

**CHAPTER 12****FUEL SYSTEM**

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## CHAPTER 12

## FUEL SYSTEM

12-00 Description

## NOTE

Per R44 Service Bulletin SB-78B, fuel tanks without bladders should no longer be in service.

The fuel system includes main and auxiliary tanks, a shutoff valve control located between the front seats, and a strainer (gascolator). The fuel tanks have flexible bladders in aluminum enclosures. Fuel tank air vents are located inside the mast fairing.

The R44 fuel system is a gravity-flow (no fuel pumps) system; the R44 II fuel system is a pressurized fuel system that includes an engine-driven pump, an auxiliary (electric) fuel pump, and a fuel return line which allows pump supply in excess of engine demand to return to the fuel tanks.

The R44 II auxiliary pump primes the engine for starting and runs in flight to provide fuel pump redundancy. The engine will function normally with either the engine-driven or auxiliary (electric) pump operating. The ignition switch prime (momentary) position operates the auxiliary fuel pump for priming prior to engine start. After start, the pump runs continuously as long as the engine has oil pressure and the clutch switch is in the engage position.

The R44 II has a pressure switch on the gascolator which illuminates the fuel filter caution light if the strainer becomes contaminated. Continued operation with an illuminated filter caution light may result in fuel starvation. A pressure switch downstream of the auxiliary fuel pump illuminates the aux fuel pump caution light if auxiliary pump output pressure is low. When the clutch switch is disengaged, the auxiliary pump is off and the aux fuel pump caution light should be illuminated. Proper mechanical fuel pump function is indicated by normal engine operation after engine start prior to clutch switch engagement and before shutdown while clutch switch is disengaged.

The R44 and R44 II have plunger-style drain valves at the gascolator and at each fuel tank sump. The gascolator is located on the lower right side of the firewall and is drained by pushing up on the plastic tube which extends below the belly. Valves for both tanks are located inside the right cowl door below the auxiliary tank. Fuel samples are taken by extending the plastic tubes clear of the aircraft and pushing on the plungers. On newer helicopters, a glass tube stowed inside the upper, aft cowl door is provided which may be used to catch the fuel samples. Fuel should be sampled from all three locations prior to the first flight of the day and after refueling to verify no contamination and correct grade.

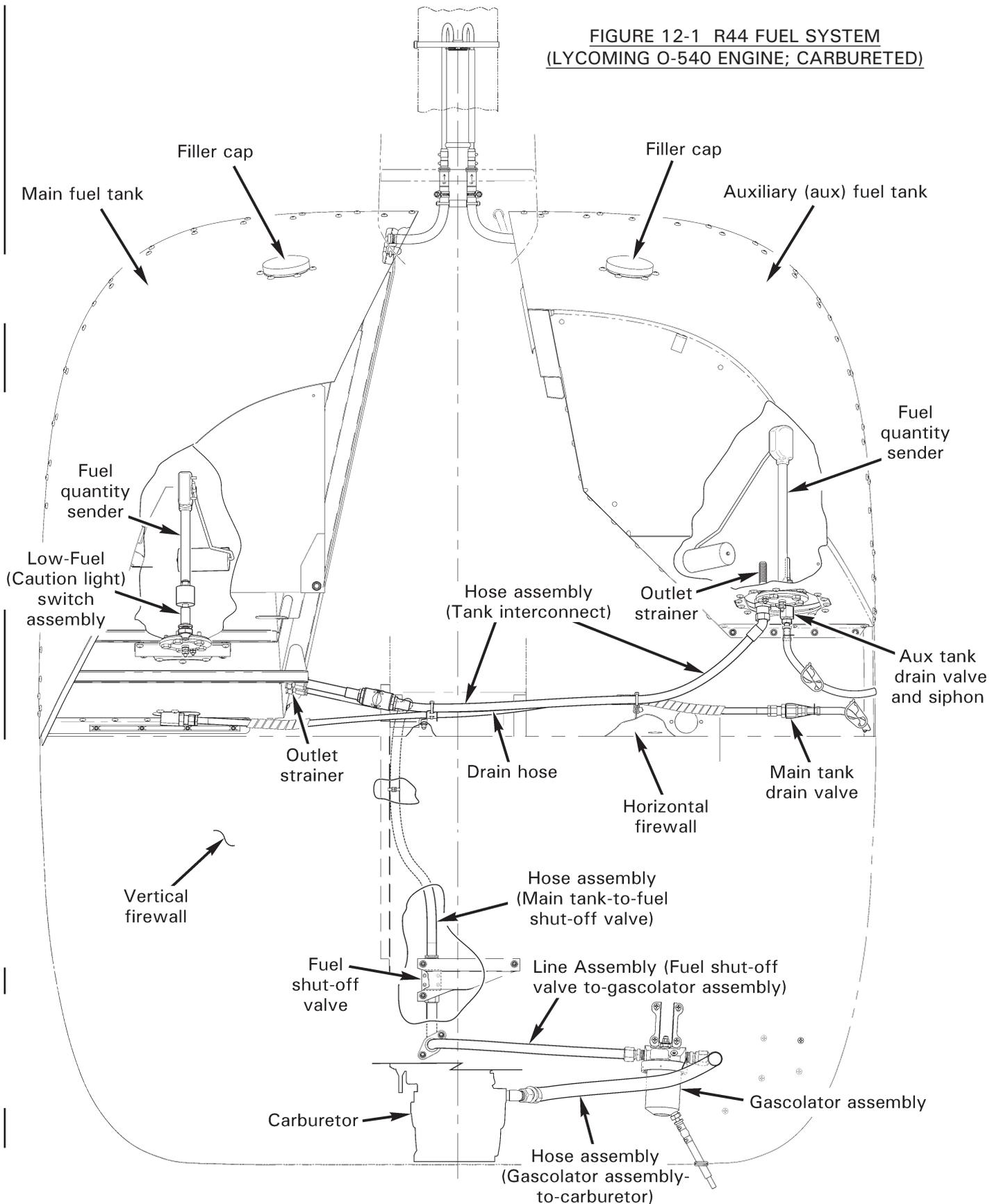
12-00 Description (continued)

The fuel gages are electrically operated by float-type transmitters in the tanks. When the gages read E the tanks are empty except for a small quantity of unusable fuel. The low fuel caution light is actuated by a separate electric sender located on the bottom of the main tank.

The auxiliary tank is interconnected with the main tank and is located somewhat higher so it will become empty first while fuel still remains in the main tank. The fuel shutoff valve controls flow from both tanks to the engine.

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FIGURE 12-1 R44 FUEL SYSTEM  
(LYCOMING O-540 ENGINE; CARBURETED)



12-10 Main Fuel Tank**CAUTION**

Flexible hoses kink easily; handle with care.

**CAUTION**

Temporarily cap fuel fittings when opened.

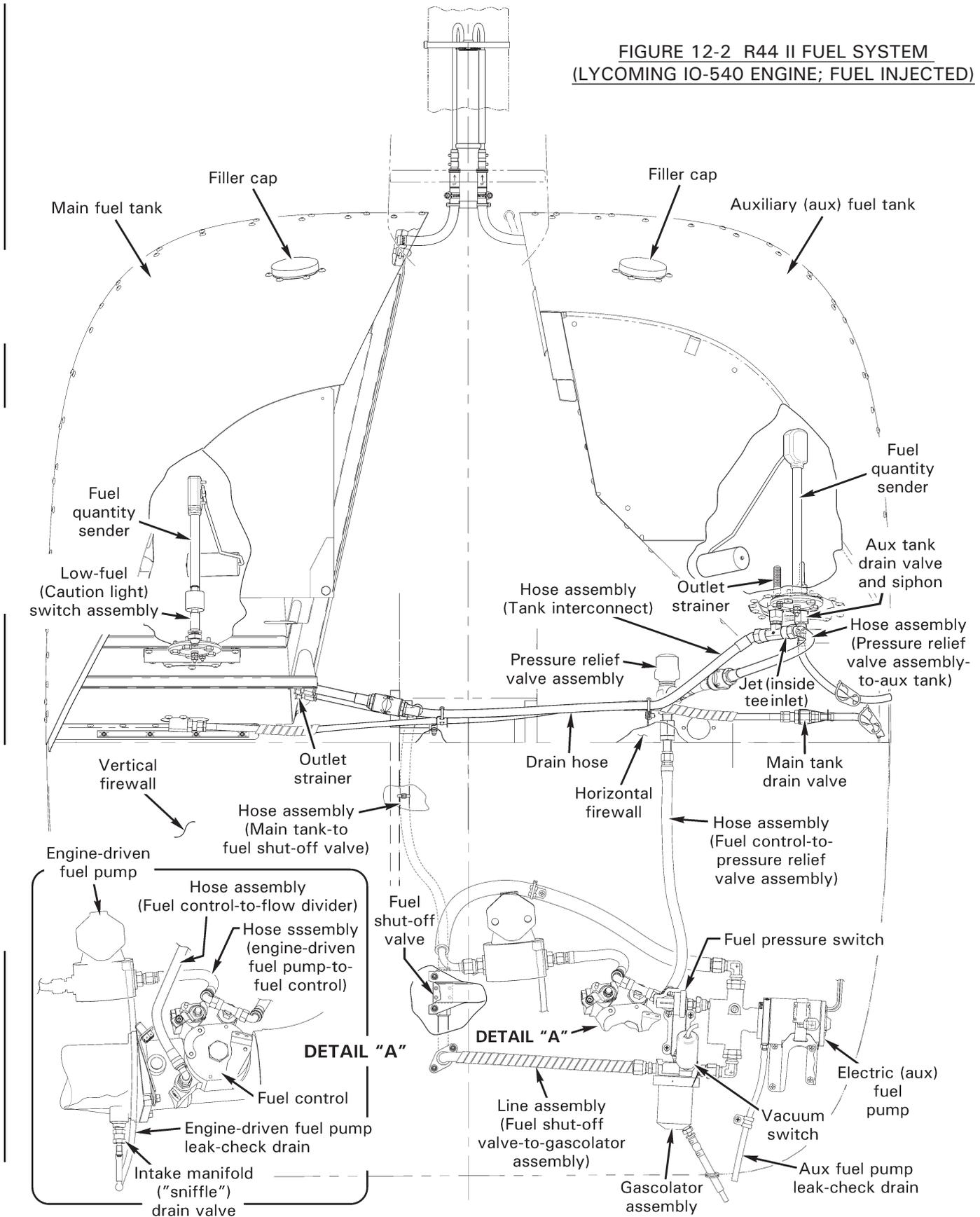
**WARNING**

**Fuel vapors are explosive. Do not use electric tools in vicinity of an opened fuel system.**

**A. Removal**

1. Defuel helicopter per § 1.150.
2. Remove mast fairing. Open access doors, disconnect ELT antenna & ground wire at connectors if ELT is installed, and remove tailcone fairing. Remove C347 channel assembly, angles, and panel.
3. Remove aft left backrest assembly. Remove left cowling assembly.
4. Loosen clamps securing vent tube(s) to C010-6 main tank assembly and pull tube(s) off tank.
5. Cut & discard ty-raps as required and disconnect fuel quantity sender and low-fuel switch assembly wiring from airframe harness at connectors.
6. Disconnect D205-38 (or D205-28; tank-to-shut-off valve) and C595-2/-3 (or D205-29; tank interconnect) hose assemblies from tank.
7. Cut & discard ty-raps attaching D205-30 (drain) hose assembly to horizontal firewall clamp and doubler, then disconnect hose from drain valve connector. Cap fittings.
8. Above aft left seat, gently lift foam from cabin bulkhead and remove four screws securing tank to bulkhead.
9. At tank aft panel, remove three screws securing tank to the intermediate bulkhead, and two bolts securing tank aft panel between horizontal firewall and upper frame.
10. Remove perimeter screws securing tank to cabin bulkhead and horizontal firewall. Remove tank, with attached D205-30 hose assembly. Cap fittings.

FIGURE 12-2 R44 II FUEL SYSTEM  
(LYCOMING IO-540 ENGINE; FUEL INJECTED)



12-10 Main Fuel Tank (continued)**B. Installation**

1. Connect D205-30 (drain) hose assembly to main tank drain union; using backup wrench on tank union, special torque hose nut per § 23-33 and torque stripe per Figure 2-1. Position C010-6 main tank assembly in helicopter, routing D205-30 (drain) hose assembly atop D255-5 support assembly (or thru "cut away" in horizontal firewall doubler; verify hose is not pinched). Install perimeter screws securing tank to cabin bulkhead and horizontal firewall.
2. At tank aft panel, install hardware securing tank aft panel between horizontal firewall and upper frame. Standard torque nuts per § 23-32 and torque stripe per Figure 2-1.
3. Install screws securing tank aft panel to the intermediate bulkhead.
4. Above aft left seat, gently lift foam from cabin bulkhead and install screws securing tank to bulkhead.
5. Remove caps. Connect D205-38 (or D205-28; tank-to-shut-off valve) hose assembly to tank forward fitting. Connect C595-2/-3 (or D205-29; tank interconnect) hose assembly to tank aft fitting. Using backup wrench on tank fittings, special torque hose nuts per § 23-33 and torque stripe per Figure 2-1.
6.
  - a. Install ty-rap around D205-30 hose assembly through D255-5 support assembly or horizontal firewall clamp; install ty-rap around trim through horizontal firewall doubler flange and install ty-rap around hose assembly through doubler ty-rap. Cinch ty-raps until snug without over-tightening, and trim tips flush with heads.
  - b. Install ty-rap around C595-2/-3 hose assembly through D255-5 support assembly; install ty-rap around trim through horizontal firewall doubler flange and install ty-rap around hose assembly through doubler ty-rap. Cinch ty-raps until snug without over-tightening, and trim tips flush with heads.
7. Connect fuel quantity sender and low-fuel switch assembly wiring to airframe harness at connectors.
8. Connect vent tube(s) to tank and tighten clamps until snug. Verify security.
9. Perform fuel quantity indication check per § 12-53. Verify no leaks.
10. Install aft left backrest assembly and left cowling assembly.
11. Install C347 channel assembly, angles, and panel. Install tailcone fairing, connect ELT antenna & ground wire at connectors if ELT is installed, and close access doors. Install mast fairing.
12. Perform pitot-static leak check per § 13-10 as required.
13. Inspect fuel cap per § 12-13 Part A.

12-11 Main Tank Bladder Replacement**NOTE**

During disassembly, progressively tape bladder openings to protect interior from foreign object contamination. During assembly, progressively remove protective tape.

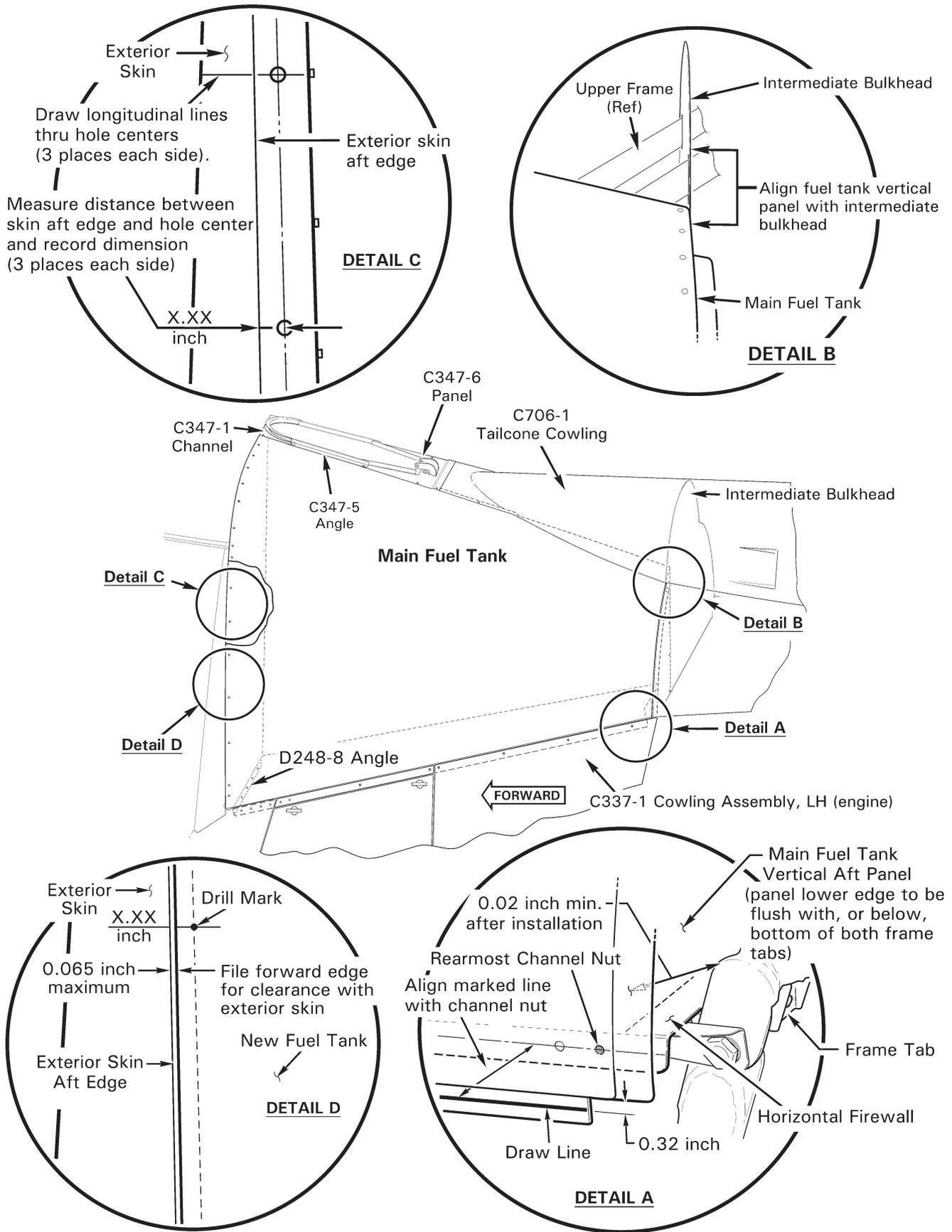
**CAUTION**

D028-1 or -3 bladder assembly temperature should be above 65°F before removing, installing, or flexing bladder.

1. Remove main fuel tank per § 12-10.
2. Remove hardware securing D247-1 bulkhead assembly and three angles to tank and remove angles. Detach hook-and-loop tape and remove bulkhead.
3. Remove fuel quantity sender per § 12-51.
4. Remove screws securing D250-1 cover assembly to D028-1 or -3 bladder assembly and tank; carefully remove cover, with low-fuel switch assembly attached. Remove and discard packing.
5. Disconnect D205-30 (drain) hose assembly from union and cap hose fitting. Remove union and discard packing. Remove two screws securing bladder to tank.
6. Remove B254-3 strainer assembly and (tank interconnect fitting) union and discard packings. Remove two screws securing bladder to tank.
7. At vents, remove screw securing bladder to tank.
8. Remove fuel cap. Remove screws securing bladder to tank.
9. Detach hook and loop tape and carefully remove bladder.
10. Carefully insert new D028-1 or -3 bladder assembly inside main tank assembly. Ensure bladder is free of wrinkles across lower surface and properly located before joining hook & loop fastener. Bladder may be pressurized with air to 1 psi max to assist installation. Align bladder and tank fastener holes and press hook-and-loop tape together.
11. Install screws securing bladder to tank near fuel cap. Install fuel cap.
12. At vents, apply A257-9 anti-seize to threads and install screw securing bladder to tank.
13. Apply A257-9 anti-seize to threads and install two screws securing bladder to tank near tank interconnect and tank-to-shut-off valve hose connections. Lubricate new packings with A257-6 grease and install packings on B254-3 strainer assembly and on (tank interconnect fitting) union. Apply A257-9 anti-seize to threads and install strainer assembly into forward fitting; special torque strainer per § 23-33, and torque stripe per Figure 2-1. Apply A257-9 anti-seize to threads and install union into aft fitting; special torque union per § 23-33, and torque stripe per Figure 2-1.

12-11 Main Tank Bladder Replacement (continued)

14. Apply A257-9 anti-seize to threads and install two screws securing bladder to tank near drain hose connection. Lubricate new packing with A257-6 grease and install packing on (drain hose fitting) union. Apply A257-9 anti-seize to threads and install union; special torque union per § 23-33, and torque stripe per Figure 2-1. Remove cap and connect drain hose to union; using backup wrench, special torque hose nut per § 23-33, and torque stripe per Figure 2-1.
15. Lubricate new packing with A257-6 grease and install packing in bladder groove in opening at bottom of tank. Carefully insert cover assembly into bladder, with attached low-fuel switch assembly aft. Apply A257-9 anti-seize to threads and install screws securing cover to bladder and tank.
16. Install fuel quantity sender per § 12-51.
17. Align bulkhead and tank fastener holes. Install hardware securing bulkhead and angles to tank.
18. Pressure check assembled fuel tank by plugging vents and fittings and pressurizing bladder to no more than 1 psi. Check for leaks with a mild soap and water solution applied to all seams.
19. Install main fuel tank per § 12-10.



**FIGURE 12-3 MAIN TANK REPLACEMENT**

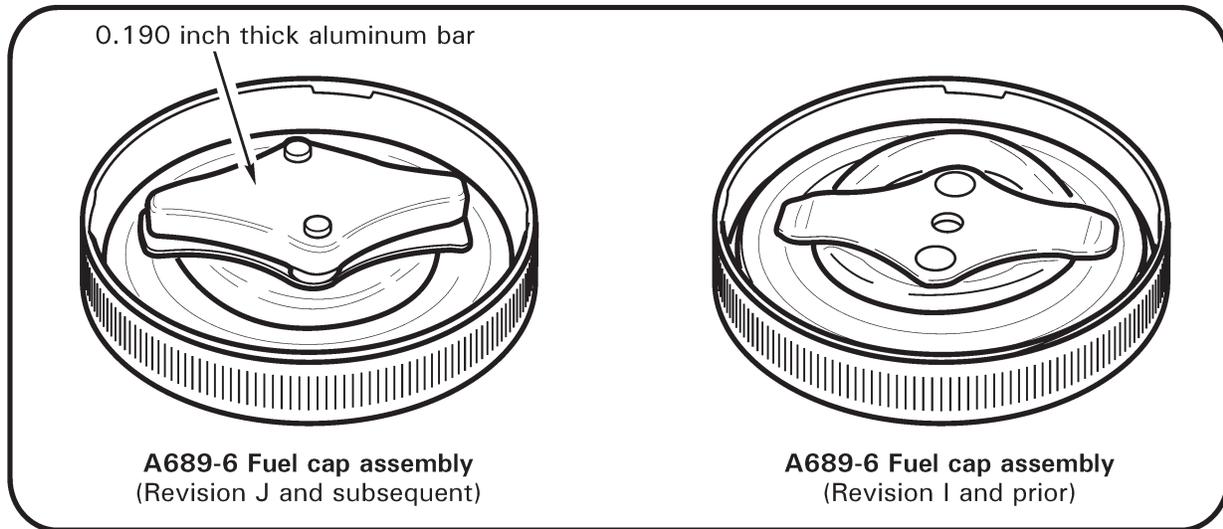
### 12-12 Main Tank Replacement

1. Remove main fuel tank per § 12-10.
2. Refer to Figure 12-3, Detail C. Draw longitudinal lines from center of three bulkhead channel nut holes onto exterior skins. Measure and record distances as shown.
3. On new C010-6 main tank assembly, loosen screws securing D248-8 angle to tank and slide angle to forward-most position. Tighten screws.
4. Refer to Figure 12-3, Detail A. Mark tank bottom flange with a line 0.32 inch below and parallel to tank skin.
5. Position tank in helicopter. Verify forward portion of tank flange is between exterior skin and horizontal firewall flange. Verify tank vertical panel is between upper frame tabs and firewall flange; panel edge must be flush or below frame tab bottom edge.
6. Align marked line with rearmost channel nut on horizontal firewall flange per Figure 12-3, Detail A. Align tank vertical panel with intermediate bulkhead per Detail C. Secure tank position by clamping panel to frame tabs.
7. Install aft cowling assembly. Install left cowling assembly, but do not install top row of screws. Adjust tank position as required for approximately 0.020 inch gap between tank skin and left cowling.
8. Refer to Figure 12-3, Detail D. Estimate material to be removed for fitting tank forward edge with cabin exterior skin aft edge; file or cut tank to create a gap of no more than 0.065 inch between tank and skin. Deburr trimmed edge with 220-grit or finer wet-or-dry aluminum oxide abrasive paper.
9. Conversion coat trimmed edge per § 23-51. Apply epoxy primer (ref. § 23-75) to trimmed edge.
10. From inside cabin, begin at the lowest nutplate and drill a #30 pilot hole through tank skin (using existing nutplate as drill guide), and install cleco. Moving upward, repeat step for remaining nutplates.
11. Transfer longitudinal lines and recorded distances from exterior skin to tank, and lay out three drill marks. Using a drill stop, enlarge pilot holes to 0.170-inch diameter.
12. From inside cabin, gently lift foam and match-drill 0.170-inch holes in D248-8 angle through holes in C259-1 bulkhead.

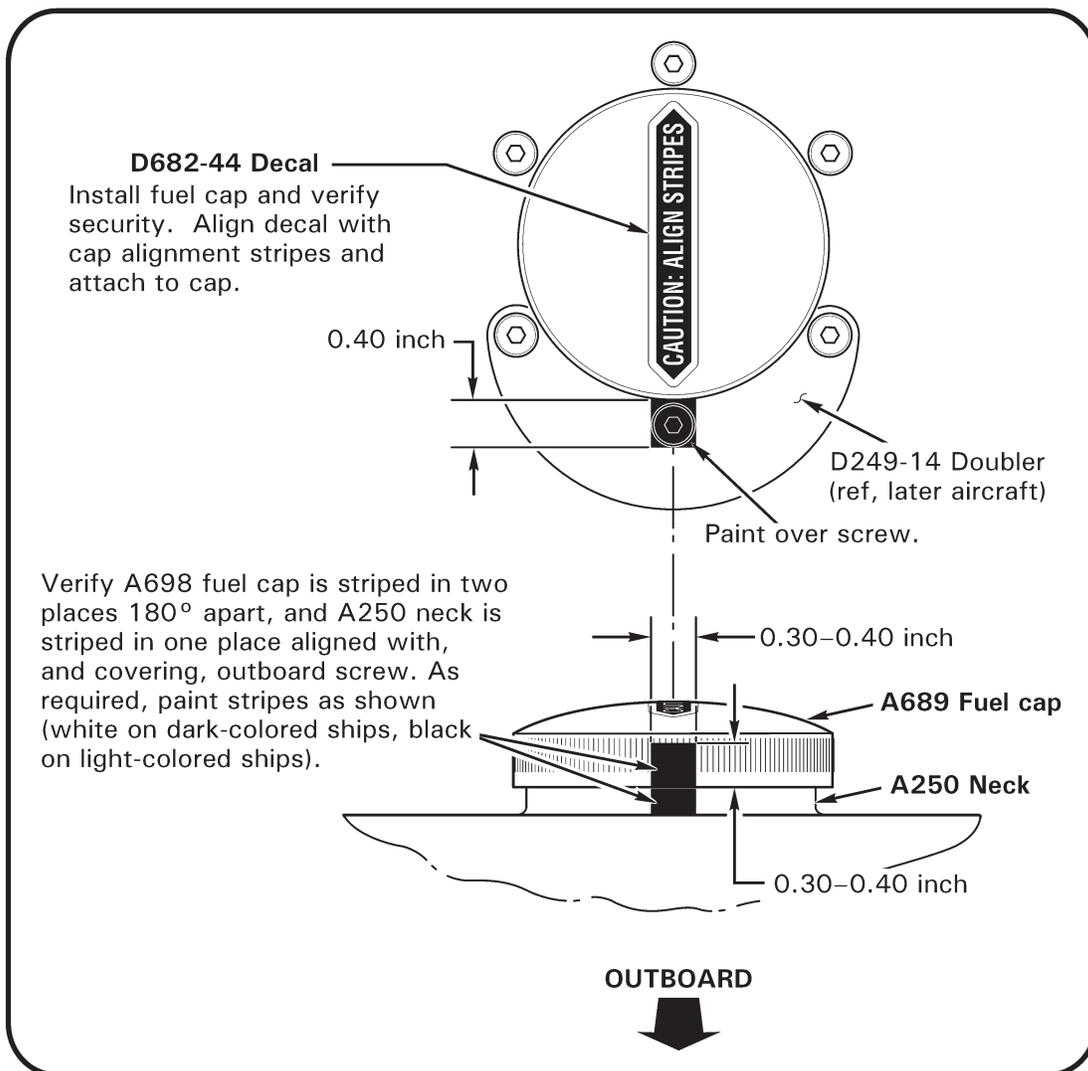
**CAUTION**

Protect drive belts from drilling debris.

13. Match-drill 0.170-inch holes in tank vertical panel through holes in intermediate bulkhead. Match-drill 0.250-inch holes in panel through upper frame tab holes; temporarily install bolts.



**FIGURE 12-3A A689-6 FUEL CAP REVISIONS**



**FIGURE 12-3B FUEL CAP ALIGNMENT STRIPES**

### 12-12 Main Tank Replacement (continued)

14. Using a drill stop, progressively match-drill and cleco 0.170-inch holes in tank flange, on marked line, through left cowling holes.
15. Cleco C347-1 channel to cabin. Match-drill 0.170-inch holes in tank inboard flanges through remaining holes in channel.
16. Clean up debris. Install main fuel tank per § 12-10.
17. Paint fuel cap alignment stripes and apply decal per § 12-13 Part B.

### 12-13 Fuel Cap

#### **A. Inspection**

1. Remove A689-6 fuel cap and verify cap is revision J or subsequent per Figure 12-3A.
2. Inspect condition of cap and gasket. Install fuel cap and verify security. Replace gasket and/or cap if cap is not snug when tightened or visual inspection is not satisfactory.
3. Verify fuel cap is striped in two places 180° apart, and fuel tank's A250 neck is striped in one place facing outboard. If cap or neck is not striped, or if stripes have deteriorated, paint stripes per Part B.
4. Verify cap decal is legible and properly installed, and stripes on cap and tank align when cap is fully closed.

#### **B. Fuel Cap Alignment Stripes and Decal**

1. As required, apply topcoat to fuel cap per § 23-60 using approved paint (ref. § 23-77).
2. Refer to Figure 12-3B. As required, paint fuel tank's A250 neck stripe (in one place aligned with, & covering, outboard screw) and/or fuel cap stripes in two places 180° apart aligned with fuel neck stripe per the following:
  - a. Clean surfaces to be painted using a lint-free, clean cloth dampened with acetone. Allow surfaces to dry.
  - b. Apply D257-7 black (Imron AF400/AF700) for light-colored ships or D257-5 white (Imron AF400/AF700) for dark-colored ships, mixed in accordance with paint manufacturer's recommendations, to surfaces.
3. Attach D682-44 decal to A689 fuel cap as shown.

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12-20 Aux Fuel Tank**CAUTION**

Flexible hoses kink easily; handle with care.

**CAUTION**

Temporarily cap fuel fittings when opened.

**WARNING**

**Fuel vapors are explosive. Do not use electric tools in vicinity of an opened fuel system.**

**A. Removal**

1. Defuel helicopter per § 1.150.
2. Open right side of mast fairing. Open access doors, disconnect ELT antenna & ground wire at connectors if ELT is installed, and remove tailcone fairing. Remove C347 channel assembly, angles, and panel. Remove D042-5 door assembly.
3. Remove aft-right backrest assembly.
4. Loosen clamp(s) securing vent tubes to D043-5 aux tank assembly and pull tubes off tank.
5. Cut & discard ty-raps as required and disconnect fuel quantity sender wiring from airframe harness at connectors.
6. Remove hardware securing rotor brake cable clamp to tank channel. Remove screws securing B157-1 mount to channel if screws have nutplates, or remove hardware securing MS24566-1B pulley to B157-1 mount.
7. a. R44: Disconnect hose assembly from B254-3 fitting (or tank elbow). Cap fittings.  
b. R44 II: Disconnect hose assemblies from tank tee. Remove D453-5 jet (used with C595-4 hose assembly) or D453-2 jet (used with D205-31 hose assembly) from tee if desired. Cap fittings.
8. Above aft right seat, gently lift foam from bulkhead and remove fasteners securing tank to bulkhead.
9. Remove aft bolt securing tank channel to upper frame.
10. Remove perimeter screws securing tank to bulkhead. Remove tank.

12-20 Aux Fuel Tank (continued)**B. Installation**

1. Position D043-5 aux tank assembly in helicopter. Install aft bolt securing tank channel to upper frame. Standard torque bolt per § 23-32 and torque stripe per Figure 2-1.
2. Install perimeter screws securing tank to bulkhead.
3. Above aft right seat, gently lift foam from bulkhead and install fasteners securing tank to bulkhead.
4. a. R44: Remove caps. Connect hose assembly to B254-3 fitting (or tank elbow). Special torque hose nuts per § 23-33 and torque stripe per Figure 2-1.  
b. R44 II: Remove caps. Verify tank tee is aligned with D321-1 valve assembly within 5°. Install if removed, or verify the proper installation of, D453-5 jet (used with C595-4 hose assembly) or D453-2 jet (used with D205-31 hose assembly) in tee inlet (outboard). Connect hose assemblies to tee. Verify D205-31 hose assembly elbow is horizontal within 5°. Special torque hose nuts per § 23-33 and torque stripe per Figure 2-1.
5. Install screws securing B157-1 mount to channel if screws have nutplates, or install hardware securing MS24566-1B pulley to B157-1 mount. Install hardware securing rotor brake cable clamp to tank channel. Verify security.
6. Connect fuel quantity sender wiring to airframe harness at connectors.
7. Connect vent tube(s) to tank and tighten clamps until snug. Verify security.
8. Perform fuel quantity indication check per § 12-53. Verify no leaks.
9. Install aft-right backrest assembly.
10. Install D042-5 door assembly. Install C347 channel assembly, angles, and panel. Install tailcone fairing, connect ELT antenna ground wire at connector if ELT is installed, and close access doors. Close right side of mast fairing.
11. Inspect fuel cap per § 12-13 Part A.

12-21 Aux Tank Bladder Replacement**NOTE**

During disassembly, progressively tape bladder openings to protect interior from foreign object contamination. During assembly, progressively remove protective tape.

**CAUTION**

D028-2 or -4 bladder assembly temperature should be above 65°F before removing, installing, or flexing bladder.

1. Remove aux fuel tank per § 12-20.
2. Remove hardware securing D247-2 bulkhead assembly and D253-3 angle to tank and remove angle. Detach hook and look tape and remove bulkhead.
3. Remove fuel quantity sender per § 12-51.
4. Remove screws securing D250-2 cover assembly to D028-2 or -4 bladder assembly and tank; carefully remove cover, with drain valve assembly attached. Remove and discard packing.
5. At vents, remove screw securing bladder to tank.
6. Remove fuel cap. Remove screws securing bladder to tank.
7. Detach hook and look tape and carefully remove bladder.
8. Carefully insert new D028-2 or -4 bladder assembly inside aux tank assembly. Ensure bladder is free of wrinkles across lower surface and properly located before joining hook & loop fastener. Bladder may be pressurized with air to 1 psi max to assist installation. Align bladder and tank fastener holes and press hook and loop tape together.
9. Install screws securing bladder to tank near fuel cap. Install fuel cap.
10. At vents, apply A257-9 anti-seize to threads and install screw securing bladder to tank.
11. Lubricate new packing with A257-6 grease and install packing in bladder groove at bottom of tank. Carefully insert cover into bladder, with drain valve assembly attached. Apply A257-9 anti-seize to threads and install screws securing cover to bladder and tank.
12. Install fuel quantity sender per § 12-51.
13. Align bulkhead and tank fastener holes. Install hardware securing bulkhead and angle to tank.
14. Pressure check assembled fuel tank by plugging vents and fittings and pressurizing bladder to no more than 1 psi. Check for leaks with a mild soap and water solution applied to all seams.
15. Install aux fuel tank per § 12-20.

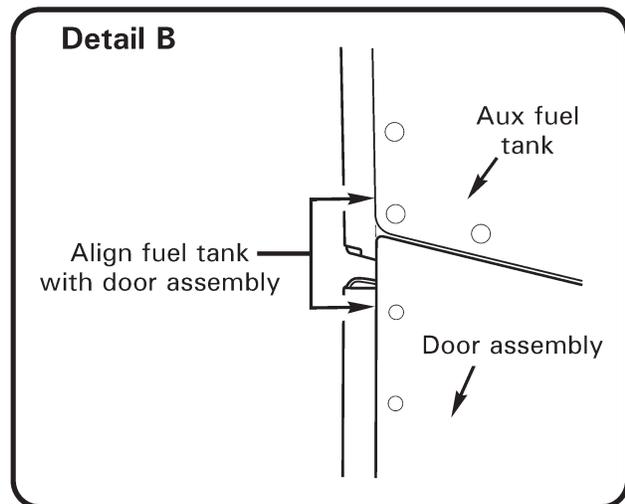
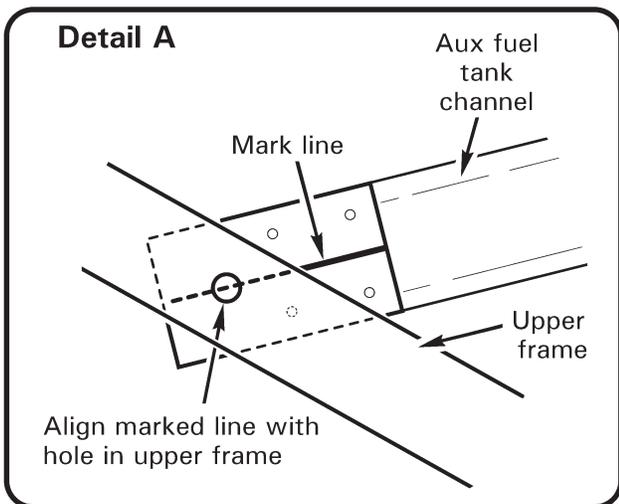
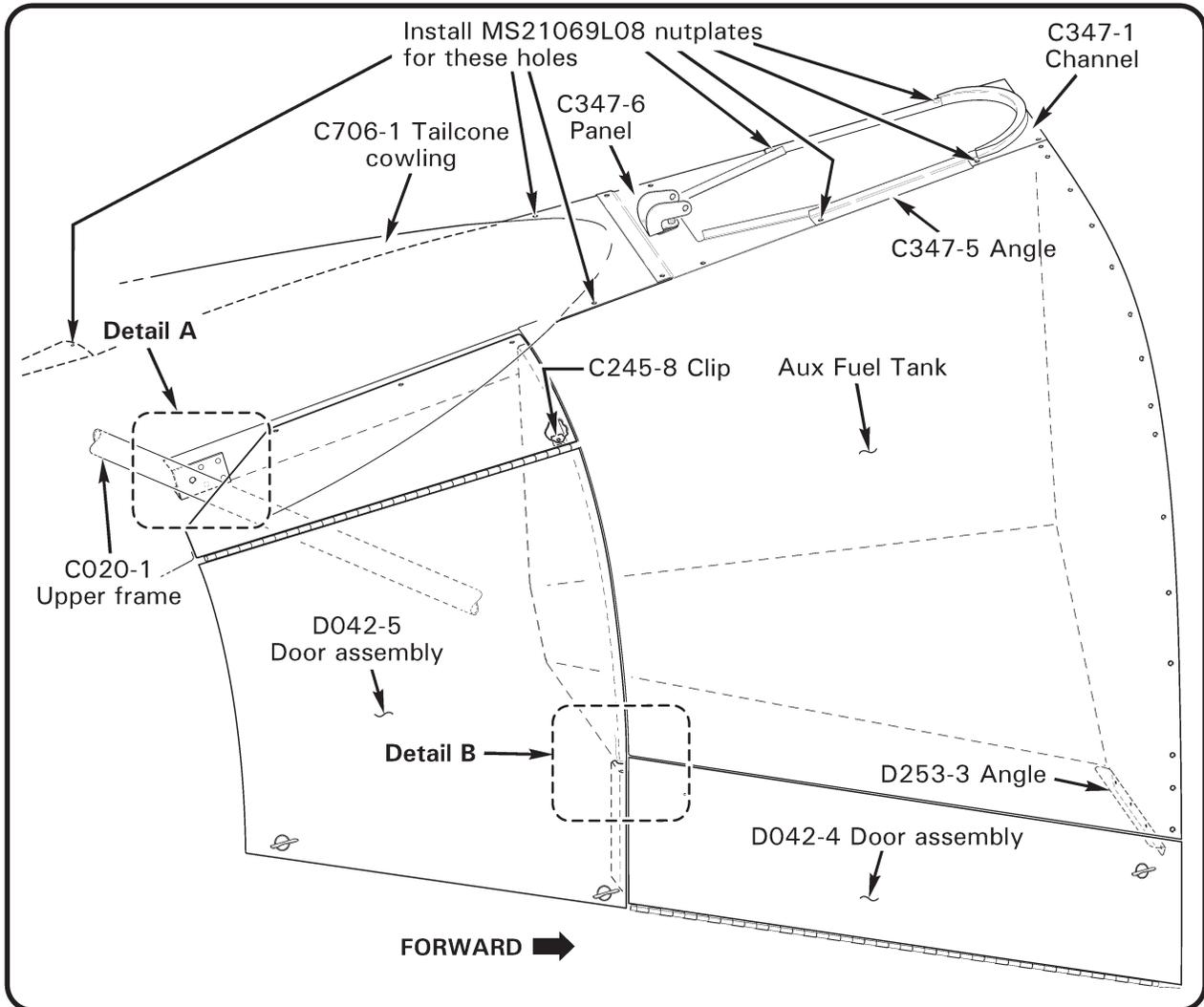


FIGURE 12-4 AUX TANK REPLACEMENT

## 12-22 Aux Tank Replacement

1. Remove aux fuel tank per § 12-20.
2. Refer to Figure 12-3, Detail C. Draw longitudinal lines from center of three bulkhead channel nut holes onto exterior skins. Measure and record distances as shown.
3. Refer to Figure 12-4, Detail A. Mark horizontal centerline of new D043-1 aux fuel tank channel doubler.
4. Position tank in helicopter. Align marked line with center of upper frame attachment hole per Figure 12-4, Detail A. Align tank exterior skin with aft edge of latched D042-4 door assembly per Detail B. Secure tank position by clamping channel to frame at attachment hole.
5. Refer to Figure 12-3, Detail D. Estimate material to be removed for fitting tank forward edge with cabin exterior skin aft edge; file or cut tank to create a gap of no more than 0.065 inch between tank and skin. Deburr trimmed edge with 220-grit or finer wet-or-dry aluminum oxide abrasive paper.
6. Conversion coat trimmed edge per § 23-51. Apply epoxy primer (ref. § 23-75) to trimmed edge.
7. From inside cabin, begin at the lowest nutplate and drill a #30 pilot hole through tank skin (using existing nutplate as drill guide), and install cleco. Moving upward, repeat step for remaining nutplates.
8. Transfer longitudinal lines and recorded distances from exterior skin to tank, and lay out three drill marks. Using a drill stop, enlarge pilot holes to 0.170-inch diameter.
9. Match-drill 0.250/0.256-inch hole in fuel tank channel through upper frame attachment hole; temporarily install bolt.
10. Refer to Figure 12-4. Open D042-4 door. Using a drill stop, match-drill 0.170-inch holes in C259-2 bulkhead through holes in D253-3 angle. Close and latch door.
11. Install D042-5 door assembly; latch door. Adjust door position for no more than 0.050-inch gap between door forward edge and tank skin edge, but maintain door-to-tank contour. Lay out hole location on C245-8 clip; verify drill hole on clip will have minimum 0.12-inch edge distance. Match-drill 0.170-inch hole in clip through door; install and secure screw.
12. Match-drill 0.170-inch holes in tank channel through holes in D042-5 door assembly.
13. Cleco C347-1 channel to cabin. Match-drill 0.170-inch holes in tank inboard flanges through remaining holes in channel.
14. Clean up debris. Install aux fuel tank per § 12-20.
15. Paint fuel cap alignment stripes and apply decal per § 12-13 Part B.

## 12-30 Fuel Vents

### 12-31 Roll-Over Valve Assemblies

R44 roll-over valve assemblies contain one brass ball. In normal conditions, air flows around the vent ball from the bladder expansion spaces. In the event of inadvertent over-filling or in-flight fuel sloshing, the ball will float and seal the vent. If the aircraft is inverted, the ball seals the vent to minimize fuel spillage. There are no internal packings.

#### **A. Removal**

1. Open mast fairing.
2. If installed, cut and discard ty-raps securing A729-63 tube between A729-48 tubes and remove A729-63 tube.
3. Loosen B277-4 clamp securing A729-48 tube to D251-1 roll-over valve assembly, pull A729-48 tube off of valve, and remove clamp.
4. Open lower D277-6 clamp (if installed, or cut and discard safety wire) securing A729-79 (or A729-47) tube to valve and pull valve through rib grommet.

#### **B. Installation**

1. Open lower D277-6 clamp (if installed), insert D251-1 roll-over valve assembly with arrow UP thru rib grommet and into A729-48 tube, and release clamp. If clamp is not installed, wrap two turns 0.032-inch diameter lockwire and safety A729-79 (or A729-47) tube tight to valve.
2. Position B277-4 clamp on A729-48 tube, insert tube on valve, and tighten clamp.
3. Install two MS3367-4-9 ty-raps thru A729-63 tube (if installed), with heads on opposite ends of tube. Secure one ty-rap to the other around one A729-48 tube; repeat around other A729-48 tube. Cinch ty-raps until snug without over-tightening and trim tips flush with heads.
4. Perform vent system check per Part C.

#### **C. Vent System Check**

1. Open mast fairing. Verify fuel caps are installed.
2. Attach temporary hose to one (of two) vent tubes.
3. Blow into the hose; do not use compressed air. Verify air blows out the other vent tube. If air does not blow out the other vent tube, remove obstruction(s) in vent line(s) or in bladder and repeat check.
4. Close mast fairing.

## 12-40 Drain Valves

### A. Removal

1. Defuel helicopter per § 1.150. Remove engine right cowling, as required.
2. a. Gascolator Assembly: Open D277-6 clamps (or cut and discard safety wire if installed), pull A729-8 tube off of CAV-110H-4 or A761-1 drain valve, pull tube thru lower skin grommet, and remove tube.  
b. Aux Fuel Tank and Main Tank Drain Hose: Cut and discard safety wire if installed (safety wire is no longer required in these locations); pull A729 tube off of A761-1 drain valve and remove tube.
3. Using backup wrench as required, remove valve from gascolator assembly, bulkhead connector, or aux tank fitting, as applicable. Tape fuel system opening.
4. To remove o-ring: actuate valve to expose stem and remove and discard o-ring.

### B. Installation

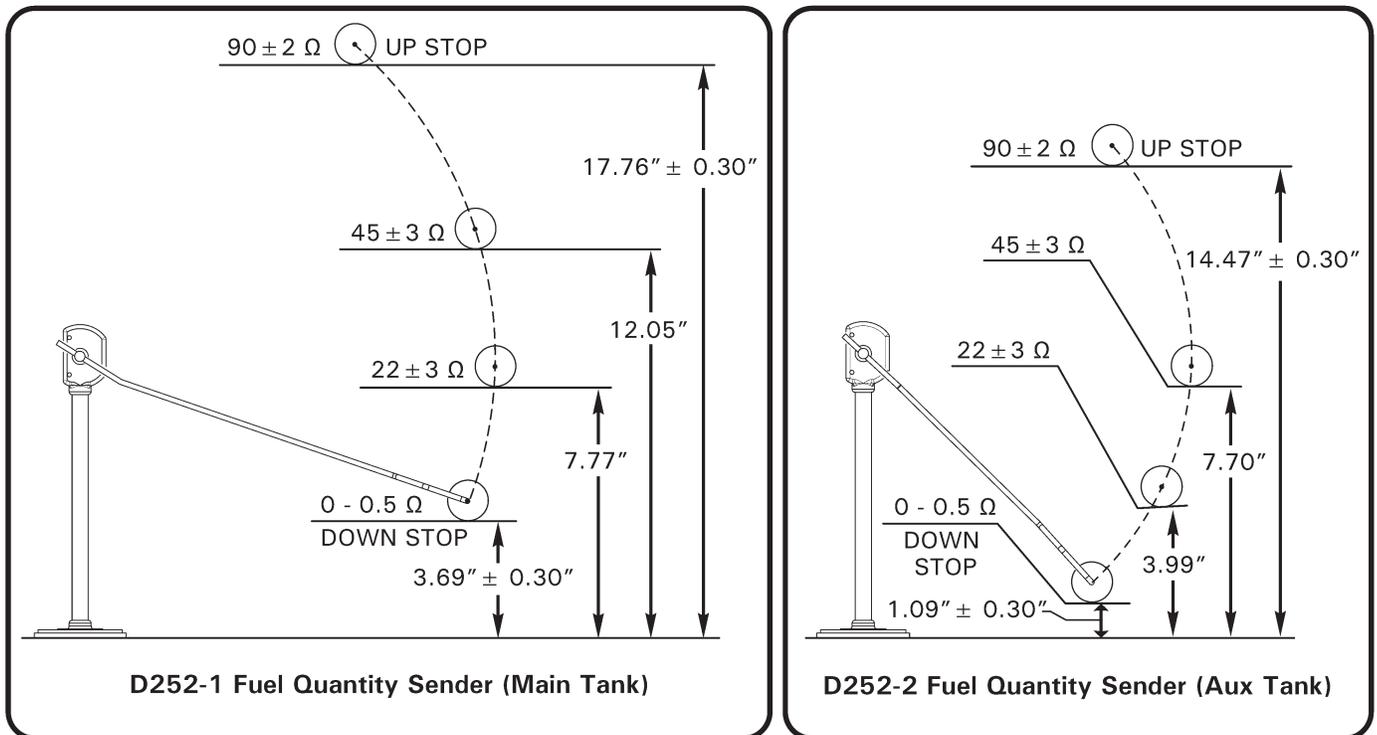
1. If o-ring was removed, actuate A761-1 or CAV-110H-4 drain valve to expose stem, and install new o-ring in stem seat.
2. Lightly coat valve threads using B270-6 sealant. Remove tape and install valve in connector, tank, or gascolator assembly. Standard torque A761-1 valve in connector or tank per § 23-32, or special torque A761-1 or CAV-110H-4 valve in gascolator per § 23-33; torque stripe per Figure 5-1.
3. a. Gascolator Assembly: Insert A729-8 tube thru lower skin grommet, open D277-6 clamps, fit tube onto valve, and release clamps (if clamps are not installed, wrap tube with two turns 0.032-inch diameter lockwire, and safety tube to valve [2 places]). Verify security.  
b. Aux Fuel Tank and Main Tank Drain Hose: Fit A729 tub onto drain valve (safety wire is no longer required in these locations). Verify security.
4. Fuel helicopter per applicable Pilot's Operating Handbook Section 2 and inspect fuel system for leaks. Install engine right cowling, if removed.

12-50 Fuel Quantity12-51 Fuel Quantity Senders**A. Removal**

1. a. D252-1 (main tank) fuel quantity sender: Remove main tank per § 12-10. Remove screws securing A374-5 angle to bladder assembly.
- b. D252-2 (aux tank) fuel quantity sender: Defuel helicopter per § 1.150. For R44s: disconnect C595-2 hose assembly from B254-3 strainer (or disconnect D205-29 hose assembly from elbow); for R44 IIs: disconnect C595-3 (or D205-29) and C595-4 (or D205-31) hose assemblies from tee.
2. D252-2 (aux tank) fuel quantity sender: Cut & discard ty-raps as required and disconnect fuel quantity sender wiring from airframe harness at connectors. Remove screws securing D250-2 cover assembly to bladder ring and tank and remove cover, with fuel quantity sender attached. Tape bladder opening.
3. Remove screws/bolts securing fuel quantity sender to cover assembly. Carefully pull sender lever through opening (main tank: tape bladder opening).
4. If required, using backup wrench on stud nuts, remove palnuts and nuts securing C049-11 connector assembly to fuel quantity sender and remove connector assembly.

**B. Installation**

1. Perform fuel quantity sender check per § 12-52.
2. If removed, install nuts securing C049-11 connector assembly to D252 fuel quantity sender; using backup wrench on stud nuts, special torque nuts per § 23-33, install new palnuts, and torque stripe per Figure 2-1.
3. Remove any tape, then carefully insert fuel quantity sender lever through opening in D250 cover assembly. Install hardware, special torque screws/bolts in criss-cross pattern per § 23-33, and torque stripe per Figure 2-1.
4. a. D252-1 (main tank) fuel quantity sender: Apply A257-9 anti-seize to screw threads and install screws securing A374-5 angle to bladder ring. Install main tank per § 12-10.
- b. D252-2 (aux tank) fuel quantity sender: Remove tape. Install D250-2 cover assembly with fuel quantity sender attached, carefully inserting lever in bladder. Apply A257-9 anti-seize to screw threads and install screws securing cover and A374-5 angle to bladder ring and tank. Connect sender wiring to airframe harness at connectors. Install ty-raps as required; cinch ty-raps until snug without overtightening and trim tips flush with heads.
5. Perform fuel quantity indication check per § 12-53. Verify no leaks.



**FIGURE 12-5 FUEL QUANTITY SENDER CHECK**

**12-52 Fuel Quantity Sender Check**

1. Remove fuel quantity sender per § 12-51.
2. Simulate mounting position of appropriate sender per Figure 12-5. Position float arm as shown and measure the resistance with a multimeter. Verify resistance is within tolerance at four noted heights.
3. If resistance is out of tolerance at any height, bend the float arm up for a sender with excessive resistance, or bend the float arm down for a sender with too little resistance. Repeat steps until sender resistance is within tolerance.
4. Install fuel quantity sender per § 12-51.

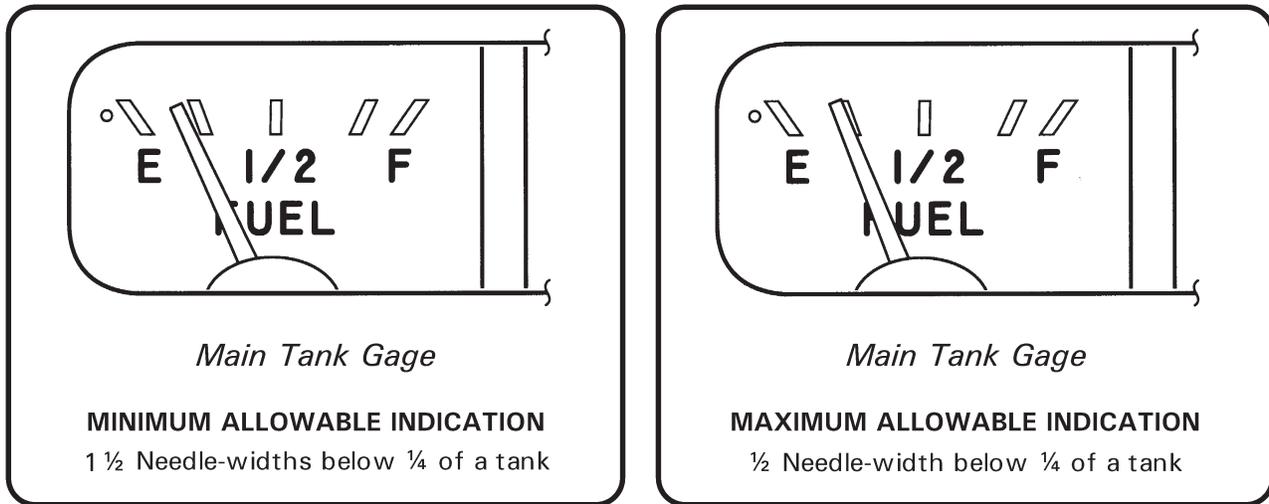


FIGURE 12-6 FUEL QUANTITY INDICATION CHECK

12-53 Fuel Quantity Indication Check

1. Defuel helicopter per § 1.150.
2. With ship level, fuel main tank with 9.25 gallons per applicable Pilot’s Operating Handbook Section 2. Wait five minutes for fuel levels to equalize (approximately 8 gallons in main tank and 1.25 gallons in aux tank). Inspect for leaks.
3. Turn battery switch on and read main tank fuel quantity gage. Verify main tank gage indicates one half to one and one half needle-widths below a quarter of a tank, as shown in Figure 12-6.
4. If indication is beyond allowable limit, perform fuel quantity sender check per § 12-52. If sender resistance is within tolerance, adjust fuel gage per § 37-110 Part D, or replace fuel gage and repeat check.

12-54 Low-Fuel Switch Assembly**CAUTION**

Avoid contaminating fuel bladder or tank interior. Cover arms with sleeves and use lint-free gloves when working inside interior.

**A. Removal**

1. Remove main fuel tank per § 12-10.
2. Remove A521-1 low-fuel switch assembly wiring pins from connector housing.
3. Remove fuel cap. Carefully capture switch assembly body with clean mechanical fingers (avoid capturing movable float). Remove A880-1005 (or AN924-5D) nut securing switch assembly to tank.
4. Carefully pull switch assembly through fuel cap opening (avoid fuel quantity sender). Install fuel cap, and tape fuel bladder or tank opening.

**B. Installation**

1. Lubricate new packing with A257-6 grease, and install packing over A521-1 low-fuel switch assembly threads.
2. Tape switch assembly wiring to 30-inch length of lockwire.
3. Remove fuel cap and tape. Position tank upside down. Thread lockwire through fuel cap opening and switch assembly mounting hole. Pull switch assembly wires and threads through mounting plate and retaining nut.
4. Apply light coat B270-1 sealant to A880-1005 (or AN924-5D) nut mating surface and install nut securing switch assembly to tank. Special torque nut per § 23-33 and torque stripe per Figure 2-1.
5. Insert wiring pins in connector housing; verify security.
6. Install main fuel tank per § 12-10.
7. Perform operation check per Part C.

**C. Operation Check**

1. Turn battery switch on. Fuel helicopter per applicable Pilot's Operating Handbook Section 2 as required and inspect fuel system for leaks.
2. With a clean wooden dowel, gently depress low-fuel switch assembly float and verify LOW FUEL warning light illuminates after approximately 1 second delay.
3. If warning light does not illuminate when float is depressed, but does illuminate when activating push-to-test switch, replace switch assembly.

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12-60 Gascolator Assembly and (R44 II) Aux Fuel Pump Installation**A. Cleaning Sediment Bowl**

1. Turn battery switch off. Turn fuel shut-off valve off. Remove right cowling assembly. Drain fuel using A666-1 gascolator assembly drain valve.
2. Clean exterior of gascolator, D743 electric (aux) fuel pump (R44 II), attached fittings, C741-1 line assembly, and B283-3 hose assembly.
3. Cut and discard safety wire securing gascolator collar to outlet fitting. Unscrew collar, and remove collar, ring (if installed), and sediment bowl.
4. Remove gasket & screen from gascolator top. Pull sediment bowl drain tube thru grommet and remove sediment bowl. Inspect, then clean, sediment bowl & screen.
5. Install screen and gasket in gascolator top. Apply light coat A257-6 grease to collar threads and collar inner flange. Verify large diameter of ring (if installed) contacts collar inner flange. Slide ring (if installed) and collar over bottom of sediment bowl so small diameter of ring engages groove in bowl flange. Position sediment bowl drain valve thru grommet in belly panel, and hand-tighten collar, ring (if installed), and bowl onto gascolator top until snug. Verify no threads exposed in gascolator top. Safety collar to outlet fitting using 0.032-inch diameter lockwire.
6. Turn fuel shut-off valve on. Verify no leaks.
7. Have a qualified person run-up and shutdown helicopter per applicable Pilot's Operating Handbook. Verify no leaks.
8. Install right cowling assembly.

12-60 Gascolator Assembly and (R44 II) Aux Fuel Pump Installation (continued)**B. Removal****CAUTION**

Temporarily cap fuel fittings when opened.

1. Pull AUX FUEL PUMP circuit breaker (R44 II). Turn battery switch off. Turn fuel shut-off valve off. Remove right cowling assembly. Drain fuel using A666-1 gascolator assembly drain valve.
2. Refer to Figure 12-7. Clean exterior of gascolator, D743 electric (aux) fuel pump (R44 II), attached fittings, C741-1 line assembly, and B283-3 hose assembly.
3. Cut and discard safety wire securing gascolator collar to outlet fitting. Disconnect C741-1 line assembly from gascolator inlet fitting.
4. a. R44: Disconnect B283-3 hose assembly from gascolator outlet fitting. If installed, disconnect primer line from AN894D4-2 bushing on gascolator outlet tee.  
b. R44 II: Disconnect B283-3 hose assembly from aux pump tee or elbow, as applicable.
5. R44 II: Cut and discard ty-raps as required and disconnect D745-1 vacuum switch and aux pump wiring from airframe harness at connectors. Mark and disconnect wires from B426-2 fuel pressure switch.
6. R44 II: Remove hardware securing aux pump drain tube clamp to vertical firewall. Open HTM-300 clamp securing aux pump to D742-1 support and clip on firewall.
7. Remove nut and washer securing gascolator to A454-1 support and remove gascolator, or aux pump with attached gascolator, as applicable.
8. R44 II: As required, separate gascolator from pump by disconnecting adapter from elbow. As required, remove pump inlet and outlet hardware, remove and discard packings, and remove pressure switch.
9. As required, remove gascolator inlet and outlet fitting(s). Remove vacuum switch (R44 II).

12-60 Gascolator Assembly and (R44 II) Aux Fuel Pump Installation (continued)**C. Gascolator Installation (R44)**

1. As required, install fittings in A666-1 gascolator assembly per the following: Apply light coat B270-6 sealant to A880-536 or -566 adapter (or AN816-6D nipple), or outlet tee (if primer system equipped) threads (do not apply sealant to first thread); install fittings in gascolator and standard torque per § 23-32.
2. Position gascolator in helicopter; route drain tube thru grommet in belly and insert A455-1 plug in A454-1 support. Connect C741-1 line assembly to gascolator inlet, finger-tight.
3. Note any gap between bottom of A454-1 support and shoulder of A455-1 plug; fill gap as required by adjusting support vertically (or installing NAS1149F0432P washers on plug if support does not have slotted holes). Install washer and nut on plug, special torque nut per § 23-33, and torque stripe per Figure 2-1.
4. Special torque C741-1 line assembly nut per § 23-33, & torque stripe per Figure 2-1.
5. If primer system equipped, assemble AN894D bushings on gascolator outlet tee and connect D101-3 line assembly to bushing. Using backup wrench, special torque bushings per § 23-33, special torque D101-3 line assembly nut per § 23-33, and torque stripe per Figure 2-1.
6. Connect B283-3 hose assembly to gascolator outlet fitting, special torque hose assembly nut per § 23-33, and torque stripe per Figure 2-1.
7. Safety gascolator collar to outlet fitting using 0.032-inch diameter lockwire.
8. Turn fuel shut-off valve on. Verify no leaks.
9. Have a qualified person run-up and shutdown helicopter per applicable Pilot's Operating Handbook. Verify no leaks.
10. Install right cowling assembly.

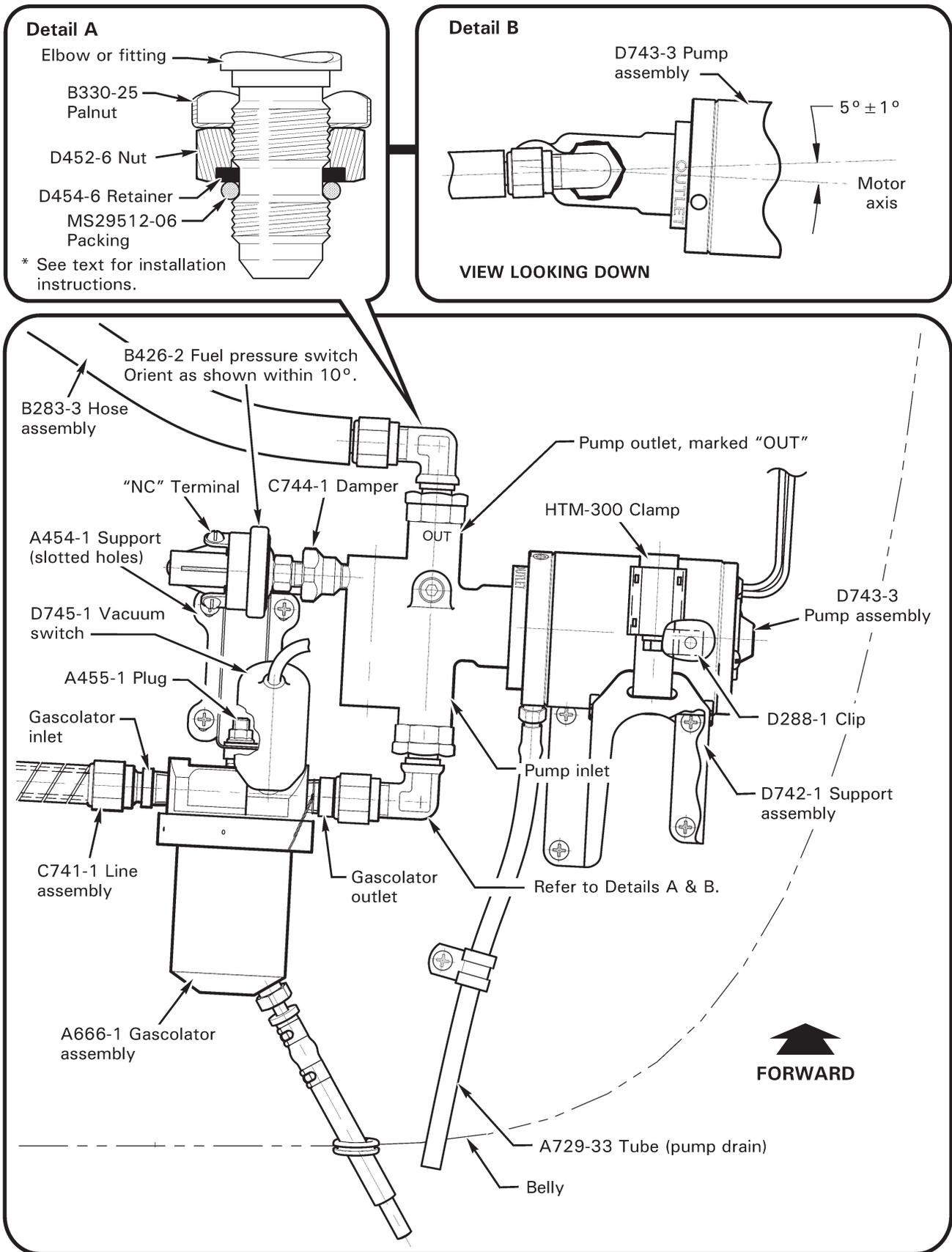


FIGURE 12-7 GASCOLATOR ASSEMBLY AND (R44 II) AUX FUEL PUMP INSTALLATION

12-60 Gascolator Assembly and (R44 II) Aux Fuel Pump Installation (continued)**D. Gascolator and (R44 II) Aux Fuel Pump Installation**

1. Refer to Figure 12-7. As required, install fittings in D743 aux fuel pump assembly per the following:
  - a. Refer to Figure 12-7 Detail A. Install (new) B330-25 palnut, D452-6 nut (orient counterbore as shown), and D454-6 retainer on elbow or tee; press retainer completely into counterbore of nut. Lubricate (new) MS29512-06 packing using A257-6 grease and install as shown; turn nut and palnut down by hand so packing is against lower threaded section of fitting.
  - b. Screw fitting into aux pump; ensure nut and palnut rotate with fitting until packing contacts pump (indicated by a sudden increase in torque). Hold nut and palnut with wrench and screw fitting into pump one-half turn, plus one turn maximum; align inlet elbow parallel to pump motor axis and align outlet fitting per Figure 12-7 Detail B to pump motor axis. Hold fitting with wrench, special torque D452-6 nut per § 23-33, special torque palnut per § 23-33, and torque stripe per Figure 2-1.
2. As required, install C744-1 damper and B426-2 pressure switch in aux pump per the following: Apply light coat B270-6 sealant to C744-1 damper threads (do not apply sealant to first thread), install damper in aux pump, and standard torque C744-1 damper to 60 in.-lb. Apply light coat B270-6 sealant to B426-2 switch (do not apply sealant to first thread), install switch on C744-1 damper, and standard torque switch to 60 in.-lb. Tighten switch (tighter only, do not loosen) as required to orient NC terminal within 10° as shown.
3. As required, install fittings and D745-1 vacuum switch in A666-1 gascolator assembly per the following: Apply light coat B270-6 sealant to A880-536 or -566 adapter (or AN816-6D nipple) threads (do not apply sealant to first thread); install fitting in gascolator inlet and standard torque per § 23-32. Apply light coat B270-6 sealant to A457-11 adapter (or 6505-04-06-SS adapter) threads (do not apply sealant to first thread); install fitting in gascolator outlet and special torque per § 23-33. Apply light coat B270-6 sealant to vacuum switch threads (do not apply sealant to first thread); install switch in gascolator and standard torque to 60 in.-lb.
4. Connect gascolator adapter to aux pump lower elbow. Align gascolator A455-1 plug to point up and parallel with pump inlet, special torque adapter nut per § 23-33, and torque stripe per Figure 2-1.
5. Position aux pump with attached gascolator in helicopter; route gascolator drain tube thru grommet in belly, insert A455-1 plug in A454-1 support, and rest aux pump motor on D742-1 support. Connect C741-1 line assembly to gascolator inlet, finger-tight.

12-60 Gascolator Assembly and (R44 II) Aux Fuel Pump Installation (continued)**D. Gascolator and (R44 II) Aux Fuel Pump Installation (continued)**

6. Note any gap between bottom of A454-1 support and shoulder of A455-1 plug; fill gap as required by adjusting support vertically (or installing NAS1149F0432P washers on plug if support does not have slotted holes). Install washer and nut on plug, special torque nut per § 23-33, and torque stripe per Figure 2-1.
7. Special torque C741-1 line assembly nut per § 23-33, & torque stripe per Figure 2-1. Verify two layers of 10.0/10.5-inch length, B161-8 spirap insulation covering line between firewall and nut. Install new spirap as required.
8. Insert HTM-300 clamp around aux pump motor, through clip on vertical firewall and slot in D742-1 support. Special torque clamp per § 23-33 and torque stripe per Figure 2-1. Install hardware securing aux pump drain tube clamp to vertical firewall. Route tube thru hole in belly.
9. Connect B283-3 hose assembly to aux pump elbow (or tee), special torque hose assembly nut per § 23-33, and torque stripe per Figure 2-1.
10. Safety gascolator collar to outlet fitting using 0.032-inch diameter lockwire.
11. Connect vacuum switch and aux pump wiring to airframe harness at connectors. Connect wires (as marked) to pressure switch. Install ty-raps as required.
12. Turn fuel shut-off valve on. Verify no leaks.
13. Push in AUX FUEL PUMP circuit breaker. With mixture control off and master switch on, verify AUX FUEL PUMP caution light is illuminated. Turn ignition switch to PRIME for one minute and verify AUX FUEL PUMP light extinguishes and pump operates with a continuous, steady tone. Turn master switch off. Verify no leaks.
14. Have a qualified person run-up and shutdown helicopter per R44 II Pilot's Operating Handbook. Verify no leaks.
15. Install right cowling assembly.

12-70 Minimum Fuel Flow Check

1. Fuel main tank with approximately 5 gallons (30 lb) fuel per applicable Pilot’s Operating Handbook Section 2, as required. Remove right cowling assembly.
2. Electrically ground helicopter, and turn fuel shut-off valve off.
3. a. R44: Disconnect B283-3 hose assembly from carburetor, turn battery switch and fuel shut-off valve on, and defuel helicopter into an approved, electrically grounded container until LOW FUEL light illuminates. Turn battery switch and fuel shut-off valve off.  
 b. R44 II: Cut and discard safety wire securing gascolator collar to outlet fitting. Unscrew collar, and remove collar, ring (if installed), and sediment bowl; remove gasket and screen from gascolator top. Turn battery switch and fuel shut-off valve on, and defuel helicopter into an approved, electrically grounded container until LOW FUEL light illuminates. Turn battery switch and fuel shut-off valve off.
4. Place electrically-grounded, calibrated container beneath hose or gascolator, turn fuel shut-off valve on, and record time required to fill container. Verify filling time does not exceed maximum time listed below:

<b>ALLOWABLE FUEL FLOW RATE</b>	
<i>QUANTITY</i>	<i>MAXIMUM TIME</i>
<b>1 U.S. Gallon</b>	90 seconds
<b>4 Liters</b>	95 seconds
<b>1 Imperial Gallon</b>	108 seconds

5. If filling time is exceeded, perform vent system check per § 12-31 Part C. Inspect fuel tank outlet strainer, line assembly, and hose assemblies for obstructions. Remove obstructions and repeat check.
6. a. R44: Connect B283-3 hose assembly to carburetor, special torque nut per § 23-33, and torque stripe per Figure 2-1.  
 b. R44 II: Inspect, clean, and install screen and gasket in gascolator top. Apply light coat A257-6 grease to collar threads and collar inner flange. Verify large diameter of ring (if installed) contacts collar inner flange. Slide ring (if installed) and collar over bottom of sediment bowl so small diameter of ring engages groove in bowl flange. Position sediment bowl drain valve thru hole in belly panel, and hand-tighten collar, ring (if installed), and bowl onto gascolator top until snug. Verify no threads exposed in gascolator top. Safety collar to outlet fitting using 0.032-inch diameter lockwire.
7. Perform ground check and run up per §§ 2.205 & 2.210. Verify no leaks.
8. Install right cowling assembly.

12-80 R44 II Troubleshooting

PROBLEM	POSSIBLE CAUSE	CORRECTION
FUEL FILTER warning light illuminates during flight	Fuel system contaminated  Fuel tank vents obstructed  Vacuum switch contaminated	Inspect gascolator and fuel control inlet screens for contamination. Inspect fuel system for obstructions or debris and correct cause.  Inspect vents for contamination. Correct cause.  Replace vacuum switch.
AUX FUEL PUMP warning light illuminates during flight	Insufficient fuel quantity  Aux fuel pump output insufficient  Failed pressure relief valve assembly	Add fuel.  Replace aux fuel pump per § 12-60.  Perform pressure relief valve leakage check per § 12-83.
Fuel draining from intake manifold "sniffle" drain valve	Engine-driven fuel pump diaphragm failure  Flow divider piston stuck open	Replace engine-driven fuel pump.  Perform flow divider check per § 12-81.
Fuel draining from electric (auxiliary) fuel pump drain	Failed seal in aux fuel pump	Replace aux fuel pump, or return aux fuel pump to <a href="http://weldonpumps.com">http://weldonpumps.com</a> for repair.
Oil draining from engine-driven fuel pump drain	Leaking diaphragm	Replace engine-driven fuel pump.

12-81 Flow Divider Internal Leakage Check

**NOTE**  
Refer to Lycoming Service Instruction No. 1518 for information on stuck-closed flow divider.

1. Fully fuel helicopter. Turn battery switch off. Electrically ground helicopter.
2. Place electrically-grounded, suitable container beneath the intake manifold "sniffle" drain valve.
3. Turn fuel shut-off valve on. Push mixture control into FULL RICH position. Wait 15 minutes, then inspect container for evidence of fuel leaking from drain valve.
4. Replace or repair flow divider if fuel is found in container.

### 12-82 Injection Nozzle Comparative Flow Check

NOTE

Refer to Precision Airmotive Form 15-810B "Troubleshooting Techniques," Lycoming SSP-1776 "Service Table of Limits," and Lycoming SB 342 (current revision; ref [AD 2011-26-04](#)).

1. Turn battery switch off. Electrically ground helicopter. Remove engine left & right cowlings and upper spark plug access panels.
2. Remove injection nozzles from cylinders and reinstall nozzles on delivery lines. Place a calibrated container beneath each nozzle.
3. Turn fuel shut-off valve on. Rotate twist grip OPEN. Activate aux fuel pump by turning key to PRIME position.
4. Push mixture control into FULL RICH position for 15 to 30 seconds then pull mixture to off; verify volume collected is similar between all injection nozzles. If volume is not similar, isolate cause (nozzle, delivery line, flow divider fitting, flow divider) and repair.
5. Install nozzles and delivery lines and torque per Lycoming SSP-1776.
6. Install upper spark plug access panels and engine left & right cowlings.

### 12-83 Pressure Relief Valve Leakage Check

Verify sufficient fuel in aux tank. Disconnect fuel control-to-pressure relief valve hose assembly from fuel control inlet tee and drain residual fuel into an electrically-grounded, suitable container. If fuel drains continuously from hose assembly, replace pressure relief valve assembly.

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