PART 1

CHAPTER 4—HYDRAULICS

Contents

DESCRIPTION OF THE SYSTEMS

General

1. There are three separate hydraulic systems in the aircraft: the Services system, the No 1 Controls system and the No 2 Controls system. The systems operate the services listed in Table 1. Diagrams of the systems are shown at Fig 1 and 2.

Table 1 — Hydraulically Operated Services

Services System	*No 1 Controls*	*No 2 Controls*
Undercarriage	Aileron PFCU (outboard)	Aileron PFCU (inboard)
Wheelbrakes	Tailplane PFCU (right)	Tailplane PFCU (left)
Airbrakes	Rudder PFCU (forward piston)	Rudder PFCU (aft piston)
Flaps	Brake parachute doors	
Feel system	Undercarriage emergency lowering	
Canopy		
Nosewheel centring and anti-shimmy		
Autostabiliser actuators		
Guided weapons pack		

Pumps

2. Hydraulic power is provided by four engine-driven pumps, two being mounted on each engine wheel case. The forward pumps on each engine jointly power the Services system; the aft pumps supply the Controls systems: the No 1 engine pump and the No 2 engine pump serving the No 1 and No 2 Controls systems respectively. A hand pump for ground operation of the Services system is behind an access panel on the left side of the fuselage. A stowage for the hand pump handle is in the left wheel well.

Reservoirs

3. The pumps draw hydraulic fluid from three main reservoirs, one to supply the Services system and one each for the No 1 and No 2 Controls systems. The reservoirs are pressurised by engine compressor bleed air. An auxiliary reservoir in the No 1 Controls system provides additional fluid for emergency undercarriage lowering; it operates in parallel with the main No 1 Controls reservoir. The reservoirs are fitted with anti-g valves to prevent air from entering the hydraulic pumps under negative-g conditions.

Accumulators

4. *Services System.* The Services system has four accumulators (see Fig 1). The services not provided with hydraulic accumulator protection are the airbrakes, undercarriage raising and lowering, and the guided weapons pack. The wheelbrakes have an accumulator solely for the wheelbrake system and can also use pressure from a second accumulator which also supplies the nosewheel centring and canopy systems.

5. *Controls Systems.* Each Controls system has two accumulators (see Fig 2) which allow for high rates of normal operation of the control surfaces and for limited emergency operation.

6. The nitrogen pressures for all eight hydraulic accumulators are shown on skin gauges. The correct pressure values are listed in FRC under **External Checks.**

Services System Pressure Gauge

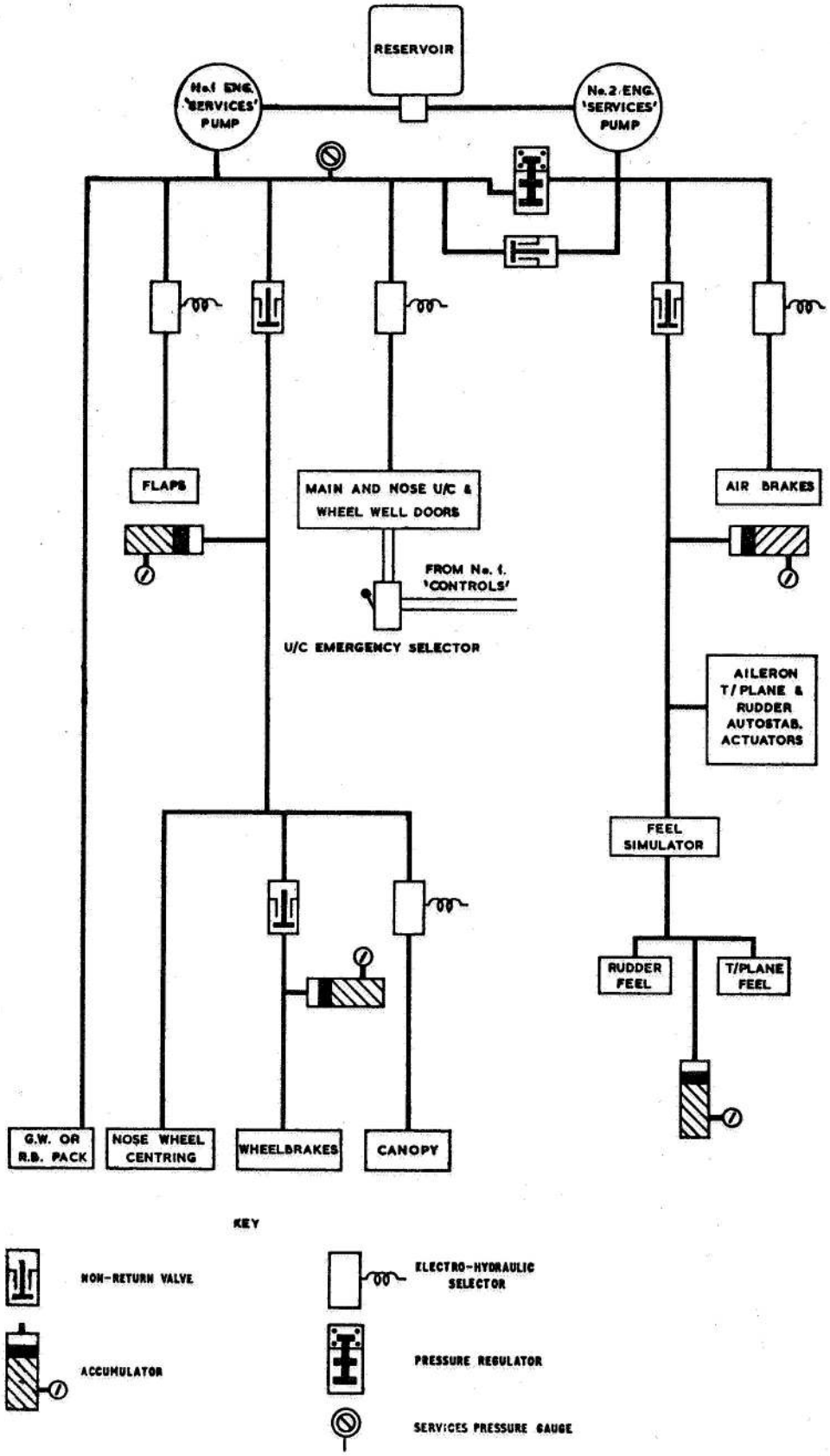
7. In the F Mk 3 and F Mk 6 a HYD pressure gauge on the left cockpit shroud indicates Services system pressure; in the T Mk 5 the gauge is marked SERVICES PRESSURE and is positioned to the right of the strip speed display. The normal pressure reading is 3000±250 PSI. When a service is selected which has a high fluid demand, the reading falls rapidly and then gradually recovers.

8. *Electrical Supply.* The gauge is powered from the 28V, single-phase, AC busbar. If the power supply fails, eg after AC failure, the reading falls below zero into the white sector of the gauge.

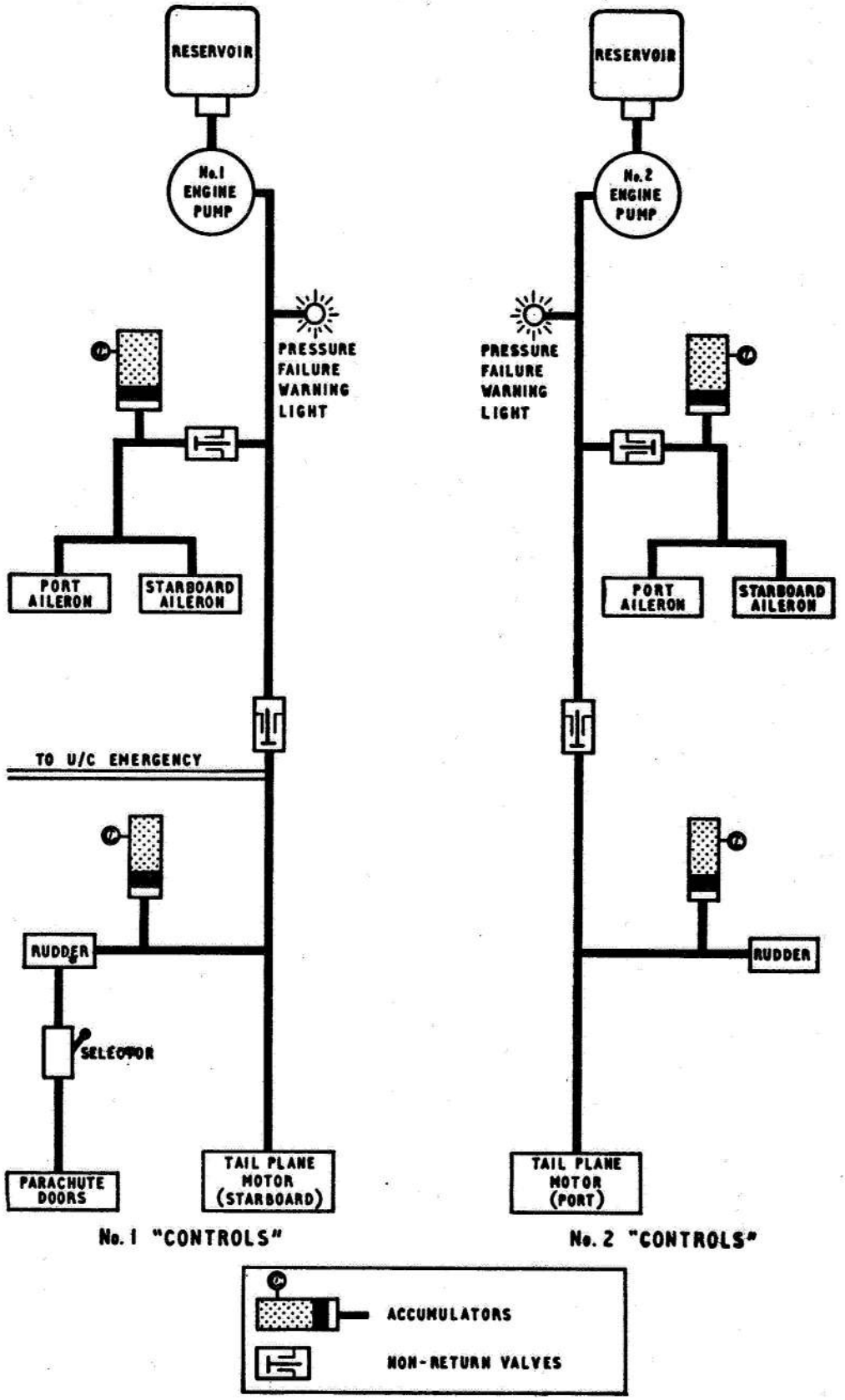
Pressure Regulator

9. The guided weapons pack alternator is driven by Services hydraulic pressure when ARM (ARMED, T Mk 5) is selected. It is necessary to maintain a minimum pressure of 2700 PSI in the system to sustain the alternator. To prevent a drop in pressure below 2700 PSI during airbrake operation, a pressure regulator and non-return valve are interposed between the delivery lines of the No 1 and No 2 Services system pumps. If airbrakes are selected during an arming sequence, the pressure regulator and non-return valve ensure that the No 1 Services pump delivery pressure is not reduced and the arming sequence is not interrupted.

10. One engine must be running at or above fast idling speed to supply sufficient Services hydraulic pressure for the missile pack alternator, and this must



1—4 Fig 1 — Services Hydraulic System



1—4 Fig 2 — Controls Hydraulic Systems

be the No 1 engine if the airbrakes are to be used. The guided weapons pack alternator is interrupted when:

a. Flaps or undercarriage are cycled.

b. Airbrakes are operated when flying on No 2 engine only.

c. Airbrakes are operated after No 1 services pump has failed.

Pressure Failure

11. *Services System.* Failure of the Services system is indicated when the gauge falls to, and remains at, zero in the red sector of the gauge.

12. *Controls Systems.* A pressure switch is fitted in the delivery lines of both the No 1 and No 2 Controls systems. If line pressure falls below 1750 PSI the switch closes and a HYD 1 or HYD 2 warning, as appropriate, is lit on the AWP. If both switches close an additional HYD warning on the SWP comes on and the attention-getters operate.

MANAGEMENT OF THE SYSTEMS

External Checks

13. During the external inspection, check that the hydraulic pump handle is securely stowed and that the eight accumulator skin gauges are showing the correct nitrogen pressures.

Before Take-Off

14. After starting No 1 engine, check the Services pressure is 3000±250 PSI and the flying controls for full and free movement. Before take-off again check that the Services pressure is correct and make another full and free controls check, ensuring that the HYD, HYD1 and HYD2 warnings are all out.

In Flight

15. During flight, periodically check the Services pressure and that no hydraulic captions are lit.

After Landing

16. When No 1 engine has been shut down and its RPM are below 10%:

a. Raise the flaps and retract the airbrakes and check that the Services pressure recovers to 3000 ±250 PSI.

b. Check the flying controls for full and free movement.

MALFUNCTIONS OF THE SYSTEMS

17. Malfunctions of the hydraulic systems are dealt with in Chapter 5 (Powered Flying Controls and Trimmers) and Chapter 6 (Other Aircraft Controls). The associated drills are in FRC.

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