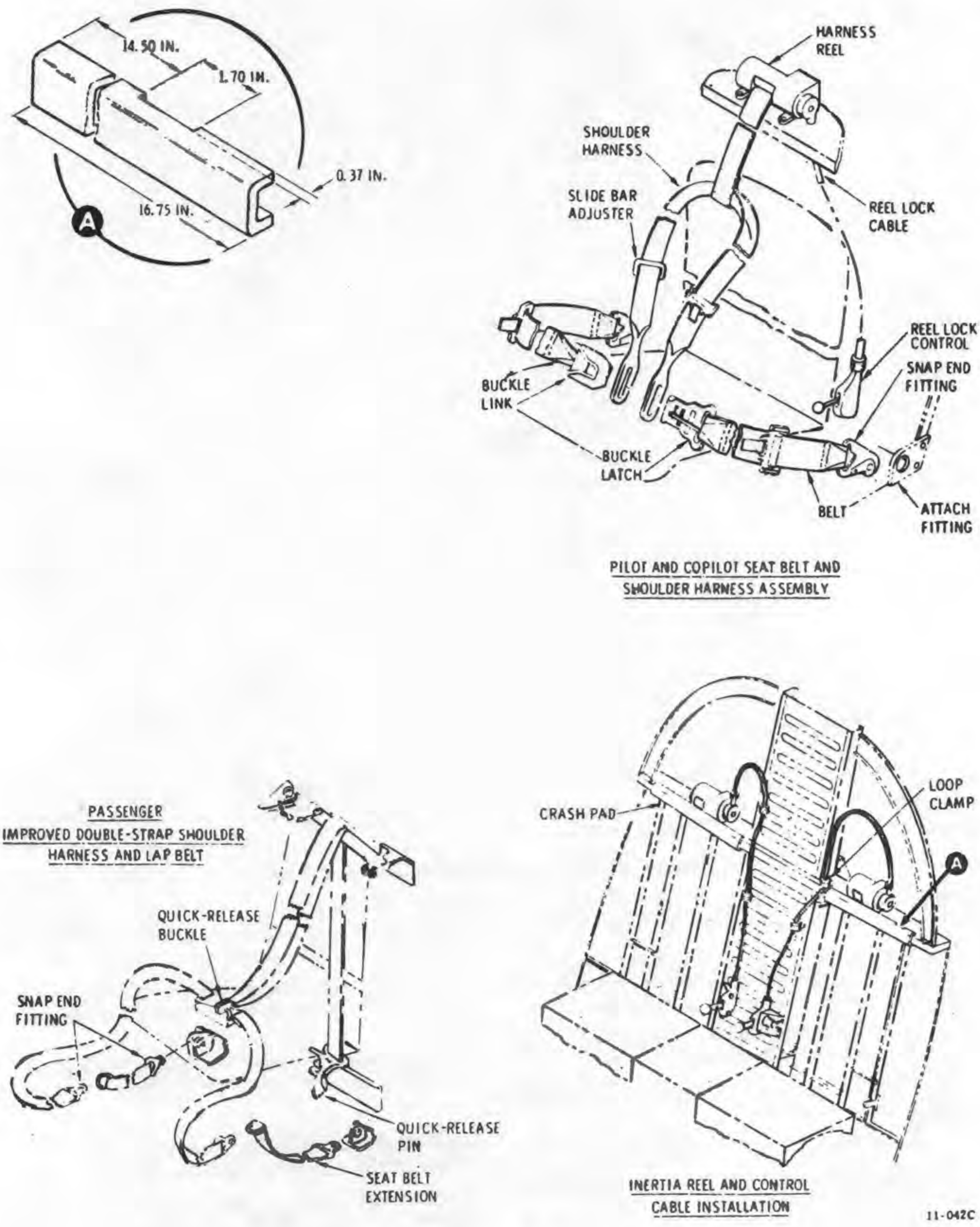


Figure 2-13. Seat Belt,Shoulder Harness,and Crash Pads.

passengers. (See fig. 2-13). Each seat belt/harness combination consists of two nylon-webbing belts and a nylon-webbing shoulder harness. Each half of the pilot's seat belt incorporates a length adjuster. Adjusters are also built into all of the shoulder harnesses. The pilot's/copilot's seat belts fasten by means of a link and latch type buckle. The pilot's/copilot's shoulder harness attach to inertial reels mounted on the canted bulkhead behind the seat. On aircraft not modified for the improved seat belt/harness for the passengers, the seat belt/harness incorporates snap end fittings for ready installation and removal, and has a quick-release friction type buckle. On aircraft so modified the seat belt incorporates seat belt extensions and snap end fittings, and the shoulder harness is attached by a quick-release pin at the firewall bulkhead. The seat belt and harness join together in a snap-over type buckle. All belts are attached to bulkhead fittings with snap end fittings. Harness adjuster springs located on all shoulder harness and seat belts except pilot and co-pilot shoulder harness.

2-206. Removal - Troop Standard Harness and Pilot's Belt. Remove seat belts and shoulder harness by unfastening one harness and two belt snap end fittings from attachment fittings at the bulkhead.

2-207. Removal - Troop Positive Restraint Harness.

a. Remove seat belt extensions by unfastening extension snap-end fittings, one at each side of the seat, from bulkhead attachment fittings. Belt extensions may be unsnapped from the seat belt end snaps.

b. Remove the shoulder harness by removing the quick-release pin at the floor attachment fitting under the seat. (If necessary, remove quick-release pin at inboard support beam fitting to free harness for removal. Remove harness, re-position support beam, and attach quick-release pin at inboard support beam fitting.)

2-208. Inspection - Seat Belts, Shoulder Harnesses, and Crash Pads.

a. Inspect seat belts and nylon webbing shoulder harnesses for worn or frayed condition and loose stitching (TM 55-1500-204-25/1.)

b. Inspect snap end fittings for cracking, wear, or deformation.

c. Inspect harness adjusters for ease of operation.

d. Inspect buckle links and latches for wear, deformation, and correct latching and release.

e. Inspect all seat belt attachment fittings for wear and deformation.

f. Inspect crash pads for serviceable condition. (Refer to para 2-169 for rebonding or replacement of crash pads.)

2-209. Cleaning and Repair - Seat Belts and Shoulder Harnesses. Refer to TM 55-1500-204-25/1.

2-210. Repair - Crash Pads. Damaged crash pads cannot be repaired, but must be replaced. Remove damaged crash pads. See figure 2-13 for crash pad installation. Refer to paragraph 2-173 for replacement of crash pads.

2-211. Installation - Troop Standard Harness and Pilot's Belt. Install seat belts and shoulder harness by fastening one harness and two belt snap end fittings to bulkhead attachment fittings.

2-212. Installation - Troop Positive Restraint Harness. *a.* Pass double strap shoulder harness over bulkhead support beam above the seat back. (It may be necessary to swing support beam out from bulkhead by removing the quick-release pin from the inboard support beam fitting. After harness is positioned over the support beam, swing support beam back into place, and reinstall quick-release pin.) Attach harness end fitting to floor attachment fitting under the seat, using the quick-release pin at that position.

b. Snap seat belt extenions onto seat belt end snaps. Fasten belt extensions to bulkhead attachment fittings under the seat, using extension snap-end fittings.

2-213. PILOT'S INERTIA REEL AND SHOULDER HARNESS.

2-214. Description - Pilot's Inertia Reel and Shoulder Harness. The inertia reel assembly consists of a harness reel, and a reel lock cable and control (fig. 2-14). On aircraft without armor installation, the reel lock cable is routed directly downward from the reel to the reel lock control located to the left of each pilot's seat. Identical inertial reel assemblies are mounted on the canted bulkhead behind the pilot and copilot. On aircraft with armor installation, the control cables loop up and then down to the reel lock controls at the pilot's left and the copilot's right. The

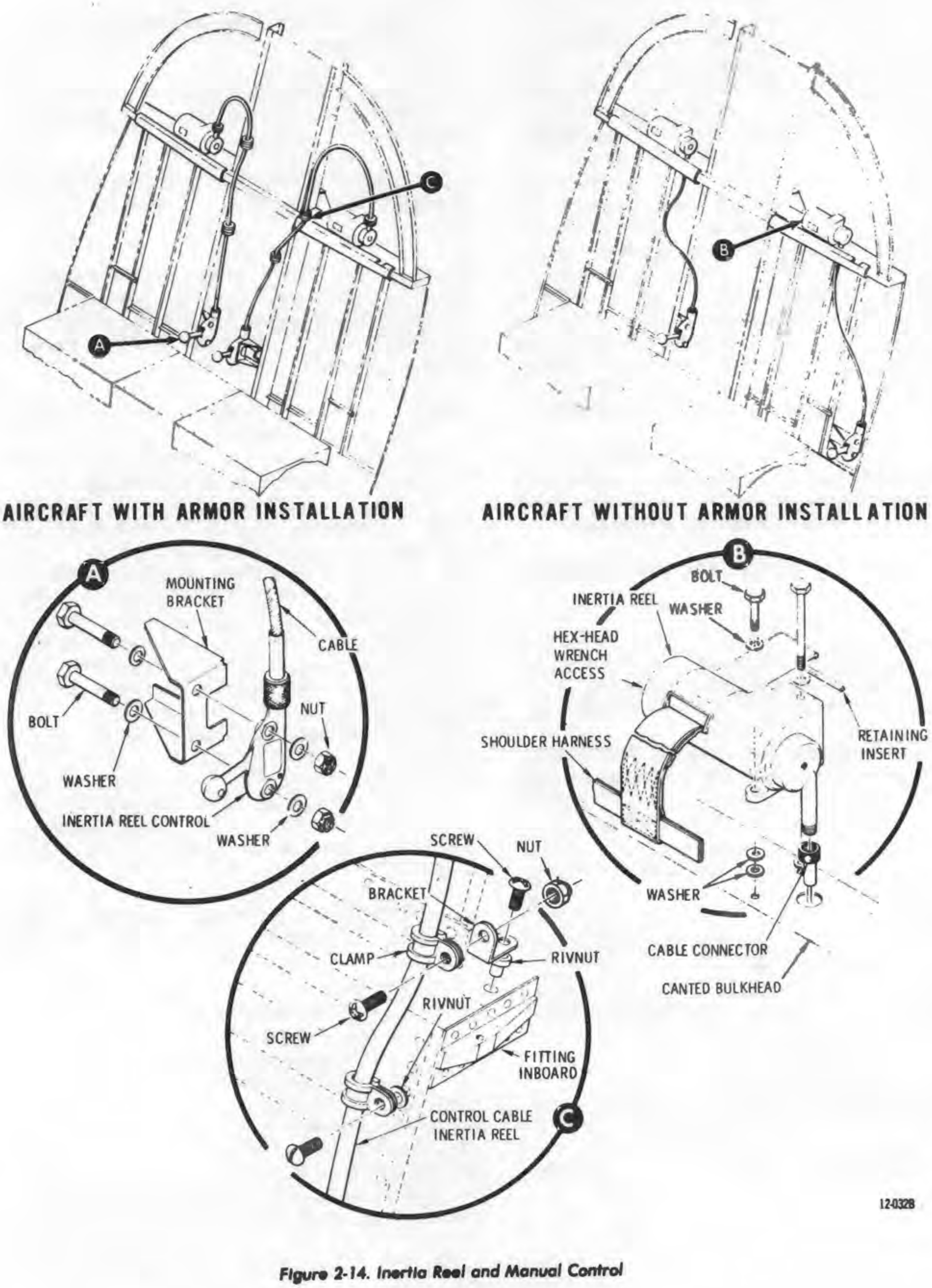


Figure 2-14. Inertia Reel and Manual Control

shoulder harness is secured to the inertia reel by a web retaining insert that fits flush into the main shaft groove. The main shaft is spring-loaded counterclockwise. The power spring is installed within the inertia reel case and is contained by the spring shield and retaining ring. A hexagonal socket is provided in the main shaft to assist in shoulder harness removal and installation, and covered by an access tab mounted on the spring shield.

2-215. Operational Check - Pilot's Inertia Reel and Shoulder Harness.

a. Move lever of reel lock control to MANUAL LOCK. Check that the harness strap cannot be pulled out of harness reel.

b. Move control lever to AUTOMATIC LOCK. Check that harness reeling is unrestrained into and out of reel.

c. With the control lever at AUTOMATIC LOCK, gently pull the harness strap out of harness reel; then jerk on the strap. Check that the sudden jerk results in automatic locking of the harness strap, limiting the forward travel of the strap to no more than an additional 0.5 inch.

d. Release tension. Check that strap automatically winds back into harness reel.

2-216. Removal - Pilot's Shoulder Harness. (See fig. 2-14).

a. Pull shoulder harness fully outward from inertia reel.

CAUTION

Use care to prevent the Allen wrench from slipping out of the main shaft socket while the power spring is in tension.

b. Remove access tab and insert a 7/32-inch hex-head wrench into main shaft socket to hold reel in position.

c. Push end of shoulder harness from main shaft, and remove web retaining insert.

d. Remove shoulder harness from inertia reel while maintaining tension on Allen wrench.

e. Slowly release tension on hex head wrench allowing power spring to unwind fully.

2-217. Removal - Pilot's Inertia Reel. (See fig. 2-14).

a. Remove 4 bolts and 12 washers that attach reel to structure.

b. Remove reel upward until knurled cable connector is accessible.

c. Loosen knurled connector and lift cable from recess in control shaft.

d. Remove inertia reel.

2-218. Inspection - Pilot's Inertia Reel and Harness Assembly.

a. Check harness reel for security of installation. Inspect reel housing and control head for dents, breaks or cracks, corrosion, or any other visible damage.

b. Inspect the reel lock cable sheath for damage. Check that cable knurled nuts are tight at the control head of the reel and at the reel lock control.

c. On aircraft equipped with armor, inspect the control cable clamps for security on the canted bulkhead (tunnel).

d. Inspect harness strap of reel for worn or frayed condition and loose stitching (TM 55-1500-204-25/1).

2-219. Cleaning and Repair - Pilot's Shoulder Harness. Refer to TM 55-1500-204-25/1.

2-220. Repair - Pilot's Inertia Reel.

a. Polish out minor nicks and scratches from aluminum and steel parts with grade 400 abrasive paper (C3).

b. Restore protective finish to aluminum parts by applying chemical film (C20).

c. If necessary, renew finish on case with a wash coat of primer (C79) and two coats of lacquer (C54).

d. Refer to TM 55-1500-204-25/1 for internal repairs.

2-221. Installation - Pilot's Inertia Reel. (See fig. 2-14.)

a. Install cable end retainer in inertia reel control shaft and tighten knurled connector.

b. Place inertia reel in mounting position on canted bulkhead.

c. Install mounting bolts with two washers (one thick and one thin) under inertia reel and one (thin) washer under the bolt head at each of the four mount points.

d. Install shoulder harness (para 2-222).

2-222. Installation - Pilot's Shoulder Harness. (See fig. 2-14.)

a. Temporarily install shoulder harness through main shaft and turn shaft clockwise with 7/32-inch hex-head wrench until harness is wound on main shaft. Note number of turns made with hex-head wrench.

b. Unwind inertia reel slowly with hex-head wrench and remove shoulder harness.

CAUTION

Prevent hex-head wrench from slipping out of main shaft socket while power spring is in tension. Sudden slippage could damage the inertia reel mechanism.

c. Insert hex-head wrench into main shaft socket; turn counterclockwise by the number of turns noted in *a* above plus approximately one more turn, until main shaft is aligned with insertion end of shoulder harness.

d. Push shoulder harness through main shaft while maintaining tension on hex-head wrench, and install web retaining insert into shoulder harness.

e. Pull shoulder harness back through main shaft until web retaining insert is seated flush in main shaft groove; then hold. Remove hex-head wrench and slowly allow shoulder harness to wind on main shaft.

f. Install access tab.

g. Perform operational check (para 2-215).

2-223. INERTIA REEL MANUAL CONTROL.

2-224. Removal — Inertial Reel Manual Control. (See fig. 2-14.) *a.* Place control lever in forward (locked) position to move drive control shaft toward cable attachment end of control case. Loosen knurled cable connector and lift cable retaining ring from recess in drive control shaft.

b. On aircraft with armor installation, remove screws that attach cable clamps to structure and remove cable.

CAUTION

Do not attempt to disassemble cable.

c. Remove two nuts, bolts, and washers that attach control unit to structure.

d. Remove inertia reel control unit.

2-225. Inspection — Inertia Reel Manual Control. *a.* Check manual control for security of installation. Inspect control housing for dents, breaks or cracks, corrosion, or any other visible damage.

b. Inspect the control cable sheath for damage. Check that cable knurled nuts are tight at both ends.

2-226. Repair — Inertia Reel Manual Control. *a.* Polish out minor nicks and scratches from aluminum and steel parts with grade 400 abrasive paper (C3).

b. Restore protective finish to aluminum parts by applying chemical film (C20).

c. If necessary, renew finish on control case with a wash coat of primer (C79) and two coats of lacquer (C54).

2-227. Installation — Inertia Reel Manual Control. (See fig. 2-14.) *a.* Install inertia reel control unit on structure by using two bolts, washers, and nuts.

b. Place control lever in the forward (locked) position.

c. Install retainer in recess in the control shaft; then tighten down knurled cable connector.

d. Operate control lever through several cycles to assure free movement.

e. Perform operational check (para 2-215).

2-228. CANOPY AND WINDOW INSTALLATION.

2-229. Description — Canopy and Window Installation. The canopy installation forms the forward part of the fuselage airframe enclosing the pilot's compartment. Windows include the polycarbonate plastic 0.040-inch thick pilot's and cargo door windows and 0.080-inch thick aft compartment windows. The canopy installation consists mainly of three sections; lower windshield, center windshield, and upper windshield. Each windshield consists of symmetrical left and right panels extending from the windshield centerline to the edges of the pilot's door frames. The center and lower windshield sections are clear acrylic or polycarbonate. The upper section is tinted a smoke-gray. On aircraft serial No. 65-12916 through 65-12934, all original canopy windshield panels are heat-resistant (cast) acrylic. On subsequent aircraft, the center and lower canopy windshield panels may be either stretched acrylic or polycarbonate. The two center windshield panels are approximately 0.080-inch thick and all other panels are approximately 0.060-inch thick.

NOTE

Polycarbonate windshields can be identified by the lack of geon attachment strips.

2-230. Inspection — Canopy and Window Installation. (See fig. 2-15.) *a.* Inspect for cracks, scratches, nicks, crazing and discoloration. Cracks are not permitted without repair. Scratches, nicks, crazing, and discoloration, or repair thereof, must not restrict operator vision.

b. Inspect windshield panels for a good seal around all edges, and security of the fairing tape.

2-231. Serviceability Criteria — Canopy and Window Installation. Refer to figure 2-15 for classification of damage and repair or replacement criteria for both types of plastic.

2-232. Repair — Canopy and Window Installation. Acrylic panels that are damaged beyond negligible limits may be repaired by using the method appropriate for the type of damage. Typical repairs and detailed procedures will be found in TM 55-1500-204-25/1. Both the stretched acrylic and cast acrylic panels are repaired by using the same methods and repair materials. The materials are cellulose tape (C18) for masking and adhesive (C8) for patching. These materials and the "glue method" of cementing should be used for all patch type repairs.

a. **Repair Polycarbonate windows and/or windshields as follows:**

(1) Stop drill at each end of crack using a number 40 drill.

(2) Lightly sand area to be repaired with sandpaper (C3) about 0.750 inch beyond crack for adhesive application.

(3) Wipe area with dry, clean cloth to remove residue.

(4) Cut section of fiberglass (C39A) to extend a minimum of 0.500 inch around crack or area to be repaired.

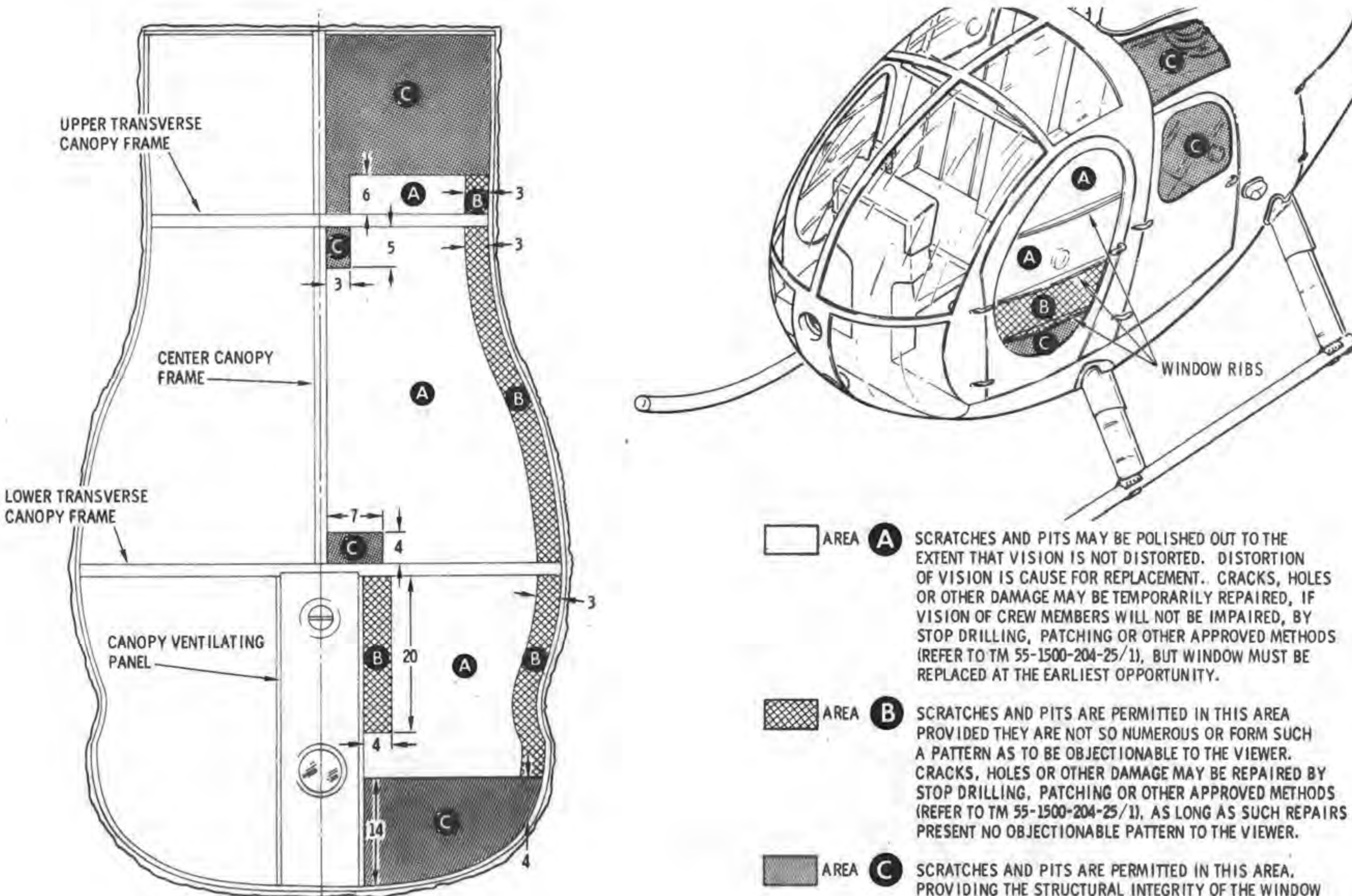
(5) Apply one brush coat of urelane adhesive (C7) to repair area and lay fiberglass over repair area.

(6) Rub patch lightly to assure adhesion to repair area and brush another coat of adhesive over area.

(7) Allow to cure for 48 hours. (Handling strength is developed in 24 hours.) Accelerated cure time will be two hours under a heat lamp at 71°C (160°C).

b. Repair water leaks by using a small bead of sealing compound (C89) on the affected area.

2-233. Replacement — Canopy Panels. (See fig. 2-16.)



CANOPY WINDSHIELD AREAS
FLAT PLANE VIEW

LEFT SIDE SHOWN
(ALL DIMENSIONS ARE IN INCHES)

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 55-1500-204-25/1), 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 REPAIRED BY STOP DRILLING, PATCHING OR OTHER APPROVED METHODS (REFER TO TM 55-1500-204-25/1), AS LONG AS SUCH REPAIRS PRESENT NO OBJECTIONABLE PATTERN TO THE VIEWER.

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 (REFER TO TM 55-1500-204-25/1) PROVIDED STRUCTURAL INTEGRITY IS NOT IMPAIRED.

11-185

Figure 2-15. Canopy and Window Serviceability Criteria.

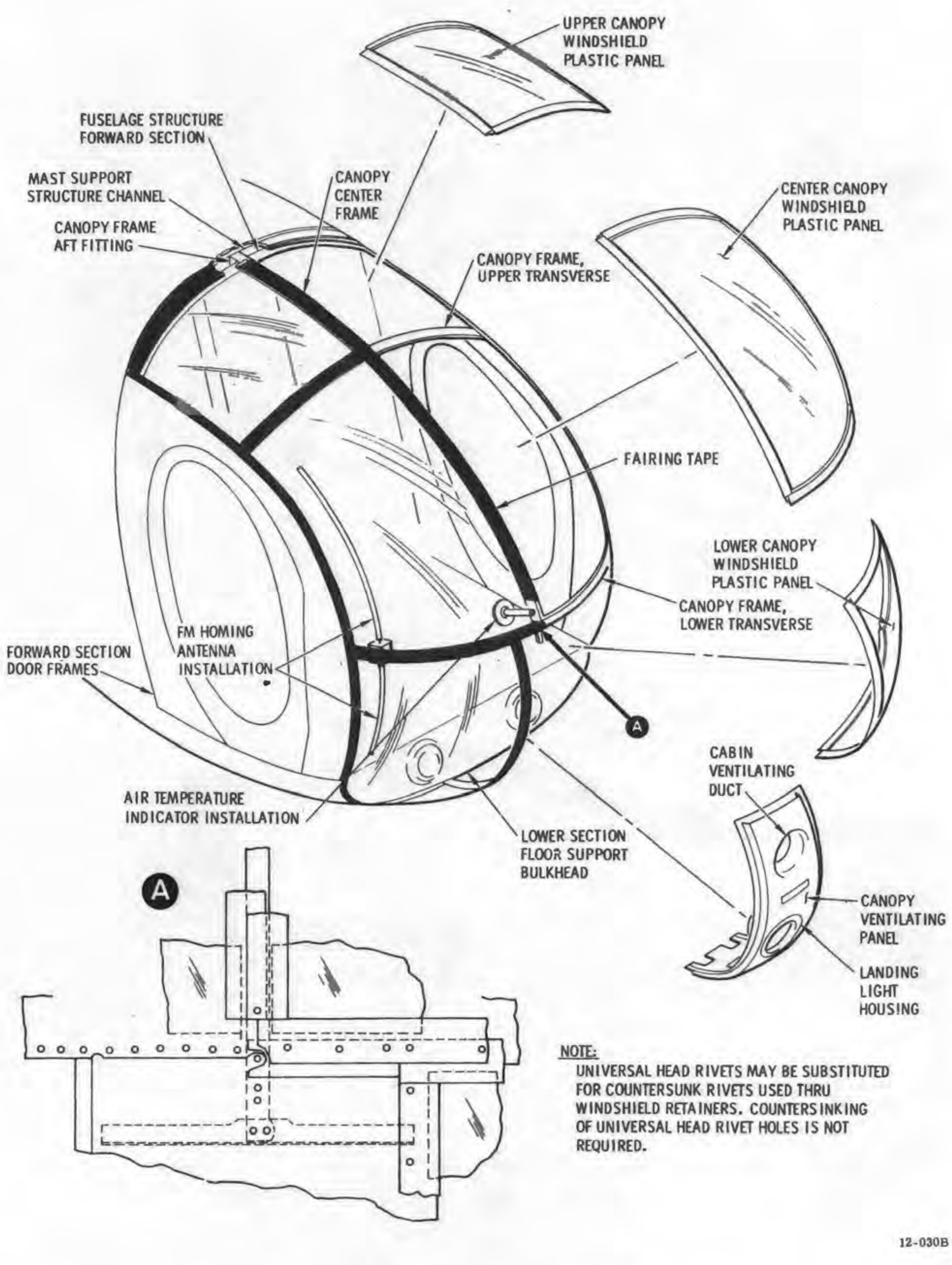


Figure 2-16. Canopy Installation.

NOTE

The individual center and lower windshield panels of cast acrylic material should be replaced with cast acrylic spares, if available. If only stretched acrylic or polycarbonate replacement panels are available, all four cast panels must be changed to the stretched acrylic or polycarbonate type. Stretched acrylic and polycarbonate panels are interchangeable on an individual basis.

a. Accomplish *b* through *e* before windshield replacement, as appropriate to the windshield panel being replaced.

b. Remove fm homing antenna components (TM 11-1520-214-20 or -20-1), as applicable.

c. Remove magnetic compass and outside air temperature indicator from the canopy.

d. Protect torque pressure and static tubes to prevent drilling damage.

e. Fashion a cloth cover above the cockpit instrument panel, the console, and over pilot's seats to catch removed rivets in areas where rivets cannot be drilled out from the inside.

CAUTION

The plastic canopy panels become brittle when cold and could crack during handling. The following procedures should be performed under warm room temperature conditions (70°F or higher).

NOTE

The left center windshield inboard retainer overlaps the right center windshield inboard retainer; these inboard retainers are riveted to the canopy frame. The aft (upper) retainers of the center windshield assemblies overlap the forward retainers of the upper windshield, and are riveted to the canopy frame. The lower retainers of the center windshield overlap the upper retainers of the lower windshield as well as the upper joggled edge of the fiberglass canopy panel.

f. Remove fairing tape and, in order, drill out rivets that attach: windshield outboard retainer to door frame; windshield inboard retainers to centerline canopy frame; aft (upper) retainer of windshield to canopy frame; and forward (lower) retainer of windshield to canopy frame. Slide windshield panel free, as applicable; push up and out to remove.

g. Lay replacement windshield panel against canopy frame. Position panel for correct overlap. Panels with retaining strips should be positioned so that drill holes are through the retainer.

gA. Slowly press the outboard pedal to its full travel position against the stop bolt. With not more than 20 pounds of pressure applied, the upper and lower edges of the pedal must clear the canopy glass by not less than 0.20 inch. Check both sets of pedals.

h. Mark and trim windshield to fit canopy opening.

i. Check window contour for fit at canopy ventilating panel upper corner. Install tapered shim, as required.

NOTE

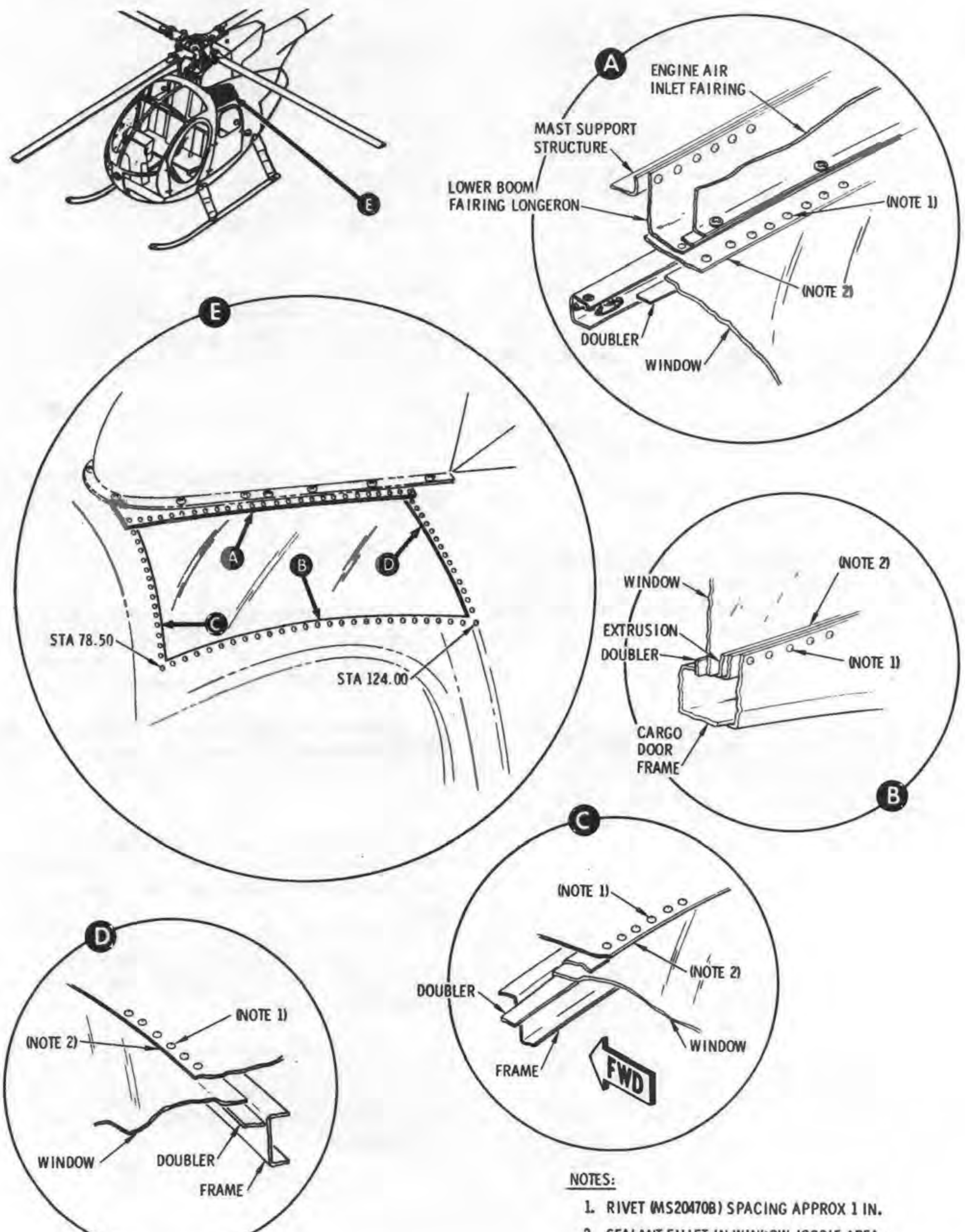
Canopy panels may be replaced by using screws (MS35218-27), nuts (MS20364D632A) and washers (AN960PD6L) in place of rivets.

j. Drill holes using the canopy frame as a guide. Install fasteners to hold panels in position. Countersink holes for flush head rivet installation as required.

k. Remove windshield from frame and apply a bead of sealing compound (C88), to lip of retainers for stretched acrylic panels and for polycarbonate panels.

l. Enlarge all rivet holds in polycarbonate panels to 0.031 inch oversize. Use washers under both sides of attachment rivets.

m. Use masking tape on universal rivet sets to prevent marking panels; rivet replacement windshield panels to the door frame and canopy frames. MS20470A4 and MS20426A3 rivets are used in most places.



NOTES:

1. RIVET (MS20470B) SPACING APPROX 1 IN.
2. SEALANT FILLET IN WINDOW JOGGLE AREA-AROUND ENTIRE WINDOW.

Figure 2-17. Aft Compartment Window Installation.

NOTE

Care should be exercised during rivet installation to drive rivets as lightly as possible. Over-driving of the rivet can cause star crazing. Star crazing within 0.50 inch of rivet is not cause for replacement of panel.

n. Remove excess sealant around retainers by using a scraper made of wood or plastic.

o. Clean acrylic retainer surfaces with naphtha (C70). Polycarbonate retainers are cleaned with isopropyl alcohol (C82). Install 2-inch wide tape (C103) over retainers and rivet patterns.

p. Install magnetic compass and outside air temperature indicator, as applicable.

q. Install fm homing antenna components (TM 11-1520-214-20 or -20-1), as applicable.

2-234. Replacement — Aft Windows. (See fig. 2-17.) *a.* Drill out rivets that secure window to the cargo door frame, canted station 78.50, and canted bulkhead station 124.00. Remove doublers.

b. Remove engine air inlet forward fairing if necessary to clear upper rivet pattern (para 2-101).

c. Drill out rivets that hold window and doubler to fuselage.

d. Break sealant bond between window and structure; remove window from inside cargo compartment.

e. Remove any sealant residue from structure by peeling off the particles.

f. Remove the protective covering from edges of the replacement window.

CAUTION

Handle window with care to avoid scratching the polycarbonate plastic.

g. Clean the window edges and structural framework mounting surfaces with nonabrasive soap or detergent and wipe with clean damp cloth.

h. Trim and fit window prior to drilling by using old window as pattern, if possible.

i. Lay replacement window in position and drill rivet holes in the window by using the existing structure rivet hole pattern as a template.

CAUTION

Use care when drilling and riveting to avoid damaging the instrument lines and cables that run alongside the mast support structure and through the substructure near the forward edge of the window.

j. Rivet window and doublers in place.

k. Apply sealing compound (C89), to fillet area around entire window.

2-235. CANOPY ENCLOSURE SUPPORTING STRUCTURE.

2-236. Description — Canopy Enclosure Supporting Structure. The frame to which the windshield and the cabin ventilating panel are mounted (fig.2-16) consists of a longitudinal frame located on the fuselage centerline, a transverse upper frame located at canted bulkhead station 74.25, and a transverse lower frame located at waterline 38.64. The canopy is secured to the fuselage structure by: the canopy frame aft fitting riveted to the mast support structure channel; the upper windshield retainers riveted to the fuselage structure forward section weld; the windshield outboard retainers riveted to the left and right section door frames; and the lower windshield retainers and lower edge of the cabin ventilating panel riveted to the floor bulkhead.

2-237. Inspection — Canopy Enclosure Supporting Structure. Inspect the supporting structural elements and canopy framework for cracks, deformations, dents, signs of corrosion, and overall general condition.

2-238. Replacement — Canopy Enclosure Supporting Structure. *a.* Remove the canopy windshields in the following order: center canopy windshields, upper canopy windshields, lower canopy windshields (para 2-233), and the cabin ventilating panel (para 2-239).

b. Remove fasteners, as required, and disconnect: cabin heat and defogging outlets; engine anti-ice and cabin heat control levers; instrument panel braces; magnetic compass support bracket; and the engine torque pressure and instrument static lines.

c. Protect all disconnected components against drill damage and drill out rivets that attach canopy frame to structure.

d. Push canopy frame up and out to remove.

e. Install fasteners to attach centerline frame to the fuselage structure.

NOTE

MS20426A rivets are used in most locations.

f. Install fasteners to attach upper and lower (transverse) canopy frames to left and right door frames.

g. Complete installation of canopy frame by riveting fastener-held locations.

h. Install canopy ventilating panel (para 2-239).

i. Install, in order: lower canopy windshield, upper canopy windshields, and center canopy windshields (para 2-233).

2-239. CABIN VENTILATING PANEL.

2-240. Description — Cabin Ventilating Panel. The ventilating (canopy) panel (fig. 2-16) is fabricated from several laminations of fiberglass, fiberglass reinforcements, and aluminum inserts. Classification of damage and repair or replacement criteria are as outlined below and in paragraph 2-244.

2-241. Negligible Damage — Cabin Ventilating Panel. Refer to paragraph 2-244.

2-242. Repair — Cabin Ventilating Panel. Repair heavy scratches, cracks or punctures, and delamination beyond negligible limits but confined to small areas within the perimeter defined by panel doublers, according to paragraph 2-244.

2-243. Replacement — Cabin Ventilating Panel. (See fig. 2-16.) *a.* Disconnect ventilating control valve (chapter 13), and remove landing light lamp and pitot tube.

b. Using the following sequence, drill out rivets attaching:

(1) Lower windshield to canopy panel.

(2) Center windshield retainers over lower windshield retainers to canopy frame.

(3) Lower corners of center windshield retainers to canopy frame. (Insert a wedge between each lower windshield retainer and canopy frame.)

(4) Canopy panel to underside of flange of the canopy frame; use care to prevent drilling through wedged upper windshield retainers. (Drill from inside the cabin.)

(5) Lower flange of canopy panel to floor bulkhead.

(6) Centerline portion of the canopy panel to the lower portion of canopy frame.

c. Push the panel lower edge away from flange of floor bulkhead, slide panel downward, and remove from canopy.

d. Position replacement canopy panel in canopy with upper left, and right mounting flanges under the canopy frame and the lower windshield inboard retainers. Seat lower mounting flange of the panel inside contoured flange of floor bulkhead.

e. Rivet components in the following sequence:

(1) Centerline portion of canopy panel to lower portion of canopy frame.

(2) Lower mounting flange of panel to contoured flange of floor bulkhead.

(3) Upper mounting flange of panel to canopy frame.

(4) Lower windshield retainers to canopy frame. (Remove wedges from under upper windshield retainers.)

(5) Lower windshield retainers to canopy panel.

(6) Lower half of center windshield retainers to canopy frame.

f. Install ventilating control valve (chapter 13).

g. Install landing light lamp and pitot tube.

2-244. TYPICAL FIBERGLASS REPAIRS.

2-245. General — Typical Fiberglass Repairs. Classification of damage and repair or replacement criteria for laminated fiberglass components are as given below, and in paragraph 2-239.

2-246. Negligible Fiberglass Damage. Minor defects or imperfections that are obviously not indications of impending structural failure are considered negligible, and do not require repair. Examples of negligible damage are:

a. Light scratches less than 0.005 inch deep.

b. Delamination in not more than one area, and at least 3.50 inches away from edge of component, structural member, or rivet pattern.

c. Minor nicks and scratches that do not penetrate the fiberglass laminations and do not intersect rivet or screw holes.

NOTE

Fiberglass components should be replaced when damage exceeds 20 percent of the total component area, when structural members bonded within the fiberglass are cracked or badly distorted, or when large sections of sharp compound-curved areas are severely damaged.

2-247. Fiberglass Repair — General. A typical fiberglass repair is shown in figure 2-18. The repair procedures apply to fiber-laminate materials (fiberglass) conforming to Military Specification MIL-C-9084, Type VIII (No. 181). Apply fiberglass finish paint as specified in chapter 1. Relative humidity and ambient temperature should approximate the following for best repair results.

HUMIDITY	AMBIENT TEMPERATURE	
(PERCENT)	(DEGREES F)	(DEGREES C)
75	70	21.1
71	75	23.9
68	80	26.7
65	85	29.4
61	90	32.2
58	95	35.0

2-248. Fiberglass Repair — Temporary. If patch or insertion repairs are not feasible, temporary repairs may be made by applying catalyzed resin (C39) to an aluminum patch 0.025-inch thick and installing the temporary patch over damaged area. Permanent types of repair or replacement of fiberglass should be accomplished as soon as possible.

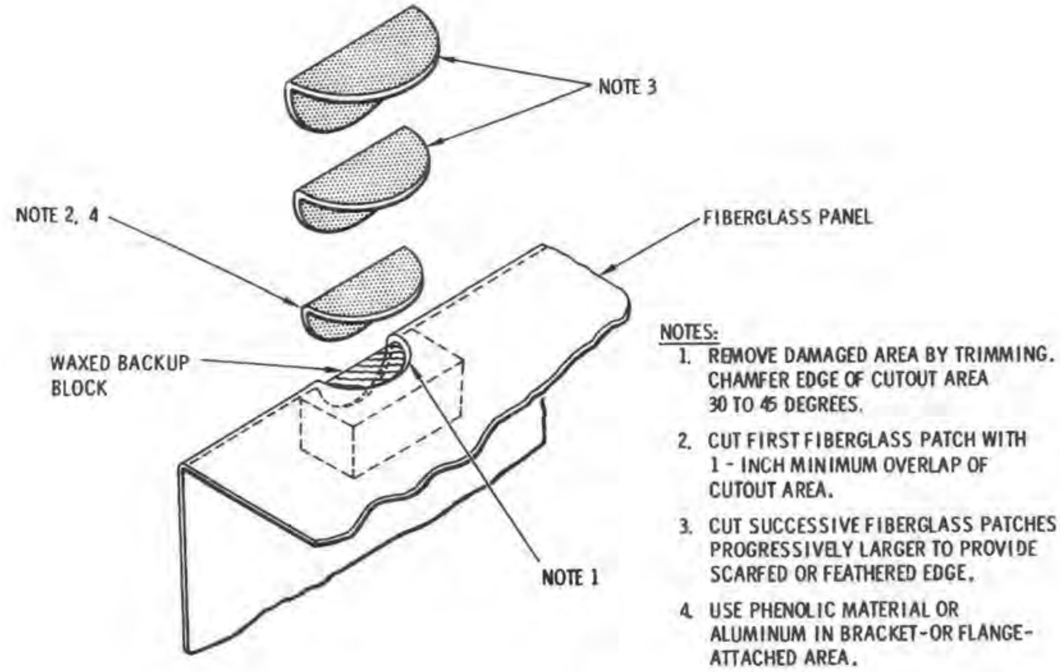


Figure 2-18. Typical Laminated Fiberglass Repair.

NOTE

Do not use temporary aluminum patches where antennas are installed.

2-249. Fiberglass Repair — Delaminations. Work catalyzed resin (C39) between plies, apply pressure to force plies together, and cure according to container instructions.

2-250. Fiberglass Repair — Small Nicks, Scratches, or Pores. Small nicks, scratches or pores may be repaired by working catalyzed resin (C39) into the discontinuity, and curing according to container instructions.

WARNING

Sanding on glass cloth reinforced laminates produces fine dust that may cause skin irritations. Breathing of this dust may be harmful. Observe necessary protective measures.

CAUTION

When maintenance work is being performed hear the engine air inlet, use care to prevent entry of foreign objects. Tape covers of cardboard or other suitable material in place over the engine inlet screen and oil cooler air inlets. Do not remove covers until work is completed and debris is thoroughly cleaned out of the area. After removing covers, verify that area around base of mast, inlet to plenum, and entire plenum chamber is free of foreign material. Install plenum access doors. When performing work above or near upward exhausts, install exhaust covers.

NOTE

Fiberglass repair kit (C39) contains the repair materials itemized in the following procedures.

When accomplishing repair in an area secured by rivets or screws always laminate or bond a metal doubler washer at each attachment point (hole) for reinforcement.

2-251. Fiberglass Repair — Holes or Cracks. *a.* Cut away damaged area to form a square, rectangular or circular opening (fig. 2-18).

b. Trim 30- to 45-degree chamfers at edges on both sides of repair area.

c. Using grade 400 abrasive paper (C3), sand damaged area (both sides, when possible) to form beveled surfaces.

d. Thoroughly clean surface of repair area with a clean, lint-free cloth moistened with methyl ethyl ketone (C69) until resin or cloth is exposed; allow to dry completely.

e. Dry repair area with a clean, lint-free cloth.

f. Cut layers of fiberglass cloth (C39) to uniformly fill repair area. After completely filling repair area, cut a final layer of cloth to completely overlap entire repair area. Remove all cloth patches, maintaining relative placement order of each cloth.

NOTE

Each layer of fiberglass cloth in kit (C39) is approximately 0.010-inch thick after curing. Use sufficient number of layers to at least equal the original thickness of the material being patched. Warming the cloth provides greater flexibility. Do not use a hot iron for warming the cloth.

WARNING

Use protective clothing during the preparation and use of resin mixture. Adequate ventilation must be provided.

g. Prepare resin (C39) according to container instructions. Stir thoroughly to ensure a uniform mixture. Avoid any whipping or beating that might produce air bubbles in the mixture.

NOTE

The resin and catalyst should not be mixed until required because the mixture has a limited pot life. Warming the mixture reduces viscosity and may facilitate handling, but shortens pot life of mixture. In all cases, refer to container instructions on use of resin. Processing and repair work should be performed in an area sheltered from adverse weather conditions and free from dust.

h. Place wax backup block against surface of repair area opposite of working (patch) surface.

i. Install first layer of cloth and brush prepared resin over repair area and cloth, thoroughly impregnating cloth. Scrape away any excess resin. Repeat procedure until repair area is completely filled. Smooth the surface, blending patch into surrounding area, and remove any air bubbles by applying slight pressure when necessary.

j. Cure at room temperature for 24 hours or allow to stand at room temperature (approx 70°F) for one hour, followed by heating at 160°F (71.1°C) for one hour.

2-252. FUSELAGE BODY STRUCTURE.

2-253. Description — Fuselage Body Structure. The body group is an assembly of three major elements: the forward fuselage, lower fuselage and aft fuselage. The tailboom and empennage are discussed further in section 2 of this chapter. (See fig. 2-19.) The airframe primary and secondary structure consists of all metal, metal and fiberglass, and transparent plastic components. The major bulkheads and structural members are shown in figure 2-20.

2-254. Fuselage Body Structure — Metal. The aircraft basic body and fuselage boom are conventional, all metal, riveted structures incorporating formed aluminum alloy, stainless steel and titanium bulkheads, canted frames, channel members, beams, structure rings, ribs, stiffeners, doublers, longerons, and stringers. All stressed skin panels are either smooth or beaded. The stabilizers are all-metal airfoils.

2-255. Fuselage Body Structure — Metal and Fiberglass. The tail rotor blades are fiberglass and stainless steel. The main transmission access door is fiberglass. The compartment access doors are metal or sheet aluminum and glass cloth. The engine inlet fairing is sheet aluminum and glass cloth.

2-256. Fuselage Body Structure — Transparent Plastic. The upper, center, and lower canopy windshields are acrylic plastic. The aft windows, the windows in the passenger-cargo and pilot's compartment doors, main transmission cover, and fuel inlet shield are clear plastic (polycarbonate).

2-257. AIRFRAME STATION LOCATIONS.

2-258. General — Airframe Station Locations. Figure 2-21 identifies major fuselage, boom, and empennage stations.

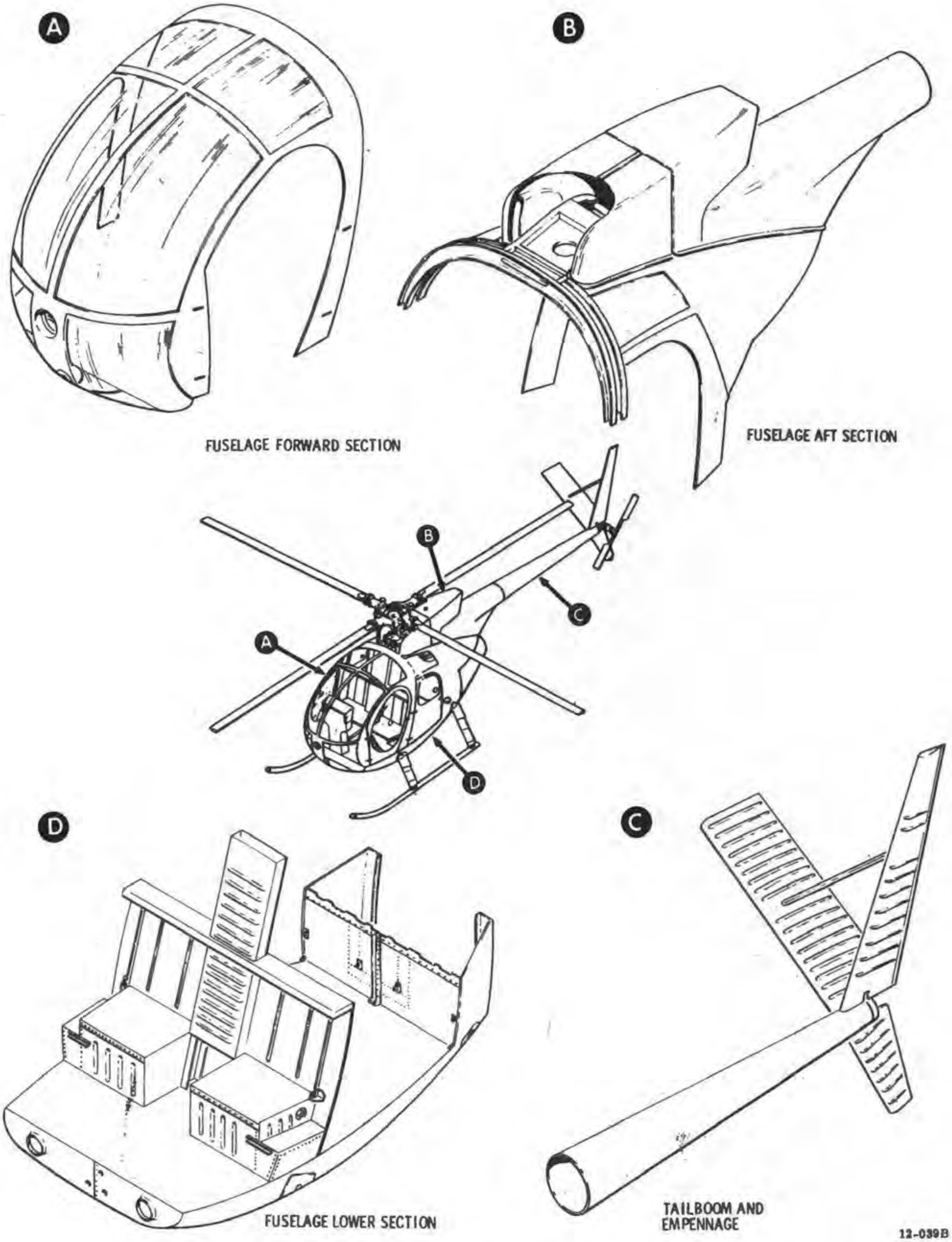
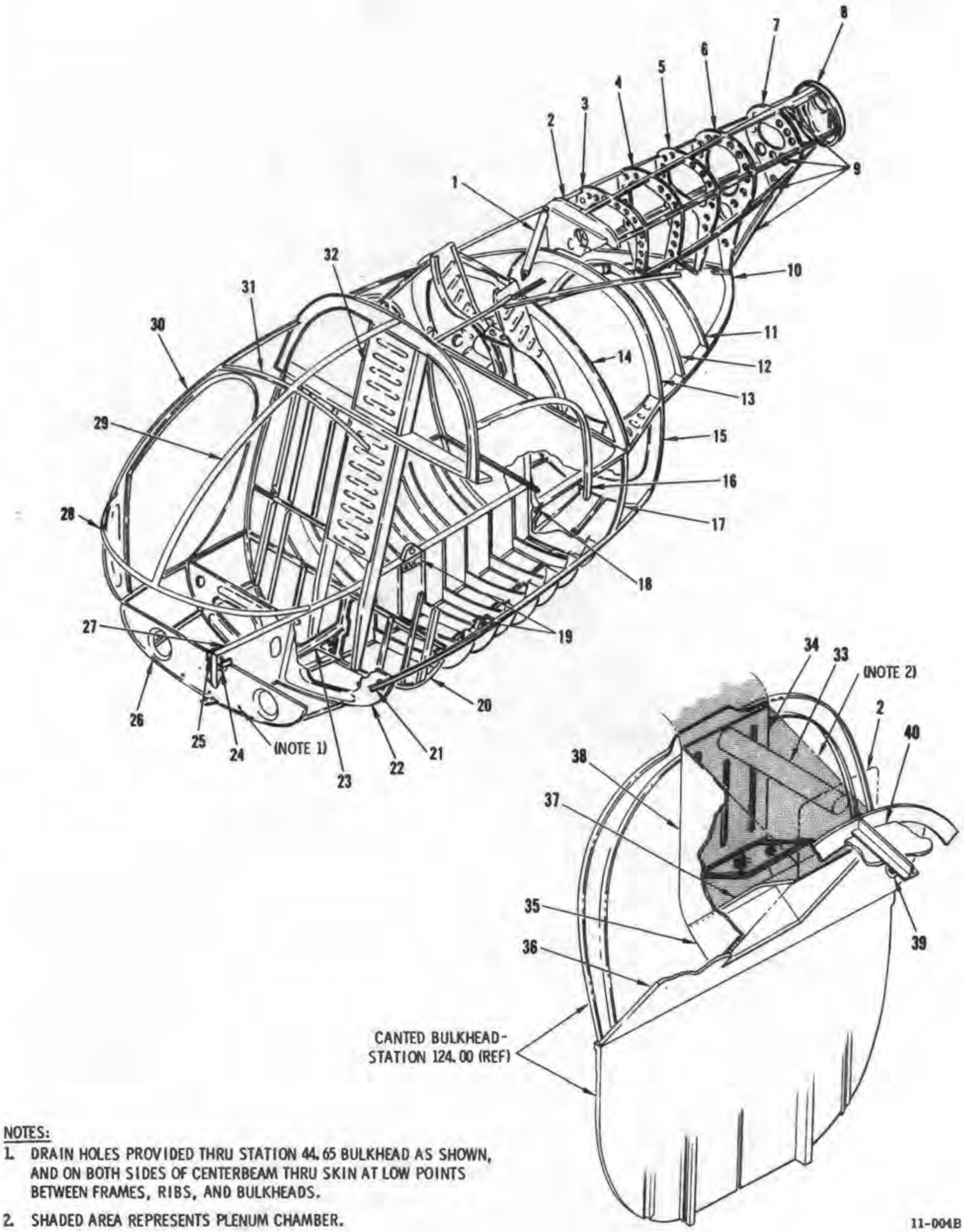


Figure 2-19. Body Group Sections.



NOTES:

1. DRAIN HOLES PROVIDED THRU STATION 44.65 BULKHEAD AS SHOWN, AND ON BOTH SIDES OF CENTERBEAM THRU SKIN AT LOW POINTS BETWEEN FRAMES, RIBS, AND BULKHEADS.
2. SHADED AREA REPRESENTS PLENUM CHAMBER.

Figure 2-20. Body Group Major Structural Sections.

Key to Figure 2-20.

1. Aft section strut	21. Floor support longerons
2. Station 137.50 boom fairing ring	22. Pilot's seat structure support bulkhead
3. Station 146.62 boom fairing ring	23. Forward landing gear fitting
4. Station 155.75 boom fairing ring	24. Lower bracket support fitting
5. Station 164.76 boom fairing ring	25. Upper bracket support fitting
6. Station 174.00 boom fairing ring	26. Pilot's floor support bulkhead
7. Station 185.89 boom fairing ring	27. Center beam assembly
8. Station 197.78 boom fairing canted frame fitting	28. Canopy lower frame
9. Boom fairing longerons	29. Canopy center frame
10. Waterline 34.96 rib	30. Pilot's door frame
11. Station 155.76 aft section ring	31. Canopy upper frame
12. Station 146.62 aft section ring	32. Station 78.50 upper canted frame
13. Station 137.50 upper aft section ring	33. Tail rotor shaft fairing
14. Station 124.00 upper canted frame	34. Forward engine air inlet panel
15. Station 137.50 lower section ring	35. Lower engine air inlet panel
16. Cargo door frames	36. Forward firewall
17. Station 124.00 lower section frame	37. Engine air inlet pan
18. Aft landing gear fitting	38. Engine air inlet side channel
19. Armament support fitting assembly	39. Engine hoist fitting
20. Station 78.50 lower canted frame	40. Aft section upper firewall

2-259. SUPPORT OF STRUCTURE DURING REPAIRS.

2-260. Support — Assembled Aircraft. Refer to paragraph 1-71 for jacking and paragraph 1-74 for hoisting instructions.

2-261. Support — Disassembled Aircraft. Support the aircraft structure with padded cradles (fig. 2-22). Position the cradles exactly under the structural bulkheads.

CAUTION

Placing supports at locations other than directly under a structural bulkhead will result in damage to the aircraft skin panels.

2-262. CLASSIFICATION OF FUSELAGE DAMAGE AND TYPES OF REPAIR.

2-263. General — Classification of Fuselage Damage and Types of Repair. Examine all damage thoroughly, regardless of how trivial it may seem. Investigate for cracks, breaks, scratches, nicks, dents, depressions, punctures, worn spots, chips, and elongated bolt holes, especially after impact. Examine all parts of the structure, as well as the locally affected section, for misalignment, distortion, and other damage. After the extent of damage has been determined, the damage to each part of the affected structure should be examined carefully and classified as: accept as is; negligible damage; damage repairable by patching; or damage requiring replacement of parts. Special jigs or holding fixtures may be required to hold critical dimensions during replacement of fittings or repair of major structural damage. Availability of special jigs or holding fixtures should be considered before attempting major repairs.

NOTE

Excessively damaged castings or forgings, such as hinge brackets, fittings, bolts, or hinge pins, should be replaced. When considering a repair, whether it be on a small part or a complete component, the time involved and the approximate cost should be taken into account, as replacement may be advantageous both in cost and in time involved.

2-264. STRESSED SHEET METAL PANELS (AVIM).

2-265. General — Stressed Sheet Metal Panels (AVIM). Stressed sheet metal panels consist primarily of the fuselage skins (fig. 2-23) and bulkhead webs. The most highly stressed skin sections are those that form the cylindrically tapered tailboom assembly (section 2). Classification of damage, guidelines defining the extent of damage requiring complete replacement, and basic repair methods applicable to stressed sheet metal panels except the tailboom are outlined as follows:

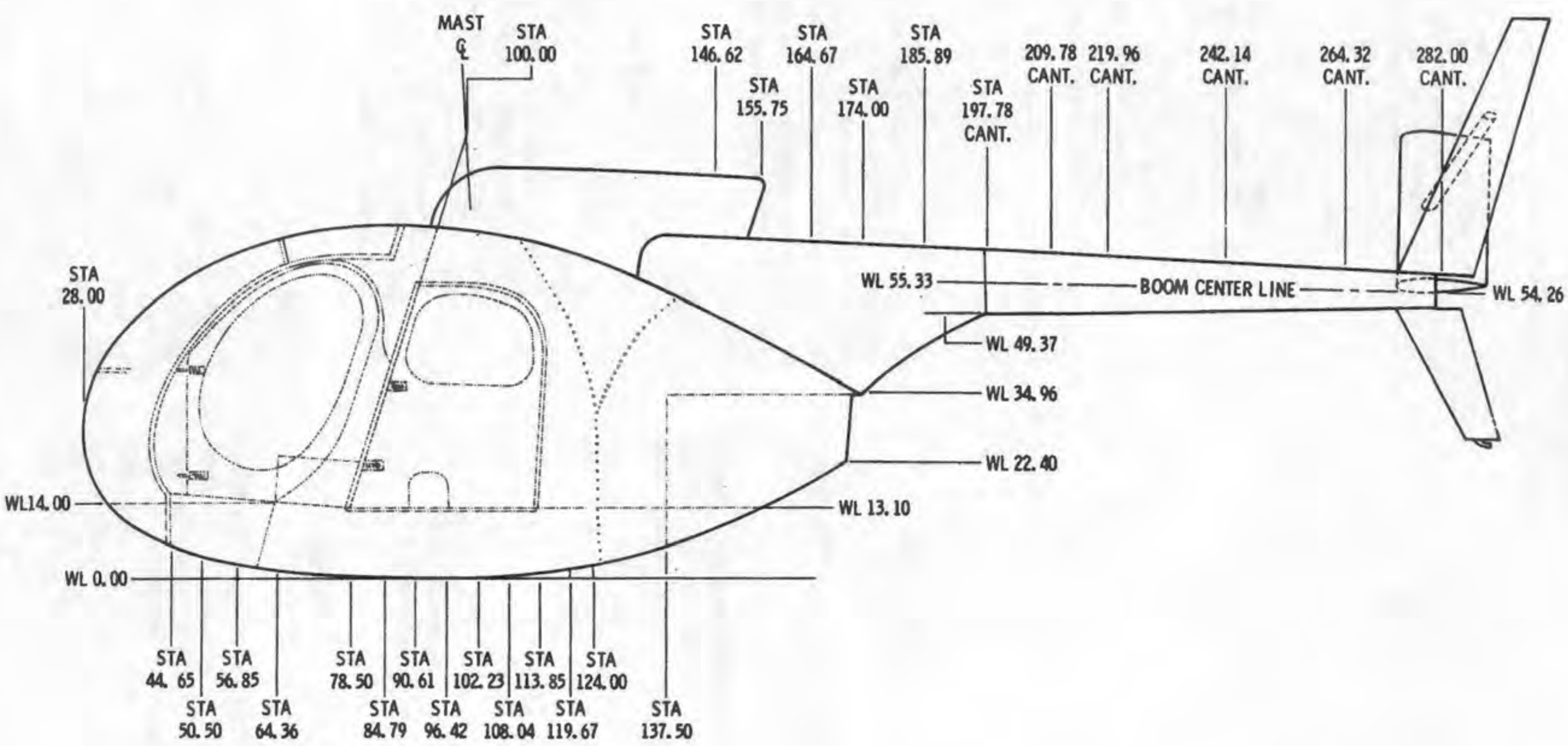


Figure 2-21. Station Diagram.

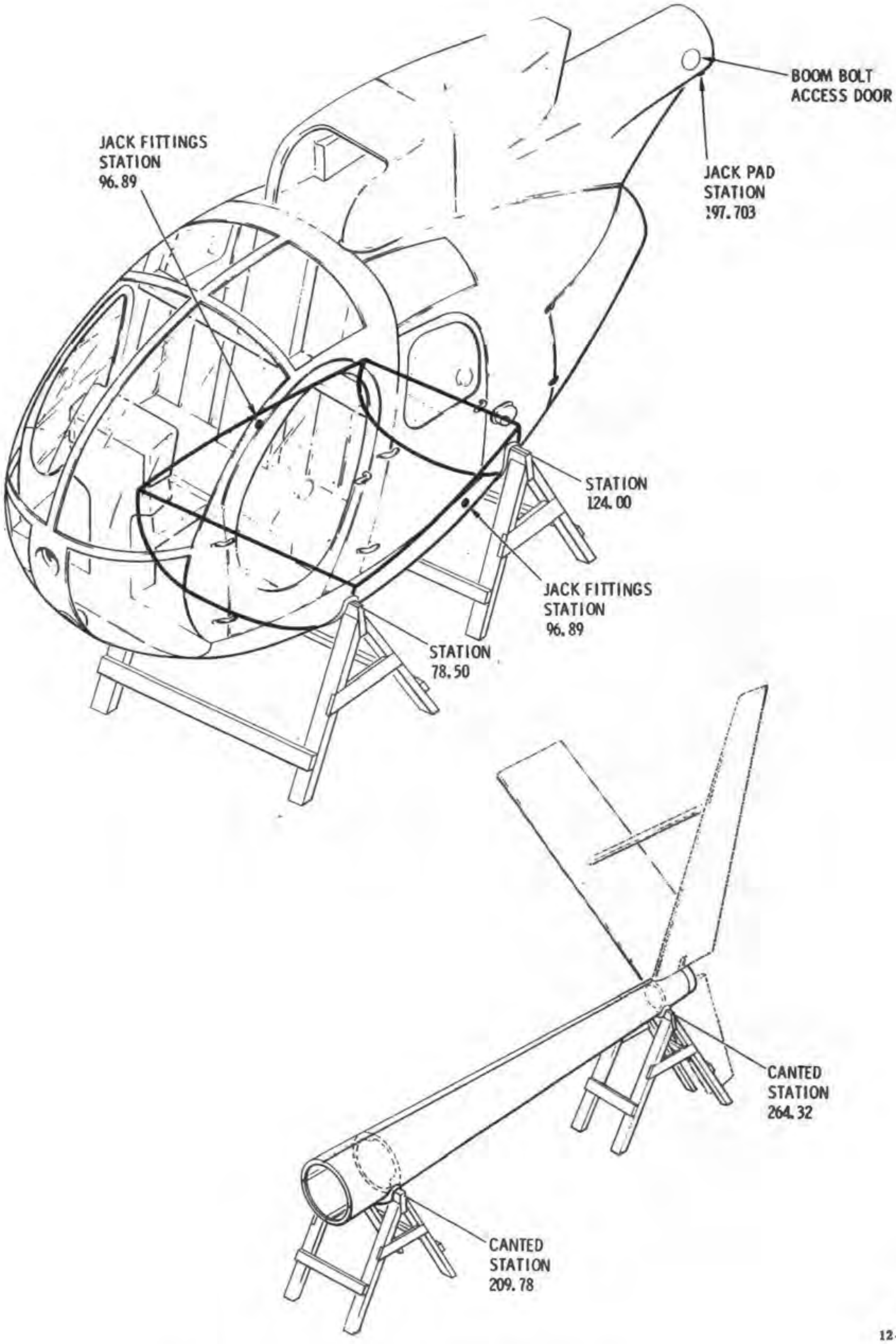
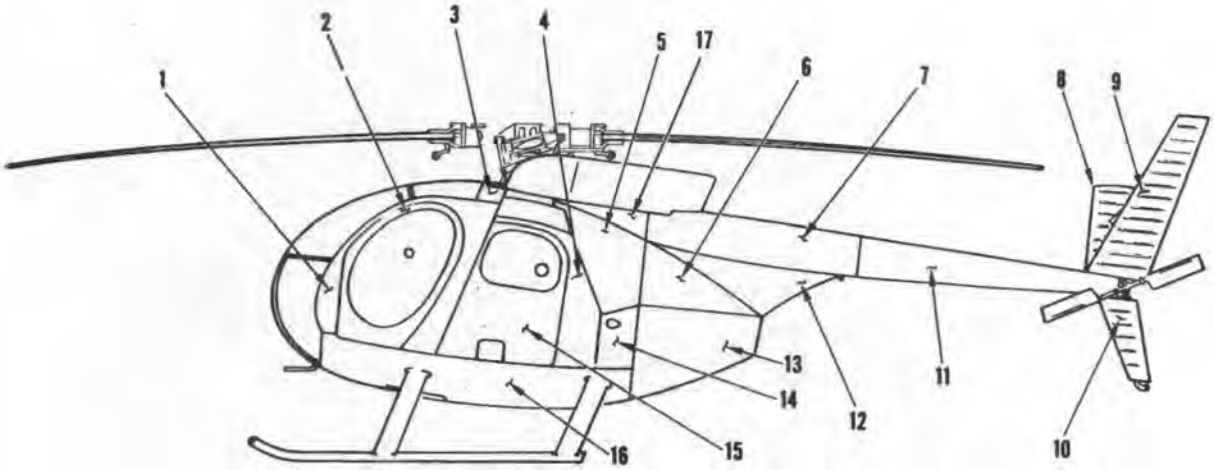


Figure 2-22. Support of Disassembled Aircraft.



CAUTION: DO NOT INSTALL CONDITION O MATERIAL. HEAT TREAT PARTS TO CONDITION INDICATED AFTER FORMING.

INDEX	NOMENCLATURE	NO. OF SKINS	GAGE AND DIMENSION	COMMERCIAL ALLOY	MIL-STANDARD
1.	PILOT'S DOOR FRAME				
	INNER SKIN	2 EA.	0.032 X 50.00 X 60.00	AL ALY 2024-T42	QQ-A-250/5
	OUTER SKIN	2 EA.	0.020 X 50.00 X 60.00	AL ALY 2024-T42	QQ-A-250/5
2.	PILOT'S DOOR				
	INNER SKIN	2 EA.	0.025 X 48.00 X 60.00	AL ALY 6061-T3	QQ-A-250/11
	OUTER SKIN	2 EA.	0.020 X 48.00 X 60.00	AL ALY 2024-T3	QQ-A-250/5
3.	FUSELAGE FWD UPPER SECTION SKIN	1 EA.	0.016 X 7.00 X 46.00	AL ALY 2024-T3	QQ-A-250/5
4.	CARGO DOOR AFT SECTION FRAME SKIN	2 EA.	0.020 X 45.00 X 45.00	AL ALY 7075-T6	QQ-A-250/13
5.	FUSELAGE AFT SECTION SKIN	2 EA.	0.016 X 26.00 X 40.00	AL ALY 2024-T3	QQ-A-250/4
6.	FUSELAGE AFT SECTION SKIN	2 EA.	0.016 X 39.00 X 32.00	AL ALY 2024-T3	QQ-A-250/4
7.	BOOM FAIRING AFT SECTION UPPER SKIN	2 EA.	0.016 X 46.00 X 63.00	AL ALY 2024-T3	QQ-A-250/5
8.	HORIZONTAL STABILIZER SKIN	1 EA.	0.012 X 35.00 X 64.00	AL ALY 2024-T42	QQ-A-250/5
9.	UPPER VERTICAL STABILIZER SKIN	1 EA.	0.012 X 32.00 X 56.00	AL ALY 2024-T42	QQ-A-250/5
10.	LOWER VERTICAL STABILIZER SKIN	1 EA.	0.012 X 36.00 X 30.00	AL ALY 2024-T42	QQ-A-250/5
11.	BOOM SKIN	2 EA.	0.032 X 45.00 X 85.00	AL ALY 2024-T3	QQ-A-250/5
12.	BOOM FAIRING AFT SECTION SKIN	2 EA.	0.016 X 17.00 X 53.00	AL ALY 2024-T3	QQ-A-250/5
13.	ENGINE ACCESS DOOR				
	INNER SKIN	2 EA.	0.020 X 41.75 X 35.50	AL ALY 6061-T6	QQ-A-250/11
	OUTER SKIN	2 EA.	0.016 X 41.75 X 35.50	AL ALY 2024-T3	QQ-A-250/5
14.	LOWER SECTION FUSELAGE STRUCTURE SKIN	2 EA.	0.012 X 24.00 X 26.00	TITANIUM UNALLOYED	MIL-T-9046 CLASS 6
15.	CARGO DOOR INNER SKIN	2 EA.	0.032 X 40.00 X 45.00	AL ALY 6061-T6	QQ-A-250-11
	OUTER SKIN	2 EA.	0.016 X 40.00 X 45.00	AL ALY 2024-T42 OR AL ALY 2024-T3	QQ-A-250/5 OR QQ-A-250/5
16.	LOWER SECTION FUSELAGE STRUCTURE BOTTOM SKIN	2 EA.	0.016 X 44.00 X 98.00	AL ALY 2024-T42	QQ-A-250/5
17.	ENGINE AIR INLET PANEL	2 EA.		AL ALY 2024-T42	QQ-A-250/5

12-002C

Figure 2-23. Skin Plating Diagram.

NOTE

A skin panel is defined as skin area bounded by three or more structural members (stiffeners, longerons, stringers, etc.).

2-266. Negligible Damage — Stressed Sheet Metal Panels (AVIM). None. All repairable damage shall be repaired upon detection. Cracks, tears, or punctures in stressed sheet metal panels that do not exceed 0.160-inch diameter and can be removed by drilling out with a No. 20 or smaller diameter drill do not require structural doublers. Install a rivet of appropriate diameter to fill the hole.

2-267. Patch Repair — Stressed Sheet Metal Panels (AVIM). Cracks, tears, or punctures in stressed sheet metal panels exceeding 0.160-inch diameter are to be patched provided the damage area does not exceed a total of 25 percent of the panel area (previously repaired areas included). The patch shall be applied to the convex surface of the stressed panel. Patch with a single row of rivets, using 6 to 8 diameter spacing.

2-268. Replacement — Stressed Sheet Metal Panels (AVIM). Damage that exceeds the limits for repair by patching requires replacement of the panel.

NOTE

Except for tailboom skin (section 2), excessive damage to the fuselage skin supporting structure (frames, longerons, stringers, etc.) must occur before replacement of a complete skin panel becomes necessary; however, any portion of the skin panel can be replaced.

2-269. NON-STRESSED SHEET METAL PANELS.

2-270. General — Non-Stressed Sheet Metal Panels. Non-stressed sheet metal panels consist primarily of hinged covers and doors (except the fuel cell access doors and controls access door which are stressed). Damage repair definitions are as follows.

2-271. Negligible Damage — Non-Stressed Sheet Metal Panels. Small dents, scratches, nicks, and light corrosion deposits are considered negligible damage. Cracks that do not exceed 0.25-inch in length, are less than one-fourth the width of the damaged component, and are removed at least 1.0 inch from the end of the damaged component or at an attachment point, may be considered negligible damage.

2-272. Damage Repairable by Patching — Non-Stressed Sheet Metal Panels. Damage exceeding that determined as negligible must be repaired by patching, or the section must be replaced. Patches can be applied to a damaged area, in many instances, provided the damage is first trimmed to a suitable shape, and the repair patch cut with sufficient overlap to allow proper edge distance for attachment rivets. An overlay patch may be used if it does not restrict a moving component.

2-273. Repair Guidelines — Non-Stressed Sheet Metal Panels. Refer to paragraph 2-7 for additional non-stressed sheet metal repair information.

2-274. Replacement — Non-Stressed Sheet Metal Panels. Damage that exceeds the limits for repair requires replacement of the part.

2-275. FUSELAGE CAST AND FORGED FITTINGS (AVIM).

2-276. General — Fuselage Cast and Forged Fittings (AVIM). See figure 2-24, sheet 1 through 4, for location and identification of fuselage fittings. Classification of damage, and repair or replacement criteria applicable to cast and forged fittings listed in table 2-1 are provided in paragraphs 2-277 and 2-282. The fittings listed in this table are highly-stressed structural parts. Any damage in excess of negligible limits (para 2-277) requires replacement of the damaged part or major assembly containing the part. Any crack, regardless of length, requires replacement of the part.

Table 2-1. Highly-Stressed Structural Fittings.

Fitting	Part Number
Mast fitting	369A2016
Cargo floor armament support fitting assembly	369A2511
Mast support structure fitting	369A3027
Boom attach fuselage fitting	369A3030
Fuselage attach boom fitting	369A3510
Stabilizer and tail rotor transmission mounting frame	369A3503
Horizontal stabilizer center boom attach fitting	369A3601
Upper vertical stabilizer center boom attach fitting	369A3626
Landing gear strut	369A6001

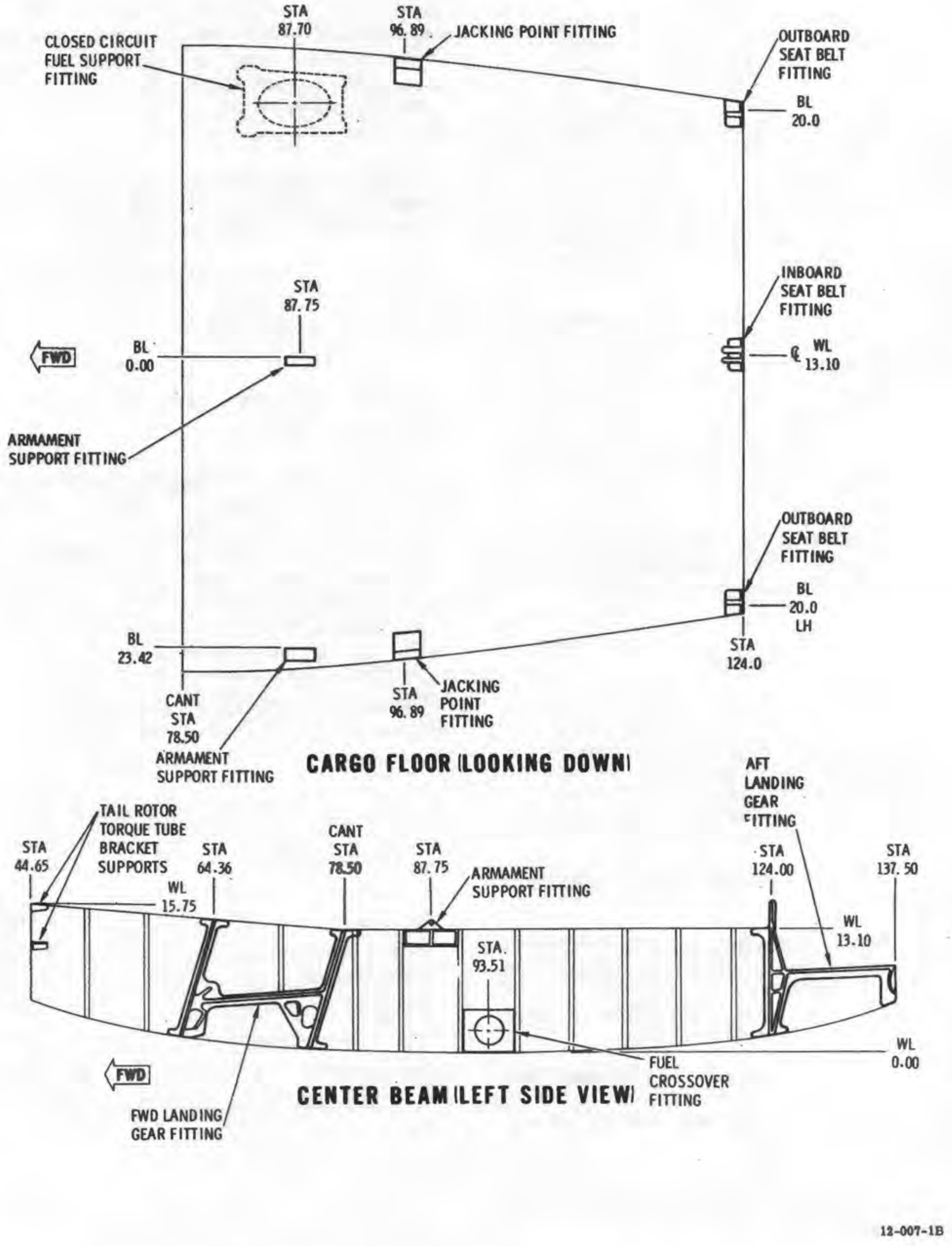


Figure 2-24. Body Group Fittings. (sheet 1 of 4)

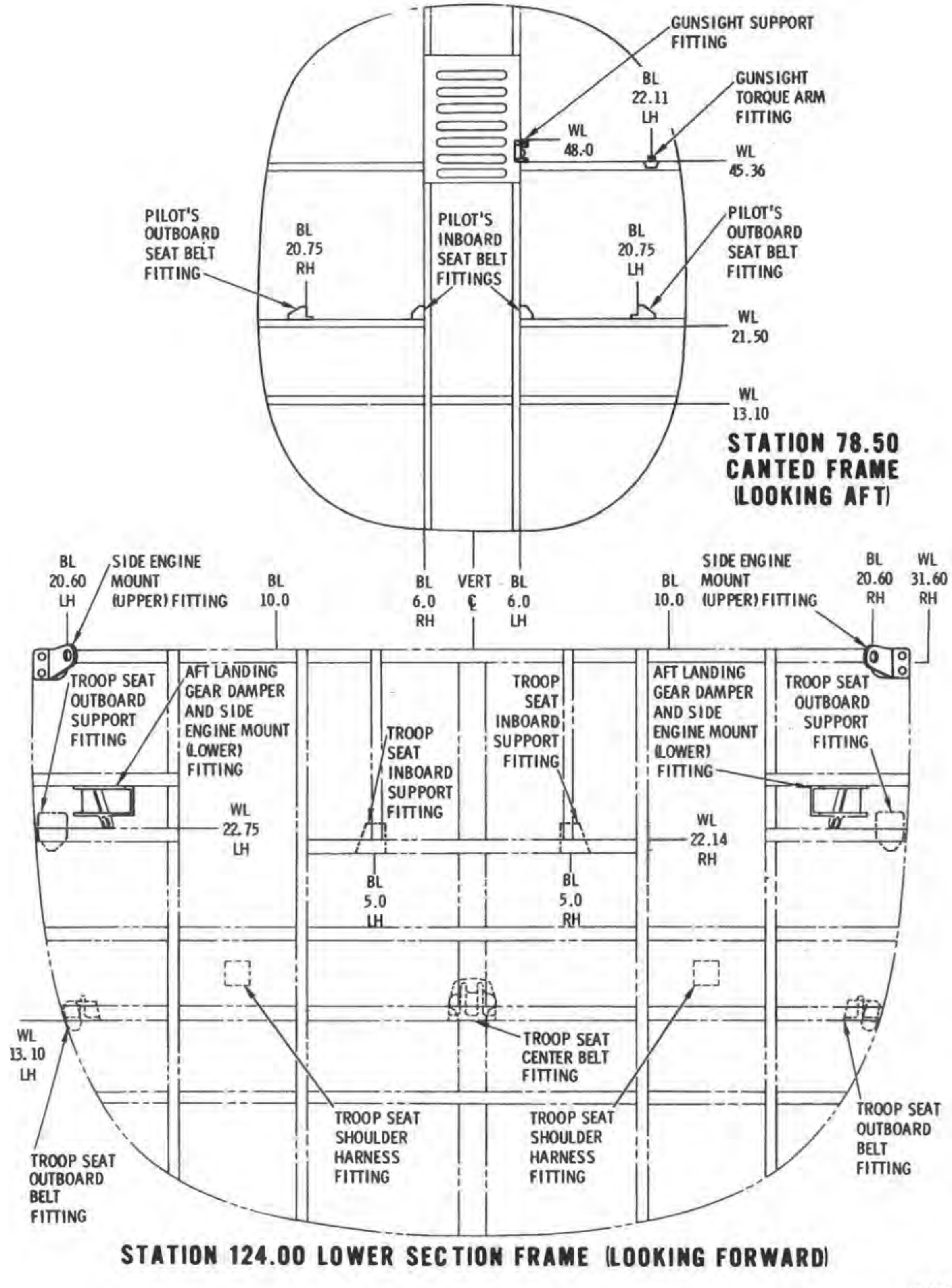


Figure 2-24. Body Group Fittings. (sheet 2 of 4)

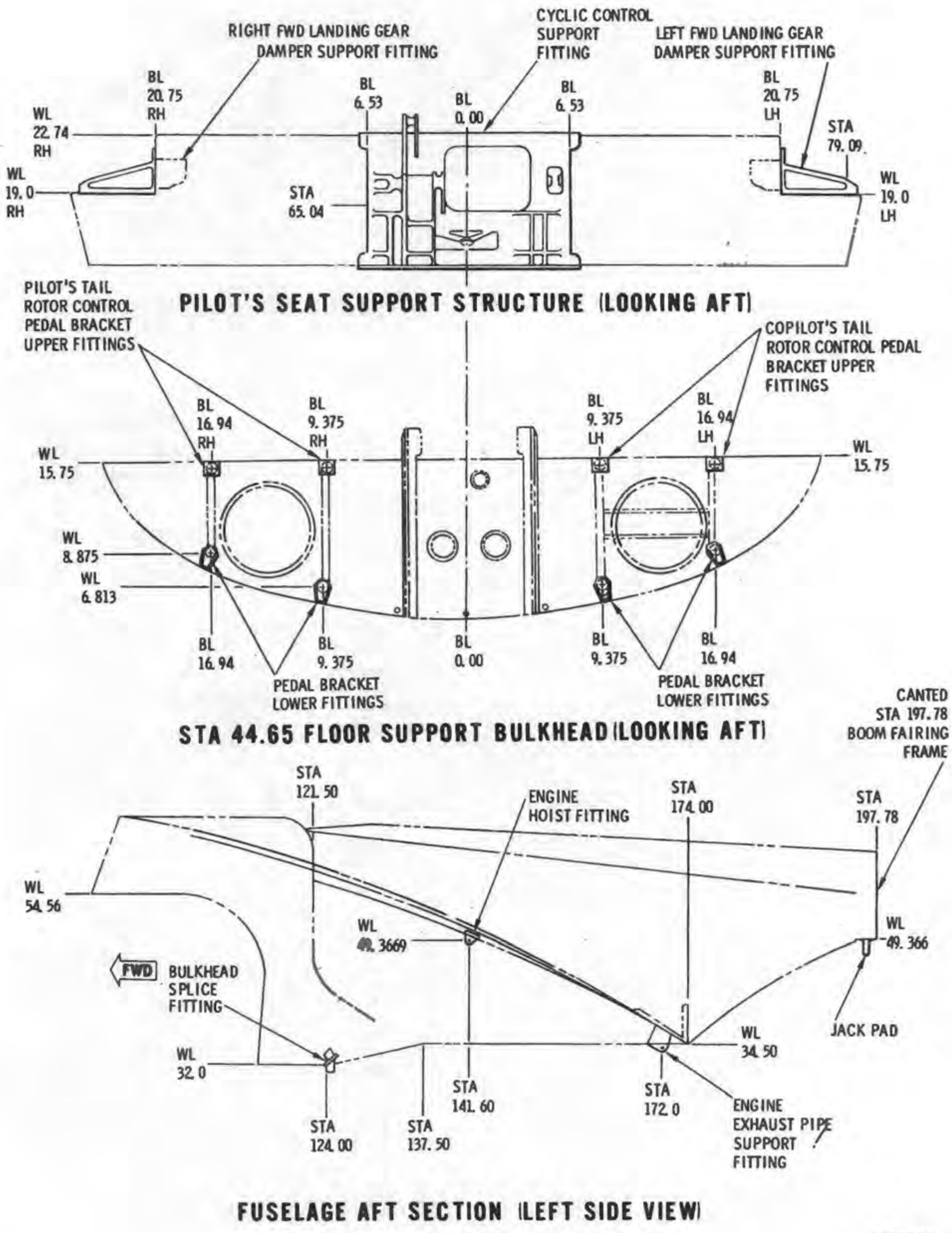
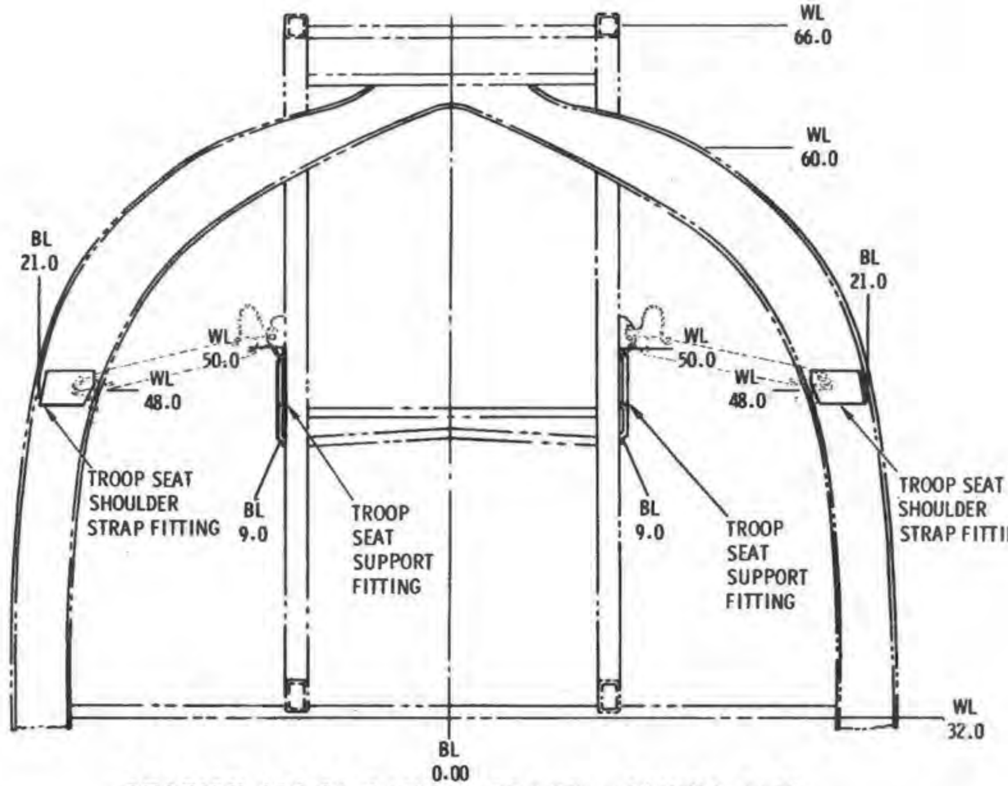
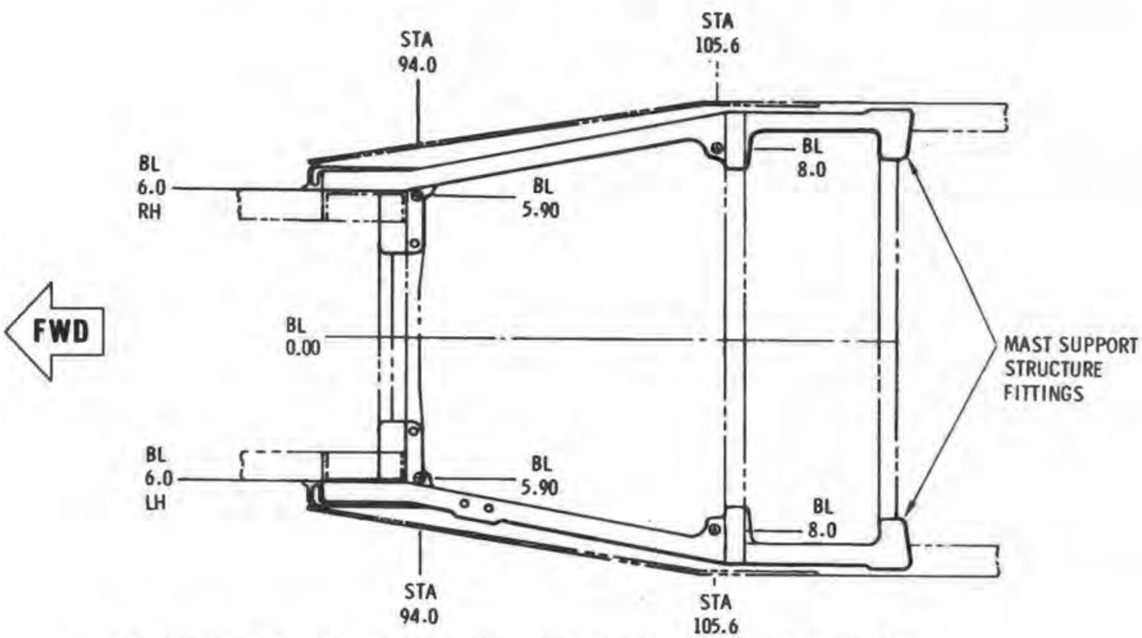


Figure 2-24. Body Group Fittings. (sheet 3 of 4)



STATION 124.00 CANTED FRAME (LOOKING AFT)



MAST SUPPORT STRUCTURE FITTINGS (LOOKING DOWN)

12-007-4B

Figure 2-24. Body Group Fittings. (sheet 4 of 4)

NOTE

Special jigs or holding fixtures may be required to hold critical dimensions during replacement of fittings. Availability of special jigs or holding fixtures should be considered before attempting major repairs.

2-277. Classification of Fuselage Cast and Forged Fitting Damage — General (AVIM).

2-278. Negligible Damage — Fuselage Cast and Forged Fittings (AVIM). Longitudinal scratches, nicks, corrosion, or dents shall not exceed 0.010-inch depth or 15 percent of the length of the fitting. Transverse scratches, nicks, or dents shall not exceed 0.010-inch depth or 15 percent of the thickness of the fitting. The preceding damage limits apply after polishing or repair is accomplished. All repaired surfaces shall be treated with chemical film (C20).

2-279. Patch Repair — Fuselage Cast and Forged Fittings (AVIM). A typical temporary patch repair for fittings is described in paragraph 2-301. Temporary repairs will be replaced at next scheduled maintenance period (PMP or Depot Maintenance). DA form 2408-13 entry is required on all temporary repairs. Temporary repairs require daily inspection until replaced.

2-280. Reparable Replacement — Fuselage Cast and Forged Fittings (AVIM). Replacement of bushings, bearings, or inserts of a dissimilar metal which form a part of the fitting are considered replacement repairs.

2-281. Non-Reparable Replacement — Fuselage Cast and Forged Fittings (AVIM). Damage to a fitting not reparable by temporary patch or insertion repair requires replacement of the entire fitting. (Refer to TM 55-1520-204-25/1 series manuals when replacement of lock-bolts is required.)

2-282. Repair or Replacement — Forward and Aft Landing Gear Fittings (AVIM). Replacement procedures for landing gear fitting bearings are given in paragraph 2-298. Cracks in the webs and flanges of the landing gear fittings are not reparable except for the temporary type repairs described in paragraph 2-301.

2-283. CARGO FLOOR.

2-284. General — Cargo Floor. The cargo floor provides a multi-use area for combination of cargo, passengers, and armament. (Refer to fig. 2-24 for fitting location.) Tie-down or mounting hard points for each use are provided on the floor within the compartment.

2-285. Cargo Tiedown Fittings — Cargo Floor. Twelve 0.186-inch diameter holes, two per stiffener, located 2.25 inches inboard from each side of the fuselage, provide attach points for cargo tiedown fittings. The cargo tiedown fittings are formed of 0.250-inch diameter, U-shaped, steel rods having a lanyard-attached quick-release pin to secure the fitting to the cargo floor. Cargo tiedown fittings can be installed at any of the 12 locations, as required for load arrangement.

2-286. Passenger Seat Belt Attachment Fittings — Cargo Floor. Seat belt attachment fittings are mounted in the cargo floor, against the aft bulkhead. The inboard fitting is a two-lug, aluminum alloy forging with a 0.25-inch cotter-pin-secured flathead pin for belt snap end fitting attachment. the outboard fittings are single-lug, aluminum alloy forgings with 0.25-inch diameter holes for the belt snap end fittings.

2-287. Armament Support Fittings — Cargo Floor. The outboard fitting just inside the left cargo door, and the inboard fitting of the center beam assembly, are single-lug, aluminum alloy forgings with 0.375-inch diameter bushed holes.

2-288. Fuel Cell Tiedown Eyelets — Cargo Floor. Twelve grommet-lined tiedown eyelets in aluminum alloy brackets on the underside of the floor provide lacing support for the fuel cells.

2-289. Jacking Point Fittings — Cargo Floor. Each fitting is a machined, aluminum alloy forging with a 0.702-inch diameter bore exposed through a cutout in the skin just below the edge of each cargo door.

2-290. Inspection — Cargo Floor. *a.* Inspect cargo floor for dents, cracks or bent members. If severe dents, cracks, or punctures are found, remove appropriate fuel access cover and inspect fuel cell.

b. Inspect all fittings for corrosion, cracked or broken lugs, and loosened rivets.

c. Inspect cargo floor for evidence of water accumulation. Check that drain holes (if present) aft of cargo doors are clear and free of obstruction

2-291. General Repair — Structural Support and Attachment. Refer to paragraph 2-264 for general repair information and TM 55-1500-204-25/1 for structural support and attachment repair and replacement. Refer to table 2-3, and note items 2, 5, 11, and 13, and items 1 and 2, table 2-4, as repair material.

2-292. Repair — Cargo Floor Drainage. Drain holes may be drilled at floor level on both sides of the aircraft to provide drainage through the exterior skin as follows:

a. Locate holes on the cargo compartment side of the exterior skin 2.00 inches forward of the station 124.00 lower section just above the cargo floor. Be sure that drilling will not damage floor and that holes are no more than 0.04-inch above the floor.

b. Drill a 0.25-inch hole and deburr.

c. Treat the area with aluminum surface protection (para 1-42 and 1-47) and touch up paint.

2-293. Replacement — Armament Support Bushing. *a.* Remove fuel access doors.

b. Remove lockbolts that attach armament support fitting to center beam; lift out fitting.

NOTE

The 0.375-inch diameter center hole of the support bushing may be located off-center in relation to the support log. Off-center bushings are installed with the thin wall up. Check bushing bore for concentricity to determine bushing wear.

c. Note location of bushing hole center and replace only with like bushing; press worn bushing out of the fitting.

d. Inspect support fitting for cracks and scoring of bore.

e. Clean the ID of the armament support fitting lug and the OD of the replacement bushing by wiping with methyl ethyl ketone (C69) and a clean cloth a minimum of three times.

f. Coat the ID of the support fitting lug and the OD of the replacement bushing with locking compound primer (C91) and allow to air-dry for 10 minutes.

g. Apply locking compound (C90) sparingly to the previously coated surfaces by using a clean applicator.

h. Press the replacement bushing into the armament support fitting lug. Off-center replacement bushings are installed with the thin wall section next to the rounded upper edge of the lug. Wipe away any compound that may have worked into the bushing ID.

i. Install armament support fitting in center beam assembly; install eight lockbolts.

j. Install fuel cell access doors.

2-294. CENTER BEAM.

2-295. Description — Center Beam. The lower section center beam assembly (27, fig. 2-20) is a primary structural member of the aircraft. The beam is a riveted and bolted assembly of aluminum alloy webbing, stiffeners, and doublers. Forged aluminum alloy landing gear fittings are mounted at tht forward and aft ends of the center beam. Each fitting contains four swivel bearings for attachment of the landing gear braces and struts. The forward fittings have two additional bearing attachment points for the longitudinal and lateral cyclic trim actuators.

2-296. Inspection — Center Beam. (See fig. 2-20.) *a.* Inspect the forward and aft landing gear fittings (18 and 23) for cracks and distortion. A distorted fitting usually indicates yielding due to excessive load. Perform dye penetrant inspection of questionable fittings according to TM 55-1500-204-25/1. Inspect the fitting bearings for scuffing or scoring on the ball surfaces caused by binding.

b. Inspect the armament support fittings (19) for secure attachment and for cracks and distortion. Inspect the bushings for secure fit and bores for elongation.

c. Inspect the tail rotor pedal torque tube bracket support fittings (24 and 25) for secure attachment; check for cracks and deformation.

NOTE

If there is any indication of center beam damage, remove fuel cells and inspect the center section of the beam (fig. 2-25).

d. Remove right fuel access door.

e. Remove necessary fuel cell attaching hardware and pull the fuel cell assembly from the keel beam.

f. Inspect the keel beam upper flange for indications of web or stiffener buckling between stations 95 and 115.

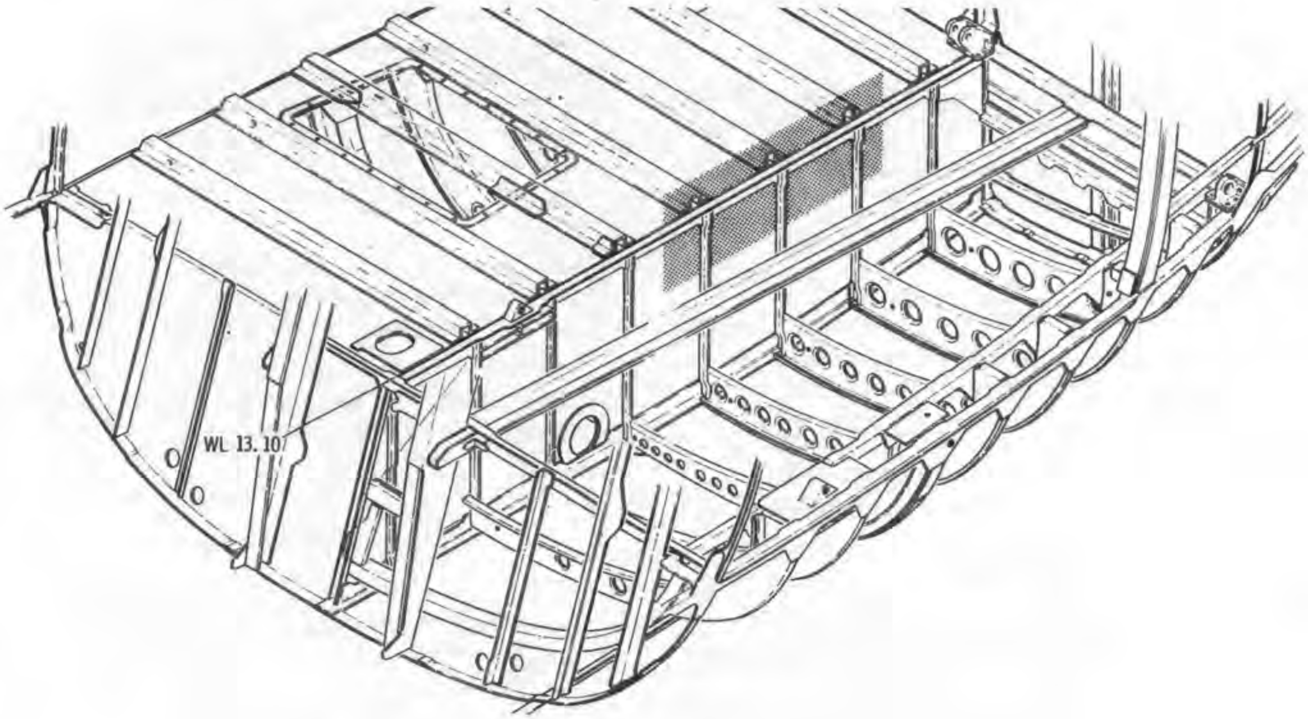
(1) Minor buckling of the keel beam is acceptable provided no top stiffener rivets have pulled out and no cracks or tears exist in the web or stiffeners.

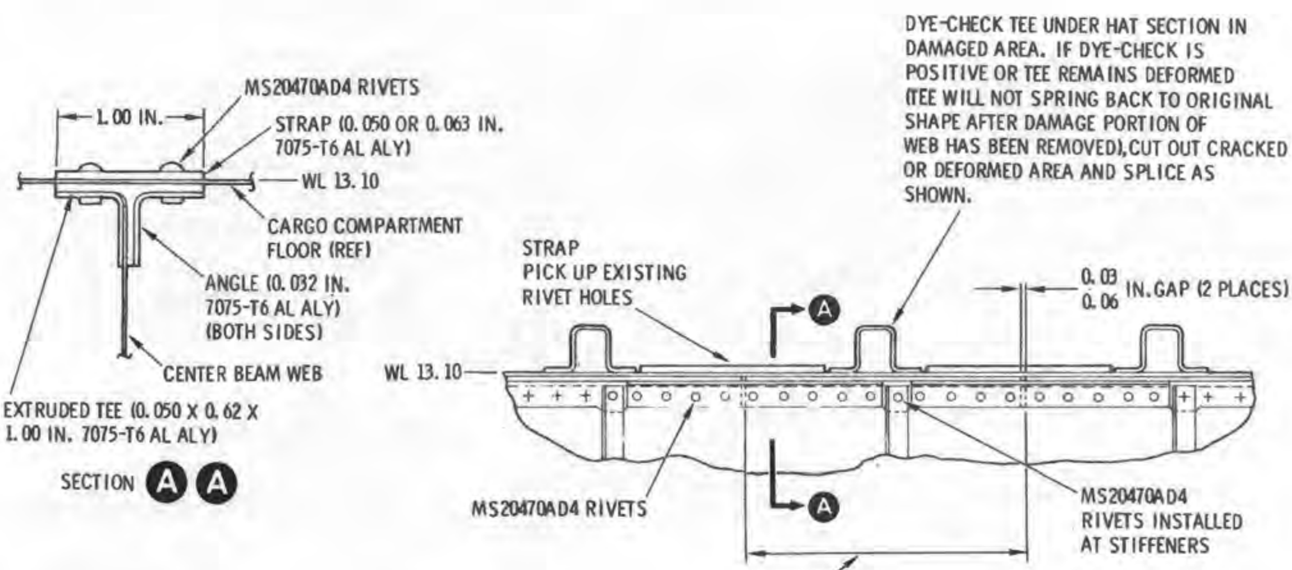
(2) If any top stiffener rivets have pulled out and/or cracks or tears are evident in the web or stiffeners the aircraft must be restricted to limited service until repairs can be accomplished.

(3) Aircraft in limited service should have cargo compartment loading restricted to 400 pounds maximum.

g. After completion of inspection reinstall hardware removed in *d* and *e* above.

2-297. Repair — Center Beam (AVIM). Scratches, nicks, light corrosion deposits, and smooth contour dents that blend smoothly into surrounding surfaces are considered negligible damage. Small, smooth, isolated dents may be classified as negligible, and if in heat treated material should be left as is. Nicks and scratches, if small, isolated, and free of sharp edges, may also be classified as negligible. Touch up dented. scratched, or broken areas to prevent corrosion (chapter 1). Materials used in all repairs and reinforcements (items 2, 5, 11 and 13, table 2-3, and items 3, 4, and 5, table 2-4) shall be selected according to TM 55-1500-204-25/1. Refer to figure 2-25.





NOTES:

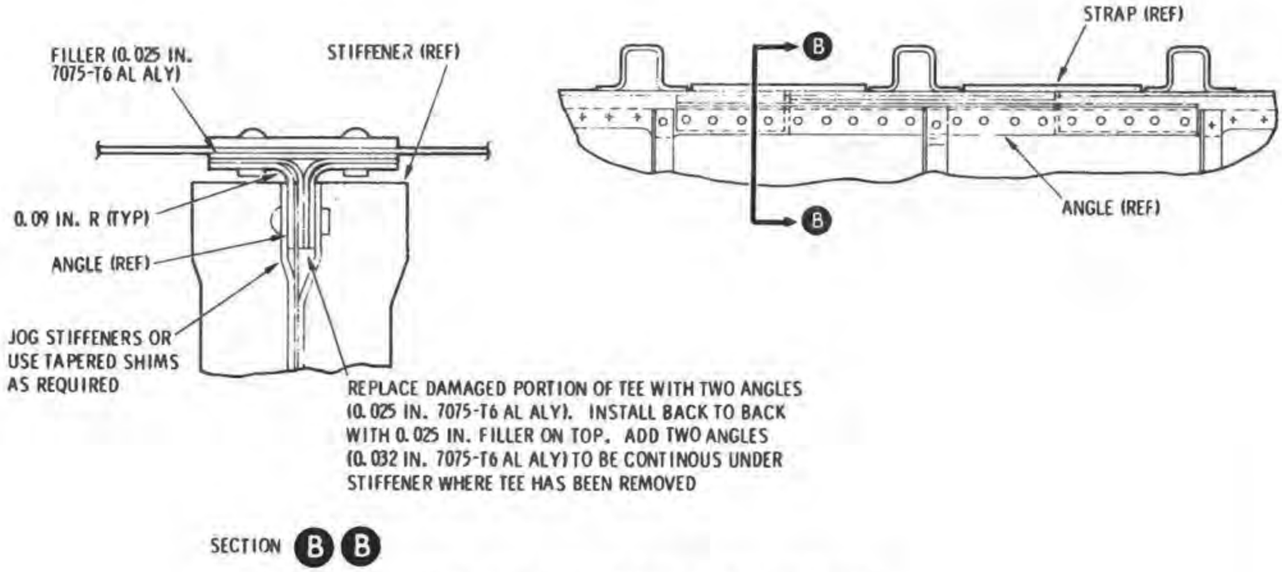
1. (+) INDICATES EXISTING RIVET LOCATION.
2. (O) INDICATES NEW RIVET LOCATION.
3. OBSERVE THE FOLLOWING SHEET METAL PRACTICE: RIVET EDGE DISTANCE 2 X DIA.; LOCATE RIVET MINIMUM OF 0.25 INCH FROM ADJACENT STRUCTURE AND OR JOGGLE BEND.

REPAIR OF CRACKED OR DEFORMED TEE

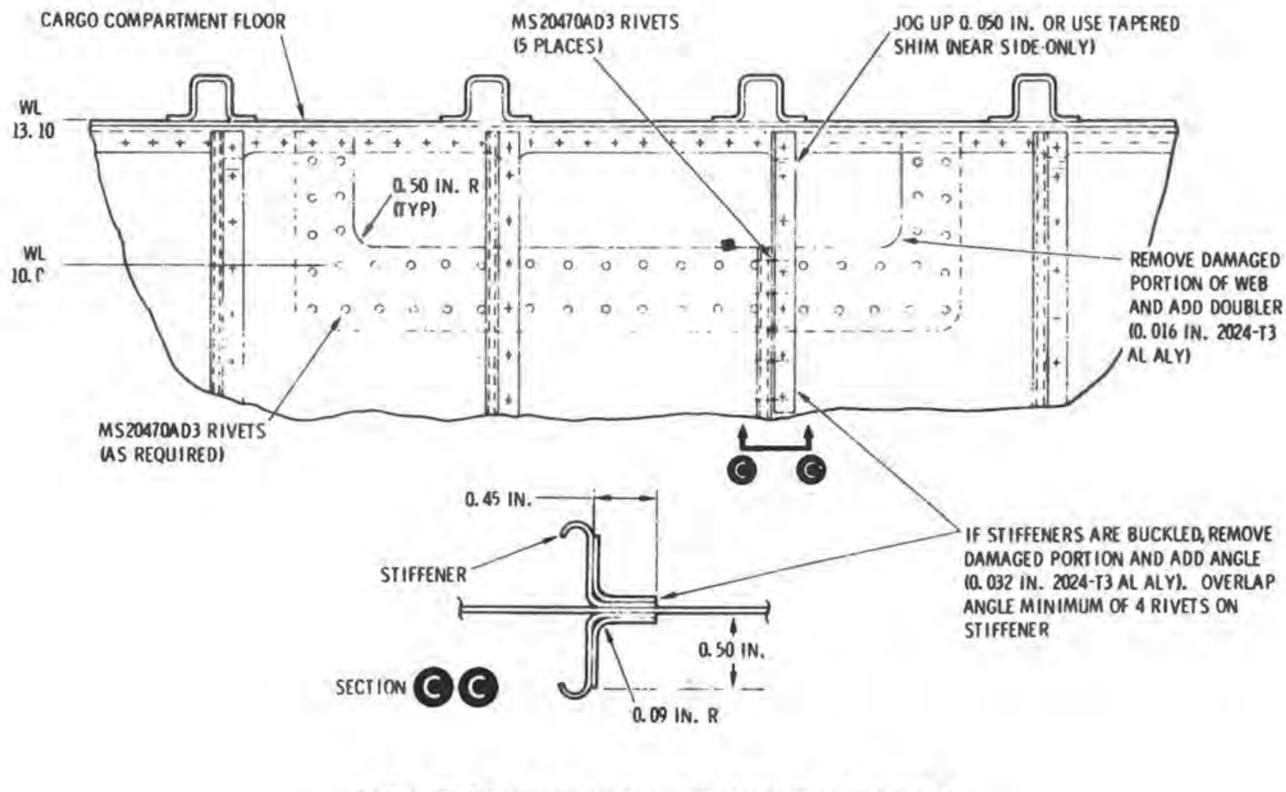
VIEW LOOKING INBOARD LEFT SIDE

12-170-1

Figure 2-25. Center Beam Repair. (sheet 1 of 2)



TEE REPAIR ALTERNATE METHOD



REPAIR OF BUCKLED WEB AND STIFFENERS

VIEW LOOKING INBOARD LEFT SIDE

12-170-2

Figure 2-25. Center Beam Repair. (sheet 2 of 2)

NOTE

Straightening of dents will disturb molecules in heat treated metal and may cause internal cracks.

When necessary, place fuselage structure in a suitable support as shown in figure 2-22.

a. Gain access to the damaged part by removing adjacent parts, opening up skins or by cutting an access hole, whichever is more feasible.

b. Drill out rivets or remove hardware that secures damaged part to structure; remove damaged part.

c. Position replacement part to structure and clamp securely in place.

d. Pick up rivet or hardware hole locations from installed structure and drill rivet or hardware holes in replacement part.

e. Install rivet or hardware to secure replacement part to structure.

f. Install parts removed to gain access; repair access hole by patching. Refer to figure 2-23 and table 2-3 for repair material.

Table 2-2. Premaintenance Requirements for Removal and Installation of Landing Gear Bearings.

Conditions	Requirements
Special Tools	(T36)

2-298. FORWARD AND AFT LANDING GEAR FITTINGS AND BEARINGS

2-299. Inspection — Forward and Aft Landing Gear Fittings and Bearings. *a.* Inspect the landing gear fittings for cracks in the webs and flanges and evidence of wear or damage in the bearing areas.

b. Inspect bearings in landing gear fittings for evidence of wear and corrosion. Wear tolerances, radial and axial, of 0.040 shall not be exceeded.

2-300. Replacement of Landing Gear Attach Bearings (AVIM). *a.* Install detail A of removal tool (T36) as shown in figure 2-26 with the bolt head on the side of the bearing seat.

b. With the bolt shank centered in the bearing bore, tighten the nut and remove the bearing.

c. Clean the ID of the bearing recess in the landing gear attach fitting and the OD of the replacement bearing by wiping with methyl ethyl ketone (C69) and a clean cloth a minimum of three times.

d. Coat the ID of the attach fitting bearing recess and the OD of the replacement bearing with locking compound primer (C91) and allow to air-dry for 10 minutes.

e. Apply locking compound (C90) to the previously coated surfaces by using a clean applicator.

f. Install the bearing by using detail B of installation tool (T36) as shown in figure 2-26. Make sure that the bearing enters the bore straight and that the bolt is centered in the bore.

g. Remove excess sealant. Apply a small fillet of sealant to the parting surfaces of the bearing and housing.

h. Allow the sealant to harden a minimum of 24 hours before installing the landing gear.

i. After the sealant has hardened, visually check the bearing for proper seating and free movement of the bearing inner race.

2-301. Repair or Replacement of Landing Gear Attach Fittings (AVIM). *a.* Cracks in the webs and flanges of the landing gear fittings are not repairable except for the temporary type repairs shown in figure 2-27.

b. Refer to paragraph 2-275 for information on replacement of fuselage cast and forged fittings.

2-302. NON-CRASH-RESISTANT (NCR) FUEL CELL SUPPORT SKINS.

2-303. General — Non-Crash-Resistant (NCR) Fuel Cell Support Skins. Cleaning and inspection of support skins can only be accomplished with fuel cells removed. (See fig. 2-28.)

2-304. Cleaning — NCR Fuel Cell Support Skins. *a.* Dry the support skins with a clean cloth, as necessary

b. Wipe skin surfaces with clean cloths wet with isopropyl alcohol (C82); then wipe with a clean, dry cloth until dry.

2-305. Inspection — NCR Fuel Cell Support Skins. *a.* Check security of fiberglass skin attachment to support angles and brackets.

b. Inspect fiberglass skin for distortion, breaks, or cracks.

c. Inspect anti-abrasion tape for secure adhesion over rivet heads and all sharp edges and lap joints.

2-306. Repair — NCR Fuel Cell Support Skins. (See fig. 2-28.) (Refer to figure 2-23 and table 2-3 for repair materials.) *a.* Disconnect all external electrical power.

b. Open all circuit breakers and set power selector switch to OFF.

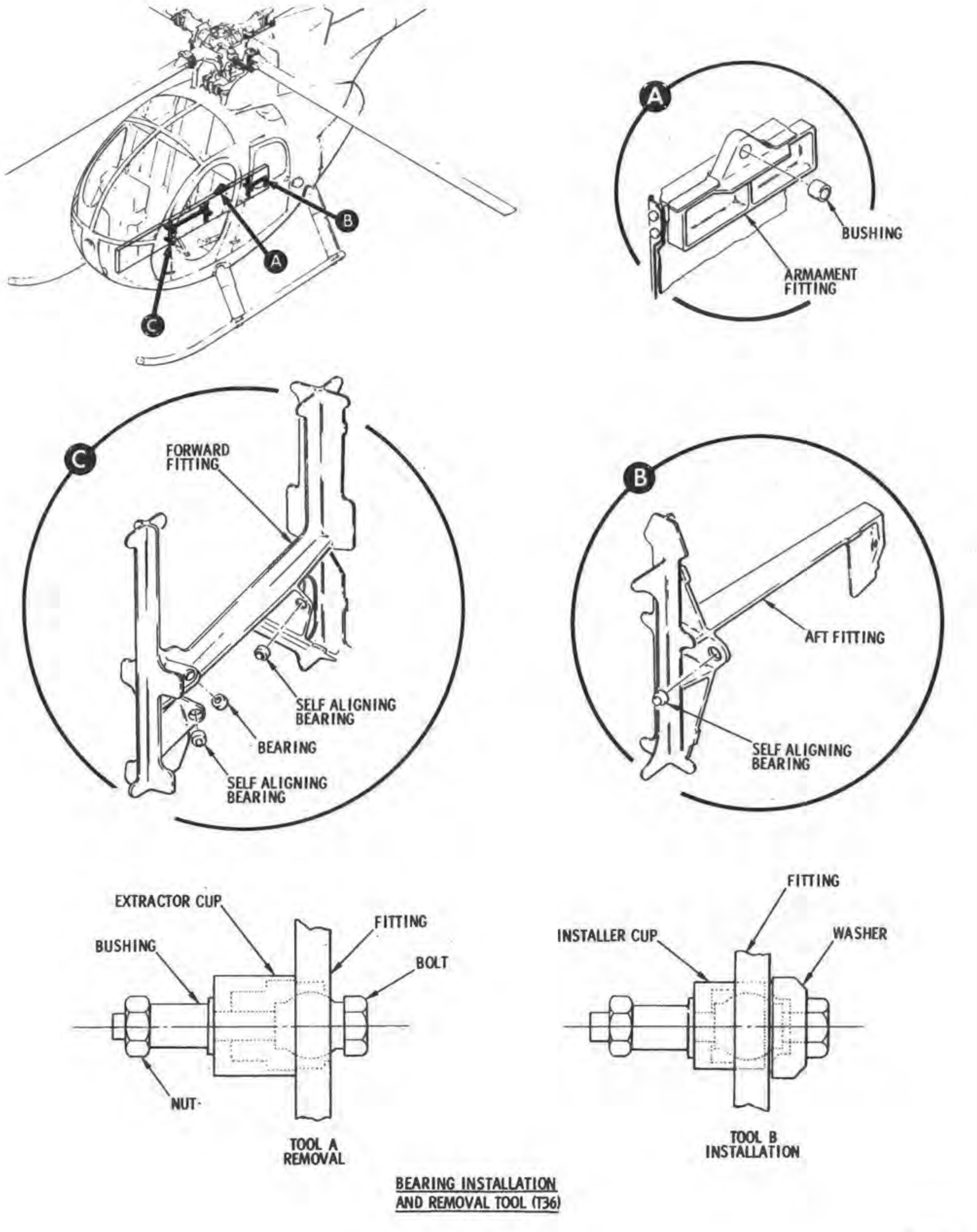


Figure 2-26. Center Beam Fitting Bearing Replacement.

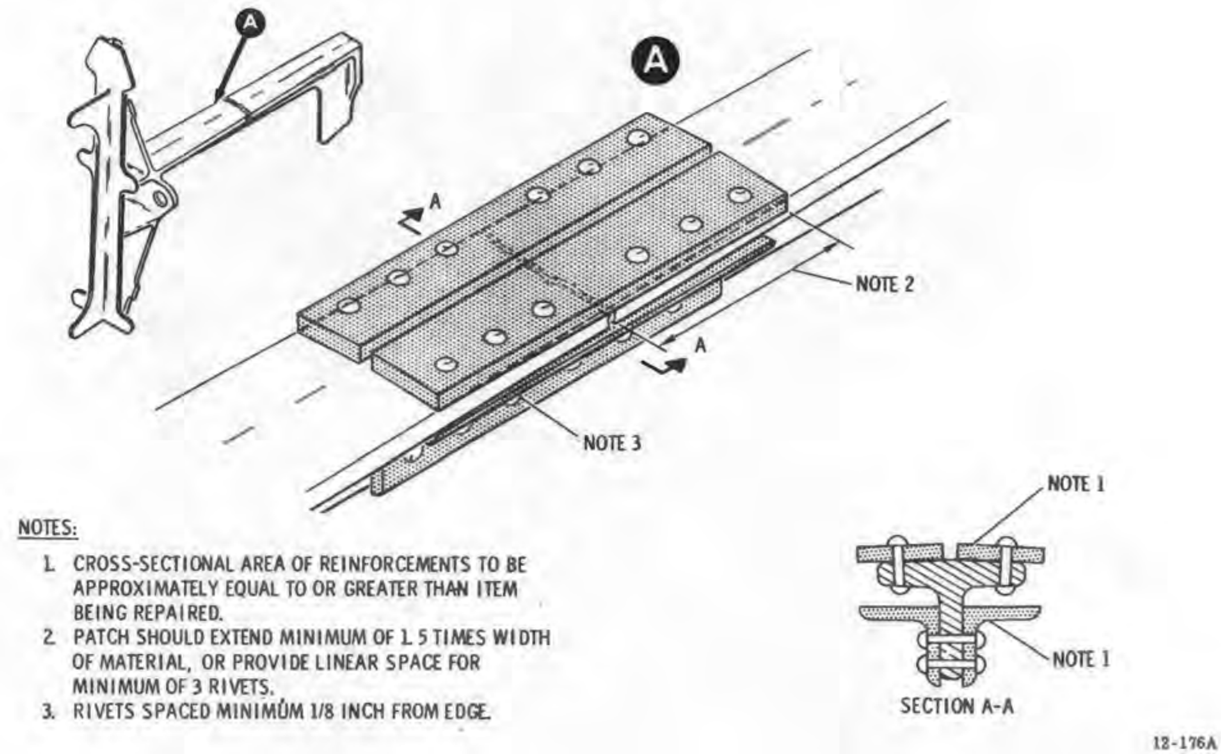


Figure 2-27. Landing Gear Fitting Temporary Repair.

c. Remove fuel cell access door.

d. Remove fuel cell (chapter 10).

e. Determine location of area requiring repair.

CAUTION

Check beneath cargo floor to make sure major structural elements are not affected by cutting operation.

NOTE

When damaged area of skin is not easily accessible through fuel cell access opening, continue according to f through h below; otherwise, proceed with step i.

f. Cut cargo floor in repair area, cutting longitudinally (parallel with aircraft centerline) 2 to 3 inches away from the aircraft center beam, through one channel, and extend cut to flange edge of adjacent forward and aft channels.

g. Cut along adjacent channel flange edges to outboard edge of cargo floor.

h. Drill out rivets on outboard edge of cargo floor between adjacent channels in cutout area and remove floor panel.

i. Repair of the fuel cell support skin requires an aluminum patch equal to, or greater than, the thickness needing repair. Overlap the edges of the aluminum patch approximately one inch with a fiberglass patch.

j. When the fiberglass skin is damaged (cracked, etc.) in an area that is attached to a supporting rib, flange, or bracket, drill the attaching rivets out of the damaged area, and stop-drill crack ends.

WARNING

During repair, do not use explosive-type rivets as they constitute a serious fire hazard because of the possible concentration of fuel vapor.

NOTE

Rivets need not be used to secure patch to skin provided the patch is clamped in place under a contact pressure of 10 to 30 psi during the curing period.

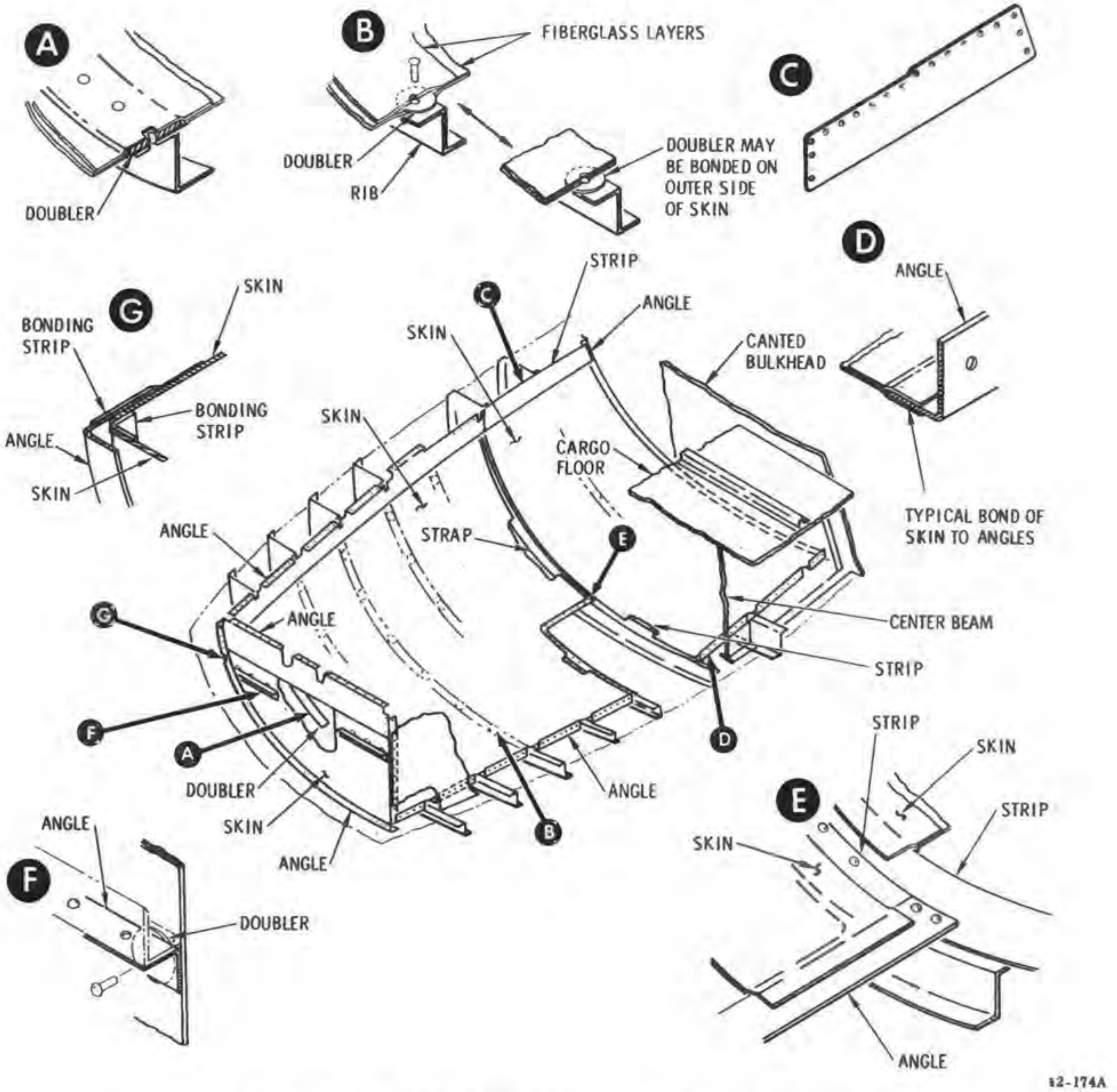


Figure 2-28. NCR Fuel Cell Support Skin Installation.

k. Install patch according to *i* above. Pick up existing rivet hole size and pattern.

l. Secure patch in position with mechanically expanded rivets. Cover rivet heads with tape (C106) to prevent chafing of fuel cell skin.

m. Obtain necessary parts of proper dimensions and material (same as or stronger than original) to accomplish repair of cutout cargo floor section.

(1) Install new channel to rest under channel. Rivet channel in place by using same rivet size and spacing as adjacent areas.

(2) Rivet angles to flanges of adjacent forward and aft channels; check for proper level of cargo floor.

(3) Install cutout section of cargo floor and rivet in place, picking up existing cargo floor rivet pattern.

n. Install fuel cell (chapter 10).

o. Install fuel cell access door.

2-307. Replacement — NCR Fuel Cell Support Skins. Refer to paragraph 2-244 for fiberglass replacement criteria.

2-308. CRASH-RESISTANT (CR) FUEL CELL BACKUP LINERS.

2-309. General — Crash-Resistant (CR) Fuel Cell Backup Liners. Cleaning and inspection of backup

CAVITY FILLER

	LEFT SIDE 369A2639	RIGHT SIDE 369A2639
1	-3	-4
2	-5	-6
3	-7	-8
4	-9	-10
5	-11	-12
6	-13	-14
7	-15	-16
8	-17	-18

NOTES:

1. FOR LINER REPLACEMENT, USE EXISTING LINER AS TEMPLATE FOR CUTOUTS AND HOLE (0.250 IN. DIA) LOCATION.
2. COVER EXPOSED EDGES AND SCREW HEADS WITH TAPE (C107).

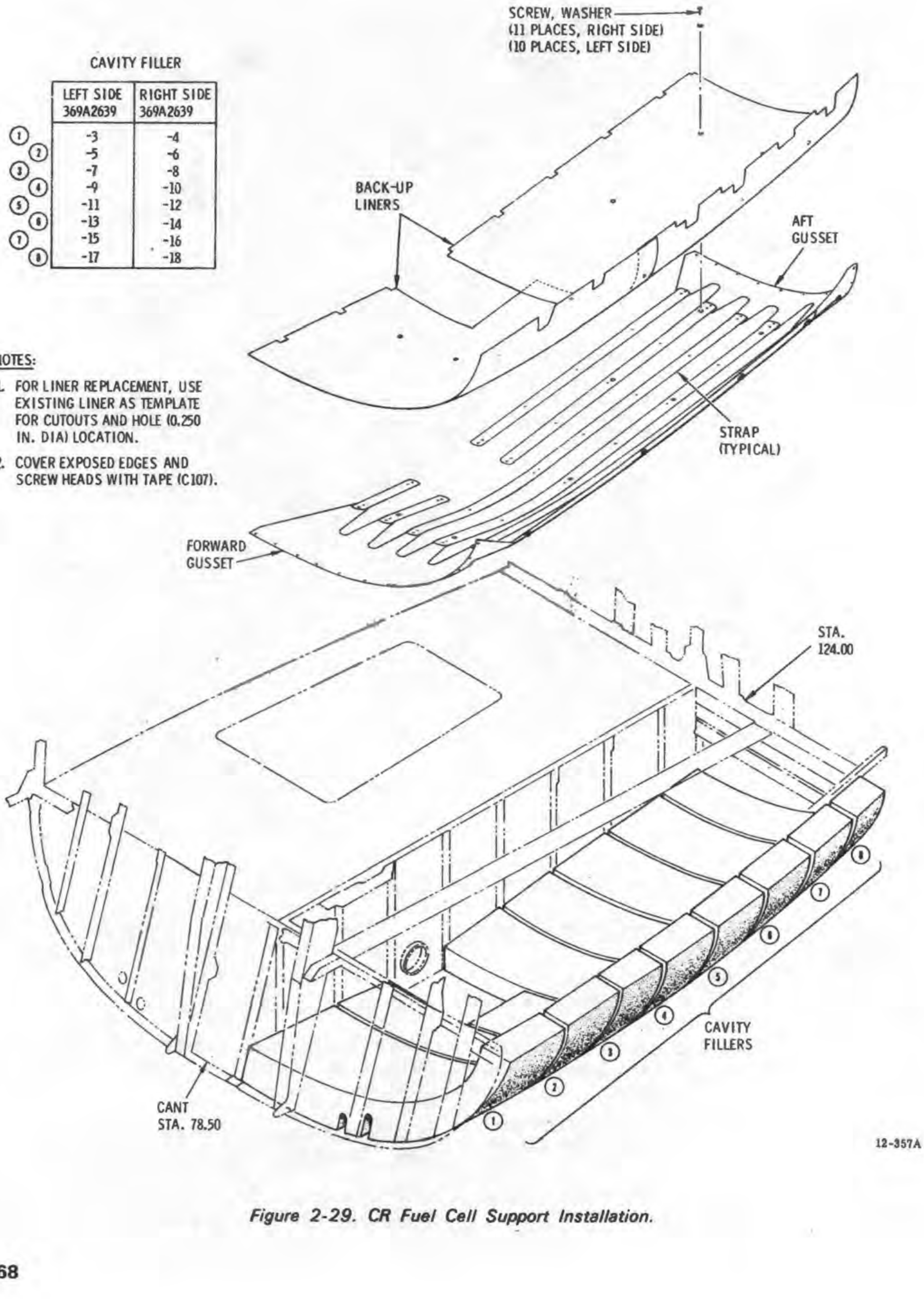


Figure 2-29. CR Fuel Cell Support Installation.

liners can only be accomplished with fuel cells removed. (See fig. 2-29.)

2-310. Cleaning — CR Fuel Cell Backup Liners. *a.* Remove talc or other foreign material from backup liners with a clean cloth.

b. Wipe liner surfaces with clean cloths wet with isopropyl alcohol (C82); then wipe with a clean, dry cloth until dry.

2-311. Inspection - CR Fuel Cell Backup Liners. *a.* Check for security of backup liner and that attachment screws are in place and secure.

b. Inspect backup liner for distortion, breaks or cracks.

c. Inspect anti-abrasion tape for secure adhesion over screw heads and exposed edges of liner cutouts.

d. Check visible fiberglass at forward and aft gussets for condition.

2-312. Removal — CR Fuel Cell Backup Liners. (See fig. 2-29.) *a.* Remove fuel cells (chapter 10).

b. Remove abrasion tape covering screw heads and exposed edges of liners.

c. Remove attachment screws and washers; then roll liner and remove through floor opening.

2-313. Removal — CR Fuel Cell Cavity Fillers. *a.* Identify strap locations for reinstallation.

b. With backup liner removed, drill out rivets and remove sufficient straps and/or forward and aft gussets to release cavity filler blocks.

c. Lift filler block out from between aircraft ribs. Note that filler may not slide out in lateral direction due to aircraft conduit running through notches at the underside of filler blocks.

2-314. Repair — CR Fuel Cell Backup Liners. No repair of backup liners is authorized. Replace any damaged liner.

2-315. Installation — CR Fuel Cell Cavity Fillers. *a.* Install correct part number (dash number) filler block(s) in locations shown in figure 2-29.

b. Reinstall straps and/or gussets in original locations with same size and type rivets.

c. Install backup liner.

2-316. Installation — CR Fuel Cell Backup Liners. *a.* With cavity fillers and straps installed, roll liner and position in fuel cell as shown in figure 2-29.

NOTE

If a replacement liner is being installed, use the old liner as a template to locate attachment holes and cutouts. Drill and trim replacement liner before installation.

b. Install liner attachment screws and washers.

2-317. FLOOR SUPPORT LONGERONS.

2-318. Description — Floor Support Longerons. The two floor support longerons (21, fig. 2-20) are structural members routed from the pilot's floor support bulkhead (26), along the fuselage contour back to the lower section ring (15). The longerons are formed and chemically milled extrusions that provide the outboard support for the floor structure.

2-319. Inspection — Forward Ends of Floor Support Longerons. Open the pilot's compartment floor access doors, inspect accessible length of the floor longerons for secure installation, corrosion, distortion, and breaks or cracks. Close access doors after inspection.

2-320. Inspection — Aft Ends of Floor Support Longerons. Open the engine compartment access doors. Inspect accessible length of the floor longerons for condition as in paragraph 2-319. After inspection, close engine access doors.

2-321. Repair or Replacement — Floor Support Longerons (AVIM). The left and right floor support longerons are chemically milled 2014-T6 aluminum extrusions riveted along the fuselage mold line, to bulkhead station 44.64, to ring station 137.50, and to other structural members of the fuselage lower section. The outboard edges of the pilot's floor and cargo floor are riveted to the horizontal leg of the extrusions. The fuselage lower section skin panels are riveted along the lower edge of the vertical web. Structural repair of the floor support longerons requires removal of the fuselage lower section skin panel from the damaged section of the longeron. Insert or overlay repairs to damaged areas of the floor support longerons are limited to 4 inches after cleanup and must be made according to TM 55-1500-204-25/1 repair instructions for stressed areas. Cracks may be repaired as follows:

NOTE

Replacement of floor support longerons is not recommended as a maintenance function as it would involve removal of the entire lower section from the fuselage. Refer to table 2-4, items 6 and 9, for repair materials.

a. Remove fuselage skin panel from section of floor support longeron where damage is located. Refer to paragraph 2-264.

b. Stop-drill ends of cracks.

CAUTION

The patch angle shall be at least 2.0 inches longer than the length of the crack, and the angle sides shall match the cross-sectional dimensions of the extrusion webs at the damaged area.

c. Form an angle from item 12, table 2-3, to match cross-sectional inside contour of longeron extrusion at damaged area.

d. Rivet patch angle to inside of longeron extrusion webs.

e. Rivet removed fuselage skin panel in place.

2-322. INSTRUMENT PANEL, HOOD, AND CONSOLE.

2-323. Description — Instrument Panel, Hood, and Console. The instrument panel is a box structure formed of sheet aluminum panels. The frame of the panel is formed of riveted aluminum angle. The panel face and side panels are riveted to the angle framework. The top of the instrument panel is shaded with a formed thermoplastic hood, stiffened by aluminum tubing bonded to the edge. The sheet aluminum electrical control console assembly provides support for the intercom, radio and electrical system switch controls, and the fuel shutoff valve control. The console structure supports most of the terminal blocks for interconnecting the various electrical and electronic systems. The terminal blocks are shielded by a cover attached with turnlock fasteners.

2-324. Inspection — Instrument Panel, Hood, and Console. *a.* Check hood mounting for secure condition.

b. Check instrument panel and console attachment to fuselage structure for cracks, corrosion and loosened rivets.

c. Check console terminal block cover fasteners for positive locking, and cover for corrosion, dents and cracks.

2-325. Repair — Instrument Panel, Hood, and Console. Refer to paragraphs 2-7 and 2-269.

2-326. PILOT'S COMPARTMENT FLOOR.

2-327. Description — Pilot's Compartment Floor. The pilot's compartment floor is a structure of aluminum alloy formed channels, intercostals, clips, gussets, and skin. The pilot's seat support structure attaches to the aft end of the floor. Tail rotor control support fittings are at the forward end of the floor, and there are openings on each side for access to the underfloor compartments.

2-328. Inspection — Pilot's Compartment Floor *a.* Inspect floor for cracks, dents, gouges, and signs of excessive wear.

b. Inspect tail rotor control support fittings for cracks, loosened attachment, and wear or elongation of bolt holes (when torque tube and mounting brackets are removed.)

2-329. Repair — Pilot's Compartment Floor. Refer to paragraphs 2-7 and 2-269 for general repair information and TM 55-1500-204-25/1 for structural support and attachment repair and replacement. Table 2-4, items 1 and 2 are listed as structural repair materials.

2-330. ELECTRONIC COMPARTMENTS.

2-331. Description — Electronic Compartments. The electronic compartments are below the fuselage floor level, on both sides of the center beam and forward of the fuel cells. The compartments primarily contain avionics equipment, the battery, and electrical control components. Access to the units is provided by floor access doors on each side of the electrical control console.

2-332. Inspection — Electronic Compartments. *a.* Inspect individual structure components and mounts for cracks, breaks and stripped threads.

b. Inspect electrical harnesses and wiring for cracked or frayed insulation and grounding terminals for corrosion.

c. Inspect disconnect plugs for corrosion, and signs of arcing or burning.

d. Inspect battery area for evidence of battery leakage and corrosion on compartment structure. Refer to paragraph 1-30 for cleaning up spilled or spewed electrolyte.

2-333. Repair — Electronic Compartments. Refer to paragraphs 2-7 and 2-269 for general repair information and TM 55-1500-204-25/1 for structural support and attachment repair and replacement. Refer to table 2-3, item 2 for repair material.

2-334. PILOT'S SEAT SUPPORT STRUCTURE.

2-335. Description — Pilot's Seat Support Structure. The pilot's seat support structure is formed of aluminum alloy ribs and sheet. The seat structure incorporates forged and machined aluminum alloy fittings for seat belt attachment, landing gear damper attachment, and flight and engine control components. On aircraft requiring armor installation, aluminum alloy armor support brackets are riveted to the seat support structure beneath the pilot's and copilot's seat positions.

2-336. Inspection — Pilot's Seat Support Structure. *a.* Inspect the seat support structure for cracks, dents, and loose attaching hardware.

b. Inspect attachment fittings, forgings, and brackets for cracks and wear.

c. Inspect electrical harnesses and wiring for cracked or frayed insulation and grounding terminals for corrosion.

2-337. Repair — Pilot's Seat Support Structure. Refer to paragraphs 2-7 and 2-269 for general repair information and TM 55-1500-204-25/1 for structural support and attachment repair and replacement. Refer to table 2-4, item 16 for repair material.

2-338. FIREWALL INSTALLATION.

2-339. Description — Firewall Installation. The firewall installation (fig. 2-30) consists of two separate units; the forward section (canted) firewall as described in paragraph 2-340, and the aft section (upper) firewall as described in paragraph 2-344.

2-340. FORWARD CANTED FIREWALL.

2-341. Description — Forward Canted Firewall. The semicircular forward firewall (fig. 2-30) is in front of and perpendicular to the engine centerline. This canted firewall is a stamped semi-circular panel fabricated from 0.012- and 0.016-inch corrosion-resistant stainless steel sheet. The firewall contains circular cutouts for the engine drive shaft and engine oil cooler lines, and a reinforced rectangular opening for the engine oil cooler. The forward firewall is riveted to the fuselage structure with monel rivets.

2-342. Inspection — Forward Canted Firewall. *a.* Inspect for punctures and corrosion.

b. Inspect for a complete seal around the openings for the engine drive shaft, engine oil cooler lines, and engine oil cooler.

2-343. Repair — Forward Canted Firewall. Repair the forward firewall as described in paragraphs 2-262 and 2-269, and according to TM 55-1500-204-25/1.

a. Stop-drill cracks.

b. Trim holes to smooth edges and patch, using the same or one gage heavier material conforming to item 14, 15, or 16, table 2-3, and monel rivets. A typical repair is shown in figure 2-31.

2-344. AFT UPPER FIREWALL.

2-345. Description — Aft-Upper Firewall. Aft upper firewall blanket (fig. 2-30) extends back from the circular edge of the canted firewall in the form of a tapered shell. The blanket surrounds the upper portion of the engine combustion chamber and exhaust pipe assembly, to contain engine heat and any fire that might develop within the engine compartment. This upper firewall is fabricated from 0.0015-inch, type 321 rigidized corrosion-resistant stainless steel sheet and is covered with a ceramic fiber blanket. Flanges at the forward and lower edges of the upper firewall are covered with heat-resistant tape. Pronged fasteners attach the upper firewall to three vertical fuselage rings and to a horizontal rib.

2-346. Inspection — Aft Upper Firewall. *a.* Inspect aft firewall for security of attachment, punctures, and corrosion.

b. Inspect ceramic fiber blanket for attachment and general condition.

2-347. Removal — Aft Upper Firewall. *a.* Remove heat-resistant tape covering fasteners and along forward edges that join with the station 124 forward canted firewall.

b. Remove tailpipe assembly (chapter 4).

c. Detach compressor cooling air duct support bracket. Remove upper firewall blanket by pulling out buttonhead fasteners that attach blanket to fuselage rings and to waterline 34.96 rib.

2-348. Repair — Aft Upper Firewall (AVIM). (See fig. 2-30.) *a.* Remove upper aft firewall (para 2-347).

b. Remove tape and ceramic fiber blankets from firewall blanket.

c. Use a stiff bristle brush wet with solvent (C94) to accomplish preliminary cleaning.

d. Wipe with a clean, lint-free dry cloth.

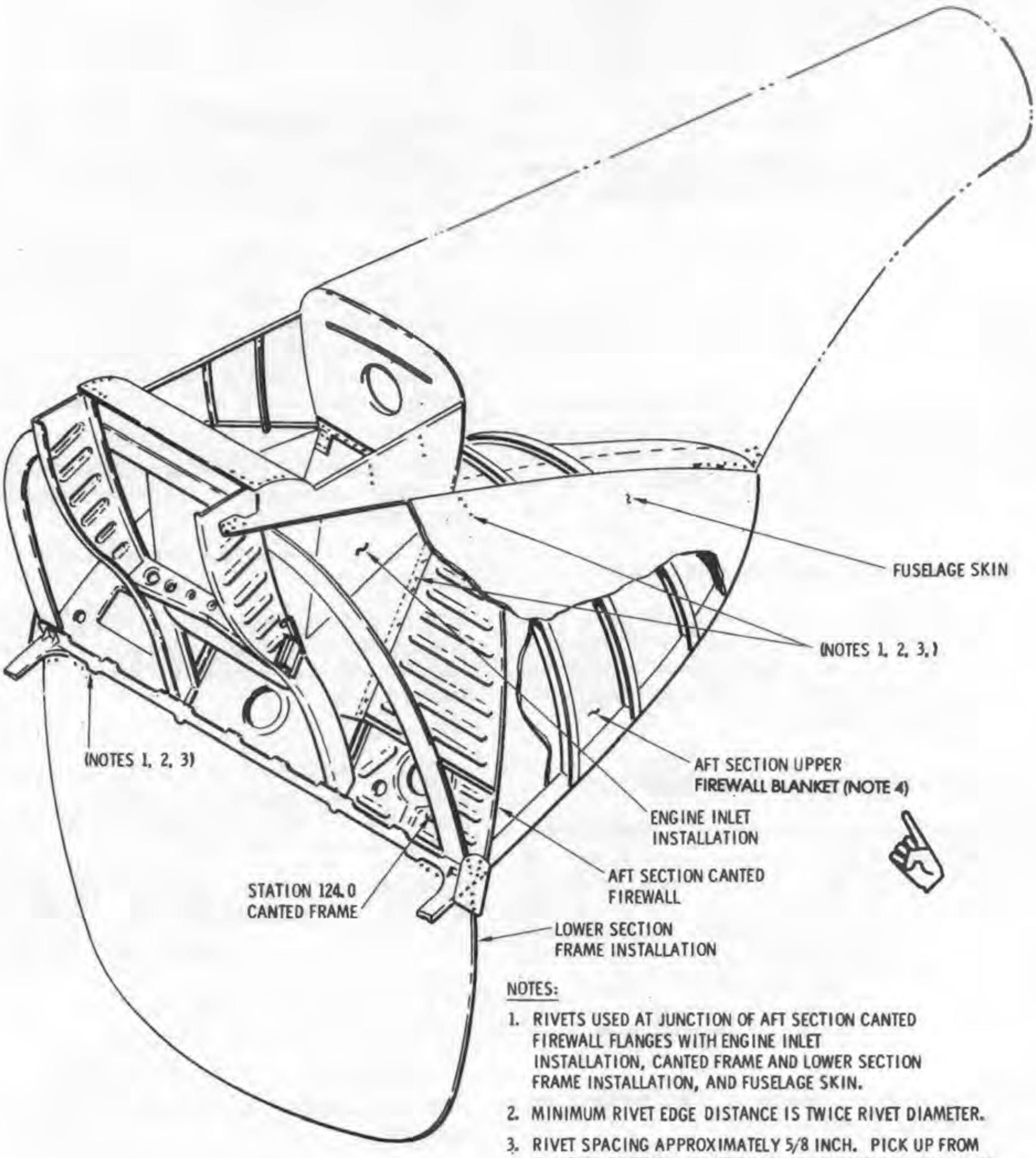
e. Smooth out the waffle pattern in the area to be repaired.

f. Prepare a cleaning solution as follows: 1- to 3-percent hydroflouric acid (C36) and 18- to 30-percent nitric acid (C71) by volume at 75 to 140°F temperature.

g. Cut a suitable repair patch from a damaged upper firewall blanket or use Type 321 stainless steel sheet of 0.0015 to 0.0018-inch thickness.

h. Contour the patch to match the contour of the firewall blanket.

i. Using a stiff bristle brush with the cleaning



NOTES:

1. RIVETS USED AT JUNCTION OF AFT SECTION CANTED FIREWALL FLANGES WITH ENGINE INLET INSTALLATION, CANTED FRAME AND LOWER SECTION FRAME INSTALLATION, AND FUSELAGE SKIN.
2. MINIMUM RIVET EDGE DISTANCE IS TWICE RIVET DIAMETER.
3. RIVET SPACING APPROXIMATELY 5/8 INCH. PICK UP FROM EXISTING PATTERN. SAME SPACING AS ORIGINAL FOR MONEL RIVETS.
4. AFT SECTION UPPER FIREWALL IS A REMOVABLE ASSEMBLY. WITHDRAW BUTTONHEAD FASTENERS FROM INSIDE SURFACE OF FIREWALL BLANKET TO REMOVE.

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Figure 2-30. Firewall Installation.

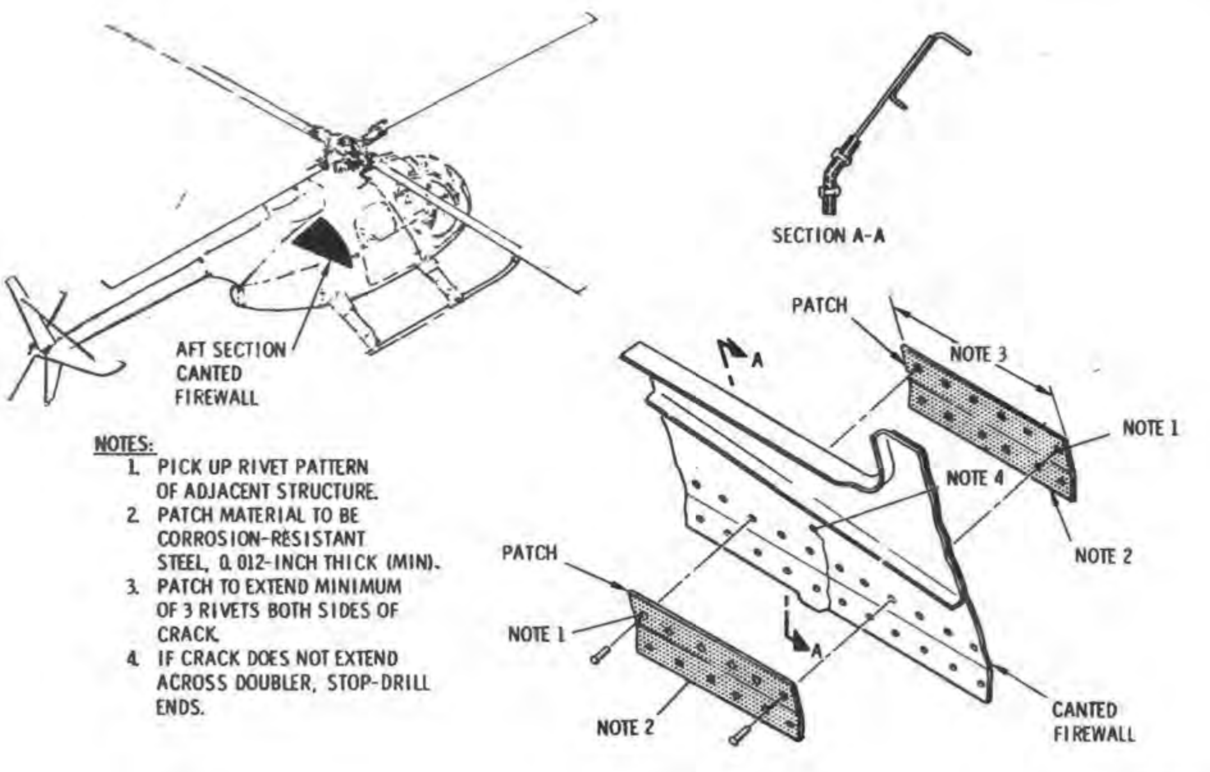


Figure 2-31. Typical Aft Section Firewall Repair.

solution prepared in *f* above, clean the inner and outer surfaces of the stainless steel patch and the firewall area to be repaired.

j. Rinse patch and firewall thoroughly with clean water, then air-dry.

k. Coat the surfaces to be joined with a thin even coating of silver alloy brazing flux (C42).

l. Use a suitable device to hold the patch in place during the brazing operation.

m. Braze patch in place with grade 4 silver brazing alloy (C17) using a suitable torch to heat the patch area to a temperature moderately above the flow point (1295°F) of the brazing alloy.

CAUTION

Do not overheat and burn through the extremely light gage (0.0015-inch thick) firewall blanket.

n. Allow joint to cool for at least 60 seconds before removing holding device.

o. Remove flux by immersing repaired area in water at 160 to 212°F for 40 minutes.

p. Follow *o* with a thorough rinse in clean, running water and air-dry, or wipe dry with a clean, dry cloth.

q. Install ceramic blanket on outer surface of firewall blanket.

NOTE

No unrepaired damage to firewall blanket is permissible. If firewall blanket cannot be repaired, it must be replaced.

r. If inspection reveals damage in the engine compartment rib area, repair according to TM 55-1500-204-25/1 and figure 2-32. Refer to table 2-3, item 4 for repair material.

2-349. Installation — Aft Upper Firewall. *a.* If a repaired firewall blanket, replace damaged or corroded fasteners.

b. If a new firewall blanket, trim blanket to fit installation. Allow suffcient trim excess for folding back the edge to provide double thickness at the attachment points.

c. Pierce fastener holes in new firewall blanket to align with holes in fuselage rings and waterline 34.96 rib. Install new buttonhead fasteners.

d. Place firewall blanket in position. Secure in place

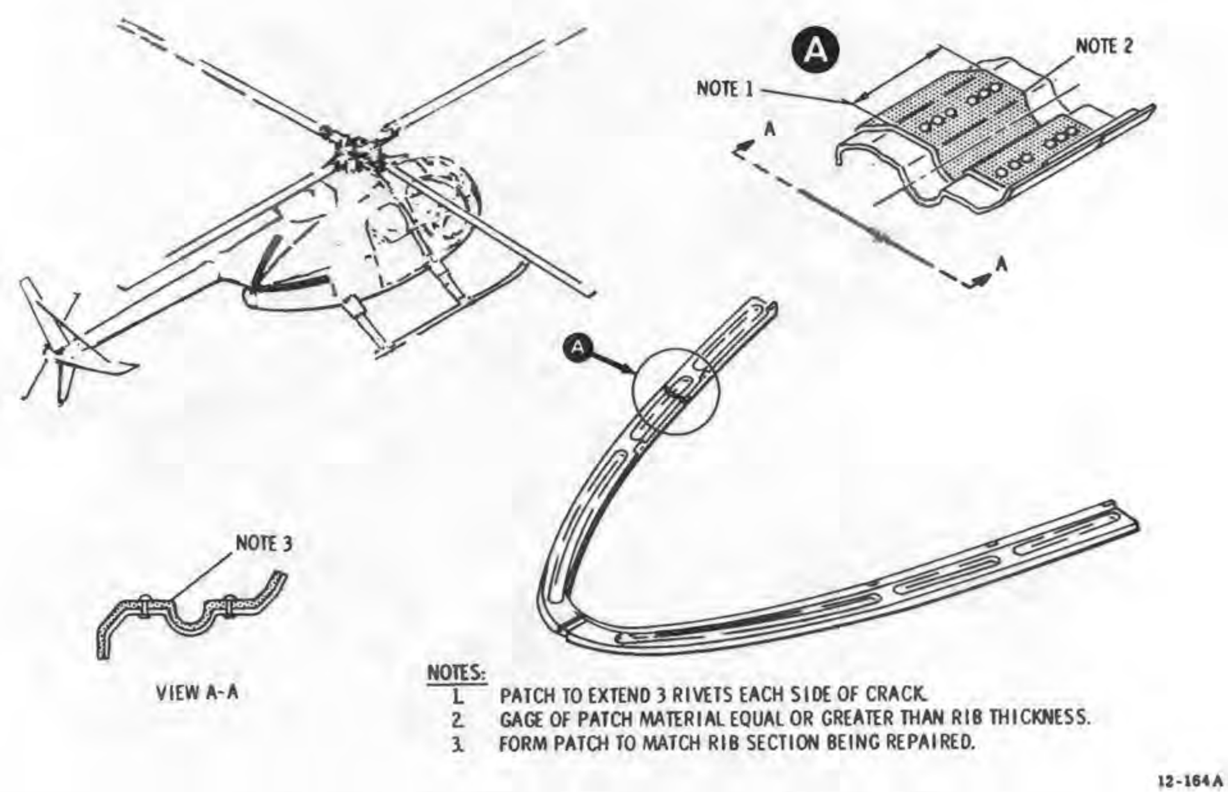


Figure 2-32. Typical Engine Compartment Rib Repair.

by pressing fasteners into holes in fuselage rings and waterline 34.96 rib.

e. Attach cooling air duct support bracket.

f. Clean the forward and lower flanges and fastener lines with solvent (C96); then apply tape (C99).

g. Install tailpipe assembly (chapter 4).

2-350. ENGINE HOIST FITTING.

2-351. Description — Engine Hoist Fitting. The hoist fitting (39, fig. 2-20) is die-forged and machined aluminum, riveted to an intercostal between two of the aft section upper structural rings. The engine hoist is attached to the fitting lug that projects through the upper firewall and into the engine compartment.

2-352. Inspection — Engine Hoist Fitting. *a.* Remove the edge tape, and enough of the upper firewall fasteners to permit access for inspection.

b. Inspect for loosened rivets.

c. Inspect for elongated or deformed lifting eye.

d. Inspect for cracks or chipping.

2-353. Repair — Engine Hoist Fitting (AVIM). Repair of the engine hoist fitting is restricted to general negligible damage as defined in paragraph 2-275. Any damage exceeding these limits or any crack, regardless of length, requires replacement of the fitting.

2-354. STATION 124.00 CANTED FRAME AND LOWER SECTION FRAME.

2-355. Description — Station 124.00 Canted Frame and Lower Section Frame. The station 124.00 upper and lower section frames (14 and 17, fig. 2-20) are primary structural members joined together at waterline 32.00 by a Y-section. The forward-canted frame is formed of channel and sheet titanium. Passenger seat, shoulder harness, and engine mount support -fittings are secured to the canted frame. The lower section frame is formed of two crescent-shaped aluminum channel members.

2-356. Inspection — Station 124.00 Canted Frame and Lower Section Frame. *a.* Inspect frame stiffeners for corrosion, distortion, cracks and secure installation.

b. Inspect frame members for corrosion, distortion, and breaks or cracks.

c. Deleted.

2-357. Repair — Station 124.00 Canted Frame and Lower Section Frame (AVIM). Refer to paragraph 2-275 for repair and replacement criteria for fittings.

a. Accomplish repair of the station 124.00 canted frame according to figure 2-33, using item 13, table 2-3 as a replacement for 2024-T3 sheet material.

b. Accomplish aft bulkhead channel repairs according to figure 2-34. Use item 13, table 2-3.

2-358. ENGINE AIR INLET (PLENUM CHAMBER).

2-359. Description — Engine Air Inlet (Plenum Chamber). The engine air inlet plenum chamber is just below the engine air inlet aft fairing. (See fig. 2-20.) On modified series 1 and 2 aircraft, an engine barrier filter is installed above the plenum chamber to provide air filtration and prevent foreign object entry. On series 3 aircraft, an inertial particle separator air filter is installed above the plenum chamber and is contained within the air inlet aft fairing. The basic air chamber is formed by a forward panel, two side panels, and a pan that extends between the lower edges of the side panels. The pan contains an opening for entry of the engine compressor bellmouth into the air chamber. The boom fairing ring at station 137.50 forms the rear wall of the plenum chamber. A diagonal strut passes through a cutout in the upper left side of the forward panel. The strut braces the structure opening from in back of the left mast support fitting to the boom fairing ring. The tail rotor drive shaft fairing passes through the chamber. Angle clips, each with a nutplate, provide attach points for either a single or double engine air shield screen.

2-360. Inspection — Engine Air Inlet. *a.* Open two access doors on right side of engine air inlet fairing, and open the engine compartment access doors.

b. Inspect all panels for evidence of corrosion, for rivet security, and for punctures.

c. Inspect the engine air shield mounting clips for secure attachment.

d. Inspect the aft section strut for rivet corrosion, and for edge clearance where it passes through the cutout in the forward panel.

e. Inspect the tail rotor drive shaft tube fairing for dents, buckled or wrinkled areas, and signs of corrosion.

f. Close the engine compartment access doors and two air inlet access doors.

2-361. Repair — Engine Air Inlet. Classification of damage and repair or replacement criteria are as outlined below and in paragraph 2-269.

2-362. Patch Repair — Engine Air Inlet. Patch cracks, tears, and holes in the outer fiberglass skin of the inlet fairing when the damage does not exceed the limits described in paragraph 2-269. The inner surface fiberglass skin is not repairable by patch methods.

2-363. Insertion Repair — Engine Air Inlet. Insertion repairs may be made to those areas of the inlet fairing where no polyurethane foam filler is present between the inner and outer fiberglass skins.

2-364. Fiberglass-to-Metal Bonding Repair — Engine Air Inlet. Damaged bonding between inlet fairing fiberglass skin and metal plates is repaired as described in paragraph 2-244.

2-365. AFT SECTION STRUT.

2-366. Description — Aft Section Strut. The aft section strut (1, fig. 2-20) consists of a tube riveted to strut fittings. The strut is approximately 28 inches long, is diagonally attached by lockbolts to the aft end of the left side mast support structure at the canted firewall (14), and to a longeron and angle in the upper right corner of the boom fairing ring (2).

2-367. Inspection — Aft Section Strut. *a.* Remove the plenum chamber access door (para 2-89).

b. Inspect strut for secure attachment to left side mast support structure at canted firewall (14, fig. 2-20) and to boom fairing ring (2).

c. Inspect tube and end fittings for cracks, and for loose or missing rivets.

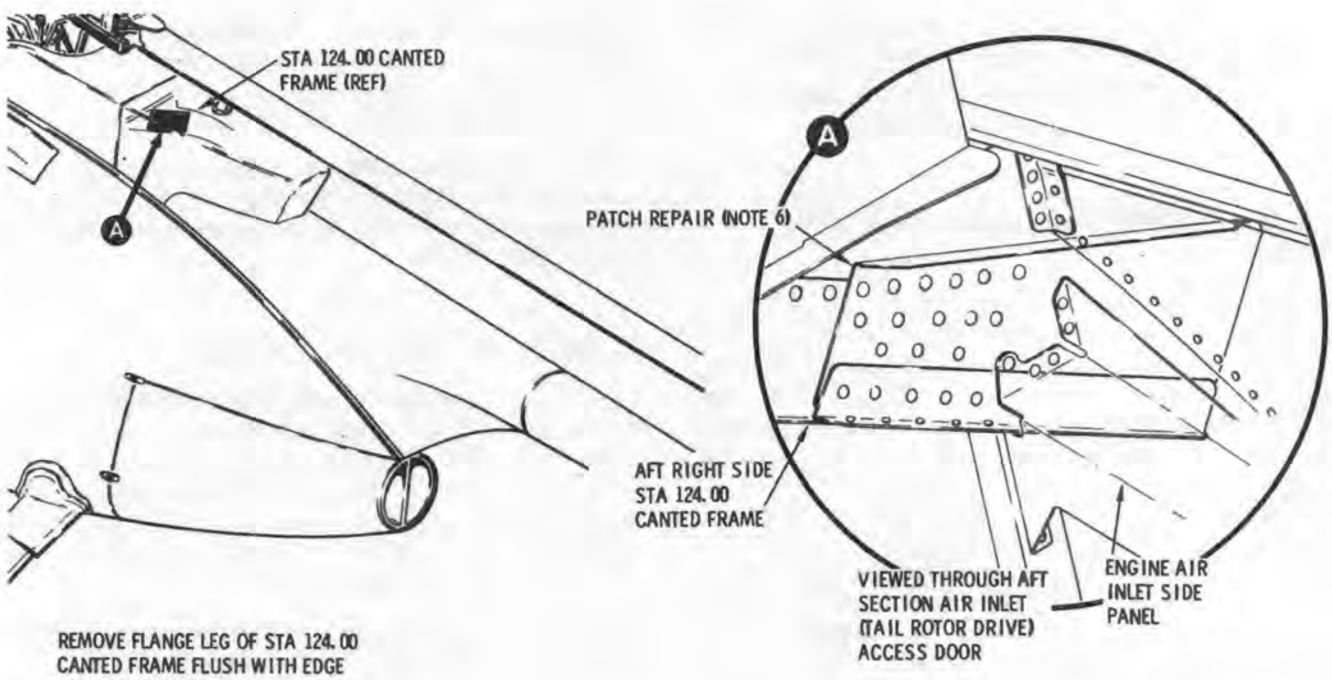
d. Inspect for scratches through protective coating, and distortion, bending, dents or other surface damage.

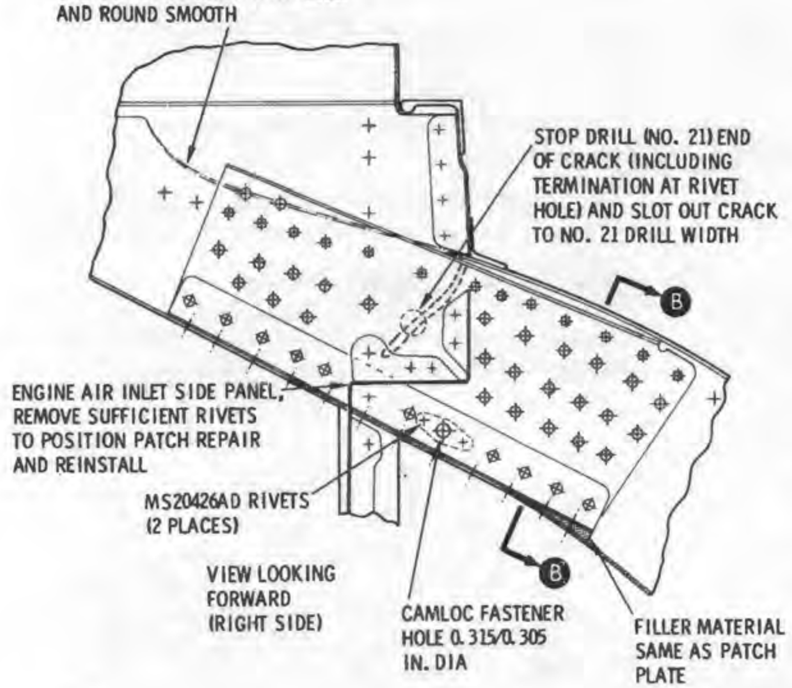
2-368. Repair — Aft Section Strut. Permissible repair of the strut is limited to smoothing out of minor dents, scratches, or nicks. If inspection reveals that the strut is badly damaged, replace the strut as follows.

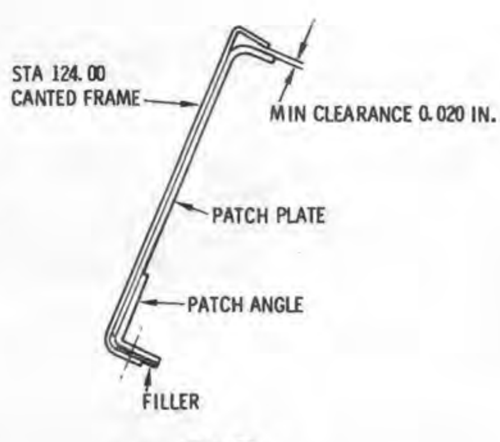
CAUTION

When maintenance work is being performed near the engine air inlet, use care to prevent entry of foreign objects. Tape covers of cardboard or other suitable material in place over the engine air inlet and oil cooler air inlets. Do not remove covers until work is completed and debris is thoroughly cleaned out of the area. After removing covers, verify that area around base of mast, inlet to plenum, and entire plenum chamber is free of foreign material. Install plenum access doors. When performing work above or near upward exhausts, install exhaust covers.

a. Remove the following parts and assemblies, in sequence:







SECTION B B

NOTES:

1. RIVET LENGTHS ARE AS REQUIRED.
2. (+) REPLACE EXISTING RIVETS (MS20470AD5).
3. (⊕) ADD MS20470AD4 RIVETS. MAINTAIN 2X DIA EDGE DISTANCE AND 5-6X DIA SPACING.
4. (¦) ADD MS20470AD3 RIVETS THROUGH UPSTANDING REPAIR ANGLE LEG. MAINTAIN 2X DIA EDGE DISTANCE ON REPAIR ANGLE, 1.5X DIA EDGE DISTANCE ON THE CANTED FRAME, AND 7X DIA SPACING.
5. (✦) MS20470AD4 RIVETS REPLACE EXISTING RIVETS.
6. RIGHT SIDE REPAIR SHOWN. DETAILS ARE TYPICAL FOR LEFT SIDE REPAIR.

12-329-1

Figure 2-33. Station 124.00 Canted Frame Patch Repair. (sheet 1 of 2)

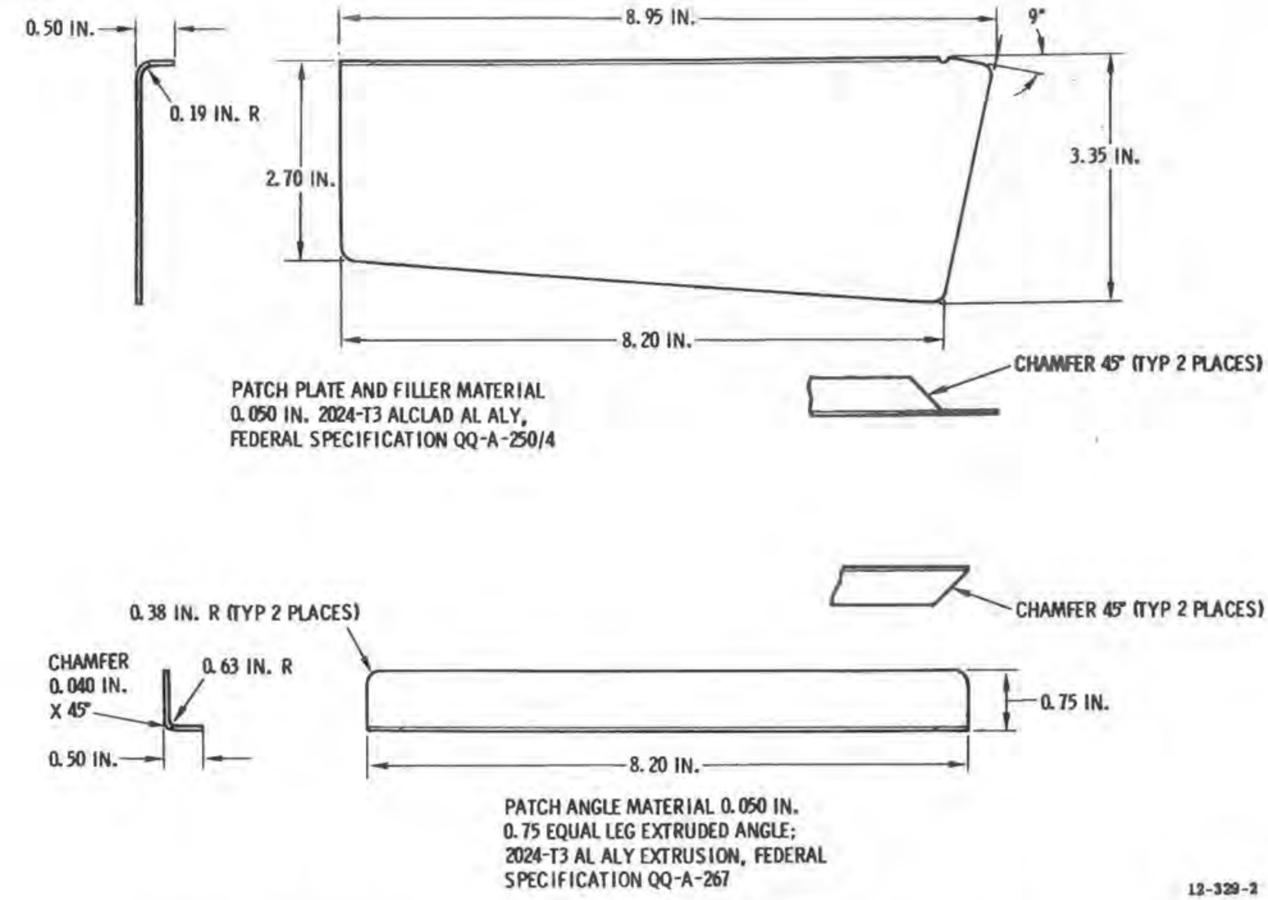


Figure 2-33. Station 124.00 Canted Frame Patch Repair. (sheet 2 of 2)

(1) Forward engine inlet fairing installation.

(2) Aft engine inlet fairing, and air filter installation (as applicable).

(3) Aft engine inlet door installation.

CAUTION

Before proceeding with replacement of the strut, install a support jack at the boom fairing jack pad. Structural damage may result if strut removal is attempted without proper support of fuselage aft section and boom weight.

b. Remove strut by removing the lockbolt collars and pins.

c. Install aft section strut replacement with lockbolts.

NOTE

The left segment of the aft engine inlet door (with oblong cut-out) must be pulled over the strut before installation.

d. Reinstall the following parts and assemblies in sequence:

(1) Aft engine inlet door installation.

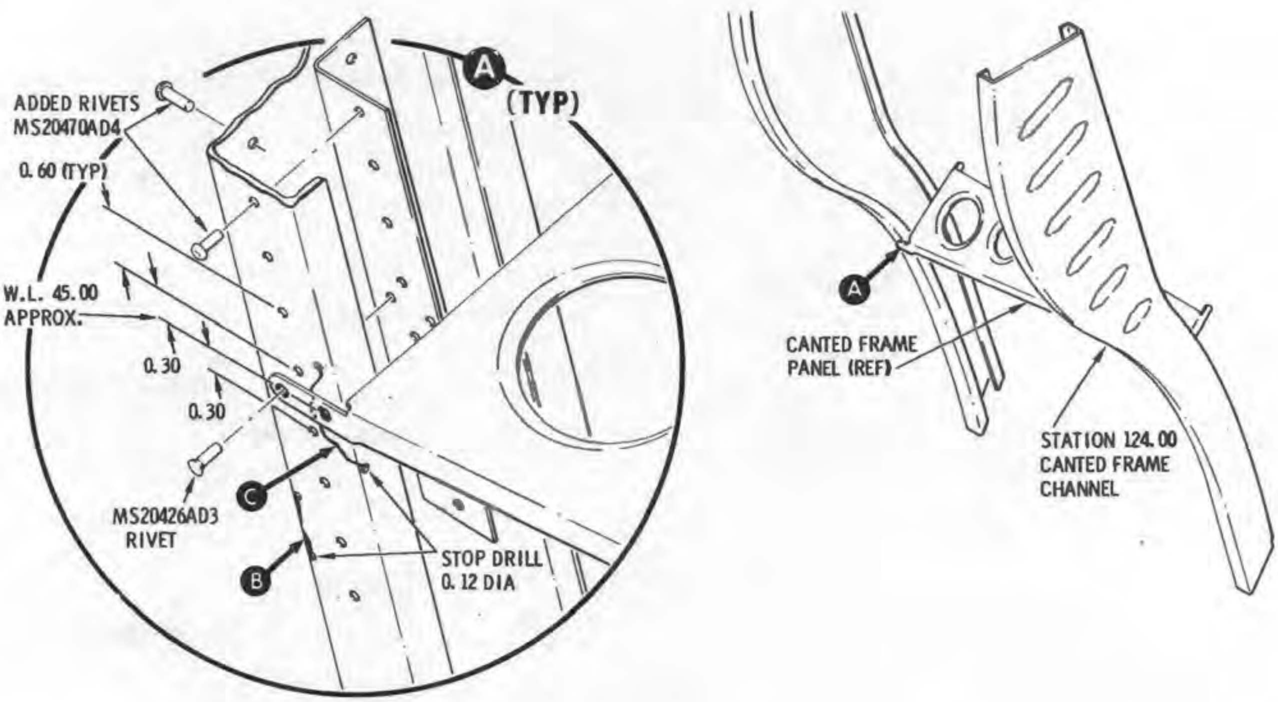
(2) Aft engine inlet fairing, and air filter installation (as applicable).

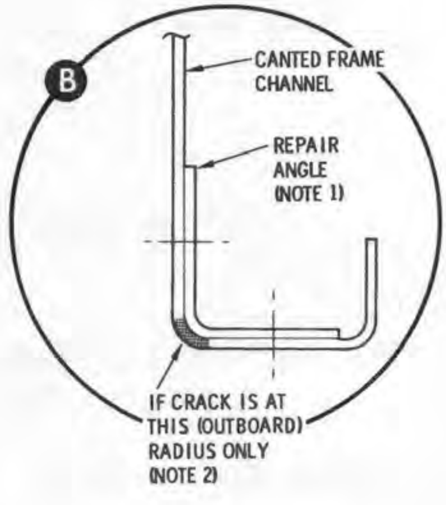
(3) Forward engine inlet fairing installation.

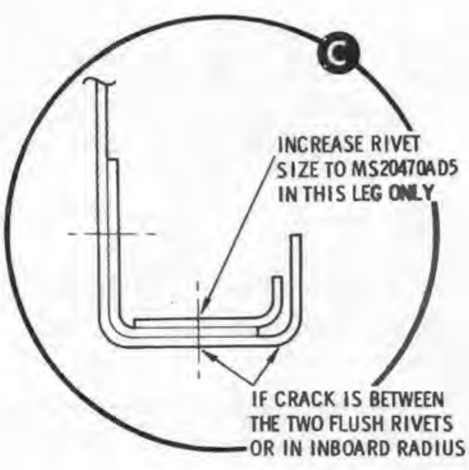
e. Remove support jack from boom fairing jack pad.

2-369. TAIL ROTOR DRIVE SHAFT FAIRING (AVIM).

2-370. General — Tail Rotor Drive Shaft Fairing (AVIM). Fairing assemblies installed on series 1 and 2 aircraft should be replaced with fairing installation 369A3021-615, shown in figure 2-35, to provide







NOTES:

1. REPAIR ANGLE MATL:
   0.051 THICK, 7075-0 FOR FORMING. HEAT TREAT TO -T6 AFTER FORMING. RIVET EDGE DISTANCE REQD IS 2X DIA.
2. IF CRACK EXTENDS INTO OUTBOARD RADIUS, USE TWO VERTICAL ROWS OF MS20470AD4 RIVETS IN OUTBOARD LEG.

12-328

Figure 2-34. Aft Bulkhead Channel Repairs.

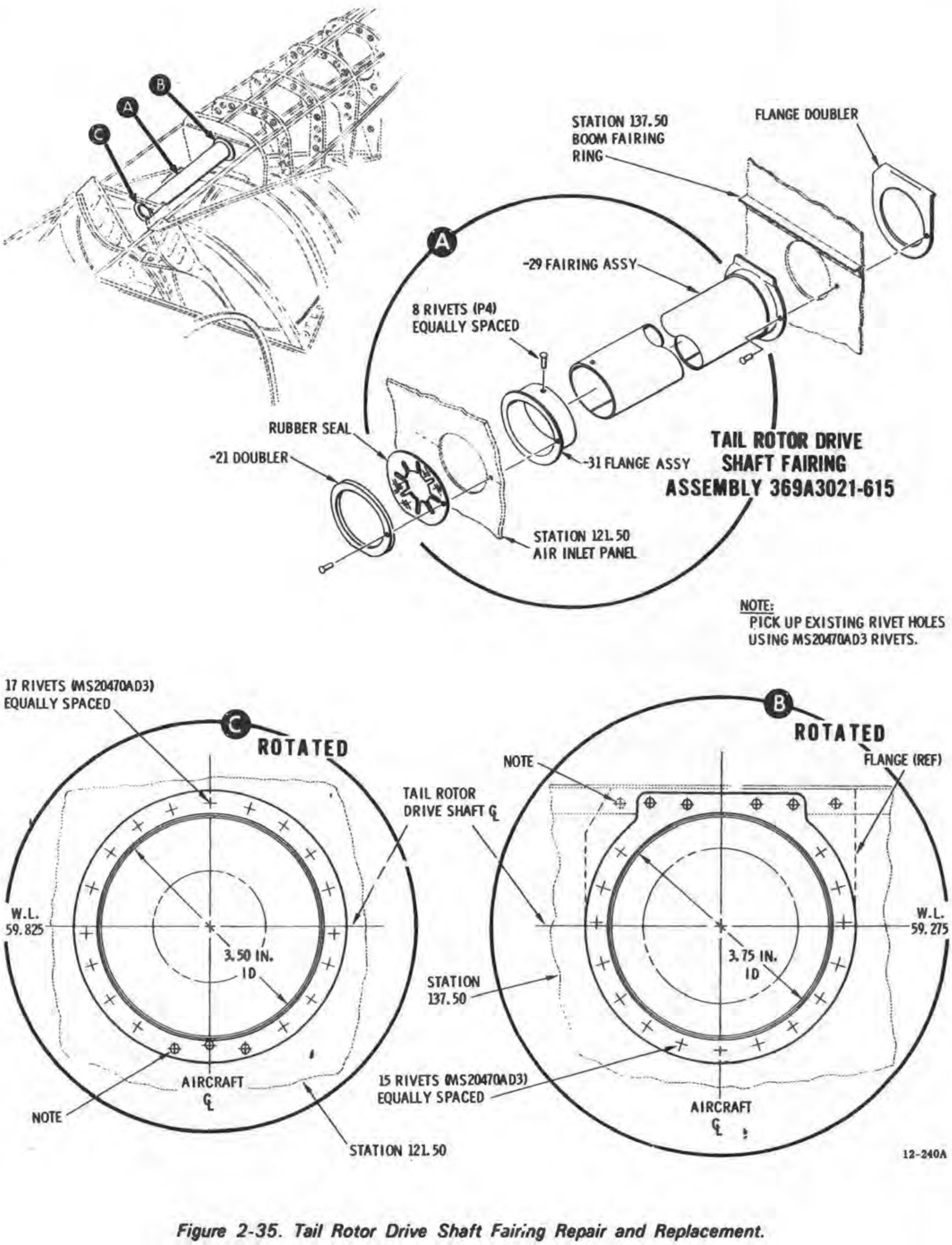


Figure 2-35. Tail Rotor Drive Shaft Fairing Repair and Replacement.

additional tail rotor drive shaft-to-fairing clearance. These fairing and flange assemblies should also be used for series 3 aircraft repair.

a. Remove engine air inlet front fairings (para 2-101) and tail rotor control bellcrank access door (para 2-95).

b. On series 1 and 2 aircraft with an engine air barrier filter, remove filter element and open the aft section engine air inlet door.

c. On series 3 aircraft with an engine air particle separator filter installed, remove filter separator as required to gain access to the tail rotor drive shaft fairing. Open the aft section engine air inlet door.

d. Remove anti-icing cable strap at center of fairing tube.

e. Remove engine air shield screen and tape a suitable covering over the engine air intake.

f. Remove rivets that secure the tail rotor drive fairing assembly to station 137.50 and 121.50 ring bulkheads and remove fairing, flanges, seal, and doublers. Retain the seal.

g. Enlarge station 137.50 ring drive shaft hole to 3.75-inch diameter and station 121.50 ring drive shaft hole to 3.50-inch diameter. Maintain hole concentricity around existing hole.

h. Position replacement fairing assembly and forward flange at bulkhead holes and locate existing rivet holes wherever possible. Drill and install fasteners.

i. Locate rivet holes as shown in figure 2-35; position doublers and drill.

j. Position rubber shield between station 121.50 doubler and air inlet panel; run drill through existing rivet holes and install rivets.

k. Position flange and fairing assemblies as shown in figure 2-35. Locate and drill eight equally spaced holes and install rivets.

l. Install all rivets at boom fairing ring and inlet panel.

m. Thoroughly clean work area and plenum chamber prior to removal of engine intake covering.

n. Reinstall assemblies removed in *a* through *e* above.

2-371. POSITION LIGHT SUPPORTS.

2-372. Inspection — Position Light Supports. Inspect for skin damage according to paragraph 2-262, and determine extent of repair necessary.

2-373. Repair — Position Light Supports. *a.* After extent of skin damage has been determined (para 2-372), repair local damage according to paragraph 2-262.

b. Form two 1.00 by 7.25-inch stiffeners from item 27, table 2-4.

c. Install stiffeners according to dimensions shown in figure 2-36.

2-374. STATION 78.50 CANTED FRAME.

2-375. Description — Station 78.50 Canted Frame. The station 78.50 aft-canted frame (bulkhead) establishes the forward portion of the cross-sectional form of the aircraft. The canted frame, constructed of formed sheet metal webs, stiffeners, and doublers, is a primary structural member of the aircraft. Three cutouts, at cargo floor level, provide access to the landing gear dampers, other underseat components and the four flight control push rods that are routed upward through the canted tunnel. A cast aluminum gunsight support fitting contains two concentrically aligned, press-fit bearings and a gunsight support nut that is secured with a roll pin. A forged aluminum gunsight torque arm fitting has two lugs with 0.25 inch holes for attachment of the torque arm from the armament subsystem. The pilot's and copilot's seat belt fittings are also located on the station 78.50 canted frame at waterline 21.50.

2-376. Inspection — Station 78.50 Canted Frame. *a.* Inspect for loose, sheared, or missing rivets.

b. Inspect sheet metal for cracks, buckled webs, and twisted or otherwise deformed parts.

c. Check fittings for secure attachment.

d. Inspect gunsight support fitting for cracks and chipping, loose or damaged bushing, defective threads, and loose or damaged rollpin.

e. Inspect all parts for corrosion.

f. Deleted.

2-377. Repair — Station 78.50 Canted Frame (AVIM). Accomplish repair of the station 78.50 canted frame according to paragraph 2-262 and TM 55-1500-204-25/1. Refer to paragraph 2-275 for repair and replacement criteria for fittings.

2-378. MAST SUPPORT STRUCTURE.

2-379. Description — Mast Support Structure. The mast support structure (fig. 2-37) consists of two mast support fittings, stiffener angles, a panel riveted to the upper-rear surface of the mast support fittings, a pan, a doubler riveted to the lower-forward surfaces of the mast support fitting, and two channels. (See fig. 2-37.) The two mast support fittings are machined aluminum alloy forgings, channel-shaped in cross section. Two bolt holes in each mast support fitting provide the four attach points for mounting the main rotor mast support base. Three additional holes through the forward end of

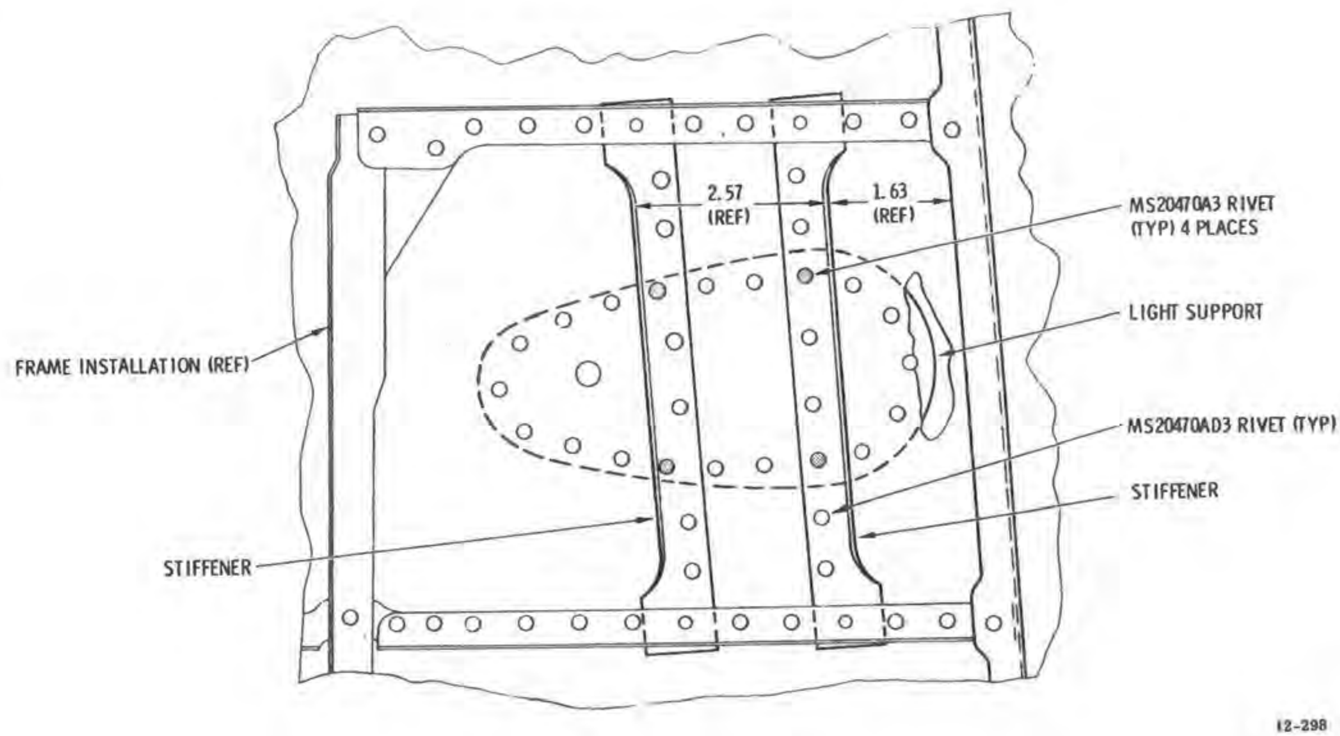


Figure 2-36. Position Light Support Repair.

the left mast support fitting provide attach points for mounting the tail rotor control rod support bracket. The forward ends of the mast support fittings are riveted to the upper ends of two channels on the aft surface of station 78.50 canted bulkhead. The aft ends of the mast support fittings are riveted to the upper ends of two channels on the forward surface of station 124.00 canted bulkhead.

CAUTION

Any time maintenance work is being performed near the engine air inlet, use care to prevent entry of foreign objects. On aircraft without an air filter, tape covers of cardboard or other suitable material in place over the engine inlet screen. Plug the oil cooler air inlets. Do not remove covers until work is completed and debris is thoroughly cleaned out of the area. After removing covers, verify that area around base of mast, inlet to plenum, and entire plenum chamber is free of foreign material.

2-380. Inspection — Mast Support Structure. Accomplish the mast support inspection as follows:

a. Remove left and right forward ends of engine air inlet fairing (para 2-101).

b. Remove main transmission cover and main transmission access cover (para 2-11 and 2-23).

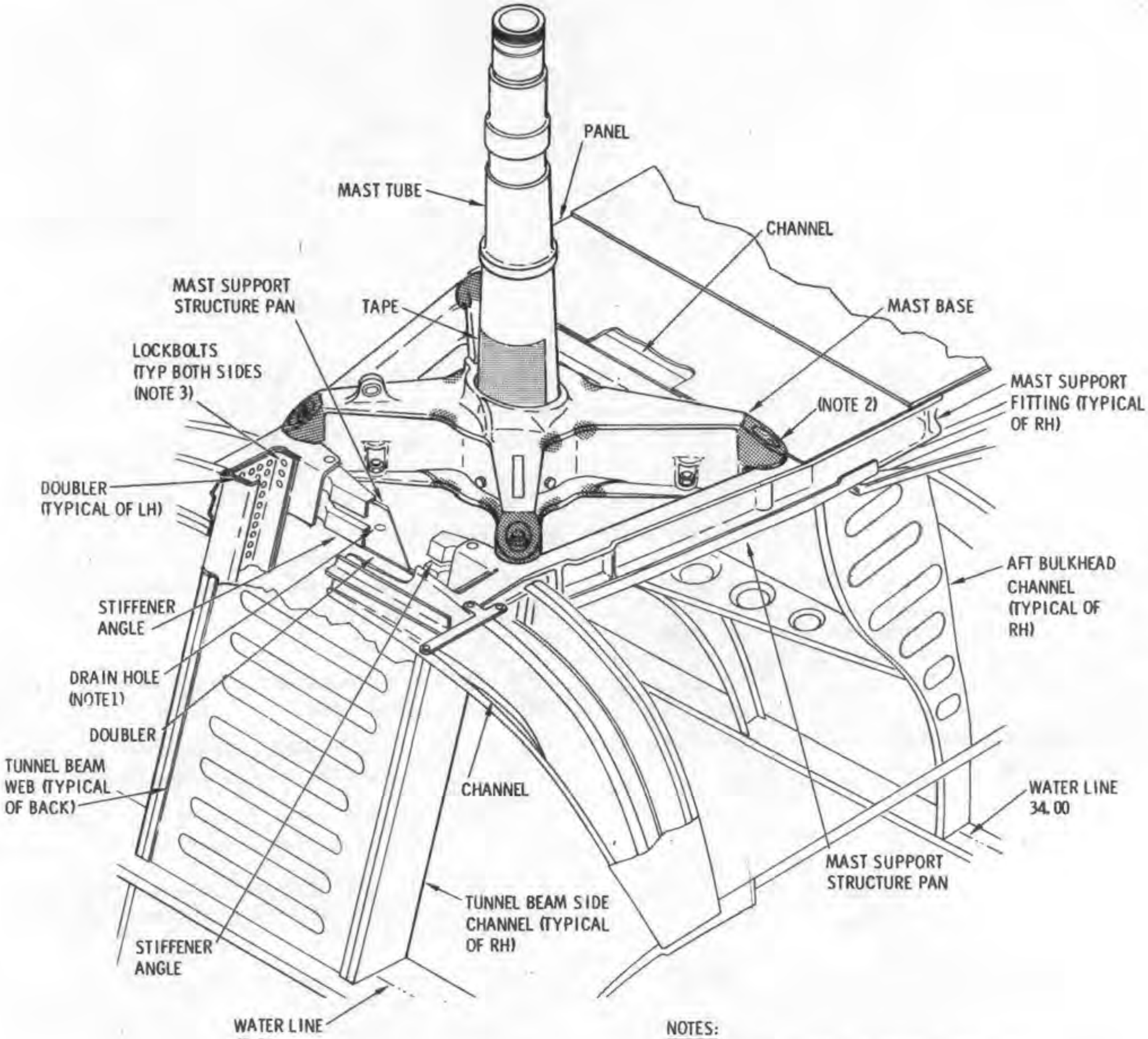
c. Detach control tunnel cover from structure. Slide cover up on control rods and secure it out of the way.

d. Using a bright light and a 5-power magnifying glass, carefully inspect the following areas for evidence of cracks. (See fig. 2-37.)

(1) Inspect the side channels and fore and aft webs of the controls tunnel, from the mast support fitting down to the top of the pilot's seatback (canted bulkhead waterline 45.36) with particular attention to lockbolts identified in figure 2-37.

(2) Inspect as much as is visible of the mast support fitting, mast base, and mast tube, with particular attention to the base attachment areas and shaded areas.

(3) Inspect both sides of the channels on the aft canted bulkhead (station 124), from the mast support fitting down to waterline 34, with particular attention to points of attachment.



NOTES:

1. SECOND HOLE IN PAN AFT OF MAST BASE.
2. SHADED SPOTS REQUIRE CLOSE INSPECTION.
3. USE A MIRROR AND FLASHLIGHT FOR CLOSE INSPECTION OF LOCKBOLTS AND ATTACHMENT AREA.

11-085B

Figure 2-37. Mast Support Structure.

(4) Clean any questionable area; use fluorescent penetrant to determine if a crack does exist. If a crack is found, the affected part must be replaced.

e. Inspect mast support structure for corrosion, loose boles and rivets, and general condition of finish.

f. Check that the two 0.25 inch drain holes in the pan are not plugged.

g. Reinstall left and right forward ends of engine air inlet fairing (para 2-101).

h. Reinstall main transmission cover and main gearbox access cover (para 2-11 and 2-23).

2-381. General Repair — Mast Support Structure (AVIM). Make general repairs to the mast support structure according to paragraph 2-262 and TM 55-1500-204-25/1.

2-382. Repair — Station 78.50 to Mast Support Fitting — Loose Lock Bolts (AVIM). (See fig. 2-37.) Affected lockbolts are located at butt line 6.00 and station 94.00 at the top end of the canted station 78.50 channels at the channel-to-mast support fitting attach points. Lockbolts are installed through left and right side channels.

a. Remove engine air inlet front fairings (para 2-101).

b. Install a cover in plenum chamber to prevent foreign objects from entering engine air inlet.

c. Check for loose of missing lockbolts and/or lockbolt collars. Remove defective lockbolt.

d. Inspect area for cracks, using a 5-power magnifying glass. If any cracks are found, repair according to procedures in paragraph 2-269 and TM 55-1500-204-25/1.

e. If no cracks are found but the original lockbolt (NAS 1425-3) was loose, check that lockbolt hole can be cleaned up to 0.188 to 0.189-inch diameter and install next size lockbolt (NAS 1426-3); alternatively, replace with a bolt as follows.

f. Drill out hole using a size "D" (0.246) drill and ream to 0.250 inch.

g. Install a bolt (AN174H6A), two washers (AN960PD416) and nut (MS21042L4). **TORQUE BOLT TO 100 — 125 INCH-POUNDS.**

h. Remove plenum chamber cover and install engine air inlet front fairings (para 2-101).

2-383. BOOM FAIRING.

2-384. Description — Boom Fairing. The boom fairing is fabricated from a formed ring, aluminum alloy bulkheads, extruded longerons and flush-riveted aluminum alloy skin. A forged aluminum alloy frame fitting (8, fig. 2-20) with four boom attachment holes, is installed at station 197.78. The frame fitting mounts a graphite-filled teflon damper for tail rotor drive shaft support.

2-385. Inspection — Boom Fairing. *a.* Inspect fairing skin for cracks, dents and abraision and corrosion.

b. Inspect all rivet patterns for pulled or loosened condition.

c. Inspect boom attach frame fitting (8, fig. 2-20) for cracks.

d. Inspect tail boom attachment bolts for security of attachment.

e. Inspect access doors and door fasteners for serviceable condition.

2-386. General Repair — Boom Fairing. Make general repairs to the boom fairing according to paragraph 2-262 and TM 55-1500-204-25/1. Refer to table 2-3, item 2 for general repair material and table 2-4 for structural repair material.

2-387. Repair — Tail Rotor Control Rod Grommets. Replace defective tail rotor control rod grommets as follows. If tail rotor control rod grommet mounting hole in damper support bracket is enlarged, refer to figure 2-38 for doubler installation.

a. Remove tail rotor control rod (chapter 11).

b. Remove engine tailpipe assembly (chapter 4).

c. Remove aft section upper firewall shell (para 2-344).

d. Replace tail rotor control rod grommets by removing snap-on ring and pulling grommet from hole. Insert new grommet and press on new snap-on ring.

2-388. Jack Pad Fitting — Boom Fairing. The boom fairing jack pad fitting is a cast steel, domed cylinder on the underside of the boom fairing at fuselage station 197.187. Four rivets attach the jack pad flange, through the boom fairing skin, to the canted frame fitting at station 197.78. (See fig. 2-38.)

2-389. Inspection — Jack Pad Fitting. Check the jack pad fitting for secure installation, corrosion, and loosened or missing rivets. Inspect areas surrounding the jack pad for buckling, cracks or any other evidence of strain.

2-390. Replacement — Jack Pad Fitting. Drill out four rivets (fig. 2-38) to remove damaged fitting. Rivet new fitting in place.

2-391. Repair — Tail Rotor Drive Shaft Damper Support Bracket. The damper support bracket is alclad sheet, riveted to the boom fairing frame fitting (fig. 2-38). Cracks up to 0.130 inch are permissible if drilled out immediately, and inspected periodically for extension. Cracks that continue to extend, or breaks and

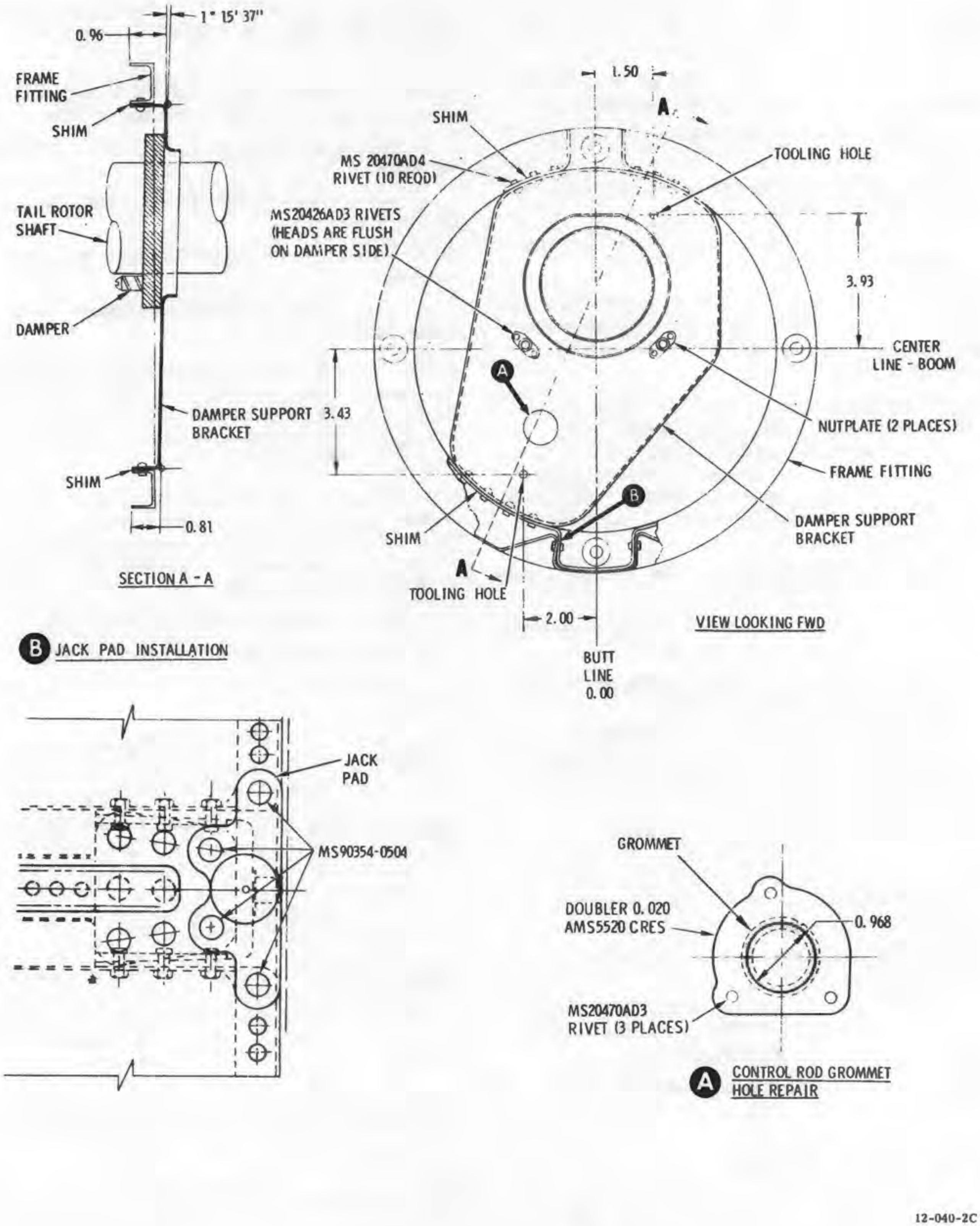


Figure 2-38. Boom Fairing Repairs.

holes may be patched. Areas that cannot be safely patched require replacement of the complete support bracket, as follows.

a. Remove tailboom (para 2-432) and place in suitable repair cradles.

b. Remove drive shaft damper (chapter 6).

c. Drill out rivets that secure bracket to boom fairing frame fittings, remove bracket and discard if unserviceable.

d. If undamaged, retain upper and lower alclad shims located between bracket and frame, and control rod grommet for reuse.

e. Clamp replacement bracket in position on frame fitting. Use care to align bracket according to the dimensions shown in figure 2-38.

f. Drill holes for damper support bracket attachment and install rivets.

g. Reinstall tailboom (para 2-432).

2-392. Repair — Boom Fairing Bellcrank Support (AVIM). The boom fairing bellcrank support consists of two aluminum alloy sheets mounted between stations 137.50 and 146.62 (inside the tail rotor control bellcrank access door). Repair cracks according to paragraph 2-269. Cracks that continue to grow and breaks or holes shall be patched. Areas that cannot be safely patched shall be repaired by partial or complete replacement.

CAUTION

Use flush rivets where clearance for bellcrank movement is required.

2-393. AFT LANDING GEAR DAMPER AND SIDE ENGINE MOUNT (LOWER) FITTING.

2-394. General — Aft Landing Gear Damper and Side Engine Mount (Lower) Fittings. The side engine mount (lower leg) fittings (fig. 2-24, sh 2) include the landing gear aft damper attach points. Any damage in excess of negligible limits given in paragraph 2-275, or any crack, regardless of length, requires replacement of the fitting.

2-395. Replacement — Aft Landing Gear Damper and Side Engine Mount (Lower) Fitting (AVIM).

NOTE

Build-up aligning tool (T8) is required.

a. Remove engine (chapter 4). Remove damage engine mount fitting.

b. Jack aircraft until landing gear skid tubes just clear the ground.

CAUTION

Remove and reinstall only one aft landing gear support fitting at a time to ensure proper alignment. Replacement fittings are supplied undrilled. Complete the following procedure in its entirety before removal of the opposite fitting.

c. Disconnect landing gear damper upper attachment bolt and remove electrical equipment from support fitting, if installed.

d. Using a pencil, trace around sheet metal and edges of fitting at bulkheads to assist in positioning of replacement fitting.

NOTE

During fitting removal, drill out rivets so that sheet metal stiffeners remain attached to the fuselage wherever possible. Mark and retain any shims for reinstallation.

e. Remove damaged fitting by drilling out attachment rivets.

f. Using the pencil outline traced on bulkheads and sheet metal, position the undrilled replacement fitting. Mark the rivet hole locations and check for rivet hole edge distance equivalent to the damaged fitting.

g. With the fitting in place pick up attachment holes and install monel rivets.

h. Reinstall landing gear damper and remove jacks. reinstall engine and engine mount. The engine mount lower attachment hole must remain unattached because the replacement support fitting attachment point is undrilled.

i. Locate and drill the engine mount-to-support fitting attachment hole as follows:

(1) Perform an engine-to-transmission alignment check (chapter 4).

NOTE

If alignment is not correct, place a jack or similar type equipment under engine and raise until correct engine-to-transmission alignment is obtained.

CAUTION

Enlargement of upper engine mount lower attachment hole will occur if drill bushing is not used.

(2) Insert a drill bushing (0.250 OD/0.1935 ID) in upper engine mount lower attachment hole. Using a No. 10 (0.1935-inch diameter) drill, drill through bushing to add upper engine mount lower attachment hole to oleo support fitting.

(3) Temporarily disconnect the upper engine mount at engine attach fitting (side) and swing the upper engine mount clear of the oleo support fitting hole. (Refer to chapter 4.)

(4) Using No. D (0.246-inch diameter) drill, enlarge the upper engine mount lower attachment hole drilled in the oleo support fitting. **REAM THE HOLE TO 0.250-INCH DIAMETER.**

(5) Reinstall engine mount and attach at oleo support fitting (chapter 4).

j. Recheck engine-to-transmission alignment.

k. If aft oleo landing gear damper support fitting on opposite side of aircraft is to be replaced, repeat entire procedure.

2-396. STRUCTURAL RINGS.

2-397. Description — Structural Rings. Structural rings are shown in figure 2-20. Station 137.50 aluminum boom fairing ring (2), the forward bulkhead of the boom fairing, supports the aft end of the tail rotor drive shaft fairing. At the lower end of the boom fairing, the canted firewall and engine inlet are attached. Station 137.50 corrosion-resistant-steel upper and lower section rings (13 and 15) attach to waterline 34.96 rib (10) and form the bulkhead structure between waterline 0.00 and boom fairing ring (2). Station 146.62 and 155.75 aluminum aft section rings (11 and 12) form the intermediate vertical rib structure between boom fairing rings (3 and 4) and the corrosion-resistant-steel rib (10) at waterline 34.96. Station 146.62, 155.75, 164.87, 174.00, and 185.89 aluminum alloy boom fairing rings (3, 4, 5, 6, and 7) form the upper vertical rib structure to which the boom fairing extruded aluminum longerons (9) are riveted. The bracket structure for the tail rotor control bellcrank is attached between rings (2 and 3).

2-398. Inspection — Structural Rings. *a.* Inspect for cracks, and loosened or missing rivets.

b. Inspect for scratches, nicks, and dents.

c. Inspect for distortion, bends, and other surface damage.

2-399. Repair — Structural Rings (AVIM). Repair structural rings according to paragraphs 2-262 and 2-264 and TM 55-1500-204-25/1.

2-400. SHEET STOCK STRUCTURAL REPAIR MATERIALS.

2-401. General — Sheet Stock Structural Repair Materials. Sheet stock materials used for most standard repairs are provided in table 2-3. Refer to TM 55-1520-214-23P for alternate or next gage material.

2-402. STANDARD STOCK EXTRUSION AND FORMED SHAPE REPAIR MATERIALS.

2-403. General — Standard Stock Extrusion and Formed Shape Repair Materials. Standard stock extrusions and formed shape materials for structural repairs are provided in figures 2-39 through 2-58. Table 2-4 provides an index listing of materials with figure references. When equivalent sections can be formed from sheet or other stock, this information is given as an alternate.

SECTION II EMPENNAGE

2-404. TAIL SURFACES (EMPENNAGE).

2-405. Description — Tail Surfaces (Empennage). The empennage tail surfaces (fig. 2-59) consist of upper and lower vertical stabilizers and a horizontal stabilizer mounted at an upward angle of 25 degrees. A strut connects the horizontal stabilizer and the upper vertical stabilizer at their approximate midpoints. Tail surfaces are bolted to fittings on the aft end of the tailboom and are not adjustable.

2-406. Inspection — Upper and Lower Vertical Stabilizers. *a.* Inspect the silicone rubber seals (when installed) at the root ribs for secure bonding.

b. Inspect the metal skin for holes, cracks, loose rivets, or corrosion.

Table 2-3. Structural Repair Materials.

Item No.	Description	Thickness (inches)	Ref. No. & FSCM	NSN
1	Aluminum alloy sheet	0.016	2024-T3 QQ-A-250/4	9535-00-167-2172
2	Aluminum alloy sheet	0.016	2024-T3 QQ-A-250/5	9335-00-084-4450
3	Aluminum alloy sheet	0.020	2024-T3 QQ-A-250/5	9335-00-084-4484
4	Aluminum alloy sheet	0.025	2024-T3 QQ-A-250/5	9335-00-084-4533
5	Aluminum Alloy Sheet	0.032	2024-T3 QQ-A-250/5	9335-00-086-9729
6	Aluminum alloy sheet	0.040	2024-T3 QQ-A-250/5	9335-00-086-4551
7	Aluminum alloy sheet	0.020	6061-T6 QQ-A-250/11	9535-00-084-4415
8	Aluminum alloy sheet	0.032	6061-T6 QQ-A-250/11	9535-00-085-4133
9	Aluminum alloy sheet	0.020	7075-T6 QQ-A-250/3	9535-00-086-9808
10	Aluminum alloy sheet	0.025	7075-T6 QQ-A-250/3	9535-00-086-9864
11	Aluminum alloy sheet	0.032	7075-T6 QQ-A-250/3	9535-00-249-5811
12	Aluminum alloy sheet	0.040	7075-T6 QQ-A-250/3	9535-00-084-4581
13	Aluminum alloy sheet	0.050	7075-T6 QQ-A-250/3	9535-00-086-9465
14	Corrosion resistant steel sheet	0.012	MIL-S-5059-301CA	9515-00-529-0434
15	Corrosion resistant steel sheet	0.016	MIL-S-5059-301CA	**9515-00-203-5899**
16	Corrosion resistant steel sheet	0.018	MIL-S-6721 COMPT1	**9515-00-683-9284**
17	Titanium unalloyed sheet	0.012	MIL-T-9046c16	9535-00-596-2093

Table 2-4. Standard Stock Structural Repair Materials.

Item No.	Description	Figure Reference
1	Extruded Angle, Equal Leg, Al Aly	2-39
2	Extruded Angle, Unequal Leg, Al Aly	2-40
3	Extruded Bulb Angle, Equal Thickness, Al Aly	2-41
4	Extruded Tee, Al Aly	2-42
5	Extrusion, Al Aly	2-43
6	Extruded Tee, Bulb, Al Aly	2-44
7	Extruded Open Angle, Al Aly	2-45
8	Tee, Bulb, Unequal Thickness, Al Aly	2-46
9	Extrusion, Al Aly	2-47
10	Extruded Open Angle, Unequal Legs & Thk, Al Aly	2-48
11	Extrusion, Al Aly	2-49
12	Tee, Bulb, Equal Thickness, Al Aly	2-50
13	Extrusion, Magnesium	2-51
14	Extrusion, Al Aly	2-52
15	Extrusion, Tee, Unequal Legs, Al Aly	2-53
16	Extrusion, Unequal Legs, Al Aly	2-54
17	Extruded Open Angle, Equal Thickness Legs, Al Aly	2-55
18	Extruded Tee, Unequal Legs, Al Aly	2-56
19	Extruded Zee, Unequal Legs, Al Aly	2-57
20	Extruded Channel, Al Aly	2-58

c. Inspect attach fittings for cracks, loose rivets, or corrosion. Check that drain holes in lower stabilizer bottom rib are open.

d. Inspect lower stabilizer attachment bolts for looseness and rotation.

e. Inspect upper vertical stabilizer attach bolts for looseness and rotation.

f. Inspect tail skid for cracks, deformation, and condition of plastic sleeve between tube and bottom rib. Check security of plastic plug in end of tube (when installed).

2-407. Inspection — Horizontal Stabilizer. *a.* Inspect the silicone rubber seals (when installed at the root rib for secure bonding.

b. Inspect metal skin for holes, cracks, or corrosion.

c. Inspect attach fittings for cracks, loosened rivets, or corrosion. Inspect for relative motion at the attach points.

d. Inspect attaching bolts for looseness and rotation.

e. Inspect outboard steel plate for loosened rivets.

f. Inspect the upper surface of stabilizer for cracks around the beaded areas between the strut attach point and the end of the stabilizer. Any evidence of cracking is cause for stabilizer replacement.

g. Inspect stabilizer spar rivet line for loose rivets. Any loose rivets must be replaced with new rivets of same size and material.

2-408. Inspection — Stabilizer Strut. *a.* Inspect the strut for holes, cracks, corrosion, and secure attachment.

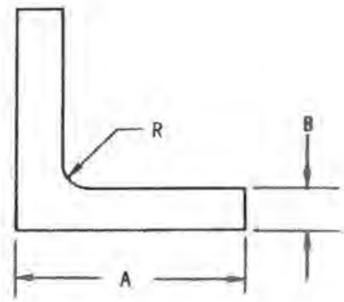
b. Inspect cushion seals at each end of strut for deterioration and secure bonding.

2-409. HORIZONTAL STABILIZER.

2-410. Description — Horizontal Stabilizer. The horizontal stabilizer (fig. 2-59) consists essentially of a forged aluminum alloy center boom attach fitting (I-beam shaped spar), a forged aluminum leading edge attach fitting, four formed sheet metal ribs, and a beaded aluminum alloy skin, riveted together to form an airfoil assembly. A lug at the spar midpoint extends through the upper skin for strut attachment. A cadmium-plated steel plate is riveted to the external surface of the outboard rib on aircraft equipped with armament. (Refer to para 2-404 for inspection.)

2-411. Removal — Horizontal Stabilizer. (See figure 2-59.) *a.* Remove tail rotor transmission and drive shaft as an assembly to provide access to stabilizer attach nuts (chapter 6).

STANDARD STOCK

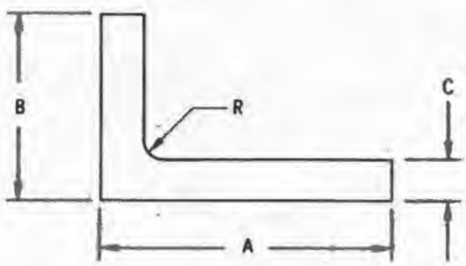


DIE NO.	DIMENSIONS A	B	R	MATERIAL (SPEC)	PART NO.	INSTL OR ASSY
6240	0.562	0.040	0.040	2024-T4 (QQ-A-200/3)	HS1003DD22	Aft section, top longeron; aft section fuselage structure; aft section, cargo door frame.
PA3070 (Pioneer (Aluminum)	0.750	0.062	0.125	7075-T6 (QQ-A-200/11)	HS1003AA40B	Lower section, cargo floor; fuselage structure, fuel access door.
AND10133-0601	0.750	0.062	0.094	7075-T6 (QQ-A-200/11)	HS1003AA6B	Lower section, pilots floor.
ALTERNATE STOCK						
Refer to TM 55-1500-204-25/1 for setback and bend allowance information	0.562	0.040	0.040	7178-0 (QQ-A-250/14) 7075-0 (QQ-A-250/13) 2014-0 (QQ-A-250/3)	For HS1003DD22	(Heattreat all materials to T6 condition after forming.)
	0.750	0.062	0.125 or 0.094	7178-0 (QQ-A-250/14)	For HS1003AA40B and HS1003AA6B	(Heattreat 7178 and 2014 to T6; 2024 to T3 after forming.)
		0.071		2014-0 (QQ-A-250/3)		
		0.80		2024-0 (QQ-A-250/5)		

12-177

Figure 2-39. Extruded Angle, Equal Leg, Aluminum Alloy.

STANDARD STOCK



DIE NO.	DIMENSIONS A	B	C	R	MATERIAL (SPEC)	PART NO.	INSTL OR ASSY
	0.750	0.650	0.050	0.125	7075-T6 (QQ-A-200/11)	HS1004AA69B	Lower section, cargo floor; fuselage structure, fuel access door.
	2.250	0.750	0.060	0.060	7075-T6 (QQ-A-200/11)	HS1004AA70B	Lower section, cargo floor.
PA6924 (Pioneer Aluminum)	1.500	1.250	0.063	0.156	7075-T6 (QQ-A-200/11	HS1004AA71B	Lower section, sta 124 frame.
PA4119	1.250	0.875	0.070	0.188	7075-T6 (QQ-A-200/11)	HS1004AA72B	Lower section, sta 124 frame.

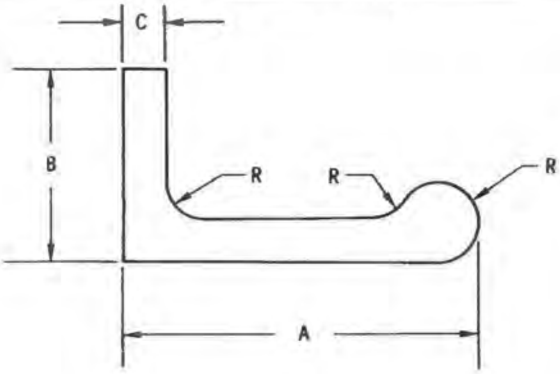
ALTERNATE STOCK

DIE NO.	A	B	C	R	MATERIAL (SPEC)	PART NO.	INSTL OR ASSY
Refer to TM 55-1500-204-25/1 for setback and bend allowance information.	0.750	0.650	0.050	0.125	7178-0 (QQ-A-250/14)	For HS1004AA69B	(NOTE: Heattreat 7178 and 2014 to T6; 2024 to T3 after forming.)
			0.060		2014-0 (QQ-A-250/3)		
			0.071		2024-0 (QQ-A-250/5)		
	2.250	0.750	0.060	0.060	7178-0 (QQ-A-250/14)	For HS1004AA70B	(See note)
			0.071		2014-0 (QQ-A-250/3)		
			0.080		2024-0 (QQ-A-250/5)		
	1.500	1.250	0.063	0.156	7178-0 (QQ-A-250/14)	For HS1004AA71B	(See note)
			0.071		2014-0 (QQ-A-250/3)		
			0.080		2024-0 (QQ-A-250/5)		
	1.250	0.875	0.070	0.188	7178-0 (QQ-A-250/14)	For HS1004AA72B	(See note)
			0.080		2014-0 (QQ-A-250/3)		

12-178

Figure 2-40. Extruded Angle, Unequal Leg, Aluminum Alloy.

STANDARD STOCK



DIE NO.	DIMENSIONS A	B	C	R	MATERIAL (SPEC)	PART NO.	INSTL OR ASSY
AND10135-0501	0.625	0.562	0.051	0.075	2024-T4 (QQ-A-200/3)	HS1005DD22-( )	Lower section, center beam.

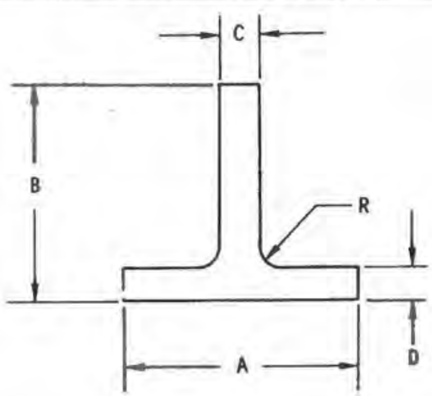
ALTERNATE STOCK

No equivalent

12-179

Figure 2-41. Extruded Bulb Angle, Equal Thickness, Aluminum Alloy.

STANDARD STOCK



DIE NO.	DIMENSIONS A	B	C	D	R	MATERIAL (SPEC)	PART NO.	INSTL OR ASSY
–	1.250	0.888	0.050	0.050	0.062	7075-T6 (QQ-A-200/11)	HS1006AA27B	Lower section, center beam.
–	2.750	1.000	0.062	0.062	0.094	7075-0 (QQ-A-200/11)	HS1006AA29A	Lower section, sta 124 frame.

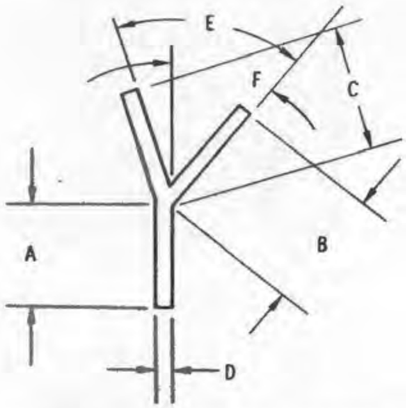
ALTERNATE STOCK

No equivalent

12-180

Figure 2-42. Extruded Tee, Aluminum Alloy.

STANDARD STOCK



DIE NO.	A	B	C	D	E	F	MATERIAL (SPEC)	PART NO.	
–	1.06	0.82	0.94	0.050	52°3'	35°9'	7075-T6 (QQ-A-200/11)	HS1011-( )	Sta 124 canted frame.

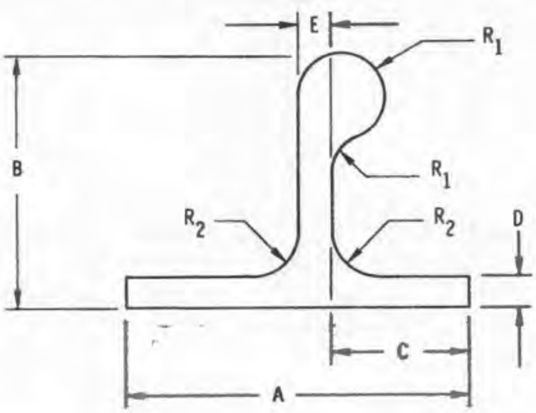
ALTERNATE STOCK

No equivalent

12-181

Figure 2-43. Extrusion, Aluminum Alloy.

STANDARD STOCK



DIE NO.	A	B	C	D	E	R_1	R_2	MATERIAL (SPEC)	PART NO.	INSTL OR ASSY
	0.700	0.700	0.460	0.040	0.040	0.075	0.040	7075-T6 (QQ-A-200/11)	HS1012AA4B	Lower section, lower longeron.

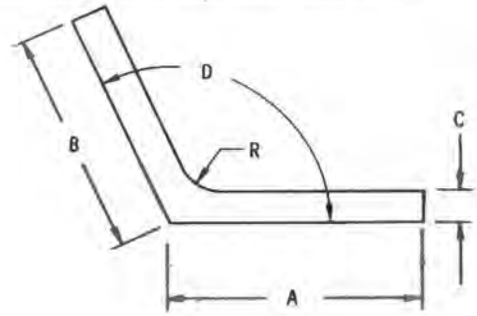
ALTERNATE STOCK

No equivalent

12-182

Figure 2-44. Extruded Tee, Bulb, Aluminum Alloy.

STANDARD STOCK



DIE NO.	DIMENSIONS A	B	C	D	R	MATERIAL (SPEC)	PART NO.	INSTL OR ASSY
–	1.000	1.000	0.062	94°0'	0.062	2014-T4 (QQ-A-200/2)	HS1019AB9	Lower section fuselage structure
ALTERNATE STOCK								
Refer to TM 55-1500-204-25/1 for setback and bend allowance information.	1.000	1.000	0.062	94°0'	0.062	7178-0 (QQ-A-250/14)	For HS1019AB9	(Heattreat 7178 and 7075 to T6; 2024 to T3 after forming.)
			0.062			7075-0 (QQ-A-250/13)		
			0.071			2024-0 (QQ-A-250/5)		

12-183

Figure 2-45. Extruded Open Angle, Aluminum Alloy.

b. Remove screws and washers (detail B) that attach access plates at each end of the strut.

c. Remove bolt and washer from each end of strut.

d. At root of horizontal stabilizer (detail C), loosen bolts and nuts far enough to allow the strut to clear the stabilizer attach fittings.

e. Remove the strut.

f. Disconnect taillight wiring, and remove bonding jumper (if installed). Remove three bolts, washers, nuts and bushing that attach the horizontal stabilizer. Remove horizontal stabilizer.

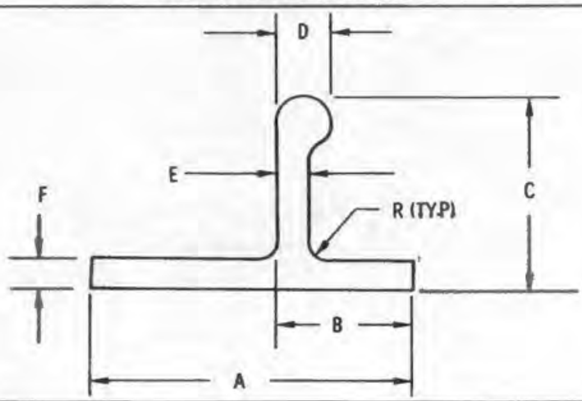
2-412. Repair — Horizontal Stabilizer. Refer to paragraph 2-429 for structural repair. Refer to table 2-3, item 2 for repair material.

NOTE

Deteriorated seals at root edges should be removed and discarded. The seals need not be replaced; however, there should be at least 0.10-inch clearance between the stabilizer skin and adjacent sheet metal. Trim skin as necessary to get clearance and apply protective finish.

2-413. Installation - Horizontal Stabilizer. (See fig. 2-59.)

STANDARD STOCK



DIE NO.	A	B	C	D	E	F	R	MATERIAL (SPEC)	PART NO.	INSTL OR ASSY
AND10141-1401	1.500	0.775	0.875	0.188	0.050	0.060	0.094	7178-T6 (MIL-A-9186)	HS1030AC2B	Top center boom fairing longeron

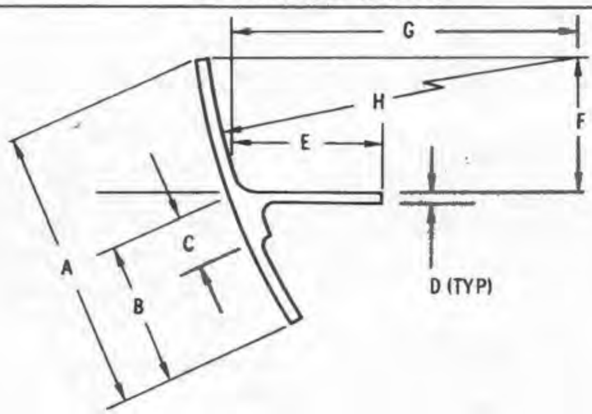
ALTERNATE STOCK

No equivalent

12-184

Figure 2-46. Tee, Bulb, Unequal Thickness.

STANDARD STOCK



DIE NO.	A	B	C	D	E	F	G	H	MATERIAL (SPEC)	INSTL OR ASSY
–	5.00	2.60	0.50	0.064	1.62	7.40	26.05	27.00R	2014-T6 (QQ-A-200/2)	HS4004 Longeron instl (lwr sect floor)

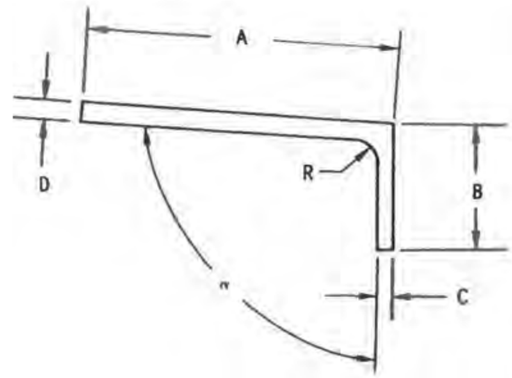
ALTERNATE STOCK

No equivalent

12-185

Figure 2-47. Extrusion, Aluminum Alloy.

STANDARD STOCK



DIE NO.	A	B	DIMENSIONS C	D	R	a	MATERIAL (SPEC)	PART NO.	INSTL OR ASSY
–	1.80	0.54	0.040	0.062	0.062	95°19'	7075-T6 (QQ-A-200/11)	HS1118-1( )	(Heattreat 7178 and 2014 ring.)
ALTERNATE STOCK									
Refer to TM 55-1500-204-25/1 for setback and bend allowance	1.80	0.54	0.062 0.071 0.080	0.062 0.071 0.080	0.062	95°19'	71780 (QQ-A-250/14) 2014-0 (QQ-A-250/3) 2024-0 (QQ-A-250/5)	For HS1118-1( )	(Heattreat 7178 and 2014 to T6; 2024 to T3 after forming.)

12-186

Figure 2-48. Extruded Open Angle, Unequal Legs and Thickness.

CAUTION

Be sure that countersunk washers are installed according to the following instructions. If washers are installed backwards, structural failure may result due to insufficient surface in bearing and the spreading or cracking of washers with resultant loss of clamp-up torque.

a. Place horizontal stabilizer in position on tailboom. Install one countersunk washer (detail C) and bushing on bolt; countersunk side of washer must face bolthead. Insert bolt in forward mounting hole. Do not tighten.

b. Install two countersunk washers on two external wrenching bolts with countersunk side of washers facing the bolthead. Insert external wrenching bolts through aft mounting holes and install two new nuts and washers Do not tighten.

c. Position strut between horizontal and upper vertical stabilizers. Install washers (detail B) and bolts through access holes at each end of strut. Do not tighten.

d. **TORQUE FORWARD MOUNTING BOLT TO 50 — 70 INCH-POUNDS.**

NOTE

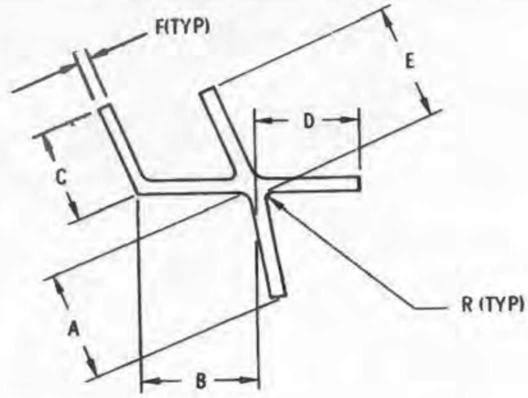
Torque values for nuts may be applied to the corresponding bolthead at the high limit of the tolerance when the nut is not accessible.

e. **TORQUE TWO AFT NUTS TO 380 — 410 INCH-POUNDS.**

f. **TIGHTEN STRUT BOLTS TO 50 — 70 INCH-POUNDS.**

g. Position access plates at each end of strut and attach with screws and washers.

STANDARD STOCK



DIE NO.	DIMENSIONS A	B	C	D	E	F	R	MATERIAL (SPEC)	PART NO.	INSTL OR ASSY
–	0.90	0.85	0.66	0.75	0.75	0.040	0.06	2024-0 (QQ-A-200/3)	HS4005A	Lower section, sta 78.50 canted frame.

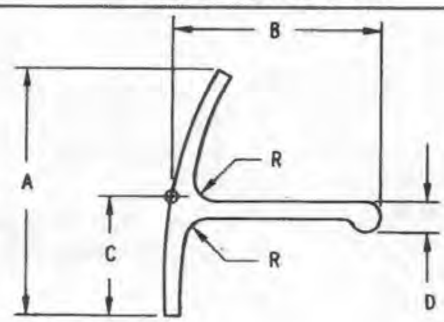
ALTERNATE STOCK

No equivalent

12-187

Figure 2-49. Extrusion, Aluminum Alloy.

STANDARD STOCK



DIE NO.	DIMENSIONS A	B	C	D	R	MATERIAL (SPEC)	PART NO.	INSTL OR ASSY
–	1.375	1.000	0.700	0.125	0.060	7075-T4 (QQ-A-200/11)	HS4006AA1-( )	Boom fairing, upper longeron.

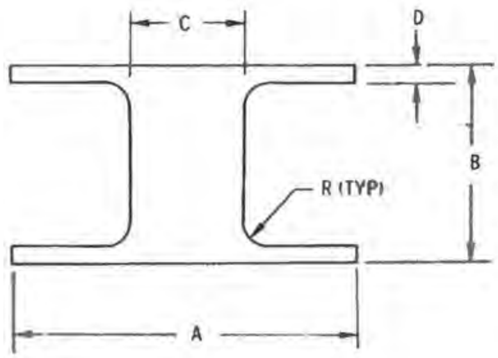
ALTERNATE STOCK

No equivalent

12-188

Figure 2-50. Tee, Bulb, Equal Thickness.

STANDARD STOCK



DIE NO.	DIMENSIONS A	B	C	D	R	MATERIAL (SPEC)	PART NO.	INSTL OR ASSY
—	1.30	0.767	0.500	0.050	0.010	AZ31B-F (QQ-M-31B)	HS4011	Pilot's and cargo doors.
	1.30	0.783	0.520	0.060	0.030	AZ31B-F (QQ-M-31B)	HS4011	Pilot's and cargo doors.

ALTERNATE STOCK

No equivalent

12-189

Figure 2-51. Extrusion, Magnesium.

h. Connect tail light wiring.

i. Attach bonding jumper, as required.

j. Reinstall tail rotor drive shaft, gearbox and tail rotor assembly (chapter 6).

2-414. UPPER VERTICAL STABILIZER.

2-415. Description — Upper Vertical Stabilizer. The upper vertical stabilizer (fig. 2-59) is an airfoil consisting of beaded aluminum alloy sheet metal skin supported by a forged aluminum center boom attach fitting, a forward boom aluminum attach fitting and five formed sheet metal ribs. The airfoil on most upper stabilizers has a 5-degree twist which improves tail rotor pedal neutral position during cruise flight. A lug at the boom fitting midpoint extends through the right side skin for strut attachment. (Refer to para 2-404 for inspection.)

2-416. Removal — Upper Vertical Stabilizer. (See fig. 2-59.) *a.* Remove strut (para 2-424).

b. Detach bond jumper (if installed).

c. Remove forward attach bolt, washers and bushing (detail A).

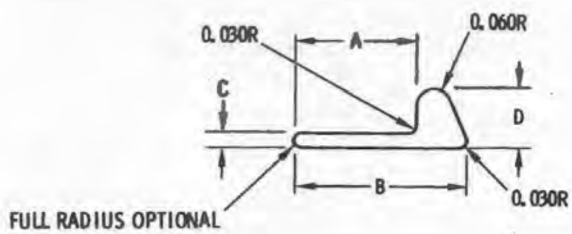
d. Remove two aft bolts, countersunk washers, washers and nuts that secure upper vertical stabilizer to tailboom structure; remove stabilizer.

2-417. Repair — Upper Vertical Stabilizer. Refer to paragraph 2-429 for structural repair. Refer to table 2-3, item 2 for repair material.

NOTE

Deteriorated seals at root edges should be removed and discarded. The seals need not be replaced; however, there should be at least 0.10-inch clearance between the stabilizer skin and adjacent sheet metal. Trim skin as necessary to get clearance and apply protective finish.

STANDARD STOCK



DIE NO.	DIMENSIONS A	B	C	D	MATERIAL (SPEC)	PART NO.	INSTL OR ASSY
–	0.50	0.68	0.040	0.22	2014-0 (QQ-A-200/2)	HS4010-1A-( )	Cargo door frame. Lower section station 78.50 canted frame. (Heattreat 2014-0 to T6 after forming.)

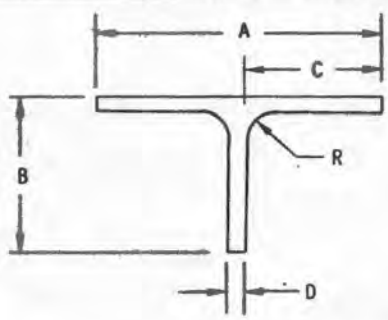
ALTERNATE STOCK

No equivalent

12-200

Figure 2-52. Extrusion,Aluminum Alloy.

STANDARD STOCK



DIE NO.	DIMENSIONS A	B	C	D	R	MATERIAL (SPEC)	PART NO.	INSTL OR ASSY
–	2.700	0.750	1.280	0.050	0.080	7075-T6 (QQ-A-200/11)	HS4013-1	Aft section, boom fairing
	2.700	1.280	0.85	0.050	0.080	7075-T6 (QQ-A-200/11)	HS4013-3	Aft section, boom fairing

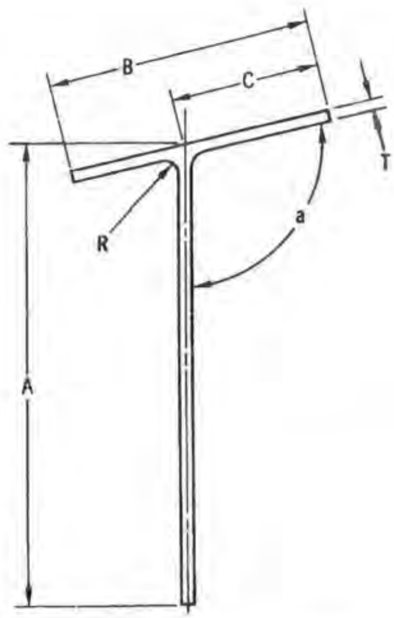
ALTERNATE STOCK

No equivalent

12-190

Figure 2-53. Extrusion, Tee, Unequal Legs, Aluminum Alloy.

STANDARD STOCK



DIE NO.	DIMENSIONS A	B	C	D	T	a	MATERIAL (SPEC)	PART NO.	INSTL OR ASSY
—	2.25	1.30	0.72	0.06	0.050	1.03°	7055-T6 (QQ-A-277)	HS4003	Pilot's seat structure (lower section).

ALTERNATE STOCK

No equivalent

12-023

Figure 2-54. Extrusion, Unequal Legs.

2-418. Installation — Upper Vertical Stabilizer. (See fig. 2-59.)

CAUTION

Be sure that countersunk washers are installed according to the following instructions. If washers are installed backwards, structural failure may result due to insufficient surface in bearing and the spreading or cracking of washers with resultant loss of clamp-up torque.

a. Place upper vertical stabilizer in position on tailboom. Install forward attach bolt, countersunk washer and bushing (detail A). Countersunk side of washer must face bolt head. Do not tighten.

b. Install aft external wrenching bolts with countersunk washers through mounting holes. Countersunk side of washer must face bolt head. Install two new nuts and washers; do not tighten.

c. Position strut between horizontal and upper vertical stabilizers. Install washers and bolts through access holes at each end of strut (detail B).

d. **TORQUE FORWARD ATTACH BOLT TO 50 — 70 INCH-POUNDS (DETAIL A).**

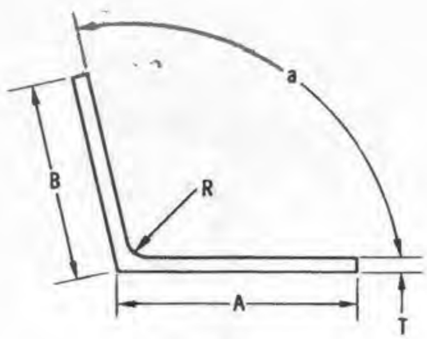
NOTE

Torque values for nuts may be applied to the corresponding bolthead at the high limit of the tolerance when the nut is not accessible.

e. **TORQUE TWO NUTS TO 170 — 200 INCH-POUNDS.**

f. **TIGHTEN STRUT BOLTS TO 50 — 70 INCH-POUNDS.**

STANDARD STOCK



DIE NO.	DIMENSIONS A	B	R	T	a	MATERIAL (SPEC)	PART NO.	INSTL OR ASSY
PA1706 (Pioneer Aluminum)	1.170	0.980	0.062	0.060	103°30'	(QQ-A-200/11)	369A2516-33	Sta. 78.50, lower

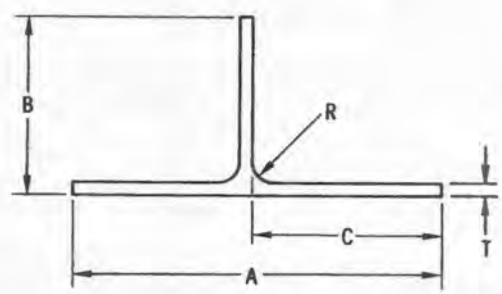
ALTERNATE STOCK

No equivalent

12-024

Figure 2-55. Extruded Open Angle, Equal Thickness Legs.

STANDARD STOCK



DIE NO.	DIMENSIONS A	B	C	R	T	MATERIAL (SPEC)	PART NO.	INSTL OR ASSY
16102 (Reynolds)	3.500	1.500	2.500	0.150	0.063	7075-T6 (QQ-A-277)	HS1021-2	Sta. 124 lower

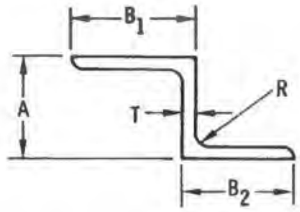
ALTERNATE STOCK

No equivalent

12-025

Figure 2-56. Extruded Tee, Unequal Legs.

STANDARD STOCK



DIE NO.	A	B_1	B_2	R	T	MATERIAL (SPEC)	PART NO.	INSTL OR ASSY
–	0.500	0.660	0.620	0.060	0.040	7075-0 (QQ-A-250/11)	HS4022	Sta. 124 lower.

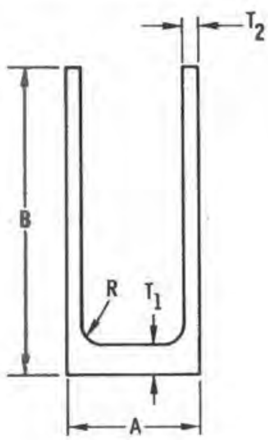
ALTERNATE STOCK

No equivalent

12-026

Figure 2-57. Extruded Tee, Unequal Legs.

STANDARD STOCK



DIE NO.	DIMENSIONS A	B	R	T_1	T_2	MATERIAL (SPEC)	PART NO.	INSTL OR ASSY
–	0.644	1.500	0.090	0.130	0.072	2024-0 (QQ-A-267)	HS1449-1	Pilot's floor (lower section.

ALTERNATE STOCK

No equivalent

12-027

Figure 2-58. Extruded Channel.

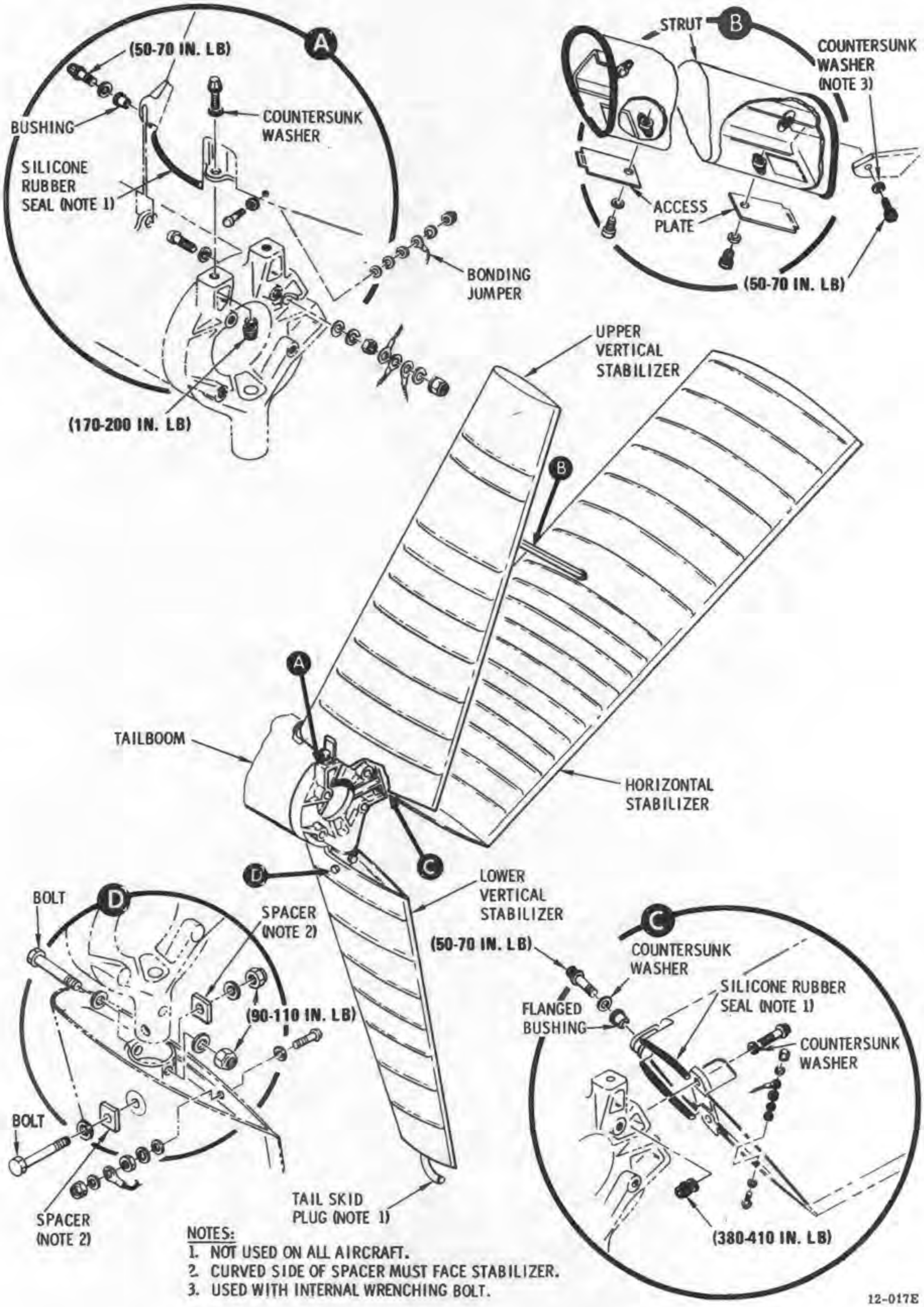


Figure 2-59. Tail Surfaces (Empennage).

g. Position access plates at each end of strut and attach with screws and washers.

h. Attach bonding jumper, as required.

2-419. LOWER VERTICAL STABILIZER.

2-420. Description — Lower Vertical Stabilizer. The lower vertical stabilizer (fig. 2-59) is an airfoil consisting essentially of beaded aluminum alloy sheet metal skin, ribs, spars, an upper fitting, and a tail skid. Two channel-shaped sheet metal spars run from the root to the tip of the stabilizer, between the ribs. The tail skid is a formed tube that tapers from its attach point in the root rib to its curved end just below the bottom rib. The upper end of the tube attaches the stabilizer to the stabilizer and gearbox mounting frame. (Refer to para 2-404 for inspection.)

2-421. Removal — Lower Vertical Stabilizer. (See fig. 2-59.)

a. Detach bond jumper (if installed).

b. Remove two nuts, washers, lower spacers and bolts (detail D).

c. Remove lower vertical stabilizer from boom.

2-422. Repair — Lower Vertical Stabilizer. Refer to paragraph 2-429 for structural repair. Refer to table 2-3, item 2 for repair material.

2-423. Installation — Lower Vertical Stabilizer. (See fig. 2-59.) *a.* When stabilizers (369A3650) are used, apply a coating of corrosion preventive compound (C31), or lubricant (C60) on the gearbox mounting frame post. When stabilizers (369A3650-601, -603, -605) are used, apply zinc chromate putty (C83) on the gearbox mounting frame post. Ensure that fiberglass liner installed in the stabilizer fitting of stabilizers (369A3650-601, -603, -605) is secure and not damaged.

b. Position stabilizer on mounting frame post and align holes in stabilizer and mounting frame.

c. Install bolt, two washers and nut at the upper attachment hole. Install a bolt, two washers and curved spacers (curved side against stabilizer) and nut as shown in detail D. **TORQUE NUTS TO 90 — 110 INCH-POUNDS.**

d. Install bonding jumper, as required.

2-424. STABILIZER STRUT.

2-425. Description — Stabilizer Strut. The strut (fig. 2-59) is a shaped airfoil section connected between the lugs of the upper vertical and horizontal stabilizer spars. A seal at the edges of each end of the strut forms a protective cushion for the skin surface of the stabilizers at the strut attach points. (Refer to para 2-404 for inspection.)

2-426. Removal — Stabilizer Strut. (See fig. 2-59.) *a.* Remove access plates (detail B) at each end of strut by removing screws and washers.

b. Remove mounting bolt and washer at each end of strut.

c. Loosen upper vertical stabilizer bolts and nuts far enough to allow the strut to clear the stabilizer attach fittings.

d. Remove the strut.

2-427. Repair — Stabilizer Strut. No structural repair is authorized for the stabilizer strut. Replace extruded rubber seals if deteriorated. Refer to paragraph 2-168 for repair or replacement of rubber extrusion seals.

2-428. Installation — Stabilizer Strut. (See fig. 2-59.) *a.* Loosen upper vertical stabilizer bolts and nuts far enough to allow positioning of strut on attach fittings of horizontal and upper vertical stabilizers.

b. Position strut and install bolt and washer at one end of the strut only.

c. **TORQUE UPPER VERTICAL STABILIZER FORWARD BOLT TO 50 — 70 INCH-POUNDS. TORQUE REMAINING TWO NUTS TO 170 — 200 INCH-POUNDS.**

CAUTION

The combined (total) deflection of horizontal and upper vertical stabilizers needed to get alignment for attachment of strut-to-stabilizer fittings must not exceed 0.25 inch. If misalignment exceeds 0.25 inch, replace the stabilizers one at a time to find cause of misalignment. Replace defective part.

d. Align strut with stabliizer hole and insert remaining bolt and washer. **TORQUE BOLT TO 50 — 70 INCH-POUNDS.**

e. Place access plates in position at each end of strut and secure with screws and washers.

2-429. CLASSIFICATION OF STABILIZER DAMAGE AND TYPES OF REPAIR.

2-430. General — Classification of Stabilizer Damage and Types of Repair. All repairable damage shall be repaired upon detection. Cracks in stabilizer skin are permissible up to 0.130 inch if drilled out and if not in a bead area. Check for extension of cracks. Any crack longer than the specified dimensions shall be stop-drilled and patched. Repair beaded skin area damage by patching according to TM 55-1500-204-25/1.

2-431. Stabilizer Attach Fittings. The upper vertical stabilizer and the horizontal stabilizer have attachment fittings which secure them at their leading edge and center on the stabilizer and tail rotor transmission mounting frame. The lower vertical stabilizer attaches to a stub fitting on the stabilizer and tail rotor transmission mounting frame. Refer to paragraph 2-446 for damage classification and repair criteria for stabilizer fittings.

2-432. TAILBOOM.

2-433. Description — Tailboom. The tailboom assembly (fig. 2-60), a monocoque structure of aluminum skin over forged aluminum frames, houses the tail rotor drive shaft and tail rotor control rod, and supports the horizontal and vertical stabilizer tail surfaces. The major fittings are the station 197.78 frame fitting, a stabilizer and gearbox mounting frame. Two lugs on the stabilizer leading edge frame support the forward ends of the horizontal and upper vertical stabilizers.

2-434. Inspection — Tailboom (Installed) *a.* Remove boom bolts access door and inspect interior of boom for moisture and corrosion.

b. Check attaching bolts and nuts in boom canted station 197.78 frame fitting for security.

c. Inspect boom canted station 197.78 frame fitting for cracks and bond jumper for security and indication of corrosion.

d. Inspect tail rotor control rod grommets in boom frames for signs of deterioration.

e. Inspect all boom assembly frames for cracks and distortion.

f. Inspect boom exterior for loosened or missing rivets.

g. Inspect exterior surfaces for wrinkles that would indicate overstress.

h. Inspect for external corrosion.

i. Inspect for bare metal areas on otherwise protected surfaces.

j. Inspect two lugs of the forward stabilizer mounting frame for cracks and elongated holes.

k. Check boom stabilizer and gearbox mounting frame for security of attachment.

2-435. Removal — Tailboom. (See fig. 2-60.) *a.* Disconnect tail light and chip detector connectors.

b. Remove tail rotor transmission (chapter 6).

c. Remove tail rotor control rod (chapter 11).

NOTE

Removal of stabilizers is not required if assembly is suitably cradled following removal. If stabilizers are to be disconnected, removal is best accomplished before the tailboom is removed.

d. If required, remove stabilizers.

e. Position suitable cradles under tailboom to hold boom in alignment with boom fairing.

f. Open boom bolts access doors.

g. If installed, disconnect adf sense antenna wire from clip on tailboom, coil the antenna, and tape coil to the forward attachment point.

h. If installed, disconnect No. 2 fm antenna splice. Remove whip antenna, module and antenna line. (Refer to TM 11-1520-214-20-1.)

i. Disconnect bond jumper at tailboom skin.

j. Disconnect taillight and chip detector splices.

CAUTION

To avoid damage, ensure that the boom is properly supported before removing attachment bolts.

k. Remove nuts, washers, and bolts attaching boom.

2-436. Inspection — Tailboom (Removed). *a.* Inspect fuselage attach frame fitting for cracks, distortion, or elongated bolt attach holes.

b. Inspect stabilizer and gearbox mounting frame for cracks, distortion, or elongated bolt attachment holes.

c. Inspect stabilizer forward mounting frame for cracks, distortion, or elongated bolt holes.

d. Perform fluorescent penetrant inspection of tailboom fitting within 0.5 inch of the bolt holes for cracks if condition is questionable.

e. Inspect the tailboom and boom fairing boom bolt holes for elongation. Maximum allowable hole diameter is 0.330 inch.

f. Visually check nuts and bolts for defective threads; countersunk washers for cracks.

g. Perform magnetic particle inspection of tailboom attachment bolts.

2-437. General Repair — Tailboom (AVIM). The two skins that form the monocoque tailboom assembly are highly stressed panels. All cracks must be stop-drilled and patched immediately. Permissible repairs are as

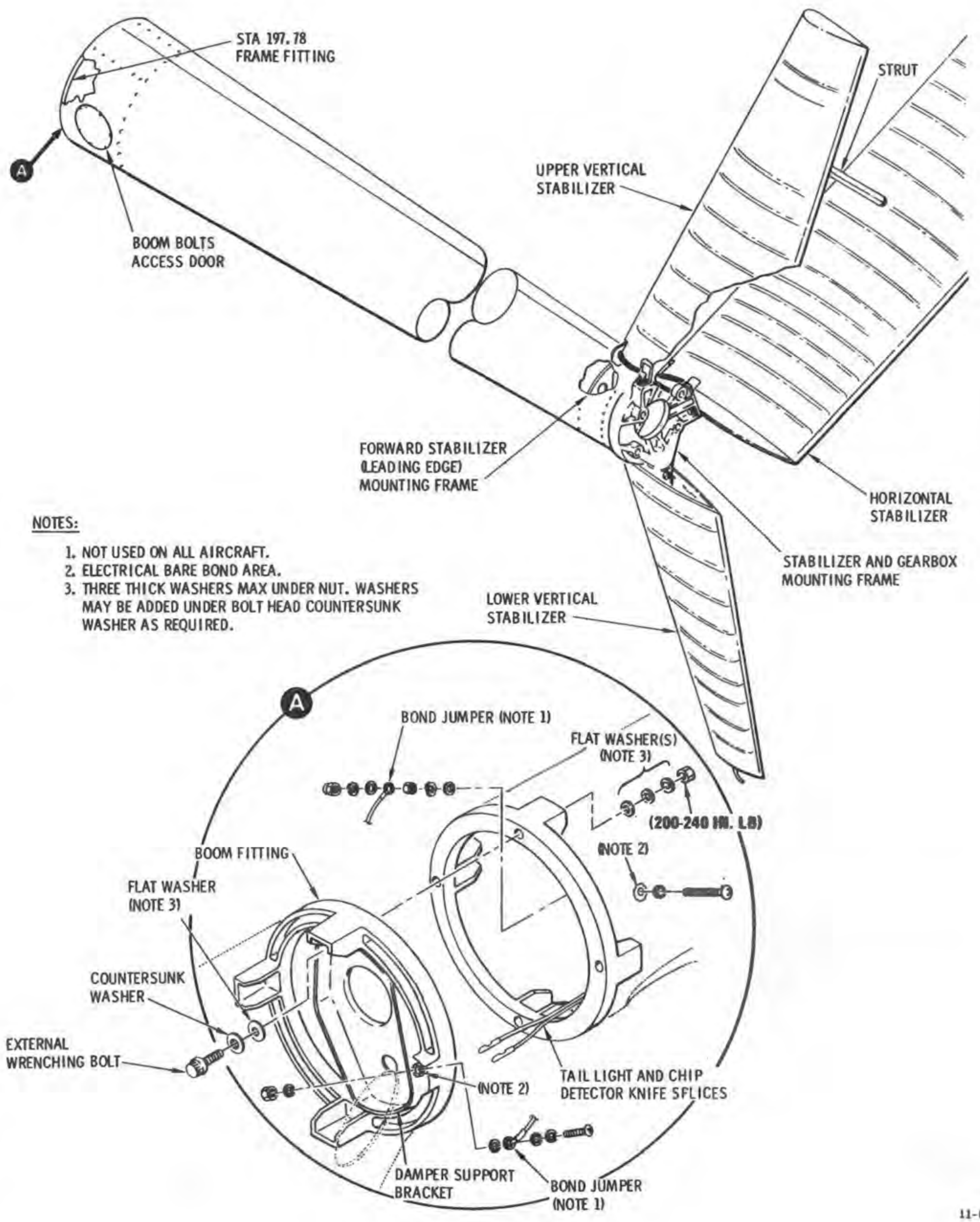


Figure 2-60. Tailboom Assembly.

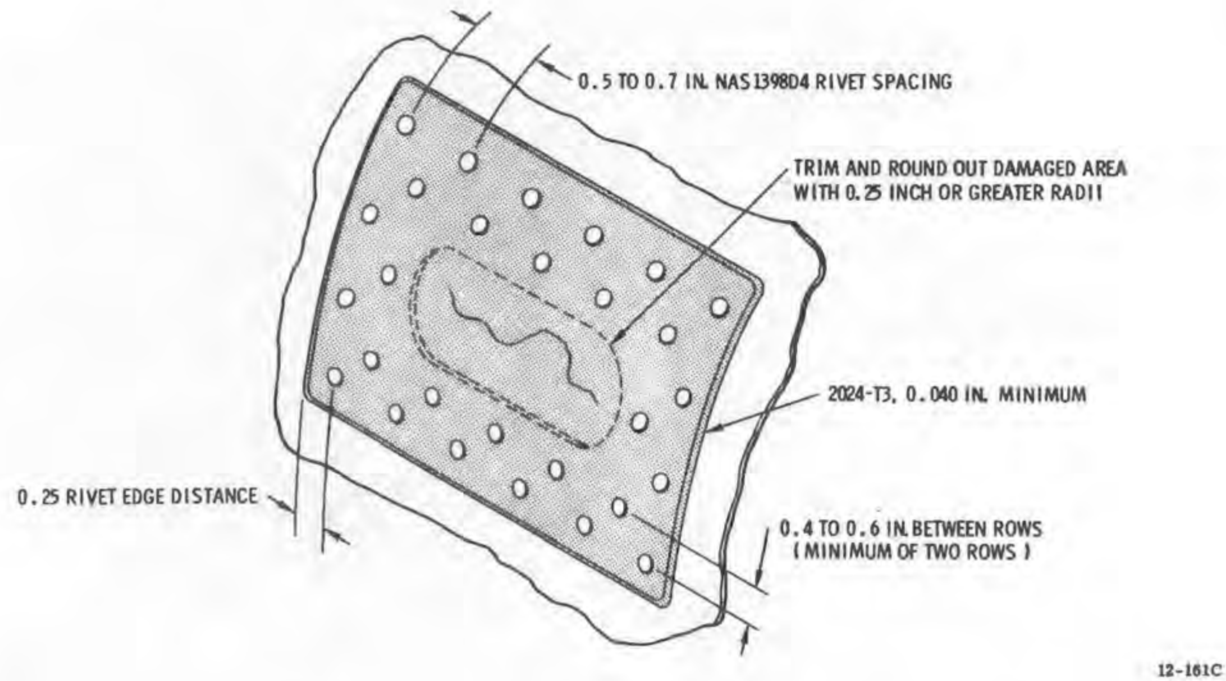


Figure 2-61. Typical Tailboom Skin Patch Repair.

given in paragraph 2-264 but with the following differences:

a. The damaged area shall not exceed 10 percent of the panel area (previously repaired areas included).

b. The patch material shall be 2024-T3 aluminum alloy of 0.040-inch minimum thickness. A typical tailboom patch repair is shown in figure 2-61. Refer to table 2-3, item 6 for repair material.

c. No insertion type patches are allowable.

2-438. Repair — Defective Tail Rotor Control Grommets and Doublers (AVIM). Tailboom grommets may be replaced without, sheetmetal work by use of the locally fabricated rods and adapter shown in figure 2-62.

NOTE

If grommet holes are worn so that grommet ring will pass through the hole, a doubler must be installed as shown in figure 2-62. During grommet installation reverse the ring to the doubler side.

a. Replace front frame grommet by removing snap-on retaining ring and pulling grommet from hole. Insert new grommet and press on snap-on retaining ring.

b. Middle frame grommet replacement:

(1) Place new grommet over the end of the 60-inch wood rod. Insert rod through the end of the tailboom and position grommet in mounting hole.

(2) Secure the snap-on retaining ring in the adapter recess. Insert the 84-inch threaded rod through the forward grommet and screw adapter on the rod.

(3) Have an assistant hold the replacement grommet in position with the wood rod. Move the metal rod aft to position the retaining ring.

(4) Tap the metal rod lightly to seat the retaining ring.

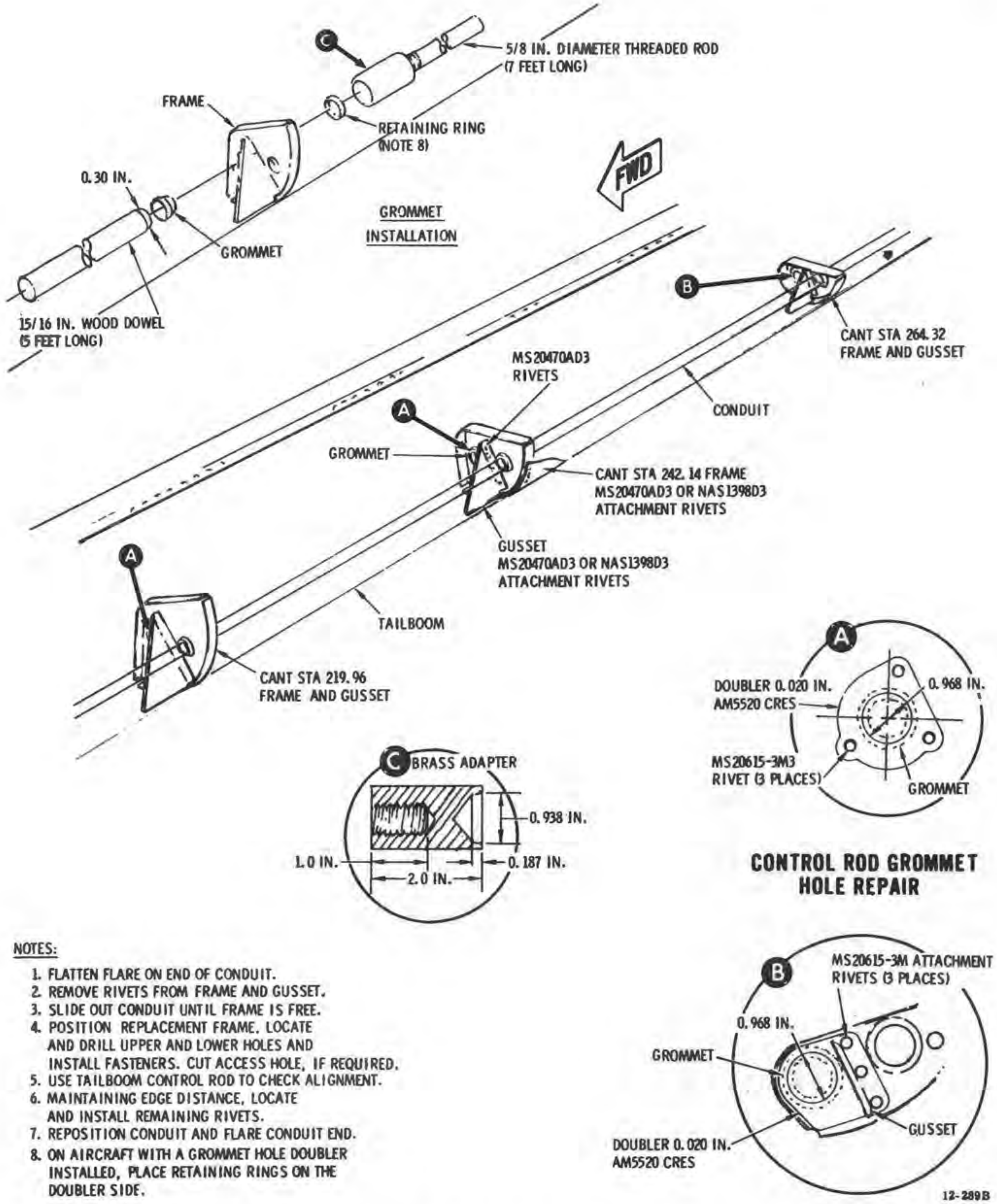
(5) Remove the rods and adapter. Inspect the grommet to verify proper seating and installation.

c. Aft frame grommet replacement: Replace by use of metal rod and adapter only.

(1) Have an assistant hold grommet in place.

(2) Thread adapter and retaining ring on the metal rod and insert through the boom, by-passing the grommet frames.

(3) Seat ring; then inspect the ring for proper seating and installation.



NOTES:

1. FLATTEN FLARE ON END OF CONDUIT.
2. REMOVE RIVETS FROM FRAME AND GUSSET.
3. SLIDE OUT CONDUIT UNTIL FRAME IS FREE.
4. POSITION REPLACEMENT FRAME. LOCATE AND DRILL UPPER AND LOWER HOLES AND INSTALL FASTENERS. CUT ACCESS HOLE, IF REQUIRED.
5. USE TAILBOOM CONTROL ROD TO CHECK ALIGNMENT.
6. MAINTAINING EDGE DISTANCE, LOCATE AND INSTALL REMAINING RIVETS.
7. REPOSITION CONDUIT AND FLARE CONDUIT END.
8. ON AIRCRAFT WITH A GROMMET HOLE DOUBLER INSTALLED, PLACE RETAINING RINGS ON THE DOUBLER SIDE.

Figure 2-62. Tailboom Frame and Gusset Repair.

2-439. Repair — Tailboom Sheet Metal Frame Members (AVIM). The sheet metal push-pull rod supports (fig. 2-62) mounted at station 219.96, 242.14, and 264.32 are 0.016-inch aluminum sheet. The flange of each support is formed to match the boom contour and is riveted to the inner surface of the skin. The canted frame that is riveted at station 209.78 is 0.032-inch aluminum sheet. Refer to paragraph 2-441 and see figure 2-62 for repair information.

NOTE

Holes as large as 3 by 4 inches may be cut in the tailboom skin for access to push-pull rod supports (refer to paragraph 2-441 for limitations). Refer to figure 2-61 for contoured panel skin patch installation.

2-440. Installation — Tailboom. *a.* Position boom in cradles so that mating bulkheads are flush.

CAUTION

Be sure that countersunk washers are installed as specified in *b* below. If washers are installed backwards, structural failure might result due to insufficient surface in bearing and the spreading or cracking of washers with resultant loss of clamp-up torque.

b. Slide countersunk washers on external wrenching bolts with countersunk side facing bolt heads.

c. Install bolts through aft section fuselage structure into boom assembly. Install flat washers on each bolt as required for proper bolt grip (fig. 2-60). Do not use more than three thick washers under each nut.

d. Install nuts and torque to **200 - 240** inch-pounds using wrench (T41).

e. Install bond jumper (fig. 2-60).

f. Connect taillight and chip detector splices.

g. Reinstall adf sense antenna and No. 2 fm antenna as required (TM 11-1520-214-20-1).

h. If removed, install stabilizers.

i. Install tail rotor transmission (chapter 6).

j. Install tail rotor control rod (chapter 11).

k. Check rigging of tail rotor (chapter 11).

2-441. CLASSIFICATION OF TAILBOOM DAMAGE AND TYPES OF REPAIR (AVIM).

2-442. Negligible Damage — Tailboom. None. All reparable damage shall be repaired upon detection. Small cracks or punctures in sheet metal that do not exceed 0.160-inch can be repaired by drilling out with a No. 20 or smaller diameter drill and installing a rivet of appropriate size to fill the hole.

2-443. Patch Repair — Tailboom. Damage to sheet metal that exceeds 0.160-inch length is to be patched provided the damage area does not exceed a total of 25 percent of the panel area (previously repaired areas included). The patch material shall be 2024-T3, 0.040-inch minimum thickness (item 6, table 2-3), applied to the outer surface of the boom.

2-444. Repair of Transverse Crack — Tailboom. Patch with a staggered triple row of rivets, using 8 to 10 diameter spacing for the inner and outer rows, and 6 to 8 diameter spacing for the center row.

2-445. Repair of Longitudinal Crack — Tailboom. Patch with a single row of rivets or using 8 to 10 diameter spacing.

2-446. TAILBOOM FITTINGS.

2-447. General — Tailboom Fittings (AVIM). See figure 2-63 for location and identification of tailboom fittings. The tailboom fittings are listed by part number in table 2-1, as highly-stressed structural parts. Refer to paragraph 2-275 for classification of damage and repair criteria.

2-448. Stabilizer and Tail Rotor Transmission Mounting Frame — Tailboom. The stabilizer and tail rotor transmission mounting frame (fig. 2-63) is an aluminum alloy forging that supports the tail rotor gearbox and the three stabilizers. The gearbox mounting frame is attached to the boom skins. Four bracket assemblies, equipped with nutplates and attached to the boom structure for mounting of the tail rotor gearbox, are also riveted to the gearbox mounting frame. Any damage other than that classified as negligible in paragraph 2-275, and reparable as such, is cause for replacement of the frame assembly.

NOTE

Special jigs or holding fixtures may be required to hold critical dimensions during replacement of fittings. Availability of special jigs or holding fixtures should be considered before attempting major repairs.

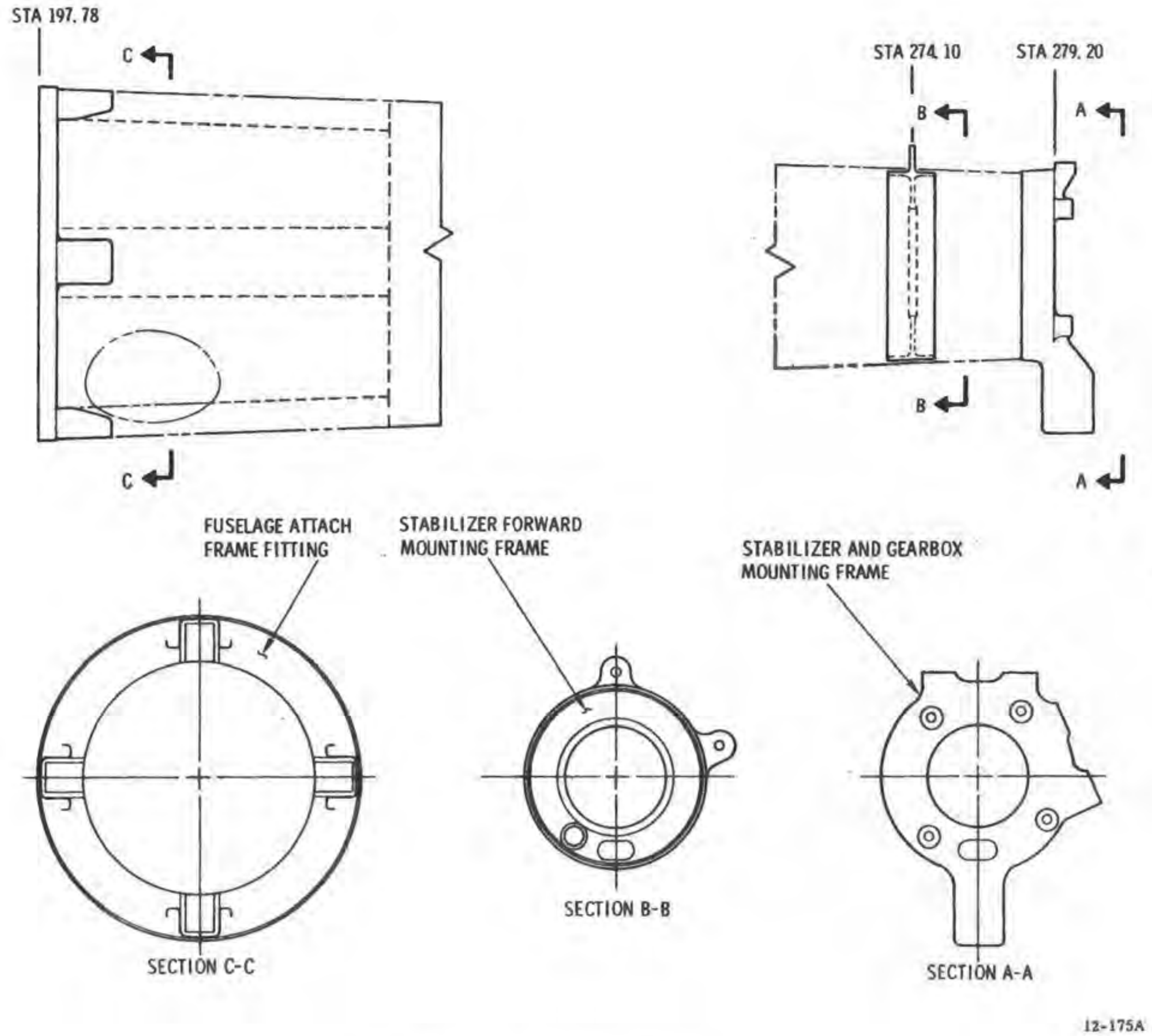


Figure 2-63. Tailboom Fittings.

2-449. Stabilizer Forward Mounting Frame — Tailboom. The stabilizer forward mounting frame (fig. 2-63) is a forged aluminum alloy frame that is riveted at station 274.10. The frame is a cylindrical-shape fitting, approximately 6.5 inches in diameter, with lugs for stabilizer leading edge attachment. Minor surface defects on stabilizer lugs, such as scratches, nicks, dents, burrs, and light corrosion deposits may be repaired by polishing with abrasive cloth (C24). Scratches, nicks, and dents in excess of 0.032 inch deep, or 0.010 inch deep within 0.125 inch of bolt hole require replacement of frame.

See NOTE (2-448) above.

2-450. Fuselage Attach Frame Fitting — Tailboom. The boom canted station 197.78 frame fitting (fig. 2-63) is a 12-inch diameter, aluminum alloy forging that mates with the fuselage boom fairing frame fitting. Any damage other than that classified as negligible in paragraph 2-275, and reparable as such, is cause for replacement of the fitting. See NOTE in paragraph 2-448.

2-451. WIRE STRIKE PROTECTION SYSTEM (WSPS)

2-452. DESCRIPTION - WSPS. Ths WSPS (fig. 2-64) provides protection against frontal impacts with horizontally strung mechanical and power transmission cables. The basic system consists of an upper cutter/deflector, a windshield protector/deflector, a midsection protector/deflector and a lower cutter deflector.

2-453. CUTTER BLADES (Upper and Lower).

2-454. DESCRIPTION - CUTTER BLADES. The cutter blades (details A and C, fig. 2-64) provide the primary wire cutting mechanism consisting of wedge type cutting blades positioned to provide the necessary mechanical advantage to cut the design objective wires while minimizing load input into the airframe.

2-455. INSPECTION - CUTTER BLADES. Inspect the cutting blades for shedding of rubber coating. Blades with any nicks or abrasions on the cutting edge are to be replaced.

2-456. REMOVAL - CUTTER BLADES. (See fig. 2-65, sh 1 and 3) *a.* Remove capscrews (10, 93) washers (11, 94) and nuts (12, 95) of the blade to be removed. Cutter throat blade removal may require removal of entry guide blade (15, 91). Remove capscrew (17 and 18, 108) washers (19, 109) and nut (20, 110) if required.

b. Remove the cutter blade(s) (8, 89) fron the cutter assembly noting position of shims (9, 90) (Shims may have been utilized to centralize the cutter blades.)

c. Clean sealant from the shim(s) and cutter assembly (TM43-0105).

2-457. REPAIR - CUTTER BLADES. Damaged or missing rubber coating due to deterioration can be replaced using ProSeal 890.

2-458. INSTALLATION - CUTTER BLADES. (See fig. 2-65, sh 1 and 3) *a.* Apply ProSeal 890 to the cutter blade(s) (8 and 15, 89 and 91) and shims (9 and 16, 90 and 92) and position in cutter assembly. Shims must be installed on the same side of the blade noted during removal.

b. Install capscrews (10, 17 and 18, 93 and 108) washers (11 and 19, 94 and 109) and nuts (12 and 20, 95 and 110). Where cutter throat blades have been removed, check gap of junction aft portion of cutter throat blades - maximum allowable gap is .020.

c. Clean excess sealant and prime/paint as required (TB746-93-2).

2-459. STABILIZER STRUTS (Upper and Lower).

2-460. DESCRIPTION - STABILIZER STRUTS. The stabilizer struts (details A and C, fig. 2-64) provide the necessary lateral support to the deflector/cutter assemblies during asymmetric loading.

2-461. INSPECTION - STABILIZER STRUTS. *a.* Inspect stabilizer struts for paint deterioration, superficial paint scratches and light corrosion. Moderate or heavy corrosion not allowed.

b. Inspect stabilizer struts for cracks particularly in the welded area and the formed tab ends. Struts showing evidence of any cracks must be replaced.

c. Inspect stabilizer struts for deformation at the strut/deflector attachment area and the foot pad area. Struts showing evidence of permanent deformation must be replaced.

d. Inspect stabilizer struts for the tube straightness. Maximum allowable bow over strut length is .060 inch. Struts exceeding this maximum must be replaced.

e. Inspect security of stabilizer struts. Loose fasteners must be replaced.

2-462. REMOVAL - STABILIZER STRUTS (AVIM) (See fig. 2-65, sh 1 and 3) *a.* Remove battery, AN/ARN-89 receiver set, AN/APX-72 transponder set, R1391/ARN-83 set and associated mounting tray from lower electronics bay.

b. Remove screws (38, 39, 40, 41 and 43, 111 and 112), washers (25, 113) and nuts (20 and 114) securing strut foot pads to the aircraft.

c. Remove strut attachment bolts (35, 115), washers (36, 116), and nuts (37, 117) and remove stabilizer struts (31, 32, 33 and 34, 79 and 80).

d. Clean sealant from strut foot pads (TM43-0105).

2-463. REPAIR - STABILIZER STRUTS. *a.* Paint deterioration, superficial paint scratches - repair (TB 746-93-2).

b. Light corrosion - clean and repair area (TM43-0105).

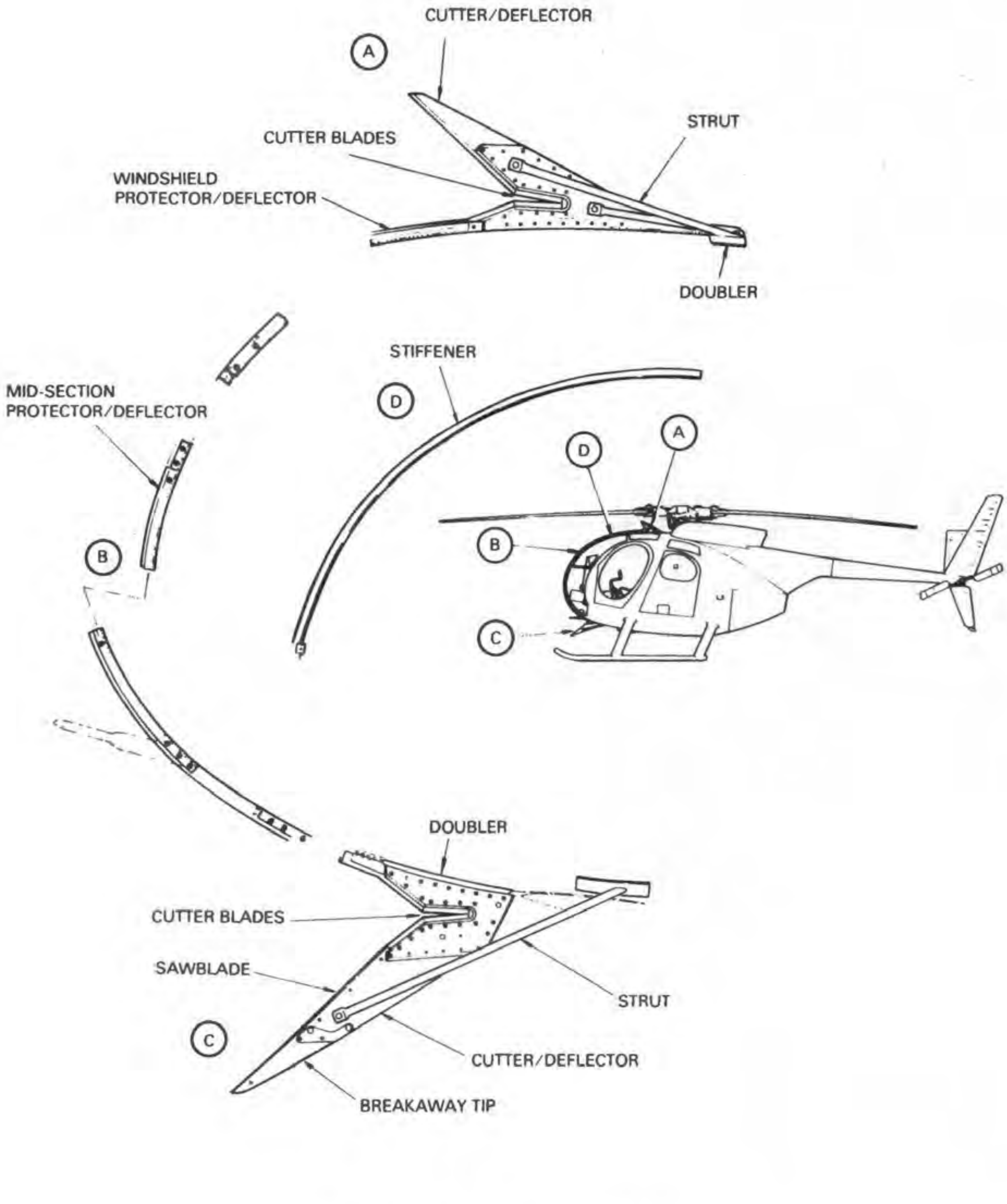


Figure 2-64. Wire Strike Protection System

2-464. INSTALLATION - STABILIZER STRUTS (AVIM) (See fig. 2-65, sh 1 and 3). *a.* Attach stabilizer struts (31, 32, 33 and 34, 79 and 80) to the cutter assembly using strut attachment bolts (35, 115), washers (36, 116) and nuts (37, 117).

b. Locate each strut foot position over the existing holes and fit and trim the strut feet as required. Transfer existing hole pattern to the strut feet. Remove, drill holes, clean and deburr.

c. Apply ProSeal 890 to the strut feet mating surfaces (upper struts only). Reposition the struts and install screws (38, 39, 40, 41 and 43, 111 and 112), washers (25, 113) and nuts (20, 114).

d. Reinstall strut attachment bolts (35, 115), washers (36, 116) and nuts (37, 117) and tighten all hardware.

e. Reinstall mounting trays and avionics in lower electronics bay and reinstall battery.

f. Prime/paint as required (TB746-93-2).

2-465. UPPER CUTTER ASSEMBLY

2-466. DESCRIPTION - UPPER CUTTER ASSEMBLY. The mechanical cutter/deflector (detail A, fig. 2-64) consists of a deflector section leading into the primary cable cutting mechanism. Wedge type cutting blades are positioned to provide the necessary mechanical advantage to cut the design objective cables while minimizing load input into the airframe.

2-467. INSPECTION - UPPER CUTTER ASSEMBLY. *a.* Inspect the upper cutter assembly for paint deterioration, superficial paint scratches and light corrosion. Moderate or heavy corrosion not allowed. Scratches, nicks or gouges to a depth of .010 inch may be repaired.

b. Inspect the cutter blades (para 2-455).

c. Inspect the deflector assembly for cracks and permanent deformation. Deflector assemblies showing evidence of any cracks and/or permanent deformation must be replaced.

d. Inspect the security of the upper cutter assembly. Loose fasteners must be replaced.

e. Inspect the surrounding support structure for evidence of permanent deformation. If permanent structural deformation exists, replace the entire cutter assembly.

2-468. REMOVAL - UPPER CUTTER ASSEMBLY (See fig. 2-65, sh 1) *a.* Remove forward lower entry guide blade (15) and shim (16) by removing capscrews (17 and 18), washers (19) and nuts (20).

b. Remove strut attachment bolts (35), washers (36) and nuts (37) from deflector.

c. Remove lower mounting capscrews (17), washers (19) and nuts (20).

d. Remove cutter assembly, noting position of shims (14), if installed.

e. Clean sealant from shims (14), channel (23), and cutter assembly (TM43-0105).

2-469. REPAIR - UPPER CUTTER ASSEMBLY. *a.* Paint deterioration, superficial paint scratches - repair (TB 746-93-2).

b. Light corrosion - clean and repair area (TM43-0105).

c. Cutter blades - refer to paragraph 2-457.

d. Scratches - using sandpaper (C1), remove scratches to a maximum depth of .010, prime/paint as required (TM 746-93-2).

2-470. INSTALLATION - UPPER CUTTER ASSEMBLY (See fig. 2-65, sh 1) *a.* Position the cutter assembly onto the top end of the channel (23). Check the gap between the channel and the cutter assembly cheek plates. Use shims (14) as required.

b. Remove cutter assembly and apply ProSeal 890 between cutter shims (if any), cheek plates and channel. Place all parts in position, ensuring that the cutter assembly is pushed down and bottoming in the channel and that it is positioned centrally within the channel and perpendicular to the airframe.

c. Secure the cutter assembly to the channel (23) with capscrews (17), washers (19) and nuts (20).

d. Install strut attachment bolts (35), washers (36) and nuts (37).

e. Install forward lower entry guide blade (15) and shim (16) using capscrews (17 and 18) washers (19) and nuts (20).

f. Prime/paint as required (TB 746-93-2).

2-471. DOUBLERS, UPPER CUTTER INSTALLATION.

2-472. DESCRIPTION - DOUBLERS. The doublers (detail A, fig. 2-64) provide additional structural support, distributing wire cutting loads to the canopy frame members.

2-473. INSPECTION - DOUBLERS. *a.* Inspect doublers for paint deterioration, superficial paint scratches and light corrosion. Moderate or heavy corrosion not allowed. Scratches, nicks or gouges to a depth of .006 may be repaired.

b. Inspect doublers for cracks and permanent deformation. Doublers showing evidence of any cracks and/or permanent deformation must be replaced.

c. Inspect security of doublers. Loose fasteners must be replaced.

2-474. REMOVAL - DOUBLERS (AVIM) (See fig. 2-65, sh 1) *a.* Cover windshields.

b. Remove forward transmission cowlings and cover exposed area with plastic sheeting or other suitable material.

c. Remove forward cabin heat duct sections and roof controls and move plastic instrument lines away from work area.

CAUTION

As instrument lines are brittle, care must be exercised when they are moved.

d. Remove struts (31, 32, 33 and 34) (para 2-462).

e. Remove doubler rivets (45, 46, 49 and 50), nuts (20 and 30), platenut (44), washers (25 and 29), and screws (39, 40, 42 and 48).

CAUTION

Care must be exercised when drilling out rivets to prevent damage to instrument lines.

f. Remove doublers (1) and clean sealant from aircraft (TM43-0105).

2-475. REPAIR - DOUBLER. *a.* Paint deterioration and/or superficial paint scratches - repair (TB746-93-2).

b. Light corrosion - Clean and repair area (TM43-0105).

c. Scratches - using sandpaper (C1), remove scratches to a maximum depth of .006. Prime/paint as required (TB 746-93-2).

2-476. INSTALLATION - DOUBLERS (AVIM) (See fig. 2-65, sh 1) *a.* Position one doubler with edge of doubler lined up with aft edge of channel and trim doubler, allowing adequate edge distance for fasteners. Ensure doubler clears fiberglass guards and transmission opening. Deburr.

b. Clamp doubler to channel. Using a hole finder, or by backdrilling where accessible, transfer all existing rivet holes, strut mounting holes, and transmission cowling mounting hole to doubler.

c. Backdrill the two doubler flange mounting holes from channel.

d. Repeat steps a, b and c for other doubler.

e. Remove doublers and countersink all flush, head rivet and four screw hole locations.

f. Deburr, clean and prime bare areas. Apply Pro-Seal 890 to doubler mating surface.

g. Cleco doublers into position and install rivets (45, 46, 49, and 50), patenut (44), screws (39, 40, 42 and 48), washers (25 and 29) and nuts (20 and 30).

h. Clean excess sealant from doubler periphery (TM43-0105).

i Install struts (31, 32, 33 and 34) (para 2-470).

j. Touchup WSPS as required (TB746-93-2).

k. Secure plastic instrument lines and install heat duct sections and roof controls.

l. Clean up and remove protective covering from control and mast area.

m. Replace transmission cowlings and remove protective covering from windshields.

2-477. STIFFENER, WINDSHIELD DEFLECTOR

2-478. DESCRIPTION - STIFFENER. The stiffener (detail D, fig. 2-64) provides structural support, distributing wire deflection and cutting loads to the surrounding airframe.

2-479. INSPECT - STIFFENER. *a.* Inspect stiffener for cracks and permanent deformation. A stiffener showing evidence of cracks and/or permanent deformation must be replaced.

b. Inspect the security of the stiffener. Loose fasteners must be replaced.

c. Inspect the surrounding support structure for cracks and permanent deformation.

2-480. REMOVAL - STIFFENER (AVIM) (See fig. 2-65, sh 1) *a.* Remove forward cabin heat duct sections and roof controls.

b. Remove compass mounting screw and compass.

c. Remove the tie wraps (50) supporting the plastic instrument lines so they may be moved aside when drilling out rivets.

CAUTION

As plastic instrument lines are brittle, care must be exercised when they are moved.

d. Cover instrument panel and console with plastic sheeting.

e. Cover windshields and overhead windows with suitable material to prevent damage.

f. Remove upper cutter assembly (para 2-468).

g. Remove windshield deflector insert (21) (para 2-489).

h. Remove nuts (30), washers (29) and screws (26, 27 and 28) from windshield deflector channel (23) that interfere with stiffener removal.

i. Remove nuts (56), washers (55), screws (54) and rivets (52 and 53) securing stiffener to aircraft and remove stiffener.

CAUTION

The center channel is relatively flexible and it is advisable to support the channel when punching out the blind rivet center stems.

2-481. REPAIR - STIFFENER. No repair authorized.

2-482. INSTALLATION - STIFFENER (AVIM) (See fig. 2-65, sh 1) *a.* Position stiffener (51) and trim to clear existing rivets at upper end and ventilation duct at lower end. Deburr.

b. Reposition stiffener and clamp, ensuring that stiffener bulb is bottoming in existing channel.

c. Backdrill holes into stiffener. If required, use rotary file to locally remove bulb material to allow proper seating of nut (56).

d. Remove stiffener, deburr and clean. Prime bare areas (TB746-93-2).

e. Install stiffener using rivets (52 and 53), screws (54), washers (55) and nuts (56).

f. Reinstall screws (26, 27 and 28), washers (29) and nuts (30) removed previously.

g. Reinstall windshield defelector insert (21) (para 2-490).

h. Reinstall cutter assembly (para 2-470).

i. Remove protective coverings and clean up work area.

j. Replace plastic instrument lines using nylon tie wraps (50).

k. Reinstall compass, forward cabin heat duct sections and roof controls.

2-483. WINDSHIELD DEFLECTOR ASSEMBLY

2-484. DESCRIPTION - WINDSHIELD DEFLECTOR ASSEMBLY. The windshield protector/deflector (detail A, fig. 2-64) consists of a nylon insert equipped aluminum extrusion, providing a deflection mechanism into the upper cutter and additional structural support for the upper cutter mounting.

2-485. INSPECTION - WINDSHIELD DEFLECTOR ASSEMBLY. *a.* Inspect the deflector assembly channel for paint deterioration, superficial paint scratches and light corrosion. Moderate or heavy corrosion is not allowed. Scratches, nicks or gouges in the deflector channel only to a depth of .010 inch may be repaired. Cuts or gouges in the nylon insert to a depth of .050 inch may be repaired.

b. Inspect security of windshield deflection system. If windshield deflector components show evidence of any cracks or permanent deformation due to impact, they must be replaced.

2-486. REMOVAL - WINDSHIELD DEFLECTOR ASSEMBLY (AVIM). Refer to paragraphs 2-489 and 2-491.

2-487. REPAIR - WINDSHIELD DEFLECTOR ASSEMBLY. *a.* Paint deterioration superficial paint scratches - repair (TB 746-93-2).

b. Light corrosion - clean and repair area (TM43-0105).

c. Scratches - using sandpaper (C1), remove scratches to a maximum depth of .010 inch. Prime/paint as required (TB 746-93-2).

d. Nylon insert - using a rotary file, remove cuts and gouges to a maximum depth of .050 inch.

2-488. INSTALLATION - WINDSHIELD DEFLECTOR ASSEMBLY (AVIM). Refer to paragraphs 2-490 and 2-492.

2-489. REMOVAL - NYLON INSERT (See fig. 2-65, sh 1) *a.* Cover windshields and overhead windows with suitable material to prevent damage.

b. Remove outside air temperature gauge.

c. Remove nuts (20), washers (25) and screws (24).

d. Remove insert (21) from channel.

2-490. INSTALLATION - NYLON INSERT (See fig. 2-65, sh 1) *a.* Position insert (21) into channel and trim aft end as required. Adjust hole alignment as required.

b. Install screws (24), washers (25) and nuts (20).

c. Remove protective covering from windshields.

d. Install outside air temperature gauge.

2-491. REMOVAL - CHANNEL (AVIM) (See fig. 2-65, sh1 and 2) *a.* Cover windshields and overhead windows with suitable material to prevent damage.

b. Remove insert (21) (para 2-489).

c. Remove cutter assembly (para 2-468).

d. Remove nuts (20), washers (25) and screws (24 and 42) retaining filler (22) and remove filler.

e. Remove clips (62 and 63) and spacer (66) by removing nuts (70 and 74), washers (69 and 73) and screws (68 and 71).

f. Remove forward cabin heat duct sections and roof controls.

g. Remove tie wraps (50) supporting the plastic instrument lines so they may be moved aside.

CAUTION

As plastic instrument lines are brittle, care must be exercised when they are moved.

h. Remove nuts (30), washers (29) and screws (26, 27 and 28) securing channel (23) and remove channel. Cleco at frequent intervals to prevent separation of mating parts. Retrieve spacer (47) from under aft canopy.

i. Clean sealant from aircraft (TM43-0105).

2-492. INSTALLATION - CHANNEL (AVIM) (See fig. 2-65, sh 1 and 2) *a.* Locate the center windshield channel fastener locations on a template using a hole finder. Align template using the upper aft skin line as a reference.

b. Scribe a centerline along bottom of channel (23), lay template along channel bottom surface and mark all hole locations. Ensure alignment of template with aft end of channel.

c. Remove template and drill holes on channel centerline regardless of whether they are offset from their original positions.

d. Position channel on aircraft ensuring that aft end of channel does not extend beyond skin line into control area and that forward end lines up with canopy crossbrace. Trim as required.

e. Remove channel and countersink channel hole locations to accommodate screws.

NOTE

Examine windshield retainer for signs of separation and repair as required.

f. Apply ProSeal 890 to underside of channel and install channel using screws (26, 27, and 28), washers (29) and nuts (30). Ensure spacer (47) is properly positioned.

g. Position clips (62 and 63) and transfer hole locations to channel. Ensure clips are flush with end of insert (21). Remove clips and drill holes in channel. Deburr.

h. Reposition clips (62 and 63) and spacer (66). Install screws (68 and 71), washers (69 and 73) and nuts (70 and 74).

i. Reinstall filler (22) using screws (24 and 42), washers (25) and nuts (20).

j. Reinstall cutter assembly (para 2-470).

k. Reinstall insert (21) (para 2-490).

l. Replace plastic instrument lines using nylon tie wraps (50).

m. Reinstall forward cabin heat duct sections and roof controls.

n. Remove protective covering from windshields.

o. Install outside air temperature gauge.

2-493. MID-SECTION DEFLECTOR

2-494. DESCRIPTION - MID-SECTION DEFLECTOR. The mid-section deflector (detail B, fig. 2-64) consists of two nylon insert equipped aluminum extrusions, providing a deflection mechanism into the upper and/or lower cutter.

2-495. INSPECTION - MID-SECTION DEFLECTOR. *a.* Inspect the deflector components for paint deterioration, superficial paint scratches and light corrosion. Moderate or heavy corrosion is not allowed. Scratches, nicks or gouges only to a depth of .010 inch may be repaired. Cuts or gouges in the nylon insert to a depth of .050 inch may be repaired.

b. Inspect the security of mid-section deflection system. If components show evidence of any cracks or permanent deformation due to impact, they must be replaced.

c. Inspect for gaps along the deflector surface and/or misalignment of deflector components. Trim or adjust components as required to ensure a snag-free surface into the cutter assemblies.

2-496. REMOVAL - MID-SECTION DEFLECTOR (AVIM). Refer to paragraphs 2-499, 2-501 and 2-503.

2-497. REPAIR - MID-SECTION DEFLECTOR. *a.* Paint deterioration, superficial paint scratches - repair (TB 746-93-2).

b. Light corrosion - clean and repair area (TM43-0105).

c. Scratches - using sandpaper (C1), remove scratches to a maximum depth of .010 inch. Prime/paint as required (TB 746-93-2).

d. Nylon inserts - using a file, remove cuts and gouges to a maximum depth of .050 inch.

2-498. INSTALLATION - MID-SECTION DEFLECTOR ASSEMBLY (AVIM). Refer to paragraphs 2-500, 2-502 and 2-504.

2-499. REMOVAL - NYLON INSERT (See fig. 2-65, sh 2) *a.* Remove outside air temperature gauge.

b. Remove nuts (74), washers (73) and screws (72).

c. Remove inserts (59) from channels.

2-500. INSTALLATION - NYLON INSERTS (See fig. 2-65, sh 2) *a.* Position insert (59) into channel and trim aft end as required. Adjust hole alignment as required.

b. Install screws (72), washers (73) and nuts (74).

c. Install outside air temperature gauge.

d. Prime/paint as required (TB746-93-2).

2-501. REMOVAL - YOKES, CLIPS, AND SPACERS (See fig. 2-65, sh 2) *a.* Remove nuts (70 and 74), washers (69 and 73) and screws (68 and 71).

b. Remove yokes (60 and 61), shims (57), clips (62, 63, 64 and 65) and spacers (66 and 67).

c. Clean sealant from yokes and clips (TM43-0105).

2-502. INSTALLATION - YOKES, CLIPS AND SPACERS (See fig. 2-65, sh 2) *a.* Position yoke (60, 61) using shims (57) as required between yokes and channels (58) to fill gap. Ensure yoke is bottoming in channels and against panel.

b. Position clips (62 and 63, 64 and 65) and spacer (66, 67).

c. Locate the yoke mounting holes in channels (58) and drill. Temporarily secure with screws (68).

d. Trim spacer and clips as required. Ensure clips (62 and 63) and spacer (66) are flush with insert (21) and that clips (64 and 65) and spacer (67) are flush with lower cutter blade (91) and that they do not project above yokes.

e. Locate and drill channel (23, 78) mounting holes in clips and spacers. Temporarily secure with screws (68).

f. Locate and drill clip mounting holes in yoke.

g. Remove yoke, clips, spacer and shims. Deburr, clean and prime bare areas (TB746-93-2).

h. Apply ProSeal 890 to mating surface at yoke. Reposition yokes, shims, spacers and clips and install using screws (68 and 71), washers (69 and 73) and nuts (70 and 74).

i. Apply ProSeal 890 around upper yoke (60) and clips (62 and 63).

j Prime/paint as required (TB746-93-2).

2-503. REMOVAL - CHANNELS (AVIM) (See fig. 2-65, sh 2) *a.* Remove crew access doors, anti-torque pedal bars, logbook holder and fire extinguisher.

b. Remove inserts (59) (para 2-499).

c. Remove yokes (60 and 61) (para 2-501).

d. Remove nuts (77), washers (76) and screws (75) and remove channels (58).

e. Clean sealant from aircraft, yokes, clips and channels (TM43-0105).

2-504. INSTALLATION - CHANNELS (AVIM) (See fig. 2-65, sh 2) *a.* Scribe a centerline on channels (58) backside and position on aircraft with yokes (60 and 61). Temporarily secure with screws (68 and 71). Channel contour is not symmetric and should be positioned to determine best fit.

b. Mark three hole locations on each channel at the top, center and lower locations.

c. Remove channels and drill holes on the centerline.

d. Reposition channels and cleco to aircraft. Mark or scribe all remaining hole locations.

e. Remove channels and drill holes. Contersink to accommodate screws. Deburr, clean and prime bare areas (TB746-93-2).

f. Apply ProSeal 890 to channels and install using screw (75), washers (76) and nuts (77). Remove excess sealant.

g. Apply ProSeal 890 to mating surface of yokes (60 and 61) and install with shims (57) using screws (68), washers (69) and nuts (70). Install clips (62, 63, 64 and 65) using screws (68 and 71), washers (69 and 73) and nuts (70 and 74).

h. Apply ProSeal 890 around upper yoke and clips.

i. Install inserts (59) (para 2-500).

j. Replace logbook holder, anti-torque pedal bars, fire extinguisher and crew access door.

2-505. LOWER CUTTER ASSEMBLY

2-506. DESCRIPTION - LOWER CUTTER ASSEMBLY. The mechanical cutter/deflector (detail C, fig. 2-64) consists of a sawtooth equipped deflector section which provides a deflection/abrading feature leading into the primary cable cutting mechanism. Wedge type cutting blades are positioned to provide the necessary mechanical advantage to cut the design objectivce cables while minimizing load input into the airframe.

2-507. INSPECTION - LOWER CUTTER ASSEMBLY. *a.* Inspect the cutter assembly for paint deterioration, superficial paint scatches and light corrosion. Moderate or heavy corrosion is not allowed. Scratches, nicks or gouges to a depth of .010 inch may be repaired.

b. Inspect the sawblade (para 2-525).

c. Inspect the cutter blades (para 2-455).

d. Inspect the deflector assembly for cracks and permanent deformation. Deflector assemblies showing evidence of any cracks and/or permanent deformation must be replaced.

e. Inspect the security of the lower cutter assembly. Loose fasteners must be replaced.

f. Inspect the surrounding support structure for evidence of permanent deformation. If permanent structural deformation exists, replace the entire cutter assembly.

2-508. REMOVAL - LOWER CUTTER ASSEMBLY (See fig. 2-65, sh 3) *a.* Remove lower struts (79 and 80) (para 2-462).

b. Remove screws (108), washers (109), and nuts (110).

NOTE

Support cutter when last few fasteners are removed to prevent cutter dropping from aircraft.

c. Remove cutter assembly.

2-509. REPAIR - LOWER CUTTER ASSEMBLY. *a.* Paint deterioration or superficial paint scratches - repair (TB 746-93-2).

b. Light corrosion - clean and repair area (TM43-0105).

c. Sawblade - refer to paragraph 2-533.

d. Cutter blade - refer to paragraph 2-457.

e. Scratches - using sandpaper (C1), remove scratches to a maximum depth of .010 inch. Prime/paint as required (TB 746-93-2).

2-510. INSTALLATION - LOWER CUTTER ASSEMBLY (See fig. 2-65, sh 3) *a.* Postition cutter assembly on channel (78) and check gap between mation parts. Maximum allowable gap is .016 inch and shims (102) are proivided to reduce gap as required.

b. Install screws (108), washers (109) and nuts (110).

c. Install struts (79 and 80) (para 2-464).

d. Reinstall panels using existing hardware.

e. Prime/paint as required (TB 746-93-2).

2-511. BREAKAWAY TIP, LOWER CUTTER.

2-512. DESCRIPTION - BREAKAWAY TIP. The lower cutter assembly features a "Breakaway Tip" (detail C, fig. 2-64) designed to shear when relatively large ground contact forces are experienced and before helicopter structural damage is incurred. The tip shear rivets are chosen to withstand the smaller forces experienced during wire strikes where the tip effectively deflects wires/cables into the cutter blades.

2-513. INSPECTION - BREAKAWY TIP. *a.* Inspect the tip assembly for paint deterioration, superficial paint scratches and light corrosion. Heavy or moderate corrosion is not allowed. Scratches, nicks, gouges to a depth of .006 inch may be repaired.

b. Inspect the security of the breakaway tip paying particular attention to the rivet fasteners. If there is evidence of loose or deformed rivets, replace the entire tip assembly.

2-514. REMOVAL - BREAKAWAY TIP (See fig. 2-65, sh 3) *a.* Remove bolts (99), washers (100) and nuts (101) and drop tip assembly (98) free of cutter.

2-515. REPAIR - BREAKAWAY TIP. *a.* Paint deterioration or superficial paint scratches - repair (TB 746-93-2).

b. Scratches - using sandpaper (C1) remove scratches to a maximum depth of .006 inch. Prime/paint as required (TB 746-93-2).

2-516. INSTALLATION - BREAKAWAY TIP. (See fig. 2-65, sh 3) *a.* Position tip assembly (98), aligning mounting holes.

b. Install bolts (99), washers (100) and nuts (101).

c. Prime/paint as required (TB746-93-2).

2-517. MOUNTING CHANNEL, LOWER CUTTER INSTALLATION.

2-518. DESCRIPTION - MOUNTING CHANNEL. The mounting channel (78, fig. 2-65 sh 3) acts as a base for the lower cutter assembly and provides additional structural support, distributing wire cutting loads to the surrounding airframe.

2-519. INSPECTION - MOUNTING CHANNEL. *a.* Inspect mounting channel for paint deterioration, superficial paint scratches and light corrosion. Moderate or heavy corrosion is not allowed. Scratches, nicks or gouges in the mounting angle only to a depth of .010 inch may be repaired.

b. Inspect the security of the mounting channel. Loose fasteners must be replaced. If channel shows evidence of any cracking or permanent deformation due to impact, it must be replaced.

c. Inspect the surrounding support structure for cracks and permanent deformation.

2-520. REMOVAL - MOUNTING CHANNEL (See fig. 2-65, sh 3) *a.* Remove battery, AN/ARN-89 receiver set, AN/APX-72 transponder set, R1391/ARN-83 set and associated mounting trays from lower electronics bay.

b. Remove lower struts (79 and 80) (para 2-462).

c. Remove lower cutter assembly (para 2-508).

d. Remove nuts (107), washers (106) and screws (104 and 105) and remove mounting channel (78).

e. Clean sealant from aircraft and mounting angle (TM43-0105).

2-521. REPAIR - MOUNTING CHANNEL. *a.* Paint deterioration or superficial paint scratches - repair (TB 746-93-2).

b. Light corrosion - clean and repair area (TM43-0105).

c. Scratches - using sandpaper (C1), remove scratches to a maximum depth of .010 inch. Prime/paint as required (TB 746-93-2).

2-522. INSTALLATION - MOUNTING CHANNEL (See fig. 2-65, sh 3) *a.* Position mounting channel (78) in line with and centered on existing row of holes in doubler (81) with forward edges of channel and doubler lined up. Transfer holes onto channel from aircraft.

b. Remove channel and drill all holes as required.

c. Deburr, clean and apply ProSeal 890 to channel mating surface.

d. Install using screws (104 and 105), washers (106) and nuts (107). Clean off excess sealant (TM43-0105).

e. Install lower cutter assembly (para 2-510).

f. Install lower struts (79 and 80) (para 2-464).

g. Prime/paint as required (TB746-93-2).

h. Reinstall mounting trays and avionics in lower electronics bay.

2-523. DOUBLER, LOWER CUTTER INSTALLATION.

2-524. DESCRIPTION - DOUBLER, LOWER CUTTER. The doubler (detail C, fig. 2-64) provides additional structural support, distributing wire cutting loads to the canopy frame members.

2-525. INSPECTION - DOUBLER, LOWER CUTTER. Refer to paragraph 2-473.

2-526. REMOVAL - DOUBLER, LOWER CUTTER (AVIM) (See fig. 2-65, sh 3) *a.* Remove battery, AN/ARN-89 receiver set, AN/APX-72 transponder set, R1391/ARN-83 set and associated mounting trays from lower electronics bay.

b. Remove lower struts (79 and 80) (para 2-462).

c. Remove lower cutter assembly (para 2-508).

d. Remove channel (78) (para 2-520).

e. Remove doubler rivets (103, 118, 119, 120 and 121) and remove doubler (81). Retrieve internal clip.

f. Clean sealant from aircraft (TM43-0105).

2-527. REPAIR - DOUBLER, LOWER CUTTER. Refer to paragraph 2-475.

2-528. INSTALLATION - DOUBLER, LOWER CUTTER (AVIM) (See fig. 2-65, sh 3) *a.* Position doubler (81) and by using a hole finder, backdrilling and scribing, transfer fastener holes in aircraft to doubler. Locate and scribe all drain hole locations.

b. Determine trim line to clear anti-collision light.

c. Remove doubler and drill all holes and trim as required. Countersink designated holes to accommodate flush rivets.

d. Deburr, clean and prime/paint doubler (TB746-93-2).

e. Apply ProSeal 890 to doubler mating surface and install using rivets (103, 118, 119, 120, and 121). Ensure internal clip is installed when installing forward rivets (103).

f. Install channel (78) (para 2-522).

g. Install lower cutter assembly (para 2-510).

h. Install lower struts (79 and 80) (para 2-464).

i. Prime/paint as required (TB746-93-2).

j. Reinstall mounting trays and avionics in lower electronics bay.

2-529. SAWTOOTH BLADE, LOWER CUTTER DEFLECTOR

2-530. DESCRIPTION - SAWTOOTH BLADE, LOWER CUTTER DEFLECTOR (See detail C, fig. 2-64). The sawtooth blade provides abrasion of wires leading into primary wire cutting blades.

2-531. INSPECTION - SAWTOOTH BLADE, LOWER CUTTER DEFLECTOR. Inspect the sawtooth blade for impact damage and/or shedding of rubber coating. Sawblade with missing or damaged teeth (one or more) is to be replaced without repair.

2-532. REMOVAL - SAWTOOTH BLADE, LOWER CUTTER DEFLECTOR(See fig. 2-65, sh 3) *a.* Remove rivets (97) retaining sawblade.

b. Remove sawblade (96) and clean sealant residue (TM43-0105).

2-533. REPAIR - SAWTOOTH BLADE, LOWER CUTTER DEFLECTOR. Damaged or missing rubber coating due to deterioration can be replaced using ProSeal 890.

2-534. INSTALLATION - SAWTOOTH BLADE, LOWER CUTTER DEFLECTOR (See fig. 2-65, sh 3) *a.* Install sawblade (96) with teeth facing the cutter throat.

b. Install rivets (97).

c. Mask deflector on each side of sawblade and coat the sawblade teeth with a minimal application of ProSeal 890. Allow sufficient time for the sealant to set before removing masking.

d. Prime/paint as required (TB746-93-2).

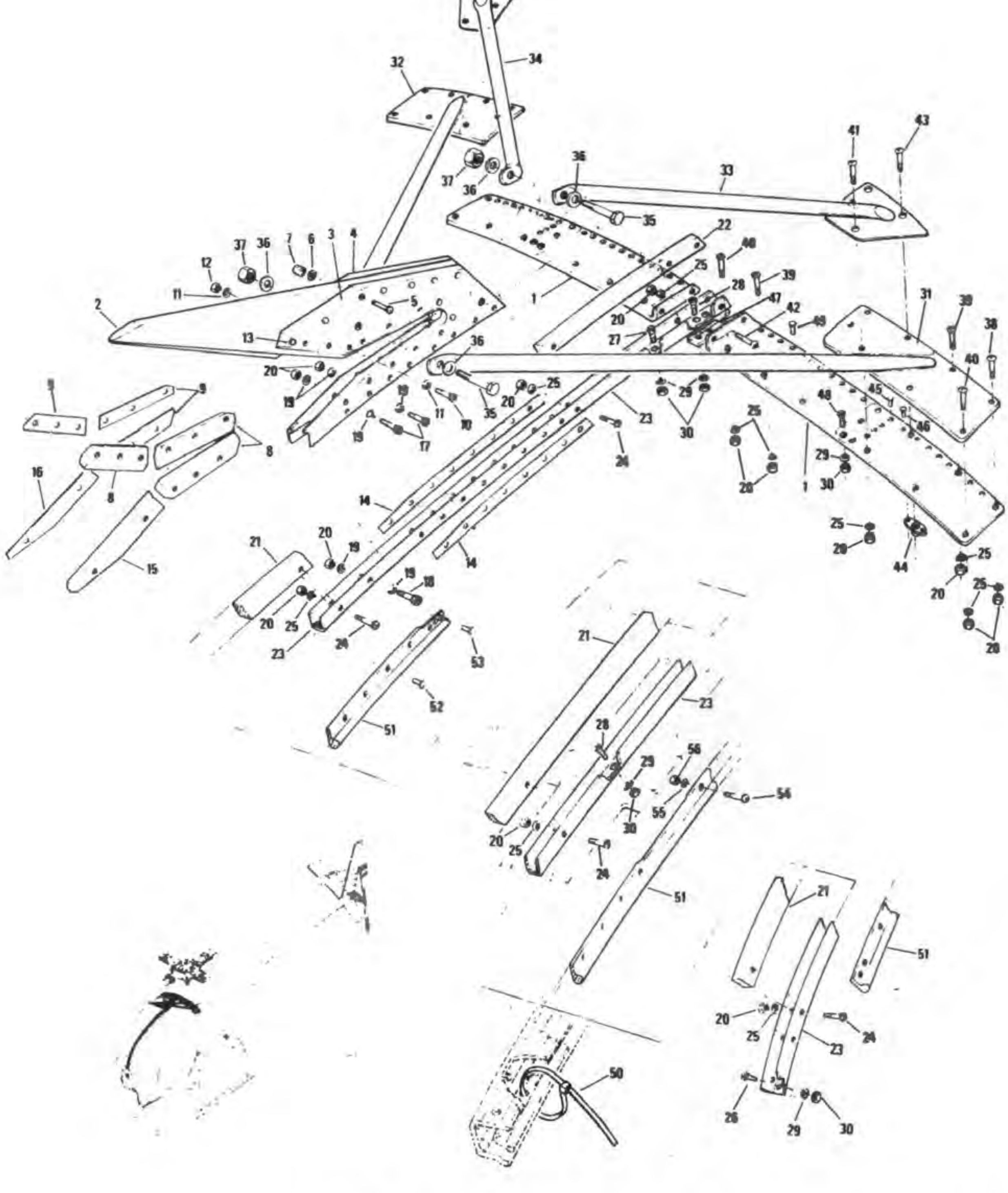


Figure 2-65. WSPS Parts Replacement Sheet 1 of 4

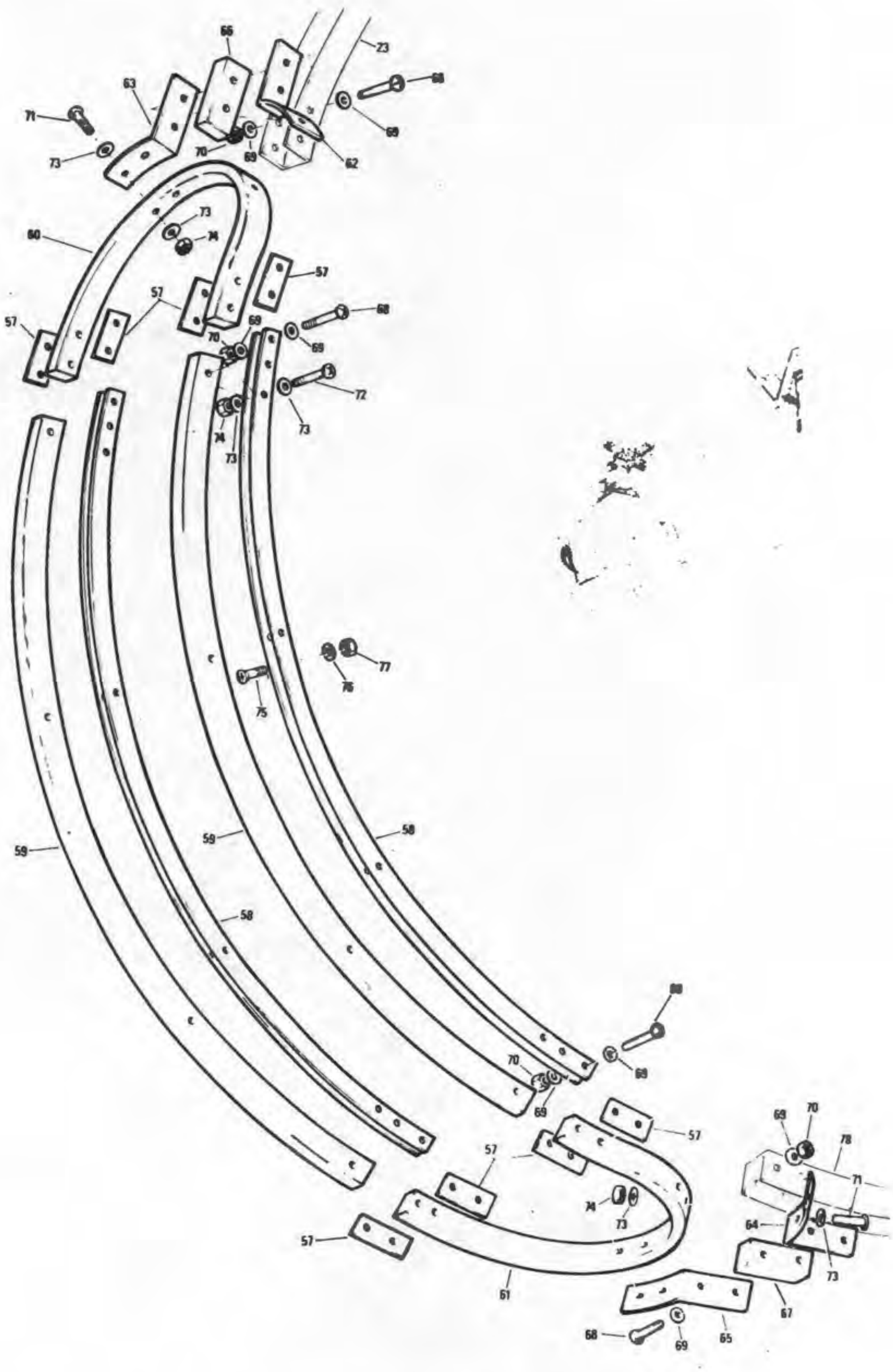


Figure 2-65. Wire Strike Replacement Sheet 2 of 4

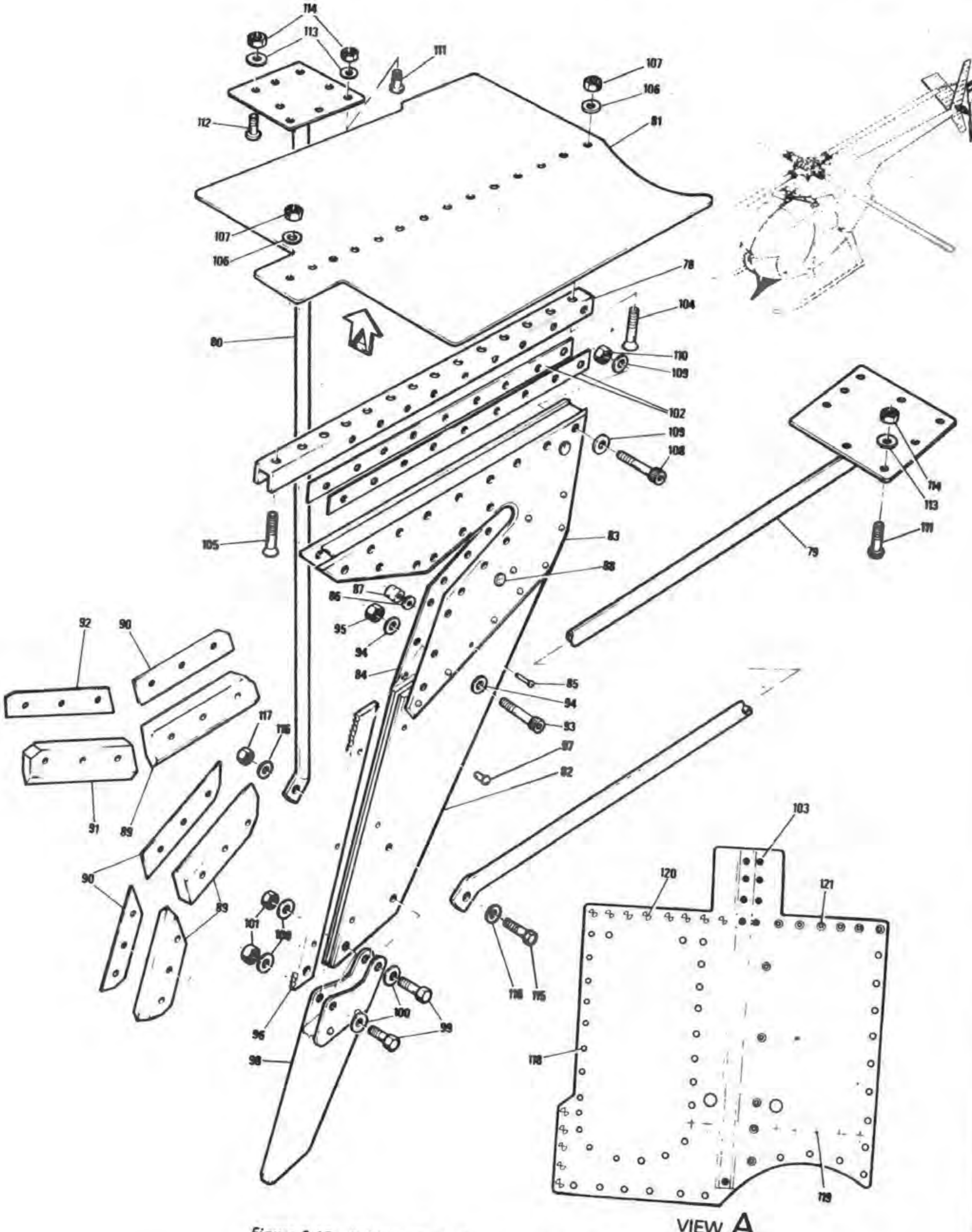


Figure 2-65. WSPS Parts Replacement Sheet 3 of 4

Key to Figure 2-65

1.	Doubler	41.	Screw	81.	Doubler
2.	Deflector	42.	Screw	82.	Deflector
3.	Cheekplate	43.	Screw	83.	Cheekplate
4.	Cheekplate	44.	Nut	84.	Cheekplate
5.	Rivet	45.	Rivet	85.	Rivet
6.	Washer	46.	Rivet	86.	Washer
7.	Collar	47.	Spacer	87.	Collar
8.	Blade	48.	Screw	88.	Rivet
9.	Shim	49.	Rivet	89.	Blade
10.	Capscrew	50.	Tie-down strap	90.	Shim
11.	Washer	51.	Stiffener	91.	Blade
12.	Nut	52.	Rivet	92.	Shim
13.	Rivet	53.	Rivet	93.	Capscrew
14.	Shim	54.	Screw	94.	Washer
15.	Blade	55.	Washer	95.	Nut
16.	Shim	56.	Nut	96.	Sawblade
17.	Capscrew	57.	Shim	97.	Rivet
18.	Capscrew	58.	Channel	98.	Tip assembly
19.	Washer	59.	Insert	99.	Bolt
20.	Nut	60.	Yoke	100.	Washer
21.	Insert	61.	Yoke	101.	Nut
22.	Filler	62.	Upper LH clip	102.	Shim
23.	Channel	63.	Upper RH clip	103.	Rivet
24.	Screw	64.	Lower LH clip	104.	Screw
25.	Washer	65.	Lower RH clip	105.	Screw
26.	Screw	66.	Upper spacer	106.	Washer
27.	Screw	67.	Lower Spacer	107.	Nut
28.	Screw	68.	Screw	108.	Screw
29.	Washer	69.	Washer	109.	Washer
30.	Nut	70.	Nut	110.	Nut
31.	Upper LH strut	71.	Screw	111.	Screw
32.	Upper RH strut	72.	Screw	112.	Screw
33.	Upper LH sec. strut	73.	Washer	113.	Washer
34.	Upper RH sec. strut	74.	Nut	114.	Nut
35.	Bolt	75.	Screw	115.	Bolt
36.	Washer	76.	Washer	116.	Washer
37.	Nut	77.	Nut	117.	Nut
38.	Screw	78.	Channel	118.	Rivet
39.	Screw	79.	Lower LH strut	119.	Rivet
40.	Screw	80.	Lower RH strut	120.	Rivet
				121.	Rivet

Figure 2-65 Sheet 4 of 4

CHAPTER THREE

ALIGHTING GEAR

SECTION I SKIDS AND STRUTS

3-1. LANDING GEAR.

3-2. Description — Landing Gear Assembly. The landing gear (fig. 3-1) consists of two strut-mounted, shock-dampened skids aligned longitudinally along the aircraft fuselage. The landing gear skids are either bolt-mounted or riveted to the landing gear struts. Both right and left skids pivot as the damper assemblies extend and retract. Either four or five replaceable abrasion strips are installed on each skid to retard skid wear on hard surfaces. Fairings on each strut reduce aerodynamic drag during flight. Landing gear braces are attached between the landing gear struts and fuselage center beam. The braces prevent shearing of the struts, and keep the struts in alignment with the landing gear. The landing gear struts are aluminum alloy forgings attached between the skids and fuselage center beam. Removal, repair, and installation procedures are identical for both sides of the landing gear installation.

Table 3-1. Premaintenance Requirements for Removal of Landing Gear.

Conditions	Requirements
Support Equipment	Jacks or Hoist
Minimum Personnel Required	Two; Three for Jacking

3-3. Removal — Landing Gear Assembly. *a.* Jack up the aircraft until the landing gear dampers are fully extended. Place supports beneath the skid tubes at the strut locations.

b. Gain access to the forward brace, strut, and damper at fuselage attachment points by opening the compartment access doors and foot support fairings, respectively.

c. Gain access to aft landing gear attachment points by opening the engine access doors.

WARNING

Exercise extreme care during bladder-type damper removal if the damper extends beyond 12.25 inches (bolt center to bolt center). This condition indicates internal failure of the damper that will result in a sudden release of internal pressure and explosion of the bladder.

d. Disconnect lower end of landing gear dampers (fig. 3-2). Remove clamp that attaches bonding jumper to strut.

e. On series 3 aircraft, remove airborne switch (fig. 3-3) from landing gear strut. (Refer to TM 11-1520-214-20-1.)

f. Pull fairing fillet downward against spring tension and secure with tape (C105).

g. Remove cotter pins, nuts, washers and bolts that attach braces to struts and support fittings, and struts to support fittings on left side of fuselage. Remove braces.

h. Remove supports from beneath left skid and carefully remove left struts, skid and fairings as an assembled unit.

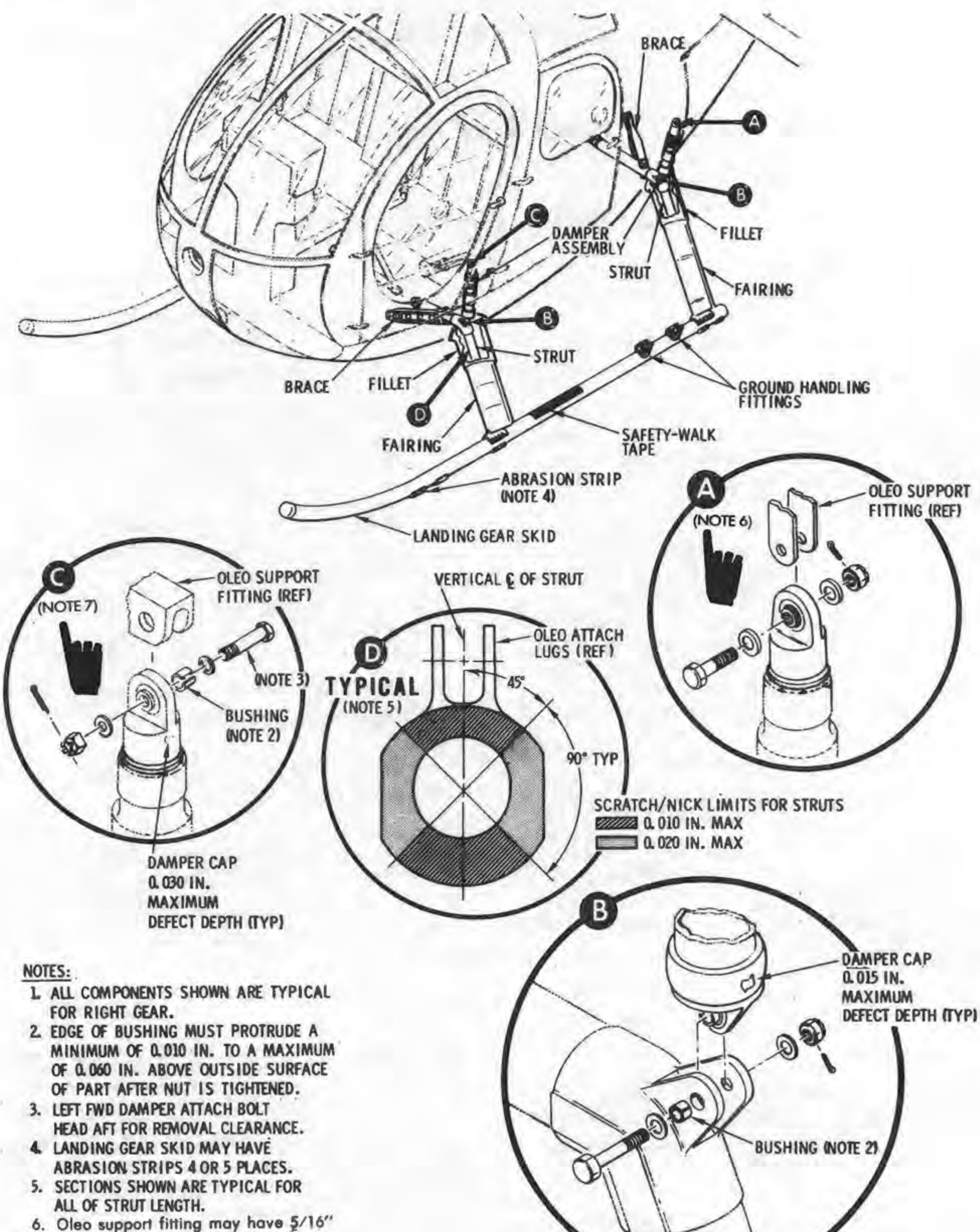
i. Repeat the sequence to remove the right landing gear.

3-4 Inspection — Landing Gear Assembly. (Refer to table 3-2.) Jack up the aircraft with the skid completely off the ground to perform the following inspection.

a. Inspect abrasion strips, struts, braces, and fairings for dents, cracks, loosened components or rivets, missing cotter pins, and loosened nuts. Repair or replace unserviceable parts.

NOTE

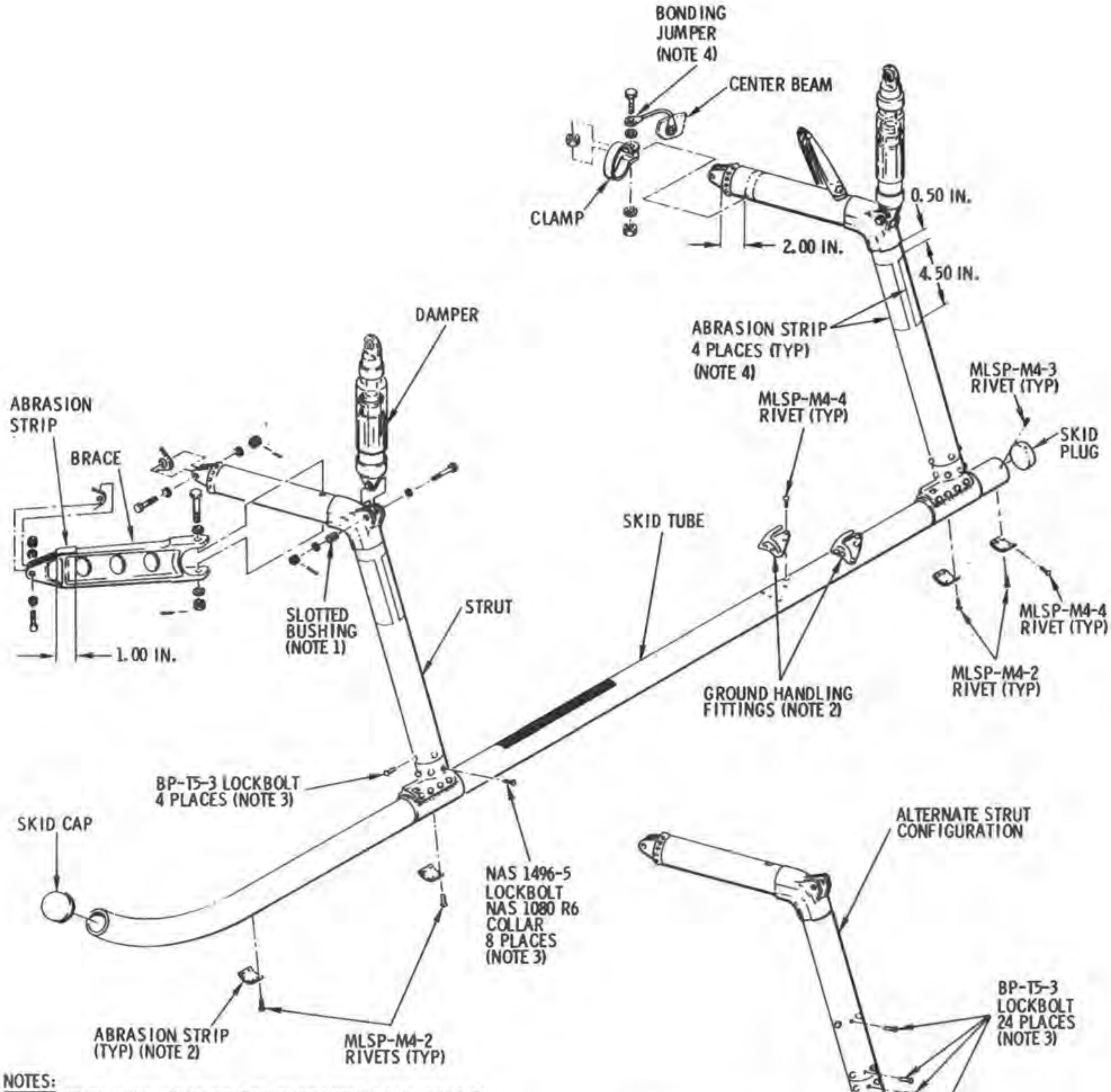
Abrasion strips with raised cobalt-barium inserts should not be mixed with smooth steel abrasion strips.



NOTES:

1. ALL COMPONENTS SHOWN ARE TYPICAL FOR RIGHT GEAR.
2. EDGE OF BUSHING MUST PROTRUDE A MINIMUM OF 0.010 IN. TO A MAXIMUM OF 0.060 IN. ABOVE OUTSIDE SURFACE OF PART AFTER NUT IS TIGHTENED.
3. LEFT FWD DAMPER ATTACH BOLT HEAD AFT FOR REMOVAL CLEARANCE.
4. LANDING GEAR SKID MAY HAVE ABRASION STRIPS 4 OR 5 PLACES.
5. SECTIONS SHOWN ARE TYPICAL FOR ALL OF STRUT LENGTH.
6. Oleo support fitting may have 5/16" dia. hole. Bushing both sides of fitting I.D. is authorized. Machine from 6061-T6 Aluminum Alloy WN-T-700/6.
7. Damper Cap P/N 369A6301 will use 1/4" dia. bolt without a bushing. Damper Cap P/N 369H6310 will use 1/4" dia. bolt with a bushing. Machine from 6061-T6 Aluminum Alloy WN-T-700/6.

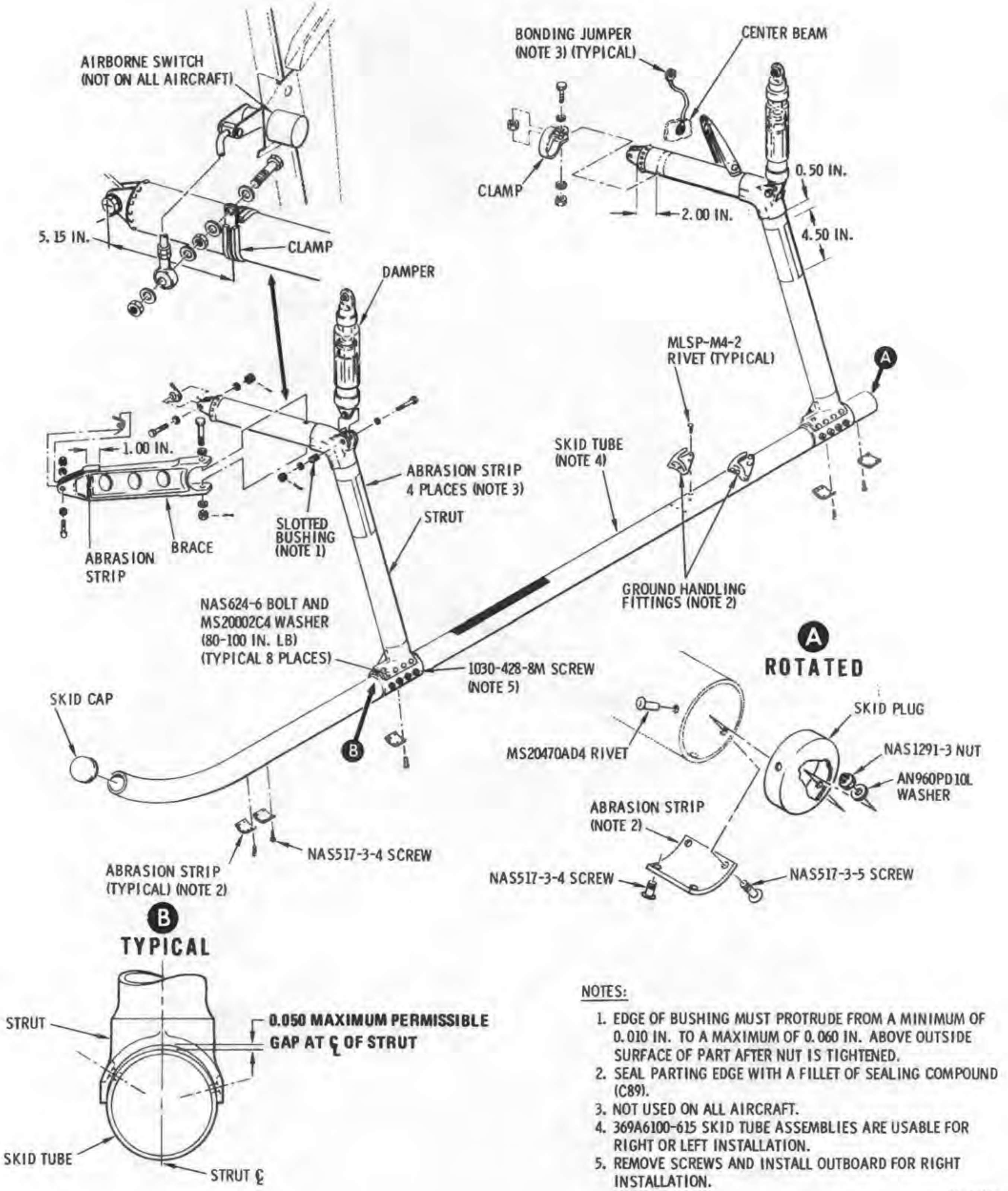
Figure 3-1. Landing Gear.



NOTES:
1. EDGE OF BUSHING MUST PROTRUDE FROM A MINIMUM OF 0.010 IN. TO A MAXIMUM OF 0.060 IN. ABOVE OUTSIDE SURFACE OF PART AFTER NUT IS TIGHTENED.
2. SEAL PARTING EDGE WITH A FILLET OF SEALING COMPOUND (C89).
3. INSTALL RIVETS WITH WET PRIMER (C79).
4. NOT USED ON ALL AIRCRAFT.
5. BP-T6-4 LOCKBOLTS MAY BE USED AS ALTERNATE IF REQUIRED BY TOLERANCE BUILDUP.
6. BP-T8 RIVETS ARE AUTHORIZED IN LIEU OF BP-T6 RIVETS FOR USE WITH MODEL 353 RIVET GUN AND NOSE ADAPTER 99-591.
7. JO-BOLTS PP200 OR PP260 MAY BE USED AS SUBSTITUTE FOR BP-T6 OR BP-T8 LOCKBOLTS.

12-041E

Figure 3-2. Landing Gear (Lockbolt-mounted skids) Repair and Replacement.



NOTES:

1. EDGE OF BUSHING MUST PROTRUDE FROM A MINIMUM OF 0.010 IN. TO A MAXIMUM OF 0.060 IN. ABOVE OUTSIDE SURFACE OF PART AFTER NUT IS TIGHTENED.
2. SEAL PARTING EDGE WITH A FILLET OF SEALING COMPOUND (C89).
3. NOT USED ON ALL AIRCRAFT.
4. 369A6100-615 SKID TUBE ASSEMBLIES ARE USABLE FOR RIGHT OR LEFT INSTALLATION.
5. REMOVE SCREWS AND INSTALL OUTBOARD FOR RIGHT INSTALLATION.

12-216D

Figure 3-3. Landing Gear (Machine bolt-mounted skids) Repair and Replacement.

b. Inspect skids for dents and depressions in excess of 0.200 inch in depth, and for punctures. Perform dye-penetrant inspection of areas adjacent to punctures according to TM 55-1500-204-25/1.

c. Inspect from the aft end of the skid tube to a point 10 inches forward of the aft strut for scratches and nicks that will exceed a length of 0.25 inch and a depth of 0.15 inch when repaired.

d. Inspect from the forward end of the skid tube to 10 inches forward of the aft strut for scratches and nicks that will exceed a length of 0.25 inch and a depth of 0.020 inch when repaired.

e. Inspect ground handling fittings for cracks, breaks, loose rivets and corrosion.

f. Inspect the four skid-to-foot and foot-to-strut attachments for loosened lockbolts and relative motion between connecting parts. If the inspection reveals that the lockbolts are loose, replace with original size (if holes are not elongated) or next larger size lockbolts.

g. Remove foot support fairings (chapter 2) and open engine access doors.

h. Inspect dampers for oil leakage. Hydraulic fluid leakage from any of the landing gear dampers is not permissible. When leakage is observed, the damper assembly must be replaced.

NOTE

It is normal for a thin hydraulic oil film to remain on the damper piston as a result of wiping contact with the piston seal. Newly installed dampers may also exhibit slight oil seepage caused by oil trapped in the end cap threads during damper assembly. Neither of these should be construed as damper leakage or cause for damper replacement.

i. Check dampers for proper extension (para 3-16), and general condition.

j. Reinstall foot support fairings and close engine access doors.

3-5. Maximum Damage Limits — Landing Gear Assembly. Refer to table 3-2 for landing gear component maximum damage limits.

3-6. Repair — Landing Gear Assembly. *a.* Repair scratches and nicks by smoothing sharp edges.

b. Drill (0.25 inch maximum) out dents, and nicks to the nearest mechanically expanded rivet size when such damage exceeds depth limits. Clean out puncture holes in the same manner. For damage exceeding 0.25-inch diameter refer to paragraph 3-13.

c. Apply zinc chromate putty (C83) to edges of drilled repair holes and install the appropriate size rivet to close the hole.

d. Replace unserviceable skid plug as follows:

(1) (See fig. 3-3.) Drill out rivets attaching skid plug. On aircraft with machine bolt-attached skids, drill out attaching rivets and remove attaching screws. Remove plug by drilling a hole in its center and using a suitable puller.

(2) Apply a thin layer of zinc chromate putty (C83) to the mating surfaces of the new plug and skid tube to ensure a watertight fit.

(3) Rivet new skid plug through aft abrasion strip to tube. (See fig. 3-2.) On aircraft with machine bolt-attached skids, secure skid plug with three rivets and two screws, washers, and nuts (fig. 3-3).

e. Replace a worn abrasion strip as follows:

(1) (See fig. 3-2 and 3-3.) Remove screws or drill out rivets (as appropriate) that attach abrasion strip and remove strip.

(2) Completely remove any zinc chromate putty residue. Apply zinc chromate primer (C79) to any bare metal.

(3) Coat new rivets with zinc chromate primer (C79). Install rivets or screws (as appropriate) to attach the replacement abrasion strip to the tube while primer is still wet. A maximum centerline gap of 0.100 inch is permissible on the aft edge of the forward abrasion strip. A maximum centerline gap of 0.030 inch is permissible on the forward edge of the forward strip and the forward edge and aft edges of the other strips.

(4) After mounting, seal all of the parting edge of the abrasion strip next to the skid tube. Apply an approximate 0.06-inch bead (fillet) of sealing compound (C89) to ensure a watertight assembly.

f. Replace a damaged skid cap as follows:

(1) (See fig. 3-2 and 3-3.) Remove skid cap.

(2) Using isopropyl alcohol (C82), clean bonding area.

(3) Bond new cap to skid tube with sealing compound (C89).

g. Replace an unserviceable ground handling fitting according to *e* above.

NOTE

As installed, the longitudinal centerline of the fitting hook should be approximately 45 degrees outboard from the centerline of the landing gear strut. Both fittings must be in line.

h. Replace worn non-slip, black safety walk tape

Table 3-2. Maximum Damage Limits for Landing Gear Components.

Component	Dents (inches)	Nicks (inches)	Scratches (inches)	Cracks (inches)	Holes (inches)
Skid tube (Note 1)	0.200	0.010, from aft side of aft strut to 10 in. forward of the strut, with cleanup not exceeding 0.015; 0.015 if forward of that point to start of curved section, with cleanup not exceeding 0.020 (Note 2)	(Same as for nicks)	No cracks allowed	0.250 (Note 3)
Strut	0.060	0.010/0.020 (see fig. 3-1)	0.010/0.20 (see fig. 3-1)	No cracks allowed	No holes allowed
Brace	0.040	0.010	0.005	No cracks allowed	No holes allowed
Damper assembly	0.060	0.010 (see fig. 3-1 for caps)	0.010 (see fig. 3-1 for caps)	No cracks allowed	No holes allowed
Ground handling fittings	0.010	0.010	0.010	No cracks allowed	No holes allowed

NOTES:

1. Damage exceeding these limits may be repaired by structural repair (para 3-13).
2. Repair of minor skid tube damage aft of the rear strut and on the forward (curved) section is not required but surface finish must be restored.
3. Hole must be plugged with correct size mechanically expanded rivet.

on top surface of skid tube when the tape grit is worn away. Install new tape as follows:

(1) Carefully pull or scrape away damaged tape. Remove all adhesive residue from skid tube by wiping with a cloth wetted by naptha (C70).

(2) Carefully align new tape with mounting surface and press firmly into place. Expel air bubbles while pressing down the tape.

(3) Touch up paint as required (TB 746-93-2).

i. Replace defective or badly damaged fairing (para 3-27).

j. Replace fairing fiberglass damage, such as small tears or punctures that do not impair the telescoping action of the fairing (refer to chapter 2).

3-7. Installation — Landing Gear Assembly. *a.* Gain access to landing gear at fuselage attachment points by opening or removing compartment access doors, engine access doors, and foot support fairings.

b. With aircraft supported by jacks, position left landing gear to align the struts with their openings in the fuselage structure.

NOTE

Ensure that the fairing fillet guide pins are engaged with the fairing guide holes before positioning the struts for attachment to the structure.

c. Lift and carefully position the left landing gear; then place supports beneath the gear to hold it in place.

d. Align lower bearings of dampers with mating holes in strut (fig. 3-2) and install bolt, slotted bushing, two washers, nuts, and cotter pins to secure each damper.

e. Align struts with mating bearings in fuselage support fittings and install bolt, two washers, nut, and cotter pin, to secure each strut.

f. Align inboard end of each brace with mating bearings in fuselage support fitting and install bolt, two washers, nuts, and cotter pin to secure. If applicable, install bonding jumper with clamp and attaching hardware.

CAUTION

Do not overtighten brace to strut hardware. Maximum permissible torque of nut is finger-tight, then backed off to nearest castellation for installation of cotter pin.

g. On series 3 aircraft, install airborne switch on landing gear strut. (Refer to TM 11-1520-214-20-1.)

h. Align outboard end of each brace with mating hole in strut and install bolt, two washers, nut, and cotter pin to secure each brace.

i. Repeat above steps to install the right landing gear.

j. Remove supports, lower aircraft, and remove jacks.

k. Close all access doors and install foot support fairings.

3-8. LANDING GEAR SKID AND STRUTS.

3-9. Description — Landing Gear Skid and Struts. The landing gear skids are constructed of tubular aluminum alloy. The skids are attached to the forward and aft struts by lockbolts or standard thread machine bolts. (See fig. 3-2 and 3-3.) The struts are aluminum alloy forgings. The abrasion strips on the machine bolt-attached strut are secured by screws. Machine bolt-attached skids are interchangeable between the right and left sides.

Table 3-3. Premaintenance Requirements for Removal and Installation of Skids.

Conditions	Requirements
Special Tools	(T40)
Minimum Personnel Required	Two; Three for Jacking
Consumable Materials	(C8) (C71) (C80)

3-10. Removal — Landing Gear Skid and Struts (AVIM). *a.* Jack up the aircraft until landing gear dampers are fully extended. Place supports beneath the skid tubes at the strut locations.

b. Remove fairings (para 3-27).

c. On aircraft with lockbolt-attached skids (fig. 3-2) remove lockbolts that attach skid to forward and aft struts. (Refer to TM 55-1500-204-25/1 for lockbolt replacement.) On aircraft with machine bolt-attached skids (fig. 3-3) remove bolts and washers that attach skid tube to forward and aft struts.

3-11. Repair — Landing Gear Skid and Struts (AVIM). *a.* Repair scratches and nicks by smoothing sharp edges.

b. Repair bolt holes in strut fittings, either inboard or outboard, as follows:

(1) Enlarge the bolt hole to a size U drill diameter.

(2) Ream the drilled hole to a diameter of 0.375-0.376 inch. Chamfer both ends of hole to 0.015 inch by 45 degrees.

(3) Check that edge distance is not less than 0.375 inch.

(4) Insert a NAS75-4 press-fit bushing of correct length coated with wet zinc chromate primer (C79).

(5) Inspect reworked hole and bushing by using dye-penetrant.

c. Repair bolt holes that exceed 0.440 inch in diameter at large end of brace attached to strut as follows:

(1) Enlarge the bolt holes to a diameter of 0.5625 inch using a 9/16 inch drill.

(2) Ream the drilled hole to a diameter of 0.5631 to 0.5638 inch. Chamfer both ends of hole to 0.015 inch by 45 degrees.

(3) Check that edge distance is not less than 0.375 inch.

(4) Insert a NAS75-7 press-fit bushing of correct length coated with wet zinc chromate primer (C79).

(5) Inspect reworked holes after bushings are installed by using fluorescent penetrant.

d. Repair the bolt holes located at the small end of the brace that attaches to the landing gear attach fitting as described in *b* above.

e. Replace any strut that is cracked.

f. Replace struts that have brace attaching bolt holes exceeding 0.440 inch in diameter.

g. Replace struts that are dented or scratched beyond the allowable limits of table 3-2.

h. Repair strut scratches and dents that do not exceed limits by sanding the affected area to blend smoothly with surrounding surface area, then treat exposed surface with chemical film (C20). Scratch areas caused by rubbing of fairing guides may be further protected by placing 0.50 inch by 4.50 inch strips (maximum of four per side) of tape (C101) vertically on wear points.

3-12. Installation — Landing Gear Skid and Struts (AVIM). If machine bolt-attached skids are to be used with the lockbolt style struts, perform *e* through *m* following to enlarge the strut holes. When bolt style strut is to be used with lockbolt style skid, use 0.250-inch lockbolts with a washer to protect counterbore surface on strut foot.

a. Completely remove any zinc chromate putty residue from strut.

b. Apply a thin coating of zinc chromate primer (C79) to strut and skid tube mating surfaces.

c. Align mating parts and install lockbolts (fig. 3-2) with zinc chromate primer (C79), or secure with machine bolts and washers (fig. 3-3).

d. Seal edges of landing gear strut foot with 0.06-inch fillet of sealing compound (C89). Seal the two unused holes on the top of each strut foot (if present) with silicone rubber (C13).

e. To enlarge strut foot mounting holes for machine bolt-attached skids, place the -1 detail of drilling jig (T10) on the left strut forward foot. Use the small diameter alignment pin to locate the existing lockbolt hole.

f. Clamp the tool to strut with "C" clamps in three places.

g. Insert the drill bushing in the jig and drill a 0.250-inch hole in the strut by using a flat end (bottom) drill (size F). Install the large diameter alignment pin in the drilled hole. Use the bushing and drill the remaining holes.

h. Remove drill jig from strut. Deburr drilled holes.

i. Enlarge counterbore of mounting holes on face of to 0.687-inch diameter, flush with or 0.020 inch above original depth (0.090-inch minimum thickness remaining). Maintain the 0.030- to 0.060-inch corner radius.

j. Apply chemical film protection on exposed aluminum surfaces (chapter 1).

k. Repeat *e* through *j* above for left aft strut foot.

l. Perform *e* through *k* above using the -2 detail drilling jig for the right struts as necessary.

m. Perform *b* through *d* above for mounting skid tube assemblies.

3-13. Structural Repair — Skid Tube (AVIM). Dents, scratches, nicks, cracks and holes exceeding the normal limits described in table 3-2 may be repaired by splice plate or insertion repair. (See fig. 3-4.) Final determination of the type of repair to be made must be decided by the repair facility.

3-14. Splice Plate Repair — Skid Tube (AVIM). Splice plate repairs are suitable for dents, nicks, cracks and single penetrations requiring 30% or less metal removal from tube diameter. Plate overlap must meet minimums shown in figure 3-4.

3-15. Insertion Repair — Skid Tube (AVIM). Multiple penetrations and damage are not reparable by splice plate. Insertion repair must meet minimums shown in figure 3-4.

3-16. LANDING GEAR DAMPER ASSEMBLIES.

3-17. Description — Landing Gear Damper Assemblies. The landing gear damper assemblies are hydraulic units charged with nitrogen. The dampers must be replaced if damage or loss of pneumatic pressure (nitrogen gas) or hydraulic oil occurs. The forward damper assemblies are attached to the oleo attachment fittings located on the outboard side of the pilot's seat structure. The aft damper assemblies are attached to the lower section oleo support fittings in the engine compartment. The damper assemblies are approximately 12.21 inches long when extended and 8.96 inches long when compressed. There are two basic types of landing gear dampers which can be installed on the helicopter: (1) A 369A6300 series bladder-type damper assembly consisting of a barrel, upper and lower mounting cap, and internal rubber bladder, and a piston; or (2) a 369A6350 poppet-type damper assembly consisting of a barrel, upper and lower mounting cap, main poppet, rebound poppet and a piston. The two damper types are interchangeable individually or in sets of four.

NOTE

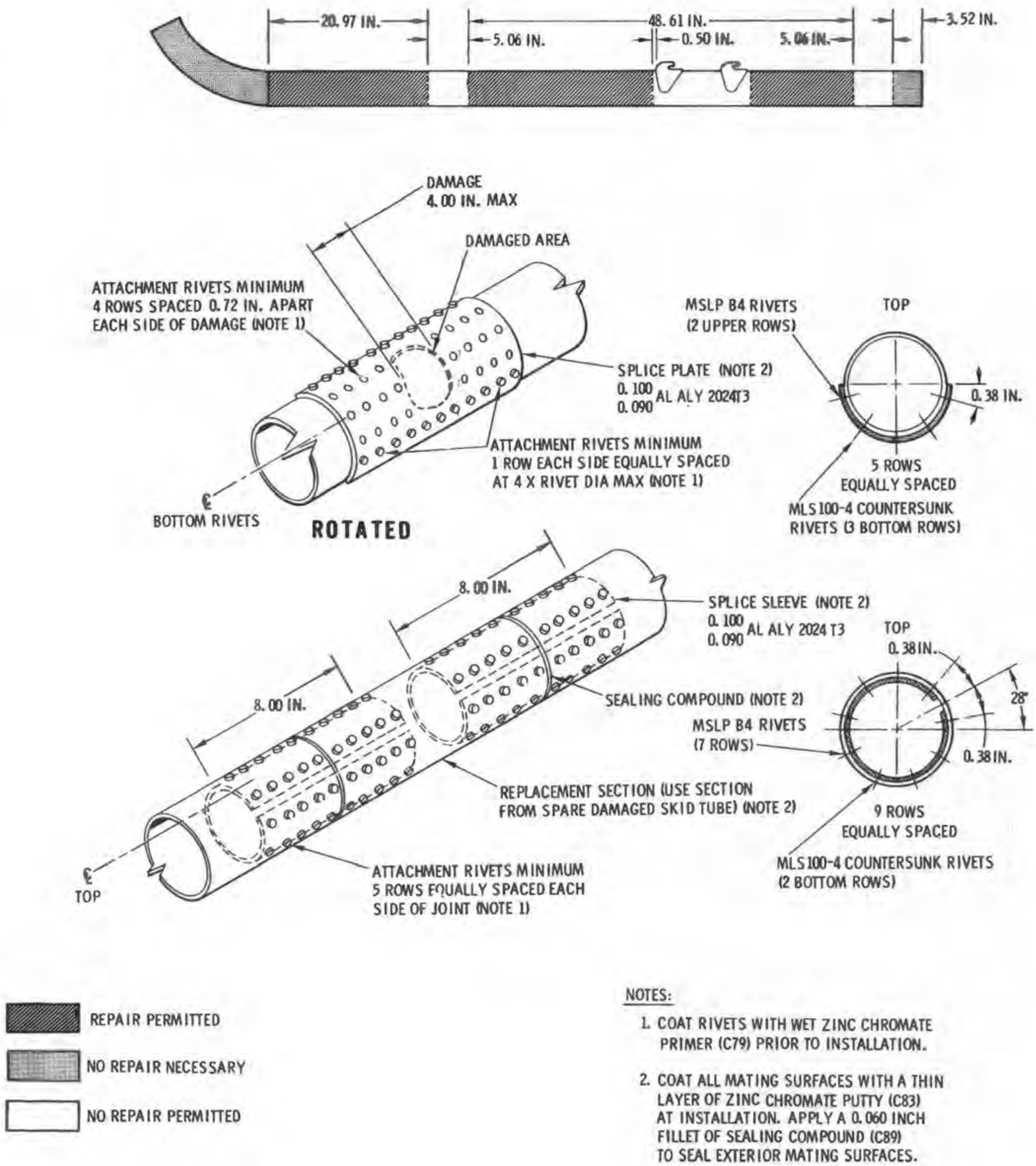
Dampers may be visually identified as follows: (1) Bladder-type (369A6300 series) damper barrels are less than 2 inches in diameter and have a transparent plastic cover; (2) poppet-type (369A6350) damper barrels are more than 2 inches in diameter and do not have a cover. (See fig. 3-5.)

3-18. Inspection — Landing Gear Damper Assemblies. Inspect forward and aft landing gear dampers as follows:

NOTE

Hoist or jack the aircraft completely off the ground prior to steps a through c below.

a. Inspect dampers for evidence of bearing looseness, defects in upper and lower caps (details B and C, fig. 3-1), loose or cracked caps security of attaching hardware, dents, scratches or cracks (table 3-2), and condition of transparent damper covers, if installed.



NOTES:

1. COAT RIVETS WITH WET ZINC CHROMATE PRIMER (C79) PRIOR TO INSTALLATION.

2. COAT ALL MATING SURFACES WITH A THIN LAYER OF ZINC CHROMATE PUTTY (C83) AT INSTALLATION. APPLY A 0.060 INCH FILLET OF SEALING COMPOUND (C89) TO SEAL EXTERIOR MATING SURFACES.

12-296C

Figure 3-4. Skid Tube Structural Repair.

b. Inspect dampers for oil leakage (para 3-3).

WARNING

Internal failure of the bladder-type damper can result in a sudden release of pressure and explosion of the bladder.

c. Inspect for damper internal failure by checking for clearance between the bottom of the landing gear strut and the fuselage and measuring the length of the extended damper. If the rear strut is touching the fuselage, or if the length of the damper, measured between the end cap flat surfaces, is 11.25 inches (12.25 inches between bolt centers) or more it must be replaced (para 3-20).

d. Perform a damper extension check, (para 3-19).

Table 3-4. Premaintenance Requirements for Damper Extension Check.

Conditions	Requirements
Support Equipment	Hoist
Minimum Personnel Required	Two

3-19. Damper Extension Check — Landing Gear Damper Assemblies.

CAUTION

A flashlight and inspection mirror should be used during the following checks to eliminate parallax errors; the damper reference points must be viewed at right angles to the damper axis.

a. Perform a quick check inspection of the dampers as directed in table 3-5. If this inspection reveals that one of the dampers is compressed to less than the minimum dimensions specified in table 3-5 and illustrated in figure 3-5, perform the comprehensive check as specified in the table. In each case, damper checks should be repeated after slight upward and downward rocking of the tailboom to ensure that the landing gear is free from any other friction or sideloads.

NOTE

If bladder-type dampers do not have painted color bands as shown in figure 3-5, equivalent red and yellow bands or reference markings shall be applied to the transparent damper covers as shown in figure 3-6. The green band located

Table 3-5. Damper Extension Check.

Damper Location	Bladder-Type (fig. 3-5)	Poppet-Type (fig. 3-5)
QUICK CHECK: (Notes 1, 2)		
Aft Damper	0.25 in. at location A	None required
Forward Damper	0.50 in. at location A	None required
COMPREHENSIVE CHECK: (Notes 1, 3)		
Aft Damper	At location B, lower edge of red band above upper edge of green band	Less than 1.54 in. at location D
Forward Damper	At location C, lower edge of yellow band above upper edge of green band	Less than 1.96 in. at location D

NOTES:

1. Condition checks are valid only when ambient temperature and aircraft systems are at 25°F (-4°C) or higher.
2. Aircraft condition for quick check:
   a. Aircraft empty, fuel tanks full.
   b. Skid runners resting on level surface.
3. Aircraft condition for comprehensive check:
   a. Aircraft resting on greased steel plates.
   b. Aircraft empty, fuel tanks full (gross weight 1630 ±100 lb).
   c. Approximate center of gravity 104.7 inches.

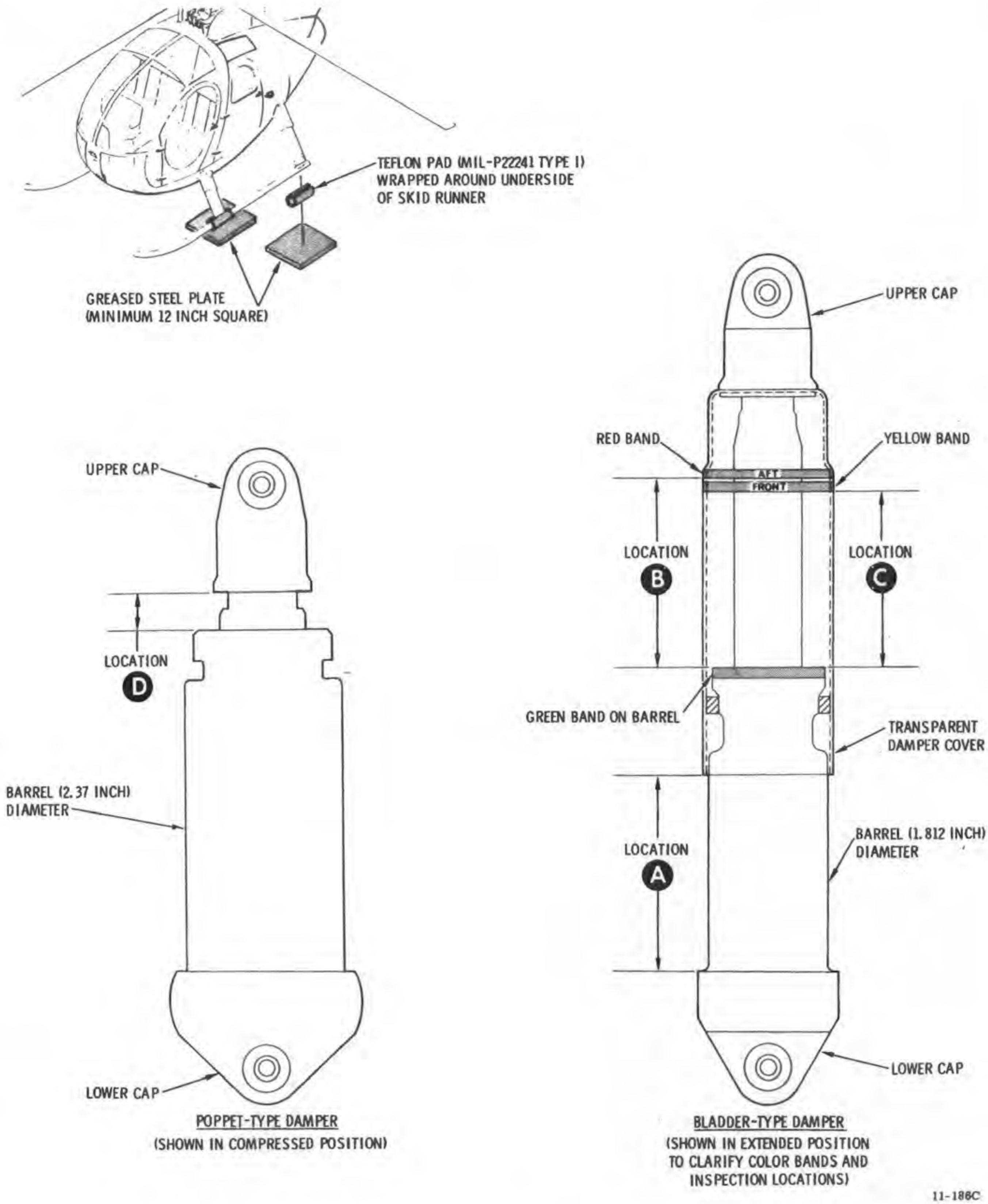


Figure 3-5. Landing Gear Damper Inspection Methods.

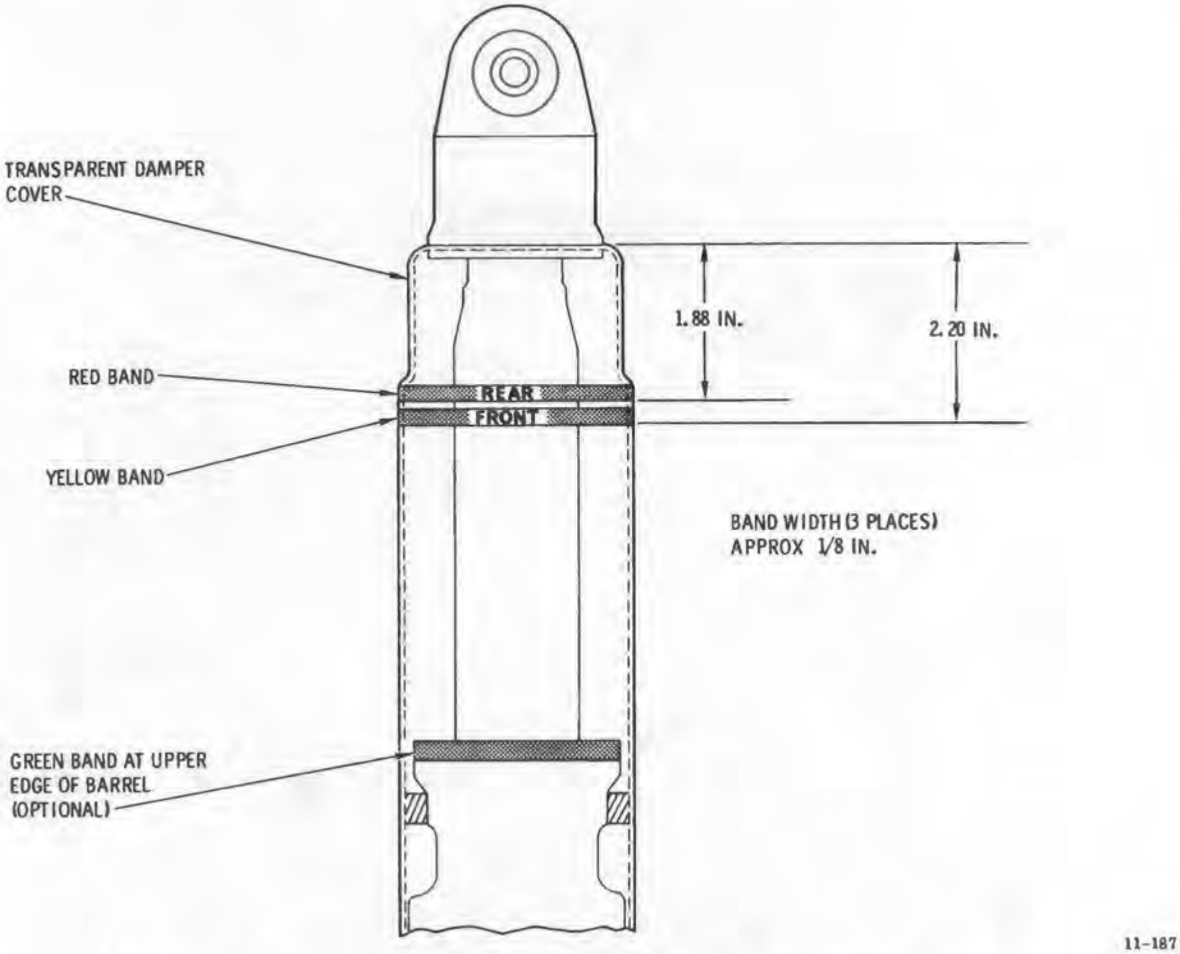


Figure 3-6. Landing Gear Damper (Bladder-type) Reference Markings.

around the upper edge of the damper barrel is an optional convenience. The upper corner of the barrel is equivalent to the upper edge of the green band.

b. If any bladder-type damper is compressed to less than the limits specified in table 3-5, it is an indication that the damper has lost part of its nitrogen charge or hydraulic oil and the damper must be replaced.

NOTE

The checks outlined in table 3-5 are only valid for the conditions stated. Failure to place the aircraft on greased plates or deviation from the specified aircraft weight, temperature and center of gravity conditions will produce inaccurate and misleading results.

3-20. Damper Removal and Installation — Landing Gear Damper Assemblies.

Table 3-6. Premaintenance Requirements for Damper Removal and Installation.

Conditions	Requirements
Support Equipment	Hoist or Jacks
Minimum Personnel Required	Two; Three for Jacking

3-21. Preparation for Damper Removal — Landing Gear Damper Assemblies.

WARNING

Check that all electrical power is OFF. This precaution will prevent personal injury or aircraft damage which could result from body or tool contact with electrical terminals.

CAUTION

Make certain the aircraft is jacked evenly in a level area so that jacks cannot slip and damage the aircraft structure.

a. Jack the aircraft until the landing gear skids just clear the ground.

b. Remove foot support fairings (chapter 2) for forward damper access or open engine compartment doors for aft dampers.

WARNING

Use extreme care during bladder-type damper removal if the damper is extended beyond 11.25 inches between the flat surfaces of both end caps (12.25 inches, bolt center to bolt center). This condition indicates an internal failure of the damper that will result in a sudden release of internal pressure and explosion of the bladder. Before the damper is released from the fuselage fittings the internal pressure must be relieved, *c* below.

c. Dampers which show evidence of, or are suspected of, internal failure must have the pressure relieved (1) through (3) below before removal.

(1) Remove any electronic equipment in the immediate area of the damaged damper. Cover all electrical connections with plastic material.

(2) Wrap the damaged damper with 1-inch-thick polyfoam (or material of equivalent absorption property) to minimize spraying of hydraulic oil.

WARNING

Protective glasses and heavy gloves must be worn when drilling the pressure relief hole in the damaged damper. The spray of hydraulic oil under pressure can result in injury to personnel.

(3) Drill a 0.059-inch hole (size 53 drill) in the body of the damper. Keep the drill bit in the hole until the hydraulic oil stops flowing.

3-22. Removal — Forward Damper. *a.* Prepare for forward damper removal according to paragraph 3-21. Observe applicable warnings and caution.

b. Remove hardware that attaches forward damper assemblies to fuselage fittings and landing gear struts.

3-23. Removal — Aft Damper. *a.* Prepare for aft damper removal according to paragraph 3-21. Observe applicable warnings and caution.

b. Remove hardware that attaches aft damper to fuselage fittings and landing gear struts.

3-24. Replacement — Bladder-type Damper Plastic Cover.

NOTE

When replacing a damper assembly plastic cover, only the upper end of the damper must be detached.

a. Remove plastic tape used to compress cover tangs.

b. Carefully but firmly press cover toward top end to disengage tangs from bearing cap groove.

c. Install a replacement by reversing the procedure.

d. Secure the cover tangs in place by wrapping several turns of tape (C100) around tanged end of cover.

3-24A. Repair — Poppet-Type Landing Gear Damper (AVIM).

CAUTION

These repair instructions are applicable to poppet-type dampers only. Do not attempt to use these instructions for any other type landing gear damper.

a. Paragraphs 3-24A through 3-24J give the approved methods for both major and minor repairs of the poppet- type landing gear damper.

b. Tools to be locally fabricated are described and illustrated in figure 3-6A. Use of these fabricated tools is shown in figure 3-6B.

c. Consumable maintenance supplies and materials required for damper repair are listed in table 1-1.

3-24B. Disassembly — Poppet-Type Landing Gear Damper (AVIM). Proceed as follows to bleed off gas pressure and disassemble damper. (See figure 3-6C.)

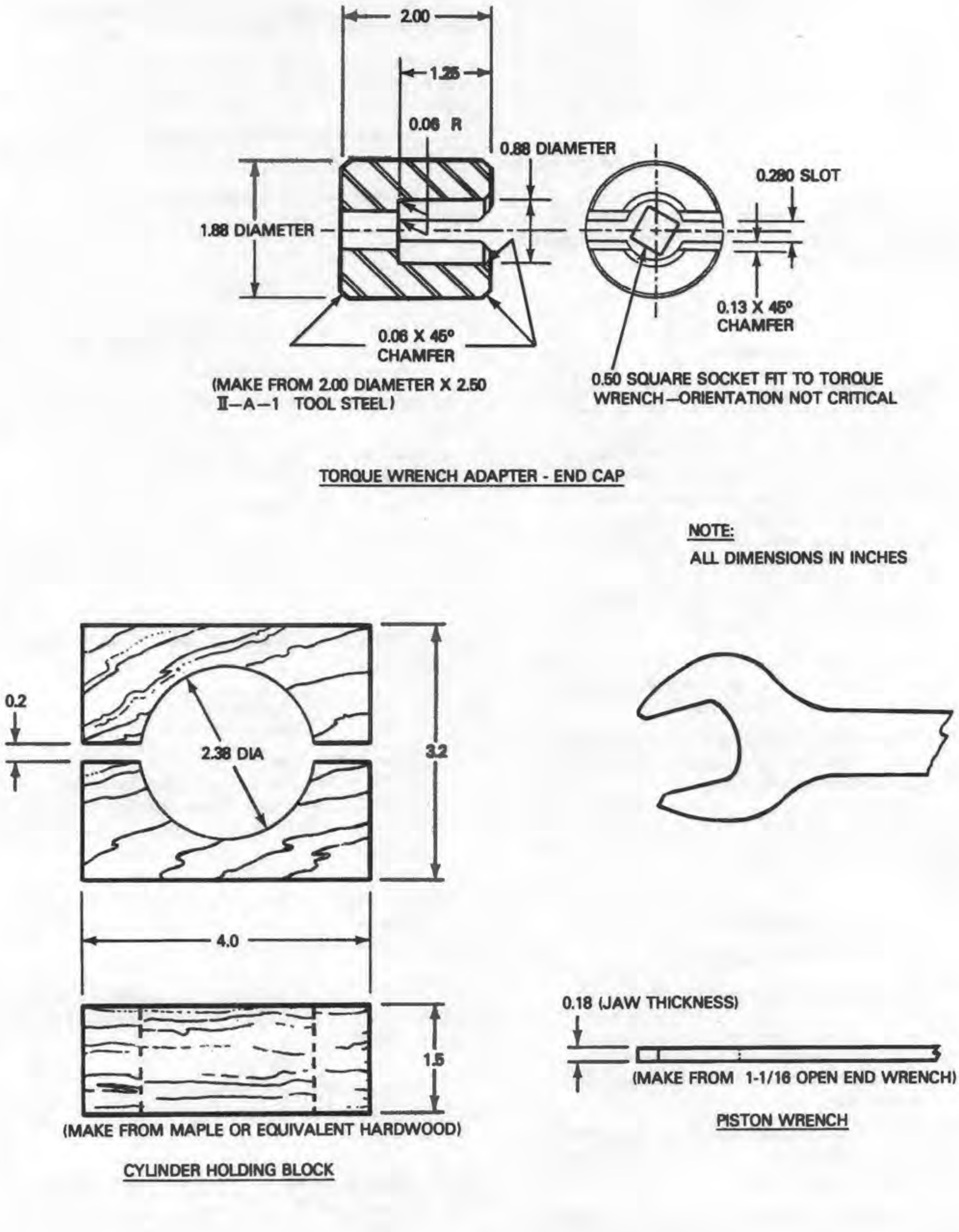


Figure 3-6A. Locally Fabricated Tools

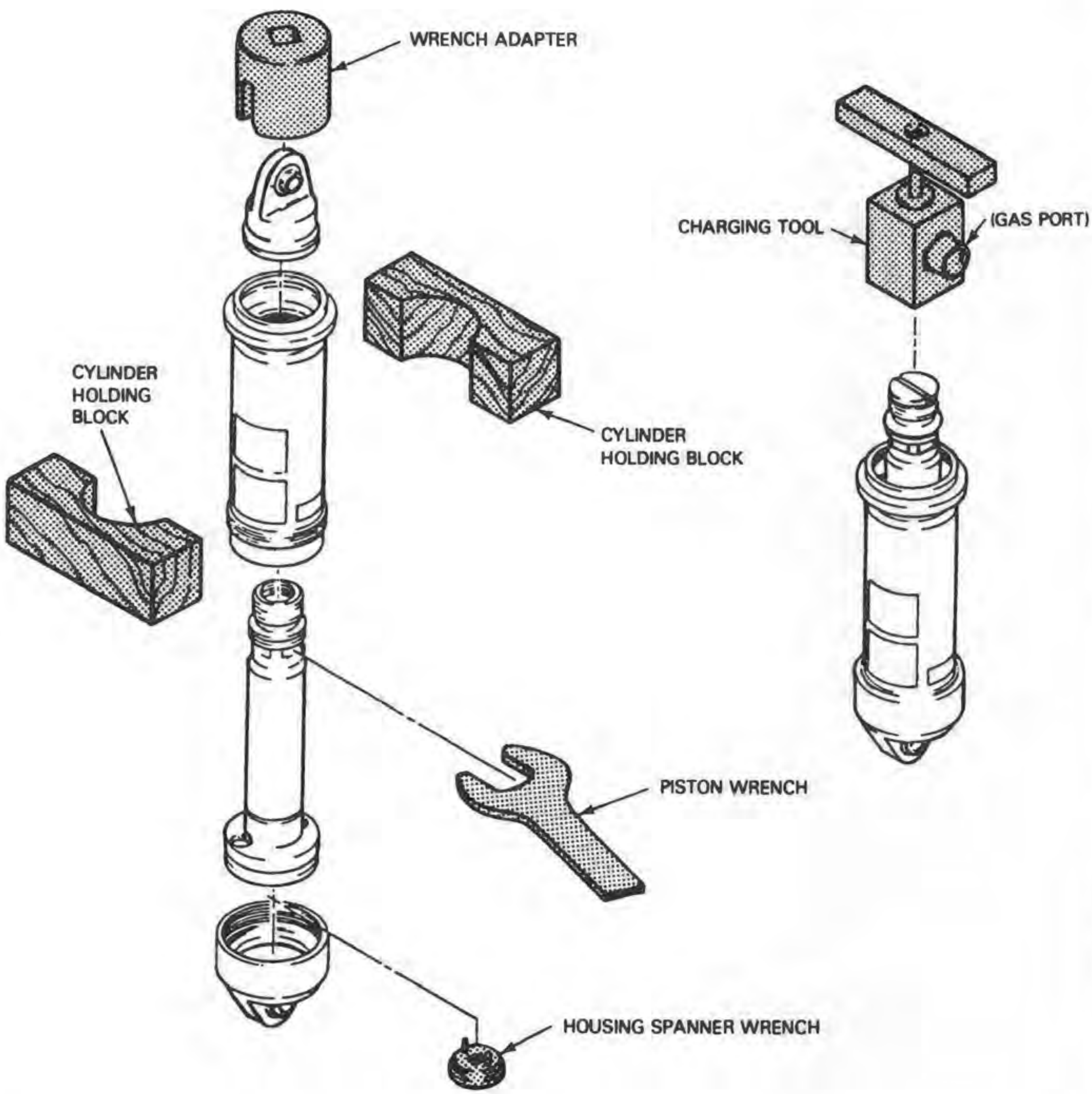


Figure 3-6B. Use of Locally Fabricated Tools

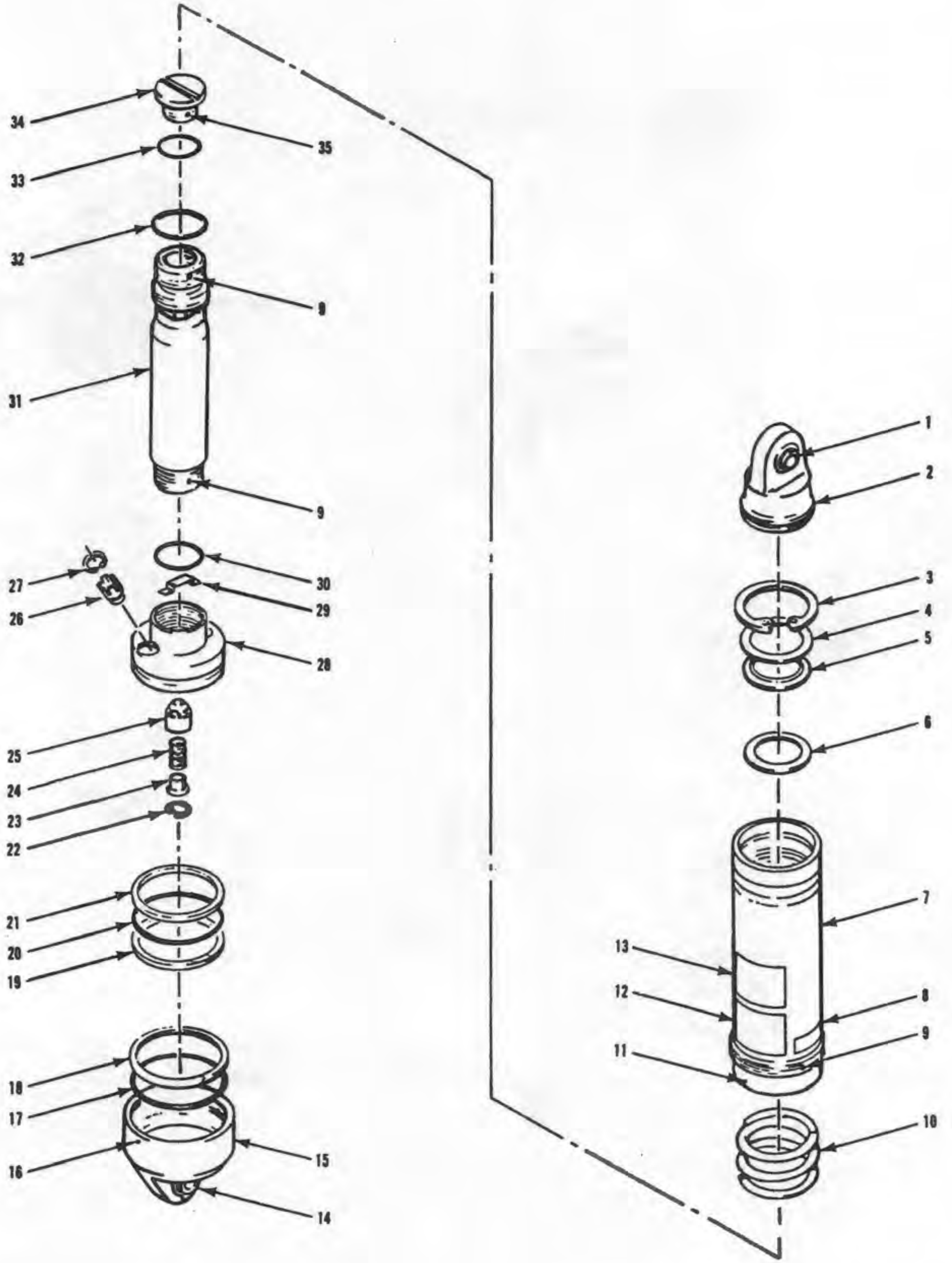
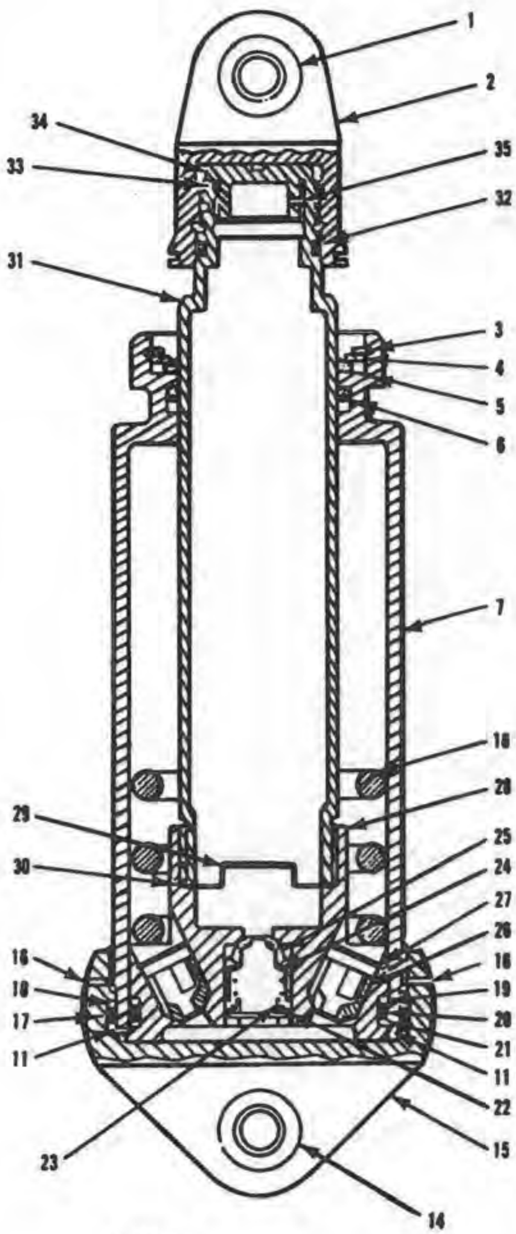


Figure 3-6C. Poppet-Type Damper Assembly - Exploded and Section Views (Sheet 1 of 2)

1. Upper Cap Bearing
2. Upper Cap Assembly
3. Retaining Ring
4. Washer
5. Scraper Ring
6. Seal
7. Barrel
8. Caution Decal
9. Nylok Insert
10. Rebound Spring
11. Pressurization Holes
12. Warning Plate
13. Serial Number Plate
14. Lower Cap Bearing
15. Lower Cap Assembly
16. Drain Holes
17. Preformed Packing
18. Backup Ring
19. Backup Ring
20. Preformed Packing
21. Backup Ring
22. Retaining Ring
23. Spring Retainer
24. Poppet Spring
25. Main Poppet
26. Rebound Poppet
27. Retaining Ring
28. Piston Housing
29. Baffle
30. Preformed Packing
31. Piston
32. Preformed Packing
33. Preformed Packing
34. Piston Plug
35. Charging Port



NOTE:
DAMPER ASSEMBLY SHOWN COMPRESSED

Figure 3-6C. Poppet-Type Damper Assembly - Exploded and Section Views (Sheet 2 of 2)

WARNING

A charged landing gear damper is under high gas pressure and must be treated cautiously or bodily injury may result. Before proceeding with damper disassembly, read the following instructions carefully and completely. Do not deviate from any procedures contained herein. A transparent face shield or safety eyeglasses must be worn during steps *a* through *f* below.

a. Place damper in a cylinder holding block; then place block in a vise with damper in a vertical position, with upper cap assembly (2) facing upward.

b. Engage wrench flats on piston (31) with a piston wrench. Place a wrench adapter on upper cap assembly (2) and slowly unscrew and remove cap assembly. It is possible for gas pressure to escape at this time if preformed packing (33) seal has been damaged. Do not remove preformed packing (32) from piston at this time.

c. Thread a charging tool onto exposed piston threads and tighten securely. Install a short length of hose between charging tool gas port and waste container for drained hydraulic fluid. Secure the end of the hose to waste container to prevent whipping when gas pressure is released.

d. Engage T-handle of charging tool with slot in head of plug (34) by pressing downward on T-handle and rotating until it engages plug slot.

e. Very slowly loosen plug until internal gas pressure begins to escape through the drain hose. Do not loosen plug too fast; escaping gas can cause hose to whip about.

f. After all gas is discharged, remove the charging tool and drain hose.

g. Remove damper assembly from vise and cylinder holding block. Unthread plug (34) and preformed packing (33) and drain hydraulic fluid into waste container by inverting the damper.

h. Replace damper assembly in cylinder holding block and clamp block in vise with open end of piston (31) facing downward.

i. Using the wrench adapter, loosen and remove lower cap assembly (15) from barrel (7). Invert damper assembly over waste container and allow it to drain.

j. While still over the waste container, carefully push out piston (31) and attached parts, taking care not to allow rebound spring (10) to drop.

k. Using a housing spanner wrench and piston wrench, loosen and unthread housing (28) and its attached parts from the piston (31).

CAUTION

Do not remove poppets and related parts (22 through 27) until directed to do so. Poppets must be removed one at a time during inspection procedure.

l. Remove packing (30) and baffle (29) from housing (28).

m. Remove two backup rings (19 and 21) and preformed packing (20) from groove in the housing.

n. Remove backup ring (18) and preformed packing (17) from groove in the lower cap assembly (15) and piston preformed packing (32) from piston.

o. Remove retaining ring (3), washer (4), and scraper ring (5) from barrel (7).

p. Remove seal (6) from groove inside mouth of barrel (7).

NOTE

Poppets and related parts (22 through 27) will be removed as part of inspection procedure. Bearings (1 and 14) and decals (8, 12 and 13) should not be removed or detached unless replacement is necessary.

q. Discard seal (6), scraper ring (5), packing backup rings (18, 19 and 21) and preformed packings (17, 20, 30, 32, and 33). Clean and inspect remaining parts as described in the following paragraphs.

3-24C. Cleaning — Poppet-Type Landing Gear Damper (AVIM).

WARNING

Most cleaning solvents are flammable and must be kept away from heat or open flame. Avoid extended inhalation of fumes or contact with skin.

a. Clean upper and lower end cap assemblies with solvent (C94) or naptha (C70). Do not submerge end caps (with bearings installed) in solvent.

b. Submerge remaining parts in solvent or naptha.

c. Use bristle brush to dislodge any stubborn residue, paying particular attention to packing grooves and threaded areas.

d. Wrap cleaned parts to prevent contamination between work operations.

3-24D. Visual and Dimensional Inspection — Poppet-Type Landing Gear Damper (AVIM). Perform a visual and dimensional inspection of damper parts according to table 3-7. In addition to inspection requirements of table 3-7, perform detailed inspection as outlined in the following procedures.

a. Inspect piston housing (28, figure 3-6C) for scratches, paying particular attention to the packing groove surfaces. Scratches may be polished out with crocus cloth (C25). Carefully clean housing and poppets to remove all traces of abrasive material after rework.

b. Perform the following steps to inspect and repair poppets and poppet seats.

(1) Remove retaining ring (22), spring retainer (23), poppet spring (24), and main poppet (25) from housing (28).

(2) Inspect seating surfaces of poppet and housing; there should be a full, uninterrupted 360-degree seat on each part. If seat surfaces are satisfactory, assemble poppet, spring, retainer and retaining ring before removing the remaining poppets (step (4) below).

CAUTION

When lapping poppets, take care not to permit lapping compound to wash or flow into other (assembled) poppets.

(3) If seat surfaces are not satisfactory, reseat defective poppet seats by light and careful lapping with good commercial grade 220 grit lapping compound until poppet makes a full 360-degree contact with the seat. Avoid excessive lapping and take care not to allow lapping compound to get onto sides of the poppet. When lapping is completed, wash housing and poppet with solvent (C94) or naptha (C70) and dry with compressed air. Coat poppet and seat with hydraulic fluid (C48 or C76) and install poppet and its attaching parts.

NOTE

When installing main poppet (25), install retaining ring (22) with flat side down.

(4) Remove only one retaining ring (27) and rebound poppet (26) at a time and inspect seat surfaces as described in step (2) above. If necessary, reseat poppet as outlined in step (3) above.

NOTE

When installing rebound poppet, install retaining ring (27) with flat side down.

(5) If both rebound poppets are removed and lapped, they should be marked so that each poppet can be assembled with its respective seat.

3-24E. Minor Repair — Poppet-Type Landing Gear Damper (AVIM). Repair of landing gear damper is limited to removing minor corrosion, nicks, burrs, and scratches from component parts and assemblies, lapping poppet valves and restoration of slightly damaged threads and surface finish on specific parts.

NOTE

Parts replacement is limited to the installation of serviceable or repaired parts as defined in TM 55-1520-214-23P.

a. Replace backup rings (18, 19 and 21, figure 3-6C), preformed packings (17, 20, 30, 32, and 33), scraper ring (5), seal (6), and decal (8).

b. Replace all other parts which cannot be restored to serviceable condition within limitations outlined in table 3-7 and paragraphs 3-24D and 3-24E *c.* With the exception of bearing replacement in end cap assemblies, replace unserviceable parts according to disassembly and assembly procedures (paragraph 3-24B and 3-24F).

c. Replace upper and lower cap bearings as follows:

(1) Using an arbor press and adapter, remove bearing from cap by pressing on bearing outer race.

(2) Remove any burrs or staking marks from removal side of cap bore edge.

(3) Coat outer race of replacement bearing and cap bearing bore with zinc chromate primer (C79).

NOTE

Install bearing in removal side of cap.

Table 3-7. Detailed Inspection After Cleaning

Inspect	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
NOTE: All inspections are visual inspections unless otherwise indicated. For items listed in inspect column, see figure 3-6C. After honing, lapping or abrasion polishing, clean parts.			
a. Bearing (1 and 14)			
(1) Looseness or roughness between bearing races (feel)	None allowed	Not repairable	Replace bearing.
(2) Rust, corrosion or binding	None allowed	Not repairable	Replace bearing.
b. Piston (31)			
(1) Nicks, scratches, cuts, and surface wear	None allowed	Light scratches to 0.010 inch depth may be reworked	Polish with crocus cloth (C25).
(2) Worn OD	OD: 1.308 to 1.310 in.	Not repairable	Replace piston.
(3) Damaged threads	None allowed	Minor damage	Rethread with same size tap and die.
c. Damper barrel (7)			
(1) Worn ID of bore	ID: 2.180 to 2.182 in.	Not repairable	Replace barrel.
(2) Light scratches in barrel bore	None allowed	Light scratches to 0.010 inch depth may be reworked	Remove scratches by light honing.
(3) Exterior corrosion, scratches	None allowed	Light scratches may be removed	Polish with crocus cloth (C25).
(4) Damaged threads	None allowed	Minor thread damage	Rethread with same size die.
d. Upper cap assembly (2)			
(1) Scratches, pits, cracks and gouges	None allowed	Shallow defects may be removed	Polish with crocus cloth (C25).
(2) Worn or scratched surface anodizing	None allowed		Treat with chemical film (C20) and zinc chromate primer (C79)

Table 3-7. Detailed Inspection After Cleaning (cont)

Inspect	Maximum Serviceable Limits	Maximum Repairable Limits	Corrective Action
(3) Worn bearing bore bearing loose	None allowed	Not repairable	Replace cap assembly.
e. Lower cap assembly (15)			
(1) Scratches, pits, cracks and gouges	None allowed	Shallow defects may be removed	Polish with crocus cloth (C25).
(2) Worn or scratched surface anodizing	None allowed		Treat with chemical film (C20) and zinc chromate primer (C79).
f. Poppet housing for nicks, scratches	None allowed	Shallow defects may be removed	Polish with crocus cloth (C25).
g. Main poppet (25) and rebound poppets (26) for proper seat	360° contact with seat	Light lapping allowed	See paragraph 3-24Db(3).
h. Rotational drag between:			
(1) Piston (31) and upper cap assembly(2) (2) Piston (31) and piston plug (34) (3) Piston (31) and housing (28) (4) Barrel (7) and lower cap assembly (15)	Nylon pellets in piston and barrel threads must create enough rotational drag to prevent hand tightening of mating parts	Not repairable	Replace defective part.

(4) While zinc chromate primer is still wet, use an arbor press and adapter and press bearing into cap bore. Replacement bearing MUST be installed flush to 0.005- inch below staking surface. Do not press against bearing inner race.

(5) Before staking, check that bearing cannot be pressed from cap bore using hand pressure.

(6) Stake bearing in four places radially around cap. Stake depressions MUST be approximately 1/4-inch long, 0.06-inch from edge of bore and 0.020-inch deep.

(7) Test bearing installation by applying a 100-pound force on bearing outer race to load bearing against new stakes. Outer race must not move.

d. Minor repair of lower cap assembly. Two drain holes (16, figure 3-6C) may be drilled just below cap-to-barrel threads. Holes provide drainage for any residual oil trapped in mating threads during the damper repair process. Drill and deburr drain holes as shown in figure 3-6D. No reidentification of component, after this repair, is required.

e. Minor repair of barrel assembly. Two seal pressurization holes (11) may be drilled at base of damper barrel. Holes provide internal pressurization of preformed packing (17) to improve sealing capability. Drill and deburr pressurization holes as shown in figure 3-6D. No reidentification of component, after this repair, is required.

3-24F. Assembly - Poppet-Type Landing Gear Damper (AVIM). Assemble the landing gear damper assembly as follows:

NOTE

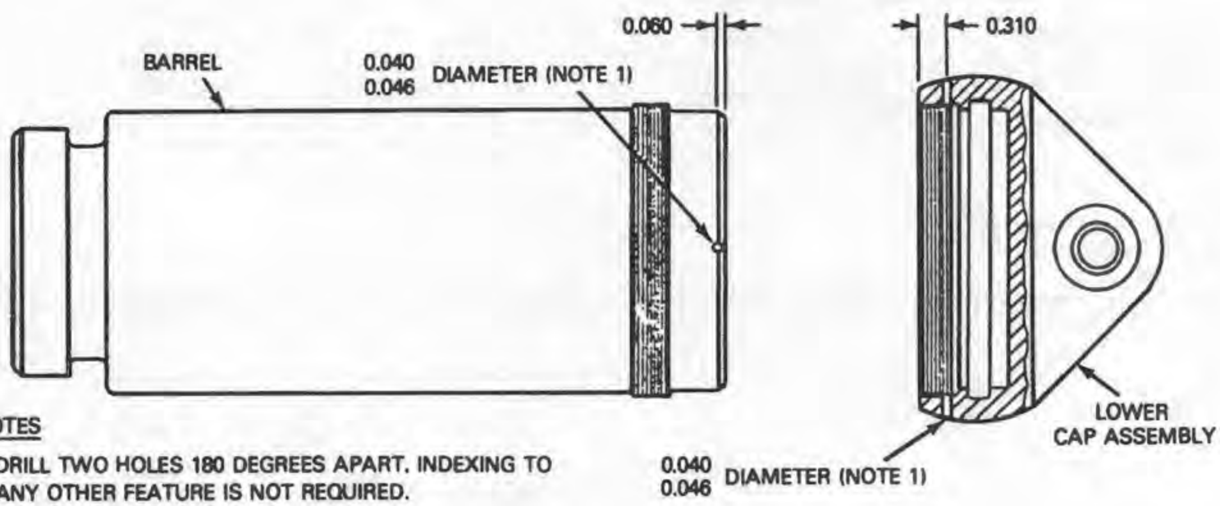
Assemble and test dampers in an area of minimum contamination (away from grinding, cutting, filing, and similar operations) at a temperature of 60 to 85 degrees F (16 to 29 degrees C). Use hydraulic fluid (C48 or C76). Keep fluid container tightly covered when not in use. Prior to use, filter the fluid through a 10-micron filter. Prior to installation, lubricate all preformed packings with clean, white petrolatum (C73).

a. Place baffle (29, figure 3-6C) in housing (28) so that baffle center (hat section) extends toward top of housing. (Baffle may have been installed in opposite direction at removal.)

b. Install a new preformed packing (30) in bore of housing, against the baffle.

c. Thread piston (31) into housing (28). Using a housing spanner wrench and a piston (figure 3-6B), torque housing to **400 to 450** inch-pounds plus drag torque.

d. Install two new backup rings (19 and 21) in groove of housing (28) and install a new preformed packing (20) between the two rings.



NOTES

1. DRILL TWO HOLES 180 DEGREES APART. INDEXING TO ANY OTHER FEATURE IS NOT REQUIRED.
2. ALL DIMENSIONS IN INCHES.

Figure 3-6D. Minor Repair - Barrel and Lower Cap Assembly

Table 3-8. Part No. 369A6350 Damper Assembly Fluid Level for Ambient Operating Temperatures of +10 to +125 Degrees F (+5.6 to +51.7 Degrees C)

Hydr Fluid Temp °F (°C)	Oil Level in. (mm)	Hydr Fluid Temp °F (°C)	Oil Level in. (mm)
50 (10.0)	1.28 (32.5)	76 (24.4)	1.15 (29.2)
52 (11.1)	1.27 (32.3)	78 (25.6)	1.14 (29.0)
54 (12.2)	1.26 (32.0)	80 (26.7)	1.13 (28.7)
56 (13.3)	1.25 (31.8)	82 (27.8)	1.12 (28.4)
58 (14.4)	1.24 (31.5)	84 (28.9)	1.11 (28.2)
60 (15.6)	1.23 (31.2)	86 (30.0)	1.09 (27.7)
62 (16.7)	1.22 (31.0)	88 (31.1)	1.08 (27.4)
64 (17.8)	1.21 (30.7)	90 (32.2)	1.06 (26.9)
66 (18.9)	1.20 (30.5)	92 (33.3)	1.05 (26.7)
68 (20.0)	1.19 (30.2)	94 (34.4)	1.03 (26.1)
70 (21.1)	1.18 (30.0)	96 (35.6)	1.02 (26.0)
72 (22.2)	1.17 (29.7)	98 (36.7)	1.00 (25.4)
74 (23.3)	1.16 (29.5)	100 (37.8)	0.99 (25.1)

e. Install a new seal (6) in internal groove of barrel (7), making sure that "O" spring of seal faces toward bottom end of barrel (smooth side of seal facing upward).

f. Install a new preformed packing (33) on piston plug (34).

g. Install a new preformed packing (32) in groove at upper end of piston (31).

h. Install a new preformed packing (17) and backup ring (18) in groove of lower cap assembly (15). Note that packing must be located at innermost side (bottom) of cap groove and backup ring at outermost side (top) of groove.

NOTE

Nylok inserts (9) cannot be replaced. If the drag provided by the insert is not sufficient to prevent hand tightening, the component containing the insert must be replaced.

i. Place rebound spring (10) inside barrel (7) and thread lower cap assembly (15) onto the barrel. Check for drag of nylok insert (9).

NOTE

Steps j through l must be accomplished while parts are totally and continuously submerged in hydraulic fluid (C48 or C76). If *air should enter the assembly at any time during these steps the damper cannot be charged correctly. A large clean container and an adequate supply of hydraulic fluid are needed for this purpose. Use an ordinary 5-gallon can, properly cleaned and with the top removed.*

j. Submerge barrel (7) with lower cap assembly (15) and rebound spring (10) installed, in a container of hydraulic fluid. Tilt and rotate the assembly while submerged to elimate any trapped air.

k. Submerge assembled piston (31) and housing (28) assembly in container and rotate while tapping to remove any trapped air; insert piston (31) inside rebound spring (10) and barrel (7) until lower edge of housing (28) is flush with or just inside lower end of barrel.

l. Submerge piston plug (34) and preformed packing (33) in container, rotate and tap to eliminate trapped air and thread plug into piston (31) hand tight.

m. Using a suitable thermometer, measure temperature of hydraulic fluid in assembly container before removing damper from container.

NOTE

Steps n through r must be completed within 15 minutes after measuring hydraulic fluid temperature. If time limit is exceeded, resubmerge damper in the fluid container, allow its temperature to stabilize for 30 minutes and then measure fluid temperature again before proceeding.

n. Hydraulic fluid level within the damper assembly is governed by hydraulic fluid temperature at the time of filling and charging, and ambient temperatures at which the damper is operated. Starting with the hydraulic fluid temperature obtained in step m, refer to table 3-8 to determine proper fluid level for the damper involved. Fluid level is the distance between upper surface (edge) of piston (31) and the surface of the fluid within the piston.

o. Remove damper assembly from hydraulic fluid and install it in the cylinder holding block and vise, with piston plug (34) facing downward. Use a wrench adapter to torque cap assembly on barrel to **500 to 600** inch-pounds plus drag torque.

p. Rotate the assembly in vise so that piston plug (34) faces upward and damper assembly is vertical. Remove plug and slowly compress piston (31) by hand until piston bottoms in the barrel (7). Tap piston gently with a mallet to make sure that it is completely bottomed.

NOTE

While pushing piston into barrel there will be an outflow of fluid from the piston. Fluid must be bubble-free to ensure that filling was properly accomplished.

q. Using an eyedropper, small syringe or similar tool, remove sufficient hydraulic fluid from piston to reduce hydraulic fluid level to the dimension determined in step *n*, above.

r. Replace piston plug (34) and engage one full thread ONLY. The port (35) through the threads and wall of plug must be clear to allow passage of charging gas pressure into the piston.

3-24G. Charging — Poppet-Type Landing Gear Damper (AVIM). Damper assembly charging consists of pressurizing the assembly to a predetermined pressure with dry nitrogen gas. Proper pressure is determined by ambient room temperature during the charging procedure and ambient temperatures to which the damper will be subjected during service.

CAUTION

Use dry nitrogen only. Store nitrogen bottle in same room area where charging is to take place for a minimum of 12 hours prior to charging.

a. Verify that a new preformed packing (32, figure 3-6C) is in place on piston (31) and thread a charging tool onto piston threads; tighten securely, using a wrench if necessary. Make sure that charging tool T-handle is pulled out (upward) and has not been engaged in slot of piston plug (34).

b. Connect nitrogen charging hose to gas port of charging tool but do not tighten the connection. Make sure that the low pressure side of the nitrogen pressure regulator has been reduced to zero pressure range.

c. Obtain the room temperature of work area; refer to table 3-9 to obtain the proper nitrogen charging pressure.

d. Slowly open high pressure valve of nitrogen bottle; slowly turn pressure regulator control until there is a flow of nitrogen at the hose connection left loose in step *b* above. Allow flow to continue for approximately 30 seconds to purge air from the charging hose and damper piston.

e. While nitrogen is still flowing, tighten the charging hose fitting at charging tool port and slowly increase the gas pressure. As pressure increases, piston will extend from the cylinder. When pressure reaches predetermined point (determined in step *c* above) stop increasing pressure and allow one minute for pressure to stabilize.

NOTE

If piston does not extend during preceding step, engage charge tool handle and loosen piston plug (34) slowly until piston begins to extend.

f. Recheck for correct pressure. If slightly over-pressurized, bleed off excess pressure slowly.

NOTE

If nitrogen is bled off quickly, for any reason, assembly procedures described in paragraph 3-24F, step j and subsequent, must be repeated.

g. When correct pressure is established, press charging tool T-handle inward and rotate it clockwise until it engages slot of piston plug (34). Tighten plug until it bottoms but do not tighten excessively.

h. Reduce nitrogen gas pressure regulator to zero and remove charging tool.

i. Torque piston plug (34) to **18 to 22** inch-pounds.

j. Install a new scraper ring (5) over piston (31) with scraper edge at seal ID facing upward. Install washer (4) and retaining ring (3) over piston (31) but do not secure retaining ring in barrel (7) at this time.

NOTE

Use solvent (C94) to thoroughly clean threads of upper cap assembly (2), mating piston threads, and preformed packing (32). All threads and packing must be completely clean and dry before installing.

k. Install upper cap assembly (2) on piston (31). Hold piston with piston wrench. Using wrench adapter and torque wrench, torque upper cap assembly to **500 to 600** inch-pounds plus drag torque.

l. Wash entire damper assembly, except end cap bearings (1 and 14) with solvent (C94) or naptha (C70).

m. Blot excess solvent from bearings and allow assembly to dry completely.

n. Install scraper ring (5), washer (4) and retaining ring (3) in barrel (7).

CAUTION

Rotate upper cap assembly and piston clockwise ONLY to align the end cap bearings.

Table 3-9. Part No. 369A6350 Damper Assembly Nitrogen Gas Pressure for Ambient Operating Temperatures of +10 to +125 Degrees F (+5.6 to +51.7 Degrees C)

Ambient Room Temp °F (°C)	Nitrogen Pressure psig (kPa)	Ambient Room Temp °F (°C)	Nitrogen Pressure psig (kPa)
50 (10.0)	487 (3358)	76 (24.4)	526 (3627)
52 (11.1)	490 (3379)	78 (25.6)	529 (3647)
54 (12.2)	493 (3399)	80 (26.7)	532 (3668)
56 (13.3)	496 (3420)	82 (27.8)	535 (3689)
58 (14.4)	499 (3441)	84 (28.9)	538 (3710)
60 (15.6)	502 (3461)	86 (30.0)	541 (3729)
62 (16.7)	505 (3482)	88 (31.1)	544 (3750)
64 (17.8)	508 (3503)	90 (32.2)	547 (3772)
66 (18.9)	511 (3523)	92 (33.3)	550 (3792)
68 (20.0)	514 (3544)	94 (34.4)	553 (3813)
70 (21.1)	517 (3565)	96 (35.6)	556 (3834)
72 (22.2)	520 (3585)	98 (36.7)	559 (3854)
74 (23.3)	523 (3606)	100 (37.8)	562 (3875)

o. Place damper in cylinder holding block and clamp in a vise. Using wrench adapter and 1/2-inch drive socket wrench handle, rotate upper cap assembly clockwise until bearings in upper cap and lower cap are in alignment.

3-24H. Leakage Check — Poppet-Type Landing Gear Damper (AVIM).

a. Place assembly on its side on a flat surface for approximately 4 hours.

b. Inspect entire assembly for leakage, particularly around piston scraper ring.

NOTE

At this time there may be a trace of fluid at the threaded connection between lower cap assembly (15) and barrel (7), or between piston (31) and scraper ring (5). This fluid can be residual fluid that was entrapped during assembly and is not necessarily leakage. Wipe away any fluid and observe to see if fluid continues to seep.

c. No visible leakage is allowed. If leakage is evident, repeat repair procedures, commencing with paragraph 3-24B, and repair or replace leakage source.

3-24J. Final Operation — Poppet-Type Landing Gear Damper (AVIM).

a. Paint torque stripes on caps, piston and barrel as shown in figure 3-6E. Use white acrylic lacquer (C55) for the stripes.

b. Install new warning plate or caution decal.

(1) Clean mounting surface with solvent (C94) or equivalent.

(2) Soak decal/plate in water until protective backing softens (2 to 5 minutes is usually required). Peel off backing, do not kink or touch adhesive.

(3) Heat decal/plate in oven or by equivalent means for approximately 5 minutes.

(4) Press decal/plate firmly to mounting surface.

(5) Seal edges of decal/plate with clear lacquer.

c. If the assembly is not to be used immediately, package it for protection from dirt and moisture. Identify package by part number.

d. Upon removal from storage or at time of installation, inspect assembly for leakage.

3-25. Installation — Aft Damper.

CAUTION

Do not overtighten damper to strut attachment lug hardware. Maximum permissible torque of nut is finger-tight, then tighten to nearest castellation for installation of cotter pin.

NOTE

Before installing a poppet-type damper at the aft right position on series 1 aircraft, check that the aircraft has been modified with the improved engine-out warning and automatic restart system. If a series 1 aircraft has not been so modified, the aft right side poppet-type damper will interfere with the start relay.

a. **Position lower end of replacement damper assembly in attachment lugs of landing gear strut. Install bolt, flat washers and nut. Tighten nut and install new cotter pin.**

b. **Position upper end of damper assembly between oleo attachment fitting lugs. Install bolt with flat washer from front of strut through damper assembly; install washer and nut. Tighten nut and install new cotter pin. (See detail A, fig. 3-1.)**

3-26. Installation — Forward Damper. *a.* Position lower end of replacement damper assembly in attachment lugs of landing gear strut. Install bolt, flat washers and nut. Tighten nut and install new cotter pin.

b. **Position upper end of damper assembly between oleo attachment fitting lugs. Install bolt with flat washer from front of strut through damper assembly; install washer and nut. Tighten nut and install new cotter pin. (See detail C, fig. 3-1.)**

3-27. LANDING GEAR FAIRING ASSEMBLY.

3-28. Description — Landing Gear Fairing Assembly. Each landing gear fairing assembly (fig. 3-7) is a two-piece, spring-loaded, telescoping fiberglass airfoil that is contour-fitted to the fuselage and skid tube. The fillet has a teflon strip bonded around the contact surface of its fuselage-contour-matching flange. The rubbing plate is color impregnated fiberglass, bonded

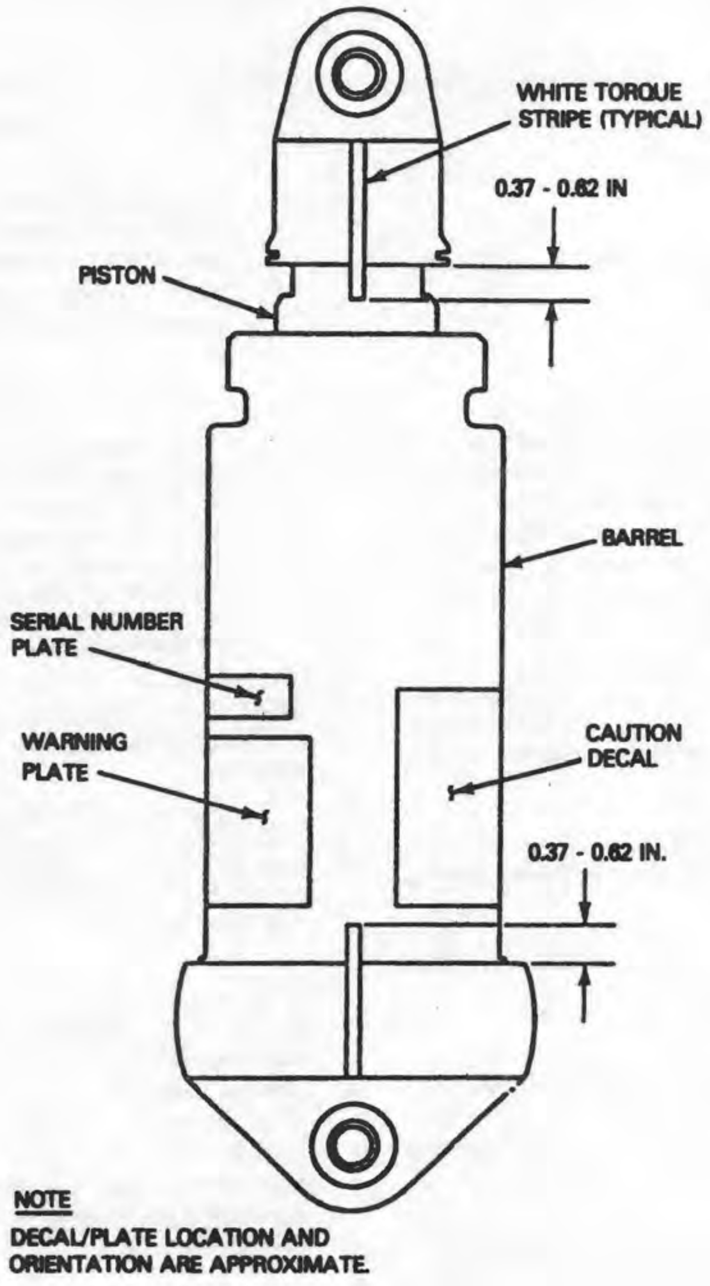
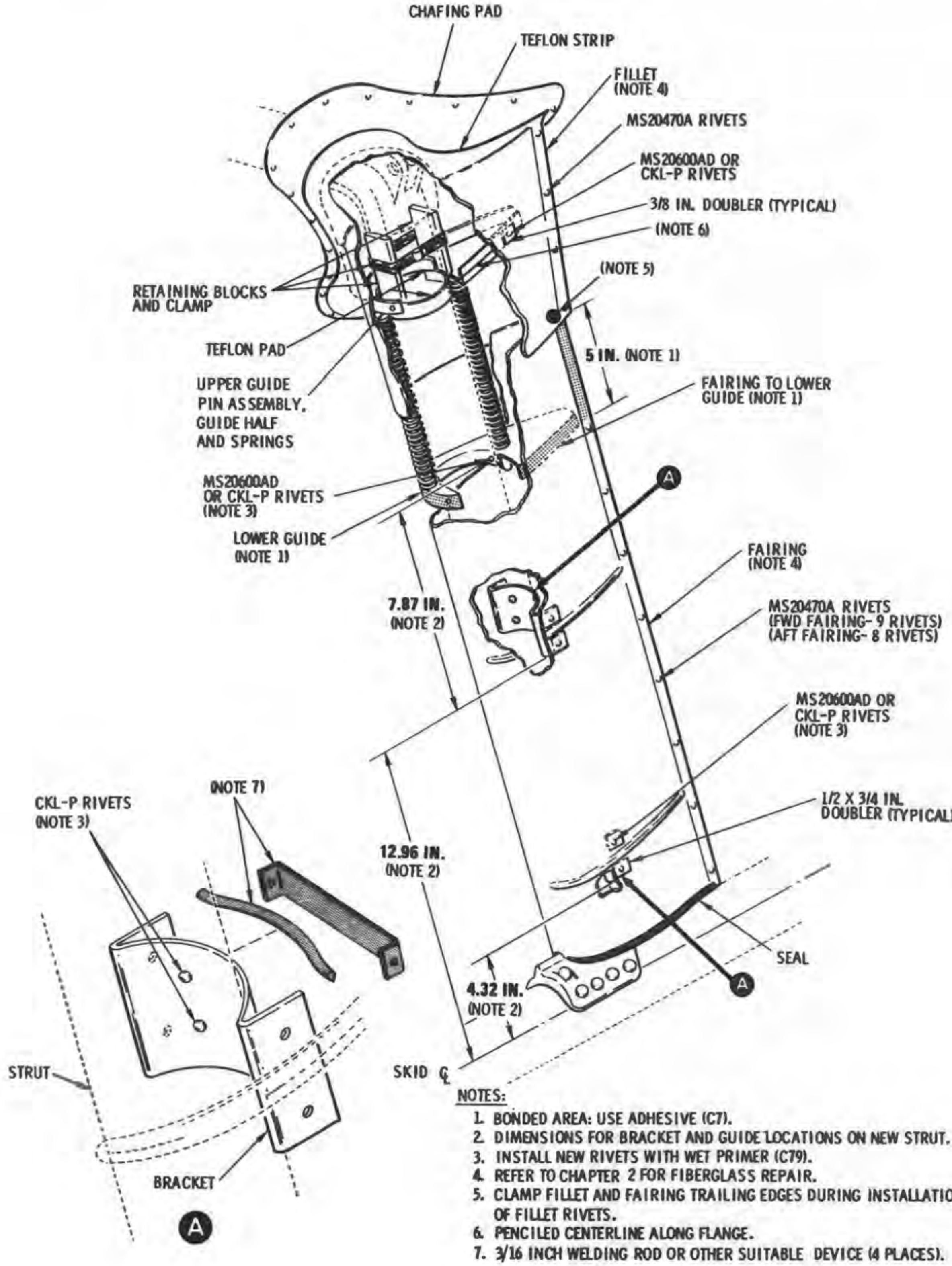


Figure 3-6E. Torque Stripe and Decal/ Plate Requirements.



NOTES:

1. BONDED AREA: USE ADHESIVE (C7).
2. DIMENSIONS FOR BRACKET AND GUIDE LOCATIONS ON NEW STRUT.
3. INSTALL NEW RIVETS WITH WET PRIMER (C79).
4. REFER TO CHAPTER 2 FOR FIBERGLASS REPAIR.
5. CLAMP FILLET AND FAIRING TRAILING EDGES DURING INSTALLATION OF FILLET RIVETS.
6. PENCILED CENTERLINE ALONG FLANGE.
7. 3/16 INCH WELDING ROD OR OTHER SUITABLE DEVICE (4 PLACES).

14-244B

Figure 3-7. Landing Gear Fairing — Repair and Replacement.

and riveted to the fuselage adjacent to the fairing. The rubbing plate does not require painting. The fairing telescopes inside the fillet to allow movement of the strut as the landing gear dampers compress or extend. The upper guide is an assembly of two unattached springs fitted over two 1/4-inch pins that engage matching holes in the lower guide. The sliding surfaces (ID) of both parts of the upper guide are lined with a teflon pad to reduce friction during movement between the guide halves and strut.

3-29. Removal — Landing Gear Fairing Assembly. (See fig. 3-7.) The following removal instructions are typical for all four fairing assemblies. If the fairing is to be replaced or removed for repair, the fillet as well as the fairing must be removed.

a. Remove the four rivets from the trailing edge of the fillet.

b. Drill out one of the six rivets that secure the fillet to the upper guide. Replace the rivet with a sheet metal hole fastener. Repeat this step on the other five rivets.

c. Open electronic compartment or engine compartment access doors for access to the strut cutout in the fuselage skin. Have an assistant push down on the upper guide with a suitable tool (wood dowel or equivalent), to relieve the spring tension.

d. With spring tension off the guide, take out the six fasteners. Slowly relax the dowel pressure on the guide until the springs reach maximum travel.

e. Carefully spread fillet at trailing edge and remove in a forward direction.

f. Remove eight or nine rivets (as applicable) that secure trailing edge of fairing, and eight rivets that secure fairing to the two strut brackets.

g. Use a putty knife or similar thin-bladed tool to carefully pry apart the bonding and separate the upper 5 inches of the trailing edge; then separate the fairing from the flange of the lower guide.

h. Carefully spread trailing edge of fairing and remove in a forward direction.

3-30. Inspection — Landing Gear Fairing Assembly. (See fig. 3-7.) *a.* Inspect fairing support brackets for security of attachment to strut, cracks and deformation.

b. Inspect fairing-to-skid seal for security of bond.

c. Inspect the fuselage rubbing plate for security of bond and excessive abrasion.

3-31. Repair — Landing Gear Fairing Assembly. (See fig. 3-7.) *a.* Replace a damaged fairing bracket or lower guide. Remove the rivets, locate the new part, and install mechanically expanded rivets per TM 55-1500-204-25/1. Use next larger size rivets if mating holes in strut are enlarged.

b. Replace a damaged guide/pin assembly or guide half if guide is cracked, pins are bent or badly worn,, or teflon pad is loose or badly worn.

c. Replace springs that are badly worn, rusty, or **REPLACE IF FREE LENGTH IS LESS THAN 8.72 INCHES.**

d. Replace fillet if the teflon strip is loose or badly worn.

e. Replace a damaged strut bracket. Remove the rivets, locate the new part, and install mechanically expanded rivets per TM 55-1500-204-25/1. Use next larger size rivets if mating holes in strut are enlarged.

f. Repair an unbonded section of the fairing-to-skid seal (chapter 2).

g. Refer to chapter 2 for typical fiberglass repairs.

3-32. Installation — Landing Gear Fairing Assembly. (See fig. 3-7.) The following installation instructions are typical for all four fairing assemblies. Where riveting is required, use rivets of the type shown in figure 3-7.

a. Assemble new upper guide, new pin assembly, new guide half, new springs and new lower guide on the landing gear strut. Install two rivets to secure lower guide to strut.

b. Push guide pins into the matching holes of the lower guide. Wedge a temporary holding device between the upper guide and the strut to keep the pins engaged.

NOTE

Use two small wood blocks or any similar suitable means to keep the springs in compression. The device must be small enough to be removed through the strut cutout in the skin after the fillet is assembled.

c. Install blind hole transfer punches (four places) or fabricate suitable tools as shown in figure 3-7. Install between opposing holes in the two strut brackets.

d. Carefully spread trailing edge of new fairing and position the fairing on the two strut brackets and the lower guide. **THERE SHOULD BE 0.020 - 0.080 INCH COMPRESSION OF THE FAIRING SEAL AGAINST THE SKID TUBE WHEN THE FAIRING IS CORRECTLY POSITIONED.** Have an assistant hold the fairing in this position.

e. Back up the fairing with a fiber block at the transfer punch location. Using a plastic hammer, strike the opposite side of the fairing hard enough to transfer the hole centers.

f. Remove fairing and check that all the transfer marks appear within the outline of the small laminated doublers. Drill out the located holes.

g. Carefully bond the fairing to the lower guide (chapter 2). (See fig. 3-7.)

h. Install eight rivets to secure fairing to the two strut brackets, and eight or nine rivets (as applicable) to secure trailing edge together.

i. Using a pencil, draw a continuous line along the horizontal center of the upper guide flange.

j. Drill a No. 40 hole in the center of each 0.38-inch-square doubler in the fillet. (There are six doublers.)

k. Carefully spread trailing edge of fillet and position about upper guide. Clamp the lower end of the fillet trailing edge to the upper end of the fairing trailing edge. Clamping will prevent fillet movement when the fillet rivets are installed.

l. Have an assistant remove the temporary holding device and push down on the upper guide with a suitable tool (wood dowel, etc.). Have the guide pushed down to a point where the pencil line drawn on the guide flange is visible through one of the No. 40 holes in the fillet. Match-drill the guide and secure the fillet and guide with hole fastener. Repeat the procedure for all six rivet locations. Remove the pushing tool from the strut opening.

m. Remove one fastener at a time, enlarge the hole to rivet diameter and install a mechanically expanded rivet.

n. Install four rivets to secure the fillet trailing edge together.

o. Check for smooth telescoping action of fairing into fillet by manually sliding the fillet up and down several times.

p. Close access doors.

CHAPTER 4

POWER PLANT

SECTION I GENERAL

4-1. PURPOSE.

4-2. General. This chapter provides maintenance instructions for powerplant related systems. This includes engine-to-airframe related troubleshooting, engine mounts, air induction, exhaust, oil, cooling, accessories and troubleshooting of the power controls.

4-3. SCOPE.

4-4. General. This chapter contains data pertaining to engine related systems according to the Maintenance Allocation Chart. It does not contain maintenance instructions for the engine itself. Maintenance instructions for the T63-A-5A and T63-A-700 engines are contained in TM 55-2840-231-23.

SECTION II POWER PLANT

4-5. ENGINE ASSEMBLY.

4-6. Description — Engine Assembly. This section contains applicable maintenance information for the T63-A-5A and alternate T63-A-700 engine assemblies. The two engines are dynamically, functionally, and operationally identical. Some T63-A-700 engines modified by an MWO have a fuel control heater which is not installed on T63-A-5A engines. The few hardware modifications which must be performed before installing the T63-A-700 engine are contained in paragraph 4-15. Maintenance information for compressor armor and engine mounts is also provided. Use 0.20-inch stainless steel lockwire (C56) unless otherwise specified. Double strand lockwire all drilled bolts, plugs, and screws, except those locked with self-locking nuts or lockwashers. Lockwire bolts in pairs where possible. When reassembling, be sure to safety wherever lockwire was removed. Do not use zinc lockwire. Do not reuse lockwire, cotter pins, ring seals, lip seals, composition gaskets, and split or tab washers.

4-7. Maintenance — Engine Assembly. Refer to TM 55-2840-231-23 for engine maintenance, trouble-shooting and permissible oil leakage informaion. Refer to table 4-1 for additional engine-to-airframe related troubleshooting.

4-8. Troubleshooting — Engine Assembly. Engine malfunctions may be obvious, or they may be of a nature which is not obvious but can cause considerable damage to the engine if not corrected. It is essential that maintenance personnel have thorough knowledge of turbine outlet temperatures, fuel pressures, oil pressures and other important details of normal engine performance in order to recognize engine malfunctions if they occur. (Refer to TM 55-1520-214-10.) Malfunction correction may require simple repair of a faulty installation, replacement of an assembly or part, or removal of the engine for inspection and repair. Refer to appendix B for corrective action authority.

4-9. Operational Check — Engine Assembly. In addition to engine runup performed to check systems operation, test run the engine after the compressor, turbine, combustion section, fuel control, governor, fuel pump, thermocouple or interstage bleed valve has been removed or replaced. Refer to TM 55-1520-214-10 for operating instructions and limits. Make note of all incidents of the run such as leaks, abnormal vibration or noises, and/or any irregular functioning of engine equipment. Also note that the following items are within operating limits:

Turbine outlet temperature

Output shaft torque

Oil pressure

Gas producer N1 speed

Power turbine N2 speed

4-10. Removal and Installation — Engine Assembly. Removal and installation of either the T63-A-5A or T63-A-700 engine assemblies in the following paragraphs are identical. Minor hardware changes and modifications are noted as applicable.

Table 4-1. Troubleshooting of the Engine.

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

NOTE

Before you use this table, be sure you have performed all normal operational checks. If you have a malfunction which is not listed in this table, notify the next higher level of maintenance.

1. **Engine fails to start.**

STEP 1. Check for faulty ignition switch or wiring (para 9-80).

If defective, replace or repair switch or wiring (para 9-80).

2. **Engine fails to light off when hot.**

STEP 1. Check for correct alignment of engine gear case cooling air duct causing the engine fuel pump to overheat and fuel vaporization.

If the gear case cooling air duct is misaligned, reposition air duct as shown in figure 4-6.

3. **Engine lights off but will not accelerate to idle speed in 45 seconds (ammeter shows a positive charge).**

STEP 1. Check for generator on during start sequence.

If generator was on during start sequence, restart with generator off.

STEP 2. Check for defective voltage regulator (para 9-10).

If the voltage regulator is defective, replace voltage regulator (para 9-10).

4. **Acceleration temperature too high during start sequence.**

STEP 1. Check for obstructed air inlet (para 4-52).

If air inlet is obstructed, clear obstruction from air inlet and clean air inlet system.

STEP 2. Check for clogged air inlet filter.

If the air inlet filter is clogged, dirty or damaged, clear and clean or replace air inlet filter (para 4-77 or 4-105).

5. **Low power with high turbine air temperature (TOT).**

STEP 1. Check for defective BYPASS AIR caution light (para 4-138).

If BYPASS AIR caution light is defective, replace light.

STEP 2. Check for clogged, dirty, or damaged air filter.

If air filter is clogged, dirty, or damaged, clear and clean or replace air filter (para 4-77 or 4-105).

6. **Low measured TOT at normal or high power setting.**

STEP 1. Check for defective or out of calibration TOT indicating system (chapter 8).

If the TOT indicating system checks within tolerance (chapter 8) and indicator still reads low; refer to TM 55-2840-231-24 for further troubleshooting and corrective action.

7. **Engine instability above idle speed.**

STEP 1. Check for engine-to-transmission misalignment (para 4-47).

If a misalignment of the engine to transmission exists, align engine-to-transmission (para 4-47).

Table 4-2. Premaintenance Requirements for Removal of the Engine.

Conditions	Requirements
Special Tools	(T11) (T38)
Minimum Personnel Required	Two (MOS 68B & 67V)

4-11. Disconnection for Removal - Engine Assembly. See figure 4-1 for the location of points to be disconnected before engine removal from the aircraft.

a. Set power selector switch at OFF and disconnect external power.

b. Remove main transmission drive shaft (chapter 6).

c. Remove fuel controls armor, if installed (para 4-35).

d. Open engine access doors and remove engine tailpipes (para 4-156).

e. Remove lockwire and engine electrical harness plug from the receptacle mounted on the right side oleo structural fitting.

CAUTION

Cap all disconnected lines and fittings. Do not use tape to cover fuel and oil openings. Tape adhesive is soluble in fuel or oil and can cause contamination.

NOTE

As an aid for reassembly, attach identifying tags to all electrical wires and fuel and oil hoses before disconnecting.

Series 2 and 3 wiring harnesses cannot be used on series 1 aircraft.

f. Remove chromel and alumel nuts and thermocouple leads from terminal studs.

g. Disconnect leads from terminals E, C, and B of starter-generator. Disconnect bond jumper at engine compartment firewall (if installed).

h. Remove loop clamp on right engine mount to release engine harness.

i. Remove combustion chamber drain line from burner drain valve.

j. Disconnect fuel inlet line at pump.

NOTE

The fuel inlet line is disconnected at the firewall on aircraft equipped with fuel controls armor.

k. Disconnect engine fuel pump seal drain line.

l. Disconnect cabin air outlet tube (or hose) at firewall fitting.

m. Loosen compressor cooling air duct clamp at firewall coupling, disconnect support bracket at hoisting eye and remove duct from engine compartment.

n. Disconnect oil line from torquemeter fitting.

o. Disconnect N2 control rod by removing cotter pin, nut, bolt, and two washers. Tie or tape control rod out of the way against the firewall.

p. Disconnect anti-icing control valve lever by removing cotter pin, loosening nut on adapter and detaching control cable.

q. Disconnect N1 control rod by removing cotter pin, nut, two washers, and bolt. Tape or tie control rod out of the way against the firewall.

NOTE

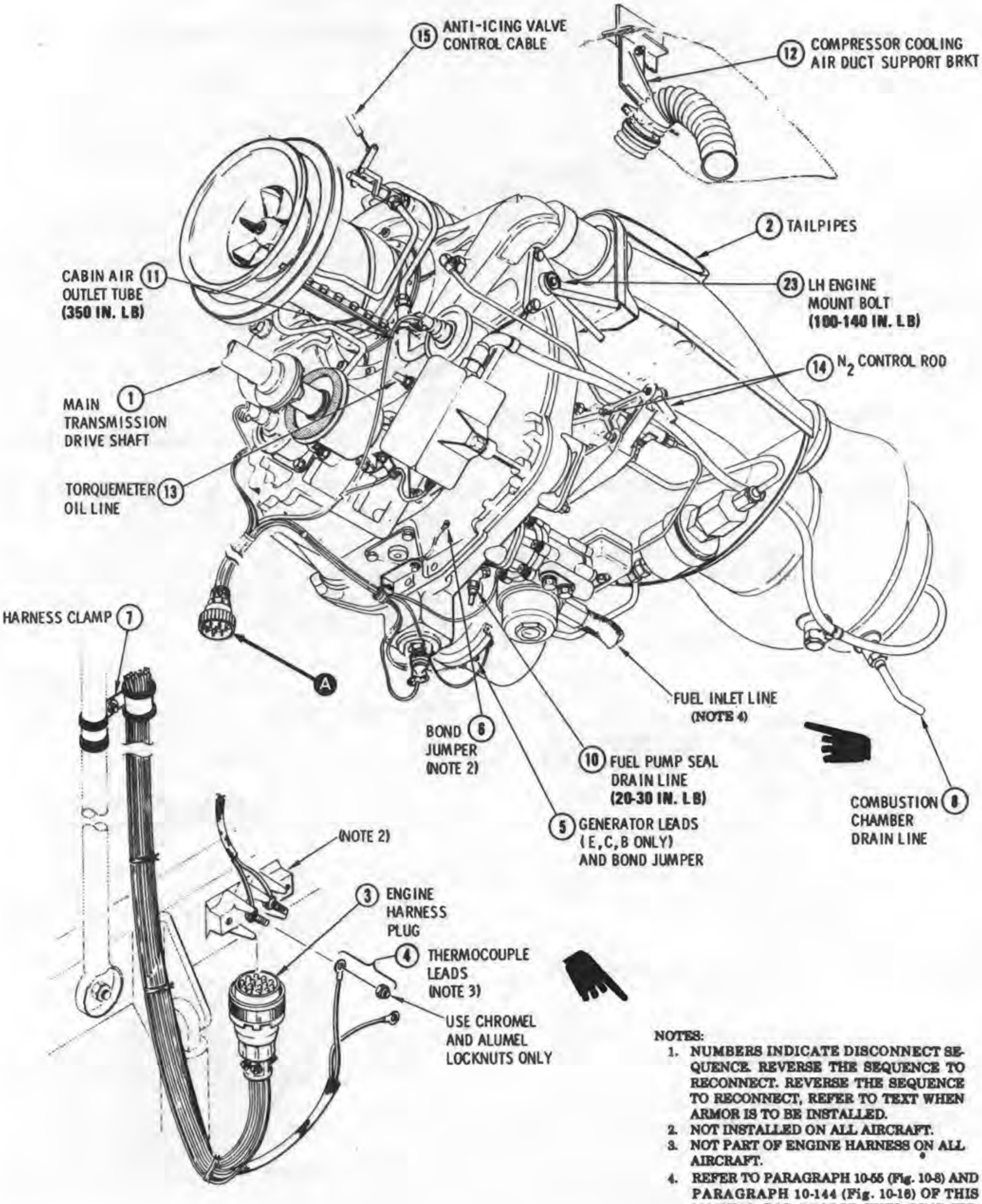
Remove N1 control rod completely on aircraft equipped with fuel controls armor.

r. Disconnect accessory drive overboard vent.

s. Disconnect oil line from engine oil pressure sender.

CAUTION

Remove the oil inlet and outlet lines, *t* and *u* below, only at the engine. Removal at the oil cooler end will damage the cooler frame if the frame oil port boss is not supported with a wrench. For the same reason, do not apply extreme bending loads on the oil lines when they are disconnected from the engine.



NOTES:

1. NUMBERS INDICATE DISCONNECT SEQUENCE. REVERSE THE SEQUENCE TO RECONNECT. REVERSE THE SEQUENCE TO RECONNECT, REFER TO TEXT WHEN ARMOR IS TO BE INSTALLED.
2. NOT INSTALLED ON ALL AIRCRAFT.
3. NOT PART OF ENGINE HARNESS ON ALL AIRCRAFT.
4. REFER TO PARAGRAPH 10-55 (Fig. 10-8) AND PARAGRAPH 10-144 (Fig. 10-16) OF THIS MANUAL FOR PROPER FUEL LINE FITTING TORQUE.

Figure 4-1. Engine Disconnect/Reconnect Points. (sheet 1 of 2) *t.* Disconnect engine oil inlet line from engine fitting. On engine oil tank end of inlet line, loosen jam nut to allow hose fitting to swivel slightly.

NOTE

Hold larger size fitting still while turning jam nut to prevent damage to oil tank. Also, if oil tank is fully serviced, do not loosen too much (1/2 turn is adequate) or oil seepage will occur.

u. Disconnect engine oil outlet line.

v. Disconnect engine oil vent line.

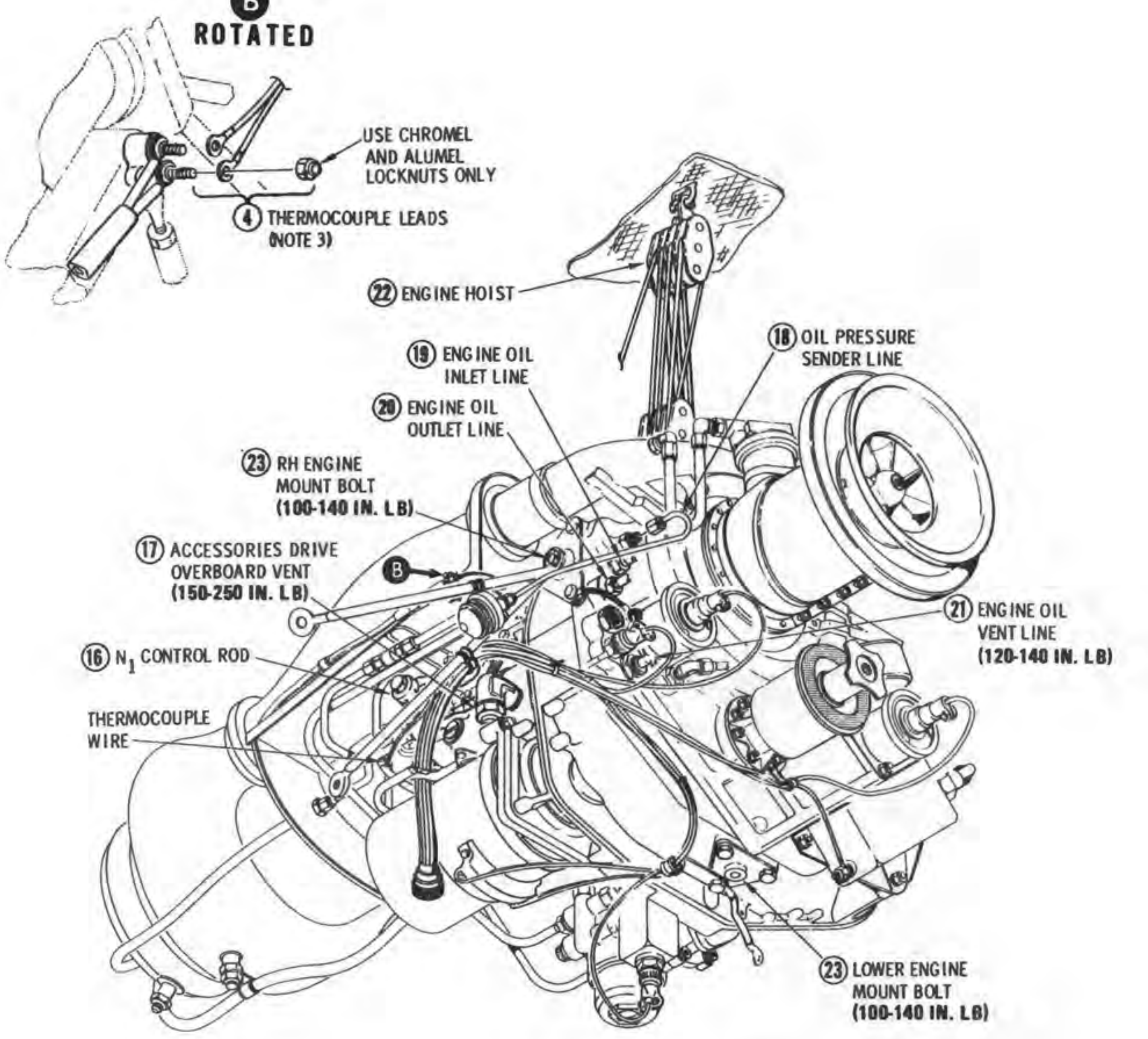
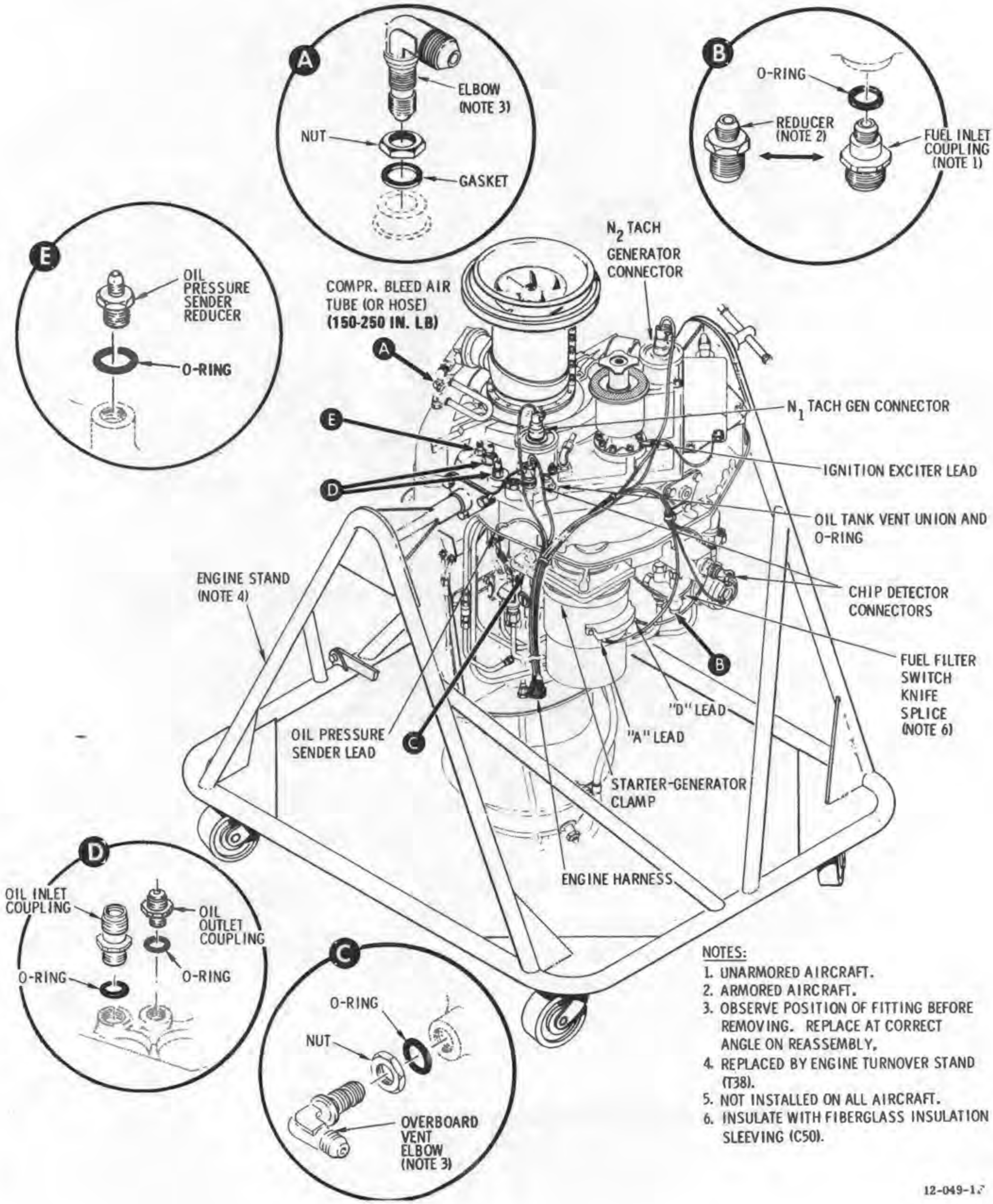


Figure 4-1. Engine Disconnect/Reconnect Points. (sheet 2 of 2)



NOTES:
1. UNARMORED AIRCRAFT.
2. ARMORED AIRCRAFT.
3. OBSERVE POSITION OF FITTING BEFORE REMOVING. REPLACE AT CORRECT ANGLE ON REASSEMBLY.
4. REPLACED BY ENGINE TURNOVER STAND (T38).
5. NOT INSTALLED ON ALL AIRCRAFT.
6. INSULATE WITH FIBERGLASS INSULATION SLEEVING (C50).

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Figure 4-2. Engine Accessory Replacement. (sheet 1 of 2)

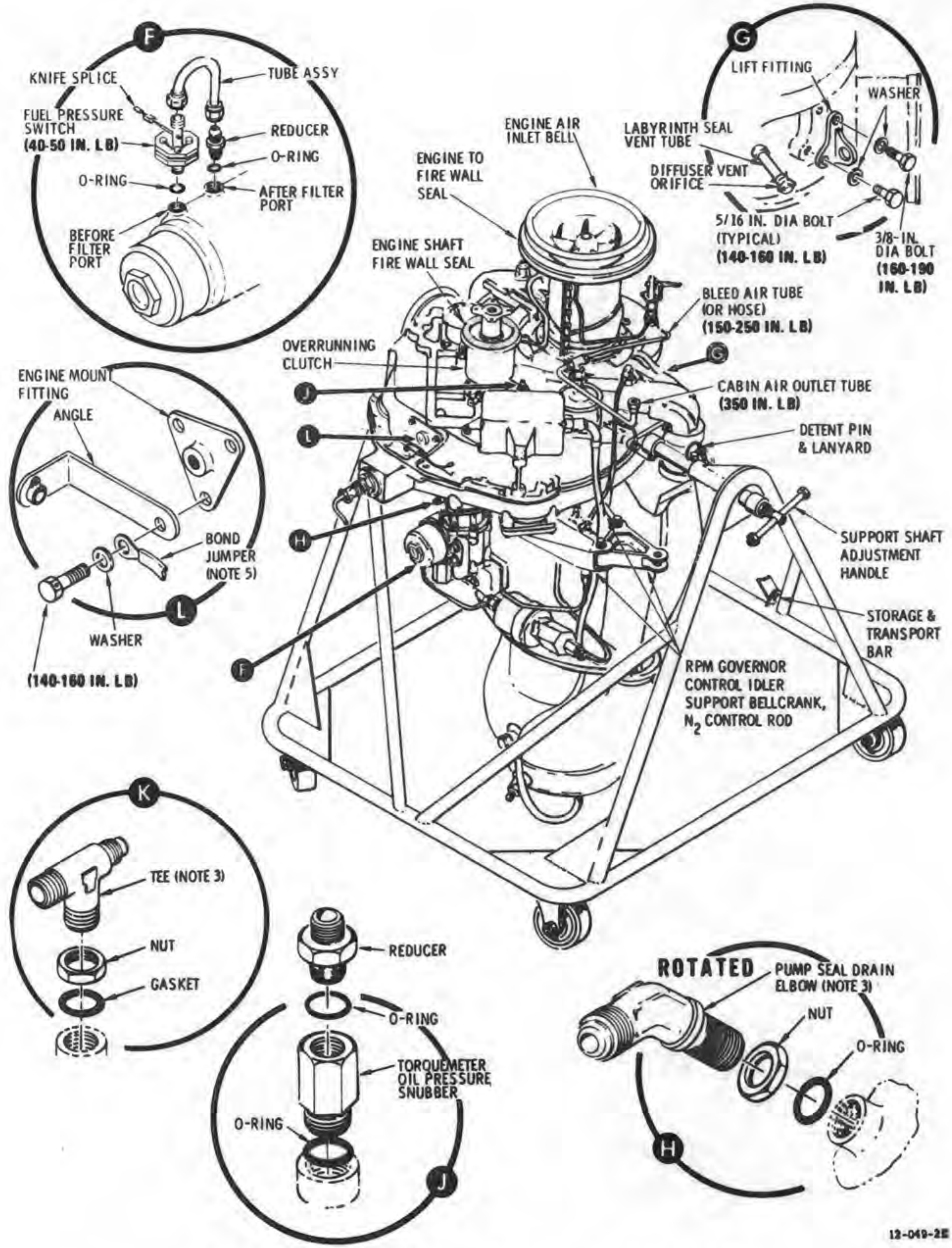


Figure 4-2. Engine Accessory Replacement. (sheet 2 of 2).

4-12. Disconnected Engine Removal — Engine Assembly using Engine Hoist (T11). (See figure 4-2.) *a.* Install engine hoist (T11) between hoisting eye fitting in structure above engine and the hoist fitting provided on engine.

b. Have an assistant apply tension on hoist line.

CAUTION

Provide sufficient support during side bolt removal to eliminate bolt loading in mount bushing. Damage to bushings can be caused by loading bolt threads.

c. Remove bolt and washer from bottom engine mount. Maintain downward pressure at rear of engine during removal of engine mount bolts.

d. Remove two bolts and washers from the left and right engine mounts.

CAUTION

Do not use fuel or oil lines to handle engine during removal. Take care not to contact adjoining structure or components while lowering engine. Use particular care to prevent damage to the No. 1 bearing oil return line on the underside of the compressor.

e. Slowly lower engine from aircraft while supporting engine from both sides.

f. Remove bolts, bond jumpers (if installed) and three mount fittings from engine (detail L, fig. 4-2, sh 2).

g. Remove hoist from engine lifting eye and install engine in turnover stand (T38). (Refer to TM 55-2840-231-24.)

Table 4-3. Premaintenance Requirements for Removal of Accessories.

Conditions	Requirements
Special Tools	(T39)
Minimum Personnel Required	One (MOS 68B)

4-12A. Disconnected Engine Removal — Engine Assembly using Engine Removal Tool (T42). *a.* Align engine jack (T42) on center line of engine.

b. Push into engine compartment, jacking as necessary.

c. Connect clevis to lift fitting.

d. Adjust saddle so it will fit on burner basket.

e. Adjust jack and saddle to accept engine weight.

CAUTION

Provide sufficient support during side bolt removal to eliminate bolt loading in mount bushing. Damage to bushing can be caused by loading bolt threads.

f. Rock engine gently while removing the lower, right and left mounts bolts.

CAUTION

Do not use fuel or oil lines to handle engine during removal. Take care not to contact adjoining structure or components while lowering engine. Use particular care to prevent damage to the No. 1 bearing oil return line on the underside of the compressor.

g. Pull jack rearward while lowering to clear airframe.

h. Place engine on engine stand (T38).

4-13. Removal of Accessories — Engine Assembly. (See fig. 4-2.) *a.* Disconnect A and D leads from starter-generator and remove starter-generator (chapter 9).

b. Disconnect electrical connectors from both chip detectors.

c. Disconnect both tachometer generator connectors, ignition exciter lead, and fuel pressure switch splice.

d. Disconnect thermocouple leads from engine, and remove entire engine wiring harness

e. Remove fuel inlet coupling (or reducer) and preformed packing (O-ring) (detail B, sh 1).

f. Remove oil inlet and outlet couplings with O-rings (detail D, sh 1).

g. Remove elbow, nut, and O-ring (detail C, sh 1).

h. Loosen both ends of compressor bleed air tube (or hose) and detach from engine.

i. Remove elbow, nut, gasket from the compressor scroll (detail A, sh 1).

j. Remove oil pressure sender reducer and O-ring (detail E, sh 1).

k. Remove both tachometer generators (chapter 8).

l. Remove tube assembly, reducer, fuel pressure switch, and two O-rings from fuel pump assembly (detail F, sh 2).

m. Remove engine air inlet bell, and engine-to firewall seal (para 4-69).

n. Remove three bolts, washers, and engine hoist fitting (detail G, sh 2).

o. Remove elbow, nut, and packing from the fuel pump seal drain port (detail H, sh 2).

p. Remove rpm governor control idler support, bellcrank, and short N2 control rod as an assembly. Install vacuum/hydraulic pump pad cover.

q. Remove oil pressure snubber, reducer, and two O-rings (detail J, sh 2).

r. Remove engine shaft firewall seal (para 4-71).

s. Remove the overrunning clutch (chapter 6). Install pad cover.

t. Remove cabin air outlet tube.

u. Remove tee, nut, and gasket from compressor scroll (detail K, sh 2).

NOTE

Step v below applies only to aircraft with the automatic restart system.

v. Remove and retain ignition igniter (Allison 6843984, Champion FHE 161-9, or AC 5611588) and ignition exciter (Allison 6870885, GLA 43754, or Bendix 6870891). These units will be reused on the replacement engine.

w. Remove engine lift (T39), if installed.

x. Remove the power turbine governor and gas producer levers. These, with the attaching nuts will be used on the replacement engine.

Table 4-4. Premaintenance Requirements for Installation of Accessories.

Conditions	Requirements
Special Tools	(T38) (T39)
Minimum Personnel Required	One (MOS 68B)
Consumable Material	(C57)

4-14. Installation of Accessories — Engine Assembly. (See fig. 4-2.) *a.* Install engine in engine stand (T38). (Refer to TM 55-2840-231-24.)

b. Install gasket, nut, and tee in compressor scroll (detail k, sh 2); secure tee with nut.

c. Hand-tighten cabin air outlet tube to scroll-mounted tee.

d. Install overrunning clutch (chapter 6).

e. Install engine shaft firewall seal (para 4-76).

f. Install gasket, nut and elbow in compressor scroll (detail A, sh 1).

g. Position compressor bleed air tube between scroll-mounted tee and elbow. **TORQUE THE TUBE NUTS TO 150-250 INCH-POUNDS.**

h. Install two O-rings, reducer, and torquemeter oil pressure snubber (detail J, sh 2).

i. Install rpm governor control idler support, bellcrank, and short N2 control rod as an assembly (para 4-215).

NOTE

Only high temperature all-metal nuts (not the fiber insert type) are to be used for anchoring governor idler support bracket to engine accessory pad.

j. Install O-ring, nut, and elbow in fuel pump seal drain port (detail H, sh 2).

k. Remove lift (T39), if installed. Install engine hoist fitting by using three washers and bolts (detail G, sh 2). **TORQUE THE 3/8-INCH-DIAMETER BOLT TO 160-190 INCH-POUNDS. TORQUE THE TWO 5/16-INCH-DIAMETER BOLTS TO 140-160 INCH-POUNDS.**

l. Install engine-to-firewall seal and engine air inlet bell (para 4-74).

m. Install packing and fuel pressure switch in the before-filter port of the fuel pump (detail F, sh 2). **TORQUE SWITCH TO 40-50 INCH-POUNDS.** Install O-ring and reducer in the after-filter port. Install tube assembly.

n. Install tachometer generators (chapter 8)

o. Install O-ring and oil pressure sender reducer detail E, sh 1).

p. Install O-ring, nut and elbow for accessories drive overboard vent (detail C, sh 1).

q. Install oil inlet and outlet couplings and O-rings (detail D, sh 1).

r. Install fuel inlet coupling (or reducer) and O-ring (detail B, sh 1).

s. Install starter-generator (chapter 9).

NOTE

Step t below applies only to aircraft with the automatic restart system.

t. Check that ignition igniter (Allison 6843984, Champion FHE 161-9, or AC 5611588) and ignition exciter (Allison 6870885, GLA 43754, or Bendix 6870891) are installed.

u. Install engine harness. Connect ignition exciter lead, starter-generator A and D leads, thermocouple leads (if applicable) and fuel pressure switch splice. Install fiberglass sleeving (C50) over knife splice and secure with high temperature lacing cord (C52). Install electrical connectors to tach generators and chip detectors. Secure connectors with 0.032-inch lockwire (C57).

v. Install power turbine governor and gas producer levers removed from the previously installed engine. Reuse the attaching nuts. Instructions for installation and adjustment of the levers are contained in paragraph 4-215.

4-15. Installation — T63-A-700 Engine Accessories. Before installing a T63-A-700 engine in the aircraft, accomplish the modification described in steps *a* through *e* below.

a. The combustion chamber drain valve assembly (furnished with engine) must be relocated to the aft port of the outer combustion case. (The drain valve differs from that used on the -5A as it is 0.334 inch longer, thus extending the attaching drain tube an additional 0.375 inch through the engine access doors.) Remove the MS9015-03 plug from the aft port of the outer combustion case and install the drain valve (from the forward port) in the aft port. Then install the special double-ended Allison (6854519) plug (removed from the forward port of the -5A or -700 engine previously installed in the aircraft) in the forward port of the outer combustion case. The double ended plug provides attachment of the bracket that supports the igniter lead. Be sure to use an MS9387-03 O-ring with the drain valve assembly and plug.

b. Remove the power turbine governor and gas producer levers from the previously installed engine and install them on the T63-A-700 engine. Instructions for installation and adjustment of the levers are contained in paragraph 4-215. Replace the attaching nuts removed from the previously installed engine.

c. If the engine has a hose assembly (compressor bleed-to-shutoff valve) routing which causes an interference with the engine "oil out" hose assembly, the restraining clamp on the compressor bleed-to-shutoff valve hose may be relocated and the hose assembly rerouted to eliminate this interference during installation (para 4-16).

d. Check to see that bleed valve jet assembly (6875147) is installed on the T63-A-700 engine. All T63-A-5A engines and most T63-A-700 engines have this new valve assembly installed; however, some T63-A-700 engines have the old MS24394C4 elbow tube installed at this location. If required, replace the old configuration valve assembly on the T63-A-700 engine with the new configuration valve assembly from the engine being removed. If the part number is not visible on the valve assembly on the T63-A-700 engine, its configuration can be determined by removing the valve from the engine and checking for a jet assembly installed inside the valve. Only the new configuration valve assemblies (6875147) have these jets installed.

d.1. If the engine has two accumulators installed (figure 4-2A, sheet 1 of 2), remove the second accumulator as follows:

(1) Loosen clamp (1, figure 4-2A, sheet 1 of 2).

(2) Disconnect flexible hose (2) at the union (3), hold union with back up wrench and unscrew the nut.

(3) Remove union (3). Hold back up wrench on hexagonal surface on the accumulator adjacent to the union (3) and unscrew the union. Discard the o-ring (4).

(4) Remove clamp assy (5) from the fire shield and accumulator.

(5) Hold elbow (8) with back up wrench and remove the accumulator (6) by turning on hexagonal surface adjacent to the union. Discard o-ring (7).

(6) Install clamp assy (5 , figure 4-2A, sheet 2 of 2), on double check valve (12). Attach clamp to fire shield using bolt, spacer, washer and nut. Tighten clamping nut to 35 - 40 inch-pounds.

(7) Place new o-ring (4) on union (3). Do not lubricate. Install union (3) in elbow (8). Hold elbow with back up wrench. Tighten union 80 - 120 inch-pounds.

(8) Attach hose and nut (2) to union (3). Hold union with back up wrench and tighten nut 80 - 120 inch-pounds.

(9) Adjust clamp assembly (1) and tighten clamping nut 35 - 40 inch-pounds.

(10) Return removed accumulator with the engine which is to be returned for overhaul.

e. After the installations have been performed, the T63-A-700 can be installed in the aircraft according to instructions contained in paragraph 4-16.

f. Verify that the fuel control heating system is installed according to MWO 55-2840-231-30/3.

Table 4-5. Premaintenance Requirements for Installation of the Engine.

Conditions	Requirements
Special Tools	(T11) (T38)
Minimum Personnel Required	Two (MOS 67V & 68B)
Consumable Materia	(C57)

4-16. Installation In Mounts — Engine Assembly using Engine Hoist (T11). (See fig. 4-2.) *a.* Position engine stand (T38) as close as possible to aircraft, with engine access doors open.

CAUTION

Do not grasp fuel or oil lines during engine installation. Use particular care not to contact adjoining structure or components. Make certain that engine is tilted so that inlet bell, firewall seal and compressor oil line clear the compressor armor (if installed).

b. Remove the engine from the stand and position under the engine compartment.

c. Install engine hoist (T11) between hoist fitting located on airframe above engine and on hoist fitting of engine.

d. Support replacement engine in position for access to engine mount fitting locations.

e. Install the three engine mount fittings including bonding jumpers and wiring harness clips (if applicable), by using nine washers and bolts (detail L, sh 2). **TORQUE TO 140 TO 160-INCH-POUNDS.** Secure with 0.032-inch lockwire (C57).

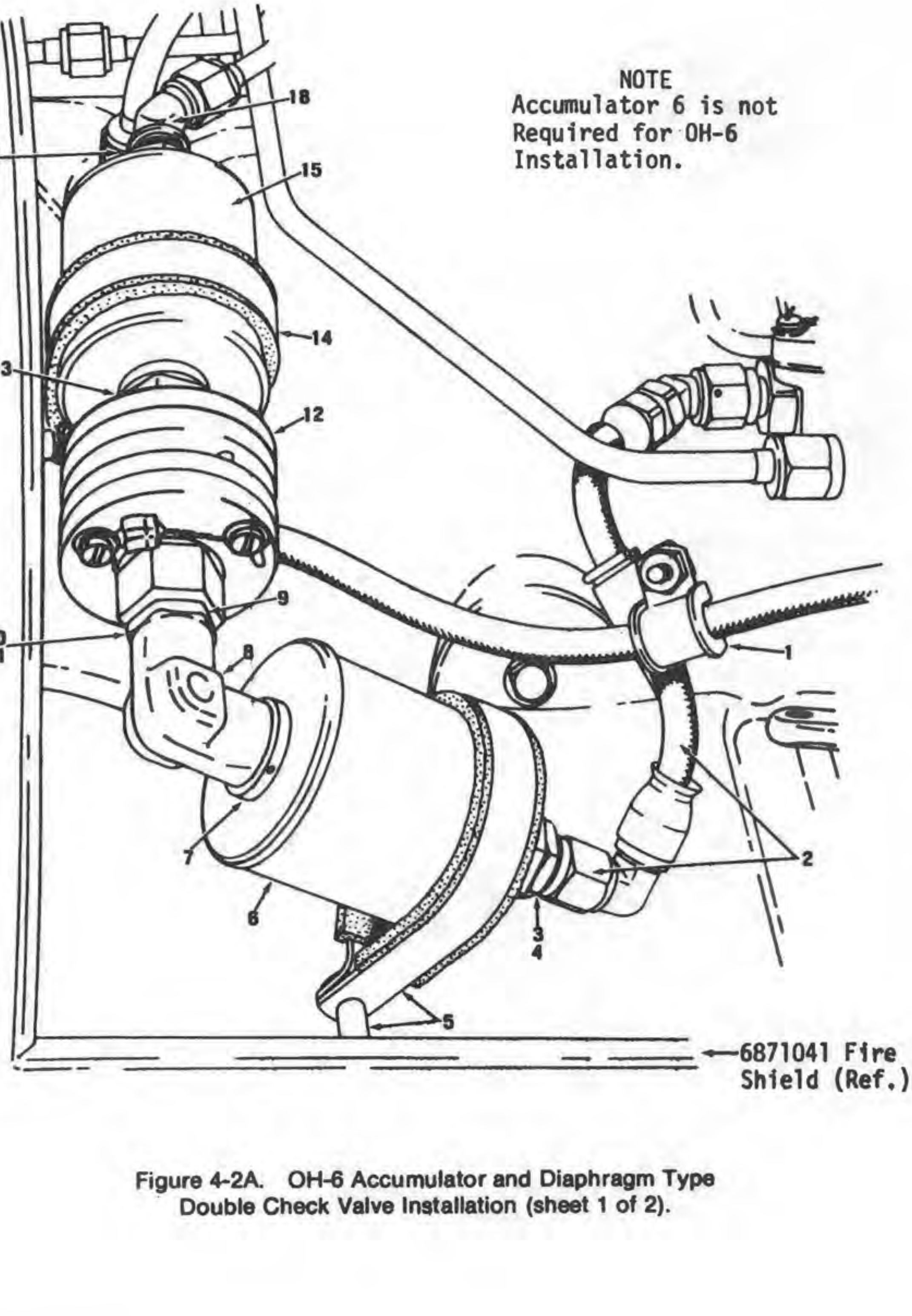


Figure 4-2A. OH-6 Accumulator and Diaphragm Type Double Check Valve Installation (sheet 1 of 2).

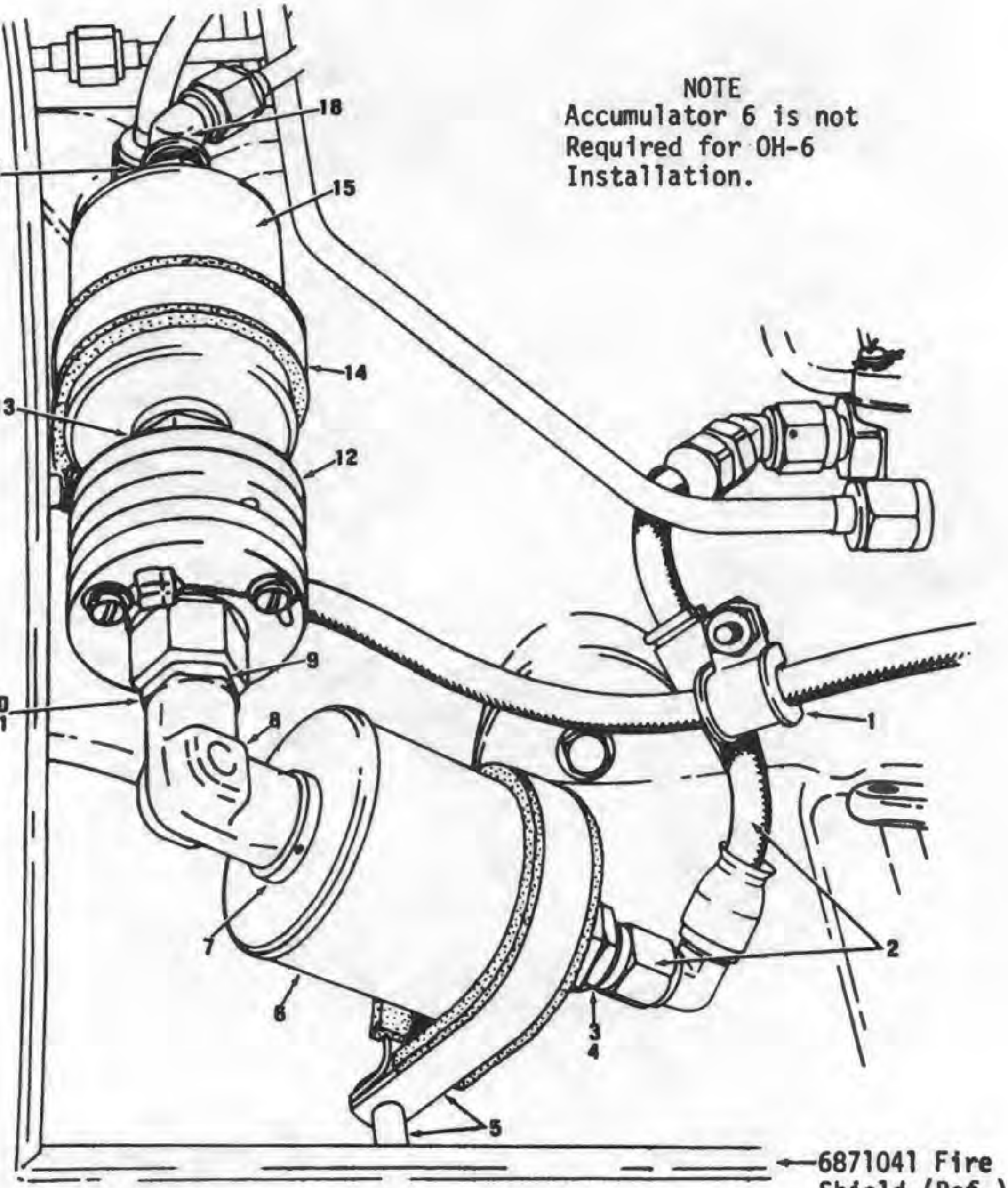


Figure 4-2A. OH-6 Accumulator and Diaphragm Type Double Check Valve Installation (sheet 1 of 2).

Key to Figure 4-2A.

1. Clamp Assy.
2. Hose and Nut
3. Union
4. O-Ring
5. Clamp Assy.
6. Accumulator
7. O-Ring
8. Elbow
9. O-Ring
10. Union
11. O-Ring
12. Double Check Valve
13. O-Ring
14. Clamp
15. 6875224 Accumulator (Ref.)
16. O-Ring
17. Nut
18. Elbow

f. Have an assistant slowly raise the engine while necessary pressure is applied downward at rear of engine.

NOTE

See figure 4-1 while accomplishing the sequence below. Reconnect the engine by reversing the number sequence shown.

g. Align left and right engine mounts with mount fittings and install bolts and washers. **TORQUE BOLTS TO 100 - 140-INCH-POUNDS.** Secure with 0.032-inch lockwire (C57).

h. Align hole in lower engine mount with mount fitting and install bolt and washer. **TORQUE BOLT TO 100 - 140-INCH-POUNDS.** Secure with 0.032-inch lockwire (C57).

NOTE

Check to ensure that the engine air inlet firewall seal is flush with the firewall.

i. Remove engine hoist from aircraft.

4-16A. Installation In Mounts — Engine Assembly using Engine Removal Tool (T42). *a.* Position engine jack (T42) over engine so that saddle is over burner basket.

b. Connect clevis on lift fitting.

c. Slowly remove engine from engine stand.

4-17. Installation — Engine Connections. (See fig. 4-1). *a.* Connect engine oil vent line. **TORQUE THE LINE NUT TO 120 - 140 INCH-POUNDS.**

CAUTION

Do not overtorque engine oil inlet or outlet couplings; damage to the self-closing valve in the coupling may result. Do not apply extreme bending loads on the oil outlet line. Such loads will be transferred to the oil cooler

inlet port boss and can cause the cooler frame to fracture.

b. Connect engine oil outlet line. Hand-tighten until snug; then **WRENCH-TIGHTEN APPROXIMATELY 1/4 TURN** or until definite resistance is felt.

c. Connect engine oil inlet line. Hand-tighten until snug; then **WRENCH-TIGHTEN APPROXIMATELY 1/4 TURN** or until definite resistance is felt.

d. Connect oil line from oil pressure sender clamped on right engine mount.

e. Connect accessories drive overboard vent. **TORQUE THE TUBE NUT TO 150 - 250 INCH-POUNDS.**

f. Connect N1 control rod to lever with bolt, two washers, nut, and new cotter pin. Install the bolt with head outboard, one washer under the nut and one washer under the head.

NOTE

If fuel controls armor is to be installed the N1 control rod is not connected until after the armor installation.

g. Install anti-icing valve control cable in lever adapter. Make an operational check of the cable installation (para 4-146).

h. Connect short N2 control rod to governor lever with bolt (head up), two washers, nut, and new cotter pin. Connect long N2 control rod with bolt (head forward), two washers, nut and new cotter pin.

i. Connect oil line to torquemeter fitting below N2 tach generator.

j. Install compressor cooling air duct support bracket on hoisting eye above engine. Connect and tighten flexible duct on firewall coupling.

k. Connect cabin air outlet tube to firewall fitting. **TIGHTEN BOTH TUBE NUTS TO 350 INCH-POUNDS.**

l. Connect engine fuel pump seal drain line. **TORQUE TUBE NUT TO 20-30 INCH-POUNDS.**

m. Connect fuel inlet line to fuel pump. Torque fuel line to pump fitting according to the fuel system installed. Refer to paragraph 10-55 (fig. 10-8) and paragraph 10-144 (fig. 10-16).

CAUTION

A twisted self-sealing (armored) fuel hose will result in a partial blockage in the line and cause flameout at high power settings. The self-sealing outer hose prevehts visual detection of a twisted inner hose. Care should be taken during installation, t following, not to twist the couplings 180° from their original position.

NOTE

If fuel controls armor is to be installed, t below, the 90-degree elbow of the fuel inlet line must be angled to provide 0.13-inch clearance between the line and the hole cutout in the armor.

n. Install combustion chamber drain line on drain valve.

NOTE

Check that the burner drain valve and plug are correctly installed in the combustion chamber. Each part must be installed with an O-ring, with the drain valve in the lower position.

o. Secure engine harness to engine mount with cushioned loop clamp. Connect oil pressure sender lead.

p. Install generator leads E, C, and B on starter-generator and secure with washers and nuts.

q. Position thermocouple leads on terminal studs and secure with chromel and alumel locknuts.

r. Connect engine harness plug to receptacle and secure with lockwire. If installed, connect bond jumper terminal to GRD on engine compartment firewall.

s. Install engine exhaust tailpipes (para 4-160).

t. Install fuel controls armor, if required (para 4-39).

u. Install main transmission drive shaft (Chapter 6).

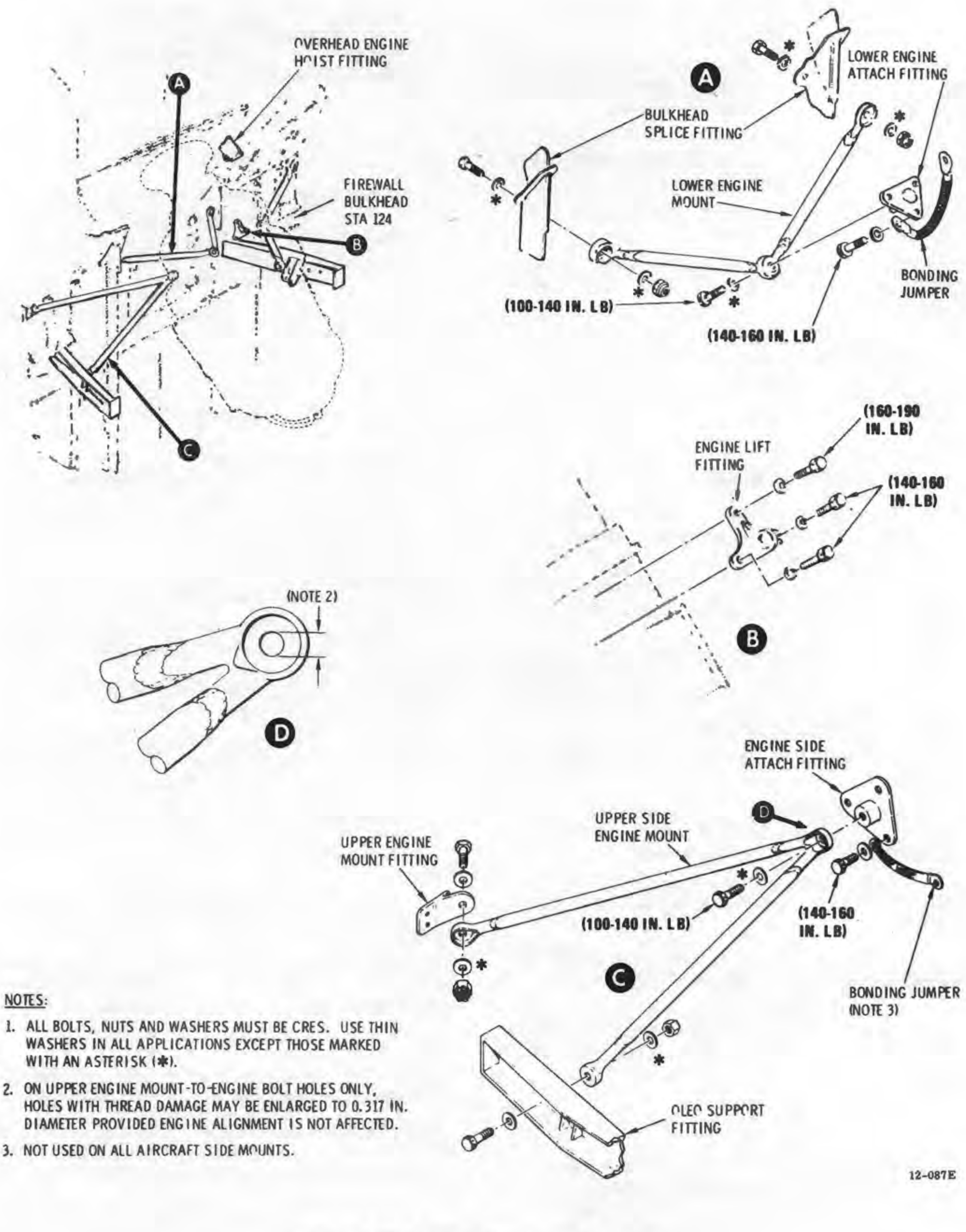
v. Install heating system and oil cooler access doors, main transmission cover assembly, and main gearbox access door. Install sound insulation.

w. Fill engine oil system.

x. Adjust gas producer (N1) and power turbine (N2) engine power controls (para 4-220 and 4-222).

y. Check overall condition of engine. Open fuel shutoff valve and operate electric fuel pump while making an engine fuel system leakage check.

z. Install the diffuser vent orifice and perform engine operational check (TM 55-2840-231-23). Correct malfunctions, if any, as necessary.



NOTES:

1. ALL BOLTS, NUTS AND WASHERS MUST BE CRES. USE THIN WASHERS IN ALL APPLICATIONS EXCEPT THOSE MARKED WITH AN ASTERISK (*).
2. ON UPPER ENGINE MOUNT-TO-ENGINE BOLT HOLES ONLY, HOLES WITH THREAD DAMAGE MAY BE ENLARGED TO 0.317 IN. DIAMETER PROVIDED ENGINE ALIGNMENT IS NOT AFFECTED.
3. NOT USED ON ALL AIRCRAFT SIDE MOUNTS.

Figure 4-3. Engine Mounts and Fittings.

4-18. ENGINE MOUNTS AND FITTINGS.

4-19. Description — Engine Mounts and Fittings. The engine mount installation consists of one lower (center) and two upper (side) engine mounts, six structural attach fittings, three engine attach fittings, and associated attaching hardware. (See fig. 4-3.) Each of the three mounts is a tubular steel, V-shaped, welded assembly. The forward ends of the lower mount are bolted to the two bulkhead splice fittings. The aft end of the lower mount is bolted to the engine attach fitting on the underside mounting pad of the power and accessories gearbox. The two upper mounts are symmetrically opposite assemblies. The longer ends of the upper mounts are bolted to mount fittings at the outboard edges of station 124.00 bulkhead and the shorter ends are bolted to the oleo support fittings. The aft ends of the left and right upper mounts are bolted to the engine attach fittings on the side mounting pads of the power and accessories gearbox. The three engine fittings (fig. 4-3) bolted to the power and accessory gearbox are machined aluminum alloy forgings, each containing a steel threaded insert. The engine lift fitting is an anodized machined aluminum alloy forging. The lift fitting has an eye for attachment of the engine hoist (T11) used for engine removal and installation. The lift fitting is mounted on the upper side of the power and accessory gearbox housing just aft of the engine air inlet scroll assembly.

4-20. Inspection — Installed Engine Mounts and Fittings. *a.* Check all engine mount assemblies for general condition of surface cadmium plating where paint is chipped away.

b. Check all engine mount tubes for straightness. Hold a steel straightedge against the surface of tubes to reveal any warps or bends in the tubes.

c. Visually check all welded joints for cracks and evidence of corrosion.

d. Check engine mount tubes and end fittings for cracks, nicks, dents, scratches, and evidence of corrosion.

e. Check engine mount attaching bolts, engine attach fitting bolts and bonding jumper for evidence of tool damage and corrosion.

f. Visually check flanges and bosses of engine attach fittings for deformation, cracks, nicks, dents, and corrosion.

g. Check engine lift fitting for condition of anodized surface, corrosion, wear in lifting eye, cracks, nicks, dents, and scratches.

Table 4-6. Premaintenance Requirements for Removal of Lower Engine Mounts.

Conditions	Requirements
Special Tools	(T11)
Minimum Personnel Required	Two (MOS 67V & 68B)

4-21. Removal — Lower Engine Mount.

CAUTION

To avoid disturbing security of the engine installation, do not loosen and/or remove more than one engine mount at any one time. Removal of the engine does not require removal of the engine mounts. Do not use open end wrenches when removing engine attach fittings and attaching hardware. Use box end and socket wrenches to avoid tool damage to hardware and engine mount fittings.

a. Remove the bolt and nut that attach the compressor air duct support bracket to overhead engine hoist fitting.

b. Install engine hoist (T11) between overhead hoist fitting and engine lift fitting (detail C, fig. 4-3). Apply enough tension with hoist to relieve stress from lower mount (detail B). Engine loading will be negative when bolts that secure the engine mount to the airframe turn freely with attaching nuts backed off one-half turn.

c. Release cargo compartment lower isolation blanket enough to gain access to the bolt heads protruding through firewall at bulkhead splice fittings (detail A).

d. At left and right forward ends of lower engine mount, remove two bolts, four washers, and two nuts at attach points. Discard the two nuts.

e. Remove engine attach bolt and washer from engine attach fitting (lower).

f. Remove three bolts, washers, bonding jumper (if installed) and fitting from mounting pad of power and accessory gearbox.

4-22. Removal — Upper Engine Mount. *a.* Remove engine oil pressure sender clamps and engine harness clamp from right side engine mount. (See detail A, fig. 4-1, sh 1.)

b. Remove bolts, washers and nuts from attach points of upper engine mount (detail B, fig. 4-3) at upper mount fitting and oleo support fitting. Discard nuts.

c. Remove engine attach bolt and washer to free aft end of mount from engine attach fitting (side) on pad of power and accessory gearbox.

4-23. Removal — Engine Mount Fitting. (See fig. 4-3.) Remove three bolts, washers, and engine attach fitting (lower or side) from mounting pad of power and accessory gearbox. (See detail A or B.) Remove bond jumper (if installed) from fitting.

4-24. Removal — Engine Lift Fitting. Remove engine fitting (detail C, fig. 4-3) by removing three bolts and washers.

4-25. Inspection — Engine Mounts and Fittings. *a.* Magnetic-particle inspect engine mount assemblies according to TM 55-1500-204-25/1 if condition is questionable. If cracks are found, the mount shall be considered unserviceable.

b. Check engine mount-to-engine bolt holes for thread damage. Determine if upper engine mount-to-engine holes have been opened to **0.317-INCH DIAMETER**. If both left and right mounts are reworked, engine-to-transmission alignment must be checked (para 4-47).

c. Check engine mount attaching bolts for damaged threads. Replace defective bolts.

d. Check flanges and bosses of engine attach fittings for flatness, cracks, and corrosion. Replace defective fittings.

e. Check holes in mount flanges for elongation and deformation. Replace defective mounts.

f. Check threaded steel insert for damaged threads, corrosion, and for full bottoming to seat of insert hole.

g. Check engine lifting eye for flatness, wear, and corrosion.

4-26. Repair — Engine Mounts. Any blended or polished wear, not to exceed .015 inch, will be cleaned with solvent (C96), zinc chromated (C81A) and returned to service. Any scratches, cracks or any damage greater than .015 inch will require the engine mount to be discarded. No straightening or weld repair of engine mounts is authorized.

4-27. Installation — Engine Mount Fitting. (See fig. 4-3.) *a.* Install engine attach fitting (lower or side) by inserting chamfered side of fitting into mounting pad recess. Align holes in fitting flange with three threaded holes in mounting pad.

b. Install bonding jumper, as required, and three bolts with washers. **TORQUE BOLTS TO 140 - 180 INCH-POUNDS.** Secure with 0.032-inch lockwire (C57).

4-28. Installation — Lower Engine Mount. *a.* Place ends of lower engine mount (detail A) against bulkhead fittings.

b. Install two bolts, four washers, and two new nuts at bulkhead attach points.

CAUTION

Do not tighten bolts installed in *b* above until the engine attach bolt is tightened according to *c* below.

c. Install engine attach bolt and washer that secure mount to fitting. **TORQUE BOLT TO 100-140 INCH-POUNDS.** Secure with 0.032-inch lockwire (C57).

d. Tighten bulkhead fitting bolts and nuts.

Table 4-7. Premaintenance Requirements for Installation of Upper Engine Mounts.

Conditions	Requirements
Special Tools	(T11)
Minimum Personnel Required	Two (MOS 67V & 68B)
Consumable Material	(C57)

4-29. Installation — Upper Engine Mount. (See fig. 4-3.) Inspect engine as described in step *b* of para 4-25 before installation.

a. Place short end of upper engine mount (detail C) against oleo support fitting and long end against upper engine mount fitting.

CAUTION

Do not tighten bolts installed in *b* below until the engine attach bolt is tightened according to *c* below.

b. Install bolt, two washers, and new nut to fasten mount to structure.

c. Install engine attach bolt and washer that secure mount to fitting. **TORQUE BOLT TO 100-140 INCH-POUNDS.** Secure with 0.032-inch lockwire (C57).

d. Tighten upper mount fitting and oleo support fitting nuts and bolts.

e. Remove engine hoist (T11) and reinstall the compressor air duct support bracket in the overhead hoist fitting.

f. Reinstall engine oil pressure sender clamps and engine harness clamp on right side engine mount. (See detail A, fig. 4-1, sh 1.)

4-30. Installation — Engine Lift Fitting. Install engine lift fitting (detail B, fig. 4-3) by installing two 5/16 inch-diameter (side) bolts and washers, and one 3/8 inch-diameter (front) bolt and washer. **TORQUE SIDE BOLTS TO 140-160 INCH-POUNDS, AND FRONT BOLT TO 160-190 INCH-POUNDS.**

4-31. ENGINE ARMOR KIT.

4-32. Description — Engine Armor Kit. The engine armor kit installation consists of an engine fuel controls armor assembly. (See details A and B, fig. 4-4.) The box-shaped fuel controls armor is mounted below the engine on two support arms. The box shape provides protection for the engine fuel pump, gas producer fuel control, power turbine governor and most of the related interconnecting lines. The mounting position also gives protection to the lower section of the power and accessories gearbox. The fuel system armor is fabricated of reinforced ceramic tile. The armor unit has a large rectangular opening in the lower right side for installation and operational movement of the N1 gas producer control rod. The lower left side has an oblong hole for entry of the fuel supply line. A 0.38-inch hole is centered in the bottom of the rear panel to drain any fuel or oil leakage. The channel-shaped compressor armor is mounted in the air inlet recess and provides protection for the bottom and sides of the compressor. Replacement of compressor armor is outlined in paragraph 4-46. The fuel controls armor is interchangeable among aircraft equipped with the installation provisions.

WARNING

If the aircraft is to be operated with the engine fuel controls armor removed, part or all of the crew armor must also be removed, depending on mission requirements and aircraft loading. A weight and balance check must always be made to ensure that center of gravity limits will not be exceeded.

4-33. FUEL CONTROLS ARMOR.

4-34. Inspection — Fuel Controls Armor Installed. *a. Check* for any evidence of cracks; rigidity and security of mounting to the right and left support (detail B, fig. 4-4); signs of fuel or oil leakage at the drain hole; and any evidence of a bullet or shrapnel strike.

NOTE

The fuel controls armor must be completely removed and a thorough inspection made of the engine (TM 55-2840-231-24) when there is evidence of fuel or oil leakage at the drain hole.

b. With armor installed:

(1) Inspect armor supports (detail B) for security of mounting to the aircraft structure, abnormal bends in the support tubing, and cracks.

(2) Inspect the armor installation for a minimum clearance of 0.13-inch between all surfaces and edges of the armor and the engine, the armor and the fuel inlet line. Check that clearance also exists between the left support and the engine gearcase cooling duct clamped to the firewall.

(3) While an assistant rotates the throttle grip through full travel on the pilot's collective pitch stick, check that there is no interference between the armor and the gas producer control rod.

4-35. Removal — Fuel Controls Armor. (See detail B, fig. 4-4.) *a.* Without loosening rod end bearings, disconnect both ends of the gas producer control rod. Carefully remove rod from between armor and engine.

b. With a container in place to catch trapped fuel, disconnect lower end of engine fuel supply hose. Drain fuel from line into container. Cap fuel line fitting.

c. Remove the bolts, washers, and nuts that secure the right and left supports (detail B) to the firewall.

d. While an assistant supports the armor unit, remove the bolts, washers and nuts that secure the supports to the structural ring. Using one man to support each side, slowly start to lower the armor unit. As the armor assembly is lowered, feed the fuel line through the hole in the left side of the armor. Continue lowering downward and aft until armor assembly clears the engine and structure.

e. If aircraft is to be operated without fuel controls armor installed, remove cap and reconnect lower end of fuel line. **TORQUE NUT TO 270 - 325 INCH-POUNDS.**

4-36. Disassembly — Fuel Controls Armor. Disassemble the fuel controls armor by removing the bolts, washers and nuts attaching the right and left supports to the armor unit. Observe that the two forward bolts are longer than the others.

4-37. Repair or Replacement — Fuel Controls Armor. *a.* Replace the armor if it is cracked or has received a strike.

b. (AVIM) Repair cracked supports (detail B, fig.

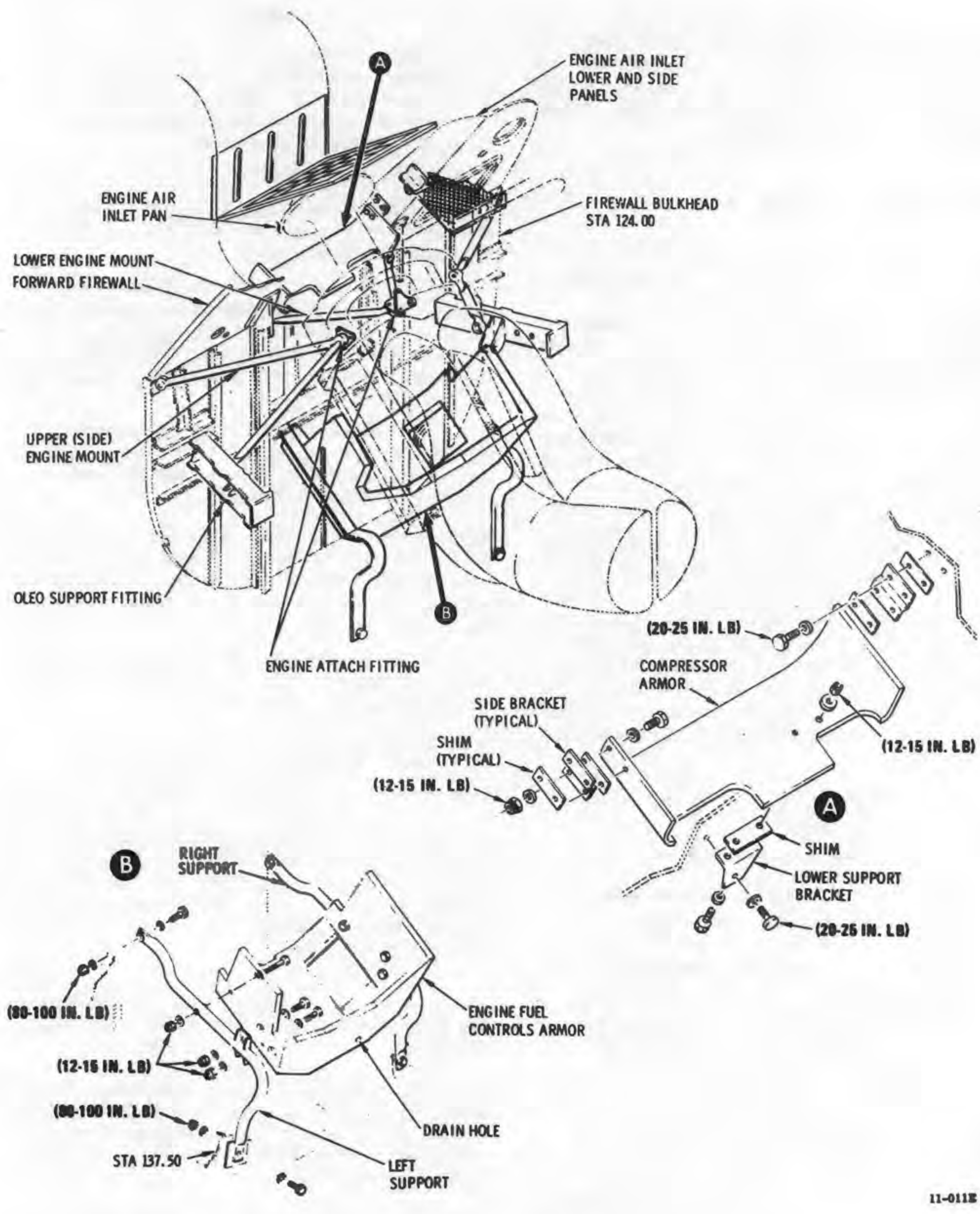


Figure 4-4. Engine Armor Kit Installation.

4-4) by inert arc welding according to TM 55-1500-204-25/1. Splices may be used in repair of cracked or kinked tubes provided the original tube angularity is maintained or restored. The supports are fabricated of Type 321 or 347 corrosion-resistant steel tube with 0.020-inch wall.

4-38. Assembly — Fuel Controls Armor. (See detail B, fig. 4-4.) Assemble by attaching the right and left supports to the armor unit with bolts, washers, and nuts. Install the two longer bolts at the forward attach points. **TORQUE THE NUTS TO 20-25 INCH-POUNDS.**

4-39. Installation — Fuel Controls Armor. (See detail B, fig. 4-4.) *a.* With the help of an assistant, slowly lift assembled armor upward and forward into position under engine.

b. As the armor is lifted, route the fuel line out through the hole in the left side of the armor. Continue lifting until armor attach points are in line and install the lower bolts, washers and nuts. **TORQUE THE NUTS TO 50-70 INCH-POUNDS.**

c. Continue to support the back of the armor and install the bolts, washers and nuts that attach the forward ends of the support to the firewall. **TORQUE THE NUTS TO 80 - 100 INCH-POUNDS.**

d. Uncap the fuel line and connect the lower end of the hose to the engine compartment bulkhead union. **TORQUE HOSE NUT TO 270 - 325 INCH-POUNDS.**

CAUTION

A twisted fuel hose will result in a partial blockage in the line, causing flame-out at high power settings. The self-sealing hose prevents visual detection of a twisted inner hose. Care should be taken during installation not to twist the coupling from their original position.

e. Carefully guide gas producer rod through right side armor cut-out and into place. Check that both rod ends are correctly aligned and install the attaching hardware. Secure nuts with new cotter pins.

f. Make a thorough inspection of the installation. (Refer to *a* above.) Check for a 0.13 inch minimum clearance between compressor armor and the torquemeter oil pressure line.

4-40. COMPRESSOR ARMOR.

4-41. Description — Compressor Armor. The compressor armor is fabricated of two steel plates fused together to form a single laminated thickness. Compressor armor is interchangeable among aircraft equipped with the installation provisions. (See detail A, fig. 4-4.)

4-42. Inspection — Compressor Armor Installed.

a. Check compressor armor for any evidence of cracks, security of support brackets and mounting to the structure, and clearance on all sides. Check for any evidence of a bullet or shrapnel strike. Armor shall be replaced if it is cracked or has received a strike.

b. Check that a minimum clearance of 0.13 inch exists between the compressor armor and the torquemeter oil pressure line.

4-43. Removal — Compressor Armor. *a.* Remove the engine (para 4-10).

b. Insert suitable wood blocking (approx. 2 in. × 2 in. × 0.38 inch thick) between the bottom of the compressor armor and the air inlet panel. (Blocking will support armor when hardware is removed.)

c. Remove attach bolt from lower support bracket (detail A, fig. 4-4). Remove the two (upper) bolts from each side bracket.

NOTE

The lower and side brackets must be kept with the compressor armor to which they are attached to ensure armor interchangeability.

d. Slide armor from air inlet recess and remove wood blocks. Tie shims to the compressor armor brackets to prevent loss. Do not disassemble side brackets from armor unless brackets are questionable.

4-44. Installation — General. The engine must be removed for compressor armor installation. If the armor to be installed was previously removed from the same aircraft, use the sequence in paragraph 4-45. If replacement armor is to be installed, use the sequence in paragraph 4-46.

4-45. Installation — Compressor Armor. *a.* Place compressor armor in approximate mounting position in air inlet recess. Support armor on wood blocks (approximately 2 in. × 2 in. × 0.38 inch thick).

b. Align shims (detail A, fig. 4-4) between side brackets and matching holes. Start bolts and washers into the four nutplates.

c. Install bolt and washer to secure lower support bracket. **TORQUE BOLT TO 20 - 25 INCH-POUNDS.**

d. **TORQUE THE FOUR SIDE BOLTS TO 20 - 25 INCH-POUNDS.** Remove wood blocks.

e. Check armor for rigidity and clearance on all sides. Ensure that a minimum of 0.13 inch clearance exists between torquemeter oil pressure line and armor.

f. Install engine (para 4-16).

4-46. Installation — New Armor, or Armor Originally Fitted to Another Aircraft. *a.* Install wood blocks (2 in. × 2 in. × 0.38 inch thick) on the horizontal panel of the air inlet recess. Secure with general purpose masking tape.

b. Place compressor armor in approximate mounting position, resting on the two blocks. Hold armor in place.

c. Move armor until right side bracket (detail A, fig. 4-4) is flush against right vertical firewall panel. Align bracket holes with nutplate holes.

d. While holding armor in this position, measure any gap between left side bracket and vertical firewall panel. Shims are required if gap is 0.012 inch or more.

NOTE

Check that not more than five shims are installed between each bracket and the armor. Additional shimming must be between the brackets and firewall panels.

e. Install 0.012-inch-thick shims to eliminate gap between bracket and firewall panel. Use approximately equal division of shims between sides if more than one shim is required.

f. If drilled shims are unavailable remove armor from recess. Fabricate the necessary shim thickness from aluminum alloy sheet stock. Finish dimensions are 0.012 inch × 0.70 inch × 2.12 inches. Material shall be 2024-T3 conforming to Federal Specification QQ-A-250/5. Drill the shims with a No. 7 drill to match the armor and mounting hole patterns.

g. Remove wood blocks. Reposition armor in firewall recess. Use shims between each bracket and firewall side panels, as required. Install bolts and washers to secure each side bracket and shim(s) to firewall. **TORQUE BOLTS TO 20 - 25 INCH-POUNDS.**

h. Observe whether hole in vertical portion of lower bracket is vertically aligned with nutplate hole. If not aligned continue with *i* below. If aligned, secure lower bracket with bolt and washer. **TORQUE BOLT TO 20 - 25 INCH-POUNDS.**

i. If holes in lower bracket and firewall are not vertically aligned, remove bracket from armor and install on firewall with bolt and washer. **TORQUE BOLT TO 20 - 25 INCH-POUNDS.**

j. Measure any gap existing between lower bracket and underside of armor. Determine the number of shim(s) required. Shim(s) are required if gap is 0.012 inch or more.

k. Install 0.012-inch-thick shim(s) to eliminate gap between bracket and armor.

l. If drilled shims are unavailable, fabricate the necessary shim thickness according to *f* above, except for finish size dimensions. Dimensions are 0.012 inch × 0.80 inch × 1.50 inches.

m. Insert required shim(s) between bracket and armor. Use two bolts, two washers, and two nuts to secure bracket to armor. **TORQUE NUTS TO 12 - 15 INCH-POUNDS.**

n. Check armor for rigidity and clearance on all sides. Ensure that a minimum of 0.13-inch clearance exists between torquemeter oil pressure line and armor.

o. Install engine (para 4-16).

Table 4-8. Premaintenance Requirements for Engine-to-Transmission Alignment.

Conditions	Requirements
Special Tools	(T8)
Minimum Personnel Required	Two
Consumable Materials	(C14) (C63)

4-47. Engine-to-Transmission Alignment. If misalignment of the engine to the transmission is suspected, check for proper alignment as follows. (See fig. 4-5.)

a. Check aligning tool (T38) to ensure that the mounting flanges and shaft are not defaced or distorted.

b. With drive shaft removed, attach aligning tool to transmission input shaft coupling with four bolts, eight washers, and four 1/4-28 nuts. **TORQUE BOLTS TO 50 - 70 INCH-POUNDS.**

c. Mount a dial indicator to contact the OD of the tool lower flange. Check that there are no obstacles near the main rotor blades, if installed. Have an assistant rotate the rotor drive system by hand-turning the tail rotor. The total indicated runout (TIR) at the lower end of the tool must not exceed 0.100 inch. (See detail A, fig. 4-5.)

d. If the TIR is more than 0.100 inch, remove tool from coupling. Remove coupling bolt from coupling using care to retain coupling shims. Rotate coupling to a different spline position. Coat coupling splines with lubricant (C63) and coupling bolt threads with antiseize compound (C14) before reassembly. Install coupling and bolt. **TORQUE COUPLING BOLT TO ACTUAL DRAG TORQUE PLUS 250 - 300 INCH-POUNDS.**

e. Repeat *b* and *c* above. If necessary, make several attempts to improve the alignment by further

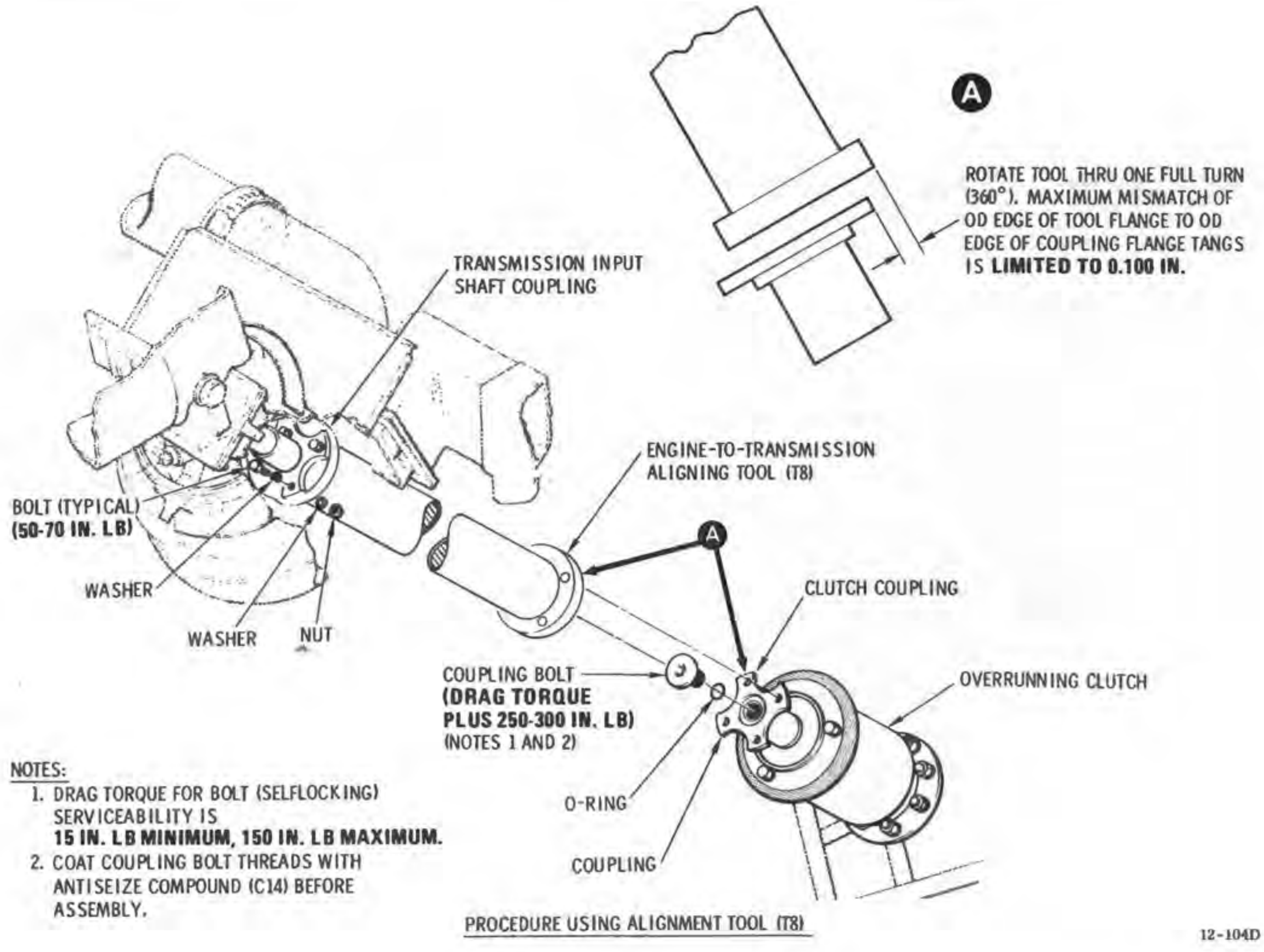


Figure 4-5. Engine-to-Transmission Alignment Check.

repositioning of the coupling. If TIR at the tool lower flange cannot be improved to indicate within the limit, remove the tool and replace the coupling.

f. With the new coupling installed, check TIR of the tool lower flange according to *b* through *d* above. If within the limit, continue with *g* below. If not within the limit, refer to *j* below.

g. Matchmark (pencil, etc) one of the four flange tangs of the clutch coupling to a starting point on the aligning tool flange. Have assistant rotate the drive system to turn the tool in 90-degree increments, through one complete revolution.

h. Measure the mismatch of the tool flange at the edge of each of the four tangs. The mismatch must be 0.100 inch or less for the engine-to-transmission drive alignment to be acceptable (detail A, fig. 4-5). If mismatch is not within the limit, refer to *j* below.

i. Remove tool from the transmission coupling and repeat *b* through *h* above with the aligning tool attached to the clutch coupling.

NOTE

If the clutch coupling is removed, ensure that the coupling shims remain installed on the clutch spline and that the packing remains on the coupling bolt.

j. Mismatch limits are the same for both points of attachment and must be met at both ends of the tool. The alignment of the transmission input shaft coupling and clutch coupling is unacceptable if limits are exceeded. Remove aligning tool after obtaining alignment.

SECTION III COOLING SYSTEM

4-48. COOLING SYSTEM INSTALLATION.

4-49 Description — Cooling System Installation. The engine cooling system consists of a ram air scoops built into the air inlet fairing, an oil cooler fan mounted on the main transmission input shaft, an oil cooler duct, and engine gearcase and compressor cooling ducts (fig. 4-6). Air enters either an external scoop or two inside scoops on the inlet fairings and flows to the oil cooler. Ambient air from the oil cooler blower is directed to and through the engine oil cooler, by the oil cooler duct, into the engine compartment. The oil cooler blower also supplies a constant ambient air flow through the engine gearcase and compressor cooling ducts into the lower and upper areas of the engine compartment. Two duct outlets direct the air upon the engine gearcase and the compressor section. All cooling air then exhausts from the engine compartment through a gap between the exhaust tailpipes and the engine access doors. A special engine gearcase cooling duct outlet is installed in armored aircraft. The duct is tilted left at a 15-degree angle to produce best possible cooling of the gearcase with the fuel controls armor installed.

4-50. Inspection — Cooling System Installation. Visually check for general condition, security of clamps, tubes and ducts, and for fraying or worn spots on tubing.

4-51. Repair — Cooling System Installation. Repair frayed or worn areas of tubes and ducts using tape (C103). Replace any tubes or ducts damaged beyond repair with the same size as that removed.

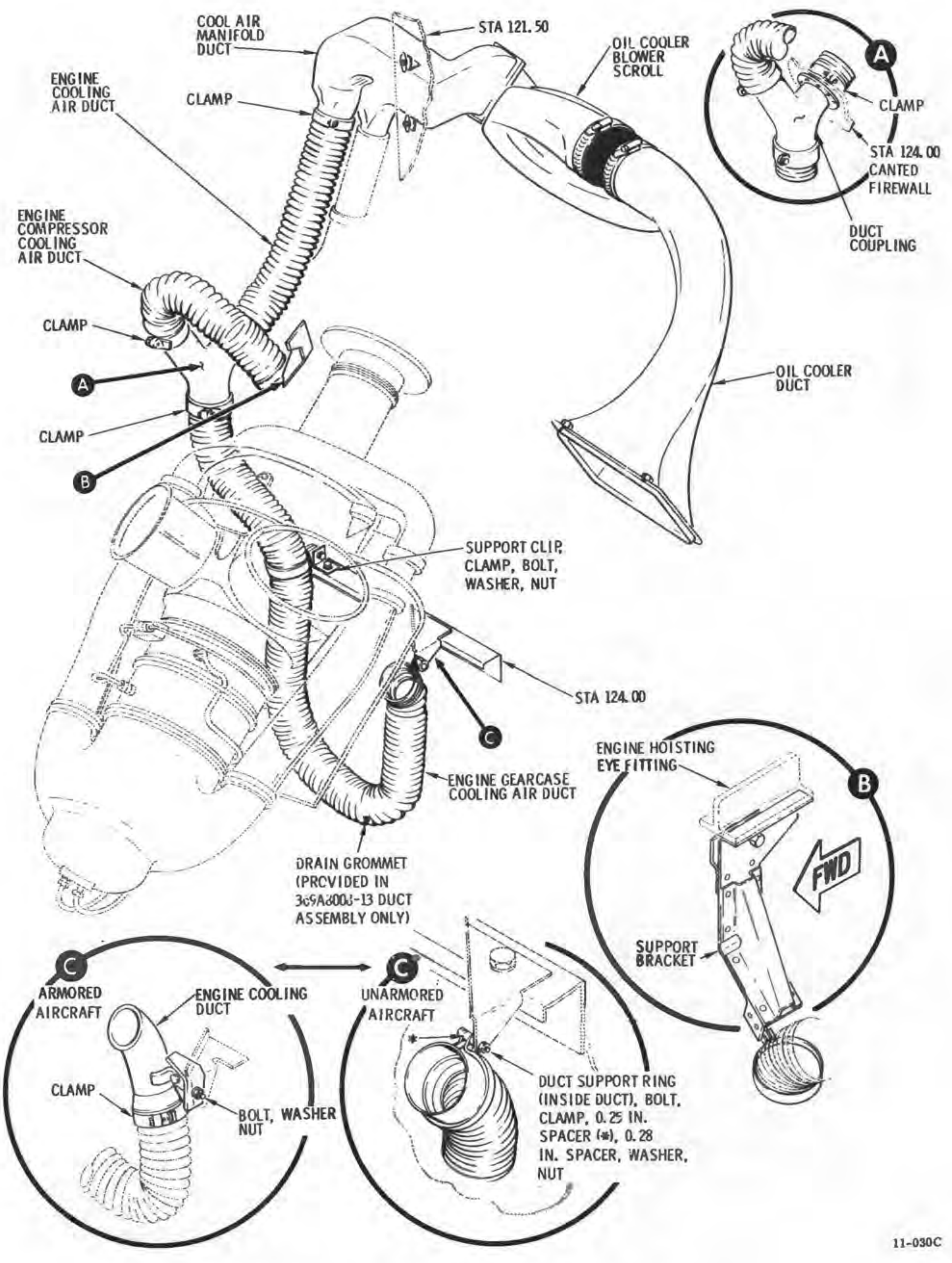


Figure 4-6. Engine Cooling System Installation.

SECTION IV AIR INDUCTION SYSTEM

4-52. AIR INDUCTION SYSTEM INSTALLATION.

4-53. Description — Air Induction System Installation. The air induction system consists of an air inlet installation (plenum chamber), and air filter system, engine air shield screen, engine air inlet bell, engine-to-firewall seal, and an engine air inlet-to-firewall seal. Air filtration is provided by either a barrier filter system or an inertial particle separator installation. Both filter systems may have been modified with a snow ingestion/cold weather kit.

4-54. Description — Engine Air Inlet Barrier Filter Installation. (See fig. 4-7, sh 1). The engine air inlet barrier filter is installed over the plenum chamber in series 1 and 2 aircraft. The unit provides for filtration of air flowing into the engine air intake and protects against foreign object entry. The filter installation consists of a filter element, a plastic filter frame for containing the element, a metal bypass door, pressure sensing switch, bypass air indicating system, and a bypass air control installation. The bypass door located on the front of the filter frame can be opened to permit air to bypass the filter element. A bypass air control release handle controls the opening of the bypass door and is located overhead in the flight compartment. The pressure switch located downstream of the filter element actuates the BYPASS AIR caution light located on the instrument panel.

4-55. Description — Engine Air Inlet Inertial Particle Separator Air Filter Installation. (See fig. 4-7, sh 2.) The inertial particle separator installation used on series 3 aircraft is located and contained within the engine air inlet aft fairing, the unit consists of a filtering system and particle separator, a bypass air control installation, filter bypass air indicating system, and an engine bleed air powered scavenging system. Atmospheric air enters the air filter tubes contained within the filter separator envelope. (See fig. 4-9.) Swirl guides within each of the filter tubes cause the inlet air to be swirled within the filter tubes. Heavier air concentrations (contaminants) are separated from the inlet air as a result of the swirling action and are forced into the separator portion of the air filter. Contaminants collected within the separator portion are withdrawn and discharged overboard through the ejector manifold nozzle and ejector tubes when the scavenge air system is placed into operation. The engine bleed air scavenging system taps bleed air at the cabin heat control and mixing valve. Operation of the bleed air scavenging system is controlled by an engine bleed air shutoff valve and operated by the SCAV AIR-OFF switch. Normally, air enters the inlet fairing, passes through the engine air filter filtering system and then flows into the plenum chamber above the engine air inlet bell and to the compressor inlet. Should the filtering system become clogged, the filter unit has provisions for bypassing the filtering system to allow inlet air to flow directly into the plenum chamber. The installation consists of a hinged bypass door mounted to the aft fairing, a series of pulleys, and a bypass door release cable assembly. A pull handle for the bypass door release is located overhead in the flight compartment. The air induction system is sealed by the engine-to-firewall seal which is springloaded against the engine side of the firewall seal bolted on the front of the over-running clutch at the firewall.

4-56. Description — Snow Ingestion/Cold Weather Kit. On aircraft with a barrier filter, a drain diverter is attached below each of the five filter pleats. The diverters drain filter moisture (water) to a natural trough on the plenum chamber forward face. The water then drains overboard through a drain tube at the right side of the chamber. On aircraft with an inertial particle-separator filter, a lipped seal around the separator lower edge collects water and provides a flow path to the drain tube. A drain hole in the filter element is also provided. Both systems tap-off compressor bleed (hot) air to melt snow and ice and clear the drain system. The hot air tube (fig. 4-10) starts at the cabin heat valve and is routed across the plenum chamber face to the overboard drain. An additional engine air shield screen is installed in both systems to completely screen the engine air inlet bell from large ice or snow formations.

4-57. ENGINE AIR INLET AFT FAIRING.

4-58. Description — Engine Air Inlet Aft Fairing. The engine air inlet aft fairing is a fiberglass structure that covers the plenum chamber. The tail rotor drive shaft access door and plenum chamber access door are on the right side of the fairing on aircraft without the particle-separator filter. Aircraft with the particle-separator have an air filter bypass door instead of the plenum chamber access door, and a filter ejector overflow opening on the left side of the fairing. Two drain holes may be located in the lower aft corners of the fairing.

4-59. Inspection — Engine Air Inlet Aft Fairing. *a.* Check the engine air inlet aft fairing for structural damage. Check for cracked or frayed glass cloth surfaces.

b. Check access doors and opening screen for damage, proper fit, and security of mounting.

c. Check that fairing drain holes, if present, are open and free of foreign matter.

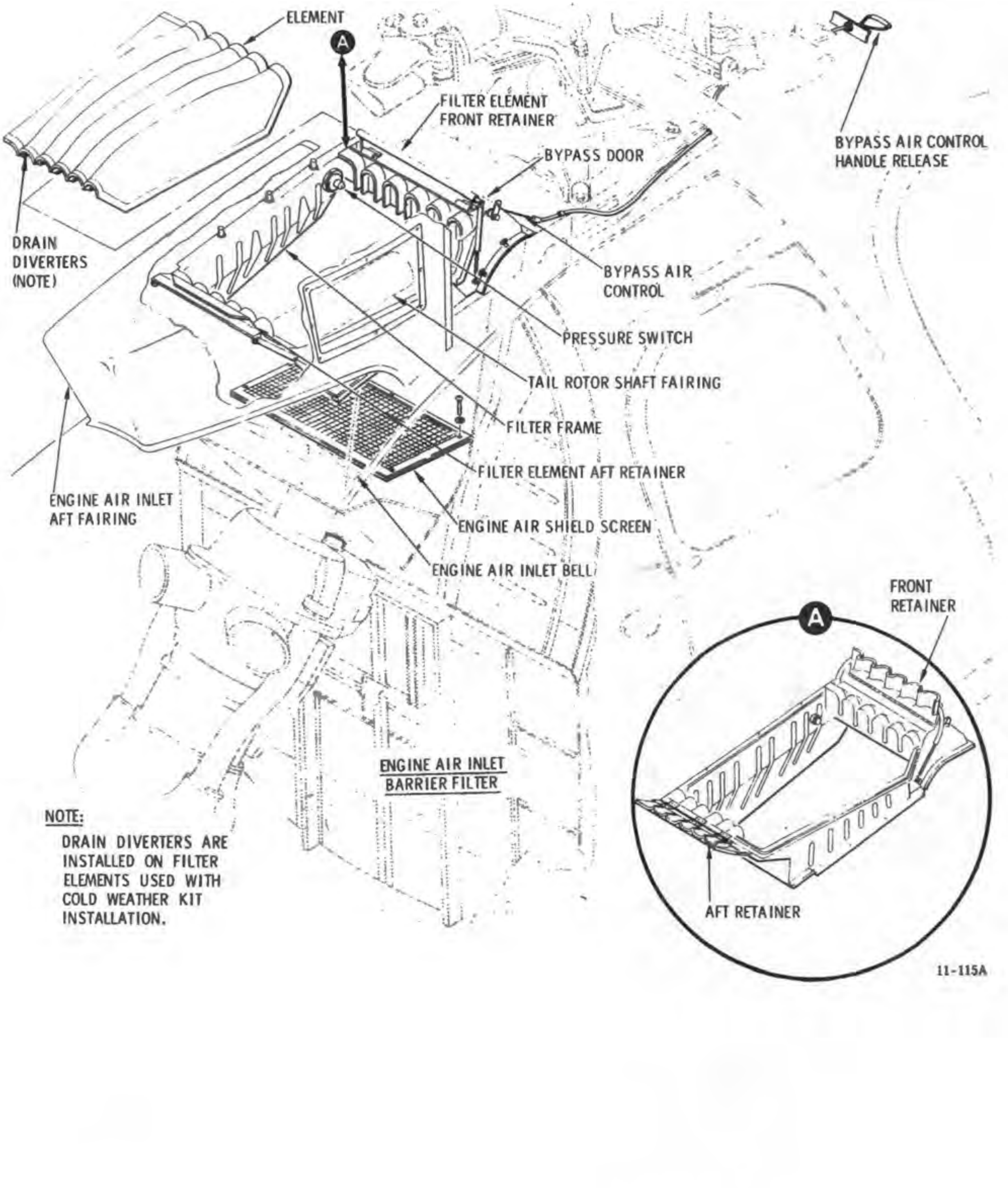


Figure 4-7. Air Induction System. (sheet 1 of 2)

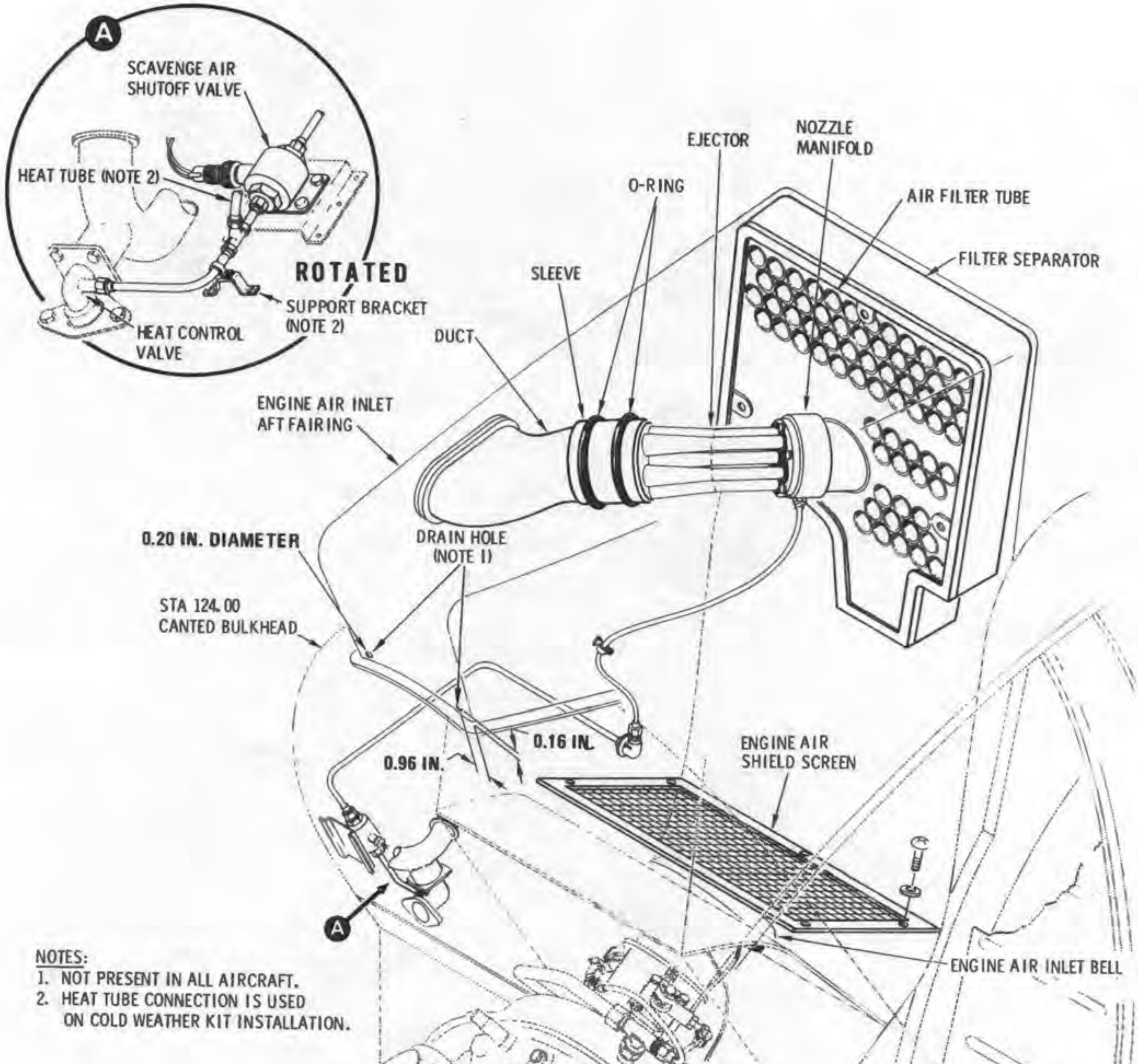
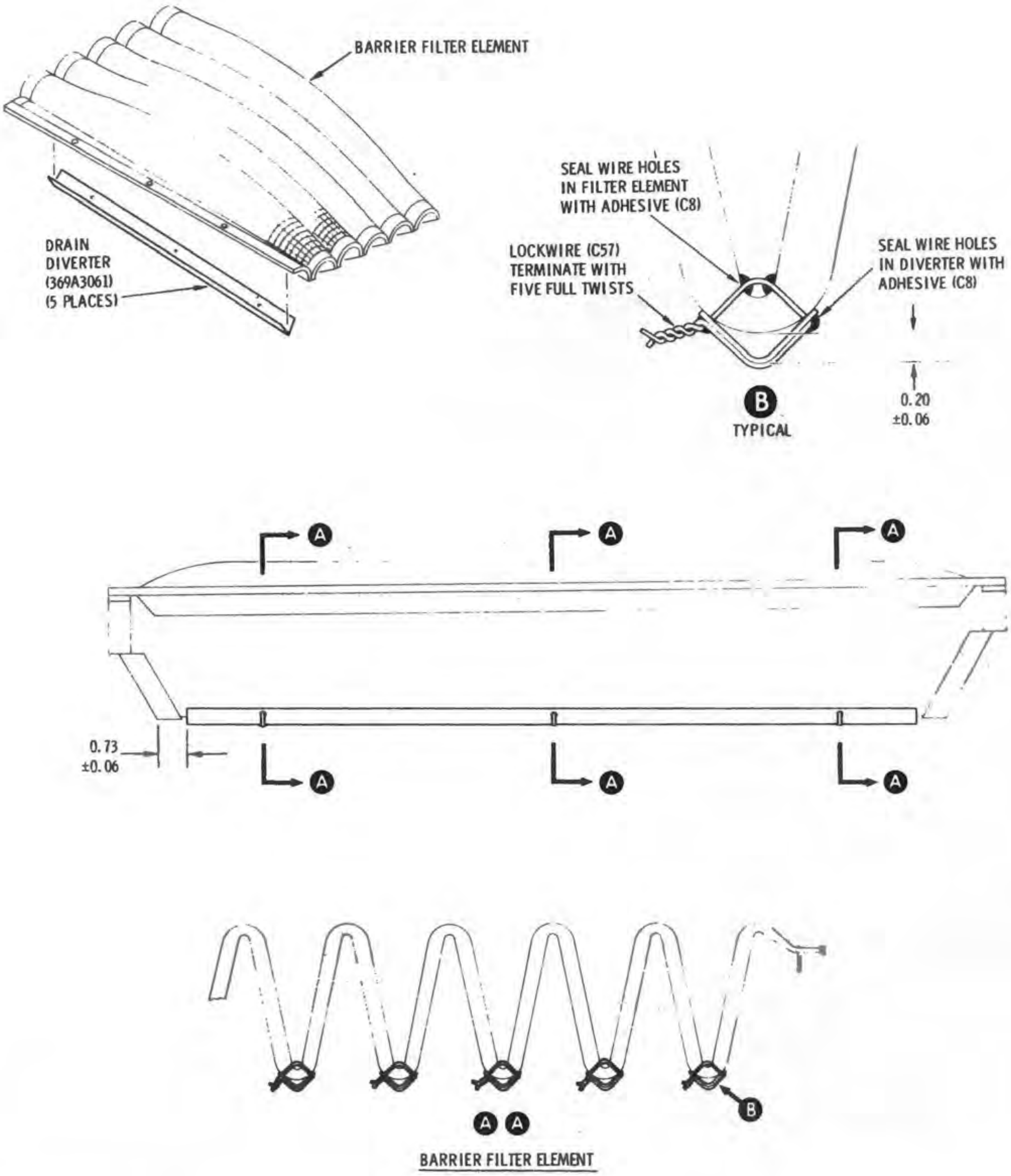


Figure 4-7. Air Induction System. (sheet 2 of 2)



NOTE:

ALL DIMENSIONS IN INCHES.

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Figure 4-8. Rework of Replacement Filter Elements. (sheet 1 of 2)

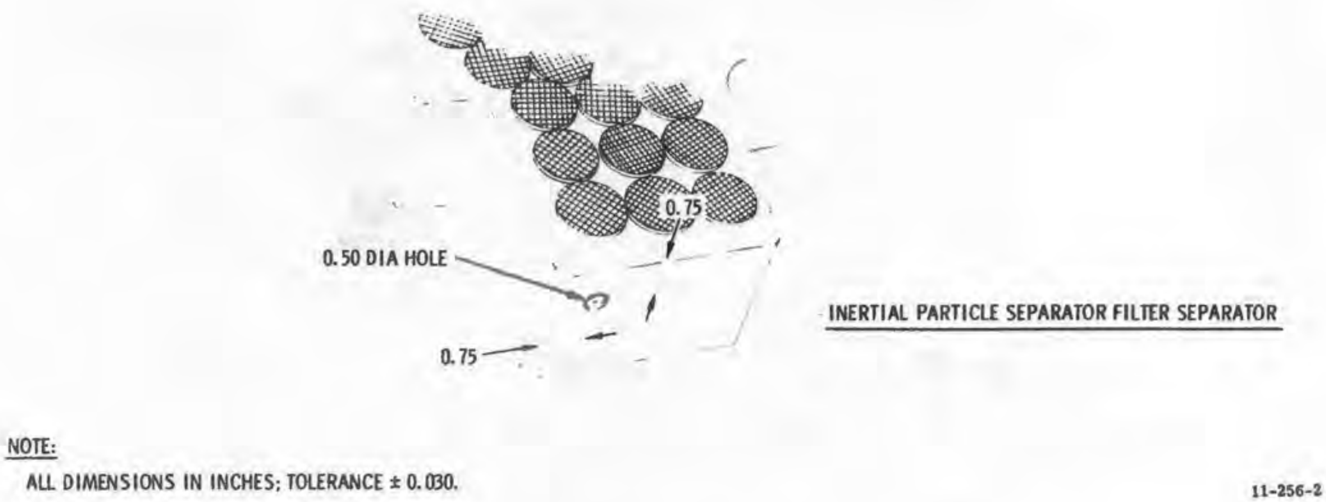


Figure 4-8. Rework of Replacement Filter Elements. (sheet 2 of 2)

4-60. Repair — Engine Air Inlet Aft Fairing. Repair aft fairing using fiberglass repair procedures described in chapter 2.

4-61. ENGINE AIR SHIELD SCREEN ASSEMBLY.

4-62. Description — Engine Air Shield Screen Assembly. The engine air shield assembly consists of either a single aluminum alloy framed screen (fig. 4-7, sh 1 or sh 2) or a dual screen installation (fig. 4-10). Dual screens are used on aircraft equipped with a cold weather kit. The forward screen is then teflon coated.

CAUTION

Use care to avoid dropping screws, washers, or any foreign material into engine air intake. The engine can be badly damaged by the entry of such objects.

4-63. Removal — Engine Air Shield Screen Assembly. *a.* Open plenum chamber access door. On aircraft with inertial particle-separator air filter, open filter bypass door.

b. On aircraft with cold weather kit, remove four screws and washers; then remove aft screen.

c. Remove forward engine air shield screen by removing attaching hardware. Remove from plenum chamber.

d. Tape a cover of cardboard or other suitable material and install over the engine air intake.

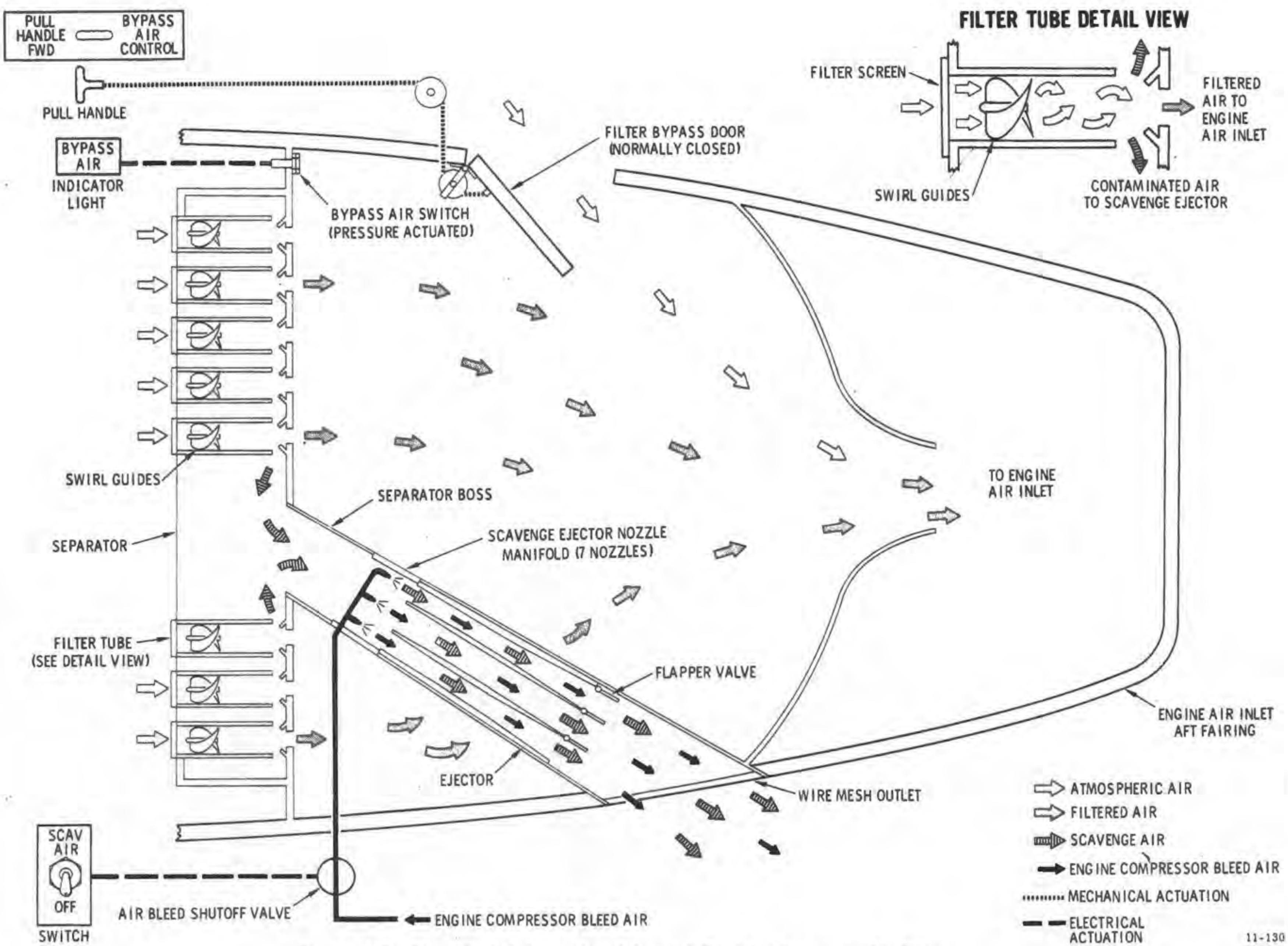


Figure 4-9. Simplified Schematic of Inertial Particle Separator Air Filter.

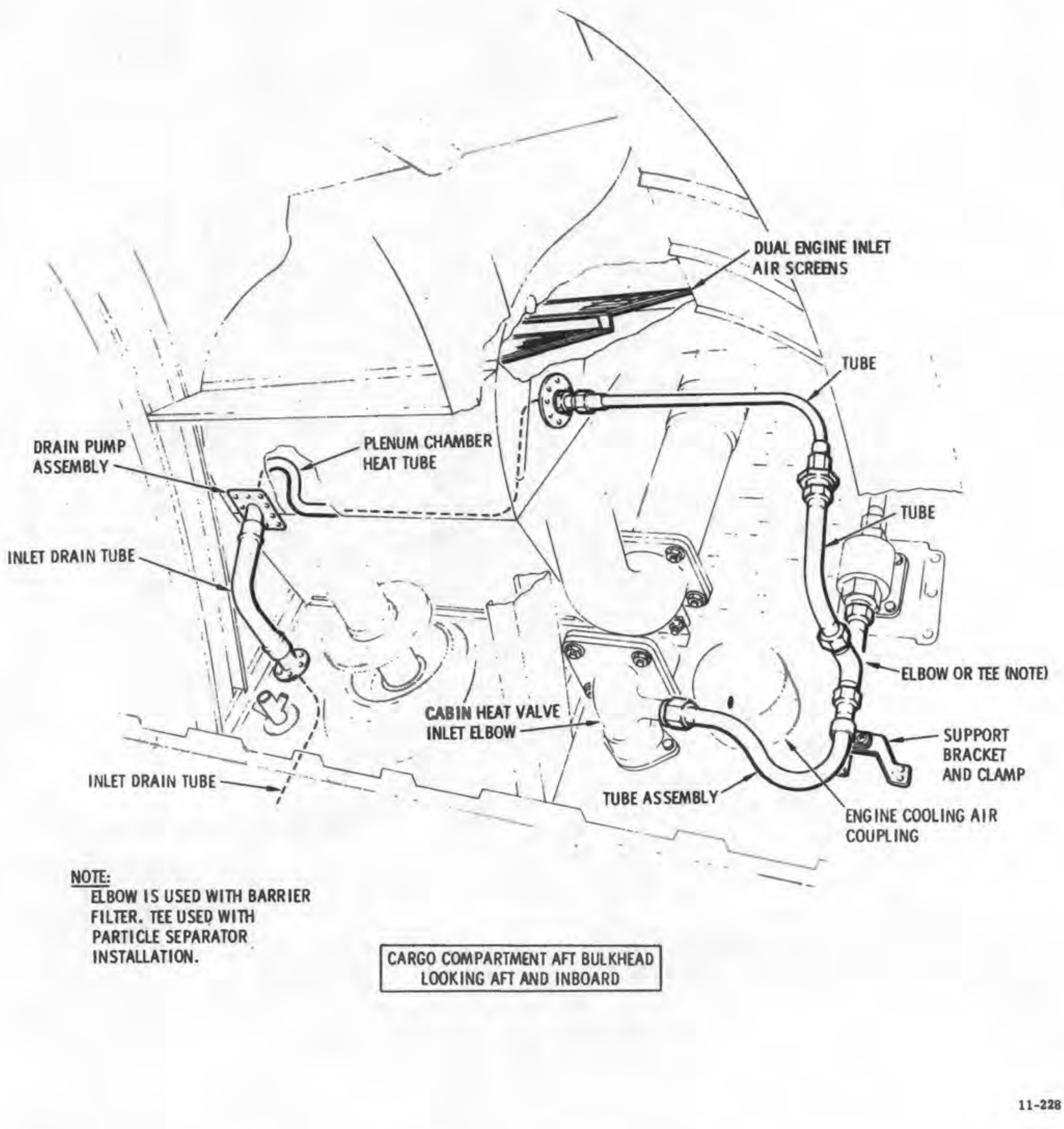


Figure 4-10. Cold Weather Heat Tube Installation.

4-64. Cleaning — Engine Air Shield Screen Assembly. Clean the engine air shield screen in solvent (C94) and allow to air dry.

4-65. Inspection — Engine Air Shield Screen Assembly. *a.* Check engine air shield screen for breaks, tears, corrosion, or other damage. Replace a damaged unit.

b. Replace a teflon coated screen if coating is chipping or peeling.

4-66. Installation — Engine Air Shield Screen Assembly.

CAUTION

Prior to removal of engine air inlet cover for screen installation, check the entire plenum area for any foreign material that could fall into engine. The engine can be badly damaged by the entry of such objects.

a. Remove taped cover from engine air inlet.

b. On aircraft without cold weather kit, position screen in plenum chamber and attach with five screws and washers.

c. On aircraft with cold weather kit, position forward teflon coated screen in plenum chamber and install three forward screws with washers. Position aft screen and secure with four screws and washers. The two center screws attach both screens.

d. Inspect plenum inlet, base of mast, and entire plenum chamber for foreign material.

e. Close plenum chamber access door. On aircraft with inertial particle-separator air filter, close filter bypass door.

4-67. ENGINE AIR INLET BELL AND ENGINE FIREWALL SEALS.

4-68. Description — Engine Air Inlet Bell and Engine Firewall Seals. The engine air inlet bell (fig. 4-11) is a molded nylon assembly with the bell and mounting flange formed as a unit. The engine air inlet bell provides a method of collecting and directing air from the plenum chamber to the engine compressor. The engine-to-firewall seal is a stamped steel assembly incorporating three flat springs, riveted to the inside diameter, for mounting to the engine air inlet bell mounting flange. The engine firewall seal seals the engine compressor to the plenum chamber. The engine air inlet firewall seal is a high temperature, all synthetic seal. The engine air inlet firewall seal provides a pliable surface for the rim of the engine-to-firewall seal to press against when the engine is installed. The engine shaft firewall seal assembly is a stamped steel backing with a seal that is bonded to the cupped diameter of the backing.

4-69. Removal — Engine Air Inlet Bell and Engine-to-Firewall Seal. *a.* Remove engine (para 4-10).

b. Remove five screws, washers, and nuts (fig. 4-11).

c. Remove engine air inlet bell.

d. Pull engine-to-firewall seal from bell.

4-70. Removal — Engine Air Inlet Firewall Seal. *a.* Remove engine (para 4-10).

b. Remove engine air inlet firewall seal (fig. 4-11).

c. Remove residue from firewall by using methyl ethyl ketone (C69); carefully scrape firewall as necessary.

4-71. Removal — Engine Shaft Firewall Seal. *a.* Remove engine (para 4-10).

b. Remove three bolts, six washers and three nuts.

c. Remove engine shaft firewall seal and backing (fig. 4-11).

4-72. Inspection — Engine Air Inlet Bell and Engine Firewall Seals. *a.* Check engine air inlet bell for cracks, breaks, or other damage.

b. Check engine-to-firewall seal for weak springs, cracks, breaks, dents, corrosion, or other damage.

c. Check engine shaft firewall seal backing for cracks, breaks, dents, corrosion, or other damage.

d. Check engine shaft firewall seal for brittleness, breaks or other damage.

e. Check engine air inlet firewall seal for cracks, breaks, dents, or excessive damage.

f. Replace a defective engine air inlet bell, engine-to-firewall seal, engine air inlet firewall seal, and engine shaft firewall seal.

4-73. Repair — Engine Air Inlet Bell and Engine Firewall Seals. *a.* To repair engine-to-firewall seal, replace any damaged or broken springs.

b. To repair engine shaft firewall seal, replace seal. Bond new seal to backing with adhesive (C9).

c. Repair of the engine air inlet bell is not authorized.

4-74. Installation — Engine Air Inlet Bell and Engine-to-Firewall Seal. *a.* Attach engine-to-firewall seal to engine air inlet bell by lifting leaf springs on seal and positioning over bell flange.

b. Place engine air inlet bell and engine-to-firewall seal into position on compressor inlet mounting flange and align bolt holes in engine air inlet bell mounting

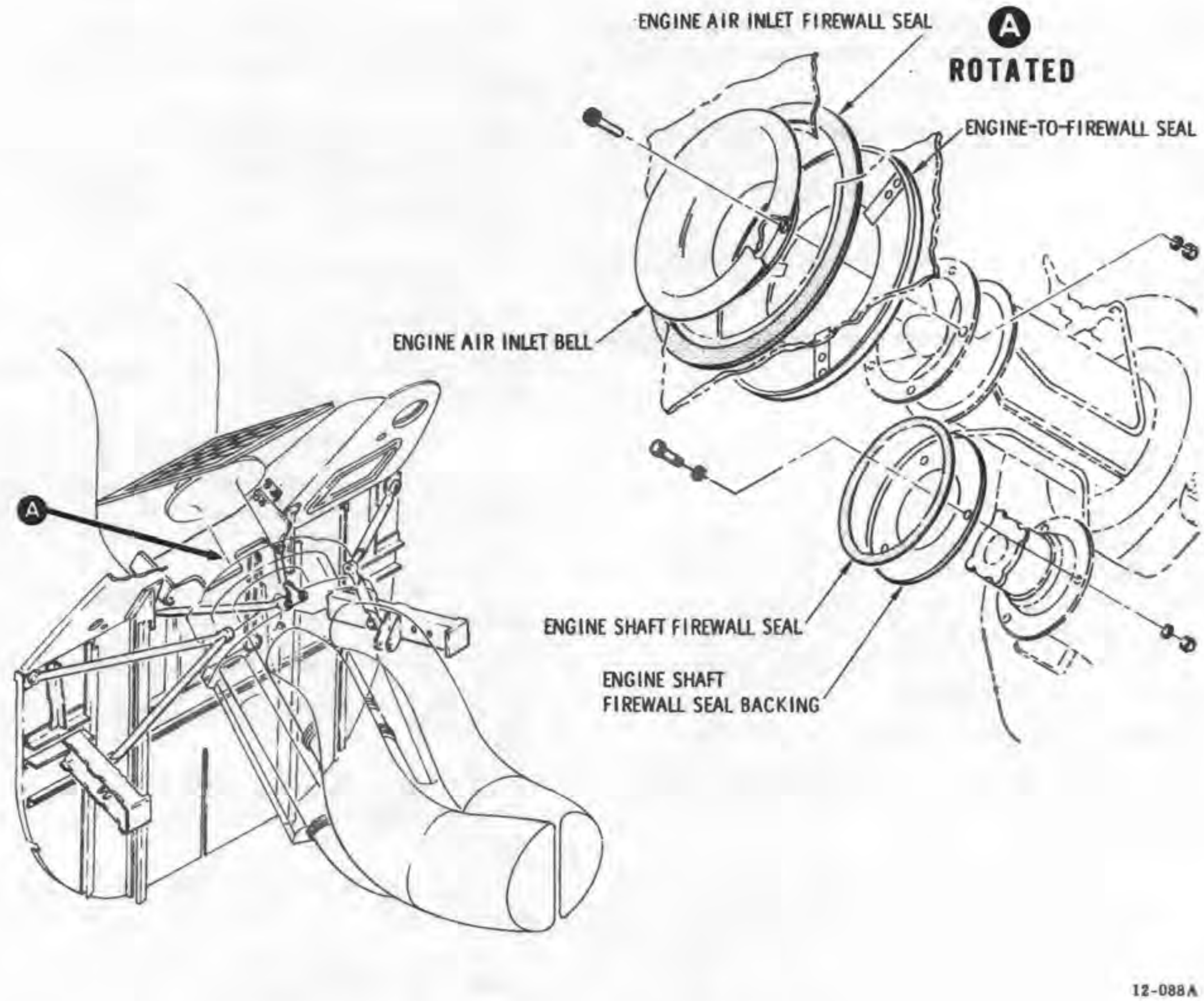


Figure 4-11. Air Induction System Components.

flange with bolt holes in mounting flange of compressor air inlet.

c. Install five screws, washers, and nuts; tighten nuts to secure.

d. Install engine (para 4-16).

4-75. Installation — Engine Air Inlet Firewall Seal. *a.* Using adhesive (C7), bond engine air inlet firewall seal into place on firewall.

b. Install engine (para 4-16).

4-76. Installation — Engine Shaft Firewall Seal Assembly. *a.* Place engine shaft firewall seal assembly into position and align holes with mounting holes in flange of overrunning clutch.

b. Install three bolts, six washers, and three nuts; tighten nuts to secure.

4-77. ENGINE BARRIER FILTER.

4-78. Description — Engine Barrier Filter. The barrier filter assembly consists primarily of a filter element, plastic filter element frame, and a metal bypass door and frame assembly. (See fig. 4-7, sh 1.) The filter element is secured in place by front and rear retainers on the filter assembly. Two configurations of filter element retainers are installed on the basic filter assembly. The filter frame is secured to the top of the air inlet installation above the plenum chamber by mounting bolts on the sides and rivets at the front and rear. The bypass door and frame assembly forms the front portion of the filter assembly and is separable from the filter frame. The bypass door frame contains a lever mechanism to allow opening of the bypass door when the bypass air control release handle is pulled. The bypass frame is hinge-mounted to the fuselage structure and can be folded forward for access to the engine air inlet access door. The filter assembly accommodates a pressure sensing switch and the tail rotor control rod at stations 113.22 and 137.50. Rubber boots are installed over the control rod where it enters and exits the filter frame to provide plenum chamber sealing.

4-79. Inspection — Engine Barrier Filter. *a.* Remove plenum chamber access door.

b. Remove engine air inlet front fairings (chapter 2).

c. Check that filter element is not clogged or contaminated. Check element for cuts, breaks, and for damaged areas. Check that filter element is properly installed and that no openings exist around sides of filter frame.

d. Check bypass air control release cable for security of attachment to bypass door lever. Check bypass door for operation.

4-80. ENGINE BARRIER FILTER ELEMENT.

4-81. Description — Engine Barrier Filter Element. The filter element is constructed of pleated fiberglass screen covering and an inner and outer filter medium. The element is held in place by retainers located fore and aft on the filter assembly. The filter element used on aircraft equipped with a cold weather kit has an aluminum moisture diverter lock wired to the bottom of each of the five pleats. (See fig. 4-7, sh 1.)

CAUTION

Install protective cover in the plenum chamber to prevent foreign objects from entering engine air inlet.

4-82. Removal — Engine Barrier Filter Element. *a.* Remove plenum chamber access door (chapter 2).

b. Release filter element retainers on forward and aft ends of filter assembly to free element. (See fig. 4-7.)

c. Move filter element forward to compress pleats and rotate through access door.

4-83. Cleaning — Engine Barrier Filter Element. *a.* If clean low pressure compressed air is available, direct air through filter element underside. To prevent damaging the element material, do not place hose nozzle directly against filter element. Continue to direct air through element until clean.

b. If no compressed air is available, turn element upside down and tap against a flat or inclined surface. Use care to avoid damaging the element corners.

c. If washing facilities are available, clean as follows: Wash in warm water and detergent (C35). Rinse in clean water flushing the filter from the underside out. Shake out and allow to air dry.

4-84. Inspection — Engine Barrier Filter Element. *a.* Inspect elements for cuts, holes, breaks and sagging. Check element fiberglass covering for security and for unraveling. Replace the element for any such damage or deterioration.

b. On cold weather kit elements, check that diverters are secure. If required, tighten or replace 0.032-inch lockwire (C57) and reseal wire holes with adhesive (C8).

4-85. Rework — Engine Barrier Filter Element. On aircraft equipped with a cold weather kit, replacement filter elements must have drain diverters installed. If required, rework filter elements as shown in figure 4-8, sheet 1.

NOTE

Modified filter is usable with summer and winter kits.

4-86. Installation — Engine Barrier Filter Element. *a.* Check for drain diverters used on aircraft equipped with a cold weather kit (para 4-85).

b. Clean exposed areas of filter frame with a cloth dampened by solvent (C94).

c. Compress filter element and rotate through plenum chamber access door and install in filter frame. Ensure that the installed element forms a tight seal on all edges (chapter 2).

d. Close plenum chamber access door. (See chapter 2.)

4-87. BARRIER FILTER PRESSURE SWITCH.

4-88. Description — Barrier Filter Pressure Switch. The barrier filter pressure switch is located on the side of the barrier filter frame and is used to sense engine air inlet pressure on the downstream side of the filter element. (See fig. 4-7, sh 1.) The switch housing contains a plenum chamber sensing port and an atmosphere sensing port. When a pressure differential is sensed, the switch closes and actuates the BYPASS AIR caution light. The switch is designed to actuate at a pressure of 3.0 ±0.25 in. water.

4-89. Inspection — Barrier Filter Pressure Switch. *a.* Check switch housing for cracks and breaks. Check condition of electrical leads and for damaged ground terminal.

b. Check that switch housing filter is not clogged or damaged. Check that switch plenum chamber sensing port is not clogged or damaged.

Table 4-9. Premaintenance Requirements for Testing Barrier Filter Pressure Switch.

Conditions	Requirements
Support Equipment	(S13) with a suitable vacuum source. Multimeter (T4)

4-90. Troubleshooting — Barrier Filter Pressure Switch. Refer to table 4-10.

4-91. Test — Barrier Filter Pressure Switch. The following test procedure may be performed with the pressure switch either removed or installed.

a. Attach a manometer pressure hose to the pressure-sensing port of the pressure switch.

b. If the switch is being tested in the installed condition, set the power selector switch at BATT to apply power to the BYPASS AIR indicator light circuit. If the switch is being bench tested, attach the test leads of a multimeter (T4) or similar continuity tester to the wire terminals of the two electrical leads extending from the switch. At this point the switch contacts should be open (BYPASS AIR indicator lamp out, or no continuity).

c. Slowly apply low-vacuum pressure to the switch pressure-sensing port while observing the manometer and BYPASS AIR indicator light or continuity tester. **THE SWITCH CONTACTS SHOULD CLOSE WHEN THE VACUUM REACHES 3.0 ±0.25 INCHES WATER** and should open when vacuum pressure is released. Repeat the check several times to verify consistent switch operation. Failure to operate consistently within the prescribed pressure range indicates a faulty switch and is cause for replacement.

4-92. Removal — Barrier Filter Pressure Switch. *a.* Set power selector switch at OFF and disconnect external power.

b. Remove engine air inlet front fairing and plenum chamber access door (chapter 2).

c. Remove filter element from barrier filter frame (para 4-80).

Table 4-10. Troubleshooting of the Filter Bypass Air Indicator System.

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

NOTE

Before you use this table, be sure you have performed all normal operational checks. If you have a malfunction which is not listed in this table, notify the next higher level of maintenance.

1. **BYPASS AIR caution light erratic or inoperative.**

STEP 1. Check for defective bypass air caution light (chapter 9).

If the caution light is defective, replace caution light.

STEP 2. Check for loose, broken, shorted, or defective electrical connectors or wiring at pressure switch and caution light. Check wiring harness between pressure switch and caution light.

If electrical connectors or wiring are found to be defective, repair or replace defective connector or wiring (chapter 9).

STEP 3. Check for defective pressure switch at barrier filter (para 4-87).

If the pressure switch is found defective, replace pressure switch.

2. **BYPASS AIR caution light illuminated when filter is not clogged.**

STEP 1. Check for a short circuit in caution light to pressure switch wiring.

If a short circuit is found, repair electrical wire(s) as necessary (chapter 9).

STEP 2. Check for defective pressure switch.

If pressure switch is found to be defective, replace pressure switch (para 4-87).

CAUTION

Install protective cover in the plenum chamber to prevent foreign objects from entering engine air inlet.

d. Disconnect pressure switch knife splice lead and ground terminal connection.

e. Remove nut with O-ring and remove switch from filter frame (fig. 4-7).

4-93. Installation — Barrier Filter Pressure Switch. *a.* Position pressure switch in filter frame and install O-ring and mounting nut.

b. Connect pressure switch knife splice lead and ground terminal connnection.

CAUTION

Remove protective cover from plenum chamber using care to prevent entry of foreign materials.

c. Install filter element in filter frame (para 4-86).

d. Install engine air inlet front fairing and plenum chamber access door (chapter 2).

4-94. BARRIER FILTER BYPASS AIR CONTROL INSTALLATION.

4-95. Description — Barrier Filter Bypass Air Control Installation. The bypass air control installation consists of a cable and housing assembly with a pull handle (fig. 4-12). The cable end is attached to the bypass door release lever at the filter frame assembly. The BYPASS AIR CONTROL release handle is located overhead in the pilot's compartment near the cabin heat and engine anti-icer control knobs. Clamps secure the cable housing where routed through the fuselage structure.

4-96. Removal — Barrier Filter Bypass Air Control Installation. (See fig. 4-12.) *a.* Remove engine air inlet right front fairing (chapter 2).

b. Disconnect bypass air control cable from bypass door release lever.

c. Remove clamps and attaching hardware that secure cable housing to fuselage structure. Unfasten straps that secure cable housing in pilot's compartment.

d. Remove the two screws that secure release assembly to canopy frame. Pull release assembly through grommet and remove from aircraft.

4-97. Inspection — Barrier Filter Bypass Air Control Installation. *a.* Check release cable and housing for kinking and cuts. Check release cable pull handle for free movement within cable housing.

b. Check grommet for condition.

4-98. Installation — Barrier Filter Bypass Air Control Installation. (See fig. 4-12.) *a.* Thread release cable and housing assembly through grommet.

b. Install release assembly handle mounting bracket to canopy frame and secure with two screws.

c. Install clamps to secure cable housing to fuselage structure. Fasten straps to secure cable housing overhead in pilot's compartment.

d. Pull cable aft to remove all slack. Secure thimble and spacer with screw, two washers, and nut. Overlap and crimp cable end to cable with a sleeve.

e. Pull BYPASS AIR CONTROL handle and check that filter bypass door opens.

f. Close bypass door and install engine air inlet right front fairing (chapter 2).

4-99. BARRIER FILTER FRAME ASSEMBLY.

4-100. Removal — Barrier Filter Frame Assembly. *a.* Set power selector switch at OFF and disconnect external power.

b. Remove engine air inlet from fairing (chapter 2).

c. Remove filter element (para 4-82).

CAUTION

Install protective cover in the plenum chamber to prevent foreign objects from entering the engine air inlet.

d. Remove main transmission cover (chapter 2).

e. Disconnect pressure switch knife splice connection and ground terminal connection (fig. 4-7, sh 1).

f. Remove tail rotor control rod (chapter 11).

g. Unfasten the two studs that lock the bypass door frame to fuselage structure. Separate bypass door frame from filter frame and fold forward. Remove eight nuts, washers, spacers, and bolts that secure filter frame. Drill out rivets that secure the front and rear of filter frame. Remove sealant from inlet mounting surfaces if necessary to free filter frame. Remove filter frame from air inlet installation.

h. To remove filter bypass door and frame, drill out rivets that secure hinge to fuselage structure. Disconnect bypass air control cable from bypass door lever. Remove filter bypass door and frame assembly with hinge shim.

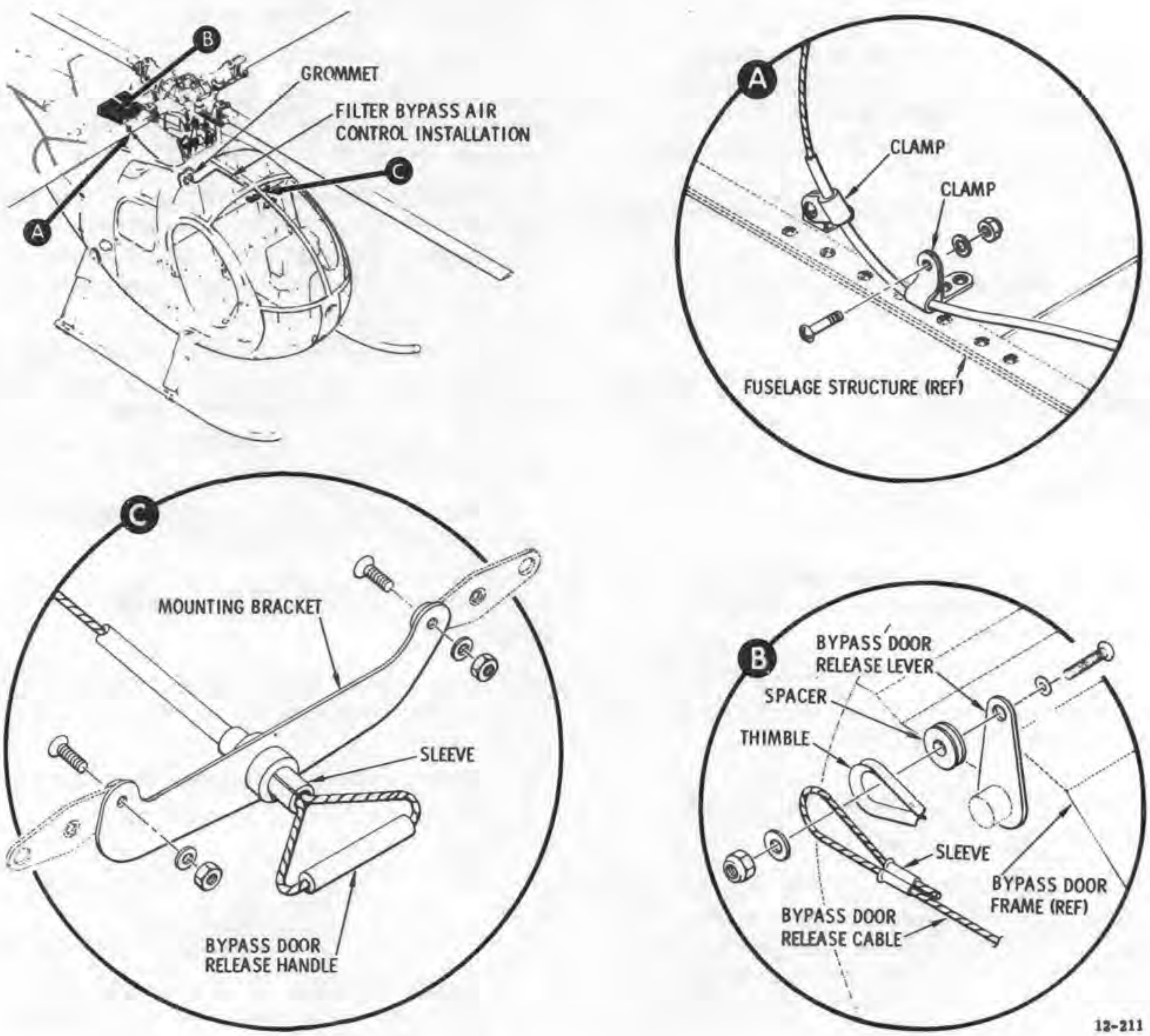


Figure 4-12. Barrier Filter Bypass Air Control Installation.

4-101. Cleaning — Barrier Filter Frame Assembly. *a.* Remove heavy dirt accumulations from frame assembly with a bristle brush.

b. Clean surfaces of frame assembly with a soft cloth dampened with solvent (C94).

4-102. Inspection — Barrier Filter Frame Assembly. (See fig. 4-7, sh 1.) *a.* Check plastic filter frame for cracks, holes and distortion. Check for cracks and breaks in frame at mounting holes.

b. Check extension spring and sleeving of element aft retainer for condition and security. When filter assembly with hinged retainers is installed, check aft hinge retainer, spring, and sleeving for condition and security.

c. Check bypass door and frame assembly for corrosion, dents, and distortion. Check bypass door release lever for security and operation.

d. Check the element retainer on bypass door frame for secure attachment and operation. When filter assembly with hinged element retainer is installed, check hinged element retainer, spring, and sleeving for condition.

4-103. Repair or Replacement — Barrier Filter Frame Assembly. *a.* For patch repairs to filter frame, refer to chapter 2.

b. Replace broken element retainer extension springs and defective sleeving.

c. Replace missing or broken locking studs on by-pass door frame.

4-104. Installation — Barrier Filter Frame Assembly. (See fig. 4-7, sh 1.) *a.* Position filter frame over plenum chamber and align with existing bolt and rivet holes. Install eight nuts, washers, spacers, and bolts. Rivet front and aft portions of filter frame in place with MS20600AD4W replacement rivets.

b. Position bypass door and frame assembly with shim in place and align with existing rivet holes. Rivet frame assembly in place with MS20600AD4W replacement rivets. Insert filter bypass frame in filter frame and secure with two locking studs.

c. Install tail rotor control rod and boot (chapter 11).

d. Install bypass door release cable on bypass door release lever.

e. Connect pressure switch knife splice and ground terminal connections.

f. Install main transmission cover (chapter 2).

CAUTION

Remove protective cover from plenum chamber.

g. Install filter element (para 4-86).

h. Seal all openings at base of the inlet portion of frame assembly with sealant (C89).

i. Seal all openings between the inlet portion of frame assembly sides and the plenum chamber with tape (C106). Check that tape is applied externally and cannot enter engine inlet.

j. Install engine air inlet front fairing (chapter 2).

4-105. INERTIAL PARTICLE SEPARATOR AIR FILTER.

4-106. Description — Inertial Particle Separator Air Filter. The air filter assembly consists of a series of screened tubes contained within the particle-separator envelope, a scavenge air ejector nozzle manifold, and an ejector tube. (See fig. 4-13.) The filter separator is shaped to fit the front portion of the aft fairing and is secured to the fairing with three mounting bolts. Each of the filter tubes contained in the separator envelope consists of a filter screen, an air swirl guide, and an opening to the separator section. The ejector nozzle manifold and ejector tube are mounted aft of the filter separator exit boss. The nozzle manifold contains a bleed air fitting connection and seven jets for the bleed air scavenging system. The ejector tube consists of a mounting flange with seven tubes and seven hinged, air-operated flapper valves. Contaminants are directed overboard through filter duct and a screened opening in the left side of the aft fairing. On aircraft equipped with a cold weather kit, a drain hole is provided at the bottom of the assembly. When the filter duct is removed from the filter assembly, a protective cover may be installed in the opening in the left side of the aft fairing.

4-107. Removal — Inertial Particle Separator Air Filter. *a.* Remove engine air inlet front fairings (chapter 2).

b. Open filter bypass door.

CAUTION

Install protective cover in the plenum chamber to prevent foreign objects from entering engine air inlet.

NOTE

Prior to removing ejector tube from nozzle, paint a mark across flange of ejector and nozzle manifold to aid repositioning of ejector tube flapper valves during installation.

c. (See fig. 4-13.) Remove three bolts that secure separator to aft fairing. Remove six bolts that secure ejector tube and nozzle manifold to separator. Tip the top of separator outward and remove from aft fairing.

d. Remove O-ring from ejector and slide onto sleeve. Disconnect bleed air tube from nozzle manifold. Remove ejector tube and nozzle manifold from aft fairing.

e. Remove aft O-ring from sleeve and slide onto the filter duct. Remove sleeve from duct.

f. Remove the duct and screen by removing the eight screws and washers that secure them to the aft inlet fairing.

4-108. Inspection — Inertial Particle Separator Air Filter. *a.* Check filter screens for damage and secure attachment. Check air swirl guides for damage and for broken or missing vanes. Up to five damaged swirl guide tubes may be blocked off *e* below. Inspect particle separator openings in filter tubes for clogging.

b. Check separator for cracks, holes and distortion. Evidence of cracking may require realignment of the

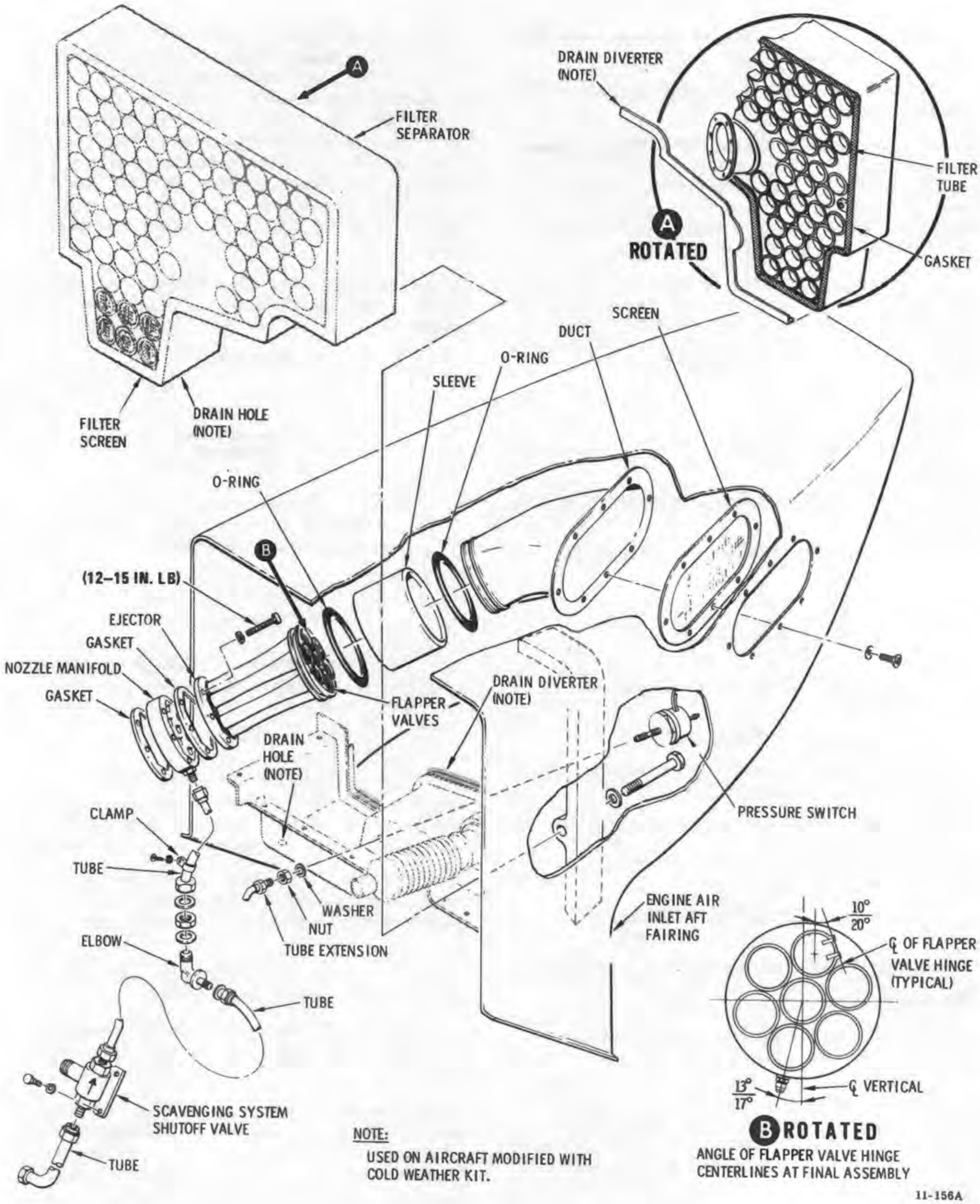


Figure 4-13. Inertial Particle-Separator Air Filter Assembly.

filter. Check that gasket installed on edge of separator is securely attached and not damaged.

c. Check bypass air control installation for security and bypass door for operation. Check hinges and pulleys for loose or missing hardware. Check door gasket for security of attachment and for cuts and deterioration.

d. Check rubber sleeving and O-rings for cuts, holes, and deterioration.

e. Check ejector tube for cuts, breaks, and distortion. Check condition of flange area. Check condition of flapper valves and that valves swing freely on hinges. Ejectors with missing flapper valves may be continued in operation until replacements are installed.

f. Check nozzle manifold for breaks, cracks, and distortion. Check fitting for crossed or stripped threads. Check that the seven nozzles are not plugged, bent, or damaged.

g. Check that air filter overboard vent screen is not damaged or clogged.

4-109. Cleaning — Inertial Particle Separator Air Filter. *a.* Remove filter tube screens and clean with a soft brush to remove dirt accumulations.

b. Immerse separator in a solution of detergent soap (C35), and allow to soak approximately 15 minutes. Flush out with clear water. Allow filter assembly to drain and air-dry thoroughly. Reinstall filter tube screens.

c. Clean nozzle manifold with high pressure compressed air. Use care to prevent damaging the nozzles.

4-110. Alignment and Surface Flatness Repair — Separator and Duct. (See fig. 4-13.) *a.* Remove the filter separator.

b. Using plywood or phenolic sheet of 0.5-inch minimum thickness, locally manufacture a flat template surface. Use the filter assembly as a guide to draw and then cut out the template.

c. Position the template against the engine air inlet aft fairing-to-filter mounting surface and install three bolts and nuts. Tighten fingertight so that template is held firmly in place without twisting.

d. Use a thickness gage and check for gap(s) at the three mounting bolt attach points. **GAP SHOULD NOT EXCEED 0.030 INCH.**

e. Eliminate excessive gap by bonding an equivalent thickness shim at engine air inlet fairing bolt attach point. Shim may consist of aluminum sheet stock bonded to the fairing with catalyzed resin (C39) or layers of fiberglass cloth installed according to fiberglass repair procedures, chapter 2.

f. Reinstall the filter separator.

g. With the rubber sleeve removed, use a straightedge and check for misalignment between the ejector and ejector overboard duct. **MAXIMUM MISALIGNMENT IS 0.25 INCH.**

h. If duct and ejector are misaligned, install tapered shim(s) between the duct and screen rubber rim picking up at least two attachment screws.

NOTE

Existing screen and duct attachment screws (MS27039C1-11) are long enough to allow a 0.25-inch-thick shim addition.

i. Reinstall the duct, screen and shim(s) with several screws and recheck duct for misalignment. If alignment is correct, *g* above, reinstall sleeve and continue with installation.

4-111. Repair — Air Filter Separator. Repairs to the air filter separator are accomplished using standard laminated fiberglass methods and fiberglass repair kit (C39) as described in chapter 2. Take care that no structural interference or potential foreign object damage to the engine can occur as a result of filter repair.

a. Rebond loose or missing fiberglass attachment bolt spacers.

b. Rebond seams that join the front and back walls to the center section.

c. Rebond manifold nozzle attachment tube.

d. Patch repair or fill any other damaged or cracked areas.

e. Replace missing or damaged guide tubes by pulling loose and rebonding in place. Up to five swirl guide tubes may be temporarily blocked out by installing an aluminum patch, attached with a minimum of three mechanically expanded rivets, over the aft side of the swirl guide hole.

f. Repair or replace worn or loose gasket on separator. For gasket bonding information, refer to general use and application of nonstructural bonding adhesives (chapter 2).

4-112. Rework — Filter Separator. On aircraft equipped with a cold weather kit, replacement filter separators must have a lower drain hole. If required drill hole as shown in figure 4-8, sheet 2.

4-113. Installation — Inertial Particle Separator Air Filter. (See fig. 4-13.) *a.* Align mounting holes of duct and screen. Secure duct and screen to aft fairing with eight mounting screws and washers. **SCREW TORQUE NOT TO EXCEED 11 INCH-POUNDS.**

b. Check filter separator lower section for a drain hole used on aircraft equipped with a cold weather kit (para 4-112).

c. Install filter separator into front of aft fairing and align mounting holes. Apply a coat of anti-seize compound (C14) to bolt threads. Secure filter separator with three mounting bolts and washers; **TORQUE BOLTS TO 60-80 INCH-POUNDS.**

d. Preassemble sleeve and one O-ring on the grooved end of the ejector. Install one O-ring on end of installed duct.

e. Position nozzle manifold in place and connect bleed air tube to nozzle manifold fitting. Apply a coat of anti-seize compound (C14) to fitting threads before installation.

f. Install ejector in place using serviceable gaskets. Position ejector so paint stripe marks and bolts in nozzle manifold align.

NOTE

To aid installation when replacement ejector is used, position ejector tubes so flapper valves are as shown in figure 4-13 and mark uppermost tube. Position flapper valves as shown for final assembly.

g. Apply a coating of anti-seize compound (C14) to ejector mounting bolts. Secure ejector and nozzle to separator with six bolts and washers. **TORQUE BOLTS TO 12-15 INCH-POUNDS.**

h. Slide sleeve over the end of the installed duct and secure with O-rings.

CAUTION

Remove protective covering installed in plenum chamber.

i. Close filter bypass door.

j. Install engine air inlet front fairings (chapter 2).

4-114. BYPASS AIR CONTROL INSTALLATION.

4-115. Description — Bypass Air Control Installation. The bypass air control installation for the inertial particle-separator air filter includes the filter bypass door, bypass air control release, a door operating cable and stop, and a series of pulleys installed on the inside of the aft fairing. (See fig. 4-14, sh 1 and 2.) The BYPASS AIR CONTROL release handle is used to unlatch and open the bypass door and is located overhead in the pilot's compartment adjacent to the cabin heat and engine anti-icer control knobs. A cable connector located at station 130.00 joins the release cable to the door operating cable and provides a disconnect point.

4-116. Removal — Bypass Air Control Installation. *a.* Remove main transmission cover (chapter 2).

b. Remove engine air inlet left front fairing (chapter 2).

CAUTION

Install protective cover in the plenum chamber to prevent foreign objects from entering engine air inlet.

c. (See fig. 4-14., sh 1.) Disconnect the bypass door release assembly cable from the bypass door operating cable at the connector. Remove connector from installation.

d. Remove screws that secure release assembly bracket overhead in the pilot's compartment. Remove clamps and straps as necessary to free release assembly cable housing. Pull release assembly cable forward through grommets in structure and remove from aircraft.

e. Remove sleeve that secures cable to bypass door cable control crank (detail C, sh 2). Remove door operating cable with cable stop from pulleys and remove from fairing.

4-117. Inspection — Bypass Air Control Installation. *a.* Check door operating cable for breaks, cuts, and kinks. Check that cable stop terminals are swaged and secure. Check cable stop for damaged and stripped threads.

b. Check bypass door release assembly for breaks, cuts, and kinks in cable and cable housing. Check terminal stop on cable end for secure attachment.

c. Check door operating cable pulleys on aft fairing for rotation and secure attaching hardware.

CAUTION

Loose, missing or improperly installed filter bypass door and latching mechanism hardware can cause foreign object damage to the engine. Perform a thorough inspection and accomplish repairs per paragraph 4-118.

d. Inspect filter bypass door hinges for secure attachment and hinge pins for wear or looseness.

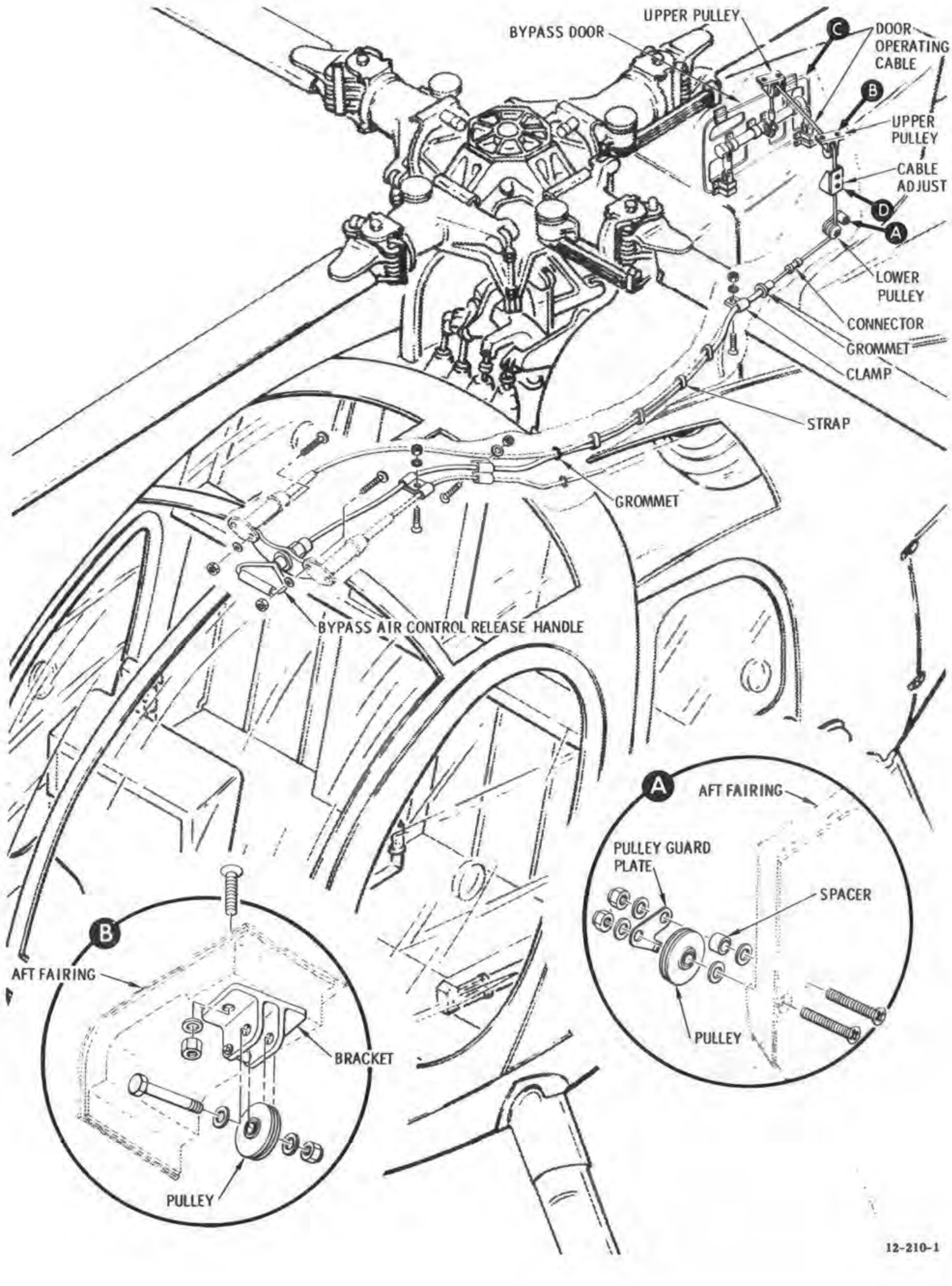
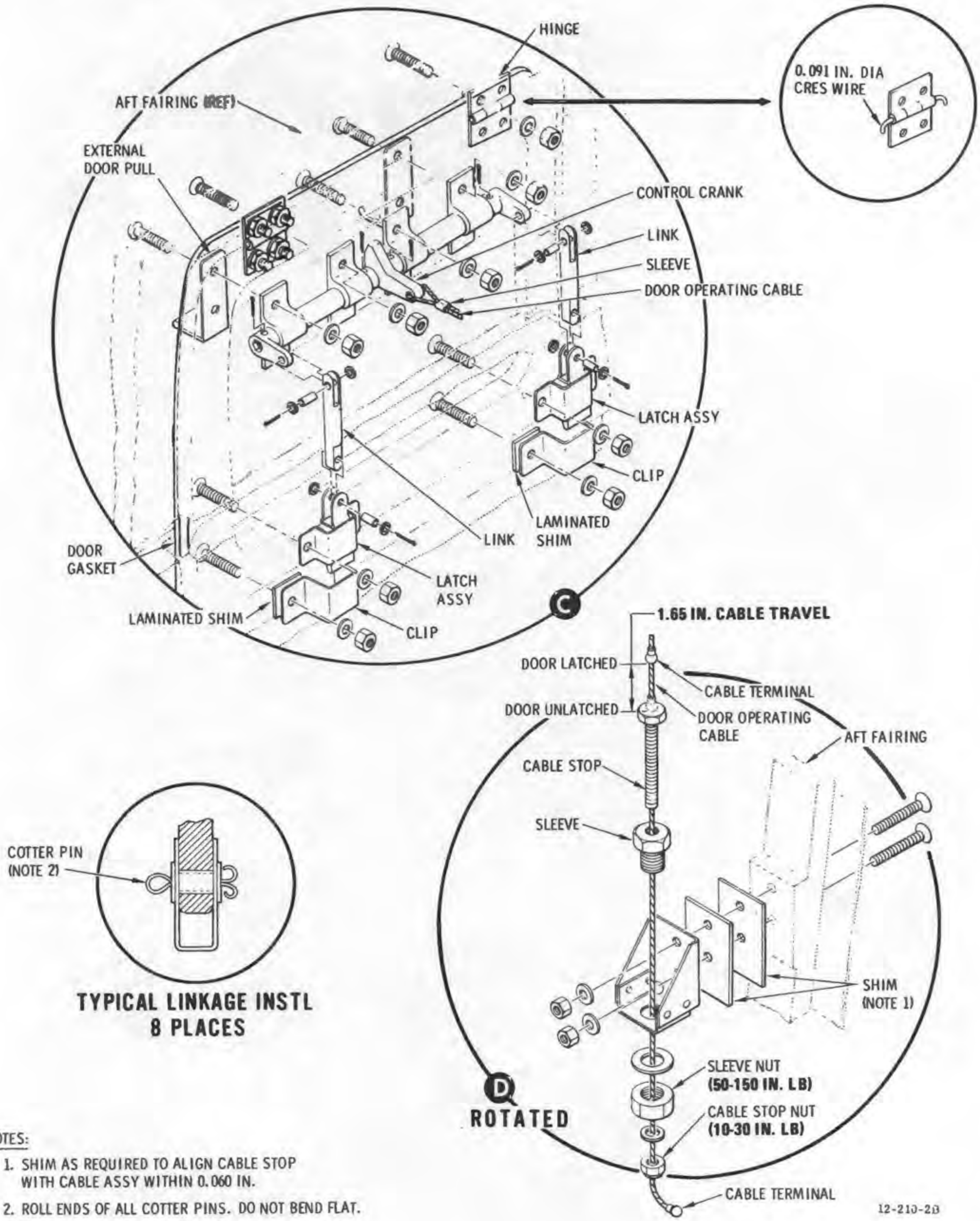


Figure 4-14. Bypass Air Control Installation, Inertial Particle Separator Air Filter. (sheet 1 of 2)



NOTES:

1. SHIM AS REQUIRED TO ALIGN CABLE STOP WITH CABLE ASSY WITHIN 0.060 IN.
2. ROLL ENDS OF ALL COTTER PINS. DO NOT BEND FLAT.

Figure 4-14. Bypass Air Control Installation, Inertial Particle Separator Air Filter. (sheet 2 of 2) *e.* Check for loose or missing door control crank and latching mechanism attaching hardware.

f. Check that all eight door mechanism cotter pins are rolled as shown in figure 4-14, sheet 2.

g. Check bypass door control crank and latching mechanism for operation and door for firm closure.

4-118. Repair — Bypass Air Control Installation. *a.* Replace unrolled cotter pins with new cotter pins. Roll ends of pins as shown in figure 4-14, sheet 2.

b. Replace loose or missing door hinge pins with 0.091-inch-diameter corrosion resistant steel wire (C59) of suitable length. Bend over at both ends after installation as shown in figure 4-14, sheet 2.

c. Adjust door clip laminated shim thicknesses as required so that door latching mechanism engages clip and door is held firmly closed without binding when latched.

d. Spray filter bypass door gasket on aft fairing and bypass door edge with dry lubricant (C64).

4-119. Installation — Bypass Air Control Installation. (See fig. 4-14.) *a.* Mount bypass air control release assembly bracket to canopy frame and install two attaching screws, washers, and nuts.

b. Thread bypass air control release assembly housing and cable through grommets in fuselage structure (sh 1).

c. Install door operating cable assembly on aft fairing pulleys.

d. Assemble door operating cable stop, stop sleeve, and stop sleeve nut on fairing bracket (detail D, sh 2).

e. Install connector to join bypass air control release cable with door operating cable.

f. Connect end of door operating cable to bypass cable control crank. With door fully latched, install sleeve on cable overlap; check that cable overlap will allow a cable travel of approximately 1.65 inches and then crimp sleeve. (See detail D, sh 2.) With cable terminal at rest on cable stop, bypass door should be opened a minimum of 45 degrees. Make final adjustment of cable travel at cable stop and sleeve. When final adjustment of cable travel is made, **TORQUE SLEEVE NUT TO 50-150 INCH-POUNDS. TORQUE CABLE STOP NUT TO 10-30 INCH-POUNDS.**

g. Install clamps and fasten straps to secure release cable housing (sh 1).

CAUTION

Remove protective cover installed in plenum chamber using care to prevent entry of foreign material.

h. Install main transmission cover (chapter 2).

i. Install engine air inlet left front fairing (chapter 2).

4-120. AIR FILTER BYPASS DOOR.

4-121. Removal — Air Filter Bypass Door. *a.* Remove engine inlet front fairings (chapter 2).

b. Disconnect bypass door operating cable (para 4-116). Cable may be removed as part of the door or disconnected by removing the cable sleeve.

c. Remove hinge pins and remove door assembly.

4-122. Disassembly — Air Filter Bypass Door. Disassemble door latching mechanism as shown in figure 4-14, sheet 2. Disassemble only as required for repair or replacement of damaged part.

4-123. Inspection — Air Filter Bypass Door. *a.* Check latching mechanism and hinges (para 4-117).

b. Check fiberglass door for structural damage such as cracked or frayed glass cloth surfaces. Repair using fiberglass repair procedures described in chapter 2.

4-124. Assembly — Air Filter Bypass Door. Assemble door latching mechanism as shown in figure 4-14, sheet 2.

4-125. Installation — Air Filter Bypass Door. *a.* Install latching mechanism and hinges as shown in figure 4-14, sheet 2.

b. Position door on aft fairing and install 0.091-inch-diameter wire (C59) hinge pins through hinges. Bend wire over at both ends after installation as shown in figure 4-14, sheet 2.

c. Reconnect door operating cable and adjust control release mechanism (para 4-119).

4-126. AIR FILTER SCAVENGING SYSTEM SHUTOFF VALVE.

4-127. Description — Air Filter Scavenging System Shutoff Valve. The air filter scavenging system shutoff valve is mounted on the forward side of the aft canted bulkhead (sta 124.00). The valve controls the flow of engine bleed air to the air filter scavenging system. (See fig. 4-13.)

4-128. Removal — Air Filter Scavenging System Shutoff Valve. *a.* Set power selector switch at OFF and disconnect external power.

b. Disconnect electrical plug from valve receptacle.

c. Disconnect tubing from valve inlet and outlet ports.

d. Remove two bolts and washers that secure valve to bulkhead. Remove valve.

4-129. Cleaning and Flushing — Air Filter Scavenging System Shutoff Valve. *a.* Disconnect scavenging system shutoff valve inlet and outlet tubes (fig. 4-13).

b. Provide for water flushing of fitting by attaching suitable hoses to valve inlet and outlet ports. Do not allow water to enter the engine.

c. Connect external power source to aircraft and set power selector switch at EXT.

d. Actuate the SCAV AIR switch. Have an assistant cycle the switch several times while flushing the valve poppet seat with a stream of clear water.

NOTE

The valve may also be removed from the aircraft for flushing. If removed, actuate the valve, using a 24 vdc power source connected to the valve electrical connector pins.

e. Using high pressure compressed air, thoroughly dry out valve passage.

f. Reinstall valve and electrical connector, if removed, and connect inlet and outlet tubes.

4-130. Inspection — Air Filter Scavenging System Shutoff Valve. (See fig. 4-13.) *a.* Check valve for cracks and dents.

b. Check valve ports for damage and clogging; check fittings for stripped or crossed threads.

c. Check valve electrical receptacle for damage to pins.

4-131. Installation — Air Filter Scavenging System Shutoff Valve. (See fig. 4-13.) *a.* Apply a coating of antiseize compound (C14) to threads of valve mounting bolts. Position valve on aft bulkhead with flow arrow pointing up, and install mounting bolts with washers; **TORQUE BOLTS TO 22 - 27 INCH-POUNDS.**

b. Apply a coating of antiseize compound (C14) to threads of valve port fittings and connect tubes to shutoff valve.

NOTE

Before connecting wire harness to valve, check for moisture. Inspect O-ring seal in connector for condition; replace if necessary.

c. Connect electrical wiring harness to valve receptacle.

4-132. INERTIAL PARTICLE AIR FILTER PRESSURE SWITCH.

4-133. Description — Inertial Particle Air Filter Pressure Switch. The air filter pressure switch is located just below the filter separator envelope and is mounted to the filter sealing panel. (See fig. 4-13.) The switch is used to sense air inlet pressure on the outlet side of the air filter. The switch consists of a housing, a plenum chamber sensing port, and an atmosphere sensing port. A tube extension is installed on the atmosphere sensing port. The switch operates on 28 vdc and has two electrical leads. When a pressure differential is sensed, the switch closes and actuates the BYPASS AIR caution light on the annunciator panel.

4-134. Inspection — Inertial Particle Air Filter Pressure Switch. *a.* Check switch housing for cracks and breaks. Check electrical wiring for cuts, fraying, and condition.

b. Check that switch plenum chamber sensing port and atmosphere sensing port are not damaged or clogged.

4-135. Test — Inertial Particle Air Filter Pressure Switch. Test the air filter pressure switch according to paragraph 4-91 with the following exception: The switch contacts should close when the vacuum reaches 4.0 ±0.04 inches water and should open when the vacuum is decreased to 2.0 inches water.

4-136. Removal — Inertial Particle Air Filter Pressure Switch. *a.* Set power selector switch at OFF and disconnect external power.

b. Remove engine air inlet front fairing.

c. Open air filter bypass door.

CAUTION

Install protective cover in the plenum chamber to prevent foreign objects from entering engine air inlet.

d. Disconnect pressure switch electrical leads from wiring harness.

e. Disconnect tube extension from atmosphere sensing port and remove mounting nut and washer that secure switch to filter sealing panel. Remove switch from panel.

4-137. Installation — Inertial Particle Air Filter Pressure Switch. *a.* Position pressure switch in filter sealing panel and install washer and mounting nut. Connect tube extension to atmosphere sensing port.

b. Connect pressure switch electrical wiring.

CAUTION

Remove protective cover from plenum chamber.

c. Close air filter bypass door.

d. Install engine air inlet front fairing.

4-138. FILTER BYPASS AIR CAUTION LIGHT.

4-139. General — Filter Bypass Air Caution Light. Perform an operational check of the caution light pressure switch according to paragraph 4-87 with the following exception: The BYPASS AIR caution LIGHT SHOULD ILLUMINATE WHEN THE VACUUM REACHES 4.0 ±0.4 IN. WATER AND SHOULD GO OUT WHEN THE VACUUM IS DECREASED TO 2.0 IN. WATER.

4-140. ANTI-ICING SYSTEM.

4-141. Description — Anti-icing System. An anti-icing system (fig. 4-15) is provided only for the engine compressor inlet. The system consists of a manually operated push-pull control cable connected to an anti-icing valve lever located on the engine compressor scroll. The anti-icing shutoff valve controls the compressor discharge air routed to the compressor inlet and front bearing support hub. There is no electrical control nor intermediate heat control position.

4-142. Troubleshooting — Anti-icing System. Refer to table 4-11.

4-143. Inspection — Anti-icing System. *a.* Check anti-icing valve control lever and cable for secure attachment to canopy frame.

b. Check cable for kinks, crushed sleeve, corrosion, and secure attachment.

c. Open engine access door and check cable wire for secure attachment to valve lever adapter.

d. Check compressor discharge air lines connected to anti-icing air shutoff valve on engine for cracks and secure hex nuts. Close engine access door.

4-144. ANTI-ICING VALVE CONTROL LEVER AND CABLE.

4-145. Description — Anti-icing Valve Control Lever and Cable. The anti-icing valve control (fig. 4-15) consists of a flexible, enclosed, wire-type cable assembly bonded to a control housing. The control housing, with cable actuating knob, is attached to the overhead canopy frame. Movement of the control lever rearward to the latch notch opens the anti-icing valve completely. Releasing the control lever from the latch notch results in spring-loaded return of the lever to the forward (OFF) position. Control lever piston travel in the housing is approximately 1.50 inches from the open to closed positions. Cable routing is on the left side of the main rotor mast support structure alongside the heating system control valve cable and torquemeter oil pressure line as far as the plenum chamber. At this point the anti-icing cable is routed downward through the firewall into the engine compartment.

4-146. Operational Check — Anti-icing Valve Control Lever and Cable. *a.* Move control lever knob to full aft (anti-icing air valve open) position and latch it in housing notch.

b. Open engine access door.

c. Check that anti-icing valve lever is positioned at aft travel limit, and that cable wire does not appear to be distorted by overtravel.

d. Release control lever knob from housing notch; lever piston return spring should return lever knob to housing forward stop without manual assistance. If knob does not return, the valve lever adapter nut may be overtightened; refer to *g* below.

e. Recheck position of anti-icing valve lever; lever should be positioned at forward travel limit.

f. If anti-icing valve lever does not have sufficient travel or the cable appears to distort when actuated, adjust cable wire for correct lever stroke.

g. When control cable operation is stiff, isolate the trouble as follows. Remove the cable wire from the valve lever adapter and check for binding during movement of control lever to latch, release, and the spring-loaded return. Manually actuate the anti-icing valve lever to check freedom of movement. Reinstall cable wire and torque adapter nut to 10 inch-pounds maximum. Secure nut with new cotter pin.

h. Close engine access door.

4-147. Removal — Anti-icing Control Lever and Cable. (See fig. 4-15.) *a.* On aircraft without a filter, or with the barrier filter, remove plenum chamber access door and left half of engine air inlet forward fairing (chapter 2). Remove the filter element from barrier filter. On aircraft with an inertial particle separator filter, open the filter bypass door to gain access to plenum

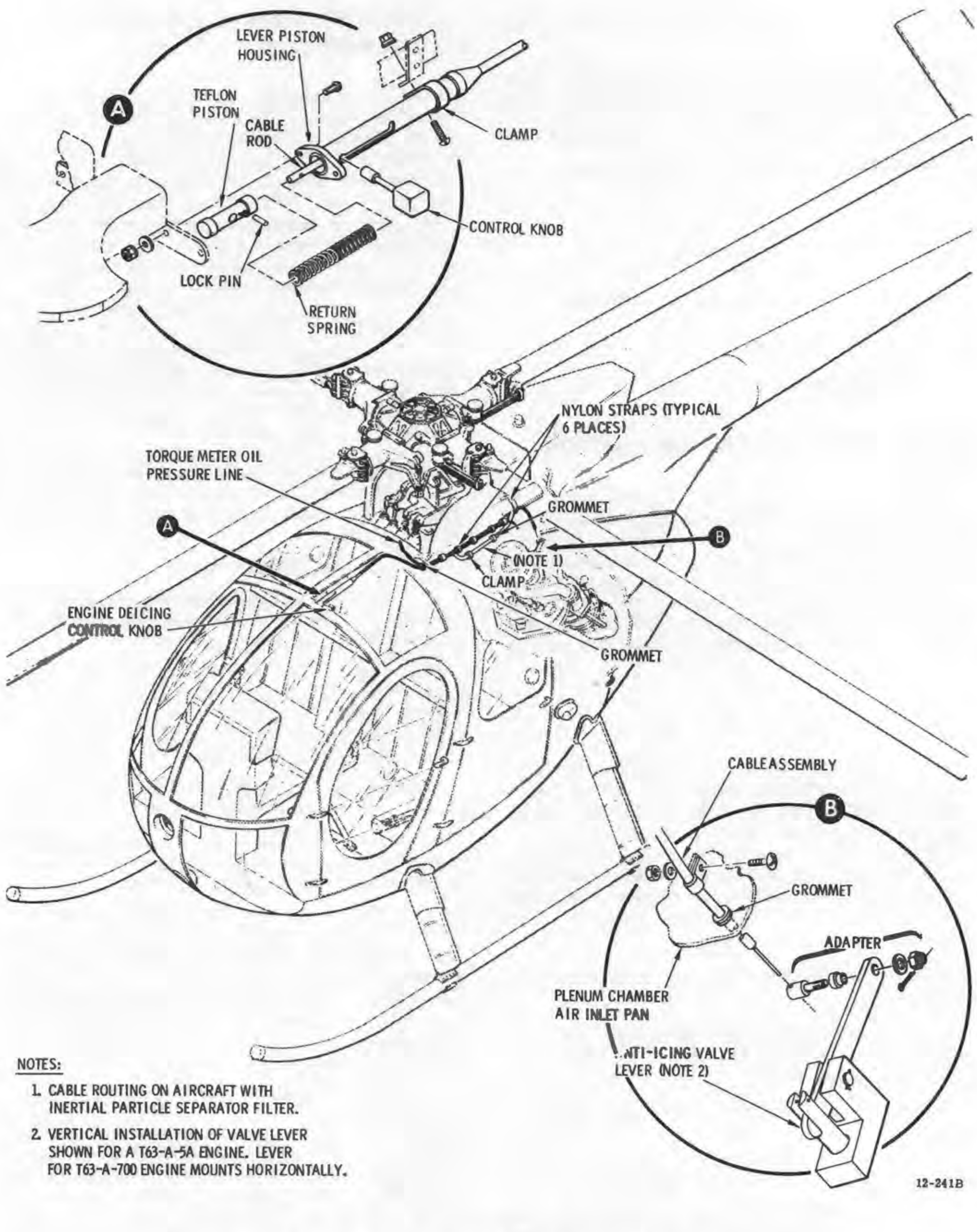


Figure 4-15. Engine Anti-icing Valve Control Cable.

Table 4-11. Troubleshooting of the Anti-icing Control System.

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

NOTE

Before you use this table, be sure you have performed all normal operational checks. If you have a malfunction which is not listed in this table, notify the next higher level of maintenance.

1. **Activation of anti-icing air shutoff valve does not restore normal engine operation when compressor icing occurs.**

STEP 1. Check for a loose cable wire in anti-icing air valve lever adapter or adapter stud sheared or stripped.

If either defects are found, tighten or replace adapter with cable and valve in correct position (para 4-144).

STEP 2. Check for a defective or stuck anti-icing air valve.

If the valve is defective or stuck, replace the valve (TM 55-2840-231-24).

STEP 3. Check for lack of anti-icing air.

If the anti-icing air is insufficient, check engine air lines for leaks.

2. **Release of anti-icing valve control lever to OFF (fwd) position does not return anti-icing valve lever to forward position. (Inflight symptom is continuation of a 10% reduction in available power or torque.)**

STEP 1. Same as STEPS 1 and 2 above.

STEP 2. Check for a sheared cable to control lever piston retaining pin (inside lever housing) (fig. 4-15).

If the retaining pin is found to be sheared, replace damaged part(s).

STEP 3. Check for an overtightened adapter nut.

If the nut is found to be overtightened, loosen adapter nut and retorque to not more than 10 inch-pounds.

3. **Anti-icing valve control lever difficult to move.**

STEP 1. Check for control cable sleeve kinked or one or more routing bend radii less than a 3-inch minimum. Check cable operation with cable wire detached from shutoff valve lever adapter (para 4-144).

If the cable is found kinked, replace cable.

If sharp bends are found, remove sharp bends in cable routing.

chamber, and remove main transmission cover (chapter 2).

b. Remove two screws, washers, and nuts that attach cable lever piston housing to canopy structure.

c. Remove clamps and straps that attach cable to structure or adjacent cabling along its full length.

d. Loosen the nut of adapter at the anti-icing valve on the engine.

e. Remove control cable.

4-148. Disassembly — Anti-icing Control Lever and Cable. (See fig. 4-15.) The control assembly is normally replaced as a unit. However, disassembly to the extent shown on figure 4-15 can be accomplished for inspection purposes or lever mechanism parts replacement.

a. Move control knob to full extent of forward travel.

b. Pull control knob shaft out of piston.

c. Pull piston out of housing.

d. Remove lock pin from piston to free cable and piston.

4-149. Inspection — Anti-icing Valve Control Lever and Cable. *a.* Check cable for kinks, crushed sleeve and corrosion *b.* Check piston for wear or elongation of knob shaft or lock pin holes.

c. Check return spring for kinks or breaks.

d. Check valve lever adapter for excessive wear.

4-150. Repair — Anti-icing Valve Control Lever and Cable. No repairs are recommended except for replacement of lever mechanism parts.

4-151. Reassembly — Anti-icing Valve Control Lever and Cable. (See fig. 4-15.) *a.* Extend cable rod through housing so parts can be assembled.

b. Apply a thin film of grease (C46) on a serviceable spring. Slide spring on cable rod and into housing.

c. Fit serviceable piston on cable rod and secure with lockpin.

d. Push piston into housing until large hole in piston is aligned with large hole in end of housing slot.

e. Insert control knob rod through housing slot and into piston.

f. Move control knob to detent until housing is installed.

4-152. Installation — Anti-icing Valve Control Lever and Cable. (See fig. 4-15.) *a.* Route the cable assembly into position. Be sure the bulkhead grommets are in place.

b. Attach control lever piston housing to canopy structure bracket with two screws, washers, and nuts.

c. Install clamps and straps that attach cable to structure or adjacent cabling.

NOTE

The clamp nearest to the valve should not be tightened until after travel is checked.

d. Adjust cable wire in valve lever adapter and perform an operational check (para 4-146).

e. When assured that control will operate the valve through full range of travel, tighten the clamp nearest the valve.

f. Reinstall barrier filter, element, plenum chamber access door, main transmission cover, left half of engine air inlet forward fairing, and filter bypass door, as applicable (chapter 2).

SECTION V EXHAUST SYSTEM

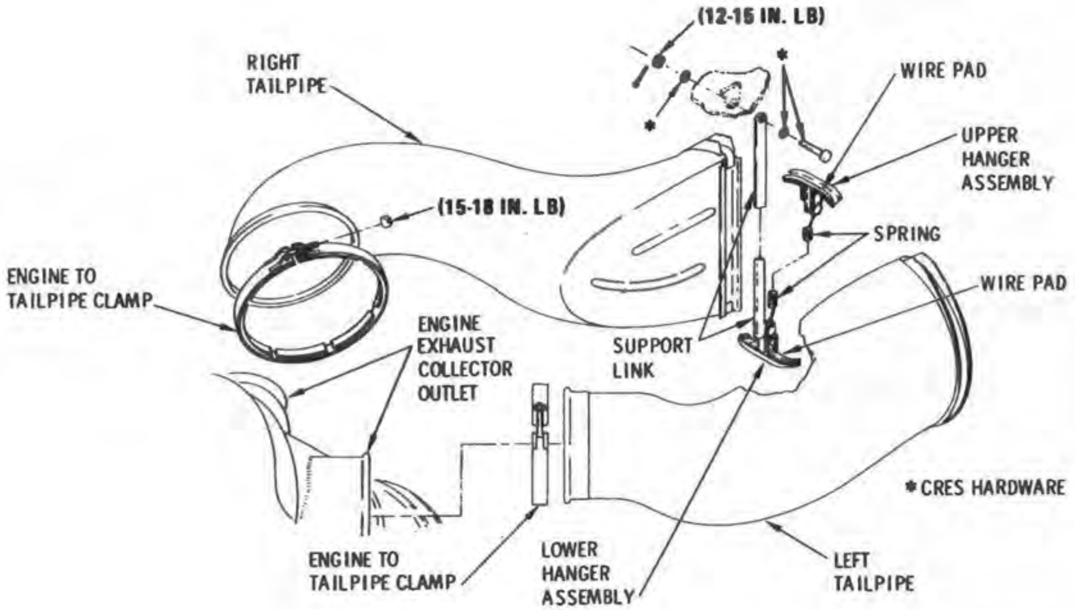
4-153. EXHAUST SYSTEM INSTALLATION.

4-154. Description — Exhaust System Installation. Two different types of exhaust systems are used. (See fig. 4-16.) The aft exhaust system directs exhaust gasses aft through the ends of the engine access doors. The system consists of two engine tailpipe clamp assemblies, right and left tailpipe assemblies, and cushioned support hangers. The engine tailpipe assembly is secured at the engine exhaust collector outlets by the tailpipe clamps, and supported at the exhaust opening by a cushioned hanger assembly. The lower hanger is suspended from a structure fitting above the tailpipes. The upper and lower hangers are spring-loaded together. Inconel wire mesh cushions and the joining spring provide flexibility between the aft ends of the tailpipes and the structure. The aft exhaust system is accessible by opening the two engine compartment access doors. The upward exhaust system consists of two stainless steel pipes which direct exhaust gasses upward from the engine through streamlined fiberglass fairings on each side of the fuselage above the engine access doors. The opening at the aft end of the engine access doors is closed by a cone shaped plug, constructed in halves, attached to each door. The upward exhaust pipes are attached to the engine with V-type clamps. No other support is required. The upper, exposed ends of the pipes are equipped with screens welded in place to prevent entry of foreign material. Fiberglass covers are also provided and should be used during maintenance activities and when the aircraft is moored (chapter 1). The following maintenance functions apply to either type exhaust system.

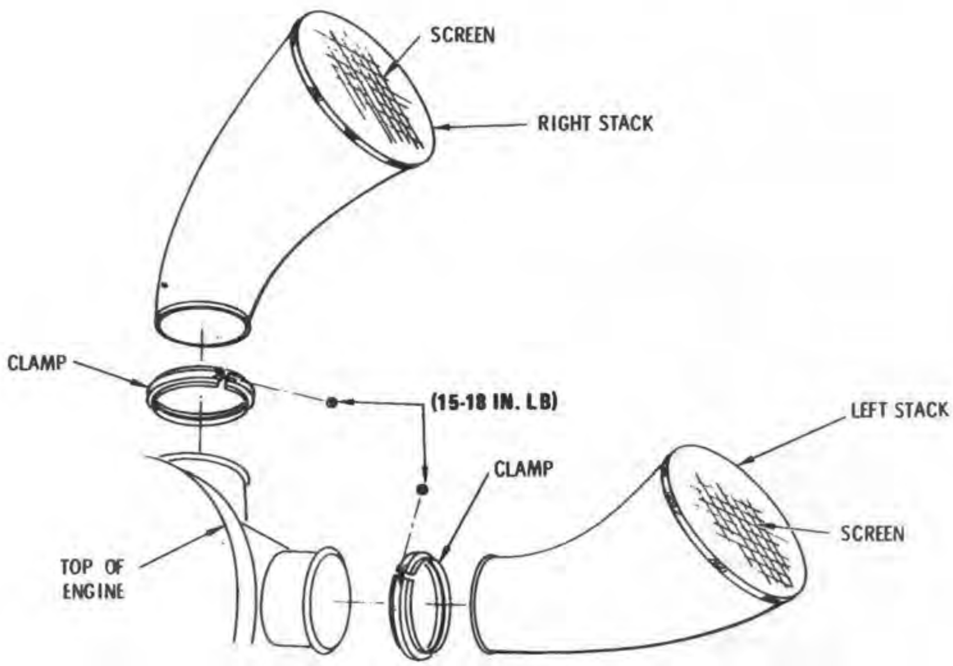
4-155. Test (Operational Check) — Exhaust System Installation. Ground run the engine for 5 minutes according to TM 55-1520-214-10; check exhaust system for leaks as evidenced by exhaust residue.

4-156. Removal — Aft Exhaust Tailpipes. (See fig 4-16.) *a.* Remove tailpipe clamp nuts and clamps. Have an assistant support the tailpipes until aft attachment is released.

b. Remove cotter pin, nut, washer, and bolt attaching lower tailpipe hanger to aircraft structure.



AFT EXHAUST SYSTEM



UPWARD EXHAUST SYSTEM

11-014C

Figure 4-16. Exhaust Systems.

CAUTION

Whenever tailpipes are removed, cover exhaust collectors with barrier material (C16) to prevent foreign objects from entering power turbine section of engine.

c. Remove left and right tailpipes as an assembly.

d. Remove spring, and upper and lower hangers; then separate the tailpipes.

4-157. Removal — Upward Exhaust Stacks. *a.* Remove stack clamp nuts and clamps (fig. 4-16).

b. Remove exhaust stacks by sliding upward through fuselage fairings.

4-158. Inspection — Exhaust System Installation. (See fig. 4-16.) *a.* Check the tailpipe support link (aft system) for cracks, breaks, corrosion or other damage, and secure attachment.

b. Check the engine tailpipes for large dents, holes, cracks, cracked or open seams, damaged flanges or fittings, corrosion or other damage, and secure attachment.

c. Check engine exhaust collector support for cracks (TM 55-2840-231-24).

d. Check upper and lower hanger assemblies (aft system) and spring for damage, corrosion and secure attachment.

e. Check visible portion of aft system inconel wire pads on hanger assemblies for wear, tears, and for secure spotwelds.

f. Check upward system protective screens and fuselage fairings for breaks or burning.

4-159. Repair — Exhaust System Installation. Repair either the aft exhaust tailpipes or upward exhaust stacks as follows:

a. Repair dents or bends by using a form block and suitable mallet.

b. Remove or smooth scratches and nicks by filing.

c. Repair cracks or breaks by stop-drilling a 0.040-inch-diameter hole at ends of the cracks and/or breaks to prevent further progression; then weld as described below:

(1) Using a stainless steel brush, thoroughly clean at least 1 inch on all sides of the cracked/broken area to remove all carbon from both inner and outer surfaces and from the crack.

NOTE

Weld repairs requiring insertion or overlay patching are not allowable.

(2) (AVIM) Weld by using inert arc method with rod (C85) that is designed for use on the CRES 21-6-9 tailpipe material. During welding, continuously flush the back-side of the tailpipe with an inert gas. If possible, the section being welded should rest on a brass bar to remove excessive heat build-up. For best results, use dc powered, tungsten tip, heli-arc welding equipment.

(3) Replace broken, excessively worn or torn hanger assemblies and springs on aft exhaust systems.

4-160. Installation — Aft Exhaust Tailpipes. (See fig. 4-16.) *a.* Remove protective covers from engine exhaust ports.

CAUTION

During tailpipe positioning and attachment, *b* through *e* below, an assistant must support the aft ends of the exhaust tailpipes while the tailpipes are being secured in place. Do not allow the aft ends of the tailpipes to become displaced from their proper mounting locations; to do so may damage the forward mounting flanges or result in a poorly mated clamp joint.

b. Position the forward end of each tailpipe over its respective engine exhaust outlet and install the two engine-to-tailpipe clamps. Position the clamp joints at the upper or lower surfaces of the tailpipes and partially tighten the clamps; final tightening will be accomplished in a step below.

c. Taking care not to displace the aft ends of the tailpipes, install the upper and lower hanger assemblies as shown. Make certain that the hanger assembly saddles are properly positioned between the locating flanges at the aft ends of the tailpipes.

NOTE

When assembling the tailpipe and hanger assemblies use care not to tear or otherwise damage the inconel wire pads that serve as cushions between the hangers and tailpipes.

d. Secure the tailpipes and hanger assemblies together by installing the spring over the rivets connecting each pair of hanger clips.

NOTE

Attach the upper spring hook so that the four captive washers on the rivet are divided equally on either side of the spring hook (two washers separating the hook from each hanger clip). Attach the lower spring hook between the left side of the lower hanger support link and the adjacent clip.

e. Attach the vertical link of the lower hanger assembly on the support fitting that extends from the structure by using CRES hardware (bolt, two washers, and nut). Tighten the nut only only finger-tight.

f. **TORQUE THE TWO ENGINE-TO-TAILPIPE CLAMP NUTS TO 15-18 INCH-POUNDS.**

NOTE

Using a plastic or rawhide mallet, tap lightly around the outside of both clamps to ensure that they are properly seated; then retorque the clamp nuts.

g. **TORQUE THE SUPPORT FITTING BOLT AND NUT TO 12-15 INCH-POUNDS** and safety with cotter pin. Check for leaks by performing an engine runup and checking for exhaust residue.

4-161. Installation — Upward Exhaust Stacks. *a.* Slip stacks into position through fuselage fairings (fig. 4-16).

b. Install stack clamps. Check that stacks are properly positioned in fairings and then **TORQUE CLAMP NUTS TO 15-18 INCH-POUNDS.**

SECTION VI OIL SYSTEM

4-162. OIL SUPPLY SYSTEM.

4-163. Description — Oil Supply System. The oil supply system includes the oil tank and cooler, oil cooler duct, oil temperature and pressure senders, check and drain valves and associated pressure and drain hoses and tubes that interconnect to the engine internal lubrication system (TM 55-2840-231-24). Oil flows from the engine through a check valve (fig. 4-17) at the inlet port of the oil cooler. The circulating oil is cooled to approximately 185° F by air blown through the cooler by the oil cooler blower that is driven by the main transmission drive shaft. The oil cooler contains a thermostat for bypassing oil around the cooler until the engine oil reaches operating temperature, and a pressure relief bypass valve. Oil then flows from the cooler into the oil tank from which the oil is pumped back to the engine internal lubricating system. Aircraft with armor provisions have a self-sealing oil tank and an oil cooler bypass system. (See fig. 4-18 and 4-19.)

4-164. Troubleshooting — Engine Internal Oil System. Refer to TM 55-2840-231-24 for engine internal oil system troubleshooting.

4-165. Troubleshooting — Aircraft Oil System. Refer to table 4-12.

4-166. OIL TANK.

4-167. Description — Oil Tank. In unarmored aircraft, the engine oil tank is constructed of two aluminum alloy halves welded together to form a sphere. (See fig. 4-17.) Space is included to allow for expansion of metal, oil, and air. Welded fittings for the vent tube, inlet line, outlet line, sight plug, and filler neck complete the assembly. In armored aircraft, the oil tank is fabricated of aluminum alloy shells, fittings and bosses welded into a tank assembly. (See fig. 4-18.) This assembly is completely coated with approximately 0.38 inch of a compound that provides for self-sealing of ruptures caused by armor piercing projectiles. The self-sealing tank is also bonded to the mounting support cradle. An oil cooler bypass line is connected to a bypass fillpipe fitting at the engine side of the tank. The bypass fillpipe extends through the tank to a point adjacent to the normal fillpipe inlet from the oil cooler. A low level warning switch is installed in the top of the tank. The switch is normally open. When the oil quantity drops below the low level operationg limit (system approximately 1 quart low), a float on the switch probe causes closure of the switch contacts. The closed contacts complete a ground circuit to a relay. On series 1 and 2 aircraft, the relay connects power from the CYCLIC TRIM circuit breaker and energized the OIL CLR BYPASS caution light and the oil cooler bypass valve. On series 3 aircraft, the relay supplies power from the OIL CLR-SCAV AIR circuit breaker which energizes the ENG OIL, LOW BYPASS MODE caution light. The bypass valve is mounted at the right side of the engine compartment. When energized, the valve diverts engine oil so that it flows directly to the oil tank bypassing the oil cooler. Oil flow from the tank back to the engine is normal. In both configurations, a replaceable sight plug provides for visual checking of the oil level within the tank.

4-168. Inspection — Oil Tank. *a.* Check oil tank for cracks, corrosion, distortion, obvious damage, leaks, and secure mounting.

b. Check all associated hoses, lines and fittings for oil leaks and secure attachment.

Table 4-12. Troubleshooting of the Engine Oil System.

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

NOTE

Before you use this table, be sure you have performed all normal operational checks. If you have a malfunction which is not listed in this table, notify the next higher level of maintenance.

1. **No oil pressure.**

STEP 1. Check engine oil tank for correct quantity.

If the engine oil tank requires servicing, service oil tank (chapter 1).

STEP 2. Check for defective oil pressure sender.

If the oil pressure sender is found to be defective, replace oil pressure sender (para 4-202).

STEP 3. Check for defective engine oil pressure indicator.

If the engine oil pressure indicator is found to be defective, replace the indicator (chapter 8).

STEP 4. Check for clogged oil filter element (TM 55-2840-231-24).

STEP 5. Check for restricted, clogged, or damaged oil lines.

If an oil line is found to be restricted, clogged or damaged, clean or replace oil line.

2. **Low oil pressure.**

STEP 1. Accomplish inspections for no oil pressure malfunction.

STEP 2. Check for improper type or contaminated oil.

If engine oil is found to be of the improper type or contaminated, drain, flush and service oil systems, (chapter 1).

STEP 3. Check for improperly adjusted oil pressure regulator valve (TM 55-2840-231-24).

3. **Oil pressure drops off severely.**

STEP 1. Check engine oil tank for low oil quantity.

If the engine oil tank requires servicing, service oil tank (chapter 1).

STEP 2. Check for defective engine oil pressure indicator.

If the engine oil pressure indicator is found to be defective, replace the indicator (chapter 8).

STEP 3. Check for defective oil pressure sender.

If the oil pressure sender is found to be defective, replace oil pressure sender (para 4-202).

STEP 4. Check oil pressure regulator valve for sticking or broken spring (TM 55-2840-231-24).

STEP 5. Check for defective oil pump (TM 55-2840-231-24).

4. **Excessive oil pressure fluctuation.**

STEP 1. Check for defective engine oil pressure indicator.

If the engine oil pressure indicator is found to be defective, replace the indicator (chapter 8).

STEP 2. Check for damaged oil lines and oil leaks.

If oil lines are damaged, replace the lines. If oil leak exists, repair or replace defective oil line(s).

STEP 3. Check for clogged oil filter element (TM 55-2840-231-24).

STEP 4. Check for improperly adjusted oil pressure regulator valve (TM 55-2840-231-24).

STEP 5. Check for defective oil pump (TM 55-2840-231-24).

5. **High oil pressure.**

Table 4-12. Troubleshooting of the Engine Oil System. (cont)

STEP 1. Check for defective engine oil pressure indicator.

If the engine oil pressure indicator is found to be defective, replace the indicator (para 8-17).

STEP 2. Check for defective oil cooler bypass valve.

If the bypass valve is found to be defective, replace bypass valve (para 4-188).

STEP 3. Check for improperly adjusted oil pressure regulator valve (TM 55-2840-231-24).

6. High oil temperature with normal oil pressure (armored aircraft).

STEP 1. Check for leaking oil cooler causing actuation of cooler bypass valve.

If the oil cooler is leaking, replace oil cooler (para 4-181).

STEP 2. Check for defective oil cooler bypass valve.

If the bypass valve is found to be defective, replace bypass valve (para 4-188).

STEP 3. Check for defective low level warning switch.

If the low level warning switch is found to be defective, replace the switch (fig. 4-18).

7. Abnormal oil temperature indication.

STEP 1. Check for defective oil pressure sender.

If the oil pressure sender is found to be defective, replace oil pressure sender (para 4-202).

STEP 2. Check for defective engine oil temperature indicator.

If the oil termperature is found to be defective, replace the indicator (chapter 8).

8. Oil consumption exceeds 6.50 fluid oz (0.05 gallon) per hour.

STEP 1. Check for oil leaks at loose fittings or connections.

If fittings or connections are loose, tighten fittings or connections as required.

STEP 2. Check for clogged or restricted vent lines.

If vent lines are found to be clogged or restricted, clear or replace vent lines.

STEP 3. Check for defective internal engine oil seals (TM 55-2840-231-24).

9. OIL CHIPS or ENG CHIPS caution light illuminates.

STEP 1. Check for metallic chips in lubrication system (TM 55-2840-231-24).

10. OIL CLR BYPASS caution light illuminates with no oil system leaks (armored aircraft).

STEP 1. Check engine oil tank for insufficient oil.

If the engine oil tank requires servicing, service oil tank (chapter 1).

STEP 2. Check for defective low level warning switch in oil tank.

If the low level warning switch is found to be defective, replace the switch (fig. 4-18).

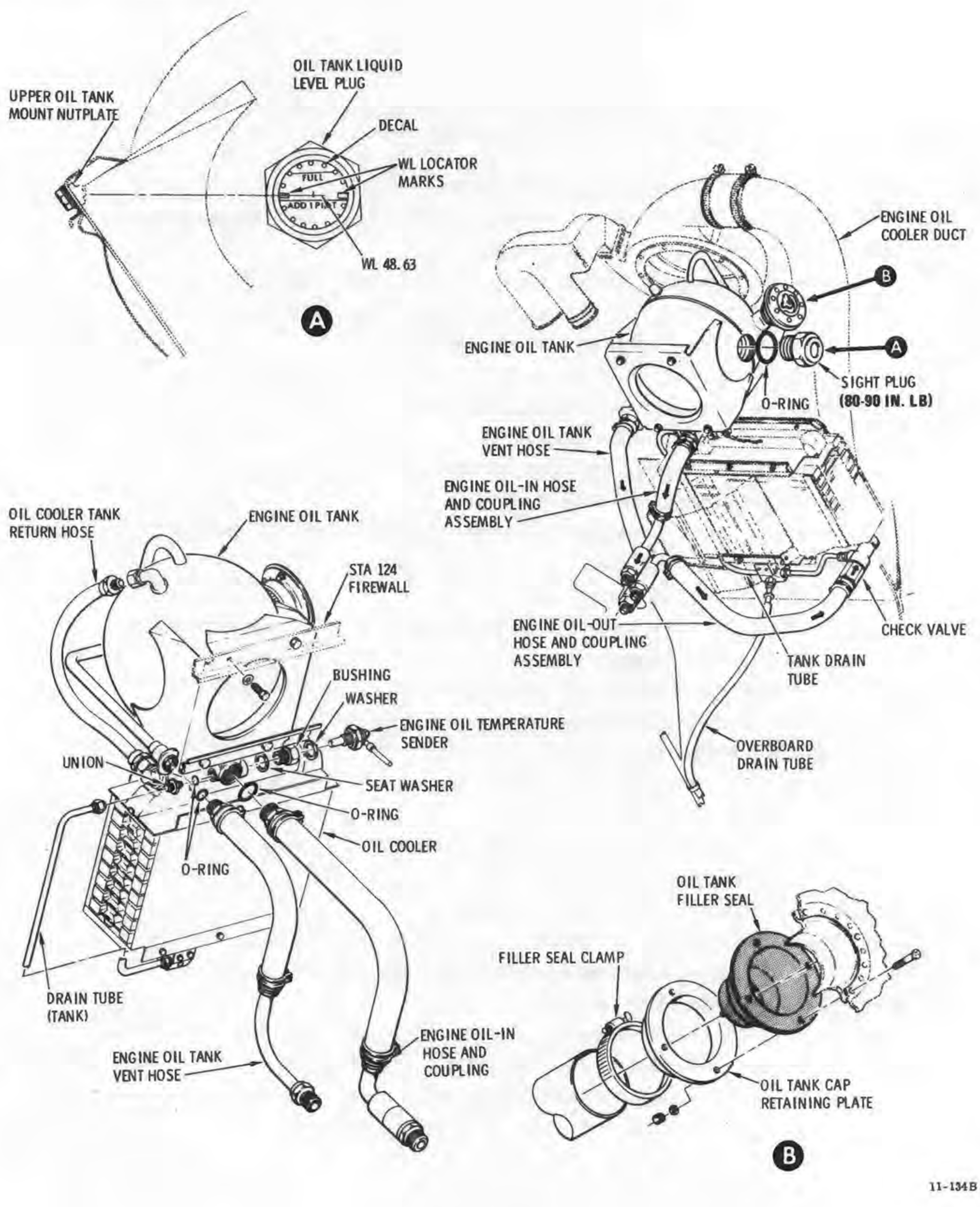


Figure 4-17. Engine Oil Tank (Unarmored Aircraft).

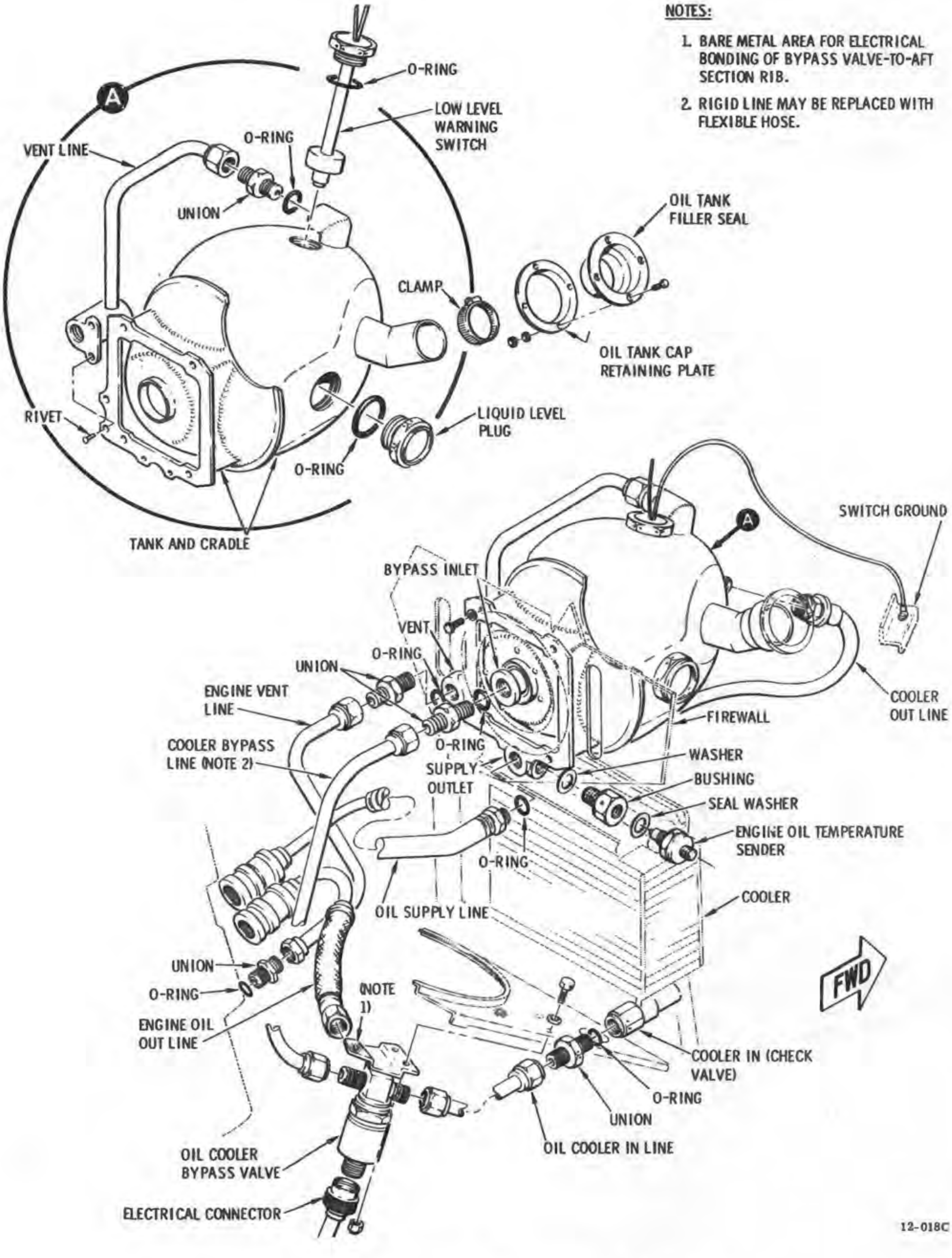


Figure 4-18. Engine Oil Tank (Armored Aircraft).

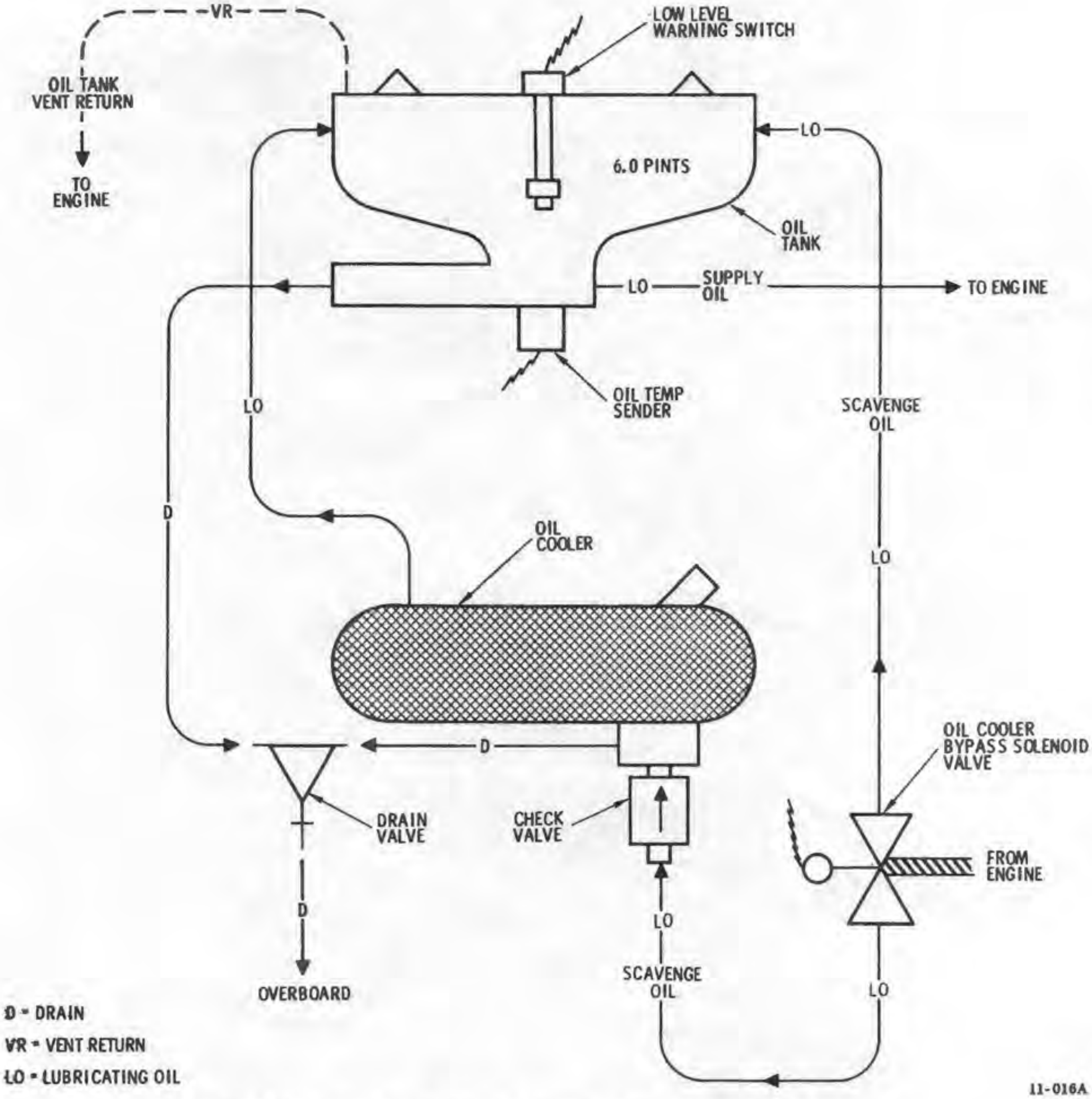


Figure 4-19. Engine Oil Supply System Schematic (Armored Aircraft).

4-169. Test (Operational Check) — Oil Tank. Check aircraft with armor provisions for correct bypass oil level switch operation (Special Inspection, chapter 1) as follows.

a. Check that oil level is at the full line. Drain oil from tank until oil cooler bypass caution light and bypass valve are energized. Measure the oil drained. With the switch closed and the caution light and bypass valve energized, from 32 to 60 ounces of oil should have been drained. If drained oil is not within the specified range the switch is faulty and should be replaced.

b. Return drained oil to tank and repeat check if necessary.

4-170. Removal — Oil Tank (Unarmored Aircraft). (See fig. 4-17.) During removal, cap or plug all open fittings, lines or ports.

a. Remove the right side troop seat, sound insulation, and oil cooler access door in the cargo compartment.

b. Drain the oil system (chapter 1).

c. Remove the oil cooler duct for access to oil tank fittings (para 4-177).

d. Open the engine compartment access doors for access to the oil hoses.

e. Disconnect the oil tank vent hose assembly at the oil tank support by loosening the clamp that secures the fire sleeve. Slide the clamp and fire sleeve back to clear the fitting.

f. Disconnect the oil-in hose and coupling assembly at oil tank outlet fitting by loosening clamp that secures the fire sleeve. Slide the clamp and fire sleeve back to clear the fitting.

g. Disconnect the oil cooler tank return hose at oil tank inlet fitting.

h. Disconnect oil tank drain tube at the tank outlet fitting. Allow tube to drain; then cap open end of fitting.

i. Remove the oil tank filler seal clamp; then remove the four nuts, washers, and screws that secure the oil tank cap retaining plate and oil tank filler seal. Lift the oil tank cap retaining plate and oil tank filler seal from position.

j. Remove four bolts and washers that secure the oil tank to the firewall and remove the oil tank.

k. Remove the oil tank liquid level plug and gasket as necessary.

l. Remove oil temperature sender, seat washer, and bushing.

m. Remove oil supply line union and O-ring.

4-171. Removal — Oil Tank (Armored Aircraft). (See fig 4-18.) During removal, cap or plug all open fittings, lines or ports.

a. Remove the right side troop seat, sound insulation, and oil cooler access door in the cargo compartment.

b. Drain the oil system (chapter 1).

c. Remove the oil cooler duct for best access to oil tank fittings (para 4-179).

d. Open the engine compartment access doors for access to the oil hoses.

e. Disconnect engine oil vent line (fig 4-18) oil cooler bypass line (or flexible hose), and the engine oil-in hose and coupling assembly. Remove unions and O-rings; discard used O-rings.

f. In the cargo compartment, disconnect the low level switch ground connection and wire knife splice. Disconnect engine oil temperature sender wire by removing nut and washers.

g. Disconnect the engine oil cooler outline at the oil tank fitting.

h. Disconnect the oil tank drain tube at the tank fitting.

i. Remove the oil tank filler seal clamp; then remove the four nuts, washers and screws that secure the oil tank cap retaining plate and oil tank filler seal. Lift the oil tank cap retaining plate and oil tank filler seal from position.

j. Remove the four bolts and washers that secure the oil tank to the firewall and remove the oil tank.

k. Remove the oil tank liquid level plug and O-ring, if necessary.

l. Remove the oil tank low level warning switch and O-ring.

m. Loosen the oil tank vent line and remove the union and O-ring.

NOTE

Do not remove vent line and boss assembly from the tank unless condition warrants replacement. The boss of the assembly is riveted to the tank cradle.

n. Remove engine oil temperature sender, washer, busing and washer.

4-172. Cleaning — Oil Tank. Clean the interior of the engine oil tank by agitation with mineral spirits (C109) or solvent (C94) until cleaning solution shows no signs of particles or oil traces.

4-173. Repair — Oil Tank (Unarmored Aircraft). *a.* (AVIM) Weld all cracks, open seams, loose fittings, and tubes with welding rod (C86).

b. Replace all damaged or unserviceable nutplates.

c. Remove or smooth scratches and nicks by filling.

d. Replace a defective oil tank, sight plug, hose, tube, or fitting.

4-174. Repair — Oil Tank (Armored Aircraft). *a.* Replace damaged, unserviceable nutplates.

b. Replace damaged, unserviceable components such as vent tube assembly, sight plug, float switch, and oil temperature sender.

c. Repair separation between tank cradle and self-sealing tank as follows:

NOTE

The self-sealing material on the tank cannot be removed or repaired. The tank is not repairable by welding. Replace unserviceable tanks.

(1) Carefully scrape away any residual bonding material at tank-to-cradle separation.

(2) Clean surfaces with a cloth dampened with naphtha and allow to dry for a minimum of 20 minutes.

(3) Using two-part adhesive (C11) mix 100 parts resin with 22 parts catalyst by weight. Mixed adhesive has a 1 to 1-1/2-hour working life.

(4) Completely fill the separation (gap) with adhesive and allow to cure for approximately 24 hours at ambient (room) temperature.

4-175. Installation — Oil Tank (Unarmored Aircraft). (See fig. 4-17.) *a.* Install new O-ring on tank drain tube union and install union.

b. Coat liquid level plug threads with lubricating oil (C67); then install with new gasket. **TORQUE PLUG TO 80-90 INCH-POUNDS.**

c. Install oil temperature sender bushing using a new washer and secure with 0.032-inch lockwire (C57).

d. Install oil temperature sender using a new washer. **TORQUE TEMPERATURE SENDER TO 100-150 INCH-POUNDS.**

e. Position the engine oil tank on firewall and install four washers and bolts. Tighten the bolts.

f. Install the oil tank filler seal in the oil tank cap retaining plate and secure with four bolts, washers, and nuts. Tighten nuts.

g. Ensure that oil tank filler seal neck is properly mated over oil tank filler neck. Install oil tank seal clamp.

NOTE

Before performing h through k below, remove protective caps or plugs from hose or tube assemblies and fittings or ports.

h. Connect tank drain tube to oil tank outlet fitting and tighten.

i. Connect oil cooler tank return hose to oil tank inlet fitting and tighten.

j. Connect oil-in hose and coupling assembly to oil tank outlet fitting and tighten.

k. Connect oil tank vent hose assembly to fitting provided on oil tank support and tighten.

l. After installing oil-in hose and coupling assembly, and the oil tank vent hose assembly, pull fire sleeves into position over ends of respective hoses and tighten clamps.

m. Install oil cooler duct (para 4-180).

n. Fill oil system with oil (C67).

o. Ground run the engine and check oil tank and related parts for leaks.

4-176. Installation — Oil Tank (Armored Aircraft). (See fig 4-18) *a.* Coat threads of the oil tank liquid level plug with lubricating oil (C67). Install new O-ring and liquid level plug in oil tank opening. **TORQUE LIQUID LEVEL PLUG TO 80-90 INCH-POUNDS.** Secure with 0.032-inch lockwire (C57).

b. Coat threads of the low level warning switch with lubrication oil (C67). Using a new O-ring, install O-ring and low level warning switch in oil tank opening. Secure with 0.032-inch lockwire (C57).

c. Install engine oil temperature sender bushing using a new washer. Secure with 0.032-inch lockwire (C57).

d. Install engine oil temperature sender using a new seal washer. **TORQUE SENDER TO 100-150 INCH-POUNDS.**

e. Install vent line union using new O-ring and tighten union. Connect oil tank vent line and tighten line nut.

f. Position and align the engine oil tank with firewall and install four bolts with washers.

g. Install the oil tank filler seal in the oil tank cap retaining plate and secure with four bolts, washers, and nuts.

h. Ensure that oil tank filler seal neck is properly mated over oil tank filler neck. Install oil tank seal clamp.

NOTE

Remove protective caps or plugs from hose or tube assemblies and fittings and ports.

i. Install unions in vent and bypass ports using new O-rings and connect vent and bypass lines.

j. Connect engine oil-in hose using new O-ring. Pull fire sleeves into position over hoses and tighten clamps.

k. In the cargo compartment, connect oil cooler out line to tank return fitting.

l. Connect low level switch ground terminal to structure using screw, nut and washer. Connect knife splice, slip fiberglass sleeving over the connected splice, and tie in place.

m. Connect oil temperature sender terminal with a washer and nut.

n. Install oil cooler duct (para 4-180).

o. Fill oil system with oil (C67).

p. Ground run the engine and check oil tank, lines and fittings for leakage.

4-177. OIL COOLER DUCT.

4-178. Description — Oil Cooler Duct. The engine oil cooler duct is a plastic assembly that directs cooling air from the oil cooler blower to the engine oil cooler.

4-179. Removal — Oil Cooler Duct. (See fig 4-20.) *a.* Remove right side troop seat, sound insulation, and oil cooler access door in cargo compartment.

b. Remove the two clamps and air duct connector.

c. Remove the four nuts, washers, and bolts that secure the engine oil cooler duct to the oil cooler. Remove the engine oil cooler duct.

NOTE

The four spacers may or may not be bonded to the duct flange. Retain unbonded spacers for reinstallation of duct.

4-180. Installation — Oil Cooler Duct. (See fig. 4-20.) *a.* Position oil cooler duct at oil cooler. If the four spacers are not bonded to the duct flange, install spacers at each attaching bolt location.

CAUTION

Overtightening bolts can crack the duct flange. Tighten nuts only to the point of firm contact.

b. Install the four attaching bolts, washers, and nuts.

c. Install the air duct connector and clamps. Tighten the clamps.

4-181. OIL COOLER.

4-182. Description — Oil Cooler. The engine oil cooler assembly (fig. 4-20) is a radiator-type heat exchanger that is constructed of aluminum alloy tubes welded to a frame. Engine outlet oil enters the cooler through an inlet fitting at the lower right corner, circulates through the tubes, and exits through an outlet fitting at the upper left corner of the cooler. In armored aircraft, a bypass valve is installed between the engine and the oil cooler. (See fig. 4-18.) If the oil cooler is ruptured it is bypassed and isolated from oil system pressure (para 4-162). The cooler bypass thermostat starts to close at approximately 140°F (60°C) and is fully closed at 180°F (82°C). The bypass pressure relief valve "cracks" at 25 psig and is fully opened at 30 psig (maximum). The bypass valve provides 3.26 gpm flow at temperatures down to -25°F (-32°C).

4-183. Inspection — Oil Cooler. Check oil cooler for cracks, corrosion, damaged or bulged plates, broken welds, foreign matter clogging, oil leaks, and secure mounting. Check all associated hoses and fittings for oil leaks and secure attachment.

Table 4-13. Premaintenance Requirements for Removal of Oil Cooler.

Conditions	Requirements
Special Tool	(T6)
Minimum Personnel Required	Two

4-184. Removal — Oil Cooler. (See fig. 4-20.) During removal, cap or plug all open fittings, lines or ports.

a. Remove the right side troop seat, sound insulation and oil cooler access door in the cargo compartment.

b. Drain the oil system (chapter 1).

c. Disconnect the oil cooler tank return hose from the oil cooler. Allow oil to drain; then cap hose connection.

d. Remove engine oil cooler duct (para 4-177).

e. Remove the drain tube, union, and O-ring.

f. Open engine compartment access door.

CAUTION

Have an assistant hold pressure with tool (T6) across the flats of the oil cooler inlet boss during performance of *g*, *h*, and *i* below to prevent twisting of the boss.

g. Disconnect oil hose connected to the check valve at the oil cooler inlet port.

h. In armored aircraft: remove union and packing in check valve.

i. Remove the check valve and O-ring.

j. Remove the screws and washers securing the plastic deflector to the mounting flange. Remove deflector.

k. Remove the six nuts, washers, and bolts that secure the oil cooler to the firewall structure and remove the oil cooler.

NOTES:

1. ENGINE OIL OUT HOSE SHOWN IS USED IN UNARMORED AIRCRAFT. IN ARMORED AIRCRAFT, A SIMILAR LINE CONNECTS TO THE BYPASS VALVE OUT FITTING.
2. SPACERS MAY BE BONDED TO OR BE SEPERATE FROM THE OIL COOLER DUCT.

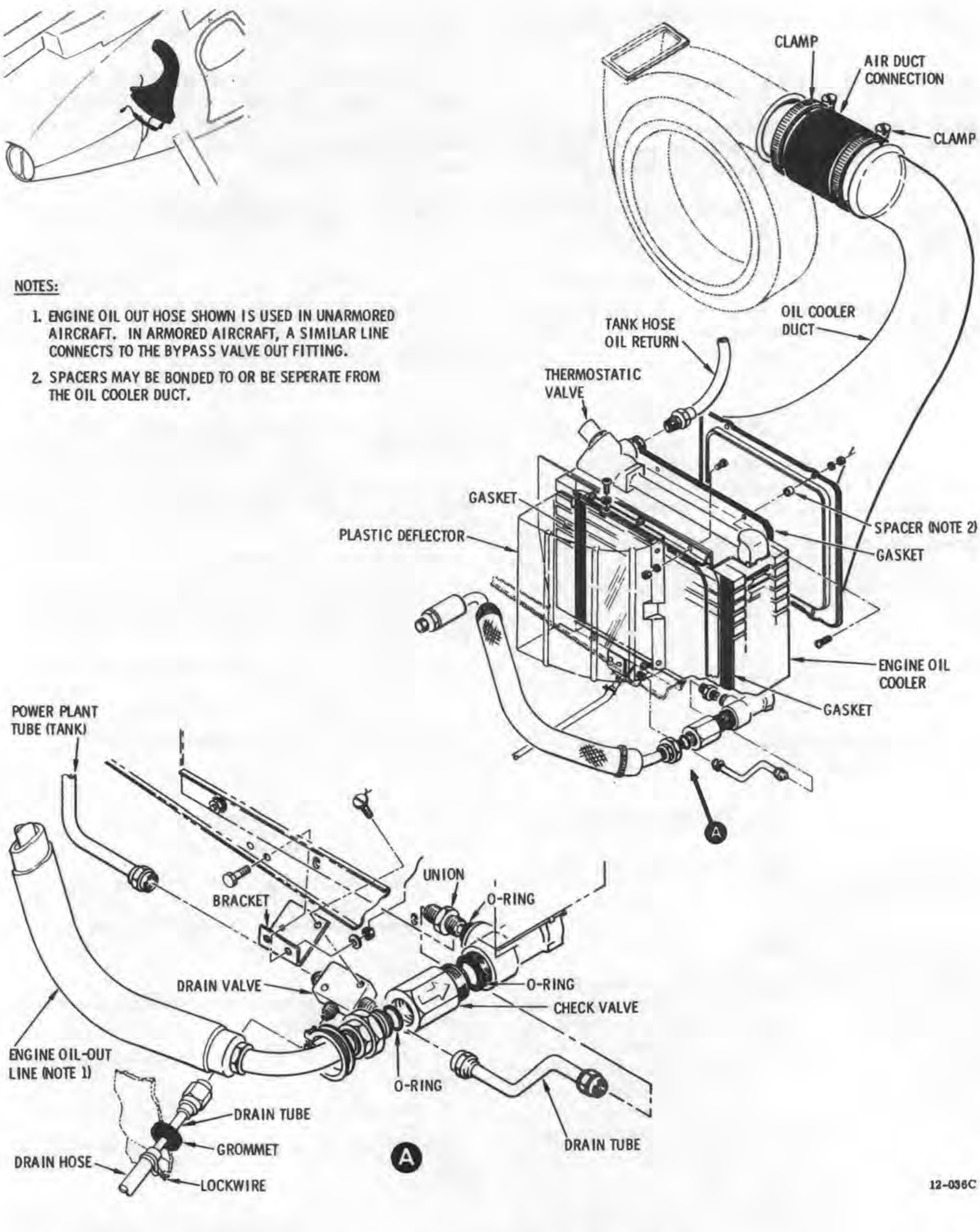


Figure 4-20. Oil Cooler and Duct Assembly.

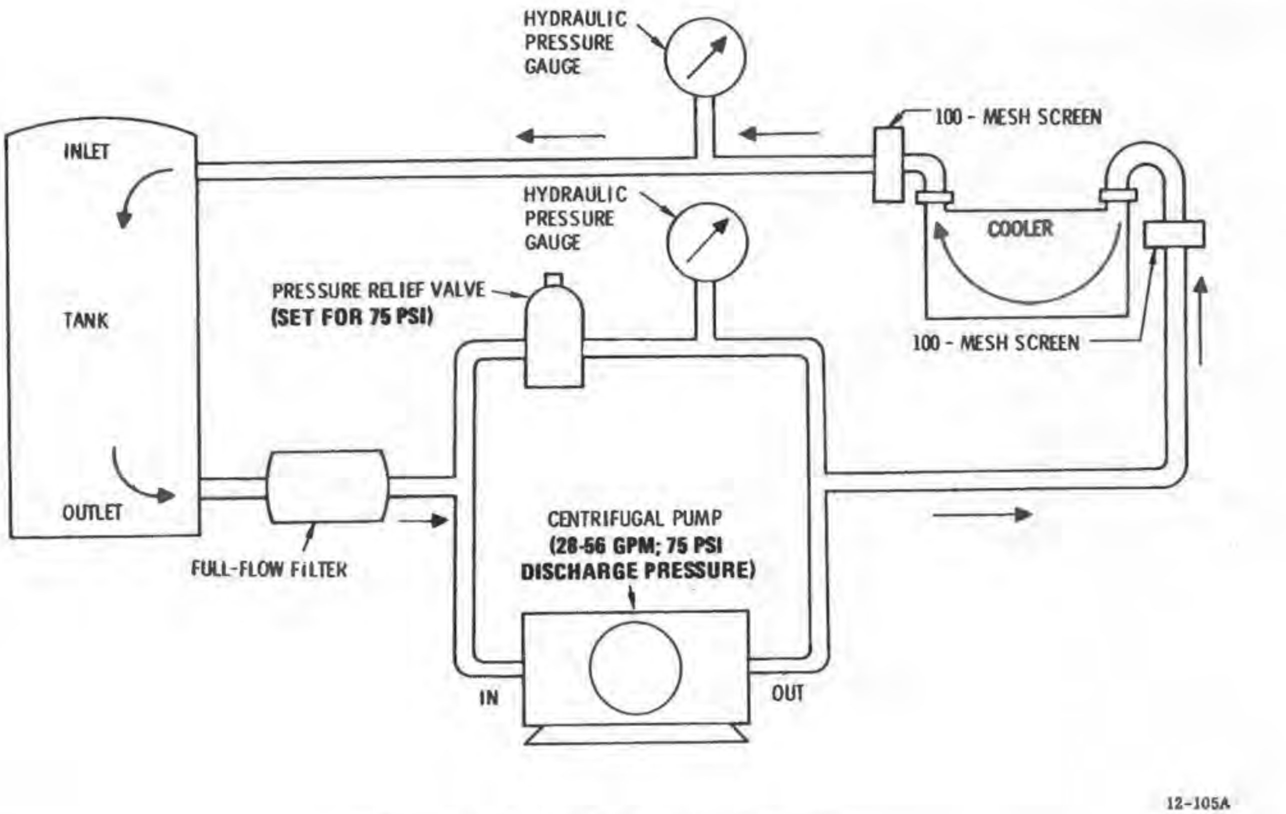


Figure 4-21. Oil Cooler Cleaning Setup.

4-185. Cleaning — Oil Cooler (AVIM). Establish cleaning setup as shown in figure 4-21.

a. Plug oil cooler inlet port.

b. Remove thermostatic valve (fig. 4-20) and plug openings in oil cooler.

c. Plug oil cooler outlet port.

d. Clean exterior of oil cooler with steam.

CAUTION

Use only cleaning solutions recommended for use on aluminum. Many solutions satisfactory for cleaning cooper or copper nickel are highly corrosive to aluminum and, if used, will result in the destruction of the oil cooler assembly. If equipment has been previously used with any other cleaning solution, it should be thoroughly washed and flushed with the recommended solution.

e. Use solvent (C94) to clean oil cooler interior.

f. Connect hose from discharge side of pump to oil cooler outlet to provide a cleaning solution flow opposite to direction of normal flow.

g. Connect hose from storage tank to inlet port of oil cooler.

h. Start centrifugal pump and allow to flush for 30 minutes or until the cleaning solution appears clean after flowing through oil cooler.

i. Reverse hoses on oil cooler and flush for approximately 15 minutes in opposite (normal flow) direction.

j. Drain oil cooler.

k. Flush oil cooler with compound (C27) in reverse direction for 30 minutes.

l. Reverse hoses and flush oil cooler for 10 to 15 minutes in normal oil flow direction.

m. To rinse, flush oil cooler with solvent (C94) for 10 minutes.

n. Check filter screens for metallic particles. Dispose of the oil cooler if metallic particles still appear in filter screens.

o. If metal particles are found, initiate oil analysis procedure.

p. Continue cleaning operations. Use solvent (C94) and dry with clean, filtered, low pressure, compressed air.

4-186. Repair — Oil Cooler. *a.* Replace a defective thermostatic valve (fig. 4-20).

b. Straighten bent cooling fins with a pair of duck-bill pliers ground to fit between cooling tubes.

c. (AVIM) Weld all small holes, cracked seams, or loose fittings with welding rod (C86). Refer to TM 55-1500-204-25/1 for welding practices and procedures.

d. Smooth scratches and nicks by filing.

Table 4-14. Premaintenance Requirements for Installation of Oil Cooler.

Conditions	Requirements
Special Tool	(T6)
Minimum Personnel Required	Two
Consumable Material	(C67)

4-187. Installation — Oil Cooler. (See fig 4-20.) *a.* Place oil cooler in position on the firewall. Install the drain tube union using a new O-ring. Install the drain tube between union and drain valve.

b. In the engine compartment: install six bolts, washers and nuts to attach cooler to firewall.

c. Remove protective caps from cooler and check valve. Coat threads of check valve with lubrication oil (C67).

CAUTION

Have an assistant hold pressure with tool (T6) across the flats of the oil cooler inlet boss during performance of *d*, *e* and *f* below to prevent twisting of the boss. Install check valve with arrows pointing toward oil cooler.

d. Install check valve with a new O-ring.

e. In unarmored aircraft: install oil-out line with a new O-ring.

f. In armored aircraft: install union and new O-ring in the check valve; then connect oil cooler in line.

g. Install plastic deflector on oil cooler mounting flange and secure with screws and washers.

h. In the cargo compartment: remove protective caps from the oil cooler port, and oil tank return hose. Install hose.

i. Fill oil system with oil (C67).

j. Ground run the engine and inspect oil cooler and related parts for oil leaks.

k. Close oil cooler access door and reinstall sound insulation, and troop seat.

4-188. OIL SUPPLY SYSTEM DRAIN VALVE, CHECK VALVE, AND OIL COOLER BYPASS VALVE.

4-189. Description — Oil Supply System Drain Valve, Check Valve, and Oil Cooler Bypass Valve. The oil supply system drain valve, a three port plug-type valve, is mounted on a bracket beneath the engine oil cooler. (See fig. 4-20.) Three oil tubes are connected to the drain valve: one from the engine oil tank, one from the engine oil cooler, and the third provides an overboard drain. The drain valve is spring-loaded in the closed position. When the valve is opened, all ports are open to each other; when closed, all ports are closed. The oil system check valve is a one-way, ball-type valve mounted at the inlet port of the oil cooler. The check valve functions to prevent hot oil from flowing back into the engine when the engine is not operating. In armored aircraft (fig. 4-18) a three-way, two-position, solenoid operated bypass valve is installed in the oil system. The valve is mounted on the fuselage structure just aft of the oil cooler deflector in the engine compartment. It is connected in the engine oil-out line, between the engine and oil cooler. When the valve coil is energized, oil flow is from the IN port to the BYPASS port (oil tank). When deenergized, oil flow is from the IN port to the OUT port (oil cooler).

4-190. Inspection — Oil Supply System Drain Valve, Check Valve, and Oil Cooler Bypass Valve. Check the oil system drain valve, check valve and bypass valve for cracks, corrosion, secure attachment, damage and leaks. Check connecting hoses and tubing for secure attachment, damage and leaks at connections.

Table 4-15. Premaintenance Requirements for Removal of the Oil Supply System Drain Valve and Check Valve.

Conditions	Requirements
Special Tool	(T6)
Minimum Personnel Required	Two

4-191. Removal — Oil System Drain Valve and Check Valve. (See fig. 4-20.) The following procedures apply to both armored and unarmored aircraft.

a. Drain the oil system (chapter 1).

CAUTION

Have an assistant hold pressure with tool (T6) across the flats of the oil cooler inlet boss during removal of oil-out hose or check valve to prevent twisting of the boss.

b. In unarmored aircraft: Disconnect the engine oil-out hose and coupling assembly at inlet port of the check valve and allow to drain. Remove O-ring.

c. In armored aircraft: Disconnect oil line connected to union in the check valve. Remove union and O-ring in check valve.

d. Remove the check valve and O-ring.

e. Plug opening at inlet port of oil cooler and cap open end of oil out (or bypass valve) hose and coupling assembly.

f. Disconnect the tank drain tube, drain hose, and drain tube at the drain valve. Cap or plug all open lines or ports.

g. Remove the two nuts, washers, bolts and brackets with drain valve attached. Remove lockwire and the two screws securing drain valve to the bracket.

4-192. Removal — Oil Cooler Bypass Valve (Armored Aircraft). (See fig 4-18.) *a.* Open the engine compartment doors for access.

b. Remove lockwire and disconnect the electrical connector from the oil cooler bypass solenoid valve.

c. Disconnect the oil lines connected to the bypass valve IN, OUT, and BYPASS ports. Cap or plug all open lines or ports.

d. Remove the three nuts, bolts, and washers that attach valve to the structure. Remove the valve.

4-193. Test — Oil Cooler Bypass Valve (AVIM). *a.* Make test setup as shown in figure 4-22.

b. Connect pressure line from test stand to the bypass valve IN port.

NOTE

Use only hydraulic fluid (C48) or (C76) in the test stand.

c. Install a cap on bypass valve out port. Set the power selector switch at OFF.

d. Raise test stand pressure to 30 psig and check for leakage at the BYPASS port. Leakage shall not exceed two drops per minute.

e. Reduce test stand pressure to zero. Remove the cap from the OUT port and install it on the BYPASS port.

f. Close the switch and energize the bypass solenoid; then raise test stand pressure to 5 psig.

g. Check for leakage at the bypass valve OUT port. Leakage shall not exceed two drops per minute.

h. Reduce test stand pressure to zero. Open the switch to de-energize the bypass solenoid.

i. Connect test stand return line to the bypass valve OUT port. Check that restrictor valve is open.

j. Raise test stand pressure to **30 PSIG AT 2.85 GPM. PRESSURE DROP AS READ ON RETURN LINE GAGE SHALL NOT EXCEED 6 PSI (24 PSI MINIMUM READING).**

k. Reduce test stand pressure to zero. Remove return line from OUT port and connect to BYPASS port. Energize the bypass solenoid by closing power switch.

l. Raise test stand pressure to **30 PSIG AT 2.85 GPM. THE PRESSURE DROP AS READ ON RETURN LINE GAGE SHALL NOT EXCEED 8 PSI (22 PSI MINIMUM READING).**

m. Reduce test stand pressure to zero and deenergize the solenoid valve.

n. Remove return line from BYPASS port and connect to the OUT port. Connect a third line from the BYPASS port to the tee N return line.

o. Raise test stand pressure and establish a flow rate of 2.85 gpm at 30 psig by partially closing restrictor valve and adjusting test stand pressure as required.

p. Energize the bypass solenoid to divert flow to the BYPASS port; then deenergize the solenoid. Repeat valve operation through 10 cycles.

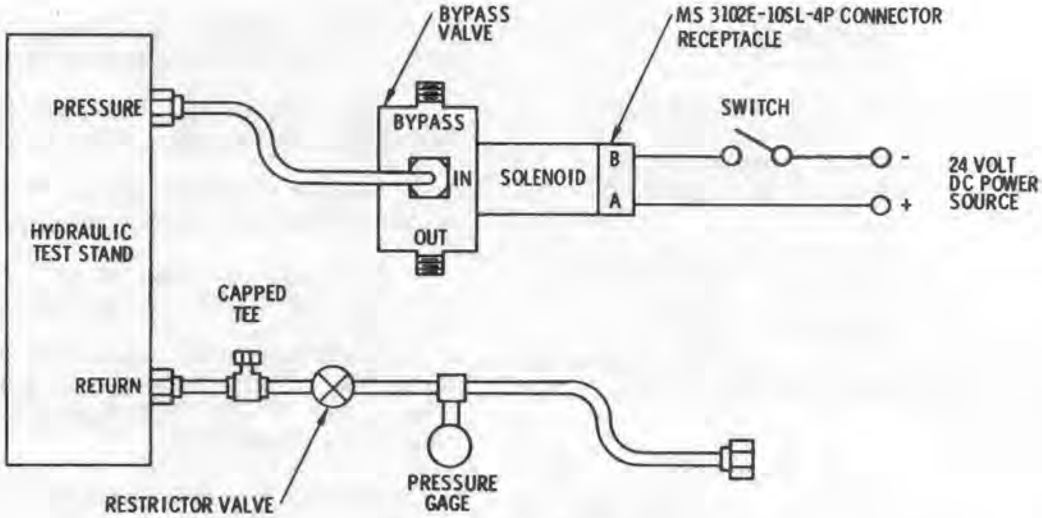
q. Reduce test stand pressure to zero and shut down. Disconnect electrical power and remove test equipment from valve.

r. Flush the valve thoroughly with solvent (C94) and dry the exterior with a clean cloth.

Table 4-16. Premaintenance Requirements for Installation of the Oil System Drain Valve and Check Valve.

Conditions	Requirements
Special Tool	(T6)
Minimum Personnel Required	Two
Consumable Material	(C57) (C67)

4-194. Installation — Oil System Drain Valve and Check Valve. (See fig. 4-20.) *a.* Install a new O-ring on the check valve.



TEST SETUP COMPONENTS

HYDRAULIC TEST STAND, 10 GPM AT 3000 PSI, CONTROLLABLE
PRESSURE GAGE, 60 PSI, LABORATORY TYPE
POWER SUPPLY, 24 VOLTS, DIRECT-CURRENT
SPST SWITCH AND WIRING AS REQUIRED
VALVE, HYDRAULIC FITTINGS, AND HOSES AS REQUIRED

12-013B

Figure 4-22. Oil Cooler Bypass Valve Test Setup.

CAUTION

Have an assistant hold pressure with tool (T6) across the flats of the oil cooler inlet boss during installation of oil-out hose or check valve to prevent twisting of the boss. Install check valve with arrows pointing towards oil cooler.

b. Coat threads of check valve with lubricating oil (C67); install male end of valve in cooler port and tighten.

c. In unarmored aircraft: Remove cap from end of engine oil-out line.

d. In armored aircraft: Install a new O-ring on the union and install the union in check valve. Remove cap from end of bypass oil line.

e. Connect oil line to union or check valve as applicable. Tighten coupling nut.

f. Position drain valve on the mounting bracket, install two screws and tighten. Secure screws with 0.032-inch lockwire (C57).

g. Install the bracket on oil cooler flange with two bolts and nuts.

h. Remove caps and connect tube assemblies to the drain valve, and tighten to secure.

i. Ground run the engine and check oil supply system check valve, drain valve, and associated plumbing for oil leaks.

4-195. Installation — Oil Cooler Bypass Valve. (See fig. 4-18.) Maintain electrical bond surfaces. Refer to TM 55-1500-204-25/1.

a. Remove protective caps from valve and lines.

b. Hold the BYPASS valve in the correct relative position. Connect, but do not tighten, the corrosion-resistant steel lines from bypass port on oil tank to BYPASS port on valve, and from the oil cooler check valve to the OUT port on the valve.

c. Align valve mounting holes with holes in structure. Install three bolts, nuts and washers. Tighten securely.

d. Tighten the line connections at bypass valve OUT and BYPASS ports.

e. Connect and tighten the oil-out line to the bypass valve IN port.

f. Remove lockwire from two of the four screws that attach valve body to its mounting bracket. Connect electrical connector and two screwheads together with 0.032-inch lockwire (C57).

4-196. OIL TEMPERATURE SENDER.

4-197. Description — Oil Temperature Sender. The oil temperature sender, mounted at the bottom of the oil tank and electrically connected to the ENG OIL TEMP indicator on the instrument panel, senses the temperature of the oil supplied from the oil tank to the engine. (See fig. 4-17 or 4-18.) Oil passing around the sender bulb causes the internal circuit resistance of the sender to vary in proportion to oil temperature. This resistance variation results in increased or decreased current flow through the ENG OIL TEMP indicator and causes proportional movement of the indicator pointer.

4-198. Test (Operational Check) — Oil Temperature Sender. Start and operate engine according to TM 55-1520-214-10. Check oil temperature sender for oil leaks and indicating circuit for proper operation. Replace defective units.

4-199. Removal — Oil Temperature Sender. (See fig. 4-17 or 4-18.) *a.* Drain the oil system (chapter 1).

b. Disconnect electrical wire and tape loose end.

c. Remove the engine oil temperature sender and seat washer.

d. Cap or plug hole in tank fitting.

4-200. Inspection — Oil Temperature Sender. Check the engine oil temperature sender for cracks, corrosion, damage, obvious oil leaks and secure electrical connection. Replace a defective oil temperature sender.

4-201. Installation — Oil Temperature Sender. (See fig. 4-17 or 4-18.) *a.* Remove plug or cap from tank fitting.

b. Position the seat washer, install the sender into fitting bushing; **TORQUE SENDER TO 100 - 150 INCH-POUNDS.**

c. Remove tape from electrical wire and connect wire to terminal.

d. Fill the oil system (chapter 1).

4-202. OIL PRESSURE SENDER.

4-203. Description — Oil Pressure Sender. The oil pressure sender, mounted on the right side engine mount and electrically connected to the ENG OIL PRESS indicator on the instrument panel, senses oil pressure between the pressure regulating valve and the engine internal lubrication system. (See fig. 4-23.) Oil pressure variations at the oil pressure sender orifice cause resistance variations proportional to the pressure variations. The resistance changes result in increased or decreased current flow through the ENG OIL PRESS indicator and cause proportional movement of the indicator pointer.

4-204. Test (Operational Check) — Oil Pressure Sender. Start and operate engine according to TM 55-1520-214-10. Check oil pressure sender and pressure line for oil leaks, and indicating circuit for proper operation. Replace defective units.

CAUTION

Do not adjust engine oil pressure until integrity of electrical system has been verified.

NOTE

Engine oil pressure may be verified by using a Gage, Oil Pressure, Direct Reading, 0-200 lb GGG-76, Class 1 Type A.

4-205. Removal — Oil Pressure Sender. (See fig. 4-23.) *a.* Remove pressure tube nut from pressure sender connector. Provide container to catch any residual oil spillage from pressure line; plug line fitting.

b. Disconnect electrical wire and tape loose end.

c. Remove the two bolts, washers, and nuts securing the sender and pressure line connector clamps to the clamps on the engine mount.

d. Remove engine oil pressure sender.

e. Remove connector from sender.

4-206. Inspection — Oil Pressure Sender. Check the oil pressure sender for cracks, corrosion, damage, secure mounting, and obvious oil leaks. Check for secure electrical connection.

4-207. Installation — Oil Pressure Sender. (See fig. 4-23.) *a.* Apply graphite lubricant (C62) on sender pipe threads.

b. Install and tighten female connector on the sender.

c. Install clamp on sender case and clamp around hex of connector. Attach clamps to engine mount clamps with bolts, washers and nuts. Do not tighten.

d. Remove plug from pressure line. Align sender connector with tube nut, connect and tighten line. Check both ends of pressure line for secure attachment. Tighten clamp bolts.

e. Remove tape from electrical wire and connect wire to terminal.

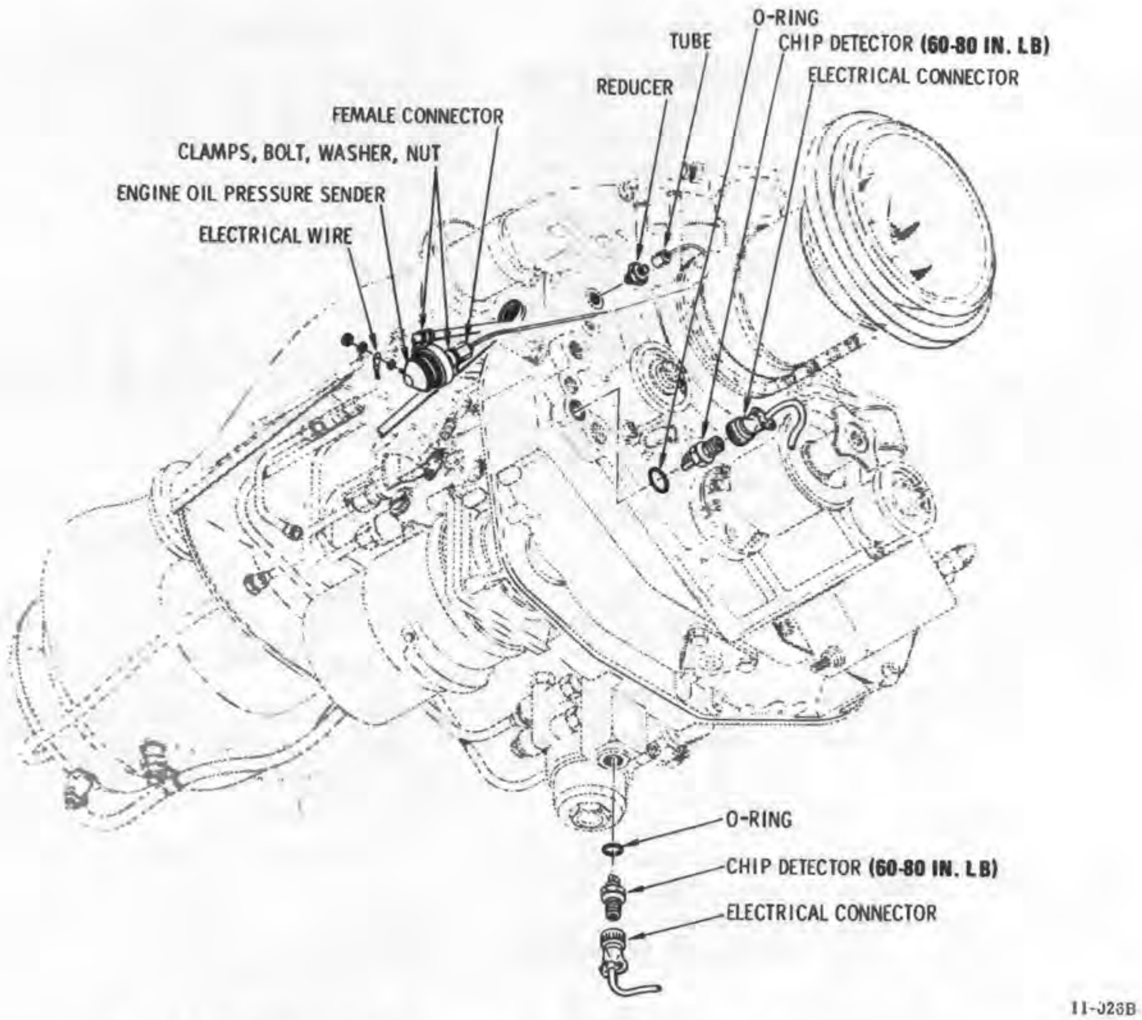


Figure 4-23. Engine Oil Pressure Sender and Chip Detector.

4-208. OIL SUPPLY SYSTEM HOSES, FITTINGS, AND TUBING.

4-209. Description — Oil Supply System Hoses, Fittings, and Tubing. The hoses and tubing used in the oil supply system are lightweight assemblies incorporating permanent fittings. The hoses located near the engine are provided with fire shields. In armored aircraft the oil cooler bypass line is either a corrosion-resistant steel tube or a flexible hose. Hose and tube assemblies are located and connected as shown in figures 4-17 and 4-18.

4-210. Inspection (Installed) — Oil Supply System Hoses, Fittings, and Tubing. *a.* Check oil lines for kinks, uniformity of diameter, breaks, and freedom from interference with adjoining structure or other components. Replace defective oil lines.

b. Check fittings and hardware for cracks, crossed threads, obstructions in openings, burrs or other damage. Replace all damaged fittings. Replace all seals, O-rings, selflocking nuts, cotter pins, and lockwire when removed from a unit.

4-211. Removal — Oil Supply System Hoses, Fittings, and Tubing. When removing an oil supply system hose or tube that is connected to lower end of oil cooler or oil tank, drain the oil from the cooler or tank before disconnecting the hose or tube. Tag or otherwise identify all fittings, tubing and hardware to aid reassembly.

a. Disconnect lower end of oil line. Drain residual oil in line into suitable container.

b. Disconnect upper end of oil line and remove line.

c. Cap oil lines and all open lines to prevent entry of foreign matter.

4-212. Cleaning — Oil Supply System Hoses, Fittings, and Tubing. Clean hoses, fittings and tubing by flushing with solvent (C94) and air-dry or blow dry.

4-213. Inspection (Removed) — Oil Supply System Hoses, Fittings, and Tubing. Inspect and reject oil tubes for the following:

a. Kinks or dents that could obstruct oil flow. **DENTS ARE ALLOWABLE UP TO 0.015 INCH DEEP.**

b. Cracked or broken tubes or coupling nuts.

c. Cross-threaded, crushed, or otherwise damaged coupling nuts.

d. **CHAFING WITHIN CLAMP AREAS IN EXCESS OF 0.010 INCH.** No chafing is allowed at or near the flared tubing end.

e. **NICKS THAT ARE DEEPER THAN 0.010 INCH.**

4-214. Installation — Oil Supply System Hoses, Fittings, and Tubing. *a.* Remove caps or plugs from fittings, oil hoses and tubes.

b. Install lower end of oil line but do not tighten.

c. Install upper end of oil line.

NOTE

During tightening, rotate coupling nut of hose or tubing with one wrench while holding the fitting to which it is being attached securely with another wrench. This procedure will prevent twisting and possible deformation of the hose or tubing.

d. Tighten No. 4 and No. 5 coupling nuts in accordance with TM 55-1500-204-25/1.

e. Refill oil system with lubricating oil (C67).

SECTION VII POWER CONTROLS

4-215. POWER CONTROLS.

4-216. Description — Power Controls. The power controls consist of the gas producer (N1) controls and the power turbine (N2) governor controls. (See fig. 4-24.) The mechanically (throttle) operated gas producer controls actuate the gas producer control lever that schedules the quantity of fuel metered to the engine. The electrically (beeper switch) operated governor trim actuator and the mechanically (collective) operated droop compensator change the position of the power turbine governor control lever that regulates the operating rpm of the engine. The N2 trim actuator, a linear electro-mechanical actuator, allows N2 speed to be varied over a range of approximately 94 to 105 percent. Any change in actuator length or in collective pitch actuates the governor linkage and establishes a new power output demand on the engine. (For all practical purposes, main rotor speed is held constant.) Operating stroke of the actuator ram is approximately 1.00 inch and travel time from full retraction to full extension is approximately 7 seconds. The actuator is lubricated by the manufacturer and no further lubrication is required for the life of the actuator. The control rod assemblies consist of aluminum alloy tubes or solid rods with spherical bearing rod ends. The bellcranks and supports all are cast magnesium, each bellcrank containing a roller bearing.

4-217. Inspection — Power Controls. *a.* Check all control rods, bellcranks, supports, and links for worn or binding bearings, cracks, stripped threads, deformed pivot lugs, corrosion, or other obvious damage.

b. Check all switches, wires, connectors, and insulation. Check trim actuator bond jumper (if installed) for secure attachment and signs of corrosion.

4-218. Troubleshooting — Power Controls. Refer to table 4-17.

4-219. GAS PRODUCER (N1 FUEL CONTROL) LINKAGE RIGGING.

4-220. Adjustment — Gas Producer (N1 Fuel Control) Linkage Rigging. (See fig. 4-25.)

CAUTION

When tightening a jam nut to secure a control rod end, always hold the rod end with a wrench to prevent jamming of the bearing against the fitting. Check that all misalignment is divided equally between bearings of each control rod assembly.

NOTE

Adjustment steps a through d of this procedure are necessary only when; the underseat linkage or the fuselage-routed control rod has been removed and reinstalled or replaced; or, with governo.

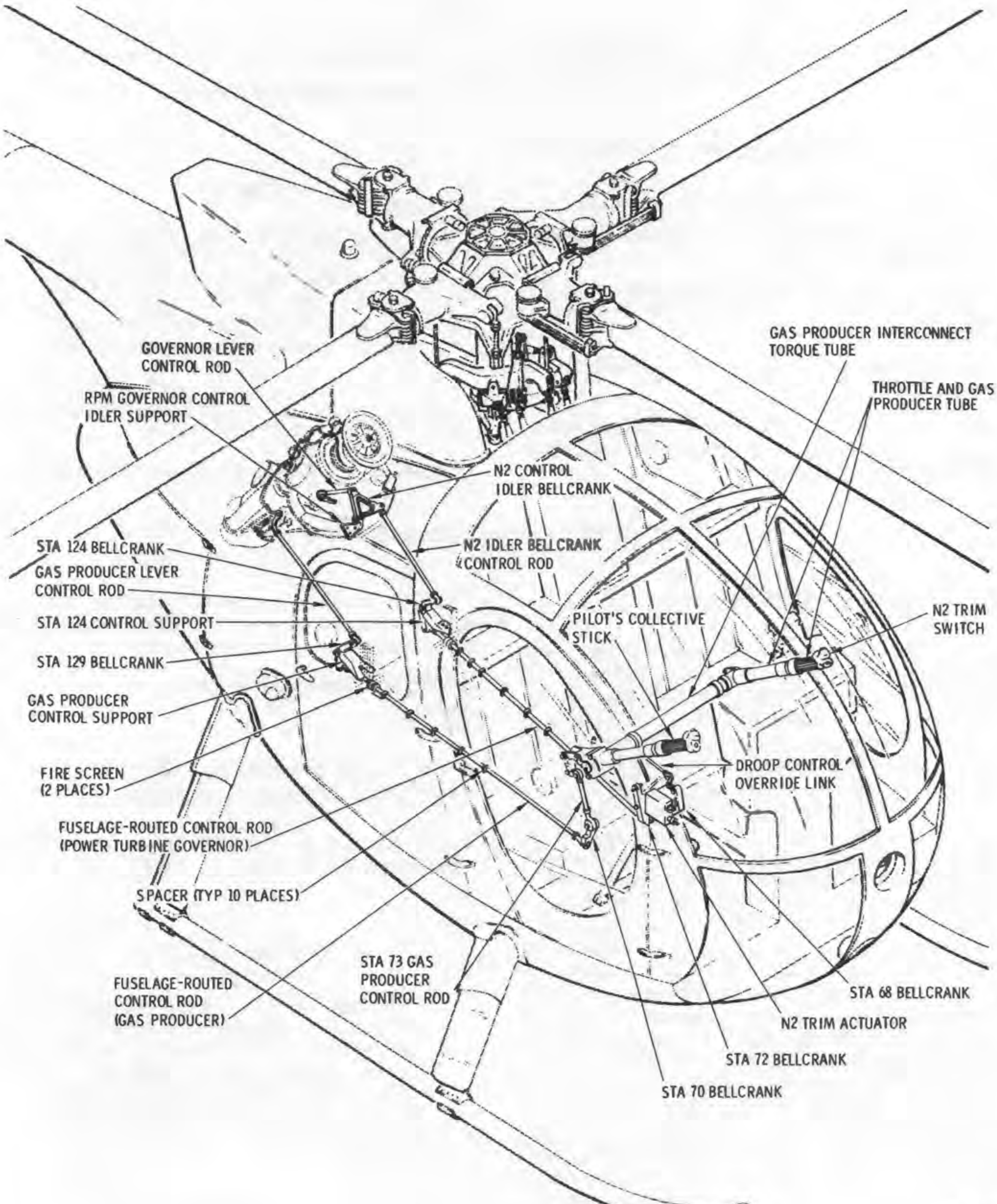


Figure 4-24. Engine Power Controls System.

Table 4-17. Troubleshooting of the Power Controls.

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

NOTE

Before you use this table, be sure you have performed all normal operational checks. If you have a malfunction which is not listed in this table, notify the next higher level of maintenance.

1. **Movement of control results in springy feeling; response lags behind control movement.**

STEP 1. Check for loose gas producer interconnect torque tube in collective stick gearshafts.

If the gas producer interconnect torque tube is found to be loose, tighten pipe plug in the torque tube for zero backlash (para chapter 11).

STEP 2. Check for worn rod ends.

If a rod end is found to be worn, replace worn rod end.

STEP 3. Check for worn bellcrank bearings.

If a bellcrank bearing is found to be worn, replace bellcrank.

2. **Control action stiff.**

STEP 1. Check for binding rod ends at connection fittings.

If the rod ends are found to be binding, realign rod end bearings.

3. **Low engine power; improper idling speed; improper acceleration; variable power output at constant setting.**

STEP 1. Check for incorrectly adjusted gas producer or power turbine governor controls (para 4-215).

If the gas producer or power turbine governor controls are found to be incorrectly adjusted, adjust the gas producer or power turbine governor controls (para 4-215).

NOTE

If the gas producer (throttle) controls are adjusted, the N2 disable switch must be readjusted (para 4-244).

STEP 2. Check for a defective gas producer control assembly or power turbine governor (TM 55-2840-231-24).

STEP 3. Check for defective engine (TM 55-2840-231-24).

(2524247) installed, if there is less than 0.030-inch clearance between the lower firewall bellcrank and the support when the governor lever is at the maximum stop. Otherwise, perform adjustment of power turbine governor controls starting with step e.

a. Position the collective stick and throttle at mid-travel.

b. Adjust the length of the station 73 control rod so that the long arm of station 70 bellcrank is vertical.

c. Adjust the length of the fuselage-routed gas producer control rod so that the bolt center in the lower arm of station 129 bellcrank is 5.00 ±0.03 inches from the firewall.

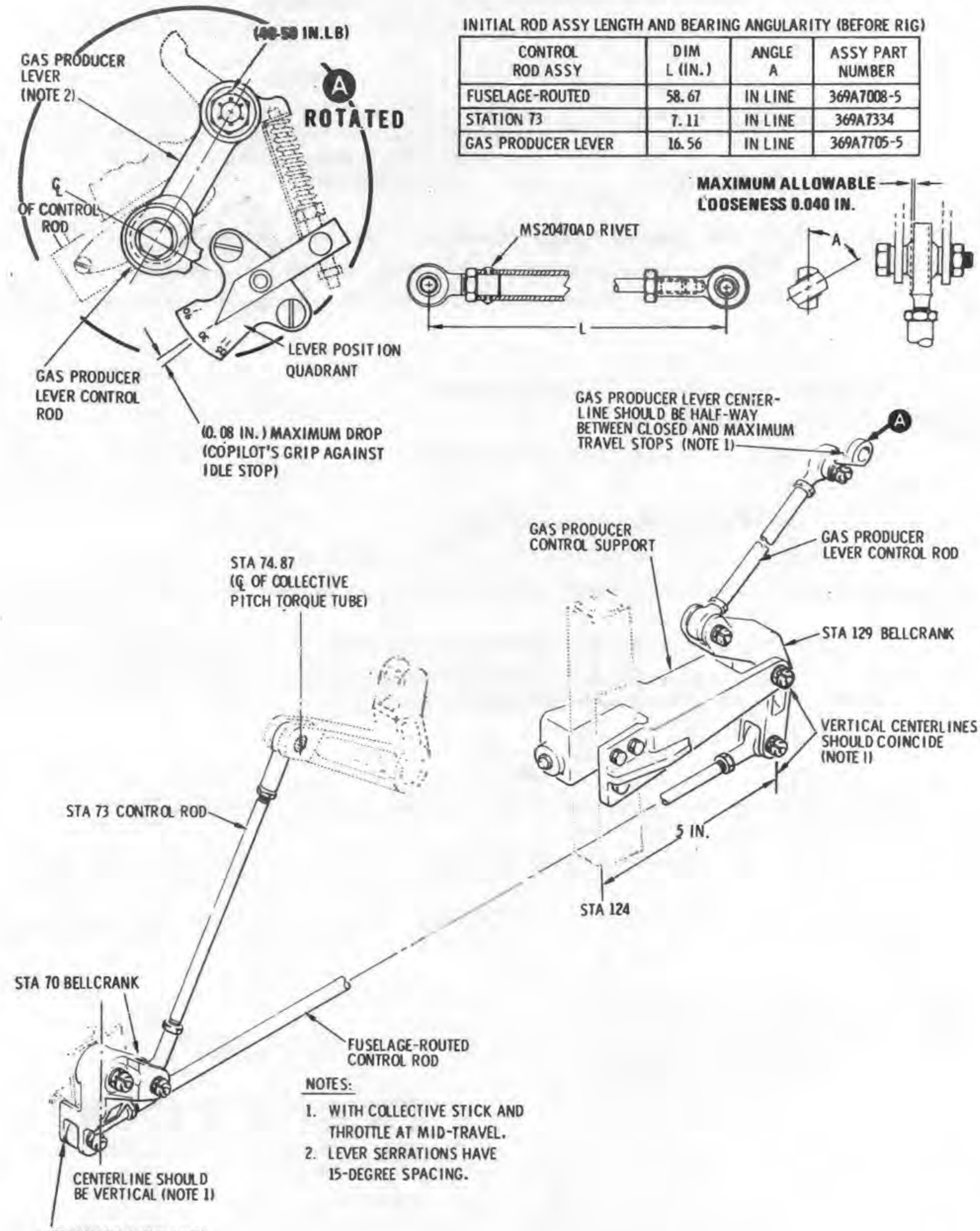
CAUTION

When repositioning the gas producer lever in *d* below, DO NOT EXCEED THE LEVER NUT TORQUE LIMIT OF 40 - 50 INCH-POUNDS. Overtorquing will cause binding of the lever.

d. With the engine compartment gas producer control rod length set to 16.56 inches, reestablish the gas producer lever mid-position so that lever centerline is half-way between the closed and maximum travel stops; lever serrations have 15 degree spacing. (The

INITIAL ROD ASSY LENGTH AND BEARING ANGULARITY (BEFORE RIG)

CONTROL ROD ASSY	DIM L (IN.)	ANGLE A	ASSY PART NUMBER
FUSELAGE-ROUTED	58.67	IN LINE	369A7008-5
STATION 73	7.11	IN LINE	369A7334
GAS PRODUCER LEVER	16.56	IN LINE	369A7705-5



NOTES:

1. WITH COLLECTIVE STICK AND THROTTLE AT MID-TRAVEL.
2. LEVER SERRATIONS HAVE 15-DEGREE SPACING.

Figure 4-25. Gas Producer Controls Rigging.

closed stop position is parallel to the engine compartment door frame within ±5 degrees.)

e. Lower collective stick to full down.

f. Rotate pilot's throttle counterclockwise to maximum rpm, then clockwise to idle.

g. With pilot's throttle held at idle, adjust upper rod end of gas producer lever control rod until pointer is positioned at 30 to 31 degrees on quadrant (detail A).

h. Release the pilot's throttle and check the gas producer pointer with the copilot's throttle held lightly but firmly against the pilot's idle stop **(NOT MORE THAN 10 INCH-POUNDS TORQUE)**. The pointer must not drop more than 0.08 inch below the 30-degree mark on the quadrant.

NOTE

As a final step of adjustment, the N2 disable switch mounted on the base of the pilot's collective pitch stick must be adjusted. Refer to paragraph 4-241 for aircraft with automatic restart system.

CAUTION

Do not alter gas producer lever position or control linkage to adjust idle speed. Idle speed will be checked during flight test and, if necessary, adjusted by the fuel control idle screw, not by the linkage. Check extreme travel position of the linkage to ensure that gas producer lever hits the fuel control stops before the throttle grip stops make contact. There must be no interference or binding in the linkage.

i. Raise pilot's throttle idle setting, if required, but do not exceed the limit specified in *r* below.

j. Rotate pilot's throttle counterclockwise to maximum rpm.

k. Observe gas producer lever to ensure it strikes the maximum travel stop.

l. Raise collective stick to full up.

CAUTION

Do not change the minimum and maximum stops. These stops are flow bench settings and are not field adjustable.

m. If gas producer lever does not strike maximum travel stop, check gas producer controls for binding.

n. Rotate pilot's throttle fully clockwise to fuel off. Observe gas producer lever to ensure it strikes minimum travel stop (closed position).

o. Lower collective stick to full down. Observe gas producer lever to ensure it does not move from the minimum travel stop. Recheck the static rigging for correct adjustment from the copilot's side.

p. At the full closed and full open positions of the throttle, check all the movable linkage for clearance with supporting or adjacent parts. Check that control rod bearings are not jammed when the linkage is in the extreme control positions.

q. Ground run the engine at idle with main rotor blades in flat pitch.

r. With pilot's throttle at idle, observe N1 tachometer indicator to ensure N1 speed stabilizes. Adjust N1 speed with the fuel control idle speed adjustment screw (TM 55-2840-231-23) if required to obtain 62-65 percent.

NOTE

Set the idle speed at approximately 63% N1 to allow for seasonal temperature changes.

CAUTION

Be sure to check N1 idle speed with the copilot's throttle after completing adjustment of idle for the pilot's throttle. N1 speed must not drop below 62 percent when the copilot's throttle is set to idle. Refer to *h* and *i* above.

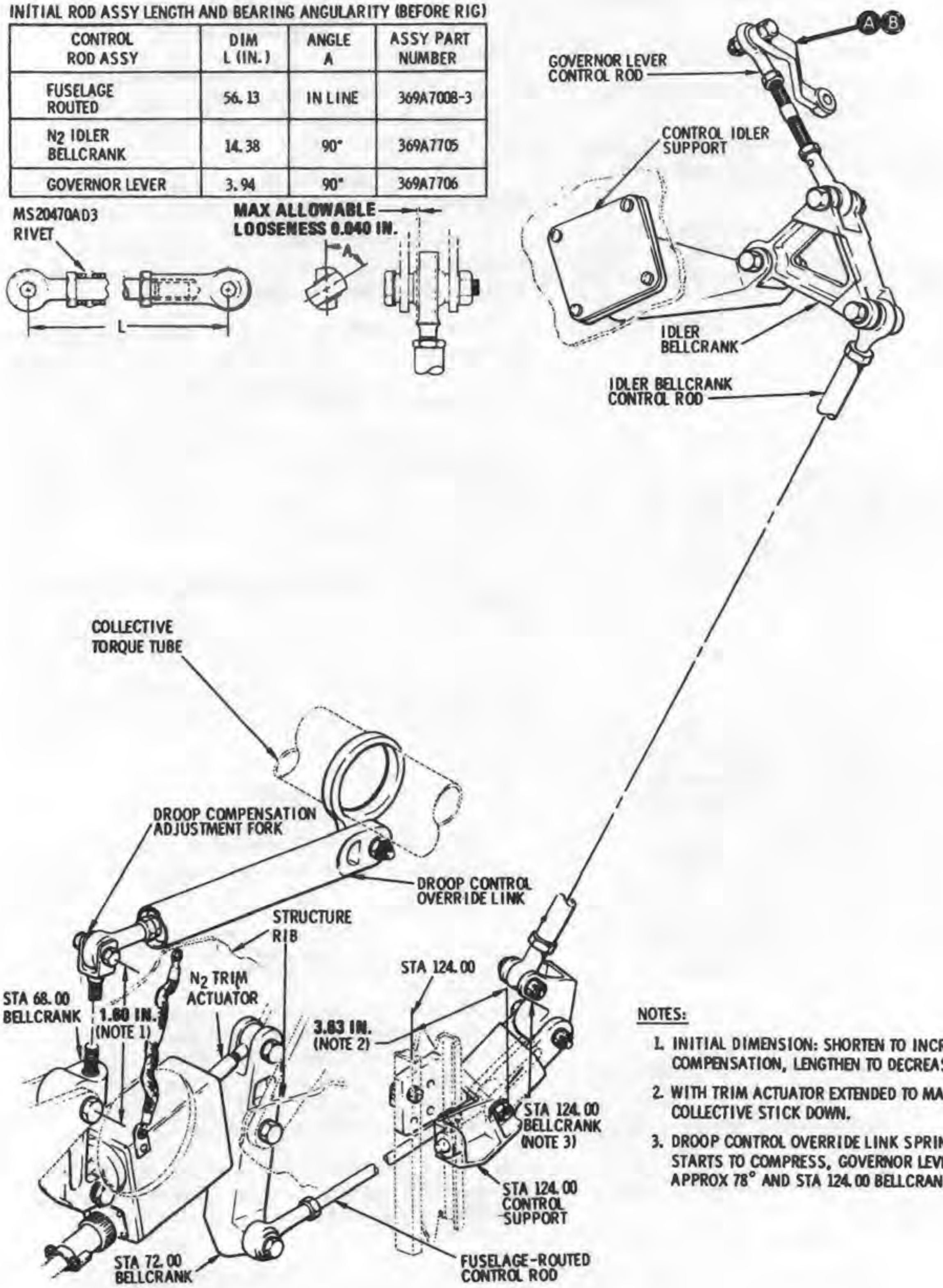
s. If idle rpm does not stabilize and/or cannot be adjusted within limits in *r* above, proceed with engine troubleshooting in TM 55-2840-231-24.

4-221. POWER TURBINE GOVERNOR (N2 RPM) CONTROL LINKAGE RIGGING.

4-422. Adjustment — Power Turbine Governor (N2 RPM) Control Linkage Rigging. (See fig. 4-26.)

INITIAL ROD ASSY LENGTH AND BEARING ANGULARITY (BEFORE RIG)

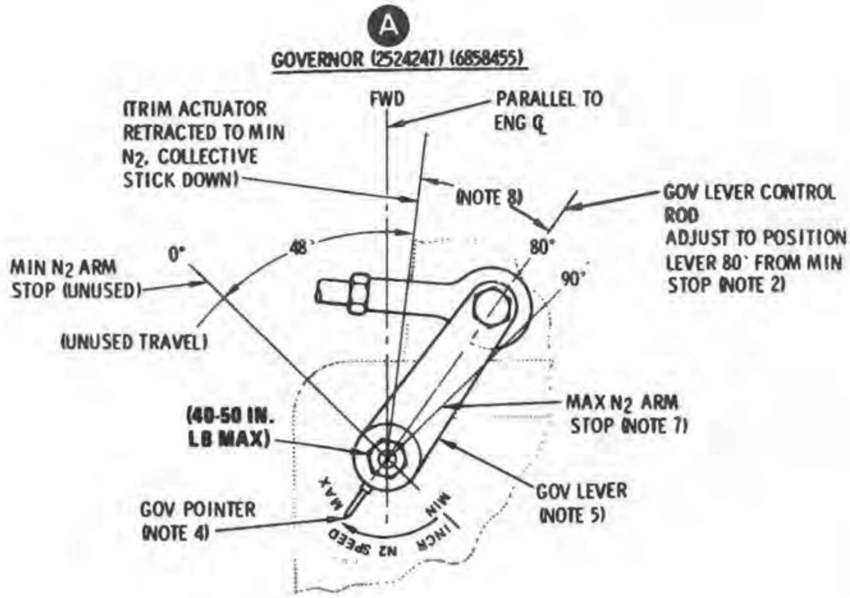
CONTROL ROD ASSY	DIM L (IN.)	ANGLE A	ASSY PART NUMBER
FUSELAGE ROUTED	56.13	IN LINE	369A7008-3
N2 IDLER BELLCRANK	14.38	90°	369A7705
GOVERNOR LEVER	3.94	90°	369A7706

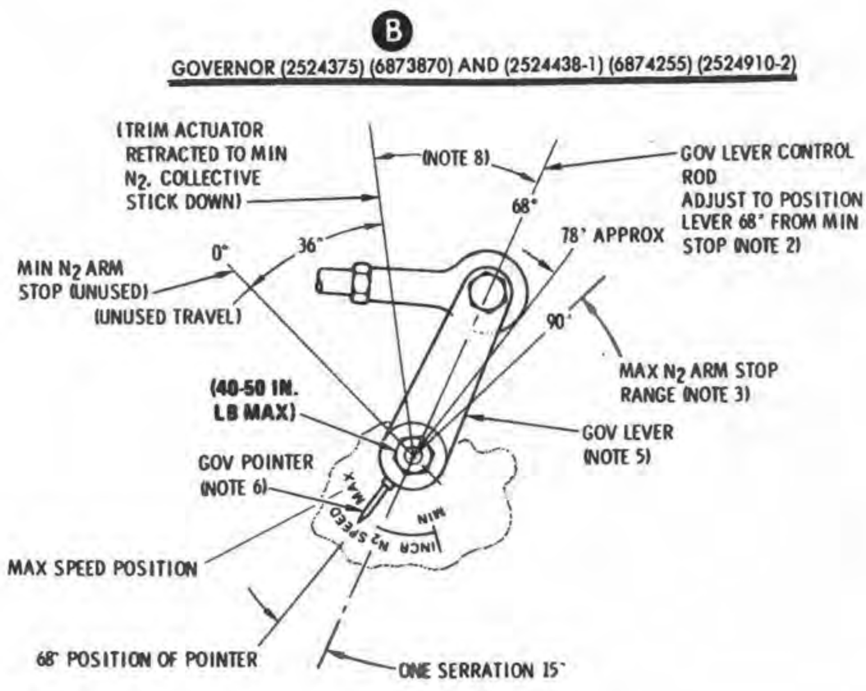


NOTES:

1. INITIAL DIMENSION: SHORTEN TO INCREASE COMPENSATION, LENGTHEN TO DECREASE.
2. WITH TRIM ACTUATOR EXTENDED TO MAX N_2 COLLECTIVE STICK DOWN.
3. DROOP CONTROL OVERRIDE LINK SPRING STARTS TO COMPRESS, GOVERNOR LEVER AT APPROX 78° AND STA 124.00 BELLCRANK BOTTOMED.

Figure 4-26. Power Turbine Governor Controls Rigging. (sheet 1 of 2)





NOTES: (CONT)

4. WITH LEVER AT 80°, POINTER MUST ALIGN WITH GOVERNOR CENTERLINE.
5. LEVER SERRATIONS HAVE 15° SPACING.
6. WITH LEVER AT 68°, POINTER TIP MUST ALIGN BETWEEN LETTERS P & E OF WORD SPEED.
7. DROOP CONTROL OVERRIDE LINK SPRING STARTS TO COMPRESS.
8. TRAVEL LIMIT OF TRIM ACTUATOR IS 32 DEGREES.

12-207-2C

Figure 4-26. Power Turbine Governor Controls Rigging. (sheet 2 of 2)

CAUTION

When tightening a jam nut to secure a control rod end, always hold the rod end with a wrench to prevent jamming of the bearing against the fitting. Check that all misalignment is divided equally between bearings of each control rod assembly.

NOTE

Adjustment steps a through d of this procedure are necessary only when; the underseat linkage or the fuselage-routed control rod has been removed and reinstalled or replaced; or, with governor (2524247) installed, if there is less than 0.030-inch clearance between the lower firewall bellcrank and the support when the governor lever is at the maximum stop. Otherwise, perform adjustment of power turbine governor controls starting with step e.

a. Check that droop control override link total end play does not exceed 0.015 inch.

b. Check that the droop compensation adjustment fork is adjusted so that the dimension between the centerlines of the station 68 bellcrank pivot bolt and the fork is 1.60 ±0.03 inches (sh 1).

c. Connect an external power source. Check that the N2 trim actuator is adjusted so that the dimension between attach bolt centers is 5.47 ±0.03 inches with actuator at maximum extension.

d. With the pilot's collective stick full down and the N2 trim actuator at maximum extension, adjust the length of the fuselage-routed governor, adjust the length of the fuselage-routed governor control rod so that the bolt center in the lower arm of station 124 bellcrank is 3.63 ±0.03 inches (sh 1) from the firewall.

e. Check that the engine compartment N2 bellcrank control rod length is set to 14.38 inches (sh 1).

f. Check position of governor lever and pointer. On governor (2524247), the lever pointer must align with the lever centerline (detail A, sh 2). On governors (2524438-1 and 2524375) the lever point must be positioned one serration clockwise (away from engine) from lever centerline (detail B, sh 2). Reposition lever and pointer, if necessary, starting with both the lever and governor shaft at the minimum stop; lever serrations have 15-degree spacing. **DO NOT EXCEED THE LEVER NUT TORQUE LIMIT OF 40-50 INCH-POUNDS** or the lever will bind.

NOTE

Approximately 48 degrees of governor lever travel from the minimum N2 stop is unused on governor (2524247); 36 degrees is unused on governors (2524438-1 and 2524375).

g. Adjust governor lever control rod length until the governor control lever is 80 degrees from lever minimum stop (detail A, sh 2), or 68 degrees from minimum stop (detail B, sh 2), as applicable. The 80-degree position is the center of the letter D in the word SPEED embossed on the power turbine governor. The 68-degree position is when the pointer tip is between the letters P and E in the word SPEED.

h. Raise the pilot's collective stick to approximately one-third of full up travel and note below.

(1) With governor (2524247) installed (detail A): When the N2 trim actuator is fully extended, the governor lever may hit the maximum travel stop when the collective stick is raised to one-third travel. At this stick position, the droop control override link spring starts to compress and spring compression continues to increase until the stick reaches full up travel.

(2) With governors (2524438-1 or 2524375) installed (detail B): When the N2 trim actuator is fully extended and the collective stick is raised to one-third travel, check for one of two conditions — that the governor lever hits the maximum travel stop without any interference or binding in the linkage, or that the pointer reaches the N2 maximum speed position (approximately 78°) before the linkage (lower arm of sta 124 bellcrank) bottoms out.

i. Lower collective stick to full down and decrease N2 trim to minimum. Check that the governor lever is at the approximate midpoint (48 or 36 degrees, as applicable) between the minimum and maximum stops.

j. At the full up and full down positions of the collective stick, check all movable linkage for clearance with supporting or adjacent parts. (Note the exception in *h* above.) Check that the control rod, N2 actuator and override link bearings are not jammed when the linkage is in the extreme control positions.

k. Ground run engine at idle with the main rotor blades in flat pitch.

l. Rotate pilot's throttle counterclockwise to maximum rpm.

m. Decrease N2 trim to minimum.

n. Observe N2 tachometer pointer for 100 percent or less when rotor rpm pointer is superimposed on N2 pointer, and N1 tachometer pointer is stabilized.

o. With collective stick down, increase N2 trim to maximum.

p. Observe N2 tachometer pointer for 104 percent minimum, 105 percent maximum, when rotor rpm pointer is superimposed on N2 pointer and N1 tachometer pointer is stabilized.

CAUTION

Make all engine compartment control rod adjustments with the engine shut down.

q. Stop the engine. Adjust the length of the governor lever control rod until N2 trim is within the limits given in *n* and *p* above. Adjust one end not more than one turn at a time.

r. Restart the engine, actuate N2 trim for 101 percent with main rotor blades in flat pitch, and lift off and hover.

s. Observe N2 tachometer pointer when pointer of N1 tachometer is stabilized. N2 pointer indication (droop compensation) should be 1.50 to 2.0 percent above N2 setting in *r* above.

t. Land and shut down engine.

u. If droop compensation does not occur as specified in *s* above perform the following:

(1) Recheck power turbine governor (N2 rpm) control linkage adjustment *a* through *j* above.

(2) Check gas producer (N1 fuel control) linkage adjustment, paragraph 4-220 above.

WARNING

Any change to the initial droop compensation fork length established in *b* above may result in interference between the N2 trim actuator case and the fork threaded end. Operate the collective through full travel after adjustment and check for clearance between movable linkage and adjacent parts.

(3) If N1 and N2 linkages are correctly adjusted, an additional adjustment may be made at the droop compensation adjustment fork (fig. 4-26, sh 1). Shorten the droop compensation adjustment fork to increase compensation. Three to five turns of the droop compensation fork may be necessary to change the droop compensation approximately 0.5 percent.

4-223. GAS PRODUCER (N1 FUEL CONTROL) LINKAGE.

4-224. Removal — Gas Producer (N1 Fuel Control) Linkage. (See fig. 4-27.) Disassemble the linkage only to the extent necessary to remove worn or damaged parts, or to perform repairs.

a. Remove cotter pins, nuts, washers and bolts, as necessary, to disconnect the appropriate control rod, bellcrank or support.

b. Remove the control support from the firewall by removing the three standard bolts, washers and nuts from the vertical stiffener; then remove the pull-type lockbolt from the firewall according to *c* and *d* below.

c. Locate the lockbolt installation at the floorline of the cargo compartment. Split the collar axially with a sharp cold chisel. Use a backup bar on the collar opposite to the side being split, to prevent deformation or breakout of the hold.

d. Drive the lockbolt pin out with a drift.

NOTE

If the lockbolt is carefully removed, another lockbolt of the same diameter may be used as a replacement. If the hole is enlarged to more than 0.187 inch, an oversize lockbolt must be installed.

4-225. Inspection — Gas Producer (N1 Fuel Control) Linkage. *a.* Check rod end bearings for binding and excessive wear **(0.040-INCH MAXIMUM AXIAL LOOSENESS).**

b. Check control rod for surface damage and evidence of bending.

c. Check for loose rivet at fixed rod end (lower end).

d. Check bearings in bellcranks for binding.

e. Perform a fluorescent penetrant inspection TM 55-1500-204-25/1 on any questionable part.

4-226. Repair — Gas Producer (N1 Fuel Control) Linkage. *a.* Perform a straightness check on a control rod that appears bent or bowed. The total length of gas producer control rods (excluding rod ends) must be straight within the following tolerances, with **STRAIGHTNESS VARIATION LIMITED TO A MAXIMUM OF 0.010 INCH IN EACH FOOT OF LENGTH.**

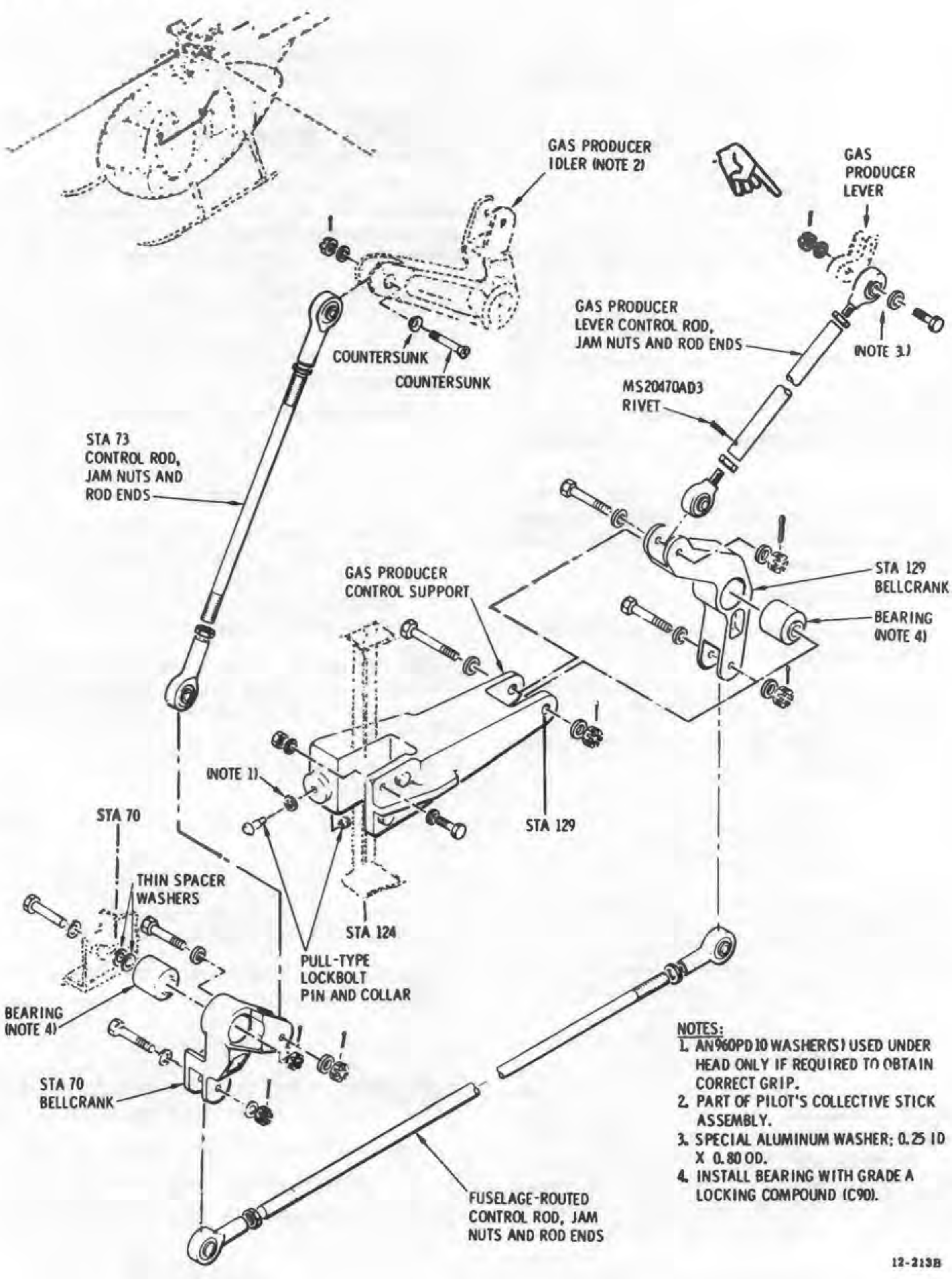
(1) Fuselage-routed control rod: 0.050 inch.

(2) Station 73 control rod: 0.010 inch.

(3) Gas producer lever control rod: 0.020 inch.

WARNING

A dye-check for cracking shall always be performed after cold-straightening



NOTES:
1. AN960PD10 WASHER(S) USED UNDER HEAD ONLY IF REQUIRED TO OBTAIN CORRECT GRIP.
2. PART OF PILOT'S COLLECTIVE STICK ASSEMBLY.
3. SPECIAL ALUMINUM WASHER; 0.25 ID X 0.80 OD.
4. INSTALL BEARING WITH GRADE A LOCKING COMPOUND (C90).

Figure 4-27. Gas Producer Control Linkage Disassembly.

(TM 55-1500-204-25/1). Replace a cracked rod, or a cracked or bent rod end.

b. Cold-straighten a bent rod that is not within tolerance, *a* above, provided there are no nicks or sharp dents in the bend length. Do NOT use the rod ends to support the rod during the straightening process.

CAUTION

Use care when drilling to remove or install a riveted rod end; the rod end is steel and the rod is aluminum. Tighten the jam nut before drilling and riveting.

c. **REPLACE A CONTROL ROD END IF BEARING AXIAL PLAY IS MORE THAN 0.040 INCH.** Set initial control rod length and bearing angularity as shown in figure 4-26.

d. Replace unserviceable bellcrank bearings. Install a new bearing of the correct type with surface primer and grade A locking compound (C91) and (C90), according to container instructions.

e. Replace bellcranks or control supports for distortion, cracks, or elongated holes.

4-227. Installation — Gas Producer (N1 Fuel Control) Linkage. (See fig. 4-27.) *a.* Position the control support on the firewall. Align the three standard bolt holes and the lockbolt hole with the matching holes. Install but do not tighten the three standard bolts, washers, and nuts.

NOTE

If the lockbolt hole diameter in the firewall does not exceed 0.187 inch, a standard diameter lockbolt pin can be used. If the hole is oversize and can be cleaned up to 0.201 inch maximum, use an oversize 0.187-inch lockbolt.

b. Install the replacement lockbolt pin and collar; best fit results when the compressed air line pressure to the pulling gun is 90 to 125 psi. Use up to three AN960PD10 washers under the pin head, if necessary, to obtain correct lockbolt grip.

c. Visually check the lockbolt installation. No measurable gap is permissible under either the pin head or collar. If the pin grip length or completeness of the collar swaging is questionable, use a lockbolt inspection gage or an equivalent inspection gage per NAS1563 to check for proper installation. Replace an incorrectly installed lockbolt.

d. Tighten the three nuts that attach the control support to the firewall.

CAUTION

When tightening a jam nut to secure a control rod end, always hold the rod end with a wrench to prevent jamming of the bearing against the fitting. Check that all misalignment is divided equally between the bearing of each control rod assembly.

NOTE

Before installing any control rod, measure the rod assembly for correct length (fig. 4-26).

e. Install control rod or bellcrank with bolt, washers, nut, and new cotter pin as shown in figure 4-27.

4-228. POWER TURBINE (N2 RPM) CONTROL LINKAGE.

4-229. Removal — Power Turbine (N2 RPM) Control Linkage. Remove control rods, bellcranks or supports according to paragraph 4-224 and figures 4-28 and 4-29. There are two exceptions: removal of the trim actuator and station 72 bellcrank as a unit, and removal of the droop control override link assembly.

NOTE

Only high temperature metal nuts (not fiber insert type) are to be used for anchoring control idler support (fig. 4-29) to engine gearcase accessory pad.

a. (See fig. 4-28.) Remove the droop control override link by disconnecting the link housing end fitting from the collective torque tube, and the rod end from the droop compensation fork.

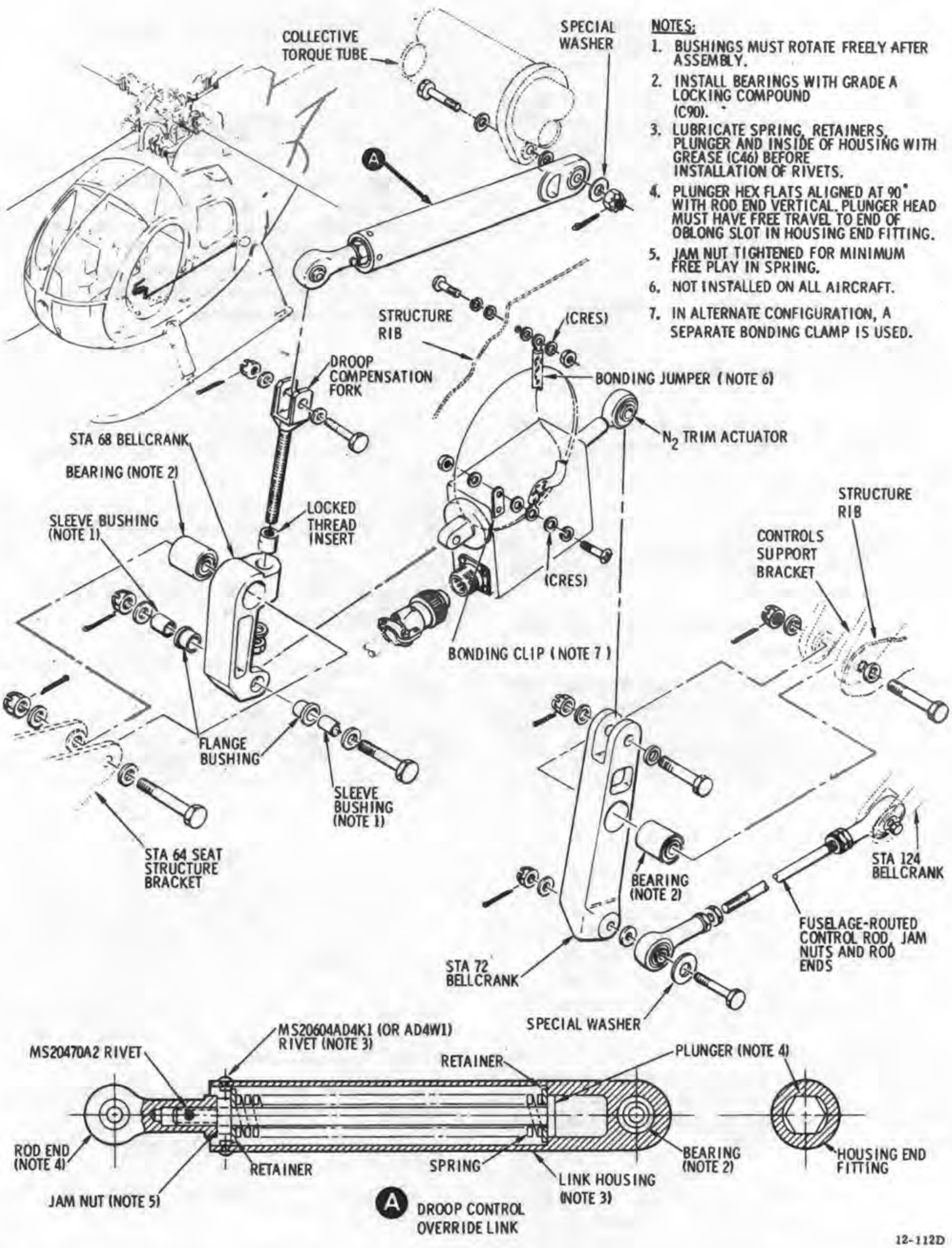
b. Remove the N2 trim actuator and station 72 bellcrank as a unit according to *c* through *f* below.

c. Disconnect the bonding jumper and electrical connector from the actuator.

d. Disconnect the actuator from station 68 bellcrank.

e. Disconnect station 72 bellcrank from the fuselage-routed control rod end.

f. Remove the pivot bolt that attaches station 72



NOTES:

1. BUSHINGS MUST ROTATE FREELY AFTER ASSEMBLY.
2. INSTALL BEARINGS WITH GRADE A LOCKING COMPOUND (C90).
3. LUBRICATE SPRING, RETAINERS, PLUNGER AND INSIDE OF HOUSING WITH GREASE (C46) BEFORE INSTALLATION OF RIVETS.
4. PLUNGER HEX FLATS ALIGNED AT 90° WITH ROD END VERTICAL. PLUNGER HEAD MUST HAVE FREE TRAVEL TO END OF OBLONG SLOT IN HOUSING END FITTING.
5. JAM NUT TIGHTENED FOR MINIMUM FREE PLAY IN SPRING.
6. NOT INSTALLED ON ALL AIRCRAFT.
7. IN ALTERNATE CONFIGURATION, A SEPARATE BONDING CLAMP IS USED.

Figure 4-28. Governor Control Linkage (Forward of Engine Compartment) Disassembly.

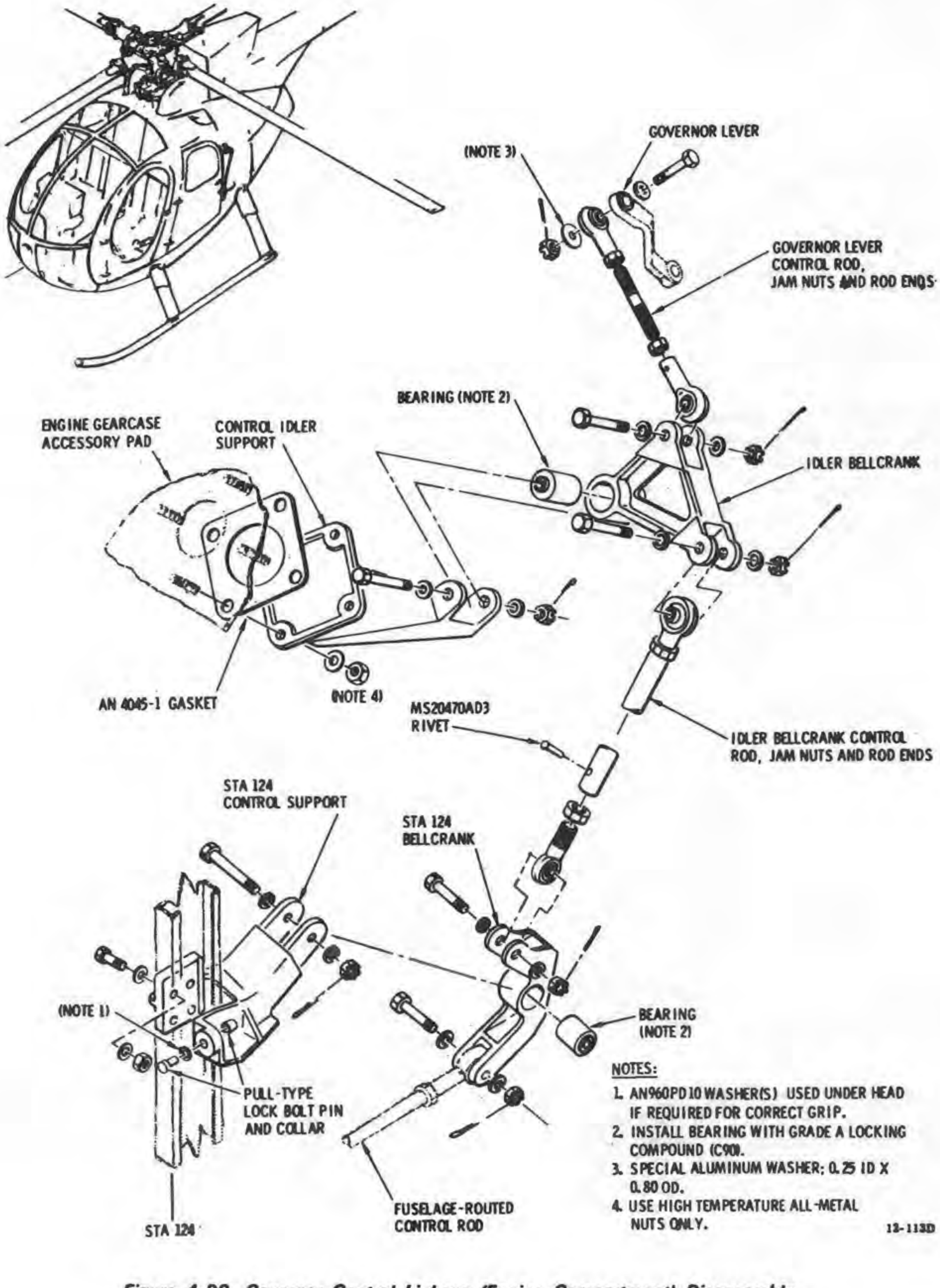


Figure 4-29. Governor Control Linkage (Engine Compartment) Disassembly.

bellcrank to structure rib and controls support bracket; remove actuator and bellcrank.

g. Disconnect the trim actuator from station 72 bellcrank. Use care to keep sleeved bushings with bellcrank.

4-230. Inspection — Power Turbine (N2 RPM) Control Linkage. *a.* Check rod end bearings for binding and excessive wear **(0.040-INCH MAXIMUM AXIAL LOOSENESS).**

b. Check control rod for surface damage and evidence of bending.

c. Check for loose rivet at fixed rod end (lower end).

d. Check bearings in bellcranks for binding.

e. Perform a fluorescent penetrant inspection (TM 55-1500-204-25/1) on any questionable part.

4-231. Repair — Governor Control Rods and Bellcranks. *a.* Perform a straightness check on a control rod that appears bent or bowed. The total length of governor control rods (excluding rod ends) must be straight within the following tolerances, with **STRAIGHTNESS VARIATION LIMITED TO A MAXIMUM OF 0.010 INCH IN EACH FOOT OF LENGTH.**

(1) Fuselage-routed control rod: 0.050 inch.

(2) Governor lever control rod: 0.010 inch.

(3) N2 idler bellcrank control rod: 0.020 inch.

b. Rods which exceed the straightness Limitations listed above will be replaced.

CAUTION

Use care when drilling to remove or install a riveted rod end; the rod end is steel and the rod is aluminum. Tighten the jam nut before drilling and riveting.

c. **REPLACE A CONTROL ROD END IF BEARING AXIAL PLAY IS MORE THAN 0.040 INCH.** Set initial control rod length and bearing angularity as shown in figure 4-26.

d. Replace unserviceable bellcrank bearings. Install a new bearing with surface primer and grade A locking compound (C91) and (C90), according to container instructions.

e. Replace bellcranks or control supports for distortion, cracks or elongated holes.

4-232. Repair — Droop Control Override Link Assembly. (See fig. 4-28.) *a.* Replace an unserviceable link housing end fitting bearing (detail A). Install a new bearing with surface primer and grade A locking compound (C91) and (C90), according to container instructions.

b. Replace an unserviceable rod end or broken spring according to *c* through *i* below.

c. Remove the four rivets from rod end of housing.

d. Drill out rod end rivet and disassemble spring assembly. Discard rod end and plunger.

e. Assemble new plunger, retainers, spring and jam nut on plunger threads until there is minimum free play of the spring.

f. Install replacement rod end to point of contact with jam nut. Check alignment of the flats on the plunger head and the rod end; with rod end vertical, two of the flats must be perpendicular at 90 degrees (detail A). Tighten jam nut against rod end. Check that there is no more than 0.010 inch free play in spring.

NOTE

When the override link assembly is installed between the droop compensation fork and the collective torque tube, the plunger must be free to travel to the end of the oblong slot in the link housing end fitting without binding.

g. Using a No. 50 drill, drill through rod end and plunger at the witness hole of the rod end. Install an MS20470A2 rivet of correct length.

h. Lubricate the interior of the housing, the spring retainers and plunger with grease (C46). Install the spring assembly in the housing so that plunger hex enters end fitting slot and rod end aligns vertically with housing bearing (detail A, fig. 4-28).

i. Complete the link assembly by installing the four retention rivets (MS20604AD4K1 or W1) in the housing (detail A).

4-233. Installation — Power Turbine (N2 RPM) Control Linkage. (See fig. 4-28 and 4-29.) *a.* Check a replacement trim actuator for correct **MAXIMUM EXTENDED LENGTH OF 5.47 ±0.03 INCHES BETWEEN ATTACH BOLT CENTERS.** If dimension is not correct, test actuator for proper operation (para 4-237).

b. Assemble original or replacement trim actuator to original or replacement station 72 bellcrank with a bolt, two washers, nut and new cotter pin..

c. Check that both sleeve bushings are in place in station 68 bellcrank arm before connecting the actuator; then install assembled unit in controls support bracket and connect linkage as shown in figure 4-28. The sleeve bushings in station 68 bellcrank arm must rotate freely, without any binding, after the actuator is attached and the connecting hardware is tightened.

d. Connect replacement droop control override link to collective torque tube. Push on rod end and check that the link assembly plunger head is free to slide back and forth in the link housing end fitting. Connect rod end to droop compensation fork; the rod end should align with the fork.

4-234. RPM GOVERNOR (N2) TRIM ACTUATOR.

4-235. Removal — Rpm Governor (N2) Trim Actuator. Refer to paragraph 4-229.

4-236. Repair and Adjustment — Rpm Governor (N2) Trim Actuator. Repair of the N2 trim actuator is limited to replacement of an unserviceable rod end in the actuator ram. With the ram at full extension, set the distance between attach bold centers to 5.47 inches before reinstalling the actuator.

4-237. Test — Rpm Governor (N2) Trim Actuator. *a.* Connect the N2 trim actuator to test harness and equipment shown in figure 4-30.

b. Turn on dc power and adjust output to 25.75 to 26.25 volts.

c. With actuator ram approximately halfway between stops, set up dial test indicator and measure the ram end play. **THE END PLAY MUST NOT EXCEED 0.005-INCH TIR WHEN MEASURED UNDER A 10-POUND REVERSING LOAD.**

d. Position test switch to RETRACT and allow the actuator ram to fully retract. Using the end of the ram sleeve as a reference point, measure the portion of ram that remains out of the sleeve to the nearest 0.016 inch. Record this measurement for use in *e* below.

e. Position test switch to EXTEND and run ram to the extend stop. Measure the length of the extended ram. Subtract the measured result of *d* above, from this value. The result should be 0.97 to 1.03 inches.

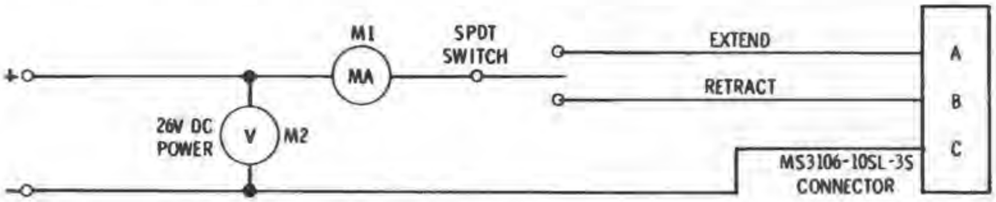
f. The operating current under no-load conditions, at 26.0 vdc input should be between 0.60 to 1.25 amperes when running and 2.0 amperes maximum when stalled.

g. Operate the actuator motor in both extend and retract direction. Overtravel must not exceed 0.020 inch maximum when power is turned off.

h. Reduce the voltage input to 21 volts. The actuator ram must retract and extend to the stops without binding on the stops or between the stops.

i. Increase the input voltage to 28 volts. The actuator ram must retract and extend to the stops without binding on the stops or between stops.

j. Run the actuator to the fully extended position. The overall length of the extended actuator should be 5.47 inches between attach bolt centers. Turn power off and disconnect the actuator.



TEST EQUIPMENT REQUIRED

6-INCH SCALE

DC VOLTMETER, CALIBRATED 0-50 VOLTS

DC MILLIAMMETER, CALIBRATED 0-5 AMPERES

VARIABLE DC POWER SUPPLY, 10-36 VOLTS

DIAL INDICATOR GAGE

SWITCH, SPDT, CENTER-OFF

12-242A

Figure 4-30. N2 Trim Actuator Test Hookup.

4-238. Installation — Rpm Governor (N2) Trim Actuator. Refer to paragraph 4-228.

SECTION VIII IGNITION SYSTEM

4-239. IGNITION SYSTEM.

4-240. General — Ignition System. Refer to TM 55-2840-231-24 for description and maintenance of the engine ignition system. Refer to paragraphs 4-241 through 4-250 for the engine ignition automatic restart system.

Table 4-18. Premaintenance Requirements for Maintenance of the Ignition System.

Conditions	Requirements
Test Equipment	(T4)
Minimum Personnel Required	Two (MOS 67V & 68F)
Consumable Materials	(C12) (C96)

4-241. Automatic Restart System Description — Ignition System. The automatic restart system (fig. 4-31) is provided to automatically energize the engine ignition system when an engine out condition is sensed by the engine power out warning unit. Engine power out warning and reignition occurs when engine N2 rpm decreases to 95 ± 1 percent or below during flight with the throttle at full open (governed) position. At other throttle positions the N2 sensing is disabled by a switch mounted on the base of the pilot's collective pitch stick. A reignition time delay of 3.5 ±0.5 seconds is provided after returning the throttle to the full open (governed) position. This prevents erroneous engine out warning and reignition while rpm is increasing to above 95 percent N2.

Engine power out warning and reignition also occurs when engine N1 rpm decreases to 55 ±5 percent or below.

NOTE

Reignition is automatically limited to a duration of 5 seconds to prevent excessive surge and to eliminate danger of post-crash fires.

An indicator light, mounted on the underside of the instrument panel hood, illuminates to indicate that reignition has occurred. The system can be reset and the light extinguished by pressing the indicator face. Reignition system power is supplied through a 5-ampere circuit breaker (AUTO RE-IGN) mounted near the switch panel. System ground is provided by the generator switch and reignition does not occur unless the generator switch is at GEN position. The system includes an isolation diode CR2, mounted near the starter relay, which allows the engine ignition system to be energized without operating the starter. Normal starting and ignition, using the start button, remains unchanged. The engine ignition exciter used with this system is Allison 6870885 (GLA43754) or Bendix 6870891. The igniter is Allison 6843984, Champion FHE161-9, or AC5611588. Refer to chapter 9 for information concerning the engine power out warning unit used with this svstem.

4-242. Test (Operational Check) — Automatic Restart System. *a.* Open the engine access doors and have an assistant prepare to listen for actuation of the engine ignition exciter.

b. Check that RE-IGN circuit breaker is engaged and set Generator switch to GEN. and power selector switch to EXT.

c. Connect external electrical power. The MASTER CAUTION, ENGINE OUT, and TRANS OIL PRESS warning lights will flash. An audible warning tone will be heard in headsets, the RE-IGN indicator will illuminate, and a buzzing sound will be heard at the engine ignition exciter.

d. Check that ignition exciter continues to buzz for 5 seconds and then stops.

e. Switch generator OFF. The audible warning tone will stop and the reignition indicator light will extinguish. Close engine access doors.

NOTE

The following steps are to be performed only after maintenance involving change of the engine power out warning unit or when required for troubleshooting the complete automatic restart system.

f. Make a normal engine start in accordance with TM 55-1520-214-10. Place generator switch at GEN after engine stabilizes at idle.

g. With collective pitch full down, twist throttle smoothly to full open position. Note that reignition indicator should not illuminate if N2 rpm reaches 95 percent or more within 3.5 seconds after throttle is opened.

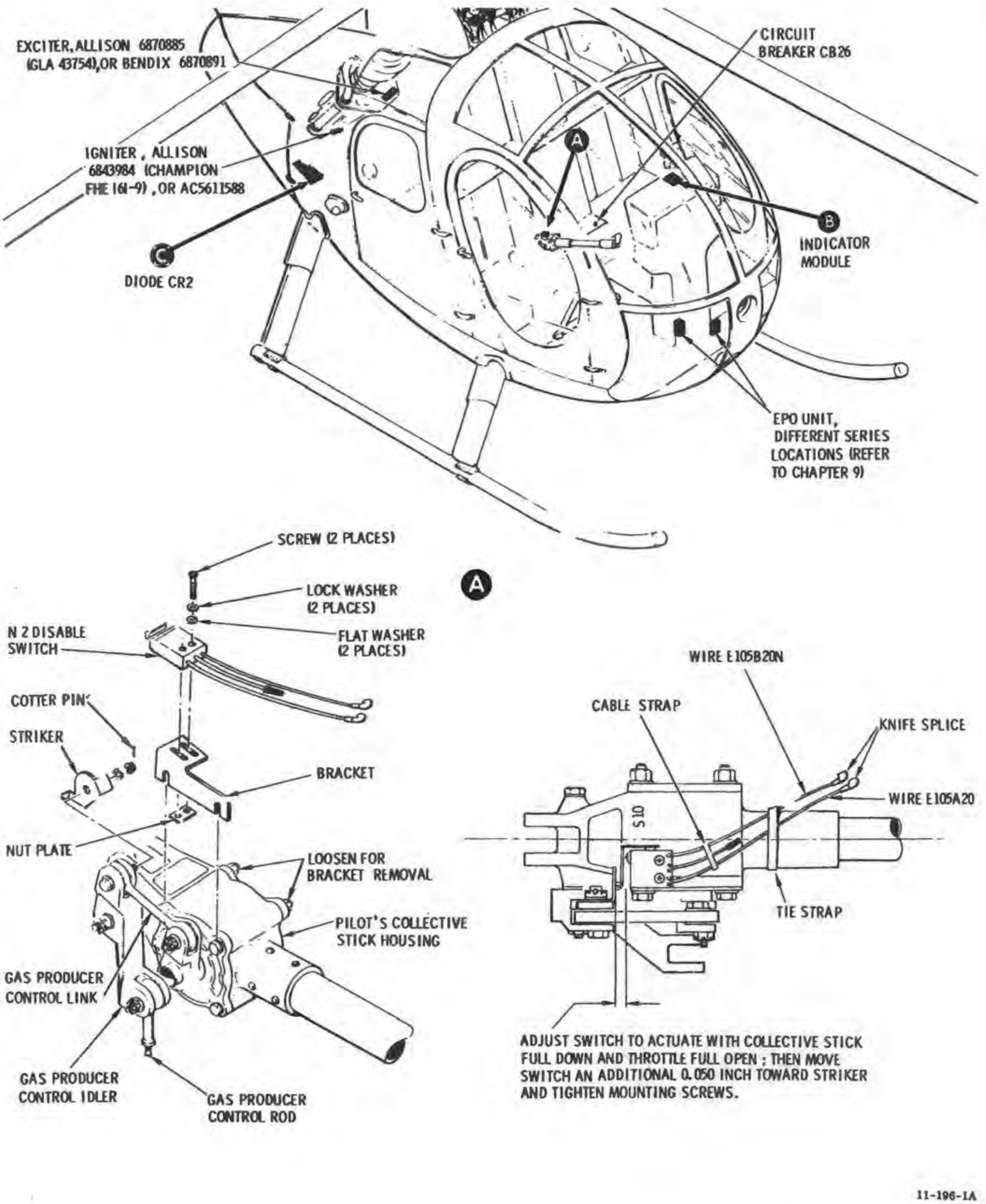
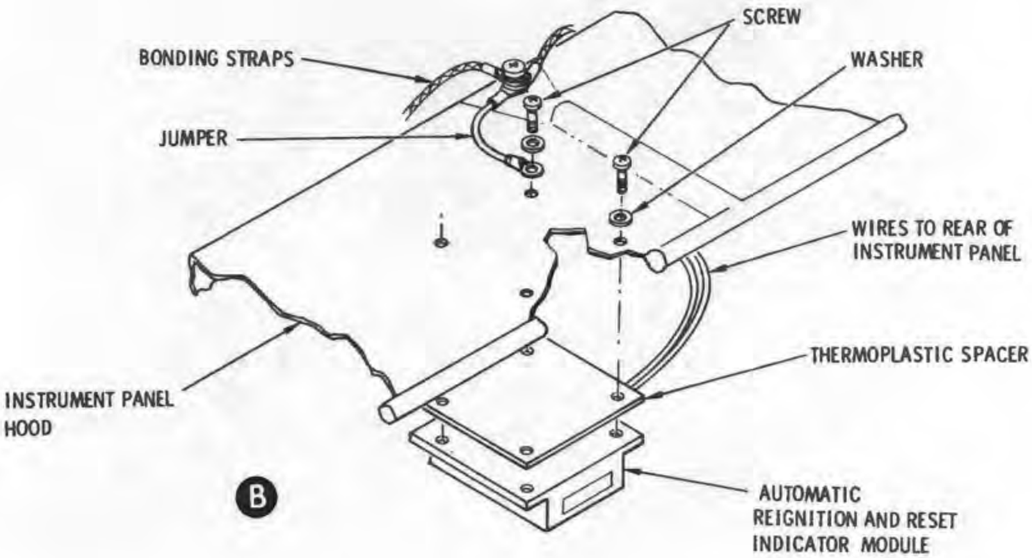
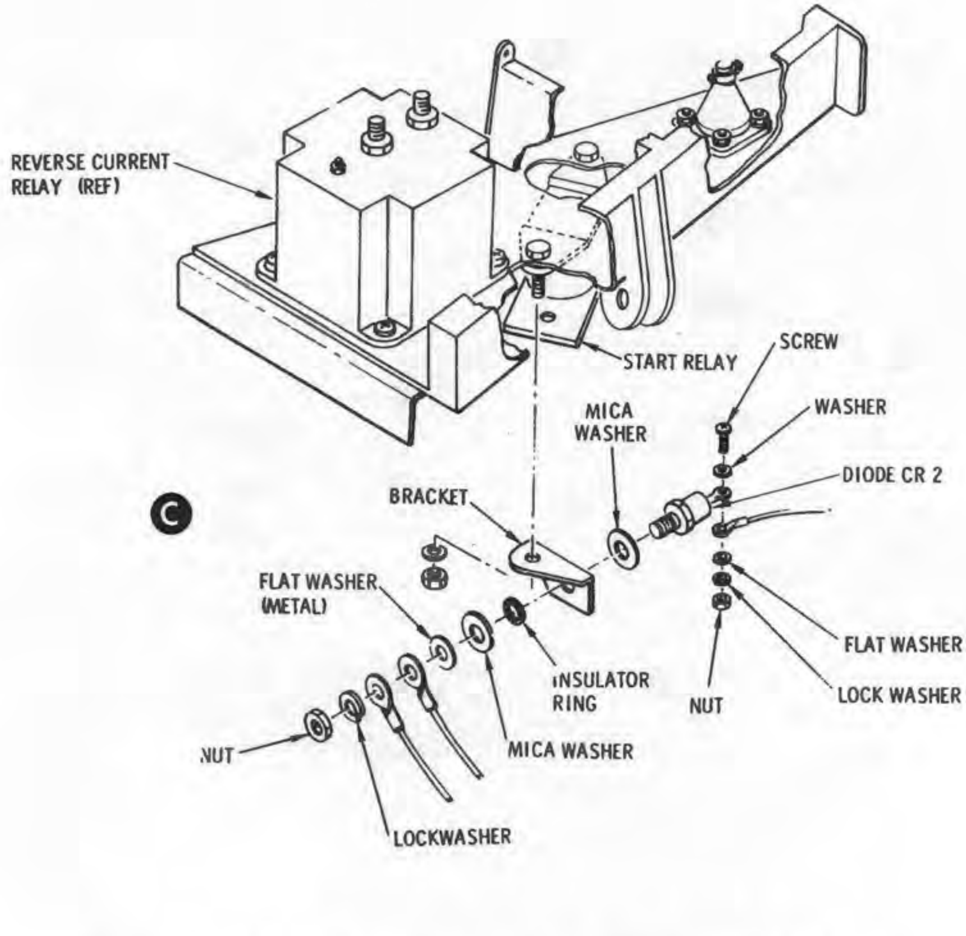


Figure 4-31. Automatic Restart System. (sheet 1 of 2)





11-196-2

Figure 4-31. Automatic Restart System. (sheet 2 of 2) *h.* Pull fuel shutoff valve to off position and allow engine flameout. As engine N2 rpm decreases to 95 percent the reignition indicator (RE-IGN) should illuminate.

CAUTION

Fuel valve must remain off until engine is completely stopped.

i. Twist throttle to idle cutoff position and push the RE-IGN indicator to reset the system.

j. Perform another start *f* above and allow engine to stabilize at idle (65 percent rpm or higher). Twist the throttle to idle cutoff and observe that RE-IGN light illuminates as N1 falls through 55 percent rpm. Complete the shutdown and remove electrical power.

4-243. Troubleshooting — Automatic Restart System. Refer to table 4-19.

4-244. N2 DISABLE SWITCH.

4-245. Adjustment — N2 Disable Switch. Adjust N2 disable switch with the collective pitch stick fully down and with throttle fully open (gas producer N1 lever on the open stop). Loosen switch mounting screws and move switch forward in mounting slots. Move switch aft, toward the striker place, until an actuating click is heard and then continue moving the switch aft an additional 0.050 inch. Tighten switch mounting screws.

NOTE

If switch actuating click cannot be heard, use a multimeter (T4) connected between splices SP-9 and SP-10 to determine actuation point.

4-246. Removal — N2 Disable Switch. (See fig. 4-31.) *a.* Gain access to the base of the pilot's collective pitch stick by removing cover. (Refer to chapter 2.) It will also be necessary to remove the lower portion of both pilot's seats.

b. Remove N2 disable switch as shown in exploded view on figure 4-30. Remove assembled switch and bracket for best access.

4-247. Installation — N2 Disable Switch. (See fig. 4-31.) *a.* Assemble N1 disable switch and support bracket as shown in figure 4-31; then install bracket and tighten collective stick housing bolts.

b. Install electrical wires and tie straps. Refer to appendix F for restart system wiring diagrams.

c. Check that tie straps are properly installed on switch wires to prevent interference with collective pitch and throttle movement.

d. Adjust disable switch according to paragraph 4-245.

e. Reinstall cover over base of collective pitch stick.

4-248. ISOLATION DIODE CR2.

4-249. Removal — Isolation Diode CR2. (See fig. 4-31.) *a.* Remove bolt attaching diode mounting bracket at base of starter relay.

b. Using a knife blade or similar tool, scrape away sealant for access to diode mounting stud and electrical terminals.

c. Remove diode from mounting bracket and disconnect electrical terminals. Retain all attaching parts.

4-250. Installation — Isolation Diode CR2. (See fig. 4-31.) *a.* Install diode in mounting bracket being sure that the diode stud is insulated from electrical contact with the bracket by installing the parts in the sequence shown in figure 4-31. Using a multimeter (T4), check that resistance between diode body and bracket is infinite.

b. Connect wire from start relay to small terminal on diode.

c. Install bolt to attach diode mounting bracket to base of start relay.

d. Perform operational check (para 4-242). Perform an engine start (TM 55-1520-214-10) to determine that normal start system functions properly.

e. Clean diode and mounting bracket with solvent (C96). Apply silicone adhesive (C12) to completely cover the diode and wire terminals. Allow adhesive to cure for 24 hours at room temperature.

Table 4-19. Troubleshooting of the Engine Automatic Restart System.

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

NOTE

Before you use this table, be sure you have performed all normal operational checks. If you have a malfunction which is not listed in this table, notify the next higher level of maintenance.

1. **Automatic engine restart functions normally, no RE-IGN indication.**

STEP 1. Check for defective indicator lamps.

If a lamp is defective, replace the lamp (chapter 9).

2. **Regular engine start is normal. Automatic engine restart does not occur when power decreases to reignite level; reignition indicator does not light. Engine power out warning normal.**

STEP 1. Check that RE-IGN circuit breaker is set (fig. 4-31).

If the generator switch is at OFF, place the switch ON.

STEP 2. Check that the generator switch is at ON (chapter 9).

If the circuit breaker is disengaged depress the circuit breaker.

STEP 3. Check for defective electrical connectors and wiring (appendix F).

If an electrical connector or the wiring is found to be defective, repair or replace defective connector or wiring.

STEP 4. Check for a defective reignition indicator module (fig. 4-31).

If the reignition indicator module is found to be defective, replace the indicator module.

STEP 5. Check for no reignition output from engine power out warning unit at connector J21 pin U.

If the engine power out warning unit is found defective refer to chapter 9.

3. **Same symptom as malfunction 2, above, except engine power out warning does not occur.**

STEP 1. Check for defective engine power out warning unit (chapter 9).

If the engine power out warning unit is defective, replace the unit.

4. **Reignition indicator light does not extinguish, on push to reset, with engine power normal.**

STEP 1. Check for defective reignition indicator module (para 4-241).

If the reignition indicator module is defective, replace the module.

5. **Engine power out warning and reignition occurs at power settings above 55 percent N1 and below 95 percent N2.**

STEP 1. Check for defective or improperly adjusted N2 disable switch (para 4-244).

If the N2 disable switch is defective or improperly adjusted, replace or adjust the switch (para 4-244).

6. **Engine power out and reignition occurs at power settings above 95 percent N2.**

STEP 1. Check for defective engine power out warning unit.

If the engine out warning unit is defective, replace the unit.

7. **Engine ignition does not occur during normal start attempt.**

STEP 1. Check for defective diode CR2 (fig. 4-31).

If diode CR2 is defective, replace the diode.

STEP 2. Check for defective exciter or igniter (TM 55-2840-231-24).

SECTION IX QUICK CHANGE ASSEMBLY

4-251. QUICK CHANGE ENGINE UNIT.

4-252. General — Quick Change Engine Unit. Replacement engines may be built-up as quick change engine units and preserved according to the following paragraphs. Use of a quick change unit depends on availability of sufficient spare components and fittings and the requirement for a slightly reduced aircraft down time.

4-253. Accessories Installation — Quick Change Engine Unit. (Refer to para 4-14.)

4-254. T63-700 Engine Accessories Installation — Quick Change Engine Unit. (Refer to para 4-15.)

4-255. Preservation — Quick Change Engine Unit. Prepare the engine for long term storage as described in TM 55-2840-231-24. Provide for corrosion protection of engine accessories as described in chapter 1 of this manual.

CHAPTER 5

ROTORS

SECTION I MAIN ROTOR HUB AND BLADES

5-1. MAIN ROTOR HUB AND BLADES.

5-2. Description — Main Rotor Hub and Blades. The main rotor (fig. 5-1) is located close to the center of the helicopter cg range. The rotor controls the helicopter lateral and longitudinal motion and the lifting force. The helicopter rate of ascent or descent is controlled by the collective pitch control system. Horizontal motion is controlled by the cyclic system. The main rotor is fully articulated with offset flapping hinges. The rotor consists primarily of four removable rotor blades attached to the rotor hub pitch housings. A central hub supports the pitch housings, cross connected retention straps, and the associated pitch change control mechanism.

CAUTION

When work is performed near the engine air inlet, use care to prevent entry of foreign objects. On aircraft without a filter, tape covers of cardboard or other suitable material in place over the engine inlet screen. Plug the oil cooler air inlets. Do not remove covers until work is completed and check that area around base of mast, inlet to plenum, and entire plenum chamber is free of foreign material. Install plenum access doors.

Install exhaust covers on aircraft with upward exhausts when work is performed above or near exhaust outlets.

WARNING

Sudden onset, excessive and/or unusual main rotor vibrations should be investigated as to cause, prior to continued flight. Under no circumstance should main rotor tracking be attempted to correct the problem until a thorough inspection of the main rotor blades, hub assembly and strap pack assembly has been performed.

5-3. Troubleshooting — Main Rotor Hub and Blades. Troubleshooting of the main rotor system includes three areas of investigation: (1) investigation of operational vibration problems originating with the main rotor assembly (table 5-1); (2) investigation of symptoms at the controls that can be recognized (table 11-1); and (3) isolation of an unusual controls malfunction that will require disconnection or removal of control components. Troubleshoot by investigating until the component that is causing malfunction has been located.

SECTION II MAIN ROTOR HUB

5-4. MAIN ROTOR HUB.

5-5. Description — Main Rotor Hub. The main rotor hub assembly (fig. 5-1) consists of a central hub, and four identical pitch housing assemblies that are 90-degrees apart and slightly offset. Lead-lag links; a blade damper and damper arm; a droop stop striker strip and spacer, and a pitch control bearing assembly are combined with each pitch housing to produce the pivoting axis, blade flapping stop contact surfaces, and lead-lag hinge for the rotor blades. Two laminated retention strap assemblies that are both vertically and torsionally flexible, extend through the pitch housings and connect to the lead-lag links. A lower shoe assembly, attached to the central hub, contains a droop stop ring and droop restrainers that support the blades at rest and distribute droop loads at low blade rpm. Hub assemblies have balancing hardware installed in the hollow cores of the lead-lag bolts. Balance washers are added or removed when main rotor balancing is required. Refer to paragraph 5-53A for balance instructions.

5-6. Inspection — Main Rotor Hub. *a.* Inspect all accessible areas of main rotor hub and subassemblies for evidence of cracks, scratches, nicks and any other physical damage or deformation. **DAMAGE THAT EXCEEDS 0.010 INCH IN DEPTH IS NOT ALLOWED** unless removed without leaving abrupt changes in surface contour. **NO CRACKS OF ANY KIND ARE ALLOWED.**

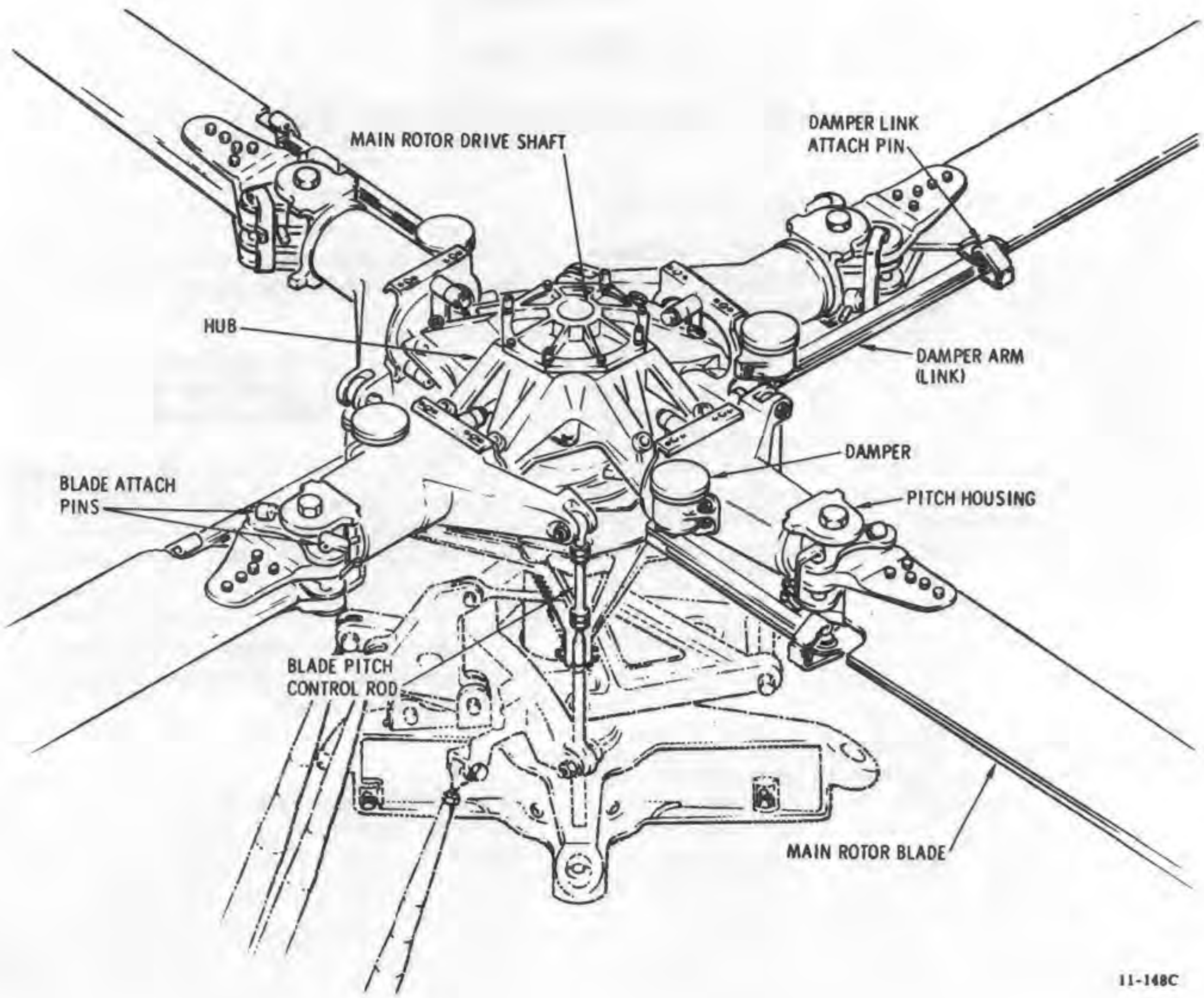


Figure 5-1. Main Rotor Hub and Blades

b. Check that blade attach pins and damper attach pins are locked and not loose (para 5-73).

c. Check for gap between damper and pitch housing **0.002-INCH MINIMUM.** If gap is insufficient, remove main rotor damper (para 5-30) and rework pitch housing by smooth blending into the surrounding area (para 5-33).

d. Inspect main rotor damper for hydraulic fluid leakage (none permitted). If leakage is noted, repair or replace damper.

5-7. Cleaning — Main Rotor Hub.

CAUTION

Do not allow solvent to enter inside of hub and contaminate bearing lubricant. Bearings are cleaned and lubricated only during hub assembly overhaul.

Clean the main rotor with a clean, dry cloth moistened with solvent (C94). Blow out all crevices and holes with dry, filtered, low-pressure compressed air.

Table 5-1. Troubleshooting the Main Rotor Hub and Blades.

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

NOTE

Before you use this table, be sure you have performed all normal operational checks. If you have a malfunction which is not listed in this table, notify the next higher level of maintenance.

1. **A one-per-revolution lateral beat is noticed during flight at high power settings. Lateral beat is also noted in autorotation and in turns.**

STEP 1. Check for correct damper torque (para 5-29).

If damper torque is incorrect, readjust torque within limits (para 5-38).

STEP 2. Remove dampers (para 5-30) and check for correct phasing.

If damper phasing is incorrect, adjust phasing (para 5-38).

STEP 3. Check main rotor balance.

If main rotor is not in balance, readjust according to paragraph 5-53A.

2. **A one-per-revolution lateral beat is noticed during warmup or shutdown.**

STEP 1. Perform steps 1, 2 and 3 in Malfunction No. 1 as required.

3. **A lateral beat occurs at low (idle) rotor rpm. When operating at normal (flight) rotor rpm, the lateral beat becomes a vertical beat.**

STEP 1. Perform steps 1, 2 and 3 in Malfunction No. 1 as required.

4. **When operating, a four-per-revolution or medium frequency beat is noticed.**

STEP 1. Check that damper is not sticking by moving blade; then check damper low range torque.

If damper is sticking or low range torque is incorrect, adjust low range torque (para 5-29). Repair a defective damper.

STEP 2. Remove dampers and check for correct phasing.

If damper phasing is incorrect, adjust phasing (para 5-38).

STEP 3. Check blade vibration absorbers for freedom of motion, condition and security.

If defective, repair or replace absorber (para 5-77).

STEP 4. Check for worn rotor hub feathering bearings.

If bearings are worn, replace bearings (para 5-13).

5. **A one-per-revolution vertical beat is present throughout all flight maneuvers. The beat becomes heavier at higher airspeeds.**

STEP 1. Check main rotor blade track.

If blades are not in track, readjust according to paragraph 5-43).

6. **When operating, a continuous one-per-revolution lateral beat is present.**

STEP 1. Check main rotor blade tip weights for security.

If tip weights are not secure, repair as necessary (para 5-65).

If tip weights are missing, replace the blade (para 5-54).

STEP 2. Check main rotor balance.

If main rotor is not in balance, readjust according to paragraph 5-53A.

7. **When operating, a lateral feedback (beat) is noted in the cyclic stick. No longitudinal feedback is detected.**

STEP 1. Check main rotor blade track.

If blades are not in track, readjust according to paragraph 5-43).

Table 5-2. Premaintenance Requirements for Removal of Main Rotor Head.

Conditions	Requirements
Special Tools	(T26 or T35)(T24)(T15)
Support Equipment	Hoist
Minimum Personnel Required	Two

5-8. Removal — Main Rotor Hub. *a.* Remove four main rotor blades (para 5-54).

b. Remove main rotor drive shaft (para 6-7).

c. (See fig. 5-2.) Disconnect flexible boot from lower end of hub outer liner.

d. Disconnect scissors assembly from main rotor hub (para 11-17).

e. Disconnect each pitch change rod from pitch housing (fig. 5-2).

NOTE

Color code each pitch change rod to match the pitch housing and blade to which it was attached. The main rotor can be reinstalled in the same position.

f. Cut lockwire and remove two screws securing retainer to locknut. Remove retainer.

NOTE

If main rotor wrench (T26) is not available, tool (T35) may be used if all tang slots are widened to 0.344 inch.

g. Remove locknut by using main rotor wrench (T35).

CAUTION

Use care to ensure proper installation and use of hub puller (T24) to prevent damaging main rotor hub assembly.

h. (See fig. 5-4.) Break loose main rotor hub by using hub puller (T24), then remove hub puller.

CAUTION

Do not lift the main rotor hub by using the pitch change housings for lifting points. The strap packs and/or the upper hub casting may be damaged.

i. Temporarily reinstall bracket (on aircraft so equipped) or eyebolts and lifting adapter (T15) on main rotor hub. Take care to tighten the four lifting bracket mounting bolts (or eyebolts) evenly and only finger tight. Do not wrench-tighten the bolts with the main rotor drive shaft removed.

j. Attach an overhead hoist to the lifting bracket or lifting adapter eye and lift the hub free from the main rotor mast.

k. Position hub in a suitable working area. Remove lifting bracket or lifting adapter and eyebolts from rotor hub.

5-9. Inspection — Main Rotor Hub Assembly. *a.* Inspect pitch housings (fig. 5-2 and 5-5) for scratches, nicks and cracks. No cracks are permissible. Scratches and nicks must be cleaned up before measuring the depth of the damage to determine housing serviceability. Accomplish repair according to paragraph 5-10.

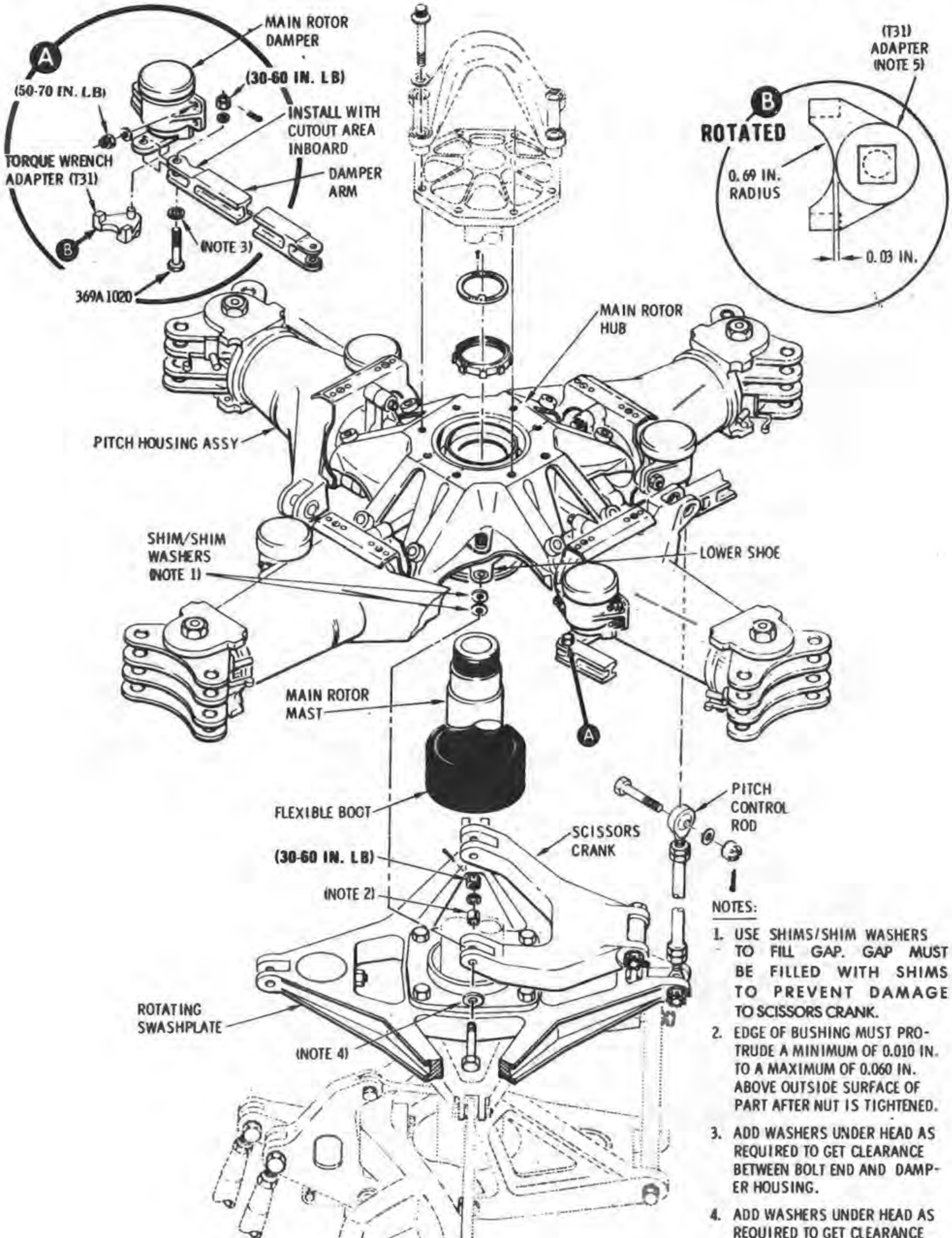
b. Inspect sleeve bushing for snug fit in pitch housing arm clevis lug; the lug must not show evidence of wear caused by bushing movement. **MAXIMUM ALLOWABLE DIAMETER OF THE HOLE IN THE BUSHED LUG IS 0.500 INCH; FOR THE UNBUSHED LUG AND THE BUSHING ID, NOT MORE THAN 0.313 INCH.** Inspect inner surfaces of all pitch housing arm clevis lugs for chafing caused by misaligned pitch control rod end bearings. Chafing will be in the form of crescent-shaped grooves. If chafing wear is found, accomplish repair according to paragraph 5-10. The chafed area must be reworked before measuring the depth of the damage.

c. Inspect the droop stop ring for corrosion, dents, and scratches. Repair defects according to paragraphs 5-20 and 5-21. To inhibit corrosion, spray droop stop ring, rollers and pitch bearings with rust inhibitor (C87).

d. Inspect droop stop roller for flat spots, pit marks, and looseness on roller shaft.

e. Inspect striker plate for dents (brinelling) and pit marks.

f. Press each pitch housing downward several times and check for evidence of a binding pitch bearing or droop restrainer follower. Inspect visible portion of droop restrainer for cracks, and the follower spring for breaks.



NOTES:

1. USE SHIMS/SHIM WASHERS TO FILL GAP. GAP MUST BE FILLED WITH SHIMS TO PREVENT DAMAGE TO SCISSORS CRANK.
2. EDGE OF BUSHING MUST PROTRUDE A MINIMUM OF 0.010 IN. TO A MAXIMUM OF 0.060 IN. ABOVE OUTSIDE SURFACE OF PART AFTER NUT IS TIGHTENED.
3. ADD WASHERS UNDER HEAD AS REQUIRED TO GET CLEARANCE BETWEEN BOLT END AND DAMPER HOUSING.
4. ADD WASHERS UNDER HEAD AS REQUIRED TO GET CLEARANCE BETWEEN BOLT END AND SWASHPLATE BOOT.
5. RECESS NOT PRESENT ON ALL ADAPTERS.

12-127G

Figure 5-2. Main Rotor Hub Installation.

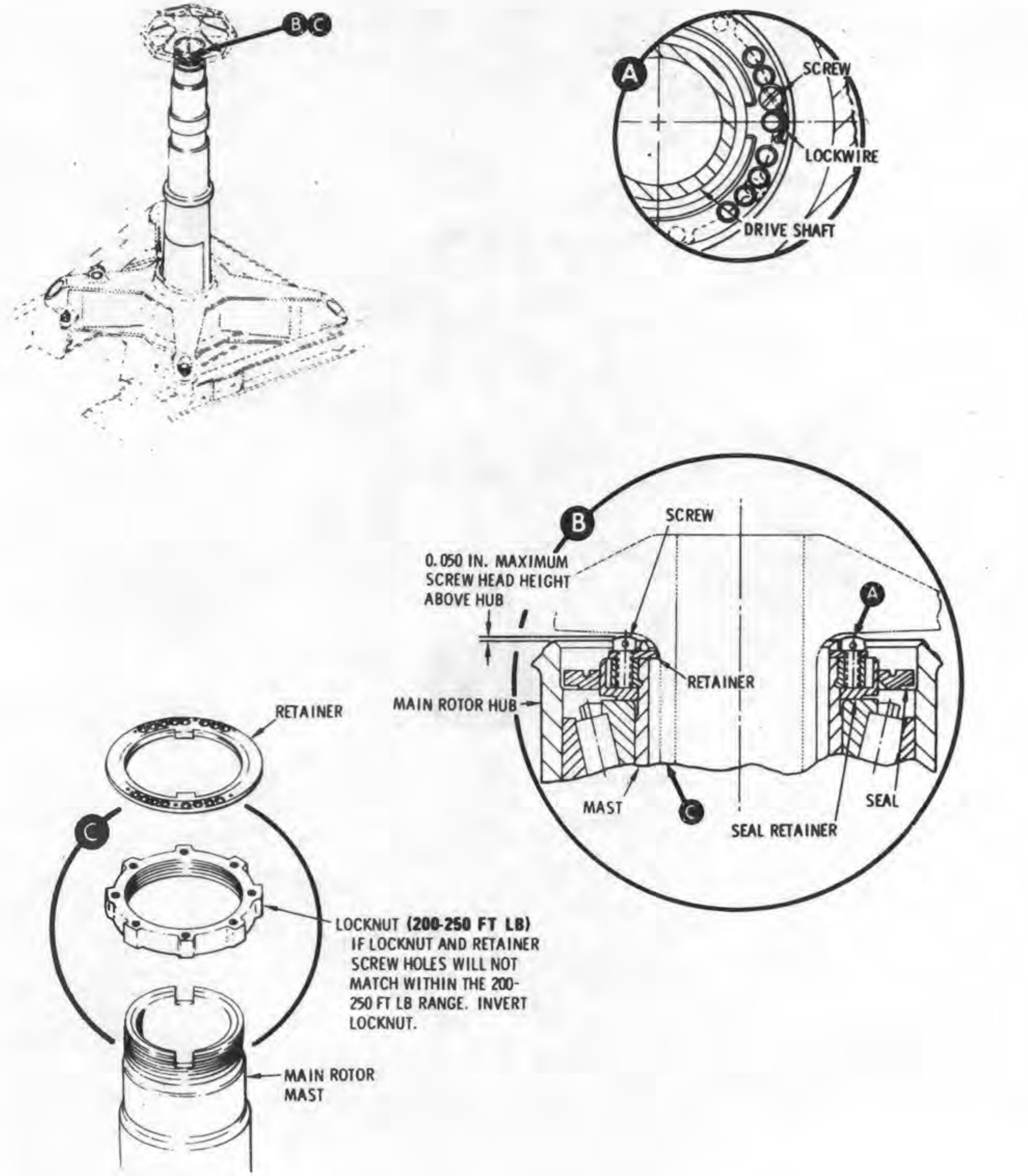


Figure 5-3. Main Rotor Mast Locknut Installation.

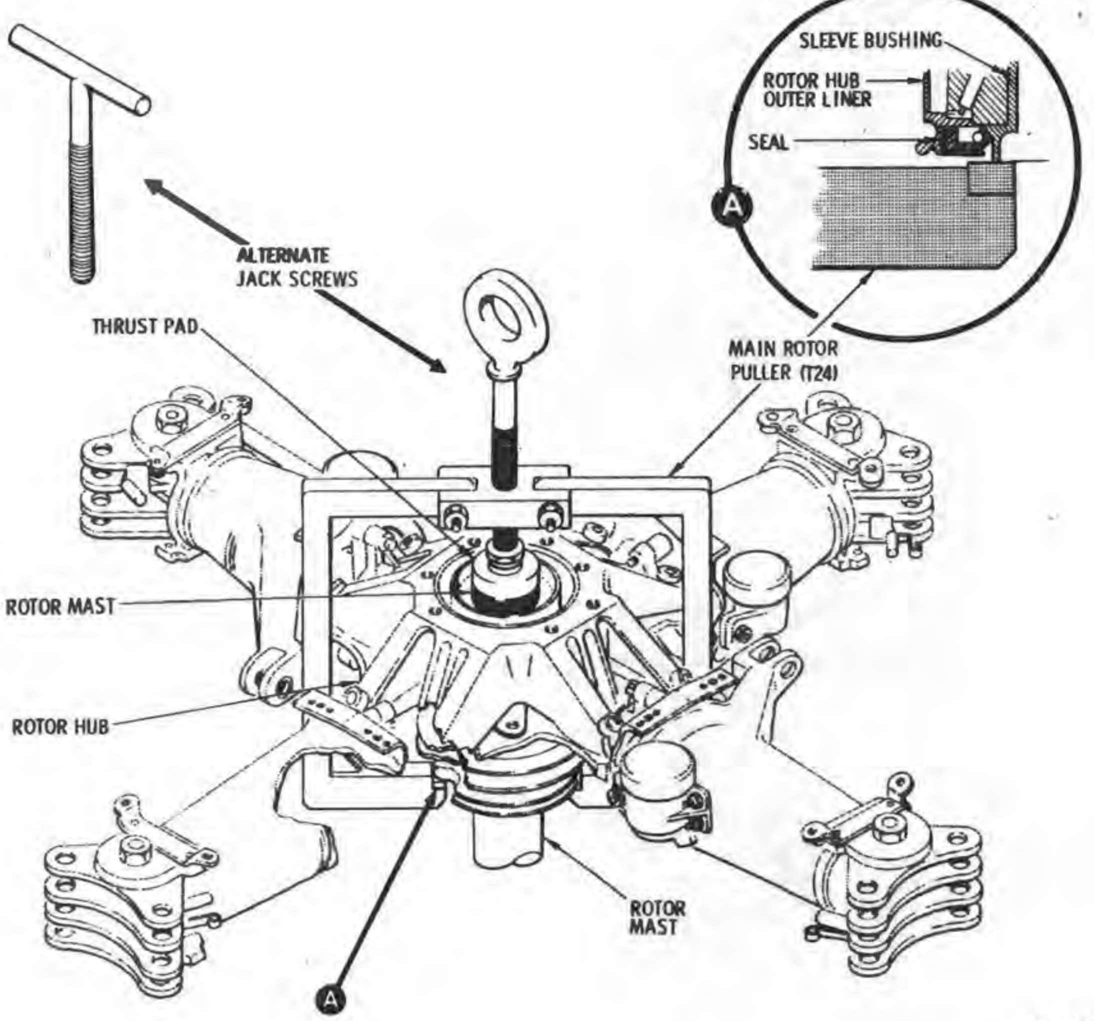


Figure 5-4. Pulling Hub Assembly Off Mast.

NOTE

Do not remove tetrafluorethylene (TFE) debris which works out of pitch bearing edge. The debris is normal and helps lubricate bearing. Removal of debris will increase bearing wear rate.

g. Inspect lead-lag link stop for broken spring cracks, breaks and visible bond line cracks. Inspect for 0.0000 axial and 0.0015 radial play as measured from the center leading lag bolt to outside edge of the link.

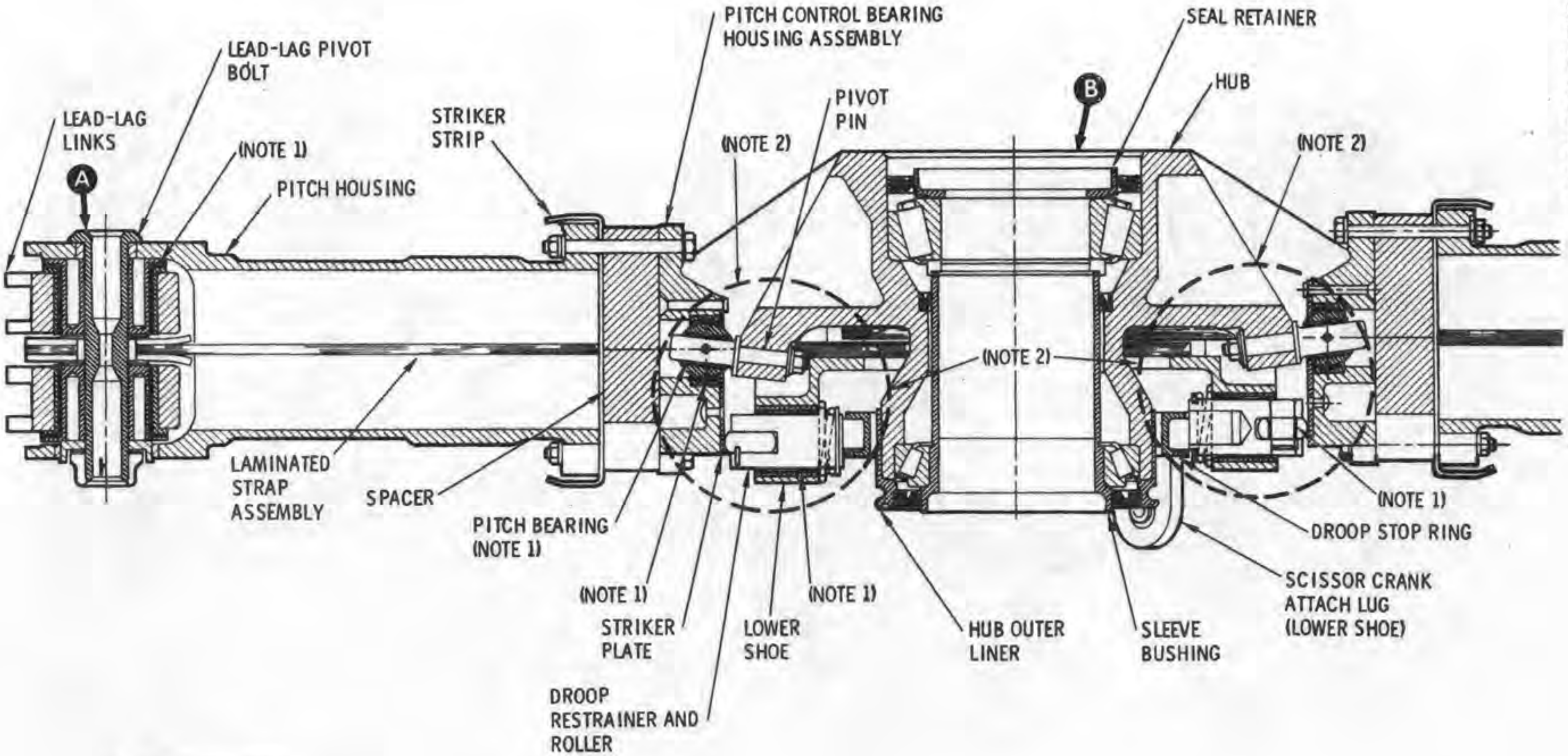
h. Inspect ID of lead-lag bolts for presence of corrosion. Bolts having evidence of corrosion should get the preventive treatment described in paragraph 5-16.

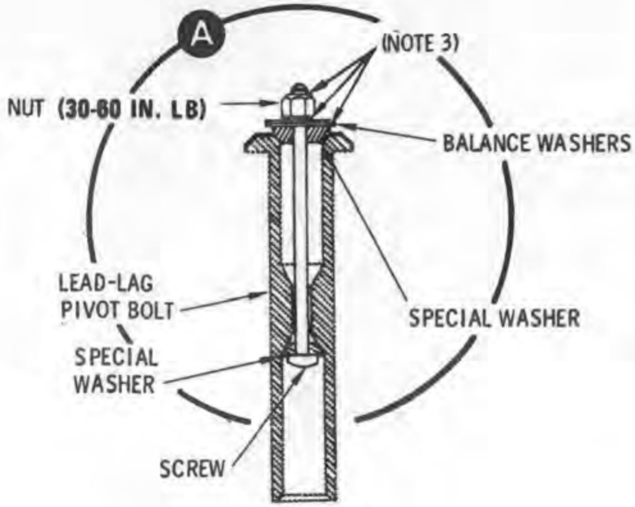
NOTE

Lead-lag bolts in hub assemblies contain balancing hardware. Remove the balancing hardware to perform the inspection. Each set of removed hardware should be tagged or color-coded to ensure correct reinstallation.

i. Inspect each striker strip for cracks, deformation, loose nutplates, and badly worn contact surfaces.

j. Inspect all parts of main rotor hub for cracks, breaks, scratches and nicks. Any evidence of damage





NOTES:

1. HEAVY LINES INDICATE REINFORCED TEFLON BEARING LININGS (TYPICAL).
2. RELATIVE POSITIONS OF PITCH LINE AND DROOP STOP DETAILS STAGGERED BY 1/4 INCH (0.25) TO MATCH OFFSET BUILDUP OF LAMINATED STRAP ASSEMBLIES.
3. USE SEALANT (C89) AT JOINTS SHOWN.AT LEAST TWO THREADS MUST SHOW THROUGH NUT AFTER TORQUING.

12-217-1E

Figure 5-5. Hub Assembly Cross Section (sheet 1 of 2)

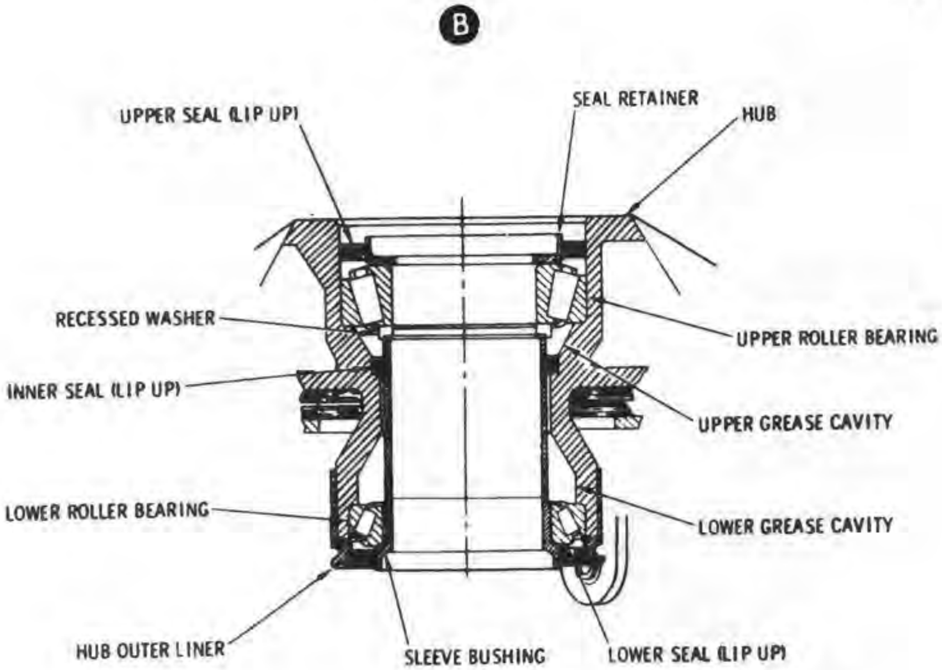


Figure 5-5. Hub Assembly Cross Section. (sheet 2 of 2)

that cannot be repaired as described in paragraph 5-10, requires that the main rotor hub be sent to overhaul.

k. Every 150 hours or six months whichever occurs first, inspect the main rotor retention straps (fig. 5-6) as follows:

(1) Check for breaks in the strap pack laminations at the inboard ends of the pitch housing where the straps are accessible to view. Check both the lead and lag legs of the straps at these locations.

CAUTION

Do not pry at the strap pack with a sharp or hard-edged tool. If edges become nicked the rotor hub assembly must be sent to overhaul.

(2) If no obvious strap failure is noted, use a blunt-nosed wooden or phenolic pin (pencil size with 0.06-inch-radius point) to probe at the upper and lower strap laminations at the inboard end of the blade pitch housings. A failed strap, either in the lead or lag leg of the pack, will move away from the other straps. If the upper and lower straps laminations remain in tension when probed, no failure has occurred.

(3) If a two strap failure is noted during inspection, rotor operations can still be continued. However, a special inspection shall be performed again in 25 hours or 30 days, whichever occurs first, and recorded on appropriate forms. When three straps to any one blade are broken (at one side of the rotor hub) the rotor hub assembly must be sent to overhaul.

NOTE

Ends of permissible broken straps must be taped according to paragraph 5-17 to prevent scratching of adjacent straps.

l. Visually inspect the outboard ends of the main rotor retention straps for gaps between the pack laminations (fig. 5-6).

(1) A single straight lamination gap **NOT IN EXCESS OF 0.030-INCH** is permissible within the pack or next to either the upper or lower outer shoe.

NOTE

On some strap packs the teflon may appear wrinkled or extend past the end of the laminates obstructing the view.

When this condition exists, visual inspection should be made from the leading and trailing edges of the strap pack.

(2) Retention strap packs showing a fanning or bowing of the laminations indicate an improper condition and the hub must be replaced.

5-10. Repair — Main Rotor Hub Pitch Housing Assembly.

CAUTION

During repair on aircraft, use covering over engine air inlet fairing opening to prevent entry of foreign objects into air intake. When reconnecting a pitch control rod, be sure that the rod ends are centered in the swashplate and housing arm clevis lugs. Realign, if necessary, and hold rod to prevent turning while tightening locknuts.

a. Use grade 320 abrasive cloth (C24) to polish smooth all scratches, nicks and chafing wear in the pitch housing.

b. After smoothing (removal of all sharp or raised edges), the **REPAIR DEPTH MUST NOT EXCEED 0.010 INCH** in any area of the housing except the inner surfaces of the arm clevis lugs.

c. A maximum (repaired) depth of 0.050 inch is acceptable in the clevis lug with the sleeve bushing. On the opposite (counterbored) lug, a maximum (repaired) depth of 0.010 inch is permissible in the area of the counterbore, and a maximum of 0.050 inch in the area outside the counterbore.

d. Touch up all repaired areas with chemical film (C21), followed by primer (C79).

e. Remove main rotor hub assembly for overhaul if repair limits are exceeded.

5-11. Repair — Main Rotor Hub Pitch Housing Attaching Parts (AVIM). Repair pitch housing attaching parts according to paragraphs 5-12 through 5-18.

5-12. Replacement — Pitch Control Bearing Housing Assembly, Spacer or Striker Strip (AVIM). (See fig. 5-7.)

CAUTION

Use care during removal of parts from around the strap pack. Any nicks or scratches on the straps require scrapping of the strap pack. Do NOT remove lead-lag hinge bolt to remove pitch control bearing housing assembly.

a. Support blade and pitch housing from beneath. Remove three nuts, six washers, and three bolts that secure bearing housing.

NOTE

Check if washers are installed between the spacer and striker strip. These washers must be reinstalled to establish correct static droop angle between the pitch housing and hub.

b. Carefully remove spacer by sliding it downward past striker strip. Retain exact number of droop shim washers, if installed.

c. Slide bearing housing assembly off pivot pin.

d. Inspect pivot pin for serviceability (para 5-14). Unserviceable pivot pins on 369A1200-617 main rotor hubs may be replaced as follows.

(1) Replace pivot pin using pitch housing stud wrench (T14).

(2) **TORQUE PIN TO 200-220 INCH-POUNDS** with vertical edges of pin flange positioned parallel to vertical lug edges.

e. Remove and discard pitch bearing if defective (para 5-13). **TOTAL RADIAL LOOSENESS OF ASSEMBLED BALL AND PIN MUST NOT EXCEED 0.010 INCH. MINIMUM ALLOWABLE PIN DIAMETER IS 0.433 INCH.**

f. Replace a flanged one-piece or two-piece striker strip if it is cracked or the flapping stop contact areas are worn through the hard anodized surface. One-piece striker strips without flanges for fairing attachment are not replaceable except at overhaul.

g. Position pitch control bearing housing on pivot pin.

CAUTION

If droop shim washers were removed from between the spacer and striker strip the exact thickness removed must be reinstalled. There must be an

A
ACCEPTABLE

A IF A CRACK IS LOCATED IN ONE STRAP (LAMINATE) ON EITHER THE LEAD OR LAG LEG OF A STRAP PACK, THE COMPLETE LAMINATE HAS NOT FAILED AND THE BREAK IN THE LEG IS ACCEPTABLE.

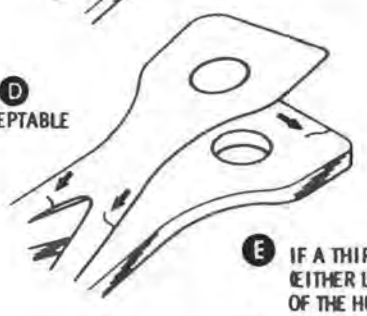
B
ACCEPTABLE

B IF ANY CRACK IS LOCATED ON THE SAME LAMINATE ON BOTH THE LEAD AND THE LAG LEGS OF ANY ONE SIDE (BRANCH) OF THE ROTOR HUB, THAT LAMINATE HAS FAILED; BUT THE FAILURE IS ACCEPTABLE.

C
ACCEPTABLE

C IF ANY CRACK IS LOCATED BEYOND THE JOINT OF THE STRAP PACK LEGS, THAT LAMINATE HAS FAILED; BUT THE FAILURE IS ACCEPTABLE.

D
ACCEPTABLE



D ANY TWO LAMINATES FAILED AS DESCRIBED IN B AND/OR C ARE ALLOWED ON EACH SIDE OF THE ROTOR HUB (TOTAL OF EIGHT PER HUB ASSEMBLY).

E IF A THIRD LAMINATE CRACKS IN THE SAME PACK (EITHER LEAD OR LAG LEG OF JOINT) AT ANY ONE SIDE OF THE HUB, THE STRAP PACK MUST BE REPLACED.

E
UNACCEPTABLE

E
UNACCEPTABLE

NOTES:

1. ANY CRACK IN A STRAP (LAMINATE) IS CONSIDERED AS A BREAK. THE LAMINATION HAS NOT FAILED UNLESS BOTH LAMINATION LEGS ON ONE SIDE OF THE ROTOR HUB ARE BROKEN OR THE CRACK (BREAK) IS LOCATED ABOVE THE POINT WHERE THE LEGS JOIN.
2. LAMINATIONS SHOWN SEPARATED ONLY TO DEPICT POSSIBLE CRACK LOCATIONS. SEE TEXT FOR INSPECTION METHODS (VISIBLE LOCATIONS ONLY).

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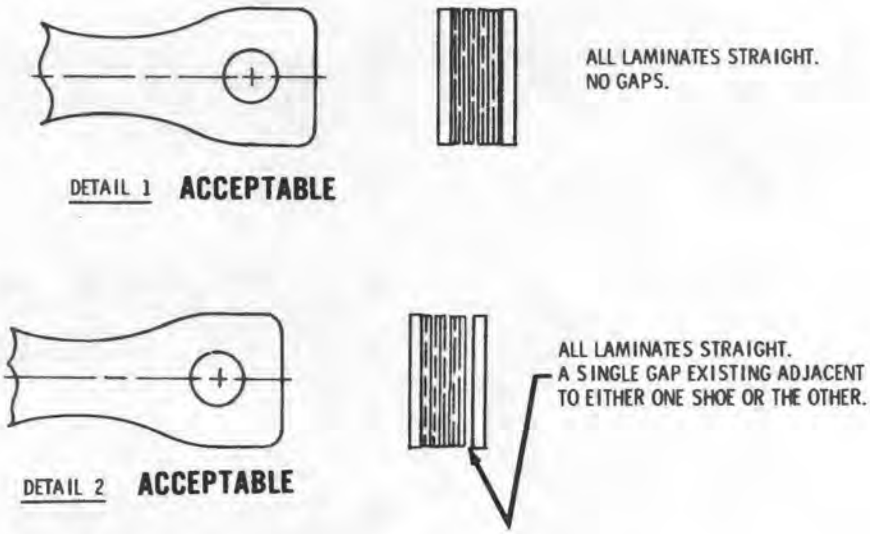
Figure 5-6. Strap Pack Lamination Inspection. (sheet 1 of 2)



NOTE:
ON SOME STRAP PACKS THE WHITE TEFLON MAY APPEAR WRINKLED AND EXTEND PAST THE END OF THE LAMINATES PREVENTING A CLEAR VIEW OF THE LAMINATES. WHEN THIS OCCURS, LOOK ALONG EITHER SIDE IN THE AREA A-A OR B-B SHOWN IN DETAIL 3.

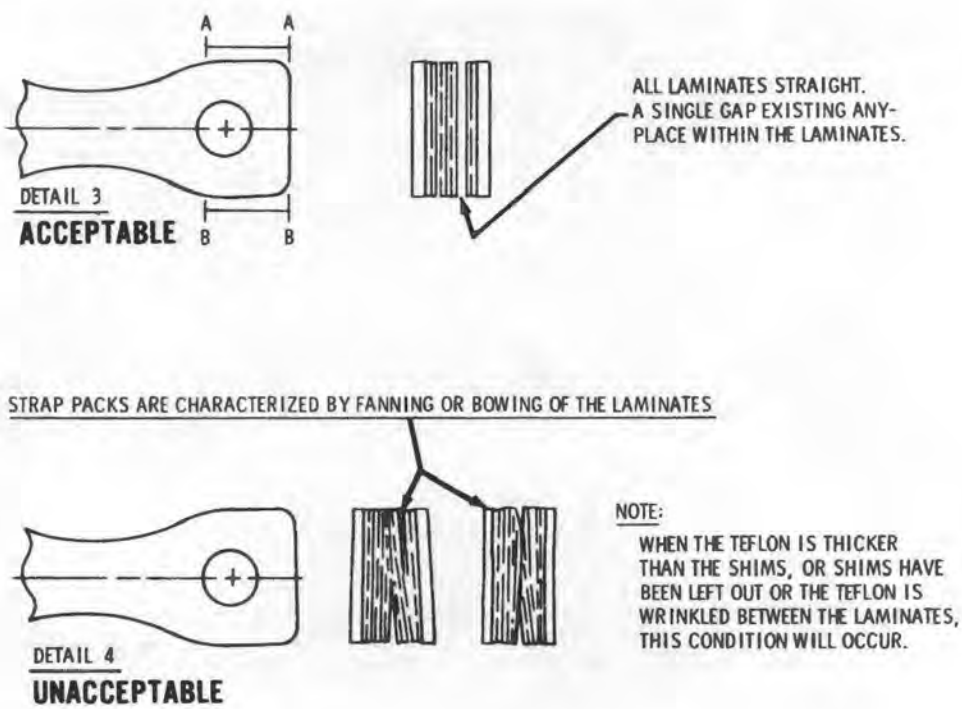
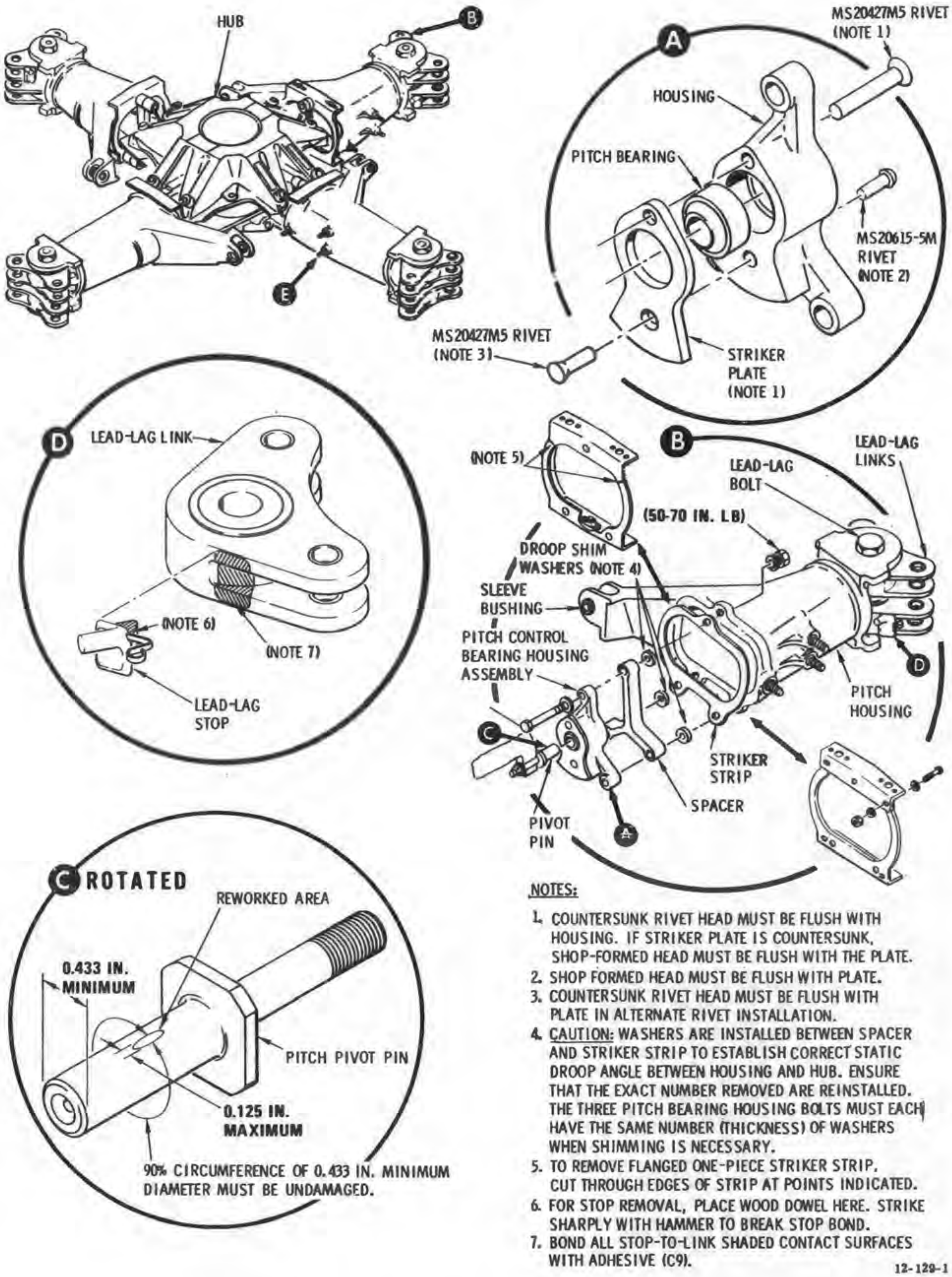


Figure 5-6. Strap Pack Lamination Inspection. (sheet 2 of 2)



NOTES:

1. COUNTERSUNK RIVET HEAD MUST BE FLUSH WITH HOUSING. IF STRIKER PLATE IS COUNTERSUNK, SHOP-FORMED HEAD MUST BE FLUSH WITH THE PLATE.
2. SHOP FORMED HEAD MUST BE FLUSH WITH PLATE.
3. COUNTERSUNK RIVET HEAD MUST BE FLUSH WITH PLATE IN ALTERNATE RIVET INSTALLATION.
4. CAUTION: WASHERS ARE INSTALLED BETWEEN SPACER AND STRIKER STRIP TO ESTABLISH CORRECT STATIC DROOP ANGLE BETWEEN HOUSING AND HUB. ENSURE THAT THE EXACT NUMBER REMOVED ARE REINSTALLED. THE THREE PITCH BEARING HOUSING BOLTS MUST EACH HAVE THE SAME NUMBER (THICKNESS) OF WASHERS WHEN SHIMMING IS NECESSARY.
5. TO REMOVE FLANGED ONE-PIECE STRIKER STRIP, CUT THROUGH EDGES OF STRIP AT POINTS INDICATED.
6. FOR STOP REMOVAL, PLACE WOOD DOWEL HERE. STRIKE SHARPLY WITH HAMMER TO BREAK STOP BOND.
7. BOND ALL STOP-TO-LINK SHADED CONTACT SURFACES WITH ADHESIVE (C9).

12-129-1

Figure 5-7. Main Rotor Hub Component Repair. (sheet 1 of 2)

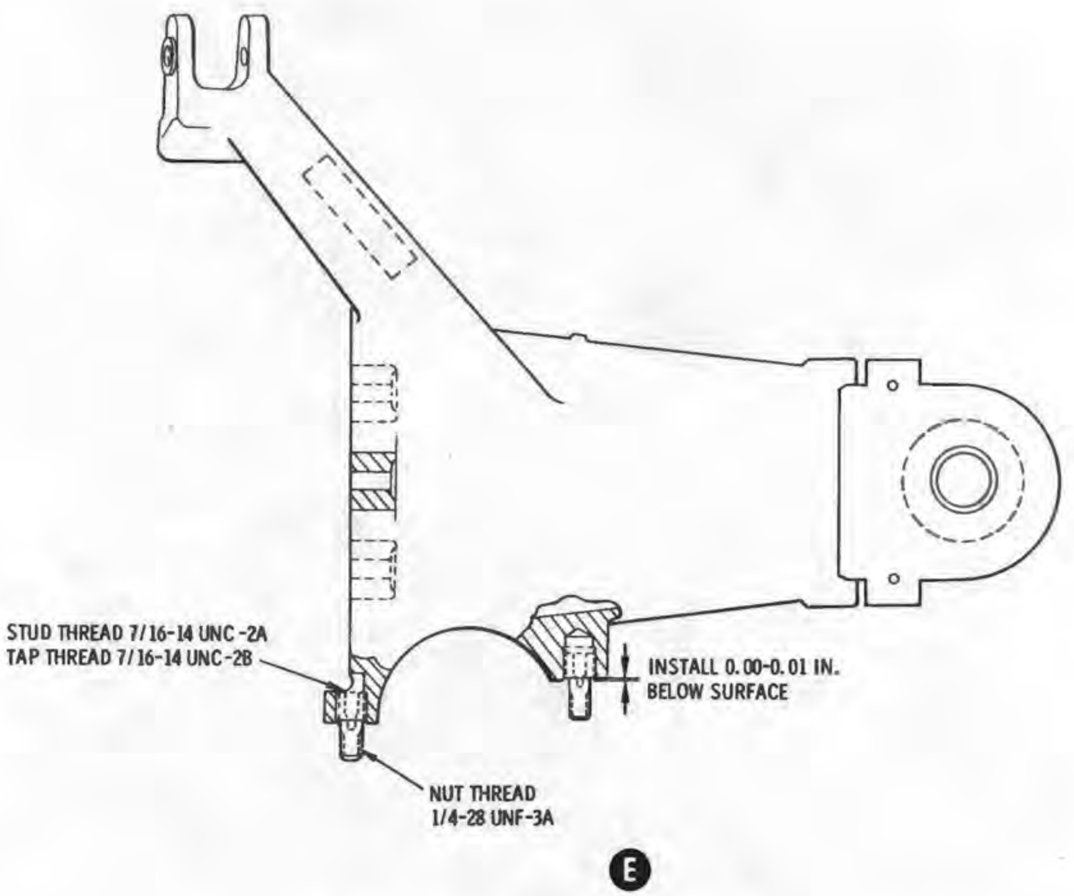


Figure 5-7. Main Rotor Hub Component Repair. (sheet 2 of 2)

equal number (thickness) of washers on each of the three bolts. These washers establish the correct static droop between the pitch housing and the hub.

h. Slide spacer into position between bearing housing assembly and striker strip on pitch housing. Install exact thickness of droop shim washers removed at time of disassembly. Align holes for the three bolts.

i. Install three bolts, six washers, and three nuts. **TORQUE NUTS TO 50-70 INCH-POUNDS.**

j. Seal all the parting lines (joints) of the assembly with a bead of sealing compound (C89).

5-13. Replacement — Pitch Control Bearing (AVIM). (See fig. 5-7.) *a.* Drill out rivets to remove striker plate. **DISCARD STRIKER PLATE IF BRINELLING OR PITTING EXCEEDS 0.030-INCH DEPTH.**

b. Press bearing from housing bore. Clean any primer residue from housing bore with methyl ethyl ketone (C69).

c. Rework minor surface abrasion in housing bore by polishing with crocus cloth (C24). Restore chemical film (C20), where removed.

d. Apply one thin coat of primer (C79) to the bearing OD and the housing bore. Press bearing into bore while primer is still wet. Wipe away any excess primer, using care to keep it out of the bearing races. Check teflon linings of bearing after installation to determine that no damage has occurred from the pressing operation.

NOTE

The outside edge of bearing outer race must be at least flush with the face of the bearing housing. However, the bearing can be recessed up to 0.015 inch.

e. Install striker plate with one MS20427M5 rivet (upper hole) and one MS20615-5M rivet (lower hole). If upper hole of striker plate is countersunk, rivet must be installed with shop-formed head flush with the plate. The shop-formed head of the MS20615-5M rivet must be flush with the plate. An MS20427M5 rivet may be used as an alternate for the MS20615-5M rivet. When the alternate is used, install the rivet from the plate side of the assembly. The heads of all countersunk rivets must be completely flush.

5-14. Repair — Pitch Bearing Pivot Pin (Stud) (AVIM). (See detail C, fig. 5-7.) Pitch bearing pivot pins should be inspected for indications of wear or grooving. Wear or grooving must be cleaned up as specified below before measurement is made to determine hub serviceability.

a. Use a fine India stone or equivalent to clean up all wear spots. Blend smoothly into surrounding area and restore finish to equal the original.

b. If 90 percent of the pin minimum diameter (0.433) is good after rework the pin is serviceable within the following limits. (See detail C, fig. 5-7.)

(1) The reworked area may extend the length of the pin but **MUST NOT EXCEED 0.125 INCH IN WIDTH.**

(2) Several places may be reworked along the diameter of the pin provided the **WIDTH OF THE REWORKED AREAS DOES NOT TOTAL MORE THAN 0.125 INCH.**

(3) **TOTAL RADIAL LOOSENESS** of assembled pitch control bearing and pivot pin **MUST NOT EXCEED 0.010 INCH.**

c. If pivot pin does not meet the above serviceability standards, proceed as follows.

(1) On 369A1200-617 main rotor hub assemblies, replace the pivot pin (para 5-12).

(2) On all other main rotor hub assemblies, replace the hub.

5-15. Replacement — Lead-Lag Link Blade Stop (AVIM). (See fig. 5-7.) Replace a blade stop if it is broken, cracked, or has a broken spring.

CAUTION

The lead-lag link assembly must not be removed from the pitch control housing for this repair. The hinge bolt cannot be retorqued without a special adapter.

a. Provide a backup support for the link assembly. Use a 1/2-inch wood dowel and a hammer to drive stop from link. Strike the dowel sharply to break the adhesive bond.

b. Using a sharp-edged metal scraper, carefully scrape any adhesive residue from the link. If scraper penetrates through the paint and chemical surface film, the surface must be refinished. **THE DEPTH OF GOUGES OR NICKS IS LIMITED TO 0.010 INCH MAXIMUM AFTER REWORK.** Rework by smooth blending into the surrounding area with grade 320 abrasive cloth (C24). Final polish with crocus cloth (C25). Restore chemical film protection (C20).

c. Clean the bond area of all contact surfaces by wiping with phosphoric acid (C74). Flush-wipe the cleaned surface four times with a mixture of equal parts of distilled water and isopropyl alcohol (C82) to remove all traces of the phosphoric acid. Rinse the cleaned surface with tap water, followed by a rinse of distilled water until the surface is "waterbreak" free. Dry for 30 minutes minimum at 150°F.

d. Check the fit of the stop in the link. The flange and radius contact surfaces of the **STOP MUST MATE WITH THE LINK WITHIN 0.010 INCH. MAXIMUM CLEARANCE BETWEEN THE STOP AND INSIDE SURFACES OF THE LINK EARS IS LIMITED TO 0.020 INCH.** This tolerance applies to either side of the stop.

e. Prepare a mixture of epoxy adhesive (C9). Apply a uniform coating of the mixed adhesive to all contact surfaces. Hand-press the stop into place between link ears until all mating surfaces are in firm contact. Apply a suitable clamping device so that contact is maintained. Cure for a minimum of 8 hours at room temperature.

5-16. Corrosion Control — Main Rotor Hub Lead Lag Bolt. (See fig. 5-5.)

CAUTION

Do not disturb the torque on the lead-lag bolts. A special adapter is needed to retorque the lead-lag bolts.

a. Remove and tag or color-code each set of balance hardware that is installed.

b. Remove corrosion with grade 180 abrasive paper (C1) and finish with grade 400 abrasive cloth (C24).

c. Swab cleaned surface with methyl ethyl ketone (C69) and apply unthinned chromate primer (C79).

d. Reinstall balance hardware that was removed.

5-17. Repair — Taping Broken Retention Strap Ends.

CAUTION

Be careful not to bend broken ends excessively or scratch adjacent straps.

a. Carefully wipe ends of broken strap with a clean, soft cloth moistened with solvent (C94).

b. Use a mild blast of filtered air to dislodge any foreign particles between broken strap ends and adjacent strap.

c. Carefully tape broken ends of strap with tape (C100).

5-18. Replacement — Main Rotor Hub Damper Attaching Studs. (See fig. 5-7, sh 2.) *a.* Prior to removing a stud, cut off the nut end of the stud at a point approximately 0.06-inch from the housing boss. There is an internal pilot hole for the removal drill.

b. Use a 11/32-inch (0.344 in.) drill and drill to a depth of 0.19-inch to remove stud kees. Break off kees by deflecting them inward. Unscrew remainder of stud with an easy-out type tool.

c. Correct any minor thread imperfections in the parent metal. Use a 7/16-14 UNC-2B bottoming tap for studs.

d. Apply a coating of primer (C79) to the stud end. Turn into the threaded bore by hand or by using applicable insertion tool. Check that the stud stops at the correct depth of 0.00 - 0.01 inch below the boss surface. (See fig. 5-7, sh. 2.)

NOTE

Before driving in the kees of a stud, check its parallelism with the other studs to reveal any possible interference with the damper housing mounting holes. A spare damper housing or assembly will serve as suitable checking device.

e. Check that the stud kee position is rotated approximately 1/8 turn from the original kee grooves. Use an applicable installation tool and drive in the kees until 0.01 - 0.03-inch below the boss surface. (An old damper housing may be used to press stud kees most of the way in to ensure stud to damper hole alignment. If this method is used, tighten down evenly on all three studs.)

5-19. Inspection — Main Rotor Hub Roller Bearing. (See figure 5-5.) *a.* Remove seal retainer from recess in top of hub.

b. Remove upper seal with a standard seal puller, or by carefully prying with a flatbladed tool. Discard seal.

c. Remove upper roller bearing cone by hand.

d. Remove recessed washer from top of sleeve bushing.

CAUTION

Do not interchange or replace recessed washer. The original washer MUST be reinstalled to obtain correct bearing preload. The recessed washer is custom fitted to each hub during overhaul.

e. Use light pressure and push sleeve bushing from the hub. As the bushing is pressed out the lower roller bearing cone will force the lower seal from the bottom of the hub bore. Discard seal.

f. Carefully remove the inner seal by grasping seal lip with longnose pliers and pulling the seal from hub bore. Discard seal.

NOTE

To prevent damage, make sure that the main rotor hub laminated strap assemblies and pitch bearings (fig. 5-5) are protected from solvent used in the following step.

g. Using solvent (C94) and a soft bristle brush, clean bearings, sleeve-bushing and main rotor hub bore and allow to air dry. Immediately apply a light coat of lubricant (C61) to roller bearing cups and cones.

h. Inspect, without further disassembly, the rolling surface of upper and lower roller bearing cups and cones for flat spots, scoring, pitting, grooving, roughness, and heat discoloration. No defects are allowed.

i. Install new center seal into center of hub by hand pressing into place. Check that the seal lip is up as shown in figure 5-5, sheet 2.

j. With the aid of an assistant, turn the hub assembly upside down on the bench.

k. Hand pack the lower cavity of the hub with grease (C47). Pack the lower roller bearing with grease and install the sleeve bushing with cone in hub bore. Fill remaining cavity up to level of seal with the same grease.

l. Position lower seal with lip towards hub center as shown in figure 5-5, sheet 2. Press in or tap lightly until seal is seated. Wipe away any excess grease.

m. With the aid of an assistant, turn the hub assembly right side up on the bench.

n. Hand pack upper cavity of the hub with grease (C47).

CAUTION

Do not interchange or replace recessed washer. The original washer must be reinstalled to obtain correct bearing preload.

o. Place original recessed washer on top of sleeve bushing with recess down as shown in figure 5-5, sheet 2.

p. Hand pack upper bearing cup and cone with grease (C47) and install cone in cup. Fill remaining cavity up to level of upper seal with the same grease.

NOTE

Do not reinstall upper seal and retainer at this time. Protect hub bore from contamination and retain new upper seal and retainer for reinstallation after seating main rotor hub on mast (para 5-23).

5-20. Repair-Main Rotor Hub Droop Stop Restrainer and Roller Repair. Replace a defective droop stop roller (fig. 5-8). If **CLEARANCE** between roller bearing liner and shaft **IS MORE THAN 0.015 INCH,** replace the worn part. **ROLLER SHAFT OD MUST NOT BE LESS THAN 0.437 INCH.** A defective follower or spring is replaceable (par 5-22A) after removal of the droop stop ring (para 5-22).

a. Remove pitch control bearing housing assembly that contacts the lower shoe roller to be removed (para 5-12).

NOTE

Only one roller of each opposing pair of droop stop rollers can be removed at one time. One droop restrainer must be pressed against the droop stop ring to force the opposite restrainer out and expose the roller shaft for removal. The same condition pertains during installation.

b. Press down on pitch housing that is opposite to the roller to be removed. Remove cotter pin and shaft.

c. Remove droop stop roller.

d. To install replacement roller, press down on pitch housing at the opposite side of the hub from the roller to be installed. Install roller, shaft, and new cotter pin.

e. Reinstall pitch control bearing housing assembly (para 5-12).

5-21. Repair — Main Rotor Hub Droop Stop Ring. *a.* The repair depth limit for corrosion nicks or scratches in the droop stop ring is **0.007 INCH FOR ALL SURFACES EXCEPT THE EDGES OF THE RING OD.** The depth limit for the **RING OD EDGES IS 0.030 INCH.** (See detail C, fig. 5-8.) All reworked areas must be blended smoothly with a 15 to 1 ratio into the surrounding area.

b. Touch up repaired areas of cadmium-plated rings, except the channel, with chemical film (C20), followed by primer (C79). Repairs in the channel of cadmium plated rings and in all areas of stainless steel rings should be sprayed with dry film lubricant (C65) only.

c. If the repair limits for the droop stop ring have been been exceeded, the ring may be replaced according to paragraph 5-22.

5-22. Replacement — Main Rotor Hub Droop Stop Ring. *a.* Turn the hub upside down (fig. 5-8). Support the hub so that the pitch housing will unload the cam followers and provide maximum clearance between the striker plates and droop stop rollers.

b. Release the retaining (snap) ring of each droop stop restrainer from its groove. Move the retaining ring flush against the T-head to provide additional clearance and reduce the spring tension.

c. Remove the four droop stop rollers (para 5-20).

d. Starting from either scissors crank attach lug, number the four droop restrainers in a clockwise direction for identification during the replacement procedure (fig. 5-8). This number code should be placed on the outboard (roller) upper end of follower. Guard against accidental removal of the codes during the remaining steps.

NOTE

Designation of upper and lower droop restrainer followers is in relation to the hub as it sits, not as it is installed on the aircraft. Notice that the odd numbered (1 and 3) followers are in the upper position and the even numbered (2 and 4) followers are in the lower position.

e. Push the droop stop ring toward the number 1 and 2 followers. Pull the number 3 and 4 follower T-heads from the droop stop ring channel. When the T-heads are free of the ring channel they should be turned perpendicular (vertical to the channel.)

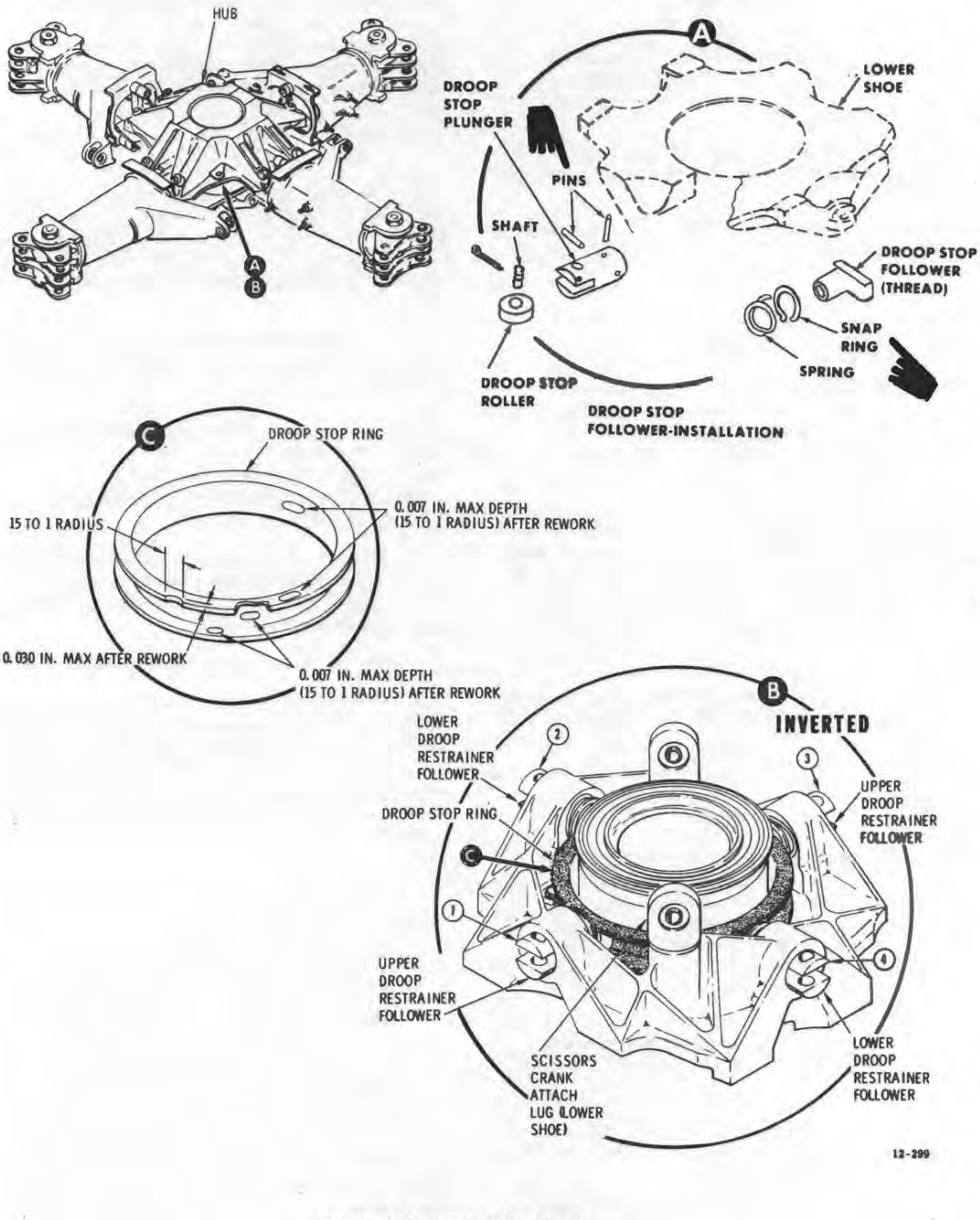


Figure 5-8. Droop Stop Repair.

NOTE

The followers can be easily rotated by the use of a non-metallic drift in the hole for the droop stop roller shaft.

f. Tilt the ring up on the number 3 and 4 followers as far as possible.

g. While pulling upward on the ring, turn the number 4 follower to rotate the T-head under the ring.

h. Continue pulling upward to the ring and turn the number 3 follower to rotate the T-head under the ring.

i. Withdraw the number 1 and 2 T-heads from the ring channel.

j. Remove the ring from the hub assembly.

k. Prepare for installation of a serviceable droop stop ring by orientating the number 4 follower for incorrect (upper) position. Orient the number 1 and 3 followers for correct (upper) position. Orient the number 2 follower for correct (lower) position.

l. Pull the number 1 and 2 followers outboard and engage the number 1 and 2 T-heads in the new droop stop ring channel.

m. Rotate the number 3 follower in the direction that has the greatest amount of clearance between the T-head and ring. Continue the rotation of the number 3 follower until the T-head is in the incorrect (lower) position and engages the ring channel.

n. Rotate the number 4 follower 180° which will position the T-head in the correct (lower) position and engage the ring channel.

o. Pull the number 3 follower outboard to disengage the T-head from the ring channel. Rotate the number 3 follower 90° until the T-head is perpendicular (vertical) to the ring channel.

p. Push down on the ring. Rotate the number 3 follower 90° until the T-head is in the correct (upper) position and engages the ring channel.

q. Check the number 1 and 3 followers for correct (upper) orientation. Check the number 2 and 4 followers for correct (lower) orientation. Check the droop stop ring for correct (level) installation.

r. Compress the droop restrainer spring and install the retaining (snap) ring in its groove on each follower.

s. Reinstall the droop stop rollers (para 5-20).

Table 5-3. Premaintenance Requirements for Installation of Main Rotor Head.

Conditions	Requirements
Special Tools	(T26 or T35) (T24) (T15) (T25)
Support Equipment	Hoist
Minimum Personnel Required	Two
Consumable Materials	(C31) (C60) (C47) (C58)

5-22A. Replacement Main Rotor Hub Droop Stop Follower (T-head) (see fig. 5-8). *a.* With main rotor hub inverted on work bench, remove main rotor hub droop stop ring (para 5-22a through j).

b. Apply inboard hand pressure to the droop stop assembly and drive out roll pins (2ea 90° apart) that hold the follower to the plunger (see fig. 5-8).

c. Separate plunger from follower by installing a non-metallic drift into the droop stop plunger where roller was installed and rotate the follower with a 5/8 inch open and wrench.

d. Spread and remove snap ring from groove then remove follower and spring from hub by sliding follower inboard.

e. Remove plunger by sliding outboard.

f. With plunger still removed from hub, install new follower into plunger. T-head must be at right angles from the roller shaft of plunger. Drill two 0.156-0.158 inch diameter holes through new follower in line with holes in plunger. Remove follower from plunger.

CAUTION

Ensure that roller pins are installed using zinc chromate primer. Care should be taken to ensure that the outside diameter of plunger is free of zinc chromate to prevent sticking during operation.

g. Install follower, snap ring and spring into inboard side of hub. Install plunger into inboard side of hub. Ensure T-head is at right angles to roller shaft in plunger. Line up holes and install roller pins.

h. Stake ends of pins (4 places). No burrs or roughness is permissable on outer diameter of plunger after staking.

i. Install spring and return snap ring into groove.

j. Complete droop stop ring installation (para 5-22).

5-23. Installation - Main Rotor Hub.

CAUTION

The main rotor hub is a highly stressed component. Use extreme care to prevent it from striking any object. Any impact damage may require replacement of the main rotor hub.

a. Temporarily install lifting bracket (on aircraft so equipped) or eyebolts and lifting adapter (T15) on main rotor hub, taking care to tighten the bolts evenly and only finger tight.

b. Attach a suitable overhead hoist to the lifting bracket eye or lifting adapter eye.

c. Check that rotor mast is clean. Hoist main rotor hub and position it over the mast; then lower the hub onto mast.

NOTE

If the upper seal and seal retainer has been installed and if the hub seats itself on the mast far enough to expose the upper mast threads, accomplish step f below and then proceed directly to step k. If the hub does not seat itself on the mast, proceed as directed in steps d through j.

d. Hoist the main rotor hub off the mast and remove the seal retainer and the upper seal (fig. 5-5, sh 2). Discard the removed seal; removal causes permanent seal damage.

e. Lower hub onto mast.

f. Remove hub lifting adapter, hoist and eyebolts from hub.

g. Seat main rotor hub on mast by using main rotor hub driver (T25).

h. Using Mobile 28 grease (C63A) only, hand pack the exposed surface of the upper roller bearing cone (fig. 5-5, sh 2) to the level of the bore step against which the upper seal will be installed.

CAUTION

During the following step, make certain that seal lip faces upward.

i. Place a new upper seal (fig. 5-5, sh 2) inside the hub bore and seat it against the bore step by carefully and evenly tapping around the seal outside edge with a plastic mallet. Take care not to damage seal lip or deform seal case.

j. Install seal retainer (fig. 5-5, sh 2) inside seal and against bearing. Make sure that the flat side of the retainer faces downward (against bearing cone).

CAUTION

Do not apply excessive lubricant in k below. Excess can transfer down the mast to the swashplate and cause swashplate spherical bearing lining to be damaged.

k. Apply a light coat of lubricant (C60), to exposed threads on mast.

NOTE

Be sure that seal is properly positioned against retainer and that retainer does not pinch seal. Check by inserting a loop of 0.042-inch-diameter lockwire (C58), round feeler gage, or other suitable tool without sharp edges, between seal lip and retainer.

l. Install locknut, using wrench (T35) and **TORQUE NUT TO 200 FOOT-POUNDS.** Apply a coat of corrosion preventive compound (C31) to the screw holes in the mast nut.

m. Place retainer on nut and check retainer-to-locknut screw hole alignment. **INCREASE LOCKNUT TORQUE TO NOT MORE THAN 250 FOOT-POUNDS** to align screw holes in retainer and locknut.

NOTE

If holes in retainer and locknut cannot be aligned in the 200 to 250 foot-pound torque range, remove retainer and locknut and invert locknut.

n. Secure retainer to locknut with two screws; secure screws to retainer (fig. 5-3) with 0.032-inch lockwire (C57).

CAUTION

Ensure that no washers are used under screwheads and screwheads are free of burrs.

o. Place a straightedge across hub upper surface. **CHECK THAT SCREWHEADS DO NOT PROJECT MORE THAN 0.050 INCH ABOVE HUB UPPER SURFACE (FIG. 5-3).** This will provide adequate clearance between screwheads and drive shaft flange underside.

p. Install four pitch change rods to pitch housings (para 11-15).

NOTE

Be sure pitch change rods are reinstalled in the same positions from which removed.

CAUTION

Scissors crank must be positioned as shown in figure 5-2 with hole in crank web down and decal, if present, up.

q. Connect scissors assembly to main rotor hub (para 11-17).

r. Connect flexible boot to lower end of rotor hub liner.

s. Install main rotor drive shaft (para 6-10).

t. Install four main rotor blades (para 5-72).

u. Perform main rotor blade droop angle inspection (para 5-24) if rotor hub is new or a replacement.

Table 5-4. Premaintenance Requirements for Droop Angle Inspection.

Conditions	Requirements
Special Tools	(T19) (T20) (T21)
Support Equipment	Propeller Protractor
	Maintenance Stand

5-24. Inspection — Main Rotor Hub Droop Angle. Inspect droop angle of all four blades whenever a new or replacement main rotor hub has been installed or whenever excessive droop is suspected. **DROOP ANGLE OF ALL FOUR BLADES MUST BE BETWEEN 5 AND 6 DEGREES.** Inspect as follows:

a. Install cyclic lateral rigging fixture (T20), cyclic longitudinal rigging fixture (T21), and collective rigging fixture (T19), according to chapter 11.

b. Remove three of the blades (para 5-54). Position main rotor so that blade to be inspected is over the tailboom.

c. Place a propeller protractor on the top center of the main rotor drive shaft. Adjust protractor to the zero setting.

d. Place the protractor on the machined surface of the outboard end of the aft blade pitch housing, alongside the lead-lag bolt head. Measure and record the static droop angle.

NOTE

When checking main rotor blade droop angle, only the blade being checked should be installed. The others must be removed per blade removal instructions described in paragraph 5-54.

e. Repeat *a* through *d* above for the remaining blade positions.

f. **THE MAXIMUM ALLOWABLE STATIC DROOP ANGLE IS 6 DEGREES.** If the measured droop angle exceeds 6 degrees, inspect the striker plate and roller for excessive wear (para 5-20) and adjust the droop angle (para 5-25).

5-25. Adjustment — Main Rotor Hub Static Droop Angle. Whenever a new or replacement main rotor hub is installed, inspect and measure the static droop angle of all four rotor blades (para 5-24). **IF STATIC DROOP ANGLE EXCEEDS 6 DEGREES OR IS LESS THAN 5 DEGREES, ADJUST AS FOLLOWS:**

a. Remove main rotor blades (para 5-54).

b. (See fig. 5-7.) Use AN960C416, C416L, PD416 or PD416L flat washers to adjust the spacing between spacer and striker strip. Any one type, or combination, of the washers specified may be used; however, an identical washer selection (thickness) must be installed on each of the three bolts that secure the pitch control bearing assembly to the pitch housing.

c. Remove nuts and washers and separate spacer from striker strip. The use of one thick (0.016-inch) washer will raise the static droop angle approximately one-half a degree. Add sufficient washers to adjust droop angle to within the range of 5 to 6 degrees. Reinstall nuts and washers.

d. If more than 0.063-inch spacing is required, inspect striker plate and droop stop roller for excessive wear. Replace as required (para 5-20 and 5-22).

e. Repeat the inspection for static droop angle (para 5-24) to recheck the droop angle.

f. Reinstall blades. Check track of main rotor blades following installation of removed or replacement parts (para 5-43).

5-26. MAIN ROTOR DAMPER.

5-27. Description — Main Rotor Damper. A main rotor damper is mounted on each pitch housing of the rotor hub assembly (fig. 5-1). The damper is connected to the inboard trailing edge of the associated main rotor blade by a damper arm. Each damper limits blade movement on the lead-lag axis and absorbs lateral vibrations that may occur in the main rotor blade. The damper contains spring-loaded friction plates and associated parts in an oil filled housing. The damper functions as a rotary friction damper with either three or four consecutive separate torque stages through a specific range. A damper torque adjustment bolt retains the components inside the housing and provides the means for torque adjustment. The damper operates as a sealed unit and does not require regular servicing.

5-28. Inspection — Main Rotor Damper. *a.* Inspect each damper arm for cracks according to *b* through *f* below.

b. Remove attach pin from damper link.

c. Have an assistant move rotor blade forward into maximum lead position; then swing damper link outward for clearance.

d. Visually inspect the outboard clevis of damper arm (link), both top and bottom lugs, for any cracks that might extend from the bushing holes toward the edges of the lugs. Use a 5-power magnifying glass (minimum) to determine the presence of any cracks. Removal of paint is not necessary.

e. Repeat *b* through *d* above on remaining damper arms.

f. If cracks are found, replace damper arm with a serviceable arm that has been inspected according to *d* above.

g. When trouble has been experienced with rotor vibration, damper torque must be checked (para 5-29).

h. Reconnect damper arm to rotor blade with attach pin. Lock the pin and check tightness (para 5-73).

i. Inspect each main rotor damper for cracks, breaks, leaks, secure lockwire and secure attachment.

Table 5-5. Premaintenance Requirements for Checking Damper Torque.

Conditions	Requirements
Special Tools	(T29)
Support Equipment	Torque wrench (dial indicating type)
Minimum Personnel Required	Two

5-29. Torque Check — Main Rotor Damper (Installed). *a.* If recessed torque wrench adapter (T29) (fig. 5-2) is to be used disconnect damper arm (link) at blade and rotate link away from pitch housing. (See fig. 5-1 and 5-2.) If unrecessed adapter is to be used disconnect damper arm (link) from damper. Attach adapter to damper.

b. Using a dial indicator type torque wrench, move the arm slowly through the first stage travel. **MINIMUM TORQUE REQUIRED TO MOVE ARM MUST NOT BE LESS THAN 265 INCH-POUNDS. MAXIMUM TORQUE REQUIRED TO MOVE THE ARM MUST NEVER EXCEED 385 INCH-POUNDS.** If torque is outside of limits damper must be adjusted (para 5-38).

c. Reconnect damper arm (link).

5-30. Removal — Main Rotor Damper. (See fig. 5-2.) *a.* Unlock damper arm attaching pin, but do not remove.

CAUTION

While removing the bolt in next step, special care must be taken to hold the blade to prevent it from swinging freely and causing damage to the hub assembly. An assistant should hold the free-swinging blade while the damper is being replaced.

b. Remove cotter pin, nut, washer, and bolt that attaches damper arm to damper.

c. Swing damper arm aside.

d. Remove three nuts and washers that mount damper, and remove damper.

5-31. Disassembly, Inspection, and Repair — Main Rotor Damper. Refer to paragraphs 5-33 through 5-39 for tear-down inspection and permissible damper repairs.

5-32. Installation — Main Rotor Damper. (See fig. 5-2.)

NOTE

For maximum effectiveness, mixing of different part number damper assemblies on installation should be avoided whenever possible. Dampers should be installed so that torques of opposing dampers are within 40 inch-pounds of each other. A spread of more than 40 inch-pounds may cause a lateral vibration.

a. Position main rotor damper on studs of pitch housing.

NOTE

Slight looseness of damper attaching studs is allowable. The maximum displacement of the threaded end (tip) of the stud is limited to 0.001 inch. The large portion of the stud must be below the mounting surface of the pitch housing. Replace damper attaching studs not meeting these requirements.

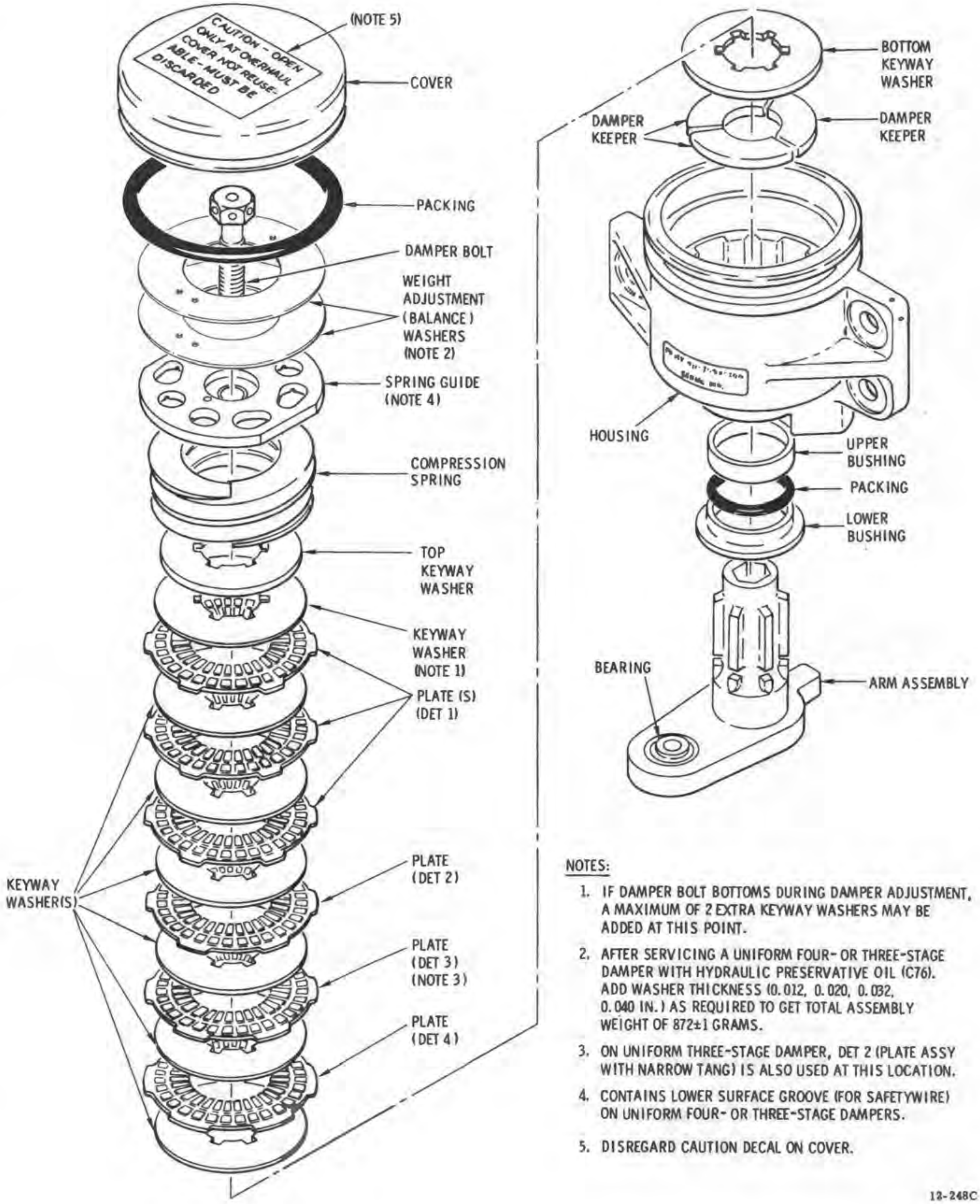
b. Install three washers and nuts. **TORQUE NUTS TO 50-70 INCH-POUNDS.**

c. Inspect for a minimum of 0.002-inch gap between damper and pitch housing. If gap is insufficient, rework pitch housing (para 5-10),

d. Align damper arm with damper; install bolt with head down, washer, and nut. Install washers under bolt head as required to provide additional clearance between bolt end and damper housing. TORQUE NUT TO 30-60 INCH-POUNDS. Install new cotter pin.

e. Install damper arm attach pin and lock in place. (Refer to para 5-73 for correct adjustment of damper arm (blade) attach pins).

5-33. Repair — Main Rotor Damper (AVIM). The following procedures apply to all damper configurations unless otherwise indicated. Data on damper configurations differences are noted in the text and on illustrations.



NOTES:

1. IF DAMPER BOLT BOTTOMS DURING DAMPER ADJUSTMENT, A MAXIMUM OF 2 EXTRA KEYWAY WASHERS MAY BE ADDED AT THIS POINT.
2. AFTER SERVICING A UNIFORM FOUR- OR THREE-STAGE DAMPER WITH HYDRAULIC PRESERVATIVE OIL (C76). ADD WASHER THICKNESS (0.012, 0.020, 0.032, 0.040 IN.) AS REQUIRED TO GET TOTAL ASSEMBLY WEIGHT OF 872±1 GRAMS.
3. ON UNIFORM THREE-STAGE DAMPER, DET 2 (PLATE ASSY WITH NARROW TANG) IS ALSO USED AT THIS LOCATION.
4. CONTAINS LOWER SURFACE GROOVE (FOR SAFETYWIRE) ON UNIFORM FOUR- OR THREE-STAGE DAMPERS.
5. DISREGARD CAUTION DECAL ON COVER.

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Figure 5-9. Rotor Blade Damper Assembly.

NOTE

The following reference names are used to indicate damper differences.

Damper 369A1400 is the "basic four-stage damper." This damper is not weight controlled.

Damper 369A1400-601 is the "uniform four-stage damper." This damper is identical to the 369A1400 damper except that its total weight is adjusted to 872±1 grams for weight uniformity. Weight adjustment is made with balancing washers that are secured to a grooved guide. Damper 369A1400-603 is the "uniform three-stage damper." This damper is weight controlled the same as the -601 but has only three friction stages and uses a special plate assembly retaining bolt.

5-34. Removal For Repair — Main Motor Damper. Refer to paragraph 5-30.

5-35. Disassembly — Main Rotor Damper (AVIM). (See fig. 5-9.) *a.* Cut and remove lockwire securing cover.

CAUTION

Damage to damper housing and distortion of the cover will result if removal is not carefully performed.

b. Using phenolic or hardwood wedge, gently pry cover from damper housing.

c. Drain oil from assembly into suitable container.

d. Remove packing and discard.

e. Cut lockwire from bolt and remove bolt by turning counterclockwise.

NOTE

Weight adjustment washers may be in place on top of the spring guide. It is not necessary to remove these washers to disassemble the damper.

f. Lift guide, spring, and keyway washer from housing.

g. Remove all washers and plates as a unit stack. Code the stack so it can be reassembled in the same buildup sequence after inspection.

h. Slide three damper keepers out of groove in arm assembly; remove keepers.

i. Remove arm assembly and packing from the housing and discard packing.

j. Clean all components, except arm assembly, with solvent (C94). Use a bristle brush as required and wipe dry with a soft lint-free cloth.

5-36. Inspection — Main Rotor Damper (AVIM). *a.* Inspect the spring guide for nicks, scratches and wear. Minor damage may be reworked by polishing with crocus cloth (C25) as long as OD of 2.125 inches is maintained.

b. Inspect compression spring for visible damage.

c. Inspect all keyway washers for nicks, burrs, scratches, corrosion (none allowed) and worn splines. **SPLINE WIDTH SHALL NOT BE MORE THAN 0.221 INCH IF WEAR IS EVIDENT.** Minor nicks, burrs and scratches may be reworked by polishing.

d. Inspect plates for scratches, nicks and voids in clutch facing (none allowed). V-grooves in facings shall not be completely worn away. **SPLINE WIDTH WEAR IS LIMITED TO 0.135 INCH FOR DETAIL 1 (FIG. 5-9), 0.254 INCH FOR DETAIL 2, 0.319 INCH FOR DETAIL 3, AND 0.492 INCH FOR DETAIL 4.** On uniform three-stage dampers, detail 3 has been eliminated and two each of detail 2 has been installed.

e. Inspect the three damper keepers for nicks, burrs, scratches and corrosion (light corrosion may be removed). Minor nicks, burrs and scratches may be reworked by polishing.

f. Inspect arm assembly for burrs, nicks, scratches and corrosion (machined and forged surfaces may have light surface corrosion removed). **SPLINE WIDTH WEAR IS LIMITED TO 0.212 INCH.** Inspect bushing surface area for wear; minimum diameter shall not be less than 0.878 inch after polishing.

g. Inspect the arm assembly bearing for looseness, binding (high rotational drag is normal), and galling or scoring in bore. **BEARING RADIAL PLAY IS LIMITED TO 0.010 INCH MAXIMUM; AXIAL PLAY IS LIMITED TO 0.020 INCH MAXIMUM.**

h. Inspect bushings for nicks, burrs and scratches. **INSIDE DIAMETER WEAR SHALL NOT EXCEED 0.887 INCH (LOWER BUSHING) AND 0.885 INCH (UPPER BUSHING.)**

i. Inspect the housing for cracks, worn or elongated mounting bolt holes (no cracks allowed) and corrosion (light corrosion may be removed). Restore chemical film protection.

j. Inspect the cover for distortion and cracks (none allowed).

NOTE

Any damper that fails to meet the above inspection requirements will be reassembled and returned for overhaul.

5-37. Preliminary Reassembly — Main Rotor Damper (AVIM).

NOTE

Apply a film of oil (C76) to all parts before assembly.

a. Install a new packing into place between upper and lower bushings as shown in figure 5-9.

b. Install arm assembly into the housing.

c. Position the three damper keepers and slide them into place in arm groove. Install bottom keyway washer with recess down to retain keepers.

d. Install the six plates, seven spacing keyway washers and top keyway washer in the same sequence as removed in disassembly.

NOTE

In the stack-up of plates (details 1 through 4, fig. 5-9) the plate with the widest splines is on the bottom with successively narrower splined plates towards the top.

e. Install the compression spring and spring guide. Install bolt; screw in until fit is a loose fingertight.

NOTE

The spring guide is to be installed with its flats perpendicular to the damper shaft arm. Hold the guide in this position while tightening the bolt. Tighten the bolt until the upper surface of the spring guide is flush with the housing.

Table 5-6. Premaintenance Requirements for Damper Adjustment, Phasing, and Reassembly.

Conditions	Requirements
Special Tools	(T7)
Consumable Materials	(C48) or (C76)

5-38. Adjustment and Phasing — Main Rotor Damper (AVIM). *a.* Clamp damper assembly holding fixture (T7) into a bench vise.

b. Loosen socket-head screw (fig. 5-10) that secures arm phasing plate.

c. Bolt damper housing in an upside down position on the fixture.

d. Install large diameter pin of torque adapter into matching hole of damper arm and swing adapter into position to align T-pin holes with hole in arm bearing. Install 0.25-inch diameter T-pin and pin spacer as shown in figure 5-10. Move damper arm to left until it contacts the lag stop of the damper housing. Shift the arm phasing plate so that plate leg "X" just touches the adapter pin with damper arm at lag stop. Tighten socket-head screw.

e. Move damper arm to right until adapter pin contacts phasing plate leg "Y"

f. Install dial indicating torque wrench on torque adapter and check torque required to move through first stage travel by slowly working damper arm from plate leg "Y" stop until second stage is felt. (First-stage travel is approximately 5 degrees for basic four-stage or uniform four-stage and 10 degrees for uniform three-stage damper assembly).

NOTE

As the damper arm is moved, the first-stage travel limit will be felt immediately. This is because twice the amount of torque is required to move into the second stage.

g. While in the first stage travel limits cycle the arm several times; then adjust damper bolt until torque required to move the arm falls within the range of **300-325 INCH-POUNDS**.

NOTE

Before each adjustment of the bolt arm, make sure the adapter pin (fig. 5-10) is at the "Y" leg position on phasing plate. If damper bolt bottoms before correct torque is reached, add an extra keyway washer.

h. After obtaining correct torque, position damper arm so that adapter pin is at the "Y" leg position on phasing plate. The damper is now correctly phased.

i. Remove T-pin, torque adapter and damper assembly from fixture.

5-39. Final Reassembly. — Main Rotor Damper (AVIM). Accomplish final reassembly of damper only after first-stage torque has been adjusted to 300-325 inch-pounds and the damper arm is correctly phased.

a. Secure head of bolt to the spring guide (fig. 5-9) with lockwire. Bend pigtail of lockwire down so that it will clear damper cover when installed.

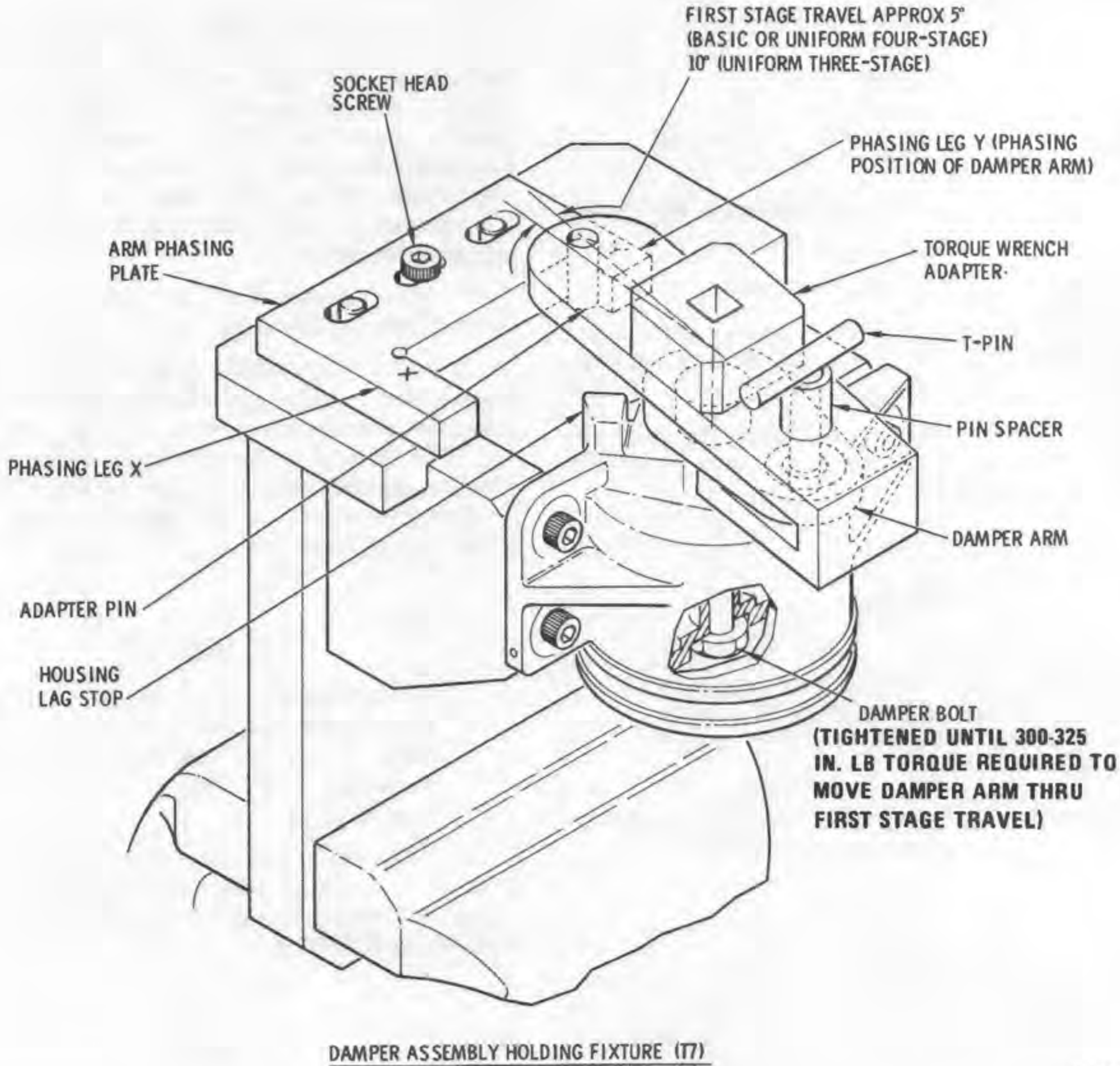


Figure 5-10. Damper Torque and Phasing Adjustment.

b. Apply a thin film of oil preservative (C76) to new cover packing and install in housing packing groove.

c. Service damper assembly with hydraulic preservative oil (C76) or hydraulic oil (C48). Fill housing until oil just covers the top surface of the spring guide.

d. Weight controlled damper assemblies (uniform three- or four-stage dampers only) must be weighed by the following procedure:

(1) Place the damper and cover on a suitable scale.

(2) Add weight adjustment washer thickness (0.012, 0.020, 0.032 or 0.040 inch) as required to bring the weight of the damper to 872±1 grams. Minor weight adjustments may be made by addition or subtraction of damper oil. Removal of oil may not uncover the top of the spring guide.

(3) Install two loops of 0.020-inch lockwire (C56) through the grooves on the underside of the spring guide. Before final balance, lockwire the balance washer(s) in place. Bend twisted pigtails of lockwire down to avoid interference with installed damper cover.

e. Set up damper assembly on a hand-operated arbor press, damper opening up.

NOTE

Lockwire must be installed in cover before pressing cover into place. The packing compresses to block the lockwire hole once the cover is installed.

NOTE

As the damper cover is seated in the following step, air may be trapped in the damper body. Use a feeler gauge or equivalent to gently work under the cap edge to relieve this pressure.

f. Install a piece of 0.020-inch lockwire (C56) through hole in edge of a damper cover. Twist lockwire approximately 5 turns. Locate cover squarely on housing and align lockwire hole in cover with lockwire hole in housing flange. Using an adapter from the arbor press, larger in diameter than the cover, press cover into place. Complete lockwiring of cover to hole in edge of housing mounting flange.

5-40. Installation — Repaired Main Rotor Damper. Refer to paragraph 5-32.

SECTION III MAIN ROTOR BLADES

5-41. MAIN ROTOR BLADES.

5-42. Description — Main Rotor Blades. Each of the four main rotor blades (fig. 5-11) is a balanced airfoil with a wrap-around aluminum alloy skin. The skin is bonded to an extruded aluminum alloy spar. One type blade (369A1100-601) has a bonded metal abrasion strip on the leading edge, the other type (369A1100) does not. Blade types may be intermixed without regard to part number. An upper and lower root fitting provide for blade attachment. A vibration absorber is installed on the blade lower inboard end. Two balance weights are installed in the tip end of each blade. A removable forward outboard tip cap is replaced with a tracking cap when blade tracking is performed. The blade trailing edge tab may be bent up or down. Bending the tab corrects the diving and climbing differences in individual blade during flight.

NOTE

The short inboard blade tab (fig. 5-14) is never used and has been deleted from later production blades. Blades may be interchanged without regard for the presence or absence of the inboard tab.

5-43. General — Main Rotor Blade Tracking. *a.* Tracking of the main rotor blades is accomplished with tracking tip cap reflectors and a strobe light. The tip caps are temporarily attached to the tip of each blade. The high-intensity strobe light flashes in-time with the rotating blades. The strobe light operates from the aircraft electrical power supply. By observing the reflected tip cap image, it is possible to view the track of the rotating blades. Tracking is accomplished in a sequence of four separate steps; ground tracking, hover verification, forward flight tracking and autorotation rpm adjustment.

b. The tracking procedure varies when tower-tracked blades are installed. Tower-tracked blades have been whirled and tracked to master blades. The blade tabs have been adjusted and pitch control rod length has been determined. A tower-tracked blade can be identified by a decal on the underside of the blade. The decal gives the basic length of the blade attaching pitch control rod. The decal shows the basic length for a blade attached to either the upper or lower strap pack span of the hub.

c. Before attempting to track the rotor blades, it is important to read and thoroughly understand the tracking sequence and interrelationship of the various adjustments. A review of the following should prove helpful.

(1) Install the tracking strobe light, blade tip cap reflectors and related equipment according to paragraph 5-44.

(2) Refer to table 5-7 for a condensed summary of the proper sequence for blade tracking.

(3) Ground tracking basically involves track-observation and adjustment at idle rpm and at flight rpm. Track at idle rpm is adjusted by the pitch control rods connecting the rotating swashplate and the blades. Ground track at flat pitch and flight rpm is corrected by blade tab adjustment.

(4) Hover track verification is a check for track variation that might occur between high rpm (flat pitch) ground track check and hovering. NO TRACK ADJUSTMENTS ARE MADE ON THE BASIS OF TRACK OBSERVATIONS DURING HOVERING. However, track variations should be noted and recorded for reference use during the check of track in forward flight.

(5) Forward flight tracking requires track observation during the following airspeeds and maneuvers. Flight track is corrected by making blade tab adjustments ONLY.

(a) Flight at 0 to 100 knots.

(b) Forty-five degree banked turns at 80 to 100 knots.

(c) Flight at 100 to 120 knots.

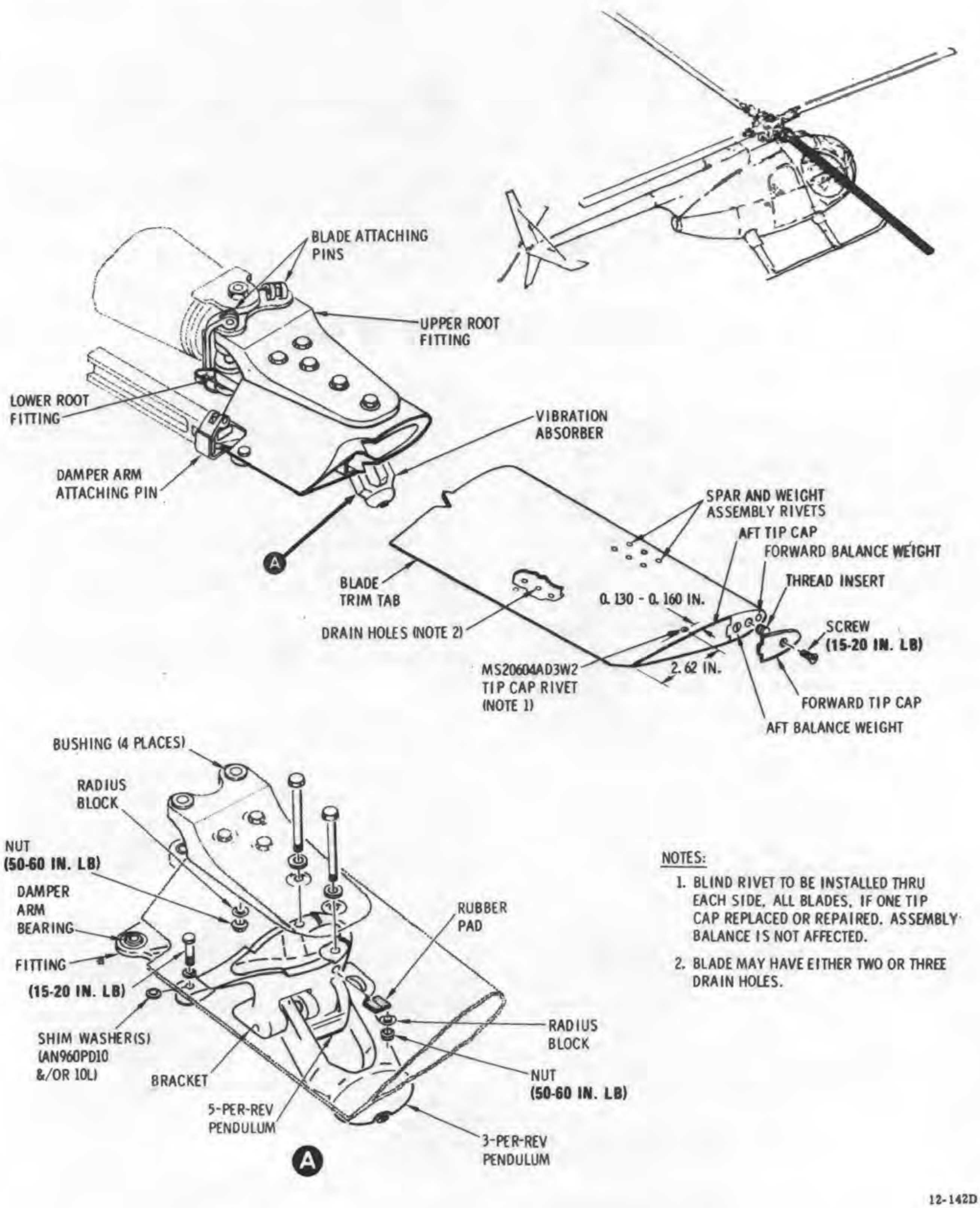


Figure 5-11. Main Rotor Blade Assembly.

Table 5-7. Blade Tracking Summary Procedure.

NOTE

The 0.5 inch-diameter tracking tip cap reflector size should be used as a guide for estimating track accuracy. For example: a reflector image displaced a half-diameter upward or downward indicates that the corresponding blade tip is approximately 0.25 inch out of track; one full reflector diameter indicates 0.5 inch out of track, etc. (See fig. 5-12.)

Observe ground track (para 5-48)		
SATISFACTORY	UNSATISFACTORY	Adjust pitch control rods (para 5-46 and/or blade tabs (para 5-47 as required, and repeat track observation.
Perform hover verification (para 5-49)		
SATISFACTORY	UNSATISFACTORY	Record track variation and proc with forward flight tracking.
Perform forward flight tracking (para 5-50)		
SATISFACTORY	UNSATISFACTORY	Adjust blade tabs (5-47) and repeat forward flight track
Perform autorotation rpm check (para 5-51)		
SATISFACTORY	UNSATISFACTORY	Adjust autorotation rpm (para 5-53) and repeat rpm check.
Remove tracking equipment and return aircraft to service.		

(6) Obtaining correct autorotation rpm consists of checking the main rotor rpm during stabilized autorotation; then adjusting rpm to specified limits. The autorotation rpm check must be made to ensure that track adjustments have not changed the rotor performance required for safe power-off landings.

Table 5-8. Premaintenance Requirements for Tracking Main Rotor Blades.

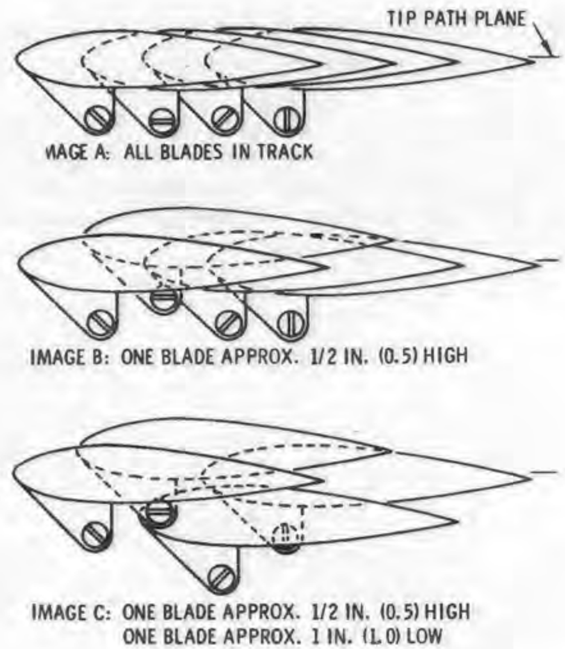
Conditions	Requirements
Special Tools	(T18)
Consumable Materials	(C103)

5-44. Installation — Main Rotor Blade Tracking Equipment. Prepare for main rotor blade tracking (fig. 5-13) by installing strobe light components furnished with the strobe light installation kit (T18). Install reflector type tip caps before tracking the rotor blades.

NOTE

The aircraft must be equipped with a set of unmixed tracking interrupters (369A9946-3, -5, -7 and -9, or 369A9946-23, -25, -27 and -29) installed on the rotating swashplate. A support bracket (369A9943) for the magnetic pickup is also installed on the stationary swashplate. (See fig. 5-13.) The duplicate set of interrupters and pickup bracket included in the strobe light installation kit should not have to be used unless existing parts are unserviceable. See figure 5-13 when replacement is necessary.

a. Install strobe light container on cargo floor. Use



CORRECTIVE ACTION

CONDITION	GROUND IDLE RPM	HIGH RPM AND FORWARD FLIGHT
IMAGE A	NONE REQUIRED	NONE REQUIRED
IMAGE B	SHORTEN PITCH CONTROL ROD (2ND BLADE)	MOVE TAB DOWNWARD (2ND BLADE)
IMAGE C	SHORTEN PITCH CONTROL ROD (2ND BLADE); LENGTHEN CONTROL ROD (3RD BLADE)	MOVE TAB DOWNWARD (2ND BLADE); MOVE TAB UPWARD (3RD BLADE)

11-145A

Figure 5-12. Typical Track Conditions and Adjustment.

four adjustable straps for tiedown. Straps should extend diagonally outward from container to tiedown fittings attached to the cargo floor.

NOTE

There are three Strobex Blade Trackers which can be used with the OH-6A: the 135M, the 135M5, and the 135M9. The instructions below are used with the 135M or the 135M5. When using the 135M9, the vernier on the back of the hand-held lamp must be turned full counterclockwise to deactivate the oscillator. With the vernier knob thus adjusted, operation of the 135M9 is exactly like that of the 135M or the 135M5 and the following instructions apply.

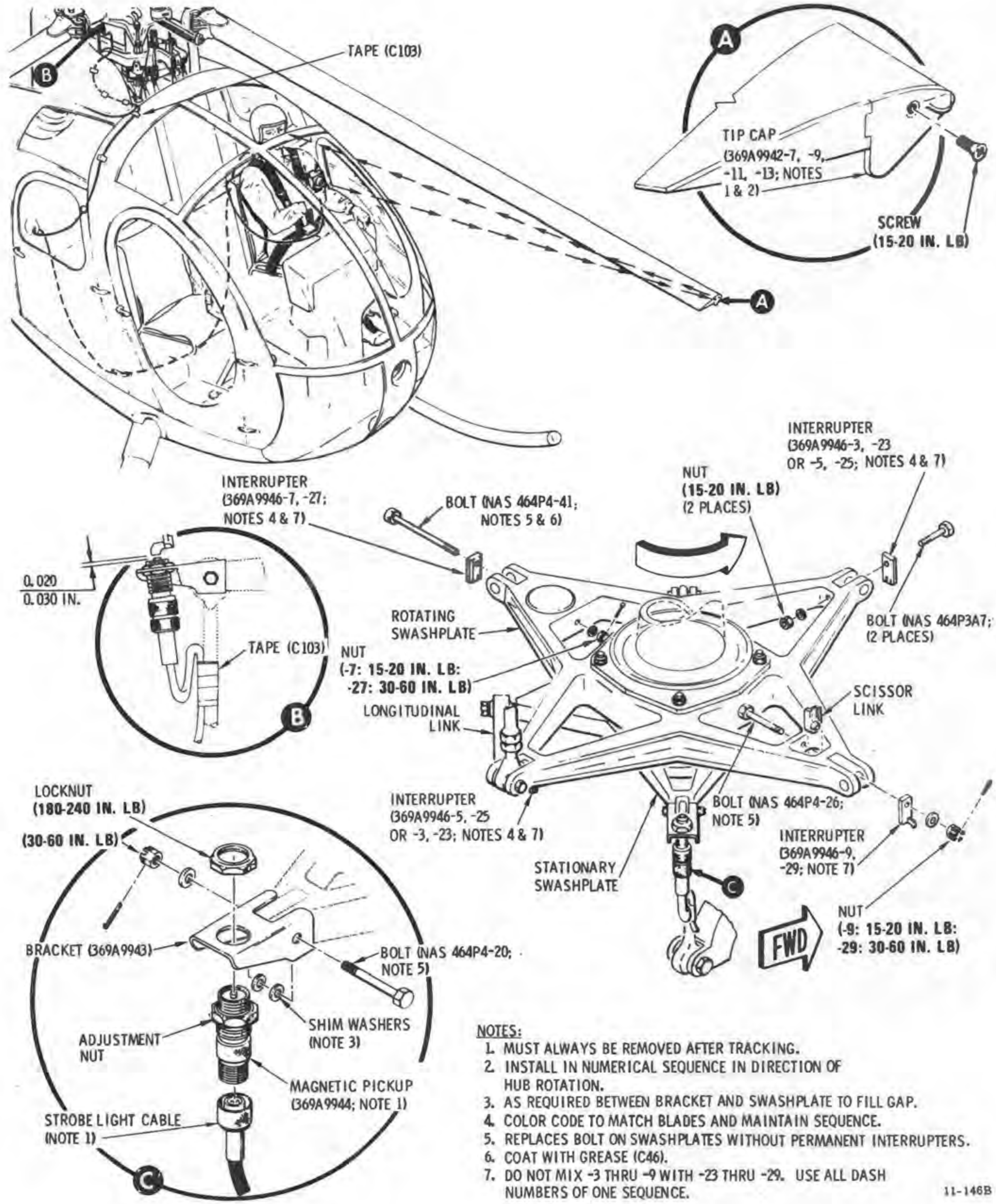
b. Remove the strobe light from container. Pass the light through left opening in the forward bulkhead to observer's seat.

c. Route all three electrical cables from the container through cutout opening in container; then close cover.

d. Attach 24-vdc power cord connector to the utility power receptacle. The receptacle is located at lower left corner of the forward canted bulkhead.

CAUTION

When work is being performed near the engine air inlet, use care to prevent entry of foreign objects. On aircraft without a filter installed, tape covers of cardboard or other suitable material in place over the engine inlet screen. Plug the oil cooler air inlets. Do not remove covers until work is



NOTES:

1. MUST ALWAYS BE REMOVED AFTER TRACKING.
2. INSTALL IN NUMERICAL SEQUENCE IN DIRECTION OF HUB ROTATION.
3. AS REQUIRED BETWEEN BRACKET AND SWASHPLATE TO FILL GAP.
4. COLOR CODE TO MATCH BLADES AND MAINTAIN SEQUENCE.
5. REPLACES BOLT ON SWASHPLATES WITHOUT PERMANENT INTERRUPTERS.
6. COAT WITH GREASE (C46).
7. DO NOT MIX -3 THRU -9 WITH -23 THRU -29. USE ALL DASH NUMBERS OF ONE SEQUENCE.

11-146B

Figure 5-13. Main Rotor Blade Tracking Strobe Installation.

completed and debris is thoroughly cleaned out of the area. After removing covers, check that area around base of mast, inlet to plenum, and entire plenum chamber is clean.

e. Route triggering cable through the cargo door and up around engine air inlet. Use strips of pressure-sensitive tape (C103) to attach cable to fuselage and air intake.

f. Install magnetic pickup (369A9944) in bracket on stationary swashplate. Do not tighten top nut that secures pickup at this time. Plug the triggering cable into pickup and secure cable. Be sure that the cable will not interfere with extreme control movements.

CAUTION

GAP MUST NOT BE LESS THAN 0.020 INCH. Swashplate must be rotated to check the clearance between each interrupter and the pickup. DO NOT USE OVER 240 INCH-POUNDS TORQUE IN TIGHTENING NUT ON PICKUP.

g. **ADJUST GAP BETWEEN INTERRUPTERS AND PICKUP TO 0.020 TO 0.030 INCH. TORQUE TOP NUT SECURING PICKUP TO 180-240 INCH-POUNDS.**

h. Remove existing forward tip caps from rotor blades and install reflector type tip caps. Start with the 369A9942-7 cap, followed by the -9, -11 and -13 caps in dash number order and in direction of hub rotation. **TORQUE ATTACHING SCREWS TO 15 TO 20 INCH-POUNDS.** Take care not to overtighten screws.

i. To operate the strobe, set the auxiliary tank (or utility power) switch to AUX TANK (or UTILITY POWER). The rotor must be turning to trigger the lamp.

NOTE

Strobe light operation can be checked with no signal input (rotor not turning) by triggering the lamp several times. This action will flash the light. Do not hold the lamp trigger for long periods when rotor is not turning; to do so may damage lamp circuitry.

Table 5-9. Premaintenance Requirements for Blade Track Adjustment.

Conditions	Requirements
Special Tools	(T31)

5-45. Adjustment — Main Rotor Blade Track. Adjustment of pitch control rods will affect blade track at all rotor speeds. However, adjust blades only when necessary to establish acceptable track at ground idle speed; the blade tabs are used for all other track corrections.

NOTE

If pitch control rods are badly out of adjustment, or if the rod end bearings have been replaced, set the length of the affected pitch control rod(s). For blades with a tower-tracking data decal, set pitch control rods (between rod end bearing centerlines) to the applicable strap pack pitch link length specified on the decal of the mating blade. For blades without a decal, set pitch control rods to 6.60 inches (between rod end bearing centerlines) for the two blades attached to the hub upper strap pack, and 6.35 inches for the two blades attached to the lower strap pack. Observe the ground track (para 5-48) before making additional adjustment.

5-46. Adjustment — Main Rotor Blade Pitch Control Rod. Repeat this adjustment procedure as necessary to establish ground idle track.

a. Remove lockwire from both ends of pitch control rod and loosen the rod end jamnuts.

NOTE

The upper jamnut and rod end have left-hand threads.

b. To lower a blade tip, shorten the pitch control rod assembly by turning the rod in a counterclockwise direction as viewed from below. To raise a blade tip, lengthen the pitch control rod assembly by turning in a clockwise direction. One-sixth turn of the rod (one flat) will raise or lower the blade tip approximately 0.25 inch.

CAUTION

After adjusting pitch control rods, accomplish the following.

c. Check that the rod end threads are engaged far enough to block the rod body inspection (witness) hole. Check upper jamnut positioning for possible contact with the pitch housing in the full up travel position. Ensure that at least four threads are exposed.

d. After adjusting the pitch control rod length, center each rod end in its fitting and hold while tightening the jamnuts. Safety with lockwire.

5-47. Adjustment — Main Rotor Blade. Once ground idle track is obtained, all remaining tracking correction is accomplished by VERY SLIGHT bending of the various blade tab zones with tab bending tool (T31). Different zones of the tabs are used to adjust blade track at different airspeeds. (See fig. 5-14.) In general, tab Zone A is used for high rpm, flat pitch ground tracking (103% N2) and Zones C, D, and E are used for tracking at the higher airspeeds. Zone B is used to supplement Zone A track correction when maximum tab (5 degrees) has been applied to Zone A; Zone B may also be used, if necessary, for correction in the 0 to 100 knot airspeed range.

CAUTION

Restrict bending to very small increments so that the bonded trailing edge joint between the upper and lower skins will not be damaged. ALL TABS MUST NEVER BE DISPLACED MORE THAN 5 DEGREES ABOVE OR BELOW THE NEUTRAL POSITION (parallel to the chordline).

a. To lower the blade tip that tends to climb during ground tracking at high rpm or during forward flight, bend the appropriate tab section slightly downward; to raise the tip of a blade that tends to descend; bend the tab slightly upward. If only slight track correction is necessary, limit tab bending to the width of the bending tool. If more correction is necessary, bend a slightly wider section of the tab. Avoid excessive rebending of tabs by using small adjustments until the necessary result is obtained.

NOTE

Tab zones on the same blade can require bending in opposite directions. For example, after bending tab Zone C downward to get good tracking at 60 to 90 knots; it might become necessary to bend tab Zone E upward to correct track at redline airspeed. In any case, do not use larger tab corrections than are actually necessary.

b. Each time blade tabs are adjusted, recheck the ground idle track and readjust if necessary (para 5-48).

c. After completion of forward flight tracking, check autorotation rpm (para 5-51).

5-48. Ground Tracking — Main Rotor Blades. For best results, tracking should be performed under calm air conditions. Wind velocity should not exceed 6 knots during preliminary adjustments nor 3 knots for the final adjustment. Accurate adjustment of the initial ground track is very important. In most instances, forward flight tracking problems can be avoided or greatly reduced by setting the initial track as nearly perfect as possible. The tolerance specified in the following instructions is the minimum permissible deviation rather than the desired goal.

NOTE

Both tower-tracked and previously used blades have been pretracked. Tower-tracked blades have a decal on the underside of the blade. Do not adjust tab zones between blade station 93 and 136 (fig. 5-14) until tracking observations indicate need for adjustment. If replacement tower-tracked blades or rotor hub have been installed, or if a replacement pitch control rod assembly or rod end bearing has been installed, set the length of each pitch control rod assembly according to paragraph 5-45 before performing ground tracking.

a. Before tracking blades that are NOT new, check that the normally straight (not to be used) tab areas shown in figure 5-14 are in the neutral position (centered on chordline) and straight.

b. Load aircraft to a gross weight of 1900 to 2200 pounds.

c. With collective pitch stick full down, operate engine for a brief period at 100% N2 and then reduce rpm to ground idle (approximately 62% N1). This will ensure that the blade dampers are correctly positioned.

d. Observe tracking tip cap reflector image by directing strobe light beam toward blade tip path; and

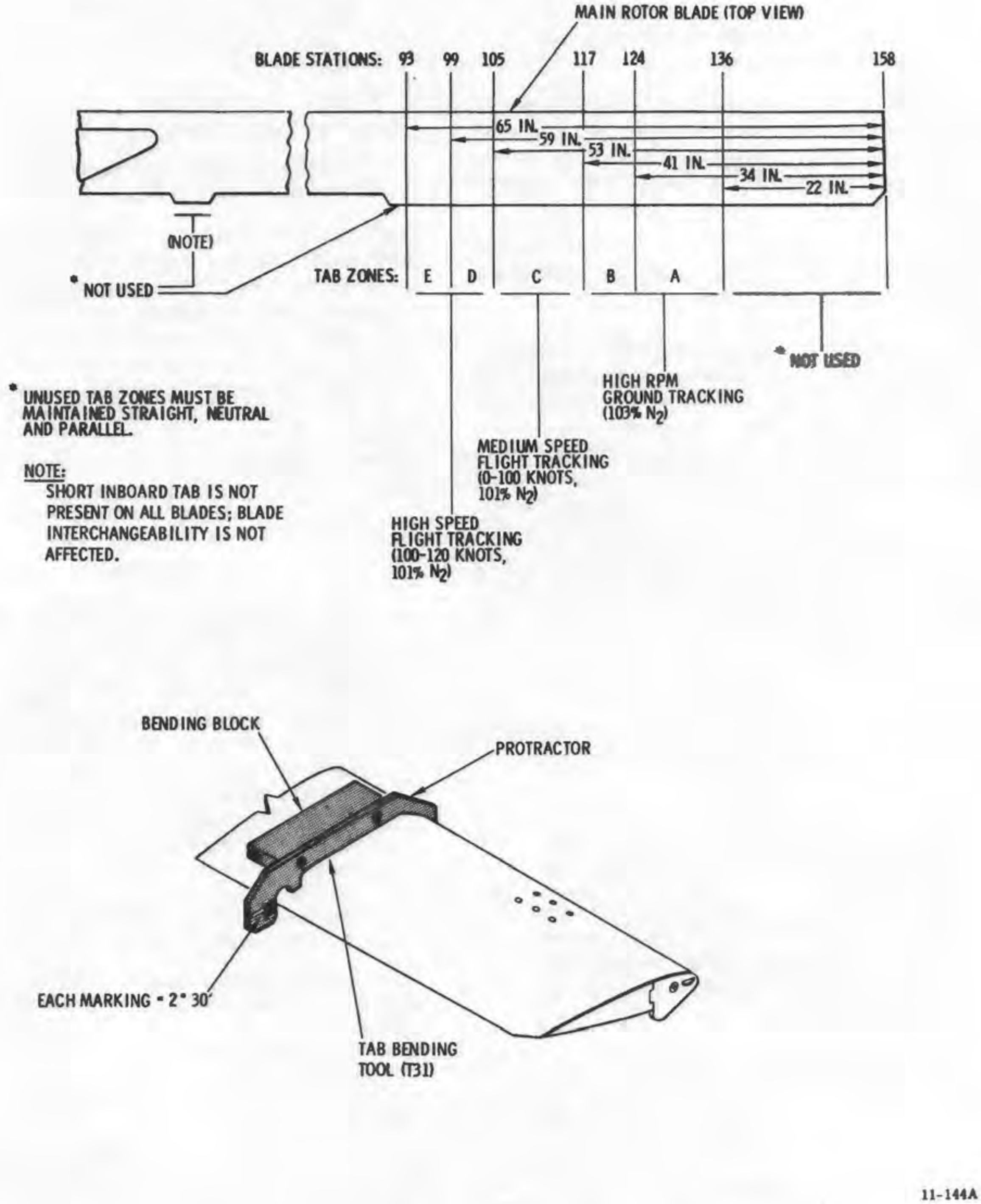


Figure 5-14. Blade Tab Angle Adjustment.

then beam slowly back and forth until reflector images can be seen clearly. The tracking image should appear directly in front of the aircraft or slightly off the aircraft centerline.

e. If blades are in track, the tip cap reflector image pattern should resemble Image A, figure 5-12 (none of the blade tips more than 1/4 of one tracking reflector diameter (1/8 inch) above or below the adjacent reflectors).

(1) If blades are in track, proceed with *f* below.

(2) If blades are out of track, adjust pitch control rods *a* and repeat *c* through *e* above.

f. With collective pitch stick full down, increase engine speed to 103% N2; then observe tip cap reflector image to see if blade track has changed the ground idle track.

(1) When all four blades are in track within 1/4 of one reflector diameter (1/8 inch), the ground track is good; proceed with hover verification (para 5-49).

(2) When a blade is out of track, adjust blade tab Zone A (para 5-47) until the high rpm ground track is within tolerance.

NOTE

Increased rotor stabilization may be obtained by minimizing blade climb between ground idle and 103% N2 by adjustment in tab Zone A.

5-49. Hover Track Verification — Main Rotor Blades. Hover track verification must be performed after ground tracking and before forward flight tracking. Verification is only a CHECK of the hover track. DO NOT adjust pitch control rods or blade tabs because of the track picture observed during hovering. Tab adjustments often cause variation between ground track and hover track. A large track variation may indicate that one or more blades is beyond its chordwise balance tolerance. However, this can only be determined during forward flight tracking. Perform hover track verification as follows:

NOTE

The collective pitch stick may be "heavy" after tracking reflectors are mounted on the blade tips. This condition is not unusual and may be disregarded.

a. Verify the aircraft gross weight (1900 to 2200 pounds).

b. With collective pitch stick full down, increase N2 to 101%.

c. Observe tracking reflector images to verify that ground track is within limits.

d. With aircraft in a stable hover, observe the reflector images. If one or more blades are out of track, record the condition for reference during forward flight tracking.

e. Proceed with forward flight tracking (para 5-50).

5-50. Forward Flight Tracking — Main Rotor Blades. Forward flight tracking should be performed whenever vertical flight vibrations indicate that the blades may be out of track.

a. Verify the aircraft gross weight (1900 to 2200 pounds).

b. Perform flight tracking from hover up to 100 knots at 101% N2. If flight track varies from hover track more than 1/2 inch, bend tab Zone C (5 degrees maximum) to limit the variation to 1/2 inch. If variation is still excessive, bend tab Zone B (5 degrees maximum). Refer to paragraph 5-47.

c. Check autorotation rpm (para 5-51); rpm must not be less than 450.

d. Perform a series of 45-degree banked turns at 80 to 100 knots and observe track change from level flight. If any blade climbs or dives more than 1 inch out of track with the others, the chordwise balance (center of gravity) of that blade is beyond its tolerance and the blade must be replaced. (Hover track variations of this type that do not repeat during the banked-turn maneuver may be ignored).

e. Perform flight tracking at 100 to 120 knots and 101% N2. If necessary, adjust tab Zone D (5 degrees maximum) to limit track variation to 1/2 inch or less and to minimize excessive vertical (1-per-rev) vibration. If variation is excessive, bend tab Zone E (5 degrees maximum). Refer to paragraph 5-47.

NOTE

When deciding whether blade track is acceptable, the overall vibration level of the aircraft should be the determining factor. Some combinations of rotor blades might produce a higher 4-per-revolution vibration as the blade tips are brought into close track; in such cases, the lowest vibration level is preferred, even though the observed blade track may be beyond the specified tolerances.

f. After flight tracking is completed, perform an autorotation rpm check (para 5-51).

NOTE

Correction may be made for cyclic feedback after blade track and vibration level are acceptable. The correction is made by separating the blade track between the blades attached to the hub upper strap pack and those attached to the lower strap pack by up to 1/4 inch (the amount of strap pack offset).

5-51. Check — Main Rotor Autorotation Rpm. An autorotation rpm check is required after each blade tracking operation and whenever the rpm is outside the limits given in table 5-10. Check rotor rpm according to paragraph 5-52 and make adjustments according to paragraph 5-53.

5-52. Check — Main Rotor Autorotation Rpm. *a.* Load aircraft to a gross weight of 1900 to 2200 pounds.

b. Perform a practice autorotative descent according to TM 55-1520-214-10, taking care not to allow rpm to exceed the rotor speed limitations.

c. During autorotative descent, take careful note of stabilized autorotative rpm at one of the gross weight/density altitude combinations given in table 5-10.

d. After landing, compare observed rpm with the values given in table 5-10. If observed rpm is within the limits given in the table, rpm setting is correct. If limits were exceeded, make corrective adjustments according to paragraph 5-53 until rpm falls within limits.

NOTE

When the rotor track autorotation rpm adjustments have been satisfactorily accomplished, remove tracking equipment that must not remain installed (fig. 5-13) before returning aircraft to service. Take care to properly tighten and safety all bolts after they have been reinstalled.

5-53. Adjustment — Main Rotor Autorotation Rpm. *a.* Hold the lower end of collective pitch mixer control rod (fig. 11-1) with a wrench to restrain it against rotation and loosen the upper rod end jamnut.

b. Remove bolt that attaches mixer control rod upper rod end to bellcrank and shorten length by turning rod end clockwise (as viewed from above) to decrease rotor rpm, or counterclockwise to increase rpm. Each 1/2 turn of the rod end will change rotor speed by approximately 6 rpm.

CAUTION

After adjusting collective pitch mixer control rod, check to make sure that the threads of the rod are engaged far enough to block the rod body inspection (witness) hole.

c. After adjusting collective pitch mixer control rod length, install bolt and check for control interference as described in *d* and *e* below.

d. Check for interference between the lateral bellcrank and longitudinal pitch idler (fig. 11-1) of the mixer controls by positioning the collective stick full up and the cyclic stick at the aft stop. If interference exists, lengthen the collective pitch mixer control rod enough to eliminate the interference; then lengthen the four blade pitch control rods equally by the same amount.

e. Check for interference between the rotating swashplate and longitudinal pitch idler (fig. 11-1) of the mixer controls by positioning the collective stick on the downstop and the cyclic stick full forward and full left. If less than 0.150-inch clearance exists, shorten the collective pitch mixer control rod enough to establish clearance (0.250 inch preferred); then shorten the four blade pitch control rods equally by the same amount.

f. After accomplishing checks and adjustments in *c* through *e* above, install nut, washer and new cotter pin. Tighten the rod assembly jamnut while holding rod end centered in the bellcrank fitting.

g. If more adjustment is needed, change the length of all four pitch control rods as necessary to obtain additional autorotation rpm. Be sure to lengthen or shorten all four rods exactly the same or blade track will be changed. One flat (1/6 turn) of the control rod body will cause approximately 8 rpm change in autorotation rpm. Refer to paragraph 5-46.

Table 5-9A. Premaintenance Requirements for Balancing Main Rotor Hub and Blades.

Condition	Requirements
Special Tools	(T40)
Consumable Materials	(C103)

5-53A. General — Main Rotor Hub and Blade Balancing.

a. Main rotor balance is accomplished using instrumentation that locates and measures vibrations due to main rotor imbalance. Data provided by the instrumentation is plotted on a chart designed to indicate how much weight shall be added to or subtracted from screws installed through the hollow lead-lag pivot bolts (fig. 5-5).

NOTE

Main rotor blades must be in track before attempting to balance the main rotor.

b. The balancing kit (T40) contains a procedural checklist, charts and all equipment necessary to accomplish main rotor balance.

c. Installation of main rotor balance equipment (fig. 5-14A) should only be accomplished using the balance checklist provided in balance kit (T40) and instructions provided in TM 55-4920-402-13&P.

CAUTION

When working near engine air inlet, care should be taken to prevent foreign objects dropping into engine inlet.

Observe all NOTES and CAUTIONS in balance kit checklist and TM 55-4920-402-13&P, relating to the installation and security of equipment, including cables, fastened to the exterior of the helicopter.

d. Balance the main rotor according to instructions in the balance kit checklist. Acceptance criteria for balance and vibration are contained on each balance chart. Figure 5-5 shows balancing hardware is installed and sealed at the lead-lag pivot bolts. Table 5-9B lists approved balancing hardware and gives the weight of each item. The balance charts indicate an option of adding or subtracting weight. Keep overall weight at a minimum. Always remove weight when possible.

Table 5-9B. Main Rotor Balancing Hardware

Hardware	Unit Weight (Grams)
NAS603-56 Screw	11.10
NAS603-64 Screw	12.25
MS21042-3 Nut	1.90
AN960C10 Washer	0.63
AN960C10L Washer	0.32
AN970-3 Washer	4.33
HS1554 Washer	1.00
HS1555 Washer	2.80

5-54. Removal — Main Rotor Blade. *a.* Using masking tape and/or grease pencil, mark each blade and its respective pitch housing links so that blades can be reinstalled in the same relative positions.

b. Have an assistant relieve load on blade attachment points by supporting blade tip from below. See figure 5-11.

c. Unlock and remove damper arm attaching pin and blade attaching pins.

d. Slide blade from lead-lag links.

5-55. Inspection — Main Rotor Blade (General). The inspection requirements for main rotor blades are divided into two groups; normal inspection criteria (para 5-56), and restricted service life inspection criteria (para 5-57). Blade damage and repairs that do not exceed the limits for normal operation (described in para

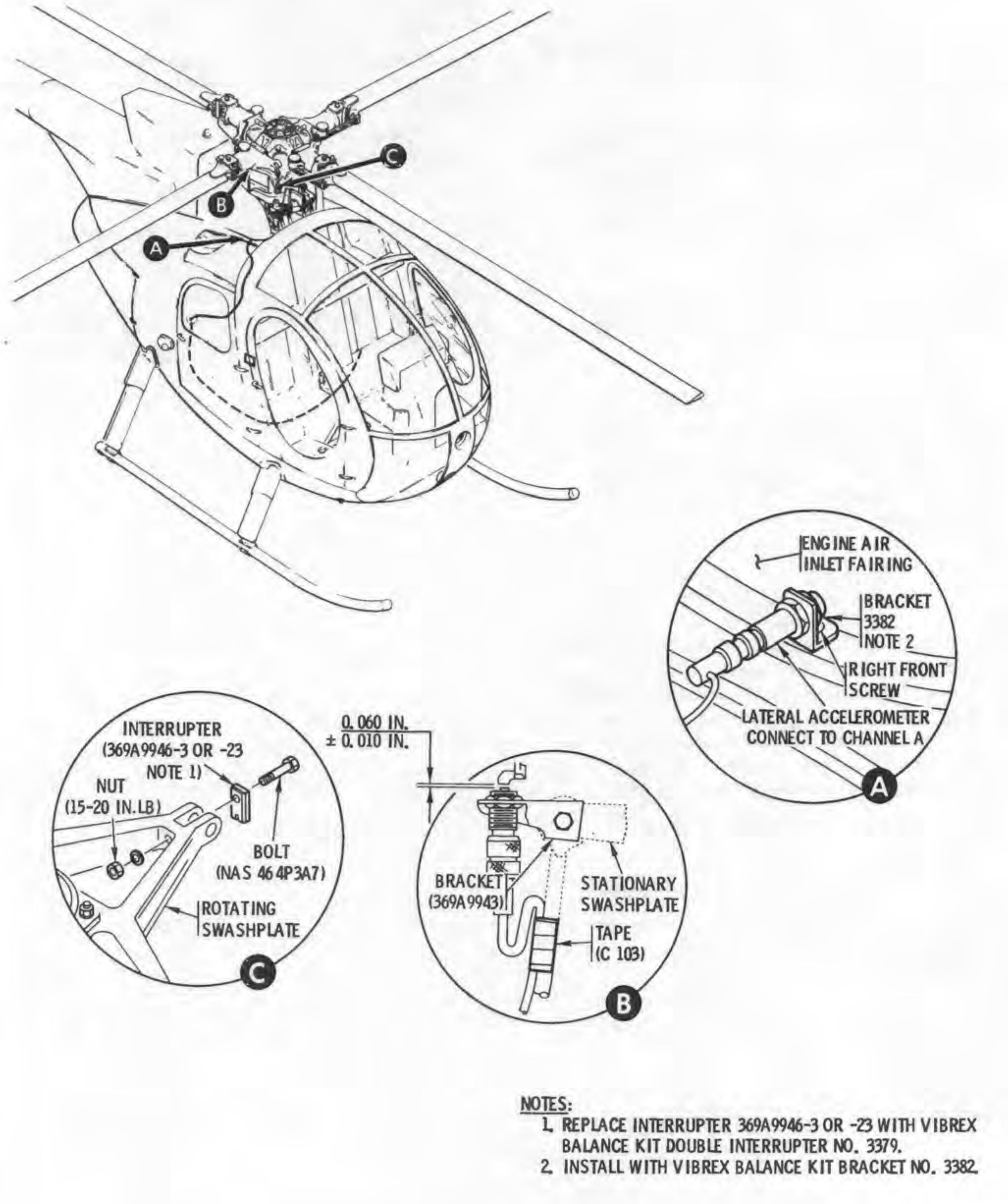


Figure 5-14A. Main Rotor Blade Balance Equipment Installation

Table 5-10. Autorotation Rpm Chart.

Gross Wt (lb)	Sea Level	1000 ft	2000 ft	3000 ft	4000 ft	5000 ft
	Stabilized Autorotation Rpm at Density Altitude					
1900	447-457	454-464	461-471	468-478	475-485	482-492
2000	459-469	466-476	473-483	480-490	487-497	494-504
2100	471-481	478-488	485-495	492-502	499-509	
2200	483-493	490-500	497-507	504-514		

NOTE:
1. Chart values based upon 15°C FAT. At sea level, 8°C temperature change is equal to 1000 ft change in density altitude.
2. Perform autorotation rpm checks at gross weight/density altitude combinations for which rpm values are given. Blank spaces indicate that application of collective pitch may be necessary to avoid rotor overspeed.

5-56) permit the blade(s) to be continued in service without restrictions. Damage and repair that are within the limits given in restricted service life inspection criteria (described in para 5-57) impose additional daily inspection requirements and reduce the service life of the blades.

5-56. Inspection — Main Rotor Blade (Normal Criteria). *a.* Inspect skin for evidence of cracks and holes. Cracks or holes in blade skin, regardless of location, shall be cause for rejection of the blade (except for damage within the restricted service life criteria of para 5-57). **SCRATCHES, DENTS, NICKS AND OTHER SURFACE DEFECTS IN THE BLADE SKIN ARE LIMITED ACCORDING TO *b* and *c* BELOW.**

CAUTION

The repairable limit dimensions presented in the following procedures apply to surfaces that have not been repaired before. Ensure that material has not been removed from damaged areas before determining that the damage depth limit has not been exceeded.

NOTE

Use a dial indicator to check depth of blade dents and scratches.

b. Limitations for surface scratches, nicks, and gouges in seven areas of the blade skin are described below. See figure 5-15 for area location. Scratches that do not penetrate the clad surface are acceptable without rework in all areas except area 5.

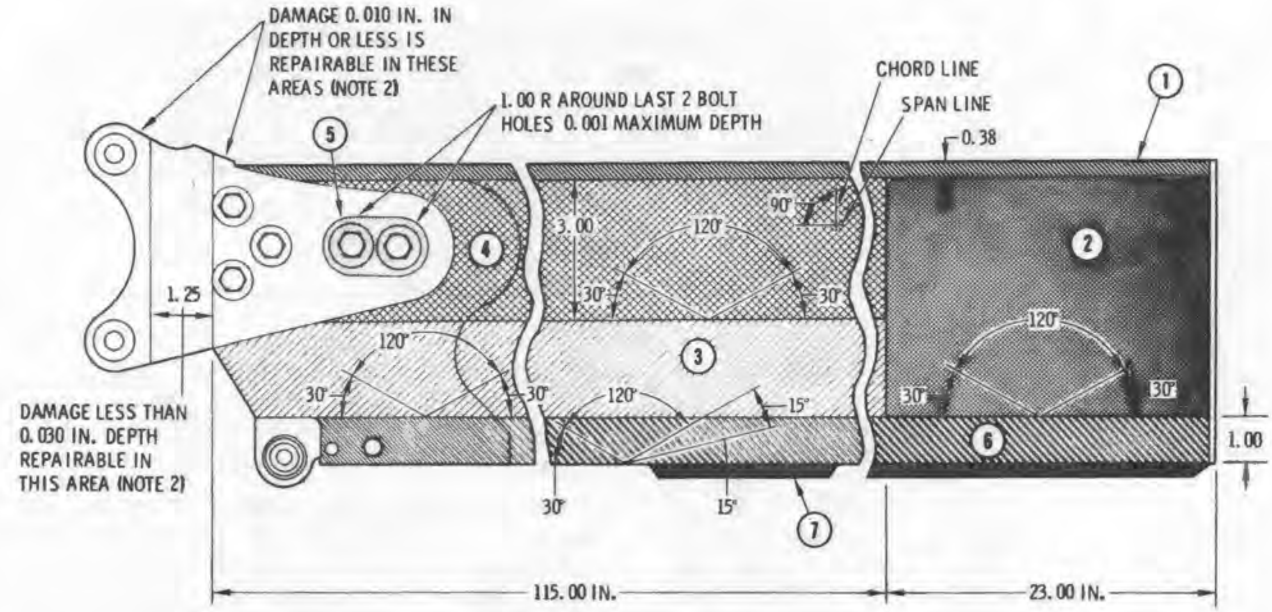
(1) AREA 1: Minor scratches, nicks, and gouges without skin penetrations are acceptable without repair on blades not equipped with the metal abrasion strip. On blades with the metal abrasion strip (fig. 5-16A) inspect the strip for erosin. Abrasion strip erosion may extend the length of the abrasion strip, but may not exceed 0.40-inch width at any point. Skin erosion under a worn abrasion strip may not exceed 0.30-inch width over a 9.0-inch length measured from the blade tip. Inspect for adhesive erosion at the interface with the abrasion strip. If adhesive erosion is found, repair as instructed in paragraph 5-67A. Skin deformation with holes is cause for replacedment. On blades not equipped with the metal abrasion strip, leading edge erosion may be repaired if the skin is not eroded through. On all blade types, if the skin is eroded through, no matter how slightly, the blade must be immediately replaced.

(2) AREA 2: Scratches to 0.005 inch deep if oriented 0 to 30 degrees from spanline and to 0.003 inch deep if oriented between 30 and 90 degrees from spanline are acceptable without repair. Nicks and gouges not exceeding 0.003 inch in depth are acceptable without repair and 0.005 inch with repair.

(3) AREA 3: Scratches to 0.005 inch deep if oriented 0 to 30 degrees from spanline and 0.003 inch deep if oriented between 30 and 90 degrees from spanline shall be removed. No sharp nicks or gouges requiring more than 0.005 inch removal of skin surface are permissible.

(4) AREA 4: Scratches to 0.003 inch deep if oriented 0 to 30 degrees and to 0.002 inch deep if oriented between 30 and 90 degrees from spanline shall be removed. No sharp nicks or gouges requiring more than 0.003 inch removal of skin surface are permissible.

(5) AREA 5: Scratches exceeding a depth of 0.001 inch shall be cause for rejection. Remove scratches to a depth of 0.001 inch. The area inside of the outboard two root fitting bolt holes (includes both upper and lower surfaces) and including the skin surface adjacent to these bolt holes within a radius of 1.00



SCRATCHES (NOTE 1)				GOUGES AND NICKS (NOTE 1)	
AREA	ORIENTATION FROM SPANLINE	MAXIMUM DEPTH WITHOUT REPAIR	MAXIMUM DEPTH WITH REPAIR (NOTE 4)	MAXIMUM DEPTH WITHOUT REPAIR	MAXIMUM DEPTH WITH REPAIR (NOTE 4)
1	0°-90°	MINOR WITHOUT SKIN PENETRATION	MINOR WITHOUT SKIN PENETRATION	MINOR WITHOUT SKIN PENETRATION	MINOR WITHOUT SKIN PENETRATION
2	0°-30° 30°-90°	0.005 0.003	(NOTE 4) (NOTE 4)	0.003 0.003	0.005 0.005
3	0°-30° 30°-90°	NONE NONE	0.005 0.003	NONE NONE	0.005 0.005
4	0°-30° 30°-90°	NONE NONE	0.003 0.002	NONE NONE	0.003 0.003
5 * (NOTE 2)	0°-90°	NONE	0.001 (NOTE 3)	NONE	0.001 (NOTE 3)
6	0°-15° 15°-30° 30°-90°	0.005 0.003 NONE	(NOTE 4) 0.005 0.003	NONE NONE NONE	0.005 0.005 0.005
7*	0°-90°	(NONE)	0.005 (NOTE 3)	NONE	0.005 (NOTE 3)

NOTES:

1. ALL DIMENSIONS ARE IN INCHES.
2. DAMAGE LIMITS APPLY TO B̄OTH UPPER AND LOWER ROOT FITTINGS.
3. INSPECTION UNDER 5 X MAGNIFICATION (MINIMUM) REQUIRED.
4. REFER TO INSPECTION CRITERIA FOR REDUCED LIFE BLADE REPAIR LIMITS.

11-172A

Figure 5-15. Main Rotor Blade Normal Damage and Repair Limits for Scratches, Gouges, and Nicks.

inch from each hole shall be free of scratches, nicks, or gouges as would be detected under 5 × magnification (minimum).

(6) AREA 6: Scratches to 0.005 inch deep and oriented 0 to 15 degrees from spanline are acceptable without repair. Scratches to 0.005 inch deep and oriented from 15 to 30 degrees from spanline shall be removed. Scratches 0.003 inch deep and oriented from 15 to 30 degrees from spanline are acceptable without repair. Scratches to 0.003 inch deep and oriented from 30 to 90 degrees from spanline shall be repaired. Nicks and gouges not exceeding 0.005-inch depth shall be repaired.

(7) AREA 7: Scratches, nicks, or gouges up to 0.005 inch deep and detectable with 5 × magnification are not acceptable without repair. Defects beyond 0.005-inch depth shall be cause for rejection.

c. Depth limitations for surface dents or depressions in eight areas of the blade skin are described below. See figure 5-16 for area location. A dent or depression is defined as a smooth depression or discontinuity with no sharp changes in section.

(1) AREA A: Dents and depressions exceeding 0.015 inch without sharp changes in section to a maximum of 0.062 inch shall be repaired.

(2) AREA B: Dents and depressions to a maximum of 0.010 inch are acceptable without repair. No repairs are permitted in this area.

(3) AREA C: No repairs permitted.

(4) AREA D: Dents and depressions exceeding 0.005 inch without sharp change in section to a maximum of 0.030 inch shall be repaired.

(5) AREA E: Dents and depressions exceeding 0.010 inch without sharp change in section to a maximum of 0.040 inch shall be repaired.

(6) AREA F: Dents and depressions exceeding 0.010 inch without sharp change in section to a maximum of 0.040 inch shall be repaired.

(7) AREA G: No repairs permitted.

(8) AREA H: Dents and depressions exceeding 0.010 inch without sharp changes in section to a maximum of 0.040 inch shall be repaired.

d. Inspect surface areas of upper and lower root fittings (other than Area 5) for evidence of nicks, scratches, and wear spots. Nicks, scratches, and wear spots deeper than 0.010 inch in the attachment lug area and the bolt hole area are not repairable. **DAMAGE 0.010 INCH DEEP OR LESS SHALL BE REPAIRED.**

e. (See fig. 5-11.) Inspect the four lead-lag link attachment bushings for security, and evidence of cracks. No bushing looseness or cracks allowed.

f. Inspect damper arm bearing for binding, evidence of galling or scoring in bore and wear. No radial play is permissible. **MAXIMUM AXIAL PLAY IS 0.015 INCH.**

g. Inspect all bonded areas for evidence of separation.

(1) If evidence of bonding separation is noted around the root fittings or root doublers the blade must be replaced. If there is doubt as to whether a visible crack is in the paint or bond, leave the blade on and check after each flight for growth (an indication of bonding failure).

(2) If there appears to be separation of the trailing edge bond, lightly probe the joint with a 0.001- to 0.002-inch feeler gauge. **IF THE FEELER CAN BE INSERTED TO A DEPTH OF 0.5 INCH OR MORE, EITHER ABOVE OR BELOW THE VEE INSERT, EXCESSIVE SEPARATION IS EVIDENT AND THE BLADE MUST BE REPLACED.**

NOTE

The trailing edge structural bond line to the vee strip insert starts 0.25 inch in (chordwise) from the trailing edge joint; therefore the above tolerance allows 0.25 inch separation. Be sure that measurement is taken from the trailing edge joint, not the tab trailing edge.

h. Ensure that vent holes are open.

NOTE

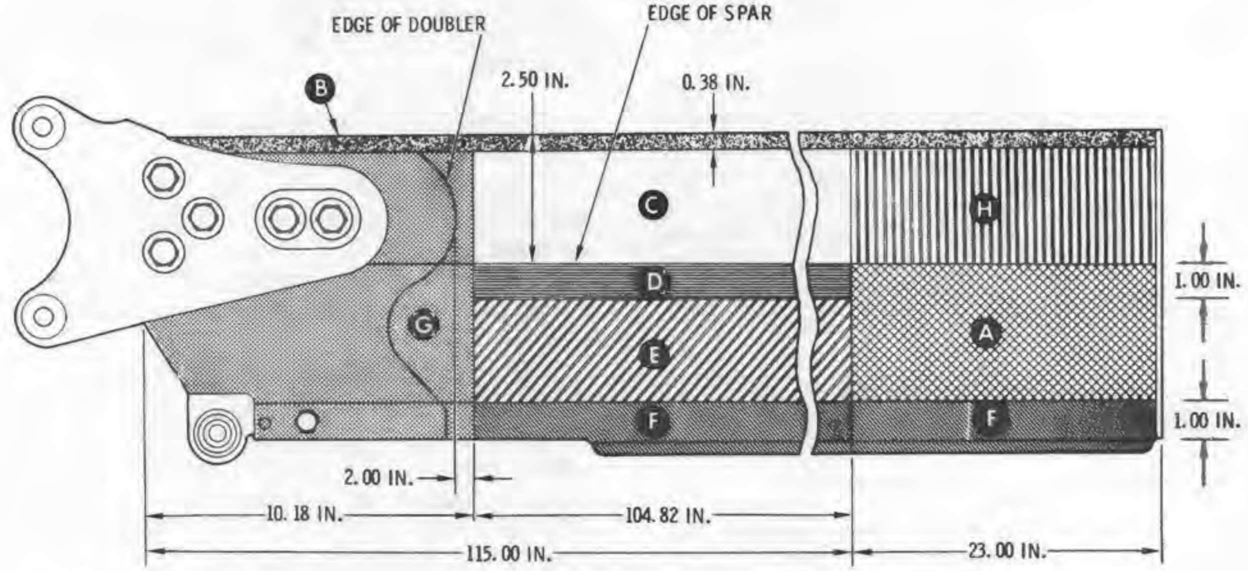
Two or three vent holes are located in the lower blade skin 5.50 inches aft of the leading edge with the first hole 7.50 inches inboard from the tip.

i. Inspect bolts that secure upper and lower root fittings for looseness by attempting to turn bolts with fingers. **IF A BOLT IS FOUND LOOSE, RETORQUE TO 50-60 INCH-POUNDS.** Inspect the six rivets that secure the blade skin to the spar near the tip. If any evidence of insecure attachment or looseness of the rivets is found, the blade must be replaced.

j. Inspect vibration absorber pad on underside of blade for secure bond. Refer to paragraph 5-69 for repair or installation of absorber pad.

k. Inspect forward tip cap screw insert for security and thread damage.

l. When continuous one-per-rev lateral vibration occurs, inspect forward and aft balance weights for security.



DENTS AND DEPRESSIONS (NOTE 1)					
AREA	MAXIMUM DEPTH WITHOUT REPAIR	MAXIMUM DEPTH WITH REPAIR (NOTE 2)	MAXIMUM ALLOWED AREA	MAXIMUM NUMBER OF DEFECTS	MINIMUM DISTANCE BETWEEN DEFECT CENTERS
A	0.015	0.062	1.5 x 1.5	1	NONE
B	0.010	(NOTE 2)	0.25 x 0.25	2	18 INCHES
C	NONE	NONE	NONE	NONE	NONE
D	0.005	0.030	1.5 x 1.5	2	18 INCHES
E	0.010	0.040	1.5 x 1.5	2	18 INCHES
F	0.010	0.040	1.5 x 1.5	3	18 INCHES
G	NONE	NONE	NONE	NONE	NONE
H	0.010	0.040	1.5 x 1.5	1	NONE

NOTES:

1. DIMENSIONS ARE IN INCHES.
2. REFER TO INSPECTION CRITERIA FOR RESTRICTED SERVICE LIFE BLADE REPAIR LIMITS.

11-173 A

Figure 5-16. Main Rotor Blade Normal Damage and Repair Limits for Dents and Depressions.

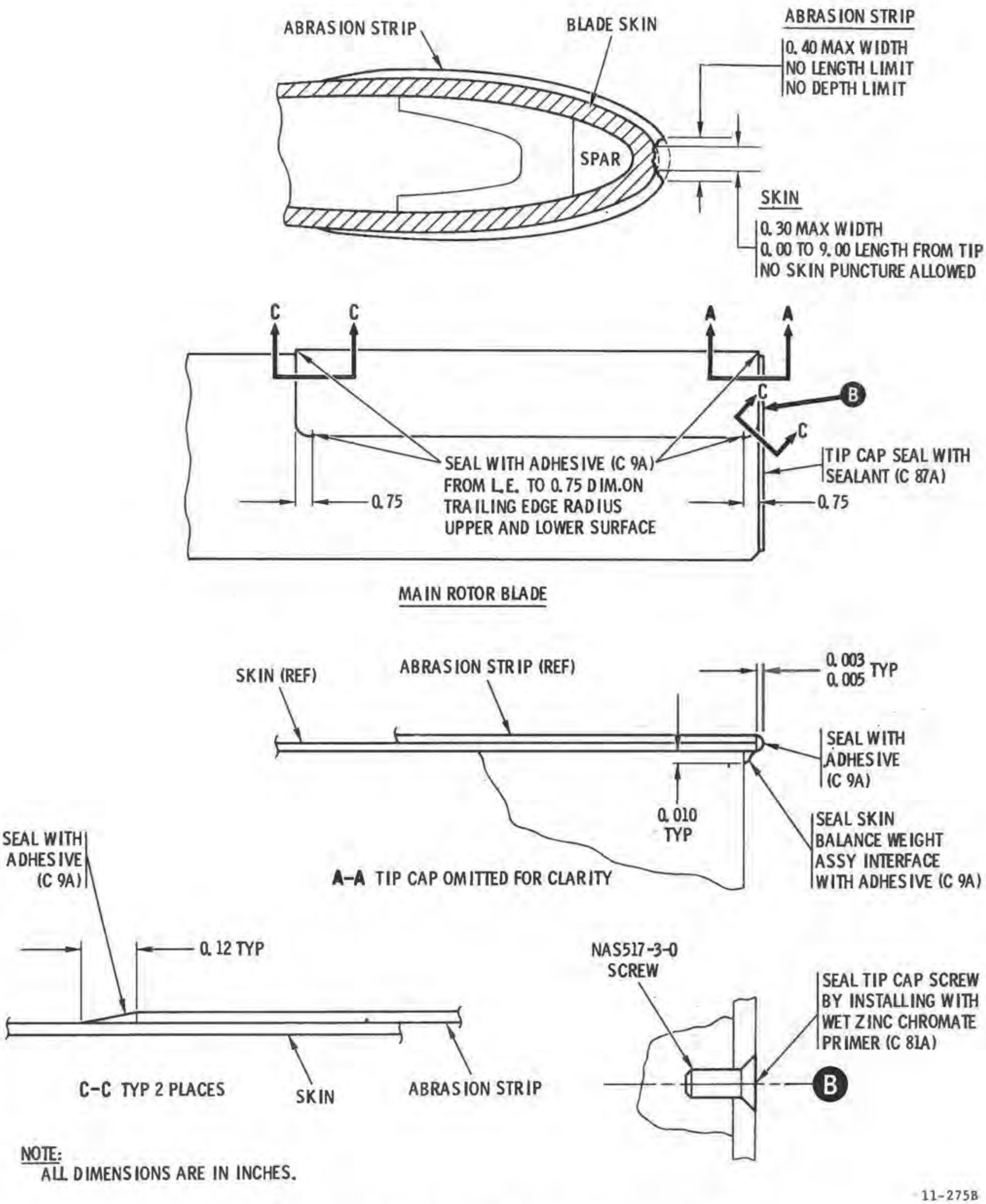


Figure 5-16A Inspection and Repair Main Rotor Blade Metal Abrasion Strip

NOTE

Weights are normally recessed 0.050 inch into threaded weight assembly tip. Security of the weights may be checked by using a torque wrench with a screwdriver socket in the slot of the weight to detect if the weight can be rotated by less than 20 inch-pounds. If a torque wrench is not available, check weight security by fitting a small coin (dime) in the weight slots, and applying the maximum force that can be exerted by only the index finger and thumb.

5-57. Inspection — Main Rotor Blade (Restricted Service Life Criteria). The following paragraphs define limits for restricted service life criteria. **BLADES DAMAGED BEYOND THE LIMITS DESCRIBED IN PARAGRAPHS 5-58 THROUGH 5-61 SHALL BE REPLACED.**

CAUTION

Restricted service life inspection criteria does not extend the normal retirement schedule for main rotor blades (table 1-10). Blades damaged beyond the restricted service criteria defined below will be disposed of locally. Daily inspection is required for all repaired or affected areas that fall within these criteria. (See fig. 5-17 for area locations.) Evidence of cracks in skin areas already repaired will be cause for replacement of affected blade.

5-58. Blade Inspection Criteria — 50-Hour Restricted Service Life.

NOTE

Refer to paragraph 5-61 for extension of restricted service life.

a. Penetrations (holes) — blade area B. Four penetrations through one or both sides (eight holes, four per side) with a minimum of 20 inches between hole centers. Within the above limits one hole may remove a maximum of 0.20 inch from the trailing edge of the spar (fig. 5-17). Maximum hole dimensions after cleanup (removing torn metal, deburring, and rounding of corners) are limited to 3.00 inches spanwise by 1.25 inches chordwise.

b. Scratches, nicks, gouges and dents — blade area C. A dent not exceeding 0.100 inch in depth and 3 inches spanwise length by 1.25 inches chordwise length after cleanup. Scratches, nicks or gouges, oriented 0° to 30° spanwise not exceeding 1.50 inches in length and 0.010 inch in depth, or oriented 30° to 90° chordwise not exceeding 0.75 inch in length and 0.006 inch in depth.

5-59. Blade Inspection Criteria — 100-Hour Restricted Service Life.

NOTE

Refer to paragraph 5-61 for extension of restricted service life.

a. Penetrations (holes) — blade area A. Limit of one hole removing a maximum of 0.20 inch from the trailing edge of the spar (fig. 5-17). Two penetrations through one or both sides (total of four holes) with a minimum of 10 inches between centers. Maximum hole dimensions after cleanup are limited to 3.00 inches spanwise by 1.25 inches chordwise.

b. Penetrations (holes) — blade area B. Four penetrations through one or both sides of the blade (total of eight holes) with a minimum of 20 inches between the centers. Maximum hole dimensions after cleanup are limited to 3.00 inches spanwise and 1.25 inches chordwise. Hole cleanup may include removal of a maximum of one-half the chordwise width of the center channel and/or trailing edge angle (fig. 5-17).

5-60. Blade Inspection Criteria — 300-Hour Restricted Service Life.

NOTE

Refer to paragraph 5-61 for extension of restricted service life.

a. Penetrations (holes) — blade area A. Two penetrations through one or both sides (four holes, two per side) with a minimum of 10 inches between hole centers. Hole cleanup may include removal of a maximum of one-half of the chordwise width of the center channel and/or the trailing edge angle (fig. 5-17).

b. Scratches, nicks, gouges, and dents — blade area A. Dents not exceeding 0.250 inch in depth and 3 inches spanwise length by 1.25 inches chordwise length after cleanup. Scratches, nicks or gouges, oriented 0° to 30° spanwise and not exceeding 1.50 inches in length and 0.025 inch in depth, or oriented 30° to 90° chordwise not exceeding 0.75 inch in length and 0.025 inch in depth.

c. Scratches, nicks, gouges and dents — blade area B. Dents not exceeding 0.150 inch in depth and 3 inches spanwise length by 1.25 inches chordwise

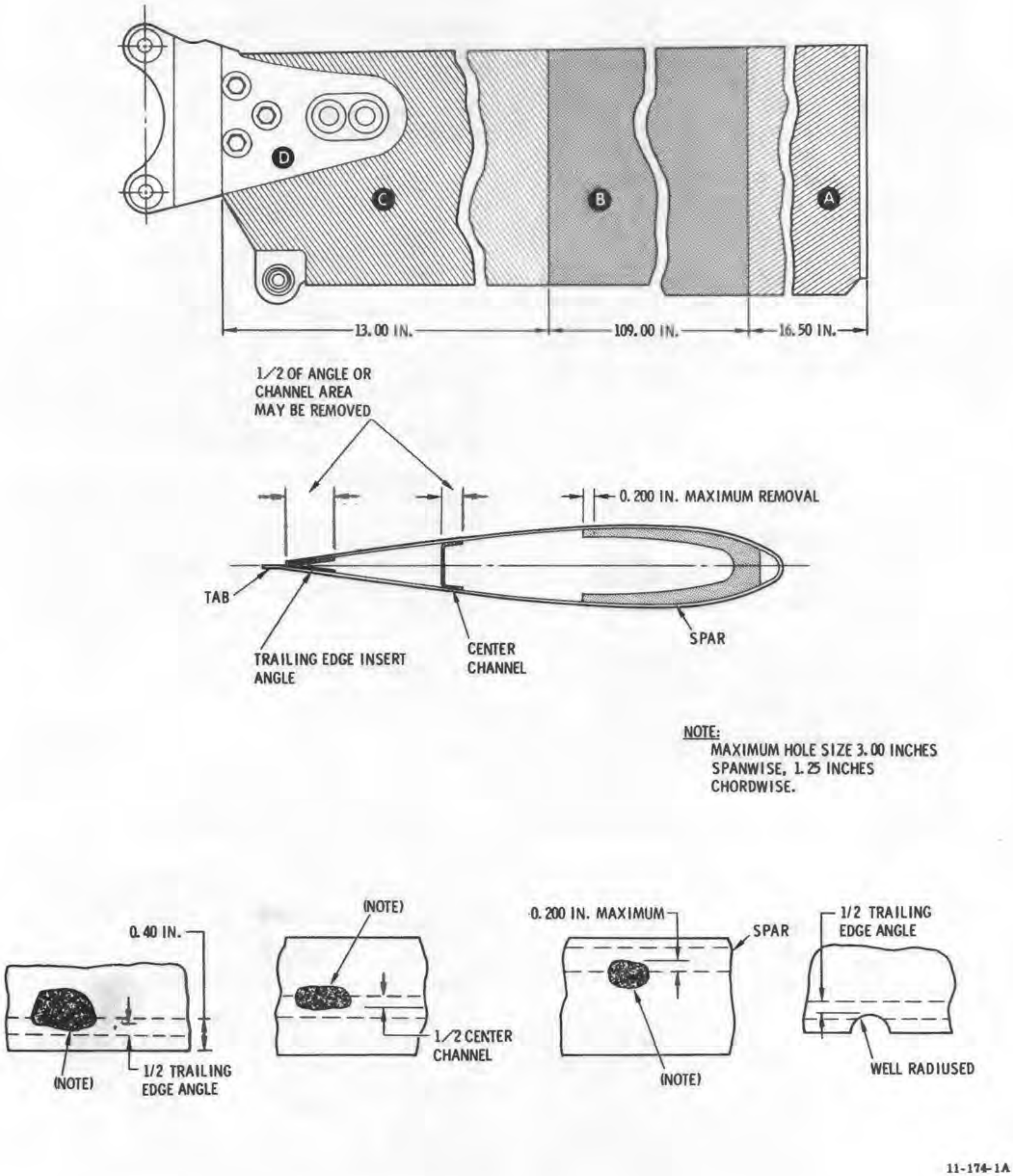


Figure 5-17. Main Rotor Blade Restricted Service Damage and Repair Limits. (sheet 1 of 2)

PENETRATIONS (HOLES) (NOTE 1)					
BLADE AREA	NUMBER OF PENETRATIONS PER SIDE	MAXIMUM AREA OF DAMAGE (NOTE 2)	MINIMUM DISTANCE BETWEEN CENTERS	ALLOWABLE STRUCTURAL DAMAGE (NOTE 2)	INITIAL RESTRICTED SERVICE LIFE LIMIT (HRS)
A	2	3.00 X 1.25	10	SKIN DAMAGE AND LIMIT OF ONE HOLE REMOVING A MAX OF 0.200 IN. OF SPAR TRAILING EDGE (NOTE 4)	100
A	2	3.00 X 1.25	10	SKIN DAMAGE AND MAX OF ONE-HALF THE CHORDWISE WIDTH OF THE CHANNEL OR TRAILING EDGE ANGLE	300
B	4	3.00 X 1.25	20	SKIN DAMAGE AND LIMIT OF ONE HOLE REMOVING A MAX OF 0.200 IN. OF SPAR TRAILING EDGE	50
B	4	3.00 X 1.25	20	SKIN DAMAGE AND MAX OF ONE-HALF THE CHORDWISE WIDTH OF THE CHANNEL OR TRAILING EDGE ANGLE	100
C	NONE	NONE	NONE	NONE	NONE
D	NONE	NONE	NONE	NONE	NONE

SCRATCHES, NICKS AND GOUGES (NOTE 1)				
BLADE AREA	ORIENTATION FROM SPANLINE	MAXIMUM LENGTH (NOTES 2, 3)	MAXIMUM DEPTH (NOTES 2, 3)	INITIAL RESTRICTED SERVICE LIFE LIMIT (HRS)
A	0°-30° 30°-90°	1.50 0.75	0.025 0.025	300 300
B	0°-30° 30°-90°	1.50 0.75	0.015 0.015	300 300
C	0°-30° 30°-90°	1.50 0.75	0.010 0.006	50 50
D	NONE	NONE	NONE	NONE

DENTS (NOTE 1)			
BLADE AREA	MAXIMUM DEPTH (NOTES 2, 3)	MAXIMUM AREA OF DEPRESSION (NOTE 2)	INITIAL RESTRICTED SERVICE LIFE LIMIT (HRS)
A	0.250	3.00 X 1.25	300
B	0.150	3.00 X 1.25	300
C	0.100	3.00 X 1.25	50
D	NONE	NONE	NONE

NOTES:
1. ALL DIMENSIONS SHOWN ARE IN INCHES.
2. LIMIT IS AFTER CLEANUP.
3. DAMAGE THAT EXCEEDS THESE LIMITS BUT NOT THE LIMITS FOR HOLES MAY BE REPAIRED AS HOLES, WITH THE SAME SERVICE LIFE LIMITS AS HOLES.
4. DAMAGE DOES NOT INCLUDE BLADE TIP WEIGHT.

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Figure 5-17. Main Rotor Blade Restricted Service Damage and Repair Limits. (sheet 2 of 2) length after cleanup. Scratches, nicks or gouges, oriented 0° to 30° spanwise and not exceeding 1.50 inches in length and 0.015 inch in depth, or oriented 30° to 90° chordwise not exceeding 0.75 inch in length and 0.015 inch in depth.

5-61. Blade Inspection Criteria Extension — Restricted Service Life. Main rotor blades within the restricted service life criteria may have that life extended if the following inspection procedures can be successfully accomplished.

NOTE

The blade life changes specified in the following criteria do not extend the normal retirement schedule for main rotor blades (table 1-10).

a. When the restricted service life limit of a repaired blade has been reached the area around the repair is to be thoroughly fluorescent-penetrant inspected for cracks. If no crack has developed, the restricted blade life may be extended, with daily inspections, for 50 hours. At the end of this 50-hour extension another fluorescent-penetrant inspection must be performed. If a crack develops the blade must be replaced.

b. With daily inspections, 50-hour fluorescent-penetrant inspections and no cracks, the restricted service life of a repaired blade may be extended to the following absolute limits.

(1) 50-hour initial limit to 100 hour absolute limit.

(2) 100-hour initial limit to 200 hour absolute limit.

(3) 300-hour initial limit to 600 hour absolute limit.

Table 5-11. Premaintenance Requirements for Main Rotor Blade Repair.

Conditions	Requirements
Minimum Personnel Required	One
Consumable Materials	(C1) (C3) (C4) (C7) (C9A) (C20) (C24) (C25) (C40) (C41) (C69) (C70) (C72) (C79) (C83A) (C87A) (C90) (C91) (C94) (C96) (C98) (C106)

5-62. Repair — Main Rotor Blade.

5-63. Repair — Main Rotor Blade Nicks, Scratches, and Wear Spots.

CAUTION

Remove only those nicks, scratches or wear spots that are within the reparable limits in paragraph 5-56*b*.

a. Using grade 400 and 600 abrasive paper (C3) and (C4), finish not coarser than grade 400 abrasive cloth (C24), remove nicks, scratches, and wear spots from upper and lower root fittings, and from the blade skin.

b. Use finer grades, as necessary, to restore surface roughness to the original finish. Remove material in such a manner that no abrupt changes occur in surface contours.

c. Apply chemical film treatment (C 20) to the repaired surface.

5-64. Repair — Main Rotor Blade Dents and Depressions.

CAUTION

Repair only those dents and depressions that are within the reparable limits of step *c* of paragraph 5-56.

a. Use paint remover (C72) to remove paint from surface area to be repaired.

b. Wipe away all residue with a clean cloth dampened by solvent (C96 or C70). Allow to air-dry for a minimum of 15 minutes.

c. Mask edges of repair area with one layer of tape (C98).

CAUTION

Do not cut tape after it has been applied to the blade.

d. Mix filler (C40), three parts "A" and two parts "B" by weight. Mix thoroughly until the mixture is dark red in color. An alternate filler (C41) may be used if equal parts "A" and "B" by weight are mixed.

e. Allow filler to cure for a minimum of 24 hours at room temperature.

f. Smooth the filled area with grade 400 abrasive cloth (C24). Limit smoothing to the masked area.

g. Remove the tape and inspect the alclad coating of the area around the repair. Penetration of the coating is cause for repair under the restricted service life criteria (para 5-57).

h. Clean repaired area with a cloth dampened by solvent (C96 or C70).

i. Touch-up edge of repaired area with chemical film treatment (C20).

5-65. Repair — Loose Forward and Aft Main Rotor Blade Balance Weights. Reinstall loose forward and aft balance weights as follows.

a. Unscrew loose weight until it projects approximately one-half inch and remove old accumulations of powdered compound.

b. Apply primer (C91) and allow to dry for 5 minutes; then apply compound (C90) and thread the weight back into the blade until the slotted end of the weight is recessed 0.050 inch into the threaded section. Wipe off excess compound.

CAUTION

Allow the sealant to cure for a minimum of 12 hours. If a faster cure is required, a complete cure can be obtained by allowing the parts to set for 30 minutes at room temperature and then heating for 30 minutes at approximately 212°F.

c. If locking compound is not available, thread the weight into normal position; then center-punch the end of the weight into the mating threads at three evenly spaced points to prevent rotation.

5-66. Repair or Replacement — Loose or Missing Main Rotor Blade Aft Tip Cap.

NOTE

Replacement tip caps are supplied with bonding surface pretreated (coated) with nylon primer.

a. Lightly abrade the blade and tip cap mating surfaces with grade 180 abrasive paper (C1). Wipe away residue with cloth dampened in solvent (C94) and allow tip cap to air-dry at room temperature for a period of 30 minutes.

b. Mix two-part bonding adhesive (C7) in equal proportions by weight.

c. Apply bonding adhesive to previously prepared tip cap and mating surfaces of rotor blade tip.

CAUTION

When clamping pressure is applied, be careful not to deform the airfoil or squeeze out all the adhesive.

NOTE

A clamping device may be fabricated by bonding 0.5-inch foam rubber to suitably shaped blocks of wood. Use clamps to provide pressure.

d. Install tip cap in blade tip, apply uniform clamping pressure to the joint, and wipe away excess adhesive. Allow adhesive to cure for 8 hours at room temperature or 2 hours at 150°F.

e. Drill two No. 40 holes, one through each side of blade tip and tip cap, as shown in figure 5-11.

f. Install mechanically expanded rivets (MS20604AD3W2).

NOTE

Tip cap replacement or repair will not affect balance.

5-67. Repair — Main Rotor Blade Forward Tip Cap Insert. Replace a loose or stripped forward cap insert. Use a self-locking insert NAS1394 of correct size for replacement, and install with wet primer (C79).

5-67A. Repair — Main Rotor Blade Abrasion Strip.

CAUTION

Repair only that erosion within reparable limits of step b of paragraph 5-56.

a. Remove screw and tip cap (fig. 5-11) from main rotor blade.

b. Remove any loose or cracked sealant or adhesive from areas of main rotor blade (fig. 5-16A).

c. Clean areas to be sealed with clean cloth and MEK (C69). Wipe surface dry before solvent evaporates.

d. Prepare adhesive (C9A) according to container instructions.

e. Apply bead of adhesive to fill area between edges of abrasion strip and blade skin (fig. 5-16A). Ensure no gaps or ridges are visible in adhesive.

f. Allow adhesive to cure according to container instructions.

g. Apply release agent (C83A) to inside of tip cap according to container instructions.

h. Prepare sealant (C87A) according to container instructions. Apply a thin layer of sealant to mating surfaces.

i. Apply zinc chromate primer (C81A) to tip cap screw. Install tip cap.

j. Remove excess sealant with clean cloth.

k. Should sealant become cracked or erroded, reapply as necessary.

5-68. Erosion Protection — Main Rotor Blade Leading Edge Not Equipped With Metal Abrasion Strip. Blades subjected to operation in a highly abrasive environment and not equipped with an abrasion strip, should have the outer three feet of each blade leading edge covered by protective tape so that blade life will not be reduced by excessive erosion. Replace the tape when it becomes abraded.

WARNING

Do not cut tape after it has been applied on the blade.

a. Remove existing tape. Wipe or wash off any dust, foreign matter or adhesive residue. Smooth the bare metal surfaces and feather the edges of painted surfaces with crocus cloth (C25).

b. Clean leading edge surface with a cloth and naptha (C70), to remove any wax or oil. Wipe dry with clean cheesecloth.

c. Cut tape (C106) to 3-foot lengths.

d. Remove backing from tape.

e. Starting at the tip end, apply tape along the leading edge of the blade so that 0.5 inch of tape is on top of the blade and 1.5 inches are on the bottom.

f. Work the tape with roller, spatula or similar tool from the leading edge toward the trailing edge until positive contact is made over the whole tape area. If air bubbles are trapped, lift tape and release air; then reaffix tape. Allow 2 hours for tape to set.

NOTE

Properly applied tape should show no evidence of air bubbles.

5-69. Replacement — Main Rotor Blade Vibration Absorber Pad.

NOTE

The vibration absorber pad bonded to the blade skin is identical to rubber pads bonded to the vibration absorber assembly.

a. Raise the 3-per-rev pendulum to locate the contact point for pad attachment.

b. Clean the blade contact area with naptha (C70) and allow to air-dry for 30 minutes.

c. Remove backing from the rubber pad.

d. Position the pad so that the narrow edge is parallel to the blade leading edge; using hand pressure, press pad firmly in place.

5-70. Repair — Main Rotor Blade Vibration Absorber. Refer to paragraph 5-83.

5-71. Repair — Main Rotor Blade with Restricted Service Life. (See fig. 5-18.)

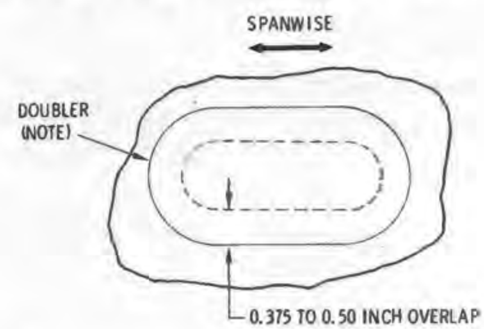
CAUTION

Repair only those holes that are within the reparable limits of paragraph 5-57.

a. Radius all sharp notches, tears, and cracks. Deburr all damaged area edges.

b. Repair holes shall either be circular or elongated in a spanwise direction. Maximum hole size is 3.00 inches spanwise by 1.25 inches chordwise.

c. Cut a doubler for each hole, using 0.020- to 0.040-inch 2024-T32 aluminum alclad sheet. Doubler should extend beyond the hole edges by a minimum of 0.375 to a maximum of 0.500 inch.



NOTE:
MAXIMUM HOLE SIZE AFTER CLEANUP 3.00 IN. SPANWISE BY 1.25 IN. CHORDWISE

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Figure 5-18. Restricted Service Life Blade Repair.

d. Lightly abrade the mating surfaces of the blade and doubler with grade 180 abrasive paper (C1). Wipe away residue with cloth dampened by solvent (C94).

e. Mix two-part bonding adhesive (C7) in equal proportions by weight.

f. Apply bonding adhesive to prepared surface of blade and doubler.

CAUTION

When clamping pressure is applied, be careful not to deform the airfoil or squeeze out all the adhesive.

NOTE

A clamping device may be fabricated by bonding 0.5-inch foam rubber to suitably shaped blocks of wood. Use clamps to provide pressure.

g. Position doubler on blade and wipe away excess adhesive. Apply uniform clamping pressure to joint. Allow adhesive to cure for 8 hours at room temperature.

5-72. Installation — Main Rotor Blade. *a.* With an assistant at the blade tip, position main rotor blade in its (marked) pitch housing linkage. (See fig. 5-11.) Install attaching pins.

NOTE

Blade types may be intermixed without regard to part number.

CAUTION

If a new blade is to be installed, or if blades are not reinstalled in same positions from which removed or are installed on a new rotor hub, the blade and damper attaching pins must be adjusted (para 5-76). It will also be necessary to track the blades.

b. Align damper arm with main rotor blade; install damper attaching pin.

c. Lock all attaching pins (para 5-76).

d. Remove blade-to-pitch housing link markings.

5-73. MAIN ROTOR BLADE AND DAMPER ATTACH PINS.

5-74. Inspection — Main Rotor Blade and Damper Attach Pins. *a.* Check the attach pin lever cam for excessive wear. Cam lobe wear is limited to the hard anodized surface.

b. Inspect for evidence of corrosion between the pivot (outside edge of barrel nut) and the bore in the cam handle. Inspect attach pin rivets for corrosion and security. Any evidence of corrosion requires replacement of attach pin.

c. Visually inspect rotating areas and cam contact surface for cracks. Using a 5x magnifying glass, inspect area of cam locking lever at top attaching point for cracks. Any evidence of cracking requires replacement of the attach pin.

5-75. Corrosion Control — Main Rotor Blade and Damper Attach Pins. *a.* Relieve load on blade attachment points by supporting blade tip from below. Unlock and remove the attach pin.

b. Lubricate pivoting surfaces with clean oil (C67).

c. Rotate pin cam handle back and forth on barrel nut several times until oil gets into all sections of the pin. Remove excess oil with a clean cloth.

d. Reinstall the attach pin.

CAUTION

The following must be accomplished after changing an attaching pin, a main rotor hub or a blade.

5-76. Adjustment — Main Rotor Blade and Damper Attach Pins. *a.* Have an assistant support the blade tip to establish alignment of holes in the blade root fittings and lead-lag links. Install the attach pin.

b. Check locking force required. **FORCE REQUIRED TO CLOSE HANDLE IS 25-35 POUNDS** (maximum hand force).

c. Adjust pin having incorrect locking force. Remove pin and adjust by turning small hex nut at end of pin. Do not adjust nut with pin installed. Reinstall and check locking action.

NOTE

After adjustment, the installed length of the pins, measured from the face of the thrust washer to the outer edge of the last bushing, should be 0.99 to 1.04 inches for the damper pins and 2.84 to 2.89 inches for the main rotor blade attachment pins.

5-77. VIBRATION ABSORBER.

5-78. Description — Vibration Absorber. One vibration absorber is installed on the lower inboard end of each main rotor blade (fig. 5-11). Each vibration absorber consists of two pendulums that pivot about a common axis. These pendulums are tuned to cancel out the first and second harmonic beats of the natural vibration frequency of each individual blade. The largest pendulum counteracts any 3-per-revolution vibrations; the smallest pendulum counteracts any 5-per-revolution vibrations.

5-79. Removal — Vibration Absorber (AVIM). *a.* Remove bolt and washer at trailing edge of blade; remove shim washer(s) if installed (fig 5-11).

NOTE

Shim washers are installed between vibration absorber and main rotor blade as required. The washers compensate for minor variations in blade contour.

b. Remove two nuts, radius blocks, washers, and bolts that attach absorber to blade.

c. Remove vibration absorber.

5-80. Disassembly — Vibration Absorber (AVIM). *a.* Remove rivet that secures pivot shaft to bracket by drilling off head and pressing rivet out (fig. 5-19).

b. Remove pivot shaft by inserting a pin through the hole in the forward end of the bracket and pushing shaft out of bracket.

c. Remove 5-per-revolution pendulum, and 3-per-revolution pendulum.

d. Do not remove shaft bearings or thrust washers unless replacement is necessary.

5-81. Cleaning — Vibration Absorber (AVIM). Clean all parts of the vibration absorber using a clean cloth

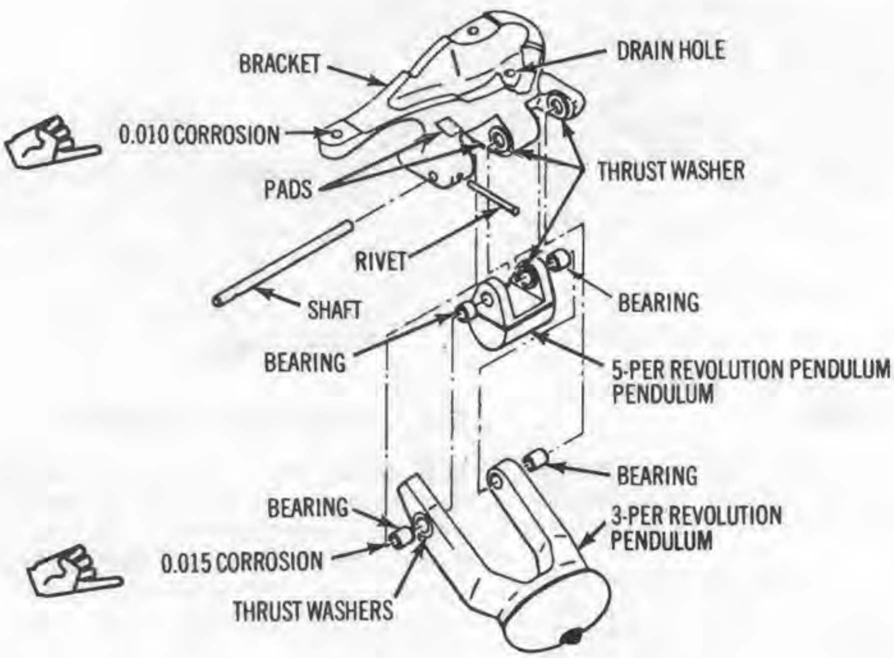


Figure 5-19. Vibration Absorber.

saturated with solvent (C1). Use dry, filtered, low-pressure compressed air to blow out bearing bores and drain hole in bracket (fig. 5-19).

5-82. Inspection — Vibration Absorber (AVIM). *a.* Inspect thrust washers bonded to bracket and pendulums for evidence of damaged teflon surfaces, wear and failure of bond.

b. Inspect bores of bearings for evidence of galling, scoring, and wear. **MAXIMUM ALLOWABLE BORE DIMENSIONS IS 0.268 INCH.**

c. Inspect pendulums for evidence of cracks and breaks.

d. Inspect bracket for cracks and breaks.

e. Inspect shaft for cracks, distortion and wear.

f. Inspect bracket for presence of ballast weights. Evidence of lost ballast will require weighing of complete vibration absorber.

5-83. Repair — Vibration Absorber (AVIM). Repair of the vibration absorber is limited to disassembly and replacement of pivot shaft, bearings, thrust washers, and rubber pads on bracket. The pendulum weights are not directly interchangeable between absorbers and the weight shims must not be altered because the weights and the assembly have been tuned.

a. Use press to remove and install new pivot bearings into pendulums.

b. Using adhesive (C7), install new, or rebond loosened thrust washers to bracket or pendulums. Follow container instructions for adhesive application.

c. Using silicone rubber adhesive (C13), install new, or rebond loosened 3-per-rev and 5-per-rev pads to bracket. Follow container instructions for adhesive application. After bonding, seal the edges of the pad with rubber cement (C19). Ensure that center hole in pad at 5-per-rev location does not block the drain hole through the bracket.

5-84. Reassembly — Vibration Absorber (AVIM). (See fig. 5-19.)

CAUTION

During reassembly, do not allow zinc chromate primer to get on the fabroid bearings.

a. Using zinc chromate primer (C79), coat cavity in bracket where undrilled end of shaft will seat.

b. Align bores of pendulums with bracket.

c. Install shaft so that rivet hole in shaft aligns with matching hole in bracket while primer is still wet.

d. Install new rivet and flush the shop-formed end.

e. Coat open hole in bracket with primer. Check that the pendulums rotate freely on the shaft without binding and that the shaft is free of primer.

5-85. Weighing — Vibration Absorber (AVIM). *a.* Add lead weights (C114) as required to establish total weight of 1360 ±0.1 grams.

b. Bond lead weight into recess cup area of bracket with adhesive (C77).

c. Assure drain hole is open through the bonding material and pad on the bracket.

5-86. Installation — Vibration Absorber (AVIM). (See fig. 5-11.) *a.* Apply zinc chromate primer (C79) on the two long bolts.

b. Align vibration absorber with holes in main rotor blade. Install two long bolts and washers while primer is still wet; then install radius blocks and nuts. Check that the shorter length bolt is in outboard hole. **TORQUE BOLTS TO 50-60 INCH-POUNDS.**

CAUTION

Improper shimming and torquing can result in damage to the vibration absorber bracket.

c. If a gap exists between the trailing edge of vibration absorber and main rotor blade, shim with washers. If no gap exists, install trailing edge bolts and washer without shim washers. Apply zinc chromate primer to bolt and install bolt and washer while primer is still wet. **TORQUE BOLT TO 15-20 INCH-POUNDS.**

SECTION IV MAIN ROTOR CONTROLS

(Refer to chapter 11)

SECTION V TAIL ROTOR AND CONTROL SYSTEM

5-87. TAIL ROTOR AND CONTROL SYSTEM.

5-88. Description - Tail Rotor and Control System. The tail rotor is mounted on the tail rotor transmission at the end of the tailboom. The tail rotor counteracts main rotor torque and controls the heading of the helicopter. The tail rotor installation (fig. 5-20) consists of a pitch control assembly, drive fork, two pitch control links, and two blade assemblies. The metal blade installation can be equipped with either spherical or elastomeric drive fork-to-hub bearings. The blade assemblies telescope over a hub and are bolted to an interconnecting tension-torsion strap assembly within the hub. Blade angle is controlled by the pitch control assembly consisting of links connecting the pitch control arms to a swashplate that slides axially on the tail rotor transmission output shaft. Movement of the swashplate is controlled through a series of bellcranks and rod assemblies connected to the pilot's foot pedals.

5-89. Troubleshooting — Tail Rotor and Control System. Troubleshooting information is divided into: (1) Investigation of operational vibration problems originating with the tail rotor assembly, or symptoms that can be recognized (table 5-12); and (2) isolation of an unusual controls malfunction (chapter 11).

Table 5-13. Premaintenance Requirements for Removal of Tail Rotor Assembly.

Conditions	Requirements
Special Tools	(T28)

5-90. Removal — Tail Rotor Assembly. (See fig. 5-21.)

CAUTION

Do not remove hub-to-drive fork hinge bolt (369A1602) during removal of the tail rotor assembly. It is possible to damage the strap pack during removal and reinstallation of bolt.

a. Disconnect station 282 bellcrank from transmission at pivot point so that bellcrank pin is disengaged from bearing in pitch control housing.

ALL DATA ON PAGE 5-50 IS DELETED.

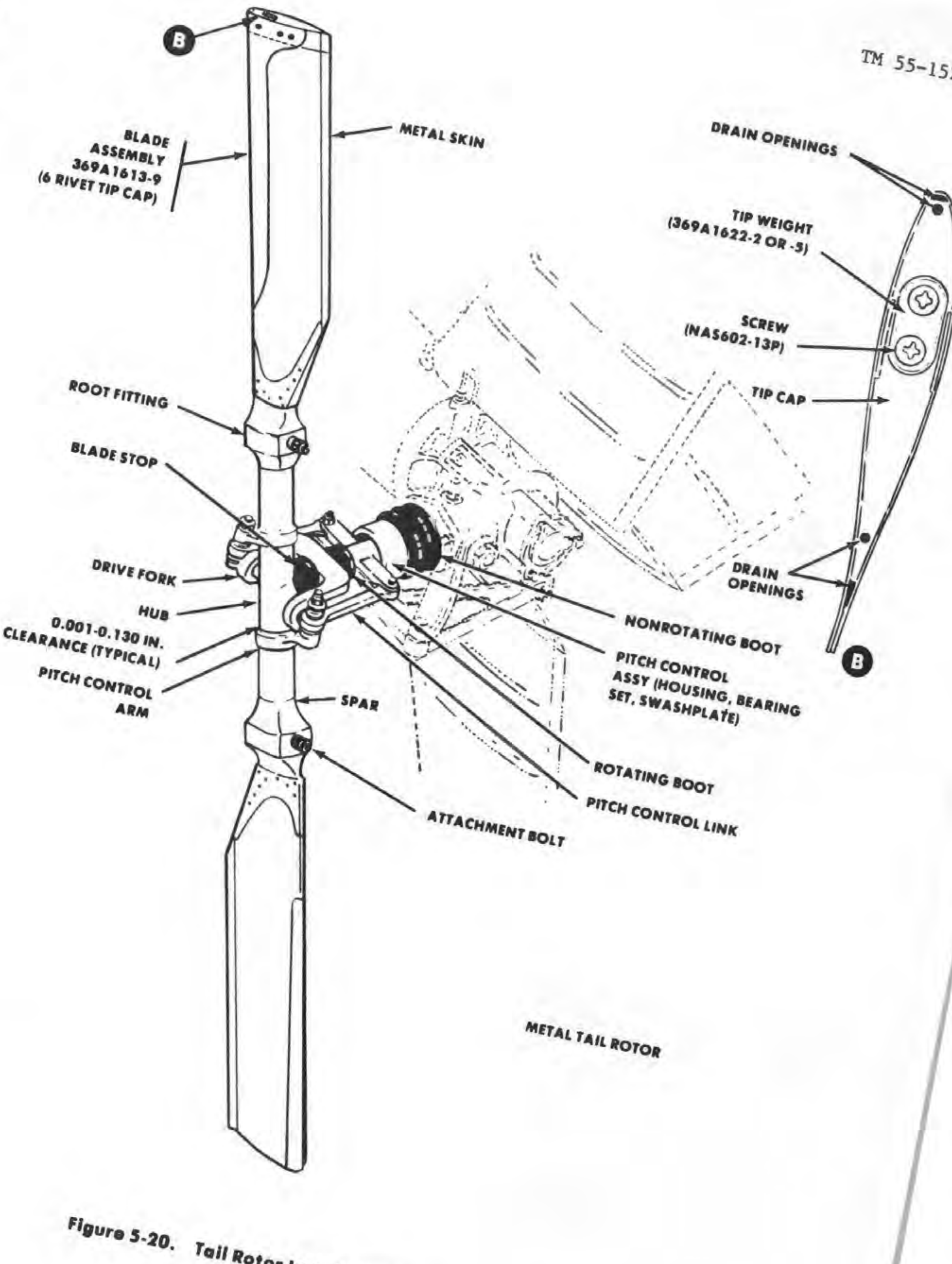
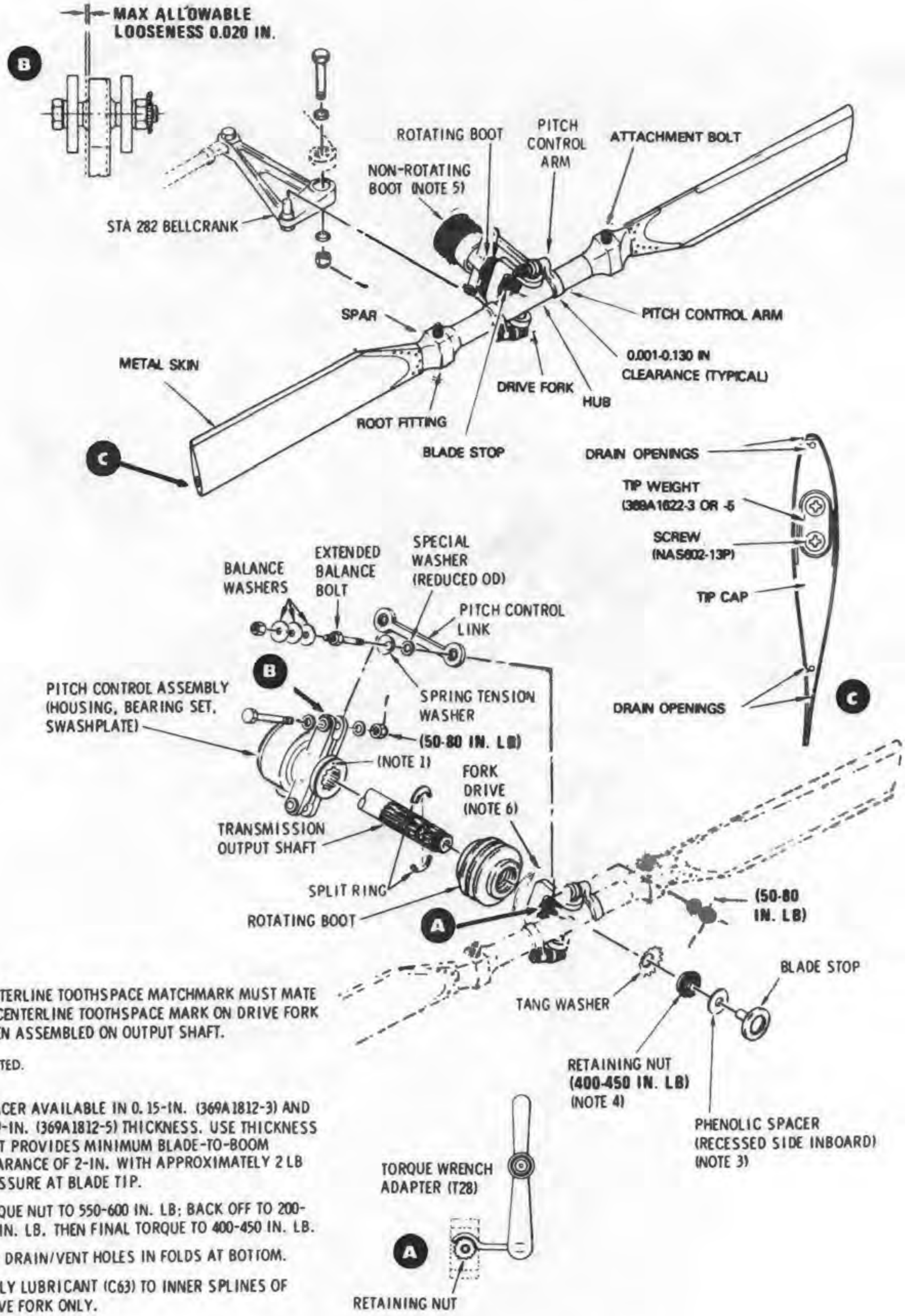


Figure 5-20. Tail Rotor Installation.



NOTES:

1. CENTERLINE TOOTHSPACE MATCHMARK MUST MATE TO CENTERLINE TOOTHSPACE MARK ON DRIVE FORK WHEN ASSEMBLED ON OUTPUT SHAFT.
2. DELETED.
3. SPACER AVAILABLE IN 0.15-IN. (369A1812-3) AND 0.19-IN. (369A1812-5) THICKNESS. USE THICKNESS THAT PROVIDES MINIMUM BLADE-TO-BOOM CLEARANCE OF 2-IN. WITH APPROXIMATELY 2 LB PRESSURE AT BLADE TIP.
4. TORQUE NUT TO 550-600 IN. LB; BACK OFF TO 200-250 IN. LB. THEN FINAL TORQUE TO 400-450 IN. LB.
5. TWO DRAIN/VENT HOLES IN FOLDS AT BOTTOM.
6. APPLY LUBRICANT (C63) TO INNER SPLINES OF DRIVE FORK ONLY.

Figure 5-21. Tail Rotor and Pitch Control Assemblies.

Table 5-12. Troubleshooting the Tail Rotor and Control System.

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

NOTE

Before you use this table, be sure you have performed all normal operational checks. If you have a malfunction which is not listed in this table, notify the next higher level of maintenance.

1. **During aircraft operation, a high frequency vibration (buzzing) is felt in the tail rotor pedals.**

STEP 1. Deleted.

STEP 2. Check for excessive looseness in tail rotor fork bearing and for play between tail rotor hub and fork.

If looseness or play is evident on the tail rotor hub area, replace the tail rotor assembly (para 5-90).

STEP 3. Check for worn pitch control link bearings.

If bearings are worn beyond 0.020 inch, replace the control links (para 5-102).

STEP 4. Check for loosened tail rotor assembly retaining nut or loose stabilizer strut bolts.

If nut or bolts are loose, retorque tail rotor nut (para 5-103) and stabilizer chapter 2.

STEP 5. Check tail rotor for separation of leading edge abrasion strip.

If the tail rotor leading edge abrasion strip on metal blade has any separation, replace the blade (para 5-99D).

STEP 6. Check for excessive wear in pitch control assembly bearing (fig. 5-22).

If wear is evident in pitch control bellcrank bearing, replace the pitch control assembly (para 5-90).

STEP 7. Check for excessive wear (wobble) in swashplate liners as shown in figure 5-22.

If wobble exceeds the 3 pound limit, replace the swashplate or pitch control assembly (para 5-90).

STEP 8. Check that tail rotor balance is within limits (para 5-103 or 5-104).

If tail rotor cannot be balanced to an acceptable level, replace tail rotor assembly (para 5-90).

b. Pull beaded end of stationary boot out of inboard groove of pitch control assembly.

c. Straighten tabs on tang washer. Using torque wrench adapter (T28), loosen retaining nut and slide tail rotor outward on shaft to remove blade stop and phenolic spacer; then remove nut.

CAUTION

Tail rotor tang washers shall not be reused.

d. Remove and discard tang washer.

e. Place a grease pencil mark on the drive fork next to the keyway on the transmission output shaft. The mark aids reinstallation of the tail rotor at the same position.

f. Slide tail rotor assembly (including pitch control assembly) off shaft; catch or remove split rings from shaft.

g. Remove hub and blade assembly from the pitch control assembly, if required. Separate by removing pitch control link bolts at the hub end.

NOTE

The hub and blade assembly is a separately replaceable item.

5-91 Component Inspection — Tail Rotor Installation. *a.* Check that no play exists between tail rotor hub and drive fork.

b. For the spherical bearings, check hub-to-drive bearings for radial looseness 0.008 INCH MAXIMUM.

c. For elastomeric bearings, check shim separation 20% visible allowed MAXIMUM.

d. For elastomeric bearings, check for fork assembly to hub play — none allowed.

e. For elastomeric bearings, check cracked shims — none allowed.

e.1. For elastomeric bearings, paint a slippage mark across the outer race of the bearing and the fork. Inspect for evidence of rotation between the bearings and the fork. No rotation is allowed. Repeat this inspection on a daily basis.

f. Inspect fork and hub for scratches, nicks, dents, cracks, corrosion and similar surface defects. No cracks are allowable. Scratches and nicks that do not exceed 0.005 inch are permissable with rework. Polish out and blend to contour with grades 180 through 600 abrasive paper (C1), (C2), (C3), and (C4).

g. Inspect all bolts and nuts for secure attachment.

h. Inspect blade stop and boots for deterioration and secure attachment. With antitorque pedals in neutral position, apply approximately 2 pounds against blade tip and check for a minimum of 2 inches clearance between tip and tailboom.

i. Accomplish metal tail rotor blade inspection (para 5-92A).

j. Accomplish pitch control assembly inspection (para 5-93).

5-92. Deleted.

5-92A. Inspection — Metal Tail Rotor Blade. (See fig. 5-20, sh 2.) Refer to figure 5-21A for damage and repair areas.

WARNING

Inspection of the tail rotor blade should be extremely thorough. Particular care should be taken when inspecting any blade deficiencies. Do not attempt repairs beyond those permitted herein. Tail rotor failure and possible injury can result.

a. Inspect the blade skin for evidence of cracks and holes. Cracks or holes in blade skin, regardless of location, shall be cause for rejection of the blade. SCRATCHES, DENTS, NICKS, GOUGES, AND OTHER SURFACE DEFECTS IN THE BLADE ARE LIMITED ACCORDING TO b and c below.

NOTE

Use a dial indicator to check depth of blade dents and scratches.

b. Limitations or surface scratches, nicks, gouges, and pits in three areas of the blade are described below. See figure 5-21A for area location. SCRATCHES THAT DO NOT PENETRATE THE CLAD SURFACE ARE ACCEPTABLE WITHOUT REWORK IN ALL AREAS.

(1) AREA A: Acceptable with repair. Scratches, nicks, gouges, or pits to 0.003-inch deep if oriented more than 15 degrees from span line; or 0.006-inch deep if less than 15 degrees from spanline.

(2) AREA B: Acceptable with repair. Scratches, nicks, gouges, or pits to 0.006-inch deep in any direction.

c. Limitations for dents in two area of the blade are described below. See figure 5-21A for area location. A dent or depression is defined as a smooth depression or discontinuity with no sharp changes in section.

(1) AREA A: Acceptable without repair. Dents to a maximum depth of 0.020 inch. No dents with sharp contour changes are allowed.

(2) AREA B: Acceptable without repair. Dents to a maximum depth of 0.050 inch. No dents with sharp contour changes are allowed.

d. Inspect all exposed blade edges for possible separation. No separations are allowed.

e. Inspect blade leading edge for erosion in AREA B, figure 5-21A. If erosion has not effected blade performance or caused tail rotor vibration, polish repair the area (para 5-99A).

f. Inspect blade spars in AREA C, figure 5-21A for nicks, cracks, and similar surface defects. No cracks are allowed. Scratches and nicks that do not exceed 0.002 inch after rework are permissible.

g. Check that tip weights and attaching hardware are secure.

h. Inspect for clogged drain openings at blade tip. If clogged, gently clear with a blunt instrument.

i. Inspect the tail rotor blade leading edge abrasion strip/airfoil bond line for cracks/chipping or other evidence of abrasion strip separation. If cracking or chipping is observed use a 5x magnifying glass and closely inspect along bond line and at blade tip for any debonding between epoxy adhesive and abrasion strip. Any separation between bonding adhesive and abrasion strip is cause for removal of blade from service. Small blow holes in the epoxy adhesive are not considerd as adhesive separation.

NOTE

Paint chipping or cracking can be the normal result of service time or operating environment, but requires a closer examination using a 5x magnifying glass, to inspect for possible discrepancies.

5-93. Inspection — Tail Rotor Pitch Control Assembly. *a.* Inspect the pitch control assembly for evidence of binding by hand-turning a few turns while listening for unusual sounds.

NOTE

When the tail rotor blades are displaced from maximum to minimum pitch angles, an audible snapping noise may be heard. This is a normal condition caused by the strap pack when it is not under a centrifugal load.

b. Move (teeter) the blades back and forth to check for evidence of binding.

c. It tail rotor control system drag or friction has been reported or is suspected, use a spring scale as shown in figure 5-22 to measure the drag (sliding friction) of the pitch control assembly on the output shaft. Note that the pitch links, station 282 bellcrank and the rubber boots must be detached from the assembly during the drag check. If drag exceeds 3 pounds, remove the pitch control assembly and clean the swashplate and output shaft splines.

d. Inspect for surface defects such as nicks, scratches, dents or corrosion. Defects may be reworked by abrasive polishing and blending to a depth of 0.015 inch on machined surfaces, or a depth of 0.020 inch on cast or forged surfaces. After repair, apply corrosion protective treatment to the magnesium alloy pitch control bearing housing or aluminum alloy swashplate as directed in chapter 1.

e. Inspect for brinelling wear of the inner surfaces of the swashplate clevis ears. **WEAR UP TO 0.003 INCH-DEPTH IS PERMISSIBLE WITHOUT REWORK OR REPAIR. WEAR UP TO 0.015 INCH-DEPTH IS REPARABLE ACCORDING TO *d* ABOVE.**

f. Inspect for slippage between the pitch control bearing inner race and swashplate. Check external slippage mark. If bearing slippage has occurred replace the pitch control assembly and accomplish the following.

(1) Paint a slippage mark across the outboard end of the replacement pitch control bearing inner race and the swashplate, midway between the connecting link ears.

(2) Allow paint to dry.

(3) Perform a ground runup of the aircraft and while running, cycle the tail rotor control through a full pedal travel a minimum of six cycles. Shut down the aircraft.

(4) Inspect the slippage mark. If there is any evidence of bearing slippage, replace the pitch control assembly.

g. Inspect for pitch control wobble on the transmission output shaft. **WOBBLE UP TO 0.020 INCH, AS SHOWN IN FIGURE 5-22, IS PERMISSIBLE.** If a greater amount of wobble is present replace the swashplate or pitch control assembly, as applicable.

NOTE

Wobble may be accurately measured by attaching a dial indicator support to the tail rotor drive fork, with the indicator probe in contact with the swashplate clevis ear location shown in the illustration. Take care not to allow the pitch control assembly to slide on the output shaft while measuring wobble.

h. Inspect pitch control assembly for loose, rough or binding bearings; bolts and bolt holes for wear and condition; swages and/or bearing retainer for looseness and damage; arms for bends and deformation.

i. Inspect swashplate (fig. 5-22) liners (1 splined, 1 smooth) and mating surfaces of tail rotor transmission output shaft for dirt deposits or other contamination. Dirt or dried grease deposits at these locations can cause excessive drag or friction in the tail rotor controls. Use solvent and abrasive cloth (C25) to remove deposits or contamination.

j. Inspect pitch control non-metallic liners for looseness, damage and wear. Maximum ID of inboard smooth liner is 0.9145 inch. Maximum ID of outboard

Pages 5-54A and 5-54B are deleted.

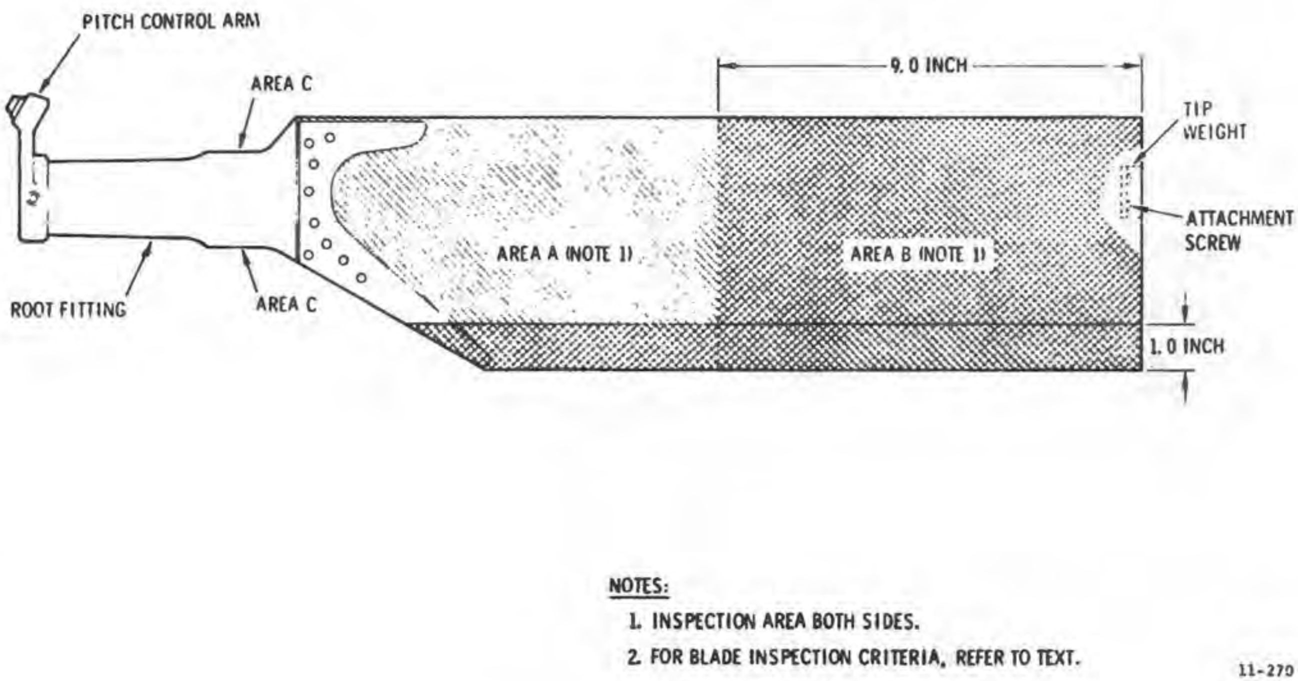


Figure 5-21A. Metal Tail Rotor Blade Damage and Repair Areas.

spline liner, measured between two 0.0864-inch-diameter pins (No. 44 drill, shank free of burrs) placed 180 degrees apart, 0.725 inch.

k. Inspect pitch control links and bearings for bending, cracks, and bearing axial play. **MAXIMUM ALLOWABLE AXIAL PLAY OF BEARING IS 0.020 INCH.**

Table 5-14. Deleted.

5-94. Deleted.

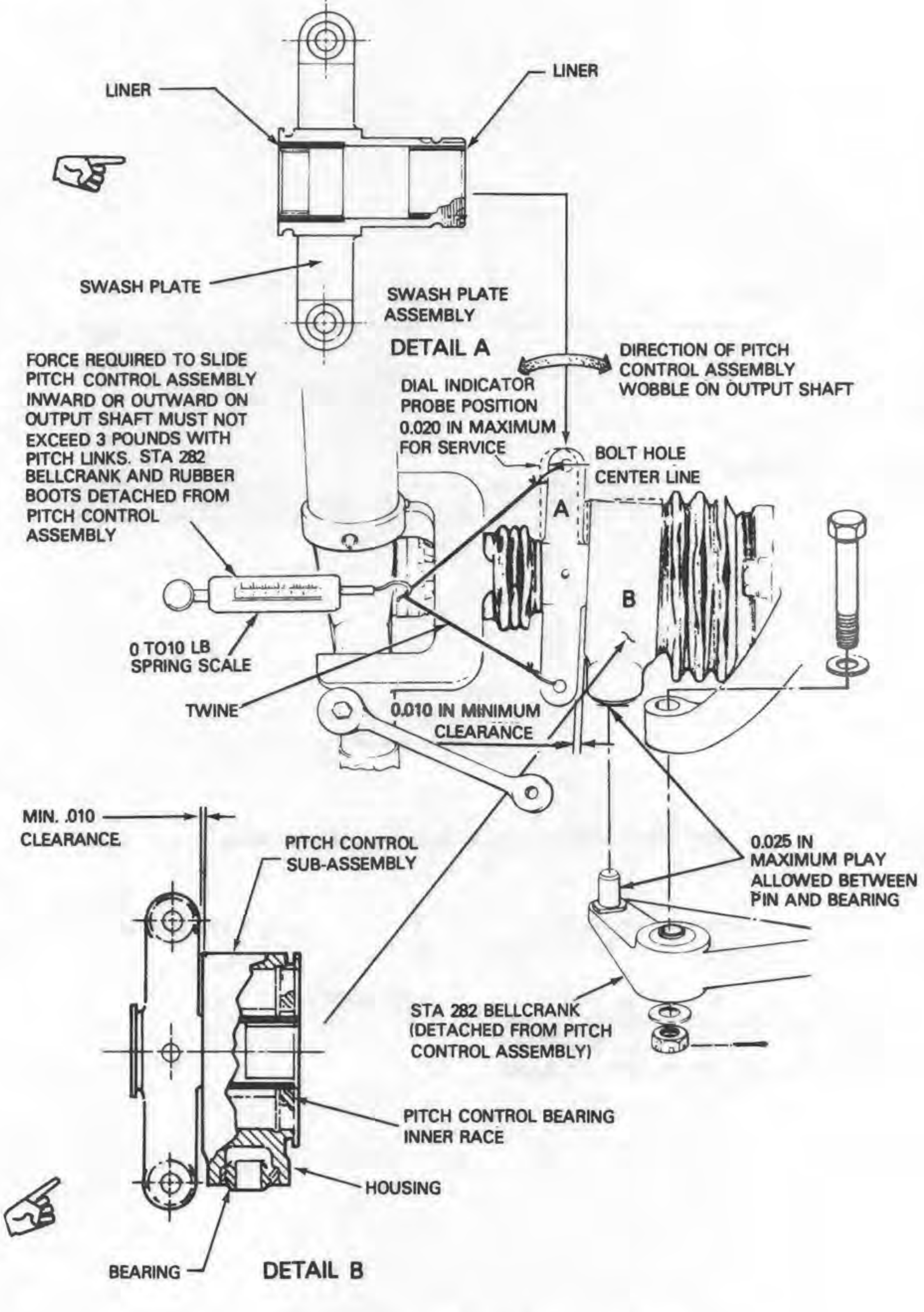


Figure 5-22. Tail Rotor Pitch Control Assembly Inspection

Paragraphs 5-95 through 5-99 and figure 5-23, is deleted.

Table 5-14A. Premaintenance Requirements for Repair of Metal Tail Rotor Blades.

Conditions	Requirements
Minimum Personnel Required	One MOS (68E)
Consumable Materials	(C1) (C2) (C3) (C4)

5-99A. Repair - Metal Tail Rotor Blade. Do not attempt repairs other than those permitted herein. The tail rotor operates at high rpm. For repair of fiberglass tail rotor blades, refer to paragraph 5-94.

WARNING

Unauthorized repairs can exceed balance limits or result in tail rotor failure and possible injury or loss of life.

5-99B. Repair - Metal Tail Rotor Blade Scratches, Nicks, and Gouges.

a. Repair the stainless steel leading edge by polishing out the defect to blend with surrounding surface. Polish with grade 400 abrasive paper (C3).

b. Repair the fork, hub, and blade spars by using grade 400 abrasive paper (C3) to round out and blend the defect . Apply exterior surface touchup treatment and paint touchup.

NOTE

If more than 2 square inches of surface is painted, tail rotor balance may be affected. If epoxy primer coats are removed, the must be refinished and balanced.

c. Repair scratches and gouges on the blade surface or spar that do not exceed the repair limits shown in figure 5-21A by polishing and blending to surrounding area. Use grades 180 through 600 abrasive paper (C1), (C2), (C3), and (C4). Apply exterior surface touchup treatment and paint touchup.

5-99C. Repair - Metal Tail Rotor Blade Tip Cap. No repairs are allowed except for replacement of tip weights and attaching hardware. Tail rotor balance shall be required if tip weights are missing or changed.

Table 5-14B. Premaintenance Requirements for Metal Tail Rotor Blade Replacement.

Conditions	Requirements
Consumable Materials	(C15) (C79)

5-99D. Replacement - Metal Tail Rotor Blade.

A new replacement metal blade is prebalanced with tip weights. This blade can be installed on a tail rotor assembly even though the opposite blade may have some erosion or paint wear that would cause minor balance differences. After installation, the assembly must be checked for balance (para 5-110A) and any weight differences adjusted.

CAUTION

The metal tail rotor assembly blade overhaul and retirement schedule (table 1-7) must always be considered when replacing a tail rotor component. THE TAIL ROTOR ASSBMBLY COMPONENT WITH THE HIGHEST TIME (LEAST SERVICE LIFE) LIMITS THE ASSEMBLY.

NOTE

Always record the number and location of existing balance washers when replacing a blade. This record aids in balance troubleshooting.

a. At the blade pitch control assembly (fig. 5- 23A), remove cotter pin, nut, and washer. Remove the bolt with washer and disconnect the pitch control link.

NOTE

Outboard blade attaching bolts and bushings may be reused. It is necessary to know which outboard bushing was under the bolt head.

b. **Remove the outboard blade attachment nut. Discard; then push the bolt out.**

c. **Pull the blade off the hub trunnion. Remove the blade bushing and crush washer installed in the hub at the attachment holes. Identify bushing removed from under bolt head. Discard the crushed washer.**

CAUTION

Do not disassemble strap shoes from end of strap pack protruding from trunnion. Strap pack parts are not individually replaceable and must remain assembled. Avoid damaging strap pack. Scratches or nicks on strap laminates are cause for replacement of the entire tail rotor blade assembly.

d. If strap pack is to remain exposed for any length of time, wrap exposed end of strap pack with barrier material (C15) or other similar non- abrasive material to protect from damage.

e. Before installation of replacement blade assembly, remove strap pack protective covering and inspect the visible strap pack. Check for scratches, nicks, and damage to the strap pack laminates and strap shoes; none is allowed.

(1) Visually inspect the bushing and bolt for evidence of interference in the radius area.

(2) Inspect outboard retaining bushings for a 0.070 inch radius or countersink on the inside diameter at the flanged end.

(3) Visually inspect the bushing. The outside diameter of the radius or countersink area must be at least 0.489 inch to clear the bolt head radius. On a properly manufactured bushing, the inside diameter edge radius or chamfer will be 0.060 inch minimum. An accurate measurement is not required. The visual inspection is used to detect obvious discrepancies.

(4) Insert a new bolt through the original bushing using hand pressure only. There must be no clearance between the bolt head and the bushing flange.

(5) If the bushing used under the bolt head has an adequate radius or countersink and no clearance is visible, then the original bolt and bushing may be reused if they are otherwise serviceable and protective plating is not worn through.

(6) If the bushing under the bolt head does not have an adequate radius or countersink and clearance is visible the original bushing and bolt must be replaced prior to furhter operation.

NOTE

Inspection procedures prior to installation of new outboard blade attaching bolts and bushings must be accomplished as described in paragraph 5-99De(1), (2), (3), and (4).

f. Slide blade on hub with blade leading edge facing in counterclockwise direction (viewing hub as in figure 5-23A). Use care to keep blade correctly aligned so that hub trunnion slides into blade pitch bearings. Do not use force.

g. Aline bolt holes in root fitting with hole through bushing in outboard shoes of strap pack.

h. Coat contacting surface of crush washers, bushings, bolt and nut with chromate primer (C79) and immediately, while wet, perform steps i and j below.

CAUTION

Do not permit zinc primer on the threads of the bolt or nut. The primer can act as a lubricant and cause incorrect torque applications.

i. Assemble and install new bolt, bushings and crush washers in sequence shown in figure 5-23A. Make certain that direction of bolt is opposite to that of opposing blade. Do not force bolt; it must have an easy but snug fit through blade, shoes and bushings.

CAUTION

During the next step, take care not to exceed the specified 650 inch-pound torque limit. If the outboard blade attachment bolt is overtorqued, replace the bolt, bushings, crush washers and nut. The blade attachment bolt, bushings, crush washers and nut cannot be lossened and retightened after they have once been torqued; replace crush washers and selflocking nut whenever the nut is lossened or removed for any reason

j. Install nut and TORQUE TO 600 TO 650 INCH-POUNDS while zinc chromate primer is wet.

j.1. Bushings removed from under the nut, if otherwise serviceable and protective plating is not worn through, may be reused under the nut. The radius or countersink is not required under the nut.

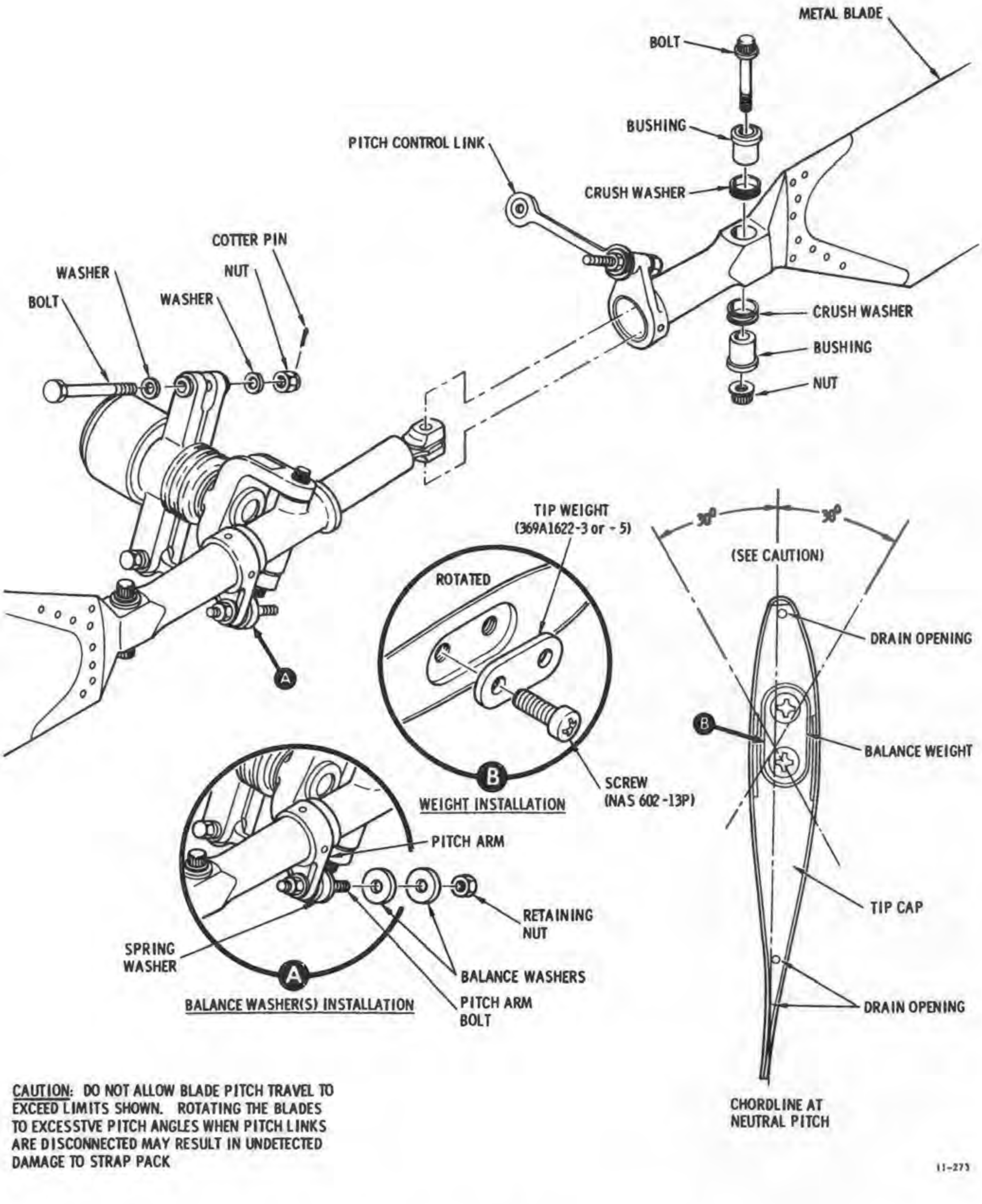


Figure 5-23A. Metal Tail Rotor Blade - Replacement.

CAUTION

After blade is secured to strap pack assembly, do not allow blade pitch travel from neutral to exceed 30 degrees in either direction (fig. 5-23A). Rotating blade to excessive pitch angles may result in undetected damage to strap assembly.

k. At the blade pitch control assembly, position the pitch control link. Install the bolt with washers and nuts. TORQUE NUT TO 50-80 INCH- POUNDS AND INSTALL NEW COTTER PIN.

l. Check the tail rotor assembly for balance (para 5-110A).

5-100. Repair — Tail Rotor Pitch Control System. Repair the tail rotor pitch controls attached at the tail rotor as described in paragraphs 5-101 and 5-102.

5-101. Repair — Tail Rotor Pitch Control Assembly. *a.* Measure the clearance between the swashplate and housing (fig. 5-22). If a minimum clearance of 0.010 inch is not present, the swashplate is unserviceable and must be replaced.

b. Replace a swashplate that exceeds the serviceability limits described in paragraph 5-93.

5-102. Replacement — Tail Rotor Pitch Control Link. Before removal of pitch control links, color code the pitch control arms, bolts, and all washers used at each arm. An identical bolt and the same combination of washers must be reassembled in the positions from which removed or tail rotor balancing will be required.

a. Disconnect ends of pitch control link at swashplate and at pitch control arm, by removing the nuts, washers, and bolts.

b. Insert either end of replacement pitch control link between lugs of swashplate.

c. Install bolt at swashplate with two washers and nut; **TORQUE NUT TO 50 — 80 INCH-POUNDS AND INSTALL NEW COTTER PIN.**

d. Pull pitch control assembly inboard or outboard as required to align pitch control link bearing with pitch control arm bushing.

NOTE

Assemble the extended balance bolt installed in the following step with the spring tension washer on the bolt so that the concave (dished) surface is against the bolt hex portion; then install the reduced OD special washer.

e. Install washer(s), extended balance bolt and nut as shown in figure 5-21. **TORQUE NUT TO 50 — 80 INCH-POUNDS** and install new cotter pin.

Table 5-15. Premaintenance Requirements for Installation of Tail Rotor Assembly.

Conditions	Requirements
Special Tools	(T28)
Consumable Materials	(C3)(C63)

5-103. Installation — Tail Rotor Assembly. (See fig. 5-21.) *a.* Pull beaded end of rotating boot from groove of drive fork and position tail rotor assembly in line with transmission output shaft. Apply lubricant (C63) to inner splines of drive fork only.

b. Rotate tail rotor back and forth slightly until splined swashplate of pitch control assembly engages spline of shaft.

NOTE

Installing tail rotor blades at 90° to the high and low extremes of transmission output shaft runout, using marks applied at time of inspection (chapter 6) reduces chances of high frequency vibration.

c. Slide tail rotor assembly onto shaft. Keep the drive fork-to-hub pivot bolt aligned with lugs of swashplate. Locate tail rotor assembly on shaft so that approximately two threads at end of shaft are exposed outboard of drive fork.

NOTE

Assembling the tang washer, nut, phenolic washer and rubber stop together makes d and e below easier to perform. Marking the outer tang next to the inner key tang also simplifies alignment of the key tang in the shaft groove. Teeter the blades to start the tang washer on the shaft.

d. Slip new tang washer over exposed threads; then install nut by two full turns.

CAUTION

Do not force blade stop into position with a screwdriver; this can crack the stop.

Page 5-58C/5-58D deleted.

NOTE

The phenolic spacer comes in two thicknesses. Install the thickness (0.15- or 0.19-inch) that will keep the tail rotor blade tips at least 2 inches from the boom with approximately 2 pounds pressure applied at the bladetip. Pedals must be placed in neutral (centered) position for this check.

e. Slide tail rotor assembly outboard against nut. Install phenolic spacer (recessed side facing inboard) and rubber stop.

f. Fold back rotating boot to expose groove in shaft. Groove must be clean and free of paint and foreign matter.

NOTE

Split rings with a full chamfer (sharp edge) must be replaced with split rings having a land (flat edge) and chamfer. Check split rings for uniformity of thickness and chamfer. Rings must be used in matched (two-piece) sets. Widths of the flat outer surfaces must be the same. If the chamfer surface is rough, polish with grade 400 abrasive paper (C3).

g. Check tail rotor fork conical split ring seat for yellow spline alignment dot. If dot is on conical surface, remove and repaint on flat surface adjacent to original dot. Insert split ring so that chamfered edges mate with beveled seat in bore of drive fork.

NOTE

Installing the split ring with its center gaps aligned with the blade assembly centerline reduces the chances for high frequency vibration.

h. While holding split ring in place, slide tail rotor assembly inboard; check that chamfered split ring remains completely nested in drive fork bevel. Check that the fork contacts both split rings. **REPLACE THE SPLIT RINGS IF A GAP OF MORE THAN 0.002 INCH EXISTS** between the fork and one split ring with the other in contact.

CAUTION

- **When torquing retaining nut, be sure that torque wrench and adapter form a right angle as shown (detail A); otherwise, torque reading will be in error.**
- Tang washer movement of more than one Tang width is an indication that the Tang washer inner key has sheared. This condition requires replacement of the washer and reassembly of parts according to the initial installation procedures. To prevent washer movement a nonmetallic rod may be inserted between Tang washer and supported on the fork drive during installation of the nut.

i. Using torque wrench adapter (T28), torque nut to 550 — 600 inch-pounds. Back off the nut to approximately 200 — 250 inch-pounds; then **FINAL TORQUE TO 400 — 450 INCH-POUNDS.**

CAUTION

Tail rotor control pedals, in the following step, must be positioned in neutral. If the foot pedals are in the extreme right or left position, the pitch control links and the stop may be damaged by forcing the blade about the teetering axis against the stop.

j. Install beaded end of non-rotating boot (drain/vent holes down) into groove of pitch control housing. Install beaded end of rotating boot into groove of drive fork.

k. Position station 282 bellcrank so that pivot pin slips into bearing of pitch control assembly.

l. Rotate bellcrank back and forth as required to align bearing with gearbox arm. Install bolt, two washers, nut, and new cotter pin.

m. With the rotor control pedals in neutral, check blade-to-boom clearance at maximum teeter position. Refer to NOTE above step e. Bend tab on tang washer to lock retaining nut.

CAUTION

One-half spline mis-alignment between pitch control swashplate and hub drive fork is possible. Perform the following check.

n. Position tail rotor pedals in neutral and observe whether the hub drive fork, the pitch links, and the swashplate are in a line parallel to the gearbox output shaft centerline. If incorrectly assembled, the swashplate will be misaligned approximately 10 degrees from the drive fork. To correct this condition, disconnect the pitch links, remove and rotate the tail rotor 180 degrees; reinstall and reconnect the links.

o. Inspect to determine that there will be no relative motion between the inner race of the pitch control bearing and the tail rotor swashplate (fig. 5-22).

p. Check rigging of tail rotor controls after installation of any removed or replaced parts (chapter 11).

All data on pages 5-60 through 5-65, including paragraphs 5-103A through 5-110, figures 5-24 through 5-26, tables 5-16 and 5-17, is deleted.

5-110A. Balance and Vibration Analysis - Metal Blade Tail Rotor Assembly.

Balancing of tail rotor assemblies with metal blades is accomplished by use of the Chadwick-Helmuth balancing kit. The carrying case of this kit contains all instrumentation, balance charts and miscellaneous items needed to balance the tail rotor. Also included is a track and balance handbook for use with the equipment to correct balance when such can be obtained by addition or subtraction of weight at pitch-arm studs or at blade tips. Since vibration reduction by weight adjustment is dependent on proper mechanical condition of the tail rotor and tail rotor drive system, troubleshooting information in paragraph 5-89 should be used with balancing kit instructions. Acceptance criteria for balance and vibration are contained in the balancing kit and on each balance chart. For specific instructions on use of the balancing hardware, refer to a and b below.

a. Balance at Blade Pitch Arm. (See figure 5-23A.) Weight increase at light pitch arm may be obtained by removal of equivalent washer weight from opposite pitch arm. Always remove washers from opposite pitch arm, if installed, and subtract from weight to be added before adding more weight . For washer data, refer to table 5-18. Maximum washer weight allowed at either pitch arm bolt is 26.91 grams (23 washers).

NOTE

There is possibility of slight weight variation between pitch control links. If tail rotor has maximum balance washer weight allowed on one pitch arm, compare the two links. If pitch link opposite the weight requirement appears larger, exchange one link for the other and repeat vibration analysis.

b. Balance at Blade Tip. When balancing procedures indicate that weight should be added to a tip it is preferable (if possible) to remove an equivalent weight from the opposite tip, to keep overall weight to a minimum. Installation of tip weights is not mandatory. However, open screw holes are not permitted; screws must be installed. Shorter than normal screws may be used for balance if minimal thread engagement (5/16-inch) exists.

(1) Remove tip-weight screws and weights (fig. 5-23A). Select balancing hardware indicated by balancing procedure.

(2) Install combination of weights required. Maximum weight permitted is twenty-four grams at each tip. For balance hardware data, refer to table 5-18.

5-111. Rigging Check — Tail Rotor Controls. Check rigging of tail rotor controls following installation of any removed or replaced parts. (Refer to chapter 11.)

Table 5-18. Metal Blade Tail Rotor Balance Weight - Value Chart

At Blade Tip (Note 4)			At Blade Pitch Arm (Note 3)			
	Screw (Note 5)			Washer (Note 1, 2)		
Part Number	Length (Inch)	Weight (Grams)	Part Number	Thickness (Inch)	Weight (Grams)	OD (Inch)
NAS1352-08-12P	0.75	2.22	HS306-227L	0.016	1.17	0.800
NAS1352-08-14P	0.875	2.44				
	Weight					
	Thickness (Inch)	Weight (Grams)				
369A1622-3	0.016	0.29				
369A1622-5	0.036	1.76				

Notes:

1. Used on balance bolt.
2. Maximum of 23 washers is permitted on each balance bolt.
3. Minimum of two threads must extend past nut securing balance washers on balance bolt.
4. Maximum weight of weight plus screws is 24 grams.
5. Minimum screw thread engagement is 5 16 inch.

CHAPTER 6

DRIVE TRAIN SYSTEM

SECTION I GENERAL

6-1. POWER TRAIN SYSTEM.

6-2. Description — Power Train System. The power train system, starting at the engine power takeoff pad, consists primarily of the overrunning clutch, drive shaft, and transmission shown in figure 6-1. At 100 percent, N2, engine power output through the clutch to the main transmission is 6000 rpm; main transmission output to the main rotor is 470 rpm. Main transmission output through the tail rotor drive shaft to the tail rotor transmission is 2045 rpm; tail rotor transmission output to the tail rotor is 3018 rpm. Rotation of the components is in the direction shown in figure 6-1.

6-3. Troubleshooting — Power Train System. Refer to table 6-1.

SECTION II MAIN DRIVE SHAFT

6-4. MAIN ROTOR DRIVE SHAFT.

6-5. Description — Main Rotor Drive Shaft. The main rotor drive shaft is a shot-peened, nitrided steel-alloy forging having a spline coupling at one end that mates with the main transmission output shaft (fig. 6-2), and an octagonally shaped head that attaches to the main rotor hub with four bolts and four hoisting eyebolts.

6-6. Inspection — Main Rotor Drive Shaft (Installed). Check exposed head of drive shaft for scratches, cracks, breaks, loosened attaching bolts, and any indication of stress damage.

6-7. Removal — Main Rotor Drive Shaft.

CAUTION

The main rotor drive shaft is a highly stressed part. Do not allow tools to strike the shaft, or the shaft to strike any object. Any impact damage may require replacement of the drive shaft.

a. Remove the nuts, washers, bolts, and lifting bracket or hoisting eyebolts (fig. 6-3).

CAUTION

Any time the drive shaft is removed, cover the opening in the top of the main rotor hub to prevent possible entry of foreign matter into the hub, mast and the transmission.

b. Lift drive shaft clear of main rotor hub.

6-8. Inspection — Main Rotor Drive Shaft (Removed). *a.* Check all surfaces of drive shaft for dents, nicks, scratches, and evidence of deformation. No damage of any kind is permissible in the area within 3.6 inches of the transmission end of the shaft. Dents less than 0.005-inch deep and 0.50-inch diameter are permissible in other areas. A dent is defined as a smooth depression of the surface with no sharp edges or abrupt changes in contour.

b. Check all external surfaces of shaft for corrosion.

c. Check for spline wear (0.005 inch maximum). Wear is measured by placing two 0.108 inch pins in opposite spline grooves; minimum diameter over the pins is 2.265 inches.

d. If shaft condition is questionable, refer to AVIM for magnetic particle inspection according to TM 55-1500-204-25/1. No surface or subsurface cracks are permissible.

e. Check entire shaft for presence of oil coating.

6-9. Repair — Main Rotor Drive Shaft. No repair of the drive shaft is permitted except for the removal of

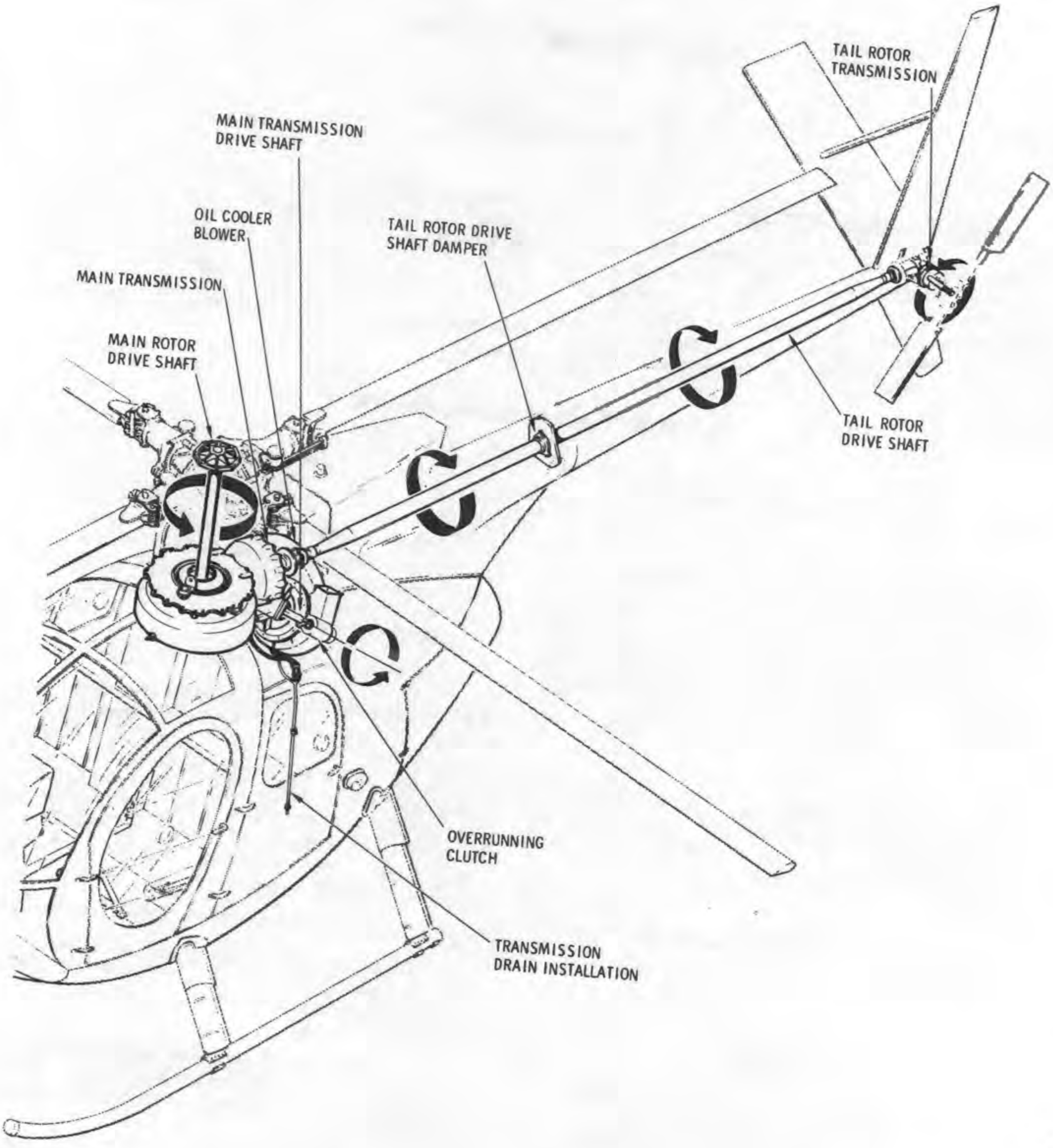


Figure 6-1. Power Train System.

Table 6-1. Troubleshooting of the Power Train System.

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

NOTE

Before you use this table, be sure you have performed all normal operational checks. If you have a malfunction which is not listed in this table, notify the next higher level of maintenance.

1. **Main rotor does not rotate.**

STEP 1. Check to make sure that the N2 turbine is not turning (TM 55-2840-231-24).

STEP 2. Check for defective overrunning clutch.

If the overrunning clutch is found defective, replace the overrunning clutch (para 6-27).

STEP 3. Check for defective main transmission.

If the main transmission is found defective, replace the main transmission (para 6-35).

2. **Main transmission drive shaft vibrates.**

STEP 1. Check for loose attaching bolts on main transmission drive shaft (para 6-13).

If the attaching bolts are found to be loose, retorque the bolts (para 6-17).

STEP 2. Check for dented or bent drive shaft (para 6-13).

If the drive shaft is found to be dented or bent, check the drive shaft for serviceability limits. Repair or replace the shaft as necessary (para 6-11).

STEP 3. Check for loose or incorrectly shimmed couplings (para 6-17).

If the couplings are found to be loose or incorrectly shimmed, check couplings for not less than 0.010 inch shimming. Adjust shims as required to maintain correct installation fit of driveshaft. Check coupling bolt for correct torque (para 6-17). Install the correct number and size of shims under couplings (para 6-17) as necessary.

STEP 4. Check for cracks in the diaphragm discs or welds.

If cracks are found in diaphragm discs or weld areas replace the drive shaft (para 6-14).

3. **Excessive noise or high frequency vibration in oil cooler blower assembly.**

STEP 1. Check for cracked or loose rivets on the impeller or a damaged scroll.

If the impeller or scroll is found defective, replace that particular item (para 6-19).

4. **Overrunning clutch vibrates or will not free-wheel.**

STEP 1. Check for a defective clutch.

If the overrunning clutch is found to be defective, replace the clutch (para 6-32).

5. **Main transmission requires frequent oil servicing.**

STEP 1. Check for oil leakage at the transmission input or output seals.

If oil leakage rate exceeds specified limits (para 6-104), replace the transmission (para 6-38).

STEP 2. Check for oil leakage around the accessory drive cover.

If oil leakage is found around the accessory drive cover, replace the transmission (para 6-38).

6. **Oil temperature warning light comes on.**

STEP 1. Check for a defective oil temperature sender.

If the oil temperature sender is defective, replace the oil temperature sender (para 6-53).

Table 6-1. Troubleshooting of the Power Train System. (cont)

STEP 2. Check for a blockage of the cooling air.

If a blockage is found, clear the blockage and clean the immediate area.

STEP 3. Check for low oil level or oil above full level in main transmission.

If the oil level is incorrect, establish correct oil level (chapter 1).

STEP 4. Check for a defective lubrication pump.

If the lubrication pump is found to be defective, replace the pump (para 6-46).

STEP 5. Check for defective bearings or gears.

If the bearings or gears are found to be defective, replace the transmission (para 6-38).

7. Excessive noise in main transmission.

NOTE

Noise that signals a defective transmission should not be confused with normal gear backlash noise usually audible at rundown or low rpm, low power conditions.

STEP 1. Check transmission oil filter and chip detector for contamination.

If contamination is found, replace the transmission (para 6-38).

8. Oil pressure warning light on (oil pressure low). Light should go out at approximately 55 percent N2.

STEP 1. Check for low oil level in main transmission.

If the main transmission oil level is low, service the transmission (chapter 1).

STEP 2. Check for a defective oil pressure sender.

If the oil pressure sender is found to be defective, replace the sender (para 6-53).

STEP 3. Check for a defective lubrication pump.

If the lubrication pump is found to be defective, replace the pump (para 6-46).

STEP 4. Check for a clogged filter element.

If the filter element is found to be clogged, remove, clean, and replace filter element (para 6-45).

STEP 5. Check for an internal lubrication system failure.

If the internal lubrication system is found to have failed, replace the transmission (para 6-38).

9. Tail rotor drive shaft or damper vibrates at high frequency (100 percent N2).

STEP 1. Check the damper alignment.

If the damper is found to be out of alignment, adjust damper friction (para 6-85).

STEP 2. Check for a defective damper.

If the damper is found to be defective, replace the damper (para 6-86).

STEP 3. Check for a bent or dented tail rotor drive shaft.

If the tail rotor drive shaft runout is beyond limits, replace the tail rotor drive shaft (para 6-14).

STEP 4. Check for loss of balance weights or defective tail rotor drive shaft.

If balance weights are missing or the tail rotor drive shaft is defective, replace the tail rotor drive shaft (para 6-14).

STEP 5. Check for tail rotor out of balance.

If the tail rotor is found to be out of balance, rebalance or replace the tail rotor (chapter 8).

Table 6-1. Troubleshooting of the Power Train System. (cont).

STEP 6. Check for loose or incorrectly shimmed couplings.

If a coupling is loose or incorrectly shimmed, check coupling for not less than 0.010 inch shimming. Adjust shims as required. Retorque coupling bolt(s), (para 6-17).

STEP 7. Check for water in the tail rotor transmission coupling diaphragm.

If water is found in the tail rotor transmission coupling diaphragm, drain the water. Replace coupling if it is corroded (para 6-76).

10. Tail rotor transmission output shaft vibrates.

STEP 1. Check for bent or excessive tail rotor transmission output shaft run-out.

If the tail rotor transmission output shaft is bent or the run-out is excessive, replace the tail rotor transmission (para 6-93).

11. Excessive noise in tail rotor transmission.

STEP 1. Check chip detector for contamination.

If contamination is found, replace the transmission (para 6-93).

12. Chip detector caution light on.

STEP 1. Check for contamination of the transmission oil.

If metal particles are found refer to paragraph 6-54 for inspection and maintenance procedures.

STEP 2. Check for a defective chip detector.

If the chip detector is found to be defective, replace the chip detector.

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minor scratches or dents and light surface corrosion by using the procedures outlined below.

CAUTION

Do not allow hands or fingers to contact any part of the shaft after degreasing and cleaning steps.

a. Degrease affected area of the drive shaft with a clean cloth saturated by solvent (C96).

CAUTION

The metal conditioner used in *b* below will irritate hands on repeated exposure. Protective rubber gloves should be worn.

b. This step is necessary for corrosion removal only. For scratch and dent removal proceed with *c* below. Using a clean cloth or brush, apply a diluted solution (1 part to 3 parts water) of metal conditioner (C68A) to corroded area. Keep wet with solution for 10 minutes, or until corrosion appears to be removed. Wipe clean, inspect, and repeat as necessary until there is no further evidence of corrosion.

c. Rinse with water and dry with a clean cloth.

d. Lightly abrade the affected surface with grade 400 abrasive cloth (C24) to remove the blemish. If metal removal exceeds the depth for the specified area listed below the shaft is unserviceable and must be replaced. (See fig. 6-3.)

(1) *Area 1:* Removal in excess of 0.001 inch from the surface between 3.6 to 6.0 inches of the transmission end of the shaft.

(2) *Area 2:* No damage or rework is allowed. Replace shaft.

(3) *Area 3:* Removal in excess of 0.005 inch from the surface of the shaft between areas 1 and 2.

(4) *Area 4:* No damage or rework is allowed. Replace shaft.

e. Repeat *a* through *c* above.

f. Immediately apply a coating of preservative oil (C61). Oil should cover the entire shaft after rework.

Table 6-2. Premaintenance Requirements for Installation of Main Rotor Drive Shaft.

Conditions	Requirements
Special Tool	(T30)

6-10. Installation — Main Rotor Drive Shaft. (See fig. 6-3.)

WARNING

Before installation of main rotor drive shaft, verify that the main rotor hub retaining nut is secured and safetied according to paragraph 5-23.

a. Check that shaft is coated with corrosion preventive (para 6-9). Position drive shaft over main rotor hub with gear coupling down.

b. Slowly and carefully lower drive shaft through main rotor hub and mast until gear meshes with main transmission internal gear teeth.

c. Rotate drive shaft head until holes align with main rotor hub.

d. On aircraft equipped with lifting bracket, install bracket, four attaching bolts and countersunk washers (beveled sides next to boltheads). Install one flat washer and nut on each bolt but do not tighten bolts.

e. On aircraft equipped with hoisting eyebolts, install four eyebolts and countersunk washers (beveled sides next to boltheads) at every second bolthole location. Install two flat washers and nut on each bolt but do not tighten nuts.

f. Install four remaining bolts in the same manner, using two flat washers under each nut.

g. Align hoisting eyebolts so that a centerline through the eyebolt flats intersects the drive shaft axis.

h. **TORQUE ALL NUTS TO 120 TO 140 INCH-POUNDS** using torque wrench adapter (T30) as shown in figure 6-3.

i. After installation of main rotor drive shaft, apply sealant C88 where drive shaft meets main rotor hub.

6-11. MAIN TRANSMISSION DRIVE SHAFT.

6-12. Description — Main Transmission Drive Shaft. The main transmission drive shaft (fig. 6-2) is located behind the sound insulation and access cover at the center of the cargo compartment aft bulkhead. The drive shaft is a dynamically prebalanced steel shaft equipped with a flexible diaphragm-type joint and mounting flange at each end. The shaft interconnects the overrunning clutch and the transmission input shaft.

6-13. Inspection — Main Transmission Drive Shaft (Installed). *a.* Remove the sound insulation and access cover from the cargo compartment aft bulkhead.

b. Inspect the drive shaft diaphragms for dents, cracks, scratches, nicks, corrosion, and evidence of joint separation from the shaft or at the outside diameter edges. Evidence of any such defects on either diaphragm requires removal of the shaft from service.

c. Inspect the drive shaft tube between diaphragms for dents, scratches, cracks, or corrosion pits.

d. Measure depth and diameter of dents. Dents that blend smoothly into surrounding surface area with no sharp change in contour and do not exceed 0.015-inch depth are acceptable. Dents that are not within these limits require removal of the shaft from service.

e. Measure depth of cracks, nicks, corrosion pits, or scratches; length and direction are not critical. **MAXIMUM DEPTH ALLOWED BEFORE REWORK IS 0.003-INCH.** The shaft must be removed to perform rework.

f. Check suspected cracks by using dye penetrant. If a crack indication appears, remove the black (phenolic compound) coating from the area by using grade 400 abrasive paper (C3).

NOTE

The drive shaft is coated with a special phenolic thermosetting compound. It is a brittle coating that may indicate a crack that does not penetrate the tube.

g. Reinspect the questionable area by using dye penetrant. If condition remains questionable, remove shaft for magnetic particle inspection. If crack does not reappear, polish the surface with crocus cloth (C25) to restore the original shaft finish, and touch up the polished area with primer coating (C79).

h. Check attaching bolts for looseness.

i. Install access cover and sound insulation.

6-14. Removal — Main Transmission Drive Shaft. (See fig. 6-4.) *a.* Remove sound insulation and main gearbox access door over main transmission drive shaft in the cargo compartment (chapter 2).

b. Remove eight bolts and washers that secure shaft to couplings.

c. Remove drive shaft; use care to prevent shaft from striking any object.

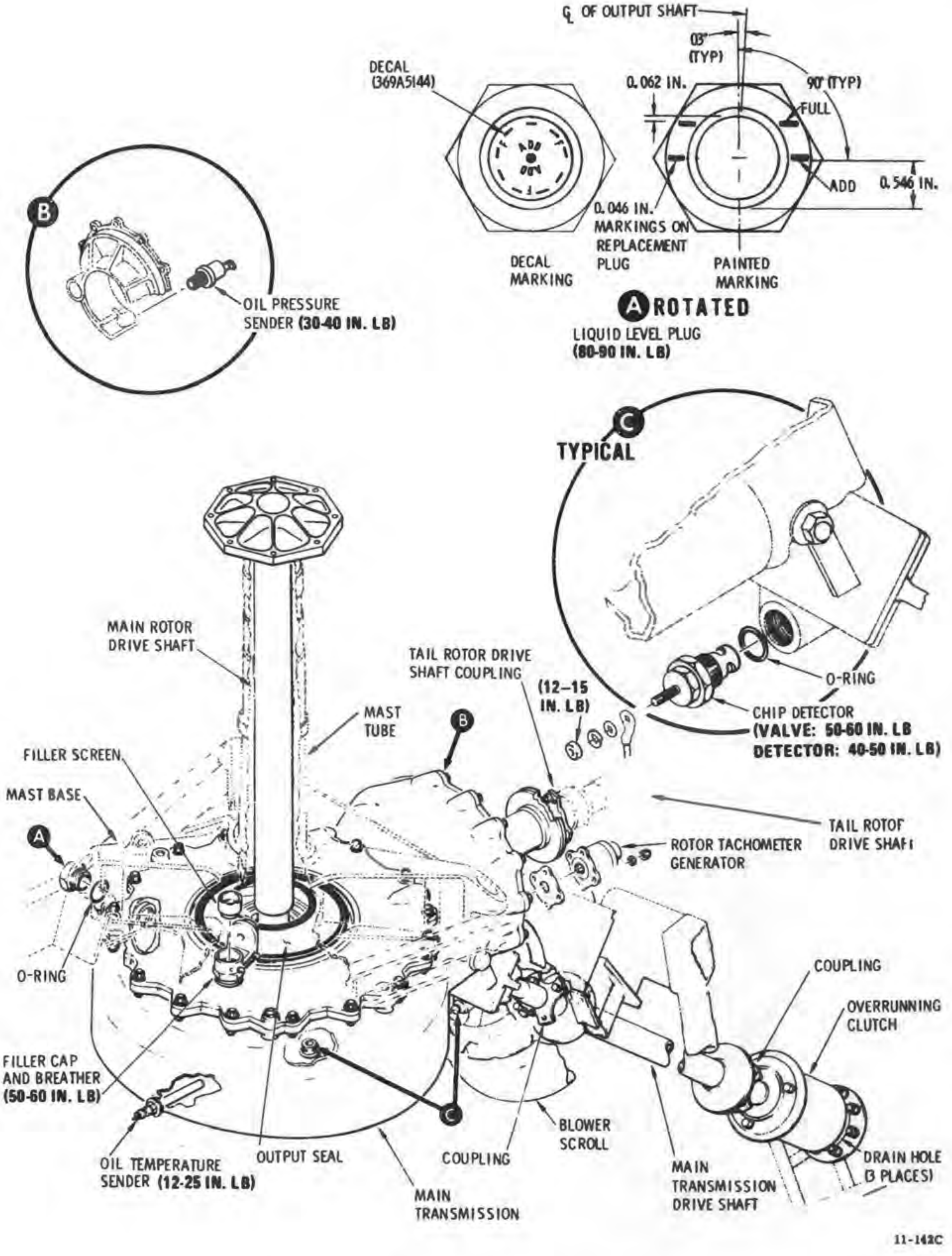
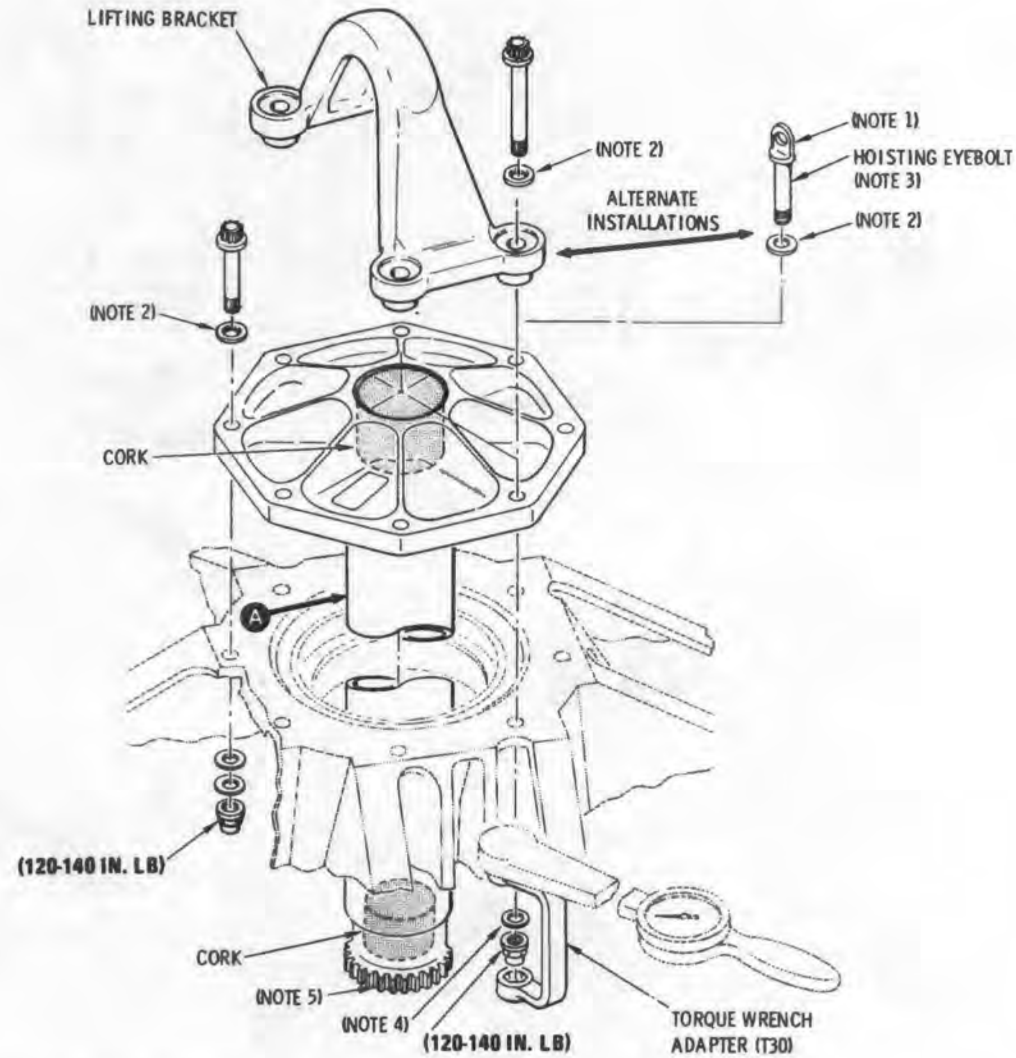
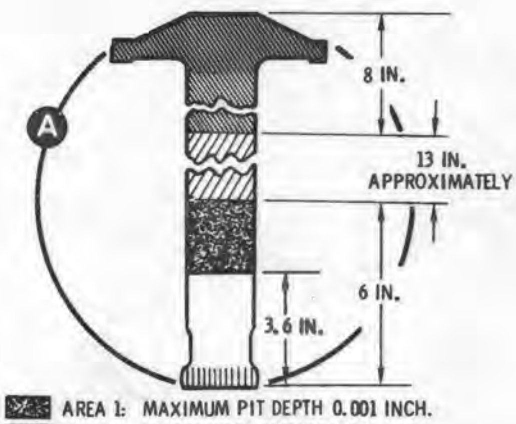


Figure 6-2. Main Transmission Installation.





AREA 1: MAXIMUM PIT DEPTH 0.001 INCH.
AREA 2: NO DAMAGE PERMISSIBLE.
AREA 3: MAXIMUM PIT DEPTH 0.005 INCH.
AREA 4: NO DAMAGE PERMISSIBLE (NOTE 5).

NOTES:

1. FLAT OF EYEBOLT HEADS TO INTERSECT DRIVE SHAFT AXIS.
2. INSTALL WITH COUNTERSINK NEXT TO EACH BOLTHEAD. OTHER WASHERS ARE STANDARD FLAT.
3. REPLACE ORIGINAL EYEBOLTS (1.235 IN. SHANK) WITH 369A1010-3 EYEBOLTS (1.360 IN. SHANK) WHEN AVAILABLE AND INSTALL TWO FLAT WASHERS AN960KD416L UNDER EACH OF THE FOUR NUTS.
4. INSTALL ONLY ONE FLAT WASHER UNDER NUTS AT THE FOUR LIFTING BRACKET BOLT LOCATIONS AND TWO WASHERS UNDER FOUR REMAINING NUTS.
5. TO CHECK FOR SPLINE WEAR, PLACE TWO 0.108 IN. PINS IN OPPOSITE SPLINE GROOVES; MINIMUM DIAMETER OVER THE PINS IS 2.265 IN.

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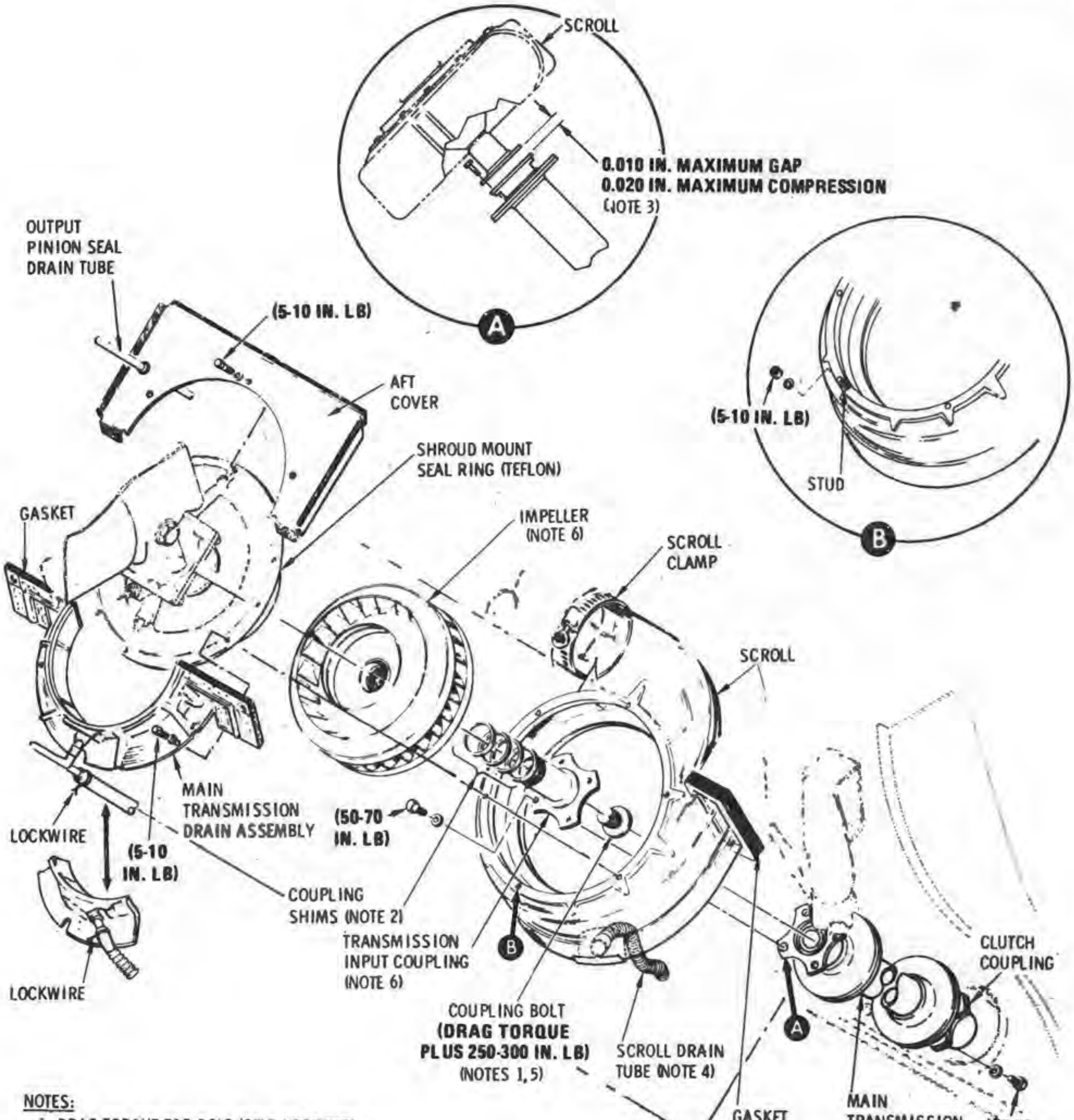
Figure 6-3. Main Rotor Drive Shaft.



NOTES:

1. DRAG TORQUE FOR BOLT (SELF-LOCKING) SERVICEABILITY IS 15 IN. LB MINIMUM, 150 IN. LB MAXIMUM.
2. CORROSION RESISTANT STEEL SHIM; 0.002-IN. LAMINATIONS. CAUTION: ID MUST NOT BE MORE THAN 1.20 IN.
3. CHECK WITH LOWER END OF SHAFT ATTACHED.
4. SCROLL DRAIN INSTALLATION NOT INSTALLED ON ALL AIRCRAFT.
5. COAT COUPLING BOLT THREADS WITH ANTISEIZE COMPOUND (C14) BEFORE ASSEMBLY.
6. COAT COUPLING AND IMPELLER SPLINES WITH LUBRICANT (C63).

Figure 6-4. Main Transmission Drive Shaft and Oil Cooler Blower Replacement

6-15. Inspection — Main Transmission Drive Shaft (Removed). *a.* Check the drive shaft diaphragms for dents, cracks, scratches, nicks, corrosion and evidence of joint separation from the shaft or at the outside diameter edges. Evidence of any such defects on either diaphragm requires replacement of the shaft.

b. Check the drive shaft tube between diaphragms for dents scratches, cracks, or corrosion pits. Determine serviceability according to *c* through *e* below.

c. Measure depth and diameter of dents. Dents that blend smoothly into surrounding surface area with no sharp change in contour and that do not exceed 0.015-inch depth are acceptable. Dents that are not within these limits require replacement of the shaft.

d. Measure depth of cracks, nicks, corrosion pits, or scratches; length and direction are not limited. **MAXIMUM DEPTH ALLOWED BEFORE REWORK IS 0.003 INCH.**

e. Check suspected cracks using fluorescent-penetrant according to TM 55-1500-204-25/1. If a crack indication appears, remove the black (phenolic compound) coating from the area with grade 400 abrasive paper (C3) and crocus cloth (C25) according to paragraph 6-16.

NOTE

The drive shaft is coated with a special phenolic thermosetting compound. It is a brittle coating that may indicate a crack that does not penetrate the tube.

f. Reinspect the suspected area using magnetic-particle or fluorescent-penetrant methods (TM 55-1500-204-25/1). If crack does not reappear, touch up cleaned area with primer coating (C79) and return part to service.

NOTE

Perform inspections g and h below only if shaft damage is suspected.

g. Check shaft tube for out-of-round conditions. **OUT-OF-ROUND SHALL NOT EXCEED 0.060-INCH TIR.**

h. Check shaft for straightness. **SHAFT SHALL BE WITHIN 0.030-INCH TIR** at all locations relative to the centerlines of the two flange mounting bolt patterns.

i. Check all attaching hardware for stripped or crossed threads, and corrosion. Discard unserviceable hardware. Check nutplates for drag torque.

6-16. Repair — Main Transmission Drive Shaft. *a.* Repair of the drive shaft coupling diaphragms is not permissible.

b. Repair all shaft tube damage that is **NOT DEEPER THAN 0.003 INCH.** Completely remove the defect. Maintain a smooth transition into the surrounding surface. Use grade 400 wet or dry abrasive paper (C3) for preliminary finishing, followed by polishing with crocus cloth (C24). Restore the surface until it equals the original finish of the shaft. After rework, check the shaft tube wall thickness in the repair area. Wall thickness shall not be less than 0.025 inch. Apply primer coating (C79) for corrosion protection.

6-17. Installation — Main Transmission Drive Shaft. (See fig. 6-4.) *a.* Assure that coupling bolt threads are coated with anti-seize compound (C14) and **BOLT IS TORQUED TO ACTUAL DRAG TORQUE PLUS 250-300 INCH-POUNDS.**

NOTE

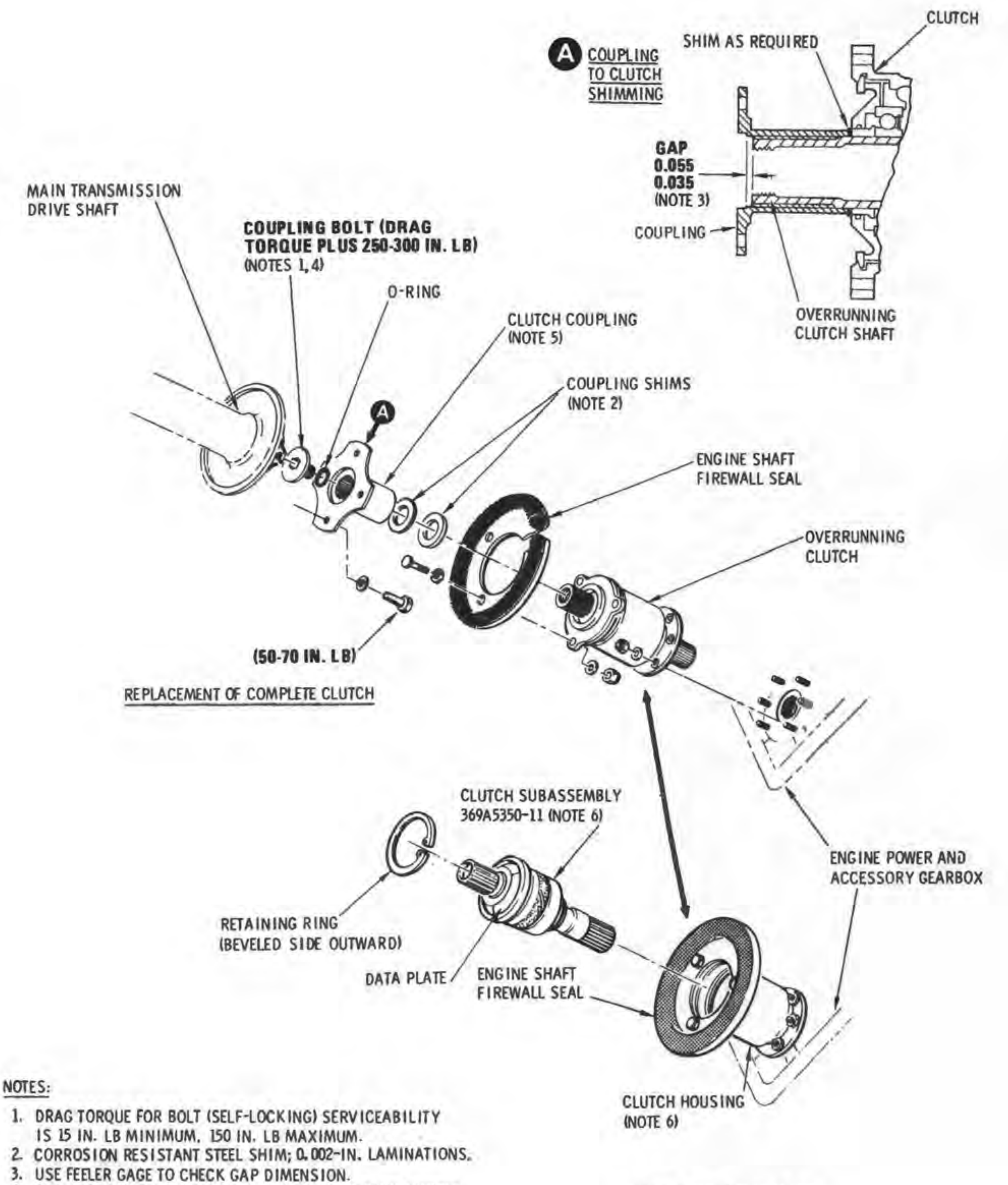
If a bolt is not seated and/or existing torque is found to be less than 250 inch-pounds, check to be sure that the bolt's self-locking drag torque is not less than 15 or more than 150 inch-pounds before retorquing bolt.

b. Position main transmission drive shaft between couplings. **COMPRESSION OF THE DIAPHRAGMS (STATIC STATE) IS LIMITED TO 0.020 INCH.** If shaft diaphragm compression is excessive, continue with *c* below. If diaphragm compression is within limits or if there is a gap between the shaft flanges or the coupling flanges, continue with *d* below.

CAUTION

Do not use clutch coupling shims under the transmission coupling. The OD of these shims is approximately the same; however, the ID of the clutch coupling shims (1.260 to 1.270 inches) is approximately 0.070 inch larger than the transmission coupling shims ID. The difference in ID can cause improper seating of the shim resulting in misalignment and cocking of the coupling.

c. Remove the bolt that secures the transmission coupling and remove coupling. Remove sufficient shims to eliminate excessive diaphragm compression, retaining a **MINIMUM OF 0.010 INCH IN SHIMS THAT MUST REMAIN INSTALLED UNDER COUPLING.**



NOTES:

1. DRAG TORQUE FOR BOLT (SELF-LOCKING) SERVICEABILITY IS 15 IN. LB MINIMUM, 150 IN. LB MAXIMUM.
2. CORROSION RESISTANT STEEL SHIM; 0.002-IN. LAMINATIONS.
3. USE FEELER GAGE TO CHECK GAP DIMENSION.
4. COAT COUPLING BOLT THREADS WITH ANTISEIZE COMPOUND (C14) BEFORE ASSEMBLY.
5. COAT COUPLING-TO-CLUTCH SPLINES WITH LUBRICANT (C63).
6. THE CLUTCH SUBASSEMBLY SERIAL NUMBER IDENTIFIES THE COMPLETE REPAIRED CLUTCH. REFER TO TEXT.

Figure 6-5. Overrunning Clutch Repair or Replacement.

Coat bolt threads with anti-seize compound (C14) and coupling splines with lubricant (C63). Reinstall coupling and bolt. **CHECK THAT BOLT DRAG TORQUE IS NOT LESS THAN 15 OR MORE THAN 150 INCH-POUNDS. TORQUE BOLT TO ACTUAL DRAG TORQUE PLUS 250-300 INCH-POUNDS.**

NOTE

Transmission input coupling shims are laminated stock. Each lamination is 0.002 inch thick. Peel away as required.

d. Attach drive shaft lower flange to clutch coupling with four bolts and washers. **TORQUE BOLTS TO 50 — 70 INCH-POUNDS.**

e. Align the drive shaft and transmission coupling flanges. **ASSURE THAT SHAFT DIAPHRAGM COMPRESSION DOES NOT EXCEED 0.020 INCH** or that gap between drive shaft and coupling flanges **DOES NOT EXCEED 0.010 INCH.** Attach drive shaft upper flange to transmission coupling with four bolts and washers. **TORQUE BOLTS TO 50 — 70 INCH-POUNDS.**

f. Install access door and sound insulation over main transmission drive shaft.

6-18. OIL COOLER BLOWER.

6-19. Description — Oil Cooler Blower. The blower (fig. 6-4) consists of an impeller mounted directly on the transmission input pinion gear shaft, within a polycarbonate plastic scroll-type enclosure that is attached to the transmission housing. The impeller, a riveted and brazed assembly of aluminum blades and a casting, is dynamically balanced at 6000 rpm. The blower draws cooling air over the main transmission in addition to supplying forced ambient air to the engine oil cooler, compartment heating system, and the engine area. Chapter 4 provides information on the oil cooler ducting.

6-20. Inspection — Oil Cooler Blower (Installed). *a.* Check for damage such as cracks, holes, crazing, or parting of joints.

b. Check for security of attaching bolts around the lower flange of the main transmission.

c. Check for scroll wear caused by impeller rubbing.

6-21. Removal — Oil Cooler Blower. (See fig. 6-4.) *a.* Remove main transmission drive shaft (para 6-14).

b. Remove scroll drain tube from scroll, if installed.

c. Loosen scroll clamp.

d. Remove bolts and washers that attach scroll to main transmission. (Remove nut from scrolls fitted with stud.)

e. Remove drain tubes, scroll, aft cover, and main transmission drain assembly.

f. Remove coupling bolt, transmission input coupling, shim(s), and impeller. Retain shim(s) with coupling for reuse.

6-22. Inspection — Oil Cooler Blower (Scroll Removed). *a.* Check for surface damage. Scratches and nicks that do not exceed 0.012 inch in depth are repairable.

b. Check for, and measure length of cracks. Cracks that do not exceed 3.0 inches in length, do not extend to the hardware mounting holes, and will not impair the function of the scroll are repairable.

c. Check ribs and seams for separation, and threaded inserts (and stud, as applicable) for stripped threads or looseness in flange.

NOTE

There may be small irregular-shaped voids in the cement between the cemented pieces. Such voids shall not be considered as delamination (separation).

d. Check rectangular gasket for deterioration.

e. Check for scroll wear caused by impeller rubbing.

f. Check teflon seal ring (fig. 6-4) that is bonded to the transmission shroud and bearing retainer mount. Seal ring must be completely bonded around the mount perimeter.

6-23. Inspection — Oil Cooler Blower (Impeller Removed). *a.* Check for cracks and separated or deformed vanes. A cracked impeller, or one having damaged vanes, shall be replaced.

b. Check for surface damage. Scratches and nicks not exceeding 0.006-inch depth are repairable.

6-24. Repair — Oil Cooler Blower Scroll. *a.* Repair cracks that do not exceed 3 inches in length, do not extend to the hardware mounting holes, and will not impair the function of the scroll. Repair by bonding a patch according to chapter 2 instructions.

b. Repair scratches and nicks not exceeding 0.012-inch depth by sanding the affected area to blend smoothly with surrounding surface area. Use grade 280 abrasive paper (C2).

c. Replace inserts that are stripped or loose. Use self-locking inserts NAS1394-3L for replacement.

d. Repair small areas of rib or seam separation by injecting dichloromethane (C38) into void area and cementing together under light pressure. Repair deteriorated or otherwise damaged gasket (fig. 6-4) by replacing with new gasket material (C44).

e. Repair a teflon seal ring that is not completely secure around outside of transmission shroud and bearing retainer mount by bonding loose area with a mixture of 100 parts of resin (C84) to 74 parts of activator (C5). Cure at 150°F for 1 hour or 8 hours at room temperature.

6-25. Repair — Oil Cooler Blower Impeller. *a.* Replace an impeller that is cracked, has damaged vanes, or loose rivets securing adapter to impeller or balance weights to impeller.

b. Repair scratches and nicks not exceeding 0.006-inch depth by sanding. Use grade 280 to 400 abrasive paper (C2) and (C3) to blend defect into surrounding surface area.

6-26. Installation — Oil Cooler Blower. (See fig. 6-4.)

NOTE

Paragraph 6-55 contains initial installation instructions for the scroll drain tube.

a. Coat transmission input shaft with lubricant (C63) and slide impeller on shaft.

b. Install retained shim(s), transmission input coupling, and coupling bolt. (Shim thickness shall not be less than 0.010 inch.) **CHECK THAT BOLT SELF-LOCKING DRAG TORQUE IS NOT LESS THAN 15 INCH-POUNDS. TORQUE BOLT TO 250-300 INCH-POUNDS ABOVE DRAG TORQUE.**

c. Position scroll to engage oil cooler and heater system ducting. Position aft cover and yoke-type drain assembly. Install bolts and washers to secure scroll to transmission. (Use nut on scrolls fitted with stud.) Tighten the bolt (and stud nut, as applicable); **TORQUE SHOULD NOT EXCEED 5-10 INCH-POUNDS.**

d. Tighten oil cooler duct clamp and connect output seal drain tube. Secure lower end of drain tube with a double wrap of lockwire.

e. Turn impeller and check for clearance with scroll.

f. Install main transmission drive shaft (para 6-17).

SECTION III CLUTCHES

6-27. OVERRUNNING CLUTCH.

6-28. Description — Overrunning Clutch. The overrunning clutch (fig. 6-2) transmits power from the engine to the main transmission drive in a clockwise direction. The purpose of the clutch is to disengage the engine from the remainder of the drive system (allow free-wheeling) in case of engine failure and during autorotations. The clutch contains a sprag unit that disengages automatically when N2 rpm is less than the corresponding main rotor rpm.

6-29. Inspection — Overrunning Clutch (Installed). (See fig. 6-5.) *a.* Remove the sound insulation and access cover in cargo compartment, and open engine access doors.

b. Visually inspect case and mounting flanges of clutch for evidence of cracks, corrosion, or excessive heat.

c. Check attaching bolts and nuts for looseness. Check for looseness of the clutch coupling that would indicate looseness of the coupling retaining internal wrenching bolt.

d. Check that oil drain holes are clean and free of obstruction.

e. Check for evidence of oil leakage or seepage. If leakage is evident, check the oil level.

f. Reinstall access cover, sound insulation, and close engine access doors.

6-30. Inspection — Overrunning Clutch Oil Level. Check clutch oil level whenever leakage is noted or the main transmission drive shaft or engine is removed for maintenance.

a. Remove main transmission drive shaft (para 6-14).

b. (See fig. 6-4.) Remove coupling bolt, preformed packing (O-ring), clutch coupling, and shim(s).

c. On aircraft with clutch housing drain holes, check that the three drain holes are clean and free of obstruction. Oil leakage may indicate engine power output seal leakage if clutch oil level is checked and found within limits.

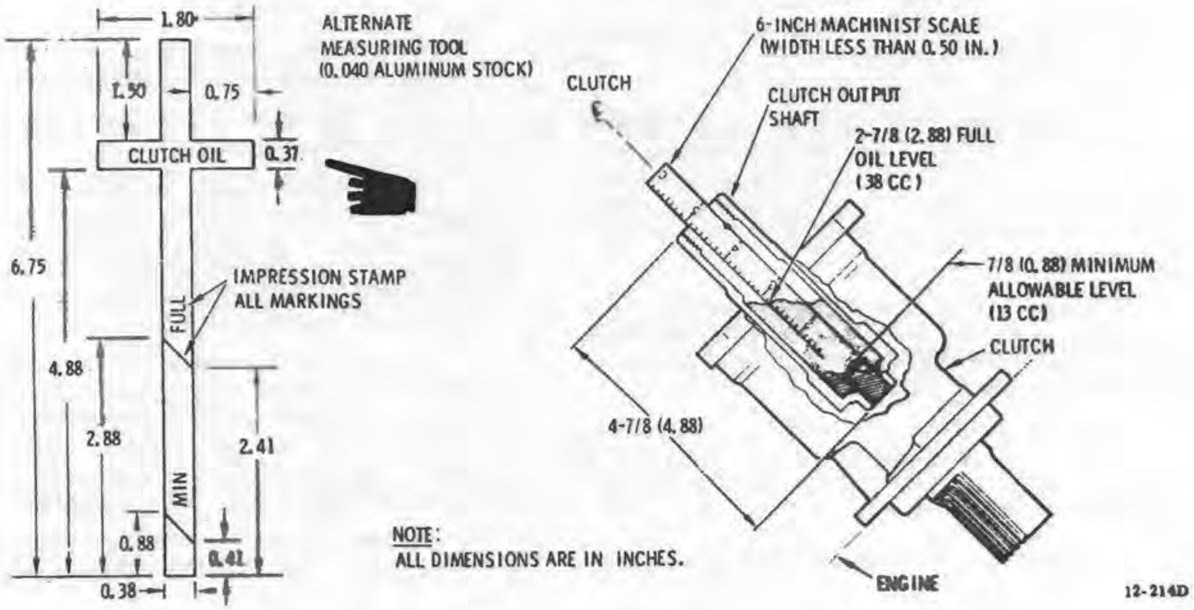


Figure 6-6 Overrunning Clutch Oil Level Check.

NOTE

To measure the clutch oil level as directed below, reduce the width of 1/2-inch scale, as required, to permit the end of the scale to bottom out in the clutch. (See fig. 6-6.) As an alternate, fabricate the measuring tool shown.

d. Slowly insert a CLEAN machinist's 6-inch scale (1/2 (0.50)-inch width) into the center of the clutch until it bottoms. Scale has reached the bottom of the clutch when it indicates 4-7/8 (4.88)-inches (fig. 6-6).

e. After the scale has been inserted 4-7/8 inches remove it and check the oil level reading. Repeat the measurement a minimum of three times.

(1) Full oil level (38 cc) reading will be 2-7/8 (2.88)-inches on the LOWER edge of the scale.

(2) Minimum allowable oil level (13 cc of trapped oil) reading will be 7/8 (0.88)-inch on the lower edge of the scale.

f. If oil level is less than the minimum acceptable quantity (13 cc) the clutch must be returned for overhaul and a serviceable unit installed.

g. Fill the clutch with lubricating oil (C67). Do not overfill. Recheck the oil level, *e* above, after servicing. (See fig. 6-6.)

CAUTION

When installing the clutch coupling bolt in *h* below, the INSTALLATION TORQUE ON THE BOLT MUST NOT BE LESS THAN 250 INCH-POUNDS. Torquing to a lower value will reduce clutch bearing clamp-up and possibly lead to bearing race spinning.

h. **SHIM COUPLING SO THAT THERE IS 0.035-0.055 INCH O-RING GAP** from end of clutch shaft to face of coupling recess (surface that bolt head contacts). Measure gap with feeler gage (fig. 6-5). Coat bolt threads with antiseize compound (C14). Coat clutch splines with lubricant (C63). Install shims(s), clutch coupling and bolt with O-ring. **DRAG TORQUE FOR SELF-LOCKING BOLT SERVICEABILITY IS 15 INCH-POUNDS MINIMUM, 150 INCH-POUNDS MAXIMUM. TORQUE BOLT TO ACTUAL DRAG TORQUE PLUS 250-300 INCH-POUNDS.**

i. Reinstall main transmission drive shaft (para 6-17).

6-30.1. Inspection-Overrunning Clutch Front Bearing.

6-30.2. Disassembly of Clutch Assembly.

a. Remove main transmission drive shaft, P/N 369A5510 (para. 6-14).

b. Remove retainer ring, P/N N5002-315, from housing.

c. Remove clutch subassembly, P/N 369A5350-11 (para. 6-31).

d. Carefully pry retainer, P/N 369A5366, loose and remove from shaft.

e. Use bearing puller, NSN 5120-00-924-7715, to remove bearing carrier, P/N 369A5355, along with bearing, P/N 369A5361, and outboard sleeve spacer, P/N 369A5367 from output shaft.

6-30.3 Inspection.

a. Using solvent, dry cleaning, (C94), and a soft bristle brush, clean bearing and allow to air dry.

NOTE

Thorough flushing of bearing and retainer of all existing grease is necessary to prevent possible mixing of dissimilar greases when bearing is repacked with WTR Grease (C63).

b. Immediately apply a light coat of lubricant, corrosion inhibiting, (C61), to the bearing.

NOTE

Do not attempt to disassemble the P/N 369A5361 bearing.

c. Inspect the bearing, P/N 369A5361, for roughness of operation and/or any other signs of damage such as heat discoloration scoring, pitting, or flat spots.

NOTE

Do not substitute other greases for that specified.

d. If the bearing is found in satisfactory condition, clean with solvent, dry and pack bearing to 50 percent capacity with Mobil 28 Grease (C63A). If the bearing is unserviceable, it must be replaced.

6-30.4. Reassembly.

a. Check to see that seal groove in clutch retainer, P/N 369A5366 and 369A5367, has been thoroughly cleaned prior to installation.

b. Install new "O" ring packing, P/N M83248-1-026 and M83248-1-035, in retainer, P/N 369A5366, and in sleeve spacer, 369A5367. To aid installation of "O" ring, packing lubricate with petrolatum, technical, (C73), prior to installing.

CAUTION

To prevent damage to the clutch assembly, the grease packed side must face up on the assembly.

c. Press carrier, P/N 369A5361, into bearing carrier, P/N 369A5355, with grease packed side up.

d. Press bearing, P/N 369A5355, on clutch inner race seats against inner sleeve spacer, 369A5367.

e. Install outer sleeve spacer, P/N 369A5367, with flange against bearing, P/N 369A5361.

f. Fill void of retainer, P/N 369A5366, 50 percent full with WTR Grease (C63). Then install retainer on outer sleeve spacer, P/N 369A5367.

g. Carefully insert subassembly into clutch housing and secure with retainer ring, P/N N5002-315, using care to assure that the flat side of the retaining ring faces in and the chamfered side out on the clutch.

h. Service clutch and reinstall main transmission drive shaft (para 6-31).

6-31. Subassembly Replacement - Overrunning Clutch. (See fig. 6-5.) If the clutch housing is serviceable, the internal subassembly of a defective overrunning clutch may be removed as a unit; then replaced with the internal subassembly of a serviceable clutch without removing the housing from the engine.

a. Remove main transmission drive shaft (para 6-14).

b. Remove coupling bolt, O-ring, clutch coupling and coupling shim(s). Retain shim(s) for possible reuse. Reinstall coupling bolt and O-ring to prevent spillage of lubricating oil from clutch subassembly during final steps of removal.

c. Remove retainer ring from clutch housing.

d. Lift out clutch subassembly from housing. If subassembly does not have a data plate attached to clutch retainer, transcribe clutch serial number and all overhaul data from data plate on housing to a tag; then attach tag to internal components subassembly. (It is not necessary to fabricate data plate for subassembly being turned in for overhaul, however, tag containing necessary data must be attached to subassembly.)

e. Place defective clutch subassembly in new housing, from which serviceable replacement subassembly was obtained for shipment to overhaul facility.

f. Drain preservative oil from the replacement clutch subassembly. Add 38 cc (1.28 oz) of lubricating oil (C67). Temporarily install coupling bolt and O-ring to prevent spillage.

g. Coat lower clutch splines with lubricant (C63) and install new clutch subassembly into housing on engine.

h. Install retainer ring with bevelled side outward.

i. Remove coupling bolt and O-ring and install coupling shim(s) and clutch coupling. Coat coupling bolt threads with antiseize compound (C14) and reinstall coupling bolt with new O-ring. (Refer to step *h* of para 6-30).

j. Coat clutch upper splines with lubricant (C63).

k. Install main transmission drive shaft (para 6-17).

6-32. Removal — Overrunning Clutch (Complete Clutch Assembly). (See fig. 6-5.) *a.* Remove engine (chapter 4).

b. Remove the bolts, washers, nuts, and engine shaft firewall seal from clutch.

NOTE

Removal of the clutch coupling from the clutch in c below is unnecessary unless clutch is being replaced.

c. Remove coupling bolt, O-ring, clutch coupling, and coupling shim(s). Retain shim(s) with coupling for reuse. Reinstall bolt and packing to prevent spillage of lubricating oil from housing during final steps of removal.

d. Remove nuts and washers that secure overrunning clutch; remove clutch.

e. If a clutch is being replaced install a spare coupling bolt and O-ring or suitable plug in the output shaft (clutch inner race bore) to prevent contamination during clutch handling, shipping, or storage.

NOTE

The operating lubricant is an approved preservative for shipping or storage.

f. Wrap clutch in barrier material (C15), to protect splined areas of race shafts.

6-33. Repair — Overruning Clutch. No field repair except replacement of clutch subassembly (para 6-31) is allowable.

6-34. Installation — Overruning Clutch. (See fig. 6-5.) *a.* If clutch is new, remove tag, drain residual (trapped) preservative oil; then temporarily install coupling bolt and O-ring.

NOTE

Trapped oil can be removed by inverting the clutch a minimum of three times.

b. Coat clutch splines with lubricant (C63). Insert overrunning clutch outer race spline into engine and install six washers and nuts.

c. Remove coupling bolt and install coupling shim(s) and clutch coupling. Reinstall coupling bolt with new O-ring. (Refer to step *h* of para 6-30).

d. Install engine shaft firewall seal, three bolts, six washers, three nuts and tighten.

e. Reinstall engine (chapter 4).

SECTION IV MAIN TRANSMISSION

6-35. MAIN TRANSMISSION.

6-36. Description — Main Transmission. The main transmission (fig. 6-7) is mounted on the main rotor mast support structure. The transmission is basically a two-stage, speed reduction unit, utilizing the first reduction stage for the tail rotor drive system and accessory drive trains, and the second stage to further reduce rpm for the main rotor. All of the gears are spiral-bevel type, except for the accessory drive gears which are spur type. The transmission housing is magnesium alloy. The input pinion drives the input bevel gear which is concentrically mounted on the tail rotor output pinion. The output pinion simultaneously drives the output bevel gear, main rotor drive shaft, tail rotor drive shaft and accessory drive train. The accessory gear train drives (at 4200 rpm) both the rotor tachometer generator and the transmission oil pump which are mounted on drive pads at the back of the transmission. Transmission cooling is accomplished by a combination of the lubrication oil, air drawn over the housing by the oil cooler blower, and raw air routed to the gearbox by the two side ducts in the forward end of the air inlet fairing.

6-37. Inspection — Main Transmission. *a.* Remove the sound insulation and transmission access covers (chapter 2).

b. Check transmission for oil leaks, cracks, corrosion, secure electrical connections, and proper oil level. Evaluate leakage, if any, according to paragraph 6-104.

c. Check the four mounting flanges on main transmission housing for corrosion and cracks. Check that transmission mounting studs and nuts are secure. This should be accomplished from the fuselage interior as well as the exterior at the main rotor mast base.

d. (Refer to para 6-54, chip detector inspection.) Remove lockwire, electrical wire, and chip detectors from self-closing valves. Check for presence of foreign matter such as dirt and metal particles. If metal particles are present, drain oil and observe condition. If condition is questionable, check chip detectors and filter after 5 hours of flight. If still questionable, check electrical system for proper operation (chapter 9). Clean oil filter (para 6-45). If no metal particles are present, wipe detectors clean, and reinstall (fig. 6-2). Secure chip detectors with 0.032-inch lockwire (C57).

e. Check that all safety wiring is intact and secure.

f. Reinstall transmission access covers and sound insulation (chapter 2).

6-38. Removal — Main Transmission. (See fig. 6-7.) *a.* Remove sound insulation, transmission cover, main gearbox access door, and oil cooler access door (chapter 2).

b. Remove main transmission drive shaft (para 6-14).

c. Remove oil cooler blower (para 6-21).

d. Remove tail rotor drive shaft (para 6-72).

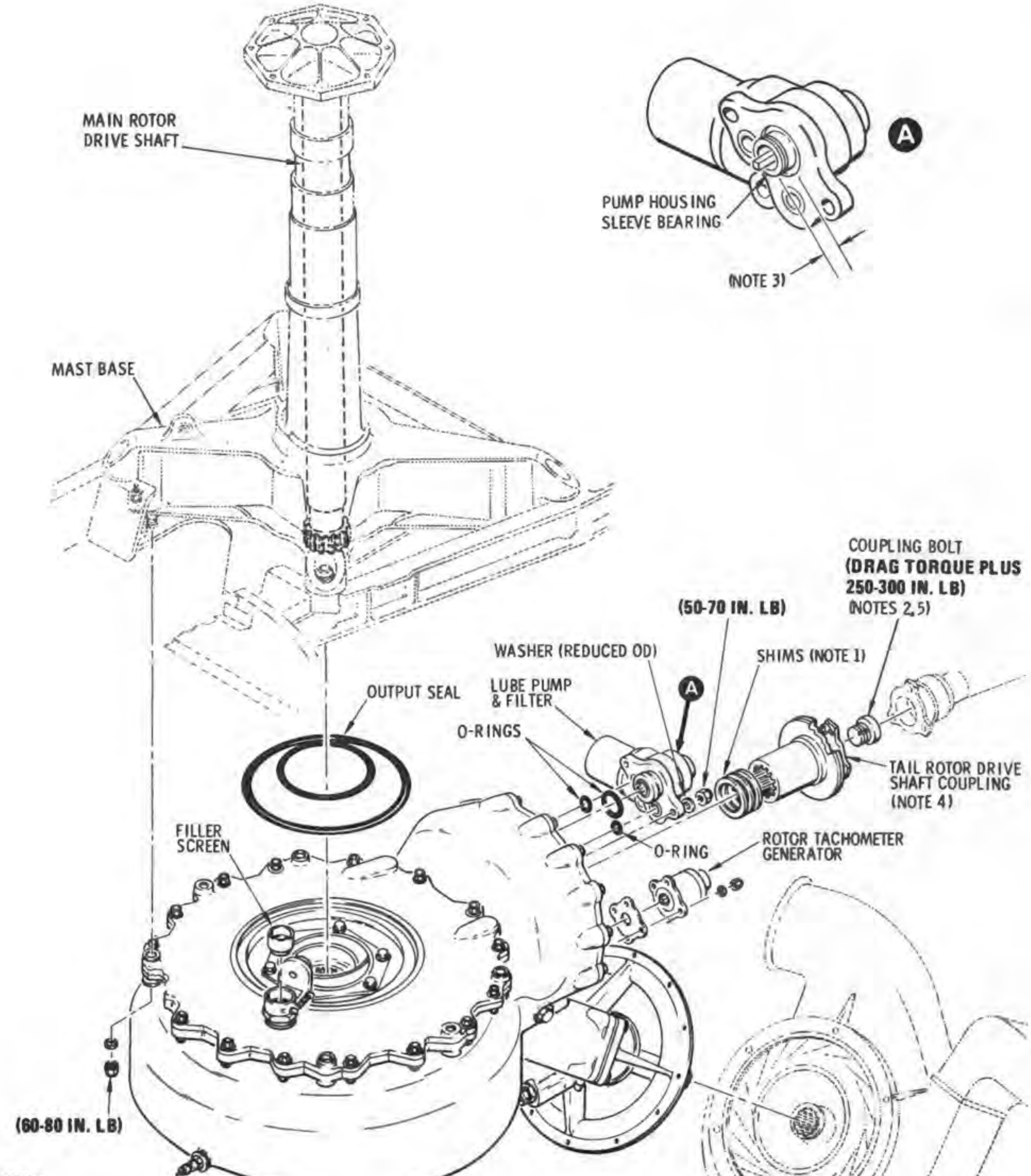
e. Disconnect wiring from rotor tachometer generator, two chip detectors, and oil pressure and temperature switches. Disconnect rotor tachometer generator bonding jumper (if installed).

f. Drain oil from transmission.

g. Have an assistant support the transmission; then remove the four mounting nuts and washers.

CAUTION

Lower the transmission with extreme care to prevent contact between the tail rotor drive coupling and the surrounding structure. Any dents, nicks or scratches on the coupling diaphragm requires replacement of the coupling. Use care to protect temperature sender and chip detector terminal studs from damage during handling



NOTES:

1. ALUMINUM ALLOY SHIMS; 0.002-IN. LAMINATION.
2. DRAG TORQUE FOR BOLT (SELF LOCKING) SERVICEABILITY IS 15 IN. LB MINIMUM, 150 IN. LB MAXIMUM.
3. MEASURE THIS DIMENSION ON PUMPS FOR MAIN TRANSMISSIONS (369A5100), DIMENSION ON REPLACING PUMP MUST NOT BE MORE THAN ON THE REMOVED PUMP.
4. COAT COUPLING SPLINES WITH LUBRICANT (C63) BEFORE ASSEMBLY.
5. COAT COUPLING BOLT THREADS WITH ANTISEIZE COMPOUND (C14) BEFORE ASSEMBLY.

12-122E

Figure 6-7. Main Transmission and/or Lube Pump Replacement.

and when placing transmission on any surface. Use suitable cover to prevent entry of contamination at main rotor drive shaft opening.

h. With help from assistant, carefully lower main transmission from mounting studs.

i. Keep output seal with transmission by taping or tying in place to prevent loss during handling, shipping or storage. Inspect seal for permanent buckling or dents that could permit water entry.

6-39. Disassembly — Main Transmision. (See fig. 6-7 and 6-8.) *a.* Remove tachometer generator (chapter 8).

b. Remove coupling bolt, tail rotor drive shaft coupling, and coupling shims. Retain shims with coupling for reuse.

c. Install suitable covers and plugs to protect seal ports, stud threads, and the tachometer generator pad.

NOTE

Further disassembly is not required. (Refer to para 6-56 for transmission drain tubing information.)

6-40. Repair — Main Transmission. Field repair of the main transmission is limited to replacement of electrical components, the breather-filler, externally accessible O-rings, oil pump and repair of surface damage. Housing external surface damage is repairable within the limits outlined as follows.

a. If the depth of a depression does not exceed 0.03 inch and the area is no greater than 0.6 square inch, repair according to steps *c*, *d* and *e*.

b. If the depth of a depression exceeds 0.03 inch but does not exceed 0.1 inch and the area is no greater than 0.6 square inch, repair according to steps *c* through *f*.

NOTE

Any evidence of lubricating oil leakage in a repaired area requires replacement of the transmission.

c. Clean area with solvent (C94), and remove sharp edges with grade 280 abrasive paper (C2).

d. Brush coat primer (C79) on the repaired surface.

e. Fill depression with epoxy adhesive (C7) and blend to surrounding surfaces.

f. Touch up the reworked area with paint (chapter 1).

6-41. Assembly — Main Transmission. (See fig. 6-7 and 6-8.)

NOTE

Refer to (para 6-17) for shimming the transmission input shaft coupling and to (para 6-75) for shimming the tail rotor drive shaft coupling after the transmission is installed.

a. Install one preliminary 0.010-inch coupling shim on transmission output (tail rotor drive) gear shaft to prevent coupling from bottoming against end of gear shaft.

b. Coat coupling splines with lubricant (C-63) and coupling bolt threads with antiseize compound (C-14) before a ssembly. Install tail rotor drive shaft coupling and coupling bolt. DRAG TORQUE FOR COUPLING BOLT SERVICEABILITY IS 15 INCH-POUNDS MINIMUM, 150 INCH-POUNDS MAXIMUM. TORQUE COUPLING BOLT TO ACTUAL DRAG TORQUE PLUS 250-300 INCH POUNDS.

c. Install tachometer generator (chapter 8).

d. Install transmission input gear shaft seal drain tube if not already in place (para 6-61).

6-42. Installation — Main Transmission. (See fig. 6-7.) *a.* Accomplish build-up described in paragraph 6-41 on replacement transmissions.

NOTE

Transmission thermoswitch (oil temperature sender) may be found taped to shroud mount. If so, remove plug from thermoswitch bore, apply a light coat of antiseize compound (C14) to the switch threads, install thermoswitch and **TORQUE SWITCH TO 12-25 INCH-POUNDS.**

b. Apply petrolatum (C73) to outer edge of output seal. Press seal firmly into recess in top of transmission housing.

c. With help from an assistant, carefully lift and position transmission and blower in place on mounting studs.

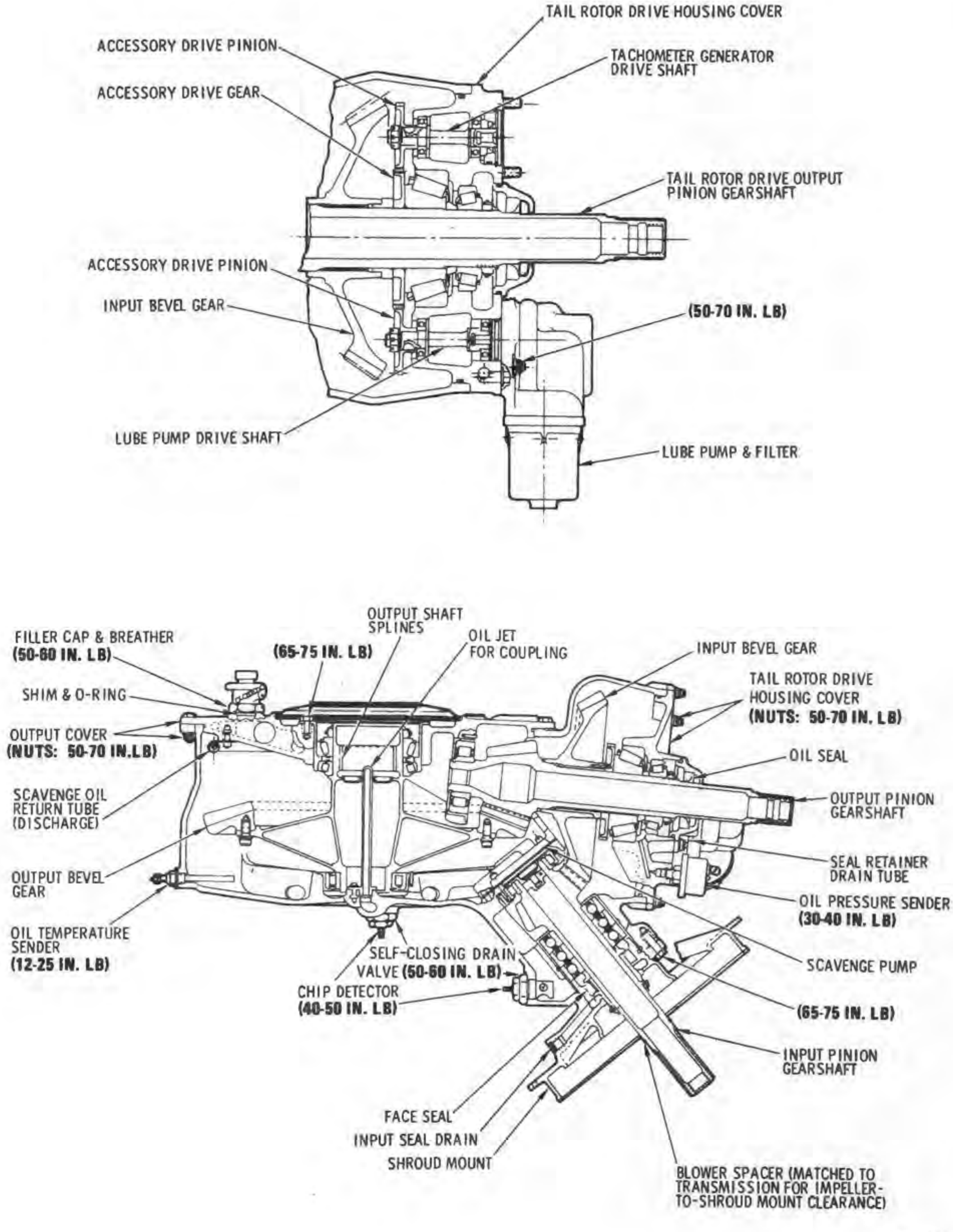


Figure 6-8. Main Transmission Cross-Section Views.

CAUTION

If main rotor drive shaft is installed, make sure that drive shaft gear coupling is properly meshed before installing transmission mounting nuts.

d. Install four washers and nuts; **TORQUE NUTS TO 60-80 INCH-POUNDS.**

e. Connect wiring to tachometer generator, two chip detectors, and oil pressure and temperature senders. Connect tachometer generator bonding jumper (if installed).

f. Service transmission with lubricating oil (chapter 1).

g. Install tail rotor drive shaft (para 6-75).

h. Install oil cooler blower (para 6-26).

i. Install main transmission drive shaft (para 6-17).

j. Ground run aircraft according to TM 55-1520-214-10 and inspect main transmission for correct warning light operation and oil leaks. (Refer to para 6-104 for oil leakage limits and table 6-1 for troubleshooting procedures.)

k. Install transmission cover, oil cooler access door, sound insulation, and main gearbox access door (chapter 2).

6-43. MAIN TRANSMISSION LUBRICATION PUMP.

6-44. Description — Main Transmission Lubrication Pump. The main transmission has a self-contained oil system. A lubrication pump (fig. 6-9) draws oil from the main sump of the transmission housing and provides oil flow to the oil pressure sender, bearings, gears and the output gear coupling for the main rotor drive shaft. The lube pump is a positive-displacement, vane-type with a non-adjustable discharge pressure of 25 to 50 psi. It is driven at 4200 rpm by the accessory drive gear attached to the tail rotor output gear shaft. A relief valve that cracks open above 60 psi, with full-flow bypass at 75 psi maximum (369A5100-601 and -603 transmissions), or 100 psi maximum (369A5100-605 and subsequent transmissions) and a filter are integral parts of the lubrication pump housing assembly. A vane-type scavenge pump, with a discharge pressure of 10 to 20 psi, is mounted on the upper end of the transmission input pinion. The scavenge pump draws oil from the input gear shaft sump and pumps the oil to a discharge tube mounted inside the top of the transmission housing. The tube is perforated to direct oil against the interior sides of the transmission housing to produce cooling as the oil drains down to the main sump. Externally mounted oil system accessories include a combined breather-filler, a sight type liquid level plug, two chip detectors, and oil pressure and temperature warning senders (fig. 6-2). Refer to chapter 1 for transmission servicing information.

6-45. Inspection — Main Transmission Lubrication Pump Oil Filter. *a.* Remove, in order, sound insulation, gearbox access cover, transmission drain assembly, and main transmission cover. Refer to chapter 2.

b. Remove lockwire from lubrication pump filter housing (fig. 6-9).

c. Position a container or cloth to catch residual oil. Loosen and remove filter housing by turning it counterclockwise.

d. Remove filter element, and element preformed packing (O-ring) from pump housing. Discard O-ring.

NOTE

There are two configurations of the transmission lubrication pump oil filter. If the part number is, 369A5264 a spring tension washer is required.

e. Remove spring washer and housing O-ring. Discard O-ring.

f. Check filter element for metal particles. If metal particles are present, remove main transmission chip detectors (para 6-54) and inspect for other evidence of internal failure in the gearbox.

NOTE

Use ultrasonic cleaning equipment if available.

g. Clean the filter element and housing with solvent (C94). Agitate element in solvent until solvent is clear and then let element air dry.

h. Check element for tears, cracks or dents that would make it unserviceable. Replace element if condition is questionable or if filter end flanges are cracked. Install new O-rings.

i. Lubricate replacement O-rings with transmission oil and install on end of filter and on filter housing.

j. Install tension washer in filter housing and install element as shown in figure 6-9. Check that the O-ring on the element will seat properly in the pump housing when element is installed.

k. Turn filter housing clockwise and tighten securely. Safety the filter housing to the pump housing using 0.032-inch lockwire (C57).

l. Replenish transmission oil supply (chapter 1) as necessary; then perform ground runup of aircraft and check joint line for oil leakage.

m. Reinstall, in order, the main transmission cover, the drain assembly, the main gearbox access cover and sound insulation.

6-46. Removal — Main Transmission Lubrication Pump. (See fig. 6-7 and 6-8.)

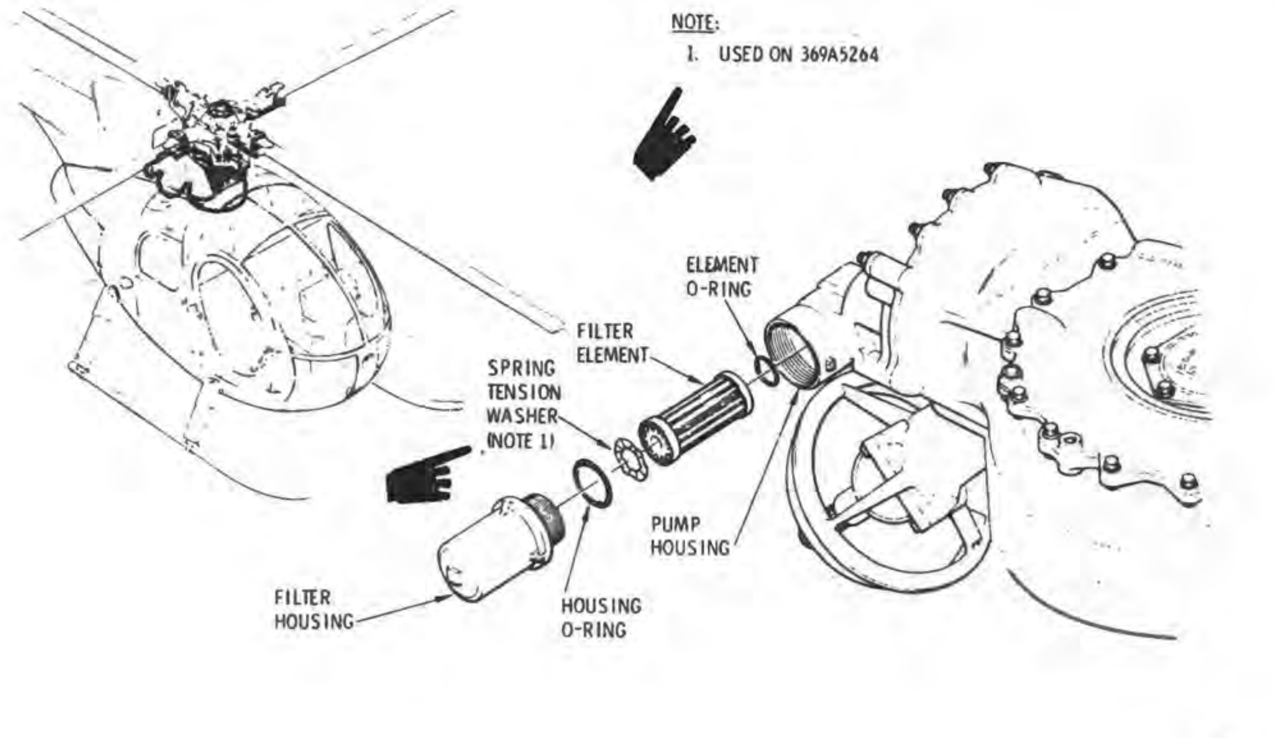


Figure 6-9. Transmission Lubrication Pump Oil Filter.

a. Remove sound insulation, transmission cover, and main gearbox access door (chapter 2).

b. Remove three nuts and washers that secure pump and filter to transmission housing accessory cover.

c. Remove pump and discard the three O-rings. Plug inlet and discharge ports in pump housing, and the drive bore in housing to keep out foreign matter.

CAUTION

Main transmissions (369A5100) incorporate bearing shims on the lubrication pump drive shaft to control end play. If the sleeve bearing of a replacement pump is longer than on the removed pump the pump drive shaft bearings can be preloaded to cause bearing failure. If transmission is identified with (369A5100-601 or subsequent dash numbers) it has been modified and the special measurement is not required when changing the pump.

Main transmissions (369A5100-605) incorporate a high capacity oil system. Only oil pump (369A5264) must be used for replacement.

d. Check part number of transmission on the identification plate next to liquid level plug. If part number is 369A5100, measure the distance that the sleeve bearing extends from the mounting face of the pump housing. (See detail A, fig. 6-7.) Make the same measurement on the replacement pump. The dimension on the new pump must not be more than on the removed pump.

NOTE

If the sleeve bearing dimension is greater than that of the old pump, return the replacement pump to supply and request a different serial number. If three attempts fail to produce a suitable pump, replace the main transmission.

6-47. Inspection — Main Transmission Lubrication Pump (General). *a.* Inspect for external leaks around mounting pad and ports, and for cracks or corrosion.

b. Check that all lockwire is intact.

c. Check senders, tachometer, and electrical connections for secure attachment.

6-48. Installation — Main Transmission Lubrication Pump. (See fig. 6-7 and 6-8.) *a.* Remove plugs from pressure ports in pump and transmission.

b. Install new O-rings in port and drive seal recesses of pump. Apply a light coating of petrolatum (C73) to both the O-ring and mating bore in transmission to prevent damage to O-ring.

c. Align square drive of pump with pump drive shaft in transmission and carefully press pump into place on mating surface.

d. Install three washers and nuts; **TORQUE NUTS TO 50-70 INCH-POUNDS.**

e. Ground run aircraft according to TM 55-1520-214-10 and inspect pump parting surfaces for leaks. Check pressure warning light for proper operation. If leaks in excess of limits described in paragraph 6-104 are detected, remove pump and replace O-rings. Recheck for leaks. Continued excessive leakage requires pump replacement.

f. Install transmission cover, main gearbox access door, and sound insulation (chapter 2).

6-49. MAIN TRANSMISSION EXTERNAL COMPONENT REPAIRS.

6-50. Liquid Level (Sight) Plug — Main Transmission External Components. (See fig. 6-2.) *a.* Drain oil from transmission until oil level is well below edge of sight plug and port.

b. Remove lockwire from sight plug.

c. Remove sight plug by unscrewing.

d. Remove and inspect O-ring. Install new O-ring on sight plug, if required.

NOTE

When a new sight plug is being installed, the liquid level markings are added f below after the plug is installed and torqued. Coat new sight plugs that are not identified with an "X" after the part number with silicone primer to prevent clouding of sight glass. Refer to g below for coating application.

e. Install sight plug. **TORQUE SIGHT PLUG TO 80-90 INCH-POUNDS,** and install lockwire.

f. Oil level markings may be applied on newly installed sight plugs as follows:

(1) Using a machinists level and scale, scribe an ADD line horizontally on both outer faces of the sight plug as shown in detail A. Do NOT mark the window.

(2) Scribe the FULL line horizontally on both outer edges of the sight plug as shown in detail A. Do NOT mark the window.

CAUTION

Application of any cleaning material other than soap and water to the sight plug window may cause it to craze.

(3) Using white paint (C55), paint four lines with the edges touching the scribe marks as shown in detail A. Do NOT paint the surface of the window.

g. A new P/N S51H sight plug may be coated as follows:

(1) Fill a clean container with silicone primer (C81) deep enough to cover the sight plug.

(2) Dip plug in primer long enough to coat inner face of window. Allow to air-dry.

(3) Reidentify plug by adding an "X" after the part number.

h. Apply decal markings to the liquid level plug as follows:

NOTE

The decal marker (fig. 6-2) may be installed on the plug prior to installation of the plug in the transmission since rotation of the bulls-eye type decal does not affect readability.

(1) Clean the exterior surface of the plug window with naptha (C70).

(2) Place the decal, backside down, on a cloth or sponge saturated with water. Allow the cellophane backing on the decal to soften for two to five minutes.

(3) Peel cellophane backing from decal using care to avoid touching adhesive back or tearing the decal.

(4) Place decal on plug window with adhesive side down and press out all air bubbles.

6-51. Chip Detectors — Main Transmission External Components. Refer to main transmission draining (chapter 1) for removal and installation instructions. Refer to chapter 9 for functional test of detector circuit and to paragraph 6-54 for inspection.

6-52. Rotor Tachometer Generator — Main Transmission External Components. Refer to chapter 8.

6-53. Oil Pressure and Temperature Senders — Main Transmission External Components. (See fig. 6-2.)

NOTE

When oil temperature sender is to be replaced, drain oil from transmission.

a. Cut lockwire from temperature sender.

b. Remove electrical wire from terminal post.

c. Unscrew sender (fig. 6-2). Catch any residual oil from the sender port in an absorbent cloth.

d. Apply antiseize compound (C28) sparingly to only the threads of the replacement sender.

e. Install oil pressure sender; **TORQUE TO 30-40 INCH-POUNDS.**

f. Install oil temperature sender; **TORQUE TO 12-25 INCH-POUNDS.**

g. Lockwire the temperature sender hex to adjacent lug on transmission housing using 0.032-inch lockwire (C-57).

h. Connect electrical wire to terminal post.

i. Service transmission (chapter 1).

6-54. Chip Detector (Caution Light ON) Inspection — Main Transmission External Components.

NOTE

Refer to the chapter 1 special inspection requirements before proceeding with the following steps.

Remove and inspect chip detector magnetic plugs and oil filter. Steel fuzz characterized by fine hair-like particles is the result of normal wear and does not indicate a problem.

a. **IF GRANULAR STEEL OR BRASS PARTICLES ARE PRESENT, REPLACE THE TRANSMISSION.** These particles usually indicate an internal failure.

b. **IF STEEL SPLINTERS OR FLAKES EXCEEDING 1/16 (0.062) × 3/16 (0.187) INCH ARE PRESENT, REPLACE THE TRANSMISSION.**

c. **IF MORE THAN 10 STEEL OR ALUMINUM FLAKES OR GRANULAR PARTICLES OF APPROXIMATELY 1/16 × 1/16 INCH SIZE ARE PRESENT, REPLACE THE TRANSMISSION.**

d. If the particles found are smaller or fewer in number than the limit in *c* above, clean the main transmission filter and reinstall, **CHECK THE CHIP DETECTORS AGAIN AFTER FIVE (5) HOURS OF FLIGHT**; if more particles are found, replace the transmission.

6-55. MAIN TRANSMISSION DRAINS AND TUBING.

6-56. Description — Main Transmission Drains and Tubing. The transmission drain installation (fig. 6-10) consists of a drain line from the output pinion (tail rotor) gearshaft seal retainer, one from the main transmission yoke type drain assembly (input pinion seal drain) and, if the oil cooler blower scroll is fitted with a drain port, one from the blower scroll. The drains merge through a two- or three-port manifold fitting in the forward firewall, and into a single drain tube that is routed down the engine compartment bulkhead and overhead.

6-57. Inspection — Main Transmission Drains and Tubing (Installed). *a.* Inspect flexible tubing for unserviceable wear, cuts or breaks.

b. Inspect grommets, chafe strip, nylon straps and lockwire for secure installation. (Refer to chapter 2 for additional information on the main transmission drain assembly.)

6-58. Removal — Main Transmission Drains and Tubing. (See fig. 6-10.) *a.* If a scroll drain tube is installed, use steps *b* through *d* to remove scroll drain tube from scroll.

b. Detach transmission drain tubes from the firewall draining fitting.

c. If not already removed, detach drain tubes from the transmission drain assembly.

d. Release supporting nylon straps and remove drain tubes.

e. Remove attaching clamp on engine compartment lower firewall drain tube and remove drain tube.

NOTE

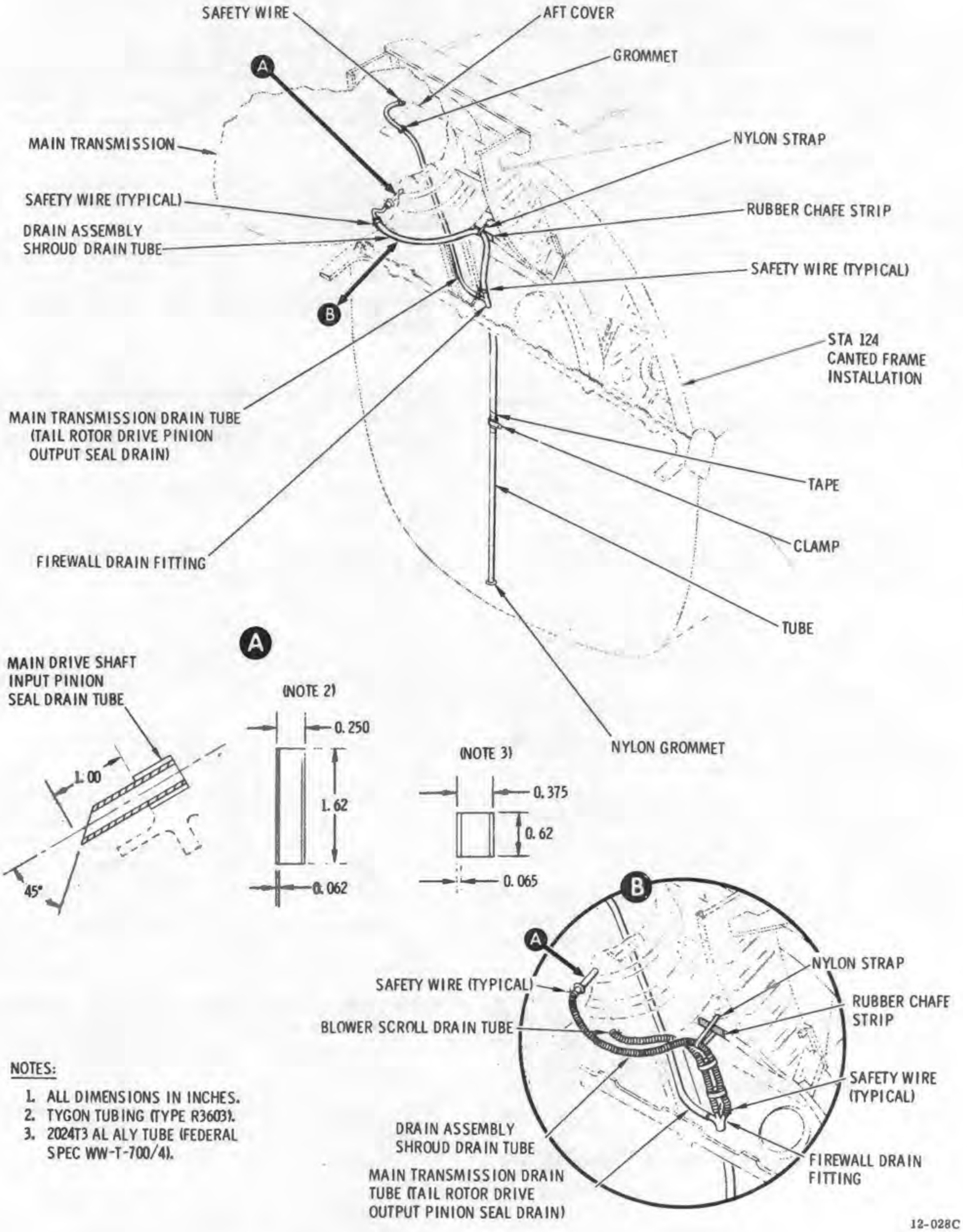
Remove main transmission input pinion flex-drain and bushing (detail A) whenever main transmission is replaced. The flex-drain and bushing are not normally part of a spare transmission assembly.

f. Grasp the flex-drain and pull out to release the bond. Insert a 5/16(0.312)- or 3/8(0.375)-inch tap or easy-out into tube ID and rotate to pull out bushing.

6-59. Inspection — Main Transmission Drains and Tubing (Removed). Check transmission yoke-type drain assembly and tubing for serviceability, and repair as necessary.

6-60. Repair — Main Transmission Drains and Tubing. *a.* Repair cracks in the yoke-type drain assembly according to repair instructions for polycarbonate plastic in chapter 2.

b. Repair deteriorated or otherwise damaged mounting gasket segments on the yoke-type plastic drain assembly by replacing with new gasket material (C44).



NOTES:

1. ALL DIMENSIONS IN INCHES.
2. TYGON TUBING (TYPE R3603).
3. 2024T3 AL ALY TUBE (FEDERAL SPEC WW-T-700/4).

Figure 6-10. Main Transmission Drain Tubing Installation.

c. Repair damaged flexible drain tubing with tape (C18).

6-61. Installation — Main Transmission Drains and Tubing. *a.* If a scroll drain is installed use steps *e* through *g* to install drain tube. For initial installations, replace the two-way firewall fitting with a three-way fitting.

b. On a new main transmission installation, clean mating surface of flex-tube, bushing, and transmission drain outlet with solvent (C94).

NOTE

A replacement main transmission flex-tube and bushing may be fabricated using materials and dimensions shown in detail A, figure 6-10.

c. Bond flex-tube to bushing and bushing to main transmission with sealing compound (C89), according to container instructions.

d. Remove excess sealing compound and scarf flex-tube at 45 degrees (detail A, fig. 6-10).

e. Position transmission drain assembly and install bolts. Ensure that main transmission flex-drain will drain directly into mating drain assembly port.

f. Attach upper ends of drain tubing to transmission drain assembly; secure with double wraps of lockwire.

g. Route drain tubing and secure with nylon straps. Position tubing so that no drainage traps are formed.

h. Secure lower ends of drain tubing to firewall fitting with double wraps of lockwire.

i. Position engine compartment firewall drain tube; wrap tube with one layer of pressure-sensitive polyurethane tape (C105) at clamp-attach point, and install clamp.

6-62. MAIN ROTOR MAST.

6-63. Description — Main Rotor Mast. The main rotor mast (fig. 6-11) is a machined steel tube joined with a forged aluminum alloy base having four legs. The tube and mast base are fitted by differential temperature, and are secured together as a one-piece assembly by the interference fit and four hi-shear rivets. The mast assembly base supports the main transmission and the mounting bracket for cyclic and collective mixer control bellcranks. The mast assembly tube provides the structure on which the main rotor hub is mounted, the axis for stationary swashplate position and main rotor hub rotation, and the housing for the main rotor drive shaft.

6-64. Inspection — Main Rotor Mast (Installed). *a.* Check all visible areas of mast for cracks, nicks, scratches, corrosion and evidence of impact damage. Figure 6-12 contains inspection and repair criteria.

b. Refer to chapter 2 for 300-hour inspection requirement.

6-65. Removal — Main Rotor Mast.

CAUTION

The main rotor mast is a highly stressed part. Do not allow tools to strike the mast, or the mast to strike any object. Any impact damage may require replacement of the mast.

a. Remove main rotor hub (chapter 5).

b. Remove main rotor controls (chapter 11).

c. Remove main transmission (para 6-38). Transmission removal is required for access to mounting studs.

NOTE

The nuts securing the studs have left-hand threads.

d. (See fig. 6-11.) Remove four mast base nuts, eight washers, and four bolts.

e. Remove the four main transmission mounting studs, washers, and nuts.

f. Lift main rotor mast from supporting structure.

6-66. Inspection — Main Rotor Mast (Removed). (See fig. 6-12.) *a.* Check all areas of main rotor mast for cracks, nicks, scratches, and evidence of impact damage. Check hub bearing surfaces for scoring and galling.

b. Check threads and serrations for damage.

c. Check for four rivets that secure the mast base to the mast tube for security.

d. Check that the tape on forward edge of the mast tube is secure and undamaged. Replace with tape (C101). Tape is installed on the front 180 degrees of lower mast tube, 5.50 inches up from the mast base. (See fig. 6-12.) Surface should be cleaned with naphtha (C70) before installation of new tape.

e. Check mast base for cracks, nicks, scratches and corrosion.

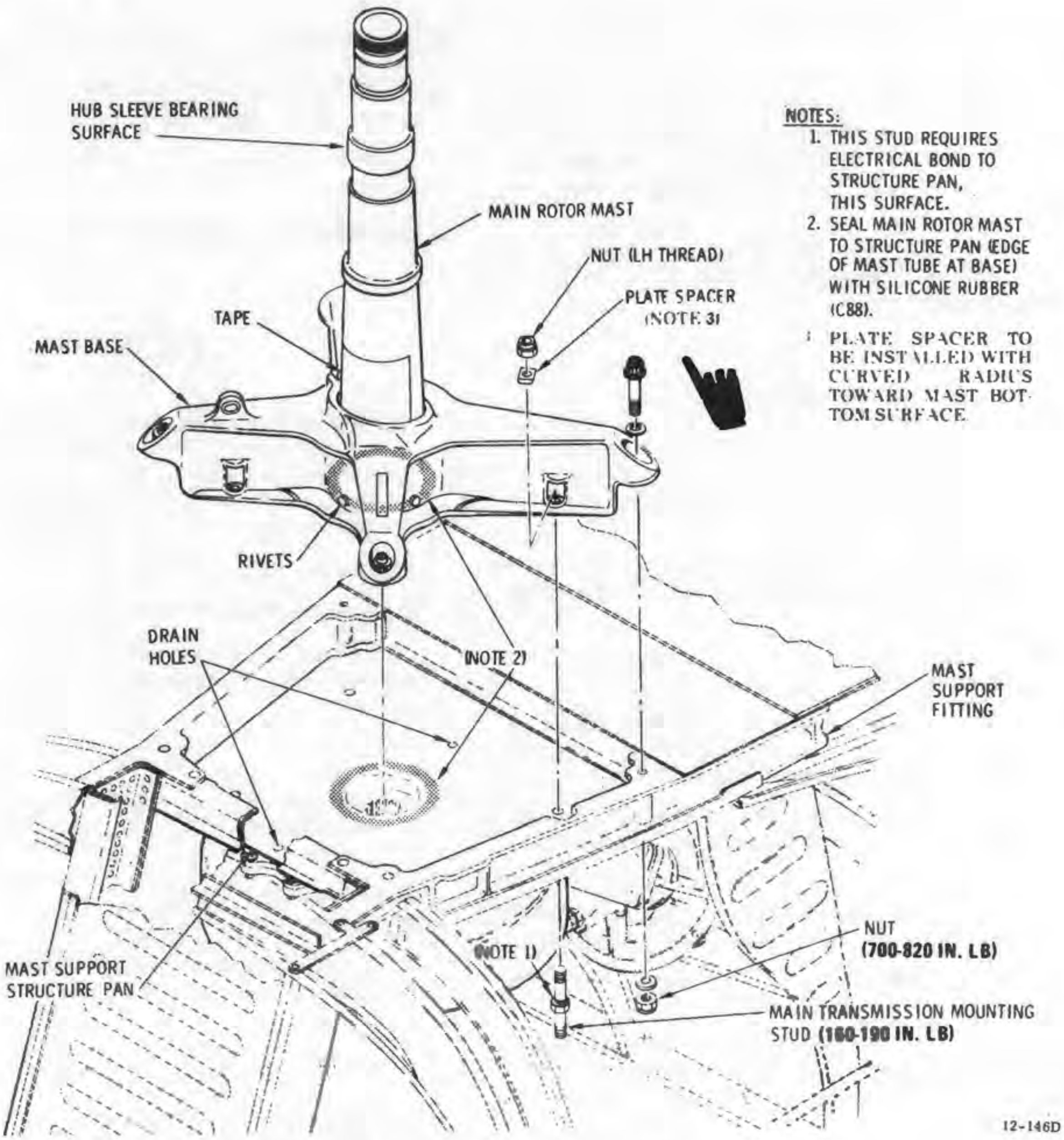


Figure 6-11. Main Rotor Mast Installation.

6-67. Repair — Main Rotor Mast. See figure 6-12 for inspection and repair criteria for the mast tube. Refer to chapter 2 for permissible repair of mast base.

6-68. Installation — Main Rotor Mast. (See fig. 6-11.) *a.* Scrape off any sealant residue and apply silicone rubber (C88) on inside base edge of main rotor mast tube. (This will seal base to mast support structure and prevent entry of water or leakage of oil.)

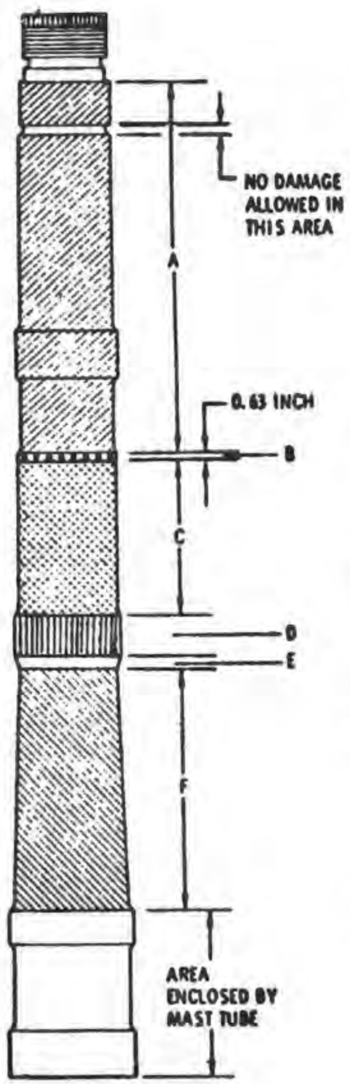
b. Position main rotor mast so that holes in base align with holes in mast support structure.

c. Install the four holddown bolts, eight washers, and four nuts. **TORQUE NUTS TO 700-820 INCH-POUNDS.**

d. Check underside of mast support structure at the left aft stud hole location. The stud-to-pan doubler surface must be clean to bear metal for electrical bonding. Install four transmission mounting studs, plate spacers, with radius side down, and nuts. **TORQUE STUDS TO 160-190 INCH-POUNDS.**

e. Using a 0.001-inch feeler gauge, check for gap between self-locking nuts and plate spacers. No gap is allowed.

f. If gap is observed, remove nut and replace with new self-locking nut; this applies to all nuts that are not flush against the mating spacer. **TORQUE STUDS TO 160-190 INCH-POUNDS** and repeat inspection, step



AREA	MAXIMUM SERVICEABLE LIMITS	CORRECTIVE ACTION	MAXIMUM REPAIRABLE LIMITS	CORRECTIVE ACTION
A	0.010 INCH 0.125 INCH WIDE CORROSION & SCRATCHES	POLISH AREA SMOOTH WITH ABRASIVE CLOTH (ITEMS 2 & 4, TABLE 1-1) IF CAD PLATING HAS BEEN PENETRATED TREAT REWORK AREA WITH PRIMER (ITEM 81A)	0.125 INCH TO 1/3 CIRCUMFERENCE 0.010 INCH DEEP CORROSION & SCRATCHES	CAD PLATE PER HP4-113 (QQ-P-416) THEN PRIME WITH (ITEM 81A)
B	0.0035 INCH DEEP 0.125 INCH WIDE CHIPPING OF NICKLE PLATE	POLISH AREA SMOOTH WITH ABRASIVE CLOTH (ITEMS 2 & 4, TABLE 1-1) TREAT REWORKED AREA WITH PRIMER (ITEM 81A)	0.125 INCH TO 1/3 CIRCUMFERENCE 0.010 INCH DEEP CHIPPING OF NICKLE PLATE	NICKLE PLATE PER HP4-113 (QQ-N-290) THEN PRIME WITH (ITEM 81A)
C	0.0035 INCH DEEP 0.125 INCH WIDE CHIPPING OF NICKLE PLATE	POLISH AREA WITH ABRASIVE CLOTH (ITEMS 2 & 4, TABLE 1-1) TO REMOVE BURRS AND SHARP EDGES ONLY.	0.125 INCH TO 1/3 CIRCUMFERENCE 0.010 INCH DEEP CHIPPING OF NICKLE PLATE	NICKLE PLATE PER HP4-113 (QQ-N-290)
D	0.020 INCH DEEP 0.125 INCH WIDE CORROSION & SCRATCHES	POLISH AREA SMOOTH WITH ABRASIVE CLOTH (ITEMS 2 & 4, TABLE 1-1)	0.020 INCH DEEP 0.125 INCH TO 1/3 CIRCUMFERENCE CORROSION & SCRATCHES	CAD PLATE PER HP4-113 (QQ-P-416)
E	0.010 INCH DEEP 0.125 INCH WIDE CORROSION & SCRATCHES	POLISH AREA SMOOTH WITH ABRASIVE CLOTH (ITEMS 2 & 4, TABLE 1-1) TREAT REWORKED AREA WITH PRIMER (ITEM 17) AND TOP COAT OF LACQUER (ITEM 54)	0.010 INCH DEEP 0.125 INCH TO 1/3 CIRCUMFERENCE CORROSION & SCRATCHES	CAD PLATE PER HP4-113 (QQ-P-416) THEN PRIME WITH (ITEM 81A) AND TOP COAT OF LACQUER (ITEM 54)
F	0.010 INCH DEEP 0.125 INCH WIDE CORROSION & SCRATCHES	REMOVE DAMAGE OR DETERIORATED TAPE POLISH CORROSION SPOTS WITH ABRASIVE CLOTH (ITEMS 2 & 4, TABLE 1-1) TREAT REWORKED SURFACES WITH PRIMER (ITEM 81A) AND A TOP COAT OF LACQUER (ITEM 54) REPLACE TAPE (ITEM 101)	0.010 INCH DEEP 0.125 INCH TO 1/3 CIRCUMFERENCE CORROSION & SCRATCHES	CAD PLATE PER HP4-113 (QQ-P-416) TREAT REWORKED SURFACES WITH PRIMER (ITEM 81A) AND A TOP COAT OF LACQUER (ITEM 54) REPLACE TAPE (ITEM 101)

Figure 6-12 Main Rotor Mast Inspection and Repair Criteria

SECTION V TAIL ROTOR DRIVE SHAFT

6-69. TAIL ROTOR DRIVE SHAFT.

6-70. Description — Tail Rotor Drive Shaft. The tail rotor drive shaft (fig. 6-13) interconnects the main transmission and the tail rotor (transmission) gearbox. The shaft is a dynamically balanced and positively damped aluminum alloy tube, approximately 13 feet long, that rotates at 2045 rpm (100% N2). Identical mounting flanges, riveted to each tapered end of the tube, connect the shaft to the flexible joint couplings on the transmissions. A damper located near the center of the shaft maintains a minimum vibration level in the tail rotor drive system.

6-71. Inspection — Tail Rotor Drive Shaft (Installed). *a.* Open access doors on the air inlet fairing and tailboom. (Refer to chapter 2.)

b. (See fig. 6-13.) Check visible portions of drive shaft for dents, scratches, cracks, corrosion, evidence of torsional buckling or shaft bending, or bulkhead interference. Check for 0.25-inch minimum clearance around drive shaft at shaft fairing opening (station 137.50) while manually rotating drive system. Less than minimum clearance is a possible indication of shaft distortion. Scratches in the shaft section that passes through the plenum chamber fairing tube can indicate possible contact with the tube edges at the bulkhead openings.

c. Check that coupling attachment at main transmission is secure.

d. Check for evidence of shaft damper sleeve bond failure (sleeve shifting) from excessive heat or loads.

e. Close all access doors.

6-72. Removal — Tail Rotor Driveshaft. (See figure 6-13.) *a.* Remove (or open) tail rotor driveshaft access doors.

b. Remove three bolts and washers that secure shaft to output gearshaft coupling on main transmission.

c. Disconnect chip detector wiring from tail rotor transmission.

d. Detach station 282 bellcrank from tail rotor transmission.

e. Remove lockwire, four bolts, and washers that attach tail rotor gearbox to tailboom.

f. Remove mount bolts one at a time and install workaid bolts (P/N AN4H77A) (fig. 6-13A).

WARNING

Application of additional loads to tail rotor transmission in extended position could cause damage to gearbox mounting frame or nutplate connection.

g. Carefully slide tail rotor gearbox to outboard end of workaid bolts.

CAUTION

While removing the driveshaft from the tail rotor gearbox coupling, the shaft will rest on the bulkhead forward of station 142 bellcrank. A cushion material of sort will stop the shaft from rubbing the bulkhead. Remove after use.

h. While holding the output shaft, remove three bolts and washers that attach driveshaft to tail rotor gearbox input coupling.

i. Slide driveshaft forward and install workaid (fig. 6-13B) to tail rotor input coupling using driveshaft attaching bolts (P/N NAS464P4A4).

j. With workaid (fig. 6-13A) remove the hex bolt holding the driveshaft coupling to the tail rotor gearbox.

k. Remove workaid bolts and tail rotor gearbox from tailboom.

l. With aid from an assistant, remove driveshaft from tailboom.

6-73. Inspection — Tail Rotor Drive Shaft (Removed). *a.* When there has been abnormal shaft vibration, check damper friction (para 6-84) and shaft straightness or runout. When rotated between centers, or with ends plugged and rolled over-rollers, **THE RUN-OUT OF THE LARGE DIAMETER MUST NOT EXCEED 0.060-INCH TIR** (permissible dents excluded).

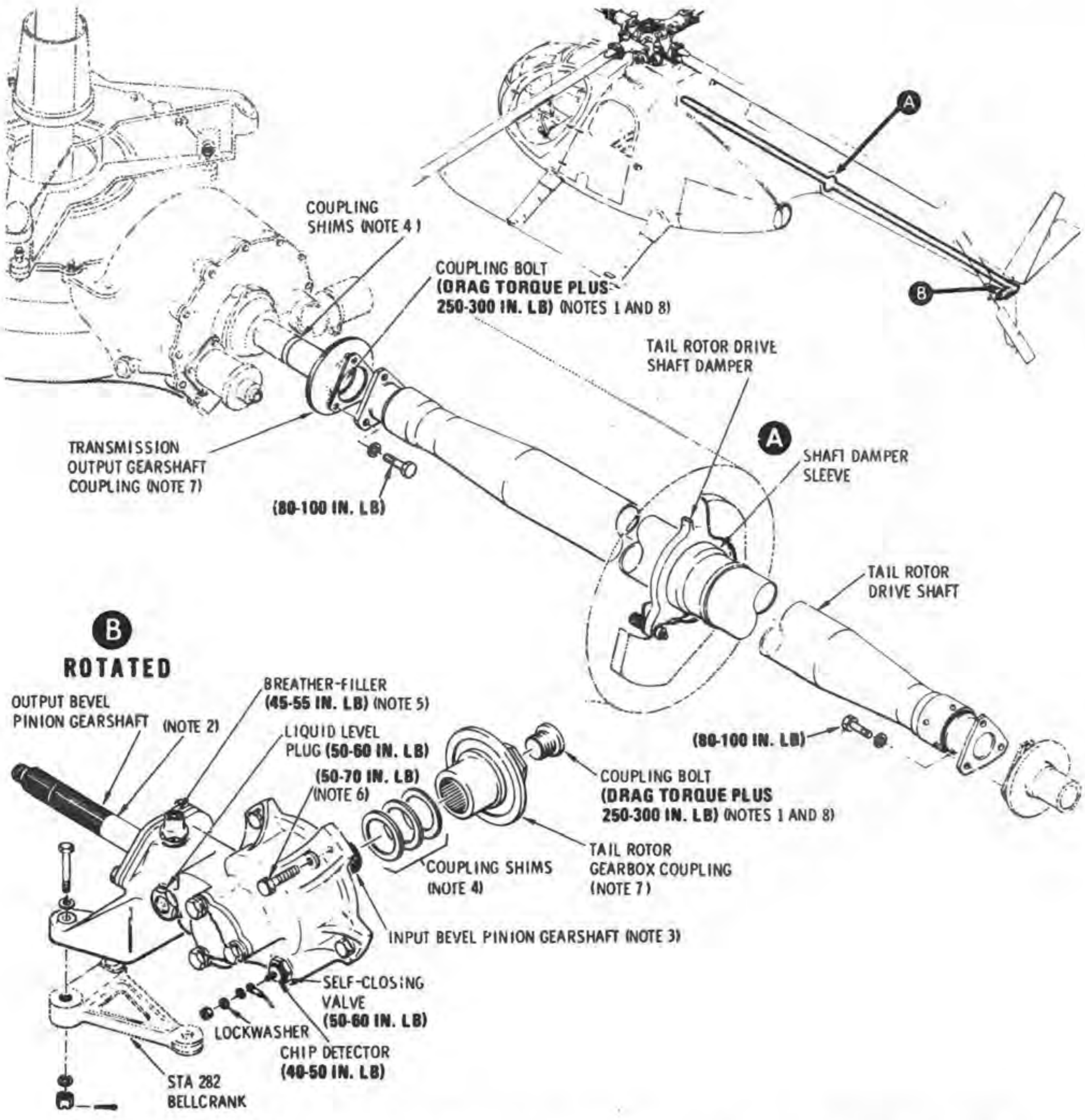
b. Check for scratches in the shaft section that passes through the plenum chamber fairing tube and bulkheads. Such scratches indicate possible contact with the tube edges in the bulkhead openings.

c. Check for evidence of torsional buckling or shaft bending as a result of a blade strike or hard ground contact by the lower stabilizer.

d. Check shaft (damper) sleeve (fig. 6-13) for security of bond and evidence of slippage (sleeve shifting) from excessive heat or loads.

e. Check for corrosion.

f. Check attaching hardware for stripped or crossed



NOTES:
1. DRAG TORQUE FOR BOLT (SELF-LOCKING) SERVICEABILITY IS 15 IN.LB MINIMUM, 150 IN. LB MAXIMUM.
2. RUNOUT (TIR) NOT MORE THAN 0.005 INCH AT THIS POINT.
3. AXIAL PLAY NOT MORE THAN 0.005 IN. WHEN OUTPUT SHAFT IS MOVED IN AND OUT.
4. ALUMINUM ALLOY; 0.002-IN. LAMINATIONS.
5. BREATHER MUST BE INSTALLED WITH HOLE ORIENTED REARWARD WITHIN ±85°
OF PARALLEL WITH THE AIRCRAFT CENTERLINE (INPUT SHAFT).
6. REPLACE AN174H-17A BOLT WITH NAS 1304-24H BOLT AT FIRST OPPORTUNITY.
7. COAT COUPLING SPLINES WITH LUBRICANT (C63) BEFORE ASSEMBLY.
8. COAT COUPLING BOLT THREADS WITH ANTISEIZE COMPOUND (C14) BEFORE ASSEMBLY.

12-140J

Figure 6-13. Tail Rotor Drive Shaft, Damper and Tail Rotor (Transmission) Gearbox.

threads and nutplates for drag torque. Discard unserviceable hardware.

6-74. Repair — Tail Rotor Drive Shaft. *a.* Replace shafts for bending, defective damper sleeve, or for scratches, nicks, dents and corrosion that exceed limits, *c* and *d* below. The tail rotor drive shaft damper sleeve repair and rework limits are the same as for the tail rotor drive shaft.

NOTE

If shaft is replaced for torsional buckling, replace and condemn the main transmission output gearshaft coupling, the tail rotor gearbox coupling, and both coupling bolts (fig. 6-13).

b. **NICKS AND SCRATCHES NO DEEPER THAN 0.001 INCH ARE ALLOWABLE WITHOUT REWORK BUT REQUIRE FINISH PROTECTION WITH CHEMICAL FILM (C20).**

CAUTION

Any section of the shaft that appears to be scratched, nicked or corroded in a previously reworked area shall not be repaired a second time. Remove such a shaft from further service.

c. Nicks, scratches and corrosion that do not exceed the limits described below are allowable with rework. Completely remove, smooth out and blend into surrounding material with grade 400 abrasive paper (C3) followed by polishing with crocus cloth (C25). Apply finish protection with chemical film (C20).

(1) **SCRATCHES 0.007 INCH DEEP TO A MAXIMUM LENGTH OF 1.0 INCH, AT ANY RANDOM ANGLE.**

(2) **SCRATCHES 0.010 INCH DEEP TO A MAXIMUM LENGTH OF 0.25 INCH, AT ANY RANDOM ANGLE.**

(3) **CIRCUMFERENTIAL SCRATCHES 0.004 INCH DEEP.**

d. **SMOOTHLY CONTOURED DENTS ARE ALLOWABLE WHEN THE RATIO OF DENT DIAMETER TO DENT DEPTH IS AT LEAST 15:1, THAT IS, WHEN THE DEPTH IS 0.040 INCH, THE MINIMUM ACCEPTABLE DIAMETER WOULD BE 0.60 INCH. THE MAXIMUM ACCEPTABLE DEPTH OF A DENT IS 0.040 INCH. DENTS THAT RAISE MATERIAL REQUIRE SHAFT REPLACEMENT.**

6-75. Installation — Tail Rotor Driveshaft. (See fig 6-13.)

CAUTION

Replacement of the main transmission, tail rotor driveshaft, tail rotor transmission or tail boom assembly requires mandatory reshimming of both the main transmission and tail rotor transmission couplings.

a. Remove any existing shims and install one 0.010 inch shim at both the main transmission and tail rotor transmission couplings. Coat coupling bolt threads with antiseize compound (C14). TORQUE COUPLING BOLTS TO ACTUAL DRAG TORQUE PLUS 250-300 INCH POUNDS. DRAG TORQUE FOR COUPLING BOLT SERVICEABILITY IS 15 INCH POUNDS MINIMUM, 150 INCH POUNDS MAXIMUM.

b. With help from an assistant, guide driveshaft carefully through tail boom and damper into position.

NOTE

Install tail rotor drive shaft with data plate forward.

c. Using bolts (P/N AN4H77A) as a workaid, install bolts through tail rotor gearbox mount holes. Install tail rotor gearbox in place. Start bolts (do not overtighten bolts as they may break nutplates loose in tailboom).

WARNING

Application of additional loads to tail rotor transmission in extended position could cause damage to gearbox mounting frame on nutplate connection.

d. Carefully pull tail rotor gearbox to outboard end of bolts, (P/N AN4H77A), to gain access to the end of the driveshaft and coupling on tail rotor gearbox.

e. Install three bolts and washers at forward end of shaft. TORQUE BOLTS 80 TO 100 INCH POUNDS.

CAUTION

While fastening the driveshaft to the tail rotor gearbox coupling, the shaft will ride on the bulkhead just forward of station 142 bellcrank. A cushion material of sort will stop the shaft from rubbing the bulkhead. Remove after use.

f. Carefully slide tail rotor gearbox forward into place against tail boom. Remove left top and right bottom long bolts. Install two bolts (P/N NAS1304-24H) used to mount tail rotor gearbox to tailboom attaching points. TORQUE BOLTS 50-70 INCH POUNDS.

g. Align the forward end of the driveshaft with the coupling on the main transmission output gearshaft. Partially install two bolts as alignment pins but do not tighten to obtain tension.

h. Use a feeler gage to measure the gap at each bolt hole between the main transmission coupling and the tail rotor driveshaft. Average the three readings. Record the average gap.

i. Remove two alignment bolts from coupling. Remove the two mount bolts holding tail rotor gearbox to the tail boom. Reinstall the two workaid bolts.

j. Carefully slide the tail rotor gearbox to the end of bolts again, to gain access to coupling and driveshaft.

k. Holding output shaft, remove bolts holding driveshaft to coupling. Carefully slid driveshaft forward.

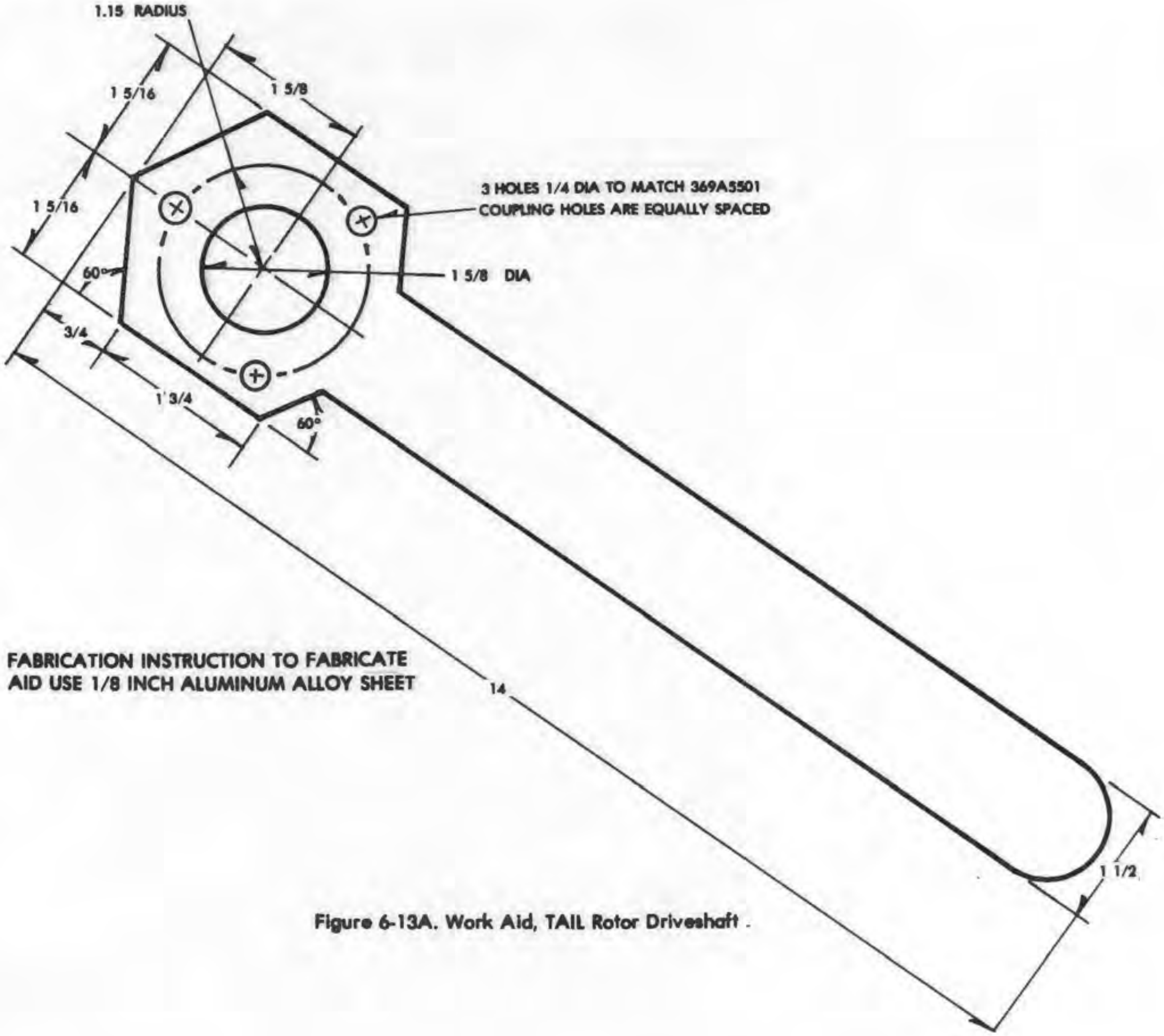


Figure 6-13A. Work Aid, TAIL Rotor Driveshaft .

NOTE

MAKE WORK-AID FROM
7/16 INCH HEXAGONAL BAR STOCK

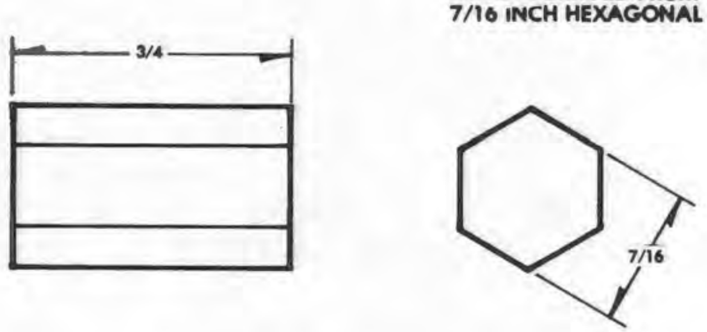


Figure 6-13B. Work Aid, Tail rotor Driveshaft *l.* Using bolts from coupling, fasten workaid (fig. 6-13B) to coupling on tail rotor gearbox.

m. Using workaid (fig. 6-13A), remove the hex bolt holding the driveshaft coupling to the tail rotor gearbox.

n. Select a shim thickness to fill the measured gap. NO GAP (COUPLING TENSION) IS ALLOWABLE, BUT THERE MAY BE UP TO 0.005 INCH COUPLING COMPRESSION.

o. Divide shims equally between the main transmission and tail rotor gearbox couplings. Install required shims. Coat coupling splines with lubricant (C63) and coupling bolt threads with antisieze compound (C14). Using workaids reinstall coupling and through bolt. TORQUE COUPLING THROUGH BOLT TO ACTUAL DRAG TORQUE PLUS 250-300 INCH POUNDS.

p. Align shaft to coupling on tail rotor gearbox. TORQUE BOLTS TO 80-100 INCH POUNDS.

q. Carefully slide tail rotor gearbox forward. Install upper left and lower right mount bolts. Torque bolts 50 to 70 inch pounds. Recheck for gap between main transmission coupling and driveshaft.

r. Apply primer (C79) to the four gearbox mounting bolts. Remove long bolts and install bolts with washers while the primer is still wet. TORQUE BOLTS TO 50-70 INCH POUNDS.

s. Install three bolts and washers at forward end of shaft. TORQUE BOLTS TO 80-100 INCH-POUNDS. Lockwire the four gearbox mounting bolts in pairs with 0.032 inch lockwire (C57).

t. Connect the electrical wire to the gearbox chip detector.

u. Insert pin of station 282 bellcrank into bearing in tail rotor pitch control. Pivot bellcrank to align with mating hole in tail rotor transmission and install bolt, two washers, nut and nut cotter pin.

v. Slowly rotate shaft and CHECK FOR NOT LESS THAN 0.25 INCH CLEARANCE BETWEEN SHAFT OF AND THE FAIRING TUBE AT STATION 137.5. While turning, also check to ensure shaft is not bent. Install all access doors and covers.

6-76. TAIL ROTOR DRIVE SHAFT COUPLINGS.

6-77. Removal — Tail Rotor Drive Shaft Couplings. (See fig. 6-13.) *a.* Remove tail rotor drive shaft (para 6-72).

b. Remove rear coupling from tail rotor transmission by removing attaching bolt. (See fig. 6-13.) Retain shims with coupling for reinstallation.

c. Remove front coupling from main rotor transmission by removing attaching bolt. (See fig. 6-7.) Retain shims with coupling for reinstallation.

6-78. Inspection — Tail Rotor Drive Shaft Couplings. *a.* Check coupling diaphragm for dents, cracks, nicks, rust spots and joint separation at the weld junction. If any such defect is evident the coupling must be replaced.

b. Check coupling ends for scratches, nicks, dents, cracks and corrosion pits. No cracks are allowed. Maximum depth of other defects before rework is 0.005 inch.

c. Measure the overall length of the couplings at three different points. If the average of the readings exceeds 2.541 inches, the coupling must be replaced.

6-79. Repair — Tail Rotor Drive Shaft Couplings. *a.* No repairs to the coupling diaphragms are permissible.

b. Repair damage to the ends of the coupling that is no deeper than 0.005 inch. Use abrasive paper grades 400 and 600 (C3) and (C4) and crocus cloth (C25) to completely remove and polish out the defect. **MAXIMUM DEPTH AFTER REWORK IS 0.010 INCH.** Apply primer (C79) to repaired area for corrosion protection.

6-80. Installation — Tail Rotor Drive Shaft Couplings. Install tail rotor couplings and tail rotor drive shaft (para 6-69).

6-81. TAIL ROTOR DRIVE SHAFT DAMPER.

6-82. Description — Tail Rotor Drive Shaft Damper. The tail rotor drive shaft damper is a graphite-filled teflon plate that controls and limits deflection of the tail rotor drive shaft about its approximate midpoint at all drive system speeds. The damper is spring-loaded against a structural support bracket mounted on the aft section tailboom fairing. Maximum possible shaft deflection in one direction is limited to less than 0.50 inch at the extreme throw positions of the damper.

6-83. Troubleshooting — Tail Rotor Drive Shaft Damper. If there is excessive damper vibration during acceleration from ground idle, the probable cause is a defective or loose damper. Friction adjustment or damper replacement is required.

6-84. Inspection — Tail Rotor Drive Shaft Damper (Installed). *a.* Remove boom bolts access doors.

b. Inspect the tail rotor drive shaft damper and support structure for broken, cracked, or bent parts.

c. Displace the damper so that it touches the tail rotor drive shaft.

d. Use a wire gage to measure the damper to shaft clearance 180 degrees from the contact point. **MINIMUM ACCEPTABLE SHAFT CLEARANCE IS 0.020 INCH.**

e. Repeat steps *c* and *d* above at 90 degrees intervals from the initial check until clearance on each side (360 degrees) of damper has been checked.

f. Dampers not meeting the minimum clearance of 0.020 inch on each side are to be replaced.

g. Close access doors.

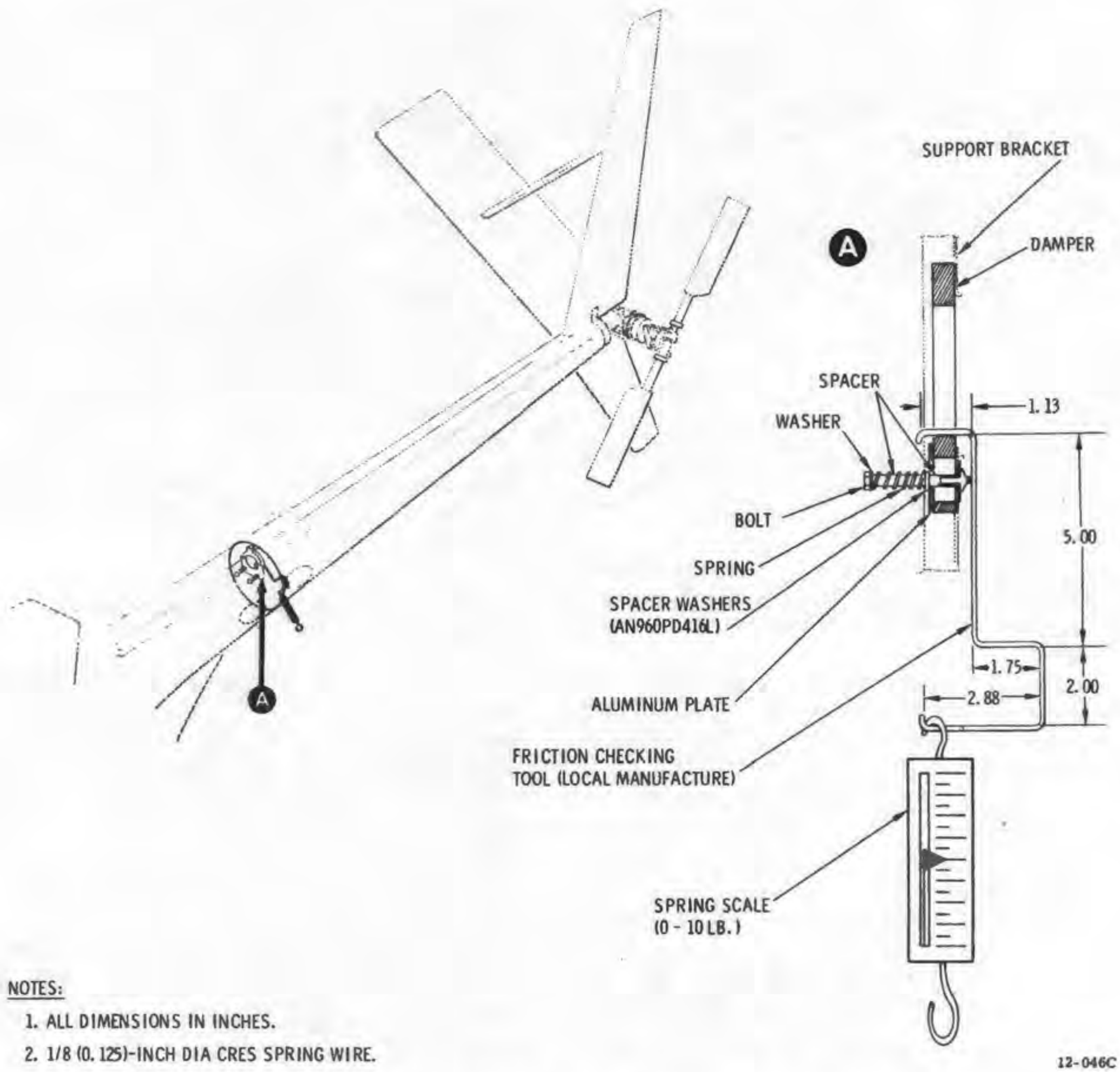


Figure 6-14. Tail Rotor Drive Shaft Damper Friction Check and Adjustment.

6-85. Adjustment — Tail Rotor Drive Shaft Damper. (See fig. 6-14.) *a.* Remove tail rotor drive shaft (para 6-72).

b. Using a 0-10 pound spring scale, measure the force required to move the damper radially on bulkhead. Pressure friction must be adjusted so that a pull of 1.75-2.25 pounds is required to slide the damper between the plate and support bracket.

c. To increase friction, add spacer washers between the springs and the plate. To decrease friction, remove washers. (Add or remove the same number of washers at each pressure point.)

NOTE

A minimum of one washer must always remain between each spring and the plate.

d. Install tail rotor drive shaft (para 6-75).

6-86. Removal — Tail Rotor Drive Shaft Damper. (See fig. 6-14.) *a.* Remove boom bolts access doors.

b. Remove tail rotor drive shaft (para 6-72).

c. Remove the two bolts, washers, springs, shim washers, plate and spacers, and damper.

6-87. Inspection — Tail Rotor Drive Shaft Damper (Removed). Inspect the inside diameter of the damper for excessive wear. If the diameter is more than 3.035 inches, the damper must be replaced.

6-88. Repair — Tail Rotor Drive Shaft Damper. Repair of the tail rotor drive shaft damper is limited to replacement of defective parts. (Refer to chapter 2 for replacement or repair of tail rotor drive shaft support bracket.)

6-89. Installation — Tail Rotor Drive Shaft Damper. (See fig. 6-14.)

CAUTION

Make certain that the two bolts and washers under the boltheads are seated against the spacers when tightened. The bolts will wear rapidly if the clamp-up is not solid.

a. Position damper over mounting holes in support bracket. Install plate and spacers with bolts, washers, springs, and spacer washers.

b. Adjust damper friction, paragraph 6-85.

c. Reinstall tail rotor drive shaft (para 6-75).

d. Install access doors.

SECTION VI INTERMEDIATE GEAR BOX

(Not Applicable)

SECTION VII TAIL ROTOR GEAR BOX

6-90. TAIL ROTOR (TRANSMISSION) GEARBOX

6-91. Description — Tail Rotor (Transmission) Gearbox. The tail rotor (transmission) gearbox is a right-angle, speed-increasing transmission (2045 to 3018 rpm at 100% N2) having a magnesium alloy housing. (See fig. 6-13.) The transmission drive consists of a pair of spiral-bevel gears that are splash lubricated. An oil liquid level sight plug and magnetic chip detector are located on the aft end of the transmission and a breather-filler is located on top. Refer to chapter 1 for transmission servicing information.

6-92. Inspection — Tail Rotor (Transmission) Gearbox (Installed). *a.* Check the transmission for leaks, cracks, or corrosion. Evaluate oil leakage according to paragraph 6-104.

NOTE

Operation in heavy rain may cause water to enter the gearbox through the breather-filler. If water contamination is suspected, drain gearbox oil and replace with new oil (chapter 1).

b. Check that bolts are secure with lockwiring intact.

c. (Refer to paragraph 6-54 and table 6-1, chip detector caution light on.) Remove lockwire, electrical wire and chip detector from self-closing valve. Check for presence of foreign matter such as dirt or metal particles. If metal particles are present, drain oil and observe condition. If no metal particles are present, wipe detector clean and reinstall (fig. 6-13). Lockwire chip detector.

6-93. Removal — Tail Rotor (Transmission) Gearbox. *a.* Remove tail rotor from tail rotor gearbox (para 5-90).

b. Remove tail rotor drive shaft; remove gearbox from shaft (para 6-69).

6-94. Disassembly — Tail Rotor (Transmission) Gearbox. (See fig. 6-13.) Remove coupling bolt, gearbox coupling, and coupling shims from input bevel pinion gearshaft. Retain shims for reuse.

NOTE

Further disassembly is not required as a replacement transmission is equipped with all other accessories.

6-95. Inspection — Tail Rotor (Transmission) Gearbox (Removed). (See fig. 6-13.) *a.* Check the input bevel gearshaft for axial play by moving the input shaft in and out. The gearbox must be cold. **AXIAL PLAY IS LIMITED TO 0.005 INCH MAXIMUM.**

b. Check TIR with dial indicator contact in split ring groove of the output bevel pinion gearshaft. **RUNOUT IS LIMITED TO 0.005-INCH TIR.** No axial play is permissible.

c. Check for high and low runout at the split ring groove on the output shaft. Mark the high and low extremes on the outer end of the shaft with a grease pencil.

NOTE

Marking the shaft to indicate the runout extremes will provide a guide for reinstallation of the tail rotor (para 5-103) so that chances of high frequency vibration are reduced along with a lessening of the need for tail rotor balancing.

d. Inspect all scoring or scratching of the output shaft to determine if the marks penetrate through the cadmium plating and into the steel shaft. **PENETRATION OF THE STEEL SHAFT IS ALLOWABLE TO A MAXIMUM DEPTH OF 0.005 INCH IF THE DAMAGED AREA IS REPAIRED ACCORDING TO PARAGRAPH 6-96.**

NOTE

The output shaft may have indications of scoring or scratching that do not penetrate the cadmium plating. If inspection reveals that the steel is not penetrated do NOT rework the area. To polish out such marks will only remove additional cadmium, leaving the shaft susceptible to corrosion.

6-96. Repair — Tail Rotor (Transmission) Gearbox. (See fig. 6-15.) Repair of the tail rotor gearbox is limited to repair of the output pinion gearshaft, and replacement of; input or output pinion gearshaft seals; liquid level plug; chip detector; breather filler (or); the complete gearbox assembly. For replacement of the liquid level plug, chip detector, or breather-filler refer to paragraph 6-98.

a. Scratches, corrosion or score marks that penetrate the steel output shaft between the seal lip contact area and splines are allowable with rework provided the repaired area is not reduced more than 0.005 inch below the surrounding area.

b. Smooth out and blend the defect into surrounding material with grade 400 wet or dry abrasive paper (C3) and then polish with crocus cloth (C25).

c. Clean shaft with thinner (C109) and apply a light coat of primer (C79) for corrosion protection.

6-97. Installation — Tail Rotor (Transmission) Gearbox.

CAUTION

Do not carry or otherwise support the gearbox by the coupling, as the coupling diaphragm will buckle if excessively deflected. During performance of all maintenance on the gearbox, use extra care to keep contaminants such as paint, dirt, etc. from the areas around the input and output shaft seals.

a. Install tail rotor drive shaft and gearbox (para 6-75).

b. Install tail rotor on tail rotor gearbox (chapter 5).

c. Drain any preservative oil residue and service gearbox with lubricating oil (chapter 1).

6-98. TAIL ROTOR TRANSMISSION EXTERNAL COMPONENT REPAIRS.

6-99. Liquid Level (Sight) Plug — Tail Rotor Transmission External Components. (See fig 6-15.) *a.* Drain oil from transmission until oil level is well below edge of sight plug and port.

b. Remove lockwire from sight plug.

c. Remove sight plug by unscrewing.

d. Remove and inspect O-ring. Install new O-ring on sight plug, if required.

NOTE

When a new sight plug is being installed, the liquid level markings are added (para 6-101) after the plug is installed and torqued. Coat new sight plugs that are not identified with an "X" after the part number with silicone primer to prevent clouding of sight glass. Refer to paragraph 6-100 below for coating application.

e. Install sight plug. **TORQUE SIGHT PLUG TO 50 - 60 INCH-POUNDS**, and safety with 0.032-inch lockwire (C57).

6-100. Application of Sight Plug Silicone Coating — Tail Rotor Transmission External Components. A new sight plug (S53H) may be coated as follows:

a. Fill a clean container with silicone primer (C81) deep enough to cover the sight plug.

b. Dip plug in primer long enough to coat inner face of window. Allow to air-dry.

c. Reidentify plug by adding an "X" after the part number.

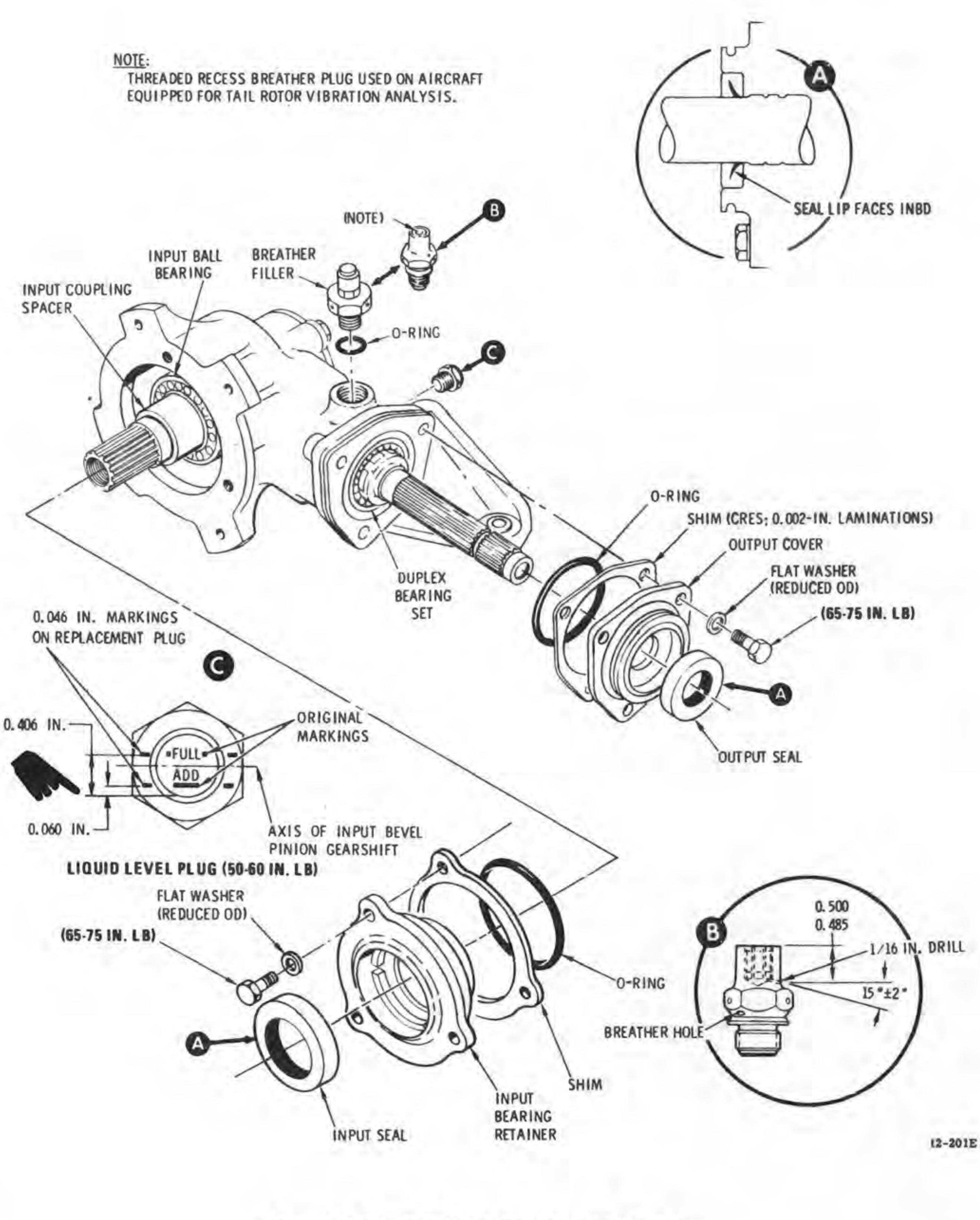


Figure 6-15. Tail Rotor Transmission Repairs.

6-101. Application of Markings-Liquid Level (Sight) Plug — Tail Rotor Transmission External Components. (See fig. 6-15.) Oil level markings may be applied on newly installed sight plugs as follows:

a. Using a machinists level and scale, scribe an ADD line horizontally on both outer faces of the sight plug, above the lower edge of the window as shown in detail A. Do NOT mark the window.

b. Scribe the FULL line horizontally on both outer edges of the sight plug, above the lower edge of the window as shown in detail A. Do NOT mark the window.

CAUTION

Application of any cleaning material other than soap and water to the sight plug window may cause it to craze.

c. Using white paint (C-55), paint four lines with the edges touching the scribe marks as shown in detail A. Do NOT paint the surface of the window.

6-102. Chip Detector — Tail Rotor Transmission External Components. Refer to tail rotor transmissions draining, removal and installation instructions. Refer to chapter 9 for functional test of detector circuit. Refer to paragraph 6-54 for inspection.

6-103. Breather-Filler — Tail Rotor Transmission External Components. *a.* Remove lockwire from breather-filler.

b. Remove breather-filler by unscrewing.

c. Remove and inspect the O-ring. Replace unserviceable O-ring.

d. Use step *f* below to install non-threaded insert breather-filler. Use steps *e* and *f* below to install threaded insert breather-fillers.

e. Locate the breather hole on threaded insert breather-fillers (between the flange and the flats). This type breather-filler must be installed with the breather hole oriented rearward with ±85 degrees of parallel with the aircraft centerline (input shaft). If proper orientation of the breather-filler cannot be obtained, one or two AN960PD1016L washers may be added between the O-ring and the breather-flange (one washer will change the breather hole orientation approximately 100 degrees).

f. **TORQUE THE BREATHER-FILLER TO 45 - 55 INCH-POUNDS.** Secure the breather-filler with 0.032-inch lockwire (C57).

6-104. MAIN AND TAIL ROTOR TRANSMISSION OIL LEAKAGE CRITERIA.

6-105. General — Oil Leakage Criteria. Oil leakage, seepage or capillary wetting at the oil seals or assembly joint lines of the main transmission or tail rotor transmission are permissible if the leakage rate does not exceed 2 cc per hour (one drop per minute). An acceptable alternate rate of leakage from either transmission is if oil loss is not more than from the full to the add mark on the sight gage within 25 flight hours. Excessive leakage must be repaired or the transmission replaced.

NOTE

On transmission input and output pinion gear oil seals with less than 2 hours of operation, some seepage or wetting of adjacent surfaces is normal until the seal is wetted and worn-in (seated). If seepage continues at a rate of one drop per minute or less, the seal may be continued in service. Check transmission oil level and observe seepage rate after every 2 hours of operation. Shorter inspection periods may be required if seal leakage appears to be increasing.

6-106. TAIL ROTOR TRANSMISSION OIL SEAL REPLACEMENT.

6-107. Output Gearshaft Oil Seal — Tail Rotor Transmission Seal Replacement. (See fig 6-15.)

NOTE

Before proceeding with the following steps, verify that output gearshaft radial and axial play do not exceed limits specified in paragraph 6-95.

a. Drain oil from transmission (chapter 1).

NOTE

To maintain the best tail rotor balance possible, mark or index the output shaft for reassembly reference.

b. Remove tail rotor assembly (chapter 5).

CAUTION

Press firmly against output shaft as output cover is removed to prevent unseating of the duplex bearing set. Replacement of the output gear shaft oil seal should only be performed under carefully controlled conditions.

c. Remove three bolts, washers, and output cover from gearbox.

d. Remove laminated shim. Retain shim with cover and use care to keep them from becoming damaged.

e. Check O-ring for cuts, breaks or swelling. Discard O-ring if it is defective.

f. Press seal from output cover and discard.

g. Apply sealing compound (C89), to outside diameter (OD) of seal. Using an arbor press, press seal into output cover so that lip direction will be toward gears (detail A). Do not allow seal to cock in cover bore during installation.

NOTE

Zinc chromate primer (C79) may be used on seal OD if sealing compound is not available. Press seal into place while primer is still wet.

h. Inspect circumference of gearbox output shaft for scratches, corrosion and general condition of finish where the seal lip makes contact.

CAUTION

Do not use an axial or diagonal (helical) motion when polishing the shaft. Use a polishing motion that is rotational and at right angles to the shaft centerline. A finish lay that is axial or helical to the direction of shaft rotation will cause excessive seal wear.

i. Using crocus cloth (C25), polish out any indications of corrosion or scratches. Reworked finish must be equal to or better than original finish.

j. Wrap one layer of cellulose tape (C18) over the full length of the output shaft splines.

k. Install new O-ring, if required. Lubricate the tape, packing and mating bore, and seal lip with petrolatum (C73).

l. Very carefully install shim and output cover; the sharp edge of the seal lip must not be damaged

CAUTION

Do not substitute standard AN960 flat washers for the NAS620A416L washers used under the output cover bolts. The NAS washers have a reduced OD to prevent entry of the washer edges into adjacent radii of the cover. Washer substitution will produce false readings when torquing the cover bolts, and the interference pressure may crack the cover.

m. Install the cover bolts and washers; **TORQUE BOLTS TO 65-75 INCH-POUNDS.** Secure all bolts together with 0.032-inch lockwire (C57).

n. Check output shaft for axial play; no axial play is permissible. If play is detected, remove output cover and shim. Shim laminations are 0.002 inch thick. Peel away laminations as required to produce 0.001- to 0.002-inch clamp-up pressure on the outer races of the output shaft duplex bearing set. Reinstall shim and cover, steps *l* and *m* above, and lockwire all boltheads together.

o. Remove tape and wipe excess petrolatum from shaft. Do NOT wipe petrolatum from seal rubber as it protects the seal from drying out.

p. Reinstall tail rotor assembly (chapter 5), and service the gearbox (chapter 1).

6-108. Input Gearshaft Oil Seal — Tail Rotor Transmission Seal Replacement. (See fig. 6-16.) *a.* Remove tail rotor transmission (para 6-93).

b. Drain oil from transmission (chapter 1).

c. Match mark the input bearing retainer and gearbox housing for reassembly reference.

CAUTION

Do not allow the input shaft to move outward. Excessive outward movement of the input pinion shaft will result in mislocation of the anular contact bearing balls which will require that the transmission be returned to overhaul.

d. Position the transmission on a suitable work bench with the input pinion shaft pointing upward. Remove three bolts and washers securing the input bearing retainer assembly (fig. 6-15.) While holding moderate downward pressure on the input pinion gearshaft, carefully lift off the input bearing retainer and shim. Retain shim with housing. Cover the gearshaft and housing bore with a clean lint-free cloth to prevent entry of foreign material.

e. Using an arbor press and suitable adapters, press seal from retainer assembly. Clean seal area with methyl ethyl ketone (C69) to remove all sealing compound residue.

f. Apply a light coat of sealing compound (C89) to the OD of seal. Using an arbor press, press seal into retainer assembly with the seal lips facing inboard (detail A).

g. Inspect O-ring for cuts, breaks or swelling. Discard and replace O-ring if it is defective. Lubricate the seal lip and O-ring with petrolatum (C73). Install O-ring.

h. Inspect circumference of input coupling spacer for scratches, corrosion and general condition finish where the seal lip makes contact.

i. Using crocus cloth (C25), polish out any indications of corrosion or scratches. Polish with a motion that is in the direction of shaft rotation. Rework finish must be equal to or better than original finish.

WARNING

Do not alter input pinion shim thickness.

j. Carefully install the retainer and shim with the match marks aligned.

k. Reinstall retainer washers and bolts; **TORQUE BOLTS TO 65-75 INCH-POUNDS.** Secure all bolts together with 0.032-inch lockwire (C57).

l. Reinstall tail rotor transmission (para 6-97) and service (chapter 1).

CHAPTER 7
HYDRAULIC AND PNEUMATIC SYSTEMS

(Not Applicable)