PART 2

CHAPTER 8 — FIRE PROTECTION SYSTEMS

List of Contents

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POWER PLANT FIRE PROTECTION SYSTEM

General

1. A separate fire warning and extinguisher system of the fault-free fire-detection (FFFD) type protects each power plant. Each extinguisher system is manually operated from the flight deck.

2. *Paragraph Not Used.*

3. Warning of power plant fire is given by the associated power plant fire warning light coming on. A fire warning bell behind the instrument panel, on Panel A, then operates.

4. The system is operated from the 28-volt DC and 115-volt AC supplies.

5. *Controls and Indicators — Power Plant Fire Protection.* (See **Table 1.**)

Power Plant Fire Protection

6. On each power plant, a continuous firewire (of the automatic resetting type), which is routed along the nacelle walls and across the aft fireproof bulkhead, is connected to an associated detection unit on panel PA.

7. Each detection unit incorporates circuits to control its associated fire warning light and the fire warning bell on the flight deck. A relay in each unit permits the operation of the warning system to be tested.

8. Each power plant fire extinguisher system contains a dual-headed methyl-bromide extinguisher bottle, the two bottles for each pair of engines being located behind a panel on the outer nacelle of the pair. Each bottle has two electrically-fired cartridges fitted, one in each head.

9. When an extinguishant bottle is discharged, extinguishant is directed to a spray ring around the forward casing of the associated engine.

10. The pipe arrangement for the two engines on each side allows the extinguisher for one engine to be used on the adjacent engine should its own bottle be insufficient to extinguish the fire. In this event there is no protection for the second engine, should it subsequently catch fire.

11. A spring-loaded double door under the front of each engine nacelle is provided for the insertion of ground fire-fighting equipment nozzles.

12. Two spare methyl-bromide extinguisher bottles are stowed behind a panel marked SPARE EXTINGUISHER BOTTLES ENGINE, on the right-hand side of the wing torque box between stations 720 and 755.

Fire Warning System Test Switch

13. All four fire warning systems, including lights and the fire bell are tested when the FIRE DET — PUSH TEST button is pressed. (The bell only operates if the bell isolation switch is in the pressed-in position (para 14)). When released, the button returns to the out position and the warning lights go out and the bell, if sounding, ceases to operate.

Fire Bell Isolation Switch

14. When the FIRE BELL— PULL ISOL switch is pulled out, the bell is isolated and an amber light in the switch comes on. The switch remains in the 'out' position until pressed in, when the light goes out and the bell is reconnected to the warning circuits.

Fire Control Handles

15. The four rectangular handles, one for each engine, have transparent red covers; each contains duplicated fire warning lights.

16. When a handle is pulled the following sequence occurs:

a. The LP fuel cock of the associated engine is closed, provided that the HP fuel cock has been manually closed.

b. The hydraulic shut-off cock is closed.

c. The airframe anti-icing HP stop valves of the two engines on that side are closed.

17. Then, when the handle is turned clockwise, the first extinguishing shot to that engine is fired and the BOTTLE No 1 SHOT fired indicator for that engine should show red or orange. When the handle is turned counter-clockwise, the second shot to that engine is fired and the BOTTLE No 2 SHOT fired indicator for the adjacent engine should show red or orange. (The extinguishant for the adjacent engine is used when a second shot is fired.)

Table 1 — Controls and Indicators — Power Plant Fire Protection

Item	*Marking/Description*
a. *On the Glare Shield*:	
Fire warning system test switch	FIRE DET — PUSH TEST
Fire bell isolation switch and warning light ...	FIRE BELL — PULL ISOL
Fire control handles (four) (containing fire warning lights)	PULL THEN TURN
b. *On the Rear Roof Panel*:	
Extinguisher bottle fired indicators (eight) ...	EXTINGUISHER BOTTLES FIRED. BOTTLE No 1 to BOTTLE No 4. SHOT No 1 and SHOT No 2
c. *Outboard Nacelles*:	
Pressure release indicators (four)	PRESSURE RELEASE INDICATORS. Normal — green disc. Discharged — red aperture

18. When the handle is reset:

a. The hydraulic cock opens, if the hydraulic cock switch is at OPEN.

b. The airframe anti-icing HP stop valves can only be opened again manually by use of the HP STOP VALVES—GROUND RESET/NORMAL switches on the rear roof panel EA.

c. If the LP cock switch is at OPEN and the HP cock is opened, the LP cock will open irrespective of whether the fire control handle has been reset or not.

Indicator Fuses — Bottles Fired

19. The eight indicator fuses (one for each bottle shot), on panel EA in the roof at the rear of the flight deck, are marked with bottle and shot numbers, two indicators being allocated to each bottle. The fuses are normally colourless, but a fuse shows red or orange when its associated extinguisher bottle has been electrically-operated.

Pressure Release Indicators

20. A pressure (thermal) release connection on each extinguisher is taken to a discharge indicator, consisting of a green disc, on the nacelle skin, below the fire-extinguisher bottle stowage. Inadvertent, and correct operation, of an extinguisher is indicated by the discharge indicator green disc having blown away revealing a red aperture. Indication that a bottle has been operated electrically is by a protruding pin on the bottle firing head and the bottle-fired indicator on panel EA indicating red/orange.

Testing the System

21. The fire protection system should not be tested in flight. Test the system prior to starting the engines and again after flight (during engine shutdown and before the heat from the cooling engine has had an opportunity to dry out the firewire); ie the system should be tested when optimum conditions for moisture contamination have been experienced such as when the aircraft has been parked in moist conditions or has encountered moisture in flight.

22. If the system is serviceable the fire warning lights come on when the FIRE DET PUSH TEST button is pressed. Unserviceability is indicated by either the lights not coming on or failing to go out when the button is released.

23. After prolonged standing in moist conditions a defective firewire may cause the fire warning lights to come on immediately the AC and DC power is switched on.

Note: Should a fire warning light remain on after the test button has been released, the possibility of this being a true fire coincidental with testing must not be overlooked.

APU FIRE PROTECTION SYSTEM

General

24. The APU bay is divided into two zones by a bulkhead attached to the rear of the APU. Zone 1 (forward of the bulkhead) contains the APU and a fireproof canister is fitted to envelope the combustion chamber. Zone 2 (rear of the bulkhead) contains the exhaust pipe.

25. *Pre-Artouste mod* 614, the fire/overheat protection system is a firewire FFFD system. *Post-Artouste mod* 614, the firewire system is replaced by six thermocouples on the APU. It is possible to have an APU with or without *Artouste mod* 614 embodied. To cater for this situation, when the APU is to *post-mod Artouste* 614 standard, the aircraft electrical connection to the firewire control unit is disconnected and connected to the plug and lead from the thermocouples. The firewire system remains in situ for reversion to the pre-mod standard should this be necessary.

Note: Two anchor nuts (AL16) on panel V, adjacent to the firewire control unit, permit the fitting of a jumper plug (containing shorting loops) and a bracket which is supplied with *post-mod* 614 APU, thus allowing the conversion from firewire to thermocouple system.

25A. The fire extinguisher is forward of the fireproof bulkhead. Distribution is via two half spray rings in Zone 1. The bottle is fitted with a pressure relief connection which is taken to a discharge indicator consisting of a nylon disc on the left side of the tail cone. Inadvertent and correct operation of the extinguisher is indicated by the discharge indicator disc having been blown out, revealing a red aperture. A bottle-fired indicator fuse is on the APU panel on panel C.

26. If fire occurs, the system causes the warning light on the APU panel on panel C, and a similar light at the APU external panel, to come on. The extinguisher normally operates automatically but can be manually-operated by a switch on the APU panel on panel C.

27. *APU Fire Protection Controls and Indicators.* (See **Table 2.**)

Operation of the APU Fire Protection System

28. For normal operation the FIRE SYSTEM — MANUAL/AUTO/TEST switch is set to AUTO. Fire at the APU causes the fire warning light to come on, followed by automatic shutdown of the APU and after ten seconds operation of the fire extinguisher, indicated by the bottle-fired indicator showing orange.

29. Selecting the APU FIRE SYSTEM — MANUAL/AUTO/TEST switch to MANUAL causes the APU to shut down by de-energising:

The fuel pump
The fuel valves
The air delivery valves (if selected on)
The air bleed valves
The APU generator, and
Shutting the fin tank ground isolation valve.

The fire extinguisher operates immediately.

30. To test the fire detector operation and warning, select and hold the FIRE SYSTEM — MANUAL/AUTO/TEST switch to TEST; the fire warning lights on *both* APU control panels should come on.

Testing the System

31. The system must be tested prior to starting the APU. Unserviceability is indicated by the light not coming on, or failing to go out when the switch is released and returns to AUTO.

32. *Paragraph Not Used.*

ASSOCIATED FIRE PROTECTION EQUIPMENT

Smoke Detectors

33. Four photo-electric cell type smoke detectors are fitted:

a. One on panel PA in the electrical bay.

b. One at the forward end of the forward freight bay (Station 379).

c. One towards the rear of the aft freight bay (Station 1049).

d. One at the extreme end of the aft freight bay (Station 1493) beneath the rear discharge valve.

34. Each detector operates a warning light on the air conditioning panel. The detectors at 33a and d sample air flowing to the forward and aft discharge valves, respectively; the detectors at 33b and c sample air in their respective freight bays.

34A. Each detector unit is supplied with 28-volt DC whenever the essential busbars are energised. Voltage is supplied to a projector lamp and photo-electric cell in each detector unit. The lamp and cell are situated so that direct light from the lamp cannot reach the cell but the presence of smoke, hydraulic mist or airborne particles causes dispersion and reflection of the light. As the illumination increases the current flow in the cell increases and, at a preset value, the associated warning light comes on.

35. A light switch in the equipment bay controls the lighting in the forward freight bay. A switch under a panel in the floor at the aft ALM station controls the lighting in the aft freight bay. An underfloor viewer stowed at the aft ALM station can be used to inspect the bay.

Table 2 — APU Fire Protection Controls and Indicators

Item	*Marking/Description*
On the APU panel at the engineer's station:	
Fire control switch	FIRE SYSTEM — MANUAL/AUTO/TEST
Fire warning light	Red
Bottle fired indicator	EXTINGUISHER BOTTLE FIRED
On the APU external panel (station 280 left, in 24-volt access panel):	
Fire warning light	Red
Shutdown switch	NORMAL/SHUT DOWN
On the tail cone — left side:	
Pressure relief outlet (discharge indicator) ...	Uncoloured — Bottle charged Red — Bottle discharged

Table 3 — Smoke Detectors Controls and Indicators

Item	*Marking/Description*
On the air conditioning panel:	
Smoke detector warning lights (four) (red) ...	SMOKE DETECTORS. FREIGHT BAYS FWD—AFT DISCHARGE VALVES. FWD — AFT
Smoke detector switch	TEST/NORM/RESET. Spring-centred to NORM

36. *Smoke Detectors Controls and Indicators.* (See **Table 3.**)

Smoke Detectors Operation

37. The smoke detectors are automatic in operation. A TEST/NORM/RESET switch, under the warning lights, is provided to test the warning circuits or reset the detectors. When held to TEST, all four warning lights should come on. When held to RESET, all systems are reset and the warning lights go out. After the systems have been tested, the detectors must be reset.

Hand-Operated Extinguishers

38. The following hand-operated extinguishers are carried:

a. *BCF Type — Six*

(1) One at the engineer's station beneath the table.

(2) Two on the bulkhead forward of the forward passenger door.

(3) Two on the forward bulkhead of the aft ALM station.

(4) One on the side of the aft ALM station.

b. BCF extinguishers are a universal type of extinguisher which may be used on any type of fire without restriction.

Smoke Goggles

39. Goggles are provided for all crew members. (See Chapter 6.)

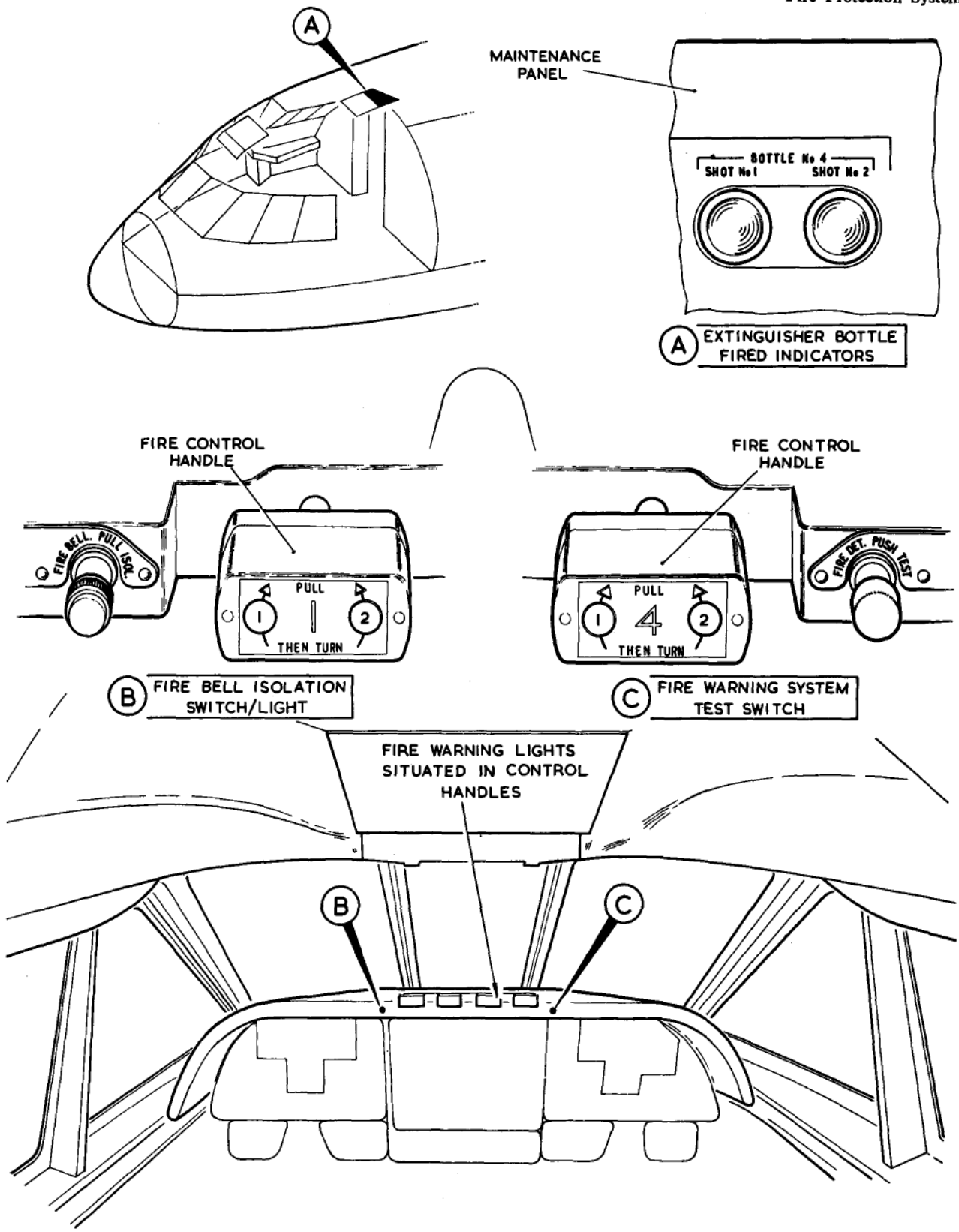
Portable Oxygen and Breathing Sets

40. Six portable oxygen sets are provided. (See Chapter 6.)

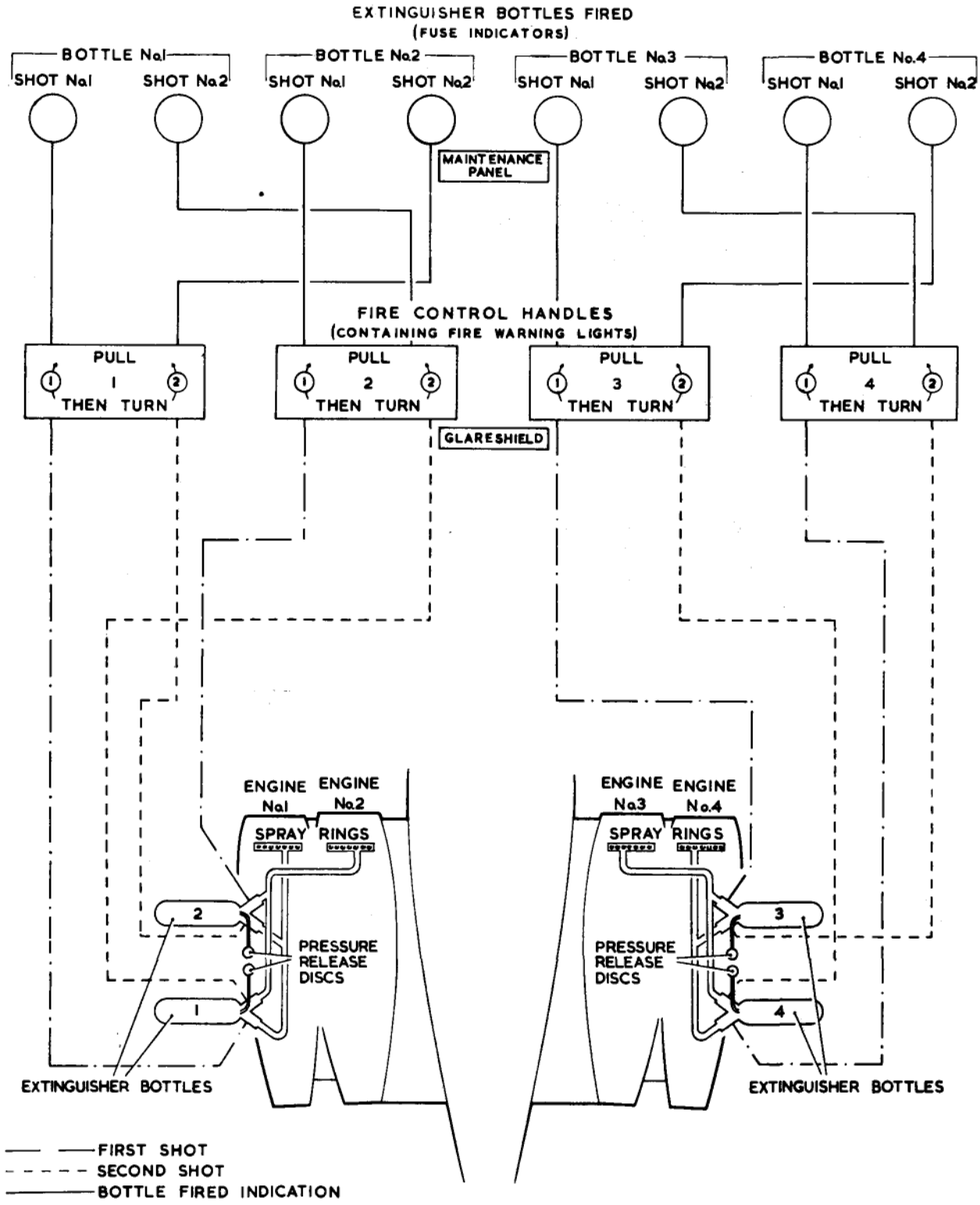
40A. Two Mk 9 portable breathing sets are provided. (See Chapter 6.)

Asbestos Gloves

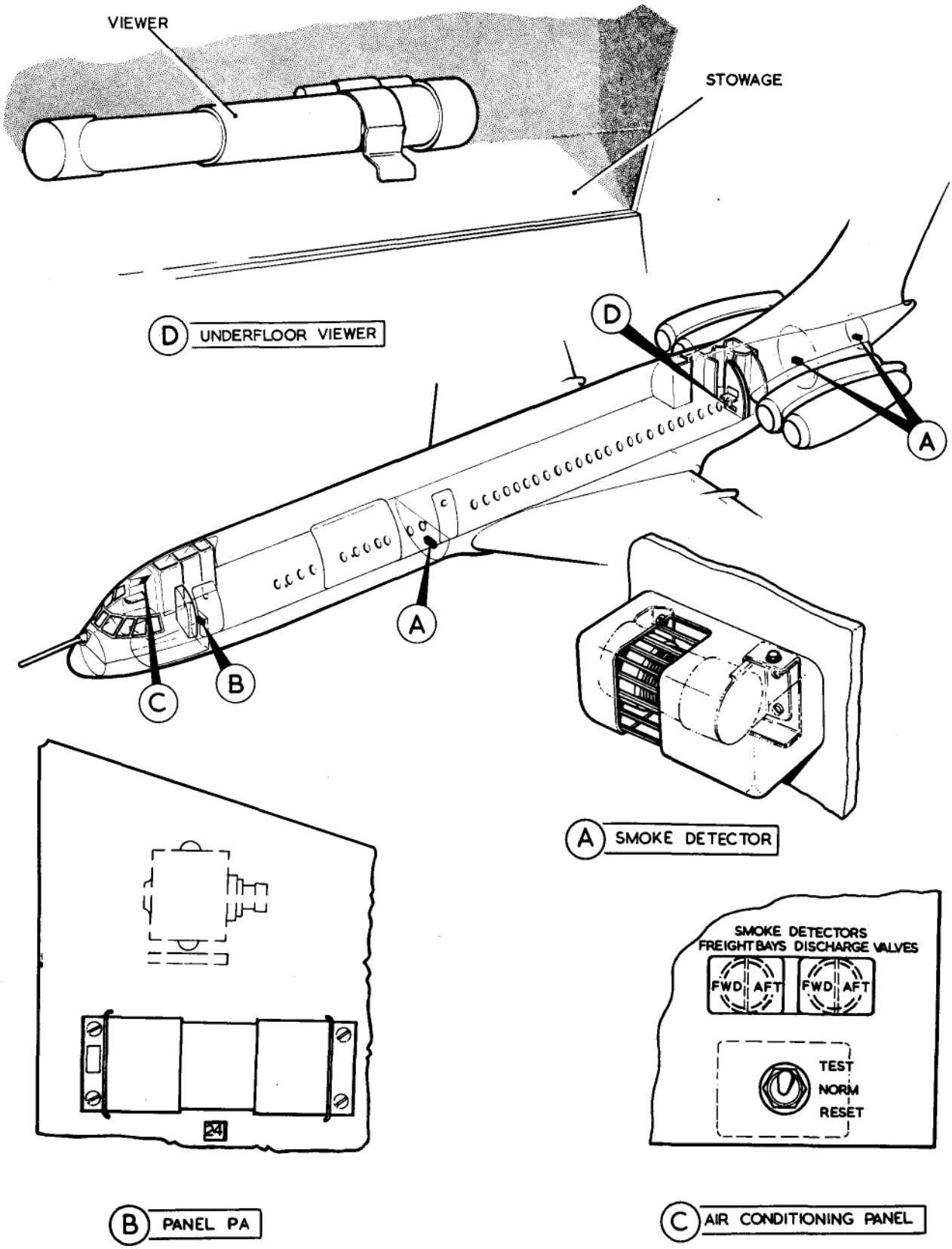
41. A pair of asbestos gloves is stowed beneath the engineer's worktop.



2.8 Fig. 1. Engine Fire Protection Controls and Indicators



2.8 Fig. 2. Engine Fire Protection System — Diagrammatic



2.8 Fig. 3. Fire Protection — Smoke Detection System