



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region

AIRFRAME AND ENGINE EXAMINATION

WPR21FA321

A. ACCIDENT

Location: Bountiful, UT
Date: September 15, 2021.
Aircraft: Cessna 182H, N8477S
NTSB IIC: Elliott Simpson

B. EXAMINATION PARTICIPANTS:

Elliott Simpson	Casey Love
Senior Aviation Accident Investigator	Air Safety Investigator
National Transportation Safety Board	Textron Aviation

C. SUMMARY

Examination of the airplane was conducted at the facilities of Air Transport, in Phoenix, Arizona on September 3, 2021. Remnants of all control surfaces were present, and there was no evidence of in-flight structural failure, catastrophic engine failure, or bird strike. The propeller blades and spinner exhibited witness signatures consistent with engine rotation at impact. The flaps were in the retracted position, and the pitch trim was set to neutral. Both front seatbelts appeared to be latched.

D. DETAILS OF THE INVESTIGATION

1.0 Airframe Examination

Airframe

The entire fuselage forward of the vertical stabilizer through to the firewall was consumed by fire. The empennage was intact, and both the rudder and elevator remained attached to the vertical and horizontal stabilizers respectively (figure 1).

No seat remnants beyond padding springs were located and presumed to have been consumed by fire. The airplane was equipped with four seat buckles; all of the belt webbing had burnt away, and only three of the buckle assemblies were located. One rear buckle was found unlatched, and the second rear buckle was not located. A forward buckle was found latched, and the second forward buckle handle had melted away from its steel assembly, but its tongue was shiny and unburnt in the area of the melted buckle, consistent with it being latched at impact (figure 2).

The left and right main landing gear springs had burnt away from the airframe, were intact, with their brake assemblies remaining attached.

Wings

Almost the entire left wing, and the inboard section of the right wing were consumed by fire (figure 3, 4).

The outboard right wing had separated at the wing strut and was located at the base of the impact tree at the accident site. It had sustained a semicircular indentation to the leading edge and underside at the separation point (figure 5), which contained fragments of tree bark, wood fragments, and leaf needles.

Neither fuel cap was located; the chain for the left cap was still attached inside the tank, and there was no paint damage that could have indicated the cap was not installed during flight. Similarly, there was no indication of fuel streaking to any of the wing surfaces.

Flaps

The remnants of the right flap remained connected to the wings aft spar and were flush with the wing surface. Burnt remnants of left flap skin were located within the debris. The flap drive actuator was in the fully retracted position, which corresponded to the flaps being fully retracted (figure 6).

Rudder

The foot pedals sustained bending damage and had detached from the burnt airframe remnants, but both rudder cables remained attached. The cables were continuous through to the rudder horn but had been cut by the recovery crew.

Elevator

The control yoke push-pull tubes had separated from the control arms of the cockpit torque tube. The left bellcrank arm had detached from the torque tube. The elevator cables remained attached to their respective control arms but had been cut by the recovery crew. Aft, the cables were continuous to the aft elevator bellcrank. The aft elevator bellcrank assembly was intact, and the push-pull-tube was continuous to the elevator horn.

The elevator pitch trim servo exhibited 1.3 inches of extension, which when compared to Textron documentation, correspond to neutral trim. The trim surface was also flush with the elevator (figure 7, 8).

Ailerons

At the firewall, the aileron chains were intact and remained wrapped around the remnants of the left and right control columns.

The left aileron had melted away, with remnants observed still attached to the wing trailing edge. The left aileron bellcrank was intact and remained connected to both control cables and the push-pull tube, which was still attached to the partial remnants of the aileron.

The control and follow cables were continuous to the cabin, where they had been cut by recovery. The right aileron cables were continuous to the aileron bellcrank. The push-pull-tube remained attached, but the rod end had broken from the bellcrank end.

There was no visible evidence of bird matter in or on any of the wreckage.

1.1 Engine Examination

Model Number: O-470-R (15)

Serial Number: 321168-R

The engine remained attached to the firewall by its aft mounts. The firewall sustained extensive crush damage and had formed around the rear of the engine. The entire engine sustained thermal damage and was coated in a layer of black and grey soot (figure 9). The alternator had broken away from its mounting bracket, all other accessories remained attached to their respective pads at the aft of the engine. The exhaust manifolds remained attached and were crushed against the cylinder heads. The left and right intake manifolds were cracked and partially melted.

The propeller hub remained attached to the crankshaft. One blade had been liberated from the hub and was found adjacent in the wreckage. Both blades exhibited similar leading-edge gouges, chordwise scratch marks and blade twist. The spinner remained attached to, and had formed around, the hub, and exhibited radial score marks (figure 10, 11, 12).

The oil cap was in place. The dipstick was in place and had bent aft against the firewall. All engine controls were in the full forward position. The oil filter sustained crush damage against the firewall, was extensively charred, and remained attached to the engine. The carburetor was not located.

The aft end of the engine sump had melted away, exposing the accessory gear train and rear of the camshaft. The rest of the sump was crushed and impinged against the camshaft. Removal of the sump revealed the camshaft to be intact, with no indications of damage to any of the cam lobes or followers (figure 13). The oil pickup screen was clear of debris. The forward lower end of the crankcase had buckled aft and become impinged against the governor crown gear on the front end of the camshaft and the forward section of the crankshaft, preventing engine rotation (figure 14).

All pushrod tubes were straight; all valve rockers, springs, and valve stems appeared intact and undamaged.

The top spark plugs exhibited dark grey deposits and normal to worn-out normal wear signatures. Plugs 2, 4, 6 were coated in oil. The plugs did not exhibit any evidence of catastrophic internal cylinder head failure (figure 15).

The exhaust muffler had detached and sustained significant crush damage. The inner baffles, while crushed, appeared intact, and were coated in light grey and brown deposits.

The left magneto remained firmly attached to its pad on the crankcase. The right magneto had detached, and broken fragments of its mounting lugs remained bolted to the pad. The upper and lower spark plug cables sustained thermal damage, but were in place, except for the right magneto lines which had been torn from the magneto in the upper right-hand corner of the engine.

2.0 Examination Figures



Figure 1 – Empennage



Figure 2 – Seat belt buckles, circle indicates shiny unburnt surface of tongue



Figure 3 – Center cabin roof and right wing

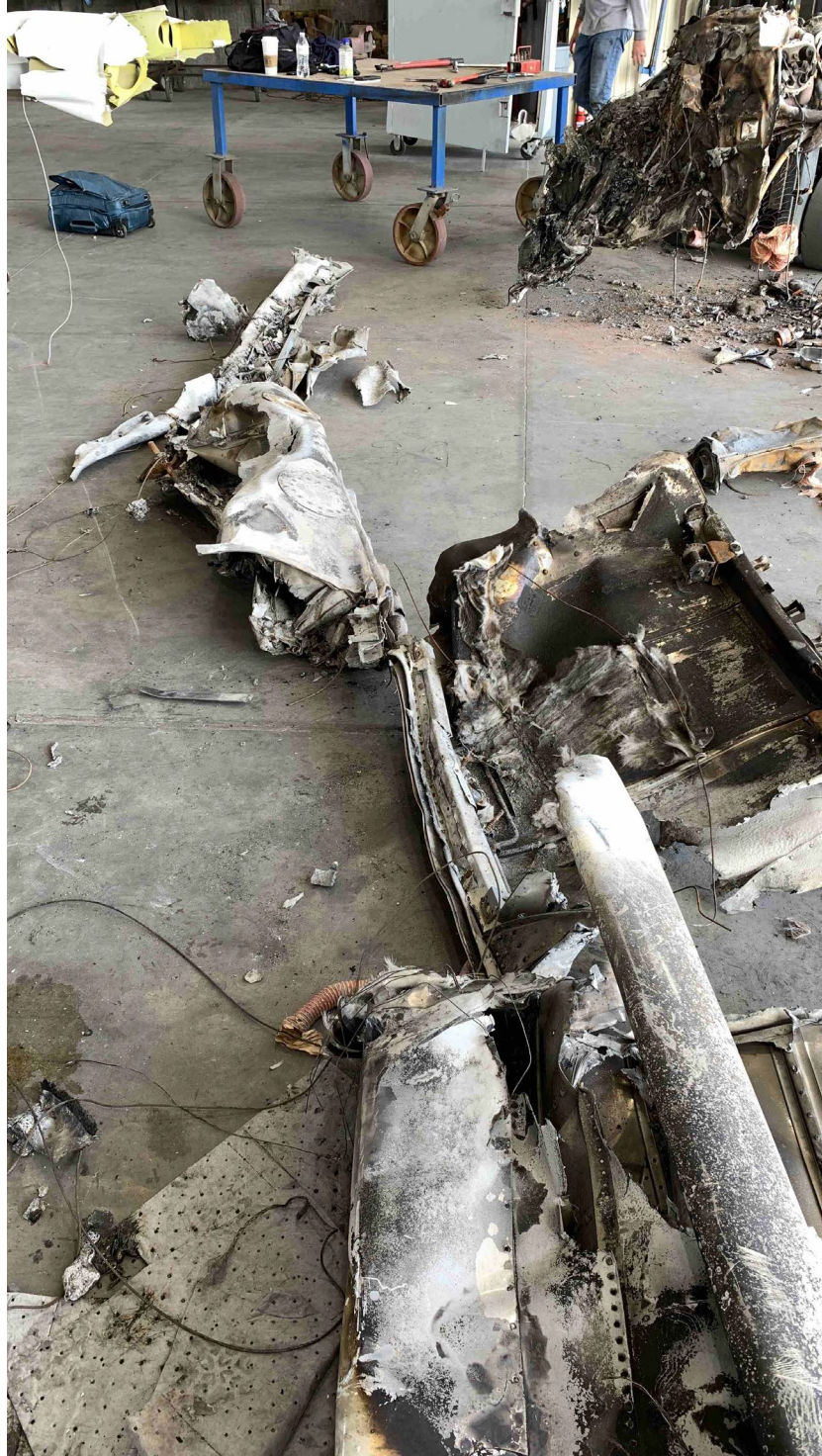


Figure 4 - Center cabin roof and left wing remnants



Figure 5 – Tree damage to right wing leading edge and underside



Figure 6 – Flap actuator



Figure 7 – Elevator trim actuator



Figure 8 – Elevator trim tab



Figure 9 – Engine



Figure 10 – Propeller blade 1



Figure 11 – Propeller blade 2



Figure 12 - Spinner



Figure 13 – Camshaft

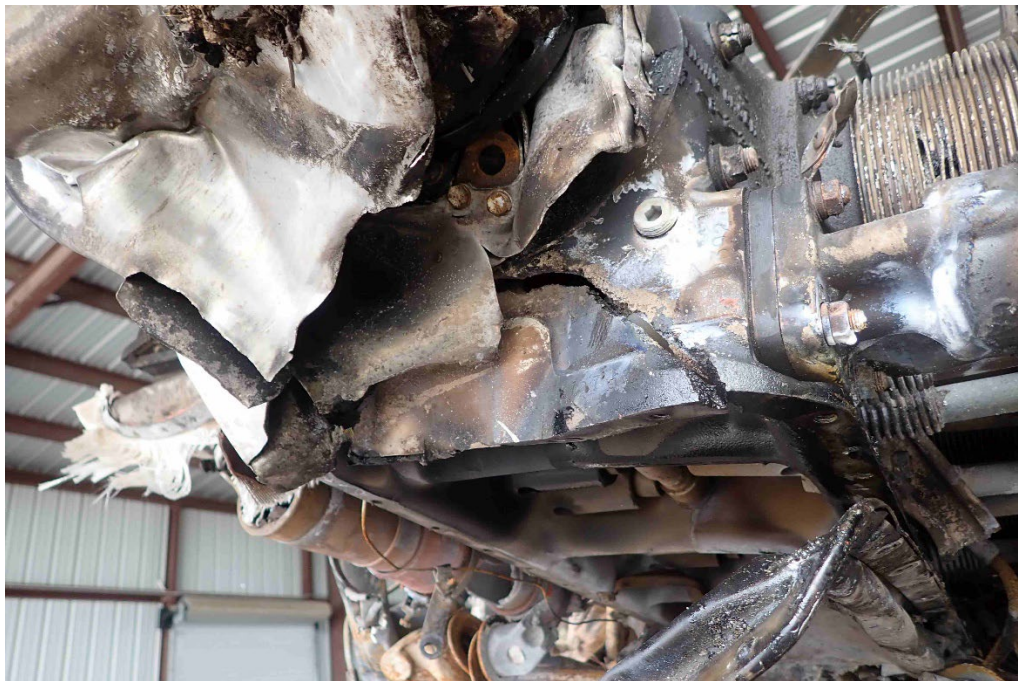


Figure 14 – Forward area of crankcase



Figure 15 – Spark plugs

Submitted by: Elliott Simpson