Part I—Description and Management of Systems

Chapter 8—Hydraulic System and Emergency Air System

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1 General

(*a*) The main hydraulic system provides pressure for operating the following:

(i) Undercarriage raising and lowering and bogie trim (Chapter 13).

(ii) Nosewheel centring and steering (Chapter 13).

(iii) Wheelbrakes (Chapter 13).

(iv) Bomb-door opening and closing (Chapter 19).

(*b*) A hydraulic power pack is provided, to supply emergency pressure for bomb-door operation and to recharge the brakes accumulators.

(*c*) An emergency air system is provided for lowering the undercarriage.

(*d*) Separate self-contained electro-hydraulic systems are provided for the powered flying control units (Chapter 10) and the windscreen wipers (Chapter 15).

Main Supplies

2 Reservoir

(*a*) The $2\frac{1}{2}$-gallon hydraulic reservoir is in the bomb-bay roof, on the port side. The reservoir and power pack are filled through a charging valve in the No. 3 engine bay; the level of fluid in the reservoir is indicated by a glass sight in the tank.

(*b*) To ensure that a positive head of pressure is maintained at all altitudes, the reservoir is pressurised with air from Nos. 1, 2 and 3 engines. A pressure-reducing valve controls the air pressure to 15-18 PSI; a blow-off valve opens at 22-27 PSI and closes at 16 PSI.

3 Engine-driven pumps

(*a*) Three engine-driven pumps, one on each of Nos. 1, 2 and 3 engines, draw fluid from the reservoir via filters. The pumps incorporate an automatic cut-out and, when idling, circulate fluid back to the reservoir through the main return line.

(*b*) From the pumps, fluid is delivered via non-return valves to the main gallery, at a pressure of 3,600-4,000 PSI. In addition to supplying the various services, this pressure is used to charge the wheelbrakes accumulators.

(*c*) The various hydraulic circuits are separately controlled by electrically-operated selector valves, with the exception of the nose-wheel centring jack which is supplied directly from the main line.

4 Hydraulic pressure gauge

A triple-pressure gauge (B/7) is on the engine instruments panel. The left-hand pointer indicates the pressure in the main system, and the two right-hand pointers indicate the pressure in the two wheelbrake accumulators. The gauge is electrically-operated from the 28-volt DC supply. When electrical power is not available the pointers read off-scale at the maximum value.

5 Operation of the main system

(*a*) Before flight, the brake accumulators residual pressure should be exhausted ; then, while making the external inspection, the accumulator inflation pressure should be checked at 2,500 $\pm \frac{50}{0}$ PSI.

(*b*) When the engines are running, check that the main and accumulator pressures are between 3,600 and 4,000 PSI. When a hydraulic service is operated, the main pressure will drop ; check that it builds up again when the operation is complete. In flight, fluctuations within the normal operating range may be disregarded. If hydraulic main line pressure indicates divergent increasing fluctuations (greater than ±500 PSI) without selection of a system, the aircraft should return to base and land as soon as possible. The undercarriage should be selected DOWN as soon as possible and left DOWN, bearing in mind the increased fuel consumption with lowered undercarriage and that extra fuel may be required.

(*c*) To check that all pumps are working, it is necessary during ground running to time the operation of the bomb-doors using the normal selector. With all 3 pumps working, this should be less than 8 seconds between selection of OPEN and the doors reaching the open position.

Emergency Systems

6 Hydraulic power pack

(*a*) A hydraulic power pack, on the starboard side of the bomb-bay, provides emergency pressure for operating the bomb-doors and for recharging the brakes accumulators.

(*b*) The unit consists of an electric motor driving a pump in an 11-pint reservoir. The reservoir is pressurised to 15-18 PSI by engine air.

(*c*) The power pack is filled from the main reservoir, via a non-return valve. Should a fractured pipe cause a loss of all the main fluid supply, the capacity of the power pack is sufficient to recharge the accumulators once. Bomb door operation is not limited as, with the emergency system in use, return fluid is delivered to the power pack.

(*d*) The pump delivers fluid at 2·5 galls/min at a pressure of 4,000 PSI ; the pressure is regulated by a pressure switch in the electrical circuit to the motor.

(*e*) The power pack operates from the 112-volt No. 4 generator bus-bar.

7 Hydraulic power pack controls

(*a*) *Bomb door operation*

The hydraulic power pack is energised to supply the bomb doors when the bomb doors emergency control switch (C/10) is put to the OPEN or CLOSED position.

(*b*) *Brakes accumulator charging*

The brakes accumulators may be charged from the power pack by operation of either of two HYD POWER START—STOP switches, one on the port console (C/30) and one in the nosewheel bay.

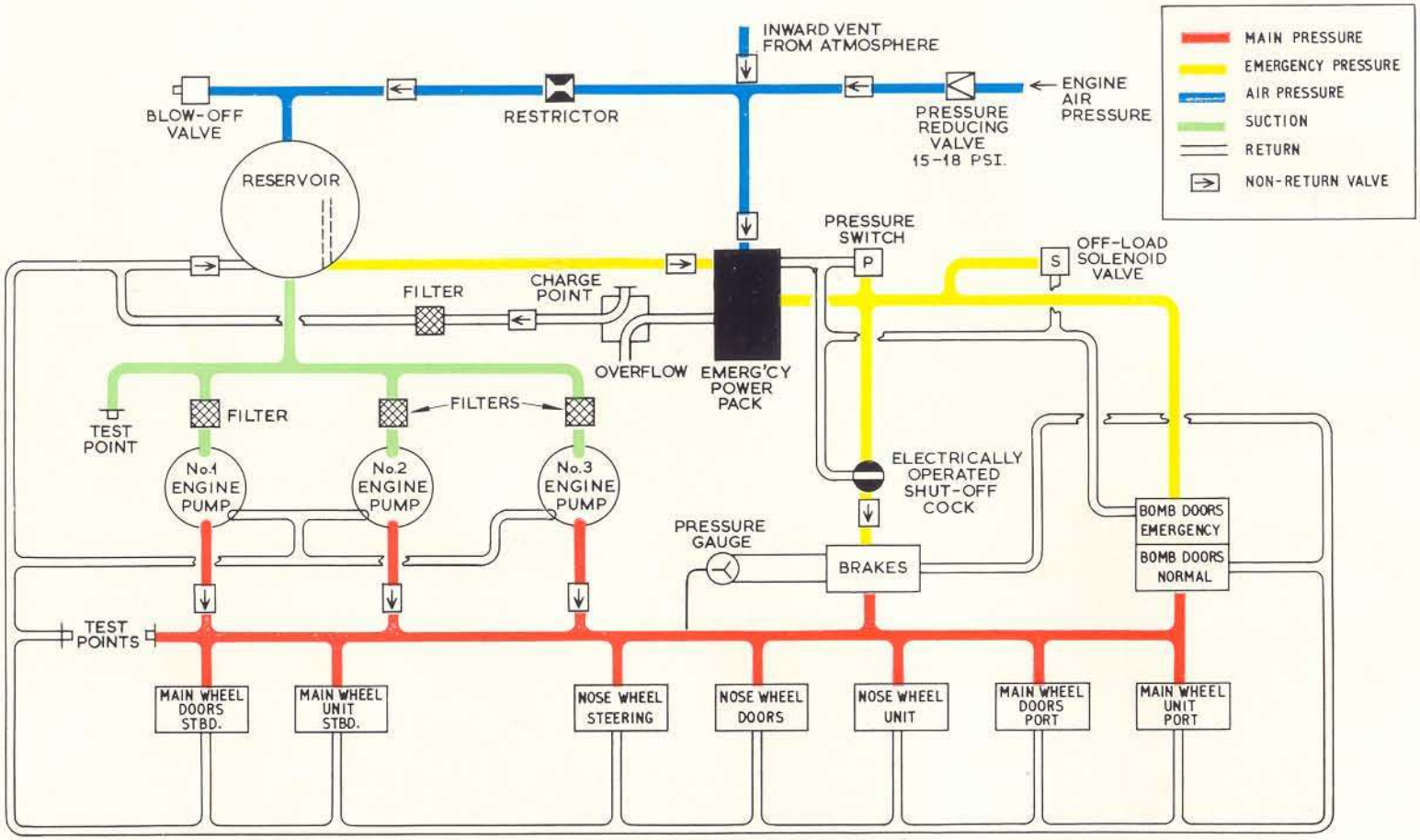

Fig 1 Hydraulic System Diagram

The switches are spring-loaded to the central position. When the switch is moved to START and released, the power pack charges the accumulators in approximately 6 seconds and switches off automatically when the line pressure reaches 4,000 PSI, unless it has already been stopped by selecting STOP. While the brakes accumulators are being charged, both normal and emergency bomb door selection is inoperative.

8 Undercarriage emergency lowering

An emergency air system is provided for lowering the undercarriage, should the hydraulic system fail. Two air bottles in the nosewheel bay are charged to 3,000 PSI; one supplies the nosewheel and the other the main wheels. Beside each bottle is a charging point and a pressure gauge. The two control valves are mechanically linked together. After the undercarriage is lowered, battery heating and ventilation is inoperative.

9 Hydraulic system faults

(*a*) If the main pressure gauge pointer moves to the top of the scale, it is likely that either the fuse has failed or the transmitter is faulty.

(*b*) If the main pressure gauge pointer falls to low pressure, a hydraulic fault is likely but an electrical fault is possible.

(*c*) If a brake pressure gauge pointer moves to the top of the scale, an electrical fault is indicated.

(*d*) If a brake pressure gauge pointer falls to the bottom of the scale, a transmitter fault is indicated. If, however, the main pressure gauge indicates abnormally low pressure, hydraulic fluid has almost certainly been lost and the remaining brake pressure is uncertain.