

Chapter 13 ANTI-G SYSTEM

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(Completely revised)

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WARNING

AN AIRCREW EJECTION SEAT IS
FITTED TO THIS AIRCRAFT

Before attempting to enter the cabin ensure that the instructions detailed on the LETHAL WARNING marker card at the front of this handbook have been complied with. This is very important.

Introduction

1. This chapter contains a brief description of the anti-G system installed in

this aircraft to supply and control the pilot's anti-G suit. The necessary servicing information required to maintain the system in an efficient condition is also included, together with an illustration of the installation. The use of an anti-G suit raises the pilot's blackout level, considerably reduces fatigue, caused by repeated application of gravity forces and enables him to carry out "all round" observations at high gravity forces. Detailed information on the components used in the system will be found in the Air Publications listed in Table 1.

DESCRIPTION

General

2. The anti-G system installed in this aircraft consists of two high-pressure air bottles which when brought into action by the operation of an ON/OFF selector valve automatically supply air to inflate the pilot's anti-G suit when gravity loads are applied. The air from the bottles is fed through an air filter, a selector valve, a pressure reducing valve and an anti-G valve; all of which are interconnected by a system of pipe-lines to a quick-release

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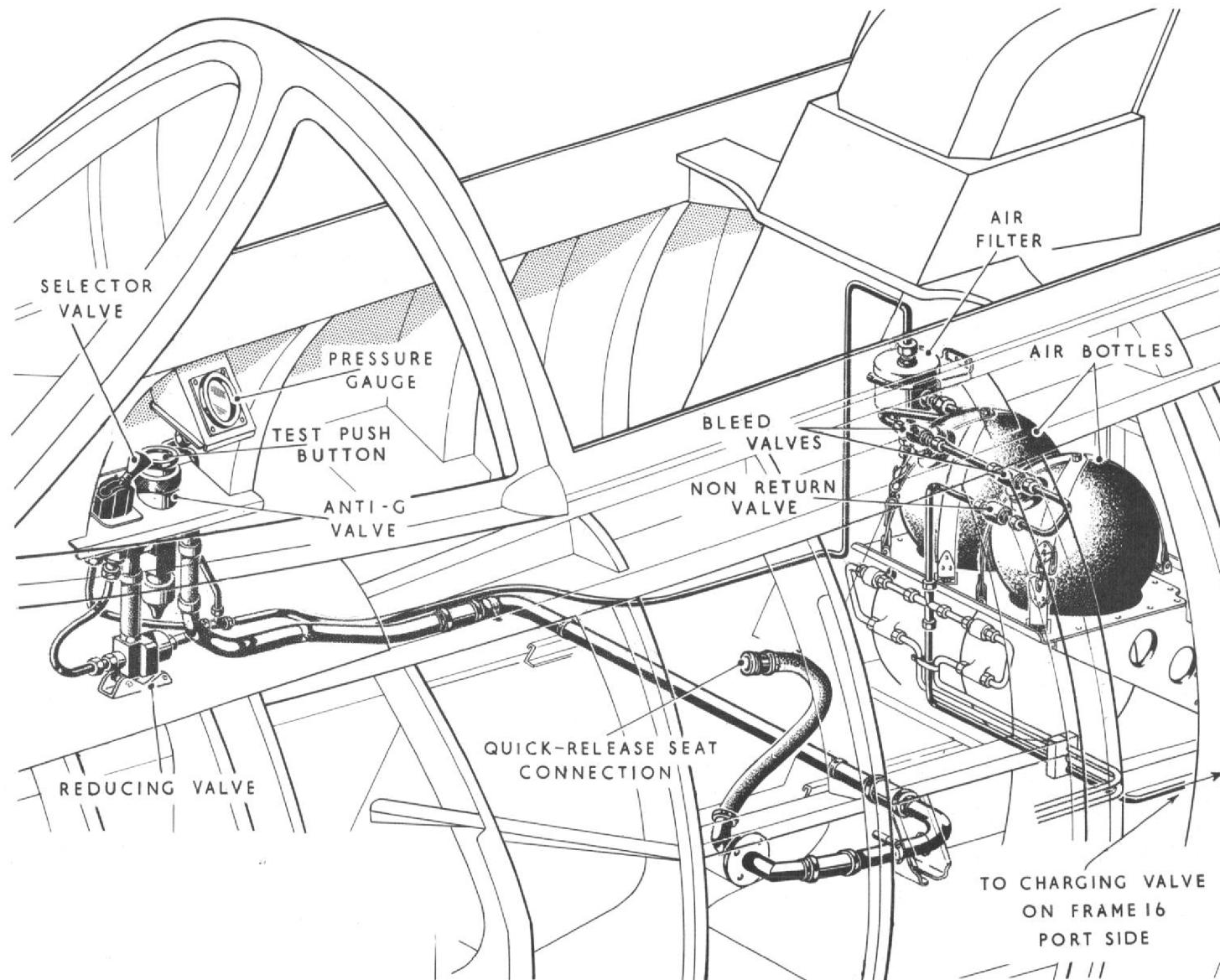


Fig. 1 Anti-g system

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connection located on a flexible hose clipped to the ejection seat. From this connection a further hose extends to the pilot's anti-G suit quick-release connection. A pressure gauge is provided to indicate the pressure in the air bottles. The two air bottles, together with the alighting gear and flap emergency air bottles, are charged in-situ through a common charging valve.

Air bottles

3. The two spherical air bottles are located side by side above the hydraulic emergency air bottles behind the ejection seat. They are clamped by wing-nut tensioned straps to support structure mounted on and secured to the forward face of frame 14, with the pipe connections facing forwards near the top of each bottle.

Charging valve

4. The charging valve is located on the strut of the accumulator mounting. The same valve is used for charging the hydraulic system emergency air bottles. A non-return valve is provided in the pipeline between the charging valve and the air bottles to prevent a return flow from the anti-G system into the hydraulic emergency air system.

Air filter

5. The air filter is clamped to the forward face of frame 14 just to starboard of the air bottles and is provided to ensure that only clean air is supplied to the sensitive reducing and anti-G valves in the system.

Pressure gauge

6. The pressure gauge, which is tapped into the system between the air filter and the selector valve to indicate the pressure in the air bottles, is located on a bracket attached to the fuselage structure above the cabin starboard shelf.

Selector valve

7. The lever operated ON/OFF selector valve, which is used to bring the anti-G system into operation, is located on the cabin starboard shelf just aft of frame 10.

Pressure reducing valve

8. The pressure reducing valve, which lowers the air pressure to the required operating value for the anti-G valve, is mounted in clips bolted to the cabin floor below the cabin starboard shelf just aft of frame 10.

Anti-G valve

9. The anti-G valve is mounted on the cabin starboard shelf just aft of the selector valve. The valve is mounted vertically with the test push-button projecting through the shelf. It automatically controls the anti-G suit pressure, depending upon the gravity loads applied perpendicular to the line of flight. The test push-button allows the pilot to manually inflate his suit either for checking the operation of the system or as an anti-fatigue measure during flight.

Quick-release connections

10. The airframe portion of the anti-G system terminates in a quick-release socket which mates with a plug attached

to a length of kinkproof hose clipped to the port side of the ejector seat. This latter hose terminates in a quick-release plug to which, when in use, the pilot's anti-G suit is connected. When not in use the hose is stowed in a blanking socket mounted on the port side of the seat pan. When ejection action is taken, the airframe portion of the system is automatically disconnected at the quick-release connection in the pipe clipped to the seat, and when the pilot leaves the seat after ejection, his suit is automatically disconnected at the quick-release connection on the suit.

Operation

11. The operation of the system, once selected for use, is fully automatic as the pressure applied to the suit is controlled by the sensitive anti-G valve, which is opened to an amount depending upon the gravity loads applied. When the anti-G valve opens, high pressure air, flows from the bottles through the filter and selector valve to the pressure reducing valve. At this valve the pressure is reduced to the required operating pressure and the air then flows, through the open anti-G valve to inflate the suit. When normal flight is resumed the anti-G valve closes, shutting off the supply to the suit which deflates through the exhaust ports in the anti-G valve.

SERVICING

General

12. The servicing necessary to maintain the system in an efficient condition, consists of keeping the installation clean,

ensuring that the exhaust ports in the anti-G and pressure reducing valves are free from obstruction, together with a check of the pipe-lines and components for leaks, damage and security. The quick-release connections should be examined to ensure that they are correctly assembled to the flexible hose and that the hose and connections are undamaged. The air filter should be drained and its felt filter pad cleaned as described in the air publication referred to in Table 1 and reference made to the pressure gauge in the cabin to ensure that the air bottles are fully charged. The pressure to which the bottles are to be charged is given in the Leading Particulars, the procedure being described in Section 2. The other servicing necessary is the serviceability and operational tests of the components, which will be found in the Air Publications referred to in Table 1.

Draining air filter

13. The air filter should be drained periodically, while compressed air is present, by unscrewing the drain plug at the bottom of the filter one quarter of a turn. When this is done, oil and water, if present will be ejected through the drain hole at the bottom of the filter body. The filter should also be dismantled regularly to enable the felt filter pad to be cleaned as detailed in the Air Publication referred to in Table 1, but before this is done the pressure in the air bottles must be dissipated by opening the bleed valve at the neck of each bottle.

REMOVAL AND ASSEMBLY

General

14. The procedure for removing the anti-G valve, reducing valve, selector valve, air filter and pressure gauge is obvious, but care must be taken to ensure that the air pressure in the air bottles is dissipated, by opening the bleed valves situated at the neck of each bottle, before the pipe-lines are disconnected. Whenever any component is removed from the system or when pipe-lines are disconnected for any reason it is essential that the pipe ends and connections on the unit are blanked off to prevent the entry of foreign matter. This is important, as any dirt, etc. in the pipe-lines or units will cause damage to the sensitive reducing and anti-G valves. Before reconnecting a component the pipe-lines must be blown through with clean dry air to ensure that they are scrupulously clean. During assembly care must be taken to ensure that the components and non-return valve are fitted correctly i.e. arrows point in the direction of flow. Removal and replacement of the pipe elbows of the anti-G valves should be carried out only under conditions of absolute cleanliness. Adhesives between the elbows and the valve body should not be used under any circumstances.

Air bottles

15. Access to the air bottles, which are located behind the ejector seat, is obtained from within the cabin. The method of removing them is as follows:-

- (1) Dissipate the pressure in the air bottles by unlocking and opening the bleed valves located on the neck of each bottle.
- (2) Unscrew the pipe couplings at the neck of each bottle and gently ease the pipes away, until they are clear of the bottles. Blank off the pipe ends and bottle connections.
- (3) Unlock and slacken off the wing nuts on the straps around each bottle.
- (4) Disengage the straps and remove the bottles, taking care that they do not foul or damage any pipe-lines and installation behind the seat.

Note . . .

The method of re-fitting the air bottles is a reversal of the above procedure, ensuring that the bleed valves are fully closed and locked before recharging the system.

Quick release connection and hose

16. Water may be used as a lubricant when screwing the kinkproof hose on to the quick release connection. The hose must be screwed on to the full length of the thread on the connection, which is provided with flats so that it can be held with a spanner whilst fitting the hose.

Testing

17. The system is to be tested at the periods specified in the servicing schedule as follows:-

- (1) Replenish the air bottles to 2000 lb. per sq.in. After allowing the charge to cool re-check the air pressure and top up if necessary.
- (2) Connect the quick release connection to the ejection seat hose.
- (3) With the selector valve ON momentarily depress the anti-G valve test

button and ensure that there is a free flow of air from the seat hose.

- (4) Connect a suitable pressure gauge (0-10 lb. per sq.in.) with a length of hose and a quick release connection ◀ to the seat port hose. ►
- (5) Set the selector valve to ON and depress the anti-G valve test button sufficiently to obtain a pressure of 7 lb. per sq.in. on the gauge. Check the pipe and hose from the anti-G valve for leaks with soapy water and check the inherent leak through the anti-G valve. This should not exceed 100 lb. per sq.in. in 45 minutes.
- (6) Set the selector valve to OFF and remove the pressure gauge from the quick release connection.
- (7) Ensure that there is no pressure drop with the selector valve OFF.
- (8) Stow the hose in the seat blanking socket.
- (9) Re-charge the air bottles as in (1) above.

TABLE 1

Component and Air Publication reference

Component	Air Publication
Bottle, Air, spherical Dunlop A.C.M.16782	4303B, Vol.1, Book 1, Sect.2, Chap.1
Filter Dunlop A.C.O.7273	1275A, Vol.1, Sect.15, Chap.6
Gauge, Pressure Mk.14KK	
Socket, Quick Release Dunlop A.C.O.6580	1182E, Vol.1, Sect.1, Chap.10
Suit, Anti-G	4303C, Vol.1, Sect.4, Chap.14
Valve, Anti-G Type A.G.2	
Valve, Non-return Dowty D.5213Y	4303Z
◀ Valve, Reducing Type C.58 ►	4303C, Vol.1, Sect.6, Chap.3, App.1
Valve, Selector Type S.V.9	

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