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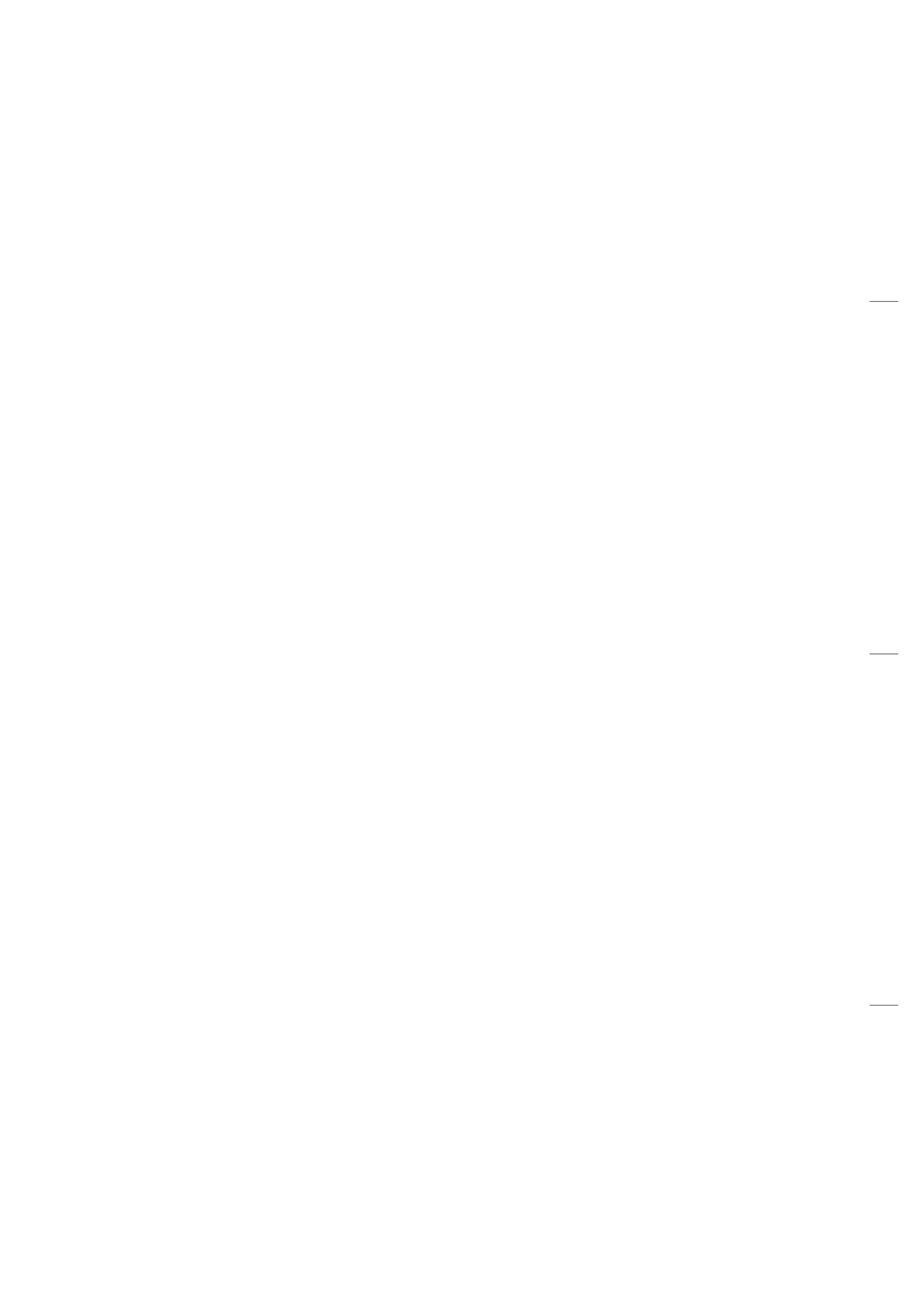
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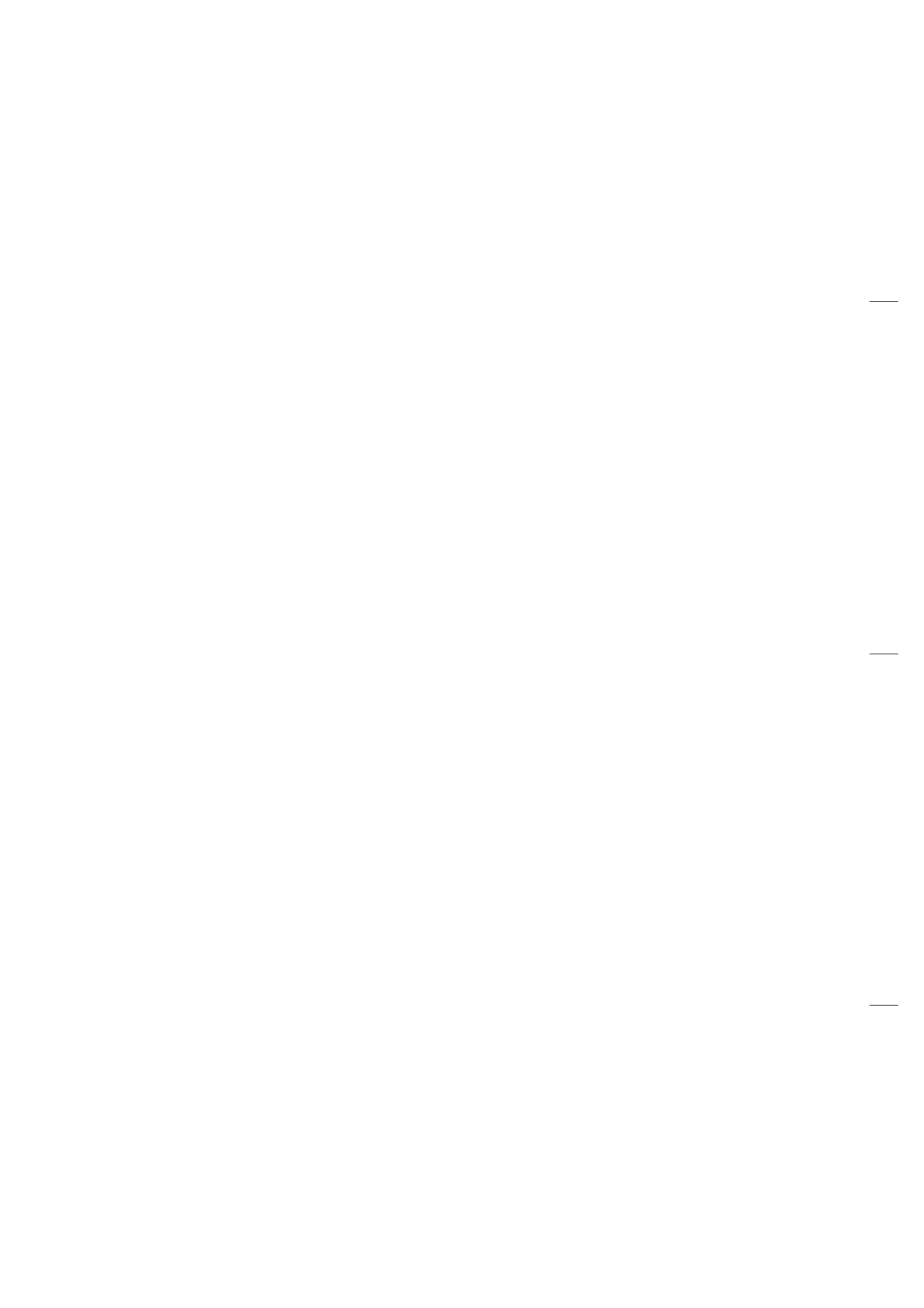
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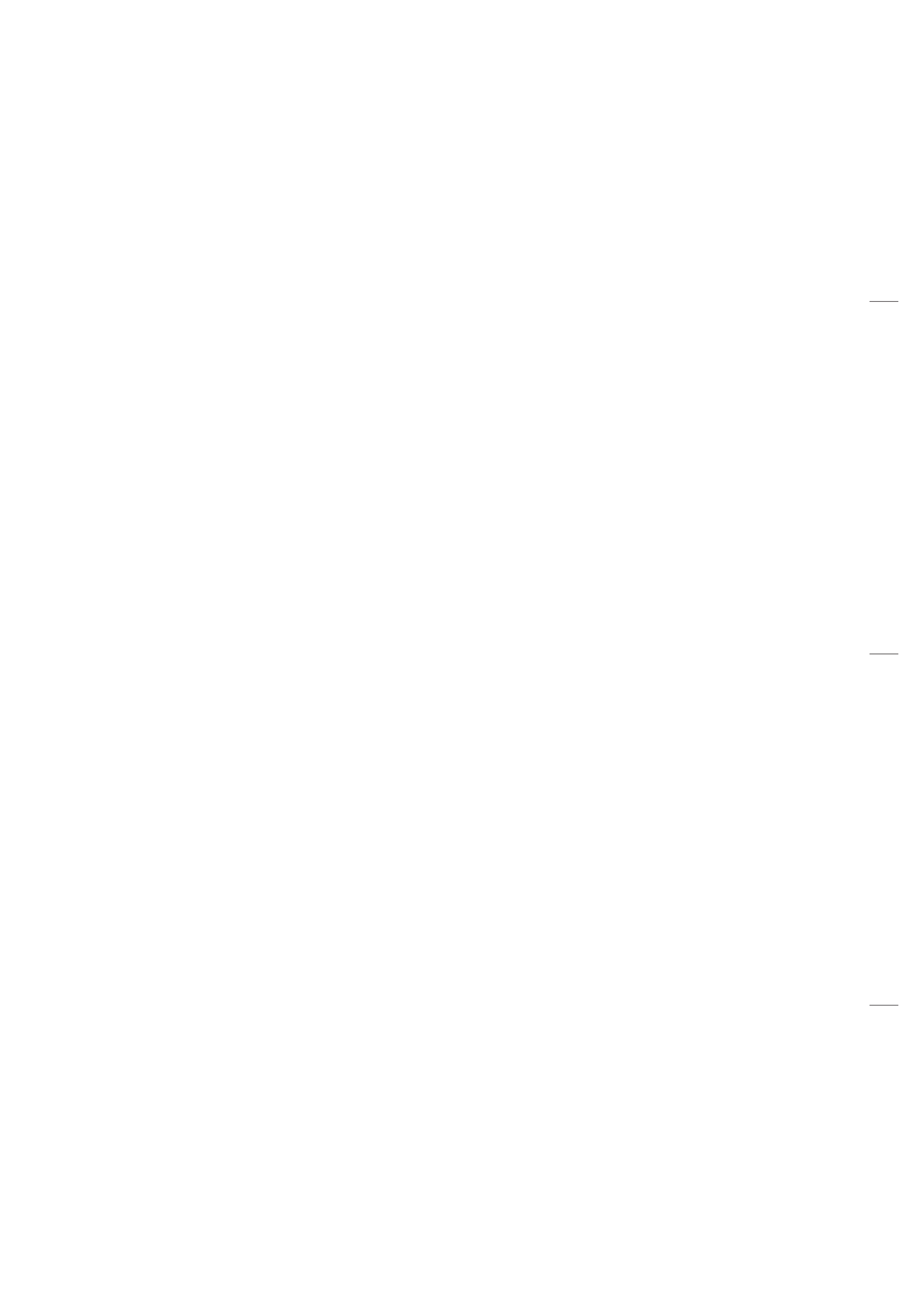
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The technical content of this document is approved under the authority of DOA ref. EASA.21J.025.

21.07.2015
Date, Signature Office of Airworthiness

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**AQUILA AT01
MAINTENANCE MANUAL**

CHAPTER 28

FUEL

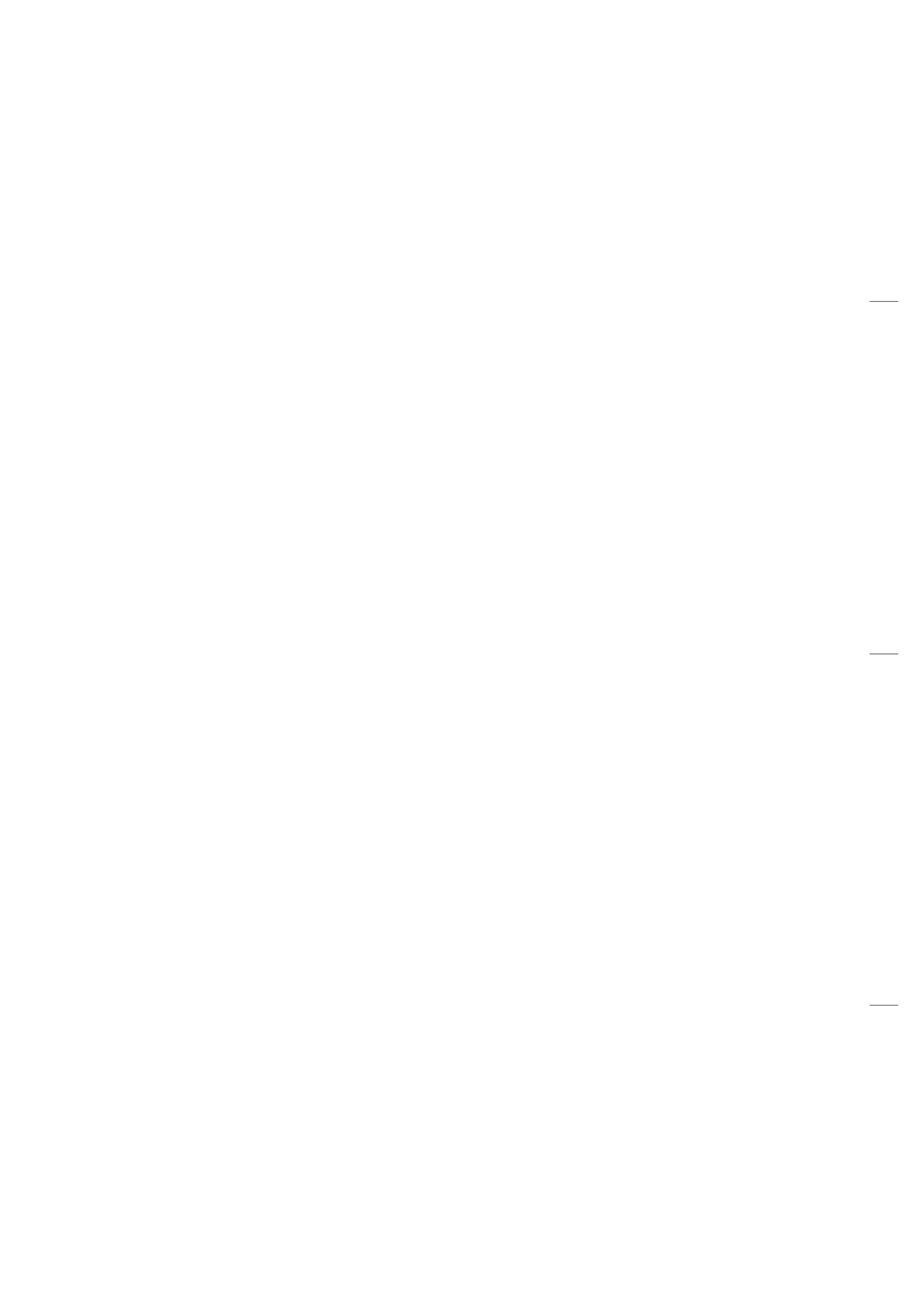
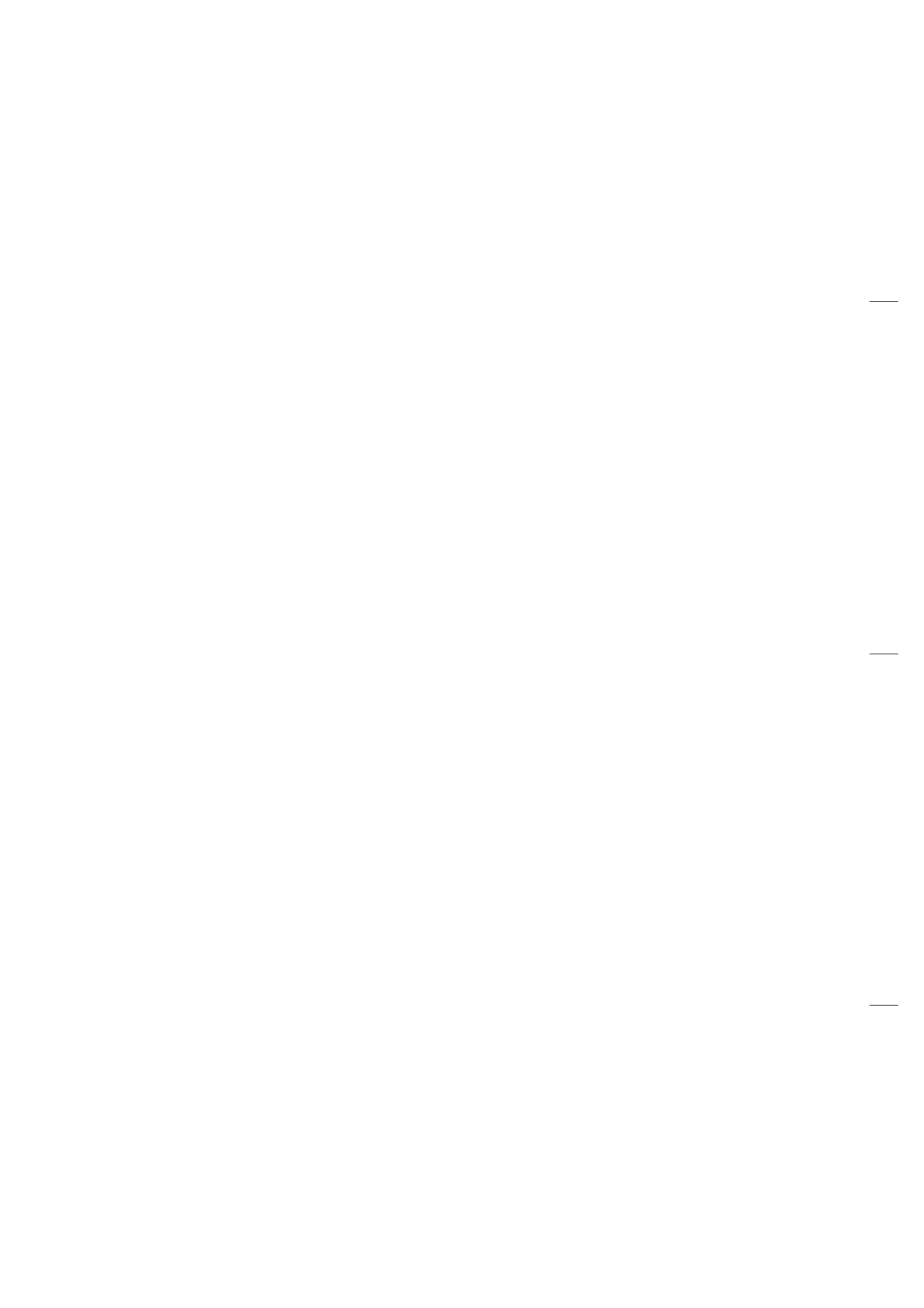


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FUEL - GENERAL

1. Introduction

- A. This chapter covers those units and components which are not part of the engine but store or deliver fuel to the engine or indicate fuel quantity and pressure. For additional information on the internal engine fuel system components, refer to the respective engine manufacturer's publications.

2. General Description

- A. The fuel system consists of two main fuel tanks which are integral parts of the wings, a fuel selector / shut-off valve on the center console, an auxiliary fuel pump with an integrated fuel filter, an engine driven fuel pump and two single-barrel float type carburetors in the engine compartment as well as flexible hoses and aluminum-fuel-lines.

Fuel Quantity Data:

Total fuel:	120 liters (31.7 gallons)
Usable fuel:	109,6 liters (28.9 gallons)
Unusable fuel:	10,4 liters (2.8 gallons)

B. Fuel Supply

- (1) Fuel is delivered to the carburetors by the engine driven fuel pump from the fuel tank that is pre-selected by the fuel selector / shut-off valve. An electrical fuel pump is provided in case of failure of the engine driven fuel pump. Excessive fuel flows through return lines and the fuel selector valve back to the same tank.
- (2) A fuel selector / shut-off valve is provided to select the desired fuel tank and to interrupt fuel supply in case of an emergency. The selector handle is mounted in view of the pilot and is easily accessible in the center console between the seats. The red, arrow shaped handle has a LEFT, RIGHT, and OFF position. Each position has a positive detent.

C. Fuel Indication

Fuel quantity is measured by capacitive or resistive type fuel level sensors and indicated by a dual fuel level indicator. Fuel pressure is measured at the engine and low fuel pressure is indicated by a warning light.

D. Fuel System Ventilation

The fuel tanks are vented from the top of each fuel tank through a vent line, connected at the outboard fuel tank rib, to a vent located on the winglets.

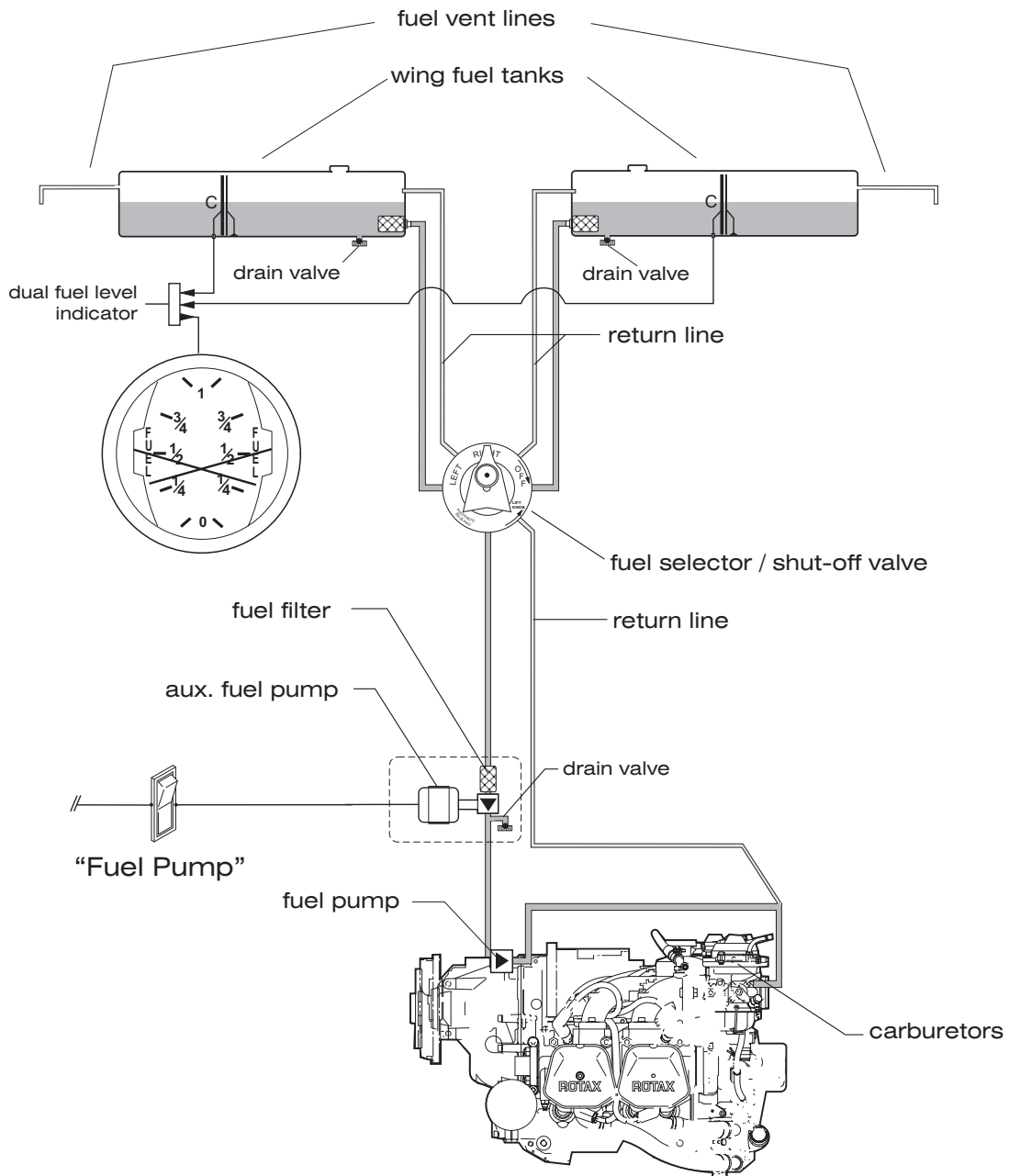
E. Fuel Drain System

Each tank has a manually operated drain at the bottom, inboard rear corner. A further drain valve is installed at the fuel system's lowest point, namely at the base of electrical fuel pump.

F. Fuel Lines

Fuel lines are made of aluminum tubing behind the firewall and stainless steel in the engine compartment. Flexible Hoses are made of Teflon with steel fittings and silicone-coated fire sleeves.

FUEL SYSTEM SCHEMATIC



Fuel System (Schematic)
Figure 1

FUEL STORAGE - MAINTENANCE

WARNING: PERFORM ALL FUEL SYSTEM MAINTENANCE IN ACCORDANCE WITH SAFETY PRECAUTIONS CONTAINED IN 12-11-00!

1. General

- A. The fuel storage system consists of two integral fuel tanks, located at the inboard portion of each wing in front of the main spar. They are bounded by the upper and lower wing skins which are reinforced in this area, the main spar web, and the inboard and outboard fuel tank ribs. Each fuel tank has a lockable fuel filler cap which is grounded to the airframe. The inner surfaces of the composite integral tanks are sealed with a special fuel tank sealing material to protect the composite fiber structure. A fuel baffle rib is provided to reduce fuel slosh in the fuel outlet and the fuel quantity sensor areas. The fuel tanks are vented from the top of each fuel tank through a vent line connected at the outboard fuel tank rib to a vent located on the winglets. Each inboard fuel tank rib has an outlet over the sump level that is equipped with a removable mesh strainer.

The inboard fuel tank ribs are easily accessible for maintenance work through access panel 610 BB / 510 BB in the lower wing skin.

- B. The wing fuel tanks are maintenance-free. However, if a leak is suspected, AQUILA Aviation GmbH should be consulted.

2. Wing Fuel Tank Leakage Test

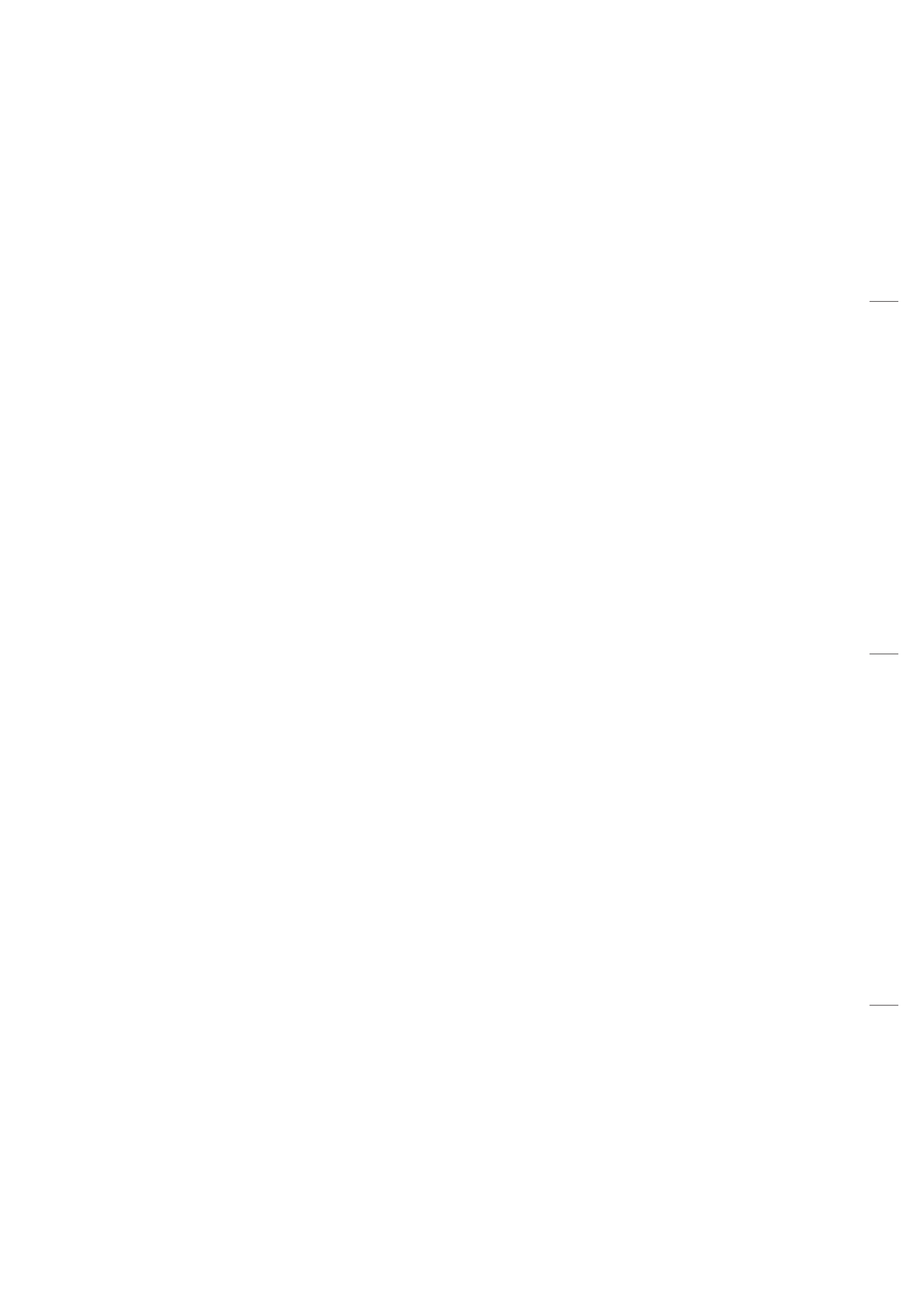
- A. The following procedure should be used to check a wing fuel tank for leakage.

- (1) Ensure electrical power to aircraft is OFF.
- (2) Disconnect battery (refer to 24-30-00).
- (3) Drain fuel from wing fuel tank.
- (4) Open access plate 610 BB / 510 BB (refer to 06-30-00).
- (5) Disconnect fuel outlet line from fuel tank.
- (6) Disconnect fuel return line from fuel tank.
- (7) Cap fuel tank vent line.
- (8) Attach a suitable manometer (water manometer) to fuel tank outlet fitting.

WARNING: NEVER APPLY REGULATED OR UNREGULATED AIR FROM AN AIR COMPRESSOR TO THE FUEL SYSTEM OR COMPONENTS.

CAUTION: DO NOT PRESSURIZE THE FUEL TANKS TO MORE THAN 1.0 PSI. STRUCTURAL DAMAGE MAY OCCUR TO THE FUEL TANK IF MORE THAN 1.0 PSI IS APPLIED.

- (9) Connect a well-regulated supply of air (1.0 psi maximum) to the return line fitting.
- (10) Make sure filler cap is installed and sealed.
- (11) Apply pressure slowly until 1.0 psi is obtained.
- (12) Shut off air supply.
- (13) If fuel tank holds pressure for 15 minutes, the tank with vent line is sealed.



FUEL DISTRIBUTION - MAINTENANCE

WARNING: PERFORM ALL FUEL SYSTEM MAINTENANCE IN ACCORDANCE WITH SAFETY PRECAUTIONS CONTAINED IN 12-11-00!

1. General

- A. The fuel distribution system consists primarily of the fuel selector / shut-off valve, an electrical fuel pump, fuel lines and the fuel pump switch.

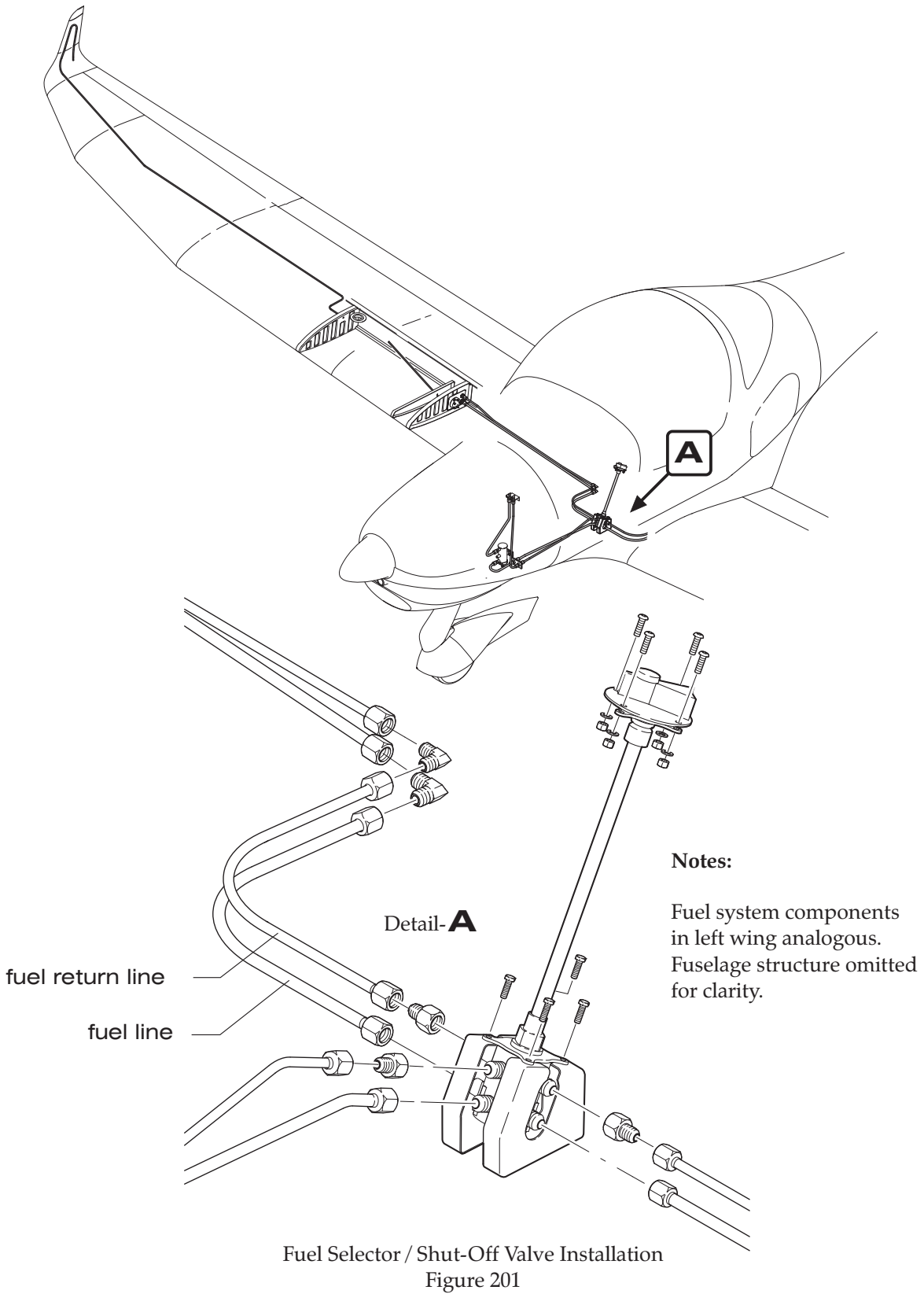
The fuel selector handle is located in the center console between the seats. The red, arrow shaped handle has a LEFT, RIGHT and OFF position. To switch the valve to the OFF position a knob located at the top of the handle must be pulled while the handle is rotated simultaneously. With the valve in this position fuel flow from and to the tanks is stopped. In both operating positions the fuel supply / return lines of the selected fuel tank are open while the fuel supply/ return lines of the other one are closed.

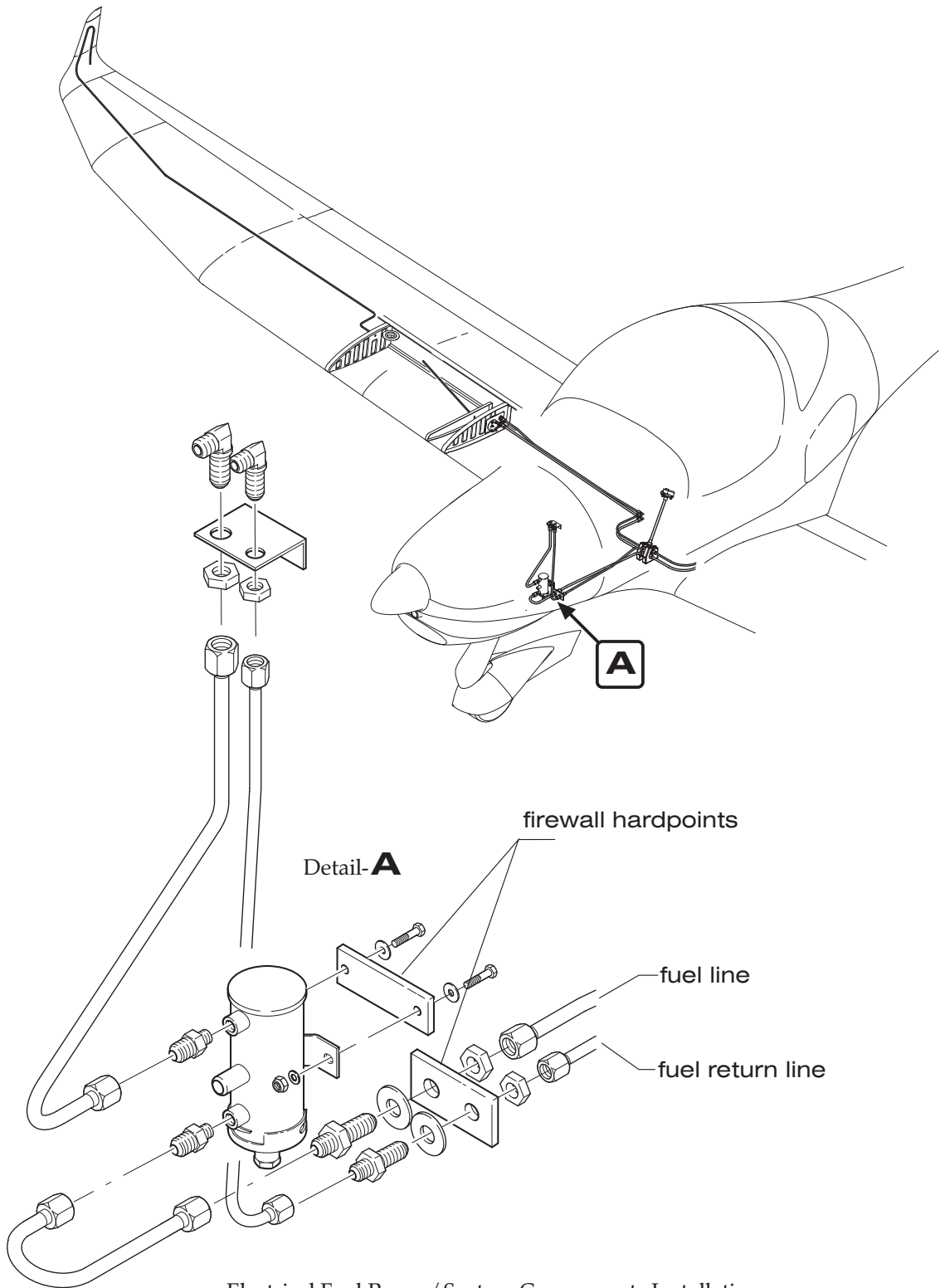
The electrical fuel pump is incorporated into the system without a bypass. In this way fuel flows through a fuel strainer which is integral of the fuel pump even if the pump is off. The electrical fuel pump is mounted in the engine compartment at the lower left firewall.

- B. A clean fuel distribution system is very important for the secure and continuous supply of fuel to the engine. The fuel system is equipped with drain valves with which fuel in the system can be examined for contamination and grade.
- (1) The electrical fuel pump has a filter screen which must be cleaned regularly. The filter screen can be removed for maintenance.
 - (2) A mesh strainer is installed on the fuel outlet in each fuel tank. The strainer is accessible by opening the fuel tank rib access panel 610 BB / 510 BB. The strainer is brazed to a fitting that is installed in the fuel tank port. The fuel strainers in the fuel tanks should always be cleaned after aircraft has been in storage. If any damage or restrictions are noted, the strainer should be replaced.
 - (3) The fuel system has a drain valve at it's lowest point, namely at the base of the electrical fuel pump. The drain valve is accessible from outside the nose section without removing any component. It should be used regularly to check fuel for water and contamination.
 - (4) Each wing fuel tank has a drain-valve at it's base. The drain valves are accessible from outside at the bottom of the wings in the wing root area. They should be used regularly to check fuel for water and contamination.

2. Fuel Selector / Shut-Off Valve Removal/Installation

- A. Remove Fuel Selector / Shut-Off Valve
- (1) Ensure electrical power to aircraft is OFF.
 - (2) Disconnect battery (refer to 24-30-00).
 - (3) Drain fuel from fuel system completely using the wing fuel tank drains and the drain at the electrical fuel pump.
 - (4) Remove access panels 211 BB and 211 HL/HR in the cabin (refer to 25-12-00).
 - (5) Remove access panel 211 GT with fuel selector / shut-off valve control lever and connecting shaft (refer to 25-12-00).





Electrical Fuel Pump / System Components Installation
Figure 202

- (6) Disconnect the fuel supply and return lines at valve.
- (7) Remove bolts securing valve to mounting bracket and remove the fuel selector / shut-off valve assembly from aircraft.

B. Install Fuel Selector / Shut-Off Valve

- (1) Verify battery is disconnected and electrical power to aircraft is OFF.
- (2) Place fuel selector / shut-off valve in position and secure using washers and bolts.
- (3) Connect all fuel supply and return lines at valve.
- (4) Connect the fuel selector / shut-off valve control lever. Make sure that both the valve and the valve control lever are set to OFF and install access panel 211 GT with fuel selector / shut-off valve control lever and connecting shaft (refer to 25-12-00).
- (5) Refuel the aircraft.
- (6) Pressure check complete fuel system (refer to "Fuel System Pressure Test" below).
- (7) Inspect fuel selector / shut-off valve and enclosure for any signs of fuel leakage.
- (8) Reconnect battery (refer to 24-30-00).
- (9) Perform operational check of the fuel distribution system.
- (10) Install all items removed for access.

3. Electrical Fuel Pump Removal/Installation

A. Remove Electrical Fuel Pump

- (1) Ensure electrical power to aircraft is OFF.
- (2) Remove engine cowling (refer to 71-10-00).
- (3) Disconnect battery (refer to 24-30-00).
- (4) Close fuel selector / shut-off valve.
- (5) Disconnect the pump wires.
- (6) Disconnect fuel lines at electrical fuel pump. Drain fuel from line.
- (7) Remove bolts, washers and nuts securing electrical fuel pump to firewall and remove electrical fuel pump.

B. Install Electrical Fuel Pump

- (1) Verify battery is disconnected and electrical power to aircraft is OFF.
- (2) Secure electrical fuel pump to firewall using bolts, washers and nuts.
- (3) Reconnect fuel lines to electrical fuel pump.
- (4) Reconnect the pump electrical wires.
- (5) Reconnect battery (refer to 24-30-00).

4. Electrical Fuel Pump Filter Element Maintenance

A. Maintenance is accomplished by the following procedure:

- (1) Remove locking wire at lower fuel pump cap.
- (2) Remove lower cap.
- (3) Remove filter element and clean by washing.
- (4) Check disk magnet for metal particles.
- (5) Reassemble filter and cap.
- (6) Secure cap using locking wire.

5. Fuel System Pressure Test

A. Leak-test the fuel system by the following procedure:

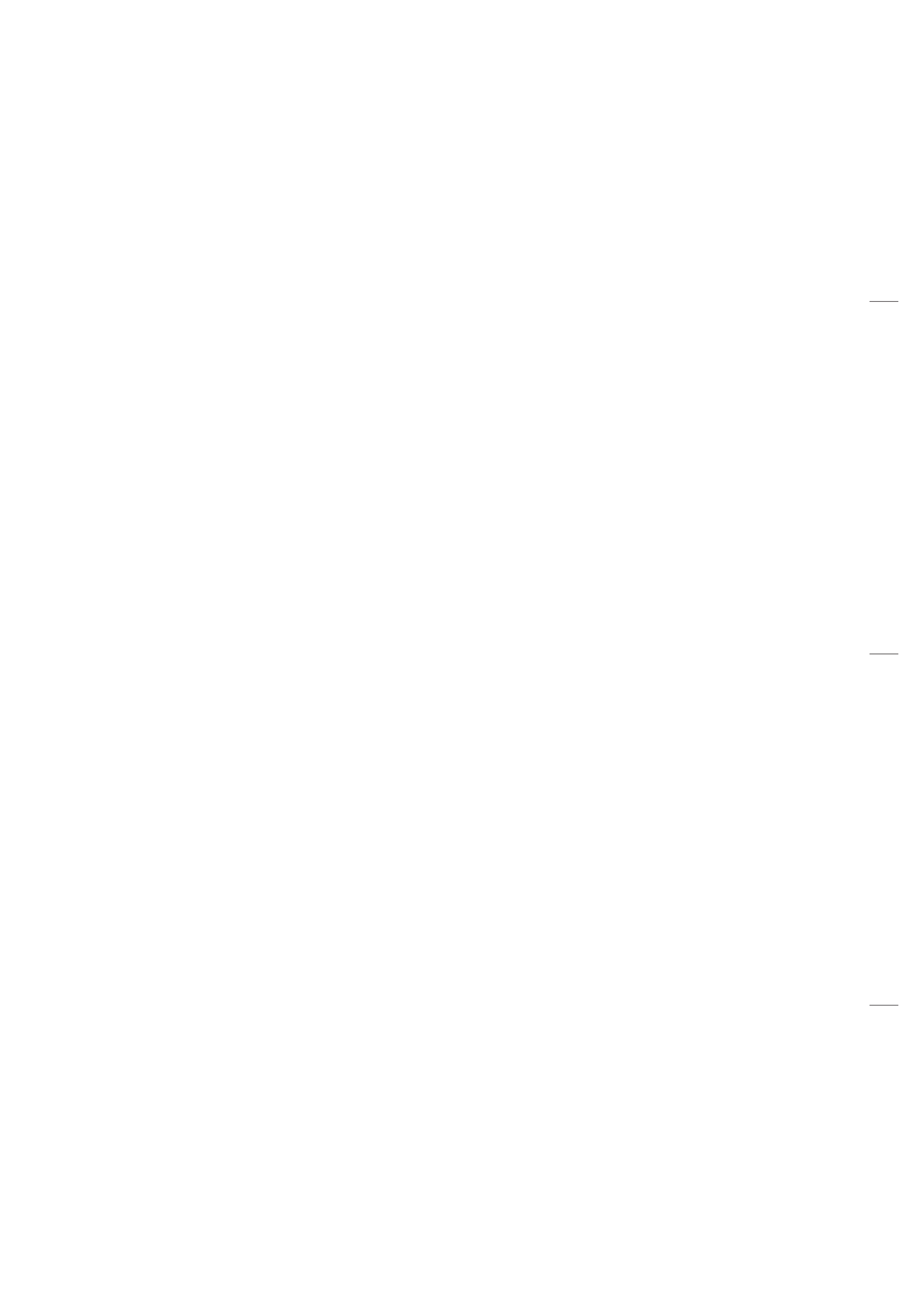
- (1) Fill the wing fuel tank with approved fuel.
- (2) Remove engine cowling, crew seats and all other panels and covers to gain access to all fuel system components and fuel lines (refer to 25-10-00, 25-12-00 and 71-10-00).
- (3) Place the fuel selector / shut-off valve in LEFT (RIGHT) position.
- (4) Disconnect the pressure fuel line and return line in the engine compartment where the flexible fuel lines are connected to the aluminum lines and cap fittings.
- (5) Connect a rubber hose with a well-regulated supply of air (1.0 psi maximum) to the outboard end of either fuel tank vent line.
- (6) Connect a suitable manometer (water manometer) to the other fuel vent line.
- (7) Make sure filler caps are installed and sealed.

WARNING: NEVER APPLY REGULATED OR UNREGULATED AIR FROM AN AIR COMPRESSOR TO THE FUEL SYSTEM OR COMPONENTS.

NEVER ATTEMPT TO REMOVE THE FUEL FILLER CAP WITH PRESSURE IN THE FUEL SYSTEM.

CAUTION: DO NOT PRESSURIZE THE FUEL SYSTEM TO MORE THAN 1.0 PSI. DAMAGE MAY OCCUR TO SYSTEM COMPONENTS IF MORE THAN 1.0 PSI IS APPLIED.

- (8) Apply pressure to the system slowly until 1.0 psi is reached.
- (9) Shut off air supply
- (10) System pressure should remain constant for 15 minutes.
- (11) Inspect the seams, fittings and connections of the accessible portion of the wing fuel tank. Check the fuel lines, the fuel selector / shut-off valve and all other fuel related areas for signs of leakage.
- (12) If leakage is suspected (pressure readings drop) apply soapy water to the area in question and inspect for bubbles.
- (13) Release all pressure from the fuel system.
- (14) Remove the rubber hose with the supply of air and the manometer from the end of fuel vent lines.
- (15) Reconnect the pressure fuel line to the electrical fuel pump.
- (16) Remove plugs of fuel filler caps vent holes.
- (17) Install all items that have been removed prior to performing the test (refer to 25-10-00, 25-12-00 and 71-10-00).
- (18) If any leakage is detected, seal as required.



FUEL QUANTITY INDICATION - MAINTENANCE

WARNING: PERFORM ALL FUEL SYSTEM MAINTENANCE IN ACCORDANCE WITH SAFETY PRECAUTIONS CONTAINED IN 12-11-00!

1. General

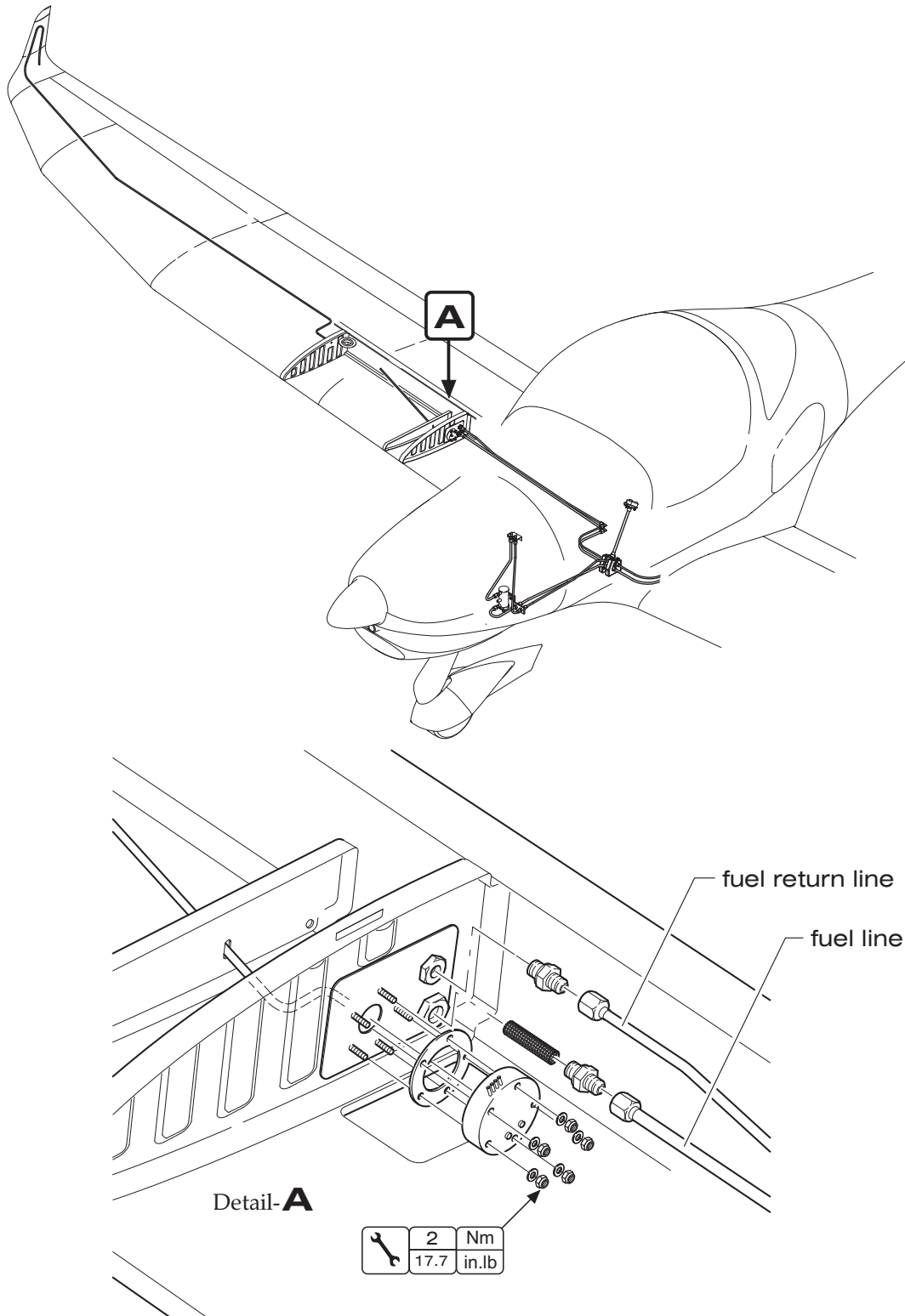
- A. The fuel quantity indicating system consists of two fuel quantity sensors, one in each tank, a dual fuel quantity indicator and wiring connecting the components. The fuel quantity indicator is located on the right side of the instrument panel. It has the markings FULL, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{1}{4}$ and EMPTY for each tank and has been calibrated during installation. The fuel quantity sensors are either capacitive or resistive type and easily accessible for maintenance or replacement through access panels in the lower wing skin.
- B. Maintenance is limited to the removal and installation of the system components.

2. Fuel Quantity Indicator Removal/Installation

- A. Remove Fuel Quantity Indicator
 - (1) Ensure electrical power to aircraft is OFF.
 - (2) Disconnect battery (refer to 24-30-00).
 - (3) Remove glare shield (refer to 31-10-00).
 - (4) Remove cable connector from back of indicator.
 - (5) While supporting indicator, remove screws attaching indicator to instrument panel.
 - (6) Remove indicator from aircraft.
- B. Install Fuel Quantity Indicator.
 - (1) Position indicator to instrument panel hole and secure with screws.
 - (2) Install cable connector at back of indicator.
 - (3) Reconnect battery (refer to 24-30-00).
 - (4) Perform a fuel quantity indicating system test / calibration (refer to "Test/Calibration" below).
 - (5) Install glare shield (refer to 31-10-00).

3. Fuel Quantity Sensor Removal/Installation

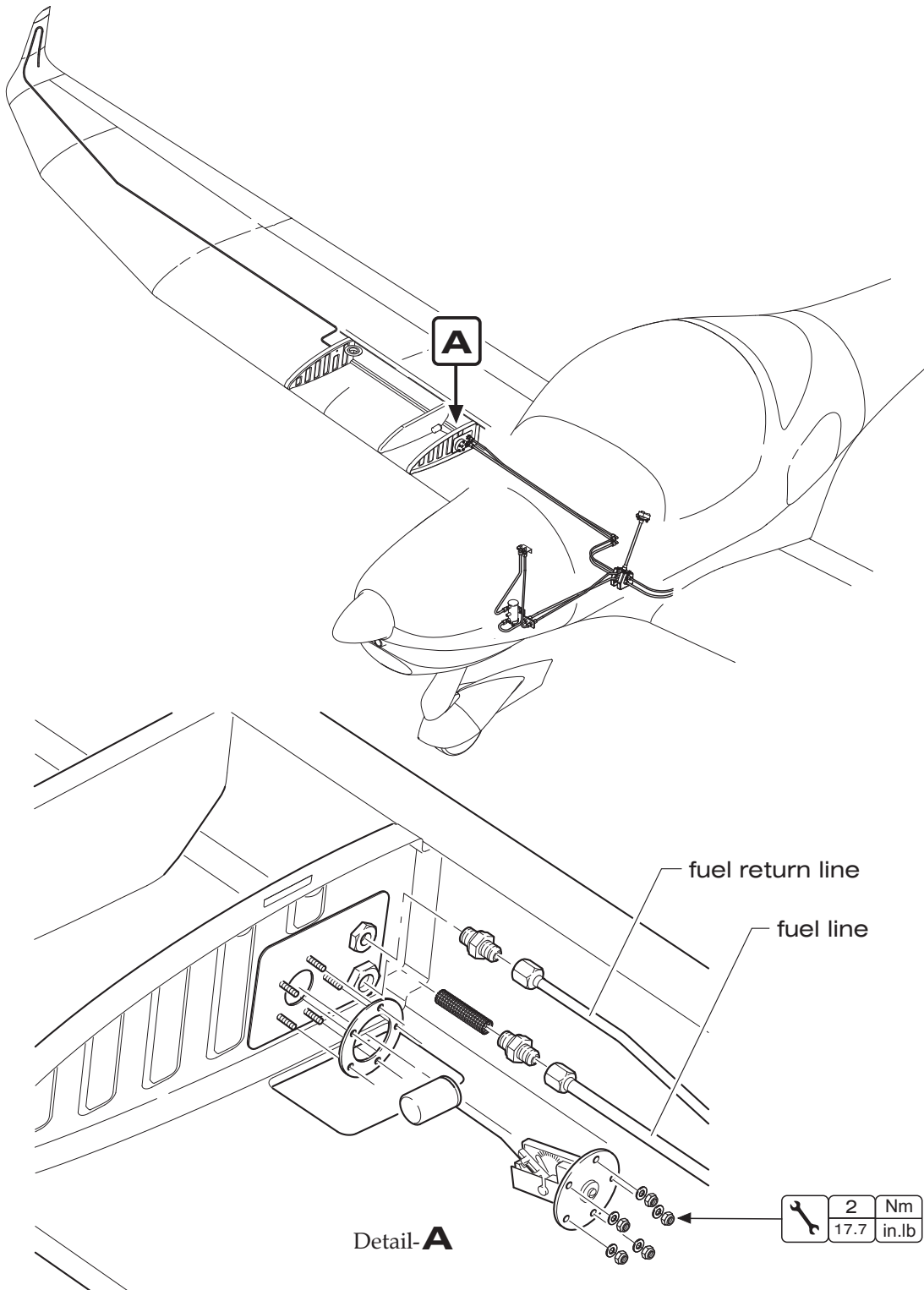
- A. Remove Fuel Quantity Sensor
 - (1) Ensure electrical power to aircraft is OFF.
 - (2) Disconnect battery (refer to 24-30-00).
 - (3) Drain wing fuel tank with sensor that is to be removed (refer to 12-11-00).
 - (4) Open access / inspection plate 610 BB / 510 BB to gain access to sensor (refer to 06-30-00).
 - (5) Remove nuts securing sensor to inboard fuel tank rib.
 - (6) Disconnect electrical cables from sensor.
 - (7) Carefully withdraw sensor from wing tank.



Fuel System Components Installation
Figure 201A

EFFECTIVITY

aircraft equipped with capacitive type fuel level sensors



Fuel System Components Installation
Figure 201B

EFFECTIVITY

aircraft equipped with resistive type fuel level sensors

B. Install Fuel Quantity Sensor

- (1) Verify battery is disconnected and electrical power to aircraft is OFF.
- (2) Check ease of movement of the float arm before installing the sensor.¹⁾
- (3) Place sensor with new gasket on to the threaded studs at inboard fuel tank rib.

CAUTION: THE FUEL QUANTITY SENSOR SHOULD BE FED CAREFULLY INTO THE FUEL TANK (AND THROUGH THE HOLE OF THE FUEL BAFFLE RIB²⁾). A BENT FLOAT ARM MAY CAUSE ERRONEOUS READINGS.¹⁾

- (4) Connect electrical cables to sensor.
- (5) Secure sensor with washers and nuts. Torque nuts crosswise to 2 Nm (17.7 in.lbs).
- (6) Reconnect battery (refer to 24-30-00).
- (7) Perform a fuel quantity indicating system calibration (refer to "Test/Calibration" below).

4. Fuel Quantity Indicating System Test/Calibration

NOTE: When a fuel quantity sensor is replaced, the fuel quantity indicating system must be calibrated. When a fuel quantity indicator is replaced, the system must be at least functionally tested and recalibrated as necessary.

A. Fuel Quantity Indicating System Test

- (1) Prepare aircraft
 - (a) Drain fuel from wing tanks (refer to 12-11-00).
 - (b) Verify fuel selector / shut-off valve is in OFF position.
 - (c) Level the aircraft laterally and longitudinally (refer to 08-10-00).
- (2) Ensure ALT1 / BAT switch is in the OFF position.
- (3) Fill 5,2 liters (1.37 gallons) of fuel into both wing fuel tanks.
- (4) Turn BAT switch to the ON position.
- (5) Wait until pointer settles in it's final position.
Check that fuel quantity indicator reads empty for both tanks.
- (6) Turn BAT switch to the OFF position.
- (7) Add 54,8 liters (14.46 gallons) of fuel to LH wing fuel tank.
- (8) Turn BAT switch to the ON position.
- (9) Wait until pointer settles in it's final position.
Check that LH fuel quantity indicator reads full.
- (10) Turn BAT switch to the OFF position.
- (11) Repeat steps (7) thru (10) for RH wing fuel tank.

¹⁾ Resistive type fuel level sensor only.

²⁾ Capacitive type fuel level sensor only.

B. Resistive Type Fuel Quantity Indicating System Calibration

NOTE: A calibration module is necessary to perform the steps described below. The calibration module is installed at the back of the fuel quantity indicator. Contact AQUILA Aviation GmbH if no calibration module is installed.

- (1) Prepare aircraft
 - (a) Drain fuel from wing tanks (refer to 12-11-00).
 - (b) Verify fuel selector / shut-off valve is in OFF position.
 - (c) Level the aircraft laterally and longitudinally (refer to 08-10-00).
 - (d) Remove glare shield (refer to 31-10-00).
- (2) Ensure ALT1 / BAT switch is in the OFF position.
- (3) Fill 18,9 liters (4.99 gallons) of fuel into both wing fuel tanks.
- (4) Turn BAT switch to the ON position.
- (5) Use the two potentiometers of the calibration module at the back of the fuel quantity gauge to set the pointers of the gauge to "1/4". Pay attention to the delayed indication of the gauge.
- (6) Turn BAT switch to the OFF position and drain fuel from wing tanks (refer to 12-11-00).
- (7) Perform fuel quantity indicating system test as described above.
- (8) Reinstall glare shield (refer to 31-10-00).

C. Capacitive Type Fuel Quantity Indicating System Calibration

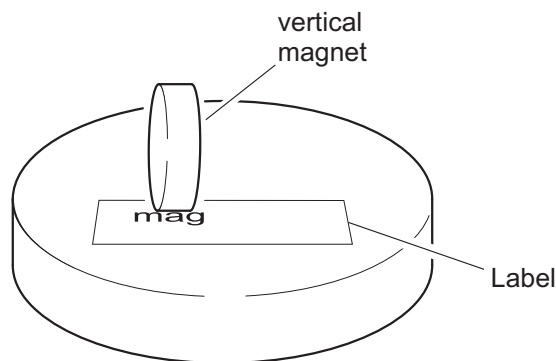
WARNING: ACCURACY OF THE INDICATING SYSTEM STRONGLY DEPENDS ON THE FUEL GRADE USED FOR CALIBRATION! REFER TO SB-AT01-020 FOR FURTHER INFORMATION.

WARNING: SYSTEM CALIBRATION SHOULD BE PERFORMED WITH UNLEADED SUPER (RON 95) OR SUPER PLUS (RON 98) FUEL GRADE. IF AVGAS 100LL OR AVGAS UL91 ARE USED FOR CALIBRATION, AN ADDITIONAL PLACARD HAS TO BE INSTALLED ON THE INSTRUMENT PANEL. DO NOT USE MIXTURES OF FUEL GRADE FOR CALIBRATION!

WARNING

Fuel gauge calibrated with AVGAS.
Indicated fuel level may differ from
actual fuel level if MOGAS is used.

WARNING: FOR U.S. REGISTERED AIRCRAFT AND AIRCRAFT REGISTERED WHERE THE FAA TC HAS BEEN ACCEPTED, SYSTEM CALIBRATION MUST BE PERFORMED WITH AVGAS 100LL OR AVGAS UL91 FUEL GRADE. DO NOT USE UNLEADED SUPER (RON 95) OR SUPER PLUS (RON 98) OR MIXTURES OF FUEL GRADE FOR CALIBRATION!



Magnet positioning during calibration
Figure 202

NOTE: Calibration procedure depends on the type of fuel quantity sensor installed:
 Type A: Capacitive sensor with potentiometers for calibration.
 Type B: Capacitive sensor without potentiometers and without “mag” label.
 Type C: Capacitive sensor without potentiometers and with “mag” label (figure 202).

NOTE: Senders without potentiometer are calibrated by using a magnet (type C) as shown in figure 202 or by applying a jumper between sender wire (yellow) and ground (type B). For these senders a second person is necessary for calibration as timing is important. One for using the magnet / jumper, the other one for switching the power.

- (1) Prepare aircraft
 - (a) Drain fuel from wing tanks (refer to 12-11-00).
 - (b) Verify fuel selector / shut-off valve is in OFF position.
 - (c) Level the aircraft laterally and longitudinally (refer to 08-10-00).
 - (d) Open access panel 610 BB and 510 BB (refer to 06-10-30).
- (2) Ensure ALT1 / BAT switch is in the OFF position.
- (3) Fill 5,2 liters (1.37 gallons) of fuel into both wing fuel tanks.

Type A: Fuel level sensors with potentiometers:

- (4) Turn both the “empty” and “full” potentiometers on both fuel level sensors to the full clockwise position.
- (5) Turn BAT switch to the ON position.
- (6) Turn potentiometers “empty” on the fuel level sensors counterclockwise until fuel level indicator reads “empty” for both tanks.
- (7) Turn BAT switch to the OFF position.
- (8) Add 27,4 liters (7.23 gallons) of fuel to both wing fuel tanks.
- (9) Turn BAT switch to the ON position.
- (10) Turn potentiometer “full” on the fuel level sensors counterclockwise until fuel level indicator reads “1/2” for both tanks.
- (11) Turn BAT switch to the OFF position.

Type B & C: Fuel level sensors without potentiometers:

- (4) For the jumper version (type B) jump the sender wire to ground. For the magnet version (type C) place the magnet on the sensor head as shown in figure 201.
- (5) Turn BAT switch to the ON position.
After 2 seconds remove the jumper / magnet.
The pointer will fluctuate between empty and full readings and then settle on empty.
- (6) Turn BAT switch to the OFF position.
- (7) Repeat steps (4) thru (6) for other wing fuel tank.
- (8) Add 54,8 liters (14.46 gallons) of fuel to both wing fuel tanks.
- (9) With power OFF apply the jumper / magnet as described under (4).
- (10) Turn BAT switch to the ON position.
After 4 seconds (jumper) / 6 seconds (magnet) remove the jumper / magnet.
The pointer will fluctuate between empty and full readings and then settle on full.
- (11) Turn BAT switch to the OFF position.
- (12) Repeat steps (9) thru (11) for other wing fuel tank.

