Chapter 10 OXYGEN SYSTEM

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DESCRIPTION

MAIN SYSTEM

General information

1. The main oxygen system is the pressure demand type, and is used in conjunction with a face mask or partial ▶pressure helmet, and a jerkin. High-◀ pressure pipes connect the charging valve to two oxygen cylinders carried in cradles between frames 3 and 5 in the forward equipment compartment. Interposed between the charging valve and the cylinders are a filter and non-return valves. From the cylinders, the high-pressure supply pipe passes through the [redacted] pressure bulkhead (frame 6) to a contents gauge, on the starboard instrument panel, and to a pressure-reducing valve fitted between frames 6 and 7; from the reducing valve, oxygen is supplied at an intermediate pressure to a demand regulator on the centre pedestal (on the starboard console of Mk.1A aircraft). A low-pressure pipe supplies oxygen from the regulator to the pilot's personal equipment connector (P.E.C.) on the ejection seat, and a flexible hose connects the P.E.C. to ◀the pilot's mask and pressure jerkin.

Charging valve

2. All the storage cylinders are charged simultaneously through a charging valve situated behind access panel 6P.

Filter

3. A pipeline filter is fitted in the ▶

charging line adjacent to the charging valve to prevent any extraneous matter entering the system.

Non-return valves

4. Four non-return valves are incorporated in the high-pressure supply system - two between the charging valve and the oxygen cylinders, and two between the cylinders and the pressure-reducing valve - as a safeguard against total loss of oxygen should a supply pipe fracture.

Cylinders

5. The two oxygen cylinders, one 750-litre and one 400-litre, are normally charged in situ. The cylinder valves are wire-locked in the open position, but may be closed to enable a charged cylinder to be removed or to facilitate the replacement of a component without discharging the cylinders. P.V.C. covers fitted over the valves protect them from oil, grease or dirt, and it is important that these covers are always in position.

Contents gauge

►**6.** The oxygen contents gauge is the◄ simple Bourdon tube type and indicates the oxygen supply available in the aircraft oxygen cylinders. It is calibrated in eight segments, that indicating the lowest reading being coloured red.

Pressure-reducing valve

7. A pressure-reducing valve, fitted on the starboard side of the fuselage between frames 6 and 7, reduces the supply pressure to the intermediate pressure required by the demand regulator. A relief valve incorporated in the unit relieves pressure if this should rise above the safe maximum.

Demand regulator.

8. The oxygen demand regulator is mounted on the centre pedestal with all controls and indicators facing the pilot (in Mk.1A aircraft the regulator is on the starboard console, facing inboard) An ON-OFF switch, normally wire-locked in the ON position, admits oxygen from the pressure supply, and a 0-500 lb/in² gauge shows the pressure at which oxygen is being delivered from the reducing valve. A magnetic flow indicator operates each time oxygen is supplied to the face mask. When set to any position other than NORMAL, a four-position manual selector control superimposes a spring load on the demand valve linkage and increases the oxygen pressure to the mask. A spring-loaded pin in the operating lever prevents inadvertent movement of the selector, and must be lifted manually to permit movement to the MASK-TEST and JERKIN TEST positions. At the

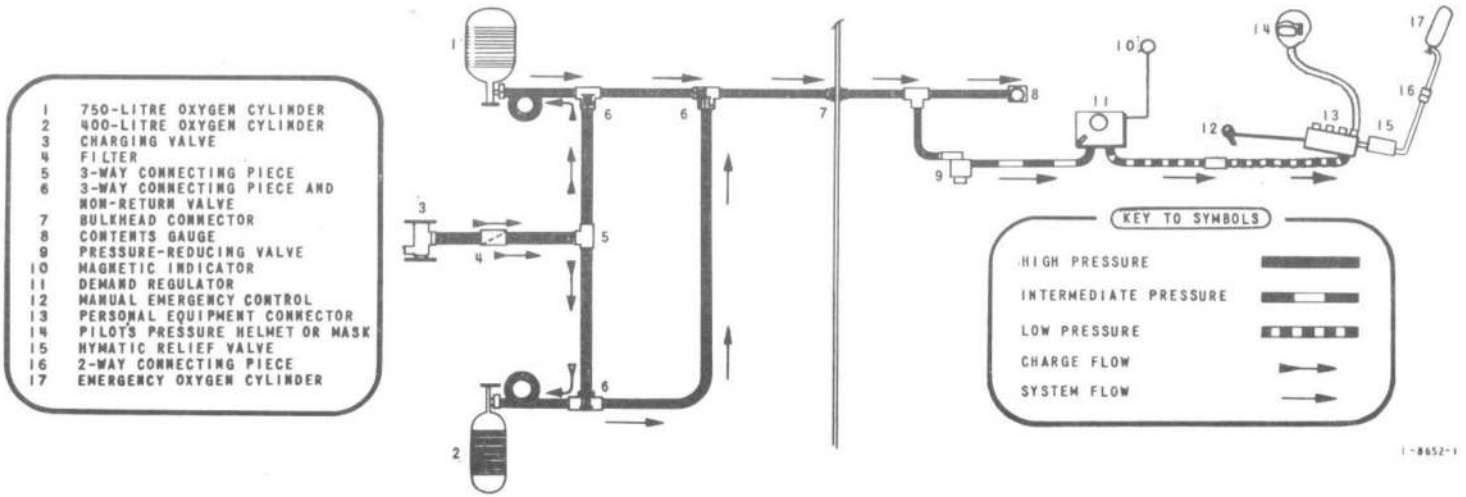

Fig. 1. Oxygen system diagram

top right-hand corner of the regulator is a manually-operated air inlet valve having two positions; NORMAL OXYGEN and 100% OXYGEN. This valve is wire-locked in the 100% OXYGEN position to supply undiluted oxygen at all times. In addition to the mask connection the regulator has a plug connection for a remote magnetic flow indicator.*(para.9)*.

Magnetic indicator

9. A magnetic indicator on the port coaming panel provides an additional indication of oxygen flow through the demand regulator. The indicator is in electrical circuit with contacts in the regulator, the contacts opening and closing in response to movement of a diaphragm during each breathing cycle.

Personal equipment connector (P.E.C.)

10. The P.E.C. consists of three main parts:- the aircraft component, seat component and personal component. The seat component is bolted to the starboard side of the seat pan and, when the pilot connects his personal component to this, the oxygen system is completed. It is important that the dust cover, stowed on the starboard side of the seat pan, is always fitted to the seat component when the personal component is disconnected. The P.E.C. is fully described in A.P.109A-0001-1.

EMERGENCY SYSTEM

General information

11. The ejection seat is provided with a completely self-contained emergency oxygen system mounted on the starboard side of the seat pan. The 55-litre cylinder is connected through a relief valve to the P.E.C.

Emergency selection

12. Emergency oxygen is selected by pulling up the yellow-and-black striped knob at the front of the seat pan. This operates the emergency selection cable to sever the break-off tube fitted at the cylinder outlet, allowing the oxygen to flow to the mask. The hollow base of the break-off tube remains in place, the small bore acting as a choke to prevent a wasteful rate of flow. Once selected, the flow of oxygen will continue until the cylinder is exhausted.

Emergency supply on ejection

13. On ejection automatic transfer to the emergency supply is provided by a trip mechanism on the back of the seat which initiates the operations described in para.12. A static line, secured to the aircraft structure and the P.E.C. causes separation of the aircraft and seat components, and valves in the seat component close when separation takes place to prevent loss of the emergency supply to atmosphere.

Relief valve

14. A Hymatic relief valve on the starboard side of the seat pan controls the pressure of the oxygen supplied from the emergency cylinder by providing outward relief of excess pressure and inward venting when the system pressure drops. A non-return valve isolates the emergency system, when not in use, from the main oxygen system.

SERVICING

WARNING

1. 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.

2. Many materials, particularly oil and water, are liable to spontaneous combustion when exposed to undiluted oxygen. Therefore, to avoid the risk of a fire or an explosion, it is essential to keep the oxygen equipment and the area in the vicinity of the equipment free from any such material.

General information

15. The servicing necessary to maintain the system in an efficient working condition consists mainly of keeping the installations free from oil, grease, and moisture, checking that the cylinders are fully charged, and testing the pipe unions and connections for leaks. It will usually be found that leakage is caused by dirt on a nipple or branch mating face; this is remedied by cleaning and de-greasing the faulty fitting. If the leak still persists, a replacement fitting will be required. An examination of the systems should also be made for damage and security and to check that the flexible hoses are fitted correctly. The emergency cylinder should be checked to ensure that the tell-tale wire has not been broken; if the wire is found

◄ broken the cylinder must be removed and recharged after fitting a new break-off tube, as described in A.P.1275G, Vol.1, or A.P.107D-1002-1. The testing of standard components is described in A.P.107D-0001-1.

16. The approved solution given in A.P.107D-0001-1 should be used when testing pipeline joints for leaks. On no account should a soap solution, prepared from soft soap, be used.

Lubrication

17. Before assembly, screw threads should be lubricated with anti-seize fluid ZX-24, which should be allowed to dry before engagement.

System charging

18. The method of charging the oxygen cylinders in situ is described in A.P. 107D-0001-1, Chap.2. Details of the charging equipment are given in A.P. 1275G, Vol.1, Part 1, Sect.4, Chap.1. ► After charging the system, close the charging valve and refit the blanking cap; it is not necessary to wire-lock the valve.

REMOVAL AND ASSEMBLY

Cylinders

Removal

19. To remove an oxygen cylinder:-

(1) Open the forward equipment hatch (access panel 3).

(2) Discharge the oxygen from the system, or, if the cylinder is to be removed in a charged condition, remove the P.V.C. cover, break the locking wire, and close the valve on the cylinder.

(3) Break the locking wire on the union nut of the supply pipe, and unscrew the nut. Fit a blanking cap to both the pipe and the cylinder to prevent ingress of dust and moisture.

(4) Remove the locking wire from the cylinder cradle nuts and retaining strap bolts, and unscrew the nuts and bolts.

(5) Hinge back the cylinder retaining straps, remove the cradle end fittings, and lift the cylinder clear.

Assembly

20. To install an oxygen cylinder:-

(1) Position the cylinder in its cradle, ensuring that the cylinder connection aligns with the pipe union.

(2) Secure the cylinder cradle end fittings and retaining straps; tighten and wire-lock the nuts and bolts.

(3) Remove the blanking cap from the pipe end and the cylinder and fit and tighten the pipe union nut. Wire-lock the nut.

(4) Open the cylinder valve and wire-lock in that position. Refit the P.V.C. cover.

(5) Charge the system with oxygen, and test the pipe connection and cylinder valve for leaks.

(6) Close the forward equipment hatch (access panel 3).

TABLE 1

List of components

Component	Ref.No.	Qty.	A.P. Reference
Cylinder, H.P. oxygen, Mk.5D, 750 litre	6D/9429894	1	1275G, Vol.1 (2nd. Edn.), Part 1 or 107D-0001-1
Cylinder, H.P. oxygen, Mk.14A, 400 litre	6D/9439448	1	
Cylinder, emergency oxygen, Mk.1 (pre Mod.4190)	6D/2284		
or Mk.4 (post Mod.4190)	6D/2896	1	
Filter, line, Mk.1	6D/574	1	
Gauge, oxygen contents, Mk.4	6D/2237	1	1275G, Vol.1 (2nd. Edn.), Part 2 or 107D series
Indicator, magnetic, Type C1	5C2/5803	1	113F-0615-1
Piece, connecting, 2-way, Mk.3A	6D/575	3	107D-0001-1
Piece, connecting, 3-way, Mk.3A	6D/603	4	
Piece, connecting, 4-way, Mk.3A	6D/604	2	
Regulator, demand and inflation,			
Mk.20A or Mk.20B (pre Mod.4418)	6D/2295 or 2483		107D-0208-1
Mk.21B (post Mod.4418)	6D/2383		
Regulator, demand, emergency oxygen, Mk.1	6D/2285	1	
Valve, non-return, Mk.1	6D/427	3	107D-0001-1
Valve, oxygen charging, Mk.10 (pre Mod.1816)	6D/1872	1	107D-0500A-1
Mk.10A (post Mod.1816)	6D/2313	1	
Valve, pressure-reducing, Mk.1	6D/1616	1	1275G, Vol.1 (2nd. Edn.), Part 2 or 107D series
or Mk.1A	6D/2344	1	
Valve, pressure-relief, Type RV.51/2	6D/2904	1	107D-0503-1