



MEMORANDUM FOR RECORD

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Subject: Wreckage and Impact Information
Date of Accident: April 24, 2017
NTSB Accident Number: ERA17FA167

Runway Examination

Examination of runway 18 revealed black tire marks in an S-shaped (sinusoidal) pattern co-located with white paint transfer marks on the surface of the runway pavement. The tire marks and paint transfer marks were discovered in two locations about 1,350 ft from the beginning of runway 18. Both the tire marks and paint transfer marks were consistent with nose wheel shimmy and nose wheel pant contact.

Accident Site Examination

Examination of the accident site revealed that the airplane first made ground contact with the left wingtip. After cartwheeling and subsequently impacting and breaching a 30-ft section of the 8-ft-tall airport security fence, the airplane slid along a public roadway on an approximate 078° magnetic heading. About 115 ft from the initial impact point, the airplane came to rest in the northbound travel lane against an earthen berm. Most of the airplane was then consumed by a postcrash fire.

A 115-ft-long and 62-ft-wide debris path extended from the initial impact point to the main wreckage. It contained the propeller, which was found buried beneath the shoulder of the southbound travel lane about 37 ft from the initial impact point; the engine cowling, which came to rest about 52 ft from the initial impact point; the left wing tip and a portion of the outer left wing panel, which came to rest about 81 ft from the initial impact point; and the top rail of the breached section of airport security fence, which came to rest about 92 ft from the initial impact point. It also contained smaller components of the airplane and portions of the airplane structure.

Airplane Examination

The fuselage came to rest upright and was mostly consumed by fire. The empennage was

separated from the aft fuselage, inverted, and displayed impact and fire damage.

The outboard section of the left wing and the left wing tip separated during the impact sequence. The remaining portion of the left wing remained in its mounting location and exhibited impact and fire damage. The left aileron was almost completely consumed by fire. Pooled aluminum was located on the ground aft of the wing at the mounting location of the left wing flap along with the remains of a flap hinge.

The right wing exhibited impact and fire damage. The inboard third of the right aileron was consumed by fire. Pooled aluminum was located on the ground aft of the wing at the mounting location of the right wing flap along with the remains of a flap hinge.

Aileron control cable continuity was verified from the remains of the cabin to the ailerons. The flap actuator was fully extended, consistent with the wing flaps in the retracted position.

The horizontal stabilizer remained attached to the empennage and exhibited impact and fire damage. The right elevator was mostly consumed by fire, with the outboard portion and elevator tip still present. The left elevator was mostly consumed by fire, with the leading edge and tip still present. Elevator control cable continuity was verified from the remains of the cabin to the elevators.

The vertical stabilizer was impact and fire damaged and remained attached to the empennage. The rudder also exhibited impact and fire damage. Rudder control cable continuity was verified from the remains of the cabin to the rudder. The pitch trim motor position could not be determined due to fire damage.

The right and left main landing gear were located beneath the wings; both were impact and fire damaged. The nose landing gear was impact and fire damaged, separated from its mounting location, and was found under the engine during recovery of the wreckage.

Both the left and right cabin doors were separated from the fuselage and exhibited impact and fire damage. The front seats were mostly consumed by fire. The steel portion of the seat frames remained. Some components remained attached to the seat rails.

Switch positions could not be documented due to the fire damage, and the Avidyne PFD and MFD were heavily fire damaged.

Propeller Examination

Examination of the three-bladed propeller revealed no evidence of any preimpact malfunction or failure. The propeller remained attached to the propeller flange, but separated from the crankshaft, which fractured just aft of the propeller flange. The crankshaft fracture surface displayed 45° shear angles and a cupped appearance with blue-black discoloration in a smeared area. All three blades remained attached to the propeller hub; however, one propeller blade tip separated during the impact sequence and one propeller blade rotated 180° in the propeller hub. All three propeller blades exhibited chordwise scratching and leading-edge gouging; the gouges

matched the spacing of the chain links of the airport security fence. The propeller governor remained secured to the front left side of the engine and the propeller control cable remained secured to the propeller control lever.

Engine Examination

The engine remained attached to the firewall via the engine control cables, the main fuel line, and the electrical wires and cables. The right side airframe mount was fractured, as were the left and right side engine mounts. The left side of the engine sustained thermal damage and the right side sustained impact-related damage that fractured the No. 5 cylinder's intake port and rocker cover, the engine-driven alternator, and the right side magneto mounting flange.

The induction system sustained impact-related damage that fractured the No. 5 induction port and dented the intake tubes. The throttle valve was found in a near-idle position. There were no pre-accident anomalies noted with the induction system. The exhaust system components remained attached to the engine with no signs of pre-accident anomalies noted. The exhaust mufflers and shrouds sustained deformation damage.

The ignition harness remained secured to each magneto and each terminal remained secured to its respective sparkplug. The left side ignition leads were thermally damaged and the No. 5 top lead sustained pinching damage.

The left magneto remained secured to its mounting pad. During crankshaft rotation, an audible snap was heard from the impulse coupling and a spark was observed from the top left ignition leads (which were cut to remove fire-damaged areas) and the bottom right sparkplugs. The right magneto was separated from the engine and its mounting flange was fractured around the securing hardware. The magneto's ignition harness remained in place. Manual rotation of the drive shaft resulted in an audible snap of its impulse coupling and a spark from the bottom left ignition leads (which were cut to remove fire-damaged areas) and the top right sparkplugs. No pre-accident anomalies were noted with either of the magnetos.

The sparkplugs remained secured to their respective cylinders. The top sparkplugs were removed and all displayed normal wear with lean operation signatures and no signs of carbon or lead fouling. The bottom sparkplugs were observed during the borescope inspection with no signs of lead or carbon fouling noted.

The engine-driven fuel pump remained secured to the backside of the engine and all but the vapor return line remained attached to the pump. The vapor return line fitting was fractured. The mixture control cable remained secured to the mixture control lever. Rotation of the mixture control lever resulted in a coinciding rotation of the mixture shaft. The engine-driven fuel pump was removed and the drive coupling was intact. Manual rotation of the drive coupling resulted in rotation of the drive shaft. The engine-driven fuel pump was disassembled. No pre-accident anomalies were noted with the internal components.

The fuel lines to and from the throttle body/fuel metering unit remained secured and fuel was observed in the lines between the fuel flow transducer and the fuel metering unit. The throttle

cable remained attached to the throttle control lever, which remained secured to the drive shaft. The drive shaft was bent. Manual rotation of the throttle lever resulted in a coinciding rotation of the drive shaft. No pre-accident anomalies were noted with the unit.

The fuel manifold valve remained secured to the engine. All fuel injection lines remained secured to the manifold valve body and the torque putty was intact. The unit was removed and disassembled. Fuel was noted within the manifold valve. A slight amount of debris (which appeared similar to lint) was present on the screen; however, the screen was not obstructed. The diaphragm remained intact and pliable and was still attached to the plunger. No pre-accident anomalies were noted with the unit.

The injector lines remained secured to the nozzles. The Nos. 1 and 5 nozzles were bent. Each nozzle was removed and inspected and no obstructions were noted. Light was visible through each nozzle jet, except for the No. 1 nozzle jet, due to bending damage.

The oil sump sustained impact deformation and puncture damage. Oil was observed leaking from the oil sump and the oil pump remained secured to the backside of the engine. The oil filter sustained thermal damage and was dented. The safety-wire securing the filter to the adapter was intact. The filter was removed and the internal components were charred. The oil cooler remained secured on the back left side of the engine. There were no signs of lubrication distress on the observed engine components, and no pre-accident anomalies were noted.

All six cylinders remained attached to the engine and borescope examination of the internal components revealed no preaccident anomalies. All six cylinders also produced thumb compression and suction during rotation of the drivetrain, and valve functionality was confirmed.

The crankcase remained intact with no external signs of operational distress. The front of the crankcase around the nose seal sustained impact-related damage that exposed the nose seal and left it protruding on bottom left side. There were no pre-accident anomalies noted with the crankcase.

The crankshaft was fractured aft of the propeller flange. Crankshaft continuity was confirmed to the front and out to each connecting rod during manual rotation from the accessory end. No pre-accident anomalies were noted.

Camshaft continuity was confirmed during manual rotation of the upper right accessory drive gear. The rockers and valve springs functioned during the continuity test and no pre-accident anomalies were noted. The Nos. 5 and 6 pushrods displayed impact-related deformation damage.

The starter motor remained secured to the starter adapter, which remained secure to the backside of the engine. No pre-accident anomalies were noted during crankshaft rotation.

The alternator remained secured to the front right side of the engine and no pre-accident anomalies were noted. The alternator housing sustained impact-related damage that exposed the internal components.