

National Transportation Safety Board

Office of Aviation Safety

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ANC23FA042

AIRFRAME AND ENGINE EXAMINATION

June 10 and November 29, 2023

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A. ACCIDENT

Location: Shaktoolik, Alaska
Date: June 16, 2023
Time: 1135 AKDT
Airplane: Cessna 180A, N91361

B. AIRFRAME AND ENGINE EXAMINATION

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C. SUMMARY

On June 16, 2023, about 1135 Alaska daylight time, a Cessna 180H airplane, N91361, was substantially damaged when it was involved in an accident near Shaktoolik, Alaska. The pilot and passenger were fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* (CFR) Part 135 on-demand charter flight.

D. DETAILS OF THE EXAMINATION

1.0 Accident Site

The airstrip was about 750 feet long and situated atop a 300 ft tall, down-sloping, rock and grass-covered ridgeline at an elevation of 1,560 ft. The airplane normally landed uphill on about a 060° heading, then departed in the opposite direction, downhill, on about a 240° heading. The airstrip sloped from about 15°, increasing to about 35° down before a shear vertical drop. During previous departures, after takeoff, the airplane would dip below the airstrip off the departure end, out of sight, then climb back into view and out of the valley.



Photograph 1 - View from the airstrip from the beginning towards the departure end. The red arrow indicates the location of the tree that was struck.

The airplane took off on a downward sloping mountain top airstrip. The aircraft struck a group of three small trees located on the left side of the ridgeline about 2/3 of the distance from the beginning of the strip to the end. The largest one was approximately 4 inches in diameter at the base and 12 ft tall. The impact mark observed on the tree was approximately 4 ft from the ground. The only impact signature on the aircraft that was consistent with tree impact signatures was located on the left horizontal stabilizer approximately 1 ft outboard from the stabilizer root. The aircraft then continued down the slope and off the left side of the mountain. It

impacted rolling tundra 300 ft below the tree impact point in a steep nose-down, wings level attitude. The wreckage was oriented on a magnetic heading of 072°.



Photograph 2 - View of the impact damage and red paint fragments.

2.0 Airframe Examination

Examination of the wreckage revealed it impacted tundra in a steep nose-down wings level attitude about 1,200 ft. from the broken tree. The wings were displaced by impact, the right wing leading edge was uniformly crushed aft along its span. The upper and lower wing skins were crushed aft in compression. Flight control continuity was established through several breaks to the flight control surfaces. All breaks and separations were consistent with impact and overstress failure. The engine was separated from the airframe and came to rest inverted behind the left wing. The propeller hub was fractured, and the propeller blades were separated from the hub.

The right horizontal stabilizer and elevator did not exhibit leading edge impact signatures, and the elevator remained attached. The left horizontal stabilizer displayed a concave dent perpendicular to the leading edge about 1 ft outboard of the stabilizer root. Tree sap and embedded tree fibers were observed in the leading edge of the horizontal stabilizer.

The wings remained partly attached. The wing leading edges sustained aftward crushing damage. The upper and lower wing skins were wrinkled consistent with aft displacement. The lift struts remained attached to the wings at the wing attach point. The left wing strut impact fractured midspan. The right wing strut buckled midspan. The ailerons remained attached.

The control wheel and control column were separated from the control yoke. The middle of the control yoke was fractured at the vertical intersection of the control column. The manually control flaps were deployed about 20°. Flap control cable continuity was established.

The upper cockpit skin and door posts were folded aft over the top of the fuselage. The cabin floorboards and seat tracks were buckled and compressed. The right main landing gear remained attached. The left main gear was displaced aft and the wheel separated from the gear at the axle.



Photograph 3 - Rear view of the wreckage and the left horizontal stabilizer.

The aft portion of the fuselage partly separated at the baggage compartment and buckled near fuselage station 140 and came to rest inverted to the fuselage. The left horizontal stabilizer sustained an impact mark and aft crushing about 1 ft outboard of the stabilizer root. Tree sap and embedded tree fibers were present. The impact displaced the leading edge of the stabilizer aft approximately 14 inches. The

left elevator torque tube impact fractured from the elevator aft bellcrank. The root of the stabilizer was pulled outward from the fuselage. The horizontal stabilizer jack screw attach points were separated from the stabilizer but remained attached to the jackscrews via attach hardware. The right horizontal stabilizer and elevator did not exhibit leading edge impact signatures, and the elevator remained attached.

Partial flight control continuity was established. The cockpit control column was impact fractured into multiple segments. One aileron control cable swage ball remained in the aileron drum. The aileron control cables from the cockpit to the ailerons were pinched between folded structure and could not be traced through their entire routing. The aileron control cables were intact from the wing root to the aileron wing bellcranks. The flaps were about 20° down and symmetrical. Flap handle was in the 20° position.

The elevator control cables were attached to the forward and aft elevator bellcranks. The forward elevator push/pull rod from the column to the forward bellcrank was impact fractured but remained attached at each end. The aft elevator bellcrank push/pull rod remained attached to the elevator torque tube. The rudder pedals were impact separated from the fuselage. One rudder control cable was cut by first responders. The other rudder control cable was impact fractured from the torque tube. The cables were continuous to the aft tailwheel steering bellcrank, and then to the rudder torque tube. The rudder pedals were not observed. The fuselage was impact damaged and the firewall was fragmented. The stab trim was -4° DOWN. Both jackscrew attachment points are separated at the stabilizer spar.

The engine controls were still connected to the engine and were cut to facilitate recovery. The throttle and mixture control knobs were separated from the instrument panel. The fuel selector was in the LEFT position.

3.0 Engine Examination

The engine was separated and located forward of the initial ground impact point and behind the left wing. It came to rest upside down; the oil pan was crushed upward.



Photograph 4 - View of the engine where it came to rest.

The aircraft was STC equipped with a fuel injected engine. The fuel boost pump was observed fractured into pieces. The fuel lines were also fragmented. The fuel system was not examined. First responders reported fuel spilling from the wings. Fuel smell was evident at the site. The engine was crated and shipped to Mobile for further examination.

The engine was removed from the crate and the engine accessories were removed. It was placed on a disassembly stand and the engine exhibited heavy impact damage to the nose and sump and except for the impact damage, the internal components of the engine were intact.

The engine exhibited normal operating signatures. The rods, bearings, gears, and camshaft were all normal. The cylinders and pistons exhibited normal operating wear patterns. The rods, gears, bearings, camshaft, and connecting rods were all normal. The crankshaft flange was impact fractured. The cams and lifters exhibited normal operating signatures.

The crankshaft would not rotate by hand until the case was opened due to impact damage. The slinger ring was partially fractured. The spark plugs were removed and appeared normal. The No. 5 top and No. 2 bottom spark plugs were

fractured, the No.1 spark plug was bent. The oil pump was removed, there was no rotational scaring noted in the oil pump.

The right magneto was removed and placed on a test bench and produced spark. The left magneto would not rotate. It was disassembled, and the stator in the housing was displaced from its location, which was adjacent from impact damage on the external housing. Impact damage to low- and high-pressure adjustment screws on the fuel pump. The fuel pump coupling was intact. The throttle body screen was removed, it was free of debris, there was a small amount of fuzz on the exterior of the screen.

4.0 Propeller Examination

The three-blade propeller was impact separated from the crankshaft. The propeller hub was fracture separated into multiple segments. The blades were separated from the hub. Only two blades were observed. Blade A was bent aft outboard of midspan. Blade B was bent forward and twisted toward high pitch.

5.0 Weight and Balance

According to the Pilot's Operating Handbook (POH), the Cessna 180's maximum takeoff gross weight is 2,800 pounds. The airplane's weight and balance listed the airplane's empty weight as 1,969 pounds.

The cargo was removed from the airplane and weighed; it totaled 192 pounds. According to the autopsy reports the pilot weighed 205 pounds and the passenger weighed 164 pounds; for a combined weight of 369 pounds.

According to fuel receipts, the pilot purchased fuel three times the day of the accident. The first time he purchased 12 gallons, then 12.2 gallons, then 13 gallons just prior to the pilots' flight to the remote airstrip. The fuel is from a self service pump and the amount of existing fuel quantity before adding fuel is unknown. The fuel tanks were breached during the accident and the total amount of fuel onboard prior to takeoff was not able to be determined. The estimated average fuel burn was about 14 gallons per hour. For estimating the gross weight of the airplane, only the fuel added at the last refueling was considered, minus the fuel burned on the flight to the airstrip. The flight time from Unalakleet to the accident airstrip was about 20 minutes, the estimated fuel burn about 5 gallons (30 pounds).

The following weights were used to estimate the airplane's gross weight at takeoff:

Empty weight of the airplane: 1,969 pounds
Pilot and passenger: 369 pounds

Fuel, 8 gallons: 48 pounds
Cargo: 192 pounds

The estimated gross weight of the airplane at takeoff was 2,578 pounds, about 222 pounds under the maximum gross weight of the airplane.

Submitted by:

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