



Aviation Investigation Final Report

Location:	Hurricane, Utah	Accident Number:	WPR19LA010
Date & Time:	October 21, 2018, 12:00 Local	Registration:	N413LL
Aircraft:	Piper PA46	Aircraft Damage:	Substantial
Defining Event:	Powerplant sys/comp malf/fail	Injuries:	2 Serious, 3 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

Shortly after takeoff, the pilot smelled smoke. As he began to turn the airplane back to the airport, the engine lost total power. He conducted a forced landing in a field just short of the airport, during which the airplane struck a metal fence and pipe. All occupants egressed, and the pilot then noticed that a fire had erupted under the airplane's engine cowling.

Postaccident examination revealed that the airplane sustained fire damage to the roof and forward end of the baggage compartment along with the engine accessory area between the firewall and aft air baffles. Further examination revealed that one of the engine exhaust crossover pipe assemblies was misaligned at the slip joint.

An engine manufacturer service bulletin (SB) called for inspections of the exhaust system slip and flange joints to identify misaligned exhaust components. The last maintenance event occurred about 7 1/2 flight hours before the accident, during which the SB was performed and resulted in the replacement of crossover pipes. The mechanic who had performed the most recent maintenance did not follow the correct procedures for reinstallation of the crossover pipe, and the inspector who reviewed his work did not examine the installation as it progressed but instead inspected the pipes after they were installed and essentially hidden from view by their protective heat shield. As a result of the misaligned engine exhaust crossover pipe, hot exhaust gases escaped into the engine compartment and started a fire, which compromised critical engine fuel and oil lines, and resulted in the loss of engine power.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The mechanic's failure to properly align the engine exhaust crossover pipe during replacement, and his supervisor's failure to properly inspect the installation, which resulted in an in-flight fire and the loss of engine power.

Findings

Aircraft	(general) - Incorrect service/maintenance
Personnel issues	Installation - Maintenance personnel
Organizational issues	Oversight of maintenance - Maintenance provider
Environmental issues	Tree(s) - Contributed to outcome
Environmental issues	Ground equipment - Contributed to outcome

Factual Information

History of Flight

Prior to flight	Aircraft maintenance event
Enroute-climb to cruise	Powerplant sys/comp malf/fail (Defining event)
Enroute-climb to cruise	Fire/smoke (non-impact)
Landing	Collision with terr/obj (non-CFIT)

On October 21, 2018, about 1200 mountain daylight time, a Piper PA46-350P, N413LL, was substantially damaged when it was involved in an accident near Hurricane, Utah. The airline transport pilot and one passenger sustained serious injuries, the remaining three passengers were not injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

The pilot reported that the preflight inspection, engine runup, and takeoff from Runway 1 were uneventful. He retracted the landing gear once a positive rate of climb had been established, and initiated a left turn to 340°. After reaching an altitude of about 1,000 ft above ground level (agl) he began to smell smoke.

The smell rapidly intensified, and the hydraulic pump annunciator then illuminated. He thought the smoke may have been coming from the hydraulic pump, which he assumed was still inadvertently operating. He selected the gear down lever in an effort to turn off the pump, and a few seconds later the two green main landing gear extension lights illuminated, but he did not receive an indication that the nose gear had extended.

As he began to turn the airplane back to the airport, the engine made a loud noise, the oil pressure dropped to 0 pounds per square inch, and the engine lost all power. He calculated that he would not be able to glide the airplane back to the runway, so he began to look for an alternate landing site. Smoke was now interfering with his ability to clearly see out of the windows, and all he could see was houses, hills, and gullies.

After descending to an altitude of about 400 ft agl, he could see a small plowed field to the right. He maneuvered the airplane for landing in the field, and shortly after touching down, the airplane struck a metal fence and irrigation pipe. The right wing separated, and the airplane came to rest after skidding about 125 ft. All occupants egressed through the upper section of the rear left cabin door, and once the pilot was out, he noticed a fire erupt from the engine cowling. The local fire department arrived a short time later, and were able to extinguish the fire before it reached the cabin.

Pilot Information

Certificate:	Airline transport	Age:	58,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	3-point
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 2 Without waivers/limitations	Last FAA Medical Exam:	October 24, 2017
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	April 25, 2018
Flight Time:	7000 hours (Total, all aircraft), 1500 hours (Total, this make and model), 6850 hours (Pilot In Command, all aircraft), 70 hours (Last 90 days, all aircraft), 38 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	Registration:	N413LL
Model/Series:	PA46 350P	Aircraft Category:	Airplane
Year of Manufacture:	2007	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	4636413
Landing Gear Type:	Retractable - Tricycle	Seats:	6
Date/Type of Last Inspection:	May 18, 2018 Annual	Certified Max Gross Wt.:	4340 lbs
Time Since Last Inspection:	30 Hrs	Engines:	1 Reciprocating
Airframe Total Time:	1088 Hrs as of last inspection	Engine Manufacturer:	Lycoming
ELT:	C126 installed, activated, did not aid in locating accident	Engine Model/Series:	TIO-540-AE2A
Registered Owner:		Rated Power:	350 Horsepower
Operator:	On file	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	KDXZ, 2884 ft msl	Distance from Accident Site:	12 Nautical Miles
Observation Time:	17:56 Local	Direction from Accident Site:	233°
Lowest Cloud Condition:	Clear	Visibility	10 miles
Lowest Ceiling:	Overcast / 7000 ft AGL	Visibility (RVR):	
Wind Speed/Gusts:	8 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	40°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30.13 inches Hg	Temperature/Dew Point:	17°C / 12°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Hurricane, UT (1L8)	Type of Flight Plan Filed:	None
Destination:	Salt Lake City, UT (SLC)	Type of Clearance:	None
Departure Time:	11:58 Local	Type of Airspace:	Class D

Airport Information

Airport:	General Dick Stout Field 1L8	Runway Surface Type:	Asphalt
Airport Elevation:	3350 ft msl	Runway Surface Condition:	Dry
Runway Used:	01	IFR Approach:	None
Runway Length/Width:	3283 ft / 40 ft	VFR Approach/Landing:	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 Serious	Aircraft Damage:	Substantial
Passenger Injuries:	1 Serious, 3 None	Aircraft Fire:	Both in-flight and on-ground
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 Serious, 3 None	Latitude, Longitude:	37.158611,-113.30722(est)

Airframe and Engine Examination

The airplane sustained fire damage limited to the roof and forward end of the baggage compartment along with the engine accessory area between the firewall and aft air baffles. Soot and splatter marks trailed aft from two holes in the right side of the fuselage at the firewall (see Figure 1); in the remaining areas around the baggage compartment and windshield, soot marks were trailing upwards.



Figure 1 – Fire Damage to Right Side

Within the engine compartment, thermal damage forward of the baffles was limited to charring of the magneto wires, and the fire sleeve of the fuel flow divider inlet line. All turbocharger "V" band clamps were intact, and both turbochargers were undamaged. The engine oil dipstick indicated about 10 1/2 quarts of oil, and there were no indications of crankcase perforation or catastrophic engine failure.

Removal of the engine revealed that while the lines for fuel, oil, hydraulic, and upper deck pressure had sustained thermal damage, they were secure and tight at their respective fittings.

Thermal damage was more pronounced in the accessory area on the right side of the engine, consuming the cabin climate scot tubes, vacuum lines, and the housing of the oil pressure sender. The right intercooler inlet pipe assembly, located in the same area, exhibited orange discoloration with a lateral flow pattern (see Figure 2). The firewall exhibited yellow-blue thermal discoloration to most of its surface, transitioning to orange discoloration on its upper right side (see Figure 3).

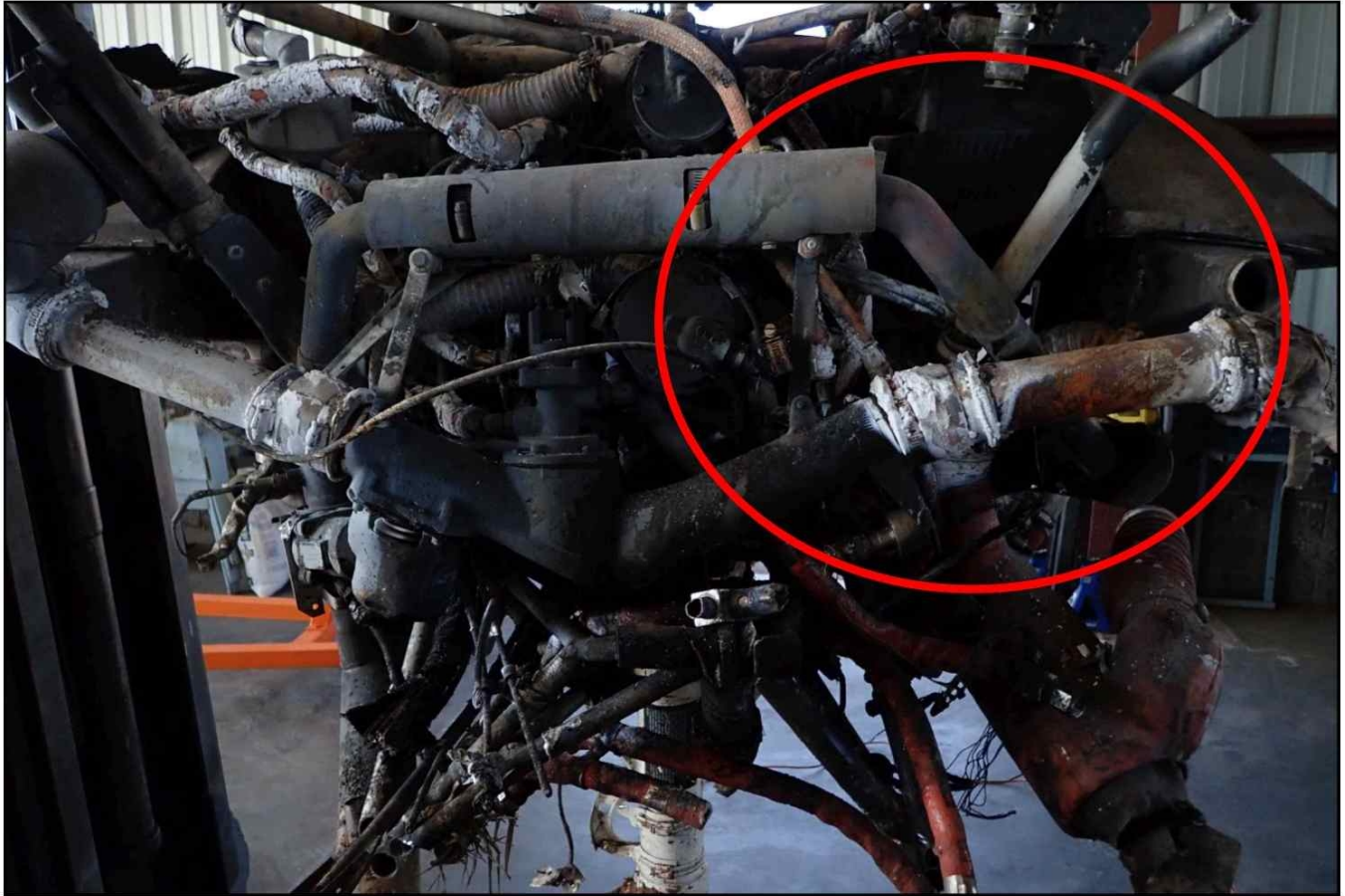


Figure 2 – Engine Accessory Area

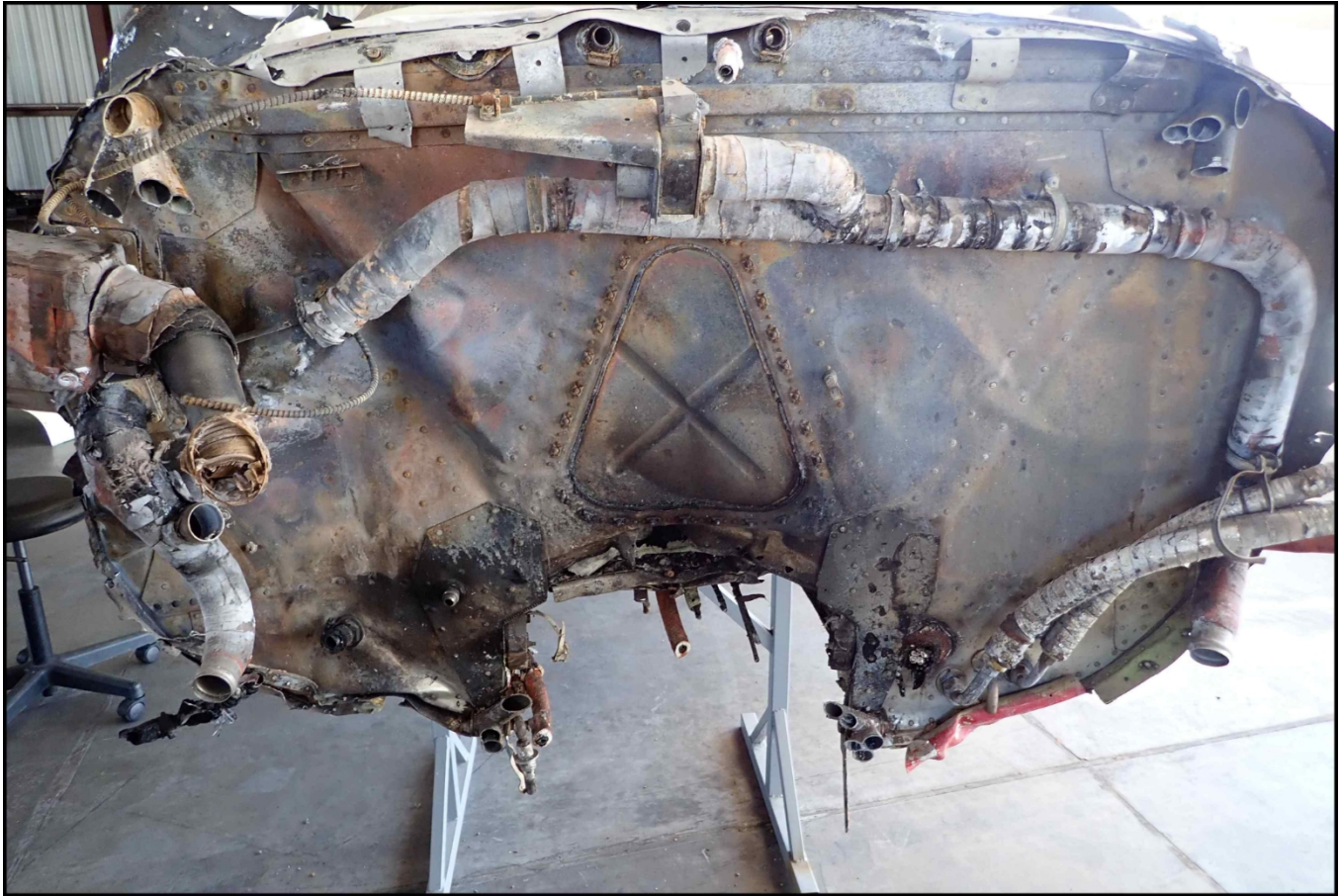


Figure 3 – Firewall

The fuel line which connected the fuel injection servo to the fuel flow divider passed next to the exhaust pipe crossover tube heat shield 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 heat shield.

Further disassembly revealed that the exhaust crossover pipe assembly appeared misaligned at the slip joint on the right side (see Figure 4). Orange/yellow discoloration was present around the pipe 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 a swirling form, leading to a lateral flow pattern to the right (see Figure 5). The crossover pipe hardware and support brackets were in place and secure, and the assembly did not exhibit evidence of impact damage.

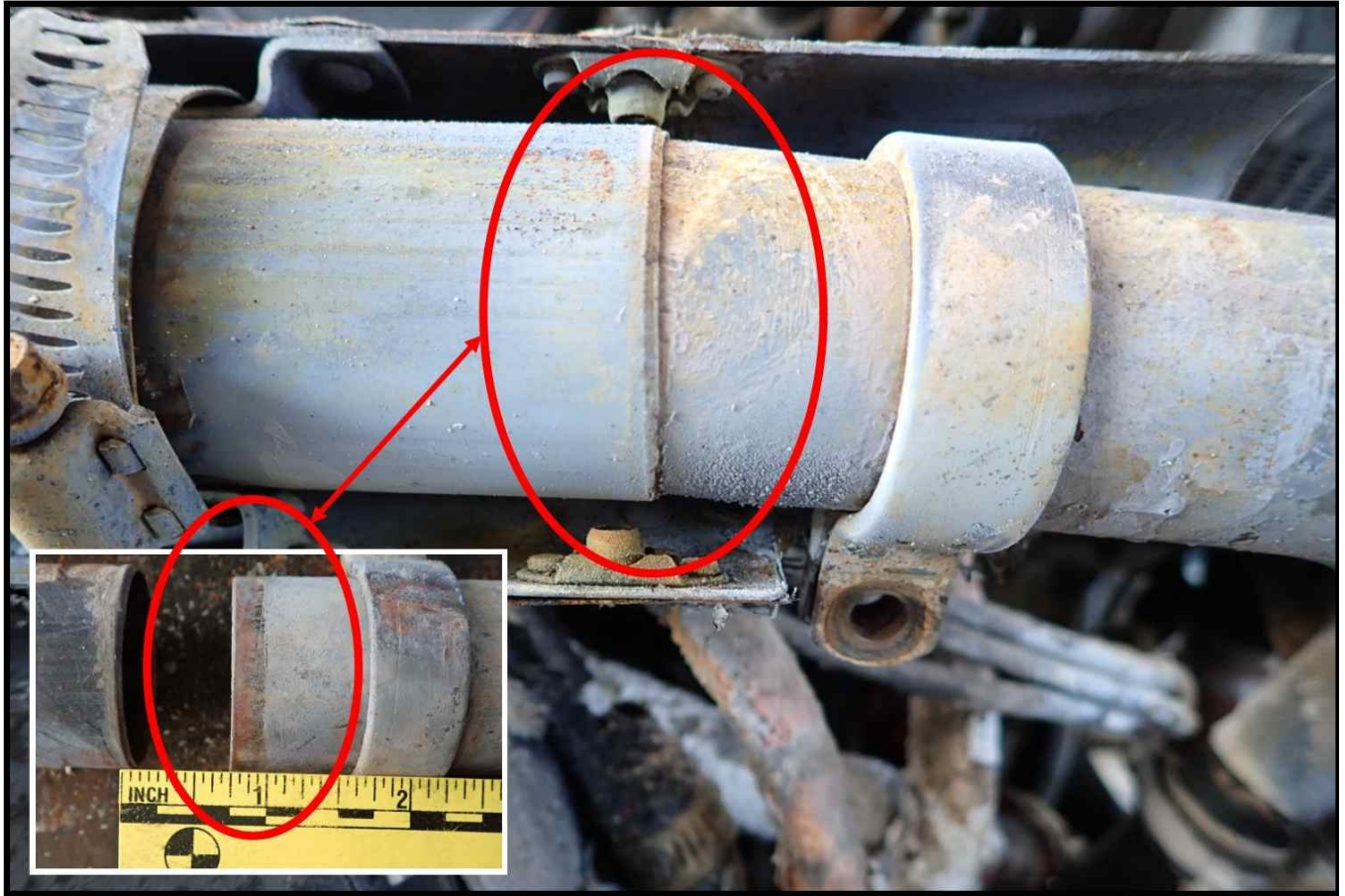


Figure 4 – Right Exhaust Crossover Slip Joint

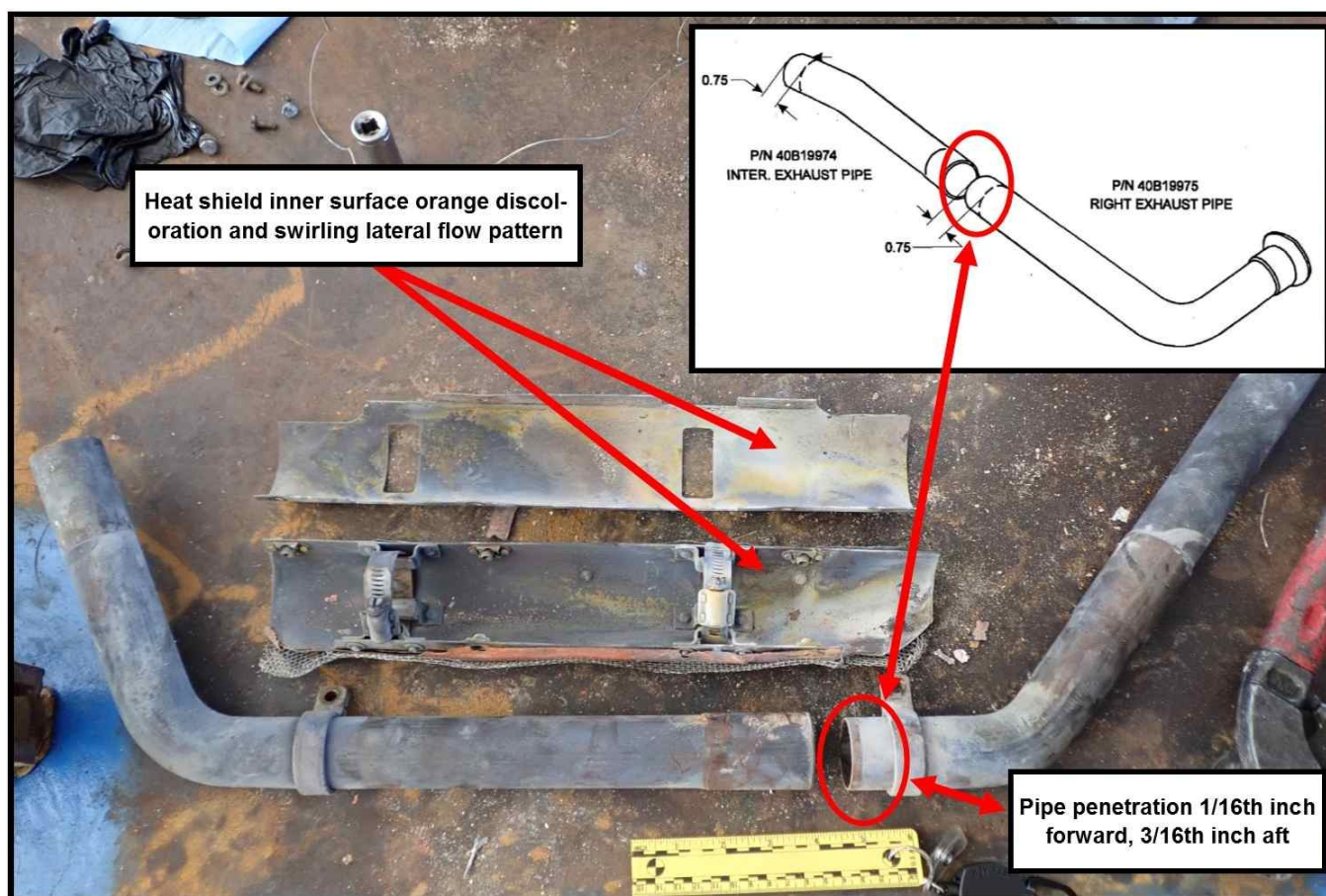


Figure 5 - Exhaust Crossover Assembly

Maintenance

Lycoming Service Bulletin (SB) 521, issued February 1995, called for inspections of the exhaust system slip and flange joints annually or at every 250 hours of operation, whichever comes first. The SB was intended to identify misaligned exhaust components, which could ultimately lead to their failure and the escape of exhaust gases. The SB indicated that the right pipe should have been engaged at the slip joint with an overlap of 3/4-inch (see Figure 5). Examination revealed that the right pipe had about 1/16-inch engagement on its forward side, and 3/16-inch engagement on the rear (see Figure 4).

The last maintenance event had been completed on October 2, 2018, 7.5 flight hours before the accident. At that time, the engine driven fuel pump was replaced, and SB 521 was performed, resulting in the replacement of the intermediate and left crossover pipes, along with the forward heat shield insert (part numbers, 40B9974, 40B19850, and 40J22416 respectively).

The mechanic who performed the SB stated that the decision was made to replace the crossover pipes, after inspection revealed that two had bound together.

The SB provided a specific set of reinstallation steps, including marking the crossover pipes with a non-

graphite marker before installation, to aid in visual confirmation that the right pipe had penetrated 3/4 inch into the sleeve of the intermediate pipe. The mechanic stated that he did not use a marker to gauge penetration, but instead utilized anti-seize compound to judge the depth by the mark the compound left behind. He stated that access to the pipes was very limited at the rear of the engine, requiring him to open the triangular baggage access panel to perform the alignment. It took him three attempts to get the pipe properly aligned, following which he secured the assembly and installed the heat shield. He stated that he had disassembled and reinstalled crossover pipes on similar PA46 airplanes twice before, about a year prior, and in his experience, they are typically hard to access and disassemble. The first time he worked on the system was with another mechanic at the maintenance facility, following which he was signed off to perform the procedure on his own.

The work was subsequently inspected by the Chief Inspector of the maintenance facility, who stated that with the heat shield in place, he was unable to confirm the pipe overlap. He stated that using anti-seize compound to gauge overlap was standard practice, and that he trusted the mechanic to perform the procedure correctly. To confirm there was no leak, he reached in through the baggage compartment access panel and pulled the tubes to confirm they were secure. He also started the engine, and again reached in through the access panel to feel and confirm there was no "blow-by" of exhaust gasses.

Administrative Information

Investigator In Charge (IIC):	Simpson, Elliott
Additional Participating Persons:	Kevin Harvey; Federal Aviation Administration FSDO; Salt Lake City, UT Mark Platt; Lycoming Engines; Williamsport, PA Kathryn Whitaker; Piper Aircraft Company; Phoenix, AZ
Original Publish Date:	September 14, 2020
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=98518

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