

Chapter 5 FIRE PROTECTION SYSTEM

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WARNING

Methyl bromide gives off an odourless non-irritant vapour which is highly poisonous. The effects may not be apparent at once and may be fatal if large amounts are inhaled before signs develop.

DESCRIPTION

Introduction (fig.2)

1. The fire protection system is operated in two ways as follows:-

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

- (2) Automatically, by inertia switches. In each case Methyl bromide is sprayed directly into the two fire zones as described in para.5.

The manual push-button control in the cockpit incorporates a warning lamp which is actuated by the flame detector switches in the engine bay. A full description of the electrical circuit is given in Book 2, Sect.5, Chap.1, Group C.2, and general information on aircraft fire protection is given in A.P.107E - series. ▶

Extinguisher bottle

2. The methyl bromide fire extinguisher bottle is mounted in a cradle (fig.1) on the rear 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 two inertia switches.

Inertia switches (fig.3)

3. The inertia switches, which operate in the event of a crash landing, are mounted one underneath the battery platform in the radio bay, and the other on frame 12 below the cabin floor. Details of the inertia switches are given in A.P.4343C, Vol.1, Book 2, Sect.3, Chap.33.

Unit re-setting flame detector switches (fig.4)

4. Twelve unit re-setting flame detector switches are arranged at vital points in

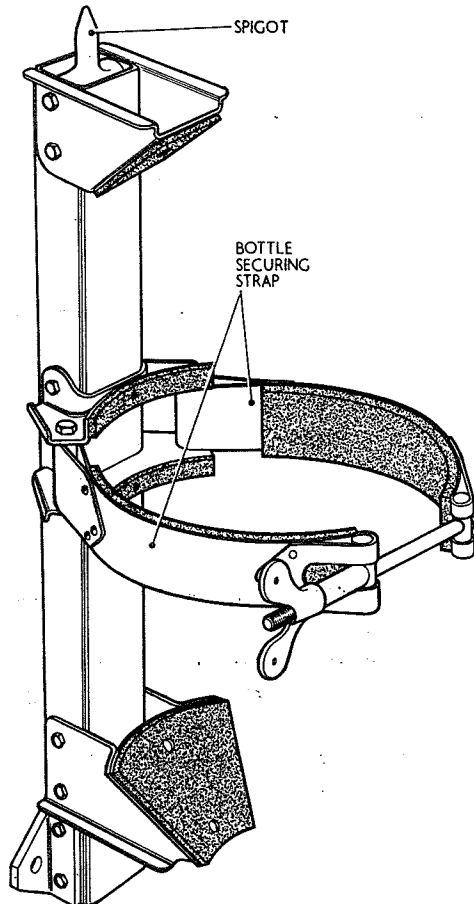


Fig.1 Extinguisher bottle cradle

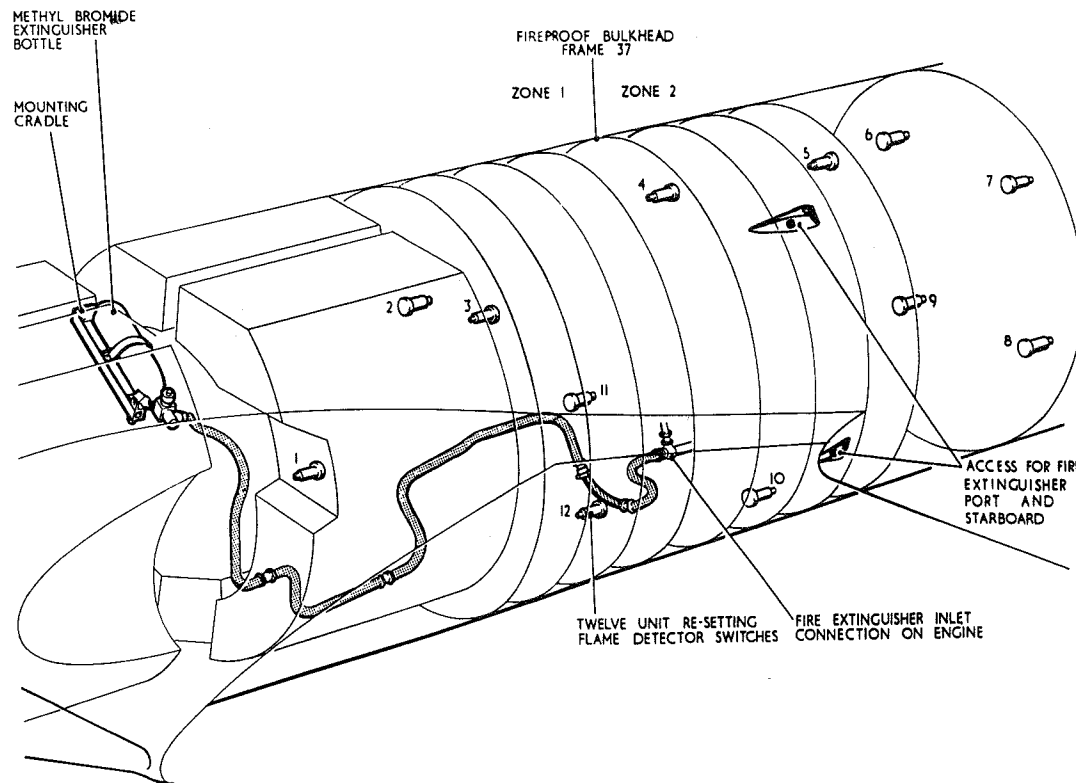


Fig.2 Fire protection system

the engine bay, and in the region of the jet pipe joint. These switches operate when subjected to temperatures in excess of that for which they are preset. The switches operate the warning lamp contained in the pilot's push-button control (para.6), but they do not operate the extinguishing system.

Note . . .

In certain circumstances during an engine ground run, when the engine bay may become temporarily overheated, the

warning lamp may flicker on and off although there is no fire. In such circumstances, emergency action is not necessary unless the warning lamp remains steadily illuminated. The positions of the flame switches are shown in fig.2.

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

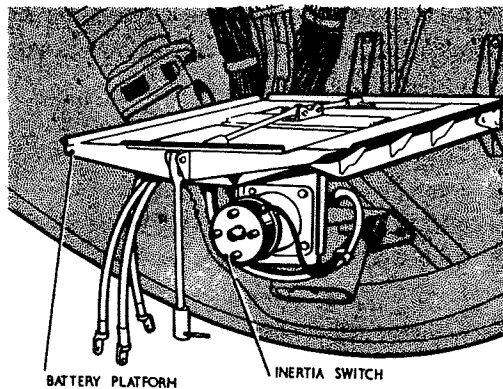


Fig.3 Typical inertia switch

combustion chambers. A spray ring is fitted in each zone, the forward ring encircling the compressor outlet casing and the rear ring encircling the turbine nozzle box. The two rings are interconnected by a pipe on the port side of the engine. They 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 mounted on the starboard arch panel in the cabin. The action of pressing the push-button energizes the fuse 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 an ENGINE FIRE warning lamp, which is actuated by the flame switches (*para.4*).

Fire warning lamp test switch

7. A test button is fitted adjacent to the combined fire warning lamp and switch. In order to test the filament of the warning lamp before each flight, switch ON the battery master switch and press the test button.

WARNING

Do not press the extinguisher control button as this will fire the extinguisher.

SERVICING

Note . . .

The fuse actuating the discharge head of the fire extinguisher bottle is very sensitive, and as the battery isolating switch in the cabin does not isolate the fire extinguisher circuit, the system must be rendered electrically safe, prior to servicing, by removal of the appropriate fuse (Sect.5, Chap.1). If the bottle has been discharged, do NOT inhale the gas.

General

8. No servicing of the flame switches is possible, 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. The servicing of the electrical circuit generally is also described in this Group.

Extinguisher bottle

9. Apart from weighing and examining the extinguisher bottle to determine whether it has been discharged, no servicing is possible. The weight of the bottle when it is fully charged is stamped on the head. Should the bottle weigh less than this figure, it must be replaced by a fully charged bottle. Checks for determining the serviceability of the fuse in the discharge head and other electrical checks of the system are described in Sect.5, Chap.1, Group C.2 of this volume.

MB and BCF fire extinguishant

9A. Bromochlorodifluoromethane (BCF) fire extinguishers are being issued for use with aircraft and are also being introduced into aircraft extinguisher systems by modification.

9B. 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.

9C. 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.

9D. 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

9E. 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.

9F. 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.

9G. 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.

9H. 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.

9J. 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.

9K. Water — Under no circumstances is water to be used.

9L. 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

10. Apart from the re-setting of the inertia switches, which is described in Sect.5, Chap.1, Group C.2 of this volume, no servicing of the inertia switches is possible.

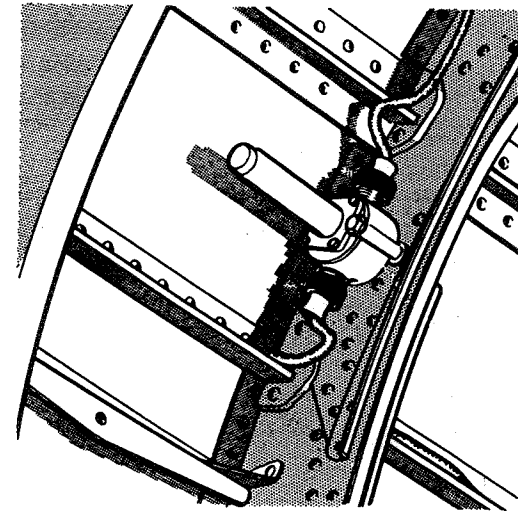


Fig.4 Typical flame detector switch assembly

REMOVAL AND ASSEMBLY

General

11. Before attempting to remove any of the components of the fire protection system, the aircraft should be made electrically safe as described in Book 2, Sect.5, Chap.1, Group A.1. Once access has been obtained, the removal of the majority of the components of the system is obvious.

Extinguisher bottle (fig.1)

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

- (1) Render the aircraft electrically safe (Sect.5, Chap.1, Group A.1).
- (2) Gain access to the engine starter bay (Sect.2, Chap.4, fig.1), remove the breeze plug from the operating head of the bottle and disconnect the spray pipe from the union on the head.
- (3) Remove two nuts securing the bottom of the cradle holding the bottle and tilt the cradle to draw it off the stud 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.

- (4) Remove the cradle complete with bottle.
- (5) 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 hinged strap and remove the bottle.

Flame detector switches (fig.4)

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

- (1) Render the aircraft electrically safe (Sect.5, Chap.1, Group A.1).
- (2) Gain access to the flame detector switch concerned and remove the electrical connections at the switch.
- (3) Remove the securing nuts and bolts and remove the switch.

Inertia switches (fig.3)

14. The inertia switches are mounted one underneath the battery platform in the radio bay, and one on frame 12 below the cabin floor. To remove the inertia switches, proceed as follows:-

- (1) Render the aircraft electrically safe (Sect.5, Chap.1, Group A.1).
- (2) Gain access to the appropriate switch.
- (3) Disconnect the electrical connections at the switch, insulate the bare ends of the leads and stow.
- (4) Remove the bolts securing the switch to the structure and remove the switch.

The procedure for re-setting the switches after operation is given in Sect.5, Chap.1, Group C.2 of this volume.

Note . . .

Assembly of the extinguisher bottle, inertia switches and flame detector switches is, in general, a reversal of the removal procedure. For electrical tests prior to re-connection, reference should be made to Sect.5, Chap.1, of this volume.

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WARNING

Methyl bromide gives off an odourless non-irritant vapour which is highly poisonous. The effects may not be apparent at once and may be fatal if large amounts are inhaled before signs develop.

DESCRIPTION AND OPERATION

Introduction (fig.2)

1. The fire protection system is operated in two ways as follows:-

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

(2) Automatically, by inertia switches. In each case Methyl bromide is sprayed directly into the two fire zones as described in para.5.

The manual push-button control in the cockpit incorporates a warning lamp which is actuated by the flame detector switches in the engine bay. A full description of the electrical circuit is given in Book 2, Sect.5, Chap.1, Group C.2, and general information on aircraft fire protection is given in A.P.957C, Vol.1.

Extinguisher bottle

2. The methyl bromide fire extinguisher bottle is mounted in a cradle (*fig.1*) on the rear 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 two inertia switches.

Inertia switches (fig.3)

3. The inertia switches, which operate in the event of a crash landing, are mounted one underneath the battery platform in the radio bay, and the other on frame 12 below the cabin floor. Details of the inertia switches are given in A.P.4343C, Vol.1, Book 2, Sect.3, Chap.33.

Unit re-setting flame detector switches (fig.4)

4. Twelve unit re-setting flame detector switches are arranged at vital points in

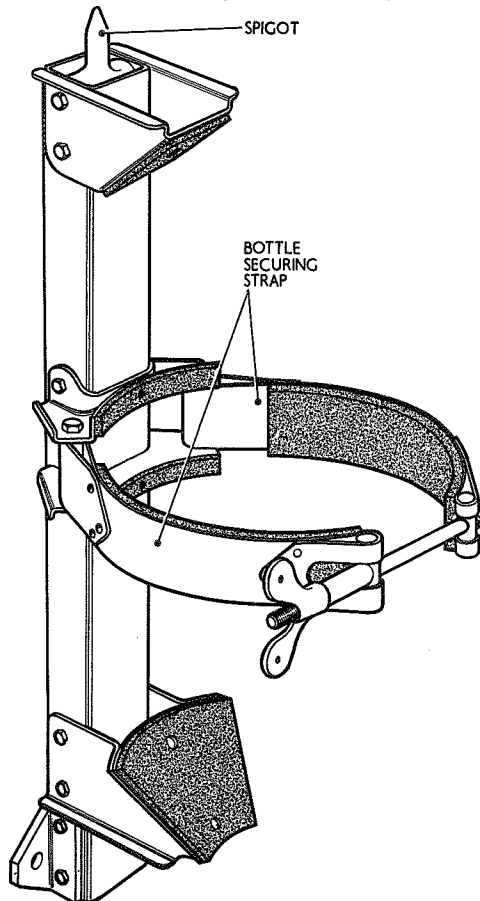


Fig.1 Extinguisher bottle cradle

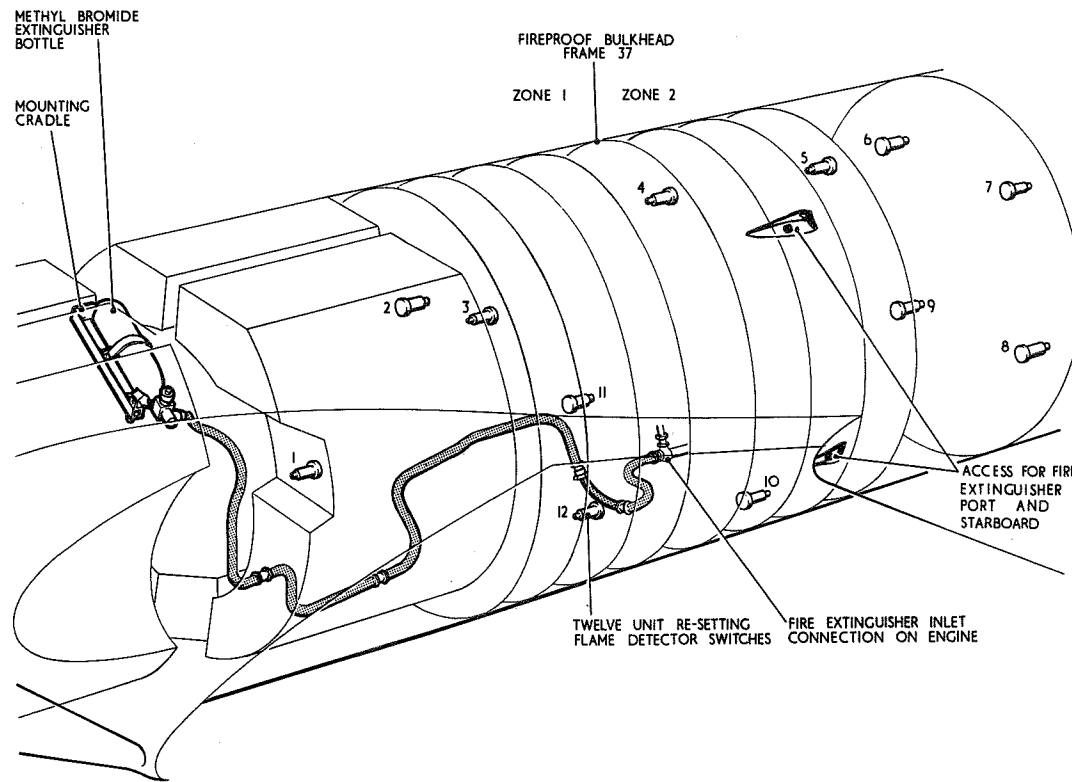


Fig.2 Fire protection system

the engine bay, and in the region of the jet pipe joint. These switches operate when subjected to temperatures in excess of that for which they are preset. The switches operate the warning lamp contained in the pilot's push-button control (para.6), but they do not operate the extinguishing system.

Note . . .

In certain circumstances during an engine ground run, when the engine bay may become temporarily overheated, the

warning lamp may flicker on and off although there is no fire. In such circumstances, emergency action is not necessary unless the warning lamp remains steadily illuminated. The positions of the flame switches are shown in fig.2.

Spray units

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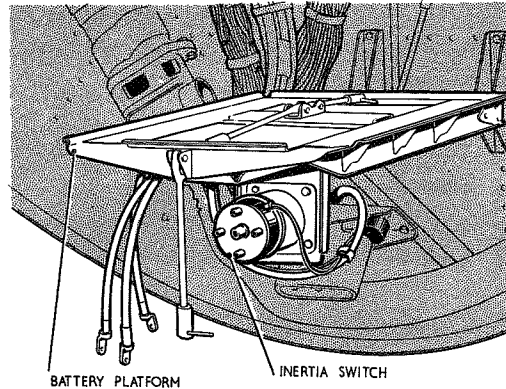


Fig.3 Typical inertia switch

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Fire extinguisher manual control

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ENGINE FIRE warning lamp, which is actuated by the flame switches (para.4).

Fire warning lamp test switch

7. A test button is fitted adjacent to the combined fire warning lamp and switch. In order to test the filament of the warning lamp before each flight, switch ON the battery master switch and press the test button.

WARNING

Do not press the extinguisher control button as this will fire the extinguisher.

SERVICING

Note . . .

The fuse actuating the discharge head of the fire extinguisher bottle is very sensitive, and as the battery isolating switch in the cabin does not isolate the fire extinguisher circuit, the system must be rendered electrically safe, prior to servicing, by removal of the appropriate fuse (Sect.5, Chap.1). If the bottle has been discharged, do NOT inhale the gas.

General

8. No servicing of the flame switches is possible, apart from the routine checks for continuity and insulation, which are described in A.P.4343 series, and a functioning check, which is described in Sect.5, Chap.1, Group C.2 of this volume. The servicing of the electrical circuit generally is also described in this Group.

Extinguisher bottle

9. Apart from weighing and examining the extinguisher bottle to determine whether it has been discharged, no servicing is possible. The weight of the bottle when it is fully charged is stamped on the head. Should the bottle weigh less than this figure, it must be replaced by a fully charged bottle. Checks for determining the serviceability of the fuse in the discharge head and other electrical checks of the system are described in Sect.5, Chap.1, Group C.2 of this volume.

Inertia switches

10. Apart from the re-setting of the inertia switches, which is described in Sect.5, Chap.1, Group C.2 of this volume, no servicing of the inertia switches is possible.

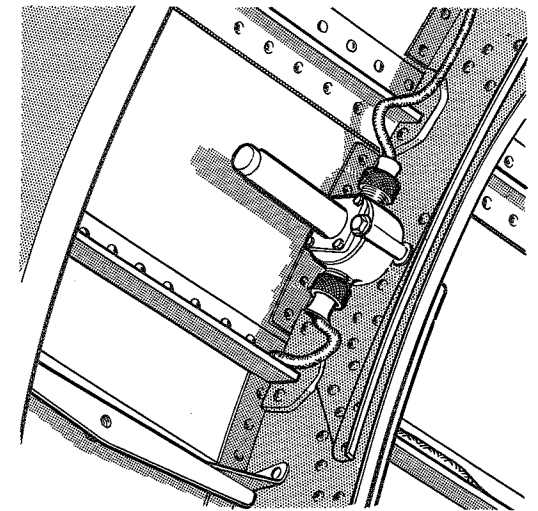


Fig.4 Typical flame detector switch assembly

REMOVAL AND ASSEMBLY

General

11. Before attempting to remove any of the components of the fire protection system, the aircraft should be made electrically safe as described in Book 2, Sect.5, Chap.1, Group A.1. Once access has been obtained, the removal of the majority of the components of the system is obvious.

Extinguisher bottle (fig.1)

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

- (1) Render the aircraft electrically safe (Sect.5, Chap.1, Group A.1).
- (2) Gain access to the engine starter bay (Sect.2, Chap.4, fig.1), remove the breeze plug from the operating head of the bottle and disconnect the spray pipe from the union on the head.
- (3) Remove two nuts securing the bottom of the cradle holding the bottle and tilt the cradle to draw it off the stud 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.

- (4) Remove the cradle complete with bottle.
- (5) 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 hinged strap and remove the bottle.

Flame detector switches (fig.4)

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

- (1) Render the aircraft electrically safe (Sect.5, Chap.1, Group A.1).
- (2) Gain access to the flame detector switch concerned and remove the electrical connections at the switch.
- (3) Remove the securing nuts and bolts and remove the switch.

Inertia switches (fig.3)

14. The inertia switches are mounted one underneath the battery platform in the radio bay, and one on frame 12 below the cabin floor. To remove the inertia switches, proceed as follows:-

- (1) Render the aircraft electrically safe (Sect.5, Chap.1, Group A.1).
- (2) Gain access to the appropriate switch.
- (3) Disconnect the electrical connections at the switch, insulate the bare ends of the leads and stow.
- (4) Remove the bolts securing the switch to the structure and remove the switch.

The procedure for re-setting the switches after operation is given in Sect.5, Chap.1, Group C.2 of this volume.

Note . . .

Assembly of the extinguisher bottle, inertia switches and flame detector switches is, in general, a reversal of the removal procedure. For electrical tests prior to re-connection, reference should be made to Sect.5, Chap.1, of this volume.

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LIGHTNING MK. 1
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