# Aviation Investigation Final Report

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| **Location:** | Angier, North Carolina | **Accident Number:** | ERA19LA159 |
| **Date & Time:** | April 27, 2019, 15:00 Local | **Registration:** | N61PG |
| **Aircraft:** | Zenair Zodiac CH601 | **Aircraft Damage:** | Substantial |
| **Defining Event:** | Loss of engine power (partial) | **Injuries:** | 1 Minor |
| **Flight Conducted Under:** | Part 91: General aviation - Personal | | |

## Analysis

About 10 nautical miles from the destination during a cross-country flight, the airplane's engine began to run rough, cut in and out, and surge. The pilot checked the header fuel tank level and noted that it was nearly full, and he activated the electrically driven fuel pump, but the engine issues continued. The airplane continued to lose altitude and the engine continued to run rough; about 1,000 ft above the ground and about two nautical miles from the destination airport, the pilot decided to reduce engine power to idle and complete a precautionary landing in a field. During the landing roll, the airplane impacted a dirt pile and nosed over, resulting in substantial damage to the fuselage, empennage, and wings.

Fuel was found in the bowls of both carburetors and in both wing tanks and the header tank. Examination of the engine found no preimpact mechanical malfunctions or failures that would have precluded normal operation, and when the engine was test run from an external fuel source using the engine-driven fuel pump, it started and produced power at multiple power settings.

Given the presence of fuel and the lack of anomalies found during the postaccident engine test run, it is possible that the fuel supply to the engine was partially interrupted, which resulted in the engine continuing to run rough to the extent that maintaining altitude was not possible; however, the reason for the interruption of the fuel supply could not be determined.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

A partial loss of engine power due to partial interruption of the fuel supply for undetermined reasons.

## Findings

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| **Aircraft** | (general) - Malfunction |
| **Not determined** | (general) - Unknown/Not determined |

# Factual Information

## History of Flight

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| **Enroute-cruise** | Loss of engine power (partial) (Defining event) |
| **Enroute-cruise** | Off-field or emergency landing |
| **Landing-flare/touchdown** | Nose over/nose down |

On April 27, 2019, about 1500 eastern daylight time, an experimental amateur-built Zodiac CH 601 HDS, N61PG, was substantially damaged during a forced landing following a partial loss of engine power about one mile from Fuquay/Angier Field Airport (NC78), Angier, North Carolina. The sport pilot sustained minor injuries. The airplane was registered to and operated by the pilot under the provisions of Title 14 *Code of Federal Regulations* Part 91 as a personal flight. Day visual meteorological conditions prevailed, and no flight plan was filed for the flight that originated from Gilliam-McConnell Airfield (BQ1), Carthage, North Carolina about 1415, and was destined for NC78.

The pilot reported that he departed BQ1 with about 15 gallons of fuel onboard and proceeded enroute without issue, until about 10 miles from his destination, where the engine "stumbled/stuttered briefly and then resumed running normally." About one or two minutes later, the engine again started to run rough, surge, and cut in and out. The pilot checked the fuel level of the header tank, which indicated it was nearly full, and he turned the electric fuel pump on, in case there was an issue with the engine driven fuel pump. He also observed the engine instruments which all appeared to be normal; however, the engine was "losing more and more power" and the airplane continued to lose altitude. For the remainder of the flight, the engine continued to run rough, and would continue to momentarily "cut out", but the engine did not stop completely.

As the airplane approached about 1,000 ft above ground level, about two miles from NC78, the pilot decided to pull the throttle to idle and approached a field to complete an off-airport landing. The airplane touched down in a rough farm field and during the landing roll, it impacted a pile of dirt and nosed over.

According to Federal Aviation Administration (FAA) airmen records, the pilot held a sport pilot certificate with an endorsement for airplane single-engine land. He did not hold a medical certificate as he was operating under sport pilot rules. He reported that his most recent flight review was in February 2019 and he had accumulated 337 total flight hours, 53 hours of which were in the accident airplane.

According to FAA-airworthiness and airplane maintenance records, the single-engine low-wing airplane was powered by a Rotax 912 ULS engine, that drove a three-blade fixed-pitch propeller. According to airplane logbook entries, an annual condition inspection was completed in December 2018. The airplane and engine had accumulated 723.9 hours of total flight time at the time of the accident.

According to the pilot, the airplane's fuel system contained two 8-gallon wing tanks that fed into one 8-gallon header tank that supplied fuel to the dual carburetors on the engine. A sight gauge mounted on the instrument panel was used to determine how much fuel was contained in the header tank; when the fuel

level dropped below about 5 gallons, the pilot could select an electrical switch in the cockpit to transfer fuel from either wing tank via electric automotive fuel pumps installed in each wing tank. Filling the header tank was required about every 25-30 minutes. There were also two additional fuel pumps that supplied fuel to the engine from the header tank; one mechanically driven by the engine and one electrically driven.

The pilot reported that about 10 minutes prior to the engine starting to run rough, he had refilled the header tank from the left wing. He added that when the engine began to run rough, he turned on the electric fuel pump that supported the fuel delivery from the header tank to the engine. He reported that he utilized high octane-93 automotive fuel as per engine manufacturer recommendations and discovered no debris or water in the fuel prior to or after the accident.

At 1500, the weather conditions reported at Harnett Regional Jetport Airport (HRJ), Erwin, North Carolina, 10 miles south of the accident site were, visibility 10 miles, clear skies, wind 240° at 6 knots, temperature 24°C, dew point 2°C, and barometric pressure of 29.91 inches of mercury.

According to an FAA Carburetor Icing Probability Chart accounting for the weather conditions about the time of the accident, the engine was not at risk for carburetor icing at glide or cruise power.

According to an FAA inspector who examined the airplane at a recovery facility 3 days after the accident, the fuselage, wings, and empennage sustained substantial damage. Both carburetors had fuel in their respective bowls, and fuel was present in both wing tanks and the header tank. The fuel was absent of debris or water contamination.

The engine was further examined about three months after the accident by a representative from the engine manufacturer, who was overseen by an FAA inspector. The airplane's engine-driven fuel pump and fuel lines leading to the carburetors did not contain any remnants of fuel. The engine's spark, compression, and continuity were evaluated by performing an engine test run.

The engine started and operated without issue at multiple power settings when fuel was supplied to the carburetors via the engine-driven fuel pump from an external fuel source. It was not possible to utilize the airplane's existing fuel supply system, due to the damage sustained in the accident. Photographs of the fuel filters provided by the pilot showed no debris or obstruction.

## Pilot Information

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| **Certificate:** | Sport Pilot | **Age:** | 67,Male |
| **Airplane Rating(s):** | Single-engine land | **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:** | No |
| **Medical Certification:** | Sport pilot None | **Last FAA Medical Exam:** | |
| **Occupational Pilot:** | No | **Last Flight Review or Equivalent:** | February 28, 2019 |
| **Flight Time:** | 337 hours (Total, all aircraft), 53 hours (Total, this make and model), 312 hours (Pilot In Command, all aircraft), 11 hours (Last 90 days, all aircraft), 5 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft) | | |

## Aircraft and Owner/Operator Information

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| **Aircraft Make:** | Zenair | **Registration:** | N61PG |
| **Model/Series:** | Zodiac CH601 HDS | **Aircraft Category:** | Airplane |
| **Year of Manufacture:** | 1999 | **Amateur Built:** | Yes |
| **Airworthiness Certificate:** | Experimental light sport (Special) | **Serial Number:** | 63888 |
| **Landing Gear Type:** | Tricycle | **Seats:** | 2 |
| **Date/Type of Last Inspection:** | December 11, 2018 Annual | **Certified Max Gross Wt.:** | 1200 lbs |
| **Time Since Last Inspection:** | | **Engines:** | 1 Reciprocating |
| **Airframe Total Time:** | 723.9 Hrs at time of accident | **Engine Manufacturer:** | Rotax |
| **ELT:** | Installed | **Engine Model/Series:** | 912 ULS |
| **Registered Owner:** | | **Rated Power:** | 100 Horsepower |
| **Operator:** | On file | **Operating Certificate(s) Held:** | None |

## Meteorological Information and Flight Plan

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| **Conditions at Accident Site:** | Visual (VMC) | **Condition of Light:** | Day |
| **Observation Facility, Elevation:** | KHRJ,201 ft msl | **Distance from Accident Site:** | 10 Nautical Miles |
| **Observation Time:** | 15:00 Local | **Direction from Accident Site:** | 180° |
| **Lowest Cloud Condition:** | Clear | **Visibility** | 10 miles |
| **Lowest Ceiling:** | None | **Visibility (RVR):** | |
| **Wind Speed/Gusts:** | 6 knots / | **Turbulence Type Forecast/Actual:** | None / None |
| **Wind Direction:** | 240° | **Turbulence Severity Forecast/Actual:** | N/A / N/A |
| **Altimeter Setting:** | 29.9 inches Hg | **Temperature/Dew Point:** | 24°C / 2°C |
| **Precipitation and Obscuration:** | No Obscuration; No Precipitation | | |
| **Departure Point:** | Carthage, NC (BQ1 ) | **Type of Flight Plan Filed:** | None |
| **Destination:** | Fuquay/Angier, NC (NC78) | **Type of Clearance:** | None |
| **Departure Time:** | 14:15 Local | **Type of Airspace:** | Class G |

## Airport Information

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| **Airport:** | Fuquay/Angier Field NC78 | **Runway Surface Type:** | Grass/turf |
| **Airport Elevation:** | 1070 ft msl | **Runway Surface Condition:** | Rough |
| **Runway Used:** | | **IFR Approach:** | None |
| **Runway Length/Width:** | | **VFR Approach/Landing:** | Forced landing |

## Wreckage and Impact Information

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| **Crew Injuries:** | 1 Minor | **Aircraft Damage:** | Substantial |
| **Passenger Injuries:** | | **Aircraft Fire:** | None |
| **Ground Injuries:** | N/A | **Aircraft Explosion:** | None |
| **Total Injuries:** | 1 Minor | **Latitude, Longitude:** | 35.392501,-78.706665(est) |

## Administrative Information

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| **Investigator In Charge (IIC):** | Gerhardt, Adam | | |
| **Additional Participating Persons:** | Francis Lauterborn; FAA/ FSDO; Greensboro, NC | | |
| **Original Publish Date:** | December 3, 2020 | **Investigation Class:** | 3 |
| **Note:** | The NTSB did not travel to the scene of this accident. | | |
| **Investigation Docket:** | https://data.ntsb.gov/Docket?ProjectID=99331 | | |