

Chapter 5

OXYGEN MASKS, TYPE A-13A AND TYPE A-13A/1

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Introduction

1. Oxygen masks, Type A-13A and A-13A/1, are used in conjunction with demand and pressure demand oxygen systems. In a demand oxygen system, the breathing mixture delivered is governed by the rate of breathing of the user, the suction of the inspired breath operating a diaphragm in the regulator. The amount of oxygen delivered is controlled by the regulator and any air necessary to make up the amount of breathing mixture required is admitted through the regulator instead of at the mask.

2. A pressure demand system is an elaboration of the normal demand system, and the breathing mixture is supplied at a pressure above that of the atmosphere. The proportion of air in the breathing mixture becomes progressively smaller, and the pressure at which the mixture is supplied becomes progressively greater, as the aircraft reaches higher altitudes. The pressure demand regulator is described in A.P.1275A, Vol. 1, Sect. 8.

3. The mask used with a pressurised oxygen system differs from the normal type of mask in that it must hold pressure, while the expiratory valve must be pressure-compensated, in the sense that it must open only at a pressure slightly greater than that of the breathing mixture.

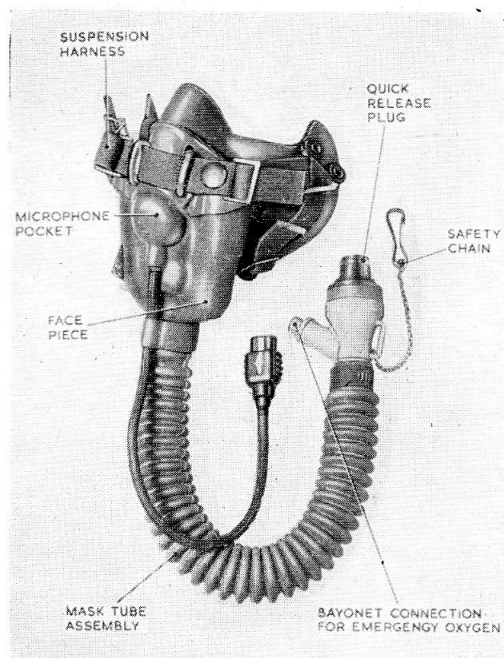


Fig. 1. Oxygen mask, Type A-13A

DESCRIPTION

4. The mask (fig. 1 and 2) consists of a rubber facepiece with two inspiratory valves connected to a mask tube assembly by ducts formed inside the facepiece, a pressure-compensating expiratory valve, a micro-

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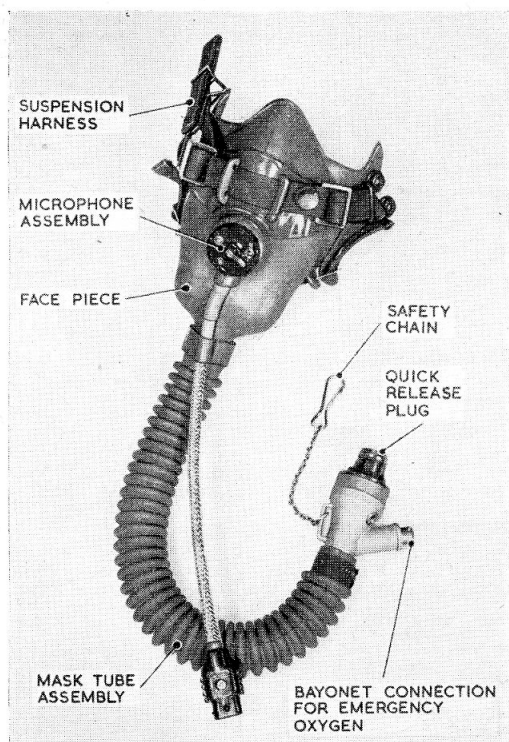


Fig. 2. Oxygen mask, Type A-13A/1

phone assembly, and the suspension harness necessary to hold it firmly on the wearer's face.

5. The mask is provisioned under the following Reference Stores numbers :—

Type	Size	Stores Ref.
A-13A	Large	6D/1690
	Medium	6D/1691
	Small	6D/1692
A-13A/1	Large	6D/1581
	Medium	6D/1582
	Small	6D/1583

Notes . . .

- (1) Masks should be identified by the Stores Ref. numbers and not by any other markings.
- (2) The masks are supplied complete with mask tube assembly and microphone assembly.

(3) The major difference between the Type A-13A and the Type A-13A/1 is the type of microphone fitted (para. 11 and 12). The Type A-13A mask is used in aircraft fitted with American radio installations.

Facepiece

6. With a pressure-breathing system, it is essential that the mask should not leak. The facepiece (fig. 3) is provided with an internal sealing flap which is pressed against the face ; a lip strap passes across the upper lip of the wearer and holds the sealing flap in position. Wide cheek flaps protect the wearer from frostbite and flash fire burns.

7. A rigid nosepiece, shaped to conform to the contour of the upper part of the face, is mounted on two rubber lugs at the front of the mask. The nosepiece acts as a brace across the front of the mask and so helps to make it pressure-tight.

8. The nosepiece is held in position by the suspension harness, part of which passes through the two lugs at the front of the mask. The harness consists of webbing straps and is attached to the facepiece at the bottom by two fabric-reinforced lugs and at the top by two rubber lugs. Four adjustable buckles, two on the front of the mask and one at each side, are attached to the straps. A metal helmet hook is fitted on the right-hand side of the harness, and the left-hand side is fitted with a double snap fastener.

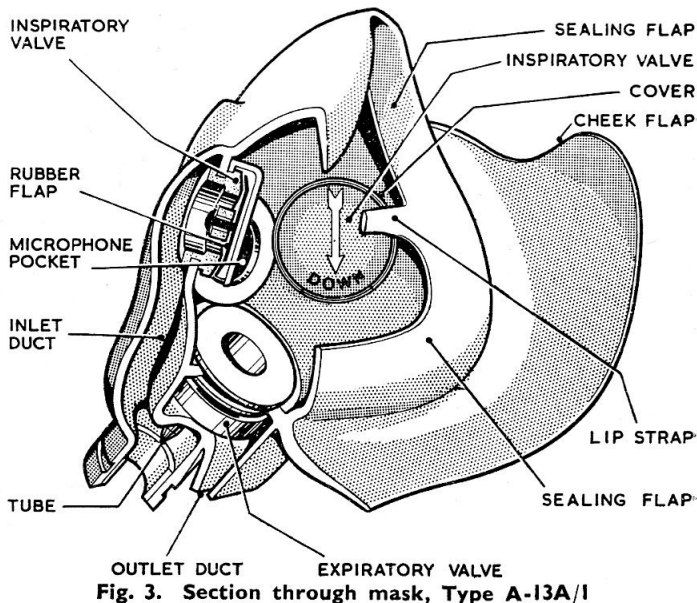


Fig. 3. Section through mask, Type A-13A/1

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Inspiratory valves

9. The breathing mixture enters the mask through an inlet tube at the base and passes into ducts formed in each side of the rubber facepiece. Each duct is fitted with an inspiratory valve which consists of a plastic valve seat covered by a rubber flap which forms a non-return valve. A plastic push-on cover is fitted over each inspiratory valve to protect it from moisture and dirt. The cover is marked with an arrow and should be fitted with the arrow pointing downwards (fig. 3).

Expiratory valve

10. The expiratory valve, which is fitted at the base of the mask, consists of a circular metal housing containing an outlet disc valve. The valve disc is mounted on a diaphragm supported by a light spring. A small chamber on the underside of the diaphragm terminates in a tube which projects into the duct conveying the breathing mixture to the inspiratory valves.

11. Under normal demand breathing conditions, the expiratory valve opens when the user commences to exhale, because in so doing he creates pressure inside the mask and this pressure overcomes the spring load on the valve disc. The pressure required to open the valve is small—about 4 mm. (0.016 in.) of water.

12. Under pressure-breathing conditions, the pressure inside the mask is equalized by the pressure applied to the underside of the diaphragm and the expiratory valve remains closed. When the user exhales, however, the inspiratory valves close and enable the small additional pressure to be built up to overcome the spring load and open the expiratory valve. The operation of the expiratory valve is shown in fig. 4.

Microphone assemblies**Mask, Type A-13A**

13. The microphone assembly used on the Type A-13A mask has not been given a number. The mask is fitted with an American carbon microphone, Type MC-254A, which has no switch. The microphone is totally enclosed in a pocket in the facepiece (fig. 1) and is provided with a connector, Type 3849. A microphone switch is fitted in the connection between the aircraft and the Type 3849 connector.

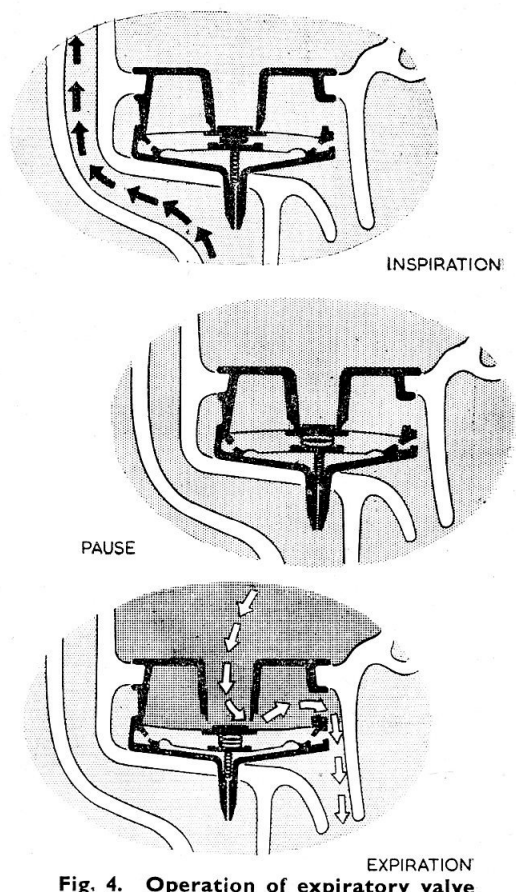


Fig. 4. Operation of expiratory valve

Mask, Type A-13A/1

14. The Type A-13A/1 mask is fitted with a microphone assembly, Type 71. An electro-magnetic microphone, Type 59, fits into a pocket at the front of the mask (fig. 2). A switch, Type 1273, is mounted in front of the microphone. A Type 3858 connector passes through a channel on the underside of the pocket and terminates in a socket, Type 453.

Note . . .

The Type A-13A/1 masks were initially fitted with a microphone assembly, Type 66, which incorporated a connector, Type 3524, which had a PVC-covered lead. This lead was insufficiently flexible and caused trouble at the end connections. Later masks are fitted with the microphone assembly, Type 71, incorporating the connector, Type 3858, which has a more flexible braided-fabric covered lead.

Mask tube assembly

15. The mask is supplied with the mask tube assembly already attached. The lower end of the tube is fitted with a quick-release connector, which has a socket at the side for the emergency oxygen set. The connector is fitted with a non-return valve, because the emergency oxygen set discharges directly into the mask tube assembly, which has no inner tube.

16. An emergency oxygen set used with a Type A-13A or A-13A/1 mask must be modified by having a bayonet union plug (Stores Ref. 6D/1377) fitted to the delivery tube. These sets, which are modified as and when required, are indicated by the suffix "A" and have new Stores Reference numbers, as follows:—

Mk. 1A — 6D/1643

Mk. 2A — 6D/1644

Mk. 3A — 6D/1645

Mk. 4A — 6D/1646

17. Masks, Type A-13A and A-13A/1, can be used with walk-around oxygen sets incorporating American low pressure demand regulators, Types A-13, A-15, and A-21.

FITTING

18. The mask must be carefully fitted because leakage would reduce, or even nullify, the efficiency of the pressure demand system, and increase considerably the rate of oxygen consumption.

19. The snap fasteners on the mask harness should be fitted to the helmet fasteners in such a position that the upper webbing strap is horizontal.

20. To hold the higher pressures, the mask must be held very firmly against the face and this may result in painful pressure on some parts of the face, especially the bridge of the nose. This discomfort may be reduced as follows:—

- (1) Do not try to maintain more tension on the mask than is necessary to hold pressure. In other words, adjust the strap tension so that it just balances the pressure inside the mask.
- (2) Do not let the cheek flaps jam against the edges of the helmet because this tends to counteract the strap tension and makes it necessary to draw the mask more tightly against the nose. The cheek flaps may be trimmed to clear the helmet.

Note . . .

The lip strap may cause some discomfort at first but for the mask to hold pressure efficiently the strap must not be removed.

EXAMINATION AND TESTING

21. The following examination and tests should be carried out before flights:—

- (1) *Examination.* Make sure that all parts of the mask are securely in place, and that the protective covers are fitted over the inspiratory valves, with the arrows pointing downwards.
- (2) *Testing the inspiratory valves.* Place the quick-release plug to the mouth and suck on it to create a partial vacuum inside the mask tube assembly. There should be no flow of air through the inspiratory valves. If air enters the mask, inspect the valves to make sure that they are properly fitted.
- (3) *Pressure tests.* The strap tension necessary for various pressures can be determined by experience. Connect the mask tube to the regulator flexible hose. Press the EMERGENCY switch (or set the dial to "45M," depending on the type of regulator) and tighten the upper and lower mask straps so that no leakage occurs during the respiratory cycle.
- (4) *Testing the expiratory valve.* With the mask still connected to the regulator, press the EMERGENCY switch (or set the dial to "45M,") draw in a deep breath and hold it. If oxygen continues to flow (and provided the mask is properly fitted), the expiratory valve is not holding pressure, and the mask should be considered unserviceable.

SERVICING

22. Clean the mask periodically, washing it with a moist clean cloth to remove dirt and perspiration. Make sure that there is no dirt under the rubber flaps on the inspiratory valves.

Note . . .

The presence of particles under the rubber flaps would cause leakage back through the inspiratory valves. If this occurred under pressure-breathing conditions, it would not be possible to build up a pressure in the mask greater than that in the mask tube, and the expiratory valve would not open.

23. While the mask is not in use, keep it clean and dry, and away from heat and sunlight.

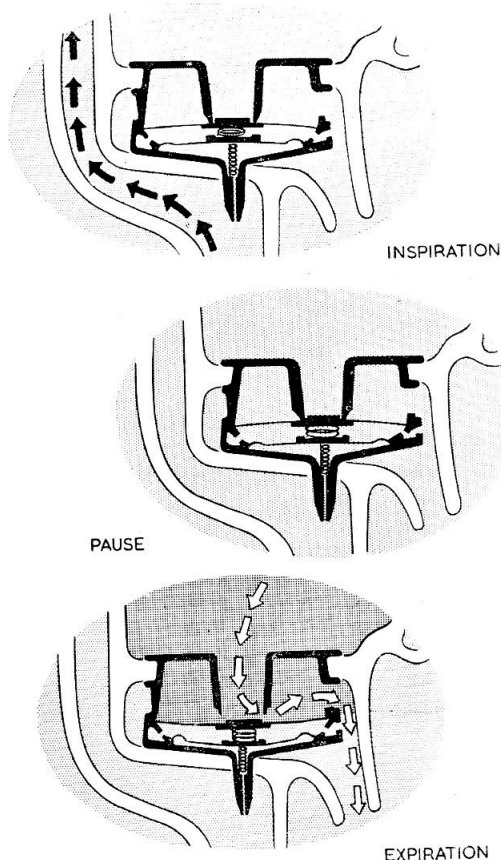


Fig. 4. Operation of expiratory valve

position shown in fig. 7. The mask is issued under the following references:—

Size	Ref. No.
Large	6D/1911
Medium	6D/1912
Small	6D/1913

OXYGEN MASK, TYPE A-13A/4

23. This mask is a version of the A-13A/2 having a Bayonet Union Plug Mk. 7 (Ref. No. 6D/2053) instead of the Inlet Warning Connector (Ref. No. 6D/2003) at the lower end of the mask tube. This enables the mask to be connected to the personal component of a P.E.C. Masks are issued under the following references:—

Size	Ref. No.
Large	6D/2091
Medium	6D/2092
Small	6D/2093

CONVERSION OF A TYPE A-13A/2 MASK TO TYPE A-13A/4 STANDARD

24. When it is necessary to convert an A-13A/2 mask to A-13A/4 standard the following sequence of operations should be followed:—

- (1) Test the inlet valves for leakage by compressing the mask tube axially until the convolutions are close together, sealing the mask tube with the thumb and allowing the mask to hang from the helmet. The extension of the mask tube should not exceed $\frac{1}{2}$ in. in 10 sec. If it does, the faces of the inlet valves should be cleaned and the test repeated.
- (2) Remove the ratchet clip and mask tube plug.
- (3) Fit the bayonet union plug into the open end of the mask tube, sliding the mask tube up to the shoulder of the plug.
- (4) Examine the ratchet for damage received during removal and if it is undamaged, refit it to secure the plug in position. If the claw on the clip has straightened, a new clip must be fitted. Draw the clip tight with a pair of suitable pliers.
- (5) Repeat the test described in sub para. (1).



Fig. 5. Oxygen mask, Type A-13A/2:
 $\frac{3}{4}$ front view



**Fig. 6. Oxygen mask, Type A-13A/2—
toggle set to normal**



**Fig. 7. Oxygen mask, Type A-13A/2—
toggle set for pressure breathing**

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