

CHAPTER 12
FUEL SYSTEM

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CHAPTER 12
FUEL SYSTEM

12.000 Description

NOTE

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

This section includes procedures for maintaining R44 (Lycoming O-540 engine, carbureted) and R44 II (Lycoming IO-540 engine, fuel injected) fuel systems. Refer to carburetor, fuel control, or fuel system accessory manufacturer's instructions for continued airworthiness. Refer to Figures 12-1 and 12-2 for R44 and R44 II fuel system overviews.

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. 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.

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.

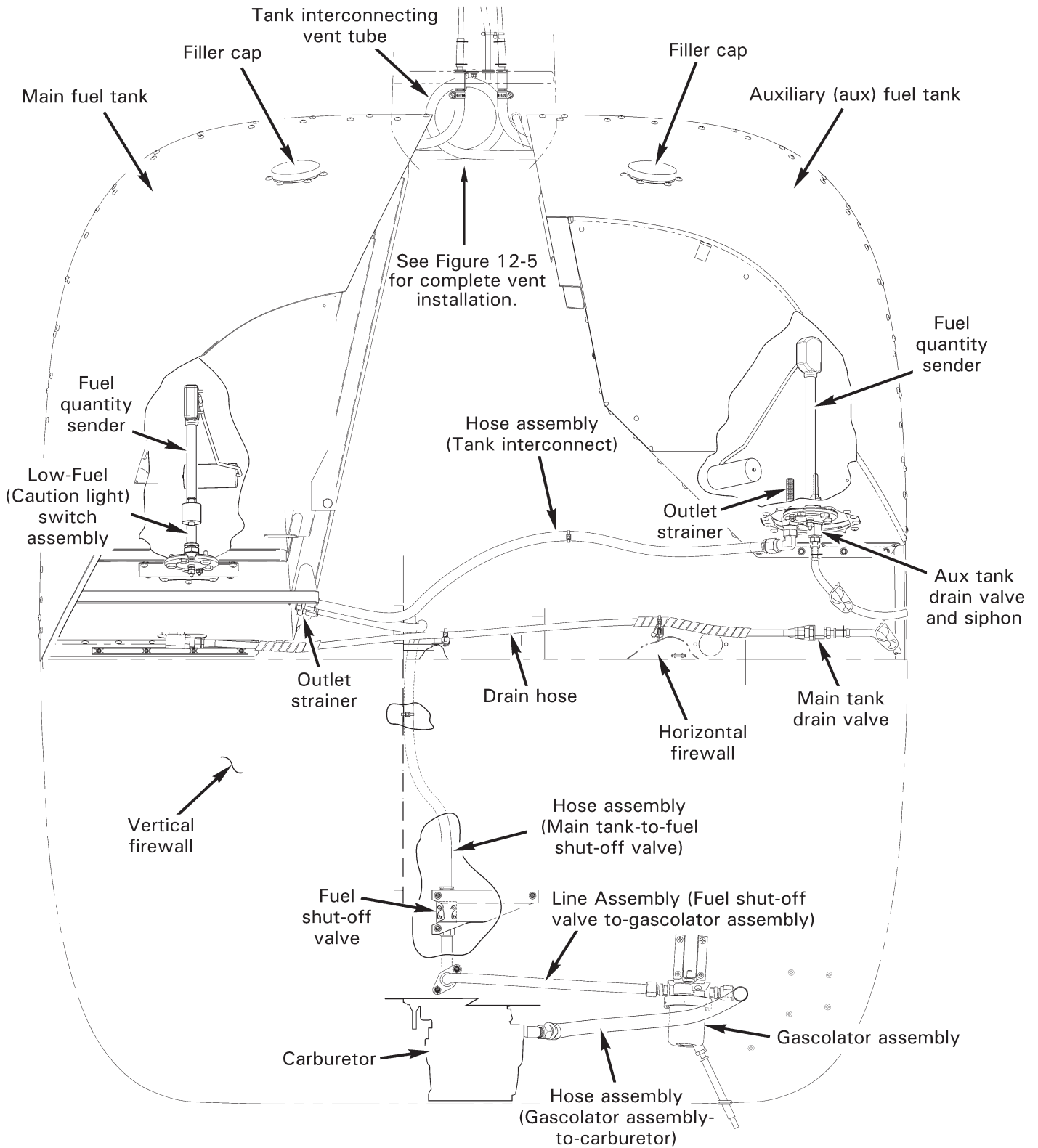


FIGURE 12-1 R44 FUEL SYSTEM (LYCOMING O-540 ENGINE; CARBURETED)

12.100 Fuel Tanks12.110 Main 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.

12.111 Main Tank Removal

1. Defuel helicopter per Section 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 tubes to C010-6 main tank assembly and pull tubes 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. Remove nuts securing wiring to fuel quantity sender if connectors are not installed.
6. Disconnect D205-28 (tank-to-shut-off valve) and 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.

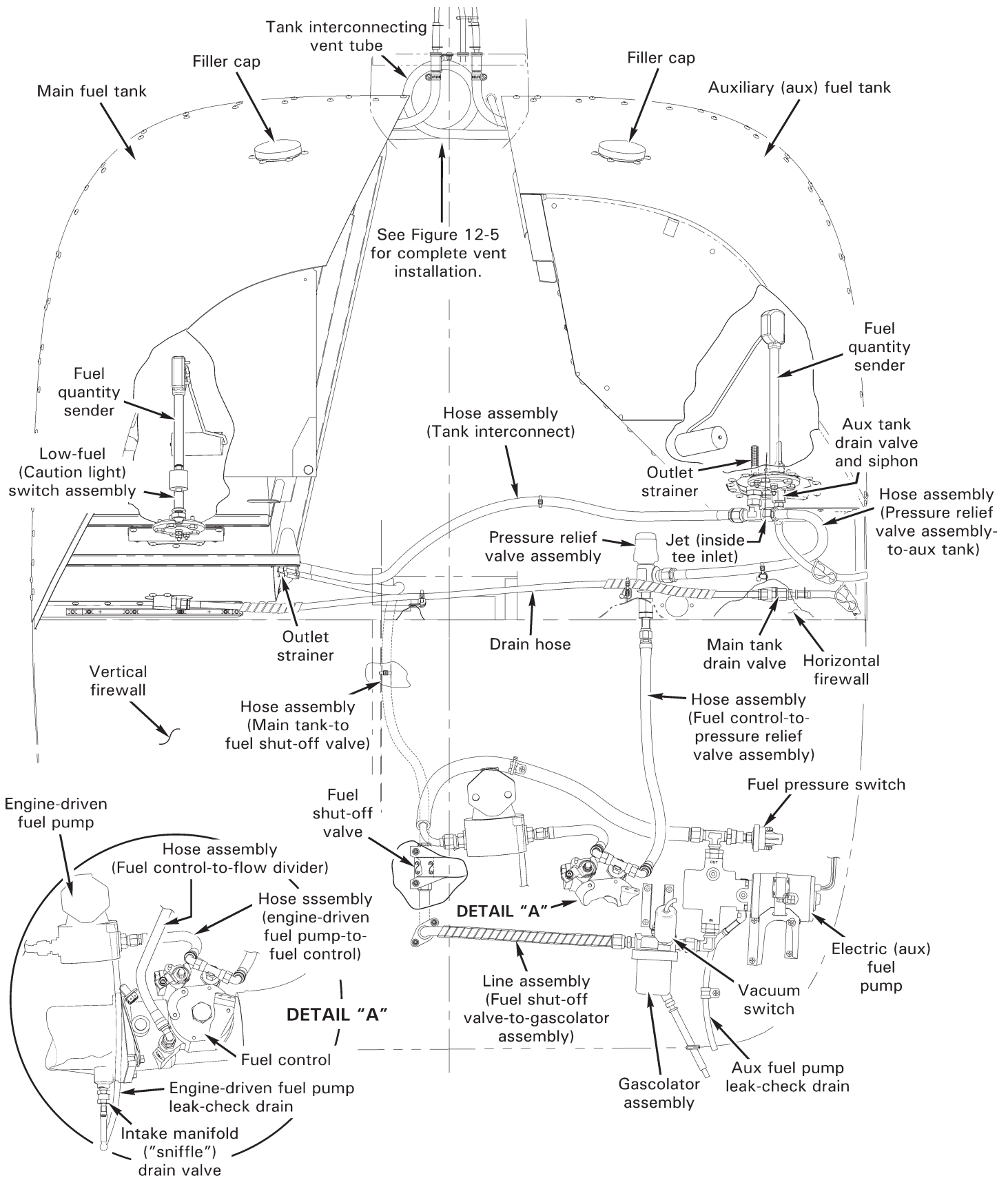


FIGURE 12-2 R44 II FUEL SYSTEM (LYCOMING IO-540 ENGINE; FUEL INJECTED)

12.112 Main Tank Installation

1. Connect D205-30 (drain) hose assembly to main tank drain union; special torque hose nut to 100 in.-lb and torque stripe per Figure 2-1. Position C010-6 main tank assembly in helicopter, routing D205-30 (drain) hose assembly 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 two bolts securing tank aft panel between horizontal firewall and upper frame. Standard torque bolts per Section 1.320 and torque stripe per Figure 2-1.
3. Install three screws securing tank aft panel to the intermediate bulkhead.
4. Above aft left seat, gently lift foam from cabin bulkhead and install four screws securing tank to bulkhead.
5. Remove caps. Connect D205-28 (tank-to-shut-off valve) hose assembly to tank forward fitting. Connect D205-29 (tank interconnect) hose assembly to tank aft fitting. Special torque hose nuts to 120 in.-lb and torque stripe per Figure 2-1.
6. Install ty-rap around D205-30 hose assembly through 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.
7. Connect fuel quantity sender and low-fuel switch assembly wiring at connectors. Install nuts securing wiring to fuel quantity sender if connectors are not installed. Install ty-raps as required.
8. Connect vent tubes to tank and tighten clamps until snug. Verify security.
9. Perform fuel quantity indication check per Section 12.412. 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 Section 13.211 as required.

12.113 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 bladder assembly temperature should be above 65°F before removing, installing, or flexing bladder.

1. Remove main fuel tank per Section 12.111.
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 Section 12.410.
4. Remove screws securing D250-1 cover assembly to D028-1 bladder assembly and tank; carefully remove cover, with low-fuel switch assembly attached. Remove and discard o-ring.
5. Disconnect D205-30 (drain) hose assembly from AN815-3D union and cap hose fitting. Remove union and discard o-ring. Remove two screws securing bladder to tank.
6. Remove B254-3 strainer assembly and AN815-6D union and discard o-rings. 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 bladder assembly inside main tank assembly. 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 o-rings with A257-6 grease and install o-rings on B254-3 strainer assembly and on AN815-6D union. Install strainer assembly into forward fitting, special torque to 150 in.-lb, and torque stripe per Figure 2-1. Install union into aft fitting, special torque to 200 in.-lb, and torque stripe per Figure 2-1.
14. Apply A257-9 anti-seize to threads and install two screws securing bladder to tank near drain hose connection. Lubricate new o-ring with A257-6 grease and install o-ring on AN815-3D union. Install union, special torque to 100 in.-lb, and torque stripe per Figure 2-1. Remove cap and connect drain hose to union. Special torque hose nut to 100 in.-lb and torque stripe per Figure 2-1.

12.113 Main Tank - Bladder Replacement (continued)

15. Lubricate new o-ring with A257-6 grease and install o-ring in bladder groove in opening at bottom of tank. Carefully insert cover 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 Section 12.410.
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 Section 12.112.

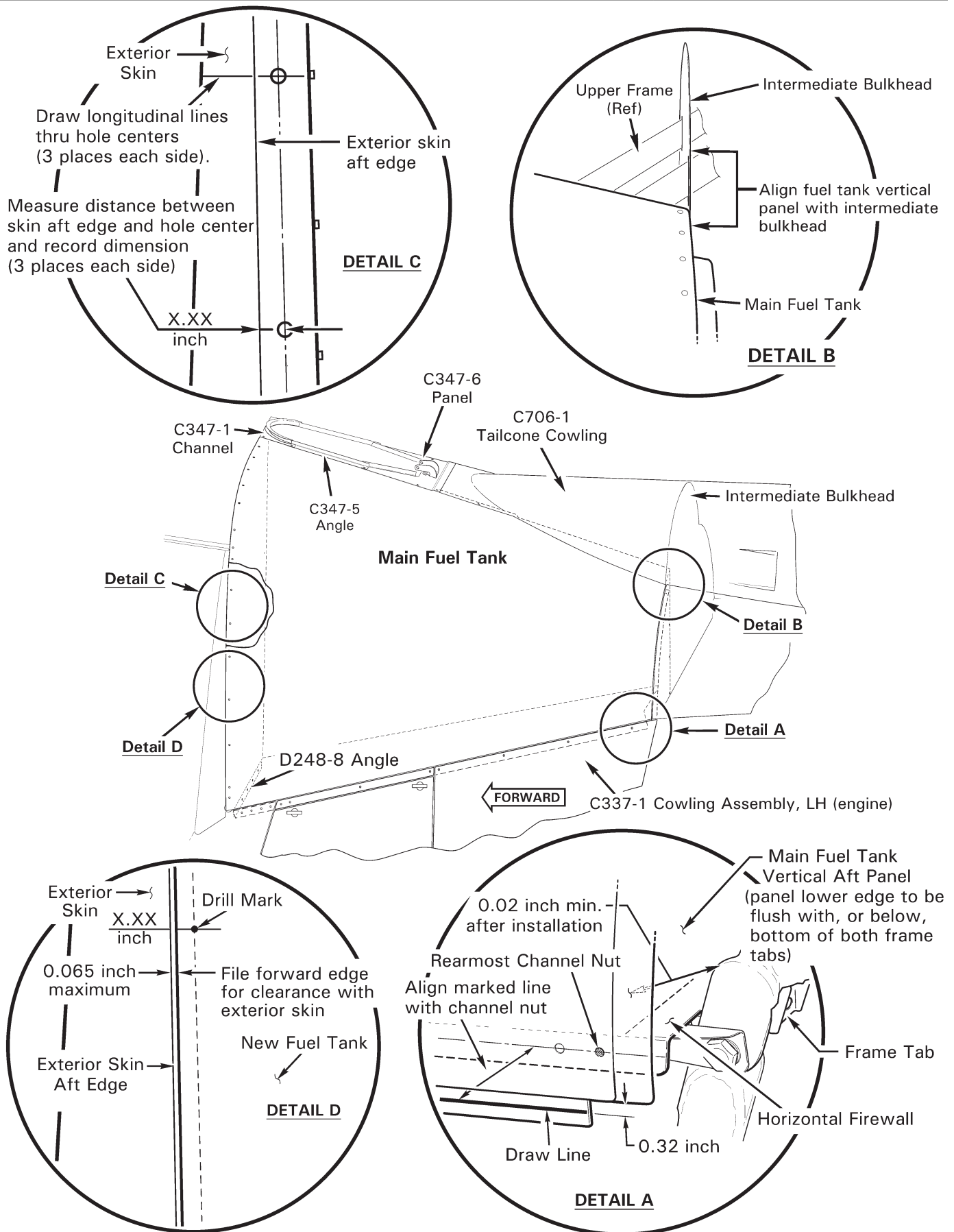


FIGURE 12-3 MAIN TANK REPLACEMENT

12.114 Main Tank Replacement

1. Remove main fuel tank per Section 12.111.
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. Solvent-clean tank deburred edge and apply Alodine 1122 or Alodine 1201 in accordance with manufacturer's instructions. Apply epoxy primer to dry 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.
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 Section 12.112.

12.120 Aux 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.

12.121 Aux Tank Removal

1. Defuel helicopter per Section 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 clamps 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. Remove nuts securing wiring to sender if connectors are not installed.
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 tank elbow. Cap fittings.
b. R44 II: Disconnect hose assemblies from tank tee. Remove D453-2 jet 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.

12.122 Aux Tank Installation

1. Position D043-5 aux tank assembly in helicopter. Install aft bolt securing tank channel to upper frame. Standard torque bolt per Section 1.320 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 tank elbow. Special torque hose nuts to 120 in.-lb 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, D453-2 jet in tee inlet (outboard). Connect hose assemblies to tee. Verify D205-31 hose assembly elbow is horizontal within 5°. Special torque hose nuts to 120 in.-lb 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 at connectors. Install nuts securing wiring to fuel quantity sender if connectors are not installed. Install ty-raps as required.
7. Connect vent tubes to tank and tighten clamps until snug. Verify security.
8. Perform fuel quantity indication check per Section 12.412. 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.

12.123 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 bladder assembly temperature should be above 65°F before removing, installing, or flexing bladder.

1. Remove aux fuel tank per Section 12.121.
2. Remove hardware securing D247-2 bulkhead assembly and D253-3 angle to tank and remove angle. Detach hook and loop tape and remove bulkhead.
3. Remove fuel quantity sender per Section 12.410.
4. Remove screws securing D250-2 cover assembly to D028-2 bladder assembly and tank; carefully remove cover, with drain valve assembly attached. Remove and discard o-ring.
5. At vents, remove screw securing bladder to tank.
6. Remove fuel cap. Remove screws securing bladder to tank.
7. Detach hook and loop tape and carefully remove bladder.
8. Carefully insert new D028-2 bladder assembly inside aux tank assembly. 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 o-ring with A257-6 grease and install o-ring 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 Section 12.410.
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 Section 12.122.

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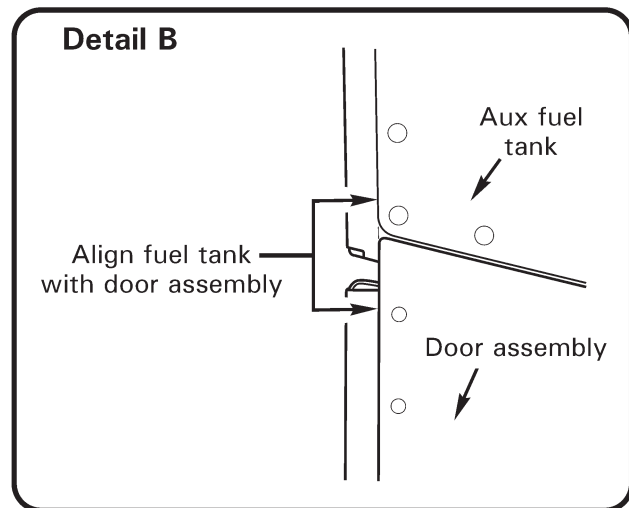
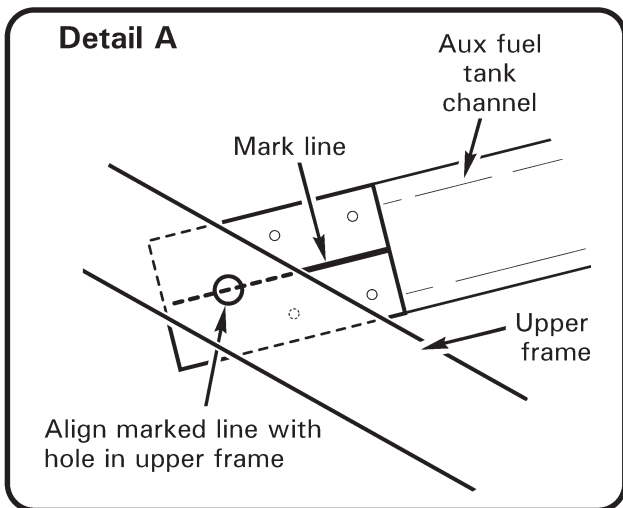
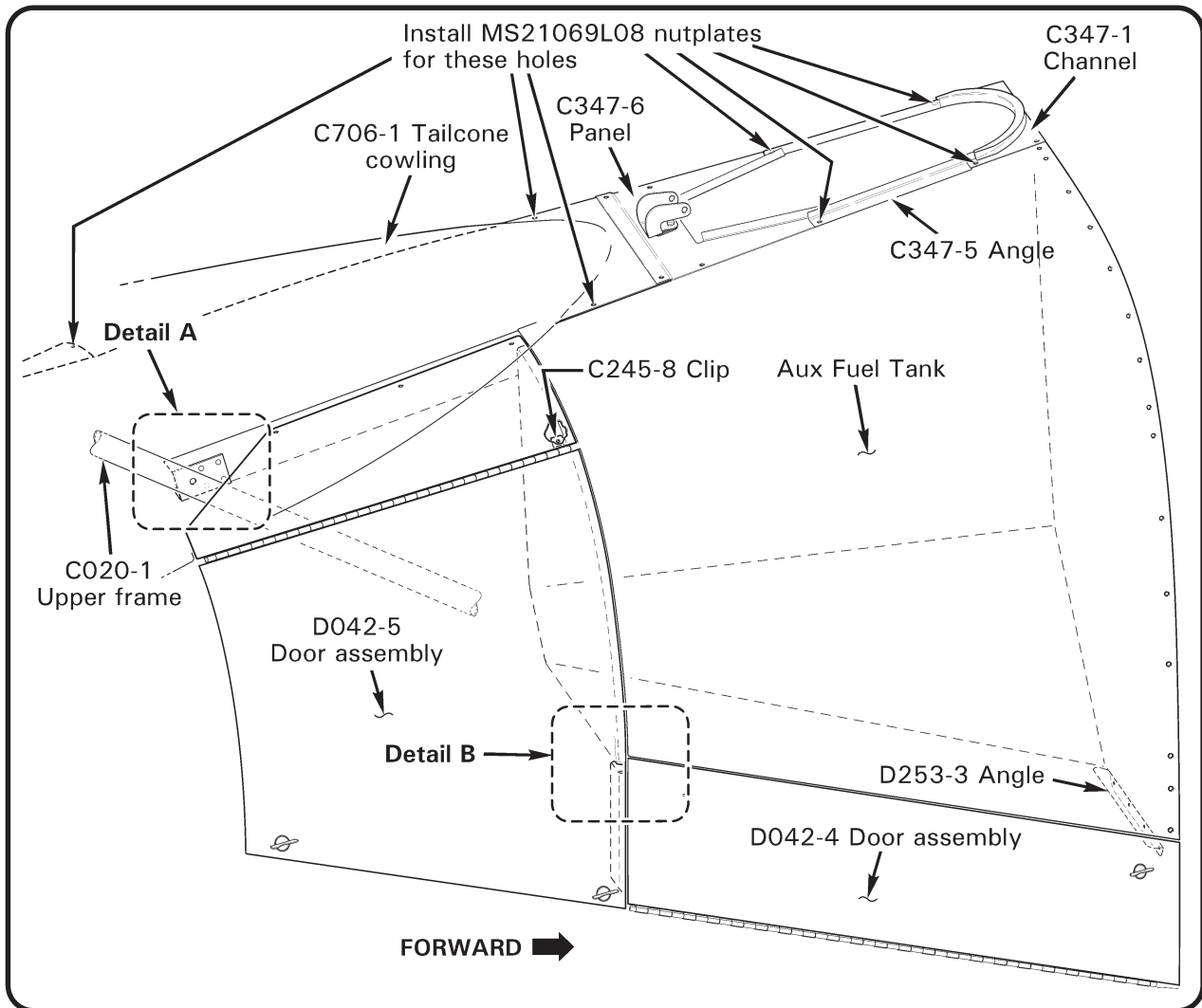


FIGURE 12-4 AUX TANK REPLACEMENT

12.124 Aux Tank Replacement

1. Remove aux fuel tank per Section 12.121.
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. Solvent-clean tank deburred edge and apply Alodine 1122 or Alodine 1201 in accordance with manufacturer's instructions. Apply epoxy primer to dry 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 Section 12.122.

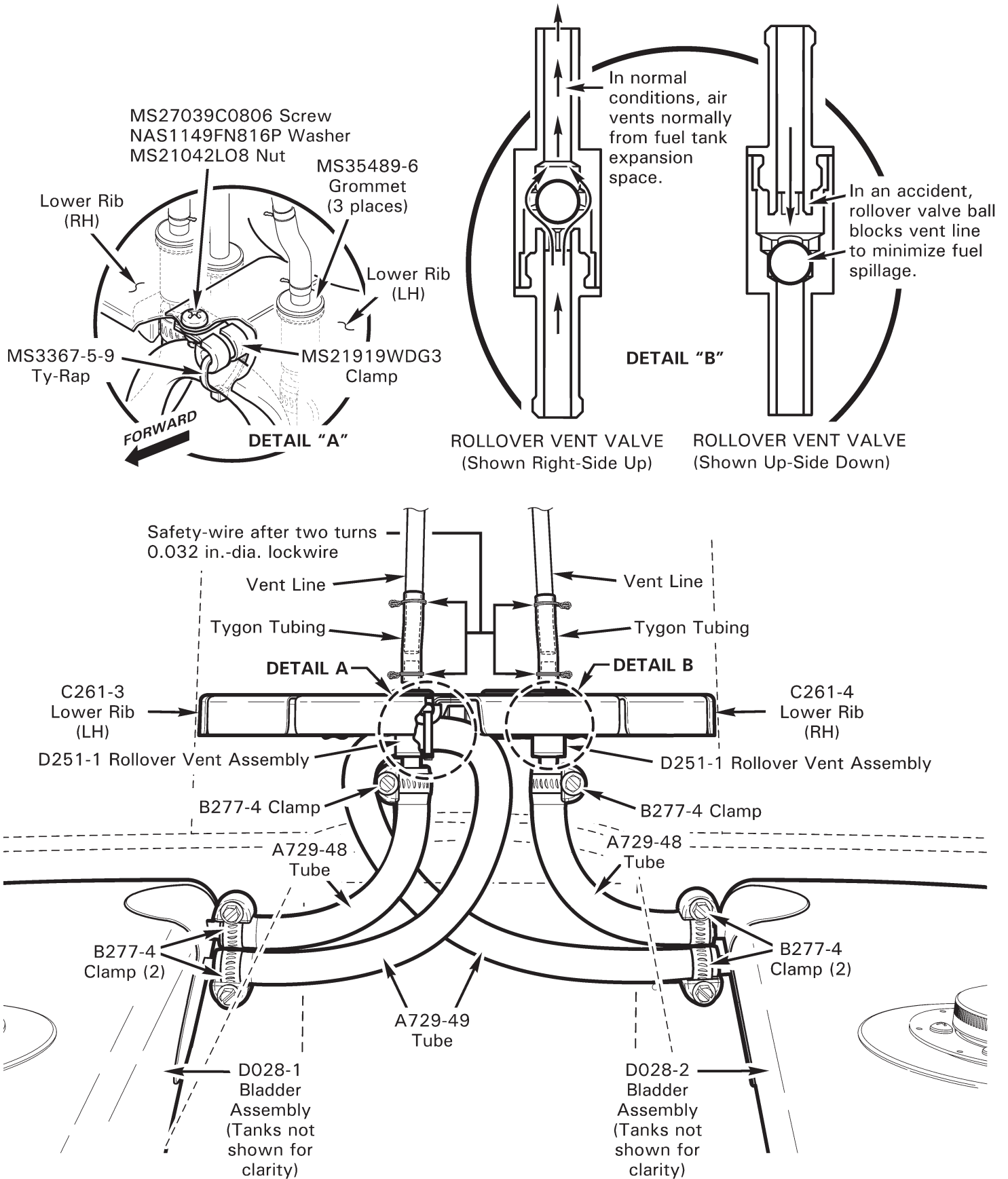


FIGURE 12-5 FUEL VENTS

12.200 Fuel Vents

12.210 Roll-Over Vent Valves

R44 roll-over vent valves 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. Cut and discard safety wire securing A729-47 tube to D251-1 roll-over vent assembly and pull tube off vent. Pull vent through rib grommet.
3. Loosen clamp securing A729-48 tube to vent and pull tube off vent.

B. Installation

1. Observe orientation markings and install D251-1 roll-over vent valve assembly to A729-48 tube and tighten clamp. Insert valve through rib grommet.
2. Connect A729-47 tube to valve, wrap two turns 0.032-inch diameter lockwire and safety tube tight to valve.
3. 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 C731-2 (vent) line.
3. Blow into the hose; do not use compressed air. Verify air blows out the other vent opening. If air does not blow out the other vent, remove obstruction(s) in vent line(s) or in bladder and repeat check.
4. Close mast fairing.

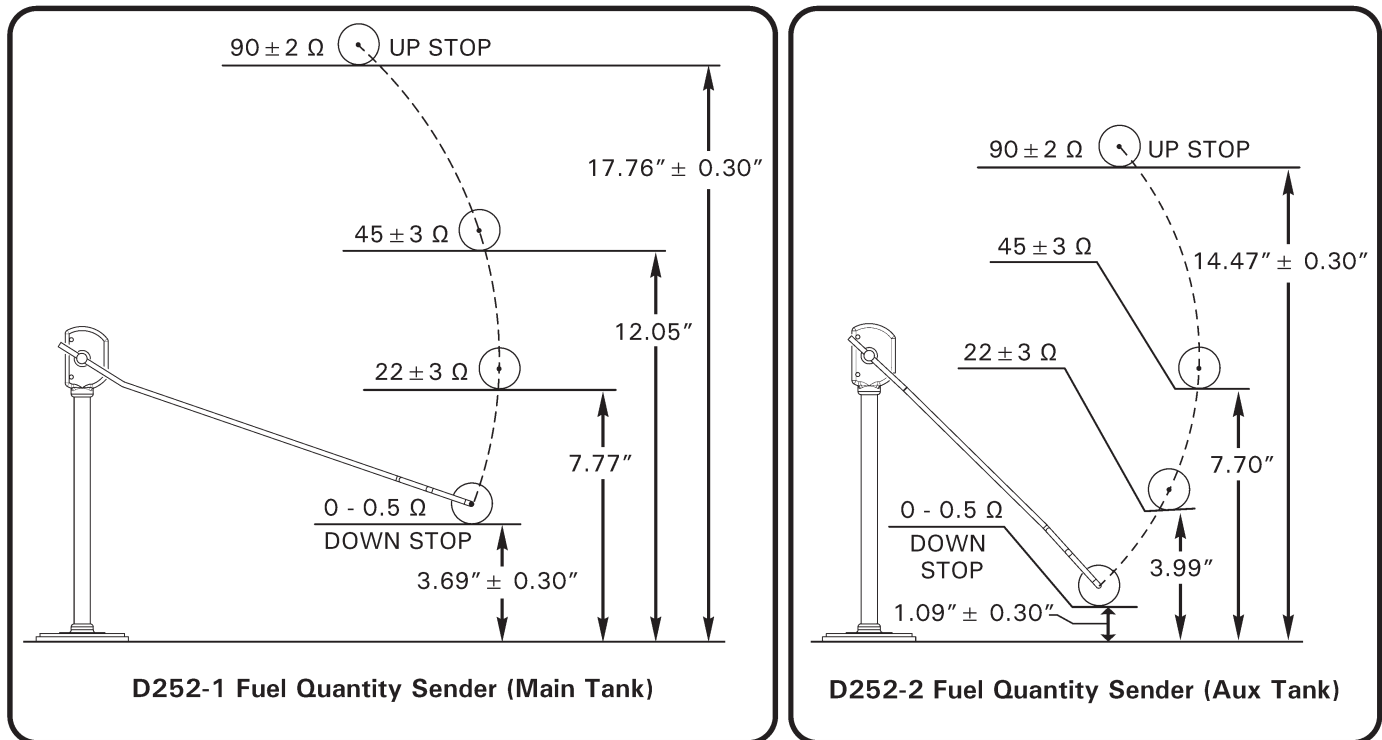


FIGURE 12-6 FUEL QUANTITY SENDER CHECK

12.300 Drain Valves

A. Removal

1. Defuel helicopter per Section 1.150. Remove engine right cowling, as required.
2. Except for all-aluminum main tank, cut and discard safety wire securing A729 tube to A761-1 drain valve and remove tube.
3. Remove valve from connector, tank, or gascolator assembly. Tape fuel system opening.
4. Actuate valve to expose stem, then remove and discard o-ring.

B. Installation

1. Actuate A761-1 drain valve to expose stem, then 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 valve per Section 1.320 (if valve is installed in B416-3 [aluminum] gascolator bowl, special torque valve to 120 in.-lb) and torque stripe per Figure 5-1.
3. Except for all-aluminum main tank, fit A729 tube onto valve, wrap tube with two turns 0.032-inch diameter lockwire, and safety tube to valve.
4. Fuel helicopter per R44 or R44 II Pilot's Operating Handbook Section 2 and inspect fuel system for leaks. Install engine right cowling, if removed.

12.400 Fuel Quantity

12.410 Fuel Quantity Senders

A. Removal

1. a. D252-1 (main tank) fuel quantity sender: Remove main tank per Section 12.111. Remove screws securing A374-5 angle to bladder assembly.
- b. D252-2 (aux tank) fuel quantity sender: Defuel helicopter per Section 1.150. Disconnect D205-29 hose assembly, and D205-31 hose assembly (R44 II) if applicable, from elbow (R44) or tee (R44 II).
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.
3. Remove bolts securing fuel quantity sender to cover assembly. Carefully pull sender lever through opening, then tape opening.
4. Remove palnuts securing C049-11 connector assembly to fuel quantity sender, using backup wrench on center stud nut.

B. Installation

1. Perform fuel quantity sender check per Section 12.411.
2. Install new palnuts securing C049-11 connector assembly to D252 fuel quantity sender; special torque palnut on center stud to 11 in.-lb using backup wrench on nut.
3. Remove tape, then carefully insert fuel quantity sender lever through opening in D250 cover assembly. Install hardware, special torque bolts in criss-cross pattern per Section 1.330, 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 Section 12.112.
- b. D252-2 (aux tank) fuel quantity sender: 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 to bladder ring and tank. Connect sender wiring to airframe harness at connectors. Install ty-raps as required.
5. Perform fuel quantity indication check per Section 12.412. Verify no leaks.

12.411 Fuel Quantity Sender Check

1. Remove fuel quantity sender per Section 12.410.
2. Simulate mounting position of appropriate sender per Figure 12-6. 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 Section 12.410.

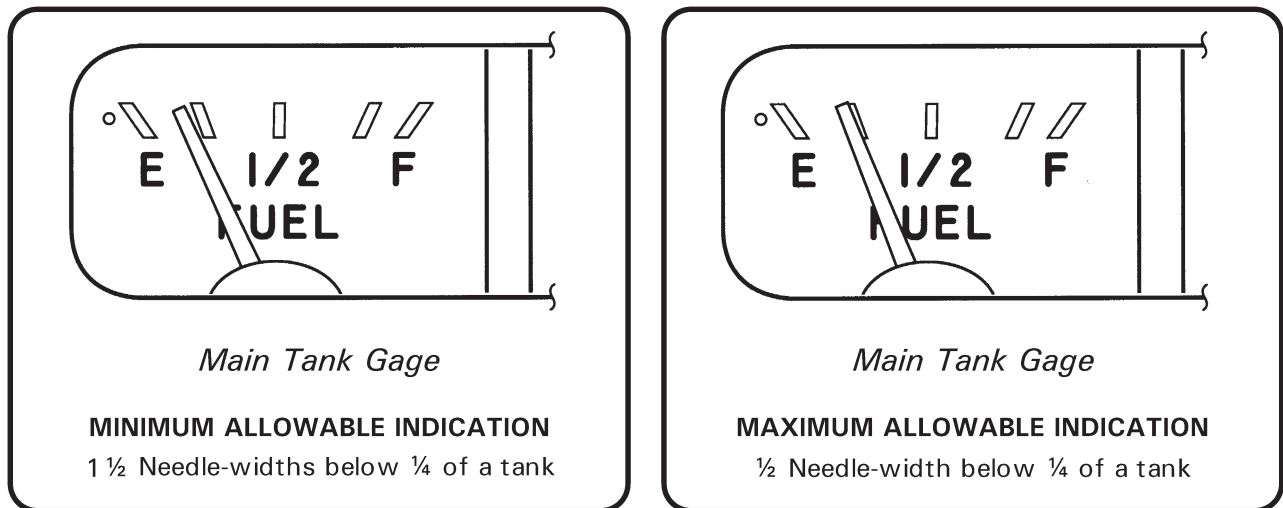


FIGURE 12-7 FUEL QUANTITY INDICATION CHECK

12.412 Fuel Quantity Indication Check

1. Defuel helicopter per Section 1.150.
2. Fuel main tank with 9.25 gallons per Pilot's Operating Handbook Section 2. Wait five minutes for fuel levels to equalize. Inspect for leaks.
3. Turn battery switch on and read fuel quantity gage. Verify fuel gage indicates one half to one and one half needle-widths below a quarter of a tank, as shown in Figure 12-7.
4. If indication is beyond allowable limit, perform fuel quantity sender check per Section 12.411. If sender resistance is within tolerance, adjust fuel gage per Section 14.440, or replace fuel gage and repeat check.

12.420 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 Section 12.111.
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 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.

12.420 Low-Fuel Switch Assembly (continued)**B. Installation**

1. Lubricate new o-ring with A257-6 grease, and install o-ring 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 AN924-5D nut mating surface and install nut securing switch assembly to tank. Special torque nut to 150 in.-lb, and torque stripe per Figure 2-1.
5. Install main fuel tank per Section 12.112.
6. Perform operation check per Part C.

C. Operation Check

1. Turn battery switch on. Fuel helicopter per R44 or R44 II 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.

12.500 Gascolator Assembly and 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. 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 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 adapter using 0.032-inch diameter lockwire.
6. Turn fuel shut-off valve on. Perform ground check and run up per Sections 2.205 & 2.210. Verify no leaks; repair as required.
7. Install right cowling assembly.

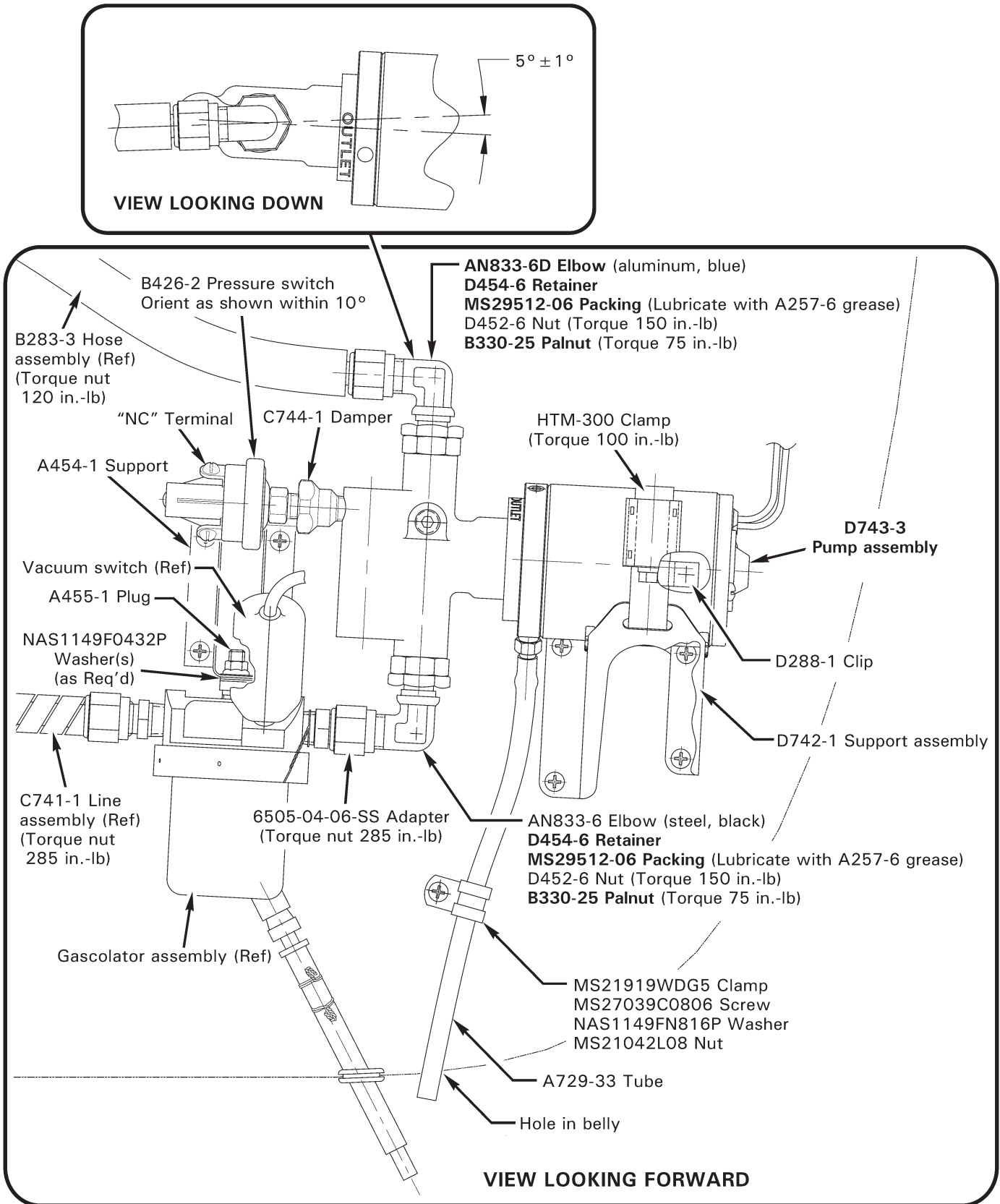


FIGURE 12-8 GASCOLATOR ASSEMBLY AND AUX FUEL PUMP INSTALLATION

12.500 Gascolator Assembly and Aux Fuel Pump Installation (continued)**CAUTION**

Temporarily cap fuel fittings when opened.

B. Removal

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. Refer to Figure 12-8. 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 nipple.
4. a. R44: Disconnect B283-3 hose assembly from gascolator outlet nipple. 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: Separate gascolator from pump by disconnecting adapter from elbow. As required, transfer fittings and pressure switch to replacement pump using new packings.

C. Installation

1. Refer to Figure 12-8. Install AN833-6 steel elbow in inlet, and new AN833-6D aluminum elbow in outlet of new D743-3 or D743-4 aux fuel pump assembly per the following:
 - a. Install new B330-25 palnut followed by D452-6 nut (counterbore facing outboard) on inboard threads of elbow. Install new D454-6 retainer on smooth area between threads and press retainer completely into counterbore of nut. Lubricate new MS29512-06 packing with A257-6 grease and install between threads adjacent to retainer.
 - b. Rotate combined nut & retainer until packing is pushed against outboard threads. Screw elbow into pump until packing contacts pump, indicated by a sudden increase in torque. Hold nut with wrench and tighten elbow no more than one full turn until elbow points away from motor. Position the steel AN833-6 lower elbow parallel to the long axis of the pump. Per Figure 12-8, Detail A, position the aluminum AN833-6D upper elbow approximately 5° counterclockwise from parallel to long axis of pump (looking down). Hold elbow and special torque D452-6 nut to 150 in.-lb, special torque palnut to 75 in.-lb, and torque stripe per Figure 2-1.

12.500 Gascolator Assembly and Aux Fuel Pump Installation (continued)**C. Installation (continued)**

2. Apply light coat B270-6 sealant to C744-1 damper threads (do not apply sealant to first thread), install damper in D743-3 aux fuel pump assembly, 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 (only) to orient NC terminal within 10°, as shown.
3. Connect gascolator 6505-04-06-SS adapter to the pump's steel AN833-6 lower elbow. Align gascolator A455-1 plug to point up and parallel with pump inlet, special torque adapter nut to 285 in.-lb, and torque stripe per Figure 2-1.
4. Remove caps. Position A666-1 gascolator assembly drain valve thru hole in belly panel. Insert A455-1 plug in A454-1 support, then connect C741-1 line assembly to inlet nipple (marked "IN"), finger-tight.
5. R44 II: With aux fuel pump motor resting firmly on D742-1 support, note any gap between bottom of A454-1 support and shoulder of A455-1 plug, and fill gap as required by installing NAS1149F0432P washers on plug.
6. Install washer and nut on A455-1 plug, special torque nut to 70 in.-lb, and torque stripe per Figure 2-1.
7. R44 II: Insert HTM-300 clamp around aux pump motor, through clip on vertical firewall and slot in D742-1 support. Special torque clamp to 100 in.-lb and torque stripe per Figure 2-1. Install hardware securing aux pump drain tube clamp to vertical firewall.
8. Special torque C741-1 line assembly nut to 285 in.-lb, & torque stripe per Figure 2-1.
9. a. R44: If installed, connect primer line to bushing on gascolator outlet tee, special torque nut to 25 in.-lb, and torque stripe per Figure 2-1. Connect B283-3 hose assembly to gascolator outlet nipple, special torque nut to 120 in.-lb, and torque stripe per Figure 2-1.
b. R44 II: Verify two layers of 10.0/10.5-inch length, B161-8 spirap insulation covering C741-1 line assembly between firewall and nut. Install new spirap as required. Connect B283-3 hose assembly to aux pump tee, special torque nut to 120 in.-lb, and torque stripe per Figure 2-1.
10. Safety gascolator collar to outlet fitting using 0.032-inch diameter lockwire.
11. R44 II: Connect D745-1 vacuum switch and aux pump wiring to airframe harness at connectors. Connect wires as marked to B426-2 fuel pressure switch. Install ty-raps as required.
12. Perform minimum fuel flow check per Section 12.600.
13. Perform ground check and run up per Section 2.205 & 2.210. Verify no leaks.
14. Install right cowling assembly.

12.600 Minimum Fuel Flow Check

1. Fuel main tank with approximately 5 gallons (30 lb) fuel per R44 or R44 II 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, 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:

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

5. If filling time is exceeded, perform vent system check per Section 12.210 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 to 120 in.-lb, 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 contacts collar inner flange. Slide ring 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, and bowl onto gascolator top until snug. Verify no threads exposed in gascolator top. Safety collar to outlet nipple using 0.032-inch diameter lockwire.
7. Perform ground check and run up per Section 2.205 & 2.210. Verify no leaks.
8. Install right cowling assembly.

12.700 R44 II Troubleshooting

PROBLEM	POSSIBLE CAUSE	CORRECTION
FUEL FILTER warning light illuminates during flight	Fuel system contaminated	Inspect gascolator and fuel control inlet screens for contamination. Inspect fuel system for obstructions or debris and correct cause.
	Fuel tank vents obstructed	Inspect vents for contamination. Correct cause.
	Vacuum switch contaminated	Replace vacuum switch.
AUX FUEL PUMP warning light illuminates during flight	Insufficient fuel quantity	Add fuel.
	Aux fuel pump output insufficient	Replace aux fuel pump per Section 12.500.
	Failed pressure relief valve assembly	Perform pressure relief valve leakage check per Section 12.730.
Fuel draining from intake manifold "sniffle" drain valve	Engine-driven fuel pump diaphragm failure	Replace engine-driven fuel pump.
	Flow divider piston stuck open	Perform flow divider check per Section 12.710.
Fuel draining from electric (auxiliary) fuel pump drain	Failed seal in aux fuel pump	Replace aux fuel pump, or return aux fuel pump to http://weldonpumps.com for repair.
Oil draining from engine-driven fuel pump drain	Leaking diaphragm	Replace engine-driven fuel pump.

12.710 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.

12.720 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.

12.730 Pressure Relief Valve Leakage Check

1. 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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