Airframe Fuel System
GENERAL DESCRIPTION

Fuel is contained in 7 flexible fuel tanks installed in the lower structure below the cabin floor. The tanks are divided into two separate groups, each of which supplies one engine. The tank bays are internally lined to protect the tanks from chafing.

Tank Organisation

The tank groups are comprised as follows -

The Left-Hand or aft group which supplies number 1 engine

- Longitudinal tank
- Transverse tank
- Rear tank

The Right-Hand or forward group which supplies the number 2 engine

- Longitudinal tank
- Transverse tank
- Centre tank (optional but fitted to all Bristow aircraft)
- Forward tank (AS332L version only)
CAPACITIES AND LIMITATIONS

Fuel capacities for the various tanks are shown below. For Bristow aircraft, fuel calibration is carried out so that the fuel gauges read zero when no more fuel is pumped out by the booster pumps. In practice therefore, there is normally no unusable fuel shown on the gauges when the aircraft is in a level attitude.

The following fuel capacities are specified for 0° 55’ nose up attitude.

<table>
<thead>
<tr>
<th>Left hand Group</th>
<th>Right Hand Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Litres</td>
</tr>
<tr>
<td>No. 1 - Longitudinal Tank</td>
<td>246</td>
</tr>
<tr>
<td>No. 3 - Transverse Tank</td>
<td>423</td>
</tr>
<tr>
<td>No. 5 – Rear Tank</td>
<td>246</td>
</tr>
<tr>
<td>-</td>
<td></td>
</tr>
<tr>
<td><strong>Left Total Capacity</strong></td>
<td><strong>915</strong></td>
</tr>
<tr>
<td><strong>Aircraft Total Fuel Capacity</strong></td>
<td><strong>2367</strong></td>
</tr>
</tbody>
</table>

**Unusable Fuel**

<table>
<thead>
<tr>
<th></th>
<th>Left-hand Group</th>
<th>Right-hand Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. One or more Booster Pumps working</td>
<td>28 lbs</td>
<td>16 lbs</td>
</tr>
<tr>
<td>2. No Booster Pumps and attitude at ½° nose up</td>
<td>98 lbs</td>
<td>127 lbs</td>
</tr>
<tr>
<td>3. No Booster Pumps and attitude at 5° nose down</td>
<td>45 lbs</td>
<td>409 lbs</td>
</tr>
</tbody>
</table>

**Non-Transferable Fuel**

1. Boost Pumps working | 87 lbs | 52 lbs |
2. No Boost Pumps      | 155 lbs | 139 lbs |

**Limitations**

The following system limitations apply -

1. Normal operating pressure – 0.15 bar - 1.2 bar – Fuel Press light illuminates at 0.15 bar
2. Fuel anti-ice additives required if OAT in flight is below –20°C.
3. Fuel Transfer must not take place during take-off and landing
Venting

Various vent pipes are fitted in the aircraft fuel system as follows -

- The tank bays are vented to atmosphere via pipes between the aircraft's skins.
- The tanks are vented to other tanks in the same group.
- The tanks are also vented to atmosphere via pipes with 'rollover' valves.

The ‘rollover’ valves close in the event of the aircraft rolling over on the ground, preventing fuel from spilling out of the vents.

Fuel Feed Path

The longitudinal tanks are the feeder tanks. Each contains two fuel booster pumps, which pump fuel up through pipelines to the engines. The pipe from each booster pump contains a non-return valve to prevent fuel flowing back into the tank through an inoperative pump. Fuel filters and ice traps are fitted in the feed path, and fuel shut-off cocks are fitted at the engine firewall. Within the engine compartment, the supply is via stainless steel flexible hoses with self-sealing couplings at the engines.

Inter-Tank Fuel Transfer

Fuel can flow by gravity between tanks of the same group, but the longitudinal (feeder) tanks are fitted with non-return flap valves, which prevent fuel from flowing out of the feeder tanks. Jet pumps, fitted to the front transverse tank and the rear transverse tank, pump fuel into the longitudinal (feeder) tanks to keep them topped up.

An electrical transfer pump is fitted between the two longitudinal tanks, and allows fuel to be transferred between tank groups in either direction. The pump is controlled by a 3-position switch on the fuel management panel. See Figure 10.
**Refuelling**

Gravity refuelling is by two filler points on the starboard fuselage. The rear filler point is connected to the left-hand transverse tank, and the front filler point to the right hand transverse tank. During refuelling, fuel flows into the other tanks of the group by gravity.

The attitude of the aircraft affects the maximum amount of fuel that can be loaded so avoid refuelling when the aircraft is inclined to the right. Reduce the flow as the fuel level approaches the top of the filler neck to allow fuel to disperse throughout the tank group.

If flight with OAT below –20°C is anticipated, an anti-icing additive must be incorporated. Pressure refuelling may optionally be installed, with a refuelling port fitted to the rear face of the starboard sponson.

**Additional Tanks**

For ferrying purposes, an auxiliary cabin mounted tank, or four cylindrical ferry tanks, can temporarily be fitted. Sponson-mounted tanks can also be fitted as an option.

The centre tank is an optional tank. However it is a standard fit on all Bristow aircraft. It can be removed to allow installation of the heavy lifting hook, which attaches to the bottom of the main gearbox and passes through cabin floor.

**FUEL TANK COMPONENTS**

**Summary of components**

Refer to Figure 3. Each tank contains the following equipment –

1. A capacitative fuel contents probe
2. A high level sensor
3. Water drains

Additionally each longitudinal tank contains -

1. 2 fuel booster pumps
2. A low level sensor
3. A fuel drain
4. Flap valves at the connection to the transverse tank
5. A feed to and from a jet pump
6. High level overflow pipes to the transverse tank
7. A connection to the electrical transfer pump

The forward transverse and rear transverse tanks are fitted with the jet pumps. Most of the internal fittings are mounted on plates at the base of the tanks. All interconnecting pipes are made of flexible material.
Fuel Contents Probes and Level Sensors

Each tank contains a capacitative fuel contents probe. They are supplied with AC power from an oscillator on the fuel control circuit board. This board itself is DC powered, so fuel contents indications are operative even with no generated AC power. The fuel control board sums up the measured contents of each tank in a group and this is displayed on a cockpit gauge (one per group).

Each tank contains a high level sensor. If all tanks in a group have their high level sensors activated, the amber **HIGH** caption for that group will illuminate on the fuel management panel in the cockpit. However, if the fuel transfer pump is running, the **HIGH** caption will illuminate when just the longitudinal tank has reached a high level.

The longitudinal tanks have low level sensors. These will illuminate a red **LOW** caption on the fuel management panel when the fuel in the corresponding longitudinal tank falls to 90 litres (156 lbs).
**Booster Pumps**

Booster pumps are housed in collector cans in the longitudinal tanks. They are of centrifugal type and have explosion proof motors. As well as supplying the engines, the booster pumps also supply the jet pumps with fuel. Any one pump can supply sufficient fuel for the engine and jet pump of its group, as illustrated below:

<table>
<thead>
<tr>
<th>Consumption</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engine Consumption</td>
<td>310 litres per hour</td>
</tr>
<tr>
<td>Jet Pump Consumption</td>
<td>175 litres per hour</td>
</tr>
<tr>
<td><strong>Total Consumption</strong></td>
<td><strong>485 litres per hour</strong></td>
</tr>
</tbody>
</table>

The nominal maximum flow rate for each pump is 700 lt/hr at 0.6 bar pressure. At 485 lt/hr pressure is nominally 0.75 bar. Pressure falls as engine consumption increases.

The engines will continue to run with no booster pumps below 10,000ft. Above this altitude there is a possibility of flame out due to vapour lock. However, if both pumps in one group fail, the jet pumps will become inoperative and unusable and untransferable fuel quantities will increase.

The booster pumps operate on DC power, with No. 2 pump for each group being supplied by PP1 (battery) bus, and the No. 1 pump by the Secondary bus. Thus when the aircraft is on battery power, only the No. 2 pumps in each group will be operative.

An alternative type of booster pump, manufactured by Airborne Air & Fuel Products, is now fitted to Bristow aircraft. It is a cartridge type and has the advantage that it can be removed without the need to drain the fuel tanks. There is a slight increase in unusable fuel of approximately 3.8 litres per tank group.

**Jet Pumps**

Jet pumps, located in the forward and rear transverse tanks, pump fuel into the longitudinal (feeder) tanks, thus ensuring that they remain full while the other tanks empty.

Figure 4 shows the left-hand system. The right-hand system is similar.

As well as supplying the engines, fuel pumped by the booster pumps reaches the jet pump inlet pipe (4). After passing through a filter it is squirted at high speed out of jet nozzle (1) into delivery pipe (5) and then back to the longitudinal tank. The high-speed flow at the jet causes a drop in pressure by venturi action, sucking up extra fuel from the transverse tank that has flowed into the pump casing through holes.

Approximately 350 litres per hour extra fuel is sucked up and delivered to the longitudinal tank this is somewhat higher than the normal cruise fuel consumption. Once the longitudinal tank is full, it will overflow back into the transverse tank through the high-level overflow pipes.

Should the fuel supply to a jet pump fail due to double booster pump failure or pipe failure, it will become inoperative and the level of all tanks in that group will fall together. In this case the unusable fuel in that group is increased significantly and the LOW level light will illuminate whilst there is still fuel in the other tanks.

The check valve (7) prevents air being sucked up by the engine following a double booster pump failure when the fuel level in the tank falls and uncovers the jet pump.
1. Jet
2. Filter
3. Jet Pump Casing
4. Inlet Pipe from booster pump
5. Delivery Pipe to Longitudinal tank
6. Flapper Valve
7. Check Valve

Flap Valves

Flap valves are fitted between the longitudinal and transverse tanks. See Figures 3 and 4. They allow fuel to flow rapidly into the longitudinal tanks from the transverse tanks during refuelling, but prevent fuel pumped into the longitudinal tanks by the jet pumps from flowing back into the transverse tanks.

In the event that the jet pumps fail to operate, fuel can still flow by gravity into the longitudinal tanks through the flap valves, although the unusable fuel quantity will increase. Should a flap valve fail open, this would have the same effect as jet pump failure. Should a flap valve fail shut, which is unlikely, it would not be possible to fill the longitudinal tank during refueling.

Transfer Pump

An electrical transfer pump is fitted between the two longitudinal tanks and allows fuel to be transferred between tank groups in either direction. The pump has a drain line for internal leakage, which opens out under the fuselage.

It is a DC operated vane-type pump which can be motored in either direction by a 3-position (centre OFF) toggle switch on the fuel management panel. A green light on this panel illuminates when the pump is running. The flow rate at the nominal pressure of 80 mBar is 350 litres/hr. This corresponds approximately to the cruise consumption of one engine.

Operation of the transfer pump is prohibited during take-off and landing.

The flight manual recommends that fuel transfer be started once 150 litres has been consumed. This corresponds to the Bristow policy of starting to transfer when the left-hand group content is 1300 lbs. Transfer should be continued until levels in the two groups are balanced. However, it is important to monitor the contents gauges and level lights during transfer to ensure that the receiver tanks are not overloaded, causing fuel to pass up the vent lines, or that the longitudinal tank of the donor group is not emptied. Thus if [HIGH] or [LOW] lights illuminate on the fuel management panel, the transfer pump must be switched off for a period to allow levels to stabilise.

Note that with the transfer pump switched off, all high level sensors in one group must be activated before the [HIGH] light will illuminate on the fuel management panel. When the pump is operational, activation of only the high level sensor in the longitudinal tank only will cause the [HIGH] light to illuminate.
FUEL FEED PATH

Overview

The fuel feed path from the tanks to the engines is shown in Figure 6. Fuel is pumped by the booster pumps up through an ice trap, a fuel filter, a non-return/thermal expansion valve through the emergency fuel shut off cock to the engine. The ice trap, fuel filter and non-return/thermal expansion valve are contained in a single unit. Details of each of these components are given below.

Ice Traps

The ice trap is fitted to the inlet union of the filter and is designed to trap any ice crystals that may be in suspension in the fuel, to prevent them subsequently clogging the main fuel filter.

Fuel circulates in the ice trap past a series of 20 baffles, each comprising a coarse metal mesh and finer screen, which retains the ice crystals. Ice build up will cause a pressure drop across the filter and once this reaches 0.2 bar, the pressure switch will be activated illuminating the **ICE FUEL** warning light. This is situated just above the fuel management panel. The light indicates partial clogging of the ice trap, but it has been demonstrated that at least half of the maximum fight time remains before full clogging would occur.

If the temperature of the fuel increases and the ice particles melt, most of the water is retained by the trap until the engine is shut down, when it returns to the fuel tank through calibrated orifices in the booster pump check valves.
Figure 6 – Fuel Feed Path

1. Flexible stainless steel pipe
2. Fuel shut-off cocks
3. Fuel shut-off levers
4. Pressure gauges
5. Pressure transmitter
6. Low pressure switch (P < 0.15 bar)
7. Low pressure warning lights
8. Non-return/thermal relief valve
9. Fuel Filter
10. Filter by-pass valve (ΔP = 0.28 bar)
11. Differential pressure switch (ΔP = 0.14 bar)
12. Filter clogging warning lights
13. Ice trap
14. Differential pressure switch (ΔP = 0.2 bar)
15. Ice warning lights
16. Booster pumps
17. Jet pumps
18. Transfer pump
Non-Return/Thermal Expansion Valve

A non-return/thermal expansion valve is fitted at the outlet union of each fuel filter. It prevents loss of prime of the engine fuel system when the fuel filter bowl is removed. It also contains a pressure relief valve that will allow fuel to flow back out of the engines if pressure builds up due to thermal expansion when the engine is not running.

Figure 7 – Non-Return/Thermal Expansion Valve

Pressure Sensing

Down stream of each fuel filter is fitted a pressure switch and pressure transducer. The pressure switch will operate with fuel pressure below 0.15 bar, illuminating the appropriate amber PRESS caption on the fuel management panel. Fuel pressure sensed by the pressure transducer and displayed on pressure gauges at the top of the systems indicating panel.

Fuel Shut-Off Cocks

Fuel shut-off cocks are fitted just below the engine decking and are housed in leak-proof boxes. They are operated by fuel shut-off levers installed in the cockpit overhead quadrant. They are used only to shut off fuel supply to the engines in case of emergency. Cranking an engine with the starter motor (start button or vent switch) is prohibited when the fuel cock is closed.

Fuel Filters

The fuel filters, including the ice trap, pressure transmitters and differential pressure transducers, are located in leak-tight compartments on either side of the cabin just forward of the cabin doors. A view of the complete filter unit is shown in Figure 8. The filter element is a paper cartridge type, which will filter particles down to 10 microns.

There is a differential pressure switch fitted, which measures any pressure drop across the filter due to clogging. This is activated at 0.14 bar and illuminates the amber FILT light on the fuel management panel. There is also a mechanical clogging indicator, which will protrude from the body of the filter when clogging occurs. The clogging indicator has three positions.

1. The normal position, where it is flush with the upper face of the filter body
2. The incipient clogging position where it protrudes 3mm above the filter body. This indicates a pressure differential of at least 0.235 bar has occurred, but the filter bypass is still closed.
3. The clogged position where it is fully protruding and revealing a red stripe. This indicates a pressure differential of at least 0.280 bar has occurred, and the filter bypass is now open, allowing unfiltered fuel into the engine.

A perspex panel on the inboard face of each fuel filter compartment enables inspection of the filter tell-tale clogging indicator without removing any covers.
Figure 8 – Fuel Filter

1. Clogging Indicator
2. Indicator (extended) locking spring
3. By-pass valve
4. By-pass valve casing
5. Filter cartridge (10 microns)
6. Filter bowl
7. Deflector to retain impurities at bottom of bowl
8. Bowl retaining stirrup
10. By-pass inlet port
11. By-pass valve rod
12. By-pass spring
13. Differential pressure switch
14. Bowl bleed valve
Cockpit Controls and Indications

Warning Lights

The 32 alpha panel includes a single amber FUEL caption, which will illuminate if any of the following warning lights on the fuel management panel illuminate:

ICE FUEL  LOW  PRESS  FILT

If the WARN attention-getter is pressed to cancel, the FUEL caption will extinguish but any lights on the fuel management panel will remain illuminated.

Figure 9 – Fuel Controls & Indications
Fuel Shut-Off Levers

The fuel shut-off levers, located in the overhead quadrant, operate the fuel shut-off cocks by means of a teleflex cable. They are normally tell-tale wire locked in the open (forward) position. The handle of each lever houses a red fire warning light.

Pulling the handle rearwards closes the fuel shut-off cock and also closes the ventilation flap at the front of the engine compartment. In the event of an engine fire, pulling this lever not only prevents fuel being pumped into the engine, but also ensures that the fire extinguishant is contained in the compartment and not blown away by ventilating air.

Pulling the handle rearwards also opens a switch that supplies power to the battery contactor. The switches are wired in parallel, so the battery is only isolated when both switches are operated.

If a crash handle is pulled, a cable link causes, amongst other things, both fuel shut-off levers to be operated and therefore the battery to be isolated.

Pressure Gauges

A pressure gauge for each engine is installed on the systems indicating panel. The normal operating range indicated by the green arc is 0.15 to 1.2 bar. See Figure 9.

Fuel Management Panel

The fuel management panel, installed towards the left of the centre console, is shown below in Figure 10.
Key to Figure 10

1. Ice fuel warning lights
2. Individual tank contents buttons
3. Contents indicator test button
4. Left-hand group contents indicator
5. Right-hand group contents indicator
6. Low level indicator lights
7. High level indicator lights
8. Filter clogging warning lights
9. Pressure drop warning lights
10. Transfer pump switch and operating light
11. Left-hand booster pumps
12. Right-hand booster pumps

The panel comprises:

- Two fuel contents gauges (4) & (5), one for each tank group, which normally display the total contents of that group in pounds. The test button (3) will cause both gauges to read zero when pressed, and the other test buttons (2) enable the contents of individual tanks to be displayed.

- Four electrical booster pumps switches (11) & (12).

- The transfer pump control switch (10) is a 3-position switch. The centre position is ‘OFF’. With the switch to the left the transfer pump is pumping fuel from the right-hand group to the left-hand group. With the switch to the right, fuel is being pumped from the left-hand group to the right-hand group. The green [TRANSF] light illuminates to show that current is being fed to the pump, though not necessarily that it is actually pumping fuel.

- Warning lights for each group
  
  1. Red [LOW] light (6) indicating fuel level below 90 litres (160lbs) in the longitudinal tank.
  2. Amber [FILT] light (8) indicating that the fuel filter is beginning to clog.
  3. Amber [PRESS] light (9) indicating that the fuel pressure is below 0.15 bar.
  4. Amber [ICE FUEL] light (1) indicating that ice particles are beginning to clog the ice trap.
  5. Amber [HIGH] light (7) indicating that all tanks in the group are full or, if the transfer pump is running, that the longitudinal tank is full.

Illumination of any of these lights except the [HIGH] lights will cause the amber [FUEL] caption on the 32-panel to illuminate.

**Auxiliary Tank Management Panel**

The auxiliary tank control panel although fitted to a few Bristow aircraft, is not used.

**Pressure Refuelling Management Panel**

The pressure refuelling management panel is optionally installed below the fuel management panel on the centre console. Although some Bristow aircraft have this fitted, it is not generally used. However, the pressure refuelling system is described later in this section.
ELECTRICAL POWER SUPPLIES

The electrical power supply to the various fuel system components is shown in Figure 11. The various services are powered through circuit breakers from the power supply busses named below.

**Booster Pump Control**

<table>
<thead>
<tr>
<th>Bus</th>
<th>Circuit Breaker Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>PP1</td>
<td>Fuel Pump Eng 1 (No 2 Booster Pump)</td>
</tr>
<tr>
<td></td>
<td>Fuel Pump Eng 2 (No 2 Booster Pump)</td>
</tr>
<tr>
<td>1PP5</td>
<td>Boost Pump No 1 LH</td>
</tr>
<tr>
<td>2PP5</td>
<td>Boost Pump No 1 RH</td>
</tr>
</tbody>
</table>

Note that as number 2 pumps are supplied by PP1, they will be available even when on battery power only.

**Transfer Pump Control**

<table>
<thead>
<tr>
<th>Bus</th>
<th>Circuit Breaker Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>PP4</td>
<td>Transfer Pump</td>
</tr>
<tr>
<td>2PP5</td>
<td>Transfer Pump</td>
</tr>
</tbody>
</table>

If PP4 is shed during the emergency load shedding procedure, transfer pump operation will be lost.

**Contents Gauges**

<table>
<thead>
<tr>
<th>Bus</th>
<th>Circuit Breaker Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>2PP6</td>
<td>Fuel Gauge LH</td>
</tr>
<tr>
<td></td>
<td>Fuel Gauge RH</td>
</tr>
<tr>
<td>1PP5</td>
<td>Fuel Gauge LH</td>
</tr>
<tr>
<td>2PP5</td>
<td>Fuel Gauge RH</td>
</tr>
</tbody>
</table>

These supplies are connected to the fuel contents PCBs, which includes an oscillator to supply the necessary AC power to the fuel contents probes.

**High and Low Level Sensors**

<table>
<thead>
<tr>
<th>Bus</th>
<th>Circuit Breaker Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>1PP6</td>
<td>Fuel Low Level RH</td>
</tr>
<tr>
<td></td>
<td>Fuel Low Level LH</td>
</tr>
</tbody>
</table>

These supplies are connected to the logic PCBs controlling the illumination of both the **HIGH** and **LOW** level lights.

**Pressure Gauges**

<table>
<thead>
<tr>
<th>Bus</th>
<th>Circuit Breaker Marking</th>
</tr>
</thead>
<tbody>
<tr>
<td>2PP6</td>
<td>Multiple Indications</td>
</tr>
<tr>
<td>1PP5</td>
<td>Multiple Indications</td>
</tr>
</tbody>
</table>

These supplies are for all the gauges on the Multiple Instrument panel (system indicating panel).

**Warning Lights**

These are supplied by the circuit breakers for the CWP Master Warning & Signal and are operated by the Auxiliary PCBs in the Central Warning System.
Figure 11 – Fuel System Electrical Supplies
PRESSURE REFUELLING

The maximum supply pressure for re-fuelling is 1.5 bar. Because this limitation cannot be guaranteed by offshore refueling systems, Bristow aircraft do not use the pressure refuelling system. There is a modification available to Bristow that includes a pressure-reducing valve to allow refuelling from higher pressure sources.

Additional Fuel Tank Components

The additional components fitted to the fuel tanks are shown in Figure 12.

A self-sealing pressure refueling connection point is fitted on the rear face of the starboard sponson. Pipes go from this point to each tank group, the flow of fuel to each group being controlled by electro-valves. A logic circuit takes information from the tank contents probes and high level lights, in conjunction with the cockpit control panel and operates the valves, allowing both refuelling and de-fuelling.

Each tank group has ‘double-acting’ valves located in the base of the longitudinal and transverse tanks through which fuel is loaded or unloaded. The valves are said to be ‘double-acting’ because they allow both re-fuelling and de-fuelling, but prevent fuel flowing out of the longitudinal (feeder) tank into the other tanks once pressure refuelling is complete. The ‘double-acting’ valves in the longitudinal tanks are also fitted with a restrictor to ensure that this tank is the last to empty during de-fuelling.

Over-filling protection is given by a pressure relief valve for each group located on the starboard side of the fuselage above the gravity refuelling points. The pressure relief valves are normally held closed by springs, but in the event of pressure building up in a tank group due to overfilling, they would open at 0.15 bar to allow fuel to escape at a sufficiently rapid rate to prevent tank rupture. Prior to using the pressure re-fuelling system these valves must be cycled by hand by pulling them out, to ensure that they are not stuck.

Control System

The control system consists of logic circuits and a cockpit mounted control panel shown in Figure 13.

Refueling

Refer to Figure 13. To refuel set the large rotary knob (5) to the total fuel required, and then move the toggle switch (6) to the REFUEL position. Assuming that the fuel required is more than the fuel in the tanks, the indicator lights MAIN (1) & (2) will illuminate, showing that the electro-valves are open. Once total fuel has reached the required level, the logic circuits close the electro-valves and the MAIN lights will extinguish. If a tank group becomes full so that all high level sensors in its tanks are activated, the electro-valve of that group will close. Thus if maximum fuel is required - set the rotary knob fully clockwise, and refuelling will continue until all high level sensors are activated.

The SUPP ‘1’ & ‘2’ lights on the fuel control panel refer to supplementary sponson tanks, which are not fitted to Bristow aircraft.

Defueling

To de-fuel - set up the required fuel level on the rotary knob and set the switch to DEFUEL. The electro-valves will open. Once the fuel level falls to the required quantity, the electro-valves will close.

For safety reasons, defueling will stop automatically when the level in each transverse tank reaches 40 litres. The amount of fuel then remaining in each feeder tank at this time is 80 litres.

In the event of a failure of the control logic, the emergency button (4) may be pressed, causing the electro-valves to remain open so long as the button is pressed. It then becomes the responsibility of the user to ensure that tanks are not overfilled. The button may also be used, with caution, to prevent the problem of cycling of the electro-valves when refuelling on a moving vessel etc.

The four lights (3) on the control panel can be used to test the logic circuits of the solenoid valves. The four lights will illuminate when the emergency button (4) is pressed to indicate a satisfactory test.
**Electrical Power Supply**

A circuit breaker labelled ‘Press Refuel’ supplies power to the logic circuits and electro-valves from 1PP5.

![Diagram of pressure refuel and defuel system]

**Figure 12 – Pressure refuel and Defuel System**

![Diagram of pressure refuel/defuel control panel]

**Figure 13 – Pressure Refuel/Defuel Control Panel**