Aviation Investigation Final Report

Location:	Forkston, Pennsylvania	**Accident Number:**	ERA21LA191
Date & Time:	April 22, 2021, 21:04 Local	**Registration:**	N4055N
Aircraft:	ROBINSON HELICOPTER R44	**Aircraft Damage:**	Destroyed
Defining Event:	VFR encounter with IMC	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot departed from his home airport about 13 minutes after sunset under visual flight rules and in visual meteorological conditions. He was not instrument-rated in helicopters, and the helicopter he owned was not approved for flight in instrument conditions. About 1 hour into the flight, the pilot likely encountered snow showers and instrument meteorological conditions that were forecast and moving through the area. Radar data showed that, after entering the area of weather, the pilot began a right, descending turn and the helicopter crashed in a rural, wooded area. The helicopter was destroyed by impact forces and a postimpact fire. Postaccident examination of the airframe and engine revealed no evidence of any preimpact mechanical malfunctions or failures that would have precluded normal operation. There was no evidence that the pilot obtained a weather briefing or reviewed the weather prior to or during the flight.

The dark night conditions under the likely overcast skies, the obscuration of the snow showers, and the lack of terrestrial illumination due to being over a remote and wooded area were all conducive to the formation of spatial disorientation. The pilot's lack of an instrument rating in helicopters, and the helicopter's lack of equipage for flight instrument meteorological conditions, would also have increased the likelihood of the pilot becoming spatially disoriented. The descending right turn exhibited by the helicopter in the final moments of the flight were consistent with the pilot experiencing spatial disorientation and a subsequent loss of control.

Probable Cause and Findings

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

The pilot's inadequate preflight weather planning, which resulted in an inadvertent encounter with instrument meteorological conditions at night, spatial disorientation, and collision with terrain.

Findings

Personnel issues	Weather planning - Pilot
Environmental issues	Snow - Decision related to condition
Personnel issues	Spatial disorientation - Pilot
Environmental issues	Dark - Effect on personnel

Factual Information

History of Flight

Enroute	VFR encounter with IMC (Defining event)
Enroute	Loss of control in flight
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On April 22, 2021, about 2104 eastern daylight time, a Robinson Helicopter R44, N4055N, was destroyed when it was involved in an accident near Forkston, Pennsylvania. The pilot was fatally injured. The helicopter was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

According to radar track data from the Federal Aviation Administration, the pilot took off from Allentown Queen City Municipal Airport (XLL), Allentown, Pennsylvania about 2010. He contacted Allentown approach control at 2011 and requested VFR flight-following to Bradford County Airport (N27), Towanda, Pennsylvania. After departure, the helicopter proceeded to the northwest, climbing to a cruise altitude between 3,000 and 4,000 ft above mean sea level (msl), remaining closer to 3,000 ft msl for most of the flight. At 2028, Allentown approach directed the pilot to contact Wilkes-Barre (AVP) approach. The pilot checked in with AVP approach and was issued the local altimeter setting. Shortly after passing Kasson Brook, Pennsylvania, the helicopter made a slight right turn, then entered a right, descending spiral until radar contact was lost about 2104 (see figure 1). The last recorded radar location was near the accident site location. No distress calls were received from the pilot prior to the accident.

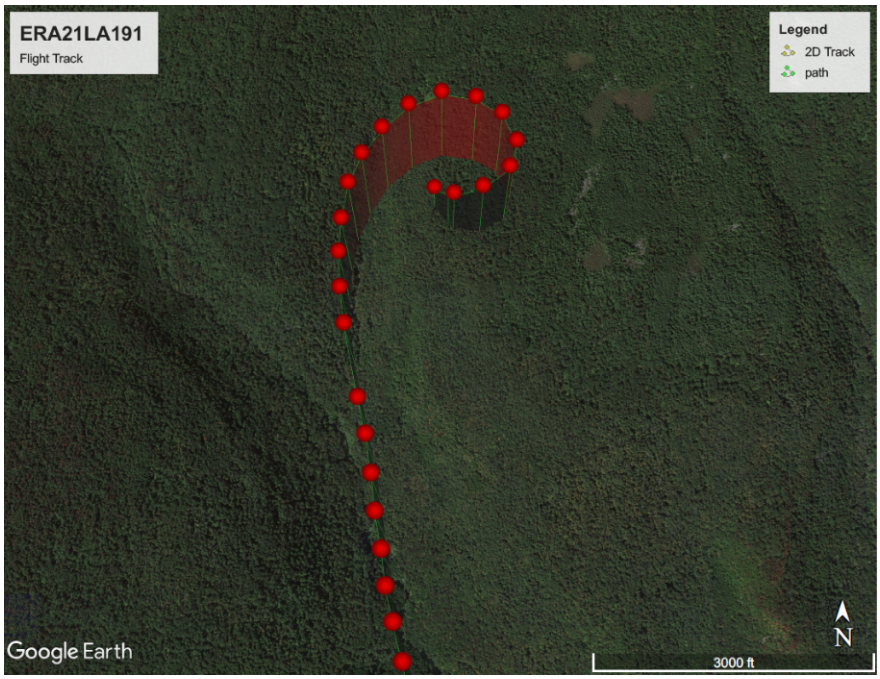

Figure 1 - Helicopter's flight track during the final moments of the flight.

The pilot's widow was interviewed after the accident. She reported that her husband purchased the helicopter about 1 year prior to the accident. He used the helicopter to commute to work at the hospital in Sayre, Pennsylvania. She stated that he had a normal work week prior to the accident; meals and rest were also normal. The pilot departed for the hospital later than he normally would have on the night of the accident. Flying at night was not an issue for her husband.

Pilot Information

Certificate:	Private	**Age:**	54,Male
Airplane Rating(s):	Single-engine land; Single-engine sea	**Seat Occupied:**	Unknown
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	Unknown
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	March 25, 2019
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	September 19, 2020
Flight Time:	2278 hours (Total, all aircraft), 104 hours (Total, this make and model), 30 hours (Last 90 days, all aircraft), 19 hours (Last 30 days, all aircraft)		

The pilot's 208 hours of logged flight time in helicopters were split equally between R22 and R44 models. He began his helicopter training in the R22 and transitioned to the R44 after he purchased the accident helicopter in June 2020. He obtained his rotorcraft-helicopter rating in the accident helicopter on September 19, 2020. The pilot held an instrument rating in airplanes but not in helicopters.

Aircraft and Owner/Operator Information

Aircraft Make:	ROBINSON HELICOPTER	**Registration:**	N4055N
Model/Series:	R44	**Aircraft Category:**	Helicopter
Year of Manufacture:	2020	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	2619
Landing Gear Type:	Skid	**Seats:**	4
Date/Type of Last Inspection:	March 22, 2021 Annual	**Certified Max Gross Wt.:**	2400 lbs
Time Since Last Inspection:	19 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	125 Hrs at time of accident	**Engine Manufacturer:**	Lycoming
ELT:		**Engine Model/Series:**	O-540-F1B5
Registered Owner:	On file	**Rated Power:**	205 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The helicopter was not approved for flight in instrument meteorological conditions.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Unknown	**Condition of Light:**	Night
Observation Facility, Elevation:	AVP,962 ft msl	**Distance from Accident Site:**	23 Nautical Miles
Observation Time:	20:54 Local	**Direction from Accident Site:**	114°
Lowest Cloud Condition:		**Visibility**	10 miles
Lowest Ceiling:	Overcast / 7500 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	14 knots / 20 knots	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	290°	**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	29.93 inches Hg	**Temperature/Dew Point:**	4°C / -8°C
Precipitation and Obscuration:			
Departure Point:	Allentown, PA (XLL)	**Type of Flight Plan Filed:**	None
Destination:	Towanda, PA (N27)	**Type of Clearance:**	Unknown
Departure Time:	20:10 Local	**Type of Airspace:**	Class G

The National Weather Service (NWS) Surface Analysis Chart centered over the eastern United States for 2000 depicted a trough located from northcentral Pennsylvania to southwestern Pennsylvania. There were no low- or high-pressure systems located near the accident site. The accident site was located east of the surface trough. Troughs can act as lifting mechanisms to help produce clouds and precipitation if sufficient moisture is present.

Greater Binghamton, New York Airport (BGM) was located 44 miles north of the accident site at an elevation of 1,636 ft. The 2053 observation included wind from 310° at 5 knots, 1 ½ statute miles visibility, with light snow, a broken ceiling at 4,300 ft, and overcast skies at 5,500 ft. The 2121 observation included wind from 300° at 8 knots, 1 ½ statute miles visibility, with light snow and mist, a broken ceiling at 2,900 ft, broken skies at 3,800 ft, and overcast skies at 5,000 ft.

A review of recorded Doppler radar data revealed a band of precipitation (snow showers) moving across the area of the accident site at the accident time. The NWS office in Binghamton issued an area forecast at 1953 for the area that included lake effect snow showers moving across the region. AIRMETs active at the time included mountain obscuration, moderate turbulence, and moderate icing.

The accident pilot did not request weather information from Leidos Flight Service or ForeFlight. There is no record of the pilot receiving or retrieving any other weather information before or during the accident flight.

At the accident site, sunset was 1953 and the end of civil twilight was 2023. At the time of the accident, the moon was located at an altitude of 60.66° and azimuth of 160.80° with 77.7% of the moon visible disk illuminated.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	On-ground
Ground Injuries:		**Aircraft Explosion:**	Unknown
Total Injuries:	1 Fatal	**Latitude, Longitude:**	41.48899,-76.18394(est)

The helicopter collided with trees and terrain in a remote, wooded area. The wreckage was recovered to a storage facility where an examination was conducted by a National Transportation Safety Board (NTSB) air safety investigator.

The aluminum and fiberglass structure of the fuselage and cabin were consumed by a postaccident fire. The forward end of the tailcone and empennage were mostly consumed by fire. The horizontal and vertical firewalls were deformed from impact and heat distress. The cyclic, collective, and antitorque pedals were fractured, deformed, and thermally damaged and were no longer attached to the structure.

The fuel tank bladders and shells were completely consumed by postaccident fire. Both filler caps were secure on their filler necks. Both finger strainers were clean and unobstructed. The fuel lines and hoses were damaged by postaccident fire. The fuel valve was found in the ON position.

The main rotor hub remained attached to the driveshaft. Both main rotor blades were cut by recovery personnel. Both blades exhibited impact damage to the leading edges and multiple fractures were observed throughout the length of the blades. The tail rotor blades sustained impact and thermal damage.

Most of the flight control tubes in the cabin and airframe areas were consumed by postaccident fire. All connections to the main rotor controls were accounted for, and all but three of the rod ends for the tail rotor controls were accounted for. The visible disconnects at the rod ends displayed either overload or thermal damage. The hydraulic servos moved smoothly by hand.

The engine separated from the airframe and exhibited heat and impact damage throughout. The engine was suspended from a lift and partially disassembled to facilitate the examination. The engine accessories were removed, and the crankshaft was rotated by turning the cooling fan. All six pistons were observed to move in their respective cylinder bores; however, the intake and exhaust valves were not observed to move as the crankshaft was rotated. Compression and suction were observed from the cylinders where both the intake and exhaust valves were closed. Observation of the crankshaft gear through the magneto mount openings in the accessory case revealed that the crankshaft gear did not rotate as the crankshaft was rotated. The head of the crankshaft gear bolt was observed raised about 1/8 inch above the crankshaft gear. The bolt safety washer was in place.

The accessory case was removed, and the crankshaft gear dowel pin was sheared, consistent with sudden stoppage of the accessory gears at impact. The crankshaft gear bolt was removed and was unbroken. The bolt head was damaged, consistent with contact with the oil pump drive. The first 3/16 inch of the bolt threads were damaged.

The crankshaft gear, crankshaft gear bolt, and safety washer were sent to the NTSB Materials Laboratory for examination. By design, the crankshaft gear contained a hole in its pilot flange that interfaced with an alignment dowel that was press-fit into a counterbored recess on the aft end of the crankshaft. The alignment dowel had fractured, and the separated piece of the dowel was captured in the pilot flange hole. All components (except the tip of the bolt) had dark-tinted surfaces, including the dowel fragment's fracture surface, consistent with exposure to elevated temperatures. The tip of the bolt had a shiny appearance and stripped threads, consistent with damage during extraction of the bolt. All surfaces were examined for indications of burnishing, rubbing, or wear, but none were found. The dowel's fracture surface had a flat, featureless appearance, with no apparent crack arrest marks. Shear lips were observed along the radially inward and outward edges of the fracture surface. The chamfer around the pilot flange hole exhibited deformation and metal transfer at the leading edge (the edge that leads during rotating of the crankshaft/gear assembly). The features were consistent with an overstress fracture of the dowel in shear and bending.

Postaccident examination of the airframe and engine revealed no evidence of any preimpact mechanical malfunctions or failures that would have precluded normal operation.

Medical and Pathological Information

According to autopsy report from the Office of the Coroner, Wyoming County, Pennsylvania, the cause of death of the pilot was blunt force trauma due to helicopter crash and the manner

of death was accident. The examination to identify any natural disease was limited by extensive trauma.

Toxicology testing performed by the FAA Forensic Sciences Laboratory detected ethanol in the pilot's liver tissue at 0.048 grams per hectogram (gm/hg) and n-butanol in the pilot's liver tissue; no other tested for drugs were detected in his muscle tissue.

Ethanol is a social drug commonly consumed by drinking beer, wine, or liquor. It acts as a central nervous system depressant; it impairs judgment, psychomotor functioning, and vigilance. Ethanol is water soluble, and after absorption it quickly and uniformly distributes throughout the body's tissues and fluids. The distribution pattern parallels water content and blood supply of the tissue. Ethanol can be produced after death by microbial activity, sometimes in conjunction with other alcohols such as butanol. Extensive trauma increases the spread of bacteria and raises the risk of ethanol production after death.

Additional Information

VFR into IMC

In April 2003, the Federal Aviation Administration (FAA) published Advisory Circular 61-134, General Aviation Controlled Flight into Terrain Awareness. The circular stated in part:

Operating in marginal VFR [visual flight rules]/IMC conditions is more commonly known as scud running. According to National Transportation Safety Board (NTSB) and FAA data, one of the leading causes of GA accidents is continued VFR flight into IMC. As defined in 14 CFR part 91, ceiling, cloud, or visibility conditions less than that specified for VFR or Special VFR is IMC and IFR [instrument flight rules] applies. However, some pilots, including some with instrument ratings, continue to fly VFR in conditions less than that specified for VFR. The result is often a CFIT [controlled flight into terrain] accident when the pilot tries to continue flying or maneuvering beneath a lowering ceiling and hits an obstacle or terrain or impacts water. The accident may or may not be a result of a loss of control before the aircraft impacts the obstacle or surface. The importance of complete weather information, understanding the significance of the weather information, and being able to correlate the pilot's skills and training, aircraft capabilities, and operating environment with an accurate forecast cannot be emphasized enough.

Preventing Similar Accidents

Reduced Visual References Require Vigilance (SA-020)

The Problem

About two-thirds of general aviation accidents that occur in reduced visibility weather conditions are fatal. The accidents can involve pilot spatial disorientation or controlled flight into terrain. Even in visual weather conditions, flights at night over areas with limited ground lighting (which provides few visual ground references) can be challenging.

What can you do?

- Obtain an official preflight weather briefing, and use all appropriate sources of weather information to make timely in-flight decisions. Other weather sources and in-cockpit weather equipment can supplement official information.
- Refuse to allow external pressures, such as the desire to save time or money or the fear of disappointing passengers, to influence you to attempt or continue a flight in conditions in which you are not comfortable.
- Be honest with yourself about your skill limitations. Plan ahead with cancellation or diversion alternatives. Brief passengers about the alternatives before the flight.
- Seek training to ensure that you are proficient and fully understand the features and limitations of the equipment in your aircraft, particularly how to use all features of the avionics, autopilot systems, and weather information resources.
- Don’t allow a situation to become dangerous before deciding to act. Be honest with air traffic controllers about your situation, and explain it to them if you need help.
- Remember that, when flying at night, even visual weather conditions can be challenging. Remote areas with limited ground lighting provide limited visual references cues for pilots, which can be disorienting or render rising terrain visually imperceptible. When planning a night VFR flight, use topographic references to familiarize yourself with surrounding terrain. Consider following instrument procedures if you are instrument rated or avoiding areas with limited ground lighting (such as remote or mountainous areas) if you are not.
- Manage distractions: Many accidents result when a pilot is distracted momentarily from the primary task of flying.

See https://www.ntsb.gov/Advocacy/safety-alerts/Documents/SA-020.pdf for additional resources.

The NTSB presents this information to prevent recurrence of similar accidents. Note that this should not be considered guidance from the regulator, nor does this supersede existing FAA

Regulations (FARs).

Administrative Information

Investigator In Charge (IIC):	Hicks, Ralph
Additional Participating Persons:	Michael Reichert; FAA/FSDO; Allentown, PA
Original Publish Date:	February 24, 2023
Last Revision Date:	
Investigation Class:	Class 3
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=102968