



# Aviation Investigation Final Report

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<b>Location:</b>	Lone Tree, Colorado	<b>Accident Number:</b>	CEN18FA168
<b>Date &amp; Time:</b>	May 11, 2018, 20:19 Local	<b>Registration:</b>	N507TX
<b>Aircraft:</b>	CIRRUS DESIGN CORP SR22	<b>Aircraft Damage:</b>	Destroyed
<b>Defining Event:</b>	VFR encounter with IMC	<b>Injuries:</b>	1 Fatal
<b>Flight Conducted Under:</b>	Part 91: General aviation - Personal		

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## Analysis

The instrument-rated private pilot departed on a visual flight rules cross-country flight just before the end of civil twilight. After departing to the north, the pilot turned onto a left downwind to depart the area toward the south; the controller advised the pilot to stay west of the extended runway centerline, which the pilot acknowledged. However, about 2 minutes after takeoff, the airplane turned east and crossed the extended centerline. After crossing the centerline, the controller asked the pilot to state his intentions, and the pilot replied that he was going to return to the airport. The airplane turned back toward the airport and began tracking west toward the extended centerline; radar contact was lost several minutes later.

The airplane impacted a field about 2.5 miles to the south of the approach end of the runway. The airplane was massively fragmented during the impact and debris was scattered for about 1,200 ft. The damage to the airplane and the ground scars at the accident site were consistent with the airplane impacting in a right wing low, nose low attitude with relatively high energy.

The postaccident examination of the engine and propeller assembly did not reveal any preimpact anomalies that would have precluded normal operation. Signatures were consistent with the engine producing power and the propeller developing thrust at the time of impact. While the massive fragmentation precluded functional testing of the flight controls, there was no damage or failure that suggested preimpact anomalies with the airframe or flight controls.

While visual meteorological conditions prevailed at the airport, statements from two pilots flying instrument approaches to runway 35R suggest that the pilot likely encountered and was flying in the clouds to the south of the airport just before the accident.

A review of radar data and voice communications revealed that the instructions issued by the controller, to the pilot, were reasonable and in accordance with air traffic control procedures. Investigators were not able to establish why the pilot did not comply with air traffic control instructions.

The accident flight was the airplane's first flight after completion of an annual inspection, and the pilot was flying to meet his family for an event in another state. It is likely that the pilot was experiencing self-induced pressure to complete the flight as planned in order to maintain the family's schedule of events, and as a result, chose to depart on the visual flight rules flight over mountainous terrain at night in marginal weather conditions. The pilot's logbook was not recovered, and the recency of his instrument flight experience could not be determined.

Based upon the reported weather conditions, the location and fragmentation of the wreckage, and radar data, it is likely that the pilot experienced spatial disorientation shortly after entering the clouds which resulted in a loss of control and descent into terrain. The reason for the pilot's stated intention to return to the airport after takeoff could not be determined, but it is possible that he became distracted and that distraction contributed to his disorientation and 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 due to spatial disorientation. Contributing to the accident was the pilot's self-induced pressure to fly the airplane at night in marginal weather conditions.

### Findings

<b>Personnel issues</b>	Spatial disorientation - Pilot
<b>Personnel issues</b>	Aircraft control - Pilot
<b>Personnel issues</b>	Decision making/judgment - Pilot
<b>Personnel issues</b>	Motivation/respond to pressure - Pilot
<b>Environmental issues</b>	Low ceiling - Effect on operation
<b>Environmental issues</b>	(general) - Effect on operation
<b>Aircraft</b>	(general) - Not attained/maintained

## Factual Information

### History of Flight

<b>Initial climb</b>	VFR encounter with IMC (Defining event)
<b>Maneuvering</b>	Loss of control in flight
<b>Uncontrolled descent</b>	Collision with terr/obj (non-CFIT)

On May 11, 2018, about 2019 mountain daylight time, a Cirrus Design Corporation SR22 airplane, N507TX, impacted terrain near Lone Tree, Colorado. The private pilot was fatally injured. The airplane was destroyed. The personal flight was conducted under the provisions of Title 14 *Code of Federal Regulations* Part 91. Dusk, visual meteorological conditions prevailed at the airport and no Federal Aviation Administration (FAA) flight plan had been filed for the flight. The airplane had just departed from Centennial Airport (APA), Denver, Colorado, and was en route to Grand Junction Regional Airport (GJT), Grand Junction, Colorado.

According to the pilot's family, the pilot traveled to APA to pick up his airplane following the completion of an annual inspection. The pilot's family was traveling to Nevada for an event and the pilot intended to fly to GJT on the evening of the accident and then join his family in Nevada the next day.

According to FAA air traffic control transcripts, the pilot contacted the APA ground controller at 1957, and stated that he was ready to taxi, had the automatic terminal information service (ATIS) information, and was departing to the south. The pilot was cleared to taxi to runway 35R. After completing an engine run-up at the approach end of the runway, the pilot was cleared for takeoff at 2014 and was instructed by the controller to remain west of the centerline for 35R following his left downwind departure to the south; the pilot acknowledged these instructions. During this time, the pilot was issued traffic advisories for another Cirrus and a military jet trainer, both on final approach for runway 35R.

According to FAA radar data, the airplane began a left turn to the east at an altitude of about 7,100 ft mean sea level (msl) and at 2016:41 the controller instructed the pilot to "just fly east through the centerline" for traffic that was descending out of 9,000 ft. About 10 seconds later the pilot responded "fly to the east of the centerline..." The airplane continued east and crossed the extended centerline of the runway.

At 2017:28, the controller asked the pilot, "what is going to be your on course heading, what are you doing now?" About 3 seconds later, the pilot responded "...I think I'm going to return to uh return to centennial." The controller asked the pilot if he wanted to land on runway 28; the pilot did not respond. At this time the airplane was flying northeast at an altitude of 7,000 ft msl.

The airplane turned left, back towards the northwest and the extended runway centerline at an altitude of 7,000 ft msl. At 2017:57 the controller stated "remain east of the centerline for runway three five right please, I've got a Hawk descending five mile final seven thousand eight hundred indicated. I need you to remain east of the centerline." About 13 seconds later the pilot responded, "I'll stay east."

About 2018, the controller issued wind information to the pilot and asked if he would like runway 28 or runway 35R. About 38 seconds later the pilot responded, "...give me the winds one more time." The controller then stated "... you're still flying westbound, please, I need you east, east of the centerline, please remain east of the centerline." The pilot did not respond. The airplane was about 7,700 ft msl and flying west-northwest.

At 2019:05 the controller stated "...I need you to do what I'm telling you to do, now fly westbound, continue westbound." The pilot did not respond, and radar contact was lost about 2019.

### Pilot Information

<b>Certificate:</b>	Private	<b>Age:</b>	67, Male
<b>Airplane Rating(s):</b>	Single-engine land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	Unknown
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	Class 2 Without waivers/limitations	<b>Last FAA Medical Exam:</b>	May 20, 2016
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>	(Estimated) 2300 hours (Total, all aircraft), 575 hours (Total, this make and model)		

The pilot's flight logbook was not located during the investigation and his total flight time or recent experience could not be determined. According to the pilot's last medical certificate application, dated May 19, 2016, he estimated his total flight time as 2,300 hours.

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	CIRRUS DESIGN CORP	<b>Registration:</b>	N507TX
<b>Model/Series:</b>	SR22	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>	2005	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	1429
<b>Landing Gear Type:</b>	Tricycle	<b>Seats:</b>	4
<b>Date/Type of Last Inspection:</b>	May 11, 2018 Annual	<b>Certified Max Gross Wt.:</b>	3400 lbs
<b>Time Since Last Inspection:</b>	1 Hrs	<b>Engines:</b>	1 Reciprocating
<b>Airframe Total Time:</b>	1269 Hrs at time of accident	<b>Engine Manufacturer:</b>	Teledyne Continental Motors
<b>ELT:</b>	Installed	<b>Engine Model/Series:</b>	IO-550-N (27)
<b>Registered Owner:</b>	On file	<b>Rated Power:</b>	310 Horsepower
<b>Operator:</b>	On file	<b>Operating Certificate(s) Held:</b>	None

In April 2018, the pilot took the airplane to APA for its annual inspection. The annual maintenance was completed on May 11, 2018, and the accident flight was the first flight following the annual maintenance. According to maintenance personnel, the inspection and maintenance was routine. The owner of the maintenance facility stated that in 2013, the Avidyne primary flight display (PFD) altimeter had failed the 14 CFR 91.411 test and was about 10 to 15 ft beyond the allowable tolerances. The pilot had deferred maintenance on the unit in 2013 and every year since, as this maintenance would require the entire unit to be removed and returned to the manufacturer.

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Night/dark
<b>Observation Facility, Elevation:</b>	KAPA, 5869 ft msl	<b>Distance from Accident Site:</b>	2 Nautical Miles
<b>Observation Time:</b>	19:53 Local	<b>Direction from Accident Site:</b>	360°
<b>Lowest Cloud Condition:</b>		<b>Visibility</b>	7 miles
<b>Lowest Ceiling:</b>	Broken / 1500 ft AGL	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	14 knots / 21 knots	<b>Turbulence Type Forecast/Actual:</b>	/ None
<b>Wind Direction:</b>	350°	<b>Turbulence Severity Forecast/Actual:</b>	/ N/A
<b>Altimeter Setting:</b>	29.87 inches Hg	<b>Temperature/Dew Point:</b>	15°C / 12°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Denver, CO (KAPA)	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	Grand Junction, CO (KGJT)	<b>Type of Clearance:</b>	VFR
<b>Departure Time:</b>	20:11 Local	<b>Type of Airspace:</b>	Class D

The closest official weather observation station was at APA, located 2.5 nautical miles (nm) north-northwest of the accident site. The elevation of the weather observation station was 5,885 ft msl. The routine aviation weather report (METAR) for APA, issued at 1953, reported, wind 350° at 14 knots, gusting to 21 knots, 7 miles visibility, sky condition, 1,500 ft broken, 10,000 ft overcast, temperature 15° Celsius (C), dew point temperature 12° C, and an altimeter of 29.82 inches of mercury. The pilot of another airplane, who was flying the instrument landing system approach to runway 35R, reported breaking out of the clouds at 6,800 ft msl.

Two different pilots on instrument approach to runway 35R at APA, about the time of the accident, reported broken-to-overcast skies between 800 ft and 1,000 ft agl, with ragged cloud bottoms, no turbulence, no icing, and no precipitation. A witness walking in a subdivision just to the east of the accident location reported low clouds, about 200 ft overcast with surface winds in excess of 25 knots.

A security camera mounted on the APA air traffic control tower and facing south captured a light, likely from the accident airplane, just before the accident. The surveillance camera image, taken from the camera mounted on the catwalk of the air traffic control tower, showed dusk lighting conditions and a potential lower cloud layer to the south where the accident occurred. The light from the airplane was not visible above the horizon until the first image captured at 2018:40. The images taken 2 seconds before and 2 seconds after did not show any lights in that direction.

According to the United States Naval Observatory, Astronomical Applications Department Sun and Moon Data, sunset was recorded at 2005 and the end of civil twilight was recorded at 2035.

A search of official weather briefing sources, such as contract Automated Flight Service Station (AFSS) provider Leidos weather briefings and the Direct User Access Terminal Service (DUATS), revealed that the accident pilot did not request a weather briefing through either source.

According to a witness who spoke with the pilot just before the accident flight, the pilot was concerned about the weather in the area and was planning to fly south to avoid the weather.

### Airport Information

<b>Airport:</b>	Centennial Airport APA	<b>Runway Surface Type:</b>	Asphalt
<b>Airport Elevation:</b>	5885 ft msl	<b>Runway Surface Condition:</b>	Dry
<b>Runway Used:</b>	35R	<b>IFR Approach:</b>	None
<b>Runway Length/Width:</b>	10000 ft / 100 ft	<b>VFR Approach/Landing:</b>	

Centennial Airport is a public, controlled airport (class D) located 15 miles southeast of Denver, Colorado, at a surveyed elevation of 5,885 ft. The airport had three open runways; 17L/35R, 17R/35L, and 10/28. The class D airspace extended upward from the surface to 8,000 ft msl and within a 4.4-mile radius. The class D airspace was surrounded by class E airspace.

### Wreckage and Impact Information

<b>Crew Injuries:</b>	1 Fatal	<b>Aircraft Damage:</b>	Destroyed
<b>Passenger Injuries:</b>		<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	1 Fatal	<b>Latitude, Longitude:</b>	39.516109,-104.833885

The airplane impacted an open field 2.5 miles south-southwest of the approach end of runway 35R and just west of a housing development. Witness marks at the initial impact point were consistent with a right wing-low, nose-level attitude at the time of impact. The airplane was fragmented, and debris was scattered for 1,219 ft.

The initial impact point was characterized by a long narrow ground scar that contained paint chips consistent with the wing of the airplane. The ground scar continued 12 ft east to three ground scars consistent in size and location with the nose and the main landing gear. The ground scar widened and contained paint chips and debris consistent with the fuselage of the airplane for another 40 ft. The far edge of the ground scar contained witness marks consistent with propeller strikes.

A debris field continued from the initial impact point, to the east, for 1,100 ft. Fragmented pieces of both wings, the empennage, and the fuselage, were contained within the debris field. The debris field also contained components of the engine exhaust system, the fragmented instrument panel, and various personal effects.

The engine separated from the fuselage and propeller assembly and came to rest at the easternmost side of the debris field. The engine was imbedded in the west-facing side of the wall of a home.

The cockpit instruments separated from their cockpit locations, were fragmented, and did not convey reliable readings.

The scope of the airframe, engine, and systems examination was limited by fragmentation due to impact damage; however, no anomalies consistent with a preimpact failure or malfunction were observed.

The details of the wreckage examination are available in the public docket for this investigation.

## **Flight recorders**

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The accident airplane was equipped with an Avidyne PFD and an Avidyne multi-function display (MFD). The PFD and flash memory device from the MFD were sent to the NTSB Vehicle Recorders Lab in Washington, D.C., for download. The PFD recording contained a record consistent with the accident flight that was 25 minutes and 56 seconds in duration. The MFD contained a data file that was 25 minutes and 6 seconds in duration.

The engine parameter data recovered from the PFD and MFD, to include the cylinder head temperatures, exhaust gas temperatures, manifold pressure, oil pressure, and fuel flow, were consistent with normal operating ranges. A spike in these parameters at 2009 was consistent with an engine runup before takeoff and the increase about 2013 was consistent with takeoff.

Pitch and roll data obtained from the unit was consistent with the radar data. The recorded roll parameter indicated that the airplane banked greater than 30° to the right and left several times during the last 2 minutes of the accident flight.

Additional details and information related to the data recovered are contained in the specialist's factual report available in the public docket for this investigation.

## **Medical and Pathological Information**

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The Douglas County Coroner's Office, Castle Rock, Colorado, performed the autopsy on the pilot on May 12, 2018. The autopsy concluded that the cause of death was "multiple blunt force injuries" and the report listed the specific injuries.

The FAA Forensic Sciences Laboratory, Oklahoma City, Oklahoma, performed toxicological tests on specimens that were collected during the autopsy. Results were negative for ethanol. Testing of the muscle and liver tissue revealed trace amounts of pseudoephedrine. Carbon Monoxide and cyanide tests were not performed.

According to the FAA Aerospace Medical Research website, pseudoephedrine is a common over the



counter decongestant used in the treatment of the common cold and hay fever. The medication found during the pilot's toxicological testing does not cause impairment or incapacitation.

## **Additional Information**

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### Air Traffic Control Services

According to FAA JP 7110.65X, "Air Traffic Control", the primary purpose of the air traffic control (ATC) system is to prevent a collision involving aircraft operating in the system. In addition, the ATC system provides a safe, orderly, and expeditious flow of traffic."

Title 14 *CFR* Part 91.123 states in part that "Except in an emergency, no person may operate an aircraft contrary to an ATC instruction in an area in which air traffic control is exercised.

The details to the Air Traffic Control Specialists factual report are contained in the public docket for this investigation.

### Spatial Disorientation

The FAA Civil Aeromedical Institute's publication, "Introduction to Aviation Physiology," defines spatial disorientation as a loss of proper bearings or a state of mental confusion as to position, location, or movement relative to the position of the earth. Factors contributing to spatial disorientation include changes in acceleration, flight in IMC, frequent transfer between visual meteorological conditions (VMC) and IMC, and unperceived changes in aircraft attitude.

The FAA's Airplane Flying Handbook (FAA-H-8083-3A) describes some hazards associated with flying when the ground or horizon are obscured. The handbook states, in part:

*The vestibular sense (motion sensing by the inner ear) in particular tends to confuse the pilot. Because of inertia, the sensory areas of the inner ear cannot detect slight changes in the attitude of the airplane, nor can they accurately sense attitude changes that occur at a uniform rate over a period of time. On the other hand, false sensations are often generated; leading the pilot to believe the attitude of the airplane has changed when in fact, it has not. These false sensations result in the pilot experiencing spatial disorientation.*

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Rodi, Jennifer
<b>Additional Participating Persons:</b>	Joshua L Pritchard; Federal Aviation Administration; Englewood, CO Brannon Mayer; Cirrus Aircraft; Duluth, MN Mike Council; Continental Aerospace Technologies; Mobile, AL Fred Barber; Avidyne
<b>Original Publish Date:</b>	November 6, 2019
<b>Last Revision Date:</b>	
<b>Investigation Class:</b>	<a href="#">Class</a>
<b>Note:</b>	The NTSB traveled to the scene of this accident.
<b>Investigation Docket:</b>	<a href="https://data.nts.gov/Docket?ProjectID=97239">https://data.nts.gov/Docket?ProjectID=97239</a>

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](#).