

## Chapter 5 FIRE PROTECTION SYSTEM

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## DESCRIPTION

**General information**

1. The fuselage surrounding the engines and jet pipes is divided into fire zones which contain sensing elements associated with electrical fire warning circuits. An extinguisher system, giving protection only to engine-bay fire zones, is normally controllable by cockpit switches but operates automatically in a crash landing.

**Fire zones (fig.1)**

2. Each engine bay is divided into two fire zones, No.1 and No.2 separated

from each other by a firewall between the engine compressor section and the turbine and exhaust section. The aft frame of both zones 2, and the floor of No.2 engine bay, constitute firewalls separating both zones 2 from a common zone 3; this latter zone comprises the space between the jet pipes and the fuselage sides. Each fire zone has a separate ventilation system.

◀ **Fire extinguisher equipment**

3. Two Type 57A extinguishers, Ref.No. 27N/264, charged with methyl bromide, ▶ are mounted in compartments on each side of the fuselage, immediately aft of No.1

engine bay (fig.2). The extinguishers are secured to the structure by metal straps, and their dual operating heads are secured to supporting saddle brackets by retaining cables. The two operating heads of the port extinguisher serve both zones 2, and the starboard extinguisher similarly serves both zones 1. The extinguishant delivery pipe to each fire zone branches, and terminates in two spray nozzles which discharge gas in a 90-deg spray cone. Provision is made for venting the extinguishant overboard in case of excessive pressure in the extinguisher, due to rises in temperature above the safe limit. Two Type

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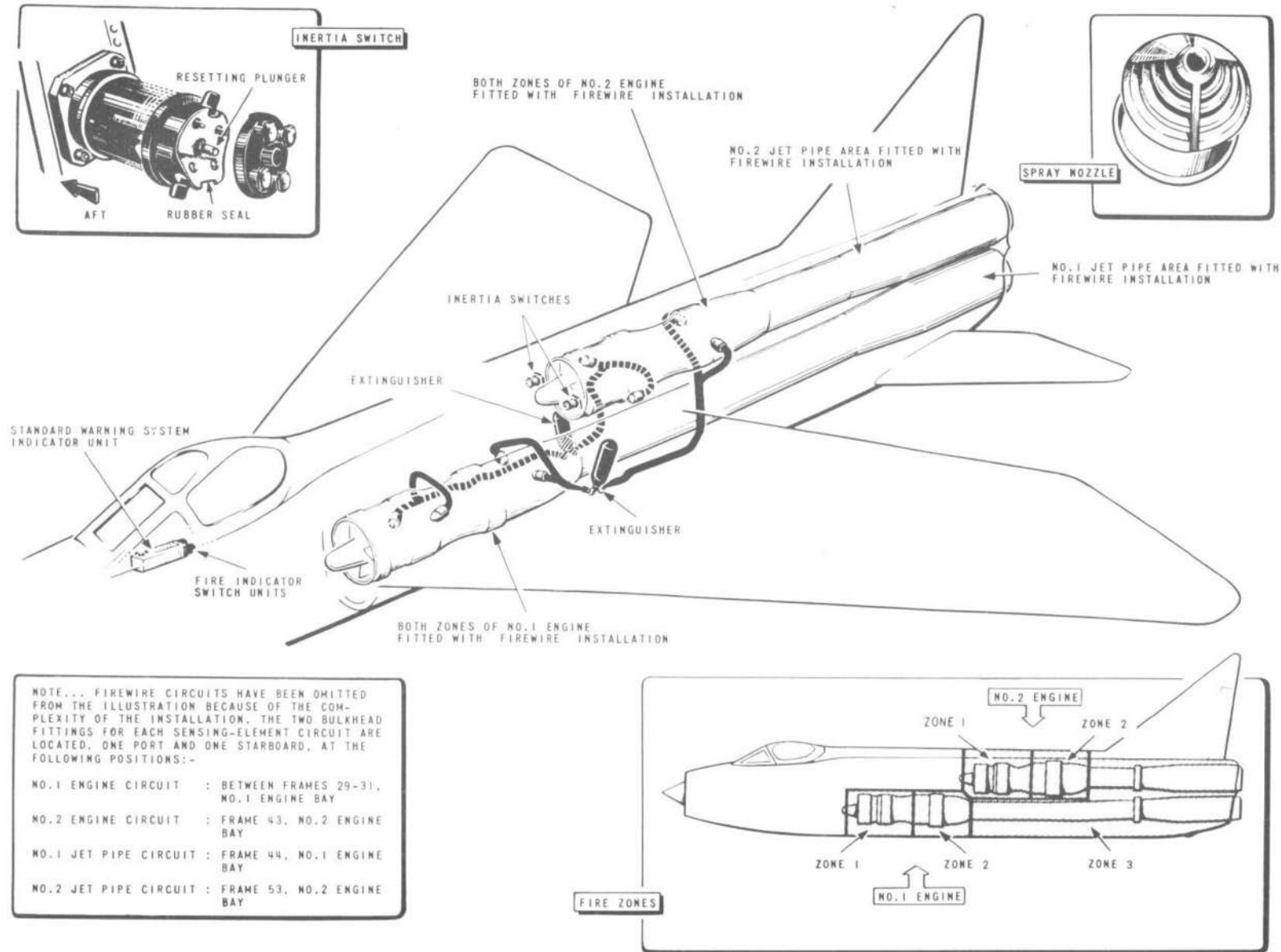


FIG.1. FIRE PROTECTION SYSTEM

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ZE20036 fusible indicators, visible through windows in access panel 61P, show a reddish-brown discoloration if the extinguishers are discharged electrically. A nylon indicator disc is dislodged if its associated extinguisher has vented its contents overboard.

#### Pressure relief

4. From each extinguisher a pressure-discharge relief pipe terminates between frame 45 and 46, port and starboard, in a cone-shaped end-piece. A press-fit plug is fitted in the end of the pipe and a nylon indicator disc in the outer periphery of the end-piece. In the event of pressure in the extinguisher becoming excessive, the extinguishant will be vented overboard via the pressure-discharge pipe, and the plug and disc will be dislodged. As it is possible for the plug and disc to be dislodged during normal discharge by firing, they must be inspected after an extinguisher has been discharged electrically. If the plug and disc have been dislodged, new parts must be fitted (Graviner Part No. A515).

#### Fire detection system

5. The medium-temperature-range Fire-wire sensing elements of the fire detection system consist of lengths of flexible stainless steel capillary which contains a central electrode separated from the inner walls of the capillary by a temperature-sensitive filling material. The filling material is semi-conductive when cold, but conducts readily when heated. The sensing elements

are connected, through bulkhead fittings and electrical cable assemblies, to relay units; these cause cockpit warning lamps to become illuminated whenever the temperature at any point along the length of a sensing element rises sufficiently to cause a critical-value current to flow between the capillary and the central electrode. The detector system is self-resetting when the sensing-element temperature returns to normal.

6. The sensing elements are coupled in five- and ten-foot lengths to form four separate circuits. There is one circuit in each engine bay, serving zones 1 and 2, and two circuits - one to each jet pipe - in zone 3. At the aft end of the rear fuselage the zone 3 circuits are extended by cable assemblies to the re-heat jet pipes, where sensing elements are fitted around the nozzles. The two ends of each sensing element circuit are interconnected electrically at the relay units, this arrangement ensuring that the detection system will remain operative should the sensing elements be severed.

#### Switches and warning indicators

7. Warning of fire in any zone is given by the standard warning system (Sect.6, Chap.12). Indicators FIRE 1 and FIRE 2, as appropriate, are illuminated if a fire occurs in No.1 or No.2 engine bay, and indicators RHT 1 or RHT 2 are illuminated if a fire or excessive temperature occurs in zone 3. Appearance of an engine-bay fire warning is accompanied by illumination of the in-

tegral lamp in one of the F1 and F2 indicator switch units mounted on the aft end of the warning system indicator unit. When either switch is operated the contents of both extinguishers are discharged into zones 1 and 2 of the appropriate engine bay.

8. Two Mk.2 Type 10C, inertia switches, Ref.No.27N/94, are mounted, one port and one starboard, on the forward face of frame 43 above the horizontal fire-wall. The switches, which are accessible when the No.2 engine hatch is removed, operate to discharge both extinguishers into both zones of each engine bay when subjected to a deceleration of 4½g.

#### Fire zone ventilation

9. Zones 1 and 2 of each engine bay are primarily ventilated by air which enters through port and starboard intakes at the forward end of each zone, and leaves through discharge vents at the aft end. Flow through the discharge vents is induced by hot air from the engines. Ram air from an intake in the fin ventilates zones 3 after being utilized for cooling the a.c. and d.c. generators, and oil in the accessory drive unit gearbox; this air is supplemented by air from an intake in the spine which exhausts into zone 3 through the firewall after cooling equipment in the spine. Additional auxiliary vents in zone 1 and 2 will assist the ventilation of both engine bays.

#### Fire break-in panels

10. Seven red-painted fire break-in

◀ panels (access panels 50A,B,C,D,E,F, and G) are fitted in the skin along the starboard side of the fuselage. Panels A and B give access zones 1 and 2 of No.1 engine bay, C and D give access to zones 1 and 2 of No.2 engine bay and E,F and G give access to zone 3.

**SERVICING**

**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.

**Extinguishers**

11. Apart from checking the electrical continuity of the cartridge unit fuzes in the operating heads (Sect. 6, Chap. 12), the only extinguisher servicing necessary is checking for leakage by weighing, and examining for corrosion, dents, and scoring. Replacement extinguishers must always be check-weighed prior to installation; for the weight of a fully-charged extinguisher with cartridge units fitted, refer to A.P. 107E-0400-1A.

**Firewire sensing elements**

12. Care must be taken to prevent ingress of moisture during assembly or reassembly of a Firewire element; this can occur if connections are not properly fitted and may result in a resistance low enough to operate the relay circuit. The transportation sealing caps, supplied with new parts, should not be removed

until it is necessary to install the particular part concerned. Each time a connection is made new copper 'S' washers must be fitted, and the gland nuts tightened to a torque loading between 80 and 100 lb in. The bend radius of the element must not be less than 1 in., and the element must be securely clipped, at intervals not exceeding 9 in., using the clips Ref.No.5CZ/5282 supplied.

**Inertia switches**

13. It is possible to observe the inside of the inertia switches through their transparent cases; should observation reveal damage or the presence of moisture a new switch must be fitted. To reset a switch, provided no damage has occurred or is suspected: -

- (1) Slacken the four finger-nuts secu-

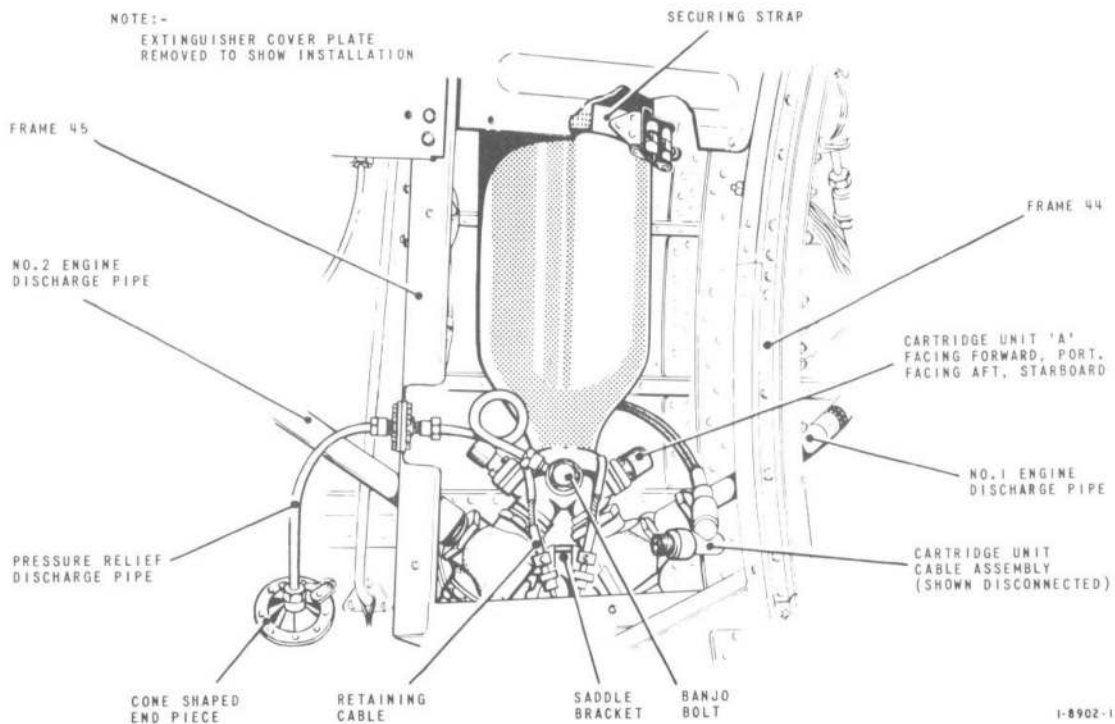


Fig.2. Extinguisher installation (port)

ring the terminal block cover, and remove the cover and the rubber seal.

(2) Depress the resetting plunger until the contact bow springs back into the unoperated position.

(3) Refit the rubber seal and terminal block cover, and tighten the nuts.

### REMOVAL AND ASSEMBLY

#### ◀ Extinguishers (fig.2)

##### Removal

14. To remove either extinguisher: ▶

(1) Remove the ventral tank (Sect.4, Chap.2).

(2) Remove No.1 engine hatch (Sect.3, Chap.1).

(3) Remove the twenty-six 2 B.A. bolts and eight 4 B.A. nuts securing the access panel on the forward face of frame 44, noting the positions of the Firewire clips.

(4) Remove the seven 2 B.A. bolts securing the extinguisher cover plate, and remove the plate.

(5) Disconnect the electrical sockets from the plugs on the cartridge firing units.

(6) Remove the locking wire and, using spanner Ref.No. 26DK/95249, unscrew the unions securing the pipes to the operating heads.

◀ (7) Remove the locking wire and disconnect the pressure-relief discharge pipe.

##### Note...

*In no circumstances may the banjo bolt be removed from the extinguisher. ▶*

(8) Disconnect the quick-release clamp on the forward pipe and remove the pipe extension.

(9) Slacken the 2 B.A. captive nuts which tension the operating-head retaining cable, until both ends of the cable are released.

(10) Supporting the extinguisher, remove the securing-strap safety-pin, release the strap, and withdraw the ex-

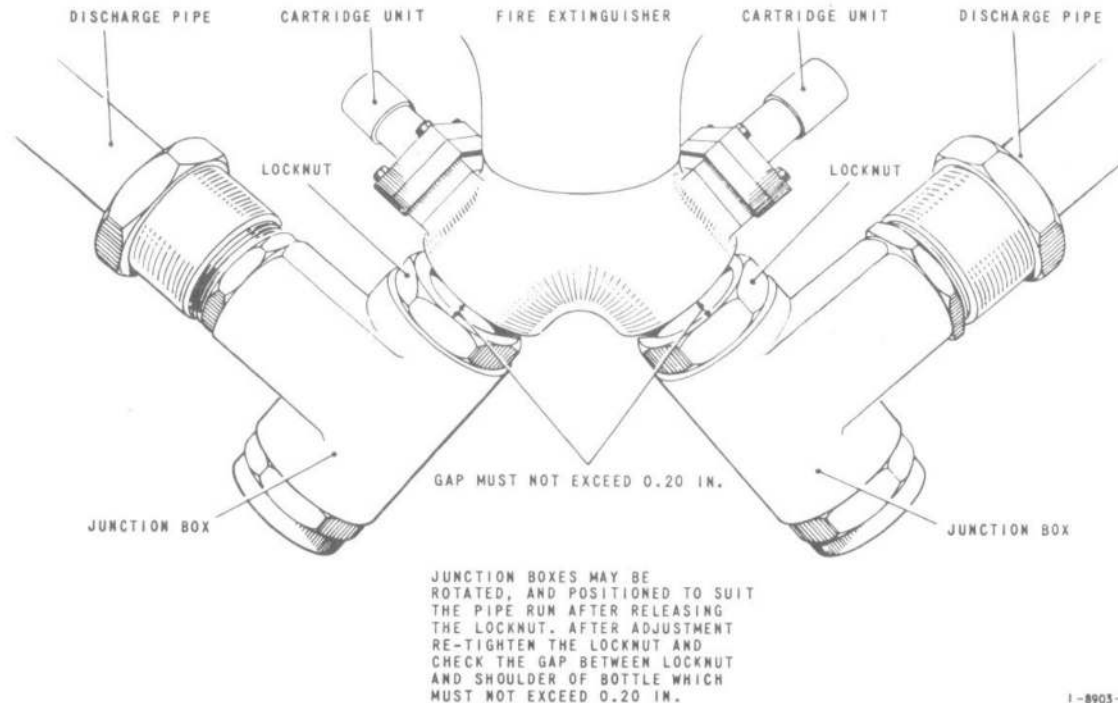


Fig.3. Adjustment of junction boxes

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tinguisher through the aperture in frame 44.

◀ Assembly (fig.3)

15. Assembly of either extinguisher is the reverse of operations (3) to (10) of the removal procedure with special attention to the following points during assembly:-

(1) Ensure that the banjo bolt on the

firing head of each extinguisher faces inboard.

(2) Ensure that the 3-pin cartridge unit marked A is facing aft.

(3) Check that a minimum gap of 0.10 in. exists between the saddle bracket and the rectangular portion of each cable end-fitting.

Note...

*Do not over-tighten the cable otherwise distortion or fracture of the saddle bracket will occur.*

(4) Tighten the banjo bolt to a torque loading of 20 lb.ft.

(5) When refitting the access panel, check that the Firewire clips are secured at the correct positions.



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