

Chapter I

FLYING CLOTHING

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GENERAL

1. Flying clothing today consists of many items of equipment, each of which has been scientifically designed to perform a particular function. It is with these items that this chapter is concerned. Full details of all items of flying clothing will be found in A.P.1182E, Vol. 1.

2. Future developments may be one or two garments which combine all the functions of the present ones. Thus they will be less bulky and more comfortable to wear. These items will be described when they go into production.

UNDERWEAR

String vest

3. The 1951 pattern string vest is made of thick cotton cord, knitted into a wide mesh, the shoulder straps being made of soft cotton fabric.

4. If the outer garments are windproof, the string vest will keep the wearer warm, but if the outer garments are well-ventilated, the vest will have a cooling effect. Thus the garment is suitable for use in both warm and cold climates.

Inner trousers, pyjama type

5. These are loosely fitting cotton trousers with button straps for waist adjustment. One or two pairs may be worn according to the weather conditions.

Aircrew shirt

6. This is made of a woollen/cotton mixture and is of the collar-attached type. A tie should NOT be worn during flight as it restricts ventilation at the neck.

Pullover jersey, 1951 pattern

7. This is a long-sleeved, slit-necked, ribbed woollen jersey with a draw string for adjusting the fit around the neck.

Necksquare

8. The necksquare is made of soft cotton and resembles a dishcloth. It is comfortable to wear and is very effective in controlling body ventilation. For ground survival purposes, it can be used to cover the face at night to protect it from the cold.

FLYING SUITS

Lightweight flying overall (1951 pattern)

9. This is a general purpose flying overall intended for use in summer conditions in the United Kingdom or in warmer climates. It is made of blue-grey windproof gaberdine and all fastenings are by means of rubber buttons. A silk scarf is attached to the collar.

Flying overall, Mk. 2

10. This will eventually replace the lightweight flying overall (1951 pattern). It is blue-grey cotton material, and incorporates built-in leg-restraint garters for use with the leg-restraint cords of the later marks of ejection seat. A towelling type of neck scarf is attached to the collar of the overall.

Cold-weather flying overall, Mk. 1

11. This overall is for use by aircrew in high-altitude aircraft or when operating in cold weather conditions. It consists of a hip-length jacket of blue-grey gaberdine lined with a woollen material, combined with a pair of trousers made from blue-grey windproof cotton fabric. The bottom edge of the jacket is lightly stitched to the trousers: for ground survival, the garments may be separated to allow adequate ventilation. If the overall is used in this way, a flap, normally buttoned at the back of the jacket, should be brought between the legs and attached to buttons inside the front of the jacket.

AIR-VENTILATED CLOTHING

12. Air-ventilated clothing is provided to cool the body in conditions of high cockpit temperature and humidity. It consists of a suit which is supplied with conditioned air from either the aircraft or a ground source. It provides evaporative cooling and enables the wearer to withstand high ambient temperatures and humidity in relative comfort for much longer periods than would otherwise be possible. There are two types of air-ventilated suits.

Air-ventilated suit, Mk. 1

13. This suit, covering the trunk and thighs, consists of a lightweight nylon overall carrying a system of manifolds, P.V.C. tubes and jets to the main perspiration areas of the body. Air at low pressure enters the suit via a flexible rubber inlet pipe and is carried via the manifolds and tubes to 96 jets on the inside of the overall, thus evaporating accumulations of perspiration.

14. The suit is intended to fit loosely over a string vest and a pair of short cotton pants. Comfort is the main consideration when selecting a suitable size as the effectiveness of the suit is not seriously impaired if it is slightly too large or small. Because the suit is permeable to water vapour, it can, if necessary, be worn for long periods without an air supply without undue discomfort, provided that the ambient temperature is not too high.

15. The air supply pressure cannot be altered by the wearer but it is possible, however, to regulate the amount of air flowing into the suit, the control being situated in a convenient position near the seat.

16. The air supply inlet pipe is coupled to the aircraft supply by a push/pull connector which, when

fitted to an ejection seat, is designed to separate as the seat leaves the aircraft. The inlet pipe joins the suit at the left waist position, and the suit is adjusted for size by means of tapes at the front.

Air-ventilated suit, Mk. 2

17. This suit differs from the Mk. 1 in that it is a full length garment, it fastens at the back and the inlet tube joins the suit at waist level in the front.

18. A more detailed description of the air-ventilated clothing will be found in A.P.1182E, Vol. 1, Sect. 1.

ANTI-G CLOTHING

19. The average pilot "greys-out" at about +4 g and "blacks-out" after about 5 seconds at +5 g, and is mentally confused for some seconds after the "g" application has ceased. Repeated or prolonged exposure to high "g" forces is followed by pronounced mental and physical fatigue and lassitude lasting, in some cases, for several hours. These effects are caused by the draining of the blood from the brain into the abdomen and legs and are particularly evident if the pilot is suffering from lack of oxygen.

20. The anti-g equipment affords protection against the effects of high "g" by applying pressure against the abdomen and legs thus preventing the blood from "pooling" in these areas. By this means, the wearer's "grey-out" and "black-out" thresholds are raised by 1½g or more.

Anti-g suit, Mk. 4A

21. The anti-g suit, Mk 4A consists of a skeleton garment containing air bladders over the abdomen thighs and calves. When inflated the bladders expand and exert pressure on these areas thus preventing the blood from "pooling".

22. The inflation of the suit is automatically controlled by the anti-g valve which is mounted in the aircraft. As the "g" force increases, the valve opens to admit air under pressure to the suit, the amount entering being directly proportional to the amount of "g" being applied. When the "g" force is removed, the suit is exhausted to atmosphere.

23. The suit is designed to be worn under or over normal flying clothing, whichever is the more convenient.

24. When the suit is first fitted, the back straps should be tightened and the lacing then adjusted when the wearer is seated. The lacing should be reasonably tight for the suit to be effective. The suit should then be inflated to 7 lb. per sq. in. (the equivalent of +8g) to make sure that it is comfortably adjusted and to accustom the wearer to the sensation of pressure.

25. Once it has been adjusted, the lacing need not be disturbed as the suit is removed by operating the zip-fasteners.

WARNING

When an anti-g suit is in use, a pilot can withstand very heavy "g" loading and possibly exceed the structural limitations for the aircraft. It is therefore essential that these limitations are known and care taken not to exceed them.

RESTRICTED

FLYING BOOTS**1952 pattern**

26. These boots were developed because of the need for boots which would be suitable not only for use in aircraft but also, if necessary, for walking long distances.

27. The uppers are made of soft, black leather and the boots have hardwearing leather soles and rubber heels. The boots are not lined, the necessary warmth being obtained by wearing two pairs of woollen socks (the boot sizes allow for this).

PRESSURE AND PRESSURE-BREATHING CLOTHING

28. Whilst the safe ceiling of an aircraft can be increased by supplying oxygen under pressure to the crew, unless this pressure is counter balanced in some way, breathing becomes very difficult because of the reversed actions needed for inhalation and exhalation. Inhalation has to be relaxed instead of forced, and exhalation obtained by forcing the air from the lungs. This process can become very tiring but the effects can be overcome by pressurising the outside of the body to the same degree as the oxygen supplied to the lungs.

29. The system adopted initially was a pressure breathing waistcoat but the current system is a pressure jerkin enclosing the whole trunk. Eventually the whole of the person will be enclosed in a pressurised garment. The advantage of this type of garment is the protection it affords to the wearer in the event of cabin pressure failure when at very high altitude. For example, if a person baled-out at 63,000 ft. without pressurised clothing, his blood would boil at body temperature.

Pressure-breathing waistcoat, Mk. 1

30. The pressure-breathing waistcoat Mk. 1 is an inflatable garment made of rubberised cotton gabardine. The material is rubberised on one side only, and the garment is constructed of two layers, the rubberised surfaces facing each other to form the oxygen compartment. To prevent the garment from bulging when inflated, internal reeds are provided.

31. The waistcoat is fastened at the front by a zip-fastener, and final size adjustments are made by lacing on the inside of the back. The oxygen supply is connected to a flanged socket at the right breast position.

32. The waistcoat is available in four sizes—small, medium, large and extra large. It is worn over all other flying clothing.

Pressure-breathing waistcoat, Mk. 1A

33. This is similar to the Mk. 1 garment but is made of rubberised linen fabric.

Pressure jerkin, Mk. 1

34. This jerkin is used in conjunction with a pressure headpiece and a pressure demand type of oxygen system to increase the safe ceiling of this system from 48,000 ft. to 70,000 ft. It covers the trunk and consists of two layers of gabardine with an

inflatable bladder sandwiched between them; a life jacket and S.A.R.A.H. are built into the upper portion of the jerkin. Holes are provided for the arms and right leg, the left leg opening being divided by a zip-fastener which runs from the neck to the leg opening. A slot is provided at the left thigh to accommodate the anti-g suit and air-ventilated suit air supply pipes.

35. The jerkin is pressurised by the normal oxygen supply to the pressure headpiece, a Tee-junction in the supply pipe being attached to a fitting at the right breast position.

FLYING HELMETS**Type 'F' helmet**

36. This helmet, made from open weave linen fabric, is coloured light blue and is intended for use under a protective helmet, although it is also suitable as a general purpose helmet. It is available in four sizes as follows:—

Size 1 equivalent to 6½—6¾

Size 2 equivalent to 6¾—7

Size 3 equivalent to 7—7¼

Size 4 equivalent to 7¼—7½

Adjustment is effected by a chin strap and an elastic strap at the back of the neck.

Type 'G' helmet

37. This is similar to the Type F helmet but has different oxygen mask attachment points to suit an A-13A/2 oxygen mask, and the elastic strap at the back of the neck is replaced by an adjustable webbing strap.

Protective helmet, Mk. 1A

38. This helmet, made from bonded laminated nylon fabric, is coloured silver on the outside and is intended to protect the wearer's head from injury during buffeting or a crash landing. It also increases the chances of safe ejection if the cockpit hood jettison mechanism fails and the wearer is forced to eject through the hood. It is available in five different sizes, each with three different fittings (narrow, regular, broad) and the wearer should try on several helmets before making the final choice as there are slight variations in helmets of the same nominal size. It is advisable to wear the helmet for at least 30 minutes before accepting it as a good fit. A well-fitting protective helmet is not uncomfortable to wear, even for long periods.

39. If the silver paint on the outside of the helmet is damaged, press that area with the thumbs to check for any softness; if any is found, the helmet is un-serviceable and should be exchanged.

40. It is most important that the chin strap is fastened during use otherwise the helmet may be lost during an ejection.

VISORS

41. Visors may be worn by aircrew instead of goggles to protect the eyes from glare. A visor, when lowered, will protect the eyes from flash burn, wind blast and injury such as might be caused by a blow on the upper part of the face.

42. A visor can be adjusted to any position between "fully up" and "fully down" and is therefore more versatile than goggles which are either "up" or "down."

Mk. 2 visor

43. This visor slides in a curved rail attached to the top of the protective helmet. It can be positively locked in any position between fully up and fully down by means of a ball-ended plunger which engages in one of a series of indentations in the rail. The plunger is disengaged by movement of the serrated thumb-catch.

LIFE JACKETS

44. A life jacket is designed to keep the wearer afloat after ditching or after a parachute descent into the sea. The flotation qualities are provided by an inflatable stole contained in a yellow fabric jacket, the inflation being by compressed gas or orally. When inflated, the life jacket supports the wearer in the water in such a manner that his head is clear of the water and if unconscious he cannot float face down.

Life jacket, Mk. 2

45. This is a waist length jacket and has the following features:—

- (1) The inflatable lobes of the stole are folded and held in position by snap fasteners, whilst the neck is folded and held in place by a single fastener at the back. The fasteners burst open as the stole inflates under the gas pressure. If either side of the stole does not inflate, pull apart the snap fasteners.
- (2) The CO₂ cylinder is operated by pulling down on the red knob at the left breast position.
- (3) The oral inflation tube is attached to the right-hand lobe of the jacket.

46. The following equipment is fitted to the life jacket:—

- (1) Life line
- (2) Life jacket lamp, Type A (see Sect. 1, Chap. 4)
- (3) Whistle
- (4) Fluorescine pack (see Sect. 1, Chap. 4)

Life jacket, Mk. 3

47. This is an improved version of the life jacket, Mk. 2, the lobes being folded upwards and out of the way of the parachute harness. As a result, the life jacket can be inflated before the parachute harness is released. Thus the shoulder straps of the parachute harness must pass under the folded stole instead of over it as in the case of the Mk. 2. When in the water, the correct flotation angle is obtained

by pulling down on the lobe adjustment cords until they are tight. The Mk. 3 life jacket carries the same equipment as the Mk. 2.

Life jacket, Mk. 4

48. This is similar in construction to the life jacket, Mk. 3 but the life jacket lamp, type 'A' is replaced by S.A.R.A.H. and the life jacket lamp, type B. Both of these items are covered in Sect. 1, Chap. 4.

DRESSING FOR FLIGHT BELOW 48,000 FT.

49. The main points to be observed when dressing for flight below 48,000 ft. are comfort and the correct type of oxygen equipment. Thus the choice of clothing to be worn beneath the flying suit must rest with the individual who must assess the conditions likely to be met. When a long wait in the aircraft prior to take-off is anticipated and the weather is very warm, an air-ventilated suit would be a wise choice (assuming that the aircraft is fitted with the necessary equipment). If, however, an immediate take-off followed by a climb to 30,000—40,000 ft. is anticipated, the use of an air-ventilated suit would seem pointless. The anti-g suit should be worn on all flights in aircraft which are equipped with the necessary installation. The life jacket should be worn on all flights which involve crossing the coast or flying within five miles of it. The oxygen equipment selected should be that appropriate to the oxygen system of the aircraft. (see Sect. 1, Chap. 2).

DRESSING FOR FLIGHT ABOVE 48,000 FT.

50. As with flight below 48,000 ft., the items of clothing should be chosen for comfort but in this case certain additional items are essential. The following is a list of the articles of flying clothing needed (in the order of donning) for flight above 48,000 ft.:

- String vest
- Short cotton pants
- Aircrew socks, inner
- Aircrew socks, outer
- Air-ventilated suit
- Aircrew shirt
- Aircrew trousers
- Anti-g suit
- Flying overall (with leg-restraint garters)
- Flying boots
- Pressure jerkin
- Pressure headpiece
- Gloves
- Cold weather clothing as required

The pressure jerkin and the pressure headpiece MUST be worn when flight above 48,000 ft. is being carried out.



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