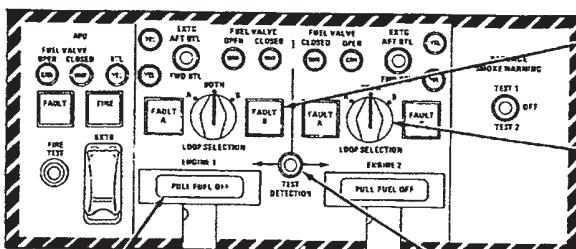


FIRE PROTECTION

CONTROLS AND INDICATORS



PULL FUEL OFF LIGHTS
(2 Red)

ILLUMINATED –
Overheat condition, or, fire detected in associated nacelle.

DETECTION FAULT LIGHTS (4 Amber)
ILLUMINATED – Malfunction detected within loop B detector circuit.
Similar for fault A light.

LOOP SELECTOR SWITCH (2)

- Selects the operating loop(s).
- A – Loop A monitoring detection system.
Loop B disarmed.
- BOTH – Loop A and loop B monitoring detection system.
- B – Loop B monitoring detection system.
Loop A disarmed.

DETECTION SYSTEM TEST SWITCH
(Spring loaded to centre)

- When selected to ENGINE 1 or ENGINE 2.
- MASTER WARNING LIGHT flashes.
 - CHECK FIRE DETECT warning light flashes.
 - Both ENGINE FIRE lights flash.
 - PULL FUEL OFF lights illuminate.
 - FAULT A and B lights illuminate.

NOTE

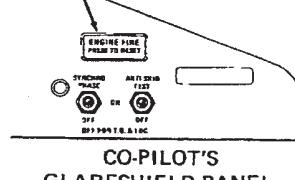
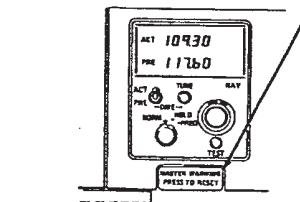
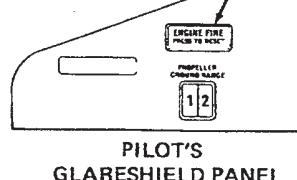
A test selection with loop A or B disarmed (with the loop selector switch), will omit the disarmed loop from the system TEST.

ENGINE FIRE WARNING LIGHTS (Red)

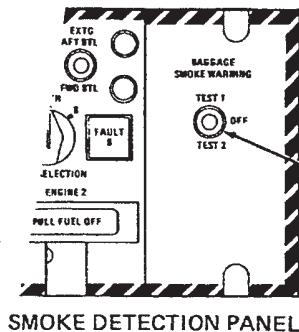
ILLUMINATED – Flashes to warn flight crew of a fire detected in either nacelle.

MASTER WARNING LIGHT (Red)

FLASHING – CHECK FIRE DET warning light triggered on and flashing.



Engine fire detection panel and indicators



SMOKE DETECTION PANEL

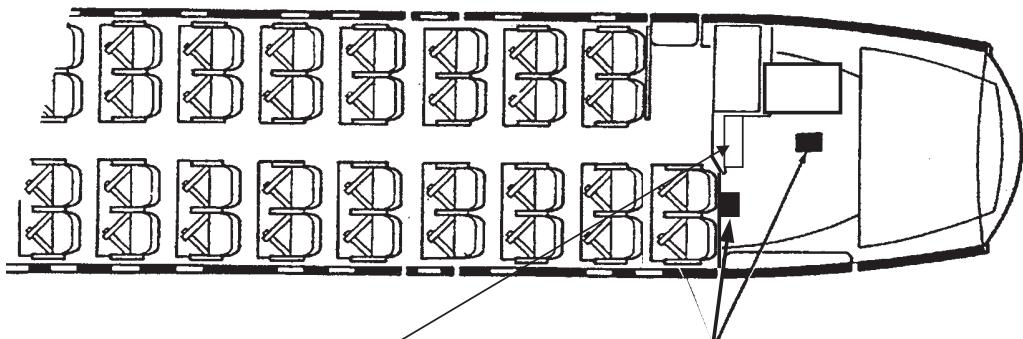
**BAGGAGE SMOKE WARNING
TEST SWITCH**

TEST 1 — Activates test circuit of No.1 smoke detector.

OFF — Test circuits deenergized but smoke detector armed.

TEST 2 —Activates test circuit of No.2 smoke detector.

Illumination of the SMOKE warning light during test, indicates alarm serviceability.



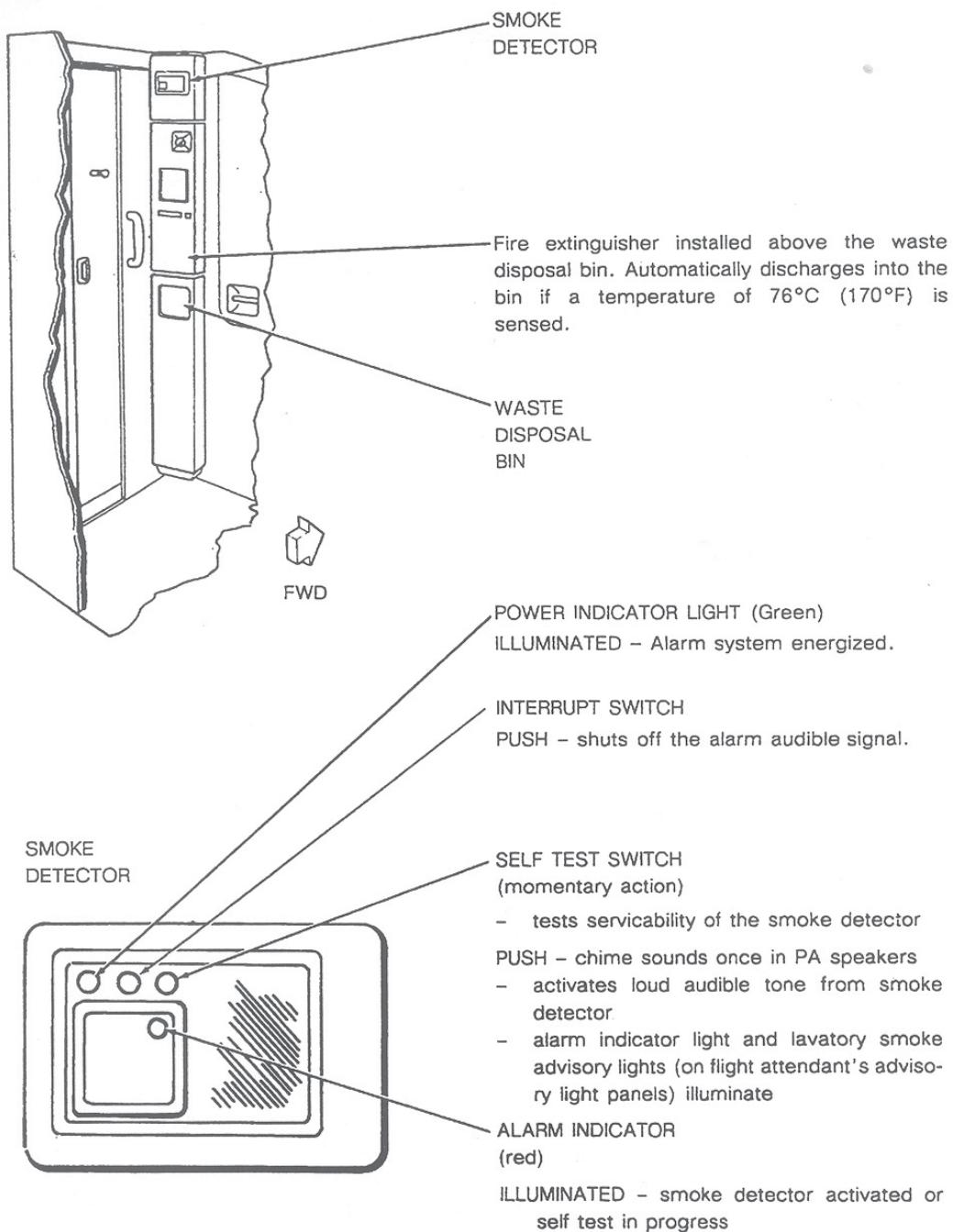
SMOKE CURTAIN

see section 12-7
(emergency equipment)
for details

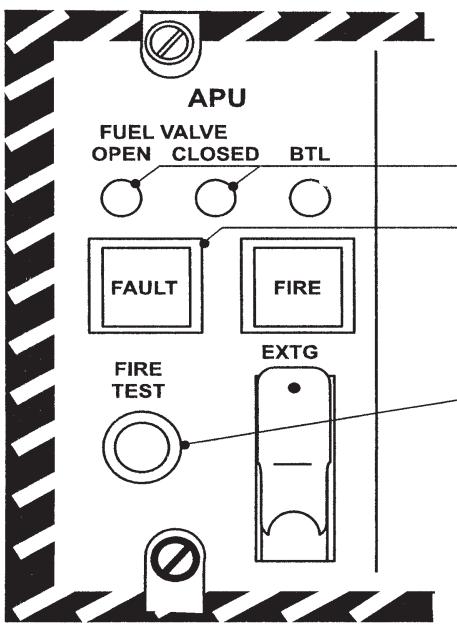
**BAGGAGE COMPARTMENT
SMOKE DETECTORS**

No.1 located in the ceiling, No2 located on the aft face of the baggage bulkhead.

Baggage compartment smoke detection



Lavatory smoke detection



FUEL SHUT-OFF VALVE POSITION LIGHTS (green or white)

OPEN indicator (green) - fuel shut-off valve open
CLOSED indicator (white) - fuel shut-off valve closed

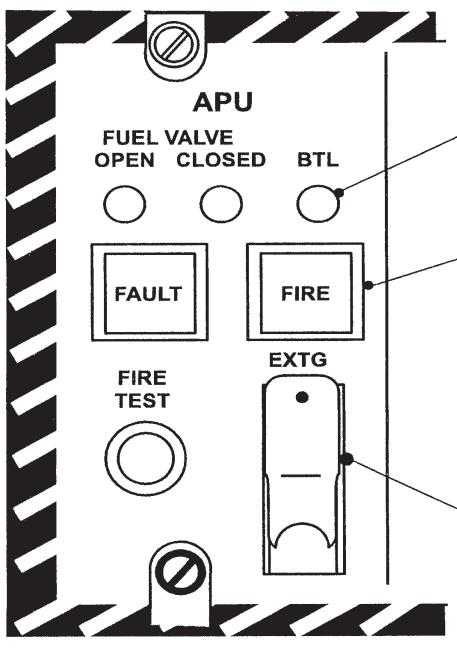
DETECTION FAULT LIGHT(amber)

- malfunction detected within fire detector loop circuit.
- loss of pressure in fire detection loop

FIRE DETECTION TEST BUTTON

PUSH - the following lights come on during the test:

- FAULT warning (amber)
- FIRE warning (red)
- BTL quantity (yellow)
- FUEL VALVE CLOSED (white)
- APU caution light (amber)
- MASTER CAUTION light (flashing amber)
- CHECK FIRE DET warning light (flashing red)
- MASTER WARNING light (flashing red)



EXTINGUISHER BOTTLE QUANTITY LIGHT(yellow)

- indicates fire extinguisher bottle is full when system is armed, or
- system being tested

- light goes out when fire bottle is discharged

FIRE WARNING LIGHT(red)

- fire or overheating condition detected in APU compartment
- APU automatically shuts down followed by the extinguisher discharging

FIRE EXTINGUISHER MANUAL DISCHARGE SWITCH (guarded, two position)

- Pull guard down and set switch to EXTG to discharge extinguishant if fire bottle has not discharged automatically (BTL quantity light yellow)

APU fire detection panel

SYSTEM DESCRIPTION

General

Fire protection is provided by heat-sensing fire detection systems in the nacelles and APU bay, smoke detection systems covering the cargo/baggage area and the lavatory, a nacelle fire extinguishing system for engine fires, an APU fire extinguishing system, an automatic lavatory waste bin extinguishing bottle, and hand-operated fire extinguishers for fires in the cabin or flight compartment.

Engine fire detection system

The engine fire detection system provides visible warnings of fire or overheats conditions in the nacelles. Identical and independent sub-systems for each nacelle are provided.

The duplicate detection sensing elements designated loop A and loop B, are routed in parallel fashion throughout designated zones in the nacelle. Each loop is a stainless steel capillary tube containing helium and hydrogen. A responder unit is attached to one end of the loop, while the other end is sealed. The responder units are wired into the related fire detection control unit, which contains individual alarm, fault monitoring (for each loop) and test circuits. Each monitoring circuit monitors its respective A or B loop for the presence of 'alarm' or 'fault' conditions.

Duplication of the system ensures continued fire detection coverage following failure of one loop. The detection control unit test circuit permits verification of control unit serviceability by simulating alarm and fault conditions.

1 Engine fire extinguishing system

The fire extinguishant chemical CF₃Br bromotrifluormethane is contained under high pressure in two spherical stainless steel extinguisher bottles and located in the left wing root fairing. The bottles are designated forward and aft, and incorporate two discharge outlet ports from each bottle.

Each extinguisher bottle has two discharge valves, actuated by explosive cartridges, which are electrically detonated. One discharge valve on each bottle is connected to the distributing system of number 1 nacelle while the other discharge valve is connected to the distributing system of the number 2 nacelle. Each engine is therefore protected by having one extinguishant discharge a side or two discharges into one engine.

When the PULL FUEL OFF handle is pulled, the:

- Fuel to the engine is shut off. This is indicated by the FUEL VALVE OPEN light (green), going out and the CLOSED light (white) illuminating
- Hydraulic fluid to the engine is shut off
- Both extinguisher arm lights illuminate (if both bottles are filled)

Selecting the appropriate EXTG switch to FWD BTL or AFT BTL discharges the bottle. This detonates the appropriate discharge cartridge to release the extinguishant into the nacelle.

If a bottle is discharged, the associated arm light will go out when the discharge is complete. For a second discharge, the remaining amber light indicates which bottle to select.

NOTE: When discharge of the extinguishant is initiated, it flows until the bottle is empty, after which, the associated EXTG amber light will go out.

The fire extinguisher discharge circuits are powered by the battery power bus to ensure fire extinguisher operation in the event of an electrical power failure.

Discharge indicator discs

Two fire extinguisher discharge indicator discs are located in the body-to-wing fairing below the left inboard wing flap.

The yellow disc is the system discharge indicator and is ejected when the extinguishant discharged into the nacelle is authentic.

The red disc is the thermal discharge indicator and is ejected by extinguishant escaping to atmosphere due to thermal expansion in the lines.

Alarm operation

Each responder unit detects engine fire conditions by sensing the gas pressure in its loop. If a nacelle fire or overheat condition occurs, the loop gas pressure increases activating the alarm pressure switch in the responder unit. This action causes the associated detection control unit to turn on its respective engine fire warning lights and fire warning bell which is located on the flight compartment bulkhead behind the pilot. The bell is silenced when the ENGINE FIRE PRESS TO RESET switchlight is pushed.

Pressing the flashing MASTER WARNING light resets the system; in the event a subsequent fire occurs. However, the CHECK FIRE DET warning light stops flashing but remains illuminated.

The Fire warning lights consist of:

- Two ENGINE FIRE PRESS TO RESET warning lights
- PULL FUEL OFF handles (ENGINE 1 and ENGINE 2) illuminates
- One CHECK FIRE DET warning light (red)
- One MASTER WARNING PRESS TO RESET light

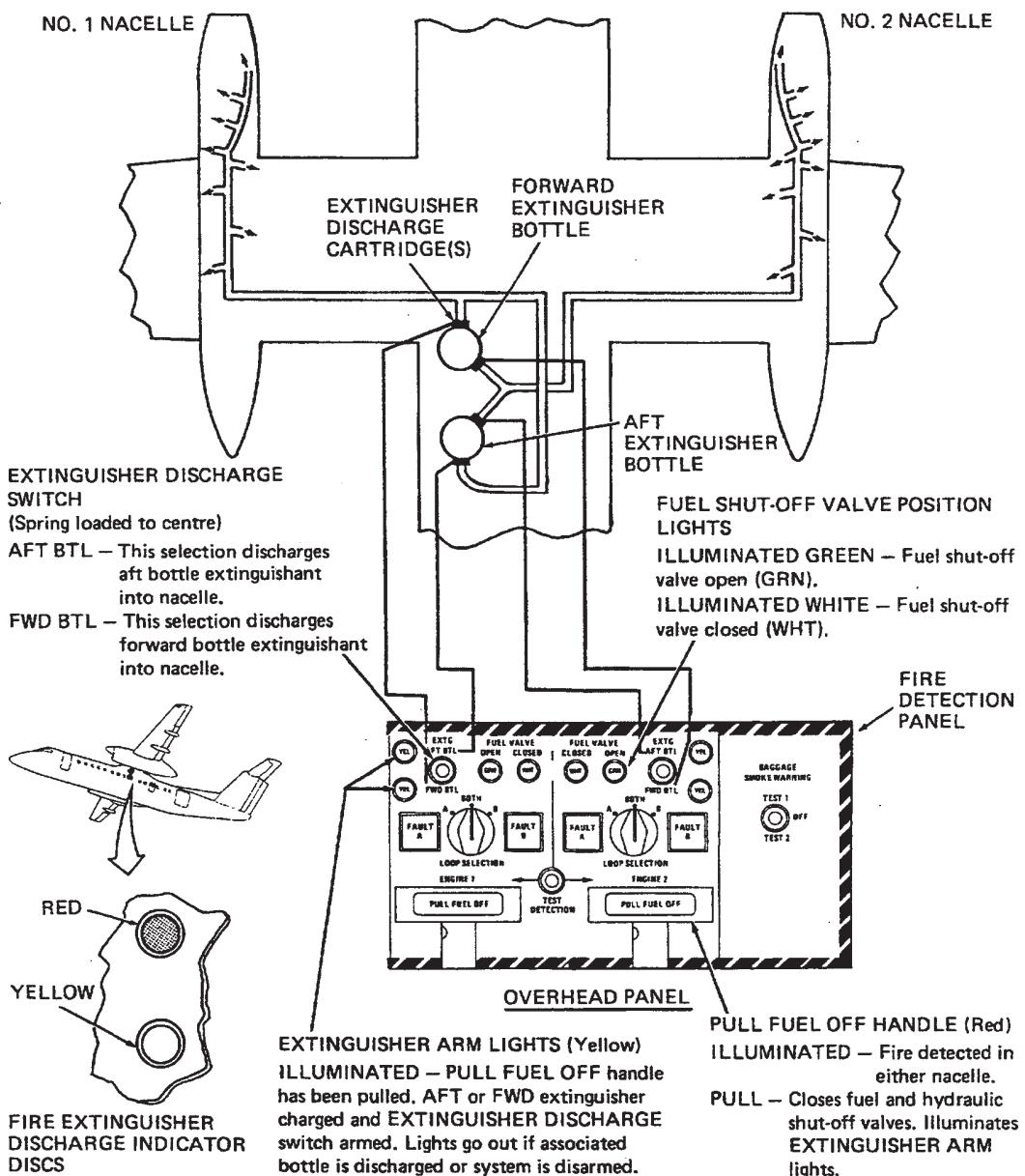
A signal from either alarm monitor circuit will trigger the fire warning lights.

Each responder unit, control unit and their power sources (the essential DC buses) are separate. Loops A and B for number 1 engine are powered by the left and right essential DC buses respectively. Loops A and B for number 2 engine are powered by the right and left essential DC buses respectively. This ensures that one loop in each nacelle remains active if either essential bus fails.

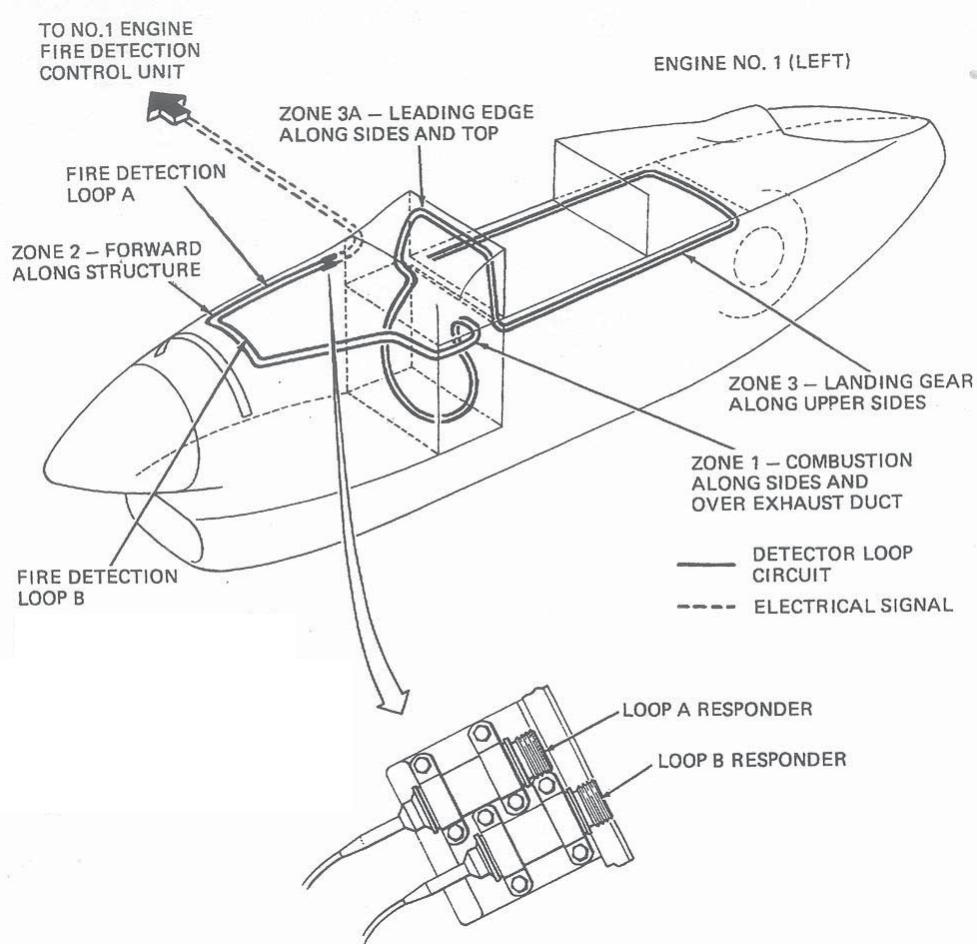
Fire detection system test

A single 3-position TEST DETECTION switch on the fire protection panel tests the fire detection system. The switch, when held to ENGINE 1 or ENGINE 2, activates the test circuit in the related detection control unit, illuminating the nacelle's alarm and fault lights plus the CHECK FIRE DET warning light (ENGINE FIRE PRESS TO RESET light flashes; all others should glow steadily) to indicate system serviceability.

NOTE: If loop A or B is deactivated (with the LOOP SELECTION switch), that loop will be omitted from the systems test.



Engine fire extinguish schematic



Fire detection loops

Baggage compartment smoke detection

Two smoke detectors in the baggage compartment provide visual warning in the flight compartment of an incipient or active fire in the baggage area. If either unit detects smoke, the SMOKE caution light on the caution lights panel illuminates for as long as the smoke is sensed. A BAGGAGE SMOKE WARNING test switch is provided on the fire detection panel to permit verification of each detector circuit.

Portable fire extinguishers

Three hand-operated fire extinguishers containing Halon 1211 are provided. A gauge on each extinguisher indicates the serviceable range (green) and the overcharge and recharge ranges (red). Halon 1211 is effective on electrical, oil and fuel fires, and is neither corrosive nor toxic and will not freeze or cause cold burns. A safety locking pin prevents accidental trigger movement and discharge. When the trigger is initially pressed, a red indicator disc at the rear of the nozzle is ejected.

One fire extinguisher is located behind the left pilots' seat, one fire extinguisher is located in the most forward RH overhead bin, and there is one fire extinguisher located in the aft RH overhead bin.

To operate: remove from stowage bracket. Hold extinguisher upright in either hand, slide the (red) safety catch down with thumb, aim the nozzle towards the base of the flames and squeeze trigger.

WARNING: If a fire extinguisher is to be discharged in the flight compartment, all crewmembers are to wear oxygen masks with EMERGENCY selected (100% oxygen).

APU fire protection

General

A fully automatic APU fire detection/extinguishing system is provided for the APU. This system is independent from the engine fire protection system. The system includes a stainless steel fire extinguisher bottle and loop sensor, which is routed to detect a fire or overheated condition. It monitors the APU compartment area continuously when electrical power is supplied to the airplane and will extinguish an internal or compartment fire. An electronic sequence unit (ESU) provides control for automatic start sequence, running and shutdown of the APU.

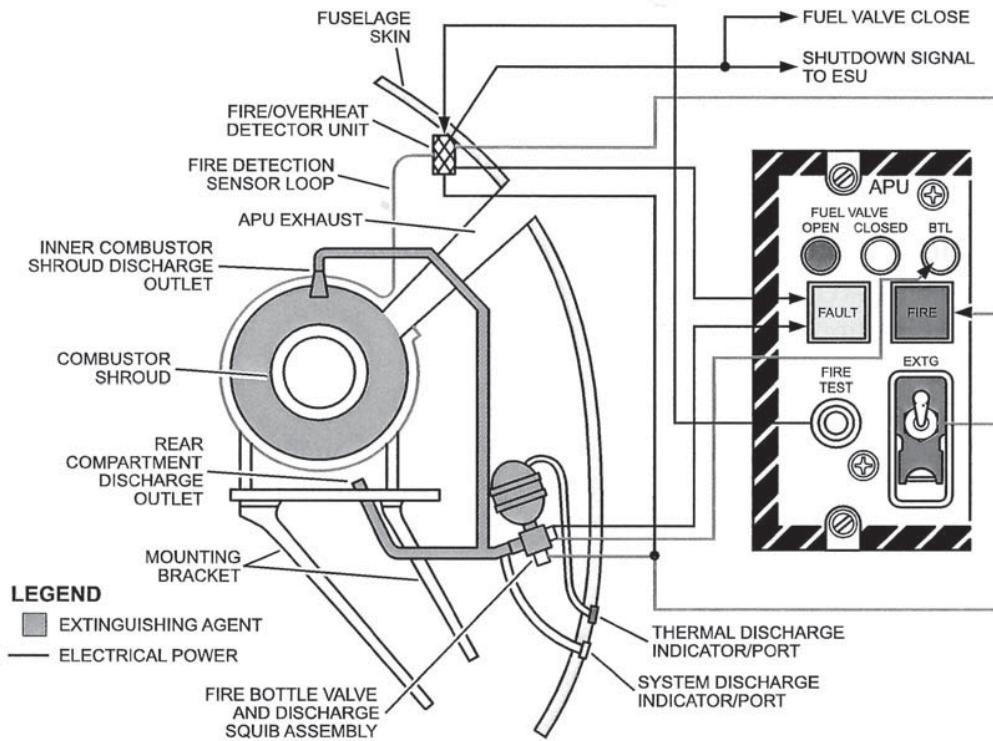
Discharge indicator discs

Two fire extinguisher discharge indicator discs are located externally at the right rear fuselage. They provide a visual indication of extinguishant discharge. The yellow disc is the system discharge indicator and is ejected when the discharge of extinguishant from the bottle is authentic. The red disc is the thermal discharge indicator and is ejected by extinguishant escaping to atmosphere due to thermal expansion in the lines.

APU fire extinguishing

When a fire is detected, the ESU automatically shuts the APU down and discharges the extinguishing agent. If the fire extinguisher has not discharged automatically (indicated by BTL light still illuminated), it can be discharged manually by the guarded EXTG switch on the APU fire detection panel.

NOTE: Once the bottle has been discharged, restarting the APU is prevented until the bottle has been recharged.



APU fire protection schematic

NON-NORMAL INDICATIONS AND OPERATION

12-08.3.1. Fault operation

The detection control unit detects and warns of failures in the A and B sensor loops and their related wiring. Two fault lights for each engine are marked FAULT A and B. Each light is connected to its associated loop.

A FAULT advisory light will illuminate if:

- A loss of gas pressure in any loop is detected
- A control unit or responder is defective
- The bus to a loop fails when its loop selector switch is selected to BOTH

The CHECK FIRE DET warning light illuminates concurrently with any of the FAULT lights.

A rotary loop selector switch is provided for each engine and used to select the operating loop(s). The switch is normally left at BOTH (loop A and B armed). If a FAULT (A or B) light and CHECK FIRE DET caution light illuminates, a fault is detected in the associated loop system. Selecting the LOOP SELECTION switch to the opposite (B or A) loop disarms the defective loop. The CHECK FIRE DET warning light and illuminated FAULT light goes out. The remaining loop continues to provide fire detection coverage to the nacelle.

NOTE: When detection has been deactivated, the remaining loop's failure monitoring circuit is prevented from warning of a power supply failure to that loop.

12-08.3.2. Warning lights

	Fire or fault condition detected, or fire detection system being tested.
Applicable ECL	ENGINE FIRE, APU FIRE, FIRE DETECTION LOOP FAILURE.
Remarks	If fire warnings are not present and a fault light is illuminated select appropriate loop arming selector to remaining loop.
 	 Smoke in the baggage/cargo compartment. Smoke detector being tested.
Applicable ECL	FUSELAGE FIRE or SMOKE
Remarks	Smoke caution light remains illuminated as long as smoke is sensed in the baggage compartment.

Caution lights

	Indicates APU fault, APU fire or compartment overheat.
Applicable ECL	APU FIRE or APU failure.
Remarks	Also illuminates during overspeed and fire test and APU generator off-line condition.