Aviation Investigation Final Report

Location:	Panama City, Florida	**Accident Number:**	ERA22FA261
Date & Time:	June 6, 2022, 16:10 Local	**Registration:**	N160LL
Aircraft:	Piper PA-28RT-201	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (partial)	**Injuries:**	2 Fatal, 1 Serious
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot was conducting a personal flight with two passengers aboard. Security camera video revealed that when the pilot arrived at the airplane prior to initiating the flight, he did not perform a complete preflight inspection, which should have included at least a cursory examination of the airplane's engine and a check of the ground below it. Shortly after departure, the pilot declared an emergency, and the airplane made a 180° left turn back toward the airport. The airplane descended and impacted terrain about 1.7 miles from the runway threshold.

Postaccident examination of the engine revealed that the crankcase was breached near the No. 4 cylinder. Also, the No. 4 connecting rod journal exhibited thermal damage and bearing material was found welded/smeared to the crankshaft journal. The No. 4 connecting rod cap, connecting rod bolts, and bearing pieces were found in the oil sump along with other metallic debris and a trace amount of oil. Examination of the oil system revealed that the oil pressure sensor was separated from the engine. The sensor's rigid copper line was fractured at the fitting to the accessory section of the crankcase. The propeller exhibited chordwise scratching and angle-cut tree branches in the vicinity of the wreckage, which were indications that the engine did not lose total power.

Examination of the rigid oil pressure line revealed that it fractured due to high-cycle fatigue. This was likely from excessive vibration due to insufficient support of the oil pressure sensor and rigid line. The oil pressure sensor, which was part of the avionics system, was installed about 3 flight hours before the accident. The installation manual for the avionics system stated that a flexible line should be used to install the oil pressure sensor in order to minimize vibration effects. Instead, a rigid line was installed, which would have been more susceptible to the effects of vibration, including high-cycle fatigue failure.

Oil staining observed on the ramp area where the airplane was parked before the flight, a trail of oil leading from the parking area to the runway, and the oil observed on the airframe exterior at the accident site all suggest that the airplane was actively leaking oil both before and during the accident flight. Based on all available information, it is likely that the oil pressure sensor line fractured during the flight before the accident flight, which resulted in oil leaking from the engine. This oil leak ultimately resulted in oil starvation and loss of engine power during the departure from, and the pilot's attempted return to the airport. Had the pilot noted and investigated the source of the oil leakage during the preflight inspection, he might have taken appropriate corrective action and avoided the accident.

Probable Cause and Findings

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

Maintenance personnel's failure to follow the avionics installation guidance for the oil pressure sensor, which resulted in the high-cycle fatigue failure of an line, oil starvation, and the subsequent loss of engine power. Contributing to the accident was the pilot's failure to perform an adequate preflight inspection of the airplane.

Findings

Aircraft	Recip eng oil sys - Incorrect service/maintenance
Personnel issues	Installation - Maintenance personnel
Aircraft	Oil - Incorrect service/maintenance
Personnel issues	Preflight inspection - Pilot
Aircraft	Recip eng oil sys - Fatigue/wear/corrosion

Factual Information

History of Flight

Initial climb	Powerplant sys/comp malf/fail
Initial climb	Loss of engine power (partial) (Defining event)

On June 6, 2022, about 1610 central daylight time, a Piper PA-28RT-201, N160LL, was substantially damaged when it was involved in an accident near Northwest Florida Beaches International Airport (ECP), Panama City, Florida. The pilot and one passenger were fatally injured, and another passenger sustained serious injuries. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

On the morning of the accident, the pilot and passengers arrived at ECP, and the pilot parked the airplane on a local fixed-base operator (FBO) ramp about 0941. About 1100, the FBO moved the airplane to another location on the ramp because the pilot and passengers were not returning until later in the day.

A review of the data downloaded from an onboard avionics system revealed that during the flight to ECP, the oil pressure initially stabilized at 89 pounds per square inch (psi) and decreased gradually as oil temperature increased. Immediately before takeoff power was set, the oil pressure had reduced to about 50 psi. The oil pressure remained steady at 80 psi during the flight. After landing, the oil pressure ranged between 50 and 70 psi (depending on the engine power setting).

A review of security camera video revealed that the pilot returned to the airplane about 1530. He opened the baggage compartment, entered and exited the cockpit multiple times, walked around the front of the airplane, and stopped in front of each wing until the two passengers arrived about 1541. During these 11 minutes, he did not appear to spend any appreciable time inspecting the airplane's engine or the ground below it. About 1551, the airplane exited the FBO ramp and taxied to runway 34.

Onboard avionics system data showed that immediately after the engine was started for the accident flight, the oil pressure stabilized at about 67 psi. The oil pressure gradually decreased as the oil temperature increased and continued decreasing as the aircraft taxied to the runway. Immediately before takeoff, the oil pressure had reduced to about 10 psi. When the engine was advanced to takeoff power, the oil pressure dropped to 4 psi.

According to automatic dependent system broadcast (ADS-B) data, the airplane began the takeoff roll about 1606 and reached a peak altitude of about 1,200 ft mean sea level (msl). According to summary of air traffic control communications, the pilot declared an emergency

about 1609. ADS-B data showed that the airplane began to descend, made a 180° left turn, and then continued to descend until it impacted trees and terrain about 1.7 miles from the runway threshold. The ADS-B data ended about 190 ft before the main wreckage; figure 1 shows the airplane's flight track.

Figure 1 - ADS-B data showing the accident flight track.

Pilot Information

Certificate:	Private	**Age:**	54,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	October 21, 2021
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	(Estimated) 310 hours (Total, all aircraft), 216 hours (Total, this make and model), 156.6 hours (Pilot In Command, all aircraft), 58.6 hours (Last 90 days, all aircraft), 19.3 hours (Last 30 days, all aircraft)		

According to the pilot's logbook, on May 25, 2022, the pilot performed a flight that the logbook described as "TEST ARROW".

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	**Registration:**	N160LL
Model/Series:	PA-28RT-201	**Aircraft Category:**	Airplane
Year of Manufacture:	1979	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	28R-7918157
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	May 11, 2022 Annual	**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	3956.73 Hrs as of last inspection	**Engine Manufacturer:**	Lycoming
ELT:	C91 installed, not activated	**Engine Model/Series:**	IO-360-C1C6
Registered Owner:	On file	**Rated Power:**	200 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

According to the most recent annual inspection, the airplane had a tachometer time of 508.6 hours. During the annual inspection, a new avionics system was installed, which included a Dynon Skyview HDX panel display and a Dynon electronic flight instrument system. The airframe maintenance logbook indicated that the work was performed by five people, one of whom was the pilot, and was signed off by a mechanic with inspection authorization. Additionally, Federal Aviation Administration Form 337, Major Repairs and Alterations, indicated that the installation of the Dynon Skyview HDX was performed in accordance with *Dynon Skyview HDX System Installation Manual*, dated October 28, 2020.

The installation manual stated the following:

> *Mount the oil pressure sensor securely to the airplane's structure using appropriate AN/MS hardware fittings, clamps, and flexible hose….*
>
> *DO NOT mount the sensor directly to engine or other areas of high vibration.*
>
> *Always mount the sensor to the airframe structure, and connect it with flexible hose to minimize vibration effects.*

Mounting the sensor directly to the engine may cause sensor failure/leakage and possibly fire.

According to the airplane flight log, the tachometer time on June 5, 2022, was 511.5 hours. Furthermore, on an entry dated May 25, 2022, the entry indicated that the pilot flew the airplane with “Fly Test” written next to his name.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	ECP,69 ft msl	**Distance from Accident Site:**	2 Nautical Miles
Observation Time:	15:53 Local	**Direction from Accident Site:**	338°
Lowest Cloud Condition:	Scattered / 5000 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	10 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	190°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.85 inches Hg	**Temperature/Dew Point:**	30°C / 22°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Panama City, FL (ECP)	**Type of Flight Plan Filed:**	
Destination:	Orlando, FL (ORL)	**Type of Clearance:**	VFR flight following
Departure Time:	16:06 Local	**Type of Airspace:**	

Airport Information

Airport:	Northwest Florida Beaches International Airport ECP	**Runway Surface Type:**	
Airport Elevation:	68 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	16/34	**IFR Approach:**	None
Runway Length/Width:	10000 ft / 150 ft	**VFR Approach/Landing:**	Forced landing

Postaccident examination of the pavement in the parking area of the FBO revealed a trail of oil drops that led to a small puddle of oil where the airplane was initially parked. A second larger area of oil staining, measuring about 6 ft by 6 ft (as shown in figure 2), was found at the airplane’s second parking location (where the airplane had been moved by FBO personnel), which was where the pilot conducted his walk-around and loaded passengers before he started the engine for taxi and takeoff. Furthermore, there was a trail of oil leading from the spot pictured in Figure 2 toward the runway that aligned with the airplane taxiing to the runway.

Figure 2 - Large oil stain on the pavement where airplane was located at engine start.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Fatal, 1 Serious	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Fatal, 1 Serious	**Latitude, Longitude:**	30.323999,-85.775898

The airplane came to rest upright in an area of dense brush at an elevation of 25 ft. All major components of the airplane were located near the main wreckage. Multiple tree branches located along the debris path exhibited black paint transfer and were cut at 45° angles. Flight

control cable continuity was established from the cockpit to the flight control surfaces. Oil was noted along the bottom right side of the fuselage.

The three-blade propeller remained attached to the engine. The spinner was impact damaged, all blades remained attached to the hub, and one of the blades exhibited chordwise scratching.

Postaccident examination of the engine revealed a breach of the crankcase near the No. 4 cylinder. The engine was disassembled, and continuity of the crankshaft was confirmed. No anomalies were noted on the main journals of the crankshaft. The No. 4 connecting rod journal exhibited thermal damage, and bearing material was found welded/smeared to the crankshaft journal. The No. 4 connecting rod cap, connecting rod bolts, and bearing pieces were found in the oil sump along with other metallic debris and a trace amount of oil. The oil drain plug remained seated and safety wired to the oil sump. The oil pump rotated freely by hand. The oil pump was disassembled, and no scoring was noted on the oil pump gears or the housing. The oil pressure sensor was separated from the engine. The sensor's rigid copper line was fractured at the fitting to the accessory section of the crankcase, as shown in figure 3.

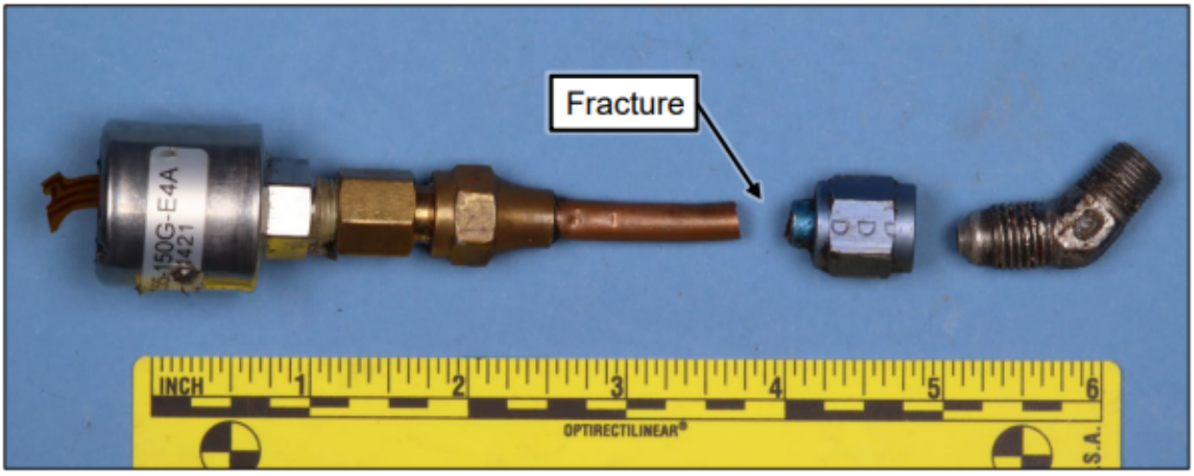

Figure 3. Fractured oil pressure sensor line.

The rigid copper line and oil pressure sensor were examined by the National Transportation Safety Board Materials Laboratory. The examination revealed that most of the fracture occurred on a flat plane perpendicular to the tube axis, and a darker region with a smooth curving boundary was observed at one side identified as the origin area, as shown in figure 4. The figure also shows that fatigue features emanated from the origin area and extended to the boundary approximately indicated with dashed lines. The remainder of the fracture surface showed a change in fracture plane with dimple features on the fracture surface; those features were consistent with ductile overstress fracture of the remaining ligament of the tube wall.

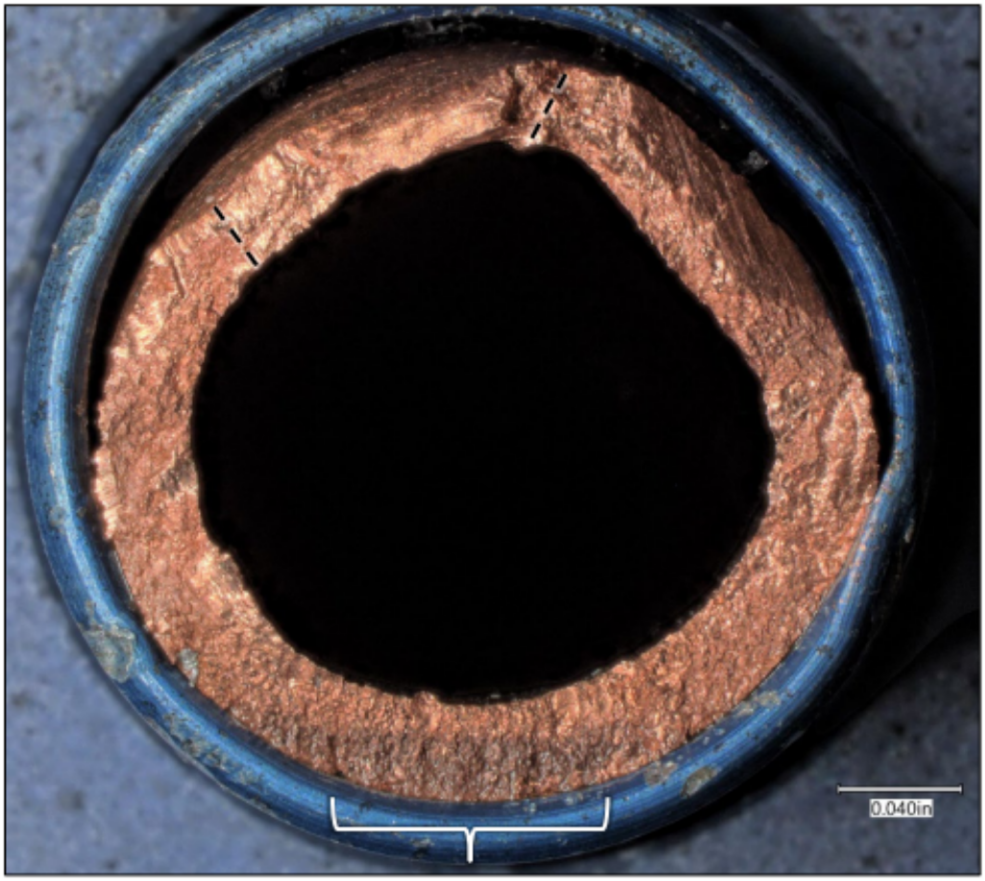

Figure 4. Oil pressure sensor line fracture surface after cleaning. The dashed lines indicate the approximate fatigue boundary from the origin area, which is indicated with a bracket.

Administrative Information

Investigator In Charge (IIC):	Kemner, Heidi
Additional Participating Persons:	Kevin Atkins; FAA/FSDO; Birmingham, AL Damian Galbraith; Piper Aircraft; Vero Beach, FL Mike Childers; Lycoming Engines; Williamsport, PA
Original Publish Date:	November 8, 2023
Last Revision Date:	
Investigation Class:	Class 3
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=105200