



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region
July 13, 2015

AIRFRAME AND ENGINE EXAM REPORT

WPR15FA206

This document contains 22 embedded photos.

A. ACCIDENT

Location: Carey, ID
Date: July 2, 2015
Aircraft: Piper PA22-135; Registration Number: N8195C, Serial #: 22-2300
NTSB IIC: Howard Plagens

B. EXAMINATION PARTICIPANTS:

Howard Plagens
Senior Air Safety Investigator
National Transportation Safety Board
Federal Way, WA

Keith Rittenberry
Aviation Safety Inspector
Federal Aviation Administration
Boise, ID

Charles Little
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Piper Aircraft
Vero Beach, FL

Mark Platt
Air Safety Investigator
Lycoming Engines
Williamsport, PA

C. SUMMARY

Examination of the recovered airframe and engine was conducted on July 21, 2015, at the facilities of SP Aircraft, Boise, Idaho. No evidence of preimpact mechanical malfunction was noted during the examination of the recovered airframe and engine.

D. DETAILS OF THE INVESTIGATION

1.0 Airframe Examination

Fuselage

The fuselage sustained heavy crush damage with the forward cockpit and instrument panel mostly separated from the center fuselage section. The tachometer separated from the instrument panel, and sustained crush damage; the hour meter read 2,731.30, and the needle was trapped at 1,800 rpm.



Figure 1 Tachometer

All control cables remained attached to the moveable control surfaces. The primary aileron control cables were in the forward cockpit area. One cable had a section of chain attached; the other cable had a fractured turnbuckle. Both cables were cut by recovery personnel.



Figure 2 Piper Photo of Control Yokes



Figure 3 Part of Control Column



Figure 4 Left Aileron Horn

Both rudder cables remained attached to the torque tube assembly, and were cut by recovery personnel.

The elevator push-pull tube rod end remained attached to the T-bar, but fractured and separated at the last thread. The rod assembly was bent, and the fracture surface was angular. The push pull tube remained attached to the elevator bellcrank, and the elevator control cables were also attached to the bellcrank.



Figure 5 Elevator Push-Pull Tube Rod End at T-bar



Figure 6 Elevator and Bellcrank Rod Assembly in Cockpit



Figure 7 Elevator Horns and Elevator Stabilizer Adjustment

Left wing

The left aileron remained attached at the outboard hinge, but separated at the inboard hinge along a jagged fracture surface. The control cables remained attached to the bellcrank and were continuous to the wing root.

The left flap cable remained connected to its bellcrank. The flap operating rod fractured and separated; the rod was bent, and the fracture surface was angular and uneven.

Right wing

The right wing sustained aft crush damage at the tip about halfway to the spar.

The right aileron separated at the hinges, but remained attached by the control cables, and the airframe was deformed in that area. The hinges separated with jagged and angular fracture surfaces.

The right flap remained attached at the outboard hinge, but separated inboard. The flap was badly deformed.

The fuel selector valve (FSV) was attached to its mounting bracket, which separated from the fuselage. The FSV cover plate was loose on the FSV, and the cover was bent and trapped in a position that had the pointer in line with the lower OFF position. Air could not be blown through the FSV. Visually, the FSV was in the OFF position. Investigators moved the FSV freely through various detents, and heard a positive click at the OFF, LEFT MAIN, and RIGHT MAIN positions. Air blown into the FSV passed through the left and right port to the engine port.



Figure 8 Fuel Selector Valve

The gascolator was crushed and deformed; the screen and bowl were not present.

The emergency locator transmitter was an Ameri-King Corp. AK-450, TSO 91a, serial number 490148

2.0 Engine Examination

The maintenance logbook indicated that the engine was Lycoming O-290-D2, serial number 7210-21; the data plate was not located.

The engine remained attached to the fuselage by the engine mount assembly, and sustained extensive crush damage. The crankshaft angled left, and lower portions of the crankcase separated.

Investigators removed the engine, and slung it from a hoist.



Figure 9 Front of Engine



Figure 10 Top Left View of Engine



Figure 11 Left Side of Engine



Figure 12 Right Side of Engine

The air filter was crushed aft, was deformed, and had organic debris on its front surface.

The starter and alternator separated from the engine, and sustained severe crush damage.

Various fuel supply lines at the engine and firewall were displaced from their respective fittings.

The crankshaft would not rotate; the front of the engine sustained aft crush damage, and portions of the crankcase were missing at the front of cylinder number two. The right side cylinders (one and three) had dirt debris impacted on the fins, and the front of the crankshaft with the propeller flange was bent to the left toward cylinder number two. The bottom of the crankcase had material missing, which allowed visual examination of the camshaft; the lobes were unremarkable. Mechanical continuity of the rotating components was established visually during partial disassembly of the engine.



Figure 13 Camshaft

Examination of the crankshaft gear revealed that it was loose within the counter bore of the crankshaft. The locking ring was bent along the edge of the hex head bolt; however, a portion of the bolt locking tab that engages the crank gear was missing. Close examination of the gear counter bore circumference mating surface revealed significant fretting signatures. The edge was shiny. There was no mechanical disconnect of the interface. The engine manufacturer's investigator opined that the fretting had been occurring over a long period of time, and if uncorrected, the condition would eventually lead to a loss of engine power.



Figure 14 Crankshaft Gear

The combustion chambers of the cylinders did not display evidence of foreign object ingestion.

Investigators removed the spark plugs, which were Champion REM-40E. The bottom plug for cylinder number one was damaged. All center electrodes were nearly circular with no mechanical deformation. The spark plug electrodes were moist due to the position of the engine at the site and post recovery. The number four top plug, which had been exposed to the elements at the site and post recovery, was rusty.

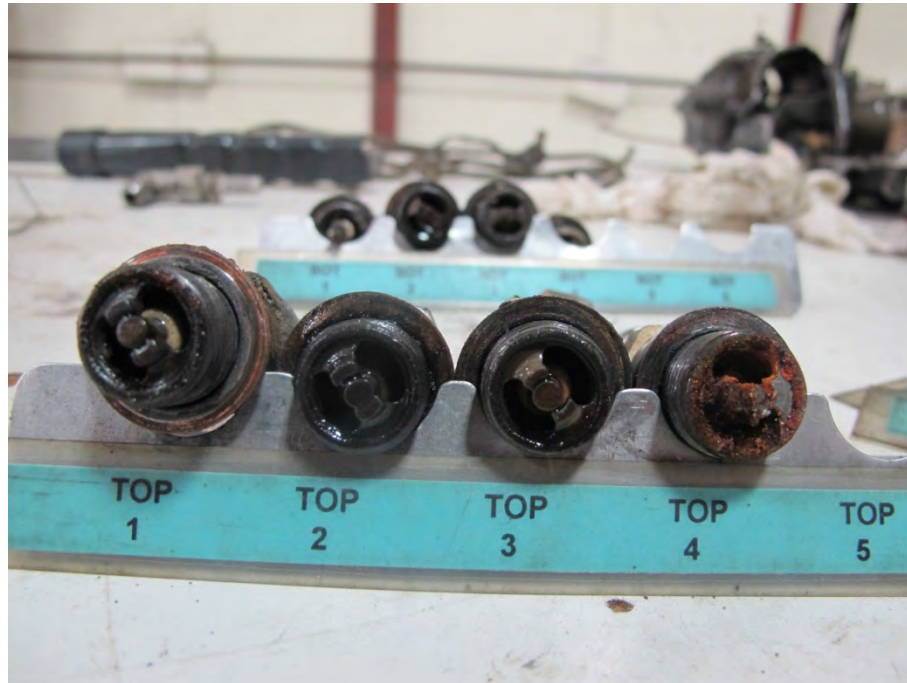


Figure 15 Top Spark Plugs



Figure 16 Bottom Spark Plugs

A borescope inspection revealed no mechanical deformation on the valves, cylinder walls, or internal cylinder head.

Investigators manually rotated the magnetos. Both magnetos produced spark at all posts.

The oil sump had material missing. The oil suction screen was not contaminated. The oil filter pressure screen separated, and was not identified.



Figure 17 Oil Screen

Disassembly of the oil pump revealed no anomalies.



Figure 18 Oil Pump

The carburetor was displaced from the engine, but the portion that remained attached to the engine was secure. Investigators disassembled the carburetor. The floats were metal, and remained secure at the mounting; they exhibited hydraulic crush damage with the right float showing more deformation than the left. A small amount of fluid that smelled like automotive fuel was in the float bowl, but no contaminants were observed. The throttle and mixture controls were securely attached to their respective operating arms on the carburetor. The fuel inlet filter screen contained visible contaminants, but there was no flow blockage.



Figure 19 Carburetor Bowl



Figure 20 Carburetor Floats



Figure 21 Carburetor Fuel Filter Screen

There was no oil residue observed in the exhaust system; the muffler baffles remained in place.

3.0 Propeller Examination

One blade was bent aft about 30 degrees about 10 inches from the hub, and the outboard 10 inches bent aft another 20 degrees.

The second blade gradually bent aft about 10 degrees.

Both blades exhibited chordwise striations across the cambered surface.

The propeller separated from the engine crankshaft flange.



Figure 22 Propeller