



1. GENERAL.

The fire protection system provides:

- Fire detection of the engines plus an extinguisher system.
- Detector failure system.
- Tail pipe overheat detection.
- Smoke detection for the avionics, lavatory and cargo compartments.
- Extinguisher system for the cargo compartment in standard version aircraft.

2. MAIN COMPONENTS AND SUBSYSTEMS.

2. 1. Engine fire protection. (Fig. 1 and 2.)

Detection of fire or overheat in the engine nacelle fire zone is ensured by a single continuous loop detection circuit below each engine.

There is one control unit for each engine. The control unit continuously monitors the resistance value in the loop. If a preset resistance value indicating a fire is reached, the unit will activate the fire warning system.

Too quick resistance change in the loop, however, will not result in a fire warning but in a detector failure indication, indicating that the loop has been mechanically short circuited and is unreliable.

For a fire, the following warnings will be given:

- Fire bell
- MASTER WARNING and
L/R ENG FIRE (CWP) light and
L/R ENG fire handle light (red).

Pressing either of the master warning lights or pulling the respective fire handle will extinguish both master warning lights, silence the fire bell and change the flashing L/R ENG FIRE light on CWP to steady. The L/R ENG FIRE light and L/R ENG fire handle light remains on as long as the warned condition exists.

A detector failure gives the following indications:

- MASTER CAUTION and
L/R FIRE DET FAIL (CWP) light.

Pressing either of the master caution lights will extinguish both master caution lights and change the flash-

ing L/R FIRE DET FAIL light on CWP to steady. The CWP light remains on as long as the caution condition exists.

The engine fire warning and detector failure system can be tested with two switches on the TEST 1 panel. Using these switches, both an engine fire and a loop short circuit are simulated with correct warning indications both aurally and visually.

Pulling a fire handle will have the following result:

- Engine fuel shutoff valve is closed.
- Engine bleed air pressure regulator valve is closed.
- Start-Gen field relay is open.
- Fire bell is silenced.
- Master warning is reset, indicated by the master warning lights going out.
- Both main and reserve extinguisher squibs for the engine are armed.
- Right fire handle shuts off the power supply to prop. brake. Hydraulic lock valves will keep the brake engaged and PROP BRAKE light and MASTER WARNINGS come on.

There is one extinguisher bottle installed in each engine nacelle equipment compartment. Extinguishing agent is Halon 1301.

Each bottle can be discharged into the fire zone of the nacelle where it is installed or it can be discharged and routed to the nacelle on the other wing to serve as reserve for its extinguisher bottle, e.g. the left FIRE EXTG switch discharges the left extinguisher into the left engine if the left fire handle has been pulled, and into the right engine if the right fire handle has been pulled.

The released extinguishant is discharged into the engine fire zone area through a manifold optimizing distribution to the spray nozzles.

The armed extinguisher squib (explosive cartridge) is activated by the respective bottle's FIRE EXTG switch located adjacent to its fire handle.



2. 2. Tail pipe overtemperature. (Fig. 1.)

There are three overtemperature detectors installed around each engine tail pipe. The detectors are wired in parallel so that an overheat signal from a single detector is enough to initiate an overheat warning.

When a tail pipe overtemperature is detected, the following warnings will be given:

- MASTER WARNING and
L/R TAIL P HOT (CWP) light.

Pressing either of the master warning lights will cancel the warning except the L/R TAIL P HOT light which will go from flashing to steady and stay on until the tail pipe temperature has decreased.

The engine fire loop test switch is also used to test the tail pipe overtemperature system. Activating the switch will simulate an overtemperature condition and thereby check the integrity of the circuit to the detectors.

2. 3. Smoke detection. (Fig. 3.)

There are three independent smoke detection systems installed, namely in the avionics compartment, lavatory and in the cargo compartment.

The smoke detectors, one in each compartment, use a pulsed light beam and a photo sensor to detect smoke. With Mod No 1819 installed there are two smoke detectors in the cargo compartment. The respective warning is triggered when smoke density reaches a preset value.

If smoke is detected in any compartment, the following warnings will be activated:

- MASTER WARNING and
AVIONIC, LAV or CARGO SMOKE (CWP) light.

Pressing either of the master warning lights will cancel all warnings except the respective CWP light, which will change from flashing to steady and stay on until the smoke has disappeared.

In the standard passenger version the smoke detectors are tested by one single test switch on the TEST 1 panel. When activated, smoke conditions in all compartments are simulated and all warnings activated.

2. 4. Cargo compartment fire extinguisher system.

The cargo compartment is provided with a fire extinguisher system consisting of a Halon 1301 extinguisher. The extinguisher is located behind the rear bulkhead of the cargo compartment on the right side. The tube terminates at a nozzle that is designed to provide an even distribution of extinguisher agent in the cargo compartment.

The extinguisher container is a dual wall type, a bottle within the bottle. When the bottle is discharged, the outer volume rapidly floods the compartment with agent in order to extinguish the fire. The inner volume slowly leaks a regulated flow of the agent through a restrictor maintaining a specified concentration level high enough to prevent reignition.

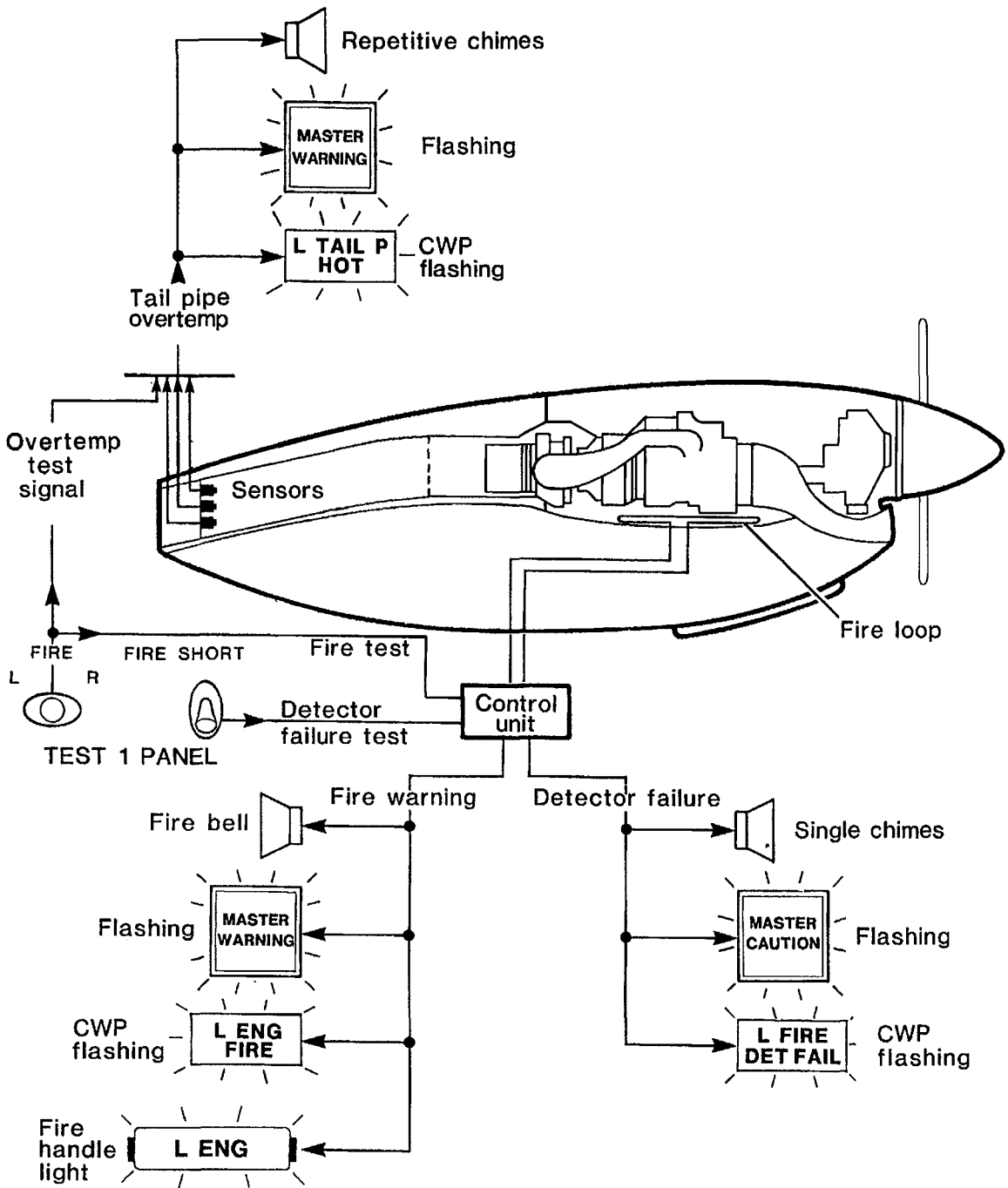
If smoke is detected in the cargo compartment, the flight crew can activate the fire extinguisher system by operating the CARGO FIRE EXTG switch on the overhead panel.

A CARGO EXTG light adjacent to the extinguisher switch is operated by a pressure switch sensing pressure in the inner volume. Normal pressure in the extinguisher container is 360 psi. The CARGO EXTG light comes on when pressure decreases to 310–260 psi indicating low pressure in the bottle. When the extinguisher system is activated the light will come on when the outer volume has been drained and the pressure in the inner volume has reached the triggering level, this can take up to 15 minutes. Accordingly CARGO EXTG light not coming on in sequence with activation of the FIRE EXTG shall not be interpreted as a non functioning system.

2. 5. Optional cargo compartment fire extinguisher system.

An optional extinguisher system, identical to the standard system, may be installed on the left side of the cargo compartment.

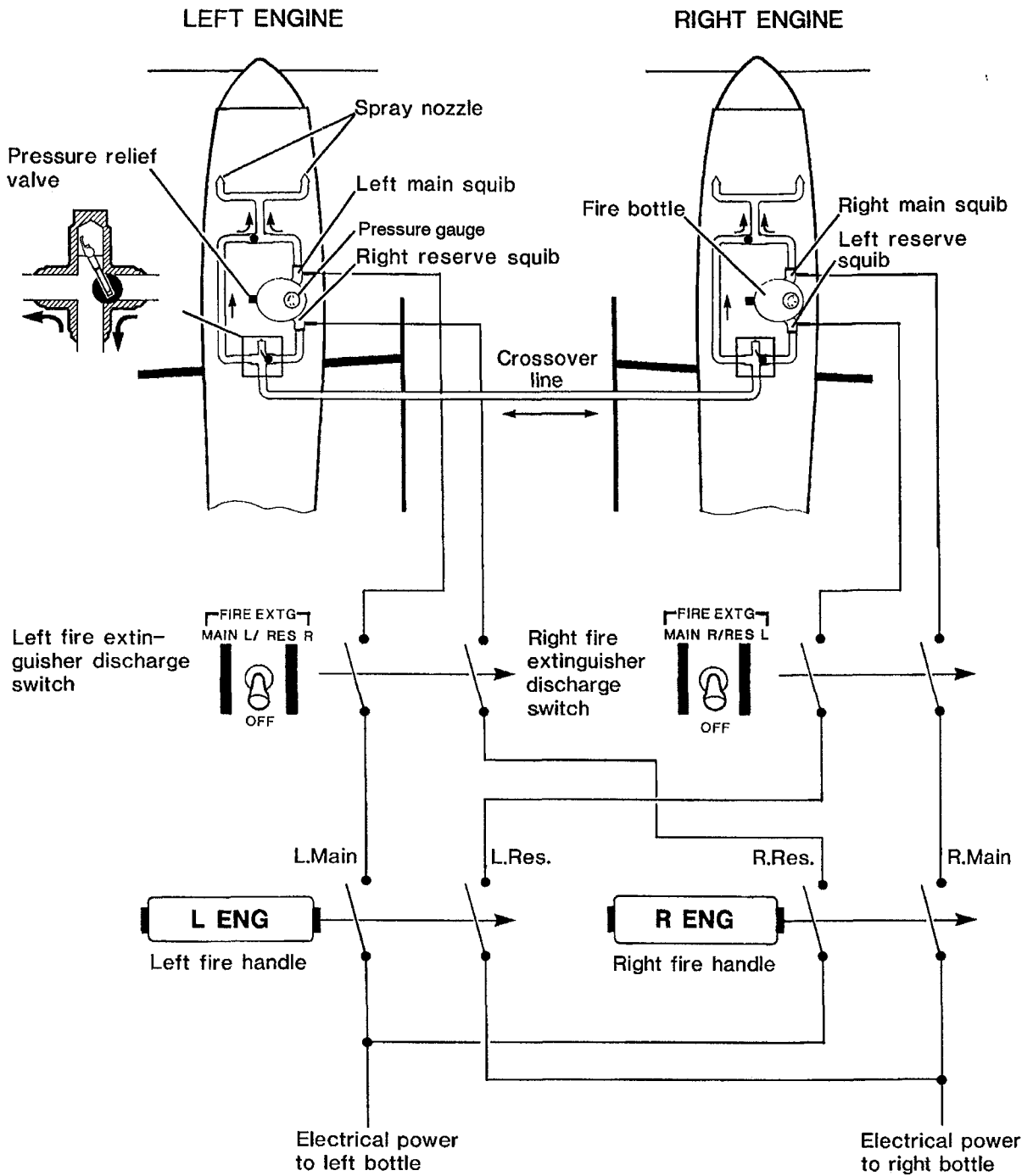
Like the standard system, the extinguisher is discharged in two stages, the first with rapid flooding and the second with a slower regulated flow. The time difference between activation of FIRE EXTG 1 and 2 must therefore be more than 2 minutes to prevent a pressure chock due to two successive flooding discharges.



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FIG. 1. Engine fire protection and exhaust duct overtemperature system.

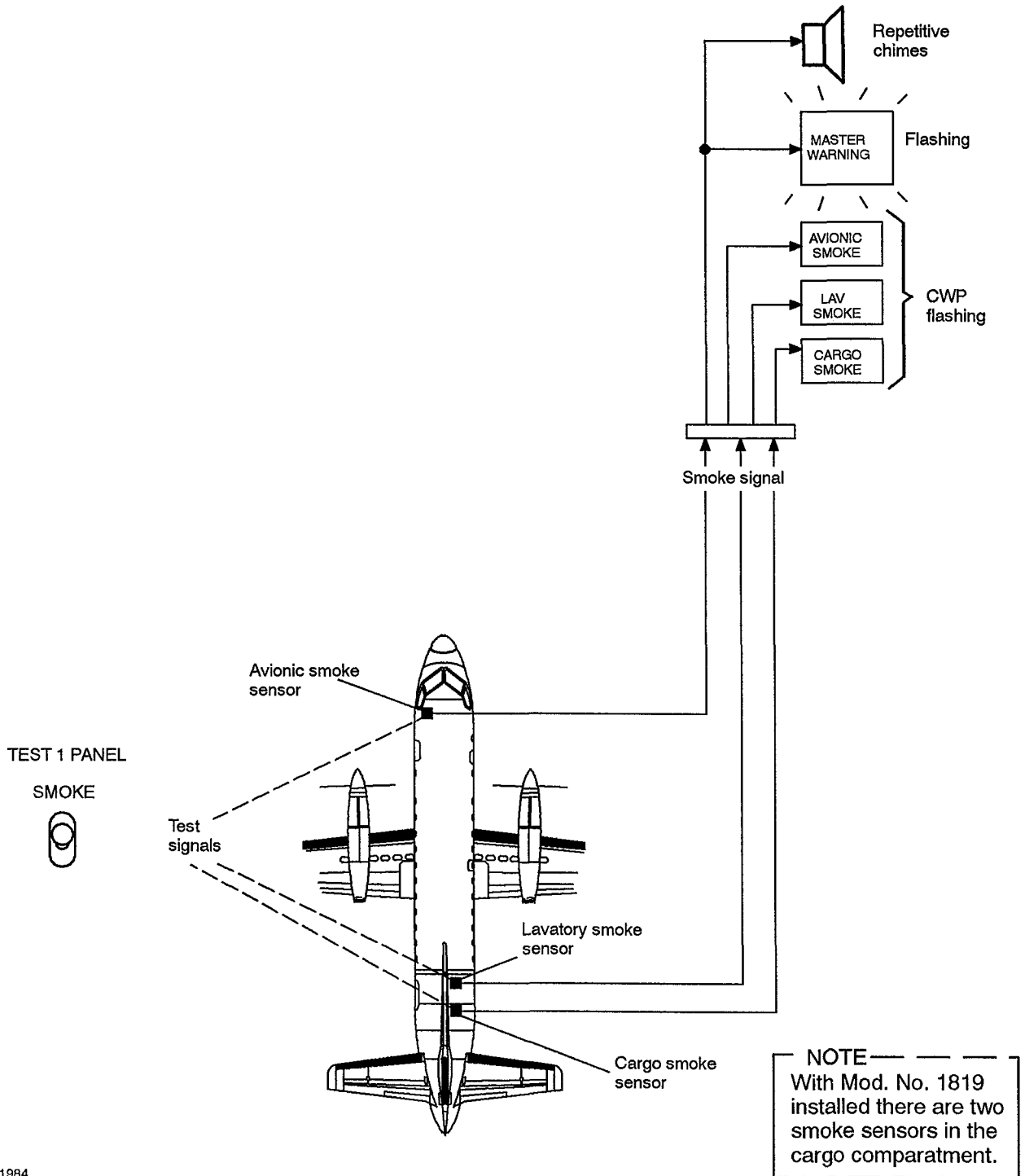
7.1



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FIG. 2. Engine fire extinguishing system.

7.1



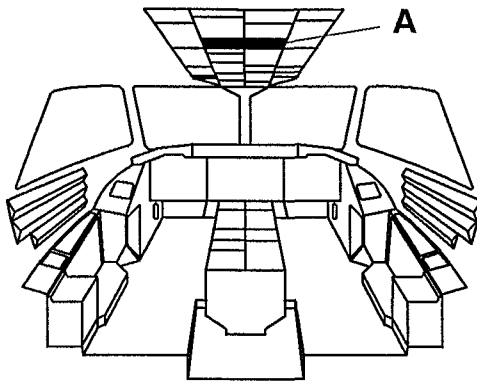
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FIG. 3. Fuselage smoke detection system.

7.1



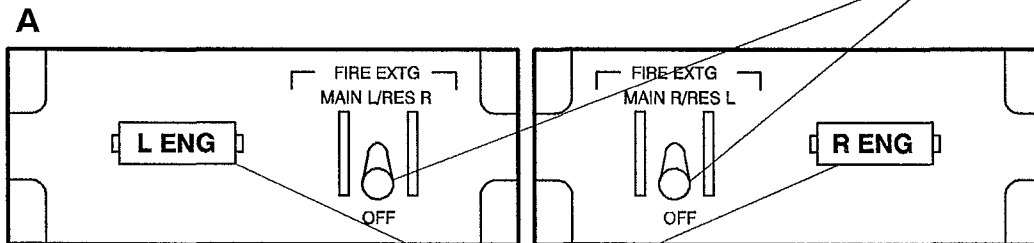
3. CONTROLS AND INDICATORS.



FIRE EXTG discharge switch (2)

When an extinguishing discharge switch is moved from OFF after the engine fire handle has been pulled for the same side, the main extinguishant bottle is discharged to that engine.

When an extinguishing discharge switch is moved from OFF after the engine fire handle for the opposite side has been pulled the bottle on the opposite side of the fire will be discharged through the crossover line into the fire.



Engine fire handle (2)

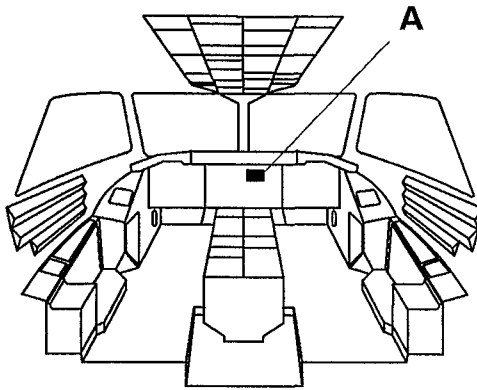
Will come on red when a fire condition occurs and remain on until the fire is out.

When the handle is pulled the following will happen:

- Engine fuel shutoff valve is closed.
- Engine bleed air is closed.
- Start-Gen field relay is open.
- Aural fire warning is shut off.
- Master warning is reset indicated by the master warning lights going out.
- Both main and reserve extinguisher squibs for the engine are armed.
- For right fire handle hydraulic pressure to the propeller brake is shut of. Brake remains engaged and PROP BRAKE warning light comes on.

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FIG. 4. Fire protection – controls and indicators.



L/R ENG FIRE light (red)

Comes on flashing for an engine fire condition. The light will remain on as long as the fire exists.

A CENTRAL WARNING PANEL

	A	B	C	D	
1	L ENG FIRE	AVIONIC SMOKE	LAV SMOKE	R ENG FIRE	1
2	L ENG OIL PRESS	CARGO SMOKE	CABIN PRESS ↓	R ENG OIL PRESS	2
3	L TAIL P HOT	=====	PROP BRAKE	R TAIL P HOT	3
4	=====	AUTO TRIM	CONFIG	=====	4
5	AUTO COARSEN	=====	PITCH TRIM	RUDDER LIMIT	5
6	L FIRE DET FAIL	FUEL ↑	ELEC ↑	R FIRE DET FAIL	6
7	ICE PROT ↑	ENGINE ↑	FLAPS	AIRCOND ↑	7
8	PARK BRK ON	HYDR ↓	EMER LTS UNARMED	OXYGEN	8
9	A-SKID INOP ↓	AVIONICS	AVIONICS VENT	DOORS ↑	9
10	L STALL FAIL	GUST LOCK	PUSHER SYSTEM	R STALL FAIL	10

AVIONIC/LAV/CARGO SMOKE light (red)

A light comes on to indicate a smoke condition in the respective compartment. The light will remain on as long as the smoke condition exists.

L/R TAIL P HOT light (red)

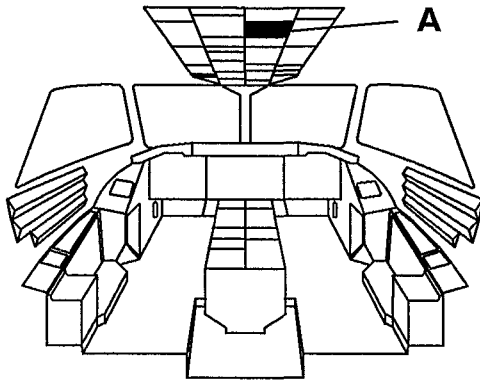
Comes on to indicate a tail pipe overtemperature. The light will remain on as long as there is an overtemperature.

L/R FIRE DET FAIL light (amber)

Comes on flashing to indicate a short circuit in the engine fire detection loop. The light will remain on as long as there is a short circuit.

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FIG. 5. Fire protection – controls and indicators.



Smoke test switch.

When activated, smoke conditions in the avionics compartment, lavatory and cargo compartments are simulated.

The smoke test warnings are:

- MASTER WARNING lights.
- AVIONIC, LAV and CARGO SMOKE lights.
- Repetitive chime.

FIRE test switch.

When held in L or R the integrity of left or right engine fire detection and tail pipe overtemperature system are checked with a simulated warning condition.

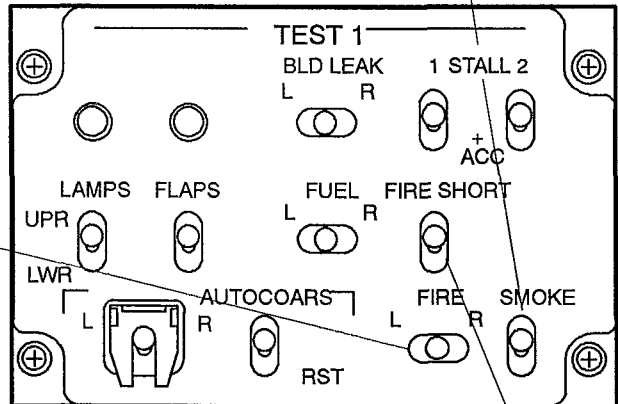
The engine fire test warnings are:

- MASTER WARNING lights.
- L/R ENG FIRE light.
- L/R fire handle light.
- Fire bell.

The additional tail pipe overtemperature test warnings are:

- L/R TAIL P HOT light.
- Repetitive chime.

A TEST 1 PANEL



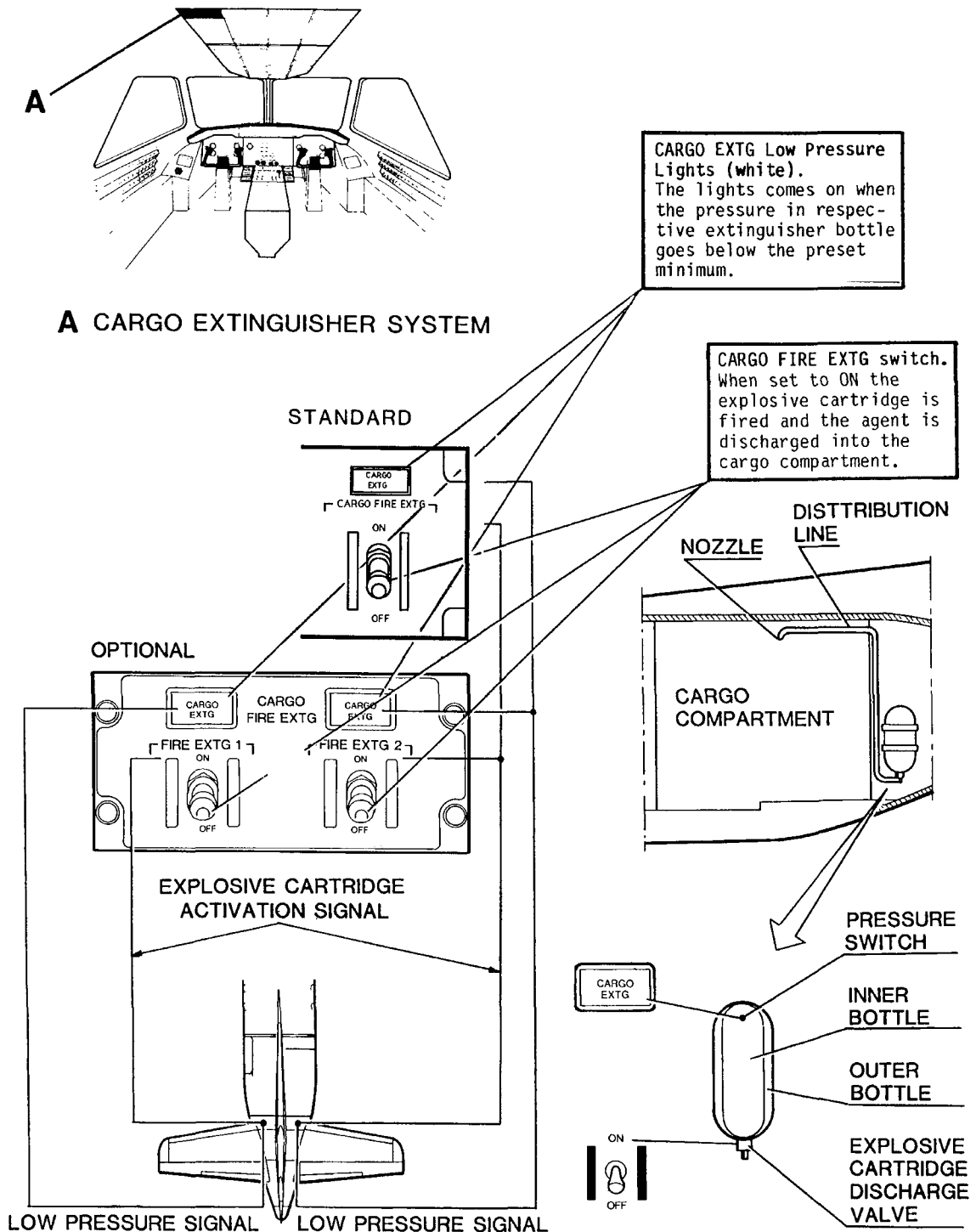
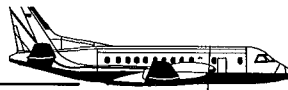
FIRE SHORT test switch.

When activated, a short circuit in both engine fire loops are simulated giving the following warnings:

- MASTER CAUTION lights.
- L and R FIRE DET FAIL lights.
- Single stroke chime.

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FIG. 6. Fire protection – controls and indicators.



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FIG. 7. Fire protection – controls and indicators.



4. ELECTRICAL POWER SUPPLY.

Detection.

Left engine	EMER BUS	E-1	L ENG FIRE
Right engine	EMER BUS	L-1	R ENG FIRE
Left engine tail pipe hot detection	EMER BUS	E-2	L TAIL P HOT
Right engine tail pipe hot detection	EMER BUS	L-2	R TAIL P HOT
Avionic compartment smoke det.	L BAT BUS	E-3	AVION SMOKE
Lavatory/cargo smoke det.	R BAT BUS	L-3	LAV CARGO SMOKE

Fire extinguishing.

L main squib & R reserve squib	L HOT BAT BUS	F-2	L BOTTLE
R main squib & L reserve squib	R HOT BAT BUS	M-1	R BOTTLE
Left engine shutoff control	L HOT BAT BUS	F-3	L ENG SHUTOFF
Right engine shutoff control	R HOT BAT BUS	M-2	R ENG SHUTOFF
Applicable for A/C with <u>one</u> Cargo ext. bottle:			
Cargo ext. bottle discharge	L HOT BAT BUS	F-1	CARGO
Applicable for A/C with <u>two</u> Cargo ext. bottles:			
Cargo ext. bottle 1 discharge	L HOT BAT BUS	F-1	EXT 1 CARGO
Cargo ext. bottle 2 discharge	R HOT BAT BUS	M-8	EXT 2 CARGO



1. LIMITATIONS.

2. NORMAL OPERATION.

CONDITIONS	NORMAL PROCEDURES
<p>2.1 SYSTEM TEST</p>	<ol style="list-style-type: none"> 1. Fire handles & extinguishers CHKD <ul style="list-style-type: none"> - Check both handles to be in and safetied. - Check both extinguisher switches OFF and safetied. 2. CARGO FIRE EXTG discharge switch CHKD <ul style="list-style-type: none"> - Check extinguisher switch OFF and safetied. 3. FIRE test switch L THEN R <ul style="list-style-type: none"> - Hold switch in L and check that: <ul style="list-style-type: none"> ◦ MASTER WARNING lights come on. ◦ L ENG FIRE light comes on. ◦ L TAIL P HOT light comes on. ◦ L ENG fire handle light comes on. ◦ Fire bell sounds. ◦ Repetitive chime sounds. - Hold switch in R and check that the same warnings for right engine comes on. 4. FIRE SHORT test switch HOLD IN UPPER POSITION <ul style="list-style-type: none"> - Hold switch in upper position and check that: <ul style="list-style-type: none"> ◦ MASTER CAUTION lights come on. ◦ L and R FIRE DET FAIL lights come on. ◦ Single stroke chime sounds. 5. SMOKE test switch HOLD IN UPPER POSITION <ul style="list-style-type: none"> - Hold switch in upper position and check that: <ul style="list-style-type: none"> ◦ MASTER WARNING lights come on. ◦ AVIONIC, LAV and CARGO SMOKE lights come on. ◦ Repetitive chime sounds.