



# Aviation Investigation Final Report

<b>Location:</b>	Alpine, Utah	<b>Accident Number:</b>	WPR19FA148
<b>Date &amp; Time:</b>	May 17, 2019, 10:34 Local	<b>Registration:</b>	N744TW
<b>Aircraft:</b>	Robinson R44	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	VFR encounter with IMC	<b>Injuries:</b>	2 Fatal
<b>Flight Conducted Under:</b>	Part 91: General aviation - Personal		

## Analysis

The noninstrument-rated pilot and passenger departed in the helicopter on a visual flight rules (VFR) cross-country flight. A family member reported that it was raining at the time of the helicopter's departure, and about an hour later, she received a video from the passenger depicting the helicopter flying above a cloud layer with no discernable horizon and some of the clouds extending above the helicopter's altitude. Review of weather and flight track information revealed that the helicopter climbed to an altitude of about 13,000 ft mean sea level (msl); remaining about that altitude for over 25 minutes. About 3 minutes before the accident, the helicopter entered a descent that continued to an altitude of about 9,200 ft msl, during which the helicopter completed more than two 360° descending turns of decreasing radius. The last recorded location of the helicopter was about 1,650 ft from the accident site.

The wreckage was highly fragmented, consistent with a high-speed impact. Examination of the airframe and engine revealed no evidence of any preaccident mechanical failures or malfunctions. The helicopter was approved by the manufacturer for day and night VFR flight, and was not approved for instrument flight. The helicopter was not equipped with a supplemental oxygen system, nor was any supplemental oxygen equipment found in the wreckage.

AIRMET Sierra for mountain obscuration and moderate icing between the freezing level 18,000 ft was valid for the accident site at the accident time. There was no record of the pilot receiving any preflight weather information from an access-controlled source. The helicopter was likely operating in visual meteorological conditions above the clouds until its initial descent from about 13,000 ft, at which point the helicopter likely entered and remained in instrument meteorological conditions for the rest of the flight.

Although the altitude and duration of the flight did not meet regulatory requirements for supplemental oxygen use, it is likely that the pilot may have been experiencing some early

effects of hypoxia, including euphoria, which may have exacerbated the effects from his use of multiple drugs. Toxicology testing revealed a blood level of amphetamine (around 300 ng/ml) and the presence of phenylpropanolamine, indicating that the pilot was most likely using a street preparation of the drug. Testing also identified phenylpropanolamine and oxycodone in blood and urine, and oxazepam in urine. Euphoria and over-confidence associated with the pilot's amphetamine use would have likely been exacerbated by the early effects of hypoxia due to his decision to operate the helicopter at high altitude.

The pilot's decision to operate the helicopter in reduced visibility conditions with no training in flight by reference to instruments in a helicopter that was not certified for instrument flight was conducive to the development of spatial disorientation. The helicopter's turning descent before impact and the wreckage distribution that indicated a high-speed impact were both consistent with the known effects of spatial disorientation. Based on the available information, the pilot entered instrument meteorological conditions and shortly after, began experiencing spatial disorientation, which resulted in a loss of control and impact with terrain. It is likely that the psychoactive effects from the pilot's use of amphetamine contributed to his preflight decision making, and the additional effects of early hypoxia contributed to his continued flight into adverse weather conditions.

## Probable Cause and Findings

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

The noninstrument-rated pilot's continued visual flight rules flight into instrument meteorological conditions, which resulted in spatial disorientation and subsequent loss of control. Contributing to the accident was hypoxia due to the high altitude at which the pilot chose to conduct the flight combined with the impairing effects of amphetamine use.

## Findings

<b>Personnel issues</b>	Decision making/judgment - Pilot
<b>Personnel issues</b>	Spatial disorientation - Pilot
<b>Personnel issues</b>	Aircraft control - Pilot
<b>Personnel issues</b>	Hypoxia/anoxia - Pilot
<b>Personnel issues</b>	Illicit drug - Pilot
<b>Aircraft</b>	(general) - Not attained/maintained
<b>Environmental issues</b>	Low visibility - Contributed to outcome

## Factual Information

### History of Flight

<b>Enroute-cruise</b>	VFR encounter with IMC (Defining event)
<b>Enroute-change of cruise level</b>	Loss of control in flight
<b>Uncontrolled descent</b>	Collision with terr/obj (non-CFIT)

On May 17, 2019, about 1034 mountain daylight time, a Robinson R44 helicopter, N744TW, was substantially damaged when it was involved in an accident near Alpine, Utah. The pilot and passenger sustained fatal injuries. The helicopter was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

The pilot's mother stated that the pilot kept the helicopter at his home in Myton, Utah, and that he and his wife had planned to fly to South Valley Regional Airport (U42), West Jordan, Utah, to pick up a second passenger before proceeding to Phoenix, Arizona. She saw the helicopter depart at 0930 and stated that it was raining lightly at that time. At 1022, she received a text message from the passenger stating that they were "17 minutes out." At 1025, she received a text stating that "the flight was smooth." At 1027, she received a short video showing the helicopter above a thick cloud layer with no discernable horizon. Some of the cloud tops appeared above the helicopter, as seen in Figure 1.

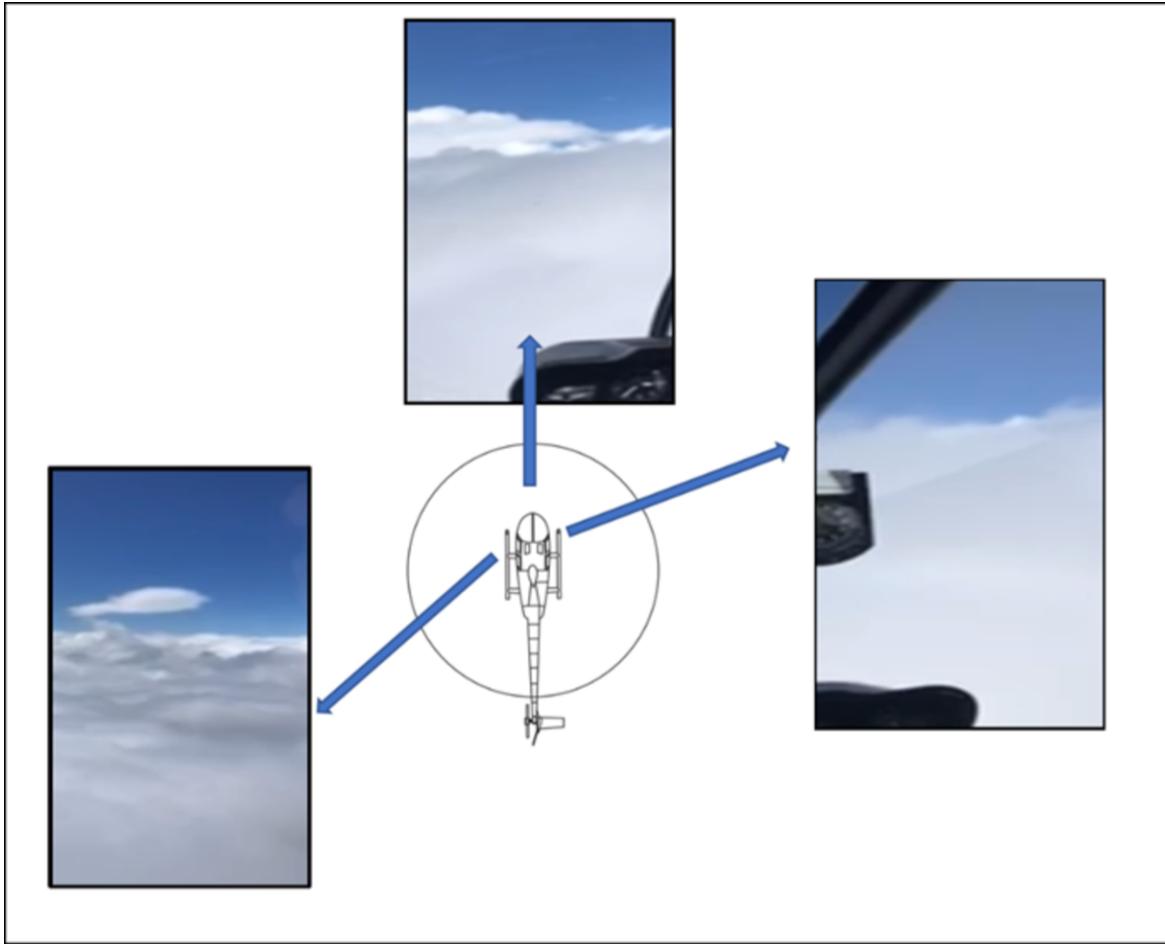


Figure 1. Images recorded by a passenger.

Radar data provided by the Federal Aviation Administration (FAA) revealed a target correlated to the accident helicopter first appear on radar at 0956 at an altitude of 10,400 ft mean sea level (msl), on a heading of  $309^{\circ}$  about 44 miles west of the pilot's residence. The helicopter continued generally on a west-northwest course, as shown in Figure 2. The airspeed initially varied from 37 to 88 knots ground speed but stabilized to about 85 knots for most of the flight. The helicopter climbed to 13,000 ft msl at 1007 and remained between 12,700 and 13,000 ft msl until about 1030, when it descended below 12,500 ft msl. At 1031, the helicopter began a right descending right turn that continued until radar contact was lost at 1033 at an altitude of 9,200 ft msl and groundspeed of 108 knots, about 1,650 ft from

the accident site. The data revealed that the helicopter completed about 2 1/2 360° turns before radar contact was lost. (see Figure 3.)

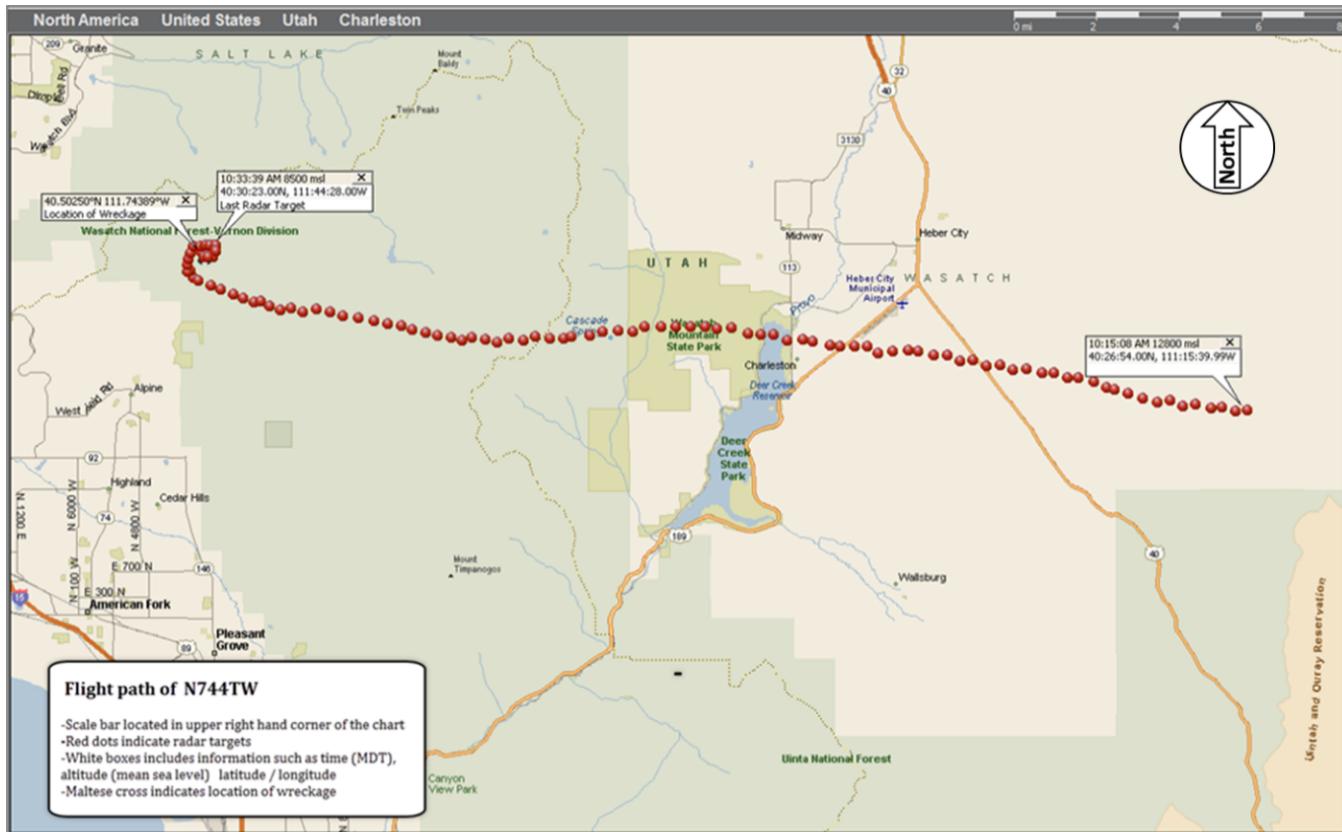


Figure 2. Recorded radar targets showing the likely route of flight.

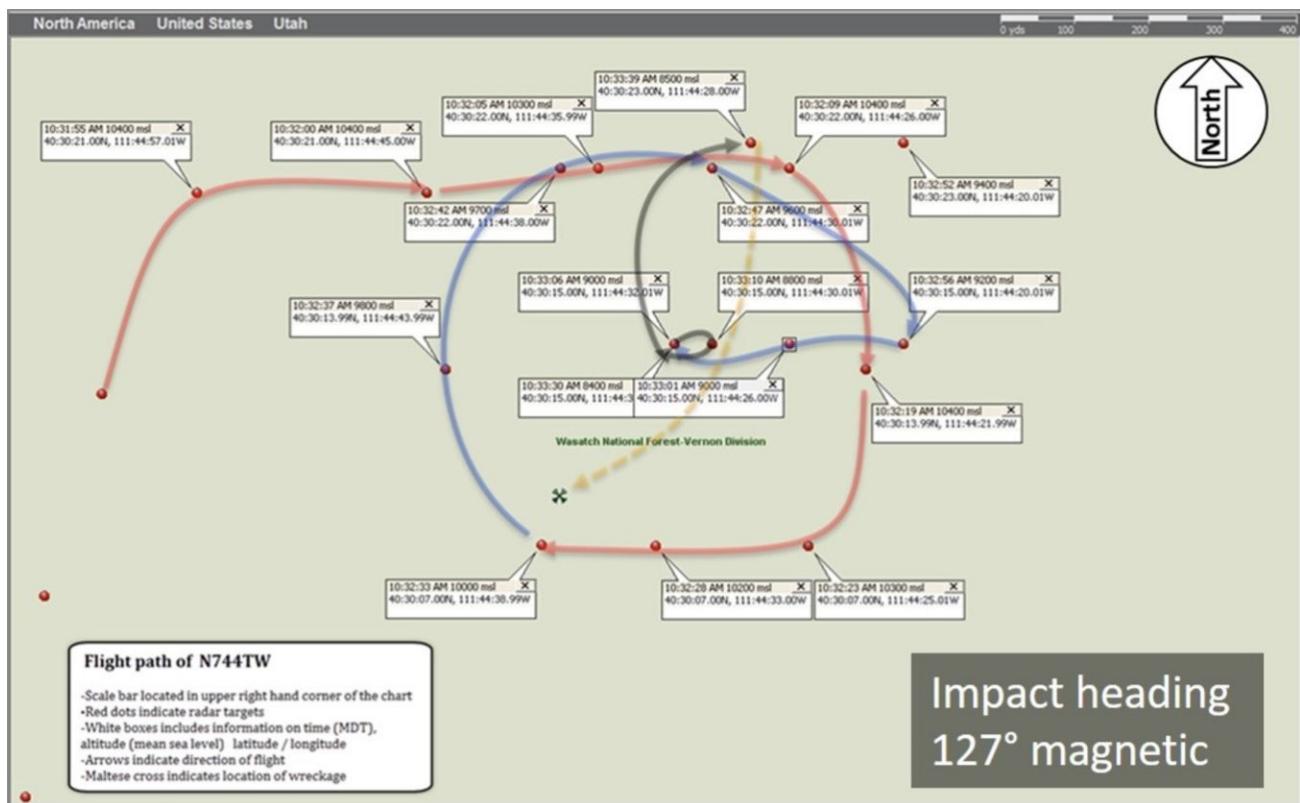


Figure 3. Radar targets showing the turning descent. Path lines show estimated track.

## Pilot Information

<b>Certificate:</b>	Private	<b>Age:</b>	32,Male
<b>Airplane Rating(s):</b>	None	<b>Seat Occupied:</b>	Right
<b>Other Aircraft Rating(s):</b>	Helicopter	<b>Restraint Used:</b>	5-point
<b>Instrument Rating(s):</b>	None	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	Class 1 Without waivers/limitations	<b>Last FAA Medical Exam:</b>	April 20, 2017
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>	(Estimated) 145.1 hours (Total, all aircraft), 31.7 hours (Total, this make and model), 30.7 hours (Last 90 days, all aircraft)		

## Passenger Information

Certificate:	Age:	34, Female
Airplane Rating(s):	Seat Occupied:	Left
Other Aircraft Rating(s):	Restraint Used:	
Instrument Rating(s):	Second Pilot Present:	No
Instructor Rating(s):	Toxicology Performed:	
Medical Certification:	Last FAA Medical Exam:	
Occupational Pilot:	Last Flight Review or Equivalent:	
Flight Time:		

Review of the pilot's logbook revealed about 145.1 total hours of flight experience: about 30.5 hours in the Robinson R44 helicopter, and about 113.4 hours in the Robinson R22 helicopter. The logbook contained no entries for instrument flight training.

The pilot's flight instructor stated that he had last provided instruction to the pilot about one year before the accident. The instructor followed a private pilot training syllabus that did not include instrument training. The instructor stated that they had done some instrument flight rules (IFR) training, and less than 5 hours "hood work" (with a view limiting device) because the pilot wanted to try it. He stated that they had discussed visual flight rules (VFR) cloud clearance requirements. The instructor stated that they may have done some unusual attitude recoveries.

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Robinson	<b>Registration:</b>	N744TW
<b>Model/Series:</b>	R44 II	<b>Aircraft Category:</b>	Helicopter
<b>Year of Manufacture:</b>	2005	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	10702
<b>Landing Gear Type:</b>	N/A; Skid	<b>Seats:</b>	4
<b>Date/Type of Last Inspection:</b>	January 13, 2019 Annual	<b>Certified Max Gross Wt.:</b>	2500 lbs
<b>Time Since Last Inspection:</b>	68.8 Hrs	<b>Engines:</b>	1 Reciprocating
<b>Airframe Total Time:</b>	3005.4 Hrs at time of accident	<b>Engine Manufacturer:</b>	Lycoming
<b>ELT:</b>	Not installed	<b>Engine Model/Series:</b>	IO-540 SER
<b>Registered Owner:</b>	On file	<b>Rated Power:</b>	
<b>Operator:</b>	On file	<b>Operating Certificate(s) Held:</b>	None

The Robinson R44 Raven II helicopter, serial number 10702, was manufactured in 2005, and was approved for VFR flights in day and night conditions. The helicopter was not equipped with a supplemental oxygen system, nor were any supplemental oxygen provisions found at the accident site. A review of the maintenance records revealed that the last annual inspection was completed on January 13, 2019, and the associated entry stated, “*Inspected avionics for security and basic electrical operation.*” There were no instrument discrepancies recorded.

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Instrument (IMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	KPVU, 4497 ft msl	<b>Distance from Accident Site:</b>	17 Nautical Miles
<b>Observation Time:</b>	16:14 Local	<b>Direction from Accident Site:</b>	177°
<b>Lowest Cloud Condition:</b>		<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	Broken / 3100 ft AGL	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	7 knots /	<b>Turbulence Type Forecast/Actual:</b>	Unknown / Unknown
<b>Wind Direction:</b>	170°	<b>Turbulence Severity Forecast/Actual:</b>	Moderate / Unknown
<b>Altimeter Setting:</b>	29.82 inches Hg	<b>Temperature/Dew Point:</b>	8°C / 3°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Ballard, UT	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	West Jordan, UT (U42)	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>	09:24 Local	<b>Type of Airspace:</b>	Class G

According to Leidos, the pilot did not have any contact with them or any other third-party vendors on the day or the day prior of the accident.

Roosevelt Municipal Airport (74V), Roosevelt, Utah, located about 5 miles north of the pilot's residence, about the time of departure reported wind from 080° at 3 knots, 10 statute miles visibility, broken clouds at 7,500 ft above ground level (agl), temperature 10°C, dew point temperature 3°C, altimeter setting of 29.77 inches of mercury.

Reported weather at U42 about the time of the accident included wind from 080° at 4 knots, visibility of 10 statute miles or greater, scattered clouds at 1,900 feet agl, ceiling broken at 4,300 feet agl, overcast at 5,000 feet agl, temperature 7°C, dew point temperature of 5°C, altimeter setting of 29.83 inches of mercury.

AIRMET Sierra was issued at 0845 for moderate icing between the freezing level and 18,000 ft msl and mountain obscuration by clouds, precipitation, or mist, and was active for the accident location at the accident time. Weather radar imagery above the accident location between about 8,600 ft and 14,200 ft msl identified reflectivity consistent with light rain in an area that included the accident site. (see Figure 4.)

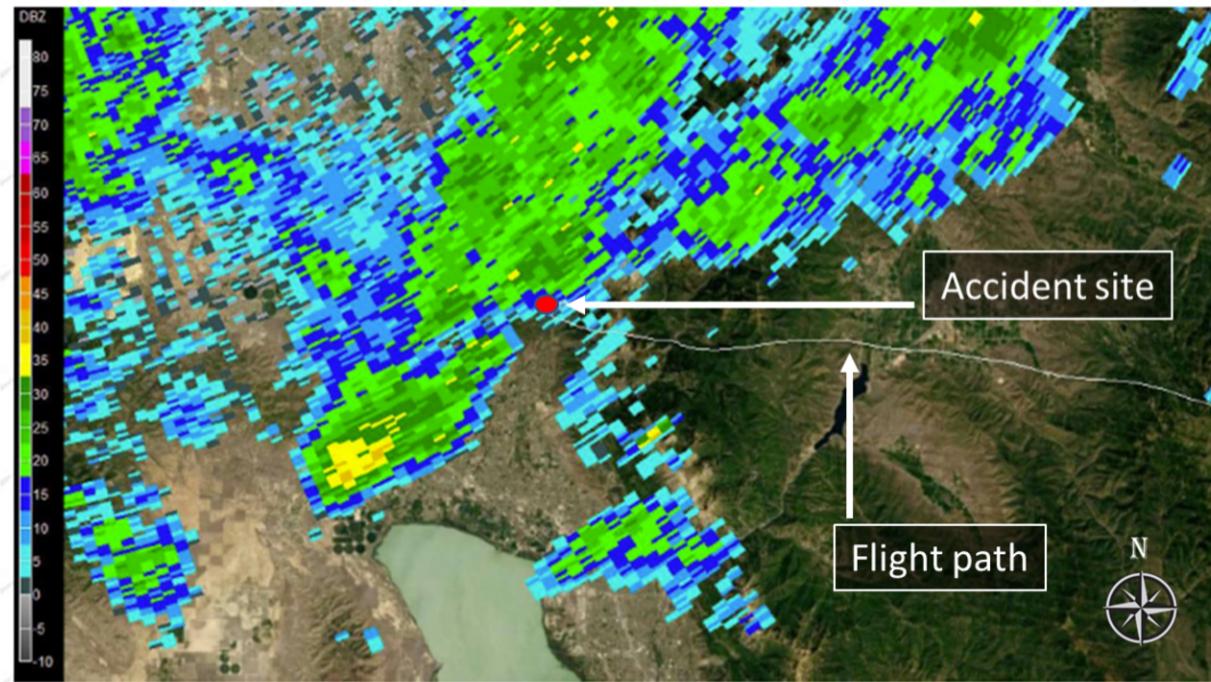


Figure 4. Weather radar imagery

Satellite imagery identified cloudy conditions over the accident site, with analysis indicating cloud tops of about 13,000 ft msl along the route of flight and a cloud top height of about 19,500 ft msl during the final portions of the flight, as shown in Figure 5.

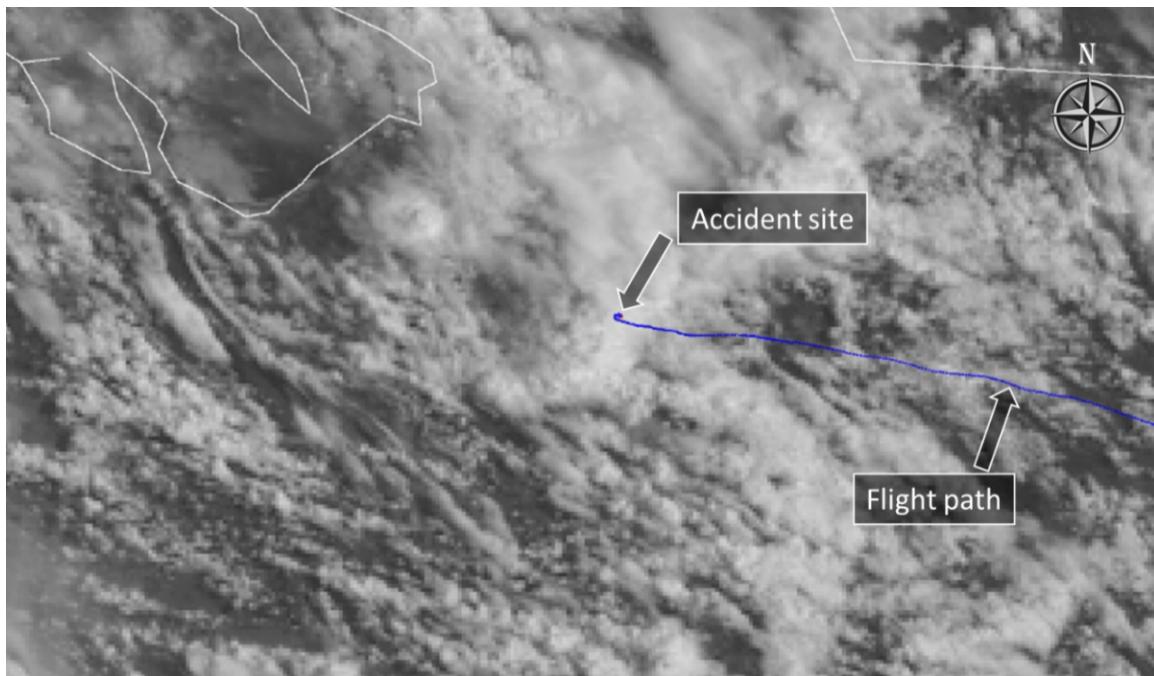


Figure 5. Satellite imagery showing clouds.

## **Wreckage and Impact Information**

<b>Crew Injuries:</b>	1 Fatal	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>	1 Fatal	<b>Aircraft Fire:</b>	On-ground
<b>Ground Injuries:</b>		<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	2 Fatal	<b>Latitude,</b> <b>Longitude:</b>	40.502498,-111.74388(est)

The debris field was about 7,656 ft msl elevation, oriented on a magnetic heading of 127° and was about 125 ft in length. The first piece of wreckage in the debris path was a small portion of a tail rotor blade. The empennage separated from the tail cone, and the tail cone separated from the fuselage. The fuselage came to rest on its right side, with the cabin portion of the fuselage fractured and lying on its left side. Both landing skids separated from the fuselage. The main rotor blades remained attached to the hub and were bowed down. The main rotor hub remained attached to the driveshaft, and the pylon remained attached to the transmission.

Fuel remaining at the time of the accident was estimated to be about 13 gallons, based on a fuel consumption estimate of 15 gallons per hour, the last recorded fuel purchase of 39 gallons and a subsequent flight time of 2.25 hours.

Examination of the recovered airframe, flight control system components, and engine revealed no mechanical malfunctions or anomalies that would have precluded normal operation.

## **Medical and Pathological Information**

Toxicology testing performed at two laboratories identified 300 ng/ml of amphetamine in blood obtained from the inferior vena cava; 346 ng/ml in heart blood and 4167 ng/ml in urine; phenylpropanolamine and oxycodone in heart blood and urine; oxymorphone, a metabolite of oxycodone in urine; and oxazepam in urine.

## **Additional Information**

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The Pilot's Handbook of Aeronautical Knowledge, FAA-H-8083-25B, states in part:

*Under normal flight conditions, when there is a visual reference to the horizon and ground, the sensory system in the inner ear helps to identify the pitch, roll, and yaw movements of the aircraft. When visual contact with the horizon is lost, the vestibular system becomes unreliable. Without visual references outside the aircraft, there are many situations in which normal motions and forces create convincing illusions that are difficult to overcome... Unless a pilot has many hours of training in instrument flight, flight should be avoided in reduced visibility or at night when the horizon is not visible. A pilot can reduce susceptibility to disorienting illusions through training and awareness and learning to rely totally on flight instruments.*

*Be physically tuned for flight into reduced visibility. Ensure proper rest, adequate diet, and, if flying at night, allow for night adaptation. Remember that illness, medication, alcohol, fatigue, sleep loss, and mild hypoxia are likely to increase susceptibility to spatial disorientation.*

The Pilot's Operating Handbook for the R44 contains a Safety Notice (SN-18) which states in part:

*Flying a helicopter in obscured visibility due to fog, snow, low ceiling, or even dark night can be fatal. Helicopters have less inherent stability and much faster roll and pitch rates than airplanes. Loss of the pilot's outside visual reference, even for a moment, can result in disorientation, wrong control inputs, and an uncontrolled crash. This type of situation is likely to occur when a pilot attempts to fly through a partially obscured area and realizes too late that he is losing visibility.*

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Salazar, Fabian
<b>Additional Participating Persons:</b>	Ken Joyce; FAA; Salt Lake City, UT Thom Webster; Robinson Helicopter Company; Torrance, CA Mark W Platt; Lycoming Engines; Williamsport, PA
<b>Original Publish Date:</b>	October 15, 2021
<b>Last Revision Date:</b>	
<b>Investigation Class:</b>	<a href="#">Class 3</a>
<b>Note:</b>	
<b>Investigation Docket:</b>	<a href="https://data.ntsb.gov/Docket?ProjectID=99444">https://data.ntsb.gov/Docket?ProjectID=99444</a>

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