



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region

ENGINE EXAMINATION

WPR19LA010

This document contains 15 embedded photos.

A. ACCIDENT

Location: Hurricane, UT
Date: October 21, 2018
Aircraft: Piper PA-46-350P; N413LL
NTSB IIC: Elliott Simpson

B. EXAMINATION PARTICIPANTS:

Elliott Simpson
Senior Aviation Accident Investigator
National Transportation Safety Board

Kenton Fenning
Aviation Safety Inspector
Federal Aviation Administration FSDO
Scottsdale, AZ

Mark Platt
Aviation Safety Investigator
Lycoming Engines

Kathryn Whitaker
Aviation Safety Investigator
Piper Aircraft Company

C. SUMMARY

Examination of the forward airframe and engine was conducted at the facilities of Air Transport, in Phoenix, Arizona on October 25, 2018. Examination revealed the separation of the exhaust crossover pipes in the aft area of the engine, an incorrectly installed linkage adapter on the absolute pressure controller, and a loose upper deck air line on the right magneto. The area between the firewall and aft baffle sustained thermal damage, and all oil and fuel lines within the engine compartment were secure at their respective fittings.

D. DETAILS OF THE INVESTIGATION

1.0 Engine Examination

All references to right and left positions are made viewing forward from the pilot's seat.

The airplane sustained fire damage to the baggage compartment, and the area between the firewall and the aft engine baffle (Photo 1). Two holes in the fuselage just aft of the firewall and the upper and lower cowling were coated in black soot that trailed aft (Photo 2). All other soot damage appeared to trail in an upwards direction. The nose landing gear remained partially attached, and the wheel had rotated 90° to the left.

The forward front cowling and air inlet duct had sustained crush damage and were removed along with the lower cowlings to facilitate examination; the upper cowling had already been removed by the FAA inspector at the accident site.

Thermal damage forward of the engine baffle was limited to charring of the magneto wires, and the fuel flow divider inlet fire sleeve. The engine oil dipstick indicated about 10 1/2 quarts of oil. All turbocharger "V" band clamps were intact, the turbochargers both appeared undamaged along with most of the engine forward of the aft baffle. The TIT probe was intact, and all exhaust and inlet manifolds were intact and in place. The inlet plenums were removed, and both turbocharger compressor wheels appeared clean, undamaged, and felt free when rotated by hand.

The absolute pressure relief valve was impinged against the wastegate controller on the left side of the engine, and its inner spring was exposed.

On the right side of the engine, in the area adjacent to the two holes on the right side of the firewall, the cabin climate scats tubes had burnt through to their support wires (Photo 3). The aft end of the right intercooler was located in the same area and sustained similar burn damage (Photo 3).

To facilitate examination, the engine mount structure was cut from the firewall, and the engine was pulled away from the airframe. All lines and fittings at the firewall were checked for security during disassembly, and although they sustained thermal damage, all were intact and tight.

The entire firewall exhibited yellow-blue thermal discoloration to most of its surface, with orange discoloration and crumple damage on the upper right side (Photo 4).

The aft end of the engine along with all accessory and ancillary components sustained varying degrees of thermal damage (Photo 5). The left intercooler air inlet housing pipe and its associated hoses and elbows were intact and charred white. The matching inlet components on the right side exhibited more extensive burn damage, and the inlet housing pipe was orange in color with a lateral flow pattern (Photo 6). The oil pressure sender switch, mounted on the top right engine mount, had sustained thermal damage, separating its plastic cap (Photo 7). The fuel injection servo pipe assembly appeared blackened and coated in oil-like residue on its right side (Photo 5); similar oil residue was found on the engine accessories on the right side below the sender.

All oil, fuel, and upper deck air lines, while exhibiting charring damage to their thermal sleeves, remained firmly attached at their respective fittings.

The inlet components were removed to facilitate further examination.

The exhaust crossover pipe heat shield was removed for examination. The intermediate and right exhaust crossover pipes (part numbers: 40B19974, and 40B19975) appeared misaligned at the slip joint (Photo 8, 9). Orange/yellow discoloration was present around the pipes at the joint, and similar discoloration was present on the inner surface of the heat shield adjacent to the joint. The discoloration on the heat shield appeared to show both a swirling form leading to a lateral flow pattern to the right (Photo 9, 10). Lycoming service bulletin 521 indicated that the right pipe should have been engaged at the slip joint with an overlap of at least 3/4-inch (Photo 11). Examination revealed that the right pipe had about 1/16-inch engagement on the forward side (Photo 11, 12) and 3/16-inch engagement on the rear (Photo 13). Prior to disassembly, all of the crossover pipe hardware and support brackets were found to be in-place and secure. The crossover pipe assembly exhibited no evidence of impact damage.

The fuel line which connected the fuel injection servo to the fuel flow divider passed next to the heatshield on the right side. The fire sleeve of the line was charred along most of its length, with more significant thermal damage in the area next to the heatshield; an oil-like substance was also present on the upper end of the line (Photo 14).

The control linkage joint and washer for the control arm of the absolute pressure controller appeared to have been installed on the wrong side of linkage adapter (spacer) (Photo 15). The linkage remained intact.

The upper deck air hose fitting b-nut at the right magneto inlet was loose by about two-turns.

1.1 Examination Photos



Photo 1 – Fire Damaged Area



Photo 2 – Smoke Streaks Aft of Firewall



Photo 3 – Right Side Aft of Engine Compartment



Photo 4 - Firewall

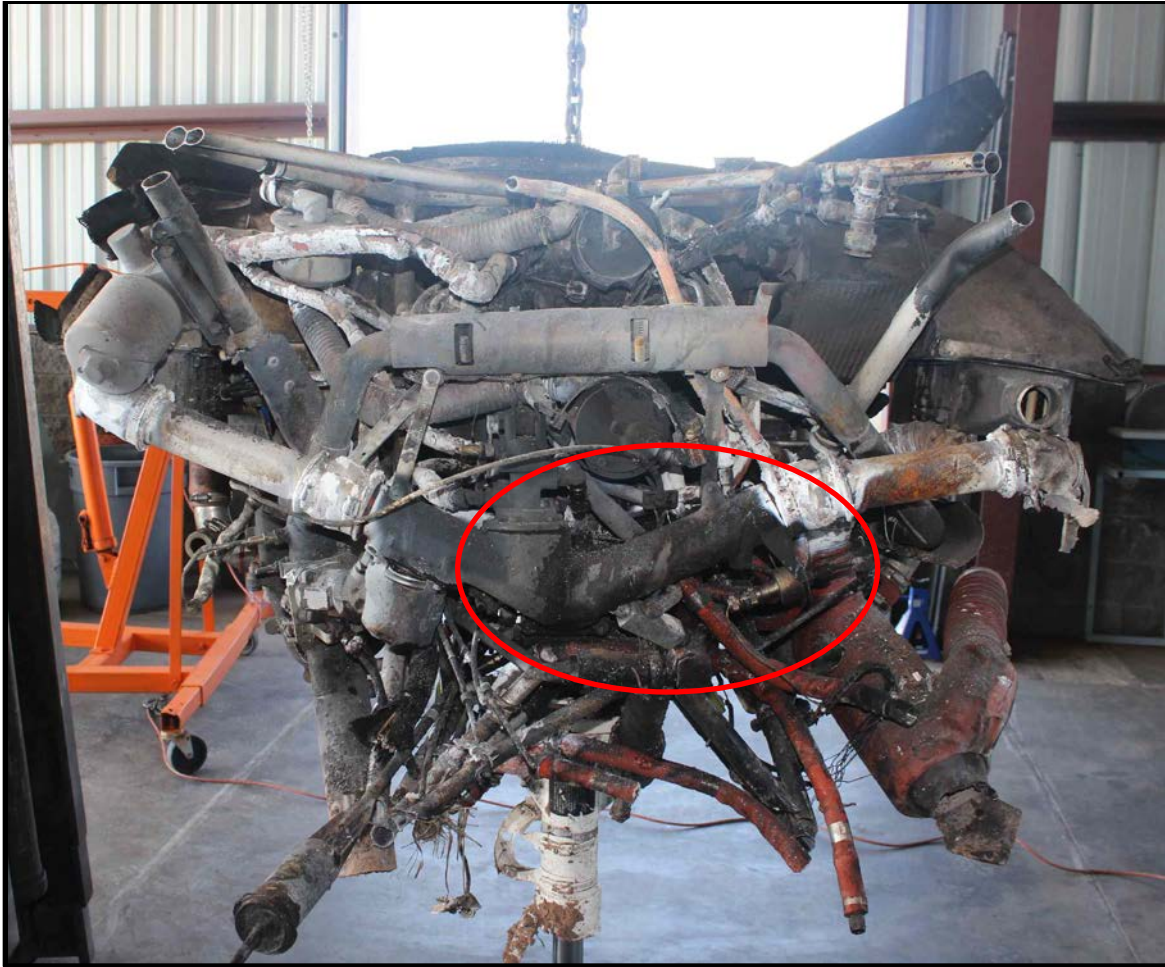


Photo 5 – Accessory Case Side of Engine (Oil Streaks in Red Circle)



Photo 6 – Intercooler Inlet Pipe



Photo 7 – Oil Pressure Sender

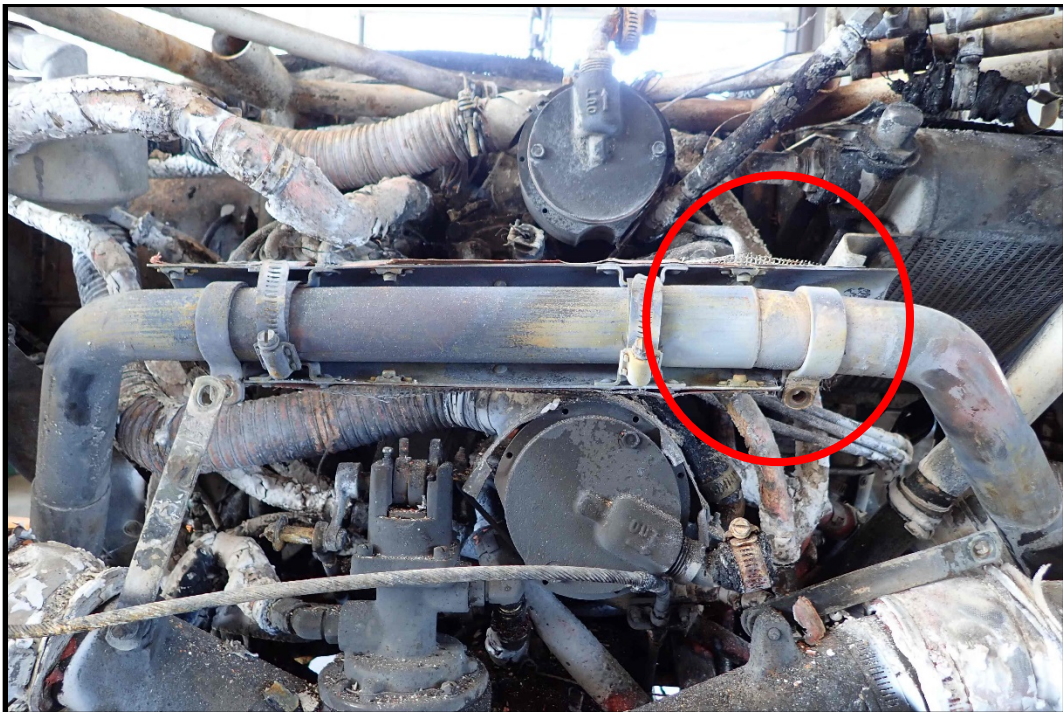


Photo 8 – Exhaust Crossover Pipes (Area of Misalignment Shown in Red)



Photo 9 - Intermediate and Right Exhaust Crossover Pipe Engagement



Photo 20 – Heat Shield

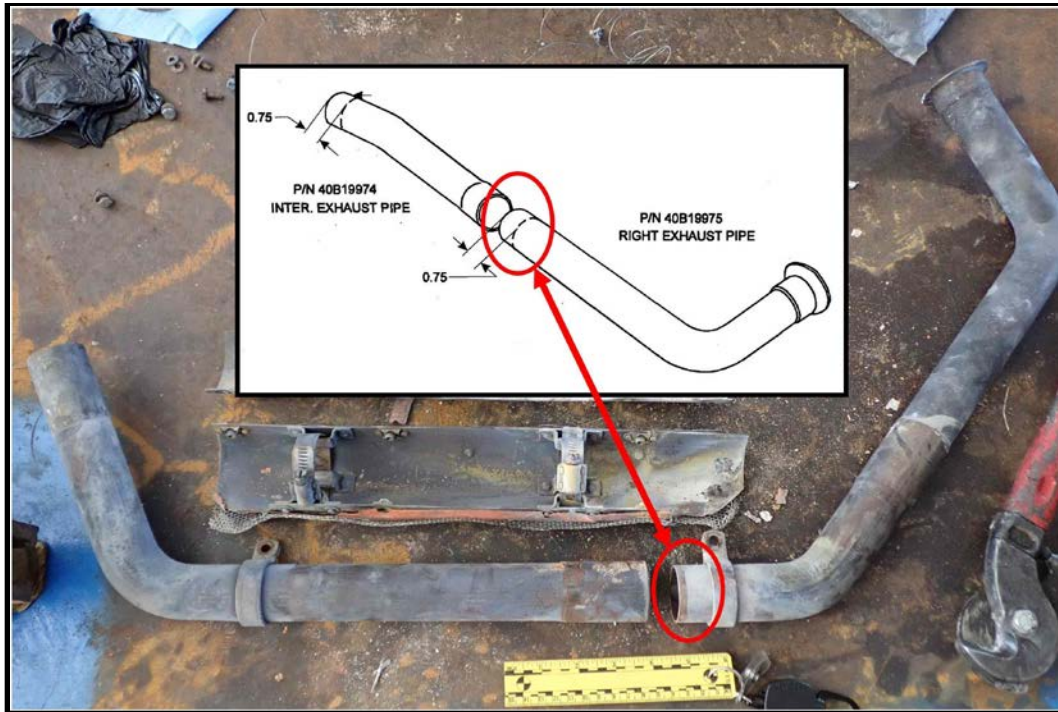


Photo 31 – Actual Pipe Engagement versus Nominal

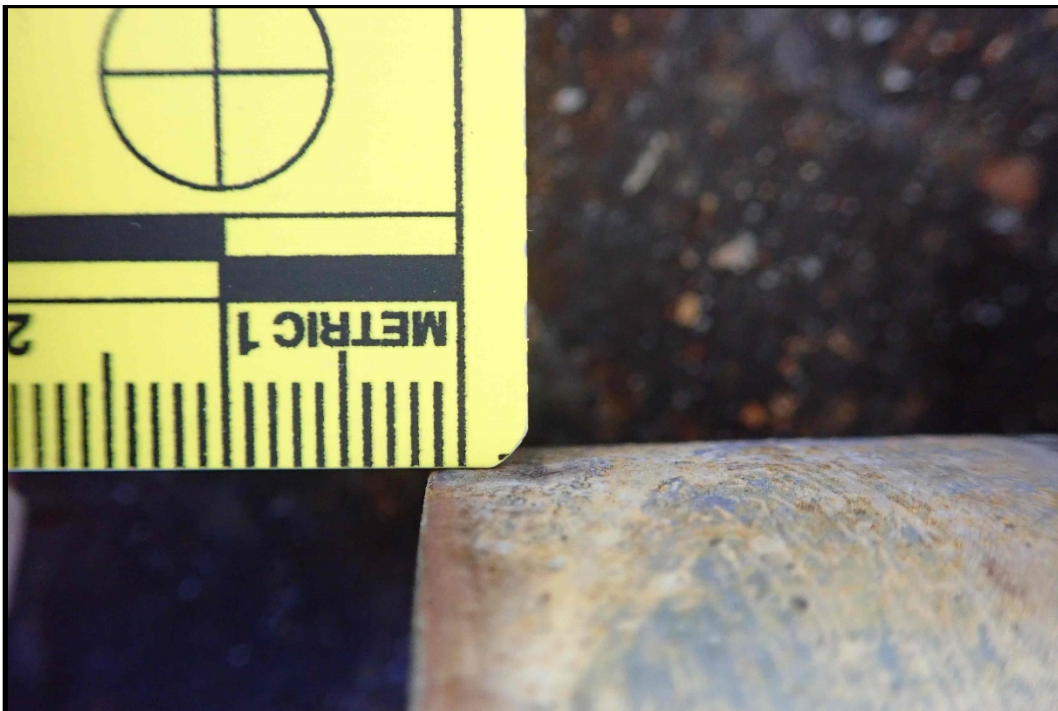


Photo 42 – Right Crossover Piper Forward Engagement

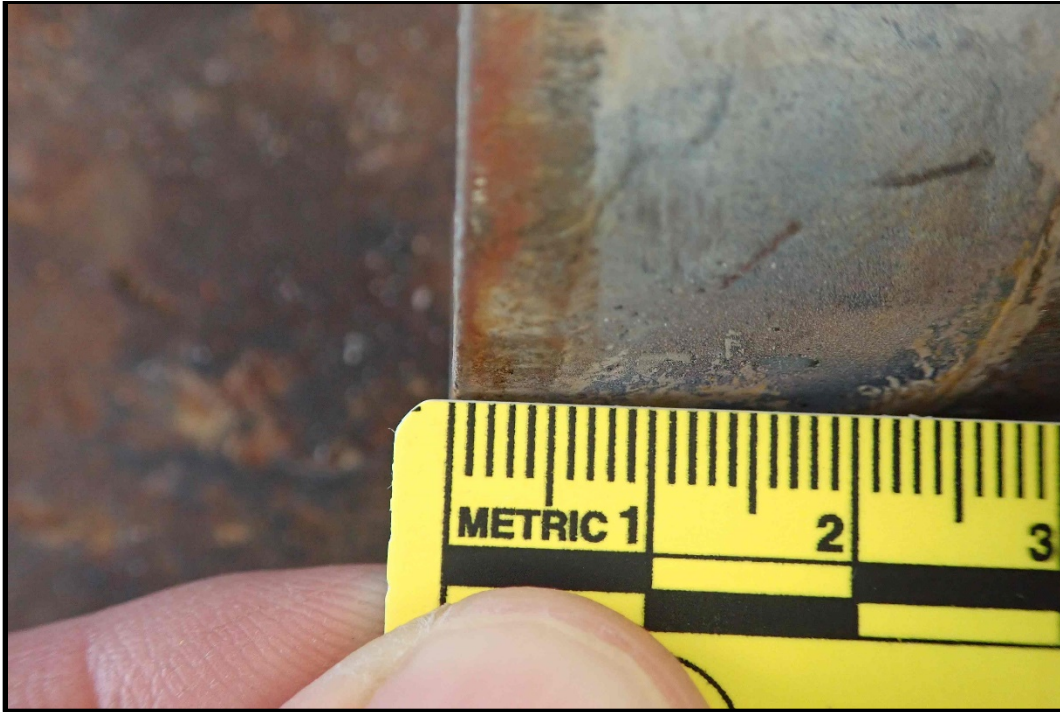


Photo 53 - Right Crossover Piper Aft Engagement

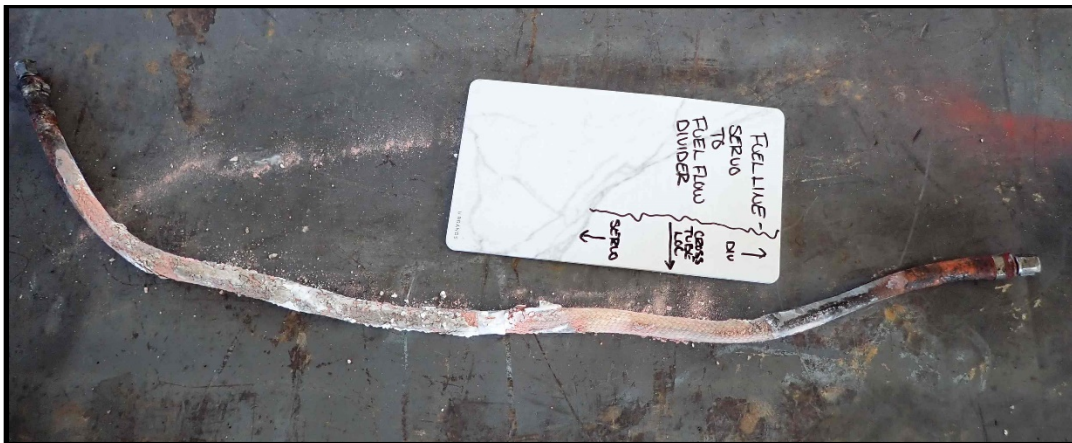


Photo 64 - Fuel Line from Servo to the Flow Divider

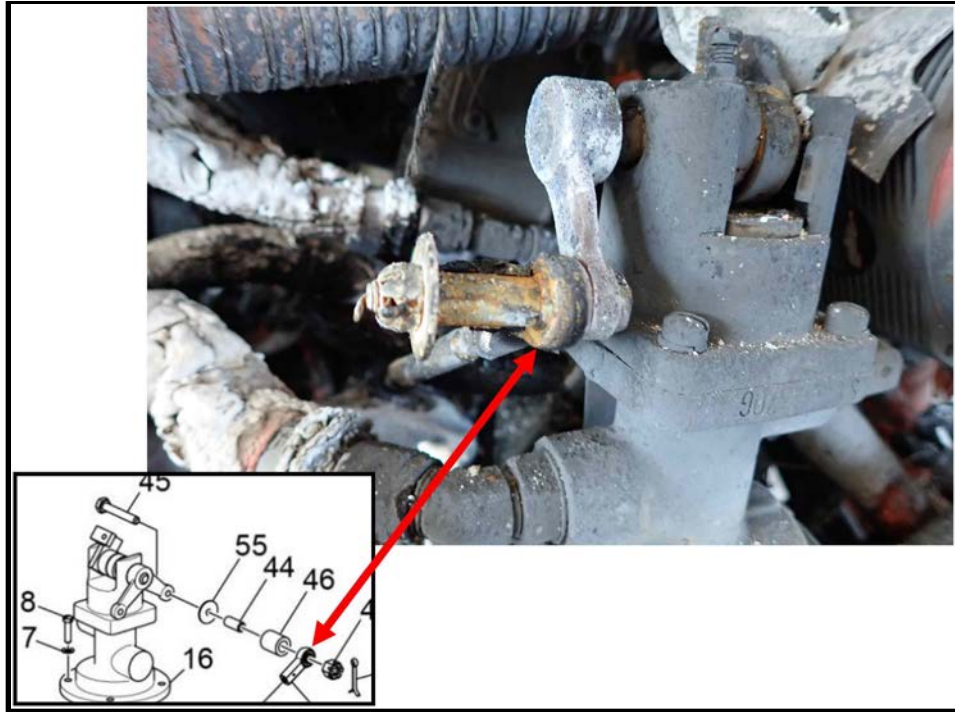


Photo 75 – Absolute Pressure Controller Linkage

Submitted by: Eliott Simpson