ADMIRALTY
AIR MINISTRY

FLYING CLOTHING AND SURVIVAL EQUIPMENT
This is A.L. No. 33 to A.P.1182E, Volume 1
Section 4. List of Chapters: *delete* "*(to be issued later)*" after the title of Chapter 4 and *write* "(A.L.32)" in the outer margin against the deletion.
Insert this Chapter 4 to follow Chapter 3.
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Chapter 4

OXYGEN MASK, TYPE H

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LIST OF ILLUSTRATIONS

Introduction

1. This mask is provided primarily for use in British aircraft which employ an economiser system for delivering the oxygen to the mask; oxygen and air are mixed in the mask as the wearer inhales. Suitably modified, as described in para. 8, the mask may be used in American aircraft which employ a diluter demand system; in this system, oxygen and air are mixed in the regulator before being delivered to the mask, and the modification consists of blanking off the inspiratory valve.

WARNING

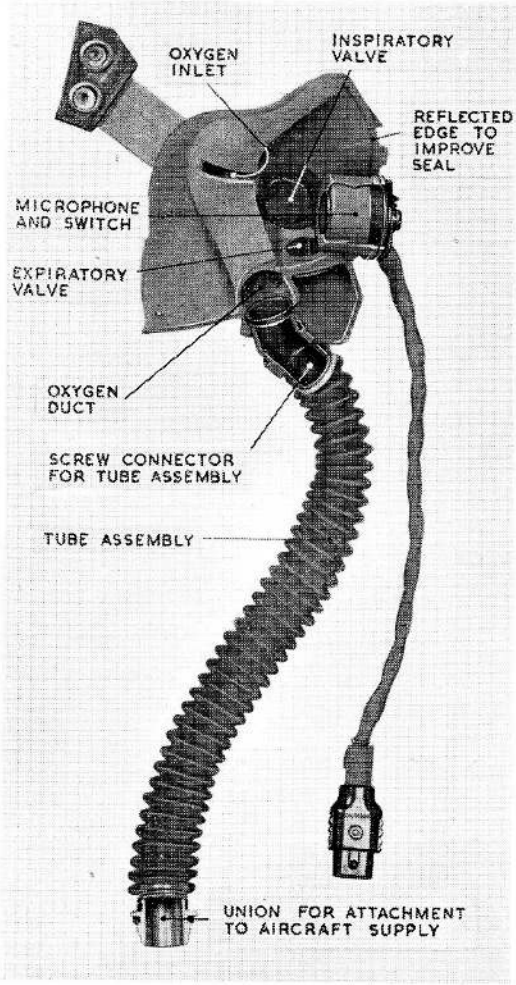
The H type mask must not be used with any pressure demand system or with pressure breathing equipment.

2. The H type mask is available in the following sizes and is illustrated in fig. 1:—

Item	*Stores Ref.*
Large	6D/814
Medium	6D/815
Small	6D/816

Each mask consists of the following components:—

Facepiece, large / medium / small (according to the size of mask)	6D/1251 / 6D/1252 / 6D/1253
Strap assembly	6D/1257
Expiratory valve (2)	6D/650
Housing for expiratory valve (2)	6D/1254
Inspiratory valve (1)	6D/616
Inlet connector, male	6D/1256



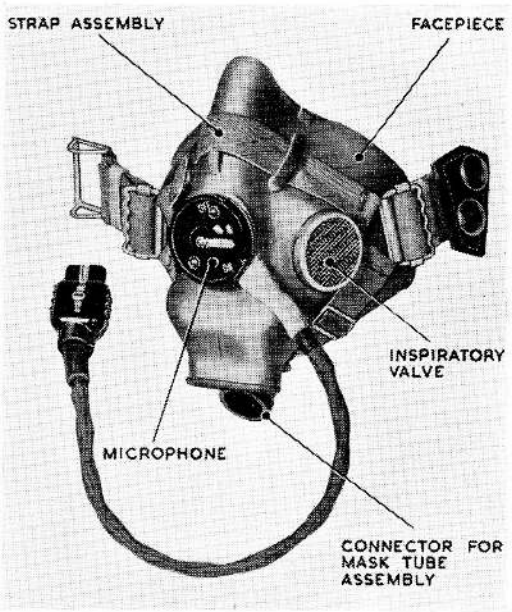


Fig. 1. Oxygen mask, Type H

Microphone assembly Type 57 or Microphone assembly, Type 66	10A/15999 or 10AH/5

One of the following mask tube assemblies :—

Mk. 1A	6D/1571
Mk. 2	6D/917
Mk. 3	6D/918
Mk. 4A	6D/1572
Mk. 7A	6D/1573

In addition the following accessories are available :—

Microphone orifice cap	6D/1258
Head harness	6D/766

Description

Facepiece

3. The facepiece (*fig.* 2) is of moulded rubber with orifices and ducts provided for the fitting of valves, microphone assembly, and inlet connector. Also formed during the moulding process are ducts for the flow of oxygen from the inlet connector. The facepiece is lined with suede for comfort.

4. Three studs, or lugs, of moulded rubber are provided on the outside of the facepiece to locate a piece of malleable wire used to obtain a better fit, and there is a rubber loop to locate the nose strap of the strap assembly.

Strap assembly

5. The facepiece is held in position by straps, formed into a harness, which is secured to the flying helmet (*fig.* 3), or

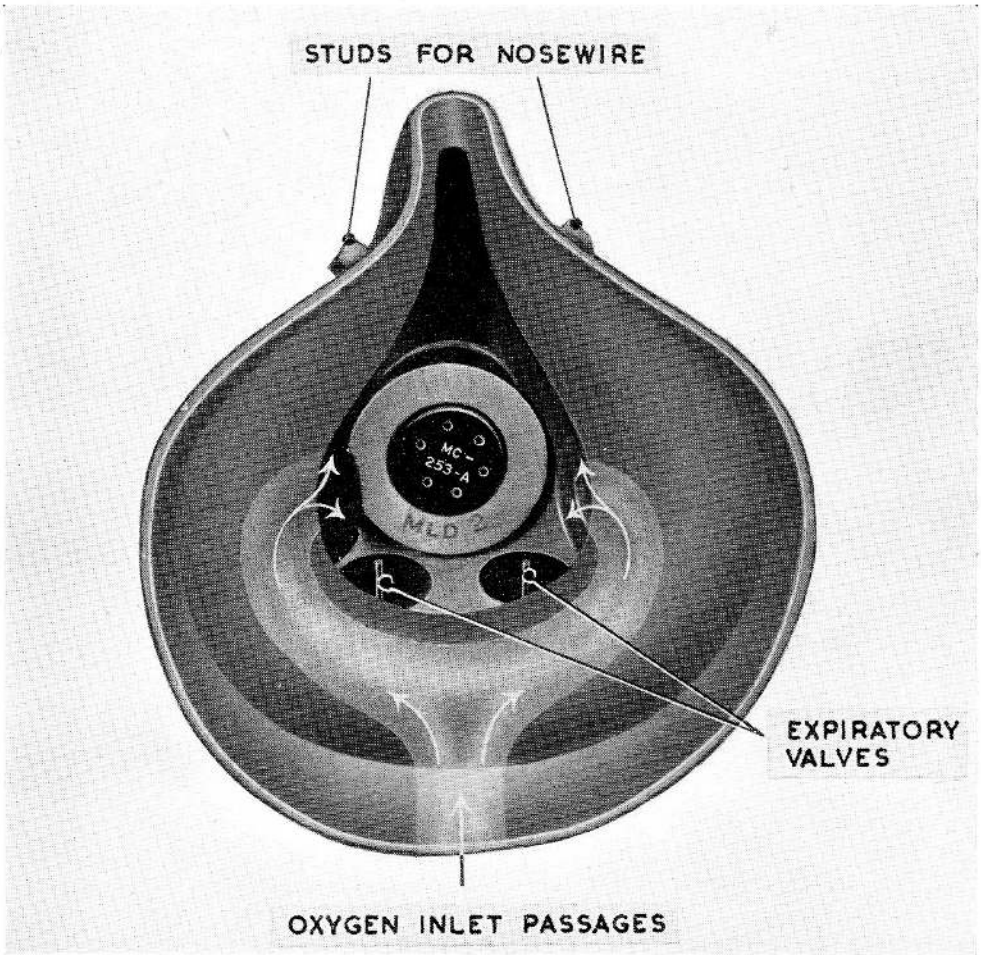


Fig. 2. Facepiece

head harness if this is worn. The assembly consists of two adjustable webbing straps, one over the nose and one under the chin, and two short elastic straps, also adjustable, which are attached to the helmet, one by a square ring-type fitting and the other by two press studs.

Inspiratory valve

6. This is located on the side of the facepiece and enables the wearer to breathe air as well as oxygen.

7. The valve consists of a body with a filter at one end ; the filter end is on the outside when the valve is fitted. Inside the body a rubber disc is held against a seating at the filter end by a spring. As the wearer inhales the spring is compressed and air enters the mask ; as inhaling ceases the spring expands and returns the disc to its seating with an audible " click " ; these functions are shown in fig. 4. The valve is a push fit and the neck of the orifice should fit into the groove in the body without wrinkling.

8. When the mask is used with the economiser system below heights at which pure oxygen is required, the wearer empties the bag in the economiser unit in about half a breath and, as he continues to inhale, air is drawn in through the inspiratory valve. Since in the American diluter system the oxygen and air are mixed in the regulator, the inspiratory valve is not required and must be replaced by a blanking off plug (*fig.* 5) ; this conversion is ESSENTIAL

Fig. 3. Strap assembly fitted to mask and helmet

to ensure that the correct mixture is delivered, but the valve should be retained so that the mask can be converted back to its normal role. The blanking off plug is not provided as a spare and is to be manufactured locally.

Expiratory valve

9. Two of these valves are fitted, one on each side of the inlet connector, to enable the wearer to exhale with the minimum of resistance. They are secured in position by wire binding.

10. The valve consists of a circular body in which there is a former with a hole through its centre, and a rubber disc at the outer end held in position by a moulded " tail " passed through the hole in the centre of the former. The tail has a bulbous section which is drawn to the inside of the valve body; this retains the disc in position,

Inlet connector

11. The inlet connector is a moulded tube threaded at one end and it is to this component that the mask tube assembly is attached. The unthreaded end is pressed into an orifice under the trunk-shaped outlet of the expiratory valves and is secured there with wire binding.

12. This connector is shaped and must be fitted so that the threaded end points forward to allow the wearer to rest his chin on his chest as he inclines his head to look downwards.

Microphone assembly

13. The Type 57 or 66 assembly is supplied with the mask. It is a push fit into an orifice in front of the facepiece and is secured in position by wire binding.

14. An orifice cap, Type D (*fig.* 5) is available to cover the microphone when it is to be used without moving the microphone switch. There may also be occasions when the mask is required to be used without a microphone, and on such occasions a wooden blanking-off plug is to be manufactured and fitted locally; the cap, Type D, is to be fitted over the blanking-off plug.

15. Further information concerning these microphones is contained in A.P.2876A, Vol. 1, Sect. 3, Chap. 1.

Head harness

16. To enable the mask to be worn without a helmet, a head harness is available (*fig.* 5). This is placed over the head and fitted to the strap assembly, after it has been adjusted for size, with similar attachments to those provided on the helmet.

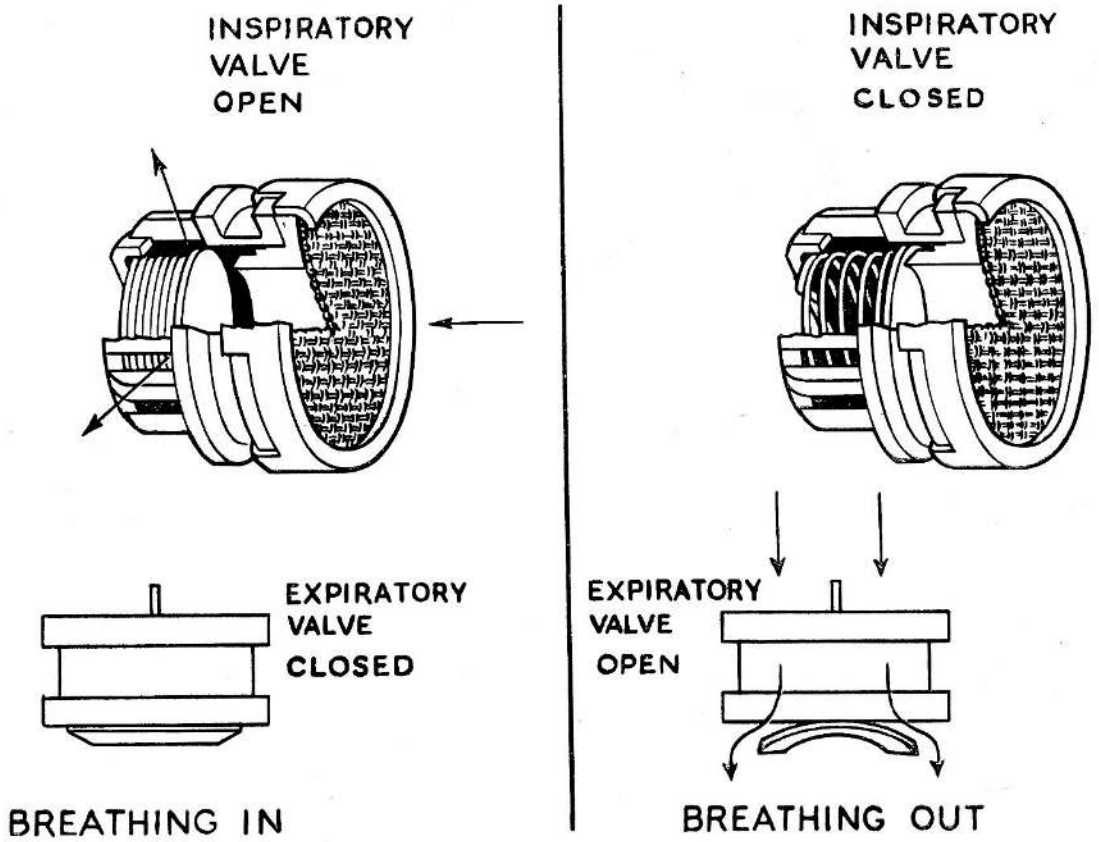


Fig. 4. Functional diagram of expiratory and inspiratory valves

Mask tube assemblies

17. These are corrugated tubes of various lengths through which oxygen is conyeved to the mask (*fig.* 6). Five types are available :—

Type	
Mk. 1A	For fighter and P.R. aircraft fitted with static seats and emergency oxygen equipment.
Mk. 2	For bomber aircraft not fitted with emergency oxygen equipment.
Mk. 3	For fighter aircraft not fitted with emergency oxygen equipment.
Mk. 4A	For high flying bomber aircraft fitted with emergency oxygen equipment, but without ejection seats.
Mk. 7A	For all aircraft fitted with ejection seats and emergency oxygen equipment.

18. The Mk. 1A, 4A and 7A tube assemblies are constructed with an additional small tube running through the centre of the main tubing to convey oxygen from the emergency oxygen cylinder to the mask. The Mk. 1A, 3 and 7A assemblies have quick-release attachnemts by which they are connected to the main oxygen system in the aircraft.

19. The first corrugation of the tube should fit over the end of the part to which it is secured, it is then bound with linen thread and covered with an adhesive tape. When replacing unserviceable tubing, ensure that these connections are properly secured. To fit an assembly to the mask, screw the end fitting shown at the top of fig. 6 to the inlet connector.

Fitting the mask

20. The importance of a well fitting mask cannot be over-emphasised. Oxygen systems depend on a mask that does not

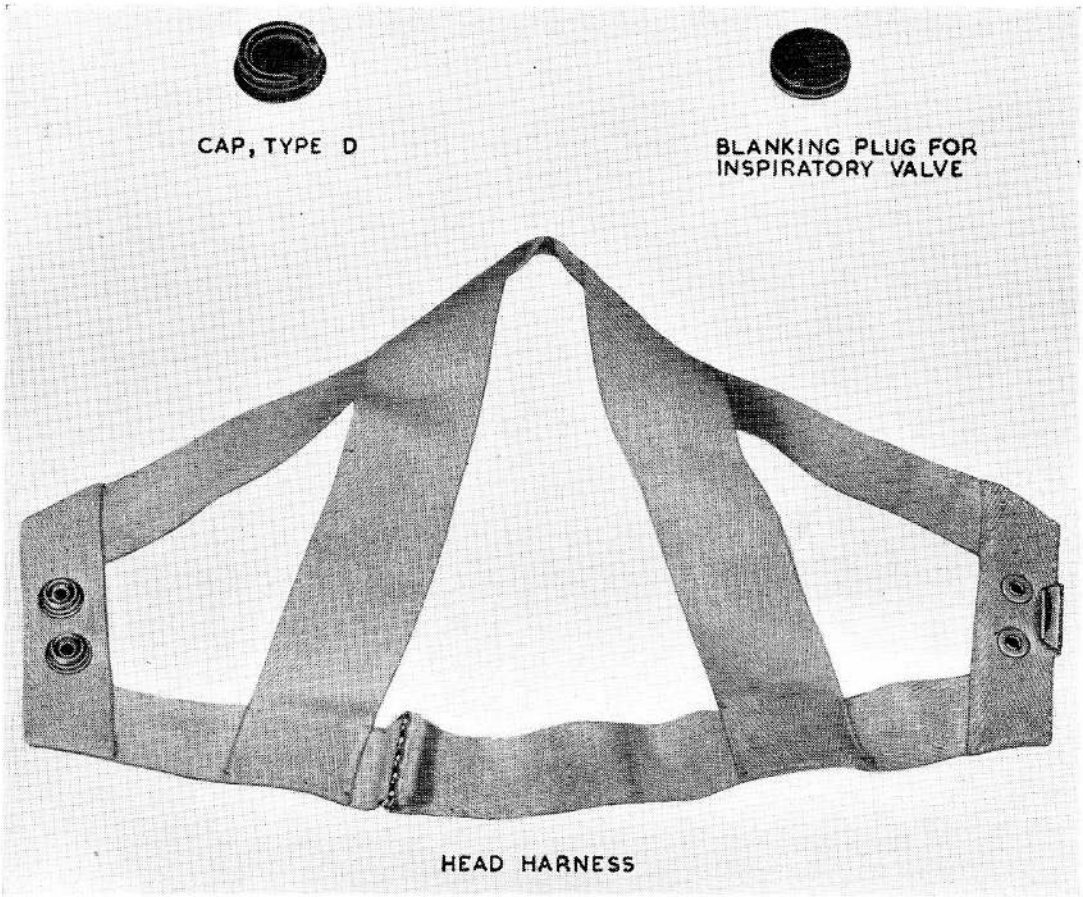


Fig. 5. Type H mask accessories

leak for correct functioning and unless the mask is carefully selected and fitted it will almost invariably leak. A badly fitting mask is not only a danger to the individual, it may also involve others in accidents which could be avoided.

21. In addition to a well fitting mask, the helmet must also be a good fit; it is a combination of a well fitting helmet and mask that produce the best results.

22. Having chosen and fitted the helmet, choose whichever of the three sizes of mask seems to fit most comfortably, holding the mask to the face with the left hand and placing a finger of the other hand over the inlet connector (*fig.* 7) as the mask is tried.

23. Apply a comfortable pressure with the left hand and breathe deeply several times. If a mask tube assembly is already fitted, squeeze or pinch the tube to prevent air entering. If air is felt leaking out into the eyes or round the edges of the facepiece, re-adjust the mask to obtain a better fit; if this fails try another size of mask.

24. Having selected the mask, proceed as follows :—

(1) Adjust the strap assembly to fit the facepiece.

(2) Slacken off the elastic straps.

(3) Attach the left-hand side of the strap assembly to the helmet with the press studs provided (*fig.* 8).

(4) Put on the helmet.

25. Hook the right-hand side of the strap assembly to the helmet (*fig.* 9) and tighten the straps evenly on each side until a comfortable fit is obtained; check for leaks as described in para. 23.

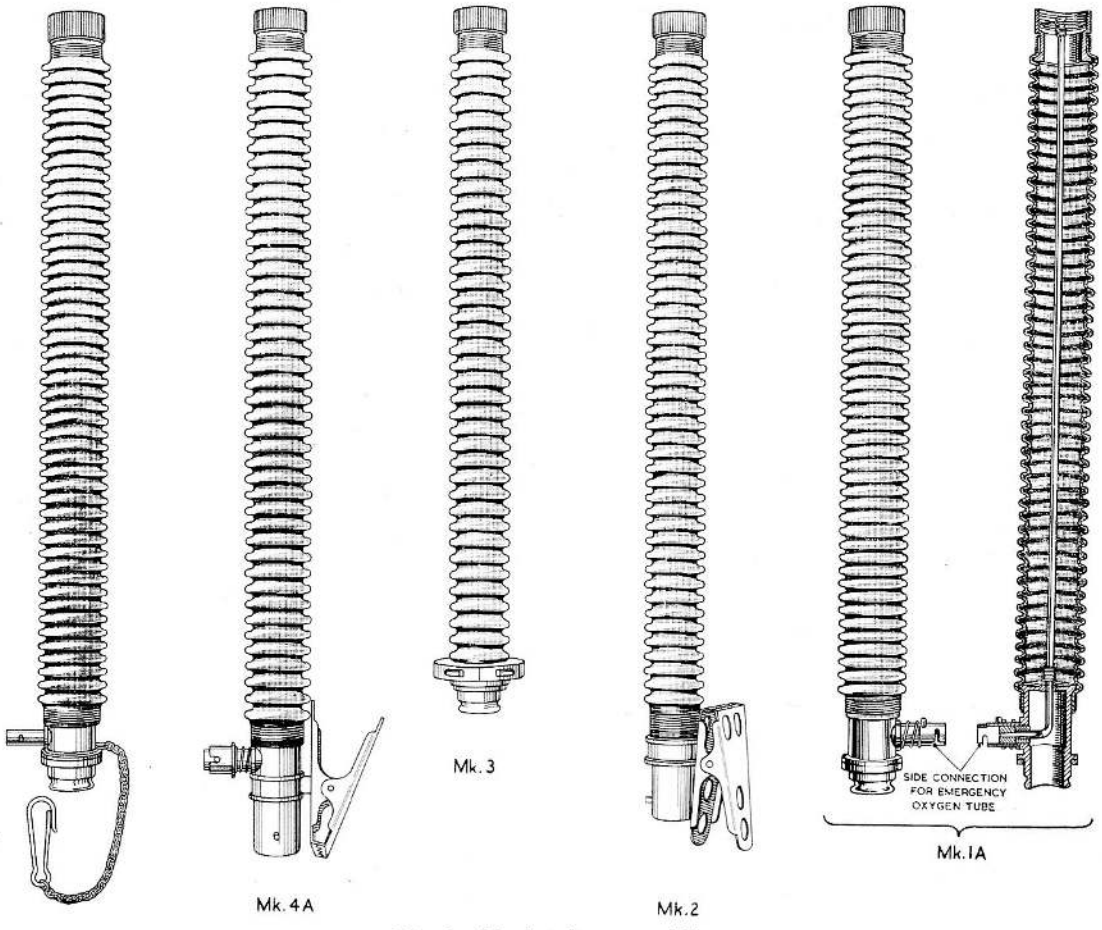


Fig. 6. Mask tube assemblies

Fig. 7. Fitting the facepiece

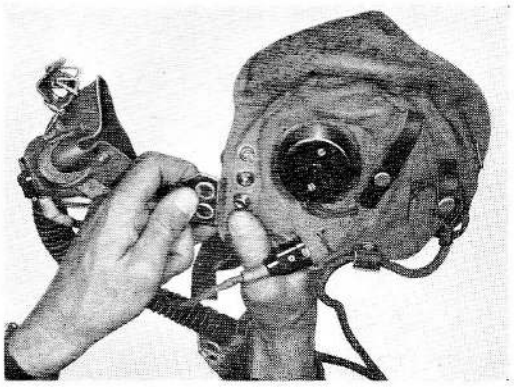


Fig. 8. Attaching the mask to the helmet, stage one

Fig. 9. Attaching the mask to the helmet, stage two

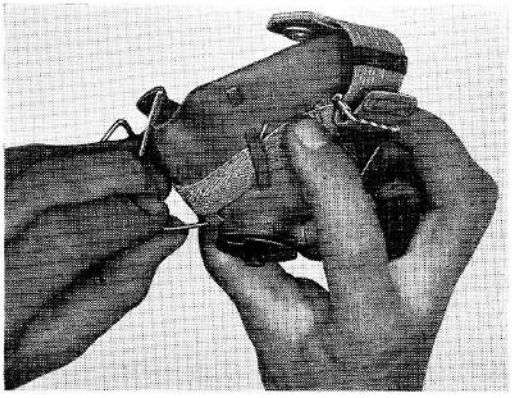


Fig. 10. Inserting a piece of wire into the nose part of the mask

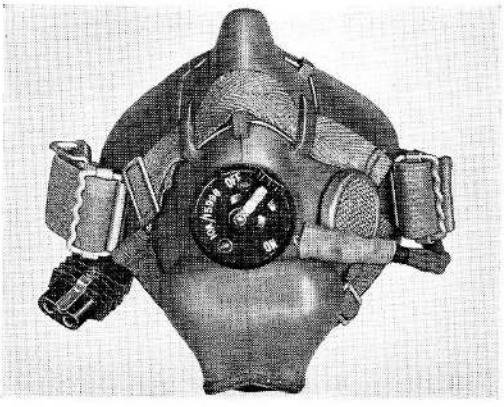


Fig. 11. Wire in position in nose part of mask

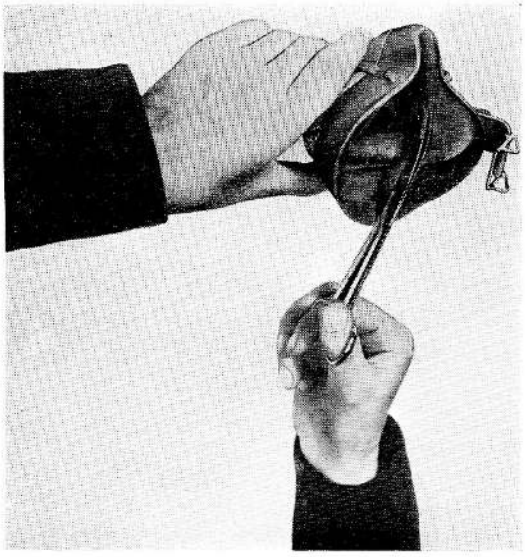


Fig. 12. Cutting away the reflected edge of a mask

26. When the mask is correctly adjusted and fitted, take off the helmet and mask and complete the assembly as follows :—

(1) Slide the rubber bands over the free ends of the elastic straps.

(2) Connect the microphone lead to the helmet.

(3) Attach the mask tube assembly if this has not already been done.

(4) Secure the end of the strap at the buckle on the nose section by stitching it back to the main strap. Use doubled No. 40 thread (Ref. No. 32B/659) and sew the two thicknesses of webbing together, by hand, $\frac{1}{16}$ in. from the edge of the strap end.

27. It may be found that a better fit can be obtained by fitting a malleable wire to " pinch " the nose part of the facepiece, so providing a more satisfactory seal round the nose. Three studs, or lugs, are provided to locate this wire and the method of inserting it is shown in fig. 10 and 11 ; 16 S.W.G. phosphor-bronze wire should be used.

28. Comfort can sometimes be improved by trimming the reflected edge inside the facepiece (*fig.* 12). This is done by cutting off small strips, not more than $\frac{1}{16}$ in. wide; the outer edge of the mask must not be trimmed.

Instructions for use

29. Apart from correctly fitting the mask to the face and helmet, or head harness when a helmet is not worn, ensure that the mask is adapted for the type of oxygen system installed in the aircraft and that the mask tube assembly is properly connected to the main supply.

30. The mask is designed to be free from freezing troubles under exceptionally cold weather conditions, but the following precautions should be taken:—

(1) Ensure that the mask is a good fit; a badly fitting mask will cause heat to be lost and the expiratory valves may freeze.

(2) Periodically remove any icicles which form below the expiratory valves at the base of the mask. An occasional deep breath will blow away any ice which forms and will warm the valve housings.

(3) Freezing of the inspiratory valve may be detected by restriction to breathing; the first part of the inspiration will be easy because oxygen is being inhaled, after this there will be some " drag " as air is drawn in through the partially restricted valve. This can be counteracted by increasing the flow of oxygen; for example, if the aircraft is flying at 20,000 ft. turn the oxygen up to " 30 " or " 35 ", this will provide enough oxygen to complete the whole breath. Holding an electrically-heated glove to the outside of the valve will assist in clearing the ice.

(4) Ensure that there are no leaks in the corrugated tubing from the mask, or the tubing from the main supply. Leaks here will cause warm damp air to pass through the tubing and form ice on the walls. Gentle squeeze the tubing at the mask end where ice collects first; if ice is present it will break as the tubing is squeezed and can be removed by disconnecting the fitting at the main supply and shaking the tube. In order to avoid damage to valves or the system, do not squeeze the tube too tightly when it is connected to the main supply.

(5) The wearing of a Balaclava type of helmet and/or a scarf will help to keep the mask warm.

Servicing

31. Masks and helmets receive hard wear and it is the responsibility of the wearer to ensure that they are serviceable before use. Occasions occur when the safety of the aircraft and crew depend on perfect functioning of the mask and microphone assembly; frequent and thorough servicing is therefore important.

32. Servicing is best performed in a methodical sequence, commencing with the attachment between the mask tube assembly and the main supply and ending with the facepiece and helmet. Fig. 13 indicates the main points to observe.

Cleaning

33. The facepiece and tube assembly become soiled, due to condensation of breath and perspiration, they should therefore be cleaned regularly. The tube assembly should be disconnected from the mask by unscrewing it from the inlet con-

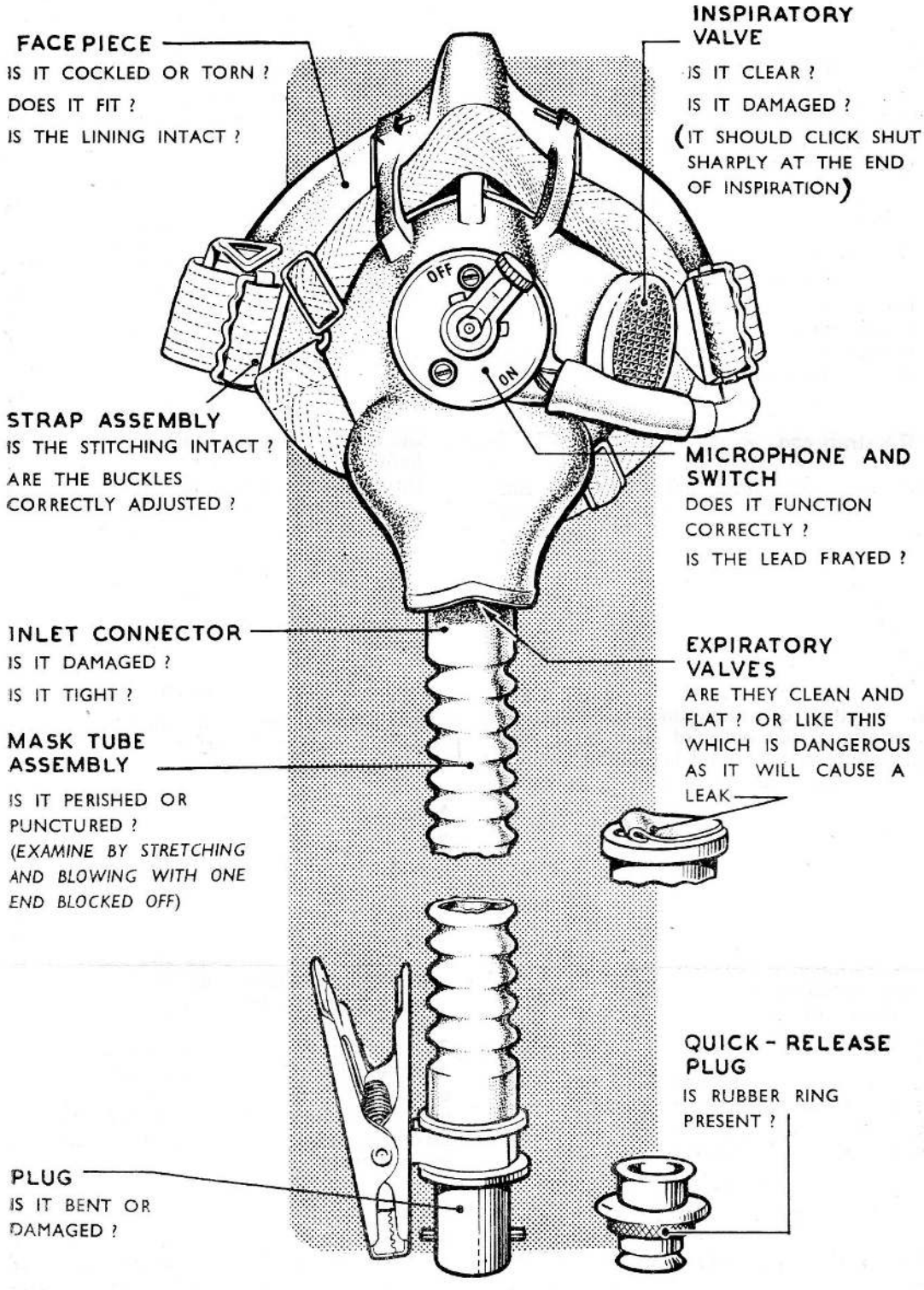


Fig. 13. Points to be noted when servicing the mask

nector and immersed in clean ◀ warm water and rinsed several times. The tube should be stretched to allow the corrugations to be cleaned. The inside of the facepiece should then be sponged with clean, warm water with the cloth wrung nearly dry.▶

34. After cleaning, wipe the mask and tube with a dry clean cloth, shake or blow out excess moisture from the valves, and allow the mask and tube to dry naturally in the atmosphere. Subject the valves to a thorough examination to ensure that moisture is not deposited in or around them.

Examination

35. Examine the mask and tube assembly for deterioration of the rubber and ensure that the suede lining and cotton covering are not frayed or otherwise damaged. Ensure that the valves, inlet connector and tube assembly are securely fastened to the facepiece, that the tube does not leak, and that the face piece is not distorted, i.e., wrinkled round the edge.

36. Apply a functional test to the inspiratory valve in the following manner. Hold the mask to the face, pinch the tube assembly to prevent ingress of air and inhale. If the valve is functioning correctly breathing will be easy and the valve disc will return to its seating with an audible "click"; if breathing is restricted, change the valve.

37. Examine the expiratory valve and ensure that the disc is flat on its seating, that the tail is drawn through the hole in the former so that the bulbous portion is on the inside, and that the valve body and housing is not damaged. Change the valve if it is unserviceable.

38. The strap assembly and head harness should be examined for fraying, defective stitching or fittings, and any other damage; renew the stitching as necessary. Test each elastic strap for elasticity; a load of not less than $4\frac{1}{2}$ lb. should be required for an extension of 50 per cent. on a 3 in. strap, and the strap should return to its original length after being stretched.

Renewal of valves and components

39. *Inspiratory valve.* Components of this valve are not to be renewed. If the valve is unserviceable it is to be removed and replaced by a serviceable item. The valve can be pushed or pulled out from the inside of the facepiece; ensure that the edge of the orifice fits into the groove on the valve body without wrinkling.

Expiratory valve. It will seldom be necessary to renew the complete valve, but if it is necessary to do so proceed as follows. Turn back the trunk extension of the facepiece, push the valve outwards to expose the locking wire, and remove the locking wire and valve; insert a serviceable valve in place of the one removed and lock it in position with a single turn of 20 s.w.g. copper wire. If the disc is unserviceable, pull it out of the valve body. Insert the tail of a serviceable disc into the hole in the former, pull it through from the inside until the bulbous section of the tail is on the inside of the former, and ensure that the disc is flat against its seating. A pair of tweezers may be used to pull the tail through.

Renewal of microphone assembly

40. If the microphone is found to be unserviceable at the pre-flight test, or any other servicing period, it may be renewed. The work is not to be undertaken by flying personnel, but may be done by a Safety Equipment worker or other qualified tradesman, as convenient. To renew the assembly proceed as follows:—

(1) Expose and remove the locking wire.

(2) Slide back the outer sleeve to expose the duct carrying the cable lead.

(3) Remove the microphone by pushing it out from the inside.

(4) Withdraw the cable lead from the duct; stretch the duct to provide a passage for the plug.

(5) Obtain a serviceable microphone assembly, stretch the duct, and insert the plug on the cable lead from the inside. Draw the cable through the duct until the microphone is over the orifice, taking care not to damage the attachment of the cable to the microphone.

(6) Fit the microphone into the orifice and ensure that the moulding inside the orifice fits over the groove on the microphone body. Draw the cable through the duct so that the assembly fits snugly.

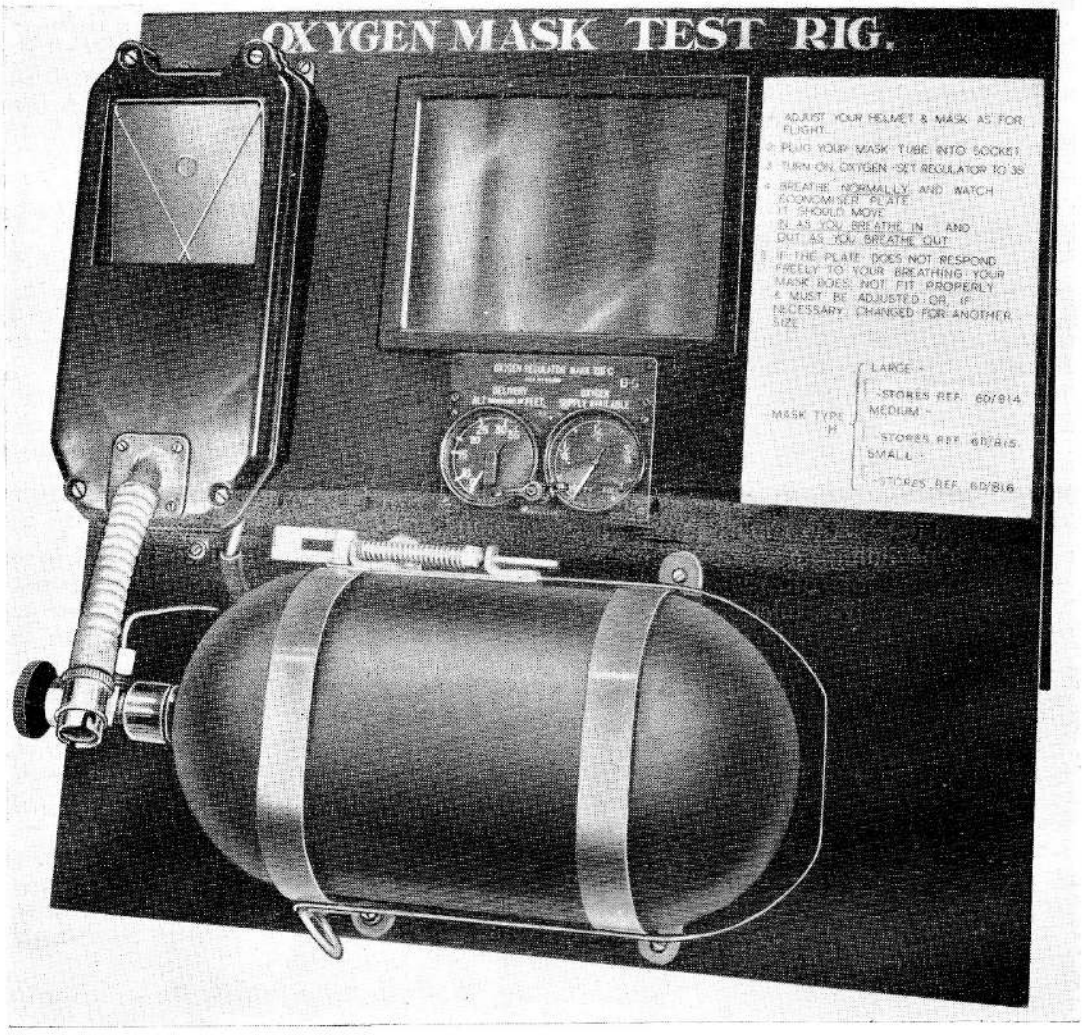


Fig. 14. Layout of test rig

(7) Lock the microphone in position with a single turn of 20 s.w.g. copper wire; the wire should fit round the groove in the body so that it " bites " into the rubber and forms an airtight seal. Cover the wire binding with a strip of adhesive tape of the approved type.

(8) Slide the outer sleeve over the cable lead duct.

Pre-flight tests

41. The person who is to wear the mask must apply the following tests daily. Ideally, the test should be applied before each flight. Proceed as follows:—

(1) Adjust the helmet and mask as for flight conditions; a head harness should be used in place of the helmet if the helmet is not normally worn.

(2) Plug the mask tube assembly into the fitting at the end of the flexible tube on the economiser unit.

(3) Turn on the oxygen and set the regulator to " 35."

(4) Breathe normally and watch the plate in the economiser unit. It should move in as you inhale and out as you exhale. If the plate does not move freely, the mask should be adjusted to obtain a better fit; if adjustment does not prove satisfactory, change the mask for one of another size.

(5) Apply a functional test to the microphone, using an approved test rig. If the test is unsatisfactory, the microphone assembly should be renewed.

42. A suitable test rig for the mask is shown in fig. 14 ; it is not provisioned and should be manufactured locally. The layout is simple but is not necessarily suited to all conditions ; if a different layout is employed the economiser unit, mirror, regulator, and the instructions for use, must be so positioned that they can be seen easily.

43. The following items are required for the rig :—

(1) A suitably modified oxygen economiser.

(2) One or more 750-litre cylinders charged with oxygen, complete with an outlet valve.

(3) An oxygen regulator, Mk. 8C, or suitable alternative.

(4) A short length of corrugated tubing for attachment to the economiser unit, with a suitable fitting at one end for connecting the mask tube assembly.

(5) A mirror.

(6) A short length of copper tubing, $\frac{3}{16}$ in. o/d. × 16 s.w.g.

(7) One spherical nipple, Mk. 3A or 3B.

(8) One union nut, Mk. 4.

(9) A short length of aluminium tubing, $\frac{5}{16}$ in. o/d. × 22 s.w.g.

(10) A short length of rubber tubing, 10 mm. o/d. × 7 mm. i/d., for low pressure connections.

(11) Instructions for use.

(12) A panel on which to mount items (1), (2), (3), (5) and (11).

44. To modify the economiser unit, cut a 3 in. square hole in the top cover at the end remote from the outlet port (*fig.* 14) and cover it with transparent material. Secure the corrugated tubing to the outlet port.

45. Mount the items listed in para. 44 (1), (2), (3), (5) and (11) as shown in fig. 14, and make the following connections. Valve on oxygen cylinder to inlet on regulator, outlet on regulator to inlet on economiser unit.

46. Prepare instructions for use on the following lines :—

(1) *Adjust your mask and helmet as for flight.*

(2) *Plug your mask tube into the socket.*

(3) *Turn on oxygen ; set regulator to* "35."

(4) *Breathe normally and watch the economiser plate. It should move in as you breathe in and out as you breathe out.*

(5) *If the plate does not respond freely to your breathing your mask does not fit correctly and must be adjusted or, if necessary, changed for another size.*

		Stores Ref.
Mask, Type H	Large	6D/814
	Medium	6D/815
	Small	6D/816

47. It is recommended that Units using oxygen install similar test rigs, they will encourage users to have confidence in the equipment provided by giving them some indication of how the apparatus works, and will also encourage them to test the equipment which they wear frequently. Serviceability of the mask is primarily the responsibility of the user, as he examines and tests it daily before flight.

48. The test rig for the microphone should be adjacent to, or part of, the test rig for the mask ; this will eliminate the necessity of testing the microphone in the aircraft to ensure that it functions correctly, and the possibility of using a mask which does not fit properly because the microphone is unserviceable.

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