Chapter 8

AIR CONDITIONING SYSTEM

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LIST OF ILLUSTRATIONS

DESCRIPTION AND OPERATION

Introduction

1. Three separate ventilating systems are fitted. Each system incorporates a ventilating - air heater and the three heaters are supplied with aviation gasoline fuel from the main fuel system. Fig.1 illustrates the complete aircraft installation. All the components not fully described in this chapter are described in A.P.4340, Vol.1.

AIR SUPPLY (fig.1)

2. Air is supplied to the interior of the aircraft through a system of scoops and ducts and to the combustion chambers of three independent heaters. The ducting is shown in fig.1.

Scoops

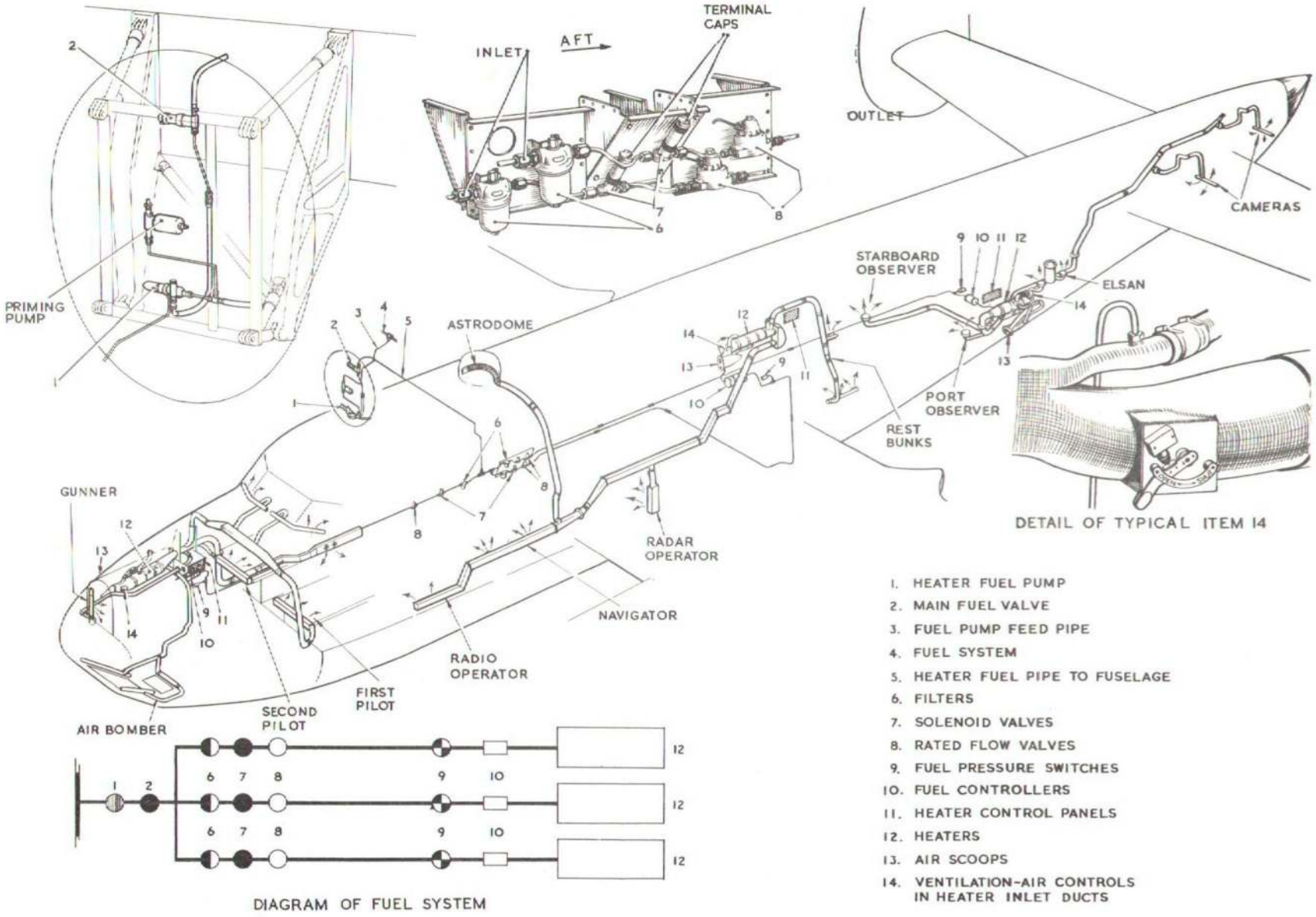
3. There are three scoops, one high up on the starboard side of the nose, one on the port side of the fuselage forward of the turret and one on the underside of the fuselage, at the end of the rear centre section. The latter two project from the fuselage surface and each combines an oval inlet for ventilating air, a circular inlet for combustion air and an angular outlet for the exhaust gases which are deflected aft by a semi-circular flange around the scoop. The forward scoop has a small combustion inlet and a larger ventilating air inlet at its aft end, inside the level of the skinning. A separate outlet for the exhaust gases from No.1 heater, which is connected to this scoop, is fitted to the nose skin further aft.

Ventilating and heating air

4. Air entering the larger or oval openings in each scoop, passes around the heater combustion chamber and thence through ducts to the various crew positions and equipment requiring warm air, where it emerges through adjustable louvres, diffusers or open pipe ends.

Heater combustion air

5. Air from the smaller or circular opening of each scoop is ducted to the heater combustion chamber and thence, either in the form of exhaust gas if the heater is on, or as unused air if the heater is not on, out to atmosphere through the exhaust outlet. Only at predetermined air speed is there adequate mass flow to ensure proper combustion of the fuel supplied to each heater. To ensure that the heaters cannot be used until this speed has been attained, a ram pressure switch, Ref. No. 5CW/4259, is fitted to the combust-



1. HEATER FUEL PUMP
2. MAIN FUEL VALVE
3. FUEL PUMP FEED PIPE
4. FUEL SYSTEM
5. HEATER FUEL PIPE TO FUSELAGE
6. FILTERS
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10. FUEL CONTROLLERS
11. HEATER CONTROL PANELS
12. HEATERS
13. AIR SCOOPS
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Fig. 1. Air conditioning system

ion air duct to No.1 (nose) heater (refer to Sect.5, Chap.1).

Combustion air relief valve (fig.2)

6. A lightly spring-loaded poppet valve is fitted in the duct which connects the combustion air duct to each heater to the exhaust. When the mass flow of combustion air reaches a maximum value, the head of the valve is lifted from its seating by the pressure of air, some of which is then by-passed to the exhaust side of the heater.

Ventilating air control (fig.1)

7. In the ventilating air duct to each heater is a manually - controlled butterfly valve which can be used to shut off entry of ventilating air when the heater is not in use. A micro-switch is arranged to break the electrical circuit of the heater, when the valve is not fully open, to prevent operation of the heater with insufficient ventilating air to keep it within its correct temperature range.

FUEL SYSTEM (fig.1)

8. Fuel is drawn from the priming system supply pipe in No.3 nacelle by a pump, Type A.1., Mk.5 (Ref.No.5U/5648) and the flow is controlled by a solenoid-operated valve, F.G.B./A/4 (Ref.No. 27V/2854), whence it passes to three separate metering and control units under the fuselage floor.

Metering and control units

9. Each of these consists of three components arranged in the following order:-

(1) Filter (Ref.No.27U/276)

(2) Solenoid valve (Ref.No.27V/2854)

(3) Rated flow valve (Ref.No.27U/269)

The output from each of the above systems is piped to one of the heater fuel controllers. When Mod.892 is embodied, this introduces the repositioning of the filters and rated flow valves on a set back panel, to give a clearance for the heater muffs, as shown in illustration fig.1 of this Chapter.

Heater fuel controllers

10. Each of the three pipes from the metering and control systems is led to a heater fuel controller by piping which incorporates a T-connected fuel pressure switch (Ref.No. 5CW/4299) The heater fuel controllers (Ref.No.27U/268), each have two outlets, one a vent and the other piped to the associated heater, and are fully described in A.P.4340, Vol.1.

HEATERS

11. The three heaters, Type C/H. Mk.2 (modified), are located and identified as follows:-

Heater No.	Location	Part No.
1	Nose	6Z/6696
2	At turret	2Z/6696
3	Rear	3Z/6696

These three heaters differ by virtue of the

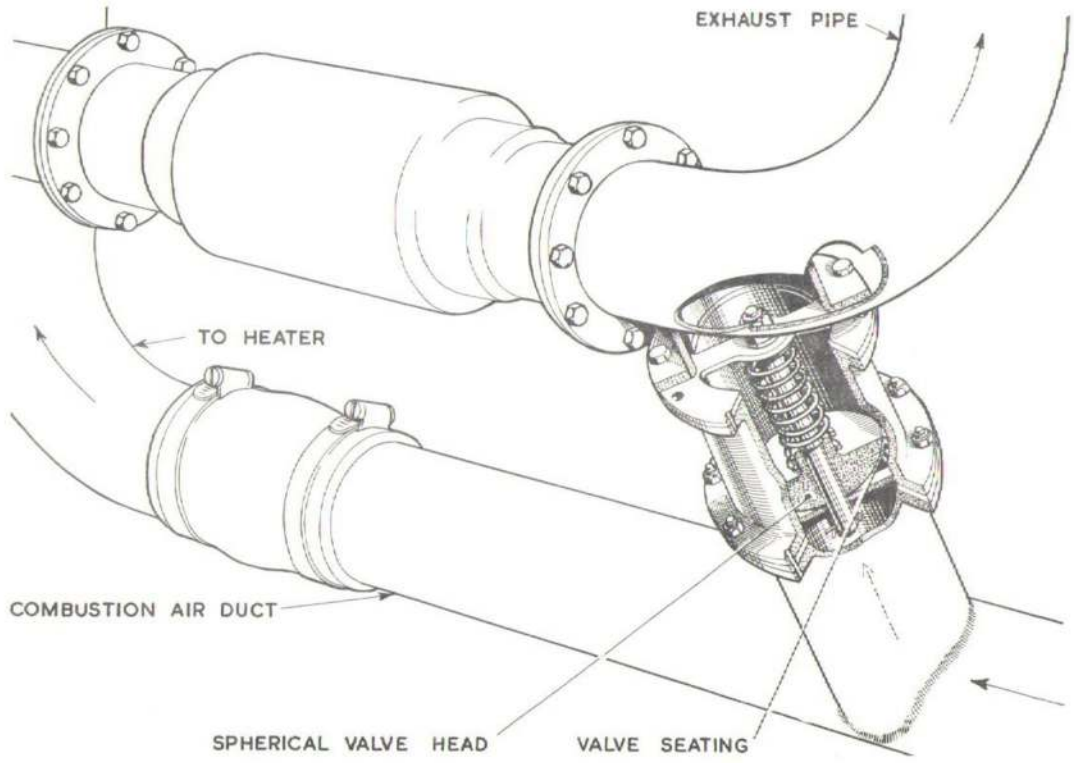

Fig.2. Combustion air relief valve

position of the ignition plug and the disposition of drain connections to suit their individual installations; No.1 heater, in addition, is provided with a heat deflector plate, fitted above it (Mod.469).

Thermal insulation

12. Certain portions of the ducting are of insulated construction where its temperature, when the associated heater is running, is likely to become high. Cool ducting is constructed of light-alloy only, but the insulated portions vary in their construction as follows:-

(1) Ventilating-air-exit duct from all heaters:- these consist of light alloy pressings welded together and lagged with ½ in. thick asbestos felt covered with adhesive tape, half lapped. The tape is painted over with four coats of black paint to Spec.B.B.A.4.

(2) Fibreglass ducting:- cured synthetic resin-impregnated fibreglass cloth, preformed prior to curing and covered with the same thermal installation as detailed in sub-para.(1).

(3) Light-alloy welded ducting covered as detailed in sub-para.(1).

(4) As (3) but with a covering of vynide which matches the sound proofing.

Controls

13. The fuel pump and main fuel valve are common to all three heaters. In addition, each heater has its own separate control panel. The ram-air-pressure switch prevents operation of all the heaters unless the I.A.S. of the aircraft is 104 knots or more.

Main switch

14. A switch on the flight engineer's main panel controls the fuel pump motor and the main fuel valve together. This switch must be ON before any of the heaters can be started.

Heater control panels and associated controls

15. The micro switch fitted to the ventilating air manual-control valve of each heater prevents the heater being started up unless this valve is fully open (Sect. 5, Chap.1). Each heater control panel, which is adjacent to its associated heater has, mounted on it, the following controls and equipment:-

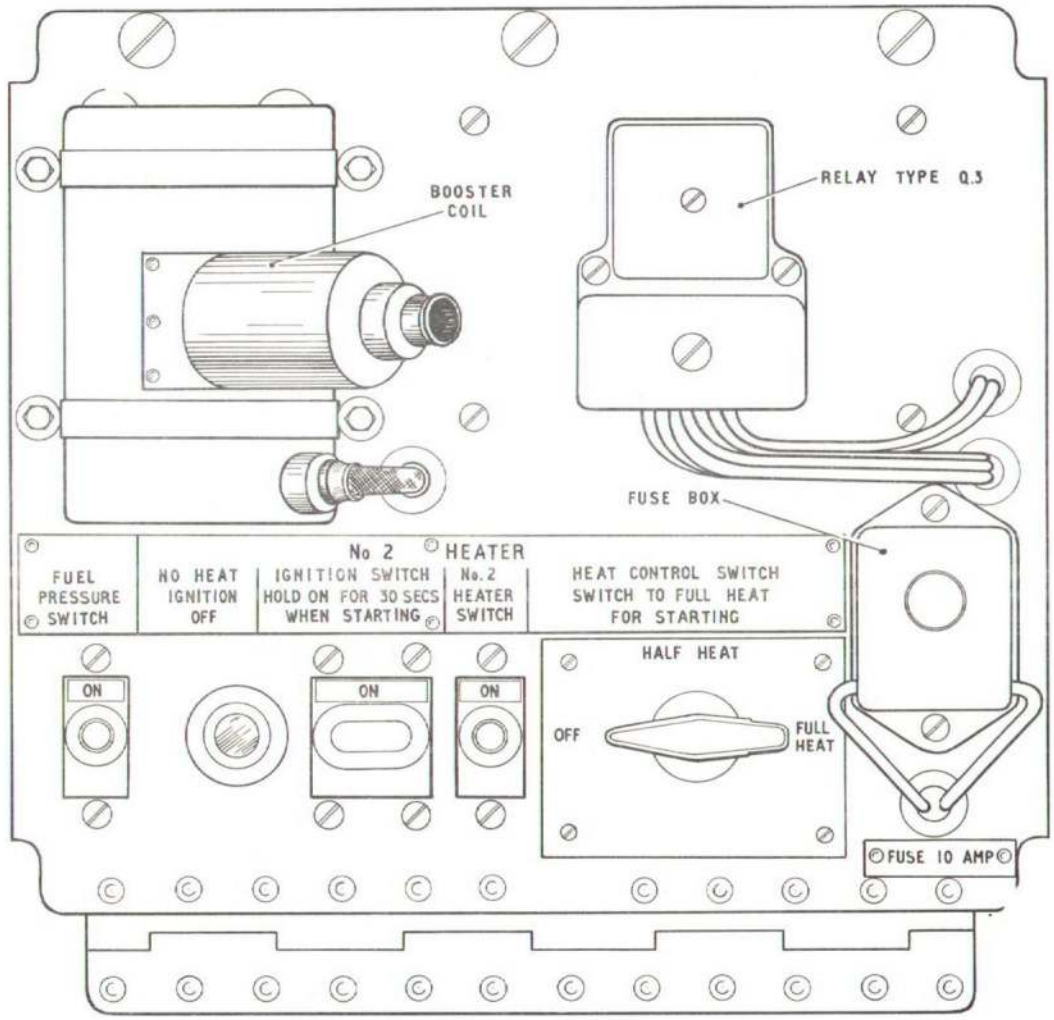

Fig.3. Typical heater control panel (No.2)

(1) Heater switch.

(2) Fuel-pressure switch override push-button switch.

(3) Heat control switch - FULL HEAT and HALF HEAT.

(4) Ignition switch.

(5) Ignition Off warning lamp.

(6) Booster coil, for H.T. supply to the ignition plug of the heater.

16. The sequence for operating these controls is described in Sect.5, Chap.1. The heaters must always be started up at FULL HEAT. When the heater is burning satisfactorily, after a period of several minutes, it can be switched to HALF HEAT, if required.

SERVICING

COMPONENTS

17. Servicing instructions for the complete system and all components, with the exception of the pump, combustion air regulator and the ventilating air control valve, are contained in A.P.4340, Vol.1.

FUEL PUMP

18. For servicing information on the pumps refer to A.P.4343B, Vol.1.

COMBUSTION AIR RELIEF VALVE

19. If it is suspected that this valve, Part No.1/Z7067 (Ref.No.26FP/3252) is sticking or is otherwise unserviceable, remove it from the associated duct by releasing the bolts from the attachment flanges. If the valve cannot be made serviceable after dismantling and cleaning, a serviceable valve should be fitted in its place. The spring compression rate is to be within 12 $\pm$ 2 oz per in. and the free length of the spring is 2·5 in.

VENTILATING AIR CONTROL VALVE

20. Periodical checks should be made for corrosion by releasing the clips, securing its associated length of ducting to the scoop ducting and to the heater and removing it for internal examination. The correct setting for the micro-switch on the outside of the assembly is that the contacts are closed only when the valve handle is set to the fully OPEN position.

DUCTING

21. Should damage, other than slight denting which would not materially alter the bore of the section of ducting affected, be found, the section must be renewed. Particular care should be taken during all servicing operations, whether relevant to the air conditioning system or not, to avoid damage to the ducting.

REMOVAL AND ASSEMBLY

REMOVAL NOTES

22. Ducting is either clipped or bolted together and each section, regarding the heater itself as a section, can be removed when released from its associated sections and from any brackets securing it to the airframe.

ASSEMBLY

23. Particulars of all operations necessary to remove components from the systems are to be borne in mind when re-assembling or renewing any component or part of the system.