# Chapter 2 FUEL SYSTEM

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## DESCRIPTION

**General information**

1. Fuel is carried in main plane, leading-edge and flap tanks (all of which are integral parts of the associated structures) and in an external, jettisonable, ventral tank attached to the fuselage by a manual release unit at frame 48.

2. Fuel is delivered to the engine and reheat pumps by two fueldraulic booster pumps, one in each main plane tank collector box. The pumps are powered by engine-driven hydraulic supply pumps mounted one on each engine wheelcase, fuel being used as the hydraulic medium. All fuel from the outboard and flap tanks is transferred to the collector boxes by air pressure and from the leading-edge and main tank compartments by gravity and by d.c. transfer pumps controlled by switches in the cockpit.

3. Pressure refuelling of the complete system *(Sect.2, Chap.2)* is effected through a single adapter (access panel 63P), fuel entering all tanks (with the exception of the leading-edge tanks, which are in unrestricted communication with the main tanks) through a variety of refuelling valves. For information regarding the associated air and electrical systems, refer to para.41, also to Sect.3, Chap.8D, and Sect.6, Chap.10 respectively.

**Integral tanks**

*Main-plane and leading-edge tanks*

4. The main-plane and leading-edge tanks constitute integral parts of the associated structures, the latter being secured to brackets on spar 1. Although structurally independent of each other, each pair of tanks functions as one unit.

5. Each main-plane tank is divided into three compartments connected from inboard to centre by orifices in the dividing wall and from centre to outboard by simple non-return valves. The outboard compartment, which is also the smallest, functions as a collector box. The leading-edge tank is in unrestricted communication, through orifices, with the inboard and centre compartments of the main tank. During pressure refuelling, fuel enters the centre compartment through a Mk.44 refuelling valve to fill the main tank compartments and the leading-edge tank. Each combined leading-edge and main tank is vented inward and outward by constant differential vent valves. The inward vent valve is mounted in the main plane leading edge and is connected to the main tank by a pipe passing through the tank end-wall; the outward vent valve is fitted in the inboard compartment roof near the fuselage.

6. When the engines are running, fuel is transferred from the inboard compartment to the centre compartment by gravity through the orifices in the dividing wall and from the centre compartment and leading-edge tank to the collector box by d.c. transfer pumps through a shuttle valve. The collector box houses a fueldraulic booster pump which delivers the fuel, through a low-pressure cock, to the associated engine high pressure fuel system. The non-return valves in the wall dividing the centre compartment and the collector box ensure that, when the fuel level is low, the collector box will remain filled in both nose-up and nose-down attitudes.

7. A gravity-refuelling point is provided in the upper surface of each tank. These are provided as a stand-by and their position is such that the tanks cannot be filled to capacity by gravity. The filler caps must not be removed when the tanks have been fully pressure-refuelled or fuel will overflow from the filler orifices.

*Flap tanks*

8. Each flap constitutes a fuel container and has two compartments. A non-return valve and an unrestricted passage in the dividing wall allow free flow of fuel between the compartments during refuelling. In fuel transfer conditions, air pressure is applied through the inboard hinge, causing fuel to flow from the inboard compartment to the outboard compartment through the unrestricted passage only. From the latter compartment fuel flows, through the outboard hinge, into the fuel system pipelines.

9. Refuelling and defuelling takes place through a Mk.27 refuelling valve in the fuel pipe to the flap. Inward venting is through a non-return valve fitted in a branch-pipe from the tank pressurizing pipe, and outward venting is provided by the main tank outward

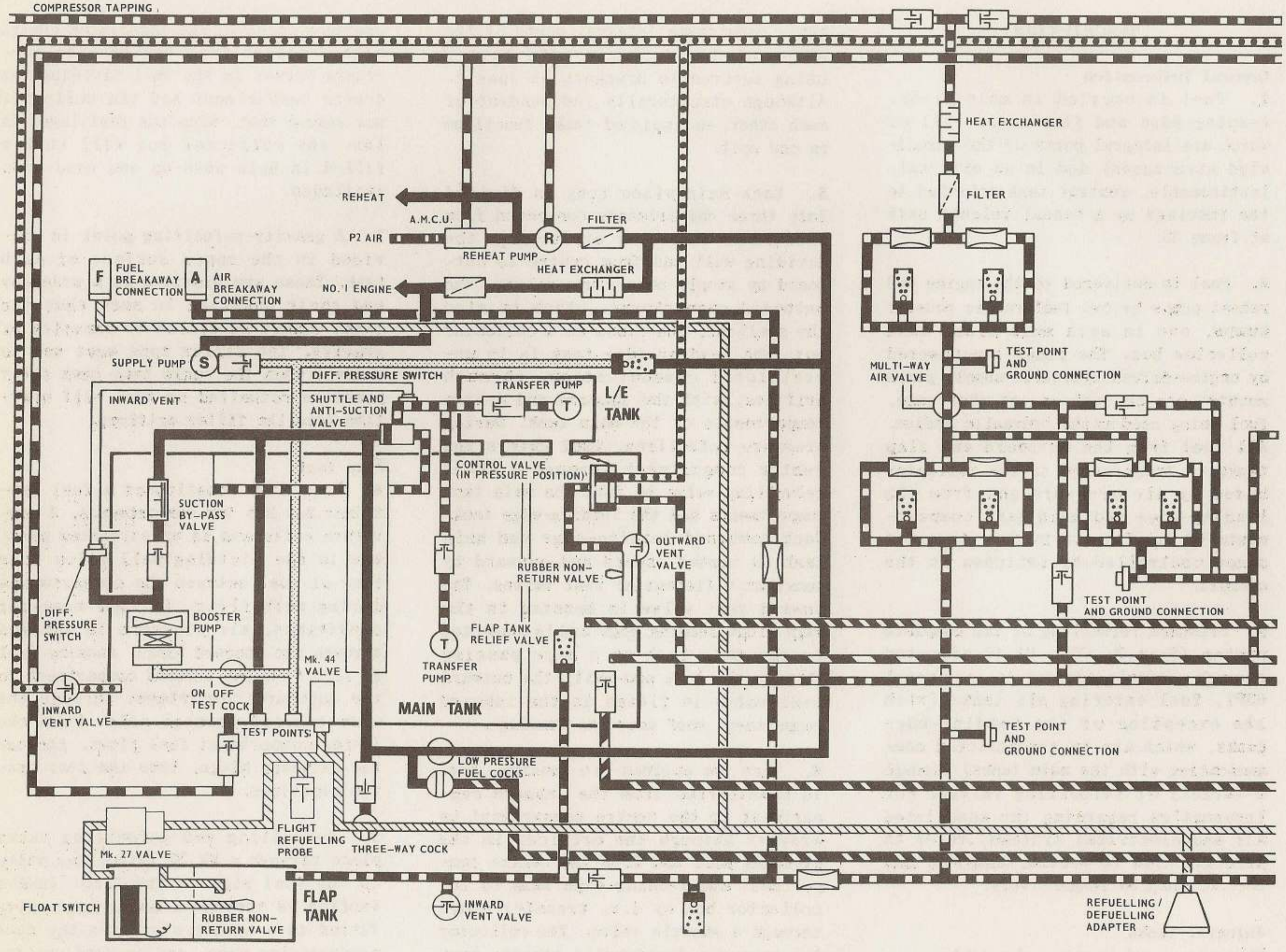


**FIG. 1. FUEL SYSTEM DIAGRAM — PORT**

◄ AUXILIARY AIR SUPPLY PIPES RE-ROUTED ►



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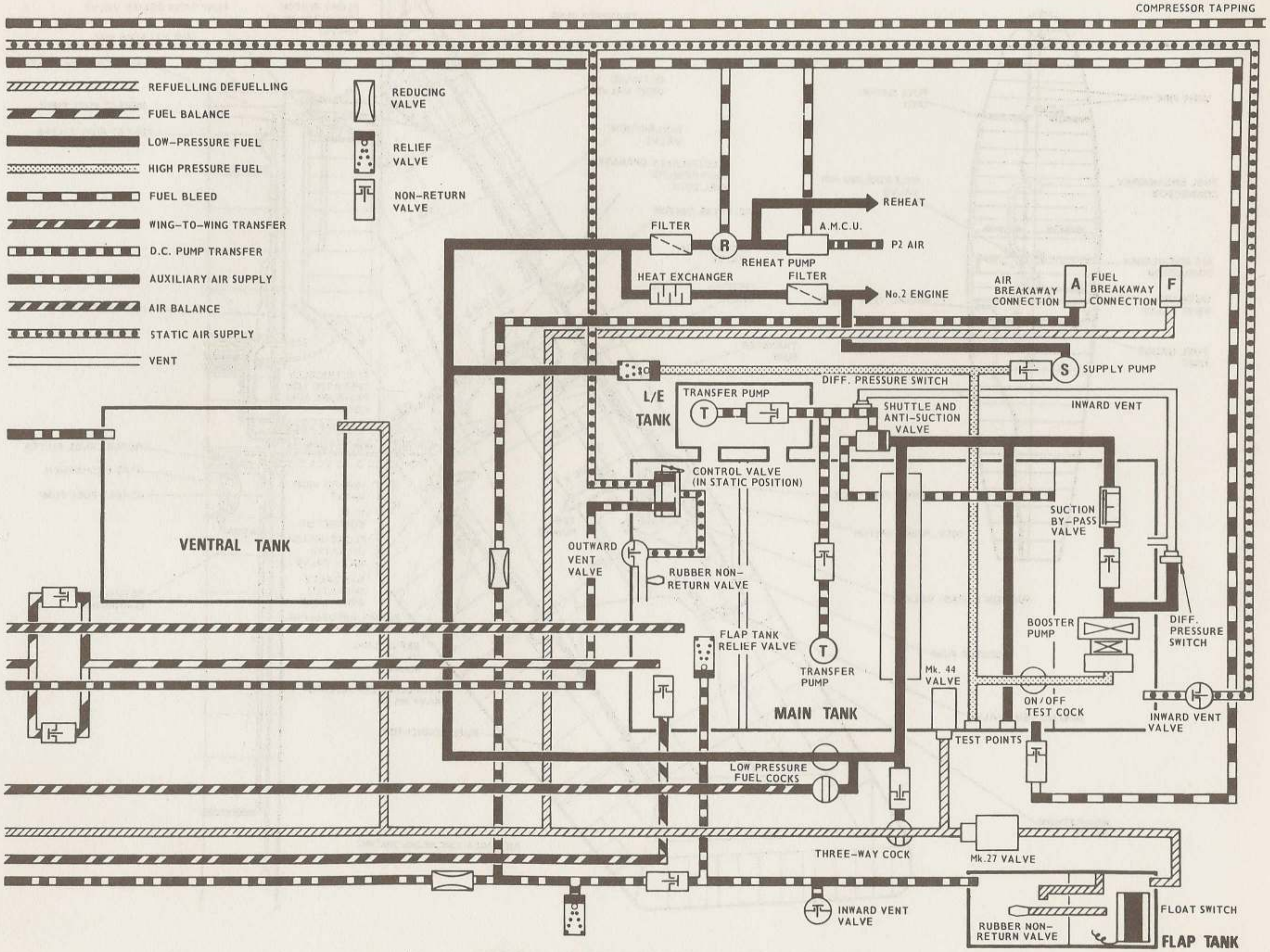


FIG. 2. FUEL SYSTEM DIAGRAM—CENTRE AND STARBOARD

◄REDRAWN►

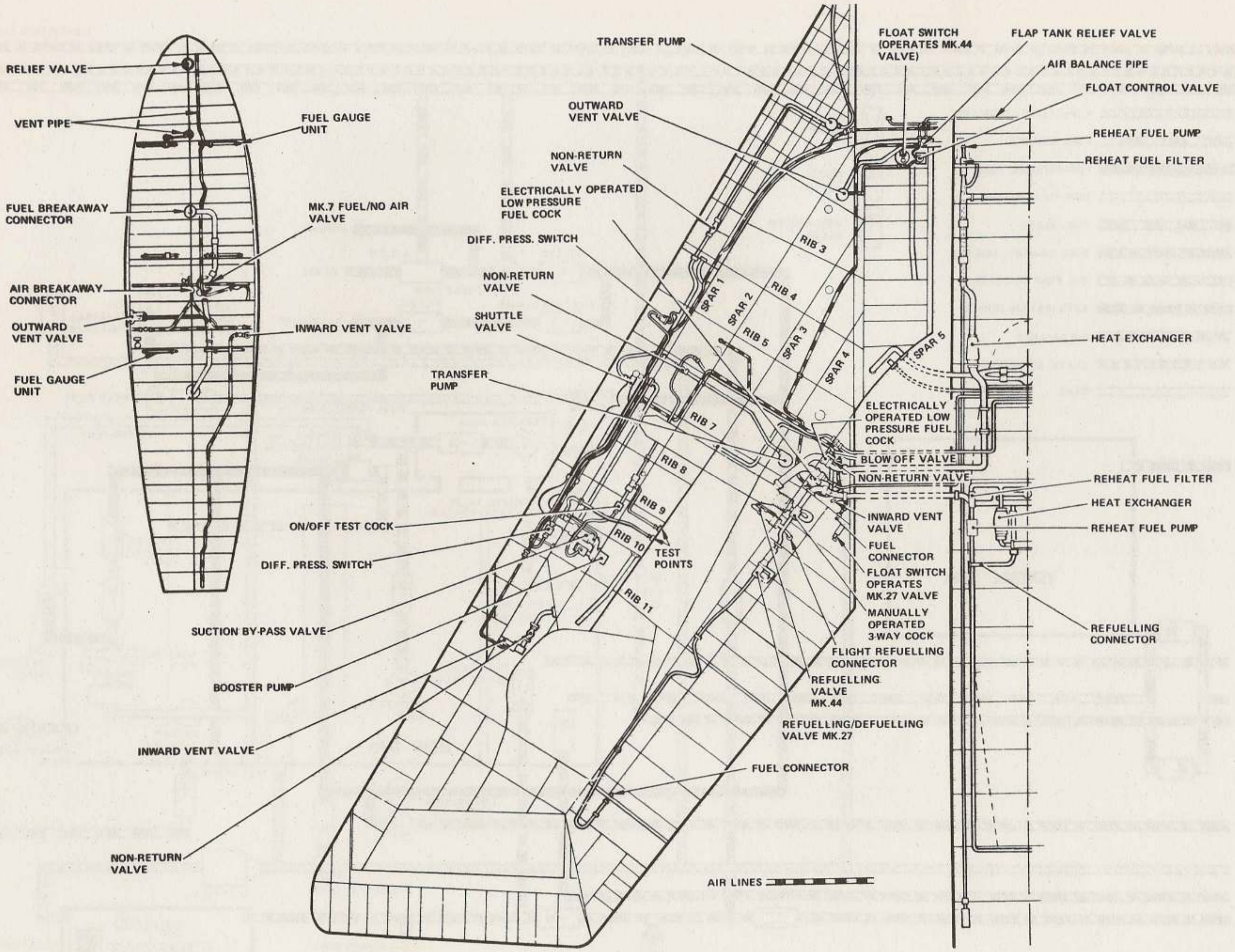


FIG. 3. FUEL SYSTEM — PORT

◀ MINOR AMENDMENTS ▶

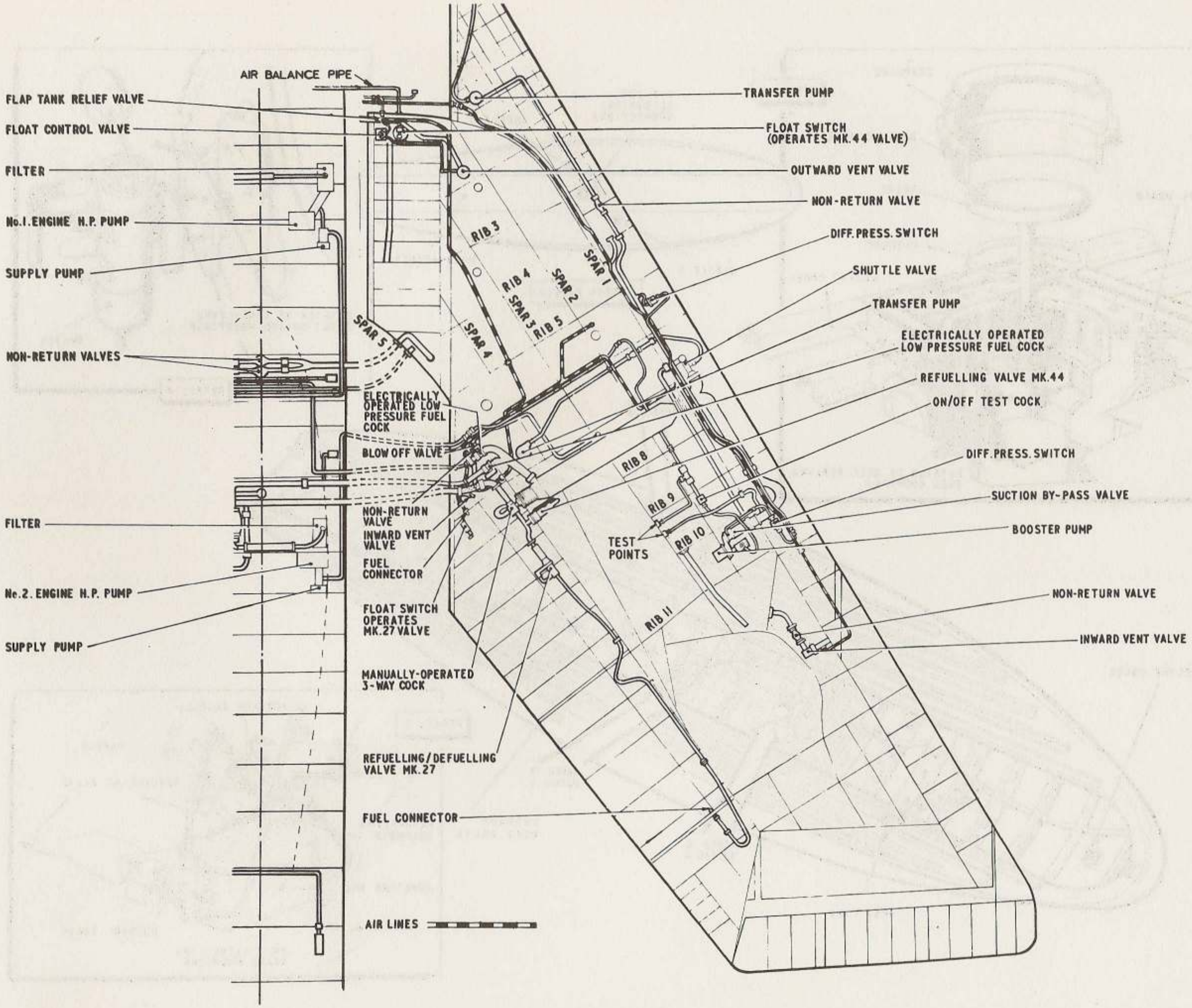


**FIG.4. FUEL SYSTEM – STARBOARD**

◄MINOR AMENDMENTS►

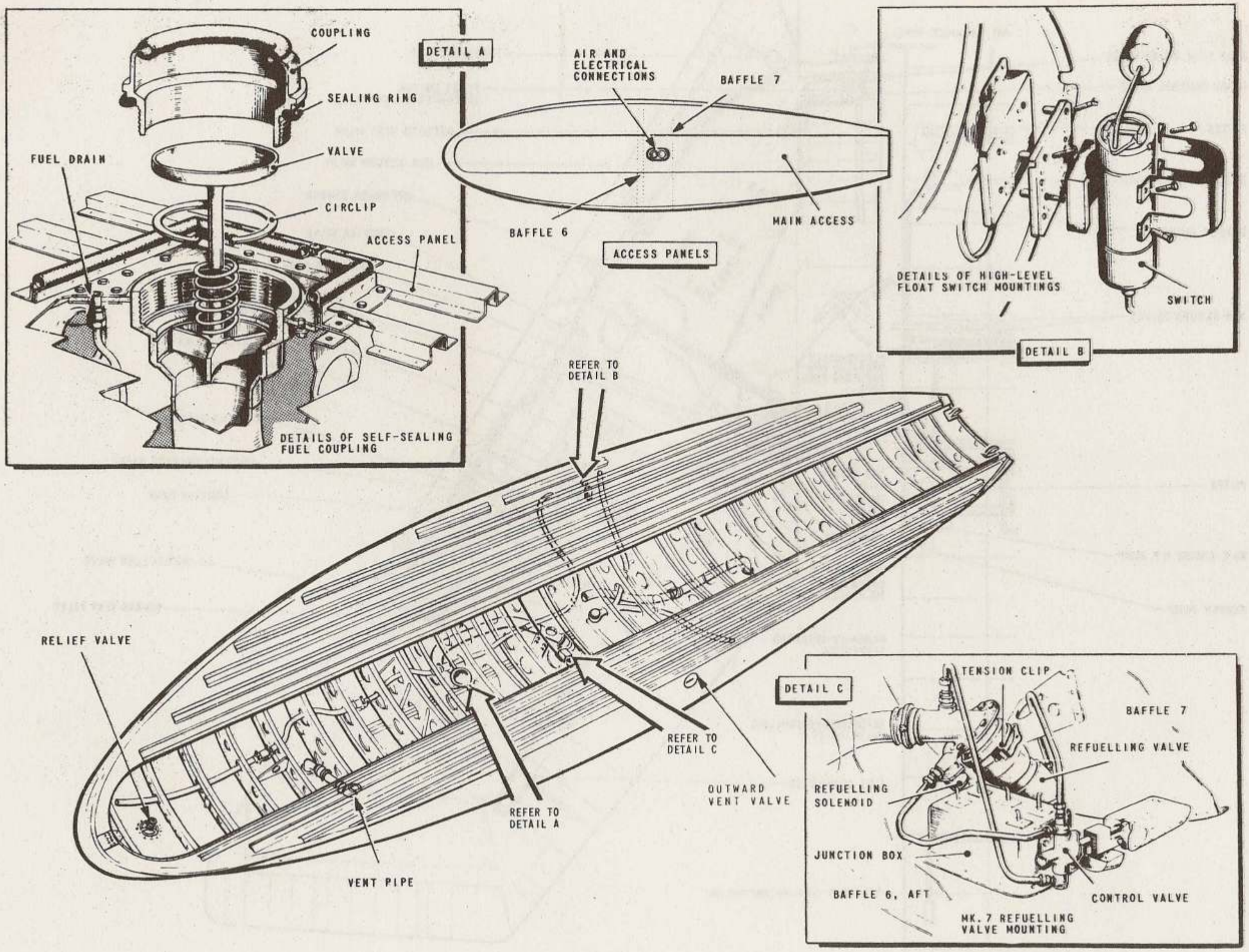


FIG. 5. VENTRAL TANK

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vent valve, flap tank pressure being communicated via a vent pipe embodying a 7-lb pressure-relief valve. An additional safeguard against over-pressurizing the tank is provided by a 9-lb pressure-relief valve in the flap tank pressurizing pipe.

**Ventral tank** *(fig.5)*

**10**. The ventral tank is of conventional stressed-skin construction, and its upper surface is so contoured that, when the tank is attached to the aircraft, a rubber seal around the tank periphery is in contact with the fuselage skin. It is attached by a single suspension bolt which engages a manually-operated release unit mounted on the forward face of frame 47; further support is provided by a pair of spring-loaded pivots, forward of frame 55, which engage two lugs formed on the tank aft-end casting. The installation is completed by a small detachable fairing which extends the tank contour aft to the fuselage skin. The fairing is attached by a spring-loaded catch on the tank engaging the shank of a bolt on the fairing, and by a lug on the fairing engaging a spring-loaded pin inside the fuselage. The tank is not normally expendable but it can be jettisoned by pulling a handle in the cockpit *(Sect.1, Chap.3)*. The handle is also used during tank removal.

**11**. The tank is fitted with fuel, air and electrical connectors which mate with corresponding connectors on the underside of the fuselage. Internally the tank structure consists of a series of baffles, positioned laterally to reduce fuel surge, one of which (No.7) divides the tank into two compartments. These compartments are connected by fuel and air pipes which incorporate non-return valves, and by two pressure relief valves which open into the rear compartment. The relief valves are set to operate at a pressure of 5 lb/in². A high level float switch in the rear compartment controls a Mk.7 fuel/no air valve *(para.17)*, which is located at the bottom of the front compartment.

**12**. An inward vent pipe, incorporating a non-return valve, runs from the top centre-section skin of the tank to the rear of the rear compartment. Internal venting is provided by a similar pipe which runs from the dividing baffle to the forward compartment. Air pressure build up between the tank and the fuselage is prevented by a large diameter pipe which passes vertically through the forward compartment. To guard against tank over-pressurization a relief valve, set to open at 16.5 lb/in² above atmospheric pressure, is fitted in the bottom skin of the forward compartment.

**Fueldraulic system**

*Description*

**13**. The Lucas fueldraulic system is designed to ensure a sufficient supply of vapour-free fuel to the engines through the full range of engine settings, whatever the altitude or attitude of the aircraft. The port and starboard systems are independent of each other, the former feeding No.1 engine and the latter No.2. Each system comprises an engine driven hydraulic supply pump which, using fuel drawn from the downstream low-pressure filter as a medium, supplies pressure to a hydraulic motor and pump unit installed in the main-tank collector box. The supply pump is a seven-cylinder cam-plate type, the cam-plate being set at a fixed angle to the shaft, consequently the output varies in direct proportion to engine speed. The hydraulic motor of the booster pump unit is a five-cylinder fixed cam-plate type, the speed of which is dependent upon the volume of pressure fluid supplied.

*Booster pumps*

**14**. The pump assembly consists of a main, and two auxiliary, impellers, the latter driven by gearing from the main shaft and located, one at the top and one at the bottom of the collector box, supplying fuel to the main impeller which, in turn, feeds the engine high-pressure and reheat systems. The upper impeller ensures the fuel supply in negative 'g' and inverted flight conditions. ▶◀

**Transfer pumps**

**15**. Four d.c. operated transfer pumps are fitted, one in the centre compartment of each main tank and one in each leading-edge tank. They are controlled by switches on the starboard leg panel in the cockpit and their functions are first to supply fuel for the engines on starting until the booster pumps reach operating pressure and then to augment the gravity flow of fuel from the main tank to the collector boxes. They are the motor-driven impeller type and are each secured in their housings by a circular screwed plug locked by a spring circlip. Each pump housing incorporates a 1/16 in. bleed hole in its outlet pipe to ensure that the pump will prime on re-immersion following dry running. A drain pipe, attached to the housing, leading to an outlet in the tank bottom skin, carries away any fuel which may seep through the gland seal into the motor compartment.

**Fuel valves**

*General information*

**16**. The fuel valves and their associated control systems permit simultaneous flow of fuel to all tanks during refuelling and a sequenced transfer of fuel between tanks during engine running. The valves fitted, include one Mk.7 fuel/no air valve, two Mk. 44 refuelling valves and two Mk. 27 refuelling/defuelling valves. For details of the electrical control circuit refer to Sect. 6, Chap. 10.

*Mk.7 valve*

**17**. This valve and its associated control valve are fitted in the ventral tank. Its function is to allow fuel to flow into, or out of, the tank but to prevent air entering the fuel pipelines. The valve operates by differential pressure applied across a piston assembly, the differential being controlled by the control valve during fuel transfer, and by an internal solenoid valve during refuelling. Energizing and de-energizing of the solenoid are controlled by the refuelling door microswitch and the ventral tank high level float switch respectively. An additional electrical circuit is made through internal contacts by movement of the piston stem. This circuit operates the Mk. 27 refuelling valve to commence flap transfer when fuel flow through the Mk. 7 valve ceases.

*Mk. 27 valve*

**18**. One Mk. 27 valve is fitted in the fuel pipeline to each flap tank and controls flow to and from the tank during refuelling, defuelling or fuel transfer. The valve embodies defuelling and refuelling solenoids, the former controlled by contacts in the Mk. 7 fuel valve, and the latter by the combined operation of the refuelling adapter access door microswitch and a high-level float switch in the flap tank. When the defuelling solenoid is energized, no flow through the valve is permitted; completion of the refuelling solenoid circuit permits refuelling flow, and when both solenoids are de-energized defuelling or fuel transfer can take place.

*Mk. 44 valve*

**19**. This valve is fitted into each main tank on the forward face of spar 5 and allows fuel to enter the tank, no reverse flow being permitted. A solenoid in the valve is in circuit with a float switch in the inboard compartment of the tank and, when the tank is less than full, the circuit is broken and the valve opens. As the tank fills, the float rises to close the switch, energizing the solenoid to cause the valve to be closed by fuel pressure behind the piston, aided by the piston spring.

**20**. *Cancelled.*

▶◀

**21**. *Cancelled.* ▶◀

**22.** *Cancelled.*

**23.** *Cancelled.*

**24.** *Cancelled.*

**Fig.6.** *Cancelled*

**Vent valves** *(fig.7)*

*General description*

**25.** With the exception of the simplified types of valve used for inward venting of the ventral and flap tanks, all the vent valves are basically similar both in construction and method of operation. Each valve has three chambers separated by two diaphragms. Tank pressure applied to the upper chamber acts upwards against the valve head, and datum pressure in

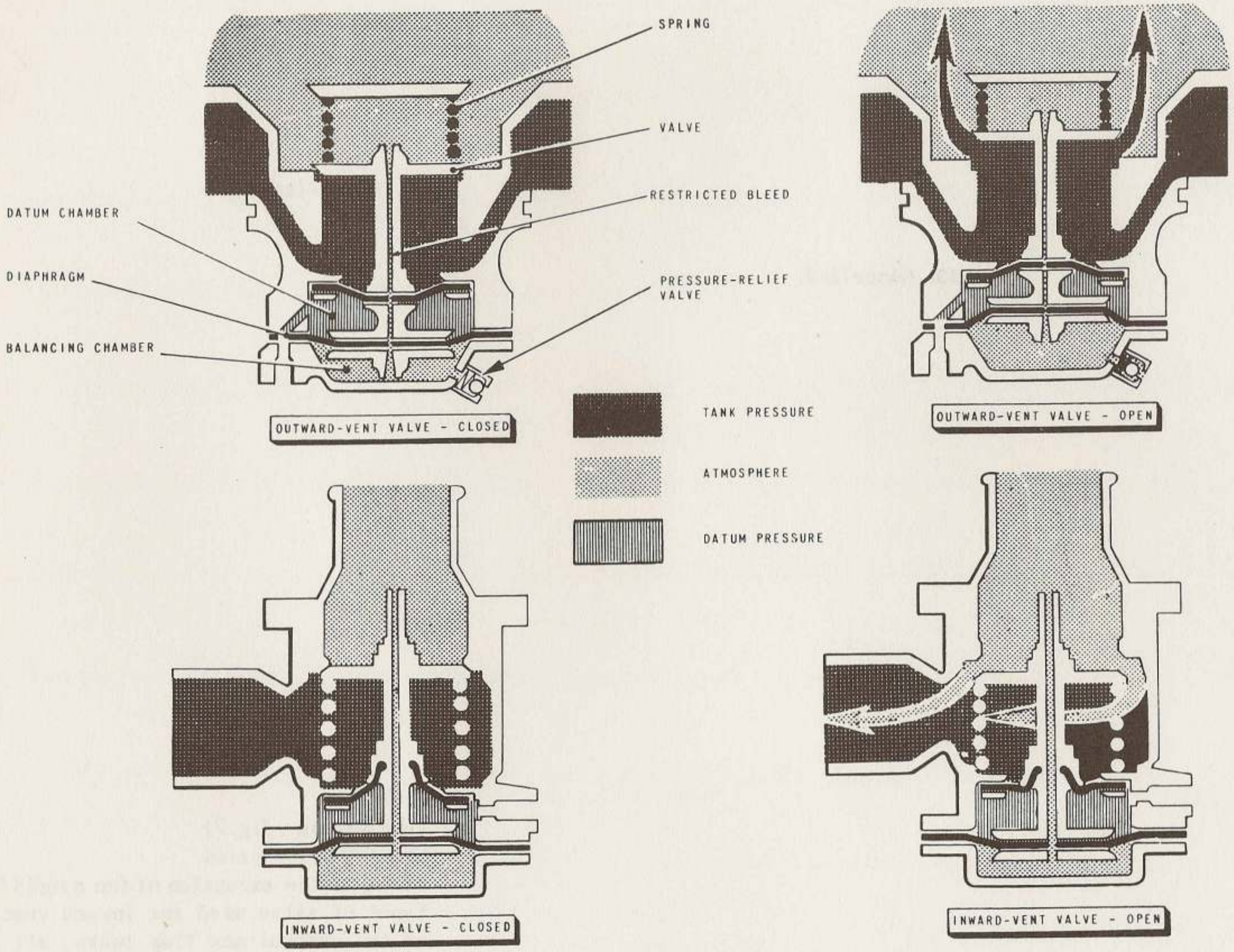


FIG. 7. VENT VALVES

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the middle chamber acts downwards against the large diaphragm. Datum pressure may be derived from any of several sources in order to satisfy the venting requirements of the particular tank in which the valve is fitted. The balancing chamber is in direct communication with the atmospheric pressure above the valve head, thus applying equal and opposite forces to the ends of the valve and ensuring that localized pressure variations around the valve head do not affect valve operation. The spring force is applied so that it tends to keep the valve closed, and determines the differential pressure at which venting occurs; it is designed to suit the requirements of the associated tank. Electric heater elements, controlled by a switch on the starboard leg panel are fitted in all integral and ventral tank vent valves.

*Integral tank inward-vent valves*

26. These are fitted one to each main tank and are designed to open when tank pressure falls 0.5 lb/in² below datum pressure. The datum pressure is, at all times, that of the aircraft static system, thus providing automatic altitude compensation.

*Integral tank outward-vent valves*

27. The outward-vent valves in the main integral tanks are designed to open when tank pressure exceeds datum pressure by 3 lb/in². The datum pressure, in all circumstances except those of inverted flight and negative 'g' conditions, is that of the aircraft static system. To obviate the possibility of fuel entering the tank-pressure chamber of the vent valves and being discharged from the aircraft (i.e., during inverted flight or negative 'g' conditions) a float valve associated with the vent valve connects a 13 lb/in² air pressure to the datum chamber; this pressure acting on the diaphragm is sufficient to hold the valve closed. If the small diaphragm in these vent valves develops a leak, over-pressurization of the tank will result due to tank pressure entering the datum chamber and holding the valve closed. To prevent this a 12 lb/in² relief valve is fitted in the wall of the balancing chamber, so that when tank pressure reaches this figure the valve will allow it to enter the chamber and balance the pressures acting on the large diaphragm.

*Flap tank inward-vent valves*

28. These valves are fitted in the air-supply lines to each flap tank adjacent to the inboard hinges and are in the form of simple non-return valves open to atmosphere.

*Flap tank outward-vent valves*

29. Situated in the inboard compartment of each main tank, these valves terminate the vent lines branched from the flap-tank air-supply lines adjacent to the inboard hinges. The valves constitute simple relief valves opening at 7 lb/in².

*Ventral tank outward-vent valve*

30. This valve is similar to the integral tank outward-vent valves, but as the ventral tank is pressurized to achieve fuel transfer *(para.47)*, different datum pressure conditions are necessary. The valve is designed to open when tank pressure exceeds datum pressure by 1 to 2 lb/in². The valve datum chamber is at atmospheric pressure during refuelling but during fuel transfer air is applied to the datum chamber at tank pressure, thus ensuring that the same pressure differential exists in each case.

**Transfer and anti-suction shuttle valve**

31. One of these valves is fitted in each main plane in the fuel pipe between the transfer pumps and the collector box. The valve is sensitive to the relative pressure of the transfer and booster pumps. Upon engine starting, before the booster pump reaches operating pressure, or in the event of booster pump failure, the shuttle moves to direct the transfer pumps output to the engine. When booster pump pressure exceeds that of the transfer pumps the shuttle valve directs the output of the latter to the collector box. In the event of complete pump failure the valve assumes a closed position and engine suction is directed to the collector box where the suction by-pass valve permits fuel to be drawn from the bottom of the tank.

**Non-return valves**

32. The locations of the non-return valves fitted in the system are shown in fig.3 and 4.

**Low pressure fuel cocks**

33. Two of these cocks are situated on spar 5 of each main plane, one each in

the engine fuel-delivery and wing-to-wing transfer lines. They constitute highly polished discs which are raised to open, or lowered to close, by d.c. motors in accordance with manual switching in the cockpit.

**Water-drain valves**

**34.** One or more water drain valves are fitted in each tank compartment at positions approximating to the lowest points of the compartments.

**Defuelling cocks**

**35.** A manually-operated three-way cock is fitted in each main plane between trailing-edge ribs 4 and 5, and is accessible behind a circular panel in access panel 99 (P or S). Appropriate selection of the cocks will permit selective defuelling of the ventral tank, the port or starboard flap tanks, or, in either main plane, the combined contents of the main and leading-edge tanks *(Sect.2, Chap.2)*.

**Differential pressure switches**

**36.** A differential pressure switch is fitted at the outlet side of each booster pump, and is in circuit with the associated FUEL 1 or FUEL 2 warning lamp on the auxiliary warnings panel. The switch is sensitive to pump output and tank pressures and is set to close its contacts when pump output pressure falls to 5 3/4 ± 3/4 lb/in² above tank pressure. In this event the associated warning lamp will be illuminated and reheat, if lit, will be automatically cancelled.

**37.** A similar switch, set to operate at a pressure differential of 1 3/4 - 2 3/4 lb/in², is fitted on the leading-edge spar of each main plane. The switch is in circuit with the associated PUMP P or PUMP S warning lamp on the auxiliary warnings panel, and is sensitive to transfer pump output and collector box pressures. Should both transfer pumps run dry or fail, or should either pump fail whilst the serviceable pump is uncovered, the switch contacts will close to illuminate the warning lamp and indicate loss of fuel transfer to the collector box.

**Fuel contents gauging and indicating**

**38.** Three contents gauges, calibrated in pounds and fitted on the starboard instrument panel, indicate, when the battery and instrument master switches are ON, the quantity of fuel contained in the integral and ventral tanks. The inboard gauge normally indicates the total fuel contents of the port main and leading-edge tanks. When the flap tanks fuel contents push switch is depressed the port flap tank contents are added to the gauge reading. Similarly the centre gauge indicates the contents of starboard main, leading-edge and flap tanks. The outboard gauge indicates ventral tank contents.

**39.** A test switch, located on the starboard console, is provided to prove the operation of the gauge pointers over the full range from FULL to EMPTY, these positions being marked on the switch.

**40.** Five coloured lamps, located on access panel 61P, indicate the fuel state of the main, flap and ventral tanks whenever the ground refuelling access panel, 63P, is removed. The lamps are individually controlled by the high-level float switch in the associated tank, and are illuminated to indicate that the tank is not full. A microswitch, located behind access panel 63P, interrupts the circuits to all the lamps and ensures that they are extinguished whenever the panel is fitted.

**Air supply** *(fig.1 and 2)*

**41.** Pressure air for fuel transfer and venting control is tapped from both engine compressors and led through a heat exchanger and a filter to duplicated pressure-reducing valves (each with an output of 16 lb/in²) and an integral 19-22 lb/in² relief valve. From the reducing valves the line branches to a pressure test point on panel 63P and, through a Saunders multi-way valve, to a second bank of two pairs of pressure-reducing valves each with an output of 13 lb/in² and incorporating relief valves set at 15 lb/in². From one pair of valves the line branches from the fuselage to the ventral tank and to each main plane to connect with the float control valves. From the float valves the air is directed, in negative 'g' or inverted flight conditions, to the datum chamber of the outward-vent valves, to hold the valves closed and prevent loss of fuel. A tapping in the line after the second stage of pressure reduction is connected to a test point behind access panel 58S.

**Multi-way valve**

**42.** The Saunders multi-way valve is fitted in the auxiliary air system at a point in the common pressure line downstream of the first set of reducing/relief valves. During normal flight, pressurizing air passes through the multi-way valve, and is directed to the main, flap, and ventral fuel tanks; the inlets to the float control valves and the datum chamber of the ventral tank outward vent valve. When flight refuelling is selected, the valve operates, closing off the auxilliary air supply and connecting the air pressure line to atmosphere. This permits a higher fuel flow rate during refuelling by removing the pressure datum from the ventral tank outward vent valve, and depressurizing the fuel tanks and inlet to the float control valves.

**Fuel flow during refuelling**

**43.** During refuelling, fuel flows through the open refuelling valves into the centre compartment of each main-plane tank, the outboard compartment of each flap tank, and the forward compartment of the ventral tank. The rising fuel level in the centre compartment of each main-plane tank coincides with a similar rise in the level in the other compartments and in the leading-edge tank, but in the flap and ventral tanks filling of the compartments occurs separately.

**44.** In each flap tank, fuel from the outboard compartment overflows, through the centre hinge and connecting pipe into the inboard compartment when the outboard compartment is full.

**45.** In the ventral tank, when the forward compartment is full, pressure build up opens the two relief valves in the dividing baffle allowing fuel to flow into the rear compartment.

**46.** Refuelling flow is shut off by the fuel valves in response to operation of the high level float switches when their associated tanks are full. At the same time the high level float switch breaks the circuit to the tank indicator lamp *(para.40)* to indicate that the tank is full.

**Fuel flow during engine running**

**47.** As engine demand causes the fuel level in the main tanks to fall, the high level float switches will operate to open the Mk.44 valves, and allow the tanks to be replenished from the ventral and flap tanks in that order. Air pressure is applied to the aft compartment of the ventral tank causing fuel to be expelled into the forward compartment, where it passes through the Mk.7 fuel/no air valve to the main tanks. When the aft compartment is empty the air pressure enters the forward compartment to continue the transfer.

**48.** When the ventral tank is empty, the control valve for the Mk.7 fuel/no air valve causes the Mk.7 valve to close and exclude air from the fuel pipes. Simultaneously the cessation of flow through the valve causes the valve contacts to close and complete an electrical circuit to energize and open the Mk.27 valves in the flap fuel pipes, permitting transfer of fuel from the flap tanks.

**49.** The air pressure is applied to the inboard compartment of each flap tank and expels the fuel through the outboard flap hinge. When the flap tanks are empty the pressurizing air enters the main tanks but has little effect.

**Reheat fuel supply** *(fig.1 and 2)*

**50.** Low pressure fuel is supplied to the reheat fuel pumps which, when reheat is selected, direct high-pressure fuel to the air motor control unit (a.m.c.u.). The main flow of fuel passes through the a.m.c.u. to the reheat burners but part is diverted into the a.m.c.u. to act as the pressure medium for the reheat throttle servo-mechanism. Low pressure return fuel from the a.m.c.u.'s and reheat pumps is bled into the main plane fuel tanks through non-return valves; these valves incorporate small feed-back holes to guard against negative pressure. Fuel which by-passes the reheat sealing glands when the pumps are stationary is directed into atmosphere.

**Fuel flow control**

**51.** The port and starboard fuel systems are each permanently associated with one engine, the port wing system supplying No.1 engine and the reheat pump, and the starboard system No.2. The supply is controlled in each case by an electrically-operated gate valve fitted to spar 5 and selected by a switch on the starboard leg panel *(Sect.1, Chap.1)* in the cockpit. Two switches on the same panel control the transfer pumps in each leading-edge and main-plane tank. On engine start, the transfer pumps output pressure operates the shuttle valves to feed the engine systems, through the recuperators (if fitted), until the booster pumps delivery pressure is sufficient to return the shuttle valves to normal and divert the output of the transfer pumps to the collector boxes.

**Wing-to-wing fuel transfer system**
*(fig.1 and 2)*

52. As a remedy for fuel asymmetry or to make all fuel available for single-engined flying, fuel may be transferred from one main plane fuel tank to the other by the appropriate setting of a switch marked P-TRANSFER-S (with centre off), on the starboard instrument panel *(Sect.1, Chap.1)* in the cockpit. The switch controls two fuel cocks similar to and near the low pressure cocks on spar 5, each connected into the fuel line to the associated engine. A lamp near the switch gives indication when transfer is proceeding. To avoid overfilling, a balance pipe with a by-pass section and two non-return valves is tapped into each main-plane tank just above normal 'tank full' level.

**Wing-to-wing air balance pipe**

53. The wing-to-wing air balance pipe is connected between the port and starboard main planes, entering the inboard compartment of each main tank on the forward face of spar 1 at points above the maximum fuel level. This pipe ensures that pressure in both tanks remains equal, therefore removing the possibility of asymmetry during fuel transfer, which may be caused by malfunctioning of the vent valves or vent valve control valves.

**Flight refuelling**
*General information*

54. Fuel enters the aircraft through a detachable probe, fitted beneath the port main plane, which communicates with the fuel system, through a branch-pipe incorporating a non-return valve, at the inlet to the Mk. 44 refuelling valve in the port main tank. Refuelling is controlled from a FLIGHT REFUEL switch on the port top panel *(Sect.1, Chap.1)* in the cockpit which, when selected ON, simulates the removal of the ground refuelling access panel by energizing the refuelling and tank-full-indicator circuits *(Sect.6, Chap.10)*. The indicator lamps on the fuselage are duplicated, in the cockpit, for the pilot's use. To relieve the fuel transfer air pressure and the vent valves datum pressure during flight refuelling, the Saunders multi-way valve, in circuit with the flight refuelling switch, is energized to isolate the tank air-pressure line and to connect the lines downstream of the valve to atmosphere.

*Refuelling probe*

55. The probe assembly incorporates two attachment brackets which are bolted to corresponding brackets on main-plane spars 1 and 5 on the port side only. The probe is connected to the branch-pipe by a curved pipe which enters the trailing-edge structure through a hole in access panel 99P. When the probe is not fitted the branch-pipe is sealed by a blanking cap and the hole in the access panel by a circular plate. Illumination of the probe is provided, and is controlled by a switch on the port coaming panel.

**SERVICING**

**WARNING**

**The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cockpit or performing any operations upon the aircraft**

**Refuelling and defuelling**

56. For details of these operations refer to Sect. 2, Chap. 2.

**Fuel sampling**

57. The fuel sampling tool *(Table 2)* is used for this operation. The tool is applied to each water drain valve in turn and pushed in to displace the valve from its seating, allowing fuel to drain into a suitable container.

**Sealing leaking water drain valves**

58. A leaking valve should be sealed by screwing 4 B.A. mushroom-head bolt Ref. No. 28D/8337, fitted with a bonded seal, into the valve and tightening it on to its seating. The valve may still be used in the normal manner after sealing.

**Integral tanks pressure test**

59. To test the tanks:-

(1) If the tanks have been pressure refuelled, set the defuelling cocks in both main planes to DEFUEL MAIN TANKS and draw off not less than 50 gal of fuel.

(2) Remove the cowl and the quick-release cover from the port outward vent valve, refit the screws in the vent valve flange, and weight the valve



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head to prevent the valve opening (not less than 60 lb wt).

(3) Remove the port gravity filler cap, using the key *(Table 2)* and substitute the tank pressure testing equipment *(fig.8)*.

(4) Connect an air supply to the testing equipment and slowly open the stop valve. When the pressure gauge registers 10 lb/in² close the valve.

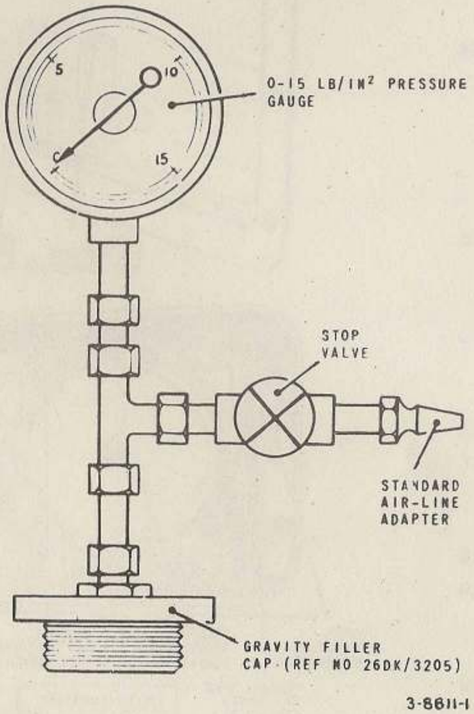



**Fig. 8. Integral tank pressure testing equipment**

(5) Examine the tank area for leakage and rectify as necessary *(A.P.101B-1000-6)*.

(6) Disconnect the air supply and allow the tank pressure to return to normal by opening the stop valve.

(7) Remove the test equipment and refit the refuelling cap.

(8) Remove the weight from the vent valve and refit the quick-release cover and cowl.

(9) Repeat (2) to (8) on the starboard main plane.

**Fuel systems pressure test**

*General information*

**60**. Pressure tests to check for leakages in the reheat, high pressure (fueldraulic) and low pressure fuel systems, are carried out with engines and jet pipes removed, using the pressure rig and adapter kit listed in Table 2. The appropriate pressures are applied to the separate systems as indicated in the following test procedures. Pump delivery pressures can be measured when ground running, using the adapter kit only to measure high or low pressures at the wheel bay test points.

*Test equipment (fig.10)*

**61**. The adapter kit comprises a metal cabinet in which separate high and low pressure gauges are mounted, with provision for connection to the pressure rig and/or aircraft system. Stowage is provided within the cabinet for loose items of equipment used in the various test procedures. In operation the kit is preset to a high, or low, pressure condition by the forward one of two selector cocks situated within the cabinet. The cock is spring loaded into the low-pressure (open) position and when operated against the spring loading to the high-pressure position, a metal retaining pin, to which is attached a warning pennant, is inserted into the body of the cock for the duration of high-pressure testing. The rear selector cock, when operated against its spring loading, relieves pressure to enable disconnection of the kit after test.

**62**. The pressure rig is similar to the standard type of oil replenishing rig and comprises a hand pump and reservoir tank with a delivery hose suitably terminated for connection to the adapter kit. Fuel in the tank is pressurized by the hand pump and applied to the aircraft fuel systems via the adapter kit, pressures being indicated on the kit gauges. Facility for pressure release after testing is provided.

**Note...**
*If an oil replenishing rig is used, it must be clearly marked 'KEROSENE' and used solely for fuel-test purposes to avoid contamination of the aircraft fuel systems.*

*Preparation of test equipment*

**63**. Prepare the adapter kit:-

(1) Remove the cabinet front-cover plate and loose items from within the cabinet.

(2) Remove the blanking plugs from the three connectors (two on left-hand side and one on right-hand side).

(3) From the loose items, connect the short rubber hose to the left-hand upper connector and the long rubber hose to the right-hand connector.

64. Prepare the pressure rig:-

(1) Replace the reservoir-tank cap with the screw-on adapter supplied; connect the free end of the short rubber hose to this adapter.

(2) Connect the free end of the pressure-rig hose to the lower left-hand connector in the adapter-kit cabinet.

(3) Turn the knob on the pressure rig front plate to 'PRESSURE'.

(4) Insert the pump operating handle.

*Reheat system test*

65.

(1) Position the test equipment alongside the rear fuselage.

(2) Turn the adapter kit pressure-selector cock in counter-clockwise direction to the high-pressure position and insert the retaining pin.

(3) Fit test blanks to the hot-shot fuel-supply pipe in No. 1 engine bay and the reheat fuel-supply pipe in No. 1 jet-pipe bay.

(4) Connect the long hose from the adapter kit to the reheat fuel supply test blank.

(5) Operate the pressure-rig handle to obtain 600 lb/in² pressure.

(6) Maintain pressure for 5 minutes and inspect the reheat fuel system pipes for leakages.

(7) Relieve test pressure by turning the pressure-rig control to 'RELEASE' then disconnect the hose from the reheat fuel supply test blank.

(8) Remove test blanks.

(9) Repeat the procedure (1) to (8) for No. 2 engine system.

(10) Remove the selector cock retaining pin and warning pennant.

*Low pressure system test*

66.

(1) Position the test equipment beneath No. 1 engine bay.

(2) Fit the appropriate test blank to No. 1 engine fuel-supply pipe.

(3) Connect the free end of the long hose from the adapter kit to the test blank.

(4) Remove access panel 41P; disconnect the reheat pump bleed pipe; fit blanks to both pump and pipe connectors.

(5) Select port fuel cock 'OPEN' and port fuel pumps 'ON' at cockpit switches.

(6) Bleed fuel pipes of air at the fuel-supply pipe test blank.

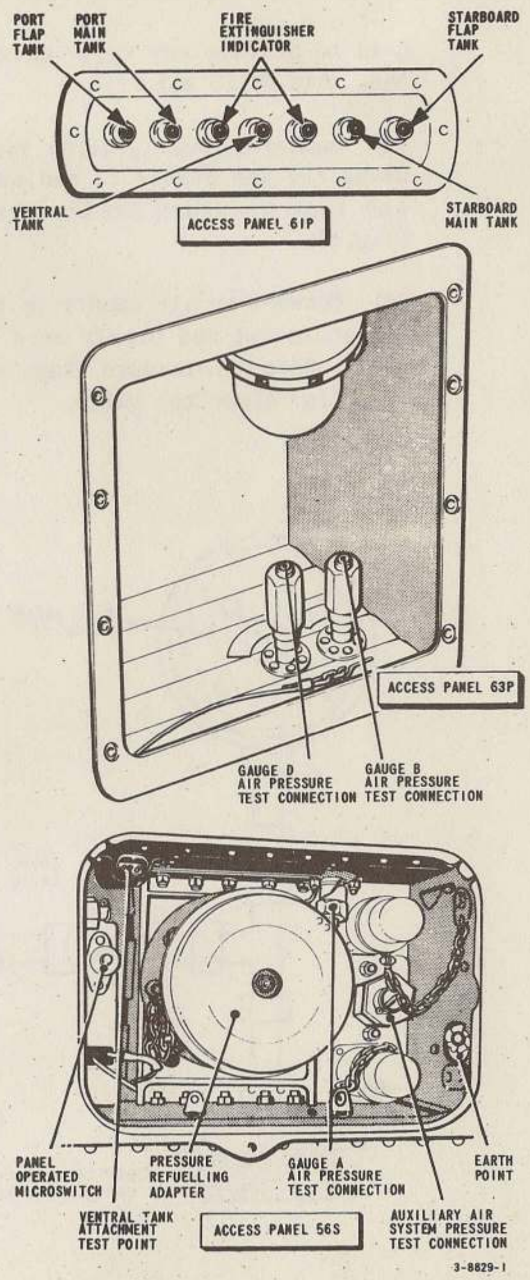



**Fig. 9. Fuel tank indicators and air pressure test connections**

(7) Close the port fuel cock and switch off fuel pumps.

(8) With the adapter kit pressure-selector cock in low-pressure position operate the pressure-rig handle until 70-75 $lbf/in^2$ is registered on the low-pressure gauge.

(9) Maintain the test pressure for 5 minutes and inspect the low pressure system pipes for leakages.

(10) Relieve the test pressure; disconnect the long hose.

(11) Drain the fuel pipes at the fuel supply pipe test blank.

(12) Remove the reheat pump test blanks and reconnect the bleed pipe. Replace access panel 41P.

(13) Position the test equipment at the starboard side beneath No. 2 engine bay.

(14) Repeat procedure (1) to (12) for No. 2 engine.

*High pressure (fueldraulic) system test*

67.

(1) Position the test equipment beneath the port wing wheel bay.

(2) Turn the adapter kit pressure selector cock to the high-pressure position and insert the retaining pin.

(3) Fit the appropriate test blank to the fueldraulic flexible supply pipe in No. 1 engine bay.

(4) Connect the high pressure adapter coupling to the inboard test connection in the port wheel bay.

(5) Release the access panel on the underside of the port wing, adjacent to the test points. Insert the fueldraulic cock operating handle, turn the cock to the closed position.

(6) Open the port L.P. transfer cocks.

(7) Operate the pressure-rig handle until 2000 $lbf/in^2$ is registered on the adapter-kit pressure gauge; maintain oressure for 5 minutes.

(8) Examine the fueldraulic pipes in No. 1 and 2 engine bays for leakages.

(9) Relieve the test pressure and disconnect the hose from the wheel bay test connection.

(10) Remove the test blank from the fueldraulic supply hose.

(11) Open the fueldraulic test cock, remove the operating handle and replace the access panel.

(12) Close the port L.P. transfer cocks.

(13) Position the test equipment beneath the starboard wing; repeat the procedure (1) to (12) for No. 2 engine system.

*Engine fueldraulic connection test*

68. To test the engine fueldraulic connection with the engine installed, the foregoing procedure *(para. 67)* is repeated with the exception of operation (3).

*Ground running pressure checks*

69.

(1) Position the test equipment beneath the port wheel bay.

(2) Fit the high-pressure right-angled coupling to the adapter kit supply hose and connect to the inboard test connection in the port wheel bay.

(3) Turn the adapter kit pressure selector cock to the high-pressure position and insert the retaining pin.

(4) Start No. 1 engine and adjust the speed to 60 per cent of maximum cold; the adapter kit gauge should register $500 \pm 50$ $lbf/in^2$.

(5) Increase engine speed to 100 per cent (maximum cold); the adapter-kit gauge should register $1250 \pm 100$ $lbf/in^2$.

(6) Decrease engine speed slowly to 60 per cent, disconnect the hose from the wheel bay test point.

(7) Relieve the hose pressure by operating the adapter kit pressure-release cock; remove the high-pressure right-angled coupling from the hose.

(8) Fit the low-pressure right-angled coupling to the hose and connect to the outboard test connection in the wheel bay.

(9) With No. 1 engine still at 60 per cent maximum cold, the low-pressure gauge should register $22 \pm 5$ $lbf/in^2$.

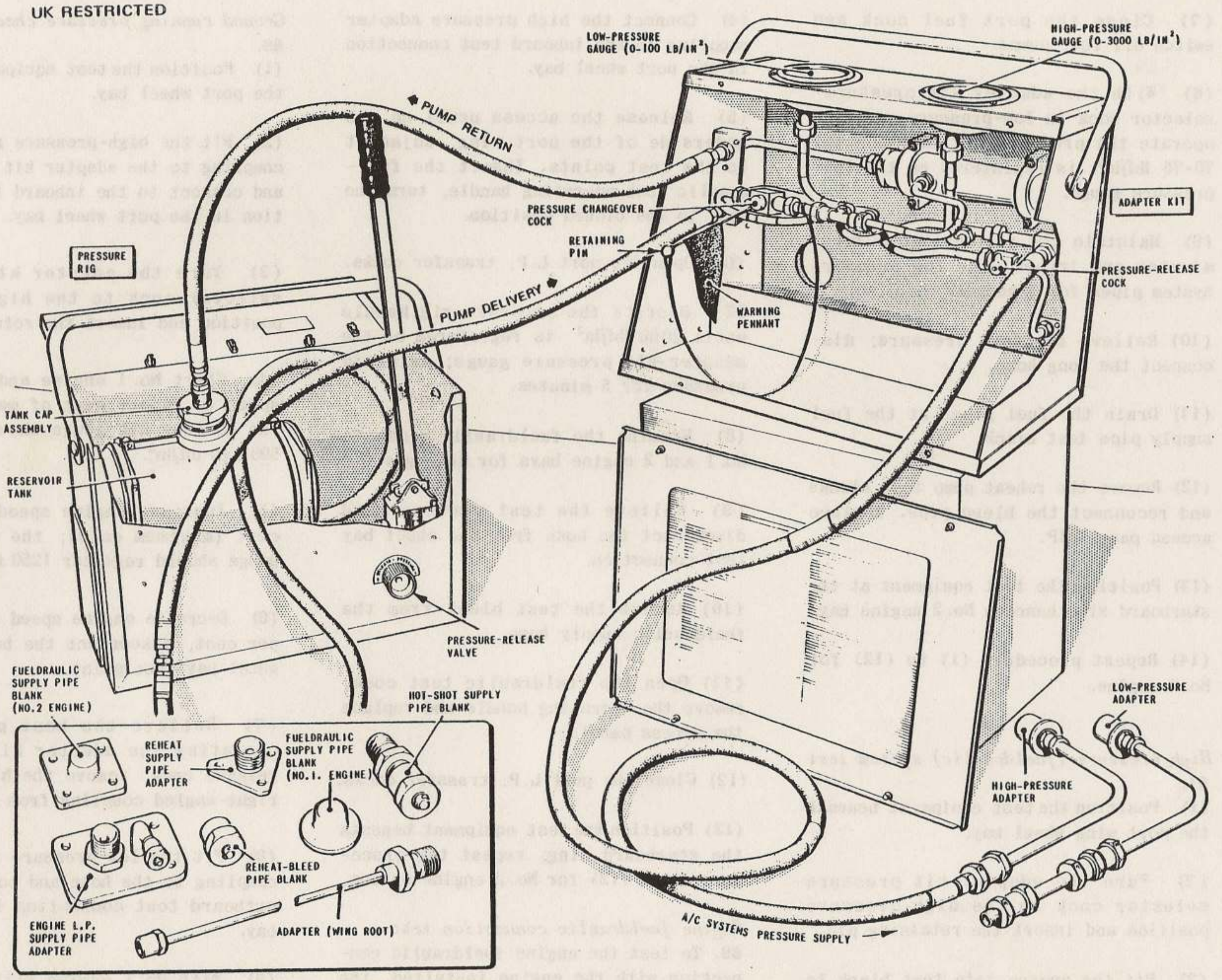



**FIG.10. FUEL SYSTEM PRESSURE — TEST EQUIPMENT**

*(Pump delivery and pump return pipes corrected)*


101B-1003-1A/158/8271353/3-85/BAe/2601

(10) Increase engine speed to 100 per cent maximum cold, the low-pressure gauge should register 50 ± 5 lb/in².

(11) Decrease engine speed to 60 per cent maximum cold; disconnect the test coupling from the wheel bay test point.

(12) Relieve the test pressure by operating the adapter-kit pressure-release cock.

(13) Repeat procedure (1) to (12) for No.2 engine system.

*Flight-refuelling probe pressure test*

**70.**
(1) Position the test equipment beneath the port wing.

(2) Refuel the aircraft with approximately 10 gallons of fuel, through the ground refuelling adapter, at 60 lb/in² pressure to ensure that all lines are filled.

(3) Remove the drain plug from the probe outlet elbow and replace with a suitable test adapter.

(4) Connect the adapter kit supply hose to the test adapter.

(5) Operate the pressure rig handle to obtain a pressure of 60 lb/in²: bleed air at the probe non-return valve.

(6) Maintain the test pressure for 5 minutes and check the probe assembly joints for leakages.

(7) Relieve the test pressure at the adapter-kit release cock, disconnect hose and remove the test adapter.

(8) Refit and wire-lock the drain plug assembly.

**Functioning checks**

*Equipment required*

**71.** A list of the equipment required during the following operations will be found in Table 2.

**Note...**
*In order that main plane tank pressures can be observed during the following test procedures, main-plane tank pressure gauges should be fitted for the duration of testing.*

*Main plane tanks refuelling*

**72.**
(1) Connect the external a.c. and d.c. power supplies. Remove access panels 124P and 124S.

(2) Isolate the flap tanks by disconnecting the electrical supply to each Mk.27 valve.

(3) Isolate the ventral tank by disconnecting the electrical supply to the Mk.7 valve.

(4) Refuel the main-plane tanks through the ground refuelling adapter at a pressure not exceeding 50 lb/in². Ensure that the outward vent valves are operating (pressure in the main tanks should not exceed 4 lb/in²).

(5) Record the time taken for each main-plane tank to fill and check that the appropriate 'tank full' indicator lamp extinguishes. The times taken to refuel each tank should not differ by more than 10 per cent.

(6) Reconnect the electrical supplies to the Mk.27 and Mk.7 valves.

*Flap tanks refuelling*

**73.**
(1) Connect a pressure gauge (0-30 lb/in²) to the test tapping, adjacent to the Mk.27 valve, in each flap tank fuel line.

**Note...**
*If the main-plane tanks are not full it will be necessary to energize the Mk.44 valves to the closed position.*

(2) Refuel the flap tanks at a pressure not exceeding 50 lb/in². The main plane tank pressures should not exceed 4 lb/in² and the flap tanks fuel lines pressures should not exceed 22.5 lb/in².

(3) Record the time taken for each flap tank to fill and check that the appropriate 'tank full' indicator lamp extinguishes. The times taken to refuel each tank should not differ by more than 10 per cent.

*Ventral tank refuelling*

**74.**
(1) Connect a pressure gauge (0-30 lb/in²) to the test tapping, located behind access panel 58S, in the ventral tank air supply line.

(2) Refuel the ventral tank at a pressure not exceeding 50 lb/in². During

this operation check the functioning of the outward-vent valve by observing the tank pressure. This should not exceed 2 lb/in².

(3) On completion of refuelling check that the appropriate 'tank full' indicator lamp extinguishes.

*Transfer pumps*

75. The functioning of each d.c. transfer pump is checked electrically using the tong-test ammeter in the test loops provided as described in Sect. 6, Chap. 10.

*Booster pumps*

76. With the adapter kit connected to the appropriate wheel bay low pressure test point, the port and starboard booster pump output pressures can be recorded as follows:-

(1) Start the No. 2 engine and adjust the speed to 50 per cent rev/min; check all engine connections to ensure no leakages.

(2) Check that the starboard booster pump output is 20 ± 5 lb/in².

(3) Increase the No. 2 engine speed to 95 per cent rev/min; check all engine connections to ensure no leakages.

(4) Check that the starboard booster pump output is 50 ± 5 lb/in².

(5) Reduce the No. 2 engine speed to not less than 60 per cent rev/min.

(6) Repeat the procedure (1) to (4) for the No. 1 engine and port booster pump.

(7) Reduce No. 1 engine speed to 50 per cent rev/min.

(8) Stop both engines.

*Flap tank transfer*

77.

(1) Ensure that there is sufficient fuel (up to a maximum of 1000 lb) in each main-plane tank to give a definite reading on the cockpit fuel contents gauges. Hold the refuelling access panel microswitch depressed.

(2) Fit pressure gauges (0-30 lb/in²) to the flap transfer line test points, and disconnect the electrical supply leads to each Mk. 27 valve.

▶◀

(3) Remove access panels 99P and 99S and select the two manually operated defuelling cocks to ISOLATE WING TANKS.

(4) Using the lifting tool open the main tank outward-vent valves.

(5) Energize both Mk. 44 valves and connect an air supply to the pressure test point at access panel 63P.

(6) Note the no-flow pressure in each of the flap tank transfer lines; this should not be less than 8 lb/in². Check, by reference to the cockpit fuel contents gauges, that no transfer takes place while this pressure is applied.

(7) De-energize the Mk. 44 valves and check that fuel transfer is taking place by reference to the cockpit fuel contents gauges. After 5 minutes the amount transferred should not be less than 120 lb to each main-plane tank.

(8) On completion of transfer the amount transferred should not be less than 250 lb to each main-plane tank.

(9) Reconnect the electrical leads to the Mk. 27 valves. ▶◀

*Ventral tank transfer*

78.

(1) Ensure that there is not more than 1000 lb of fuel in each main-plane tank. Hold the refuelling access panel microswitch depressed.

(2) Note the reading on each of the cockpit fuel contents gauges. Check that the ventral tank air supply pressure is not greater than 15 lb/in² and not less than 12.5 lb/in².

(3) Select the defuelling cocks to NORMAL simultaneously and check that fuel transfer is taking place by observing the cockpit fuel contents gauges. After 3 minutes the amount transferred should not be less than 250 lb to each main-plane tank.

(4) On completion of transfer the total amount transferred should not be less than 1950 lb and the amounts to each tank should not differ by more than 156 lb.

(5) Check the ventral tank air supply pressure is not greater than 15 lb/in² and not less than 12.5 lb/in².

*Wing-to-wing transfer*

**79.**

(1) Ensure that there is sufficient fuel (up to a maximum of 1000 lb) in each main-plane tank to give a definite reading on the cockpit fuel contents gauges.

(2) Using the lifting tool, open the starboard main-plane outward vent valve.

(3) Switch the No.1 (port) fuel pumps 'ON' and select the fuel transfer switch to 'STARBOARD'. Check that the fuel transfer indicator lamp is lit.

(4) Check that transfer is taking place by observing a registered increase on the starboard main fuel gauge; this should not be less than 375 lb in 5 minutes.

(5) Cancel the fuel transfer to 'STARBOARD' selection. Check that on cancellation the indicator lamp extinguishes momentarily, then lights for the period taken by the transfer valve to close (2-3 seconds), and then extinguishes.

(6) Close the starboard main tank outward vent valve.

(7) Open the port main tank outward vent valve and repeat the test procedure (3) to (5), making the appropriate switch selections.

(8) Close the port main tank outward vent valve.

*Flight refuelling check*

**80.**

(1) Fit the test pressure gauge to the ventral tank air supply test connection *(fig.8)*.

(2) Select the cockpit flight-refuelling switch to FLT. REFUEL and check that the ventral tank air supply pressure is not greater than 1 lb/in².

(3) Check that the cockpit indicator lamps are lit.

(4) Depress the ground-refuelling panel microswitch for the duration of the test procedure.

(5) Completely refuel the aircraft through the ground-refuelling adapter at a pressure not exceeding 50 lb/in²; check that the indicator lamp for each tank extinguishes as the tank becomes full.

(6) Remove approximately 50 gallons from each main tank through the engines fuel supply hoses.

(7) Reselect the cockpit flight-refuelling switch to NORMAL and check that the ventral tank commences to transfer.

(8) When the main tanks are full, check that ventral-tank transfer ceases.

*Aircraft drainage check*

**81.** On completion of the preceeding test, carry out the drainage test procedure as follows:-

(1) Commence draining all usable fuel through the engine inlet fuel pipes.

(2) As drainage progresses check the fuel transfer sequence by periodic reference to the cockpit fuel contents gauges.

(3) When the contents of both main-plane tanks have fallen to 2000 lb, select the flight refuelling switch to FLT. REFUEL. During the remainder of main-plane tank drainage the tank pressure should not fall lower than 1.5 lb/in² below atmospheric pressure if the inward-vent valve is functioning correctly.

(4) Disconnect the air supply and test gauge; release the microswitch plunger and replace the access panels.

(5) Select the flight refuelling switch to NORMAL.

**Rectification of leaks**

**82.** Refer to A.P.101B-1000-6.

◀ *Fault diagnosis*

**82A.** To assist in the efficient diagnosis and rectification of fuel system faults, tables 4 to 11 have been provided which detail the symptoms exhibited when component failure occurs.

**82B.** When a venting fault arises and the defective component is not immediately indicated by the symptoms displayed, proceed as follows:-

(1) Ensure the d.c. fuse is serviceable.

(2) Position observers so that each venting outlet can be monitored.

(3) Isolate the port or starboard tanks by defuel cock selection so that the side where venting was observed is refuelled.

(4) Remove the refuel access panel and isolate the flap tank by electrically disconnecting the Mk.27 refuel/defuel valve.

(5) Connect the refueller and commence to refuel. If venting occurs:-

(a) Before the main tank fills - the vent pipe rubber NRV has failed, or the outward vent valve 'O' ring is damaged. ▶

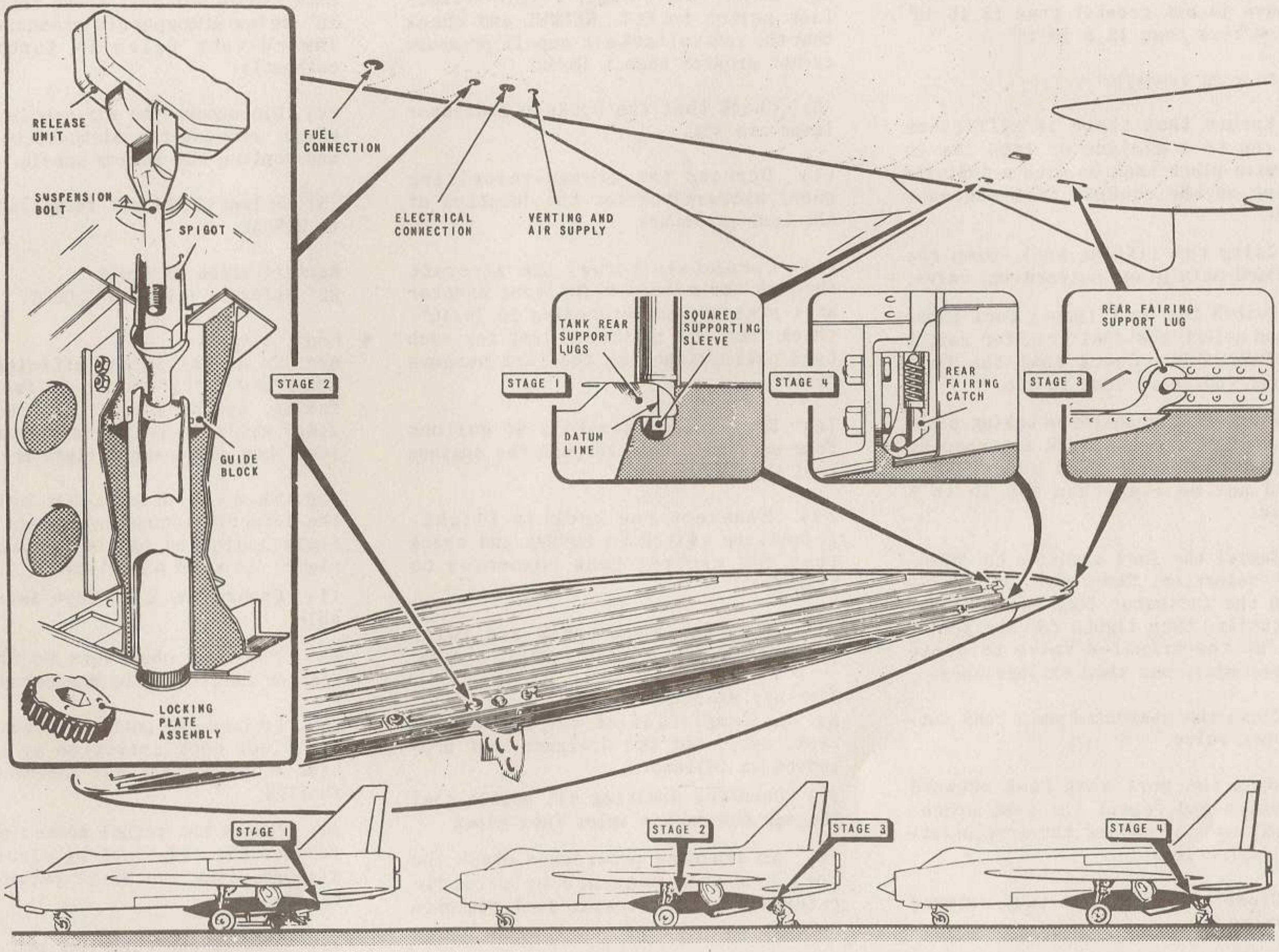



FIG. 11. VENTRAL TANK – REMOVAL AND ASSEMBLY

3-8812-1

(b) When the tank is full, and the tank full light is not indicating correctly - the high level float switch has failed.

(c) When the tank is full, and the tank full light indicates full - the faulty component is either the Mk.44 valve, or the high level float switch.

**Note...**
*Replace the most accessible component first.*

(d) From the opposite wing - the outward vent valve on the refuelled side has failed closed.

(6) If no venting occurs then the fault lies either in the flap tank components or in the opposite wing. Proceed as follows:-

(7) Reconnect the Mk.27 flap tank valve disconnected at operation (4) and continue to refuel. If venting occurs:-

(a) When the tank is full, and the tank full light is not indicating correctly - the high level float switch has failed.

(b) When the tank is full, and the tank full light indicates full - the faulty component is either the Mk.27 valve, or the high level float switch.

(8) If no venting occurs on the refuelled side, repeat operations 4 to 7 inclusive on the opposite wing.

## REMOVAL AND ASSEMBLY

**General information**
83. Instructions for the removal and assembly of system components are given in the following paragraphs. Assembly is normally the reverse of the removal procedure; where this is not the case the fact is noted. Equipment and tools required to perform the operations are listed in Table 2.

**Note...**
1. *Serviceable rubber components removed from the fuel system are to be completely immersed in aircraft fuel, in an opaque container fitted with a lid. They are not to be allowed to dry out or subsequent failure may occur.*

2. *When refitting non-return valves it is essential to check that they are not reversed.*

3. *Non-return valves must not be dismantled; suspect valves are to be rejected and serviceable items fitted.*

4. *When refitting Flight Refuelling connectors to fuel pipes within the fire zones (Sect.4, Chap.5) new Series 1 seals (black) must be used. For details of seals and connectors refer to fig.19 and Table 3.*

5. *When refitting Saunders multi-way valve, it is essential that the U.K.A.N. connector is wire-locked to the valve mounting structure only.*

**Ventral tank** *(fig.11)*
*Removal*
84. To remove the ventral tank in its fuelled or defuelled condition:-

(1) Remove the tank fairing by disengaging the catch with a ¼ in. dia. rod and pushing the fairing aft until it is free to pivot downwards about the lug, allowing the lug to disengage from the spring-loaded pin.

(2) Position the handling trolley beneath the tank. Adjust the trolley to give adequate support.

(3) Operate the ventral tank jettison handle in the cockpit to disengage the suspension bolt from the release unit.

(4) If the tank is to be refitted, mark a datum line on the rear feet of the tank corresponding with the centre line of the squared supporting sleeves *(fig. 11, stage 1)*.

(5) Remove the bolts and squared sleeves retaining the tank rear supporting lugs between the spring-loaded forks, and lower the tank.

(6) Blank off all apertures and, if the tank is not to be refitted immediately, place it in the storage stand.

*Assembly*
85. To fit the ventral tank:-

(1) Unscrew the tank suspension bolt from the locking tube and withdraw the tube, spring, and locking plate from the tank.

(2) Insert the yoke-end of the tank suspension bolt through the aperture in the fuselage skin, so that the yoke engages the release unit *(fig.11, stage 2)* and cocks the mechanism. Check that the suspension bolt is secure.

(3) Connect a lamp and battery continuity tester across the pins of the test plug located behind access panel 63P. Check that the lamp is illuminated to indicate that the release unit is correctly cocked.

(4) Mount the tank on the handling trolley. Inspect the tank and aircraft connectors for cleanliness and ensure that all blanks are removed. Position the trolley beneath the aircraft.

(5) Using the spring retaining tool, pull down the two spring-loaded forks in the fuselage at frame 54 and hold them in their extended position. Manoeuvre the tank so that its rear supporting lugs fit between the forks, then insert the squared sleeve between each fork, retaining each sleeve with

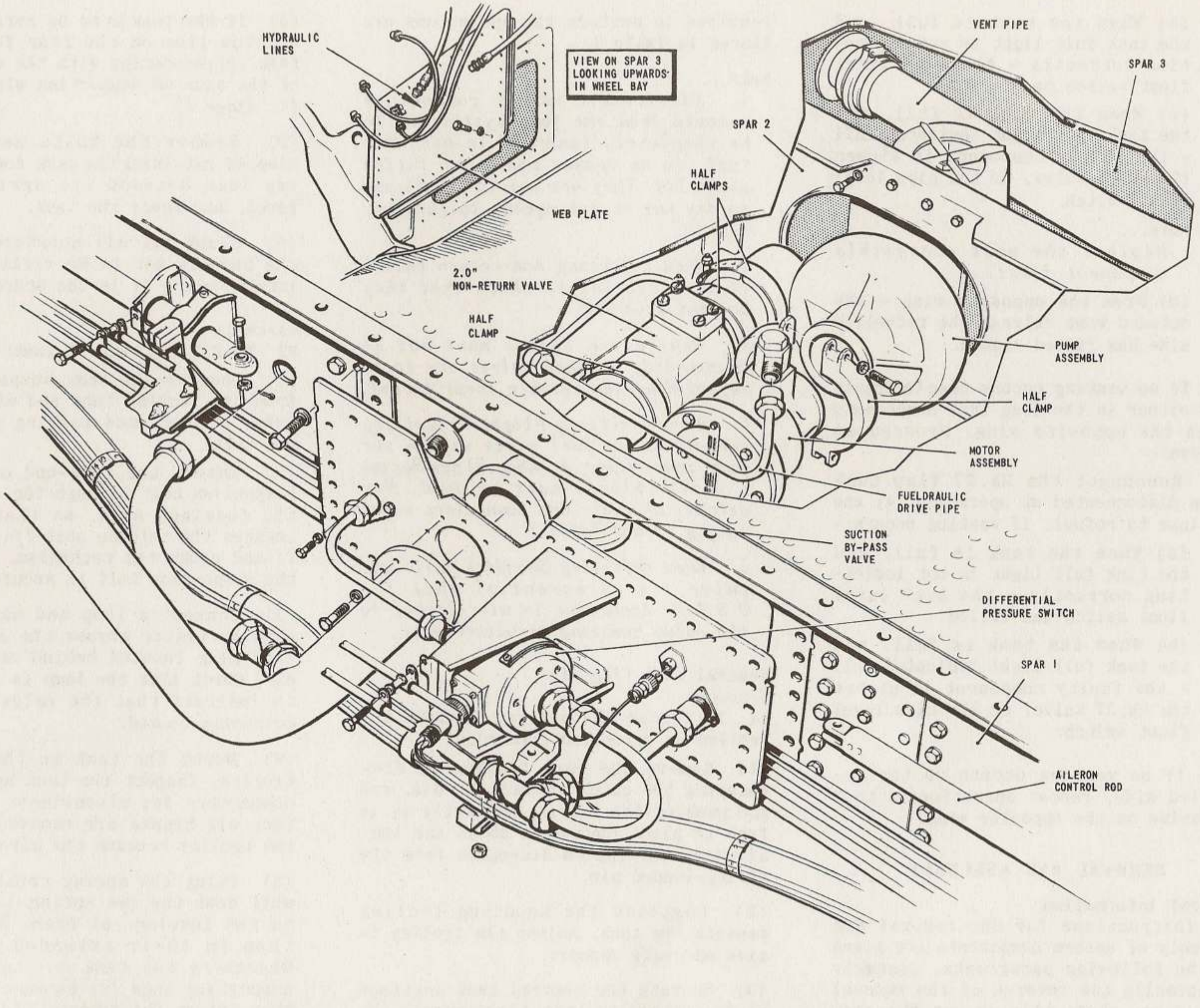



**FIG. 12. BOOSTER PUMPS - REMOVAL AND ASSEMBLY**

◀ MINOR AMENDMENTS ▶

the special-to-type bolt. Secure each bolt with a washer, slotted nut, and split pin.

(6) Carefully align the datum lines made in para.84(4) (the positions of the rear feet on the squared sleeves are critical).

(7) Manoeuvre the tank so that the spigot is central fore and aft and aligned by eye with the socket in the fuselage. Slowly raise the tank on the trolley, and, as the spigot approaches the bolt, check with a torch through the bottom housing that the bolt is centring correctly. Very carefully operate the hydraulic lift and feel if there is any resistance to the spigot entering the socket. Any such resistance will indicate malalignment and the tank must be levered forward or aft to reposition the rear feet on the supporting sleeves before completing the lift *(fig.11, stage 2)*.

(8) Insert the locking tube assembly through the serrated aperture in the tank skin, and screw the tube on to the suspension bolt until it is finger-tight.

(9) Push the spring over the hexagon on the lower end of the locking tube assembly, and insert the locking plate assembly (tongued plate uppermost) into the serrated aperture in the tank skin, so that it passes over the hexagon. Rotation of the locking tube will probably be necessary before this is possible.

(10) Tighten the locking tube assembly with a torque wrench fitted with a ½ in. B.S.F. socket; press upwards with the socket to disengage the serrations of the locking plate assembly before attempting to tighten. Set the wrench to slip at $450^{+50}_{-0}$ lb/in.

(11) Remove the wrench, whereupon the locking plate assembly will be pushed downwards by the spring. If the serrations will not engage when the hexagons are aligned, slacken the locking tube assembly slightly (the maximum angle through which the locking tube assembly will require to be slackened is less than 10 degrees). If the tongues on the locking plate assembly coincide with the gaps in the serrations when the hexagons are aligned, disengage the locking plate assembly and rotate it through 60 degrees.

(12) Fit the tank fairing by inserting the lug, at the aft end of the fairing, through the aperture in the fuselage skin *(fig.11, stage 3)*, so that it engages the spring-loaded pin and moves the pin rearwards. Pivot the fairing forward and upward until the upper surface fits the fuselage skin contour, then move the fairing forward to engage the fairing lock bolt with the catch on ▶ the tank. Check that the wire mesh at ◀ the forward end of the tank is in contact with the engine-hatch skin.

(13) If the tank is empty, check the correct functioning of the tank pressure-relief valve by screwing a ¼ in. B.S.F. eyebolt into the valve head, and applying a pull force with a spring balance. The valve should open with a pull of 65± 5 lb.

**Leading-edge and flap tanks**

**86**. Refer to Sect.3, Chap.2.

**Booster pump**

*Removal*

**87**. To remove the pump:-

(1) De-fuel the associated main-plane tank *(Sect.2, Chap.2)*.

(2) Remove the inboard leading-edge fairing and access panel 100.

(3) Unstrap the electrical cable loom traversing spar 1.

(4) Release a sufficient number of hydraulic pipe fairleads to permit removal of the web plate giving access to the collector box.

(5) Disconnect and remove the short section of aileron control rod.

(6) Disconnect and remove the vent valve static pipe.

(7) Remove the web plate bolts and the web plate, taking care to avoid damaging the bonded rubber seal.

(8) Disconnect the fueldraulic drive pipe from the motor.

(9) Unfasten and remove the two half-clamps attaching the motor to the pump assembly and remove the motor.

(10) In the appropriate main-undercarriage bay, disconnect the undercarriage hydraulic lines to enable the access panel to be removed from spar 3. Remove the access panel.

(11) Disconnect and remove the fuel compartment vent pipe.

(12) Remove the eight bolts attaching the flange of the pump assembly to spar 2 and withdraw the pump.

*Assembly*

**88**. Assemble in reverse order ensuring that the 'O' ring and web plate seals are serviceable. The web plate securing bolts must not be overtightened.

**Note**...

*After assembly is complete, the services and No.1 controls hydraulic systems must be primed, bled and tested (Sect.3, Chap.6)*.

**Transfer pump** *(fig. 13)*

*Removal*

**89.** To remove a transfer pump:-

(1) Defuel the associated tank *(Sect. 2, Chap. 2)*.

(2) Remove the circular access panel in the upper skin of the main or leading-edge tank from which the pump is to be removed.

(3) Remove the locking circlip from the pump housing.

(4) Unscrew the pump housing cover, using a 7/8 in. B.S.W. box spanner or socket.

(5) Disconnect the two electrical cables from the pump terminals and carefully bend them clear of the pump.

(6) Insert the eyebolt into the tapping in the pump upper surface and withdraw the pump by exerting a straight pull.

*Assembly*

**90.** To fit a transfer pump:-

(1) Using a suitable probe, ensure that the bleed hole in the pump housing outlet pipe is not obstructed.

(2) Lightly lubricate the 'O' rings of the pump with grease XG-410 and insert the pump into its housing, ensuring that the locating dowel enters its slot.

(3) Secure the pump and restore the system to normal by reversing the removal procedure *(para. 89)*.

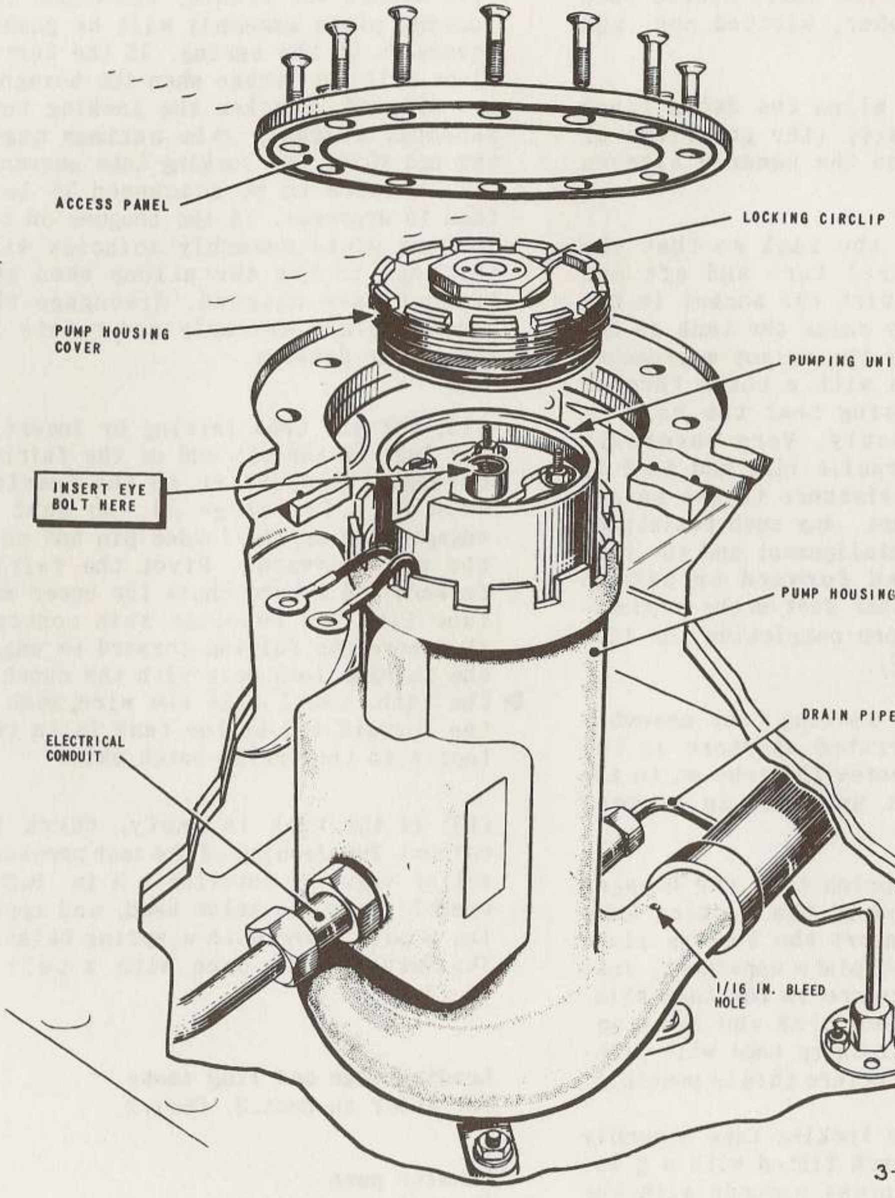



**Fig. 13. Transfer pump - removal and assembly**

**No.1 reheat fuel pump** *(fig.14, detail B)*

**Note...**
*Numerals related to components are common to text and illustration.*

*Removal*

**91.** To remove the pump:-

(1) Remove No.1 E.C.U. *(Chap.1)*.

(2) Remove the turbine air inlet pipe (3) by disconnecting at the turbine.

(3) Remove the turbine exhaust pipe (1) by disconnecting at the turbine and at the fuselage skin.

(4) Disconnect the fuel inlet pipe (9) at the pump flange.

(5) Disconnect the fuel outlet pipe (8) from the pump. Retain the nipple.

(6) Disconnect the drainpipes from the fuel pump *(detail C-10)* and oil reservoir *(detail A-11)*.

(7) Disconnect the servo-bleed pipe (7) from the servo-bleed casing. Retain the nipple.

(8) Disconnect the electrical cable to the servo-bleed solenoid (6).

(9) Remove three bolts securing the pump casing to the fuselage mounting bracket (4).

(10) Sever the locking wire on the tension clip bolt (2), remove the bolt and lift the pump out of the fuselage.

(11) Blank off all apertures and pipes on the pump and fuselage.

*Assembly*

**92.** To refit the pump reverse the removal operations *(para.91)*, observing the following precautions:-

(1) All bolts and nuts, with the exception of the tension clamp bolt, are to be locked with serviceable spring washers. The tension clamp must be wire-locked.

(2) Pipe nipples are to be fitted at the fuel outlet (8) and servo-bleed (7) connections.

(3) All sealing and insulating gaskets are to be examined for serviceability and renewed as necessary.

**No.2 reheat fuel pump** *(fig.14, detail D)*

*Removal*

**93.** To remove the pump:-

(1) Remove No.2 E.C.U. *(Chap.1)*.

(2) Fit the fuselage walkway.

(3) Remove the turbine air inlet pipe by disconnecting at the turbine.

(4) Disconnect the turbine exhaust pipe (1) at the turbine.

(5) Disconnect the fuel inlet pipe by releasing the split clamp (5) between the pump and the filter.

(6) Disconnect the fuel outlet (8) from the pump and retain the nipple. Exercise care to avoid damaging the fire seal in the fire floor.

(7) Disconnect the drainpipes from the fuel pump (9), and oil reservoir *(detail A-11)*.

(8) Disconnect the oil reservoir replenishing pipe *(detail A-10)*.

(9) Disconnect the servo-bleed pipe at the servo-bleed valve casing (7). Retain the nipple.

(10) Disconnect the electrical cable to the servo-bleed valve solenoid (6).

(11) Remove three bolts securing the pump casing to the fuselage mounting bracket (4).

(12) Sever the locking wire in the tension clip bolt (2) remove the bolt and lift the pump out of the fuselage.

(13) Blank off all pipes and apertures in the fuselage and on the pump.

*Assembly*

**94.** To refit the pump reverse the removal sequence *(para.93)*, observing the necessary precautions *(para.92)*.

**Integral tank inward-vent valve** *(fig.15)*

*Removal*

**Note...**
*Removal of the integral tank inward-vent valve 'breaks' the static system and reference must be made to Sect.7, Chap.5, for the test procedure necessary after assembly.*

**95.** To remove the valve:-

(1) Ensure that the valve heater switch *(Sect.1, Chap.1)* is OFF.

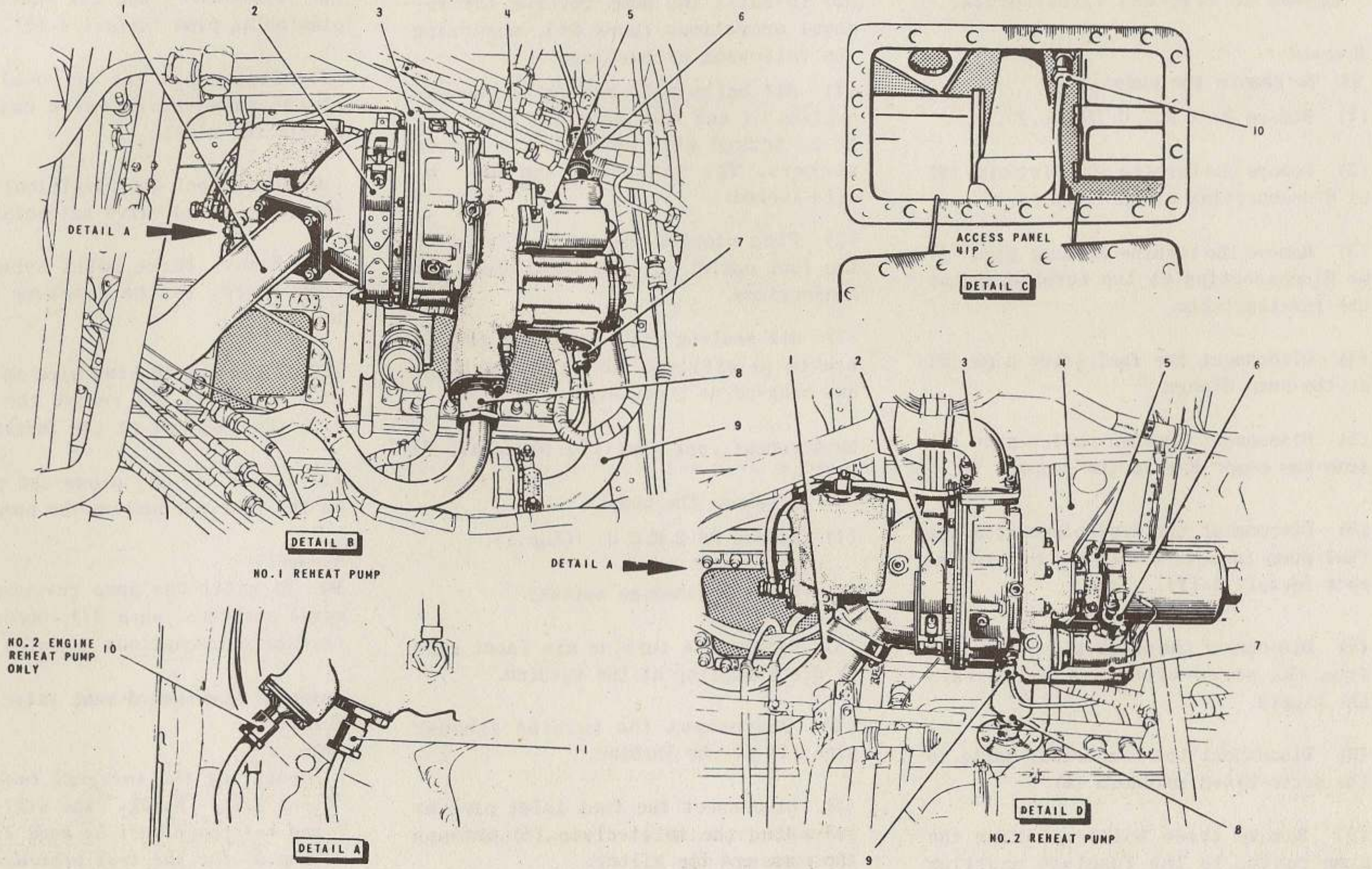



FIG. 14. REHEAT PUMPS - REMOVAL AND ASSEMBLY

3-8815-1

(2) Remove the access panel in the main wheel well forward wall.

(3) Disconnect the heater element electrical cable at the valve.

(4) Slacken the hose clips on the corrugated rubber hose and slide the hose forward.

(5) Disconnect the static air pipe at the valve.

(6) Remove three nuts securing the valve to rib 13 and withdraw the valve (the valve mounting flange is sealed with a rubber ring which may become detached when removing the valve).

*Assembly*

**96.** To assemble the vent valve to the aircraft reverse the removal sequence *(para. 95)*.

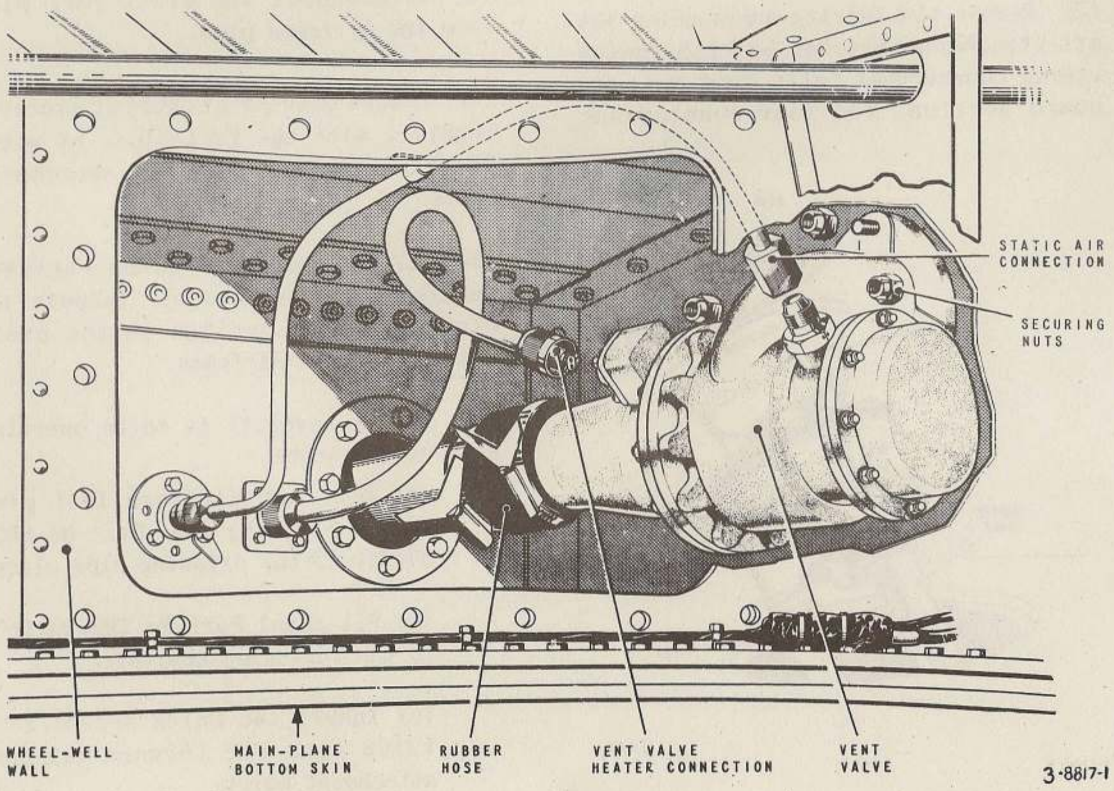



**Fig. 15. Integral tank inward-vent valve - removal and assembly**

**Integral tank outward-vent valve** *(fig. 16)*
*Removal*

**97.** To remove the valve:-

(1) Remove the cowl from the main plane upper surface.

(2) Remove the quick-release cover from the valve.

(3) Remove sixteen countersunk bolts around the valve periphery and lift the valve sufficiently to reveal the bottom surface.

(4) Disconnect the flexible pipes and the valve heater electrical cable.

**Note...**
*Take care not to immerse the open ends of the flexible pipes in fuel.*

(5) Remove the vent valve from the tank.

*Assembly*

**98.** To assemble the valve to the aircraft reverse the removal sequence *(para. 97)*.

**Vent valve control valve** *(fig. 17)*
*Removal*

**Note...**
*Removal of the vent valve control valve 'breaks' the static system, and reference must be made to Sect. 7, Chap. 5 for the test procedure necessary after assembly.*

**99.** To remove the valve:-

(1) Defuel the associated tank.

(2) Remove the float switch panel *(para. 101)*.

(3) Disconnect the three air pipes from the valve.

(4) Unscrew the bolts, securing the valve to the detachable mounting bracket, just sufficiently to allow the valve to be tilted and withdrawn from the bracket *(detail A)*.

(5) Detach the valve from its bracket and withdraw it through the float switch aperture.

*Assembly*

**100**. To assemble the valve reverse the removal sequence *(para. 99)*.

**Main tank high level float switch** *(fig. 17)*

*Removal*

**101**. The float switches are mounted on the lower surface of two circular panels, one for each tank, which are accessible inside No. 2 engine intake duct. The switches are withdrawn with their respective panels after unscrewing the countersunk bolts and the electrical cable. To detach the switch from the panel release the two bolted straps.

*Assembly*

**102**. When assembling a replacement switch to the bracket, the switch height is determined by the pitch of the locating straps and shoulders on the switch body. To ensure that the float arm does not foul the delay tank however, it is essential that the long edge of the float arm pivot block is set parallel to a straight edge placed across the mounting bracket flanges.

**Flight-refuelling probe** *(fig. 18)*

*Removal*

**103**. To remove the probe:-

(1) Remove the fairing surrounding the forward attachment bracket by withdrawing ten countersunk bolts, five at each side.

(2) Remove the fairing surrounding the aft attachment bracket by withdrawing eleven countersunk bolts from the outboard section, and four countersunk bolts which enter the bracket from the inboard section.

(3) Support the probe and remove the bolts securing the forward bracket to the main plane and withdraw the probe and bracket forward from the aft bracket.

(4) Remove the split panel where the probe fuel pipe enters the main plane.

(5) Disconnect the probe fuel pipe from the airframe pipe.

(6) Remove the rear attachment bracket, complete with the fuel pipe, by withdrawing the three bracket attachment bolts.

(7) If the probe is to be refitted before subsequent flight, temporarily blank off all openings in the probe aft bracket and airframe.

(8) If the aircraft is to be operated without the probe:-

(a) Seal the airframe fuel pipe with a blanking cap, Part No. EB3. 57.221 and the existing pipe clamp.

(b) Fit panel Part No. EB3.20.1603 to the fuel pipe aperture.

(c) Insert two bolts Ref. No. 28D/12166 into the forward bracket attachment holes.

(d) Insert two bolts Ref. No. 28D/12166 into the aft bracket attachment holes in the main-plane skin

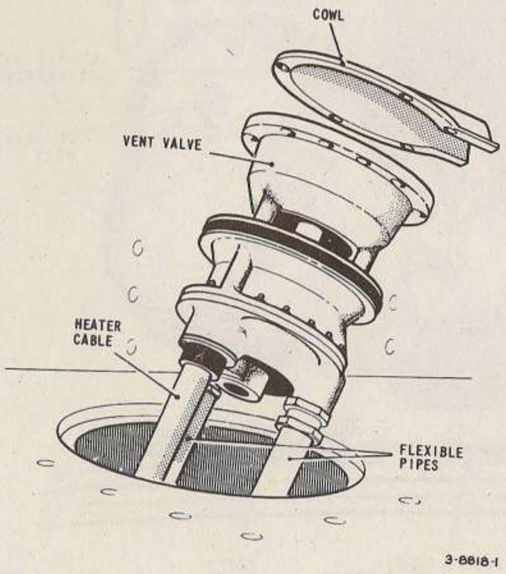



**Fig. 16. Integral tank outward-vent valve - removal and assembly**

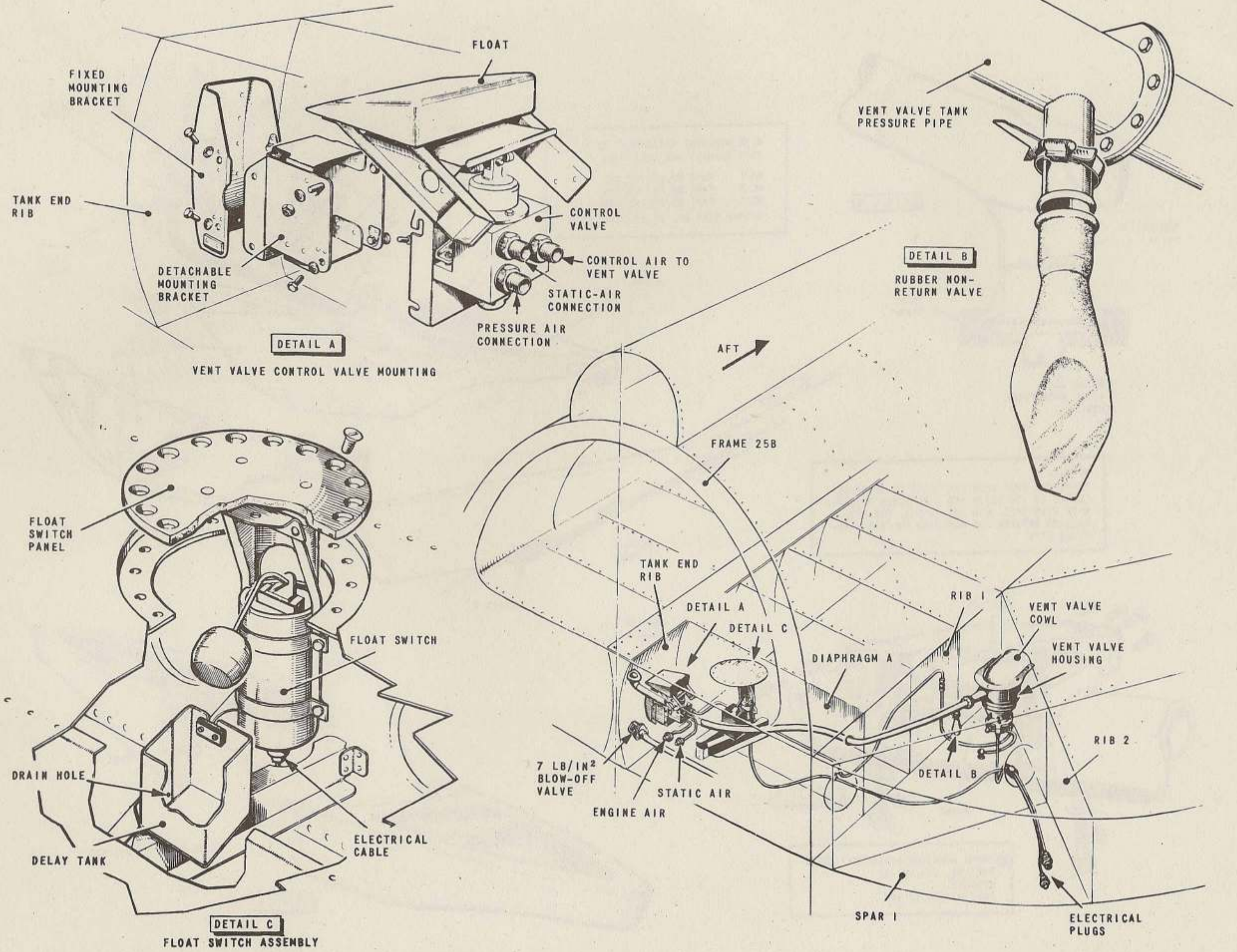



**FIG. 17. COMPONENTS - MAIN - PLANE TANK – INBOARD**

3-8820-1

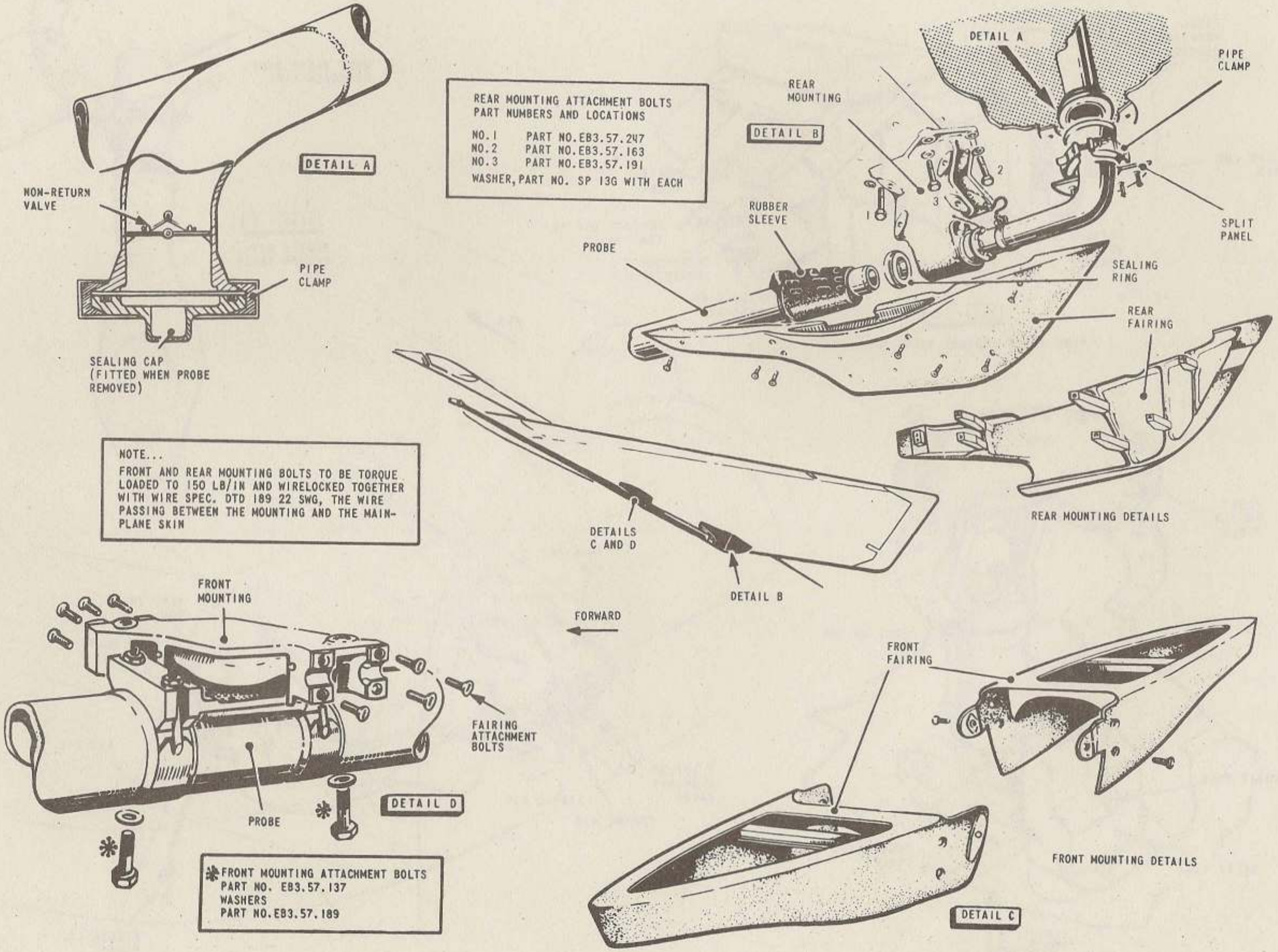



**FIG. 18. FLIGHT REFUELLING PROBE - REMOVAL AND ASSEMBLY**

3-8835-1

and one bolt Ref. No.28D/12199 into the attachment hole in access panel 99P.

Note . . .

*Return the following items to storage:*

*Probe*

*Probe attachment brackets and bolts*

*Fairings and bolts*

*Split panel.*

*Assembly*

**104.** To fit the probe:

(1) If the probe has been withdrawn from storage:

(a) Remove the mushroom-head bolts from the five bracket-attachment positions in the lower skin of the port main plane.

(b) Remove the circular closing panel, outboard of the defuelling cock access panel.

(c) Release the pipe clamp around the airframe fuel pipe and detach the blanking cap.

Note . . .

*Return the bolts, panel and cap to storage for use when the probe is not fitted.*

(2) Secure the probe aft attachment bracket to the main plane. Lock the bolts with a double strand of 22 s.w.g. D.T.D.189 locking wire.

(3) Fit the clamp to the aircraft-to-probe fuel pipe joint.

(4) Fit the two sections of the split closing panel with joint disposed fore-and-aft.

(5) Check that the rubber sleeve is fitted over the aft end of the probe. Seal the leading edge of the sleeve to the probe with a bead of PR.1422A-1/2.

(6) Lubricate the 'O' rings in the probe aft end with fuel and insert the probe into the aft attachment bracket.

(7) Secure the forward attachment bracket to the main plane and wire-lock the bolts with a double strand of 22 s.w.g. D.T.D.189 locking wire.

(8) Assemble the fairings to the forward bracket and secure them with ten countersunk bolts Ref. No.28D/13786 and lock washers Ref. No.28W/1013428.

(9) Assemble the inboard section of the aft fairing to the attachment bracket and secure it with four countersunk bolts, Ref. No.28D/12760.

(10) Offer up the outboard section of the aft fairing and secure it to the inboard section and the attachment bracket, using four bolts, Ref. No.28D/12760 through the bracket, four bolts Ref. No.26DK/2214 through the fairing holes nearest the bracket and three bolts Ref. No.26DK/10079 in the remaining positions.

**Fueldraulic cock (Saunders)**

*Replacement of spindle 'O' ring seals in-situ*

**105.** Should leaks occur around the spindle of the Saunders fueldraulic cock (27FS/1454774) it is permissible to replace the spindle 'O' ring seal in-situ provided the following precautions are observed and the system is pressure tested after completion of the replacement:

(1) Ensure that the spherical plug is not disturbed when the spindle is removed from the valve.

(2) Ensure that the spindle is correctly aligned with the locating groove.

*High pressure leak test (after spindle 'O' ring seal replacement)*

**WARNING**

**The maximum pressure for testing the fueldraulic cock after an 'O' ring seal change in-situ is 2000 lb/in². Should it be deemed necessary to test the cock at any higher pressure, the cock is to be removed from the aircraft and tested under bay servicing conditions.**

**106.**

(1) Ensure the main plane fuel tanks are refuelled.

## REQUIREMENT

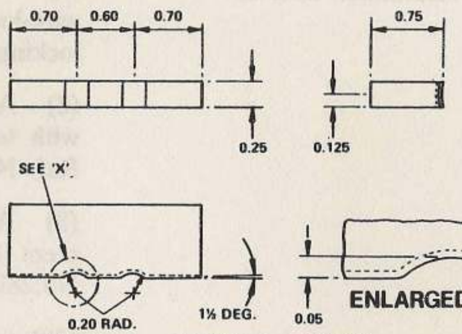
Manufacture a setting gauge to the instructions given in Detail A, using B.S.970 EN3B steel, (cadmium plated to D.T.D.904) or an approved alternative.

Using the setting gauge as shown in Detail C check the distance between the beads on the respective pipe ends in at least three locations. Ensure that any pipe offset is not greater than 1/16 in. (measured at the beads). Detail B shows a typical bead section.

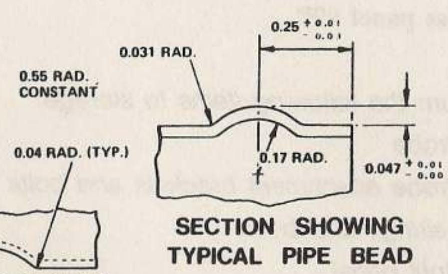
NOTE . . .
Slight adjustment of a pipe position may be possible when the appropriate clamps are loosened.

Pencil mark the position of the 1/4 in. edges of the setting gauge on the pipe at each of the three locations and remove the gauge.

Refer to Detail C. Wrap each pipe with 8 mm. wide white tape having a gloss finish to Scotchcal 3650 and 3980 specifications, or approved alternatives. The edges of the tapes nearest the pipe beads must be aligned with the pencil marks.




DETAIL A SETTING GAUGE




DETAIL B

ALL DIMENSIONS ARE IN INCHES

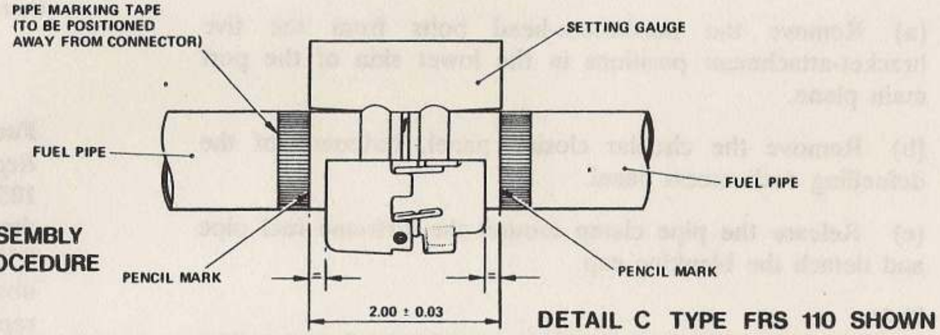
## ASSEMBLY OF FRS 110 CONNECTORS TO PIPES

1. Assemble a new seal, lubricated with the XG276 , with the split collars and the two halves of the connector on the pipe joint. Ensure that the split collars are correctly seated in the two halves.
2. Hand tighten the connector and check that not more than two threads on the male half are visible.
3. Tighten the female half to the respective torque, using special spanners FRS 58 and FRS 124 or suitable alternatives.
4. Fit the locking ring to the connector, apply tightening action only when necessary.
5. Check the distance between the inner edges of the tape, Detail C, and that the connector body lies approximately central.

## ASSEMBLY OF FRS 380 & FRS 1230 CONNECTORS TO PIPES

1. Assemble two new 'O' rings lubricated with GREASE XG276, with the split collars and the retaining rings to the inner sleeve. Ensure that the split collars are correctly seated.
2. Hand tighten the two outer sleeves to the inner sleeve. Check the symetry of exposed threads.
3. Tighten each outer sleeve to the respective torque or in the case of FRS 380-L-1 by a half turn to each side. Use special spanners FRS 58 and FRS 124 or suitable alternatives.
4. Wirelock the outer sleeves using D.T.D.189 locking wire.
5. Check the distance between the inner edges of the tape, Detail C, and that the connector body lies approximately central.

ASSEMBLY PROCEDURE




DETAIL C TYPE FRS 110 SHOWN

WARNING
Seals manufactured from 1972 do not carry identifying colour spots. Type 54 and 151 seals are mould marked with the series number, but 'O' rings can only be identified by their packaging
DO NOT OPEN UNTIL REQUIRED FOR IMMEDIATE USE.

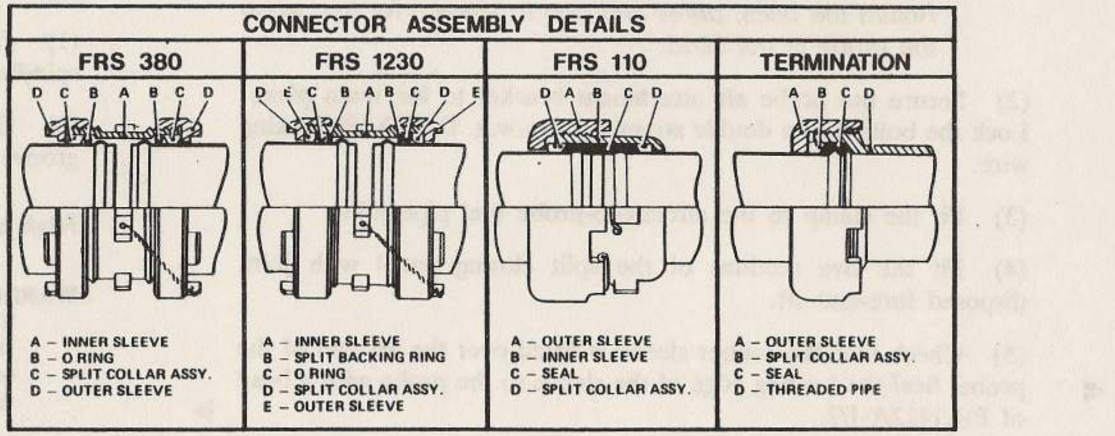



FIG.19. ASSEMBLY PROCEDURE FOR FRS PIPE CONNECTORS

ASSEMBLY OF FRS 380 AND FRS 1230 CONNECTORS AMENDED

(2) Position the test equipment beneath the relevant wheel bay.

(3) Turn the adapter-kit pressure selector cock to the 'high pressure' position and insert the retaining pin.

(4) If the E.C.U. is removed, ensure a test blank is fitted to the appropriate flexible fueldraulic supply pipe.

(5) Connect the high pressure adapter coupling to the inboard test connection in the relevant wheel bay.

(6) Insert the fueldraulic cock operating handle and ensure the cock is OPEN.

(7) Open the relevant L.P. and TRANSFER cocks.

(8) Operate the pressure-rig hand-pump to provide a flow of fluid through the booster pump. Maintain this flow for one minute to ensure that the supply pipe is free of air.

(9) Insert the fueldraulic cock operating handle and turn the cock to CLOSE.

(10) Operate the pressure-rig hand-pump until a pressure of 2000 $lb/in^2$ is registered on the adapter-kit pressure gauge. Maintain this pressure for 10 min, ensuring there are no external leaks during this period.

(11) Relieve the test pressure. Insert the fueldraulic cock operating handle and turn the cock to OPEN.

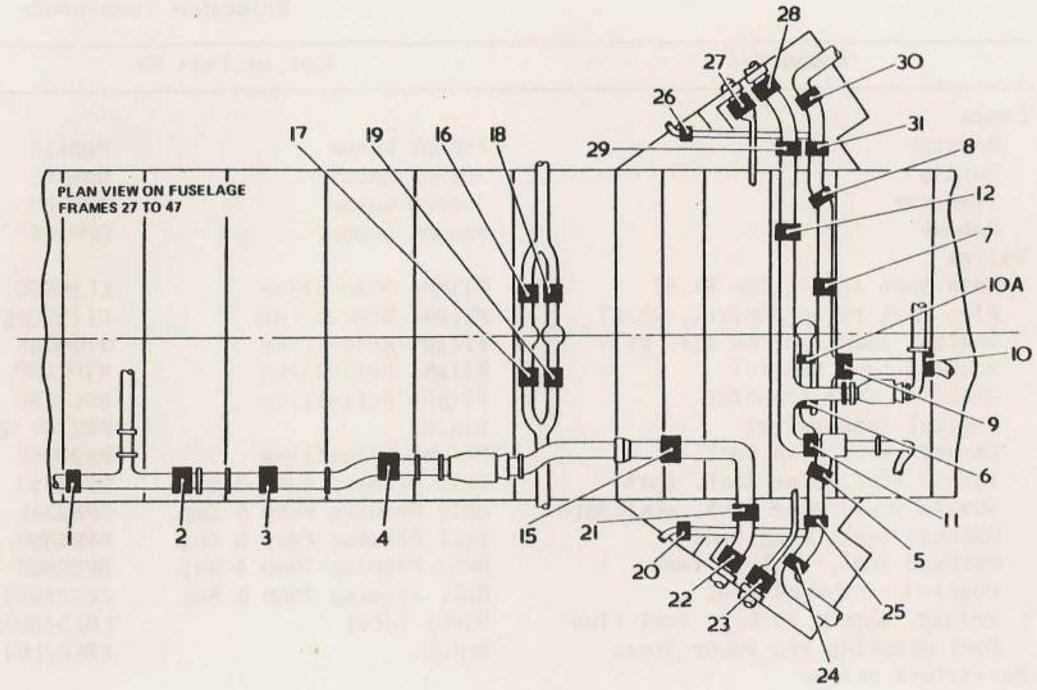
(12) Remove the fueldraulic cock operating handle and refit the access panel.

(13) Close the relevant L.P. and TRANSFER cocks.

(14) Remove the test blank (if fitted in sub para.(4)).

(15) Remove the test equipment from beneath the relevant wheel bay.

| FRS CONNECTORS | | | SEALS | |
|---|---|---|---|---|
| No. Type | | Torque Loading lb.in. | Part No. | Seal (27FR Ref.No.) |
| 1 | 110-K | 140–145 | 54/K-9 | (1488102) |
| 2 | 110-M | 165–170 | 54/M-9 | (1488100) |
| 3 | 380-M | 165–170 | 1225/77 | (1487881) |
| 4 | 380-M | 165–170 | 1225/77 | (1487881) |
| 5 | 1230-K | 140–145 | 1225/66 | (1487877) |
| 6 | 110-L | 165–170 | 54/L-9 | (1488101) |
| 7 | 110-K | 140–145 | 54/K-9 | (1488102) |
| 8 | 1230-K | 140–145 | 1225/66 | (1487877) |
| 9 | 380-M | 165–170 | 1225/77 | (1487881) |
| 10 | 110-M | 165–170 | 54/M-9 | (1488100) |
| 10A | 353-L | 165–170 | 151/L-9 | (1488099) |
| 11 | 1230-K | 140–145 | 1225/66 | (1487877) |
| 12 | 110-M | 165–170 | 54/M-9 | (1488100) |
| 13 | | NOT APPLICABLE | | |
| 14 | | TO MK3 | | |
| 15 | | BULKHEAD CONNECTOR (NOT FRS) | | |
| 16 | 380-H | 130–135 | 1225/61 | (1487869) |
| 17 | 380-H | 130–135 | 1225/61 | (1487869) |
| 18 | 380-H | 130–135 | 1225/61 | (1487869) |
| 19 | 380-H | 130–135 | 1225/61 | (1487869) |
| 20 | 380-J | | 379/J-1 | (30159) |
| 21 | 380-M | 165–170 | 379/M-1 | (30172) |
| 22 | 110-M | 165–170 | 54/M-1 | (2320) |
| 23 | 110-M | 165–170 | 54/M-1 | (2320) |
| 24 | 1230-K | 140–145 | 379/K-1 | (30170) |
| 25 | 152-K | 140–145 | 151/K-1 | (2433) |
| 26 | 380-J | | 379/J-1 | (30159) |
| 27 | 110-M | 165–170 | 54/M-1 | (2320) |
| 28 | 110-M | 165–170 | 54/M-1 | (2320) |
| 29 | 380-M | 165–170 | 379/M-1 | (30172) |
| 30 | 1230-K | 140–145 | 379/K-1 | (30170) |
| 31 | 152-K | 140–145 | 151/K-1 | (2433) |




NOTE...
1. DO NOT REMOVE SEALS FROM THEIR PACKAGING UNTIL REQUIRED FOR IMMEDIATE USE
2. ENSURE THAT THE PACKAGE OF EVERY SEAL IS MARKED WITH THE SECTION, REFERENCE, AND THE PART NUMBER AS DETAILED ABOVE.

**FIG. 20. FRS PIPE CONNECTORS LOCATION AND DETAILS IN FUSELAGE AND WING ROOT**

◄TABLE AMENDED►

TABLE 1

Principal components

| Component | Type or Part No. | | A.P. | Vol. | Sect. | Chap. |
|---|---|---|---|---|---|---|
| Pumps | | | | | | |
| Booster | Joseph Lucas | FBP111 ▶ | | 1 | | |
| Supply | Joseph Lucas | GBB151 | | 1 | | |
| Transfer | Joseph Lucas | TPE103 | | 1 | | |
| Reheat | Joseph Lucas | TPF118 | ◀ | 1 | | |
| Valves | | | | | | |
| Main tank refuelling Mk.44 | Flight Refuelling | 1144000 | 106D-0109-16C | | | |
| Flap tank refuel/defuel, Mk.27 | Flight Refuelling | C1127035 | 106D-0112-16C | | | |
| Ventral tank fuel/no air, Mk.7 | Flight Refuelling | 3706065 | 106D-0402-16C | | | |
| Ventral tank control | Flight Refuelling | 3707030 | 106D-0402-16C | | | |
| Shuttle, fuel transfer | Flight Refuelling | 9813190 | 4511 | 1 & 6 | 7 | |
| Ventral tank relief | B.A.C. | EB2.62.97 | | | | |
| Inward vent, flap tank | Flight Refuelling | 9809060 | 106D-1000A-1 | | | |
| Inward vent, wing tank, port | Self Priming Pump & Eng. | SPE2340 | 4737A | 1 & 6 | | |
| Inward vent, wing tank, starboard | Self Priming Pump & Eng. | SPE2341 | 4737A | 1 & 6 | | |
| Outward vent, wing tank | Self Priming Pump & Eng. | SPE2680 | 4737A | 1 & 6 | | |
| Outward vent, ventral tank | Self Priming Pump & Eng. | SPE2669 | 4737A | 1 & 6 | | |
| Control, outward vent | Self Priming Pump & Eng. | SPE21025 | 4737A | 1 & 6 | | |
| Relief, supply to L.P. fuel line | Dowty Rotol | 101346003 | 1803U | 1 | | |
| Fuel sampling and water drain | B.A.C. | EEAS.104 | | | | |
| Non-return valves | | | | | | |
| Recuperator defuelling line | Flight Refuelling | 9813014 | 106D-1000A-1 | | | |
| Transfer pump output | Flight Refuelling | 9807100-2 | 106D-1000A-1 | | | |
| Supply pump output | Dowty Rotol | H2017 | | | | |
| Booster pump outlet | Saunders Valve | 716DA-12-L | 4737A | 1 & 6 | | |
| Main tank balance | Flight Refuelling | 9807350 | 106D-1000A-1 | | | |
| Ventral tank | B.A.C. | EB2.62.1033 | | | | |
| Flight refuelling probe | Normalair | 31603000 | 106C-0324-1 | | | |
| Cocks | | | | | | |
| Low pressure | B.A.C. | EF2.57.927 | | | | |
| Defuelling | B.A.C. | EB2.57.1789 | | | | |
| Fueldraulic test | Saunders | 104AC-03-1 | | | | |
| Float switches | | | | | | |
| Main tank | Flight Refuelling | 3504100-288 | | | | |
| Flap tank | Flight Refuelling | 3504100-289 | | | | |
| Ventral tank | Flight Refuelling | 3504100-288 | | | | |
| Pressure switches | | | | | | |
| Booster pump pressure | Thermal Controls | TP30028 | 112G-1112-1 | | | |
| Transfer pump pressure | Thermal Controls | TP30099 | 112G-1112-1 | | | |
| Adapter, pressure refuelling | Avery Hardall | FC113 | 4511 | 1 & 6 | 3 | 5 |
| Filter | B.A.C. | EF2.57.369 | | | | |
| Heat exchanger | Marston Excelsior | D2718-2A | 4340 | 1 | 8 | |

**TABLE 2**

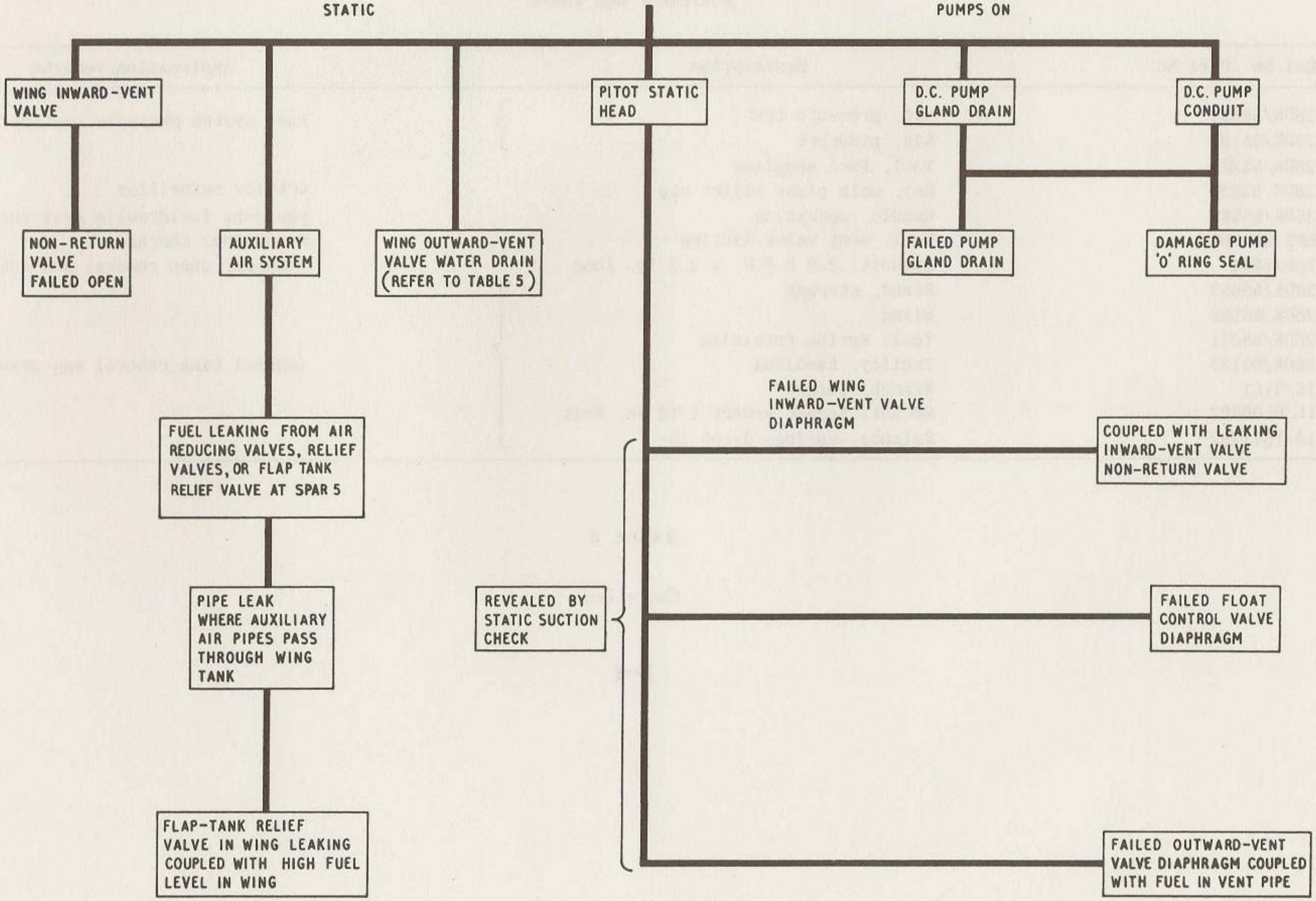
**Equipment and tools**

| Ref.No./Part No. | Description | Application/remarks |
|---|---|---|
| 26DK/95852 | Kit, pressure test | Fuel system pressure testing |
| 26DE/95162 | Rig, pressure | |
| 26DK/95234 | Tool, fuel sampling | |
| 26DK/95233 | Key, main-plane filler cap | Gravity refuelling |
| 26DK/95789 | Handle, operating | Saunders fueldraulic test cocks |
| EF3.88.2073 | Tool, vent valve lifting | Functional checks |
| 28G/5894 | Eyebolt, 3/8 B.S.F. x 2.2 in. long | Transfer pump removal and assembly |
| 26DK/95052 | Stand, storage | Ventral tank removal and assembly |
| 26DK/95298 | Sling | |
| 26DK/95071 | Tool, spring retaining | |
| 26DK/95135 | Trolley, handling | |
| 1C/7151 | Wrench, torque | |
| 1L/9106392 | Socket, torque wrench 7/16 in. Whit. | |
| 1A/1043782 | Balance, spring, 0-100 lb | |

**TABLE 3**

*Cancelled*

## TABLE 4. FAULT DIAGNOSIS
## FUEL LEAKAGE OTHER THAN VENTING

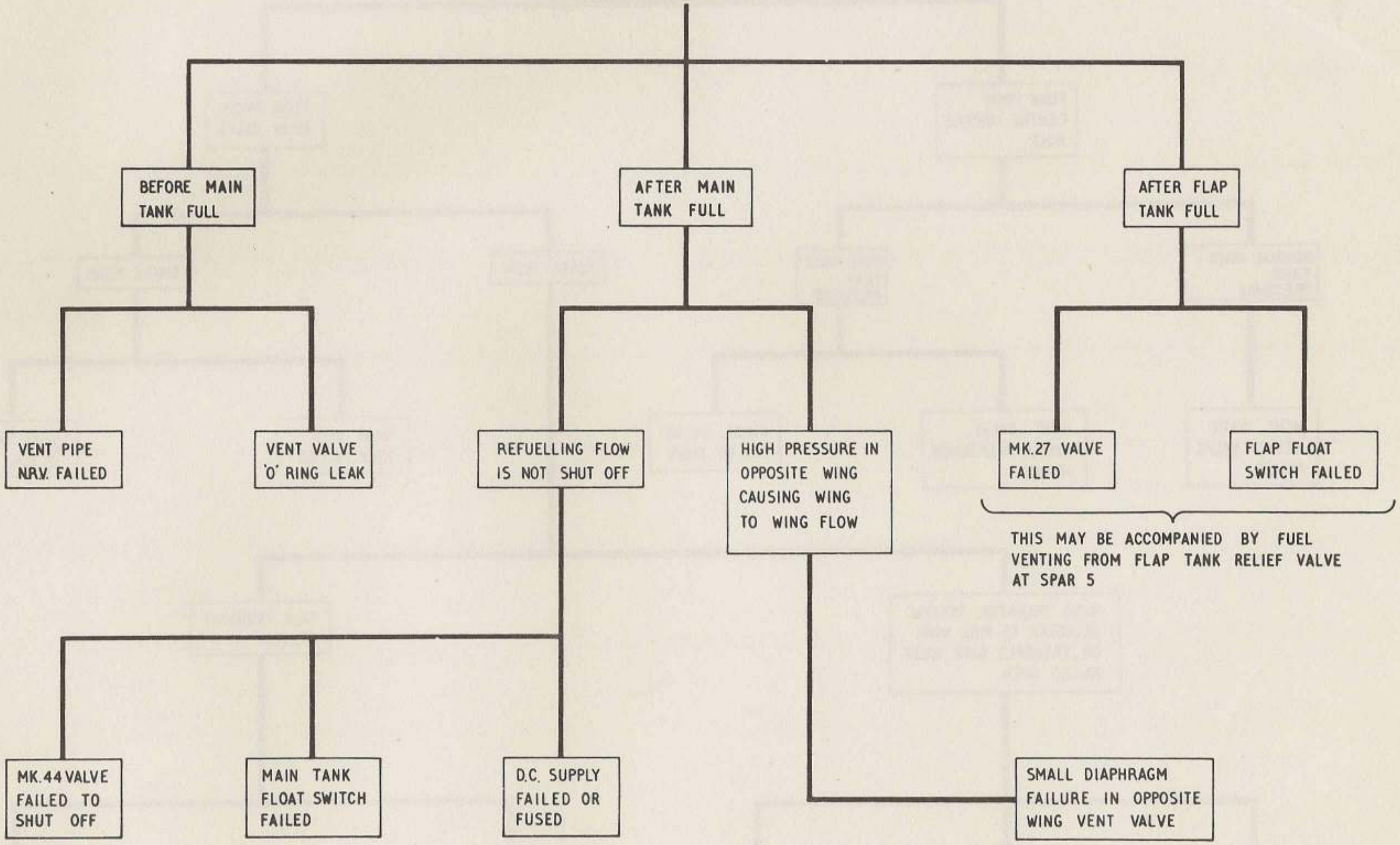



3-8836-1



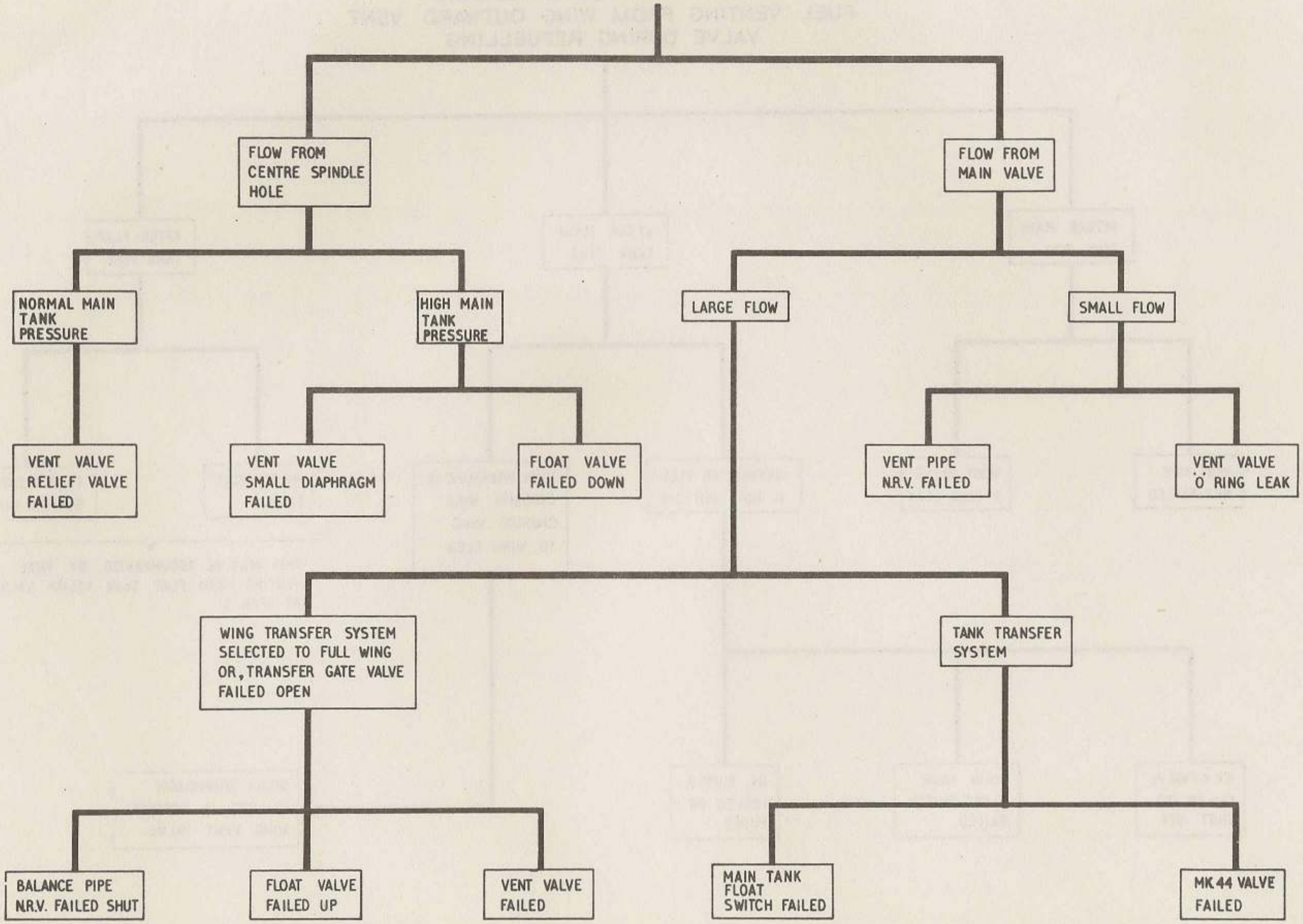
1018-1003-1A/117/176828/273/7-75/BAC/1405

## TABLE. 5. FAULT DIAGNOSIS FUEL VENTING FROM WING OUTWARD VENT VALVE DURING REFUELLING




3 – 8837 – 1

TABLE. 6. FAULT DIAGNOSIS
FUEL VENTING FROM WING OUTWARD VENT VALVE
DURING ENGINE RUNNING (AUXILIARY AIR ON)

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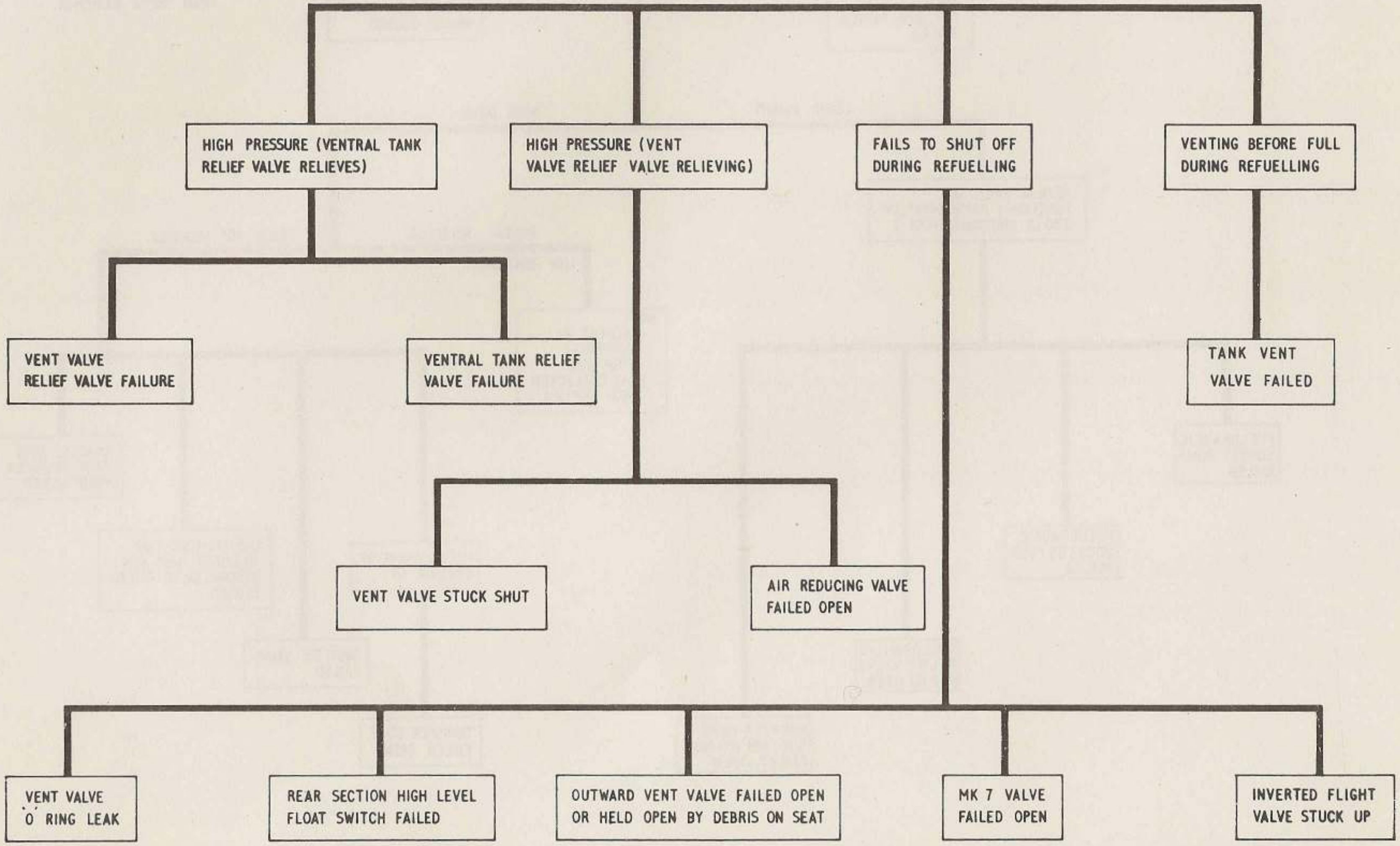
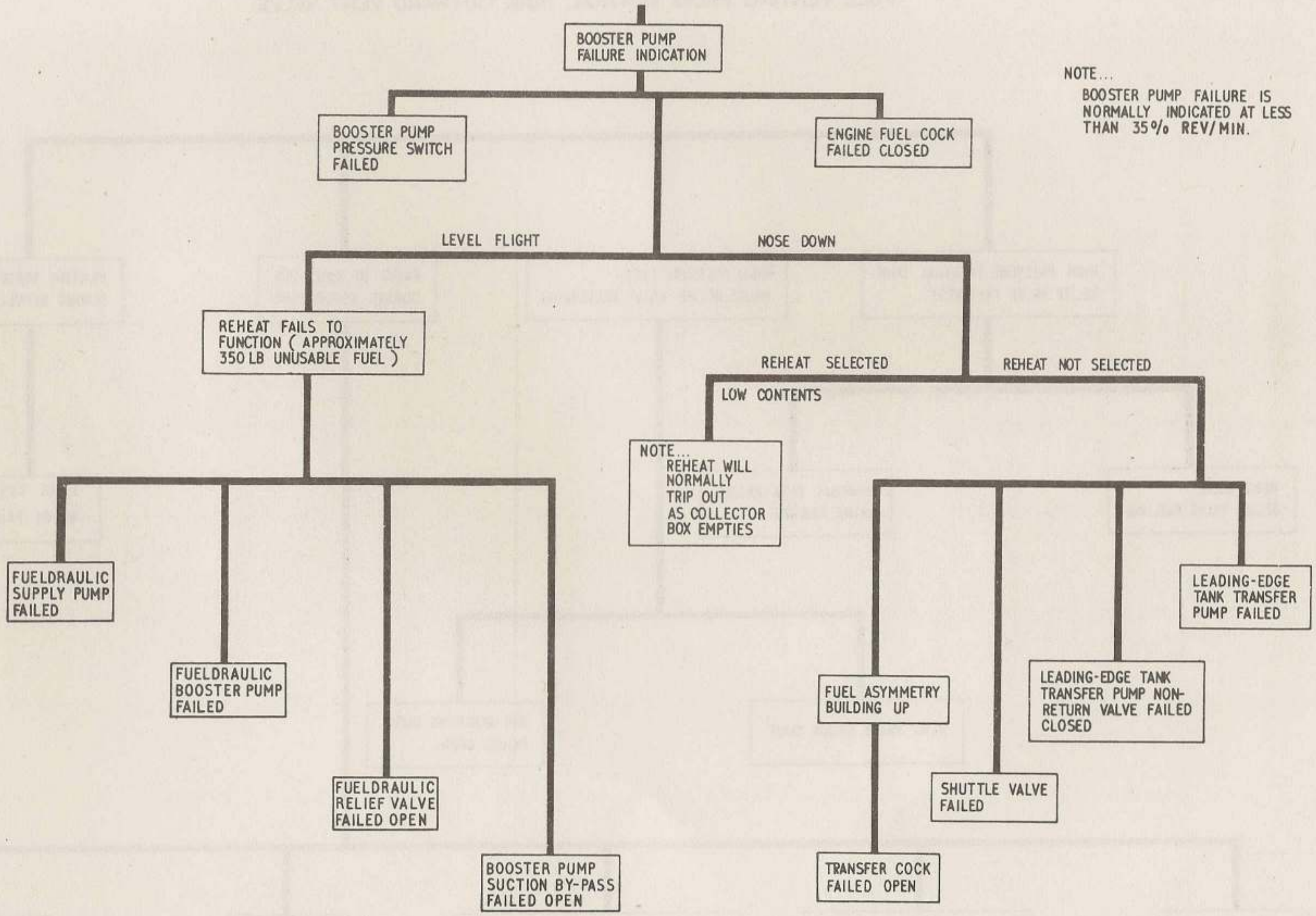
## TABLE. 7. FAULT DIAGNOSIS
## FUEL VENTING FROM VENTRAL TANK OUTWARD VENT VALVE



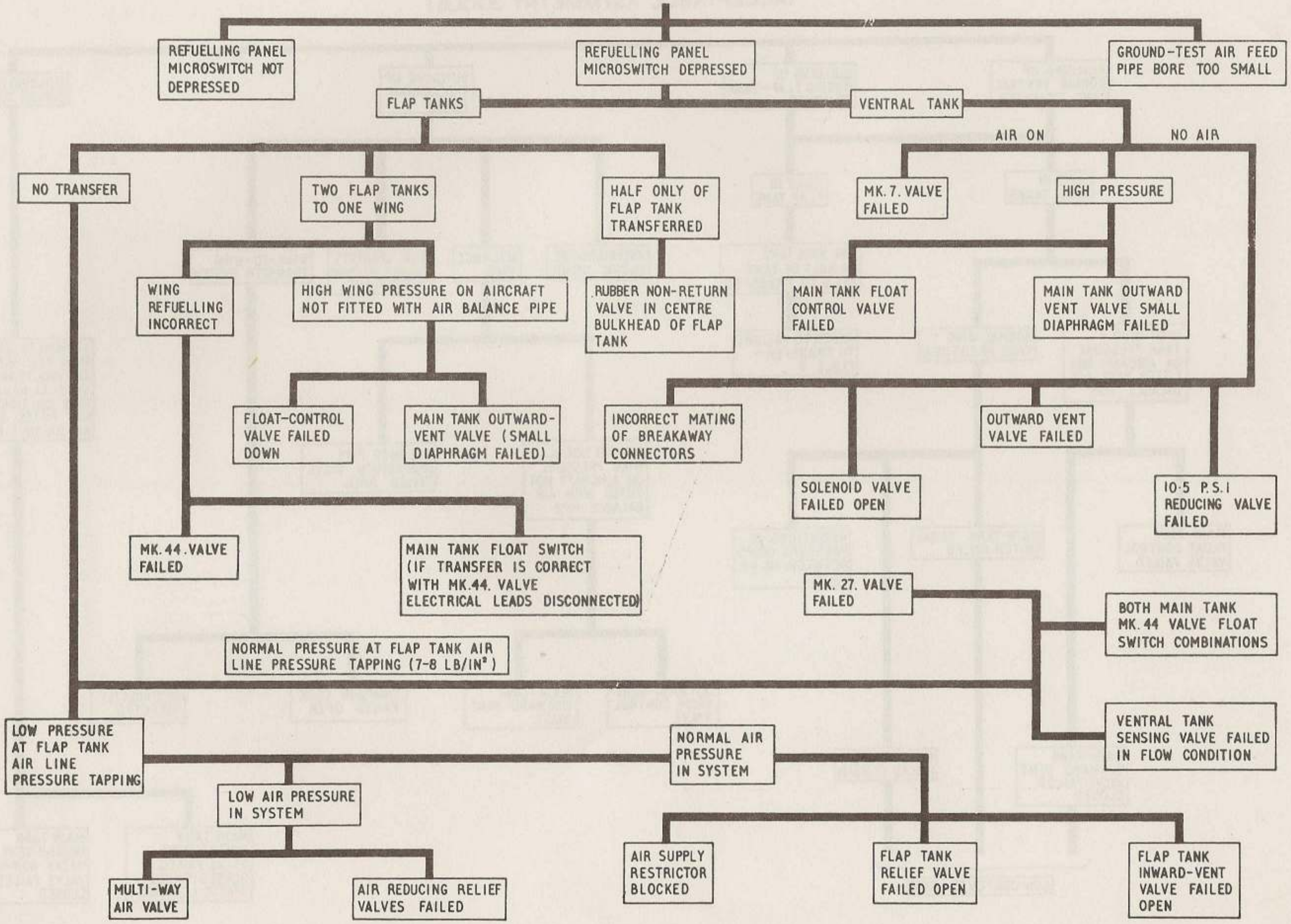

3-8856-1

## TABLE. 8. FAULT DIAGNOSIS
## LOW FUEL PRESSURE



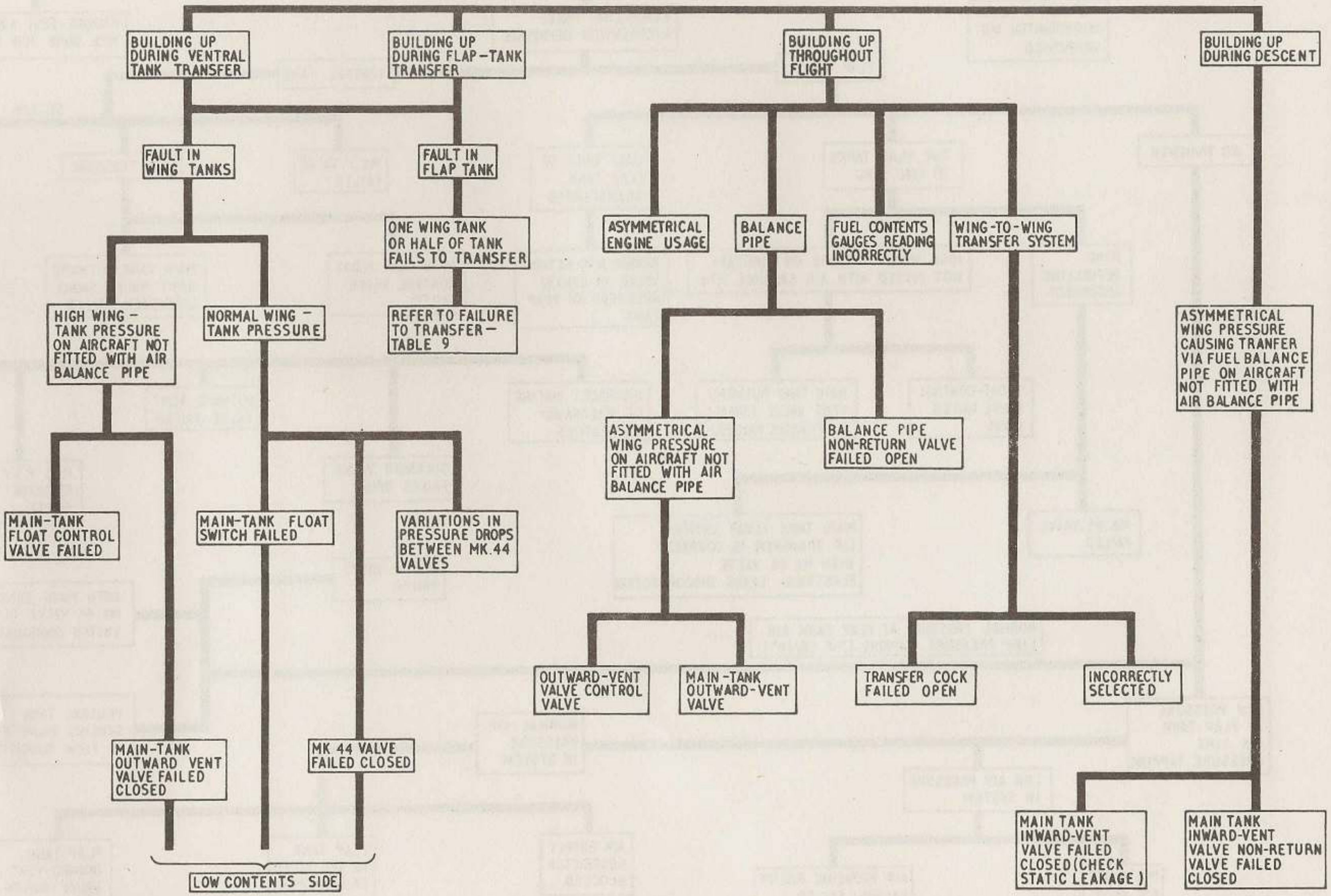

3-8838-1

## TABLE. 9. FAULT DIAGNOSIS FAILURE TO TRANSFER




3-8839-1

# TABLE 10. FAULT DIAGNOSIS FUEL ASYMMETRY (ACCEPTABLE ASYMMETRY 300LB)




3-8840-1

## TABLE 11. FAULT DIAGNOSIS
## FUEL SYSTEM FUSING

| | TANK LOCATION (a) | COMPONENTS SUPPLIED (b) | FUEL SYSTEM SELECTION (c) | FUSE NO (d) | EFFECT OF FUSE FAILURE WHEN FUEL SYSTEM IS AS SELECTED AT 'c' (e) |
|---|---|---|---|---|---|
| 1 | MAIN WING TANKS (PORT AND STARBOARD) | MK.44 REFUEL / TRANSFER VALVES AND HIGH LEVEL FLOAT SWITCHES | (i) GROUND REFUEL (ACCESS PANEL 'OFF') | 181 | (i) MK.44 VALVE OPEN, FLOAT SWITCH INOPERATIVE, FUEL WILL VENT CONTINUOUSLY UNTIL REFUELLING CEASES |
| | | | | 63 | (ii) MK.44 VALVE OPEN, FLOAT SWITCH INOPERATIVE, FUEL WILL VENT CONTINUOUSLY UNTIL REFUELLING CEASES<br>(iii) MK.44 VALVE OPEN, FLOAT SWITCH INOPERATIVE, FUEL WILL VENT CONTINUOUSLY UNTIL TRANSFER CEASES |
| 2 | FLAP TANKS (PORT AND STARBOARD) | MK.27 REFUEL / DEFUEL VALVES AND HIGH LEVEL FLOAT SWITCHES | (ii) AIR TO AIR REFUELLING | 181 | (i) MK.27 REFUEL LINE SHUT, REFUELLING CEASES |
| | | | | 63 | (ii) MK.27 REFUEL LINE SHUT, REFUELLING CEASES<br>(iii) MK.27 TRANSFER VALVE OPEN, FUEL WILL FLOW INTO MAIN TANKS AND WILL VENT OVERBOARD |
| 3 | VENTRAL TANK | MK.7 FUEL-NO-AIR VALVE AND HIGH LEVEL FLOAT SWITCH | (iii) INFLIGHT TRANSFER | 181 | (i) MK.7 VALVE SHUT, TANK WILL NOT ACCEPT FUEL |
| | | | | 63 | (ii) MK.7 VALVE SHUT, TANK WILL NOT ACCEPT FUEL<br>(iii) MK.7 TRANSFER VALVE OPEN WITH TRANSFER MAGNETIC INDICATOR INOPERATIVE. MK.44 VALVE IN MAIN TANK OPEN, FUEL WILL FLOW INTO THIS TANK AND VENT OVERBOARD |
| 4 | ALL | SAUNDERS MULTI-WAY VALVE LOCATED IN COMMON FUEL TANK PRESSURISATION LINE | | 42 | (i) FUSE NON EFFECTIVE AT THIS SELECTION<br>(ii) TANKS WILL NOT DE-PRESSURISE, REFUELLING WILL CEASE OR CONTINUE AT A MUCH LOWER RATE<br>(iii) FUSE NON EFFECTIVE AT THIS SELECTION |

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LIGHTNING
COVER PITOT HEAD