

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



DCA24LA330

SYSTEMS

Specialist's Factual Report

October 20, 2025

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A ACCIDENT

Location: Kenner, LA
Date: December 20, 2023
Time: 1414 central standard time
2014 coordinated universal time
Airplane: Boeing 737-8

B SYSTEMS SPECIALIST

Specialist Rob Wansker
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C SUMMARY

After takeoff, at 1000 ft, the airplane ingested a bird into the left engine. The airplane started vibrating excessively and the left engine had an over-temperature warning. The flight deck filled with smoke. The crew declared an emergency and performed memory items for smoke/fumes. The crew also ran the Quick Reference Handbook procedure for Engine Separation Severe Damage. The crew coordinated with Air Traffic Control for a return to MSY. The airplane landed on runway 11 with the left engine shut down. Aircraft rescue and firefighting responded, examined the airplane, and the airplane was able to taxi on its own power to the gate.

D 737-8 MAX BLEED AIR SYSTEM DESCRIPTION

The environmental control system (ECS) controls outside air flow for airplane pressurization and ventilation, flight compartment and passenger cabin temperature, and additionally filters and recirculates cabin air for ventilation. The air distribution system distributes outside air mixed with filtered, recirculated air. Left and right recirculation fans with high efficiency particulate air (HEPA) filters recirculate approximately 50 percent of the cabin air for ventilation purposes. Air constantly flows in and out of the cabin, and continuously exits the airplane through an outflow valve in the aft section of the airplane. Bleed air from the engines provides the outside air used by the ECS. Engine bleed air comes from the 4th and 10th stages of the high pressure compressor. A High Pressure Shutoff Valve (HPSOV) controls the flow of 10th stage bleed air. An Intermediate Pressure Check Valve (IPCV) prevents reverse flow into the 4th stage.

At high engine speed, the HPSOV closes, and only the 4th stage supplies bleed air. At low engine speed, 4th stage air is not sufficient for the pneumatic system

demands, and the 10th stage supplies bleed air. The Integrated Air Systems Controller (IASC) controls the HPSOV with inputs from the Intermediate Manifold Pressure (PI) sensor. Fan air from the engine is used by a precooler to cool engine bleed air temperature from the 4th and 10th stages before it goes to the cooling packs.

The left and right cooling pack systems control the temperature of engine bleed air before it flows into the air distribution system. Typical control of temperature in the system is dictated by the zone (flight deck, forward cabin, or aft cabin) requiring the most cooling, and then the system mixes engine bleed air to achieve the desired temperature in each zone. Conditioned air from the left cooling pack (supplied by bleed air from the Number 1 engine) flows directly to the flight deck. Excess air from the left cooling pack, air from the right cooling pack (supplied by bleed air from the Number 2 engine), and air from the recirculation system is combined in the mixing manifold and distributed through the left and right sidewall risers to the passenger cabin (see Figure 1). In failure conditions (such as trim valves failing open), the system will prioritize the flight deck.

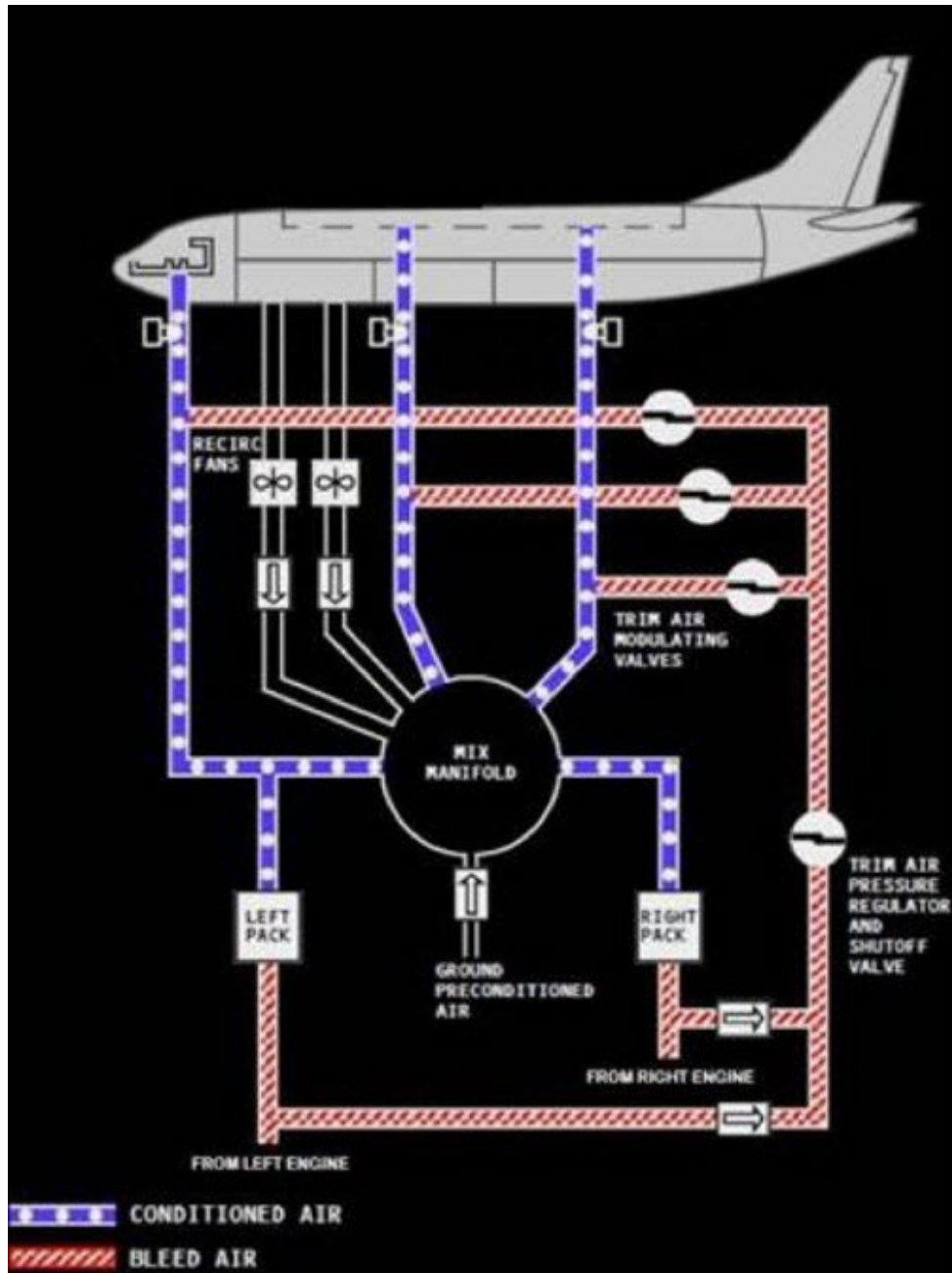


Figure 1. Air Distribution System. (Courtesy of Boeing)

Each engine has an engine bleed pressure regulating shutoff valve (PRSOV) (see Figure 2). The PRSOV is normally controlled by the IASC with inputs from the manifold pressure sensor and manifold temperature sensor. When the engine bleed PRSOV closes, the engine bleed manifold pressure will be lost on the affected side, and the affected air conditioning pack flow control and shutoff valve will move to the closed position.

The PRSOV can also be commanded closed, independent of the IASC, through the Air Conditioning Accessory Unit (ACAU) that contains a PRSOV enable/disable relay. This relay closes the PRSOV when any of the following occur:

- The engine running relay is de-energized. [This occurs when the engine spools down to < 62% N2 (minimum core speed) or the engine start lever is moved to CUTOFF when the engine fire handle is not pulled].
- The engine fire handle is pulled.
- The bleed switch is selected OFF.

Relays in the ACAU can also close the PRSOV during non-normal conditions such as:

- When the DUAL BLEED light illuminates (indicating possible reverse flow and backpressure of the APU by the engines).
- When the BLEED light illuminates (over-temperature, over-pressure, or under-pressure bleed trip conditions).
- Certain IASC failures and bleed system sensor failure conditions.

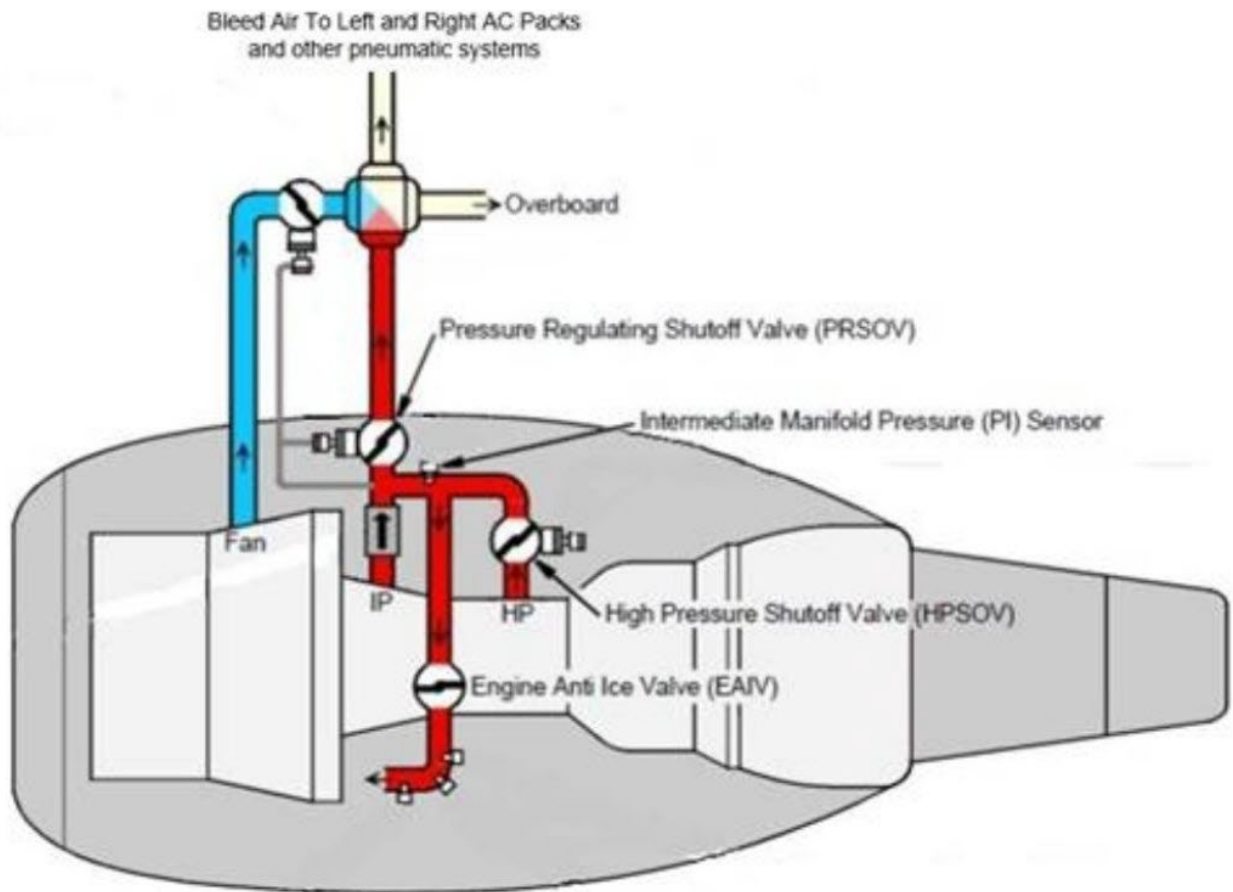


Figure 2. Engine Bleed Air System. (Courtesy of Boeing)

Submitted by:

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