



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region

March, 2016

ENGINE EXAMINATION

WPR16FA041

This document contains 14 embedded photos.

A. ACCIDENT

Location: Bakersfield, California
Date: December 19, 2015
Aircraft: Piper PA-32RT-300T, Registration Number: N36402
NTSB IIC: Elliott Simpson

B. EXAMINATION PARTICIPANTS:

Elliott Simpson
Senior Aviation Accident Investigator
National Transportation Safety Board

C. SUMMARY

Examination of the recovered engine was conducted on March 30, 2016 in a hangar at Corona Airport, Corona, California.

D. DETAILS OF THE INVESTIGATION

1.0 Engine Examination

Lycoming TIO-540-S1AD
SN: L-5380-61A

The engine remained partially attached to its mount, with all but the upper left mounting lugs separated from the crankcase. The engine mount was attached to the forward cabin which included the flight instruments and controls, along and forward baggage hold (Photo 1). The upper side of the engine sustained crush damage, flattening the pushrods and exhaust manifolds around the cylinder heads, and severing all spark plug leads at the spark plugs (Photo 2). The governor had broken away from the upper bolts at its mounting pad, and the upper side of the crankcase exhibited multiple lateral cracks. The flywheel, along with the propeller and hub remained attached to the crankshaft; the flywheel was bent, and the starter motor and alternator had fragmented and separated from their respective pads. The six engine cylinders remained attached to the crankcase, and the oil dipstick was in place at the filler neck, which was crushed.

The oil sump had fragmented, revealing the inside of the crankcase lower chamber, along with the bent oil dipstick. The inlet manifolds, and servo throttle body (Photo 3), had been crushed

and fragmented. The turbocharger and all exhaust pipes remained attached; the turbocharger inlet shroud was clogged with mud, crushed, and impinged against the compressor wheel (Photo 4). The compressor wheel was intact, with two blades bent at the point of contact with the shroud. The turbine wheel was intact, and coated, along with the inner surface of all exhaust pipe, with light colored tan deposits (Photo 5).

The butterfly valve of the throttle body was in the 45-degrees open position. The throttle cable remained attached to its linkage arm on the fuel controller, and was continuous through top the cabin.

The accessory case was cracked, separating the dual magneto, turbo scavenge pump, and engine driven fuel pump, which were all intact. Both pumps rotated smoothly at their input shafts. All fuel and oil lines throughout the engine compartment were intact at their respective fittings.

The dual magneto case had shattered, separating the spark plug leads, and resulting in the crushing, and expulsion of the magneto's internal components (Photo 6).

The fuel selector valve was disassembled and contained 3 ounces of clear, blue-colored fuel (Photo 7).

The top spark plugs exhibited crush damage to their insulating sleeves. Removal revealed that the plugs for cylinder number two, four, and six were wet with oil, with one, three and five exhibiting grey and tan deposits. When compared to the Champion Aviation Check-A-Plug chart, the plugs exhibited worn out – normal signatures (Photo 8).

Borescope examination of the cylinder chambers via the upper plug holes revealed no indications of catastrophic failure. The rocker covers were removed, and all rockers, and springs were intact and coated in a light film of oil.

The primary vacuum pump had broken away from its pad, exposing the plastic coupling which was intact. Two of the coupling pins (Photo 9) had broken away and remained within the coupling; no smearing was present on the coupling surfaces. The pump was disassembled, all vanes were intact, and the rotor had cracked in the center. (Photo 10). The electrically driven backup vacuum pump assembly was intact at the firewall (Photo 11), disassembly revealed that the plastic coupling (Photo 12) along with the rotor and all vanes (Photo 13) were intact and undamaged. The vacuum filter was clear.

The engine could be rotated about 5 degrees at the propeller. Rotation revealed drive train continuity through to the gears at the accessory case.

No indications of thermal damage were noted anywhere within the engine compartment.

The propeller blades attached to the hub (Photo 14), One blade was intact, the second exhibited a 15 degrees forward bend midspan, the third blade was bent 5 degrees aft at hub. All blades were free of leading edge nicks.

2.0 Examination Photos



Photo 1 – Engine and Instrument Panel at Accident Site



Photo 2 – Engine



Photo 3 – Throttle Body



Photo 4 – Turbocharger Inlet



Photo 5 – Turbo Charger Turbine Wheel

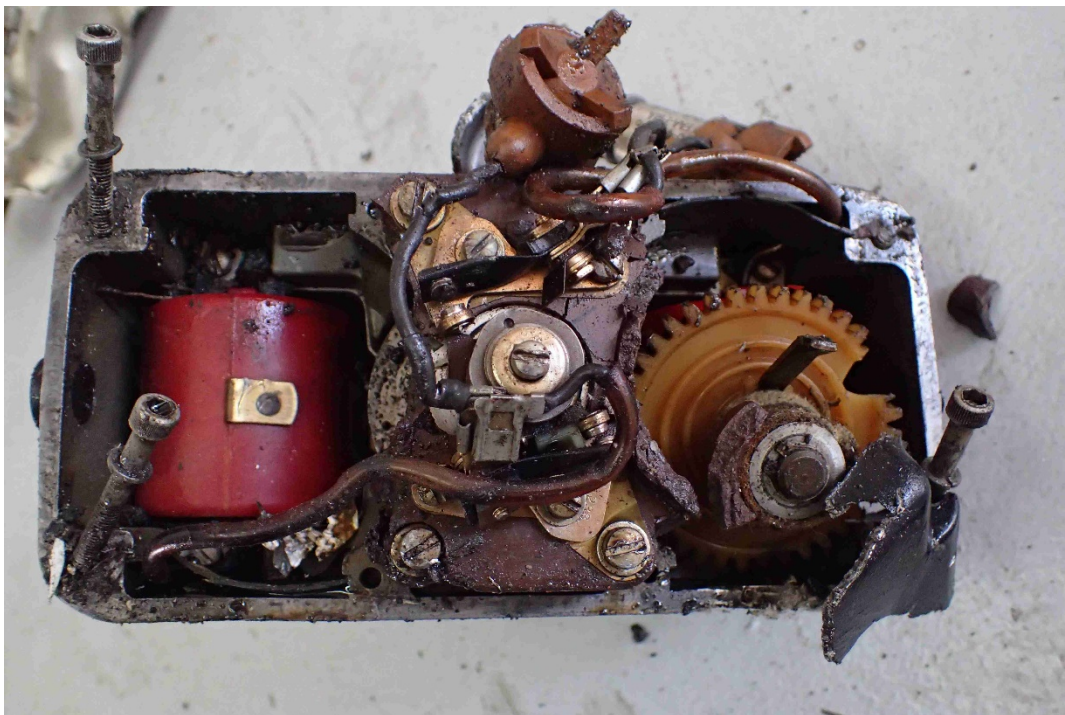


Photo 6 – Dual Magneto



Photo 7 – Fuel From Fuel Selector Valve

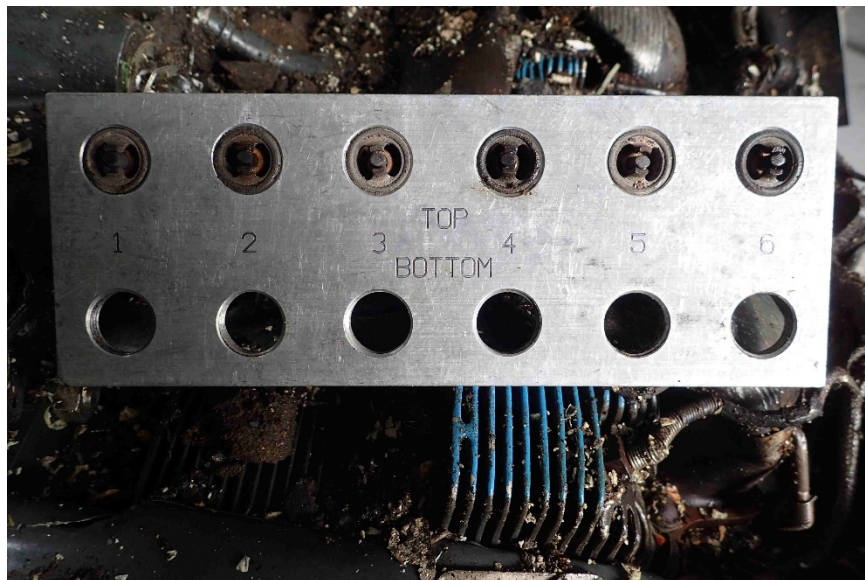


Photo 8 – Top Spark Plugs



Photo 9 – Primary Vacuum Pump Drive Coupling

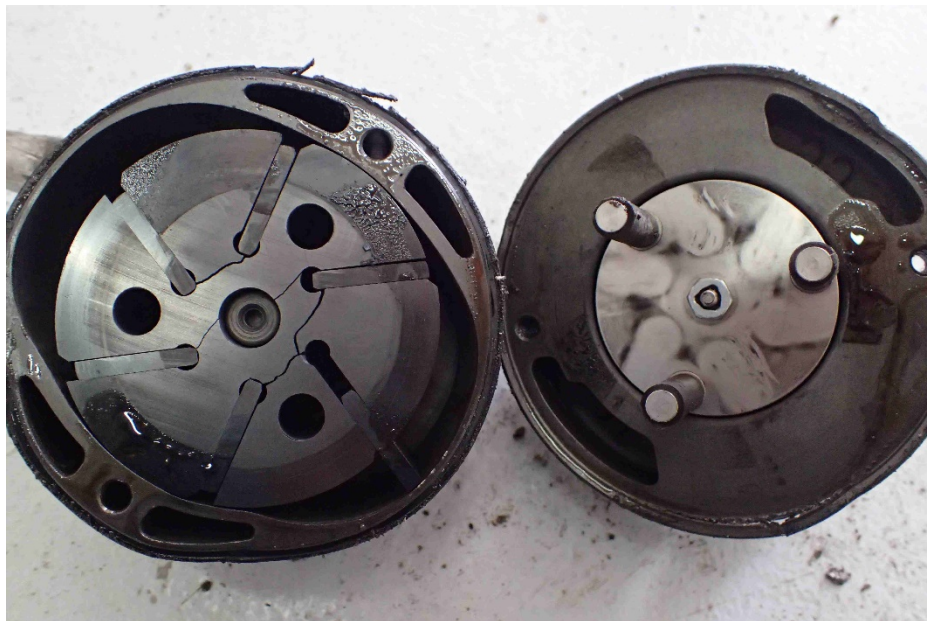


Photo 10 – Vacuum Pump Internal Components



Photo 11 – Secondary Vacuum Pump



Photo 12 – Secondary Vacuum Pump Drive Pins



Photo 13 - Secondary Vacuum Pump Vanes and Rotor



Photo 14 – Propeller and Hub

Submitted by: Elliott Simpson