Aviation Investigation Final Report

Location:	Monterey, California	**Accident Number:**	WPR21FA270
Date & Time:	July 13, 2021, 10:42 Local	**Registration:**	N678SW
Aircraft:	Cessna 421C	**Aircraft Damage:**	Destroyed
Defining Event:	Collision with terr/obj (non-CFIT)	**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

Before taking off, the pilot canceled an instrument flight rules (IFR) flight plan that she had filed and requested a visual flight rules (VFR) on-top clearance, which the controller issued via the Monterey Five departure procedure. The departure procedure included a left turn after takeoff. The pilot took off and climbed to about 818 ft then entered a right turn. The air traffic controller noticed that the airplane was in a right-hand turn rather than a left-hand turn and issued a heading correction to continue a right-hand turn to 030°, which the pilot acknowledged.

The airplane continued the climbing turn for another 925 ft then entered a descent. The controller issued two low altitude alerts with no response from the pilot. No further radio communication with the pilot was received. The airplane continued the descent until it contacted trees, terrain, and a residence about 1 mile from the departure airport.

Review of weather information indicated prevailing instrument meteorological conditions (IMC) in the area due to a low ceiling, with ceilings near 800 ft above ground level and tops near 2,000 ft msl. Examination of the airframe and engines did not reveal any anomalies that would have precluded normal operation.

The airplane's climbing right turn occurred shortly after the airplane entered IMC while the pilot was acknowledging a frequency change, contacting the next controller, and acknowledging the heading instruction. Track data show that as the right-hand turn continued, the airplane began descending, which was not consistent with its clearance.

Review of the pilot's logbook showed that the pilot had not met the instrument currency requirements and was likely not proficient at controlling the airplane on instruments. The pilot's lack of recent experience operating in IMC combined with a momentary diversion of

attention to manage the radio may have contributed to the development of spatial disorientation, resulting in a loss of airplane control.

Probable Cause and Findings

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

The pilot's failure to maintain airplane control due to spatial disorientation during an instrument departure procedure in instrument meteorological conditions which resulted in a collision with terrain. Contributing to the accident was the pilot's lack of recent instrument flying experience.

Findings

Personnel issues	Aircraft control - Pilot
Environmental issues	Below VFR minima - Effect on operation
Personnel issues	Spatial disorientation - Pilot
Personnel issues	Recent instrument experience - Pilot

Factual Information

History of Flight

Initial climb	Collision with terr/obj (non-CFIT) (Defining event)

On July 13, 2021, about 1042 Pacific daylight time (PDT), a Cessna 421C, N678SW, was destroyed when it was involved in an accident near Monterey, California. The pilot and passenger were fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

Review of recorded communications from the Monterey air traffic control tower revealed that before takeoff the pilot canceled their instrument flight rules (IFR) clearance and requested a visual flight rules (VFR) on top clearance. The controller subsequently cleared the airplane to the Salinas VOR via the Monterey Five departure and to proceed VFR-ON-TOP. The controller issued a clearance for takeoff and shortly after, instructed the pilot to contact the Oakland Air Route Traffic Control Center (ARTCC).

Review of recorded communications from the Oakland ARTCC revealed that the pilot established radio communication with the Oakland ARTCC controller as the airplane ascended through 1,700 ft mean sea level (msl). The controller observed on the radar display the airplane was turning in the wrong direction and issued an immediate right turn to a heading of 030° which was acknowledged by the pilot. The controller then immediately issued two low altitude alerts with no response from the pilot. No further radio communication from the pilot was received.

Recorded automatic dependent surveillance-broadcast (ADS-B) data provided by the Federal Aviation Administration (FAA) showed that the airplane departed from runway 10R at 1738:44 and ascended to 1,075 ft msl before a right turn was initiated. The data showed that at 1740:14, the airplane continued to ascend in a right turn and reached an altitude of 2,000 ft msl before a descent began. The airplane continued in a right descending turn until ADS-B contact was lost at 1740:38, at an altitude of 775 ft msl, about 520 ft southwest of the accident site as seen in figure 1.

Figure 1: View of airplane ADS-B track.

A witness located near the accident site reported that he observed the accident airplane descend below the cloud layer in a nose low attitude with the landing gear retracted. The witness stated that the airplane made a right descending turn and impacted the top of a pine tree before it traveled below the tree line out of sight, followed by the sound of an explosion.

Pilot Information

Certificate:	Airline transport; Commercial	**Age:**	74,Female
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	January 28, 2019
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	July 17, 2020
Flight Time:	9337 hours (Total, all aircraft)		

Passenger Information

Certificate:		**Age:**	61,Female
Airplane Rating(s):		**Seat Occupied:**	Right
Other Aircraft Rating(s):		**Restraint Used:**	Unknown
Instrument Rating(s):		**Second Pilot Present:**	No
Instructor Rating(s):		**Toxicology Performed:**	
Medical Certification:		**Last FAA Medical Exam:**	
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:			

A review of the pilot's logbook indicated that a flight review was accomplished on July 17, 2020. The flight instructor reported that during the flight, an instrument proficiency check was also conducted. However, an instrument proficiency check endorsement dated July 17, 2020 was not observed in the pilot logbook. In the 12 months preceding to the accident flight, the pilot accumulated about 0.3 hours of simulated instrument flight, 0.7 hours of actual instrument flight and no instrument approaches.

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N678SW
Model/Series:	421C	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	421C1023
Landing Gear Type:	Retractable - Tricycle	**Seats:**	8
Date/Type of Last Inspection:	October 1, 2020 Annual	**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	2 Reciprocating
Airframe Total Time:	5818.7 Hrs as of last inspection	**Engine Manufacturer:**	Continental Motors
ELT:	C126 installed	**Engine Model/Series:**	GTSIO-520-N (2)
Registered Owner:		**Rated Power:**	300 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KMRY,165 ft msl	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	10:54 Local	**Direction from Accident Site:**	300°
Lowest Cloud Condition:		**Visibility**	9 miles
Lowest Ceiling:	Overcast / 800 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots /	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	280°	**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	29.99 inches Hg	**Temperature/Dew Point:**	15°C / 11°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Monterey, CA	**Type of Flight Plan Filed:**	IFR
Destination:	Sacramento, CA (KMHR)	**Type of Clearance:**	VFR on top
Departure Time:		**Type of Airspace:**	Class C

The preliminary weather for MRY reported that at 1054 PDT, wind from 280° at 7 knots, visibility of 9 statute miles, ceiling overcast at 800 ft above ground level (agl), temperature of 15°C and dew point temperature of 11°C, altimeter setting of 29.99 inches of mercury, remarks included: station with a precipitation discriminator.

A High-Resolution Rapid Refresh numerical model sounding near the accident site supported cloudy conditions from about 1,100 to 1,700 ft with a freezing level at about 17,000 ft. The wind below 2,000 ft was from the west at magnitudes less than 10 knots. A temperature inversion was noted between 1,600 and 4,600 ft.

A pilot on a decent to landing at MRY, in the hours leading to the accident, reported that cloud tops were near 2,000 ft msl with the bases at about 800 ft msl.

Airport Information

Airport:	MONTEREY RGNL MRY	**Runway Surface Type:**	
Airport Elevation:	256 ft msl	**Runway Surface Condition:**	Vegetation
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	None

The Monterey Regional Airport is a public airport operating under class-Delta airspace. The airport features multiple runways. Runway 10R, is charted with two IFR departure procedures (both requiring a climbing left turn after takeoff), elevation is 158 ft and runway dimensions are 7,175 ft x 150 ft.

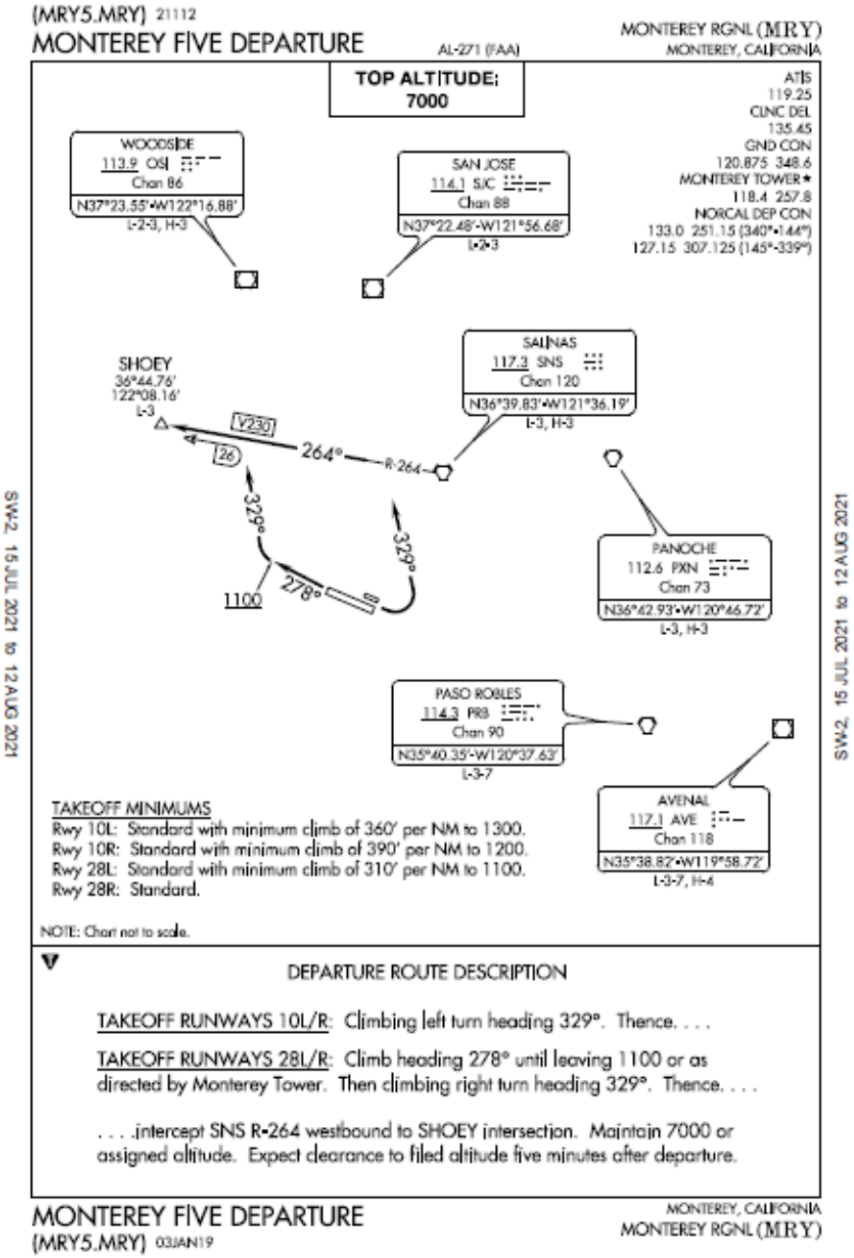

Figure 2: View of the Monterey Five Departure procedure.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	On-ground
Ground Injuries:		**Aircraft Explosion:**	On-ground
Total Injuries:	2 Fatal	**Latitude, Longitude:**	36.575343,-121.82523(est)

Examination of the accident site revealed that the airplane impacted trees about 1 mile south of the departure end of runway 10R. The first identifiable point of contact (FIPC) was a 50 to 75 ft tall tree that had damaged limbs near the top of the tree. The debris path was oriented on a heading of about 067° and was about 995 ft in length from the FIPC, as seen in figure 3. The main wreckage was located about 405 ft from the FIPC. Various portions of aluminum wing skin, right wing, flap, aileron, engine, propeller blades, and propeller hub were observed throughout the debris path. Additionally, several trees were damaged throughout the debris path. The fuselage came to rest upright against a residential structure at an elevation of 447 ft msl.

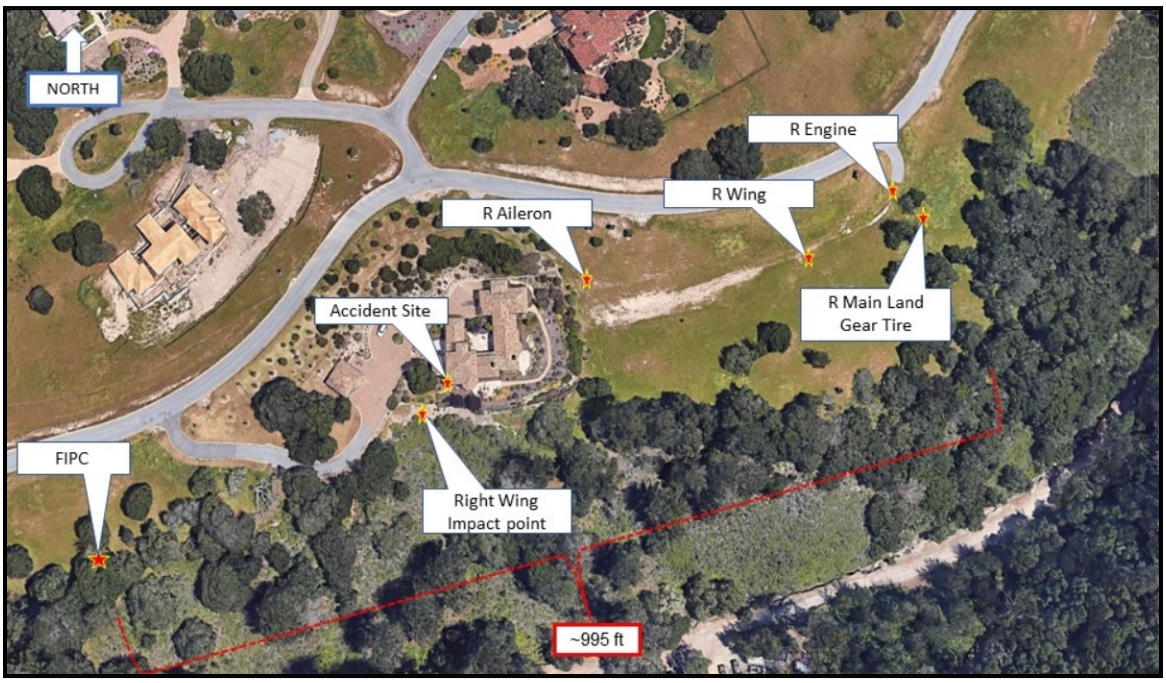

Figure 3: View of accident site diagram.

A postaccident examination of the airframe and engines revealed rotational continuity throughout both engines and no evidence of mechanical malfunctions or failures were identified that would have precluded normal operation.

Additional Information

The FAA Civil Aeromedical Institute's publication, "Introduction to Aviation Physiology," defines spatial disorientation as a “loss of proper bearings; 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 IFR conditions, frequent transfer between visual flight rules and IFR conditions, and unperceived changes in aircraft attitude.

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

The vestibular sense (motion sensing by the inner ear) in particular can and will confuse the pilot. Because of inertia, the sensory areas of the inner ear cannot detect slight changes in airplane attitude, 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.

Medical and Pathological Information

An autopsy of the pilot was performed by the Monterey County Sheriff’s Office – Coroner Division in Salinas, California. The cause of death was “multiple blunt force injuries.”

Toxicology testing performed at the FAA Forensic Sciences Laboratory found no drugs of abuse.

Administrative Information

Investigator In Charge (IIC):	Gutierrez, Eric		
Additional Participating Persons:	Mark Mitchell; FAA; San Jose, CA Jennifer Barclay; Textron; Wichita, KS Duncan A. Ballantyne; FAA; San Jose, CA		
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Note:			
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=103470		