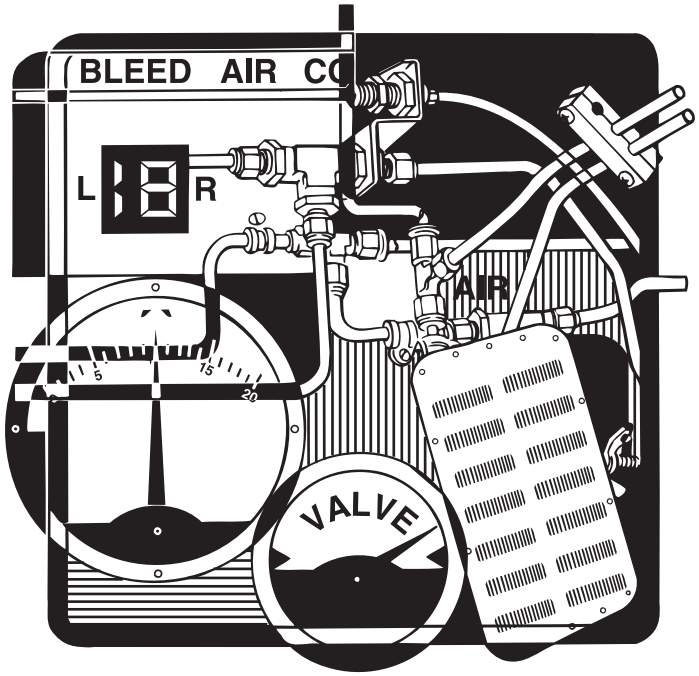
CHAPTER 9
PNEUMATICS



INTRODUCTION

This chapter describes the pneumatic systems on the Citation Mustang aircraft. The pneumatic systems route air or nitrogen from various sources to aircraft systems that use pneumatics for heating, cooling, pressurization, landing gear, and brakes. Because each of the Mustang pneumatic systems is dedicated to a specific purpose, this chapter provides a brief overview of each system, then refers the reader to the appropriate chapter elsewhere in this manual.

GENERAL

The Mustang pneumatic systems are each discrete systems, dedicated to a specific task, and isolated from all other pneumatic systems. The Mustang pneumatic systems (Figure 9-1) include:

- Bleed air from engine compressors (outboard bleed-air port on each engine) for pneumatic ice-protection systems
- Bleed air from engine compressors (inboard bleed-air port on each engine) for temperature-controlled pressure vessel air supply
- Compressed nitrogen from the storage bottle for emergency landing gear extension (blow-down bottle)
- Compressed nitrogen from the storage bottle for emergency brakes (emergency braking bottle)

Each of these systems is independent of the others and can function when any other pneumatic system fails. Single-engine operation can normally maintain all required pneumatic system functions. However, loss of DC power can cause complete or partial failure of multiple systems. Compressed nitrogen pneumatic systems are not dependent upon engine operation or DC power.

Safety devices in each pneumatic system prevent excessive pressure. Each system has its own controls. All systems are controlled directly or indirectly by pilot command. Indications for the compressed nitrogen systems are in the nose baggage compartment. Indications for all other pneumatic systems are displayed in the engine indicating and crew alerting system (EICAS) in the cockpit displays.

DESCRIPTION

BLEED-AIR DISTRIBUTION

High-temperature engine bleed air is extracted from the high-pressure compressor section of each engine and routed through two separate ports. The outboard port on each engine supplies bleed air for ice protection. The inboard port supplies bleed air for the temperature-controlled pressure vessel air supply.

From separate engine bleed-air ports, the bleed air enters ducts to the ice protection system and pressure vessel air supply. Check valves prevent flow (in any of the ducts) from reversing and entering an engine, including any crossover flow from the opposite engine.

Ice Protection

The outboard port supplies bleed air for ice protection. It supplies hot engine bleed air:

- Directly to the respective engine anti-ice system
- Through a service air regulator to the aircraft pneumatic deice boot system

Engine Anti-Ice System

Bleed air for each engine anti-ice system is routed to the leading edge of the engine inlet through a valve. The hot bleed air warms the leading edge as it passes through, then exits overboard through an opening in the bottom of the engine nacelle. The engine anti-ice system is explained in Chapter 10—"Ice and Rain Protection."

Surface Deice (and Service Air) System

Bleed air for the surface deice system is routed to the service air regulator for operation of pneumatic deice boots. Refer to Chapter 10—"Ice and Rain Protection."

Pressure Vessel Air Supply

Hot, high-pressure bleed air supplies air for temperature control and pressurization. The bleed air from the inboard bleed-air port on each engine is routed through a heat exchanger in the respective engine pylon. The heat exchanger dissipates heat from the bleed air to the metal ducts of the heat exchanger. Cooler outside ram air from the pylon ram-air inlets

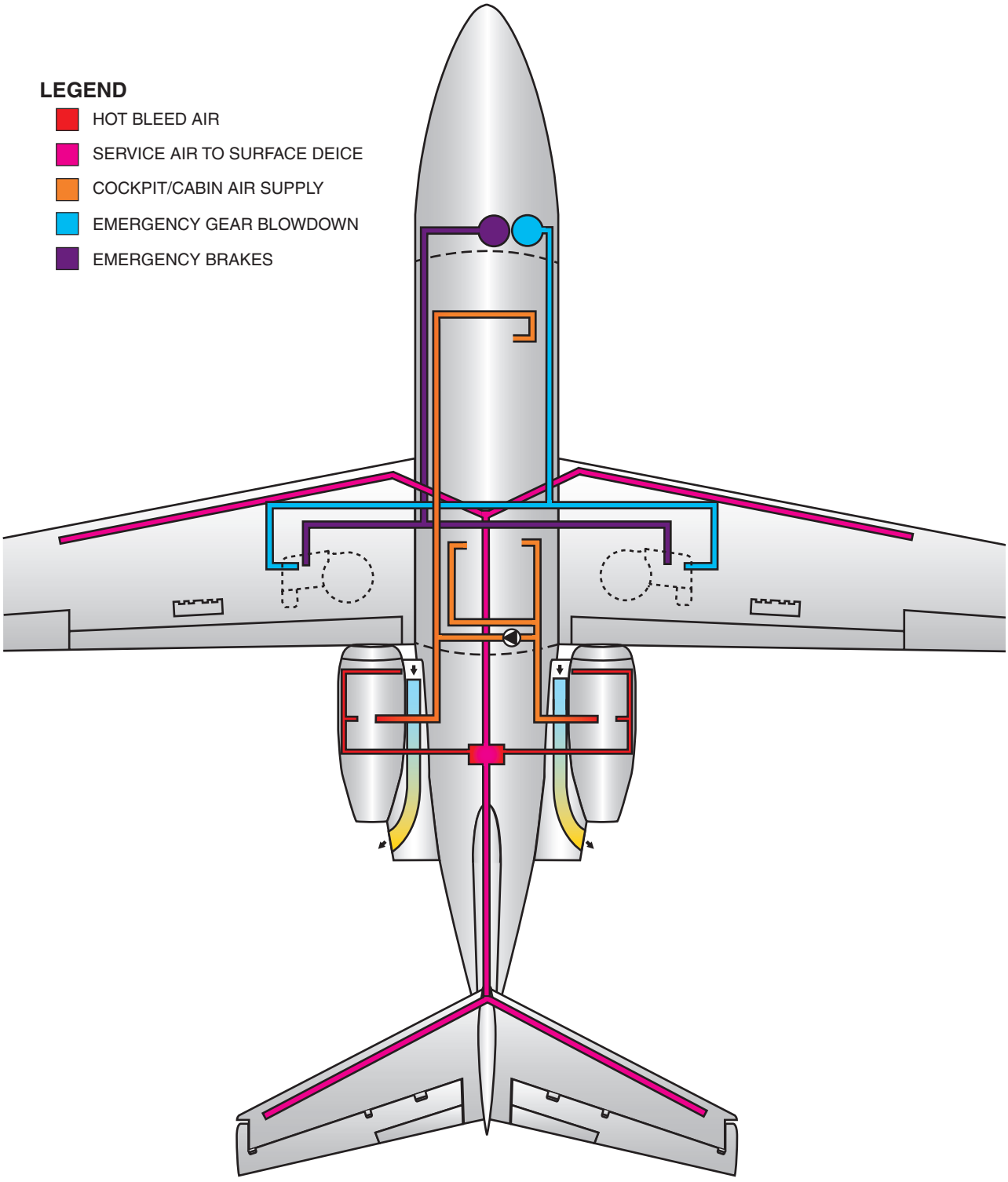


Figure 9-1. Mustang Pneumatic Systems

passes over the heat exchanger ducts and carries the heat away. The temperature of the pressure vessel air supply is regulated by a valve, which varies the amount of pylon ram air flowing over the heat exchangers.

The cooled, pressurized bleed air enters the pressure vessel through a set of valves. Pressure regulating shutoff valves (PRSOVs) ensure that a constant bleed-air pressure is maintained regardless of engine power settings. Flow control valves adjust flow to compensate for single-engine operation. The inboard bleed air from both engines supply temperature-controlled bleed air directly to the pressure vessel. Pressure vessel air supply is discussed in more detail in Chapter 11—"Air Conditioning."

The pressure vessel air supply exhausts overboard through nominal leakage in the cabin and through controlled venting by outflow valves in the aft cabin pressure bulkhead. The outflow valves are controlled by the pressurization system to maintain adequate cabin pressure at all altitudes. The pressurization system is explained in detail in Chapter 12—"Pressurization."

COMPRESSED NITROGEN BOTTLES

Separate bottles of pressurized nitrogen supply emergency pneumatic power for emergency landing gear extension and emergency braking.

Landing Gear Emergency Extension (Blow-Down)

An independent emergency pneumatic system uses pressurized nitrogen in a bottle for emergency landing gear extension (blow-down). The high-pressure nitrogen bottle is attached to the right forward bulkhead inside the nose baggage compartment. Emergency gear extension is pilot-activated with the AUXILIARY GEAR CONTROL handle. This system is explained in Chapter 14—"Landing Gear and Brakes."

Emergency Brakes

An independent emergency pneumatic system uses pressurized nitrogen in a bottle for emergency braking. The high-pressure nitrogen bottle is attached to the right forward bulkhead inside the nose baggage compartment. Emergency braking is pilot-activated with the EMERGENCY BRAKE handle. This system is explained in Chapter 14—"Landing Gear and Brakes."