



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region

AIRFRAME AND ENGINE EXAMINATION

WPR19FA022

This document contains 12 embedded photos.

A. ACCIDENT

Location: Guthrie Center, Iowa
Date: November 9, 2018
Aircraft: Piper PA 28-236, Registration N91770, S/N 28-7911174
NTSB IIC: Elliott Simpson

B. EXAMINATION PARTICIPANTS:

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C. SUMMARY

Examination of the airplane was conducted at the accident site on November 11, 2018.

The airplane was located in an area composed of rolling hills and pastures, at an elevation of 1,200 ft, 6 miles southwest of Guthrie County Regional Airport (KGCT). The main wreckage, which included the cabin, both wings and the empennage, had come to rest facing uphill on a heading of about 270° magnetic (Photo 1). The first identified point of impact was located about 25 ft southeast and was composed of three 18-inch-long by 8-inch-wide divots, the spatial dimensions of which matched the main landing and nose gear (Photo 1). The nose gear-scissor leg was found impaled in the soil just beyond the center divot, and a few feet further the soil had cratered leaving a 15-inch-deep by 4-ft-wide hole. Two matching linear impact marks, the total length of which matched the airplanes wingspan, stemmed from either side of the crater at an orientation of about 320 ° (Photo 2). Red lens fragments were present at the tip of the northwest mark, and a complete green lens was located just beyond the tip of the southeast mark.

Soft dirt, along with shards of composite material, sections of seat rails, the battery, and propeller had been ejected in a westerly direction towards the main cabin.

D. DETAILS OF THE INVESTIGATION

1.0 Airframe Examination

1.1 Cabin

The fuselage sustained crush damage from the nose through to the leading edge of the vertical stabilizer (Photo 3). The flight controls, instrument panel, and avionics were heavily fragmented and compressed (Photo 4). The firewall had folded underneath the instrument panel, which was obscuring the engine. The right side of the cabin walls, along with the cabin roof had peeled back, exposing the aft seats and baggage area. The ignition switch key was in place, and the switch was in the “BOTH” position. The engine primer knob was in the closed and locked position.

The cabin heat control was in the “ON” position, the “DEF” control was about 1/3 short of the on position (Photo 5).

Photographs taken by first response personnel revealed that the pilot (front left seat) and male rear left-seat passenger had been ejected and were located about 15 ft in front of the airplane. The photographs indicated that the female occupant, located in the rear right seat, and male occupant, located in the front right seat remained buckled into their respective seats within the cabin remnants.

Three bags, totaling about 78 lbs in weight, were located both on the ground adjacent to the baggage area and on the right wing. The ELT remained mounted to the airframe behind the baggage hold. It was still connected to the antenna cable, and the ELT power switch was found in the “OFF” position (Photo 6). The rear baggage access panel for the ELT was intact, and there was no indication that the ELT had been accessed by first response personnel.

No Hobbs-hour meter or carbon monoxide detector was found.

The front seats had detached from the airframe, and both seat backs had separated.

The front left seat belt shoulder harness was cut, and its fitting remained attached to the cabin roof. The lap belt remained buckled and attached to the left side of the cabin floor. The right side of the belt had detached from the flooring anchor point.

The front right seat belt was cut at the lap belt, and the buckle was latched and remained anchored to the cabin floor on both sides. The shoulder harness remained anchored to the ceiling and was not connected to the lap belt.

The rear seats had similarly detached from the airframe and exhibited buckling damage. The rear right lap belt remained attached to the cabin floor on both sides, it had been unbuckled. The aft left belt was cut and remained attached to the cabin floor at both anchor points; its buckle was latched.

Both yokes had separated and were located in the forward cabin area. The top of the control tee bar had separated, and the yoke chain was in place and remained attached to the aileron cables, which were continuous through to their respective aileron bellcranks. The left yoke remained attached to the chain sprocket, but the right yoke was separated at the sprocket universal joint.

The rudder pedal bar sustained bending damage and remained partially attached to the cabin structure behind the firewall. The rudder control cables remained attached, and were continuous through to the rudder control horns.

1.2 Empennage

The empennage remained attached to the tailcone, and the entire assembly had canted about 10° nose-down, just forward of the vertical stabilizer. The rudder remained attached to the vertical stabilizer, and the stabilator remained attached to the tailcone. The left side of the stabilator sustained minimal damage, and the right side exhibited a slight upward bend at the tip. The stabilator balance weight remained attached, and the control cables were continuous through to the cabin controls. The stabilator trim barrel exhibited three exposed threads, which according to Piper documentation corresponded to a partial nose-down (stabilator up) trim.

1.3 Wings

Both wings remained attached to the fuselage, and both exhibited leading edge accordion-like crush damage throughout their entire span. Both fuel filler caps were present at their respective filler necks. The left fuel tank was breached at the leading edge, and light-blue colored fuel could be seen at the bottom of the tank. The right tank was similarly breached, and an odor consistent with aviation fuel was noted when the filler cap was removed.

The ailerons and flaps for both wings remained attached at their respective hinges.

1.4 Fuel System

The fuel supply lines from the tank through to the forward cabin were intact, and all fittings were secure. The remaining components of the fuel system sustained significant crush damage. The gascolator was full of fuel. The fuel selector valve position could not be determined due to cabin crush damage.

2.0 Engine

Engine Model: O-540-J3A5D
Serial Number: L-21258-40A

The engine came to rest inverted underneath the forward cabin and remained partially attached to the airframe by its engine mount. The exhaust muffler system and its associate pipes sustained crush damage, and the starter ring gear, carburetor, and engine-driven fuel pump had detached. The oil lines sustained varying degrees of impact damage, but all remained tight at their respective fittings.

The engine was removed from the airframe by the team and, examined while being suspended by a tractor loader (Photo 7).

The dual magneto had detached from its mounting pad, and the accessory the case area was coated in oil. The spark plug harnesses appeared largely undamaged. The magneto points cover sustained crush damage and engine oil was observed inside. The magneto was rotated by hand and a spark was observed at one of the ignition towers.

Oil was observed on the engine dipstick, and oil drained freely from the sump. The oil suction screen was free of debris. The oil filter sustained crush damage, and disassembly revealed that the filter media was oil-coated, and free of observable debris.

The spark plugs were removed and examined. All appeared undamaged, except for the lower plug of cylinder 1, the electrode of which was slightly offset. All plug electrodes were coated in light grey deposits (Photo 8) and exhibited “normal” to “worn out – normal” wear signatures when compared to the Champion AV-27 Aviation Check-A-Plug chart.

The rocker covers were removed, and all components appeared to be coated in oil. The engine was rotated by hand via an adapter fitted to the accessory drive. The engine turned freely, and “thumb” compression was noted on all cylinders. Mechanical continuity was established throughout the rotating group, valve train, and accessory section, and the rockers all moved similar heights.

Visual inspection of the combustion chambers was accomplished through the spark plug bores utilizing a borescope; there was no evidence of foreign object damage or detonation and all combustion surfaces exhibited light grey deposits consistent with normal operation.

The carburetor had separated from the engine at the throttle bore, exposing the butterfly valve which was in the partially open position. The induction air box and carburetor heat valve were crushed. The throttle control arm was intact, and the cable had separated at the rod end. The mixture control remained attached to the mixture shaft and had been wrapped around sections of the induction box, but the control arm had detached. The carburetor heat control cable remained attached to the carburetor heat control arm. Disassembly of the carburetor revealed no internal damage, and the floats were of the blue plastic type. No fuel was present bowl, and the fuel inlet screen was free of debris.

The engine driven fuel pump was disassembled and examined. The rubber diaphragms and check valves were intact, and fluid with an odor consistent with aviation gasoline drained from the pump and the inlet hose.

The exhaust muffler assembly was cut from the engine down-pipes to facilitate examination. The rear muffler exhibited a two-inch-long lateral hole to its outer surface (Photo 9,10). The metal on the edges of the hole were thinned and coated in black deposits. Similar metal thinning was observed at the intersection of the muffler inlet and the muffler seam (Photo 11). The inner surface of the heat shroud was coated in tan deposits; similar deposits were also present on the inner surface of the scat tube leading from the shroud to the cabin heat mixing valve (Photo 12).

The vacuum pump remained attached to the engine, its drive coupling was intact. The carbon rotor had fractured, and the vanes were intact.

2.1 Propeller

The aft end of the propeller hub remained attached to the crankshaft flange. The remaining assembly had separated from the engine and was located in the debris field. The spinner had crushed around the propeller hub. One blade had bent back approximately 90°, 2 ft from the hub. The blade face was coated in mud, and the surface exhibited leading edge and chordwise scuff and polish marks.

The second blade had bent back about 45°, 1 ft from the hub. The blade exhibited 90° tip twist, and chordwise polishing at the leading edge.

3.0 Examination Photos



Photo 1 – Main Wreckage



Photo 2 – Wing Marks



Photo 3 – Main Wreckage



Photo 4 – Instrument Panel and Cabin Flight Controls



Photo 5 – Cabin Heat Control



Photo 6 – ELT



Photo 7 – Engine



Photo 8 – Spark Plugs



Photo 9 – Exhaust Muffler System with Hole Circled



Photo 10 – Aft Exhaust Muffler

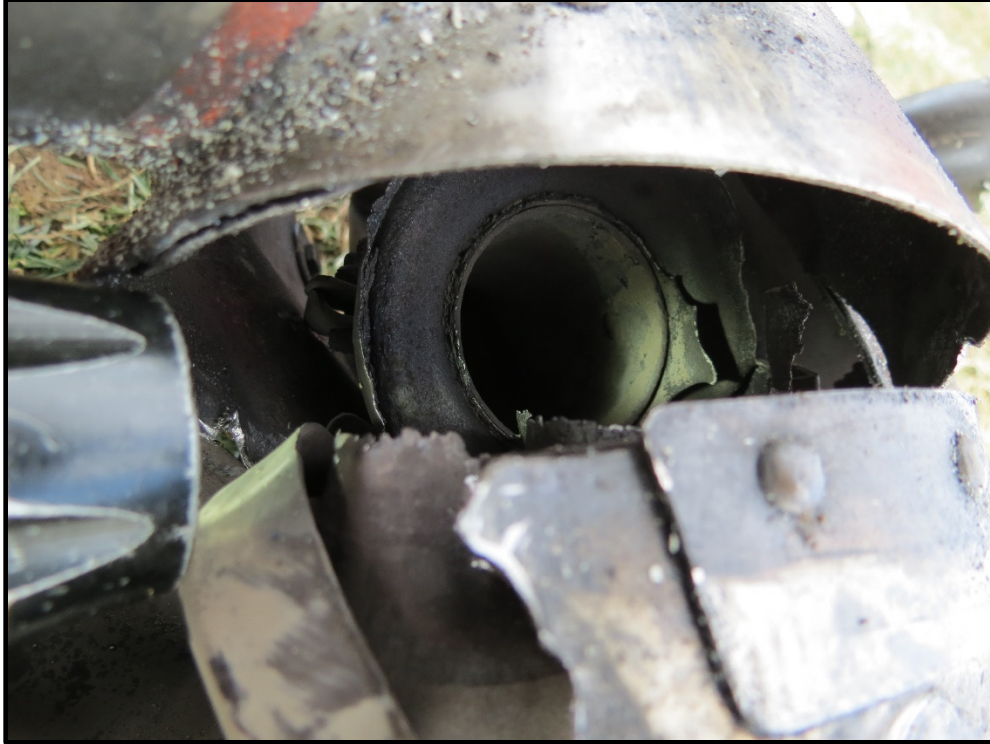


Photo 11 – Exhaust Muffler End



Photo 12 – Cabin Heat Tube

Submitted by: Elliott Simpson