



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region

October, 2015

AIRFRAME AND ENGINE EXAMINATION

WPR16FA014

This document contains 25 embedded photos.

A. ACCIDENT

Location: Morongo Valley, California
Date: October 17, 2015
Aircraft: Piper PA28R-180, Registration Number: N4972J, Serial #: 28R-30723
NTSB IIC: Elliott Simpson

B. EXAMINATION PARTICIPANTS:

Elliott Simpson
Senior Aviation Accident Investigator
National Transportation Safety Board
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Scott Hutson
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Air Safety Investigator
Piper Aircraft Company
Vero Beach, FL

C. SUMMARY

Examination of the recovered airframe and engine was conducted on October 21, 2015 at the facilities of Air Transport in Phoenix, Arizona. No evidence of preimpact mechanical malfunction was noted during the examination.

D. DETAILS OF THE INVESTIGATION

1.0 Airframe Examination

The airframe sustained extensive thermal damage consuming the entire cabin through to the tail section (Photo 1). The firewall was crushed and detached from the airframe, and the steel remnants of the seat frames, flight control columns, cables, and bellcranks exhibited fragmentation and bending damage with fire consuming all of their ancillary components (Photo 2).

Both wings separated from the airframe but remained connected to each other through the flap torque tube and aileron balance cable, which remained connected to the outboard bellcrank in each wing. All remaining aileron cables had been cut at the wing root by recovery personnel but were continuous to their respective outboard bellcrank attach points in each wing.

The right wing sustained leading edge crush damage through to main spar along its entire length, along with thermal damage to all surfaces (Photo 3). The fuel tank was breached, and the fuel cap was in place at the filler neck. Both the flap and aileron remained attached (Photo 4). The wing tip had separated. The outboard bellcrank remained connected to its wing rib, and the push-pull tube remained connected to the aileron (Photo 5). The landing gear was retracted within the wheel well, and exhibited bending damage around the well frame consistent with the wheel being retracted at impact (Photo 6).

The left wing sustained leading edge crush damage through to main spar along its entire length, along with fire damage to all surfaces (Photo 7). The fuel tank was breached, and the fuel cap was in place at the filler neck. The outboard wing section had separated adjacent to the flap and aileron interface (Photo 8). The flap remained connected at its inboard hinge. The aileron bellcrank was still attached to its wing rib and control cables, but the aileron push-pull tube had separated at the eyebolt, where it exhibited bending signatures consistent impact. The landing gear had separated from the spar, and the wheel had separated from landing gear arm (Photo 9). According to recovery personnel, the left aileron had been misplaced during recovery (it was observed and documented by the NTSB investigator-in-charge at the accident site (Photo 10)).

The tailcone had become crushed forward against the remnants of the aft cabin (Photo 11). The vertical stabilizer and stabilator remained attached to each other and the tailcone. The vertical stabilizer sustained crush damage and the rudder remained attached at its hinges. Both control cables were still attached to the rudder (Photo 12) and were continuous to the cabin where they had been cut by recovery personnel. Forward of the cut, the cables were continuous to the remnants of the rudder foot pedals.

The stabilator and trim tab were intact. Twelve threads were visible on the upper jack of the trim actuator (Photo 13), and the stabilator control cables were continuous to the cabin where they had been cut by recovery personnel. Forward of the cut, the cables were continuous to the remnants of the control column.

2.0 Engine Examination

The engine remained partially attached to its mount, which had detached from the firewall (Photo 14). The engine was thermally discolored and covered in soot, and the forward crankcase had sustained cracks around the area of the forward crankcase bearing (Photo 15). The forward fins of cylinder number 1 were bent, along with all of the pushrod cover tubes.

The accessory case was consumed by fire along with both magnetos, the vacuum pump, the oil sump and induction tubes. The drive train area was exposed, with only the crankshaft and camshaft drive gears remaining (Photo 16). Both idler gears were located separately and had been incased in molten aluminum. The engine driven fuel pump, along with the fuel servo sustained extensive thermal damage, exposing their internal components (Photo 17, 18). The crankshaft gear, bolt, locking device and dowel remained secure and intact.

The fuel flow divider remained intact, with all fuel lines connected to their respective fuel injector nozzles with the exception of line three which was crushed and separated at the flow divider outlet. The flow divider was disassembled and the diaphragm appeared thermally damaged (Photo 19). The fuel injector nozzles were free of obstruction.

The rocker covers were removed, and no damage was observed to the rockers or valve springs. There was no metal contamination observed within the rocker box areas.

The top spark plugs were removed and examined. The spark plugs were of the massive electrode type, and cylinder number 1, 2 and 4 were dark in color with plug 3 exhibiting a lighter grey coloration. The varying coloration was attributed to being exposed to the thermal effects of the post impact ground fire. According to the Champion Aviation Check-A-Plug AV-27 Chart, the electrodes exhibited wear signatures consistent a short service life (Photo 20).

The cylinder combustion chambers were examined utilizing a borescope. The combustion chambers appeared mechanically undamaged, and according to the Lycoming representative, there was no evidence of foreign object ingestion or detonation. The valves were intact and undamaged, and there was no evidence of valve to piston face contact.

Holes were drilled in the upper crankcase to facilitate examination of the camshaft lobes utilizing a lighted bore scope. All lobes appeared undamaged. The crankshaft and attached connecting rods remained undamaged and free of heat distress.

The propeller hub had separated from the crankshaft. The separation features on the crankshaft were conical in appearance with a 45 degree shear lip around the entire radius of the break (Photo 21). Both propeller blades had separated about 10 inches from their tips (Photo 22). Both inboard blade sections exhibited similar chordwise scratches, tip twist, and leading edge nicks (Photo 23, 24). One of the blades tips was located and, exhibited similar damage signatures (Photo 25). The second tip was not located and presumed destroyed by fire; however its separation surfaces were similar to the other blade.

3.0 Examination Photos



Photo 1 - Aft Cabin



Photo 2 - Remnants of Cabin



Photo 3 - Right Wing



Photo 4 - Right Wing



Photo 5 - Right Wing Bellcrank



Photo 6- Right Main Landing Gear



Photo 7 - Left Wing

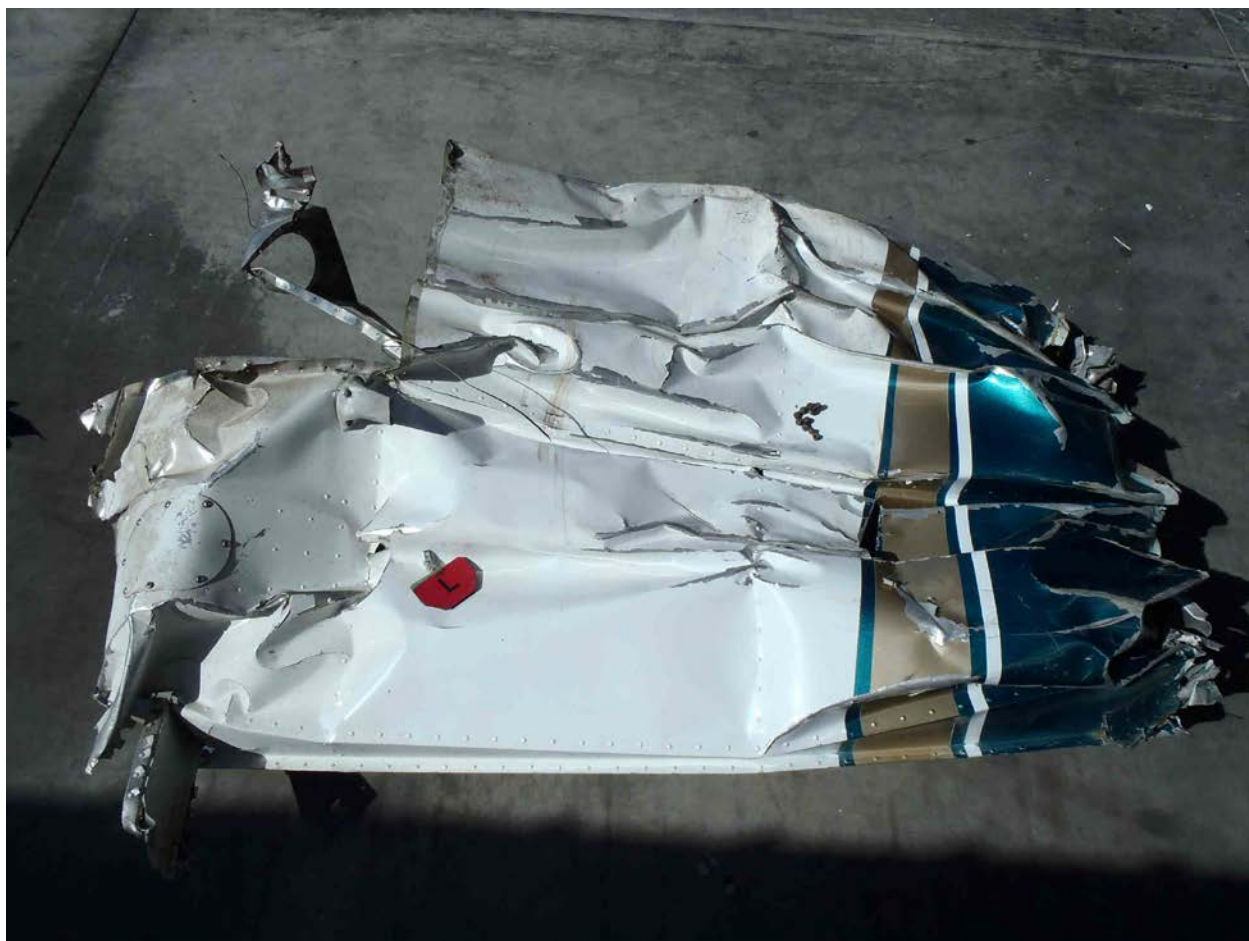


Photo 8 - Outboard Section of Left Wing



Photo 9 - Left Main Landing Gear



Photo 10 - Right Aileron at Accident Site



Photo 11 - Empennage



Photo 12 - Rudder Control Horn

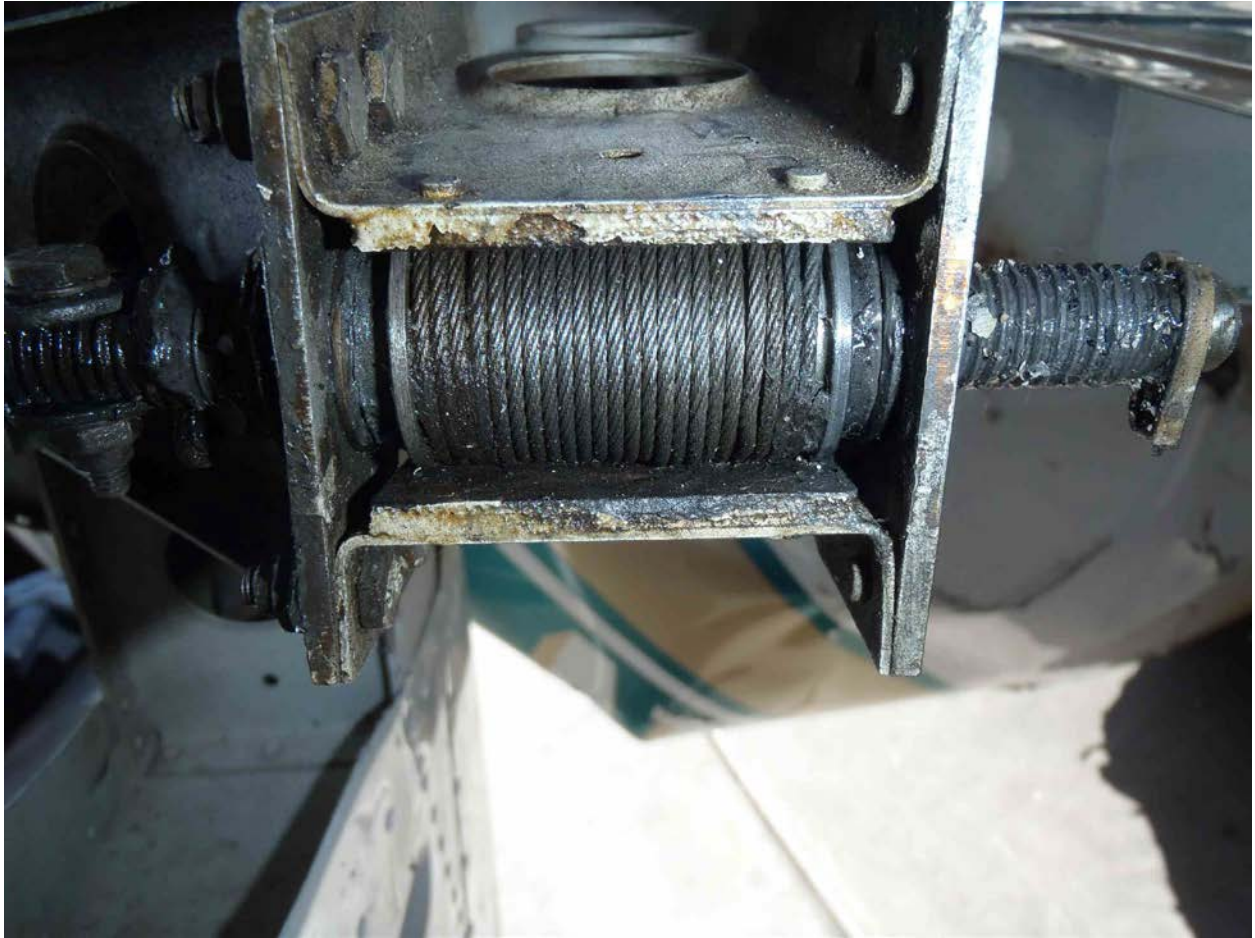


Photo 13 - Stabilator Trim Actuator



Photo 14 - Engine



Photo 15 - Forward Crankcase



Photo 16 - Aft Engine Section



Photo 17 - Engine Driven Fuel Pump Remnants



Photo 18 - Fuel Servo

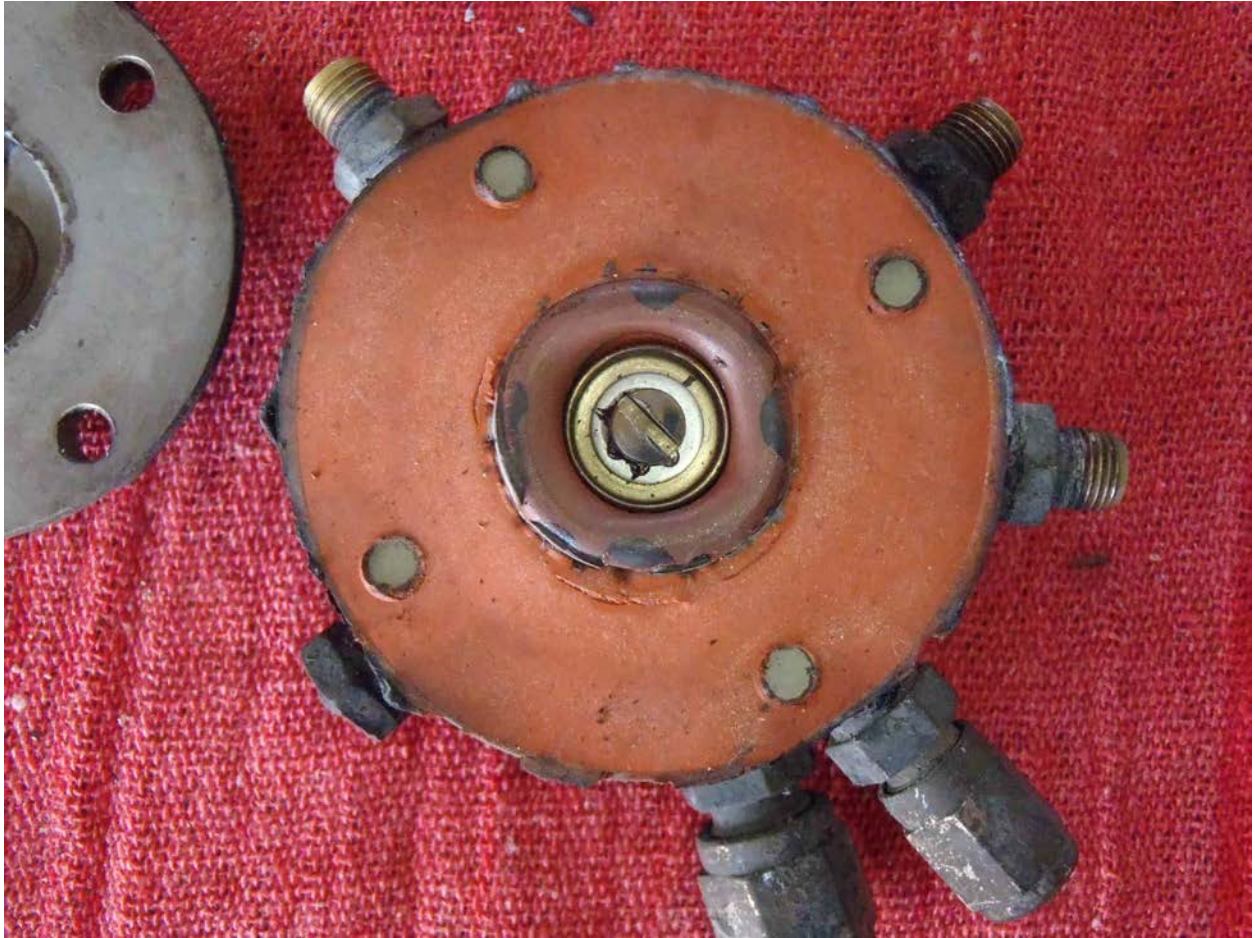


Photo 19 - Fuel Flow Divider Diaphragm

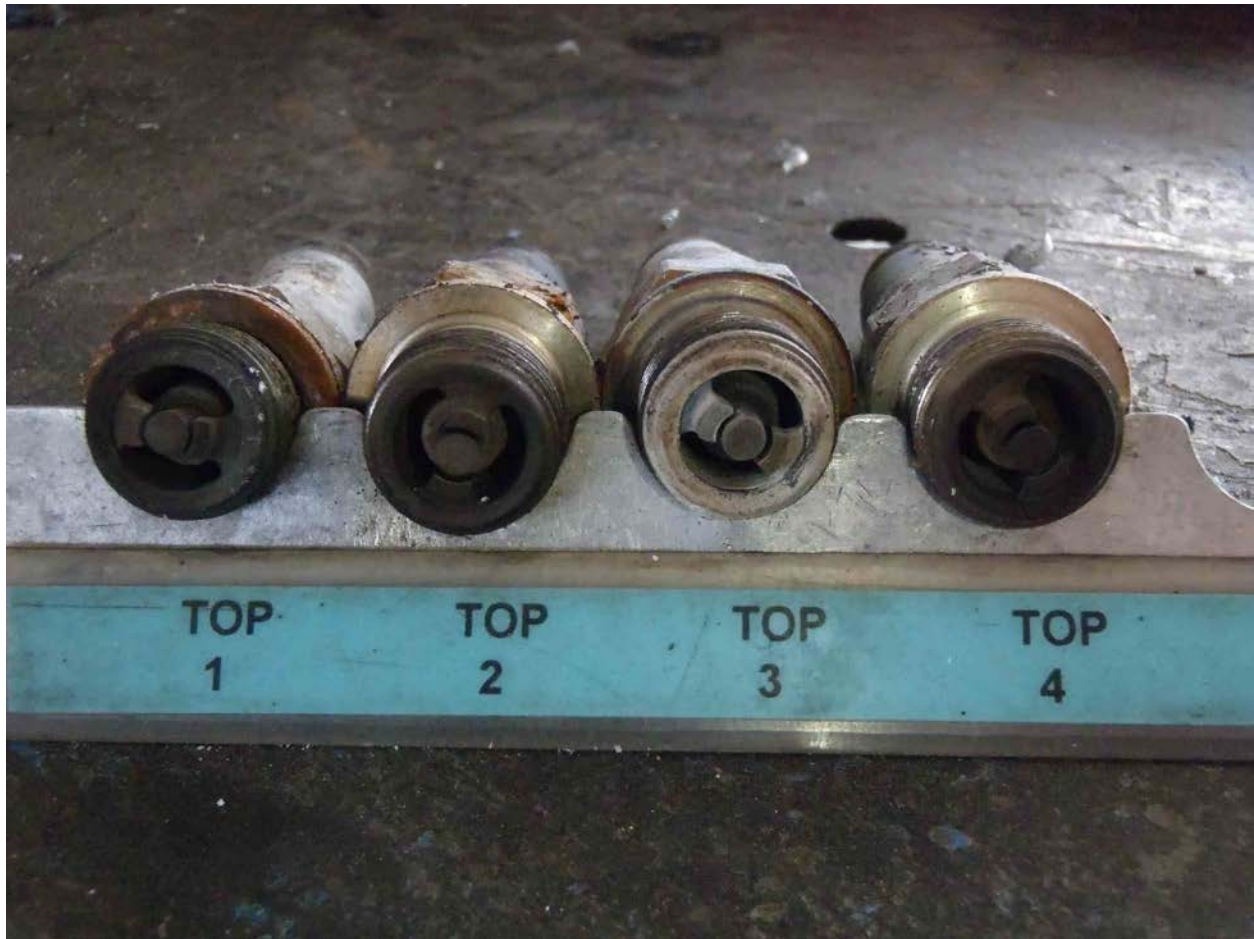


Photo 20 - Top Spark Plugs



Photo 21 - Crankshaft at Prop Hub



Photo 22 - Propeller



Photo 23 - Propeller Blade



Photo 24 - Propeller Blade



Photo 25 - Propeller Blade Tip

Submitted by: Elliott Simpson