

Chapter 24

AIR VENTILATED SUITS, MK. 3 AND 3A

LIST OF CONTENTS

	Para.		Para.
<i>Introduction</i>	1	Servicing	
<i>Description</i>	2	<i>Examination and testing</i>	9
<i>Sizes</i>	4	<i>Fitting the connector to a Mk. 3 suit</i>	10
<i>Handling</i>	6	<i>Repairs</i>	11
<i>Storage</i>	7	<i>Cleaning</i>	12
		<i>Periodical inspection and testing</i>	13

TABLE

	Table
<i>Suit sizes</i>	1

LIST OF ILLUSTRATIONS

	Fig.		Fig.
<i>Air ventilated suit, Mk. 3 and 3A: front view</i>	1	<i>Layout of air circulation system</i>	3
<i>Air ventilated suit, Mk. 3 and 3A: rear view</i>	2	<i>Packing the suit: first stage</i>	4
		<i>Packing the suit: final stage</i>	5

Introduction

1. The Mk. 3 and 3A air ventilated suits, although serving the same purpose as earlier Marks, i.e. the affording of relief from the discomfort caused by high temperatures in aircraft cockpits, are of an improved design, which results in a compromise between direct and evaporative cooling. Compared with the Mk. 2 and 2A suits, the required flow of air is provided at a reduced pressure, thus simplifying the problem of maintaining the supply at high altitude. The air circulation system has been designed with the object of maintaining a uniform skin temperature over the whole body. Although designed primarily for direct cooling, the Mk. 3 and 3A suits may also be used with an air system intended for evaporative cooling. The air enters the suit through an inlet hose leading into a distributor positioned at chest level on the inside of the suit. From the distributor the air is conveyed to all parts of the body and limbs by a simple circulation system of tubes. Fig. 1 and 2 show front and back views of a suit and fig. 3 shows the layout of the air circulation system. The suits are

intended to be worn either next to the skin, or over a string vest and under-pants and without modification, can also be used as a means of supplying warm air to counteract conditions of extreme cold. The actual size of the suit chosen by an individual is of less importance than the comfort it provides and the latter should be the main consideration when selecting the garment.

Description

2. The suit is a simple garment made of cotton. It is open at the back, but fastened after donning by means of tapes tied at the back of the waist and neck. The arms and legs are full length but differ from earlier suits in that they are narrow cut at the limb extremities and are not provided with tabs and buttons for fastening around the ankles. The main inlet hose is wire-reinforced rubber. All tubing in the circulation system is made from P.V.C. Seven main tubes, all of 6.5mm bore, radiate from the distributor, the upper central tube alone having no branches. This tube carries a threaded end-fitting to which an adapter can be attached when air is

required for head cooling. A blanking cap is fitted when the adapter is not in use. The six remaining tubes, three on each side of the distributor, lead to small manifolds and from each of these the air flows on through three smaller tubes, all of 5.2mm. bore. These smaller tubes convey the cooling air to the arms, legs and back, the air emerging through a series of holes drilled near the tube ends. In addition, holes are drilled in both the main and the branch tubes to supply a small quantity of ventilating air to the chest, stomach and armpits. All holes in the tubing are drilled so that the air emerges, so far as is possible, parallel to the body, this providing area coverage rather than locally concentrated jets.

3. The tubes are routed through tunnels formed by sewing strips of thick knitted cotton fabric to the inside of the suit and the same material is used as padding over the distributor and manifolds. The cotton fabric also serves to insulate the tubing from the wearer and thus eliminates any risk of local burning or frost-bite. Under an input pressure of 0.45 lb/sq. in., measured at the suit side of the connector, the total air flow through the suit is approximately 13 cu. ft./min. At the distributor the air flow is broken down to give approximately 2.2 cu.ft./min. to each arm, 3.3 cu.ft./min. to each leg, 1.8 cu. ft./min. to the back of the body, and a small amount to the front of

the body. The Mk. 3A suit differs from the Mk. 3 only in respect of the main inlet hose, the hose on the Mk. 3 being shorter and fitted with a connector.

Sizes

4. Suits are made in six sizes to cater generally for wearers having body measurements within the ranges given in Table 1. The chest and waist measurements are taken over the shirt and trousers respectively, the height given is without shoes, and the weight is without jacket and shoes.

Note . . .

Table 1 is intended as a guide to the selection of an appropriate size, and only the principal body measurements are given. Other body measurements, not included in the Table, could affect the weight of a wearer and he may need a suit larger than that indicated by the height, chest and waist measurements.

5. Comfort should be the first consideration when selecting a suit and only a reasonable fit is necessary. The efficiency of the suit is not impaired by it being a little too large, but creased material and distorted tubing may result from the wearing of a suit that is excessively large. Some care in selecting the suit is therefore necessary.

TABLE 1
Suit sizes

Mk. 3 Ref. No. 22C/	Mk. 3A Ref. No. 22C/	Size	Height	Chest	Waist	Weight
2283	2289	1	5 ft. 1 in. to 5 ft. 6 in.	Less than 38½ in.	Less than 33 in.	Less than 150 lb.
2284	2290	2	5 ft. 1 in. to 5 ft. 6 in.	Over 38½ in.	Over 33 in.	Over 150 lb.
2285	2291	3	5 ft. 6 in. to 5 ft. 11 in.	Less than 39¾ in.	Less than 34¼ in.	Less than 170 lb.
2286	2292	4	5 ft. 6 in. to 5 ft. 11 in.	Over 39¾ in.	Over 34¼ in.	Over 170 lb.
2287	2293	5	5 ft. 11 in. to 6 ft. 4 in.	Less than 41 in.	Less than 35½ in.	Less than 190 lb.
2288	2294	6	5 ft. 11 in. to 6 ft. 4 in.	Over 41 in.	Over 35½ in.	Over 190 lb.

RESTRICTED



Fig. 1. Air ventilated suit, Mk. 3 and 3A: front view

RESTRICTED



Fig. 2. Air ventilated suit, Mk. 3 and 3A: rear view

Handling

6. Careful handling of the suits is always necessary and especially so in cold weather when the P.V.C. tubing hardens and becomes brittle. A suit that has remained cold for a period must be conditioned in surroundings

having a temperature of not less than 45 deg. F. This process can be speeded by connecting the inlet hose to a warm air supply. The suit must not be donned until flexibility of the tubing is restored.

RESTRICTED

Storage

7. Normally, the suits are pre-packed in accordance with an approved packaging specification (Ref. No. R.D.A.E.1/A0/150/04 dated 1.6.60) prior to dispatch by the manufacturers. Fig. 4 and 5 show the method of folding the suit prior to enclosure in the protective covering. Prepared formers and covering sheets of corrugated paper, not shown in the illustrations, are added to prevent kinking or crushing of the tubing. The whole is then placed in a polythene envelope from which the excess air is extracted prior to heat sealing, this envelope is placed in a cardboard box and padded to prevent movement during transit. The box is finally sealed with gummed paper. When so packaged, the suits may be stored for long periods under temperature conditions rang-

ing from -30 deg. F to $+130$ deg. F. With reasonable care in handling, a packaged suit is unlikely to suffer damage. Full packaging as above will not, of course be required for suits being returned for repair but they must be carefully folded, as illustrated, and dispatched in a suitably-padded box.

8. After removal from the packaging, the suit should be suspended from the neck loop or from a clothes hanger and hung in a dust-proof cupboard away from direct heat and sunlight. The ideal conditions for storage are in a temperature of from 60 to 65 deg. F. and with a relative humidity of 65 per cent.

SERVICING**Examination and testing**

9. An examination and testing of the suit

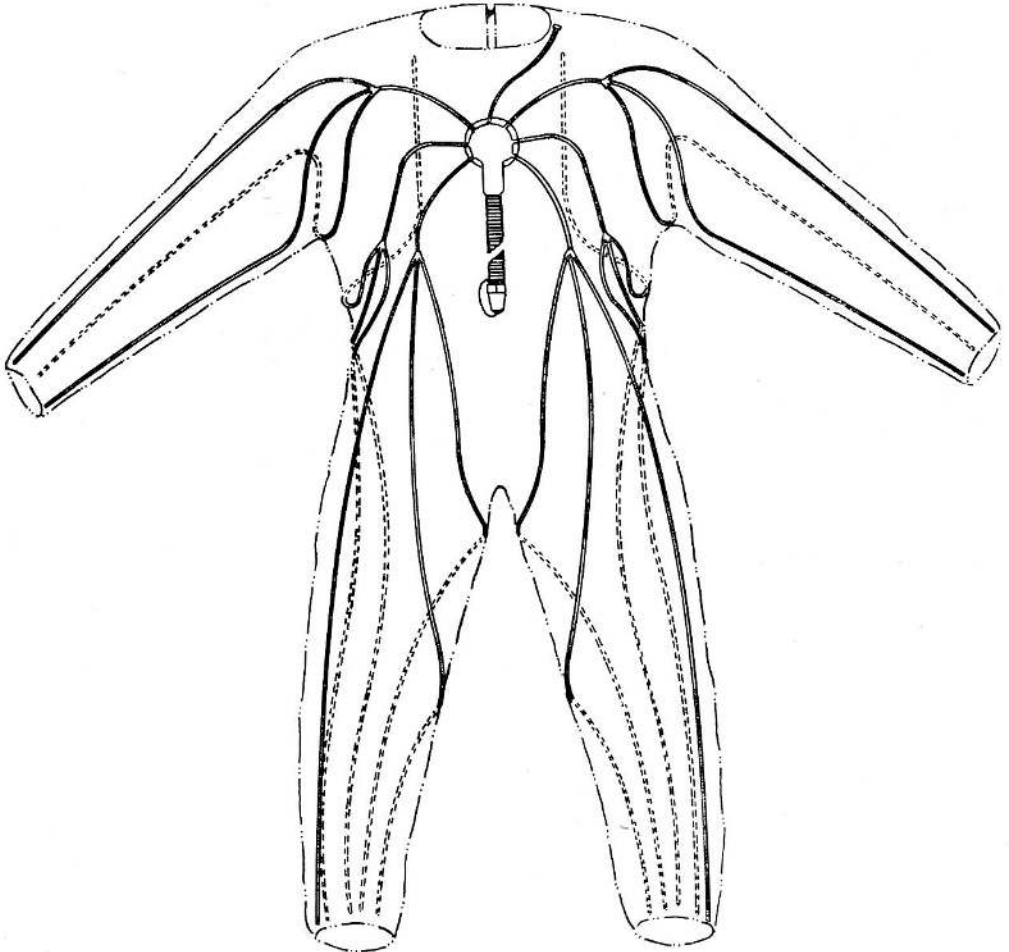


Fig. 3. Layout of air circulation system

RESTRICTED

should be undertaken immediately after unpacking. Holes and tears in the fabric and minor leaks in the tubing may be repaired in accordance with the instructions given in para. 11, before the suit is put into use. If a suit has suffered more than minor damage it should be returned for detailed examination and given a repair classification. A repaired or apparently serviceable suit is to be tested by connecting the inlet hose to an air supply delivering air at the rate of 13 to 15 cu.ft./min, under a pressure of approximately 0.5 lb/sq.in. Ensure that there is an unrestricted flow through all tubes.

Note . . .

(1) *To facilitate the checking of the air flow from the small holes drilled in the tube ends, the free ends of the tubes can be withdrawn through 2 in. slots formed by leaving gaps in the stitching along the edges of the cotton fabric tunnels. These slots are positioned in the area of the knees, the elbows and the centre of the back, and can be easily found by tracing along the tunnel stitching on the exterior of the suit.*

(2) *Air must emerge freely through all holes and, in the unlikely event of a new suit having one or two holes blocked, these can be cleared by the careful use of a blunt-ended wire or pin of appropriate diameter. Having passed this test, the garment must be hung in a suitable place until required.*

Fitting the connector to a Mk. 3 suit

10. After inspection, the inlet hose on each suit must be cut to meet individual requirements. It should be of a length sufficient to reach the personal equipment connector without being under tension nor unduly slack. Using the helical coils of the hose as a thread, the connector is screwed in until the flange is in contact with the cut end of the hose. If a lubricant is needed to assist the entry of the connector, water, silicone grease (Ref. No. 34B/237) or Aquadag 4042/DTD/500J may be used, but the two latter must be very lightly applied and great care taken to ensure that no surplus remains in the hose to be carried into the distributor and tubing.

Repairs

11. No major repairs should be attempted by user Units. Very small holes in the suit fabric may be darned and tears repaired by normal patching. Minor leaks from tubes

may be stopped with a wrapping of P.V.C. self-adhesive tape. Suits requiring extensive repairs must be exchanged for serviceable garments.

Cleaning

12. Cleaning of the suits is permissible but only by rinsing in a warm (not hot) solution of good quality detergent in water, followed by a thorough rinsing in several changes of clean water. Do not wring out. Suspend from a coat hangar to drain and dry. During the cleaning process and until completely drained, maintain a flow of filtered air through the inlet hose, with a pressure regulated to avoid excessive frothing, but not so low that frothing is completely eliminated. This will assist the cleaning and also ensure that the air circulation system does not become blocked by dirt and scum. When drained completely, hang the suit to dry, but do not expose to direct heat or sunlight.

Periodical inspection and testing

13. At the intervals stated in Vol. 4 the suit must be inspected and tested and, when necessary, repaired within the limitations given in para. 11. Remove the connector and couple the inlet hose to an air supply test rig. The pressure requirement for periodical tests is 0.45 lb/sq.in. at entry into the hose and the flow required is:—

(1) With the head cooling tube blanked off, 13 cu.ft./min. ± 0.75 cu.ft./min.

(2) With the blanking cap removed from the head cooling tube and replaced by a bush calibrated to pass air at 2 cu.ft./min., the total flow through the suit shall be 15 cu.ft./min ± 0.75 cu.ft./min.

(3) During the pressure/flow tests above, a physical check must be made to verify that the air is emerging through all vent holes (para. 9).

14. Minor blockage of a small number of vent holes at the tube ends can usually be cleared in the manner described in para. 9. A major blockage of the air flow calls for closer examination and the suit must be labelled to show the nature of the unserviceability and returned for repair, being folded as shown at fig. 4 and 5 and dispatched in a suitably-padded box.

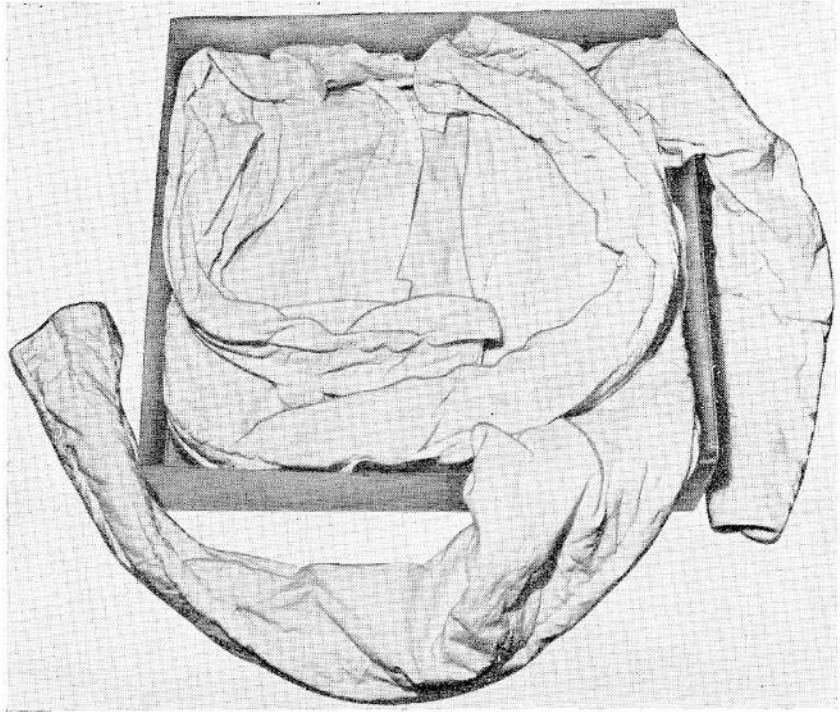


Fig. 4. Packing the suit: first stage

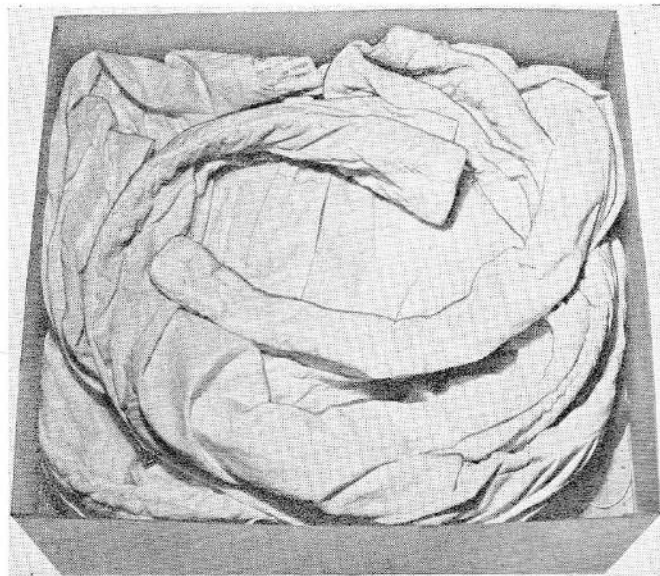


Fig. 5. Packing the suit: final stage

MR Wright (R)

February, 1964

Air Publication 1182E
Volume 1

AIR MINISTRY

FLYING CLOTHING AND SURVIVAL EQUIPMENT

ADVANCE INFORMATION LEAFLET NO.1/64

Insert this leaflet in A.P.1182E, Vol.1, Sect.1, after Chap.24

SUITS, IMMERSION, HELICOPTER, MK.1

1. A limited number of Suits Immersion Helicopter Mk.1 will shortly come into Service use and will be issued to selected Units engaged in Search and Rescue operations. The suits are single piece garments of lower bulk than the two piece now in use which tend to impede the wearer in the type of operation described.

2. The suits are issued, less boots, in the following sizes :-

Ref. No.	Sizes
22C/2486 to 2489	1 to 4

3. The boots are the Mk.3 boots used with existing suits, and are to be fitted by Units in the following manner :-

- (1) Smear three coats of KB.63 on the inside of the boots for a depth of 1 in. allowing each coat to become tacky.
- (2) Similarly treat the outside of the trousers legs.
- (3) Press the two treated surfaces together and cover the joint with 1½ in. Indiana tape using the same solution.

4. Items of underclothing recommended for use under the suits are:-

Ref. No.	Nomenclature
22C/2239 to 2241	Drawers, acrilan pile
22C/2236 to 2238	Vest, acrilan pile
22C/9421244 to 9421250 and 942459	Socks, woollen, knitted, plain
22C/9421251 to 9421258	Socks, woollen, knitted, ribbed

5. To don a suit, first pull on the legs, then, with the head bent well forward, the sleeves. Pull the neck seal over the head and adjust, ensuring that the collar and sleeves of the vest do not foul

the seals and so permit leakage and, finally, close the sliding fastener.

Notes

- (1) The information contained in this leaflet will be incorporated by normal amendment list action in due course.
- (2) If, after receipt of this leaflet, an amendment list with a prior date and conflicting information is received, the information in the leaflet is to take precedence.

ENGINEER

This file was downloaded
from the RTFM Library.

Link: www.scottbouch.com/rtfm

Please see site for usage terms,
and more aircraft documents.

