

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



CEN24LA145

EXHAUST & CABIN HEAT SYSTEM EXAMINATION SUMMARY

May 2, 2024

A. ACCIDENT

Location: Alpine, Arkansas
Date: April 2, 2024
Time: 1056 CDT
1556 UTC
Airplane: N86UM, Mooney M20E, S/N 1137

B. EXHAUST & CABIN HEAT SYSTEM EXAMINATION SUMMARY

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C. SUMMARY

A follow-up examination was conducted with FAA at Dawson Aircraft in Clinton, Arkansas, May 1, 2024. The examination consisted of both a visual and teardown inspection of the exhaust and cabin heat system. The examination revealed a pin hole in the exhaust, cracked weld on the exhaust pipe, scorched cabin heat inlet tube, separated cabin heat air valve, and unapproved cabin heat system parts.

D. DETAILS OF THE EXAMINATION

1.0 Exhaust System

This Mooney M20E is equipped with a Hanlon & Wilson Engine Exhaust System that consists of a single muffler, heat shroud, and exhaust pipe. Visual inspection shows the exhaust system was still properly attached to the engine with crush damage and bending in the aft direction of the exhaust pipe. The exhaust pipe bend was at an existing repair weld. Partial separation of the exhaust pipe at the muffler flex fitting was also observed.



Figure 1. Exhaust System as removed.

The exhaust system was removed at the cylinder exhaust tube flex fittings for teardown of the muffler and inspection of the exhaust pipe repair weld. The muffler cabin heat shroud was in good condition with one area of exhaust blowby. The air inlet scat tube was in good condition and properly attached to the air intake and heat shroud.



Figure 2. Muffler Cabin Heat Shroud with area of exhaust blowby.

The heat shroud cabin air outlet scat tube was properly attached to the heat shroud outlet and cabin [heat] air cover assembly, P/N 640047-501. The tube had an area of scorched and missing material that was located at the exhaust pipe repair weld. The tube had engine oil and exhaust sooting present on both the exterior and interior of the damaged area.



Figure 3. Damaged scat tube.

The muffler was in good condition with one pin hole located along the edge of a weld.



Figure 4. Pin hole in muffler.

The exhaust pipe had a repair weld located about five inches from the muffler flex fitting. The weld contained multiple cracks and holes with engine oil penetration and exhaust sooting. This weld was also located at the damaged area of cabin heat scat tubing.



Figure 5. Exhaust repair weld

2.0 Cabin Heat System

The cabin heat system consists of an inlet scat tube from the muffler heat shroud that is connected to a Cabin [heat] Air Cover Assembly, P/N 640047-501. The cover assembly is attached to the engine side firewall and contains a simple lever with an attached Valve Plate, P/N 640047-11, that functions as the cabin heat on/off valve. Behind the cabin air cover and valve is a Junction Box Assembly, P/N 640014-507, located on the cabin side of the firewall. The junction box receives both cabin heat from the cabin air cover (Index #4) and fresh air (Index #24) from an outside air scoop assembly. The mixed cabin air is then routed through three separate scat ducts (Index #14, 19 & 20) and an air deflector (Index #3).

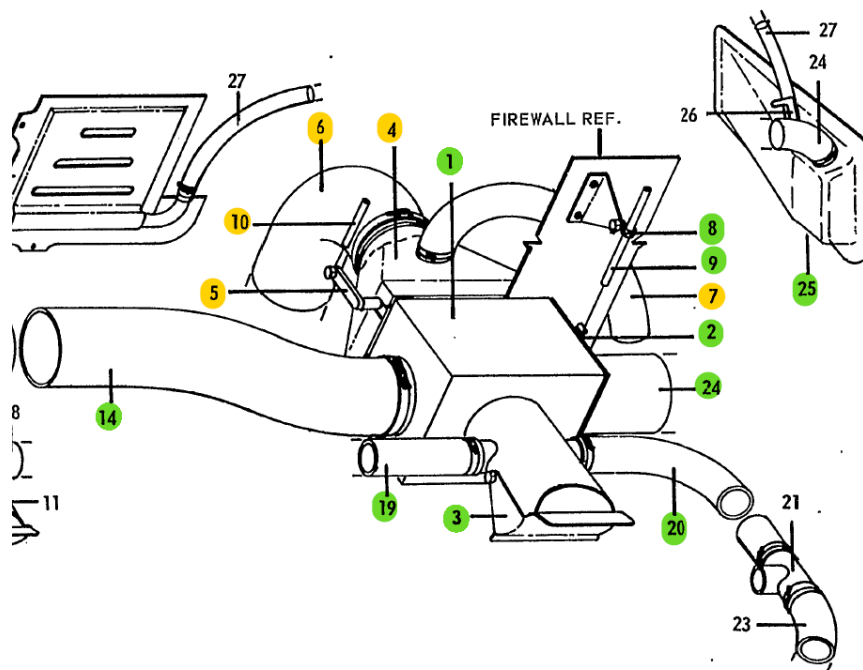


Figure 6. Part Catalog Figure 56 Exploded Diagram.

Visual inspection showed minor crush damage to the junction box (Index #7) and a fracture of the cabin heat valve control arm (Index #10). The inlet scat tube was properly attached to the cover assembly and the cover assembly was attached to the firewall base plate. One screw was observed to be missing from the cover to base plate connection. The junction box outlet ducts (Index #19 & 20) were found disconnected with unapproved parts covering both outlets. Additional unapproved parts were found covering various scat tubing inlets within the glareshield assembly.



Figure 7. Junction Box with an unapproved part covering the outlet.



Figure 8. Cabin Air scat tube with an unapproved part covering the inlet.

The cabin air cover assembly was removed from the base plate with the valve plate, P/N 640047-11, found separated from the control arm, P/N 653-032-11. The fracture was inspected with a 10x power jeweler's glass on both surfaces. The surfaces had a dull appearance with various discolorations within and along the fracture. The plate edges were observed to have scuffing along all machined edges. The valve control arm moved freely when rotated by hand.



Figure 9. Valve plate and base fracture surfaces.

Submitted by:

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