



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety

Western Pacific Region

December 28, 2020

AIRFRAME AND ENGINE EXAMINATION

WPR20FA063

This document contains 10 embedded photos.

(15 Pages)

A. ACCIDENT

Location: Billings, Montana

Date: January 11, 2020

Aircraft: Cessna TR182 Skylane

NTSB IIC: Stephen Stein

B. EXAMINATION PARTICIPANTS

Stephen Stein
Air Safety Investigator (IIC)
National Transportation Safety Board
Federal Way, Washington

Troy Helgeson
Air Safety Investigator
Lycoming Engines
Williamsport, Pennsylvania

Casey Love
Air Safety Investigator
Textron Aviation
Wichita, Kansas

C. DETAILS OF THE INVESTIGATION

HISTORY OF FLIGHT

On January 11, 2020, about 1730 mountain standard time, a Cessna TR182 airplane, N736YU, was destroyed when it crashed in mountainous terrain near Billings, Montana. The airline transport pilot and three passengers were fatally injured. The airplane was registered to and operated by the pilot as a personal flight, conducted under the provision of Title 14 *Code of Federal Regulations* Part 91. Visual meteorological conditions prevailed and a flight plan was not filed for the cross-county flight, which departed Billings Logan International Airport (BIL), Billings, Montana at 1656.

According to a family member, the pilot had planned a recreational flight from BIL with intermediate stops in Hardin, Montana and Roundup, Montana and was expected to return to his home about 1930. Preliminary radar information obtained from a commercially available source was consistent with the family member's recount of the pilot's flight path. Following its departure from BIL, the airplane landed in Hardin, Montana about 1715 and subsequently departed about 1740 and flew a straight track. The radar track ceased at 1801 about 700 ft from the accident site.

PERSONNEL INFORMATION

The pilot, age 69, held an airline transport pilot certificate with a rating for airplane multi-engine land. Additionally, he held a commercial pilot certificate for single-engine land and a flight instructor certificate with ratings for multi-engine land, single-engine land, instrument airplane and glider. His most recent second-class medical certificate was issued on August 7, 2018, which included one limitation: "Must wear corrective lenses." At the time of the examination, the pilot reported that he had accumulated 13,800 total flight hours and 20 hours in the previous 6 months.

The pilot's flight records were retrieved from a logbook that spanned July 30, 2018 to December 26, 2019. His previous records were stolen from his car two years prior to the accident. According to the flight record, the pilot amassed a total of 42.6 flight hours; 27.4 of which were in the accident airplane and took place from July 12, 2019 to the final entry.

AIRCRAFT INFORMATION

Federal Aviation Administration records showed that the airplane was manufactured in 1978 and was registered to Marginal Aviation, LLC, a company managed by the pilot and another individual on October 2, 2017. The airplane was powered by a Lycoming Engines O-540-L3C5D, an air cooled, 235 horsepower, reciprocating engine. Maintenance records indicated that the airplane's most recent annual inspection was completed on January 3, 2019 at a total time of 3,101.6 flight hours. The engine inspection was completed simultaneously at 3,903.7 flight hours time since new and 0 hours since overhaul. The engine had recently been overhauled by a separate maintenance facility that was defunct at the time of the accident.

METEOROLOGICAL INFORMATION

The 1753 recorded weather observation at BIL included wind 240° at 14 knots, visibility 10 statute miles, few clouds 12,000 ft, broken clouds 16,000 ft, temperature 01° C, dew point 10° C, and an altimeter setting of 29.66 inches of mercury.

WRECKAGE AND IMPACT INFORMATION

The airplane was located in mountainous terrain area at an elevation of about 4,252 ft mean sea level. All major sections of the airplane were accounted for at the accident site. The initial impact point (IIP) was marked by several bent cross members and a broken guy wire about 65 feet high on an approximately 185 foot tall radio tower. Several sections of the outboard left wing were located about 100 ft north of the tower and two pieces displayed longitudinal signatures consistent with impacting a wire. The remaining section of left wing was found in the debris path about 300 ft from the main wreckage. Several airframe and engine fragments were distributed along the energy path, which was oriented on a heading of about 295° magnetic. A 5 foot-long intermediate ground scar was located about 120 ft from the main wreckage. The main wreckage was located about 600 ft northwest of the IIP in a coulee and comprised of the right wing, fuselage, empennage, and engine and oriented on a heading of 122° magnetic.

One propeller blade separated from the blade hub and was located along the debris path. The other propeller blade remained attached to the blade hub and was collocated with the main wreckage.

ADDITIONAL INFORMATION

Airframe Examination

Cockpit

The cockpit was comprised of the instrument panel and cockpit controls, which were fragmented and deformed from the accident sequence. Both the circuit breaker switch panel and throttle quadrant remained intact. The propeller lever was in the full forward position, the throttle was in the FULL OPEN position, and the mixture control was in the FULL RICH position. Cockpit control continuity was verified for the elevator, aileron, and rudder flight controls through various separations in their respective control systems. The rudder pedal torque tube was intact and the right pedal for the right seat passenger remained attached to the tube along with the rudder cables, which remained intact. The cables were continuous from the pedals to the aft section of the cockpit where they separated with evidence consistent with overload separation. The cockpit elevator bellcrank push/pull tubes separated from the control column and the elevator trim cable was continuous from the trim chain to a separation in the aft section of the cockpit. Both elevator cables remained attached to the elevator torque tube. The right aileron control wheel cables displayed fracture signatures consistent with overload. Both cables were continuous to the aft section of the cockpit; one cable fractured in overload and the other was cut by recovery personnel. The airframe boost pump was intact.

Fuselage

The main fuselage was crushed during the accident sequence and exhibited deformation throughout. Each of the four seats had been ejected from the main fuselage. Most of the seat belt buckles were connected except for the pilot's restraints. His shoulder harness was attached to the ceiling structure, but not latched to the buckle, lap belt segments were still attached to floor, and the lap belt buckle not found. The co-pilot seat 4 point harness was latched into the belt buckle and the overhead was still connected to the inertial reels and the lap restraint was cut by recovery personnel. Both rear seat occupant lap belt buckles were attached and the belt attachments have been separated from the floor structure. The elevator and rudder cables were continuous throughout the main fuselage and the cables displayed signatures consistent with overload failure.

Wings

The right wing and flap remained intact along with most of the right aileron, which had separated about midspan. The inboard portion of the right wing including the wing tank were intact and most of the outboard left wing had separated into sections, most of which were found near the tower. Aileron flight control continuity of the right wing was confirmed from the wing root to the right aileron. The aileron carry through cable was continuous from the right wing to the left

wing through a separation that was consistent with overload failure. The left aileron bell crank was not recovered. The flap down cable was continuous from the right wing flap motor to the left wing, but separated at the flap bellcrank. The flap up cable was continuous from the center flap bellcrank to a separation at the left wing root. The flap motor actuator measured 0.1 inches, consistent with a flap retracted position.

Tail Section

The tail section separated from the fuselage, but was mostly intact with deformation to the vertical stabilizer, rudder, and both horizontal stabilizers. The rudder cables, elevator cables, the autopilot servo cable, and electric pitch trim cable had separated at the aft fuselage with signatures consistent with overload separation. Control continuity was confirmed for the rudder and elevator control cables to their respective control surfaces. The elevator trim actuator measured 0.8 inches, consistent with a 15° nose up trim position (full nose up trim).

Fuel System

The gascolator was attached to the engine firewall and was disassembled to examine the condition of the screen and fuel bowl, both of which were free of debris. No fuel resided in the fuel bowl. The fuel selector was attached to the fuselage and was in the BOTH position. Disassembly of the selector valve did not reveal any anomalies or obstructions.

Engine Examination

The engine case was mostly intact, with exception of the oil sump and lower half of the accessory case, which was destroyed along with several accessories that had separated. The magnetos were destroyed. Mechanical continuity of the crank shaft and valvetrain were visually confirmed by removing cylinder nos. 1 and 5. The crankshaft could only be rotated partially due to impact damage. The oil cooler remained attached, but was crushed. Each of the ignition leads had separated from the spark plugs, which were mostly attached to their cylinders. The bottom spark plug to cylinder no. 2 had separated. Most of the spark plugs displayed signatures consistent with normal wear except for the cylinder no. 2 top spark plug, which was oil fouled. Cylinder nos. 1 and 5 were removed from the case and both exhibited normal wear on the cylinder walls, the piston and valve faces. Cylinder nos. 2, 3, 4, and 6 were examined with a borescope and displayed normal wear on the cylinder walls and valve faces. Visual inspection of the internal case through the cylinder no. 1 and 5 positions revealed minimal wear on the cam lobes and lifters. Both connecting rods were unremarkable. Internal inspection of the case did not reveal any indications of oil starvation. The oil sump suction screen was partially exposed due to sump damage and the screen showed minimal debris due to the accident. The right side exhaust outer shroud was removed and no cracks or black soot or burn signatures were observed on the external case of the inner shroud. A visual examination of the inner shroud did not reveal any anomalies. The left side exhaust was not recovered. The engine driven fuel pump had separated from the engine and was damaged, but was connected to the electric boost pump through a fuel line.

All three propeller blades were recovered from the accident site. Two of the propeller blades separated from the blade hub, which had fractured during the accident. One propeller blade displayed a forward bend, S bending, and leading edge nicks. Another propeller blade also displayed a forward bend and leading edge nicks and gouges along with a bend at the blade tip. The remaining propeller blade had a minimal forward bend.

Follow-Up

The following components were retained for further examination:

- Garmin GTN 750
- Marvel Schebler 10-6001 Carburetor
- Right side exhaust
- JPI EDM 930



Photograph 1: Layout of Wreckage



Photograph 2: Postaccident Condition of Cockpit Area and Instrument Panel



Photograph 3: Postaccident Condition of Fuselage



Photograph 4: Postaccident Condition of Tail Section



Photograph 5: Right Wing



Photograph 6: Outboard Left Wing



Photograph 7: Inboard Left Wing



Photograph 8: Engine



Photograph 9: Propeller Blades and Propeller Hub



Photograph 10: Exhaust Inner Shroud