Chapter 8E AIR SYSTEMS - MISCELLANEOUS VALVES

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WARNING

The relevant safety precautions detailed on the LETHAL WARNING marker card must always be observed before entering the cockpit or performing any operations upon the aircraft.

DESCRIPTION

CONSTANT-FLOW VALVE

General information

1. The constant-flow valve is fitted in the air supply pipe to the de-misting, rain dispersal and anti-icing systems *(Chap.8C)*, to regulate the mass flow of air to a constant value irrespective of upstream pressure, downstream restriction or aircraft altitude. The valve operates automatically and the air flow is sufficient to supply anti-icing/de-misting or rain dispersal/de-misting. The principal components of the valve are a valve body, a valve casing and needle valve assembly.

Description *(fig.1)*

Valve body

2. The valve body is essentially a cylinder divided, by a transverse wall, into two chambers of differing lengths and diameters. The chambers enclose a spring-loaded piston and sleeve assembly, the spring and piston in the upstream chamber and the sleeve in the downstream chamber being connected by a rod passing through the transverse wall. Three webs, radiating from the valve body, support a flanged annular ring to which the two parts of the valve casing are bolted; when the valve is assembled the annular ring forms part of the casing.

Valve casing

3. The casing is in two parts flanged to match the body and incorporating coupling flanges for assembly into the air system. The downstream component is a profiled nozzle which, in conjunction with the sleeve, forms a variable-area restriction to air flow through the valve.

Bleed system

4. The passages communicate with the piston chamber, one from the valve body inlet, through the piston rod, and the

second through one of the radial support webs. The latter passage terminates in a bleed orifice which is normally controlled by the solenoid-operated needle valve. On this aircraft, the solenoid is inoperative, so that the orifice becomes a fixed area bleed.

Operation

5. Air entering the valve flows through the annular chamber surrounding the valve body and out through the outlet nozzle. Air pressure acts on the piston head through the filter and some of this air enters the bleed system and vents to atmosphere through the bleed orifice. The bleed system maintains a constant pressure ratio across the piston, thus making the spring the controlling factor. If inlet pressure increases, pressure on the piston compresses the spring and displaces the sleeve into the nozzle, so reducing the outlet area and preventing the increase in mass flow which would normally result from the pressure rise; a reduction in inlet pressure allows the spring to extend with the opposite effect.

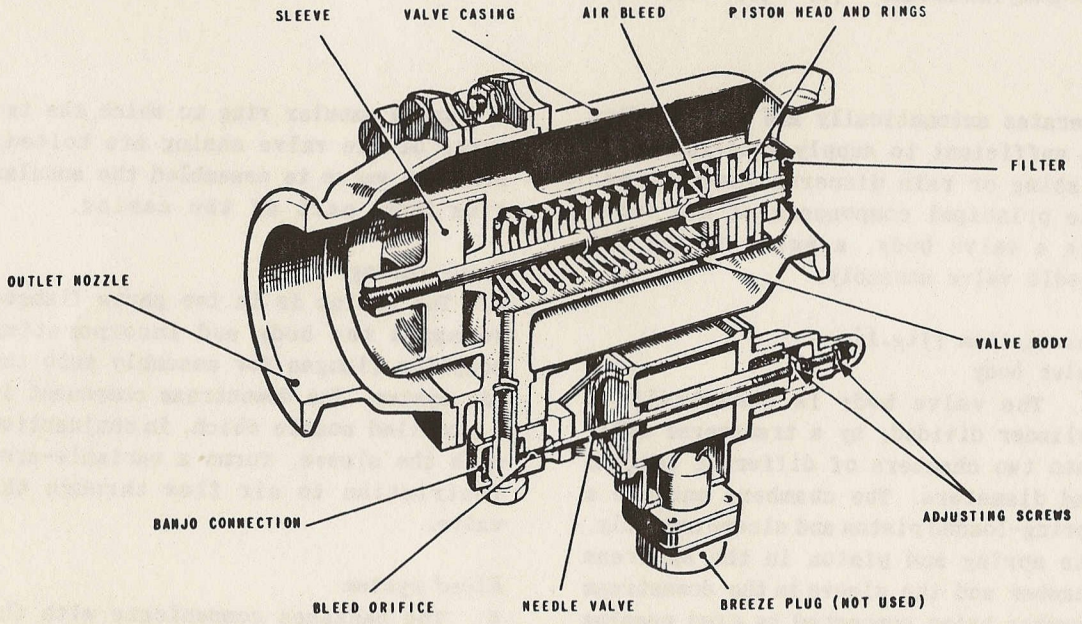

Fig. 1. Constant-flow valve

SPILL VALVE

Description *(fig. 2)*

6. The valve consists of a casing containing an adjusting screw, an adjusting plate, and a spring-loaded piston. The screw is free to rotate in the casing and, when rotated, causes the plate to move along the thread to increase or decrease pressure on the spring. The piston is free to slide along the plain portion of the screw against spring pressure.

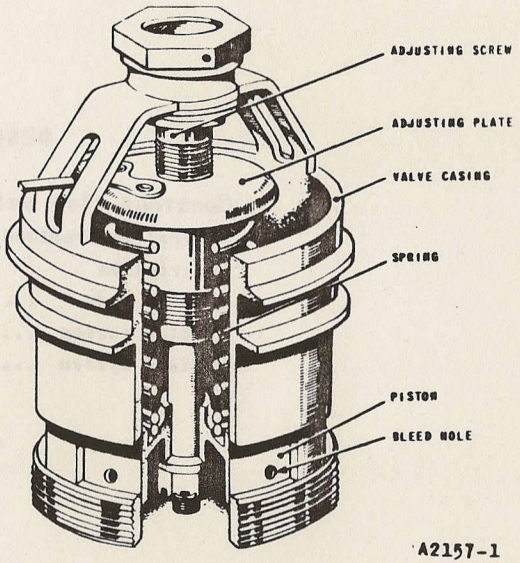

Fig. 2. Spill valve

Operation

7. When air pressure acting on the underside of the piston is less than spring pressure the piston closes the ports in the casing wall; this shuts off the air supply to the equipment compartments with the exception of a small permanent bleed through the holes in the piston. When air pressure from the cold-air unit exceeds 5.5 lb/in^2 however, the piston is raised to permit

overload air to enter the equipment cooling system.

◀ EMERGENCY RAM-AIR VALVE ▶

Description *(fig.3)*

8. The valve is installed in the port console so that, in the closed position, the outer end is flush with the aircraft skin, the inner end protruding into the cockpit. The valve consists basically of a sleeve containing a tubular slide capable of axial movement within the sleeve. Inlet air to the cockpit passes through the slide; air from the cockpit is exhausted through outlets in the valve sleeve which communicates with an annular chamber between slide and sleeve. Bolted inside the outer end of the slide is the valve block which forms the inlet and outlet ports, and also seals the cockpit when the valve is closed. A spring-loaded pin with a roller at each end passes transversely through the slide and engages a helical cam slot in the valve sleeve. The slide is restrained from rotary motion by two locating pins in the valve base which engage axial slots in the valve block. A freely-pivoted valve plate serves to close the inlet port when internal pressure exceeds atmospheric pressure. Bolted to the inner end of the valve casing is the air entry tube which carries a lever, interconnected by a link to a control lever on the console; the end of the tube is open to allow the passage of air to or from the cockpit.

Operation

9. Movement of the handle to the OPEN position rotates the air entry tube and valve sleeve in the valve base. The valve slide, prevented from rotating by the pins in the valve base, moves outward under the influence of the cam slot into the air stream. Air at ram pressure enters through the inlet port, and air from the cockpit leaves via the exhaust port. Should there be a large pressure differential between the cockpit and the outside atmosphere, the valve plate closes the inlet port so that cockpit pressure is relieved only through the exhaust port, thus regulating the rate of decompression.

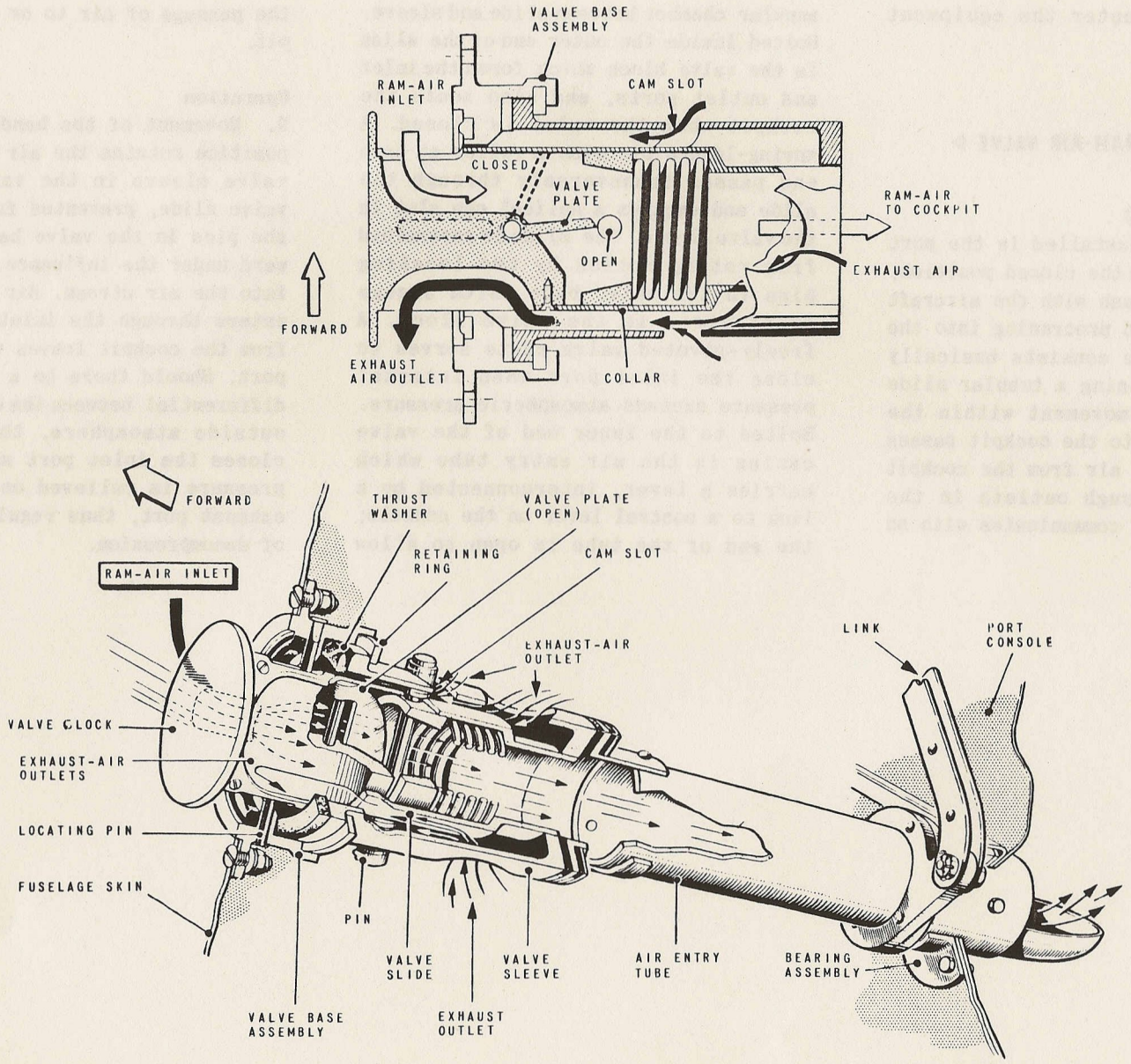

FIG. 3. EMERGENCY RAM-AIR VALVE

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