

CHAPTER 26 - FIRE PROTECTION

TABLE OF CONTENTS

GENERAL 26-1

ENGINE OVERHEAT OR FIRE DETECTION 26-3

SMOKE DETECTION 26-7

OVERHEATING DETECTION IN CENTRAL WING SECTION 26-11

ENGINE FIRE EXTINGUISHING 26-13

PORTABLE EXTINGUISHERS 26-18

LIST OF FIGURES

26-1	Fire Protection System - Components	26-2
26-2	Engine Overheat or Fire Detection - Components.....	26-4
26-3	Engine Overheat or Fire Detection.....	26-5
26-4	Engine Overheat or Fire Detection - Controls and Indicators.....	26-6
26-5	Smoke Detection - Components	26-8
26-6	Smoke Detection - Controls and Indicators	26-10
26-7	Overheating Detection in Central Wing Section - Components.....	26-11
26-8	Overheating Detection in Central Wing Section	26-12
26-9	Engine Fire Extinguishing - Components.....	26-13
26-10	Engine Fire Extinguishing - First discharge	26-15
26-11	Engine Fire Extinguishing - Second discharge	26-16
26-12	Engine Fire Extinguishing - Controls and Indicators.....	26-17
26-13	Portable Extinguishers - Components	26-18
26-14	Portable Extinguishers - Controls and Indicators.....	26-19

GENERAL

The fire protection system provides the crew with cautions and warnings, and the proper extinguishing equipment when an overheat condition or fire occurs. Therefore, the purpose of the Fire Protection System is to minimize the consequences of a fire onboard by detecting any smoke, overheating or fires that take place. It is composed of two subsystems:

- Fire detection:

The Fire Detection System for the engines consist mainly of sensing items, while that of the cargo compartment, in the underfloor and the toilet has smoke detectors.

- Fire extinguishing:

The Fire Extinguishing system for the engine uses a permanent installation which is composed of two extinguisher bottles. For the cargo compartment and the cockpit there are three manual fire extinguishers.

To accomplish the targets established above, the fire protection is possible by means of:

- **Engine Overheat or Fire Protection:** detects overheating or fire in engines.
- **Smoke Detection:** detects smoke in the following areas:
 - In the Cargo Zone: cargo cabin and ramp area.
 - In the Underfloor Zone.
 - In the Lavatory Zone: toilet ventilation ducts.
- **Overheating Detection in Central Wing Section:** detects any bleed air in the central wing section.
- **Engine Fire Extinguishing:** extinguishes fires in the engines.
- **Portable Extinguishers:** allow the crew members to extinguish fires.

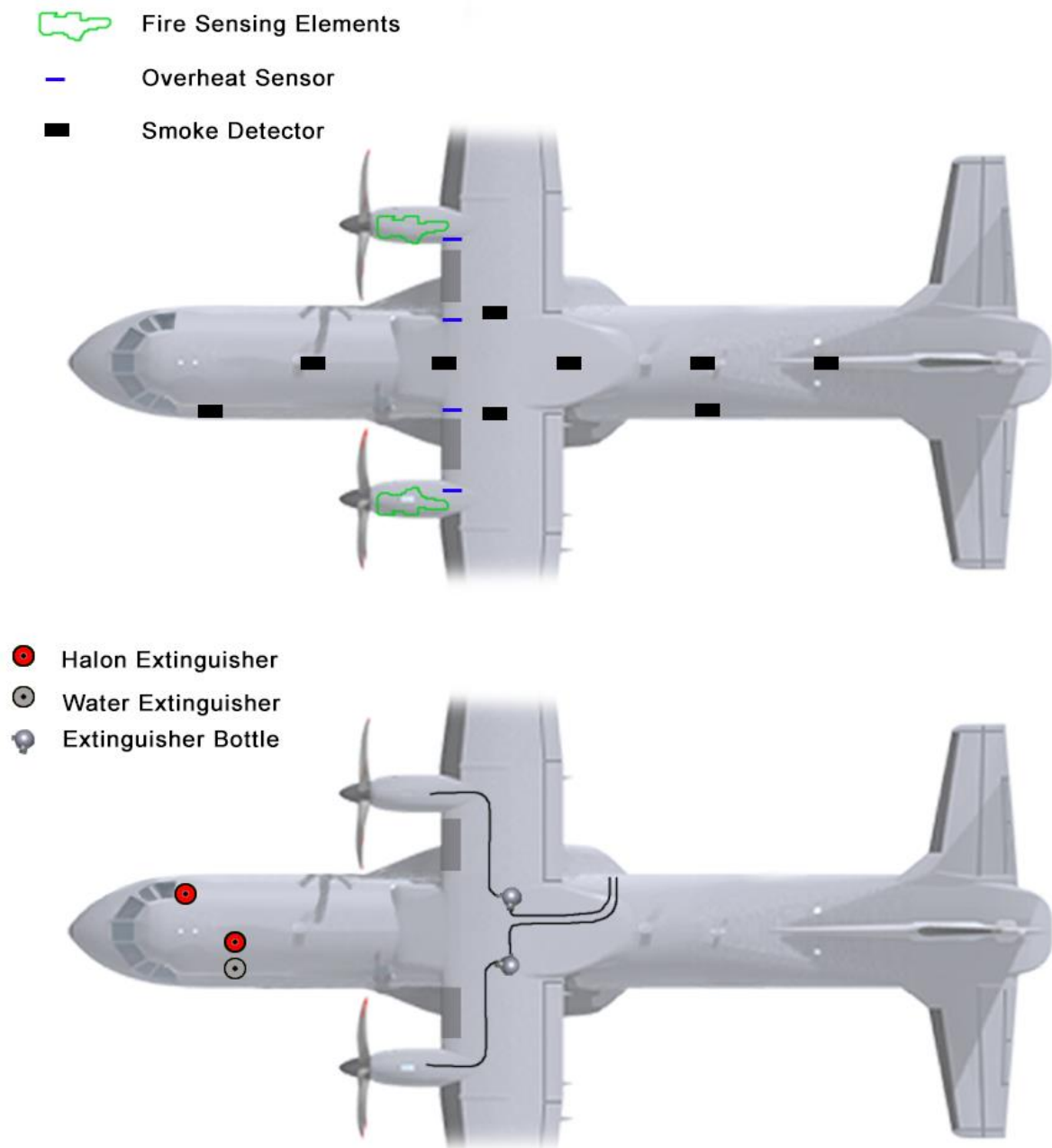


Figure 26-1 Fire Protection System - Components

ENGINE OVERHEAT OR FIRE DETECTION

Its function is to detect overheating or fire in each engine nacelle area.

DESCRIPTION

The main components are:

- | – **Fire Sensing Elements:** a continuous detector wire, sensitive to heat, located around the most critical engine areas.
- | – **Fire Detection Control Units:** receive the signals from the related detector wire, in case of fire, activate the following signals:
 - 1, 2 E/FIRE warning (related to the affected engine) will be displayed on the IEDS.
 - Master WARNING lights
 - FIRE warning light, located below the related FFL on the throttle levers quadrant on the pedestal.
 - FIRE warning light on the related fire extinguishing lever on the FIRE control panel on the overhead panel.
 - Intermittent alarm bell.
- | – **FIRE Control Panel:** located in the overhead panel, enables system management and monitoring.

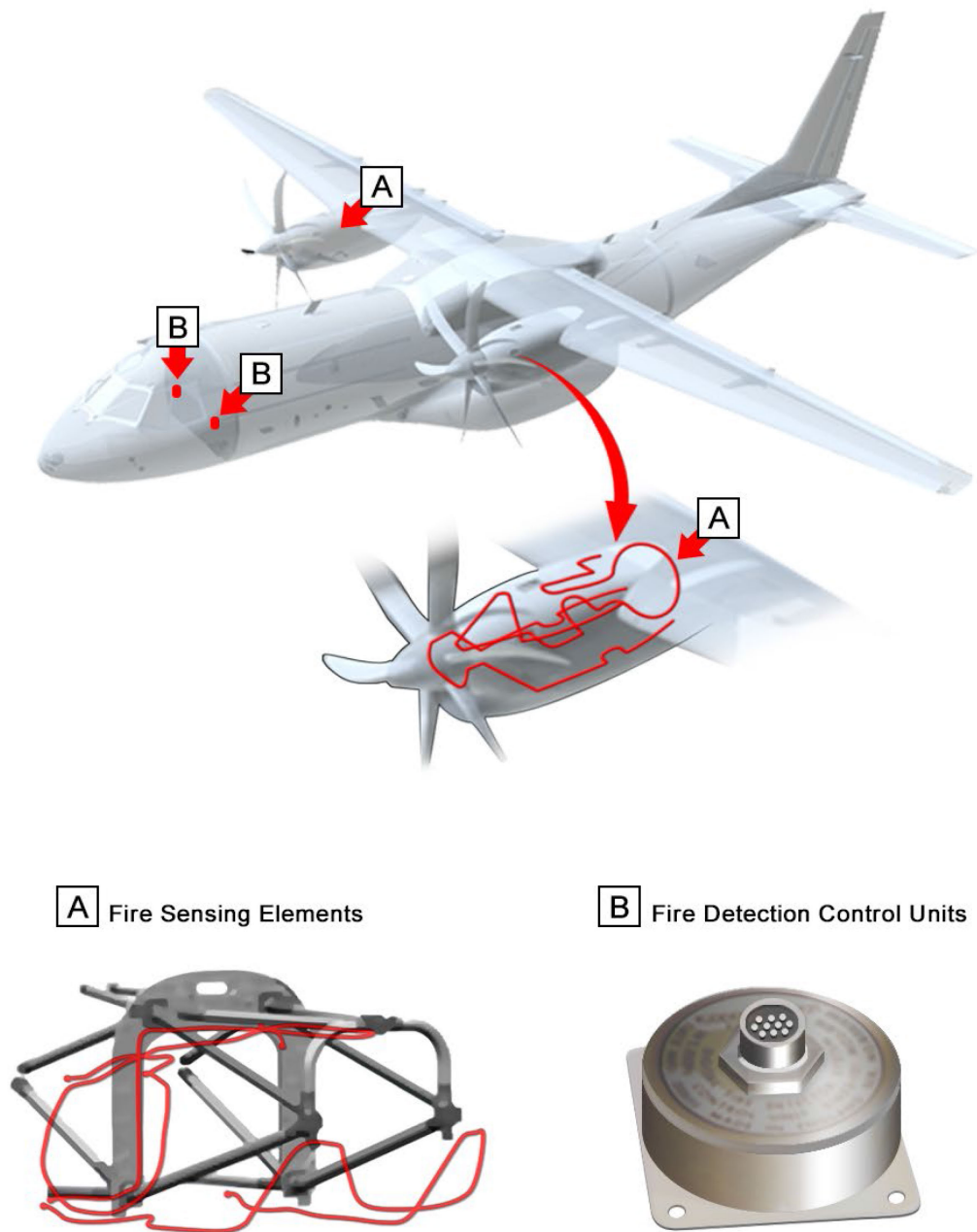


Figure 26-2 Engine Overheat or Fire Detection - Components

OPERATION

When there is an overheat or fire, the detector wire detects it and sends the signal to the control unit, that activates the related signals.

The warnings go off automatically when the overheat or fire stops. The alarm bell can be cancelled by pressing one of the master WARNING lights.

The system checks its own status with two tests:

- **WARN:** it tests the related detector wire. If operative, the following signals are activated:
 - 1, 2 E/FIRE warning on the IEDS.
 - Master WARNING lights.
 - FIRE warning light below the related FFL.
 - FIRE warning light on the related fire extinguishing lever.
 - Alarm bell.
- **FAULT:** it tests the related control unit. If operative, the following signals are activated:
 - 1, 2 FIRE DET caution on the IEDS.
 - Master CAUTION lights.

If there is a failure in the system operation, the related 1, 2 FIRE DET caution will be displayed on the IEDS.

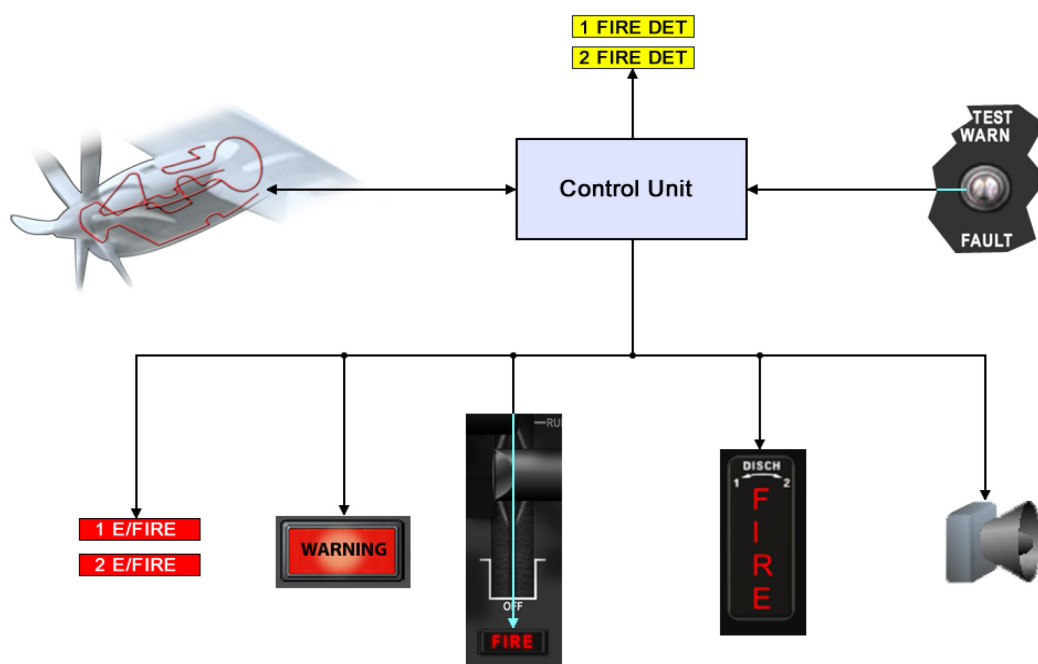


Figure 26-3 Engine Overheat or Fire Detection

CONTROLS AND INDICATORS

(1) FIRE TEST Switches:

- *WARN (momentarily)*: performs the WARN test.
- *FAULT (momentarily)*: performs the FAULT test.

(2) FIRE Warning Lights:

- *FIRE (red) light on*: overheating or fire in the related engine.

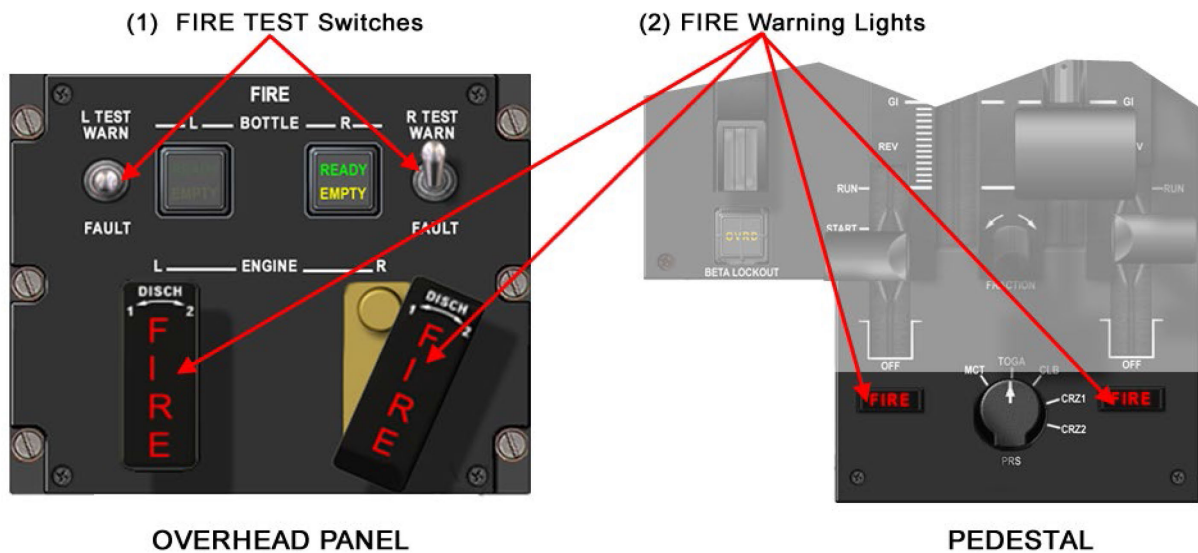


Figure 26-4 Engine Overheat or Fire Detection - Controls and Indicators

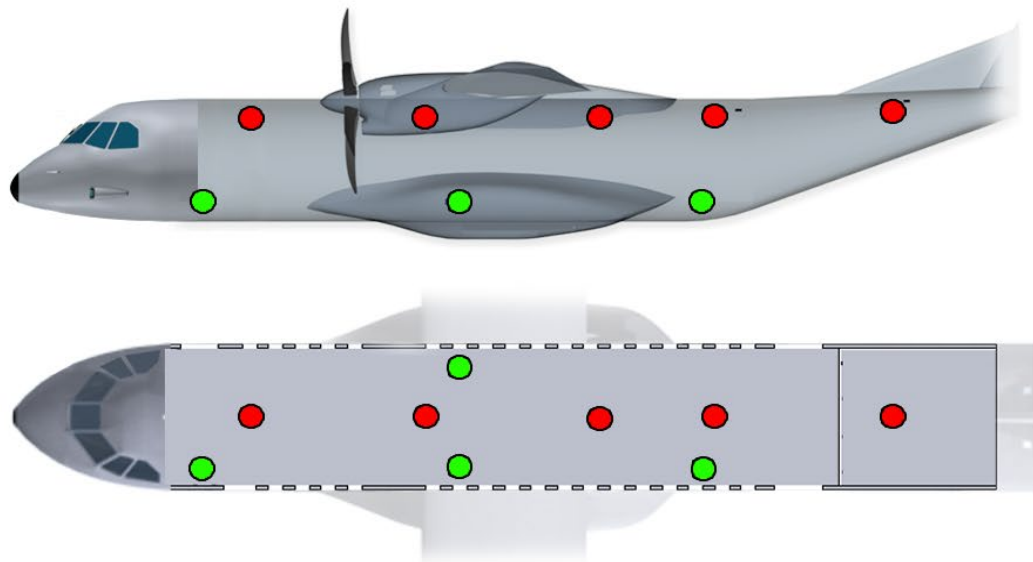
SMOKE DETECTION

Its function is to detect smoke in both the cargo cabin and the ramp area.

DESCRIPTION

The main components are:

- **Five Ambient Smoke Detectors:**
 - Four located along the ceiling of the cargo cabin.
 - One located in the ceiling of the ramp area.
- **Four Flow Through Smoke Detectors:**
 - One located in the blowing fan duct (underfloor).
 - One located in the suction fan duct (underfloor).
 - One located in the Avionic Pressurized Bay.
 - One located in the toilet ventilation ducts (Lavatory Zone).
- **SYSTEM TEST Control Panel:** located in the cockpit overhead panel, enables system management and monitoring.



● Ambient Smoke Detectors

● Flow Through Smoke Detectors



Figure 26-5 Smoke Detection - Components

OPERATION

When the air flowing through any of the detectors contains a given quantity of smoke, the related CARGO SMK light, on the SYSTEM TEST control panel, comes on. Also, the related CARGO SMK warning will be displayed on the IEDS and the alarm bell rings.

The system checks its own status with two tests:

- CARGO SMK: it tests the five smoke detectors in the ceiling, the two smoke detectors in the ventilation ducts and the smoke detector in the suction fan duct. If operative, the following signals are activated:
 - CARGO SMK warning on the IEDS.
 - Master WARNING lights.
 - CARGO SMK light on the pushbutton.
 - Alarm bell
- TOILET SMK: it tests the smoke detector in the toilet. If operative, the following signals are activated:
 - LAV SMK warning on the IEDS.
 - Master WARNING lights.
 - TOIL SMK light on the pushbutton.
 - Alarm bell

CONTROLS AND INDICATORS

(1) **CARGO SMK Pushbutton:**

- *CARGO SMK (red) light on:* smoke in the cargo cabin.
- *Pressed:* performs the CARGO SMK test.

(2) **TOILET SMK Pushbutton:**

- *TOIL SMK (red) light on:* smoke in the toilet.
- *Pressed:* performs the TOILET SMK test.

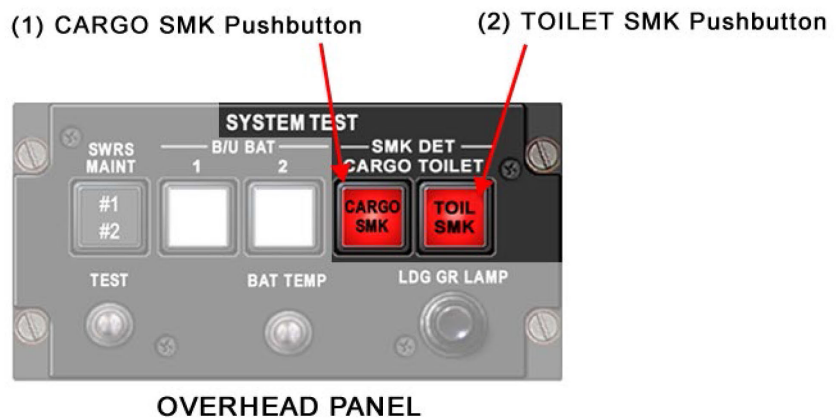


Figure 26-6 Smoke Detection - Controls and Indicators

OVERHEATING DETECTION IN CENTRAL WING SECTION

Its function is to monitor overheating in the central wing section (hump and engine nacelle area).

DESCRIPTION

The main components are:

- **Overheat Sensors:** four sensors that are sensitive to heat. Two of them located in the hump and two in the engine nacelles bleed area.

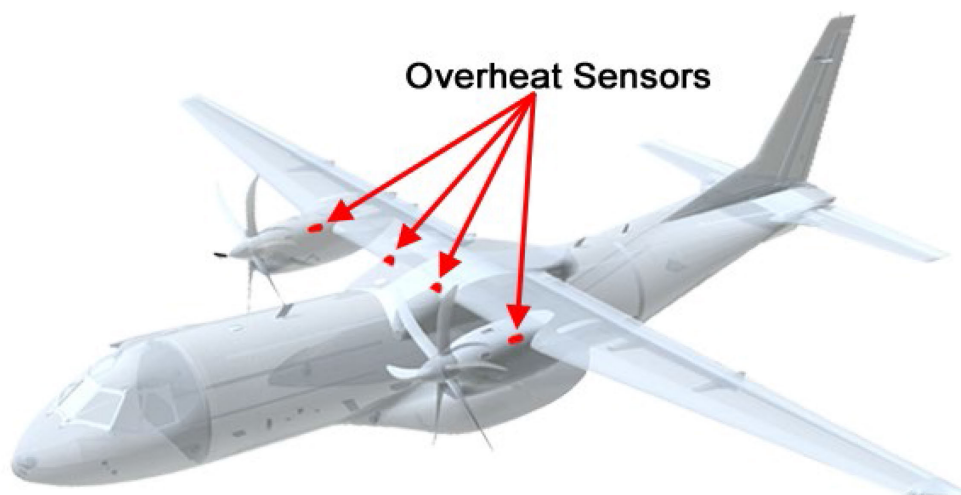


Figure 26-7 Overheating Detection in Central Wing Section - Components

OPERATION

If, in the central wing section, there is leaking of bleed air from the engine, the sensors detect the overheating produced and:

- WING OVHT warning will be displayed on the IEDS.
- The related high-pressure shut-off valve (HPSOV) is closed.
- The related pressure regulating and shut-off valve (PRSOV) is closed.
- The related magnetic indicator, on the AIR CONDITIONING control panel, is crossed.

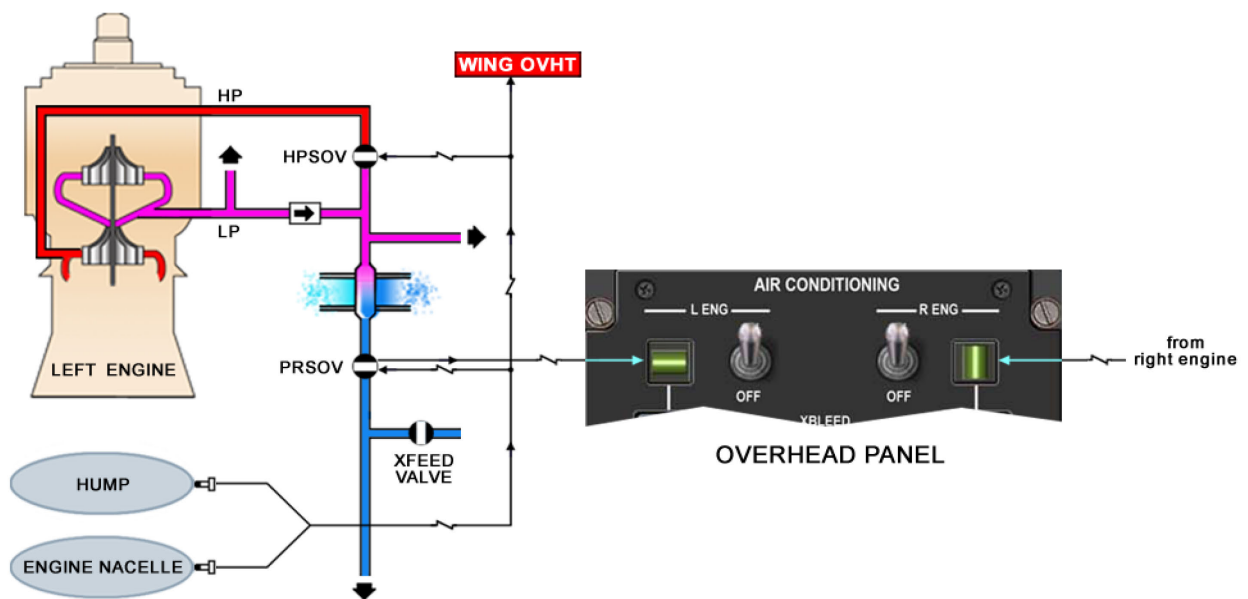


Figure 26-8 Overheating Detection in Central Wing Section

ENGINE FIRE EXTINGUISHING

The engine fire extinguishing system provides the possibility to extinguish fires in the engines.

DESCRIPTION

The system has a fixed circuit with two extinguishing bottles in parallel, which can be discharged into either engine. The process is started by electrically detonating a small explosive cartridge to discharge the extinguishing agent into the appropriate engine.

The main components are:

- **Extinguisher Bottles:** located in the hump, each bottle contains Halon and has two exits (one for each engine), two explosive cartridges (one for each exit), one relief valve and one pressure sensor. Each fire extinguishing lever is associated with one of the engines.
- **Distribution Valves:** located in the discharge ducts, they drive the discharged Halon towards the selected engine and prevent the Halon from flowing into the other bottle.
- **Overpressure Rupture Discs:** two green rupture discs, located in the RH wing root, showing if one of the extinguisher bottles has been discharged by overpressure.
- **FIRE Control Panel:** located in cockpit overhead panel, enables system management and monitoring.

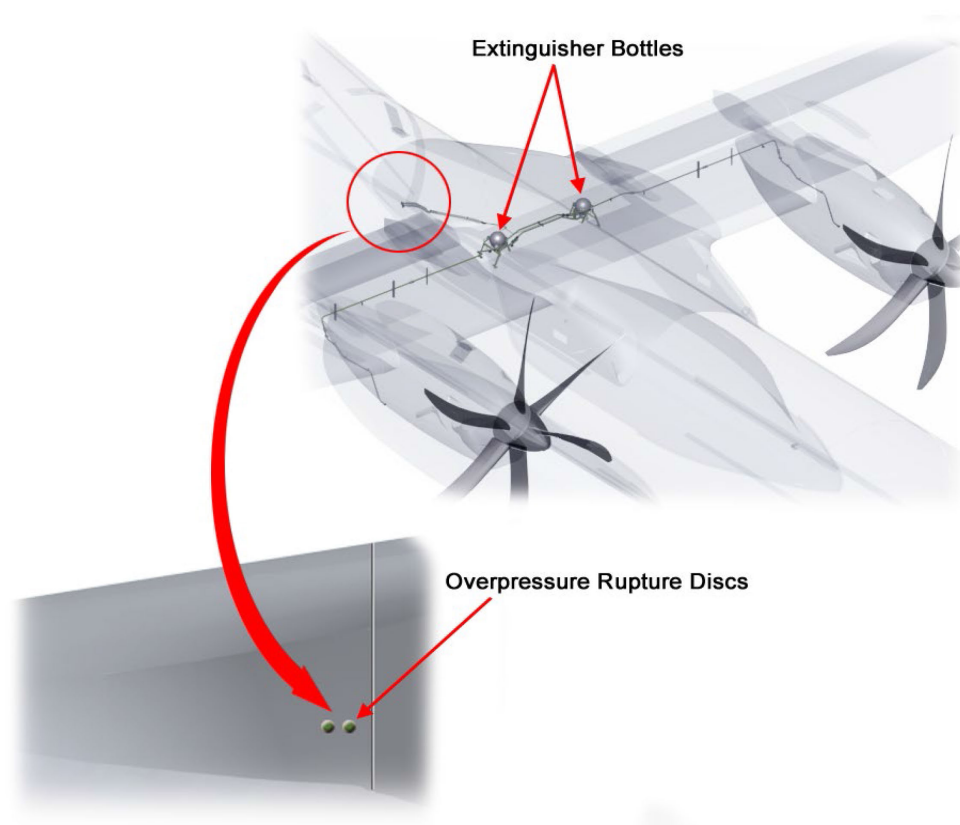


Figure 26-9 Engine Fire Extinguishing - Components

OPERATION

When the fire extinguishing lever is pulled, the system gets ready to discharge:

- The fuel supply to the related engine is shut off.
- Its generator-starter is disconnected.
- The propeller brake is disabled (in the case of engine 1).
- The two READY discharge control lights come on. (when EMPTY light comes on instead of READY, the related bottle has no pressure, therefore, it is not possible to perform the discharge).

When the lever is fully turned to the left (DISCH 1):

1. The first discharge is made into the engine (the related cartridge explodes and the Halon flows to the engine).
2. The related READY discharge control light goes off.
3. The related EMPTY discharge control light comes on.

NOTE

If DISCH 1 has been made in one engine, the other engine has DISCH 2 unavailable.

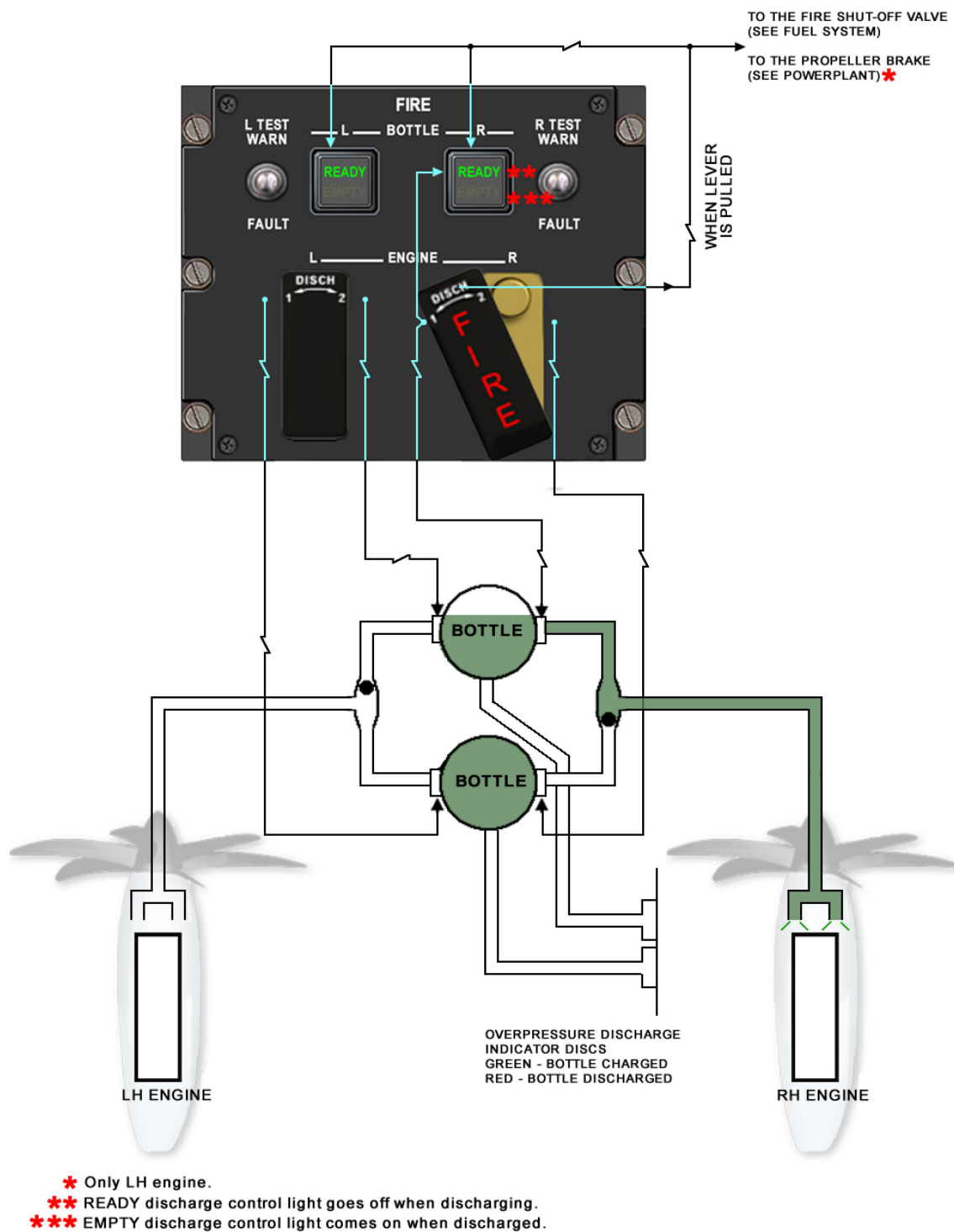
If a second discharge (DISCH 2) is necessary, the same lever is fully turned to the right and:

1. The second discharge is made into the engine.
2. The remaining READY discharge control light goes off.
3. The other EMPTY discharge control light comes on.

NOTE

If DISCH 1 and DISCH 2 have been made in one engine, the other engine has no discharge available.

If one of the extinguisher bottles has been discharged by overpressure through the relief valve, the related overpressure rupture disc is broken and the inner red part is shown as visual indication.



CONDITION: RH ENGINE FIRE, FIRST DISCHARGE BEING PERFORMED.

Figure 26-10 Engine Fire Extinguishing - First discharge

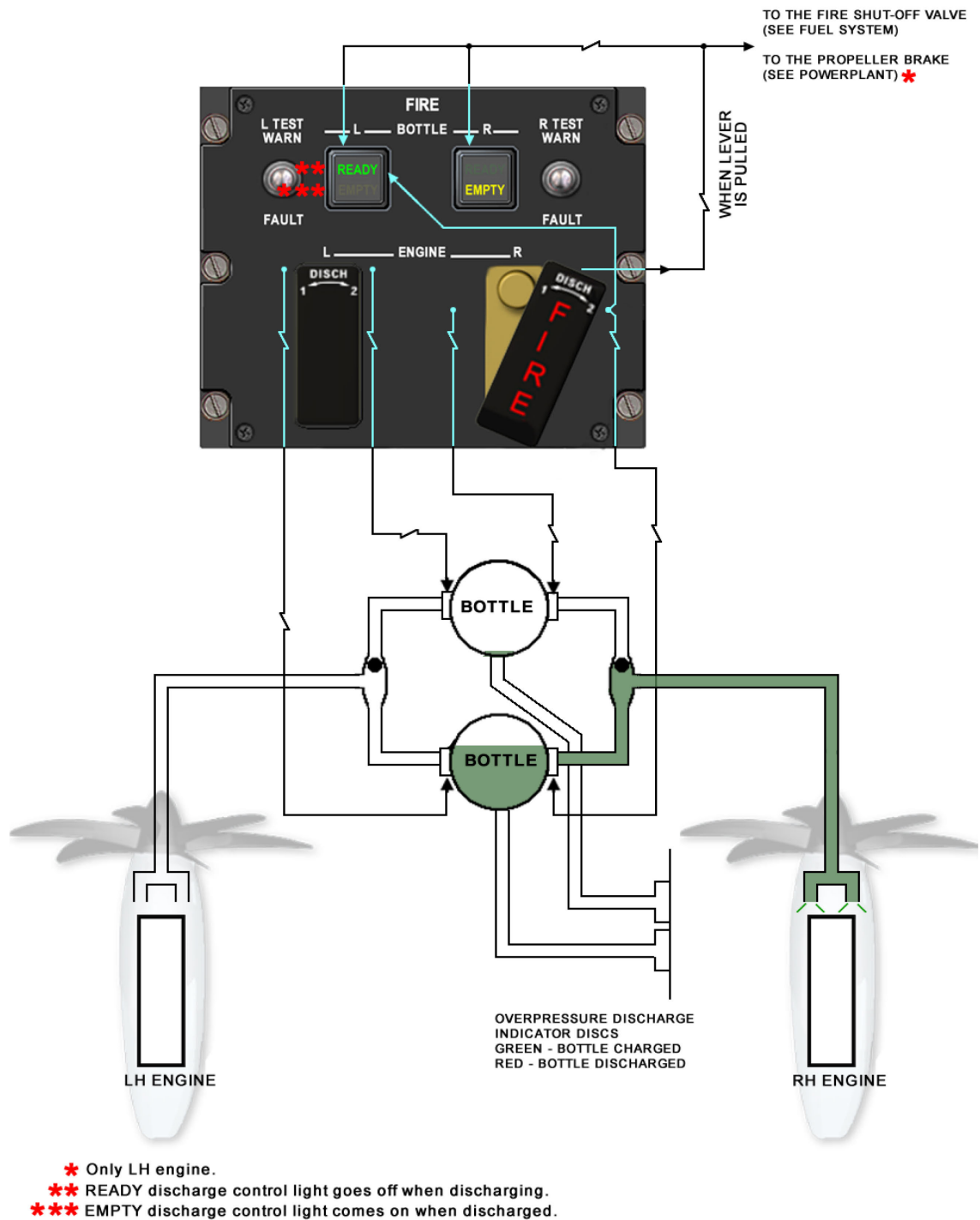


Figure 26-11 Engine Fire Extinguishing - Second discharge

CONTROLS AND INDICATORS

(1) Fire Extinguisher Lever Safety Button:

located behind the lever, it must be pressed in order to pull the lever.

(2) L,R BOTTLE Pushbuttons:

- *Pressed*: performs a lamp test.
- *READY (green) light on*: the system is ready and the bottle can be discharged.
- *READY light off*: cartridge detonated and bottle discharging.
- *EMPTY light on*: discharge completed.

(3) Fire Extinguisher Levers:

- *Pulled*: sets the system ready to discharge.
- *Fully turned to the left (DISCH 1)*: activates the first discharge into the related engine.
- *Fully turned to the right (DISCH 2)*: activates the second discharge into the related engine.

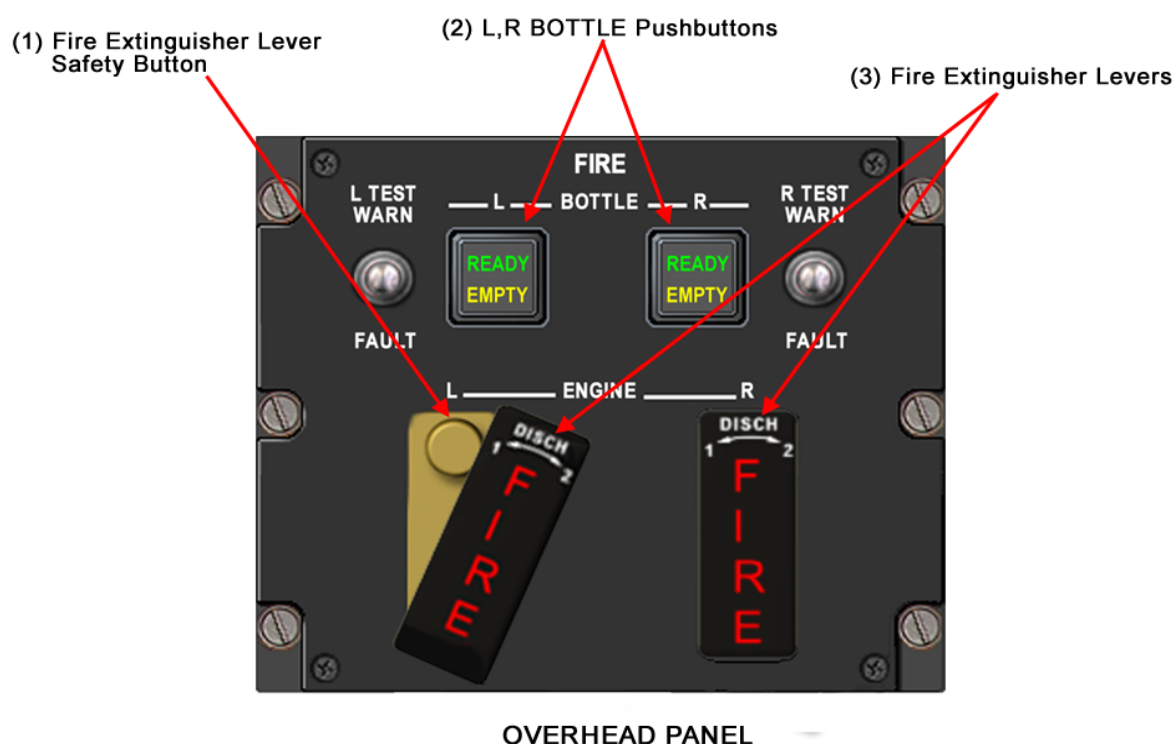


Figure 26-12 Engine Fire Extinguishing - Controls and Indicators

PORTABLE EXTINGUISHERS

Three portable extinguishers for manual use.

DESCRIPTION

There are three extinguishers:

- **Halon Extinguishers:** one located behind the right seat on the cockpit, and the other located on the outer wall of the toilet compartment. This type of extinguisher must be used on class B fires (i.e. inflammable liquids, butane gas, grease or paint) and class C fires (i.e. electrical fires). However, it can also be used to extinguish ordinary fires.
- **Water Extinguisher:** located on the outer wall of the toilet compartment. This type of extinguisher must only be used on class A fires, such as caused by burning fabric, paper or wood.

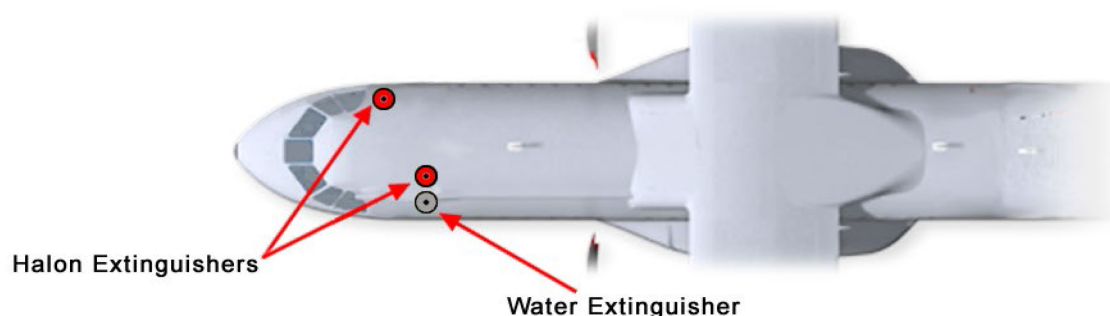


Figure 26-13 Portable Extinguishers - Components

OPERATION

To use the halon extinguisher:

1. Release the bracket and remove the extinguisher.
2. Remove the safety ring.
3. Point the discharge nozzle toward the base of the fire.
4. Press the operating lever against the handle.

To use the water extinguisher:

1. Remove the extinguisher.
2. Remove the safety seal.
3. Point the discharge nozzle toward the base of the fire.
4. Turn the lever in clockwise sense.
5. Press the operating lever against the lever.

CONTROLS AND INDICATORS

(1) *Discharge Nozzle:*

allows the extinguishing agent to expand.

(2) *Safety Ring:*

prevents the extinguisher from involuntary operation.

(3) *Operating Lever:*

- *Pressed:* the halon is sprayed through the discharge nozzle.

(4) *Handle:*

allows to hand-hold and point the bottle.

(5) *Pressure Indicator:*

shows the pressure in the bottle.

(6) *Discharge Nozzle:*

allows the extinguishing agent to expand.

(7) *Operating Lever:*

- *Pressed:* the extinguishing agent is sprayed through the discharge nozzle.

(8) *Safety Seal:*

prevents the extinguisher from involuntary operation.

(9) *Lever:*

- *Turned clockwise:* perforates the carbon dioxide cartridge, pressurizing the cylinder to discharge.

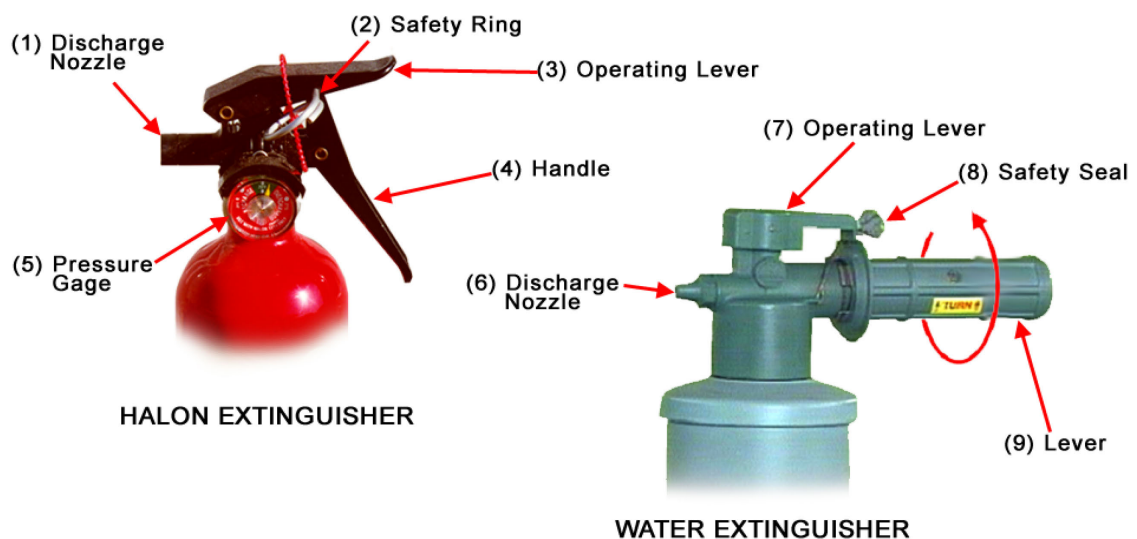


Figure 26-14 Portable Extinguishers - Controls and Indicators

Intentionally Left Blank