Chapter 10 OXYGEN SYSTEM

(Completely revised)

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DESCRIPTION AND OPERATION

Introduction

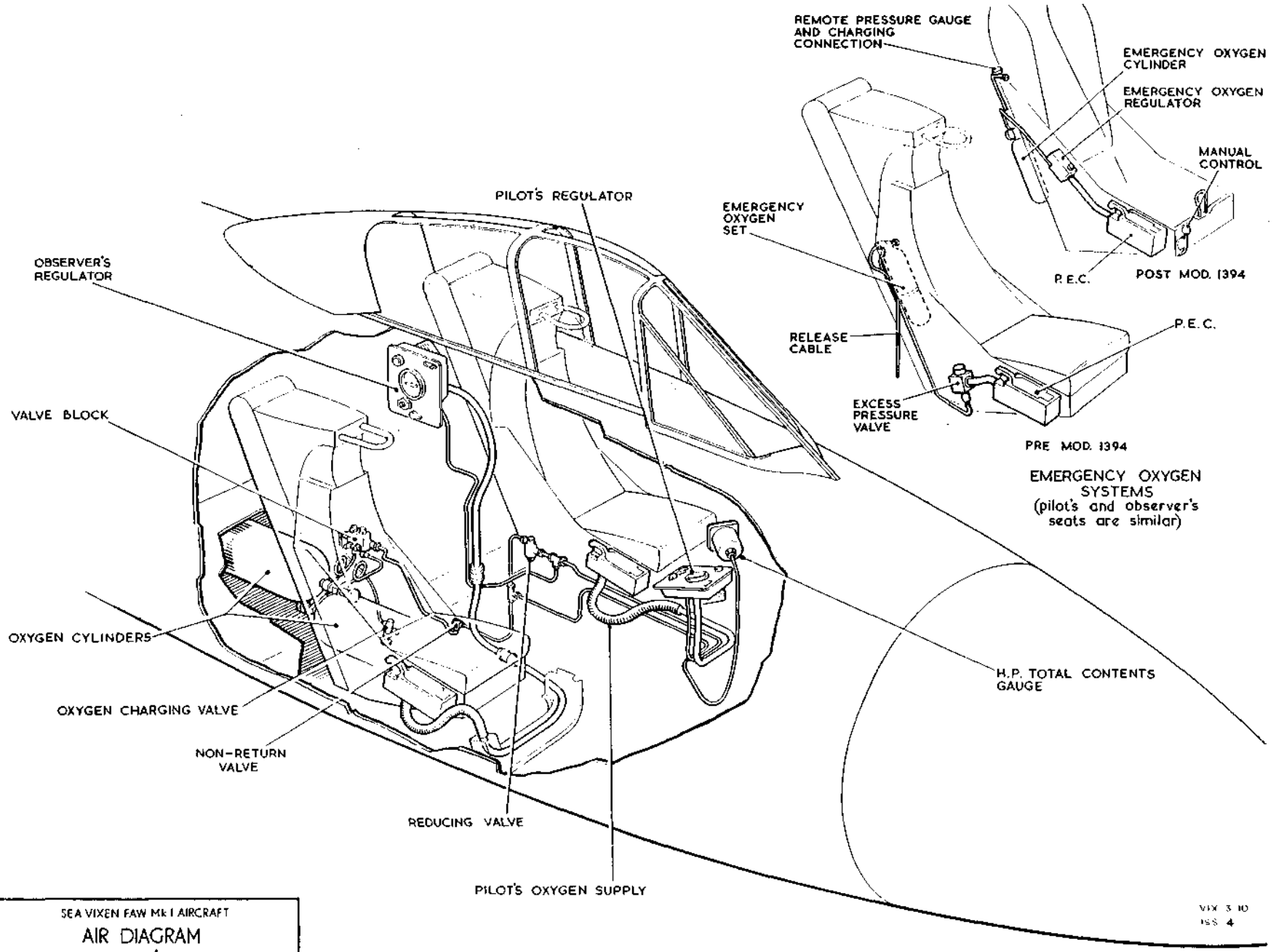
1. The oxygen system (fig. 1) is designed for high altitude flying in conjunction with a pressurized cabin. A Mk. 17E or 17F regulator is fitted for the pilot's use on the starboard console panel, and for the observer on the observer's port shoulder guard. A magnetic indicator on the starboard console warns the pilot if the observer's oxygen supply fails. On post-Mod. 439 aircraft, the oxygen is supplied to the pilot and observer through a personal equipment connector (P.E.C.) fitted to the starboard side of each seat. On pre-Mod. 439 aircraft the supply from the regulator is delivered via a standard oxygen flexible hose and quick-release connector. Each ejection seat is fitted with an emergency oxygen set should the main system fail, and for use after ejection.

General

2. Two 2,250 litre capacity wire-wound high-pressure cylinders, fitted with Mk. 7A stop valves, are installed below the cockpit floor, and are charged in situ through a charging connection which is accessible after opening the air brake centre access door (Sect. 2, Chap. 4). The charging line passes to a valve block (fig. 2) where a filter is fitted at the connection; four non-return valves are housed in the block, and the charging line passes, via two of these valves and a filter fitted in each line, to connections on the cylinders.

3. The high-pressure oxygen supply from the cylinders passes back through the charging pipes to the valve block, and via the other two non-return valves to the cockpit supply pipe. Should the pressure drop, in either of the cylinders, the non-return valves are arranged to prevent interfeeding.

4. The supply line enters the cockpit via a Mk. 1 non-return valve and an elbow adapter, and then from a tee-piece to a contents gauge fitted on the starboard side of the pilot's cockpit; a non-return valve is fitted below the cockpit floor to prevent a total loss of pressure, should a leak develop in the line, back to the valve block. A Mk. 1 reducing valve (or Mk. 1A, post-Mod. 1037), fitted in the line from the tee-piece, reduces the supply pressure to that required by the regulators. From the reducing valve, a supply line carries the oxygen to the pilot's regulator, and from a tee-piece in this line a supply is taken to the observer's regulator; from the regulators the supply is taken to the aircraft component of the P.E.C. (post-Mod. 439). When the seats are fitted, the aircraft component is fitted to the seat component. The final connection is made by the seat occupant fitting the personal component to the seat component. On pre-Mod. 439 aircraft, the supply from the regulators terminates in a flexible hose with a quick-release end-fitting for the attachment to the oxygen mask.



SEA VIXEN FAW Mk 1 AIRCRAFT	
AIR DIAGRAM	
7625/MIN.	
ISSUE 2	PREPARED BY MINISTRY OF AVIATION FOR PROMULGATION BY ADMIRALTY

Fig. 1. Oxygen system
(Pre and post-mod. 1394)

Oxygen regulators

5. Each Mk. 17E or 17F oxygen regulator performs the dual function of regulator and economizer, an aneroid assembly supplies a progressively richer oxygen/air mixture as altitude is gained. Manual override controls make pure oxygen and pressure breathing available at any time. When an air inlet lever on the regulator panel is set to 100% OXYGEN the regulator will deliver undiluted oxygen at any altitude; this lever closes an air inlet shutter and, should there be contamination of the cabin air or loss of cabin pressure, the lever must be moved to the 100% OXYGEN setting. A blinker on the regulator panel indicates when oxygen is being supplied to the user, by showing alternately BLACK and WHITE; internal electrical contacts in the observer's regulator operate a magnetic indicator, mounted on the pilot's starboard console panel which, when white, shows the pilot that the observer is receiving an oxygen supply. A full description of the Mk. 17E and 17F regulator and servicing instructions are given in A.P.1275G, Vol. 1 (2nd Edn.), Part 2, Sect. 1.

Emergency oxygen (pre-Mod. 1394)

6. Each ejection seat is fitted with a Mk. 7F (pre-Mod. 439) or Mk. 8A (post-Mod. 439) emergency oxygen set for use after ejection at high altitude or for emergency use in the cockpit. The bottle is mounted on the rear of the seat structure at the starboard side and is secured by a single quick-release pin. On pre-Mod. 439 aircraft the supply is taken direct to a quick-release fitting near the oxygen mask. On post-Mod. 439 aircraft, the supply is taken to the excess pressure valve, RV151–003, on the starboard side of the seat pan and then to the rear of the P.E.C. seat component to enter the main oxygen supply chamber. The excess pressure valve controls the flow of emergency oxygen, and isolates the emergency system when the normal oxygen supply is being used. The excess pressure valve is described in A.P.4288 (Naval), Vol. 1, Part 1, Sect. 8, and the emergency oxygen sets in A.P.1275G, Vol. 1 (2nd Edn.), Part 2, Sect. 4.

7. The emergency oxygen is delivered when a cable attached to the head of the bottle is pulled to operate the release mechanism. The pilot's emergency control lever (knob, pre-Mod. 637) is located on the centre, rear console and by pulling the lever (or knob) up, the pilot can operate the emergency oxygen bottle. The cable, being attached to the aircraft structure, also discharges the bottle when the seat is ejected. The observer has a similar control knob situated on the starboard side of the cockpit, between the seat pan and the fuselage skin.

Emergency oxygen (post-Mod. 1394)

8. When ejection seats to Mod. 1112 and 2779 standard are fitted, the emergency oxygen system is self-contained on the seat.

9. An emergency oxygen cylinder (Pt. No. OP5800), mounted on the aft face of the seat, is connected to an emergency oxygen demand regulator, Mk. 1 (Pt. No. OP 4230), which controls the oxygen flow to the emergency connection of the P.E.C.

10. The cylinder is discharged by pulling a control knob on the forward face of the seat pan, or by a trip lever striking a bracket on the guide rail when the seat is ejected.

11. The cylinder is charged in situ by an external supply, which is connected to the charging valve (Pt. No. OP5400) mounted on the starboard side of the seat. Pressure gauges, located on the cylinder and charging block, register the pressure in the cylinder. A probe unit (Pt. No. OP19267) is fitted in the charging connection of the cylinder to allow the pressure to be registered on the remote gauge.

12. The demand regulator, charging connection, cylinder (with release mechanism), and probe are described in A.P.1275G, Vol. 1 (2nd Edn.), Part 2, Sect. 1, 2, 4 and 7 respectively.

SERVICING

WARNING . . .

(1) Oil, grease or organic matter in contact with high-pressure oxygen forms a dangerous explosive combination. All servicing and inspection of oxygen systems must be done with degreased equipment and clean hands. All pipes and fittings must be thoroughly de-greased and blown through with filtered air before installation.

(2) Oil or other fluids must not be allowed to drip or splash in the vicinity of a regulator, as there is a risk that it may seep into the supply lines via the air inlet shutter.

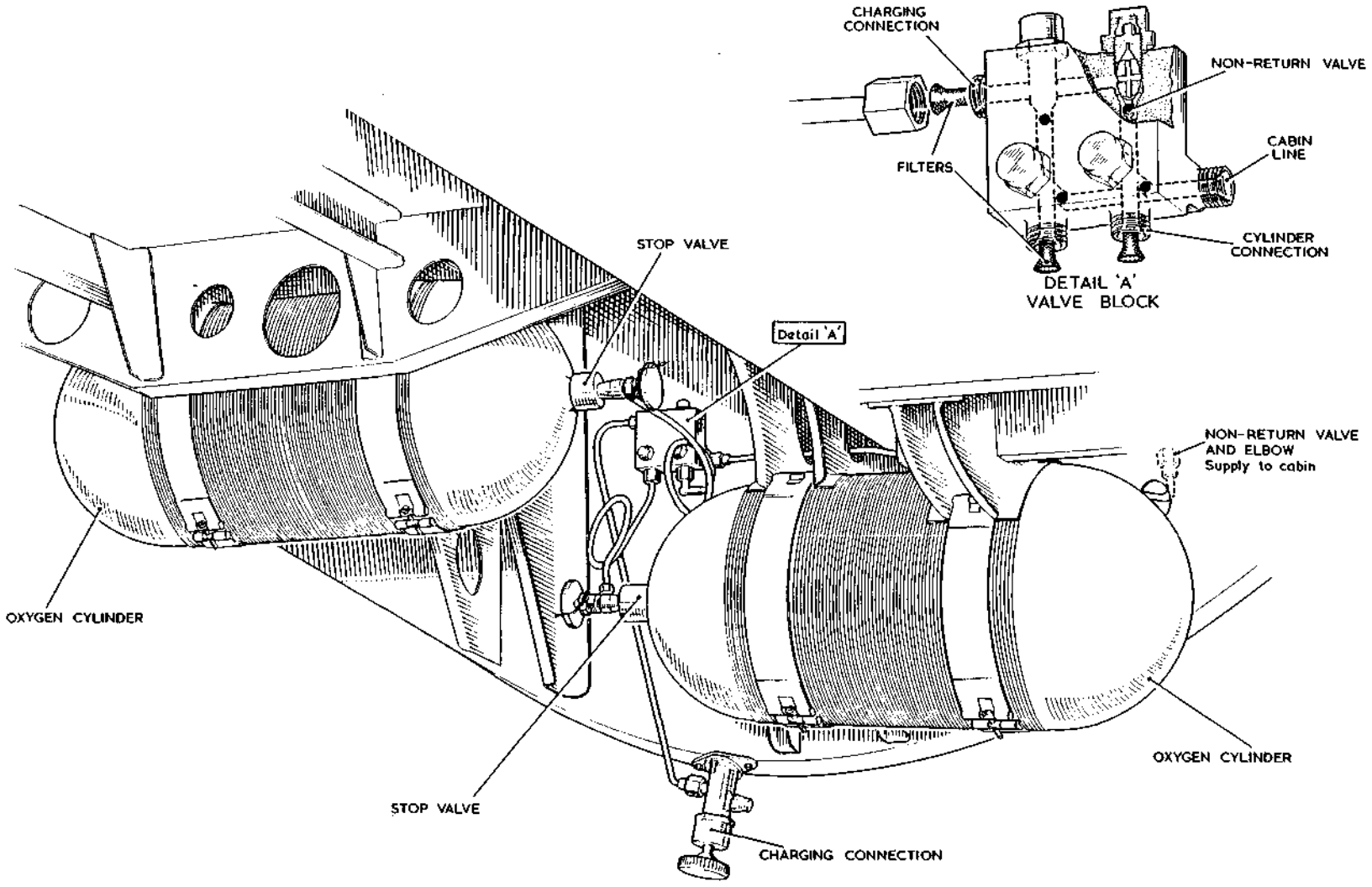


Fig. 2. Oxygen installation under the cockpit floor

General

13. The various components in the system must be inspected in accordance with the instructions given in the Vol. 5, A.P.4288 (Naval), Vol. 1, and A.P. 1275G, Vol. 1 and 6.

Ground charging

14. The cylinders are charged in situ from an oxygen-charging trolley and the procedure is described in A.P.1464G, Vol. 1, the charging connection and valve are shown in fig. 2. Each cylinder must be charged to 1,800 lb p.s.i., care being taken to check that the stop valves on the cylinders are open and securely wire-locked in this position.

WARNING . . .

(1) Special care must be taken to ensure that there is no oil, grease or moisture in the vicinity of the charging connection.

(2) An element of risk also exists in the presence of kerosine. As this does not evaporate readily, spillage contaminates the ground and the aircraft structure, and can be picked up on the hoses and on the hands of personnel. In view of this, special care must be taken to guard against trace contamination by aircraft fuel and also cleaning fluids. Rubber oxygen hose will also deteriorate in the presence of fuel.

(3) Instances of contamination of the oxygen system by water have occurred. This can have very serious results, including a complete failure of the system at high altitude through freezing. Likely sources of contamination include water entering the hose of the charging trolley should the blanking plug be left off after use, and the absorption of water by the asbestos sealing used in the charging hoses when the trolleys are left in the open air. A further source of trouble is condensation, caused by the aircraft standing with a completely discharged oxygen system.

REMOVAL AND INSTALLATION

General

15. When any part of the system which is under pressure from the cylinders is to be dismantled, the cylinder valves must be turned off and a convenient union nut slackened to allow the residual pressure to escape. When the work is completed, wire-lock the valves in the open position before re-charging the system.

Fitting low-pressure oxygen hose

16. On pre-Mod. 439 aircraft, care must be taken when fitting the low-pressure oxygen hose to ensure that it is not in tension when the seat is raised to its highest position, and that it is not tending to pull away at the quick-release point. Conversely, the hose must not be too long, or it may foul under the seat or become trapped.

17. On post-Mod. 439 aircraft, the low-pressure oxygen hoses must be screwed right home on to their respective metal pipe connections. If the hoses are correctly fitted it should not be possible to remove the hose without damage. Therefore, whenever a hose is removed, it must be scrapped and a new hose fitted. It is recommended that the hose to the pilot's P.E.C. is removed and installed as follows:—

(1) Slacken the clamp securing the pipe (code No. 12) to the cockpit floor.

(2) Disconnect the pipe (code No. 11) at the regulator.

(3) Remove the four screws securing the pilot's regulator, lift the regulator to slacken the upper clip and disconnect the pipe (code No. 12) from the regulator.

(4) Withdraw the pipe from the starboard console and remove the anti-kink hose from the pipe and the P.E.C.

(5) Fit a new anti-kink hose to the P.E.C. ensuring that the hose is screwed on fully. Screw the pipe (code No. 12) into the hose until the threaded portion of the pipe is fully covered.

Note . . .

The fitting of anti-kink hoses is fully described in A.P.1275G, Vol. 1 (2nd Edn.), Part 2, Sect. 3, Chapter 10.

(6) Connect the pipe (code No. 12) to the regulator and refit the regulator.

(7) Connect and wire-lock pipe (code No. 11).

(8) Tighten the pipe clamp to the cockpit floor.

(9) Perform an oxygen flow test.

Fitting emergency oxygen bottle

18. On pre-Mod. 439 aircraft, when fitting the Mk. 7F oxygen set, the regulator head outlet must face to starboard, and the clamp securing the operating cable housing must have the clamps lugs facing aft. The cable operating housing should follow the centre line of the bottle from the point where it emerges from the regulator head.