



Aviation Investigation Final Report

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| Location: | Lake Worth, Florida | Accident Number: | ERA18FA244 |
| Date & Time: | September 9, 2018, 10:37 Local | Registration: | N2707J |
| Aircraft: | Cessna 335 | Aircraft Damage: | Destroyed |
| Defining Event: | Loss of control in flight | Injuries: | 2 Fatal |
| Flight Conducted Under: | Part 91: General aviation - Personal | | |

Analysis

The pilot, who was the owner of the airplane, was conducting a personal cross-country flight with one passenger. Recorded engine data indicated that, about 9 miles from the destination airport, the left engine lost all power for about 2 minutes. Power was restored for about 2 minutes before it was lost again as the airplane was on a left downwind leg abeam the approach end of the runway. The right engine's power output remained relatively constant for the remainder of the flight. The airplane continued the downwind leg for about 20 seconds, then began a left descending 180° turn. Data recovered from the primary flight display indicated that, at the end of this turn, the airspeed decreased to 73 knots (kts), below the airplane's published minimum control speed of 83 kts, and the airplane rolled inverted and descended into the ground.

The pilot did not hold a valid pilot certificate at the time of the accident, as his certificate had been revoked about 21 years earlier. Although the pilot had owned the airplane for about 7 years, he had logged only 1.8 hours in the preceding eight months, and 6.4 hours during the prior calendar year. The most recent documented practice of one engine inoperative (OEI) procedures was over 6 years before the accident, and there was no record of any flight reviews in his logbook; therefore, it is unlikely that the pilot was proficient in the procedures associated with OEI at the time of the accident, which included the criticality of maintaining minimum control speed (Vmc) and not turning into the nonoperational engine.

Examination of both engines revealed no anomalies that would have precluded normal operation and the right engine's recorded data parameters and propeller exhibited signatures consistent with the engine operating until impact. Although the engine monitor's recorded parameters indicated the left engine lost power immediately before the accident, it lacked sufficient parameters to determine why the loss of engine power occurred. Given the available fuel onboard, the airplane had adequate fuel to complete the accident flight; however, the pilot's management of the fuel during the flight and whether it contributed to the loss of left engine power could not be determined.

Although autopsy of the pilot revealed evidence of severe coronary artery disease, the recorded flight

data indicated that he continued to fly the airplane after both losses of power in the left engine; therefore, it is unlikely that sudden impairment or incapacitation from an acute cardiac event contributed to the loss of control. The pilot may have been experiencing effects from his use of diphenhydramine, such as psychomotor slowing and impaired judgment. However, based on the available information, whether effects from his use of diphenhydramine contributed to this accident could not be determined.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's loss of control during approach for landing following a total loss of left engine power for undetermined reasons.

Findings

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| Aircraft | Engine out control - Incorrect use/operation |
| Personnel issues | Aircraft control - Pilot |
| Aircraft | (general) - Inoperative |
| Personnel issues | Qualification/certification - Pilot |
| Personnel issues | Recent experience w/ equipment - Pilot |

Factual Information

History of Flight

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| Approach-VFR pattern downwind | Loss of engine power (total) |
| Approach-VFR pattern base | Loss of control in flight (Defining event) |
| Approach-VFR pattern base | Aerodynamic stall/spin |
| Uncontrolled descent | Collision with terr/obj (non-CFIT) |

On September 9, 2018, at 1037 eastern daylight time, a Cessna 335, N2707J, was destroyed when it was involved in an accident in Lake Worth, Florida. The pilot and passenger were fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

The airplane had departed Key West International Airport (EYW), about 0936. A review of data recorded by the on-board engine monitor and the primary flight display revealed that, when the airplane was about 9 miles southwest of Palm Beach County Airpark (LNA), descending through an altitude of about 7,000 ft mean sea level (msl) at an airspeed of about 170 knots, the engine exhaust gas temperature (EGT) values for all cylinders on the left engine decreased to below 300°F, consistent with a total loss of engine power. About 2 minutes later, the values all increased to between 900°F and 1,100°F, where they remained for about 2 minutes. The EGT values then rose briefly to about 1,350°F before decreasing again to below 300°F, consistent with a second total loss of engine power. This second loss of engine power occurred as the airplane was on a left downwind leg abeam the runway 16 threshold at LNA, at an altitude of about 1,000 ft msl and an airspeed of about 110 knots. The right engine EGT values remained relatively constant about 1,300°F until the last 30 seconds of data, when they increased to about 1,400°F. The airplane maintained its heading and altitude for about 20 seconds after the loss of engine power before it entered left descending 180° turn. During this turn, the bank angle varied between 0 and 30°. About 5 seconds before the end of the recorded data, the airspeed decreased to about 73 knots, the bank angle increased and the airplane rolled inverted as its pitch increased to 76° nose down.

Several witnesses reported that while the airplane was on approach to runway 16 at LNA, it rolled back and forth, became inverted, then descended to the ground in a spiral and spin.

Pilot Information

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| Certificate: | None | Age: | 70, Male |
| Airplane Rating(s): | None | Seat Occupied: | Left |
| Other Aircraft Rating(s): | None | Restraint Used: | 3-point |
| Instrument Rating(s): | None | Second Pilot Present: | No |
| Instructor Rating(s): | None | Toxicology Performed: | Yes |
| Medical Certification: | None | Last FAA Medical Exam: | |
| Occupational Pilot: | No | Last Flight Review or Equivalent: | |
| Flight Time: | 1779 hours (Total, all aircraft), 157 hours (Total, this make and model) | | |

According to Federal Aviation Administration (FAA) airman records, the pilot did not possess a valid medical or airman certificate. He had previously held a private pilot certificate with ratings for airplane single and multiengine land; however, his certificate was revoked in 1997. His most recent second-class medical certificate was issued on June 30, 2014, and had expired for all classes in June 2016.

The pilot had owned the airplane since 2011. He received dual instruction in the accident airplane in 2011 and 2012, including one flight annotated in his logbook as "emergency procedures engine outs" in June 2011, and another annotated as "engine out procedures" in May 2012. In the 3 years preceding the accident, he logged 8.2 (2016), 6.4 (2017), and 1.8 (2018) hours in the accident airplane. There were no records of a flight review in his most recent logbook, which dated back to January 1997.

Aircraft and Owner/Operator Information

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| Aircraft Make: | Cessna | Registration: | N2707J |
| Model/Series: | 335 No Series | Aircraft Category: | Airplane |
| Year of Manufacture: | 1979 | Amateur Built: | |
| Airworthiness Certificate: | Normal | Serial Number: | 335-0023 |
| Landing Gear Type: | Retractable - Tricycle | Seats: | 6 |
| Date/Type of Last Inspection: | July 23, 2018 Annual | Certified Max Gross Wt.: | 5990 lbs |
| Time Since Last Inspection: | | Engines: | 2 Reciprocating |
| Airframe Total Time: | 3242 Hrs as of last inspection | Engine Manufacturer: | Continental |
| ELT: | C91 installed, activated, did not aid in locating accident | Engine Model/Series: | TSIO-520EB |
| Registered Owner: | | Rated Power: | 300 Horsepower |
| Operator: | On file | Operating Certificate(s) Held: | None |

The airplane total time at the time of the accident could not be determined.

Recent Maintenance

Other than periodic inspections and oil changes, the most recent maintenance entry in the left engine logbook was recorded on September 3, 2014, noting the replacement of cylinder Nos. 1, 3, and 5. The airplane had accrued about 73 hours between this maintenance and the last annual inspection.

Other than periodic inspections and oil changes, the most recent maintenance entry for the right engine (found in the airframe logbook) was performed on June 21, 2018, noting the replacement of cylinder No. 3. That entry was made by the accident pilot, who was not a certificated mechanic. The airplane had accrued about 8 hours between this maintenance and the last annual inspection.

Fuel Information

The airplane was equipped with two main fuel tanks located in the wingtips (each with a capacity of 50 usable gallons), two auxiliary fuel tanks located in the wings (each with a capacity of 31.5 usable gallons), and one wing locker tank installed in the forward portion of the left engine baggage compartment (capacity 20 usable gallons). According to the airplane operating manual, the main tanks were to be used for takeoff, landing, descent, emergency, and the first 90 minutes of flight. The auxiliary tanks were to be used during level cruise flight only. The left wing locker tank did not supply fuel directly to either engine; instead, fuel could be transferred from the wing locker tank to the left main tip tank via an electric transfer pump using a switch in the cockpit. The engine fuel selector valve positions were off, main, auxiliary, and cross-feed.

The airplane was serviced with 50 gallons of fuel on September 5 at LNA, with an order to top off the main fuel tanks. The airplane flew from LNA to EYW uneventfully on September 6; the flight was about 62 minutes. The airplane was fueled with 47 gallons on September 9 at EYW, with an order to top off the auxiliary tanks. The accident flight was about 65 minutes long.

Fuel burn calculations estimated that the total fuel used on the accident flight was about 41 gallons.

Speed Limitations

According to the airplane operating manual, the minimum control speed, noted as "...the minimum flight speed at which the airplane is controllable with one engine inoperative and a 5° bank toward the operative engine," was 83 knots.

Meteorological Information and Flight Plan

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| Conditions at Accident Site: | Visual (VMC) | Condition of Light: | Day |
| Observation Facility, Elevation: | LNA, 14 ft msl | Distance from Accident Site: | 1 Nautical Miles |
| Observation Time: | 10:55 Local | Direction from Accident Site: | 5° |
| Lowest Cloud Condition: | Scattered / 2400 ft AGL | Visibility | |
| Lowest Ceiling: | | Visibility (RVR): | |
| Wind Speed/Gusts: | 5 knots / | Turbulence Type Forecast/Actual: | None / |
| Wind Direction: | 280° | Turbulence Severity Forecast/Actual: | / |
| Altimeter Setting: | 29.96 inches Hg | Temperature/Dew Point: | 29°C / 24°C |
| Precipitation and Obscuration: | No Obscuration; No Precipitation | | |
| Departure Point: | Key West, FL (EYW) | Type of Flight Plan Filed: | None |
| Destination: | Lake Worth, FL (LNA) | Type of Clearance: | None |
| Departure Time: | 09:36 Local | Type of Airspace: | Class G |

Airport Information

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| Airport: | Palm Beach County Park LNA | Runway Surface Type: | Asphalt |
| Airport Elevation: | 14 ft msl | Runway Surface Condition: | Dry |
| Runway Used: | 16 | IFR Approach: | None |
| Runway Length/Width: | 3421 ft / 100 ft | VFR Approach/Landing: | Traffic pattern |

Wreckage and Impact Information

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| Crew Injuries: | 1 Fatal | Aircraft Damage: | Destroyed |
| Passenger Injuries: | 1 Fatal | Aircraft Fire: | On-ground |
| Ground Injuries: | N/A | Aircraft Explosion: | None |
| Total Injuries: | 2 Fatal | Latitude, Longitude: | 26.608888,-80.083335 |

The airplane impacted trees and terrain in a park about 1 mile north of LNA. The main wreckage came to rest upright on a heading of about 030° magnetic. The airplane was partially consumed by a post-crash fire. The wreckage path was also oriented about 030° and was about 40 ft in length. The impact area was surrounded by trees; the only damage to branches were those directly above the main wreckage. A series of three ground scars consistent with propeller strikes were located on an asphalt jogging trail along a heading of 030°, which were aligned with and about 15 ft behind the right engine.

The wreckage sustained impact and fire damage; however, all major components of the airplane were present at the accident site. Flight control continuity was established from the cockpit controls to the flight control surfaces. The center and forward fuselage, as well as a large section of the left wing outboard of the left engine, were significantly damaged by postimpact fire. The aft fuselage was partially separated at the aft bulkhead, and the empennage was intact with only minor damage to the right horizontal stabilizer leading edge. The right wing was buckled downward near the right engine, and the leading edge was consumed by fire outboard of the right engine. The split-type flaps were partially extended. The landing gear actuator was found in the extended position.

All five fuel caps were intact and secure. The main fuel tanks were separated from the wing, with no damage to the attach fitting baffle. Both auxiliary fuel tanks were significantly fire damaged and partially consumed. The left wing locker fuel tank was intact and about 15 gallons of fuel were recovered from it. The left fuel selector valve was thermally damaged and remained attached to the wing. When air was applied, the valve was confirmed to be in the main tank position. The right fuel selector valve was thermally and mechanically damaged, remained attached to the control rod only, and appeared to be in the main tank position, but this could not be confirmed with an air test. Both of the cockpit fuel selector handles were found in the auxiliary tank position, the linkages between the handles and the valves were impact and fire damaged.

Both mixture controls were found near the cutoff position. The right propeller lever was near the low pitch position. The left propeller lever was near mid-travel. The right throttle was near the full-forward position. The left throttle was near mid-travel. All throttle quadrant control levers were folded over and bent toward the left.

The right engine remained attached to the wing and was impact and thermally damaged. The propeller remained attached to the engine. All three propeller blades were bent and twisted aft and displayed chordwise scratches and leading-edge gouges.

The left engine remained attached to the wing with its cowling intact and was impact and thermally damaged. All 6 cylinders produced thumb compression when the engine was rotated by hand. Valve train, camshaft, and crankshaft continuity were confirmed. A borescope examination of each cylinder revealed no anomalies. The oil filter was opened and contained no debris. Both magnetos produced spark on all towers when rotated with an electric drill. The top sparkplugs were removed, and all appeared "normal" in color and condition when compared to a Champion Check-a-Plug chart. The engine-driven fuel pump was impact damaged near the bellows. The drive coupling was intact, the pump rotated freely, and the vanes were intact. The fuel metering unit was intact with the control cable attached. The inlet screen was unobstructed. The fuel manifold was intact and its screen was unobstructed. The manifold cavity contained a small amount of debris, which was attracted to a test magnet. The ports in the cavity were unobstructed. The propeller was separated at the propeller flange. Two blades remained attached to the propeller hub, one of which was largely undamaged. The second blade was bent slightly about 8 inches from the root and again about 24 inches from the root; the blade displayed a slight twist. The third blade was separated from the hub and was largely undamaged. Examination of the left propeller assembly at the manufacturer's facility with oversight by the FAA revealed that the blades were at the low pitch stops at the time of impact. No anomalies were found.

Additional Information

Data recovered from the on-board engine monitor included parameters for each cylinder's head temperature and exhaust gas temperature, the turbocharger inlet temperature, and battery voltage. The unit typically records additional parameters such as fuel flow, engine RPM, engine manifold pressure, and engine oil temperature and pressure. It could not be determined if these parameters were not present due to the damage to the engine monitor (it could not be downloaded using the normal procedures for an intact unit) or if they were not connected when the unit was installed. The airplane was equipped with other non-recording instruments that displayed this information to the pilot.

The FAA Airplane Flying Handbook defined minimum control speed (V_{mc}) as:

The minimum flight speed at which the airplane is controllable with a bank of not more than 5 [degrees] into the operating engine when one engine suddenly becomes inoperative and the remaining engine is operating at takeoff power... At low airspeed and high-power conditions, the downward moving propeller blade of each engine develops more thrust than the upward moving blade... When the right engine is operative and the left engine is inoperative, the turning force is greater... In other words, directional control is more difficult when the left engine (the critical engine) is suddenly made inoperative.

Medical and Pathological Information

An autopsy of the pilot was performed by the Office of the District Medical Examiner, District 15 – State of Florida; the cause of death was multiple blunt force injuries. Examination of the heart found calcified yellow plaques and green-brown grumous plaques in the native left anterior descending, left circumflex, and right coronary arteries, with luminal stenosis of greater than 75%, greater than 90%, and approximately 100%, respectively.

Toxicology testing performed on the pilot by the FAA Forensic Sciences Laboratory identified 0.132 ($\mu\text{g/mL}$) of diphenhydramine in cavity blood. Diphenhydramine is a sedating antihistamine available over-the-counter in many products used to treat colds, allergies, and insomnia. The therapeutic range is 0.0250 to 0.1120 $\mu\text{g/mL}$. It causes sedation and can result in impaired cognitive and psychomotor performance. Diphenhydramine undergoes postmortem distribution and central levels may be 3 times higher than peripheral levels.

Administrative Information

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| Investigator In Charge (IIC): | Brazy, Douglass |
| Additional Participating Persons: | Anthony Saavedra; FAA/FSDO; Miramar, FL Mike Council; Continental Motors; Mobile, AL Andrew Hall; Textron; Wichita, KS |
| Original Publish Date: | August 11, 2020 |
| Note: | The NTSB traveled to the scene of this accident. |
| Investigation Docket: | https://data.nts.gov/Docket?ProjectID=98265 |

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).