

**CHAPTER 22****SERVICING**

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## CHAPTER 22

## SERVICING

22-10 Main Rotor Gearbox

## NOTE

Inspect main rotor gearbox for leaks when "top off" is required.

## NOTE

Verify aircraft is on level ground when evaluating gearbox oil level.

## WARNING

**Refer to Safety Data Sheets (SDS) and observe precautions when working in proximity to hazardous materials.**

**A. Draining Oil**

1. Run-up helicopter for approximately five minutes at 70-75% RPM per R22 Pilot's Operating Handbook (POH) Section 4 as required to warm oil and expedite draining.
2. Disconnect chip detector wiring from airframe harness at connectors. Remove chip detector from housing.
3. Refer to Figure 22-1. Insert MT054-1 drain assembly (or MT053-1 drain assembly for threaded chip detector) into housing. Position drain hose overboard into a suitable drain container. Jam wedge between firewall and drain assembly to open valve and drain oil. Remove drain assembly after oil has drained.

**B. Adding Oil**

1. Install chip detector in housing, if removed. (Special torque threaded chip detector per § 23-33.) Connect chip detector wiring to airframe harness at connectors.
2. Remove gearbox filler-plug. Fill gearbox to center of sight glass using A257-2 oil. Rotate rotor system by hand for several revolutions and pull down on tail rotor gearbox several times. Check gearbox oil level and adjust as required. Install gearbox filler-plug and special torque plug per § 23-33.
3. Run-up helicopter approximately five minutes at 70-75% RPM per R22 Pilot's Operating Handbook (POH) Section 4.
4. Check gearbox oil level, and adjust as required.

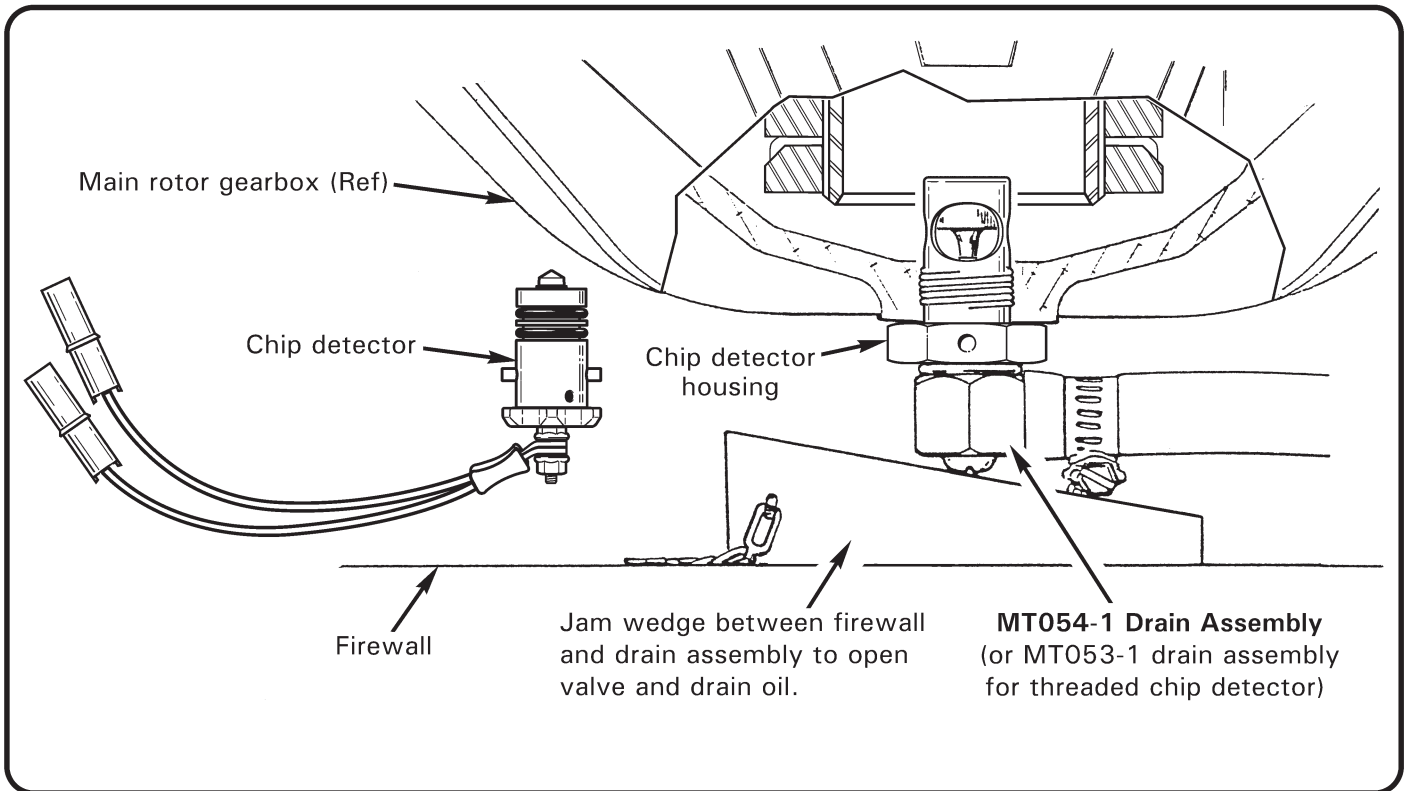


FIGURE 22-1 DRAINING MAIN ROTOR GEARBOX

22-11 Cleaning Chip Detector and Chip Detector Housing**WARNING**

**Refer to Safety Data Sheets (SDS) and observe precautions when working in proximity to hazardous materials.**

1. Disconnect chip detector wiring from airframe harness at connectors. For tail gearbox chip detector, place suitable drain container below gearbox. Remove chip detector from housing or gearbox.
2. Clean chip detector using a toothbrush and approved solvent (refer to § 23-70). Remove debris using compressed air or masking tape; do not use a magnet. Dry chip detector using compressed air or a lint-free cloth. Inspect condition.
3. Connect chip detector wiring to airframe harness at connectors. Turn battery on. Touch detector's magnet to airframe and verify appropriate gearbox caution light illuminates. Turn battery off. Disconnect chip detector wiring from airframe harness at connectors.
4. Install chip detector in housing or gearbox. Special torque threaded chip detector per § 23-33. Connect chip detector wiring to airframe harness at connectors.
5. Turn battery on. Depress push-to-test button(s) and verify appropriate gearbox caution light illuminates. Turn battery off.
6. As required, remove filler-plug. Fill gearbox to center of sight glass using A257-2 oil. Rotate rotor system by hand for several revolutions and pull down on tail rotor gearbox several times. Check gearbox oil level and adjust as required. Install filler-plug in gearbox and special torque plug per § 23-33.

22-12 Cleaning Sight Gage

1. Drain main rotor gearbox oil per § 22-10.
2. Remove sight gage from gearbox.
3. Clean sight glass using a toothbrush and approved solvent (refer to § 23-70). Dry sight gage using compressed air or a lint-free cloth. Inspect condition.
4. Install sight gage in gearbox and special torque gage per § 23-33. Verify security.

22-13 Main Rotor Gearbox Drain And Flush**WARNING**

**Refer to Safety Data Sheets (SDS) and observe precautions when working in proximity to hazardous materials.**

1. Run-up helicopter for approximately five minutes at 70-75% RPM per R22 Pilot's Operating Handbook (POH) Section 4 as required to warm oil and expedite draining.
2. Disconnect chip detector wiring from airframe harness at connectors. Remove chip detector from housing.
3. Refer to Figure 22-1. Insert MT054-1 drain assembly (or MT053-1 drain assembly for threaded chip detector) into housing. Position drain hose overboard into a suitable drain container. Jam wedge between firewall and drain assembly to open valve and drain oil.
4. Remove drain assembly after oil has drained. Install chip detector (special torque threaded chip detector per § 23-33). Connect chip detector wiring to airframe harness at connectors.
5. Remove filler-plug. Fill gearbox to center of sight glass using SAE30, SAE40, SAE50, or SAE20W50 mineral oil. Install filler-plug and special torque plug per § 23-33.
6. Run-up helicopter for approximately five minutes at 70-75% RPM per POH Section 4.
7. After shutdown, drain mineral oil per steps 2 thru 4. Remove drain assembly after oil has drained.
8. Remove chip detector housing. Clean chip detector and housing using a toothbrush and approved solvent (refer to § 23-70). Remove debris using compressed air or masking tape; do not use a magnet. Dry chip detector and housing using compressed air or a lint-free cloth. Inspect condition.
9. Connect chip detector wiring to airframe harness at connectors. Turn battery on. Touch detector's magnet to firewall and verify MR CHIP caution light illuminates. Turn battery off. Disconnect chip detector wiring from airframe harness at connectors.
10. Install chip detector housing in gearbox and special torque housing per § 23-33. Install chip detector in housing. (Special torque threaded chip detector per § 23-33.) Connect chip detector wiring to airframe harness at connectors.
11. As required, remove sight gage and clean glass using approved solvent (refer to § 23-70). Install sight gage and special torque gage per § 23-33.
12. Remove filler-plug. Fill gearbox to center of sight glass using A257-2 oil. Rotate rotor system by hand for several revolutions and pull down on tail rotor gearbox several times. Check gearbox oil level and adjust as required. Install filler-plug in gearbox and special torque plug per § 23-33.
13. Turn battery on. Depress push-to-test MR CHIP button and verify caution light illuminates. Turn battery off.

22-20 Tail Rotor Gearbox

## NOTE

Inspect tail rotor gearbox for leaks when "top off" is required.

## NOTE

Verify aircraft is on level ground when evaluating gearbox oil level.

## WARNING

**Refer to Safety Data Sheets (SDS) and observe precautions when working in proximity to hazardous materials.**

**A. Draining Oil**

1. Cut and discard ty-raps as required and disconnect chip detector wiring from airframe harness at connectors.
2. Place a suitable drain container under tail rotor gearbox to catch oil, then remove chip detector.

**B. Adding Oil**

1. Install chip detector in tail gearbox and special torque detector per § 23-33.
2. Connect chip detector wiring and install ty-raps, as required. Cinch ty-raps until snug without over-tightening, and trim tips flush with heads.
3. Turn battery switch on. Verify TR CHIP caution light illuminates when test button is depressed. Turn battery switch off.
4. Remove gearbox filler-vent plug and fill gearbox with A257-22 lubricant to center of sight glass. Rotate rotor system by hand for several revolutions and pull down on tail rotor gearbox several times. Check gearbox oil level and adjust as required.
5. Install filler-vent plug in gearbox and special torque plug per § 23-33.

### 22-21 Cleaning Chip Detector

1. Drain tail rotor gearbox oil per § 22-20.
2. Clean chip detector using a toothbrush and approved solvent (refer to § 23-70). Remove debris using compressed air or masking tape; do not use a magnet. Dry chip detector using compressed air or a lint-free cloth. Inspect condition.
3. Connect chip detector wiring to airframe harness at connectors. Turn battery switch on. Touch detector's magnet to airframe and verify TR CHIP caution light illuminates. Turn battery switch off. Disconnect chip detector wiring from airframe harness at connectors.
4. Install chip detector in gearbox and special torque detector per § 23-33. Connect chip detector wiring to airframe harness at connectors. Verify security.
5. Turn battery switch on. Depress push-to-test button and verify TR CHIP caution light illuminates. Turn battery switch off.

### 12-22 Cleaning Sight Gage

1. Drain tail rotor gearbox oil per § 22-20.
2. Remove sight gage from gearbox.
3. Clean sight gage using a toothbrush and approved solvent (refer to § 23-70). Dry sight gage using compressed air or a lint-free cloth. Inspect condition.
4. Install sight gage in gearbox and special torque gage per § 23-33. Verify security.



22-23 Tail Rotor Gearbox Drain And Flush**WARNING**

**Refer to Safety Data Sheets (SDS) and observe precautions when working in proximity to hazardous materials.**

1. Run-up helicopter for approximately five minutes at 70-75% RPM per R22 Pilot's Operating Handbook (POH) Section 4 as required to warm oil and expedite draining.
2. Disconnect chip detector wiring from airframe harness at connectors. Place a suitable drain container below tail rotor gearbox and remove chip detector.
3. Remove filler-plug. Fill gearbox to center of sight gage using SAE30, SAE40, SAE50, or SAE20W50 mineral oil. Install filler-plug and special torque plug per § 23-33.
4. Run-up helicopter for approximately five minutes at 70-75% RPM per POH Section 4.
5. After shutdown, drain mineral oil per step 2.
6. Clean chip detector using a toothbrush and approved solvent (refer to § 23-70). Remove debris using compressed air or masking tape; do not use a magnet. Dry chip detector and housing using compressed air or a lint-free cloth. Inspect condition.
7. Connect chip detector wiring to airframe harness at connectors. Turn battery on. Touch detector's magnet to airframe and verify TR CHIP caution light illuminates. Turn battery off. Disconnect chip detector wiring from airframe harness at connectors.
8. Install chip detector in gearbox and special torque detector per § 23-33. Connect chip detector wiring to airframe harness at connectors.
9. As required, remove sight gage and clean glass using approved solvent (refer to § 23-70). Install sight gage and special torque gage per § 23-33.
10. Remove filler-plug. Fill gearbox to center of sight gage using A257-2 oil. Rotate rotor system by hand for several revolutions and pull down on tail rotor gearbox several times. Check gearbox oil level and adjust as required. Install filler-plug in gearbox and special torque plug per § 23-33.
11. Turn battery on. Depress push-to-test TR CHIP button and verify caution light illuminates. Turn battery off.

22-30 Clutch Assembly Lubricant Inspection and Servicing**A. Clutch Assemblies with A168-4 (Forward) Retainer****WARNING**

**Avoid contaminating drive belts and sheaves with lubricant. Clean contaminated surfaces with mild soap and water solution, followed by a warm water rinse. Place a clean, absorbent rag beneath MT147-2 fittings, when installed, to catch any drips.**

1. Open main rotor gearbox compartment access doors.
2. Rotate clutch shaft until bolts securing yokes to shaft are vertical. Engage rotor brake.
3. Remove A168-4 (forward) retainer's top B289-3 screw and install clean MT147-2 fitting. Attach drain hose.
4. Rotate sheave until fitting and attached drain hose are on bottom. Route drain hose into a suitable, clean container. Remove top B289-3 screw and allow lubricant to drain into container.
5. Install second clean MT147-2 fitting at top of retainer and connect a clean supply of A257-4 lubricant to fitting. Flush sprag clutch housing until exiting lubricant is obviously red. Disconnect lubricant supply and allow lubricant to drain completely into container.
6. Strain all lubricant from container through a 180-200 micron paint filter/strainer. Fluid may be dark, and may sparkle with very fine metallic debris; this is normal. If metallic debris is trapped in the filter/strainer, remove clutch assembly and return it to RHC, or an R22 Service Center authorized to overhaul clutch assemblies, for disassembly and inspection.
7. If metallic debris is not found in the filter, attach drain hose to top fitting. Route drain hose into a suitable container. Connect a clean supply of A257-4 lubricant to bottom fitting. Fill sprag clutch housing thru bottom fitting until no air bubbles are visible in drain hose. Shut-off fluid flow.
8. Remove top fitting and install screw. Rotate sheave until opposite fitting is on top. Remove fitting and verify lubricant level contacts threads; add lubricant as required. Install forward screw.
9. Close main rotor gearbox compartment access doors.

**B. Clutch Assemblies with Retainer without B289-3 Screws**

1. Perform clutch assembly (aft) seal replacement per § 7.213.

## 22-40 Clutch Actuator Upper and Lower Bearings

The actuator upper bearing is located on the clutch shaft, and the actuator lower bearing is located on the fanshaft. Failure of either actuator bearing in flight could cause loss of power to rotor system and result in a serious accident. Refer to § 2.110 for general indications of bearing failure. In addition, just before failure of an actuator bearing, clutch light may flicker (on and off in less than one second) constantly or illuminate for a longer time than usual. Do not be confused with normal retensioning in flight (light on for up to 8 seconds, then off). Flight should not be resumed until cause of abnormal clutch light illumination has been determined.

Perform the following bearing inspections whenever an actuator bearing discrepancy is suspected or fanwheel is removed:

## 22-41 Upper Bearing Lubrication

### **WARNING**

**Refer to Safety Data Sheets (SDS) and observe precautions when working in proximity to hazardous materials.**

### **NOTE**

KI-115 Special Tools Kit (syringe and probe) required to perform the following procedure.

1. Fill syringe with 2-3 grams A257-12 grease (refer to § 23-70). Note: 2.5 grams of grease fills a 0.5 inch (13 mm) long space inside a syringe body with a 0.63 inch (16 mm) inner diameter.
2. Thoroughly clean an accessible portion of A184 bearing assembly aft rubber seal and surrounding surface.
3. Gently press plastic tip of syringe against cleaned seal inner lip until lip deflects inward and tip slips into bearing. Do not damage seal. Inject grease with syringe perpendicular to seal. Withdraw syringe. Part of seal's inner lip remains deflected inward.
4. Slide tip of steel probe under seal inner lip and return deflected portion of lip to original position. Do not damage seal.
5. Run-up helicopter for approximately two minutes 104% RPM per R22 Pilot's Operating Handbook (POH) Section 4. Shut down, inspect bearing, and clean off any escaped grease.

### **WARNING**

**Bearing used in A184 bearing assembly has modified internal clearance for use on R22. Do not substitute any other bearing.**

22-42 Lower Bearing Lubrication**WARNING**

**A181-1 & A181-3 bearings are obsolete and must be removed from service.**

1. Remove fanwheel per § 6.210.
2. Disconnect lower end of belt tension actuator from bearing housing.
3. Rotate bearing housing. Verify no roughness, scraping, or excessive looseness (0.010 inch maximum axial play). Verify no seal damage, and no heat damage. Lubricate bearing:
  - a. Remove four perimeter screws, nuts, and washers.
  - b. Remove bearing block with attached outer race (bearing outer race is split type). Forward seal retainer, forward seal, bearing inner race and bearing rollers will remain on fan shaft.
  - c. Clean parts, including seals, and inspect for obvious damage.
  - d. Lubricate bearing by filling openings on both sides of roller cage with A257-12 grease, but do not fill spaces between rollers.
  - e. Reassemble. Ensure forward seal fits properly into recess provided in forward seal retainer (not applicable to Rev L bearings).
  - f. Standard torque MS24694-S61 screws per § 23-32.
  - g. Rotate bearing housing. Verify no roughness and no excessive looseness.
4. Inspect bearing inner race on fanshaft. No movement or fretting is allowed between inner race and fanshaft.
5. If any indication of bearing failure is found, replace A007-3 or -5 shaft and bearing assembly per § 7.290.
6. Install fanwheel per § 6.220.
7. If bearing was lubricated, inspect & clean off any escaped grease after balancing fanwheel.

22-50 Fuel System**WARNING**

Refer to Safety Data Sheets (SDS) and observe precautions when working in proximity to hazardous materials.

**WARNING**

Always fuel or defuel helicopter in a well-ventilated area. No smoking within 100 feet of aircraft during fueling.

22-51 Fueling

1. Turn battery switch off.
2. Ground helicopter and ground fuel vehicle. Ground fuel vehicle to helicopter.
3. Verify proper grade of aviation fuel. See R22 Pilot's Operating Handbook (POH) Section 2 for approved fuel grades and instructions for use of anti-ice additive.

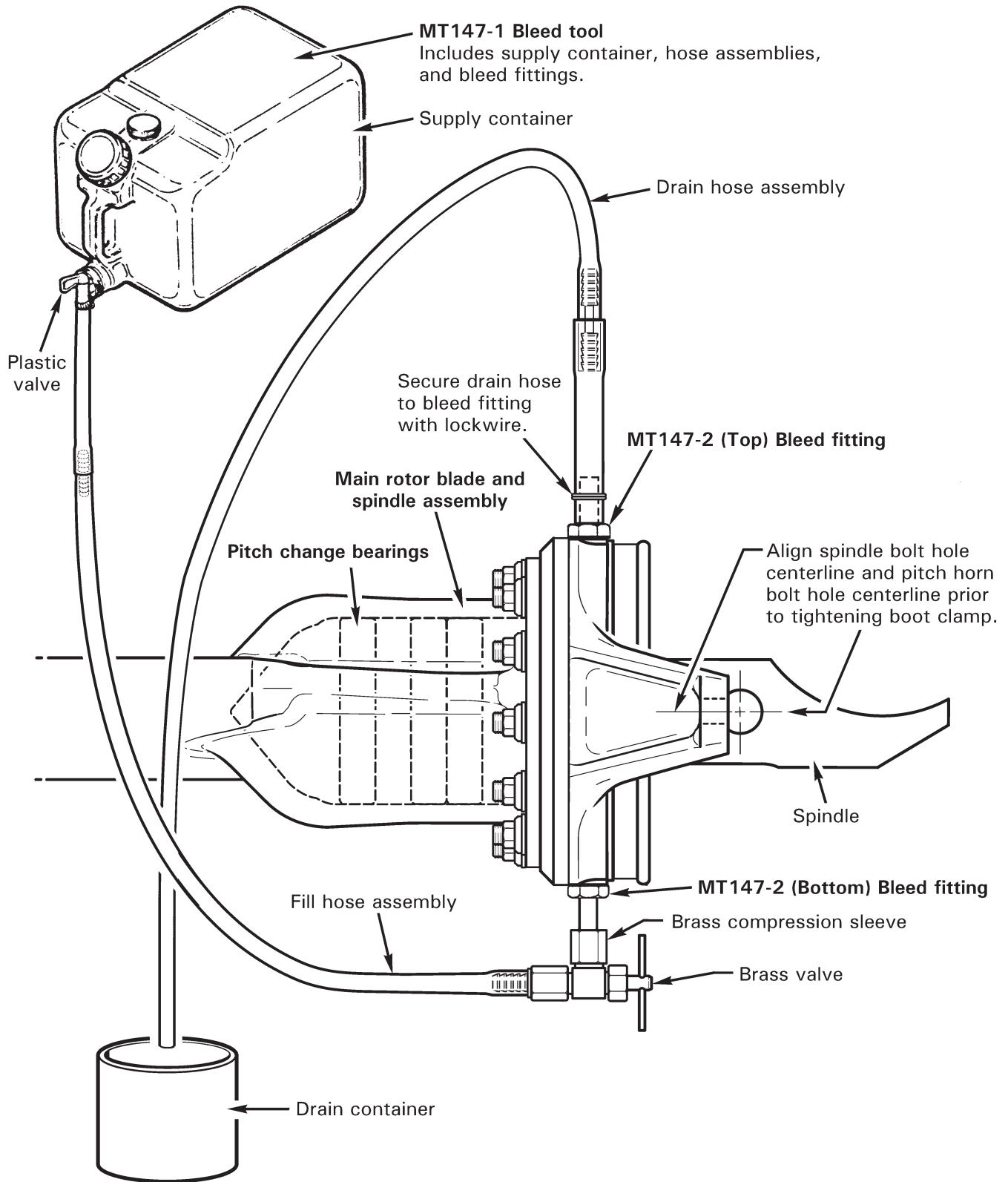
**NOTE**

Refer to Figure 2-4A. Verify A689-6 fuel cap is revision J or subsequent if bladder tanks are installed (revision J or subsequent caps may also be used on all-aluminum tanks).

4. Remove fuel cap(s) and fuel helicopter as required.
5. Install fuel cap(s); verify security.
6. Remove grounding equipment.

22-52 Defueling

1. Turn battery switch and fuel valve off.
2. Place suitable drain container beneath carburetor and ground container to helicopter.
3. Disconnect fuel hose assembly from carburetor.
4. Turn fuel valve on to drain fuel. (Perform low-fuel switch operation check per § 12.430, if desired.)
5. Connect fuel hose assembly to carburetor, special torque hose assembly nut per § 23-33, and torque stripe per Figure 2-1.



**FIGURE 22-2 FILLING PITCH BEARING HOUSING**

22-60 Main Rotor Blades22-61 Pitch Bearing Housing**NOTE**

MT147-1 Main rotor blade spindle air bleed tool includes supply container, hose assemblies, and bleed fittings.

**WARNING**

**Refer to Safety Data Sheets (SDS) and observe precautions when working in proximity to hazardous materials.**

1. Remove main rotor blades per § 26-10.
2. Refer to Figure 22-2. Place a suitable drain container below main rotor pitch horn. Remove two B289-2 bolts from pitch horn and drain fluid.
3. Install MT147-2 bleed fittings into pitch horn openings. Attach drain hose assembly to (top) bleed fitting, secure with two wraps of lockwire. Position drain hose into drain container.
4. Place supply container with sufficient A257-4 fluid approximately 3 feet above spindle. Route fill hose assembly into drain container and open brass valve. Open supply container plastic valve and purge air from fill hose. Close valves.
5. Connect brass valve to (bottom) bleed fitting by tightening brass compression sleeve.
6. Open valves and fill spindle housing until no air bubbles are visible in drain hose assembly. Massage spindle boot, oscillate spindle, and raise blade tip up & down to remove trapped air.
7. Remove drain hose assembly and (top) bleed fitting, and install B289-2 bolt. Roll the blade over. After five minutes, inspect the boot for leaks. If no leaks are found, close valves, remove fill hose assembly brass valve and (bottom) bleed fitting, and install other bolt.
8. Special torque B289-2 bolts per § 23-33 and torque stripe per Figure 2-1.
9. Repeat steps for opposite blade.

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