# Aviation Investigation Final Report

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| **Location:** | Moab, Utah | **Accident Number:** | WPR17FA035 |
| **Date & Time:** | December 12, 2016, 05:37 Local | **Registration:** | N772RT |
| **Aircraft:** | QUEST AIRCRAFT COMPANY LLC KODIAK 100 | **Aircraft Damage:** | Destroyed |
| **Defining Event:** | Loss of control in flight | **Injuries:** | 1 Fatal |
| **Flight Conducted Under:** | Part 135: Air taxi & commuter - Non-scheduled | | |

## Analysis

The commercial pilot was departing on a routine positioning flight in dark night visual meteorological conditions. Footage from a security camera at the airport showed the airplane take off normally and initiate a right turn, which was the established direction of traffic for the takeoff runway. The airplane continued the right turn, then entered an increasingly rapid descent and subsequently impacted terrain about 1 mile southwest from the airport. The wreckage distribution was consistent with a high-energy impact. Examination of the airframe and engine revealed no evidence of any preimpact mechanical malfunctions or anomalies that would have precluded normal operation.

Autopsy and toxicology testing of the pilot did not reveal any evidence of impairment or incapacitation. Visual conditions prevailed in the area at the time of the accident; however, the setting Moon was obscured by cloud cover, and the airport was located in an area of remote, sparsely-populated high desert terrain. This would have resulted in few visual references to which the pilot could have oriented the airplane. Although the pilot had experience operating in this environment in night conditions and held an instrument rating, the circumstances of the accident are consistent with the known effects of spatial disorientation. The investigation could not determine the initiating event which led to the pilot's mismatch between the airplane's perceived and actual attitude; however, he likely experienced a sensory illusion as a result of spatial disorientation, which led to a 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 loss of control shortly after takeoff due to spatial disorientation. 

## Findings

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| **Personnel issues** | Spatial disorientation - Pilot |
| **Personnel issues** | Aircraft control - Pilot |
| **Environmental issues** | (general) - Effect on operation |

# Factual Information

## History of Flight

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| **Initial climb** | Loss of control in flight (Defining event) |
| **Initial climb** | Collision with terr/obj (non-CFIT) |

On December 12, 2016, about 0537 mountain standard time, a Quest Kodiak, N772RT, was destroyed when it impacted terrain shortly after takeoff from Canyonlands Field Airport (CNY), Moab, Utah. The pilot was fatally injured. The airplane was registered to Lease Air LLC, and operated by Aerowest Aviation, dba Redtail Air, under the provisions of 14 *Code of Federal Regulations* Part 135. Visual meteorological conditions prevailed, and a visual flight rules company flight plan was filed for the positioning flight, which was originating at the time of the accident. The flight's intended destination was Salt Lake City International Airport (SLC), Salt Lake City, Utah.

Review of security camera footage showed that the pilot boarded the airplane about 0526, started the engine about 0529, and subsequently taxied to runway 21 for takeoff. The pilot activated the runway lights about 0534, and the airplane took off about 0536. The takeoff appeared normal and the airplane initiated a right turn after becoming airborne. Shortly thereafter, the airplane entered an increasingly rapid descent that continued to ground contact.

## Pilot Information

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| **Certificate:** | Commercial; Flight instructor | **Age:** | 64,Male |
| **Airplane Rating(s):** | Single-engine land | **Seat Occupied:** | Left |
| **Other Aircraft Rating(s):** | None | **Restraint Used:** | 3-point |
| **Instrument Rating(s):** | Airplane | **Second Pilot Present:** | No |
| **Instructor Rating(s):** | Airplane single-engine | **Toxicology Performed:** | Yes |
| **Medical Certification:** | Class 2 With waivers/limitations | **Last FAA Medical Exam:** | February 1, 2016 |
| **Occupational Pilot:** | Yes | **Last Flight Review or Equivalent:** | April 27, 2016 |
| **Flight Time:** | 4635 hours (Total, all aircraft), 243 hours (Total, this make and model), 4635 hours (Pilot In Command, all aircraft), 110 hours (Last 90 days, all aircraft), 31 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft) | | |

The pilot held a commercial pilot certificate with ratings for airplane single engine land and instrument airplane; in addition, a flight instructor certificate with ratings for airplane single engine and instrument airplane. He held a Federal Aviation Administration (FAA) second-class medical certificate issued February 1, 2016, with the limitation that he must wear corrective lenses for near and distant vision. The operator reported that the pilot had 4,635 total hours of flight experience, of which 243 hours were in the accident airplane make and model. The pilot had 170 total hours of night experience, and 291 hours in actual instrument conditions.

## Aircraft and Owner/Operator Information

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| **Aircraft Make:** | QUEST AIRCRAFT COMPANY LLC | **Registration:** | N772RT |
| **Model/Series:** | KODIAK 100 | **Aircraft Category:** | Airplane |
| **Year of Manufacture:** | 2015 | **Amateur Built:** | |
| **Airworthiness Certificate:** | Normal | **Serial Number:** | 100-0140 |
| **Landing Gear Type:** | Tricycle | **Seats:** | 2 |
| **Date/Type of Last Inspection:** | November 10, 2016 Annual | **Certified Max Gross Wt.:** | 7305 lbs |
| **Time Since Last Inspection:** | 31 Hrs | **Engines:** | 1 Turbo prop |
| **Airframe Total Time:** | 504 Hrs at time of accident | **Engine Manufacturer:** | P&W CANADA |
| **ELT:** | C126 installed, not activated | **Engine Model/Series:** | PT6A-34 |
| **Registered Owner:** | LEASE AIR LLC | **Rated Power:** | 750 Horsepower |
| **Operator:** | Aerowest Aviation | **Operating Certificate(s) Held:** | Commuter air carrier (135) |
| **Operator Does Business As:** | Redtail Air | **Operator Designator Code:** | OWGA |

The two-seat, high wing, fixed-gear airplane, serial number 100-0140, was manufactured in 2015 and was configured to carry cargo. It was powered by a Pratt and Whitney PT6A-34, 750-horsepower turbine engine equipped with a Hartzell HC-E4N-3P, four-blade, controllable-pitch propeller. The airplane's most recent 200-hour inspection was conducted on November 10, 2016, at an airframe total time of 473.5 hours. At the time of the accident, the airplane had 504.2 total airframe hours.

## Meteorological Information and Flight Plan

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| **Conditions at Accident Site:** | Visual (VMC) | **Condition of Light:** | Night/dark |
| **Observation Facility, Elevation:** | KCNY,4557 ft msl | **Distance from Accident Site:** | 1 Nautical Miles |
| **Observation Time:** | 05:53 Local | **Direction from Accident Site:** | 72° |
| **Lowest Cloud Condition:** | Clear | **Visibility** | 10 miles |
| **Lowest Ceiling:** | None | **Visibility (RVR):** | |
| **Wind Speed/Gusts:** | 4 knots / | **Turbulence Type Forecast/Actual:** | / None |
| **Wind Direction:** | 330° | **Turbulence Severity Forecast/Actual:** | / N/A |
| **Altimeter Setting:** | 29.94 inches Hg | **Temperature/Dew Point:** | 1°C / -2°C |
| **Precipitation and Obscuration:** | No Obscuration; No Precipitation | | |
| **Departure Point:** | Moab, UT (CNY ) | **Type of Flight Plan Filed:** | Company VFR |
| **Destination:** | Salt Lake City, UT (SLC ) | **Type of Clearance:** | None |
| **Departure Time:** | 06:00 Local | **Type of Airspace:** | Class G |

The 0553 weather observation at CNY included wind from 330° at 4 knots, visibility 10 statute miles, clear skies below 12,000 ft, temperature 1°C, dewpoint -2°C, and an altimeter setting of 29.94 inches of mercury. Satellite imagery indicated a broken layer of high cirriform clouds with tops near 21,000 ft.

According to the United States Naval Observatory, the Moon phase for the morning of the accident was a waxing gibbous, with about 97% of the Moon's visible disk illuminated. Moonset occurred at 0536; at 0540, the Moon was -1.5 degrees below the horizon at an azimuth of 290°.

## Airport Information

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| **Airport:** | Canyonlands Field Airport CNY | **Runway Surface Type:** | Asphalt |
| **Airport Elevation:** | 4557 ft msl | **Runway Surface Condition:** | Dry |
| **Runway Used:** | 21 | **IFR Approach:** | None |
| **Runway Length/Width:** | 7100 ft / 75 ft | **VFR Approach/Landing:** | None |

CNY is a non-towered/uncontrolled facility at a field elevation of 4,557 ft mean sea level; the airport was located in an area of remote, sparsely-populated high desert terrain. The airport has one runway, runway 3/21, which is 7,100 ft long and 75 ft wide. The published traffic pattern for runway 21 includes right turns.

## 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:** | 38.753055,-109.752777(est) |

The airplane descended through two 30-40 ft-tall powerlines about 1 mile southwest of the airport before impacting terrain below. The debris field was about 323 ft long and extended beneath the powerlines on a magnetic heading of 359°. The first piece of debris was the flange from the right wheel, followed by outboard right wing components. A large impact crater contained two propeller blades, some instruments, and right wing aileron and flap components. Various pieces of debris from the right wing, instrument panel, and cabin area extended from the impact crater about 134 ft to the main wreckage. The main wreckage included the engine, cabin, fuselage, and empennage, and was consumed by postimpact fire. Beyond the main wreckage were components from the left wing and inboard right wing. The final piece of debris was the right tire.

Two of the four propeller blades exhibited striations and damage consistent with impact with powerlines. These blades were fracture-separated from the hub and located in the impact crater. The cabin area was heavily damaged and burned; the flight instruments were heavily fragmented. Continuity of all primary flight controls was established from the cabin area to the respective flight control surfaces.

Examination of the engine revealed that both the front and aft sections were bent toward the right side, giving the engine a half-circle appearance. The casing from the power section of the engine was heavily twisted and sustained heavy inward crush damage at the C-flange. Dirt, airframe fragments, stator vanes, and fragmented pieces of the power turbine were removed from this area, revealing the power turbine and a few compressor blades. The visible power turbine blades were fractured about midspan and the outer fragments were found within the exposed area. The fracture surfaces were rough. In addition, scoring was noted along the inside edge of the casing. A few compressor blades could be seen through the stator and the leading edges displayed a "chewed" appearance. An internal examination with a borescope revealed no evidence of heat distress, and several blade fragments were observed forward of the power turbine.

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

## Medical and Pathological Information

The Utah Office of the Medical Examiner, Salt Lake City, Utah, performed an autopsy of the pilot. The cause of death was listed as total body blunt force injuries.

The FAA Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, performed forensic toxicology on specimens from the pilot, with no ethanol or tested-for drugs detected in urine.

## Additional Information

According to an FAA Safety Team pamphlet, "Spatial Disorientation:"

Sight, supported by other senses, allows a pilot to maintain orientation while flying. However, when visibility is restricted (i.e., no visual reference to the horizon or surface detected) the body's supporting senses can conflict with what is seen. When this spatial disorientation occurs, sensory conflicts and optical illusions often make it difficult for a pilot to tell which way is up.

Contributing to these phenomena are the various types of sensory stimuli: visual, vestibular (organs of equilibrium located in the inner ear), and proprioceptive (receptors located in the skin, muscles, tendons, and joints). Changes in linear acceleration, angular acceleration, and gravity are detected by the vestibular system and the proprioceptive receptors, and then compared in the brain with visual information.

In the flight environment, these stimuli can vary in magnitude, direction, and frequency, resulting in a "sensory mismatch" that can produce illusions and lead to spatial disorientation.

## Administrative Information

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| **Investigator In Charge (IIC):** | Link, Samantha |
| **Additional Participating Persons:** | Paula Behrend; Federal Aviation Administration; Salt Lake City, UT<br>David Schuck; Quest Aircraft; Sandpoint, ID<br>Marc Gratton; Pratt & Whitney Canada; Longueuil |
| **Original Publish Date:** | March 14, 2018 |
| **Last Revision Date:** | |
| **Investigation Class:** | Class |
| **Note:** | The NTSB traveled to the scene of this accident. |
| **Investigation Docket:** | https://data.ntsb.gov/Docket?ProjectID=94489 |

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, "accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties … and are not conducted for the purpose of determining the rights or liabilities of any person" (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB's statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available here.