G650 Fire Protection System
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The Fire Protection System is about:

1. Detection:
   - **Fire Detection System:**
     - Engine nacelle - temperature sensitive wires
     - APU compartment - helium-filled tubes
   - **Smoke Detection System:**
     - Smoke detectors (optical sensors)
     - Baggage compartment
     - Forward and aft lavatories
   - **Overheat Detection System:**
     - Ten (10) areas monitored by thermal switches
     - Areas monitored and trip points:
       - Bleed air related areas (5) (250°F)
       - Electronic equipment areas (5) (150°F)
**Notification:**

**Crew notification**

- **Fire:**
  - L Engine Fire
  - R Engine Fire
  - APU Fire

- **Smoke:**
  - W
  - Galley Smoke
  - Cabin Smoke
  - Fwd-Aft Lav Smoke
  - Baggage Smoke

- **Overheat condition:**
  - W
  - Red Overheat CAS - 250°F
  - Bleed Air Related
  - W
  - Amber Overheat CAS - 150°F
  - Electrical Related
③ Fire fighting:

- Engine and APU fire bottles:

  L ENGINE FIRE  R ENGINE FIRE

  R Fire Bottle Discharge
  L/R Fire Bottle Discharge

  Disch 1
  2 1
  APU

  Disch 2
  2 1
  APU

  FIRE EXT DISCHD

  Press to discharge
Smoke Evacuation:

- Portable Fire Bottles:
  - Halon x 3
  - Water x 1
  - PBE x 2
- Dual loop Fire Detection System
- Each engine has two (2) fire loops - A and B

<table>
<thead>
<tr>
<th>L ENG</th>
<th>R ENG</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOOP A</td>
<td>LOOP A</td>
</tr>
<tr>
<td>LOOP B</td>
<td>LOOP B</td>
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</tbody>
</table>

- A loop is a temperature-sensitive wire
- It can be routed - looped - throughout the engine nacelle
- Each loop sends raw data to the Fire Detection Control Unit (FDCU)
- The FDCU determines whether a loop is faulty, failed, or sensing an actual fire
- A faulty/failed loop can be deselected. The system can then operate as a single loop system
- Requires L ESS DC and R ESS DC to operate
- Comprised of a series of detector segments/elements
- Temperature sensitive wires are routed throughout the engine nacelle

- Semi conducting glass/oxide material

- Coaxial center wire

- Outer sheath

- The stainless steel sheath covers the temperature sensitive semi conducting glass and coaxial center wire

- As temperature increases the resistance around the center wire decreases

![](image)

[Graph showing the relationship between Resistance and Temperature]
The two (2) FIRE DETECTION CONTROL UNIT (FDCU) are the brains of the system.

- Raw data input
- Receives and processes data
- Determines loop condition/status
- Then notifies crew via CAS message

- Loops A/B:
  1. Fault,
  2. Failed, or
  3. FIRE

**C** Fire Detection Loop Fault  **C**

**W** Engine Fire Loop Alert  **W**

**R Engine Fire**
Engine Fire Extinguishing System

- Available any time the buses are powered

- The system has two (2) identical single-shot fire extinguishing bottles

  L bottle = Disch 2  
  R bottle = Disch 1

- The bottles are located in the tail compartment

- Each bottle contains extinguishing agent under high pressure (non-toxic, non-corrosive)

- In the event of overpressure the extinguishing agent is vented into the tail compartment

- The bottles can be discharged into the engine nacelle by the crew via the Fire Handles

- Upon discharge a CAS is displayed
- Each engine has its own **Fire Handle**

- **Pulling a Fire Handle:**

  1. Shuts off fuel at the tank
③ Shut off Hydraulic fluid downstream from reservoir

Shut off Valve
Closed

Shut off Valve
Open

③ Trips the IDG

L Bus Tie

R Bus Tie

L MAIN AC

Emergency AC Bus

R MAIN AC
Fire handles, when rotated, can discharge one or both bottles/shots.

- L bottle: Either engine
  - APU

- R bottle: Either engine

- Left engine: L bottle
- Right engine: R bottle
- APU: FIRE EXT DISCHD
Rotating the **Fire Handle** outwards discharges

Shot 1

L Engine Fire  R Engine Fire

R Fire Bottle Discharge

Disch 1

APU

Disch 1

APU
- Rotating the **Fire Handle** **inwards** discharges shot 2

**L Engine Fire**

**R Engine Fire**

**L Fire Bottle Discharge**

Disch 2

APU

inwards

2
ENGINE FIRE TEST

1. IT TESTS THE FIRE DETECTION SYSTEM FOR EACH ENGINE

2. If a loop does not illuminate it is because there is:
   - AN OPEN LOOP, OR
   - NO CONTINUITY, OR
   - A DEFECTIVE FIRE DETECTION CIRCUIT

3. "Good TEST, good ENGINE." ✓
   "Bad TEST, bad ENGINE." ×

4. When pressed the following lights illuminate:

   (Similarly for left engine)
   Two (2) OVERHEAD LIGHTS

   Two (2) CAS MESSAGES

   Two (2) MASTER WARNING LIGHTS

   FIRE HANDLE

   FUEL CONTROL SWITCH

   R ENG
   LOOP A
   LOOP B

   ENGINE FIRE LOOP ALEAT
   R ENGINE FIRE

   W W

   R
   Run off
Engine Fire Fault Test

1. It tests the fire detection fault system, not the loops.

2. When the switchlight is pressed in and held the following lights illuminate:
   - Five (5) overhead lights
   - One (1) CAS message
   - Two (2) master caution lights

3. A faulty loop can be deselected.
- The APU is enclosed in a titanium case capable of sustaining a fire for fifteen (15) minutes. Beyond this period, damage to other systems will occur.

- The APU Overheat/Fire Detection System consists of a hermetically sealed Helium-filled tube secured to the top of the APU enclosure.

- As the temperature inside the enclosure increases, the gas in the tube expands and the pressure increases.

![Graph showing pressure vs. temperature with a pressure sensor trigger point marked]
APU Fire Extinguishing System

- APU is enclosed in a fireproof Titanium case
- APU Fire Extinguishing System is powered by the L'ESS DC bus (down to main batteries)

![Diagram of APU fire extinguishing system]

- Press to discharge
- In the event of an engine fire the Right bottle/shot is used first. This saves the other bottle for the APU.

- APU **FIRE** TEST=
  
  Two (2) overhead lights
  
  Two (2) CAS messages
  
  Two (2) master warning lights
  
  Two (2) master caution lights

  Exterior aural warning "Fire Bell" (Ground) only

After the APU **FIRE** TEST ensure the following CAS message is not displayed:

1. Fire Bottle Discharge
In the event of an APU FIRE, the ECU will auto shutdown the APU. The QRH will direct the crew to:

1. Select APU switchlight to OFF
2. Press the APU switchlight to fire the bottle and discharge extinguishing agent into the APU.

Uses L Fire bottle.

L Fire bottle no longer available to engines.

[Diagram of APU fire protection system]
SMOKE EVACUATION

An emergency smoke evacuation valve allows for smoke in the baggage compartment to be vented overboard. The valve inlet, located in the ceiling, extracts smoke by depressurizing the baggage compartment. This deprives it of oxygen.
Smoke in the cabin can also be vented overboard by partially opening the internal baggage door.
With the Emergency Smoke Evacuation Valve closed the Vent Valve can be reset and the baggage compartment repressurized.
Questions, comments or errors...please send me an email: ivan@code7700.com

Thank you!