



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region

AIRFRAME AND ENGINE EXAMINATION

WPR17FA008

This document contains 16 embedded photos.

A. ACCIDENT

Location: Lake Tahoe, California
Date: October 15, 2016
Aircraft: Cessna 182D, N8718X, SN: 18253118
NTSB IIC: Elliott Simpson

B. EXAMINATION PARTICIPANTS:

Elliott Simpson
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C. SUMMARY

Examination of the airframe and engine was conducted at the facilities of Air Transport in Phoenix, Arizona on November 14, 2017. All controls surfaces were located. Neither of the safety belt shoulder straps were being used during the flight, and the left side lap belt was found 2 inches short of its full range. Loose baggage was present throughout the cabin. No evidence of preimpact mechanical malfunction was noted during the examination.

D. DETAILS OF THE INVESTIGATION

1.0 Airframe Examination

Fuselage

The fuselage sustained extensive crush damage, from the firewall through to the leading edge of the horizontal stabilizer (Photo 1). The top and bottom of the main cabin had detached, and the remaining structure had become fragmented into multiple pieces.

Both front seats had detached from the airframe. The right lap belt was not latched, and both ends of the belt remained coupled to the airframe. The right shoulder harness had been knotted up, and tied up against the airframe in what appeared to be an intentional manner. The left lap belt was latched about 2 inches short of its full range, and did not exhibit any indications of fraying or stretch (Photo 2, 3). Each end of the belt remained attached to its fitting hardware, which had been separated from the airframe. The shoulder harness nylon bushing at the belt buckle was intact and undamaged, and the shoulder harness had been tied and knotted up against the airframe in what appeared to be an intentional manner (Photo 4). The rear bench seat lower section remained attached to the airframe, and its back had detached. Both seat's buckles were unlatched. Cargo, including folding chairs, water canister cylinders, coolers, tools, and clothing was located unsecured, and no indication of webbing was found (Photo 5).

The rear baggage door remained attached at its hinges. Both main cabin doors along with their associated window frames had detached and fragmented.

The left main landing gear strut remained attached to the airframe. The corresponding tire was separated, and the hub and brake rotor assembly remained attached to the airframe by the brake line. The right main landing gear strut had detached from the airframe, along with its corresponding rotor and hub assembly which had separated at the axle. The upper strut of the nose landing gear assembly was located crushed up against the firewall, the lower strut and wheel were not located.

The instrument panel was fragmented, and all instruments had detached, with the exception of the turn and slip coordinator, and fuel and oil gauge cluster. The airspeed indicator was intact and largely undamaged, the needle was at the 0 knots position. The heading indicator, engine tachometer, turn coordinator, and vacuum gauge sustained crush damage, exposing their internal components and fracturing their faces. The vacuum gauge needle indicated 1 inch of suction. No other instruments were located. The radios and transponder were damaged such that an assessment of their settings prior to impact could not be determined.

Both control yokes had detached at the control lock hole. Forward of the failure, the entire flight control system had become twisted and entangled within the forward cabin. The aileron cable remained attached to the right yoke chain. The left chain was crushed and had separated at the sprocket, and the left cable (right control) had detached just below the interconnect drum assembly. The flap control lever was in the stowed, 0° flaps position.

The fuel selector valve was in the BOTH position, and when opened the valve balls were free and undamaged, and the valve cam was intact with minimal wear (Photo 6).

The ELT tray had detached from the tail, but the ELT was not located.

Tail

At the accident site, the vertical stabilizer along with the horizontal stabilizer remained attached to the tailcone, and the rudder remained attached to the vertical stabilizer at its hinges. The vertical stabilizer and outboard section of the left horizontal stabilizer were removed during

recovery. The rudder cables were attached to the rudder horn assembly, which had been cut off during recovery (Photo 7). The rudder cables were continuous to the cabin, where they had been cut by the recovery crew just behind the rear seats. Forward of the seats, the cables were continuous to the rudder pedal torque tube assembly. The elevator remained attached to the horizontal stabilizer at its hinges. The elevator trim actuator was at a length, which when compared to Cessna documentation, was consistent with a 5 ° stabilizer down (nose up) position. The elevator push-pull control tube was continuous from the elevator pylon through to the cable bellcrank. The elevator cables remained attached to the bellcrank, and were continuous through to the recovery cut aft of the rear seats. Forward of the cut, the cables were continuous through to the lower control column bellcrank. The forward end of the column sustained crush damage and had bent away from the control column.

Left Wing

The left wing sustained accordion-like crush damage along its entire length, separating the leading edge skins (Photo 8). The fuel tank bladder was exposed and had shredded. The fuel cap was in place at the filler neck. The flaps remained attached at the rails, and the lift strut had separated mid-span, but remained attached to its mount points on the main spar and the fuselage belly structure. The aileron, outboard of the push-pull control rod, had separated; inboard of the rod, the aileron remained attached by its hinges. The control rod and bellcrank were intact, and the control cables were continuous to the wing root, where the drive cable appeared to have been cut during recovery, and the carry-through cable had separated with broom straw-like signatures consistent with overload.

Right Wing

The right wing had fragmented into multiple pieces (Photo 9). A 10-ft-long section of the spar along with leading edge skins had detached, outboard of the flap. The fuel tank bladder was exposed, and had shredded. The fuel cap was in place at the filler neck. The flap remained attached to its rails, and the aileron remained attached by its hinges. The control rod and bellcrank were intact, and the cables were continuous to the wing root, where the drive cable appeared to have been cut during recovery and the carry-through cable had separated with broom straw-like signatures consistent with overload. The lift strut was not located, however, its fittings at the wing spar and fuselage belly structure were in place.

1.1 Engine Examination

Model Number: O-470R (25)

Serial Number: 226892-R

The engine had detached from its mount, and had sustained extensive damage, with most of the ancillary components liberated, and the induction manifold and exhaust system shattered and crushed (Photo 10). The magnetos were not located, however fragments of their attachment lugs remained in place at the mounting bolts on the engine. The accessory case was fractured, and the magneto gears were missing and not located. The carburetor body remained bolted to a

section of the induction manifold. It's butterfly valve was intact, and connected to the throttle cable via its control arm. The only other sections of the carburetor recovered where two fragments of the bowl assembly, one of which contained the needle valve and a section of white float material with its associated hinge. The starter adapter was removed by the group, and the gears could be rotated smoothly. Orange RTV-like material had been used to seal the gearbox to the crankcase.

The engine's oil sump was breached and impinged against the camshaft and crankcase webs. All cylinders remained attached to the crankcase. The crankcase was free of breaches. Cylinder 1 exhibited crush damage to the aft upper fins; the rocker arms and valves were intact, and the pushrods were in place. Cylinder number 3 exhibited crush damage to the lower forward fins; the rocker arms and valves were intact, and the pushrods were in place. Cylinder number 5 exhibited extensive crush damage to the lower front side, detaching the rocker arms and pushrods. Cylinder 2 exhibited crush damage to the aft upper fins; the rocker arms and valves were intact, and the pushrods were in place. Cylinder number 4 was largely intact and undamaged. Cylinder number 6 exhibited extensive crush damage to the lower front side, detaching the rocker arms and pushrods.

The top spark plugs were removed; all electrodes exhibited varying degrees of corrosion, particularly evident on the plugs for cylinders 1, 3, and 5 (Photo 11, 12). The ground electrodes for plugs 3, and 5 had detached, most likely during plug removal. All plug electrodes exhibited worn out-normal operational and wear signatures when compared with the Champion Aviation Check-A-Plug AV-27 Chart. Visual inspection of the combustion chambers was accomplished through the spark plug bores utilizing a borescope; there was no evidence of foreign object ingestion or valve damage and all combustion surfaces exhibited white, grey, and rust-colored corrosion-like deposits, again particularly sever for cylinders 1, 3, and 5.

The oil pump was removed, disassembled and examined. Orange RTV-like material had been used to seal the pump. The gears were intact, and the inner surfaces of the pump chamber were smooth and free of gouges. The oil filter was removed and opened, and the paper element examined. No metallic debris was observed.

The sump was removed, and the camshaft was examined. All cam lobe contact areas were shiny and free of gouges, and all exhibit similar lift dimensions. The oil screen was free of debris, and looking within the crankcase webs, no damage was observed within the crankcase, or to the crankshaft or any of the connecting rod caps.

The vacuum pump was the wet type, and was disassembled and examined. All vanes were intact, wet with oil, and the inner pump cavity was free of damage (Photo 13,14). The input drive gear was undamaged and remained attached via it's coupling.

Propeller

Both propeller blades had separated from the hub, and the partial remains of the propeller hub, remained attached to the crankshaft flange. One blade exhibited 1- to 2-inch-deep gouges along

its entire leading edge, with aft curling and chordwise scratches at the tip (Photo 15). The second blade exhibited diagonal gouges to its front side, with 2-inch-deep leading edge gouges emanating outwards from midspan. The tip had separated into a 9-inch-long section, and had curled aft, leaving a serrated tear (Photo 16). The hub had fragmented, exposing the piston and spring. The governor was not located.

2.0 Examination Photos



Photo 1 – Airframe Remnants



Photo 2 – Left Front Lap Belt



Photo 3 – Left Lap Belt



Photo 4 – Shoulder Belt - Left Side



Photo 6 – Fuel Selector Valve Cam



Photo 7 – Rudder Horn



Photo 8 – Left Wing



Photo 9 – Right Wing



Photo 10 - Engine



Photo 11 – Top Spark Plugs 5,3,1



Photo 12 - Top Spark Plugs 2,4,6



Photo 13 – Vacuum Pump Rotor



Photo 14 – Vacuum Pump Housing



Photo 15 – Propeller Blade A



Photo 16 - Propeller Blade B

Submitted by: Elliott Simpson