Chapter 7 PNEUMATIC SYSTEM

(Completely Revised)

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LIST OF ILLUSTRATIONS

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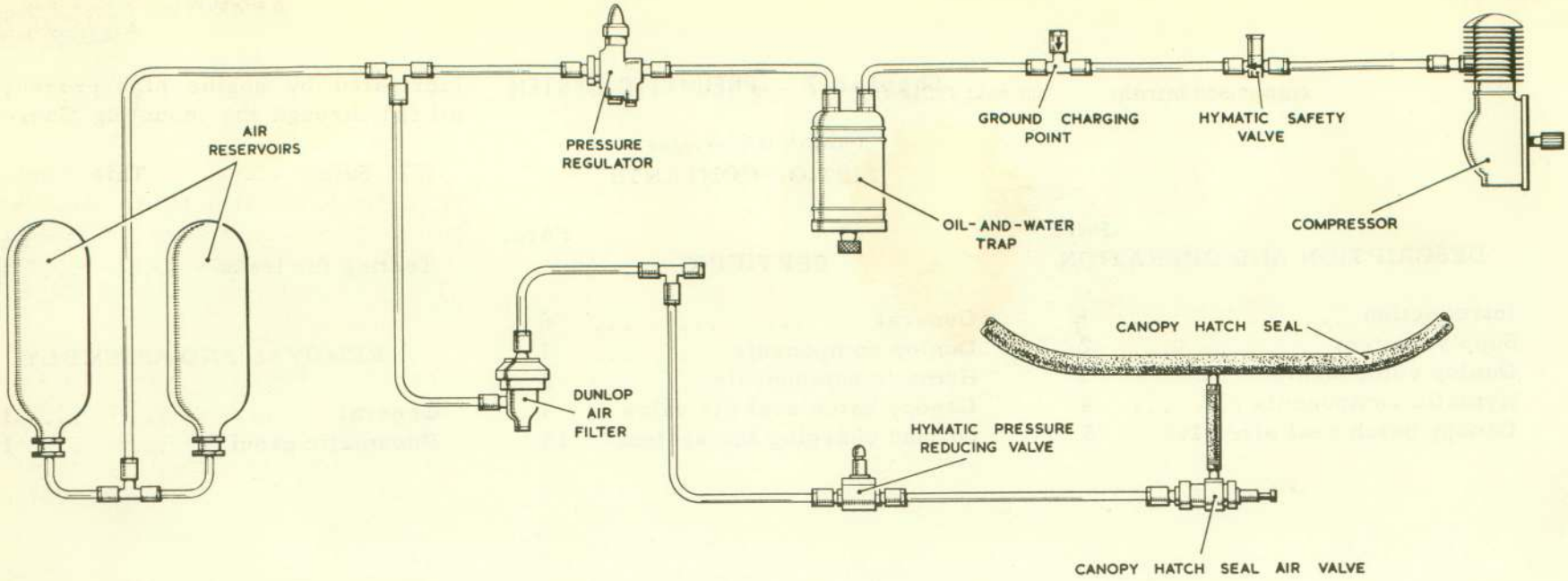

Fig. 1. Diagram of pneumatic system

DESCRIPTION AND OPERATION

Introduction

1. The pneumatic system provides controlled pressure for operating the canopy hatch seal, and, on aircraft of pre-Mod. N. 894 standard, the R. A. T. O. equipment jettison mechanism. Fig. 1 illustrates the relative positions of the components in the system.

Supply system

2. The air pressure in the reservoir is supplied by an engine-driven compressor, the pressure being transmitted, via a safety valve (a non-return valve incorporating a pressure relief valve), to an oil-and-water trap and thence to an automatic regulator valve. This regulator valve controls the charging of the air reservoir. A valve for ground charging the air reservoir is tapped into the supply line, between the safety valve and the oil-and-water trap. From a T-joint in the supply line between the regulator and the reservoir, pressure is supplied through an air filter, a pressure-reducing valve, and a canopy hatch seal air valve for the inflation of the canopy hatch seal. The air supply for actuating the spring return rams of the R. A. T. O. equipment jettison mechanism (see para. 1) is supplied from a T-joint between the air filter and the pressure-reducing valve, via a selector valve.

Dunlop components

3. The following components are briefly described and for detailed information reference must be made to A. P. 4303B, Vol. 1.

(1) Air filter: The air filter (Part No. A. C. O. 1268) allows clean compressed air to enter the system and collects any oil, dust, and water vapour in the base of the unit.

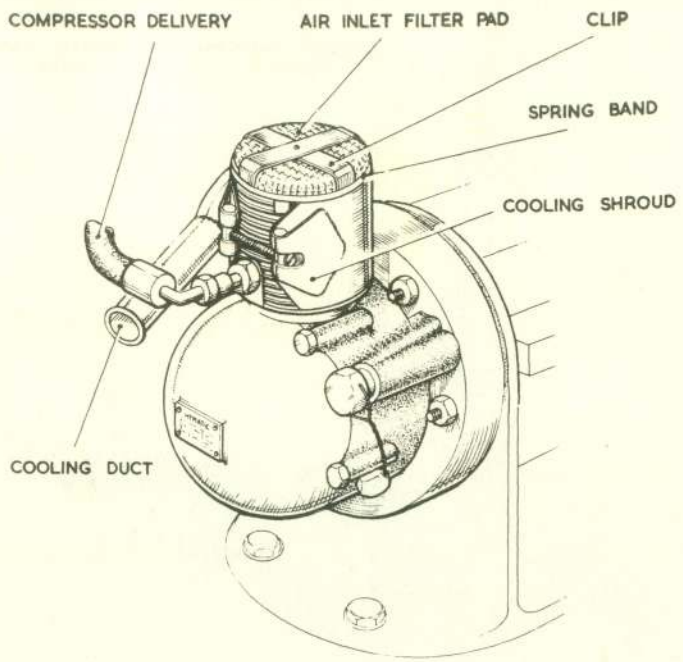

Fig. 2 Installation of compressor

(2) R. A. T. O. equipment jettison selector valve: The selector valve (Part No. A. C. M. 1158) allows air at reservoir pressure to pass to the spring return rams, and also allows air to be exhausted which is displaced by the rams returning to their initial position.

(3) Spring return rams: The spring return rams (Part No. A. C. M. 1044) pneumatically operate the R. A. T. O. equipment jettison mechanism and are returned to their initial position by a return spring which is contained within the jack.

(4) Air reservoir: The air pressure is stored in two cylinders (Part No. A. C. M. 1119) which are interconnected by a common pipe line.

Hymatic components

4. The following components are briefly described and for detailed information, refer to A. P. 4303C, Vol. 1.

(1) Compressor: This compressor (Ref. No. 37G/505) is mounted on the top starboard side of the engine wheel case and is designed to deliver air at a pressure of 450 p. s. i. It is lubricated by engine high-pressure oil fed through the mounting flange.

(2) Safety vlave: This valve (Part No. R. V. 10) acts as a safety valve by venting excess pressure in the system to atmosphere and prevents back pressure on the second stage of the compressor.

(3) Oil-and-water trap: This unit (Type No. O. W. T. 46/1) is situated between the ground charging valve and the pressure regulator, and its purpose is to prevent oil and water enter the system.

(4) Pressure regulator: The regulator (Type No. AR. 5/450-2) controls the charging of the air reservoir, so that any pressure in excess of the system operating pressure is automatically relieved to atmosphere. The safety valve incorporated in the regulator is set to relieve at slightly higher pressure than the main regulating valve and acts as a safeguard should the latter fail.

(5) Pressure reducing valve (canopy hatch seal): This valve (Type No. P. S. 29) is situated between the filter and the canopy hatch seal air valve and reduces the air pressure to the canopy hatch seal to 10 p. s. i. Some aircraft may be fitted with an alternative valve (Type P. S. 29/19) which reduces the air pressure to 6 p. s. i.

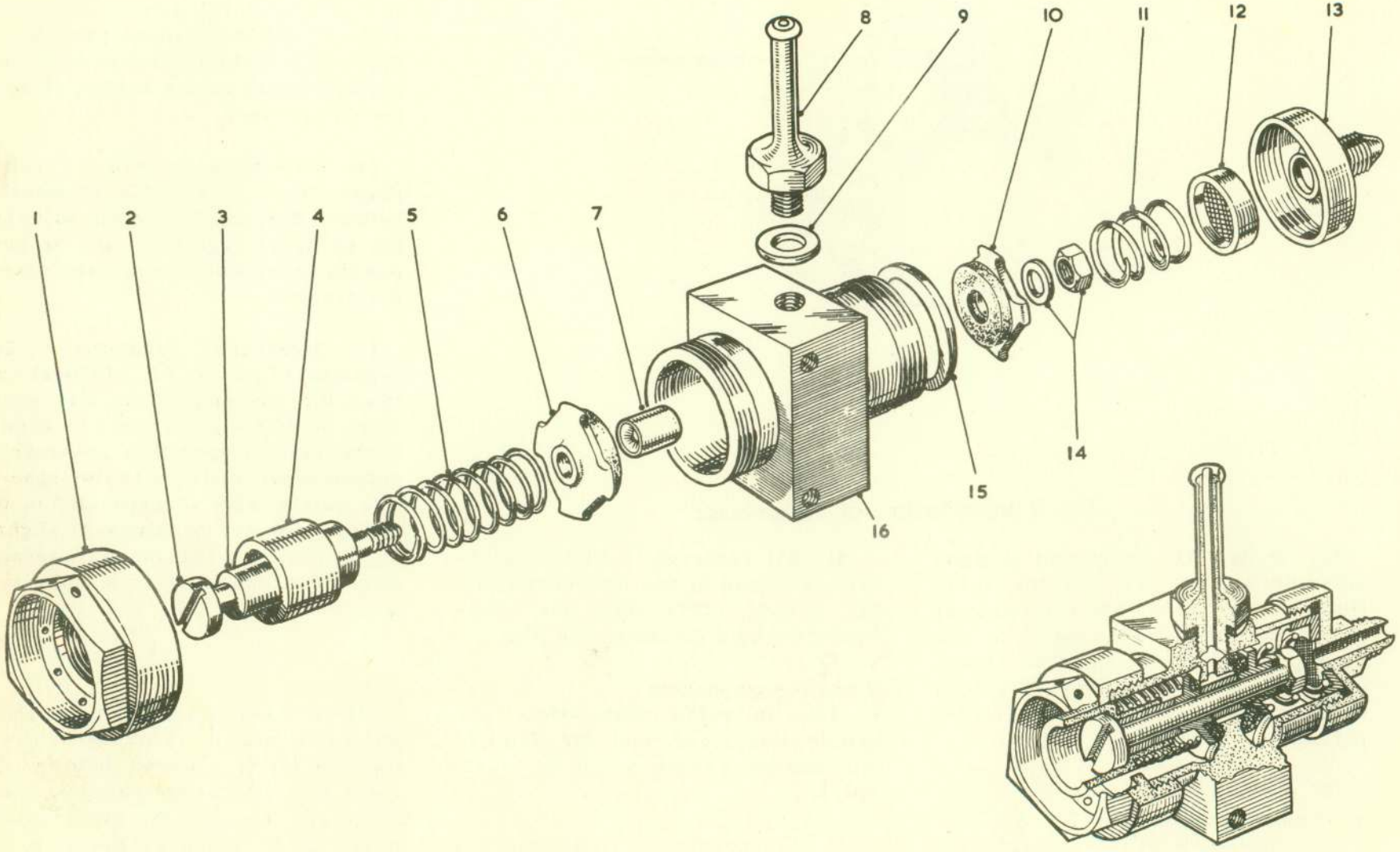

Fig. 3 Canopy seal air valve

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Canopy hatch seal air valve

5. The canopy seal air valve is fitted in the aft portion of the canopy near the external handle housing and controls the flow of air to the canopy hatch seal; it is automatically operated by the canopy hatch locking and unlocking mechanism (Sect. 3, Chap. 1).

SERVICING

General

6. The pneumatic components must be inspected at the periods laid down in the relevant servicing schedule and any adjustment or replacements made accordingly.

Note...

It is essential that all pressure is released from the system before breaking down any part of the circuit. The drain plug at the base of the air filter should be PARTIALLY unscrewed to exhaust the air pressure, through the small drilled hole, to atmosphere. When screwing in the drain plug, ensure it is locked by the lock-nut.

Extreme cleanliness must be maintained during all servicing operations, since dirt or dust in the system may render any of the valves inoperative.

Dunlop components

7. Servicing for the following components is briefly outlined. For full details, reference must be made to A. P. 4303B, Vol. 1.

(1) Air filter: The lock-nut and drain plug must be slackened off periodically to allow any foreign matter to drain from the base of the filter.

(2) Selector valve: No servicing is necessary except when the valve is removed and can be tested on a test rig.

(3) Spring return rams: No servicing is necessary except when the rams are removed and can be tested on a test rig.

(4) Air reservoir: The only servicing necessary is occasional removal from the aircraft to drain off condensation.

Hymatic components

8. Servicing for the following components is briefly outlined. For full details, reference must be made to A. P. 4303C, Vol. 1.

(1) Compressor: The oil inlet filter screw should be removed periodically and the gauze filter cleaned or renewed if necessary. The air inlet valve gauze and the air inlet filter pad (fig. 2) should be examined periodically, the latter being renewed when necessary.

(2) Safety valve: If the valve is suspect, it must be removed and tested on a test rig.

(3) Oil-and-water trap: Draining, which should be carried out periodically, is effected by unscrewing the blanking cap at the base of the trap and allowing the fluid to run out. Draining under pressure can be carried out with the engine running, or by applying pressure at the ground charging point.

(4) Pressure regulator: The adjusting screws for the regulator, or the relief valve incorporated in it, should not be altered unless the unit is removed and tested on a rig.

(5) Pressure-reducing valve: If the valve is suspect it must be removed and tested on a test rig.

Canopy hatch seal air valve (fig. 3)

9. The valve body (16) is closed by screw-on end caps. The air inlet connection (13) is formed on one of these end caps, whilst the other, the outlet connection (1), is drilled to allow exhaust air to escape to atmosphere. A gauze air filter (12) is embodied in the inlet end cap. Screwed into the square portion of the valve body is the adapter (8), to which is attached the rubber tubing connecting it with the canopy seal. Contained within the body is a spring-loaded shuttle valve (7), the two pistons of which have rubber faces (6) and (10) that seal against spigots on the reduced bore flange.

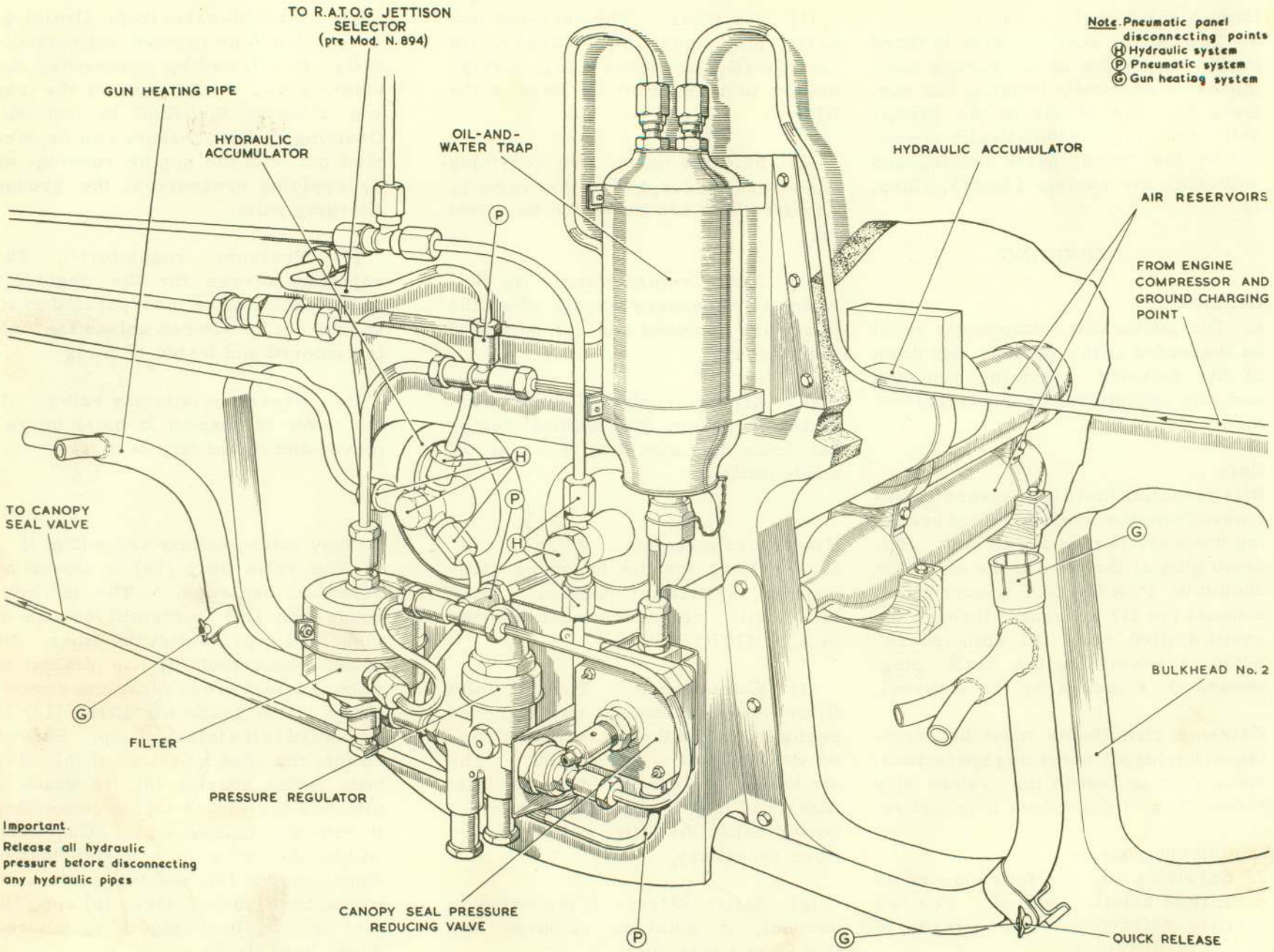

Fig. 4 (1) Pneumatic panel (pre-Mod. N. 627)

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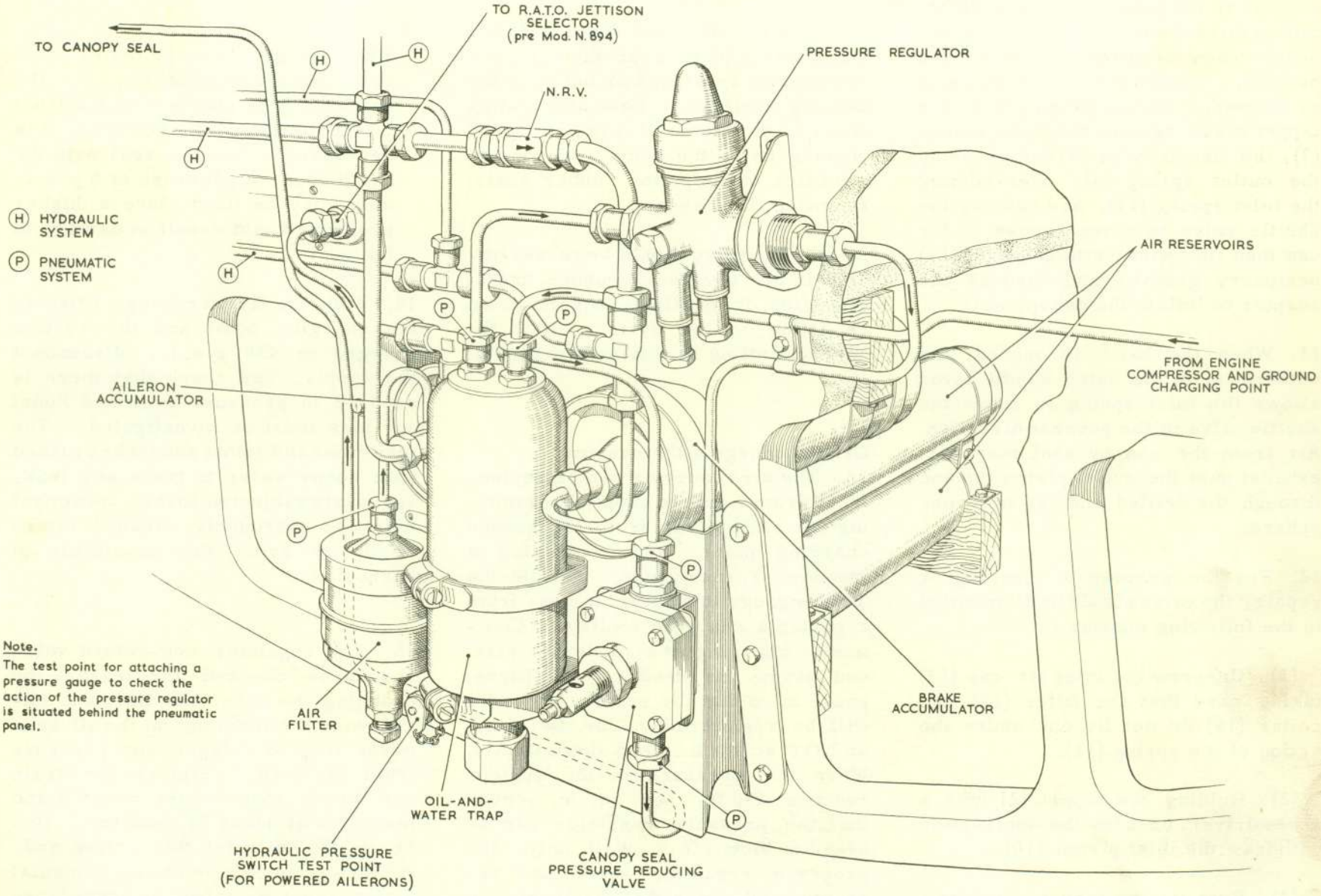

Note.
The test point for attaching a pressure gauge to check the action of the pressure regulator is situated behind the pneumatic panel.

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Fig. 4 (2) Pneumatic panel (post Mod. N. 627)

10. The valve tappet (2) is adjusted so that it is depressed by 0.08 in. minimum by the lever arm on the hatch handle when the latter is in the locked position. Operation of the valve is as follows. On being depressed, the tappet bears against the valve sleeve (3), the sleeve collar (4) compressing the outlet spring (5), over-coming the inlet spring (11), and causing the shuttle valve to move across. Air can then flow past the inlet piston (10) periphery grooves and through the adapter to inflate the canopy seal.

11. When the hatch is opened, the withdrawal of the hatch handle lever allows the inlet spring to move the shuttle valve in the reverse direction. Air from the canopy seal may then exhaust past the outlet piston (6) and through the drilled end cap to atmosphere.

12. For the purpose of cleaning or repair, the valve should be dismantled in the following manner :-

(1) Unscrew the inlet air cap (13) taking care that the filter (12) and collar (15) do not fly out under the action of the spring (11).

(2) Holding the tappet (2) with a screwdriver, unscrew the nut (14) and withdraw the inlet piston (10).

(3) Remove the tappet, unscrew the outlet end cap (1) and withdraw the outlet piston (6).

(4) Remove the adapter (8).

(5) Wash the inlet filter (12) and metal parts in trichlorethylene, and remove any scratches or burrs on the bearing surfaces. Ease the sliding faces of the piston if it is not a good running fit in the body. Check the condition of the piston rubber seals, renewing if necessary.

(6) The valve should be re-assembled in the reverse sequence to that given for dismantling, ensuring, on re-fitting to the system, that the correct setting is obtained (para. 10).

Ground charging the system

13. The air reservoir can be replenished from a ground supply by removing the sealing cap from the ground charging point, and connecting a standard Turner gauge. Couple the Turner gauge to a charging hose from a portable charging trolley. Commence charging at a moderate rate, and screw the head of the Turner gauge in so that the system pressure will be registered on the dial face; do NOT screw the head down tightly. When the pressure in the system reaches 450 lb. per sq. in., check that the pressure regulator can be heard to blow-off. Wait until the pressure regulator valve has re-seated, and check that the maximum pressure in the system is 450 lb. per sq. in.

Testing for leaks

WARNING

When the seal is to be tested at its operating pressure of 10 p. s. i., the hatch must be closed with the front latches locked. If, however, it is necessary to test the seal with the hatch open, a pressure of 6 p. s. i. only may be used since a higher pressure would result in damage to the seal.

14. With the Turner gauge fitted to the charging point and the system charged to 450 p. s. i., disconnect the supply, and check that there is no drop in pressure over one hour; any loss must be investigated. The pipe lines and joints should be brushed with soapy water to trace any leakage; parts subjected to this treatment must be thoroughly cleaned afterwards to avoid the possibility of corrosion.

15. The regulator non-return valve should be checked for leakage by charging the reservoir fully and unscrewing the drain nut on the oil-and-water trap to release any pressure from the trap. Tighten the drain nut, brush soapy water round it and leave for at least 15 minutes. Unscrew the nut after this period and, if there is an escape of air, remedial action must be taken in accordance with A. P. 4303C, Vol. 1, Sect. 4, Chap. 1.

REMOVAL AND ASSEMBLY

General

16. Removal and assembly instructions for the pneumatic panel only, are given, since the procedure for the other components will be apparent when viewed in the aircraft.

WARNING

All the pressure must be released before breaking down any part of the system.

17. All open pipe ends and components must be blanked off as they are disconnected. Pipe line joints and couplings should only be broken down where necessary. The bore of any new or refitted piping must be thoroughly cleaned with a 'pull through' and then subjected to a compressed air blast before attachment.

Pneumatic panel

18. Removal of the pneumatic panel from the aircraft must be carried out in the following manner (fig. 4(1) and (2)) :-

WARNING

Before disconnecting any pipe couplings, EXHAUST THE HYDRAULIC PRESSURE FROM ALL THE HYDRAULIC SYSTEMS. (Refer to Sect. 3, Chap. 6) and exhaust all air pressure from the pneumatic system.

(1) Remove the ammunition feed chutes from the inboard guns (Sect. 7, Chap. 3).

(2) Disconnect the hydraulic pipe lines at the aileron and brake accumulator banjo connections (pre-Mod. 627 aircraft), and remove the banjo bolts together with the banjo connections; post-Mod. 627 aircraft have normal pipe unions.

(3) Disconnect the pneumatic pipelines as shown in fig. 4.

(4) Disconnect the gun heating pipe on bulkhead No. 2 at the points shown in fig. 4. Release the heating pipe from the bulkhead by means of the two quick-release fasteners and remove the pipe.

(5) Remove the six 2 BA bolts and two woodscrews securing the pneumatic panel to the bulkhead, and lower the pneumatic panel down and away from the aircraft.