Chapter 5 FIRE PROTECTION SYSTEM

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WARNING

Methyl bromide vapour is highly poisonous if inhaled, although the effects may not become apparent for some time. If methyl bromide liquid or vapour is allowed to remain in contact with the skin, severe and painful blisters may develop. Contaminated skin must, therefore, be washed thoroughly at the first opportunity.

DESCRIPTION

Introduction

1. The fire protection system is brought into operation by either of two methods as follows:-

(1) Manually by push-button control from the cabin.

(2) Automatically, by inertia switches which complete the circuit to operate the discharge head of the extinguisher bottle in the event of a crash landing.

The manual control in the cabin incorporates a fire warning lamp which is actuated by the flame detector switches in the engine bay. For details of the electrical circuit of the system, reference should be made to Sect.5, Chap.1, Group C.2 of this volume. A description of fire

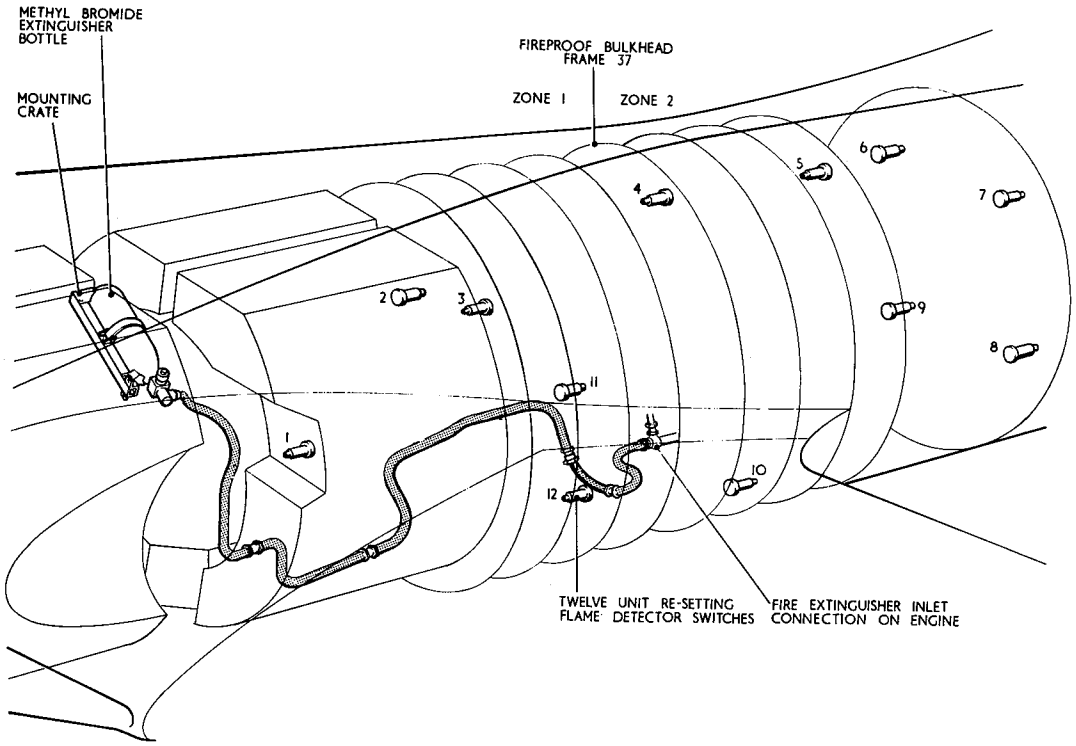

Fig. 1 Fire protection system

protection generally will be found in A.P.957C, Vol.1.

Extinguisher bottle

2. One methyl bromide fire extinguisher bottle is provided. It is mounted in a cradle on the aft face of the main spar member, on the starboard side of the aircraft. The bottle, which is secured in its cradle by a metal strap, has a single discharge head, the outlet being piped to the inlet connection of the engine spray units. The discharge head is fired electrically, either by means of the push-button control in the cabin or automatically on operation of the two inertia switches *(para.3)*.

Inertia switches

3. The two inertia switches, which operate in the event of a crash landing, are mounted one on the port upper forward face of frame 17B, and the other on the starboard side of the forward face of frame 19. These inertia switches are for the operation of the fire extinguishing system, and should not be confused with the additional inertia switches also mounted on frame 17B which are provided for the isolation of the electrical generators, also in the event of a crash landing.

Flame detector switches

4. Twelve unit resetting flame detector switches are arranged at vital points in

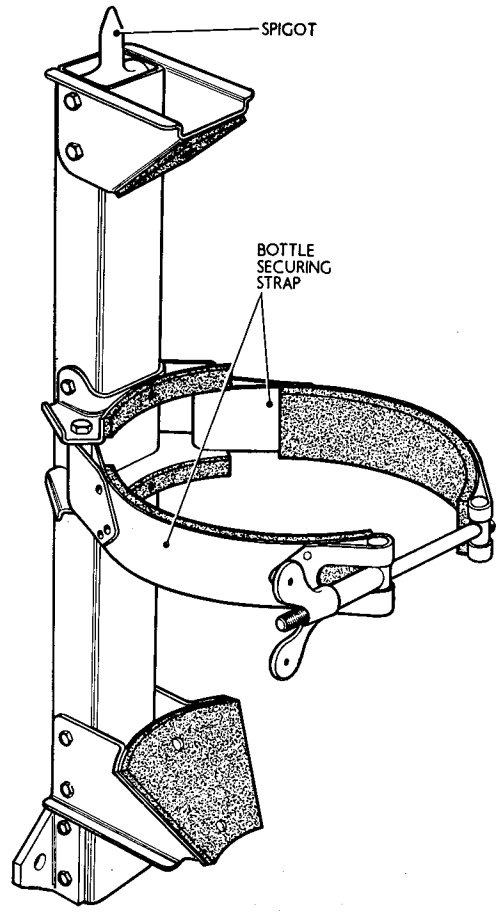

Fig.2 Extinguisher bottle cradle

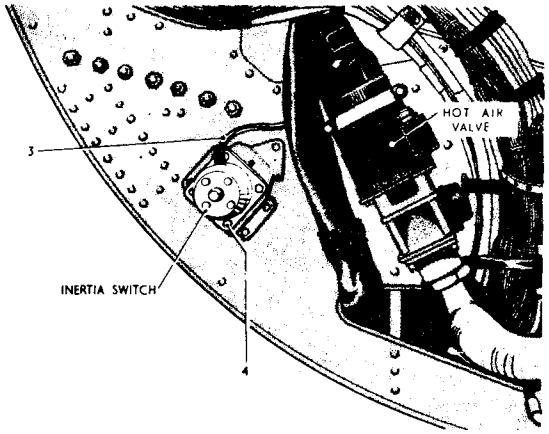

Fig.3 Typical inertia switch

the engine bay and in the region of the jet pipe joint. These switches operate when subjected to temperatures in excess of those for which they have been pre-set, thus completing the circuit to illuminate the fire warning lamp incorporated in the pilot's push-button control (para.6). *They do NOT operate the fire extinguishing system.* The location of the switches is shown in fig.1.

NOTE . . .

In certain circumstances during an engine ground run, when the engine may become temporarily overheated, the fire warning lamp may flicker on and off although there is no fire. In such circumstances, emergency action is not necessary unless the lamp remains steadily illuminated.

Spray units

5. For fire protection purposes, the engine bay is divided into two zones by a fireproof bulkhead (frame 37) which screens the fuel system components from the engine combustion chambers. A spray ring is in each zone, the forward ring encircling the engine compressor outlet casing and the rear ring encircling the turbine nozzle box. Both rings are in connection with each other and with the extinguisher bottle by piping as shown in fig.1. The spray rings are drilled to enable them to spray both fore and aft.

Fire extinguisher manual control

6. The manual control consists of a push-button switch which is mounted on the centre instrument panel in the cabin. The action of pressing the push-button energizes the detonating fuze in the discharge head of the extinguisher bottle which, being piped to the engine system, feeds extinguisher fluid to the spray rings. The manual control switch incorporates the ENGINE FIRE warning lamp which is actuated by the flame switches (para.4). The lamp is checked for serviceability by the use of a test switch which is located adjacent to the manual control.

SERVICING

General

7. Before attempting to service any part of the fire extinguisher system, the aircraft *must* be made electrically safe, and, since the battery master switch does NOT isolate the fire extinguishing circuit, the following procedure MUST be adopted prior to servicing or the removal of any component:-

(1) Place the battery master switch in the cabin to the OFF position and remove the Breeze plug from the operating head of the extinguisher bottle.

(2) Ensure that the ground service trolley battery is disconnected from the aircraft.

(3) Disconnect the Cannon plugs from their terminals on the aircraft batteries and place them in a position where they will not short against any part of the aircraft structure.

NOTE . . .

After servicing is completed, ensure that the Breeze plug is not live before reconnection to the operating head of the extinguisher bottle.

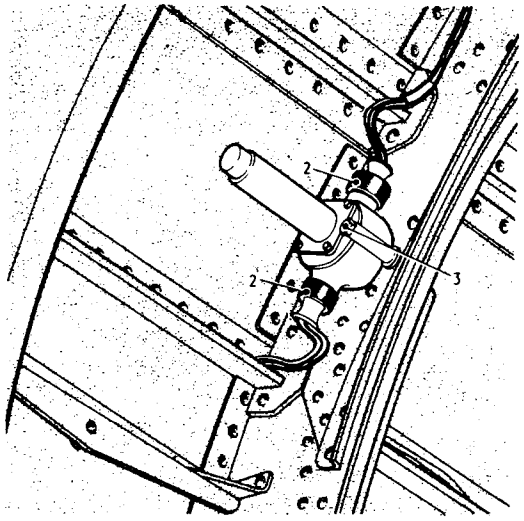

Fig.4 Typical flame detector switch assembly

Extinguisher bottle

8. The weight of the extinguisher bottle fully charged is stamped on the head. Should the bottle weigh less than that indicated on the head, it should be replaced by a fully-charged bottle. Checks for determining the serviceability of the discharge head and other electrical tests are given in Sect.5, Chap.1, Group C.2 of this volume.

MB and BCF fire extinguishant

8A. Bromochlorodifluoromethane (BCF) fire extinguishers are being issued for use with aircraft and are also being introduced into aircraft extinguisher systems by modification.

8B. BCF is an effective fire control agent. However, like most other fire suppressants, effective cleaning procedures must be implemented to any hardware which has been subject to the extinguishant and its by-products. To prevent corrosion when ground extinguishers are used the minimum quantity for effective control of the fire should be used.

8C. A.P.1464C, Vol.2, Pt.1, details the action for treating aero-engines after contamination by fire extinguishant methyl bromide (MB) but does not refer to BCF extinguishant. In due course this leaflet will be replaced by an A.P.100 series leaflet which will cover the use of BCF as well as MB extinguishant.

8D. Pending the issue of this A.P.100 series leaflet, the following procedure should be used as a guide to the action to be taken following the use of either BCF or MB fire extinguishers on an engine; this procedure supersedes the action detailed in A.P.1464C, Vol.2, Pt.1, Leaflet 14.

Recommended procedures following the use of MB or BCF

8E. *In-flight fires using aircraft-carried extinguishers* – Following a fire incident or an accidental discharge of the extinguisher system, the normal ventilation flow will disperse the extinguishant and its by-products and no further cleaning procedures are required.

8F. *Ground fires* –

(1) *Using aircraft-carried extinguishers* – Following a fire incident or an accidental discharge of the extinguisher system, the following action should be taken:–

(a) If the engine is operational carry out a ground run within 30 min. of the discharge.

(b) If the engine is not operational the access doors should be opened, access panels removed and the ECU area dried out thoroughly with a warm air blower. If a blower is not readily available, or in inclement weather conditions, where possible the aircraft should be removed to the hanger and the ECU dried accordingly.

(2) *Using ground services extinguisher* – In the event of ground fire extinguishing equipment being used it is expected that the minimum quantity of agent should be used to provide effective control of the incident. If the agent has been applied to the accessory bays etc. carry out cleaning procedures. If the agent has been applied to the intake or exhaust system and the engine is operational a ground run should be carried out within 30 min. of the incident. If the engine is not operational, the engine should be dried out by the application of a warm air blower via the intake or the nozzle, dependant on where the extinguishant has been applied.

8G. *Engine rejection* –

(1) If as a result of a fire incident the engine is to be rejected for mechanical reasons, if the engine can be motored over copious injection of PX-24 is recommended before despatch to the overhaul base.

(2) If for any reason excessive quantities of MB or BCF have been used to control the fire incident, although this will almost certainly involve engine rejection for the cause of the incident, the engine should be rejected for cleaning purposes irrespective of service condition.

(3) When returning an engine which has been subject to MB or BCF, silica-gel should be placed in the container and the exterior marked that the engine has been subject to fire extinguishing agent.

8H. *Ground running* – When a ground run is to be carried out to dry out the engine installation, the running time will be dependant on the size of the unit and whether the extinguishant has been applied internally or externally. As a general guide, a minimum of 5 min. for an internal and 15 min. for an external application should be used.

8J. *Heater application* – If a heater is to be used to dry out the engine internally, application time will vary with the size of the engine; a minimum of 4 hours is recommended.

8K. *Water* – Under no circumstances is water to be used.

8L. *Lubrication* – MB and BCF are effective degreasing agents and oil and grease films should be restored. Lubricate all controls and components in accordance with the relevant chapters.

Inertia switches

9. Apart from the resetting of the inertia switches as described in Sect.5, Chap.1, Group C.2 of this volume, no servicing of the inertia switches is possible.

Flame detector switches

10. Apart from the routine checks for continuity and insulation which are described in A.P.113 – series, and a functioning check which is described in Sect.5, Chap.1, Group C.2 of this volume, no servicing of the flame detector switches is possible.

Spray rings and pipe-lines

11. Examine the pipe-lines and spray rings for security of attachment and ensure that no chafing of pipes has occurred. Ensure that the holes in the spray rings are clear and unobstructed.

REMOVAL AND ASSEMBLY

General

12. Before attempting to remove any of the components of the fire protection system, ensure that the aircraft is made electrically safe in accordance with the instructions given in para.7. Once access has been obtained, the removal of the majority of the components of the system is obvious.

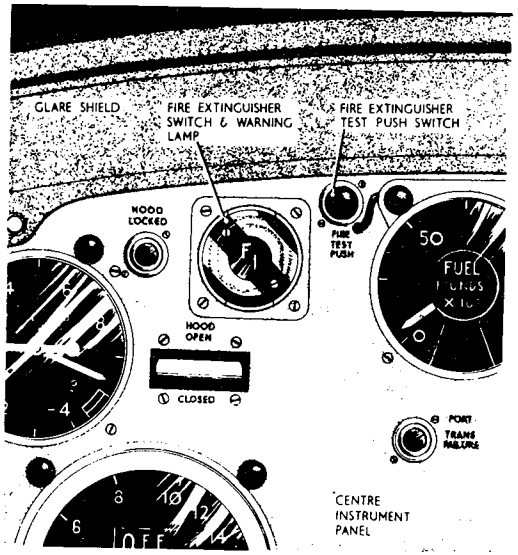

Fig.5 Fire extinguisher manual control

Extinguisher bottle

13. To remove the extinguisher bottle, proceed as follows:-

(1) Render the aircraft electrically safe (para.7).

(2) Gain access to the engine starter bay (Sect.2, Chap 4, fig.2), remove the Breeze plug from the operating head of the bottle and disconnect the supply pipe from the union on the bottle.

(3) Remove the two nuts securing the bottom of the cradle and tilt the cradle to draw it off the studs in the aircraft structure. Pull the cradle downwards until the spigot at the top of the cradle is free from its attachment bracket on the structure and remove the cradle complete with bottle.

(4) Release the locking wire securing the wing nut on the strap securing the bottle to the cradle and unscrew the wing nut. Open out the two halves of the strap and remove the bottle.

NOTE . . .

Prior to reconnection of the Breeze plug to the operating head of the extinguisher bottle during re-assembly, ensure that the plug is not live.

Flame detector switches

14. The removal of the flame detector switches presents no unusual difficulties when once access has been obtained. Removal is effected as follows:-

(1) Render the aircraft electrically safe (para.7).

(2) Gain access to the switch concerned and remove the electrical connections at the switch.

(3) Remove the securing nuts and bolts and remove the switch.

Inertia switches

15. To remove the inertia switches proceed as follows:-

(1) Render the aircraft electrically safe (para.7).

(2) Gain access to the switch concerned via the radio bay access doors.

(3) Disconnect the electrical connections at the switch, insulate the bare ends of the leads and stow.

(4) Remove the nuts and bolts securing the switch to the structure and remove the switch.

Assembly

16. The assembly of the components of the fire protection service is, in general, a reversal of the removal procedure. When the assembly is completed, ensure that all nuts are securely locked, and that the wing nut securing the metal strap holding the extinguisher bottle in its cradle is locked to the strap with 22 s.w.g. stainless steel locking wire to Specification D.T.D. 189 or 161. For details of the electrical tests and the re-setting of the inertia switches prior to reconnection, refer to Sect.5, Chap.1, Group C.2 of this Air Publication.

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