

Chapter 10

ANTI-G SUIT INSTALLATION

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Introduction

1. The average pilot "greys out" at about 4g and "blacks out" after 5 seconds at about 5g, and he is mentally confused for some seconds after the "g" application has ceased. Repeated exposures to "g" are followed by pronounced mental and physical fatigue lasting some hours. These effects are caused by the draining away of the blood from the brain into the abdomen and legs, and are particularly evident if the pilot is already suffering from a lack of oxygen.

2. An anti-g suit affords protection against the effects of "g" by applying pressure to the abdomen and legs, so 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. The suit is pressurised by compressed air at (n-1) lb. per sq. in., where n is the "g" applied.

3. The supply of compressed air to the suit is automatically controlled by an anti-g valve mounted in the cockpit. The anti-g valve is, briefly, a valve with a weight inside supported on a spring. When "g" is applied to the aircraft, the control weight moves downwards and opens the valve, allowing compressed air to pass into the suit. The valve cuts in at about 2g and applies pressure which increases and decreases with variations in "g." The valve cuts out at about 1.75 g and the suit is exhausted to atmosphere.

4. Typical systems for an aircraft with an ejection seat and for a two-seater aircraft with fixed seats are shown in fig. 1 and 2. The compressed air for inflating the suit is supplied either from a compressed air cylinder or from the aircraft pneumatic system. If an aircraft ancillary system, such as brakes, is also operated

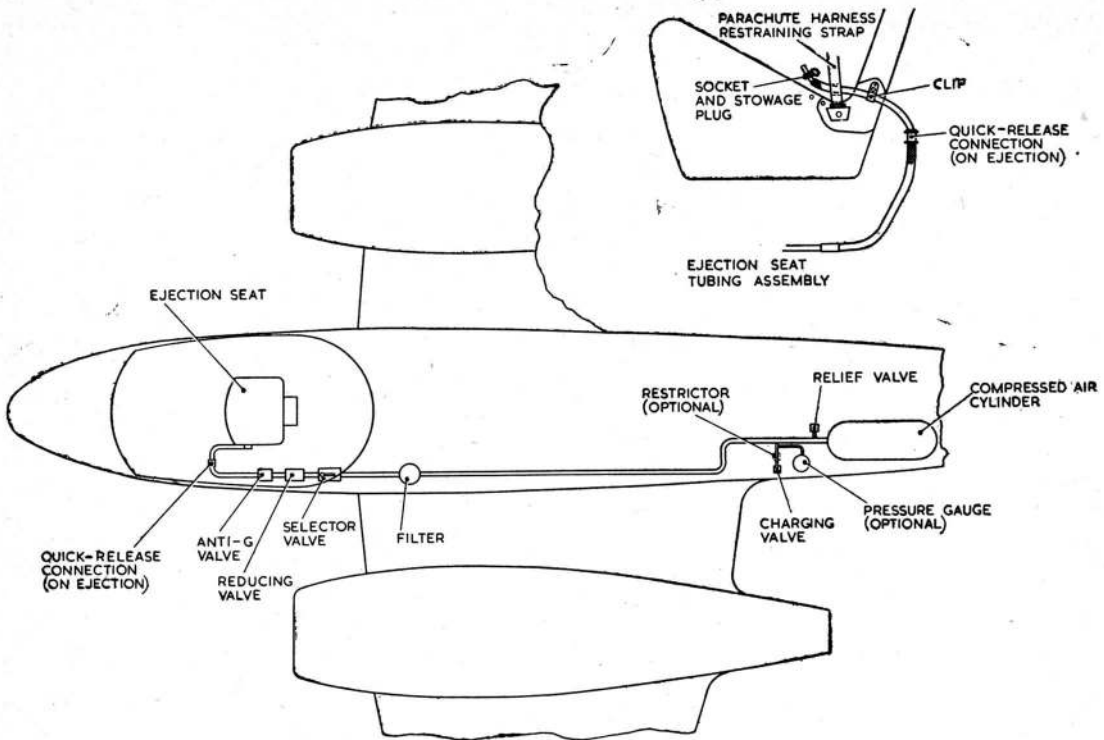


Fig. 1. Typical anti-g installation (ejection seat)

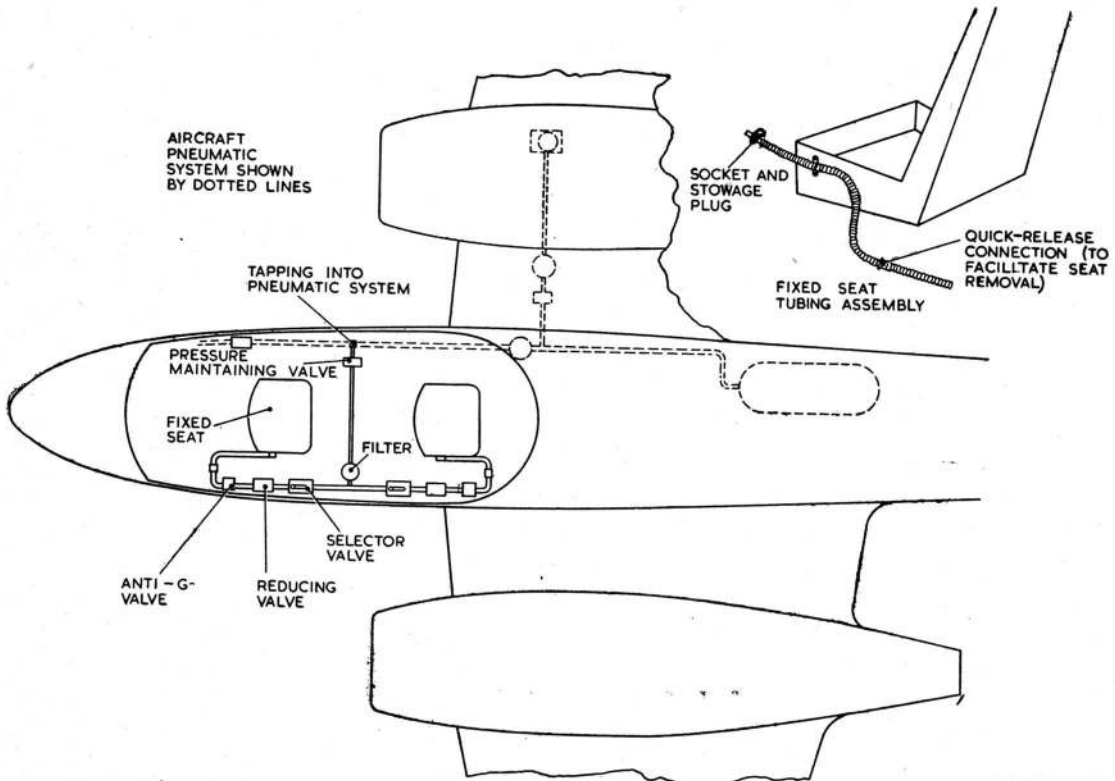


Fig. 2. Typical anti-g installation (two-seater aircraft with fixed seats)

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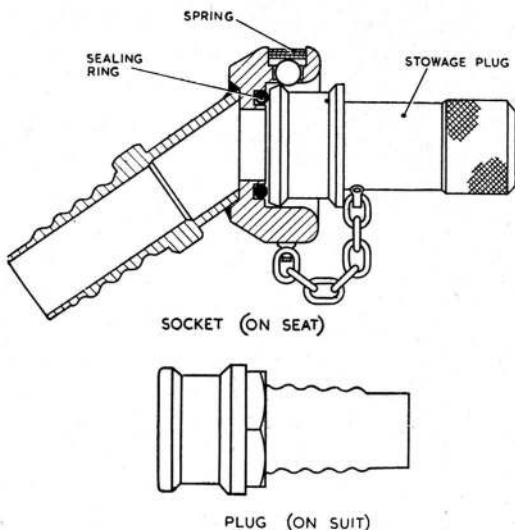


Fig. 3. Quick-release coupling (seat-to-suit)

by the pneumatic system, a pressure-maintaining valve (if not already fitted) is incorporated in the circuit to ensure that there is always adequate air for the operation of the ancillary service if the anti-suit is used excessively or if a component fails.

5. The pressure of the compressed air is reduced to 10 to 20 lb. per sq. in. by a pressure-reducing valve and the supply of air to the suit is automatically controlled by the anti-g valve.

6. The anti-g valve and an ON-OFF cock are mounted within reach of the pilot. The anti-g valve is connected to the suit by non-kinking hose and a quick-release coupling (fig. 3). An additional quick-release coupling (fig. 4) is fitted in the hose between the seat and the aircraft structure.

7. If the aircraft has twin seats the installation is similar, but apart from the pressure-maintaining valve and possibly the ON-OFF cock and filter, all components are duplicated.

DESCRIPTION

8. The anti-g suit, Mk. 4, is made in three sizes, as follows:—

Size	Stores Ref.	Height of wearer
Small	22C/1289	5 ft. 4 in.— 5 ft. 7 in.
Medium	22C/1290	5 ft. 8 in.— 5 ft. 11 in.
Large	22C/1291	6 ft. 0 in.— 6 ft. 4 in.

Note . . .

The heights are quoted only as a guide: the suit must be fitted to the individual.

9. The suit is a trouserlike garment cut away at the back, crotch, and knees, and containing an inflatable rubber bladder which extends across the abdomen and down the outside of the legs. The air connection is on the wearer's left. When the bladder is inflated, the suit fabric is tensioned and so applies pressure to the lower part of the body.

10. The suit is adjusted to fit the wearer by straps at the back and by lacing on the legs, and is provided with zip fasteners at the waist and insides of the legs so that it can be donned and removed without any interference to the adjustments.

11. The suit is made of an open-weave nylon fabric and the bladder is fitted inside a cover of the same material (fig. 5). The cover is sewn to the suit along the legs; across the abdomen it is free of the suit but is connected to it by elastic supporting straps. This allows the bladder to expand without distortion when it is inflated. Metal stays are fitted in webbing pockets to maintain the shape of the abdominal band.

Bladder

12. The bladder (fig. 6) is made of flexible rubber sheet, protected at the edges by

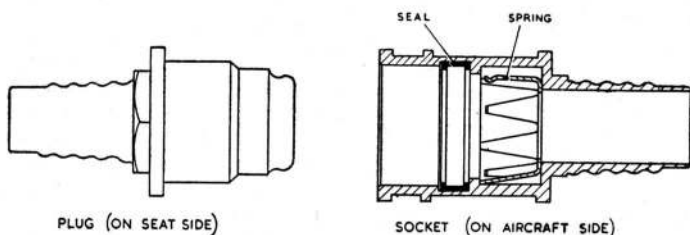


Fig. 4. Quick-release coupling (seat-to-aircraft)

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Fig. 5. Internal view of anti-g suit, Mk. 4

chafing strips where necessary. Anchor tabs of rubberised fabric are attached at intervals and sewn to the suit to prevent any part of the bladder from folding over, creasing, or being displaced when the suit is donned. Strips of sponge rubber are fitted inside the bladder to form air ways. A 2-in. wide reed is fitted in the abdominal part of the bladder to prevent it from expanding unduly when inflated.

13. A short length of rubber tube is cemented to the bladder to act as a housing for the air inflation tube. The bladder is reinforced locally with patches of rubberised fabric.

14. When the anchor tabs are sewn to the suit, short lengths of tape are sewn into the seam (*fig. 5*) so that if the bladder is later removed the stitching can be cut against the tape and not against the fabric of the suit."

Air inflation tube

15. The air inflation tube is a lightweight rubberised fabric hose with a spiral wire reinforcement. The tube is supported by a fabric anchor strap where it passes through the suit. The plug half of the quick-release coupling (*fig. 3*) is screwed into the end of the hose. The mating parts of the coupling are identical with those used for American anti-g suits, so that a British suit can be used in an American aircraft and vice versa.

Waist adjustment straps

16. Three adjustment straps are fitted at the back. The buckles are of the non-slip type, but the strap must pass through the metal loop as shown in *fig. 7*.

FITTING THE SUIT

17. The suit can be worn over or under the normal flying clothing, whichever is more convenient, but if it is worn under other garments, provision must be made for

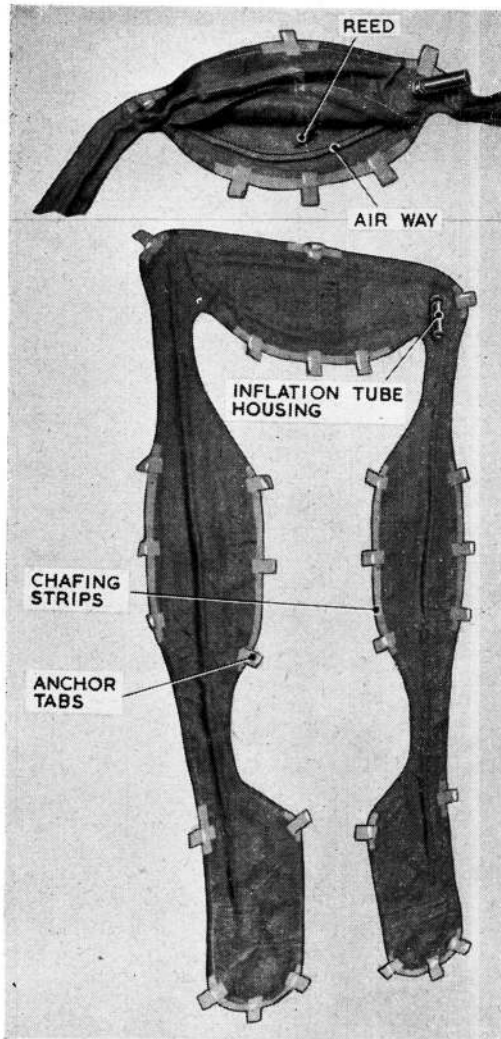


Fig. 6. Bladder

the air inflation tube to pass through them. If an immersion suit is worn, the anti-g suit must be worn under the immersion suit, a waterproof fitting being provided on the immersion suit for the air inflation tube.

18. The wearer should put on the suit over the clothing with which he expects to wear it, fasten the zip fasteners at the waist and legs (fig. 8 to 11), and then tighten the back straps. The clothing underneath the suit should be as free as possible from folds and creases. The lacing on the legs should be drawn reasonably tight and the laces securely tied.

19. If possible, the suit should be inflated (maximum pressure—7 lb. per sq. in.) to give the wearer some experience of the effect before he uses it in an aircraft. The suit should be inflated with the wearer sitting down (fig. 12 and 13). Any final adjustments to the lacing should then be made and the laces tucked away or else cut to length, the cut ends being sealed with rubber solution to prevent their fraying. The lacing need not be adjusted again unless the suit is worn with a very different combination of clothing.

Note . . .

The lacing should be reasonably tight, because the pressure must take effect immediately it is applied if the suit is to be of maximum value. Any time lost because the bladder has to take up looseness will reduce the "g" protection given to the wearer.

SERVICING

Examination

20. Examine the suit generally to make sure that all stitching is intact, the zip fasteners in good condition, the webbing straps secure and undamaged, the eyelets and lacing satisfactory, and the material of the suit undamaged. Make sure that all metal parts are free from corrosion. Ensure that the air connection is clean and undamaged.

Washing

21. The suit may be washed in soapy water (good quality soap flakes should be used) provided that a watertight cap is fitted over the air connection to prevent water from getting into the bladder. The suit should be well rinsed in clean water.

Testing the bladder

22. At six-monthly intervals, the 6-in. tape strip along the top of the bladder cover should be removed and the abdominal

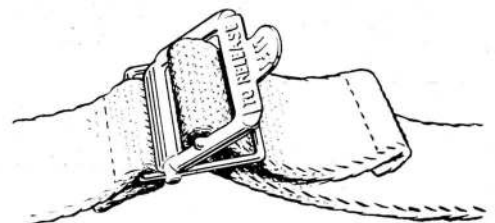


Fig. 7. Strap buckle



Fig. 8. Before donning

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Fig. 9. Waist engagement

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Fig. 10. Leg engagement

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Fig. 11. Tying the laces

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Fig. 12. Ready for inflation

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Fig. 13. Suit inflated

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portion of the bladder examined for signs of deterioration. The bladder should then be tested by being inflated to 5 lb. per sq. in. for 5 minutes. There should be no leakage.

23. At twelve-monthly intervals, the bladder should be completely removed from the suit and examined for signs of deterioration. It should also be tested by inflation to 5 lb. per sq. in. for 5 minutes. No repairs to the bladder are permissible; a faulty bladder should be renewed.

To remove the bladder

24. (1) Cut the stitches securing the anchor strap round the base of the air inflation tube.
- (2) Cut the stitches holding the anchor tabs to the suit, cutting against the tapes and not against the suit. Open

the top edge of the abdominal bladder pocket in the same way.

- (3) Take out the bladder.

To fit the bladder

25. (1) Insert the bladder through the opening in the abdominal cover and ease it into place. The use of 15-in. wire hooks (similar to those used for parachute rigging lines) which can be fitted through the tabs will facilitate this operation. Take care that the bladder is not twisted.
- (2) Position the anchor tabs, place short lengths of tape over the edge of the pocket fabric and machine the three together. Use 20 gauge nylon thread T.159 (Stores Ref. 22 C/) with 10—12 stitches to the inch. Tie off the threads. During the machining,

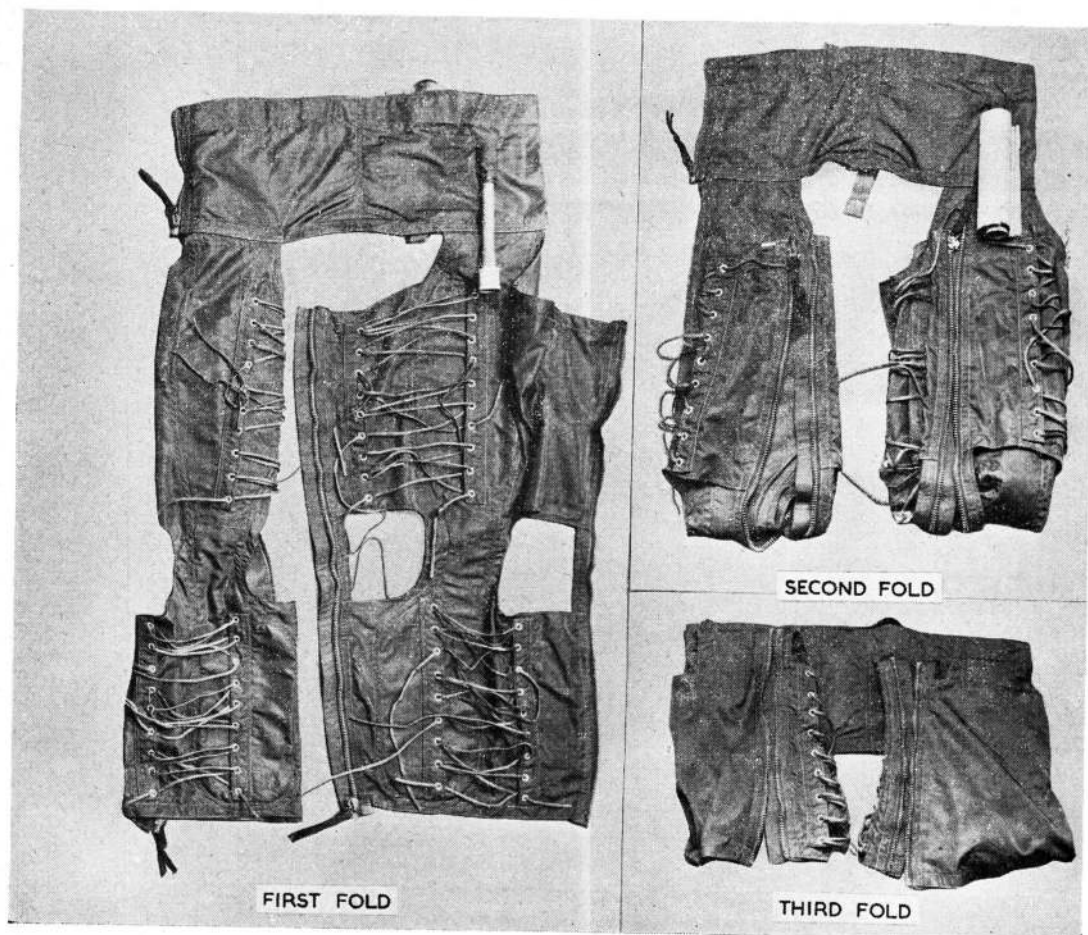


Fig. 14. Folding

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take care not to puncture the rubber part of the bladder. Take care to sew *all* the anchor tabs in place.

- (3) Place a 6-in. length of tape across the opening on the abdominal bladder pocket and sew it in position.
- (4) Sew the fabric anchor strap by hand around the air inflation tube.

Folding for storage

26. Lay the suit flat with the zip fasteners undone. Fit a protective cap over the quick-release plug and cover the air inflation tube with a roll of corrugated cardboard or similar material. Fold the legs under and up as shown in fig. 14.

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