# Aviation Investigation Final Report

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| **Location:** | Viroqua, Wisconsin | **Accident Number:** | CEN19FA276 |
| **Date & Time:** | August 19, 2019, 18:34 Local | **Registration:** | N634SC |
| **Aircraft:** | SHIRLEY CARL SPORTCOPTER VORTEX | **Aircraft Damage:** | Destroyed |
| **Defining Event:** | Loss of engine power (total) | **Injuries:** | 1 Fatal |
| **Flight Conducted Under:** | Part 91: General aviation - Personal | | |

## Analysis

The noncertificated pilot was conducting taxi operations in a gyrocopter at the airport. A witness near the airport stated that the aircraft became airborne and then turned and descended rapidly. A second witness near the airport stated that he heard the engine running and then quit suddenly, with no sputtering. A third witness heard the impact and saw smoke rising from the field.

The main rotor blade had separated at the shaft near the main rotor hub and was one of the first pieces of wreckage located within the ground scar. The flywheel contained dirt and debris embedded on one side, consistent with a near vertical ground impact with no rotation of the main rotor. A postaccident engine examination revealed that all of the crankshaft bearings were seized in place and that a foreign substance in all bearings was congealed, consistent with exposure to high heat. When the engine case was separated, circumferential scarring was present on both sides of the case corresponding to the No. 1 (most forward) bearing, consistent with a spun bearing and lack of oil around the bearing journal It is likely that, based upon these findings, the engine seized in flight.

No maintenance records were located during the investigation. Additionally, the previous owner had not started the engine or performed any maintenance on it. A photograph that the previous owner provided showed the tachometer displaying 122 hours about 5 months before the accident.

According to the engine maintenance manual, a 100-hour inspection should include, among other tasks, an inspection of the cylinder head and piston crown and an inspection of the piston rings for movement. A general overhaul of the engine was to be completed every 5 years or 300 hours, whichever came first. Based upon the serial number, the engine was produced in 2002.

Given the findings from the engine examination and the statements from the previous owner, it is unlikely that the engine had ever been overhauled or inspected in accordance with the engine

maintenance manual. Had the required maintenance been performed, it is likely that the signs of a lubrication issue would have been revealed.

Further, the pilot's lack of flight experience in the aircraft likely contributed to the loss of control after the engine failure. The pilot's logbooks indicated that he had logged less than 20 hours of total gyrocopter flight experience, of which only 3.5 hours occurred in 2019. It is likely, based upon this lack of experience, the pilot was not prepared for an engine failure to occur, and likely did not possess the aeronautical knowledge or skills required to appropriately respond to such an event, leading to a loss of control in flight.

## Probable Cause and Findings

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

The noncertificated pilot's loss of control of the gyrocopter after a total loss of engine power due to seizure of the crankshaft bearings. Contributing to the accident were the insufficient maintenance of the engine and the pilot's lack of gyrocopter flight experience.

### Findings

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| **Personnel issues** | Aircraft control - Pilot |
| **Aircraft** | (general) - Failure |
| **Aircraft** | (general) - Not serviced/maintained |
| **Aircraft** | (general) - Related maintenance info |

# Factual Information

## History of Flight

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| **Initial climb** | Loss of engine power (total) (Defining event) |

On August 19, 2019, about 1834 central daylight time, an experimental light sport Sport Copter Vortex gyrocopter, N634SC, was destroyed when it was involved in an accident in Viroqua, Wisconsin. The noncertificated pilot was fatally injured. The aircraft was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

The flight departed Viroqua Municipal Airport (Y51), Viroqua, Wisconsin, about 1830. According to a family member of the pilot, the purpose of the flight was to practice taxi operations at the airport and become familiar with the handling characteristics of the aircraft . A witness near the airport stated that she saw the aircraft become airborne but that it then turned and descended rapidly. A second witness near the airport stated that he heard the engine running and that it "sounded healthy" but then it quit suddenly, with no sputtering. A third witness heard the impact and saw smoke rising from the field. First responders found the gyrocopter fully engulfed in fire.

## Pilot Information

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| **Certificate:** | None | **Age:** | 65,Male |
| **Airplane Rating(s):** | None | **Seat Occupied:** | Single |
| **Other Aircraft Rating(s):** | None | **Restraint Used:** | Unknown |
| **Instrument Rating(s):** | None | **Second Pilot Present:** | No |
| **Instructor Rating(s):** | None | **Toxicology Performed:** | Yes |
| **Medical Certification:** | None None | **Last FAA Medical Exam:** | February 1, 1999 |
| **Occupational Pilot:** | No | **Last Flight Review or Equivalent:** | |
| **Flight Time:** | 81 hours (Total, all aircraft) | | |

The pilot was issued a student pilot certificate on July 28, 2009, which would have expired July 31, 2014.

The pilot's most recent third-class Federal Aviation Administration (FAA) medical certificate was issued February 1, 1999, with a limitation that the pilot must wear corrective lenses. The medical

certificate was not valid for any class after February 28, 2001. No record was located of the pilot applying for BasicMed.

A review of the pilot's personal logbooks revealed that he first logged flight hours (1.5 hours) in a gyrocopter on October 7, 2015. In 2017, he logged 4.5 hours, in 2018 he logged 9.0 hours, and in 2019 he logged 3.5 hours, for a total of 18.5 flight hours in a gyrocopter.

## Aircraft and Owner/Operator Information

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| **Aircraft Make:** | SHIRLEY CARL | **Registration:** | N634SC |
| **Model/Series:** | SPORTCOPTER VORTEX No Series | **Aircraft Category:** | Helicopter |
| **Year of Manufacture:** | 2004 | **Amateur Built:** | |
| **Airworthiness Certificate:** | Experimental light sport (Special) | **Serial Number:** | 1122 |
| **Landing Gear Type:** | Tricycle | **Seats:** | 1 |
| **Date/Type of Last Inspection:** | | **Certified Max Gross Wt.:** | |
| **Time Since Last Inspection:** | | **Engines:** | 1 Reciprocating |
| **Airframe Total Time:** | | **Engine Manufacturer:** | Rotax |
| **ELT:** | | **Engine Model/Series:** | 582 |
| **Registered Owner:** | On file | **Rated Power:** | |
| **Operator:** | On file | **Operating Certificate(s) Held:** | None |

The gyrocopter was first issued a special airworthiness certificate on September 11, 2004. No records were located to determine the total flight hours on the aircraft at the time of the accident.

The aircraft was equipped with a Rotax 582 Mod 99 engine that was produced manufactured on August 20, 2002. No maintenance records for the aircraft were located during the investigation. Before the pilot owned the gyrocopter, it was owned by a museum. According to the museum sales director, while the aircraft was in their possession, the engine was never started and no maintenance was performed. A photograph that the museum provided of the tachometer, dated March 26, 2019, showed 122 hours. He also stated that the engine appeared new with no bluing or discoloration present on the exhaust.

According to the Rotax Aircraft Engines maintenance manual, a 100-hour inspection should include, among other tasks, an inspection of the cylinder head and piston crown and an inspection of the piston rings for movement. A general overhaul of the engine was to be completed every 5 years or 300 hours, whichever came first.

## Meteorological Information and Flight Plan

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| **Conditions at Accident Site:** | Visual (VMC) | **Condition of Light:** | Day |
| **Observation Facility, Elevation:** | KLSE,656 ft msl | **Distance from Accident Site:** | 23 Nautical Miles |
| **Observation Time:** | 22:53 Local | **Direction from Accident Site:** | 321° |
| **Lowest Cloud Condition:** | Clear | **Visibility** | 10 miles |
| **Lowest Ceiling:** | None | **Visibility (RVR):** | |
| **Wind Speed/Gusts:** | / | **Turbulence Type Forecast/Actual:** | None / None |
| **Wind Direction:** | | **Turbulence Severity Forecast/Actual:** | N/A / N/A |
| **Altimeter Setting:** | 29.98 inches Hg | **Temperature/Dew Point:** | 27°C / 13°C |
| **Precipitation and Obscuration:** | No Obscuration; No Precipitation | | |
| **Departure Point:** | Viroqa, WI (Y51 ) | **Type of Flight Plan Filed:** | None |
| **Destination:** | Viroqa, WI (Y51 ) | **Type of Clearance:** | None |
| **Departure Time:** | | **Type of Airspace:** | Class G |

## Airport Information

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| **Airport:** | Viroqua Muni Y51 | **Runway Surface Type:** | |
| **Airport Elevation:** | 1291 ft msl | **Runway Surface Condition:** | Unknown |
| **Runway Used:** | | **IFR Approach:** | None |
| **Runway Length/Width:** | | **VFR Approach/Landing:** | None |

## Wreckage and Impact Information

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| **Crew Injuries:** | 1 Fatal | **Aircraft Damage:** | Destroyed |
| **Passenger Injuries:** | | **Aircraft Fire:** | On-ground |
| **Ground Injuries:** | N/A | **Aircraft Explosion:** | None |
| **Total Injuries:** | 1 Fatal | **Latitude, Longitude:** | 43.582778,-90.914443 |

The gyrocopter impacted a field about 0.31 nautical miles west of the departure end of runway 29 at Y51. The debris field was about 65 ft long and was aligned on a 336° magnetic heading.

The main rotor blade had separated at the shaft near the main rotor hub and was one of the first pieces of wreckage located within the ground scar. The flywheel contained dirt and debris embedded on one side, consistent with a near vertical impact with no rotation of the main rotor.

Following the main rotor blade in the debris field was a separated portion of fiberglass propeller. Additional pieces were located along the path, consistent with pieces separating with each rotation of a cartwheel of the gyrocopter.

The main wreckage came to rest against a row of corn and was largely consumed by a postaccident fire. The rudder remained attached at all attach points. The rudder cables were unbroken from the control surface to the rudder pedals, but movement could not be verified due to impact damage. The cabin structure was largely consumed by fire. The frame contained multiple fractures consistent with impact damage. Most fractures contained 45° shear lips, consistent with overstress fracture.

An engine examination revealed that the aft portion of the engine was damaged during impact, with about 6 inches of the aft portion of the engine case separated. Two of the spark plugs were absent of damage and confirmed tight before removal. The other two plugs were fractured about ½ of the length and found to be finger tight.

An internal examination of the engine revealed that the No. 2 piston appeared deformed toward the forward edge of the cylinder and contained signatures consistent with high heat exposure. The No.1 cylinder and piston were removed and found to be unremarkable. When the No. 2 cylinder was removed, the piston rings were seized with vertical scarring present on the piston rings on one side.

When the engine case was separated, circumferential scarring was present on both sides of the engine case corresponding to the No.1 (most forward) bearing.

The substance in all bearings was congealed, consistent with exposure to high heat. See figure 1.

Figure 1: Congealed substance in each bearing

## Additional Information

According to the FAA Rotorcraft Flying Handbook (FAA-H-8083-21), "[f]or safe operation, you must be thoroughly familiar with he procedures and limitations for your particular aircraft along with other factors that may affect the safety of your flight." It further states "By having a thorough knowledge of the gyroplane and its systems, you will be able to more readily handle the situation. In addition, by knowing the conditions which can lead to an emergency, many potential accidents can be avoided."

Under a section titled *Emergency Approach and Landing* the handbook discusses that engine failures are possible, which necessitates planning and practicing emergency approaches and landings.

## Administrative Information

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| **Investigator In Charge (IIC):** | Williams, David |
| **Additional Participating Persons:** | Mike Dziengel; FAA; Milwaukee, WI<br>Jim Vanek; Sportcopter; Scappoose, OR |
| **Original Publish Date:** | January 28, 2021 |
| **Last Revision Date:** | |
| **Investigation Class:** | Class 2 |
| **Note:** | The NTSB traveled to the scene of this accident. |
| **Investigation Docket:** | https://data.ntsb.gov/Docket?ProjectID=100089 |