



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region

February 22, 2016

ACCIDENT SITE / AIRFRAME / ENGINE EXAMINATION SUMMARY

WPR17FA151

This document contains 0 embedded photos.

A. ACCIDENT

Location: Marineland, Florida
Date: July 13, 2017
Aircraft: Piper PA-44-480, N2173S
NTSB Investigator-in-Charge: Joshua Cawthra

B. DETAILS OF THE INVESTIGATION

1.0 Accident Site

Examination of the accident site by National Transportation Safety Board Investigators along with representatives from the FAA and Piper Aircraft revealed that the airplane impacted terrain about 11.5 miles north of the Flagler County Airport, Palm Coast, Florida. The main wreckage came to rest inverted within a heavily wooded area. Trees directly above the wreckage were broken and there appeared to be little to no forward movement. The outboard portions of the left and right wings, baggage door, and a portion of the right side of the stabilator were located throughout a 0.5-mile-long and 0.2-mile-wide debris path throughout water and marshland northwest of the main wreckage.

The fuselage came to rest inverted on a heading of about 022 degrees magnetic. Various debris including fragments of the left stabilator were located within about 50 feet of the fuselage. The fuselage was crushed downward throughout the entire length to the empennage.

2.0 Airframe Examination

Examination of the recovered wreckage revealed that the roof structure was compressed into the cabin seating area. The fuselage was partially separated at station 156. The instrument panel was crushed aft into the front seat area. The cabin door and baggage area door were separated. Both the left and right inboard portion of the wings remained attached to the fuselage structure.

Cockpit Documentation:

Transponder: Impact Damaged
Garmin GPS Com: Impact damaged
Audio Panel: Impact Damaged
Second Com: Impact Damaged
HSI: Impact Damaged
Circuit Breaker Panel: Multiple breakers tripped / missing / impact damaged
Throttle / Mixture / Propeller Levers: Impact damaged / all forward
Carburetor Heat (Left and Right): Off
Gear Lights: Impact damaged
Gear Handle: Impact damaged / down position
Right Tach: 1400 rpm (approximate) / impact damaged / hour meter: unreliable
Left Tach: 500 rpm (approximate) / impact damaged / hour meter: 9468.08

Right Engine:
Fuel: 0

Fuel Pressure: Middle of Green
Oil Pressure: Damaged
Cylinder Head Temp: Left of 350 degrees
Oil Temp: Deflected left

Left Engine:
Fuel: Deflected right
Fuel Pressure: Deflected left
Oil Pressure: Deflected left
Oil Temp: left of 180 degrees
Cylinder Head Temp: Impact Damaged

Left Alt Ampres: needle deflected full right
Right Alt Ampres: 34
EGT: Impact damaged
Airspeed: Just above 60, possibly 63 knots. Also, once needle was moved, slight impact mark on the gauge face consistent with the needle position as found.

Switches: Left side panel / impact damaged
Starter: Impact Damaged
Left Fuel Pump: On
Right Fuel Pump: Off
Anti Collision Lights: On
Nav Lights: On
Pitot Heat: Off

Rudder Trim Wheel: Separated from fuselage

Flap Lever: Retracted

Fuel Selector: Left: On / Right: Off

The gascolators were both clear of debris and the screens were free of debris. The fuel selector valve positions could not be verified due to impact damage and mount separation at the fuselage. Air was applied to the fuel selector valves and continuity was established throughout each valve.

Both left and right seat control wheel horns fragmented. The T bar remained attached to the fuselage hinge point. The horizontal section was fragmented. The aileron control cables remained attached to the T bar chain. The stabilator cables remained attached to the T bar assembly. The rudder pedals were impact damaged. The rudder cables remained attached to the rudder cable assembly.

Pilot and Co Pilot shoulder harnesses remained attached to the fuselage mount and impact damage was noted to the reels. The shoulder harnesses were not connected to the lap belt. The pilot lap belt remained attached to the fuselage mounts and was unbuckled (functionally tested ok). The co pilot lap belt remained attached to the fuselage mounts. The outboard section of the seat belt was cut by first responders, however, the belt remained buckled at the clasp (functionally tested ok).

Both the pilot and copilot seats remained attached to the seat tracks. Both seat frames and seat backs were deformed aft.

Right Wing:

The inboard 95 inches of the right wing remained attached to the fuselage via the forward and aft attach points. The outboard portion of the right wing was separated 33 inches outboard of the engine nacelle at the leading edge and 25 inches outboard of the engine nacelle at the trailing edge. The outboard portion that was separated was about 94 inches in length. The wing tip was separated. An approximate 70-inch-wide and 24-inch-deep portion of the leading edge and bottom side of the wing structure was separated. The area of where the wing separated exhibited upward and aft bending of the main spar.

The aileron remained attached to the wing via the inboard mount and was separated into two pieces about mid span. The outboard portion of the aileron had the counter weight attached. The center hinge point remained attached to the inboard portion of the aileron and the control rod remained attached. Both portions of the aileron were bent and buckled throughout. The aileron bellcrank was deformed inboard (consistent with load on both the aileron drive and balance cables). The aileron bellcrank travel stops did not exhibit evidence of repeated contact. The drive cable measured 57.5 inches from the bellcrank and exhibited overload signatures. The balance cable measured 59 inches from the bellcrank and exhibited overload signatures.

The flap remained attached and was in the up position, however, exhibited an upward bend about 18 inches outboard from the wing root. The engine nacelle was impact damaged and exhibited downward crushing. The fuel tank was impact damaged and breeched. The fuel cap was separated and located in the main wreckage. The right engine remained attached to its mounts, however, to facilitate wreckage recovery, the right engine mount structure was cut and the engine was removed.

Control continuity was established to the right wing. Multiple areas of separation were observed and found to be consistent with overload signatures.

Left Wing:

The inboard 84 inches of the left wing remained attached to the fuselage from the forward and aft attach points. The outboard portion of the right wing was separated 11 inches outboard of the engine nacelle on the leading edge and 15 inches outboard of the engine nacelle at the trailing edge. The outboard portion that was separated was about 85 inches in length and exhibited upward bending of the wing skin at the area of separation. The inboard area of the separation exhibited a downward and aft bending at the main spar. The wing tip was separated. The pitot tube head remained attached to the wing. The pitot and static holes had liquid within them. The stall vanes remained attached to the wing and no major damage to the vanes were noted.

The aileron was separated and fragmented into multiple pieces. The outboard 2 feet of the left aileron was not located, which included the aileron counter weight. The rod end bearing remained attached to the aileron. The control rod was fragmented from the rod end bearing, however, remained attached to the bell crank. The aileron bellcrank travel stops did not exhibit evidence of repeated contact. Impact marks were observed below the aft bellcrank stop. The forward section of the bellcrank was embedded into the web under the forward stop.

The aileron balance cable remained attached to the bell crank. The drive cable measured 53 inches from the bulkhead, outboard of the bellcrank and exhibited overload signatures. The balance cable measured 161 inches and was separated at the turnbuckle. The portion of separated balance cable and turnbuckle were retained for further examination.

The flap remained attached via the inboard mounts and was bent and buckled throughout.

The engine nacelle was impact damaged and exhibited downward crushing. The fuel tank was impact damaged and breeched. The fuel cap remained attached. The left engine remained attached to its mounts, however, to facilitate wreckage recovery, the left engine mount structure was cut and the engine was removed.

Empennage:

The stabilator was separated from the vertical stabilizer. The right side of the stabilator, which was about 52 inches in width, was separated and located in the debris field. The trim tab remained attached to the right side of the stabilator, however, was separated at the inboard hinge. The left portion of the stabilator was separated and fragmented into multiple pieces and was located about 20 feet from the main wreckage. The left side trim tab was separated about mid span. The inboard portion of the trim tab remained attached to its respective attach point. The stabilator travel stops were intact and exhibited no evidence of repeated contact. The stabilator push pull tube remained attached to the bellcrank and counter weight, however, was fragmented.

The vertical stabilizer was separated from the fuselage. The aft spar remained attached to the fuselage and displaced to the left, however, it was separated from the vertical stabilizer. The upper right side portion of the vertical stabilizer below the stabilator mount exhibited a dent/impression. In addition, 45-degree scuffing lines were observed throughout the indentation. The rudder was separated from the vertical stabilizer and was bent and buckled throughout. Rudder stops remained intact and exhibited no evidence of repeated contact. The rudder cables remained intact, however, the rudder bellcrank was separated and not located. The trim tab was separated however remained attached to the control linkages. The rudder trim barrel assembly was separated from its attach point.

3.0 Engine Examinations

Right Engine

The right engine remained attached to the engine mount. The propeller assembly was separated from the engine just forward of the nose case. The magneto and carburetor were separated from their respective mounts. The upper portion of the engine exhibited impact damage, mostly to the pushrod tubes. The upper spark plugs, vacuum pump, propeller governor, and fuel pump were removed from the engine. The crankshaft was rotated using a hand tool attached to an accessory drive mount pad. Rotational continuity was established throughout the engine and valve train. The number 4 intake valve, number 1 exhaust valve, and number 3 intake and exhaust valve push rods exhibited impact damage and would not allow for movement of the rocker arm and valve when the crankshaft was rotated. Thumb compression and suction was obtained on all four cylinders. All four cylinders were examined internally using a lighted borescope and were found unremarkable. Residual oil was present within the engine. The oil suction screen and oil filter were free of metallic debris. The oil cooler hoses were secure to both the engine and oil cooler.

The starter and alternator remained attached to the engine and were unremarkable.

The carburetor impact separated and fractured across the throttle bore. The throttle and mixture control cables were separated, however, remained attached to the respective control arms. The carburetor fuel inlet screen was partially crushed and exposed to elements, however, was found free of debris. The internal plastic float was intact. No fuel or debris was observed within the carburetor float bowl.

The engine driven fuel pump base remained attached to the engine. The pump section of the governor was separated and consistent with impact. The pump was partially disassembled, and all internal components examined were unremarkable. A liquid consistent with 100LL was observed within the fuel line from the engine driven fuel pump to the carburetor.

The magneto was separated from the engine and exhibited impact damage which precluded the magneto from being tested. All internal components were present and unremarkable.

The propeller governor base remained attached to the engine. The upper portion of the governor was fractured. The cable was separated however remained attached to the actuator arm. The propeller governor screen was free of debris.

The vacuum pump remained attached to the engine with no external damage noted. The drive shaft was intact. The vacuum pump was disassembled. The carbon rotor was fractured, and the vanes remained intact.

The top and bottom spark plugs were removed and examined. All four upper plugs were fractured and impact damaged. All eight spark plug electrodes exhibited worn normal signatures. The number upper and lower spark plugs exhibited darker deposits within the electrode area than the remainder of the spark plugs which exhibited light gray deposits.

Left Engine

The left engine remained attached to the engine mount. The propeller assembly was partially separated from the engine just forward of the nose case and the crankshaft was fractured through about 2/3rds of the circumference. The carburetor was separated from their respective mounts. The upper portion of the engine exhibited impact damage, mostly to the pushrod tubes. The upper spark plugs, vacuum pump, propeller governor, propeller, and fuel pump were removed from the engine. The crankshaft was rotated using the propeller flange. Rotational continuity was established throughout the engine and valve train. The number 2 cylinder pushrods were damaged and would not allow for movement of the rocker arm and valve when the crankshaft was rotated. The rocker arms were removed. Thumb compression and suction was obtained on all four cylinders. All four cylinders were examined internally using a lighted borescope and were found unremarkable. Residual oil was present within the engine. The oil suction screen and oil filter were free of metallic debris. The oil cooler hoses were secure to both the engine and oil cooler.

The carburetor impact separated and fractured across the throttle bore. The throttle and mixture control cables were separated, however, remained attached to the respective control arms. The carburetor fuel inlet screen was missing, and the house exhibited impact damage. The internal plastic

float was intact and contained a blue liquid within 2 of the 3 bays. One bay was almost full, and the other bay was about 1/3rd full. No fuel or debris was observed within the carburetor float bowl.

The engine driven fuel pump base remained attached to the engine. The pump section of the governor was separated and consistent with impact. The pump was partially disassembled, and all internal components examined were unremarkable. Residual liquid consistent with fuel was observed within the fuel pump.

The magneto remained attached to the engine and exhibited impact damage which precluded the magneto from being tested. All internal components were present and unremarkable.

The propeller governor base remained attached to the engine. The upper portion of the governor was fractured. The cable was separated however remained attached to the actuator arm. The propeller governor screen was free of debris.

The vacuum pump remained attached to the engine with external damage noted. The drive shaft was intact. The vacuum pump was disassembled. The carbon rotor was fractured, and the vanes remained intact.

The top and bottom spark plugs were removed and examined. All four upper plugs were fractured and impact damaged. All eight spark plug electrodes exhibited worn normal signatures. All of the spark plugs exhibited dark gray deposits within the electrode area with the exception of the number 4 top spark plug, which the electrode was separated (impact damage).

Submitted by: Joshua Cawthra