CHAPTER 8
FIRE PROTECTION

INTRODUCTION

This chapter describes the fire protection system on the Citation Mustang aircraft. The engine fire-detection system consists of two separate detection circuits (one for each engine), which provide visual warnings. The engine fire-extinguishing system includes one fire bottle, which is activated from the cockpit. A portable fire extinguisher is in the cabin.

GENERAL

The fire-*protection* system consists of engine fire detection, engine fire extinguishing, a portable fire extinguisher, and aircraft construction that reduces a fire risk. The engine fire-*detection* system detects fires and overheat conditions in the engine nacelles and alerts the crew. The engine fire-*extinguishing* system suppresses those fires upon pilot command by supplying fire-extinguishing agent.

Fire suppression in the cabin area is accomplished using a portable fire extinguisher.

For additional protection, the engine nacelle fire zone is separated from the pylon and the rest of the aircraft by a stainless steel firewall. At the firewall penetrations and in the nacelle, fuel is contained in stainless steel fittings, stainless steel tubes, and fire-resistant hoses.

The rotary TEST knob on the instrument panel is used to test the fire warning system.

DESCRIPTION

ENGINE FIRE DETECTION SYSTEM

The engine fire-detection system consists of:

- Fire-detection loop
- Pressure sensor
- Red L and R ENGINE FIRE lights

Excessive heat by fire or other heat sources expands inert gas inside the fire-detection loop. The expansion of gas closes a pressure switch that sends a signal to illuminate the left or right ENGINE FIRE light.

The fire-detection system requires DC power. FIRE DETECT circuit breakers for the independent sides are on the left and right CB panels within the ENGINE SYSTEMS grouping.

ENGINE FIRE-EXTINGUISHING SYSTEM

The single bottle engine fire-extinguishing system enables the flightcrew to suppress a fire in the left or right engine compartment. This action is limited to one use.

The engine fire-extinguishing system consists of:

- Engine fire bottle assembly
- Distribution tubes
- Nozzles in each engine nacelle
- BOTTLE ARMED lights
- Fuel shutoff valve and generator disconnect

These components shut off the generator and fuel supply as well as discharge extinguishing agent, which is pressurized with nitrogen and discharged by electrically activated cartridges to the engine nacelles.

PORTABLE FIRE EXTINGUISHER

A portable fire extinguisher provides fire protection inside the aircraft.

COMPONENTS

FIRE DETECTION LOOP

Each fire detection loop detects a fire or overheat condition in the respective engine compartment (Figure 8-1). The tube routes along both sides of the engine.

An increase in temperature on any part of the tube increases the pressure of the gas (helium) inside the tube.

If the tube develops a leak, normal pressure vents and closes the test pressure switch; this is indicated by L and R ENGINE FIRE lights not illuminating when the rotary TEST knob is placed in the FIRE WARN position.

PRESSURE SENSOR

A pressure sensor is at the end of the fire-detection loop. When the loop is heated by fire or a bleed-air leak, the gas in the tube expands, activating the pressure sensor. This produces an electrical signal that provides a warning to the flightcrew. The signal is in the form of:

- L or R ENGINE FIRE lights
- MASTER WARNING lights

ENGINE FIRE BOTTLE ASSEMBLY

The engine fire bottle (with two squibs) is in the tail compartment. It can be used to extinguish a fire in either engine nacelle (Figure 8-2). The fire bottle contains enough extinguishing agent to protect against one engine fire (0.85 pound of Halon 1301 extinguishing agent).

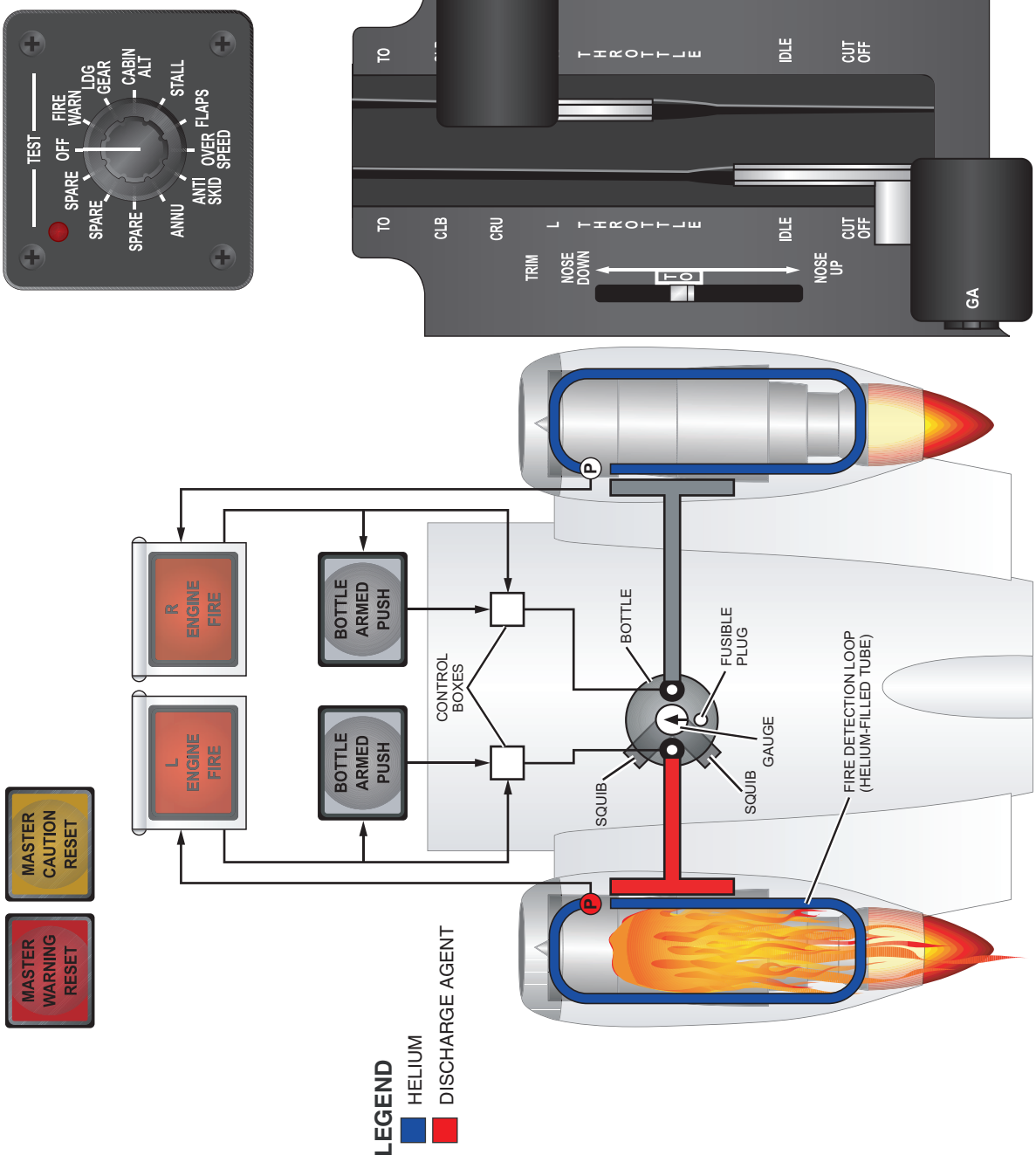

Figure 8-1. Engine Fire-Detection and Extinguishing System

Figure 8-2. Engine Fire Bottle

Figure 8-3. Portable Fire Extinguisher

The fire-extinguisher bottle contains two individual firing cartridges (squibs). The cartridges are connected to distribution tubes that are routed to the left and right engine compartments. The bottle has a safety relief valve that thermally relieves (discharges) its contents into the tail cone if the internal bottle temperature rises above 210°F.

FUEL SHUTOFF VALVE AND GENERATOR DISCONNECT

The firewall shutoff valve closes and electrical flow from the generator is stopped when an illuminated ENGINE FIRE light is pushed. An amber F/W SHUTOFF L-R message in the crew alerting system (CAS) window indicates that the fuel shutoff valve is fully closed. When the generator is disconnected, the respective GEN OFF message appears in the CAS window.

PORTABLE FIRE EXTINGUISHER

One portable handheld fire extinguisher is in a drawer in the cabinet behind the pilot (Figure 8-3). It is accessible from either the pilot, copilot, or passenger positions. The Halon 1301 type extinguishing agent discharges as a vapor with no residue or decrease in vision to personnel. The discharge distance is approximately 9–15 feet with a discharge time of 10 seconds.

CONTROLS AND INDICATIONS

ENGINE FIRE LIGHTS

Red L and R ENGINE FIRE lights are on the upper part of the center instrument panel (Figure 8-4). They respond to signals from the respective engine fire sensors. Each light is covered by a spring-loaded, transparent plastic guard and has an integral pushbutton switch.

If the red L and/or R ENGINE FIRE light illuminates steady, it indicates a fire or overheat condition in the corresponding engine.

MASTER WARNING LIGHTS

The MASTER WARNING lights are on the instrument panel above each primary flight display (PFD). The MASTER WARNING lights illuminate flashing when the L or R ENGINE FIRE lights illuminate. The pilot acknowledges by pressing one of the MASTER WARNING lights. Pressing will extinguish both lights.

WHITE BOTTLE ARMED LIGHTS

A white BOTTLE ARMED light is below each red ENGINE FIRE light on the upper-center panel (Figure 8-4). Each BOTTLE ARMED light has an integral pushbutton switch.

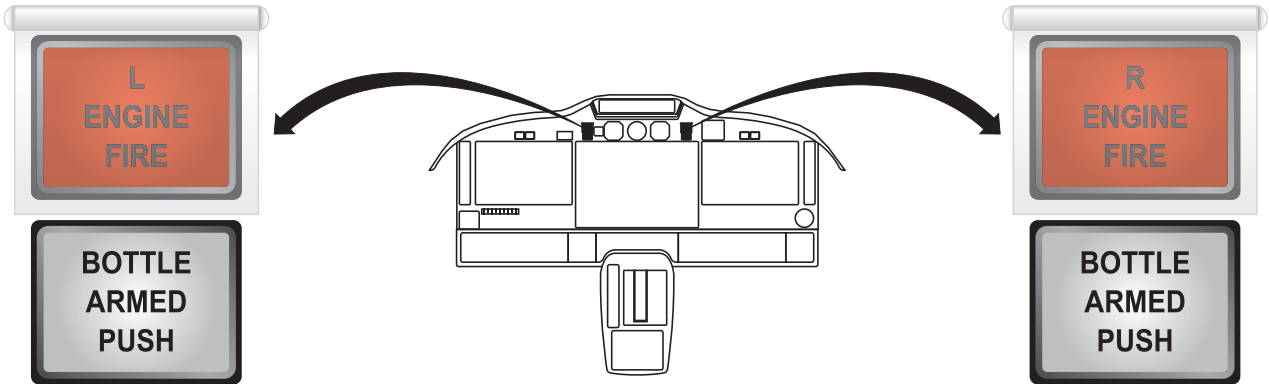

Figure 8-4. ENGINE FIRE and BOTTLE ARMED Lights

These lights indicate when the bottle is armed for the respective engine and prepared to release extinguishing agent. After the extinguishing agent is released, the light extinguishes, indicating to the crew the extinguisher bottle is empty and is no longer available for use.

CAS MESSAGES

GEN OFF L-R

When either of the ENGINE FIRE lights are pushed, the respective amber GEN OFF message appears in the CAS window.

F/W SHUTOFF L-R

When either of the ENGINE FIRE lights are pushed, the respective amber F/W SHUTOFF message displays in the CAS window. This indicates that the corresponding fuel shutoff valve is closed.

OPERATION

PREFLIGHT

Rotary TEST Knob

Test the engine fire-detection system before each flight by using the rotary TEST knob (Figure 8-5) during the preflight inspection. This test verifies connections to the fire bottles and warning system. Illumination of both ENGINE FIRE lights is an indication the warning system is working properly.

NOTE

A successful test of the fire-detection system using the rotary TEST knob, or illumination of either BOTTLE ARMED light, does not confirm that the fire bottle is serviced and full. This can only be confirmed by a visual check of the bottle gauge and comparing the reading to a placard that correlates the acceptable pressure/temperature ranges.

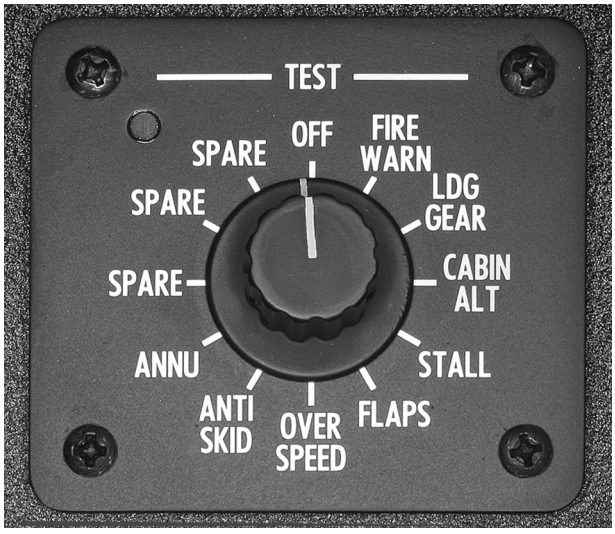

Figure 8-5. Rotary TEST Knob

Portable Fire Extinguisher

During preflight, check that the portable fire extinguisher is serviced and secure. Verify that the pressure gauge on the extinguisher indicates in the green arc and that the extinguisher is secure in its drawer behind the pilot seat.

Engine Fire Bottle Inspection

An inspection door is in the aft compartment to view the fire bottle gauge. A placard is on the back of the door. Check that the gauge pressure matches the acceptable ranges based on outside air temperature (OAT). Refer to the *Normal Procedures Checklist.*

IN FLIGHT

Refer to approved *Airplane Flight Manual (AFM)* checklist. Pushing the L ENGINE FIRE or R ENGINE FIRE light:

- Provides power to the fuel shutoff valve, which cuts off the fuel supply to the affected engine. The amber F/W SHUT-OFF L-R message appears in the CAS window.
- Disconnects the starter-generator on the affected engine. The amber GEN OFF L or R message appears in the CAS window.
- Arms the engine fire bottle squib (explosive cartridge) that routes extinguishing agent to the selected engine. However, the bottle contents do not yet discharge into the engine. (The corresponding white BOTTLE ARMED light illuminates.)

The BOTTLE ARMED light illuminates to indicate the fire bottle is armed and ready to supply fire-extinguisher agent to the affected engine. Push the illuminated BOTTLE ARMED light to release the agent into the engine and cowling area to extinguish the fire. The single fire bottle is fully released to extinguish the fire.

CAUTION

The white BOTTLE ARMED light does not illuminate (and cannot operate) until *after* the corresponding red L or R ENGINE FIRE light has been pressed.

NOTE

If a crewmember presses the *other* BOTTLE ARMED light, which is *not* illuminated, the fire bottle does not discharge, and no extinguishing occurs.

When the pilot pushes the illuminated white BOTTLE ARMED light, the light extinguishes.

Portable Fire Extinguisher

CAUTION

If smoke or fire is present, immediately don oxygen masks and smoke goggles, and set oxygen to 100%. Ensure that passengers have supplemental oxygen.

To operate the portable fire extinguisher, open the top cabinet drawer and remove extinguisher, hold the extinguisher upright, and aim the extinguisher at the base of fire. Using the attached ring, pull the pin from the extinguisher.

Squeeze the handles of the extinguisher together to release the extinguishing agent. Spray the extinguishing agent using a side-to-side motion while aiming at the base of the fire.

Anytime the extinguisher is used, even partially, maintenance is required before further dispatch.

EMERGENCY/ ABNORMAL

For specific information on emergency/abnormal procedures, refer to the appropriate abbreviated checklists or the FAA-approved *AFM*.