



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region

AIRFRAME AND ENGINE EXAMINATION

WPR17LA096

This document contains 7 embedded photos.

A. ACCIDENT

Location: Mukilteo, Washington
Date: May 2, 2017
Aircraft: Piper PA-32-260, Registration Number: N3457W, Serial #: 32-326
NTSB IIC: Elliott Simpson

B. EXAMINATION PARTICIPANTS:

Elliott Simpson
Senior Aviation Accident Investigator
National Transportation Safety Board

John Osborne
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Lycoming Engines

C. SUMMARY

Examination of the recovered airframe and engine was conducted on June 27, and 28, 2017 at the facilities of AvTech in Auburn, Washington.

D. DETAILS OF THE INVESTIGATION

1.0 Airframe Examination

The fuel selector valve cover was removed from the belly, revealing the selector bowl. There was no indication of fuel staining or streaks to any of the belly skins in the vicinity of the selector drain port. The screws attaching the bowl to the valve case appeared to be held in place with minimum torque and were removed from the bowl for examination. The bowl contained about ¼ cup of clean, bright, light-blue colored fuel (Photo 1). The O-ring, spring, and retaining washer were in place, and the white plastic screen was clear. The valve was observed in the left tip tank position, which corresponded to the valve handle in the cabin. The fuel selector valve moved freely through its range, and the detents were positive. There was no fuel staining on the inside cabin belly skins in the area of the fuel selector valve.

The fuel from the bowl was tested with water detecting paste, and no water was found.

Both wings had been separated from the fuselage at the accident site by recovery personnel.

The right wing had separated into two sections during the impact. All fuel lines within the wing were clear, and the partial burnt remnants of the tip tank were all that remained. The tip tank screen was intact and free of blockage.

The left wing sustained minimal damage; the fuel lines were clear, and the partial burnt remnants of the tip tank were all that remained. The tip tank screen was intact and free of blockage.

According to the FAA and NTSB representatives who responded to the accident site, the selector valve was in the OFF position when initially examined. According to the Fire Chief who responded to the accident, one of his fire crew members switched the valve position to OFF immediately following the accident, but they did not document the position it was found in.

2.0 Engine Examination

Model: O-540-E4B5

Data Tag Serial #: L-11864-40

Case Stamp #: L-944-40

Examination

The engine sustained minimal damage and remained partially attached to the firewall (Photo 2), with the upper left engine mount broken. The airbox sustained crush damage and the Bendix starter gear had extended, making contact with the ring gear. The propeller remained attached to the crankshaft, with both blades exhibiting about 360° of tip curl, and chordwise scratches at the curled areas (Photo 3). One blade tip had detached, leaving a jagged separation surface (Photo 4).

The dipstick indicated 6 quarts of oil.

The induction filter was removed and was free of obstruction. The carb heat control was noted in the OFF position, and this corresponded to the flapper position in the airbox. The carburetor heat induction scat tubes and the carburetor venturi were clear. The throttle valve was intact, and moved appropriately with corresponding movement of the cabin control. The fuel mixture and propeller controls were continuous from the cabin controls to the respective engine controls, and could be moved freely.

The fuel primer valve in the cabin was in the locked position, and all primer lines were intact to cylinders 1 through 5. No primer line was present on cylinder 6, with a manifold pressure line taking its place. A backup vacuum system had been installed on the intake manifold of cylinder number 6; it's plumbing remained firmly attached to the inlet manifold.

Each of the magneto harnesses were intact and undamaged, and the P-leads both remained connected. The top spark plugs were removed, and all exhibited normal wear signatures consistent with short service life when compared to the Champion AV-27 check-a-plug chart.

The electrodes of plugs 1 through 4 were dark grey in color. The electrodes of plug 5 were coated in dark grey/black soot (Photo 5), and plug 6 was coated in black soot (Photo 6). The electrodes of the lower spark plug for cylinder 6 exhibited similar black sooting.

The engine was rotated by hand at the propeller, and “thumb” compression was noted at all upper plug holes. The remaining plugs were removed and connected to their respective magneto harness leads. Each plug sparked while the engine was rotated by hand, and the impulse coupling could be heard to trigger during rotation. The rocker covers for cylinders 4 and 6 were removed, and each valve moved an appropriate and equal amount during engine rotation.

Engine Run

The propeller was exchanged with a two-blade Hartzell constant speed propeller. A fuel canister was connected to the right tip tank inlet line at the wing root. The canister was filled with the same fuel recovered from the airplane at the accident site and raised level with the wing tip. The selector valve was set to the right tip tank position, and the auxiliary fuel pump was turned on. The pump made a clicking sound consistent with operation, as the fuel pressure increased to the green range on the cabin indicator of between 5 and 8 psi. The fuel lines were then checked, and no fuel leak within the cabin or forward of the firewall was observed.

After two cranking attempts, the engine started. The engine was run for about 4 minutes at speeds varying from 700 to 2,500 RPM. The engine operated smoothly throughout, each magneto indicated a 100 RPM drop when tested at 1,500 RPM, and the engine speed responded to adjustments of the propeller control.

Following the run, the top spark plugs were removed, and all exhibited dark grey-colored deposits.

With the engine still warm, a differential compression test was performed. The following results were observed:

Cylinder Number – leakage pressure (psi)/orifice pressure (psi)

1 – 70/80
3 – 74/80
5 – 60/80
6 – 75/80
4 – 75/80
2 – 74/80

Difficulties were encountered with installing the pressure testing equipment at cylinder 5, which were attributed to baffling interfering with the pressure line. No leakage was heard from cylinder 5, therefore it was presumed that the lower pressure was due problems with the test equipment against the baffling.

The magneto-to-engine timing was checked; the right magneto was found at an advance of 25°, and the left 23°. The engine data tag indicated 25° spark advance. The magnetos were two different types:

Left Magneto

Type: Slick (TCM Factory Rebuilt)

Part: S6LSC-21

Serial: BL-500516-2

MFG: D05AA202R

Right Magneto

Type: Bendix S6LN-204 (Airmith Magneto)

Part: 10-163050-9

Serial: A12100 411.9

The muffler was removed, and all exhaust down-pipes were free of obstruction, with their inner surfaces coated in light tan deposits. The internal components of the muffler were intact (Photo 7).

The number 6 cylinder assembly was then removed, and examined. The valves were removed, the valve shafts were clean and smooth, and moved freely within their guides. Both valve seats within the cylinder head were coated in carbon-like deposits. The valves were symmetrical in appearance, and the beveled valve seats were smooth.

The two rear cam lobes (exhaust 6 and shared intake 5 & 6), did not exhibit any indications of scoring, spalling or wear. The piston rings were intact, and the cylinder walls were bright and still displayed crosshatch markings.

2.1 Examination Photos

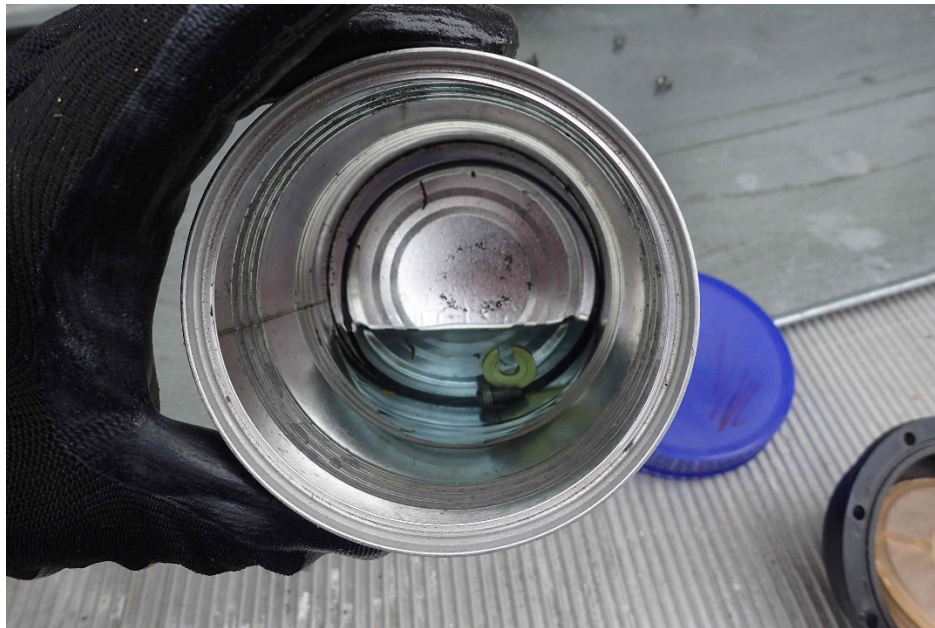


Photo 1 – Fuel Recovered from Selector Valve



Photo 2 - Engine



Photo 3 - Propeller



Photo 4 – Propeller Blade Tip



Photo 5 – Top Spark Plugs



Photo 6 – Top Cylinder 6 Spark Plug



Photo 7- Internal Muffler Baffling after the Engine Run

Submitted by: Elliott Simpson