National Transportation Safety Board
Office of Aviation Safety
Washington, DC 20594

WPR24FA004

AIRFRAME AND ENGINE EXAMINATION

October 11, 2023

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A. ACCIDENT

Location:	Newberg, Oregon
Date:	October 3, 2023
Time:	18:47 Pacific daylight time
Airplane:	Piper, PA-44-180, N8360K

B. AIRFRAME AND ENGINE EXAMINATION

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C. SUMMARY

On October 3, 2023, about 1847 Pacific daylight time, a Piper, PA-44-180, N8360K, was substantially damaged when it was involved in an accident near Newberg, Oregon. The flight instructor and the pilot receiving instruction were fatally injured; a pilot rated passenger was seriously injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 instructional flight.

D. DETAILS OF THE EXAMINATION

1.0 Airframe Examination

N8360K – Piper, PA-44-180
SR# 44-8195018
Hobbs: 4771.0 (at time of dispatch)
Tach: 62.3 (at time of dispatch)
Annual inspection conducted: 6/7/2023

Examination of the airframe revealed that the forward section of the cockpit was heavily impact damaged and crushed aft. The instrument panel was impact damaged with multiple instruments displaced. The landing gear lever was in the down position. The forward portion of the fuselage was impact damaged and displaced aft. The flap handle was observed in the 40˚ position. The flap torque tube assembly was observed in a position that was consistent with 40˚. The front nose gear was fracture separated. The aft fuselage was mostly intact, crushing and bending was observed throughout.

Figure 1: View of airplane during exam

The cockpit flight controls were separated and exhibited impact damage throughout. The rudder pedals were observed in the cockpit area with heavy impact damage. Flight control continuity was established from the flight controls to the primary flight control surfaces. Multiple separations in the control cables were observed, consistent with impact damage or cut by recovery personnel.

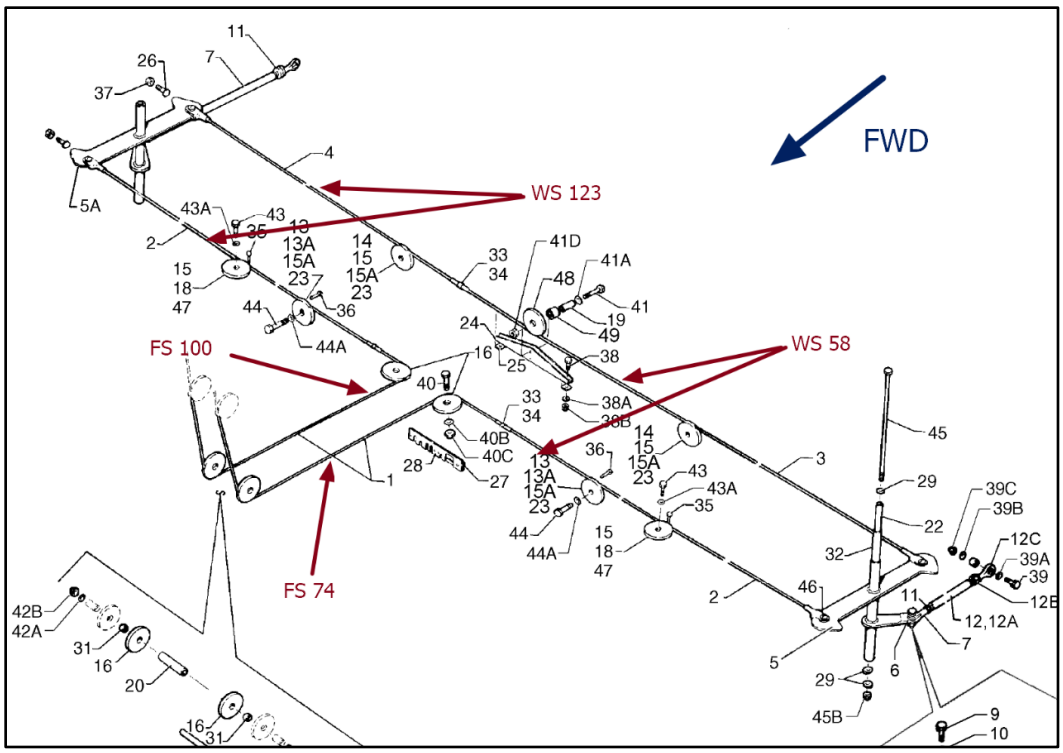

Figure 2: View of flight control cables (figure courtesy of Piper Aircraft)

Engine control continuity was established from cockpit to the engines. Multiple separations in the control cables were observed, consistent with impact damage or cut by recovery personnel.

A visual inspection was conducted of the fuel system. Continuity was established from the main fuel tanks throughout the system to the engines. Both left and right fuel selector values remained attached to the center fuselage. The left and right fuel selector arms were in the aft position, consistent with the on position. The left and right airframe fuel strainers remained attached to the center fuselage. The fuel strainers were removed, disassembled, and trace amounts of blue in color liquid, consistent with 100 LL was observed. Minor debris were observed in the fuel bowls. Power was applied to both left and right airframe electric fuel pump and an activation sound was heard.

The left wing was separated from the fuselage at the wing root. The wing exhibited buckling, crushing and tearing of the skin from the wing root to about mid span. Crushing and bending was observed throughout the wingspan. The left flap and aileron remained attached via their respective mounts. The flap was observed in an intermediate position near 10˚. The left main landing gear remained attached via the wing mounts, was partly extended and the landing gear actuator rod was observed extended from the actuator. The left aileron had separated from the bellcrank at the aft control rod end. The aileron control cable was traced to the wing adjacent to the

engine nacelle. The left main fuel tank fuel cap was observed in place and secure. The left wing bladder style fuel tank was torn.

Figure 3: View of left wing during examination (courtesy of Piper Aircraft)

The right wing was separated near the wing root. The wing exhibited buckling, crushing, and tearing of the skin. The outboard wing separated near the engine nacelle. The flap remained attached to the wing via its attachment points. The aileron remained attached to the wing via the two outboard attachment points. The right aileron had separated from the bellcrank at the aft control rod end. The aileron control cable was traced to about wing station 123. An engine mount support structure was crushed aft, protruding into the filler neck of the right fuel tank. The fuel cap gasket was observed on the engine mount support structure. The right wing bladder style fuel tank was torn.

Figure 4: View of right wing during examination

The vertical stabilizer, rudder, stabilator, and elevator trim tabs remained attached and secure to their respective mounts. Crushing and bending was observed throughout. The empennage, aft of the cargo compartment was separated by recovery personnel to facilitate wreckage recovery. The flight control cables to the rudder and stabilator remained attached to their respective attachment points. The flight control cables were traced through the aft fuselage to about fuselage station 156.

Figure 5: View of empennage during examination

2.0 Engine Examination

Left Engine
Engine Manufacturer: Lycoming
Engine Model Number: O-360-E1A6D
Engine Serial Number: L-358-77T

Examination of the recovered engine revealed impact damage to the four engine mounts. All four cylinders remained attached to the engine. All fuel and oil lines that were removed were tight. The crankshaft was fracture separated at the propeller flange. No evidence of any mechanical damage was observed to the engine crankcase.

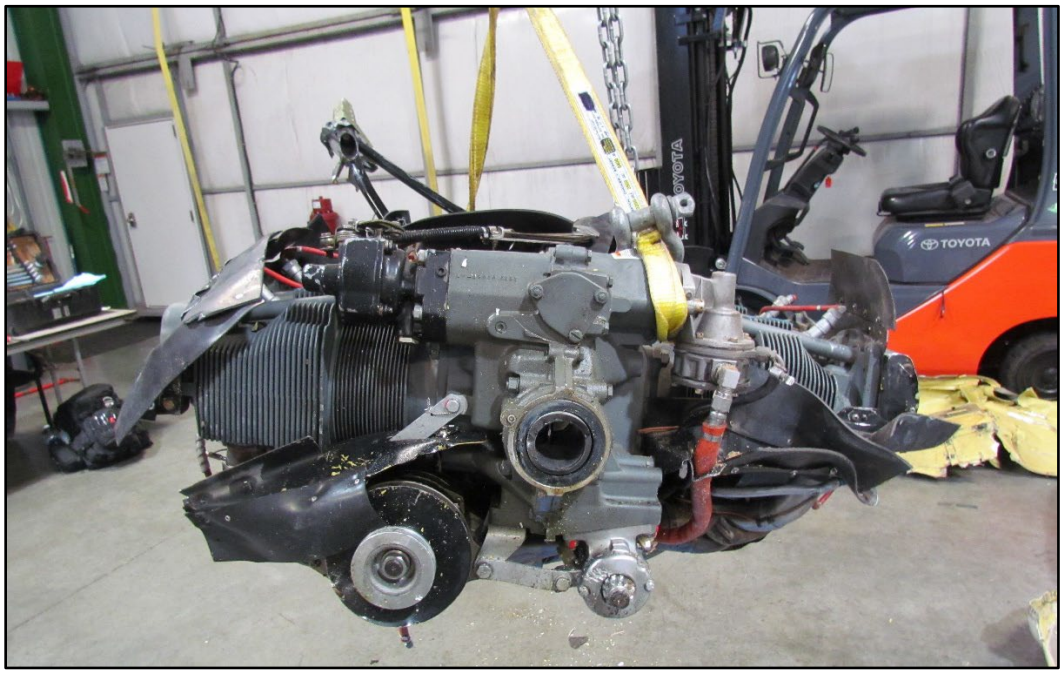

Figure 6: View of left engine during examination (courtesy of Lycoming Engine)

The rocker box covers were removed. The intake and exhaust rocker arms were intact and oil coated on all cylinders. All intake and exhaust valve springs were in place and visually appeared to be undamaged. The upper spark plugs were removed, and all four cylinders were examined internally using a lighted borescope. A normal amount of combustion deposits was observed within the combustion dome of each cylinder and piston face. All of the intake and exhaust valves were unremarkable. Using a spline drive adapter, the engine was rotated by hand. Rotational continuity was established throughout the engine and valve train. Thumb compression and suction was obtained on all four cylinders.

The exhaust system remained secure to the cylinders. No evidence of any exhaust leaks around the cylinder attach points were observed. Crushing and bending was observed throughout.

The spark plugs were removed from the engine and they were the massive electrode type. All sparkplugs exhibited gray deposits within the electrode area. All spark plugs exhibited signatures consistent with worn-normal when compared to the Champion Check-A-Plug comparison chart.

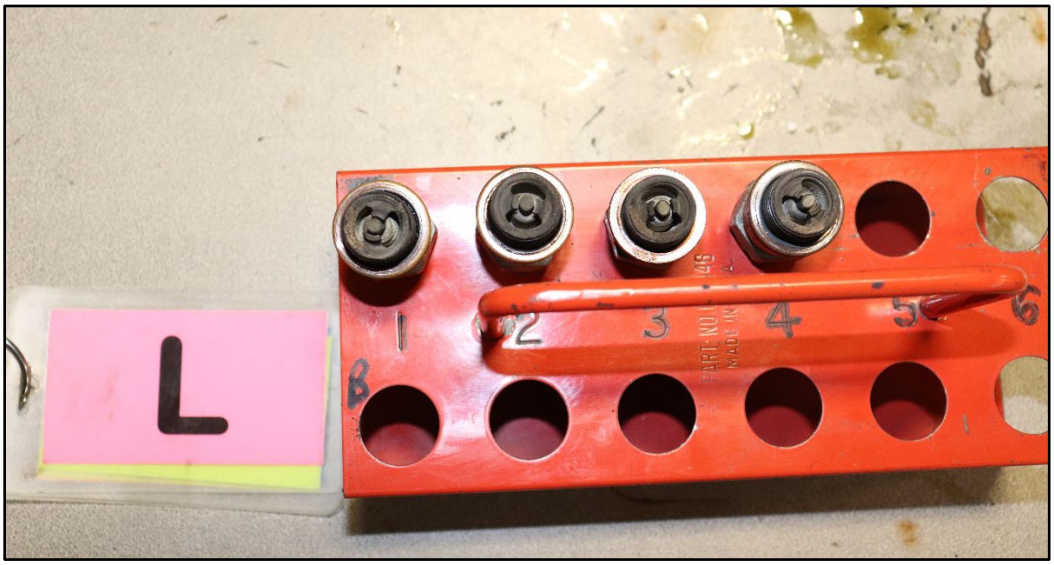

Figure 7: View of left engine spark plugs

The single drive dual magneto was fracture separated near the magneto flange; no other external damage noted. The magneto was rotated by hand, spark was produced on all eight ignition leads and impulse coupling engagement was heard.

The propeller governor remained attached to the engine; however, the propeller control cable was separated near the control arm. The propeller governor screen and gaskets were intact and free of debris. The propeller governor arm remained attached to the control rod and moved from stop to stop when actuated by hand. The drive shaft was rotated freely by hand.

The carburetor remained attached to the engine. The throttle control cable was attached to the throttle arm and was fracture separated near the arm, consistent with impact damage. The throttle arm moved freely from stop to stop when actuated by hand. The mixture control cable remained attached to the carburetor and was fracture separated near the arm, consistent with impact damage. The mixture control arm moved freely from stop to stop when actuated by hand. The fuel inlet fuel screen was removed, and free of debris. The carburetor was disassembled, and blue in color liquid, consistent with 100 LL was observed in the fuel bowl. The fuel was tested for

water using SAR-GEL water finding paste, with negative results. The carburetor float exhibited hydraulic crushing.
The air induction system was separated from the engine baffle. The air induction body remained attached to the carburetor. The air induction conduit was clear of obstruction and debris.

The engine oil sump remained attached to the engine, and crushing, consistent with impact damage was observed. The oil sump pick-up screen was removed, and a slight amount of debris was observed.

The engine driven fuel pump remained attached to the engine. No visual damage was observed. The fuel pump was removed and actuated by hand, air pressure was felt at the fuel outlet.

The oil filter and oil filter adapter were fracture separated from the engine accessory case. Crush and bending was observed throughout.

Right Engine
Engine Manufacturer: Lycoming
Engine Model Number: LO-360-E1A6D
Engine Serial Number: L-418-72T

Examination of the recovered engine revealed impact damage to the four engine mounts. All four cylinders remained attached to the engine. All fuel and oil lines that were removed were tight. The propeller and propeller hub remained attached to the engine via the crankshaft. No evidence of any mechanical damage was observed to the engine crankcase.

Figure 8: View of right engine during exam

The rocker box covers were removed. The intake and exhaust rocker arms were intact and oil coated on all cylinders. All intake and exhaust valve springs were in place and visually appeared to be undamaged. The upper spark plugs were removed, and all four cylinders were examined internally using a lighted borescope. A normal amount of combustion deposits was observed within the combustion dome of each cylinder and piston face. All of the intake and exhaust valves were unremarkable. The propeller was rotated by hand and rotational continuity was established throughout the engine and valve train. Thumb compression and suction was obtained on all four cylinders.

The exhaust system remained secure to the cylinders. No evidence of any exhaust leaks around the cylinder attach points were observed. Crushing and bending was observed throughout.

The spark plugs were removed from the engine and they were the massive electrode type. All sparkplugs exhibited gray deposits within the electrode area. All spark plugs exhibited signatures consistent with worn-normal when compared to the Champion Check-A-Plug comparison chart.

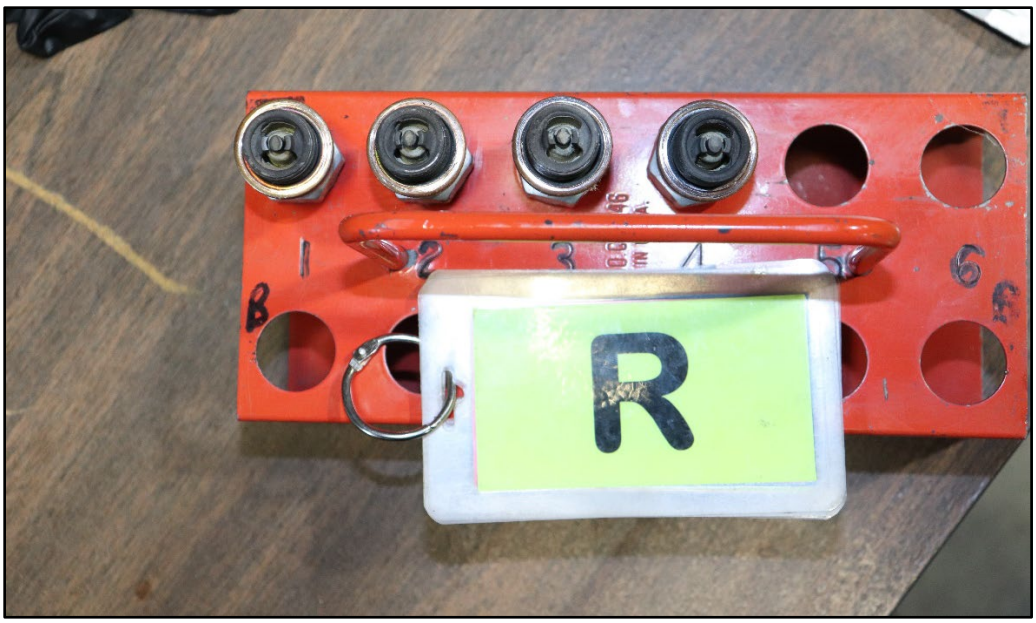

Figure 9: View of right engine spark plugs

The single drive dual magneto remained attached to the engine accessories case, no external damage noted. The magneto was removed and was rotated by hand, spark was produced on all eight ignition leads and impulse coupling engagement was heard.

The propeller governor remained attached to the engine. The propeller control arm was bent and the control cable was cut by recovery personal near the engines accessories case. The control cable was removed from propeller governor arm and moved from stop to stop when actuated by hand. The propeller governor was removed and the input shaft was rotated freely by hand. The propeller governor screen and gaskets were intact and free of debris.

The carburetor remained attached to the engine. The throttle control cable was attached to the throttle arm and the control cable was cut near the engines accessories case. The throttle arm moved freely from stop to stop when actuated by hand. The mixture control cable remained attached to the carburetor and was cut near the engines accessory case. The mixture control arm moved freely from stop to stop when actuated by hand. The fuel inlet fuel screen was removed, and clear and free of debris. The carburetor was disassembled, and blue in color liquid, consistent with 100 LL was observed in the fuel bowl. The fuel was tested for water using SAR-GEL water finding paste, with negative results. The carburetor float exhibited hydraulic crushing.

The air induction system was separated from the engine baffle. The air induction body remained attached to the carburetor. The air induction conduit was clear of obstruction and debris.

The engine oil sump remained attached to the engine, and crushing, consistent with impact damage was observed. The oil sump pick-up screen was removed, and a slight amount of debris was observed.

The engine driven fuel pump remained attached to the engine. No visual damage was observed. The fuel pump was removed and actuated by hand, air pressure was felt at the fuel outlet.

The oil filter remained attached to the oil filter adapter, but was fracture separated from the engine accessory case. Crush and bending was observed throughout.

3.0 Propeller Examination

Left Propeller
Manufacturer: Hartzell
Model Number: HC-C2YR-2CLEUF
Serial Number: AU11842B

The left engine was equipped with a two blade Hartzell propeller. The propeller and propeller hub separated at the propeller flange. Propeller blade A exhibited aft bending at the hub, with unidirectional striations on the cambered side of the blade and polishing along the leading edge. Propeller blade B exhibited aft bending about mid span and chordwise striations along the cambered side.

Figure 10: View of left engine propeller

Right Propeller
Manufacturer: Hartzell
Model Number: HC-C2YR-2CLEUF
Serial Number: AU12562B

The airplane was equipped with a two blade Hartzell propeller. The propeller and propeller hub remained attached to the engine. Propeller blades C and D exhibited aft bending about mid span, with unidirectional striations on the cambered side of the blades.

Figure 11: View of right engine propeller (courtesy Piper Aircraft)

Submitted by:

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