



# Aviation Investigation Final Report

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<b>Location:</b>	Chester, Arkansas	<b>Accident Number:</b>	CEN20LA379
<b>Date &amp; Time:</b>	September 4, 2020, 20:55 Local	<b>Registration:</b>	N733CD
<b>Aircraft:</b>	Cirrus SR22	<b>Aircraft Damage:</b>	Destroyed
<b>Defining Event:</b>	Loss of control in flight	<b>Injuries:</b>	4 Fatal
<b>Flight Conducted Under:</b>	Part 91: General aviation - Personal		

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## Analysis

The noninstrument-rated pilot and three passengers departed on a visual flight rules (VFR) cross-country flight in dark night visual meteorological conditions. The pilot established contact with air traffic control and requested VFR flight-following to the destination airport; shortly thereafter, the controller provided a 20° right turn around an area of precipitation ahead of the airplane. The pilot acknowledged and flew the suggested heading for a short time before he turned left toward the area of precipitation. When queried by the controller, the pilot replied that he was returning to the departure airport; however, the pilot did not establish a heading toward the airport. When queried again, the pilot stated that, “the wind caught me” and that he was correcting the airplane’s heading. Shortly thereafter, the airplane began a turning descent and radar contact was lost, about 6 minutes after the pilot’s initial contact with air traffic control. The wreckage was found the next day in wooded terrain. Examination did not reveal any mechanical malfunctions or anomalies that would have precluded normal operation.

Based on flight track and weather information, the pilot likely encountered instrument meteorological conditions and turbulence when the airplane flew in close proximity to an area of convective activity as depicted on radar just before the accident. The pilot’s inability to respond positively to ATC-provided vectors and maintain altitude before the turning descent is consistent with the pilot experiencing spatial disorientation. The pilot’s inability to maintain aircraft control under those conditions was likely exacerbated by the presence of frequent lightning.

Although the pilot obtained a weather briefing for the accident flight about 17 hours before the planned departure time, there were no records to indicate that he obtained updated weather information, which would have reflected increased potential for convective activity along the planned route.

The pilot purchased the airplane about 8 months before the accident and received transition training in the airplane, which included use of the avionics suite. Instructors who flew with the pilot in the accident airplane reported that the installed avionics was “old technology” and “not easy to use.” Although the airplane was equipped with an autopilot, the extent to which the pilot may have used the autopilot during the accident flight could not be determined. Review of the pilot’s logbook indicated that he did not meet recency of experience requirements to carry passengers at night.

Toxicology testing of the pilot revealed the presence of ethanol; however, it is most likely that some or all of the identified low concentration of ethanol was from sources other than ingestion. Thus, the identified ethanol did not contribute to this accident.

## 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 flight into dark night instrument meteorological conditions which resulted in spatial disorientation and a subsequent loss of airplane control.

### Findings

<b>Aircraft</b>	Directional control - Not attained/maintained
<b>Personnel issues</b>	Spatial disorientation - Pilot
<b>Environmental issues</b>	Thunderstorm - Effect on personnel
<b>Environmental issues</b>	Lightning - Effect on personnel
<b>Environmental issues</b>	Clouds - Effect on personnel
<b>Environmental issues</b>	Dark - Effect on personnel

## Factual Information

### History of Flight

Enroute	Windshear or thunderstorm
Enroute	VFR encounter with IMC
Enroute	Loss of control in flight (Defining event)

On September 4, 2020, about 2055 central daylight time, a Cirrus SR22 airplane, N733CD, was destroyed when it was involved in an accident near Chester, Arkansas. The private pilot and three passengers sustained fatal injuries. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

After working his job the day of the accident, the pilot intended to fly with three passengers to visit a family member that evening. About 1900, the pilot called his flight instructor/airplane mechanic and advised that he intended to fly to North Carolina. The mechanic advised the pilot to leave in the morning. Fueling records showed the accident airplane was fueled about 1949 with 36.41 gallons of 100 low lead aviation gasoline.

Radar and air traffic control information indicated that the airplane departed from Muskogee-Davis Regional Airport (MKO), near Muskogee, Oklahoma, about 2027 and proceeded east. About 2049, while climbing through 8,500 ft mean sea level (msl), the pilot established radio communication with air traffic control and requested visual flight rules (VFR) flight-following to the destination airport. The controller subsequently suggested a 20° right turn for moderate to heavy precipitation ahead of the airplane. Shortly thereafter, the airplane turned into the area of precipitation; when the controller queried the pilot about the course change, the pilot replied that he was returning to the departure airport. The airplane subsequently proceeded northwest, and the controller advised the pilot that the airplane appeared to be on a heading of 340°. The pilot replied that “the wind caught me” and that he was correcting course. However, the airplane turned northeast and began descending. The controller then advised the pilot to turn left heading 270°. The pilot acknowledged the instruction; however, the airplane continued to descend and turn right. The controller advised the pilot to level the airplane's wings and fly southbound. Radar contact was lost about 2055.

An alert notice was issued, and the wreckage was found in wooded terrain the following day.

## Pilot Information

<b>Certificate:</b>	Private	<b>Age:</b>	31, Male
<b>Airplane Rating(s):</b>	Single-engine land	<b>Seat Occupied:</b>	Unknown
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	Unknown
<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 3 Without waivers/limitations	<b>Last FAA Medical Exam:</b>	November 29, 2017
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	November 3, 2019
<b>Flight Time:</b>	(Estimated) 162 hours (Total, all aircraft), 37.8 hours (Total, this make and model), 74.9 hours (Pilot In Command, all aircraft), 9.9 hours (Last 90 days, all aircraft)		

A Federal Aviation Administration (FAA) inspector recovered the pilot's logbook and supplied a summary of the pilot's flight experience based off the last entry on August 2, 2020. The recorded entries showed the pilot did not meet recency of experience requirements to carry passengers at night.

According to the pilot's primary flight instructor, the airplane's autopilot did not initially function; however, it was repaired and during two post-maintenance local flights, the autopilot worked properly. The pilot subsequently demonstrated basic knowledge of autopilot usage. The pilot received training in turbulent conditions and the pilot "calmly responded" with "no unreasonable reactions" to the turbulence. The pilot received simulated instrument conditions training and was "good at it." The pilot had experience using the ForeFlight application along with a Stratus receiver.

The pilot requested and was granted Cirrus Embark training on January 13, 2020. According to Cirrus, Cirrus Embark is a safety program designed to provide free transition training to pilots that are new to Cirrus SR operations. The program consists of a maximum of 3 full days of flight training. From instructor recollections, the accident pilot had accumulated about 100 to 120 hours total time at the time of his application. Direct owners or designated pilots of pre-owned Cirrus aircraft must enroll into Cirrus Embark within 30 days of aircraft delivery. Once enrolled into the program, the owner or designated pilot must complete the training within 60 days. According to Cirrus training records, the pilot completed all the flight training lessons, but there was no record of him completing all of the online self-study lessons.

Instructors who provided the Cirrus Embark transition training reported that the accident pilot's training comprised of a VFR transition to the SR22. The training was not conducted at night or in instrument meteorological conditions, and no extensive training on exiting inadvertent instrument conditions was conducted. The pilot was given autopilot instruction to include following headings and holding altitudes; however, the instructors described the ARNAV Systems Inc. display installed in the airplane as "old technology" and stated that the Sandel electronic horizontal situation indicator (EHSI) was "not easy to use."

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Cirrus	<b>Registration:</b>	N733CD
<b>Model/Series:</b>	SR22 Undesignat	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>	2001	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	0134
<b>Landing Gear Type:</b>	Tricycle	<b>Seats:</b>	4
<b>Date/Type of Last Inspection:</b>	June 2, 2020 Annual	<b>Certified Max Gross Wt.:</b>	
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	1 Reciprocating
<b>Airframe Total Time:</b>	2053.8 Hrs as of last inspection	<b>Engine Manufacturer:</b>	Continental
<b>ELT:</b>	Installed, not activated	<b>Engine Model/Series:</b>	
<b>Registered Owner:</b>	On file	<b>Rated Power:</b>	
<b>Operator:</b>	On file	<b>Operating Certificate(s) Held:</b>	None

The airplane was sold to the accident pilot on January 4, 2020. According to copies of airplane logbook entries, an annual inspection was completed on June 2, 2020, and the airplane had accumulated 2,053.8 hours total time at the time of that inspection.

The accident airplane was equipped with avionics that included dual Garmin 430s/Terrain Avoidance and Warning System, Sandel 3308 EHSI, ARNAV ICDS (integrated cockpit display system) 2000, WX-500 Stormscope, S-Tec 55X Autopilot with GPSS (GPS Steering) and Glideslope Tracking, and Digital Altitude Preselect. The ICDS 2000 is a moving map multifunction display that also displays engine data.

The airplane was fitted with a Cirrus Airframe Parachute System (CAPS) advertised by the manufacturer to recover the airplane and its occupants to the ground in the event of an in-flight emergency.

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Instrument (IMC)	<b>Condition of Light:</b>	Night
<b>Observation Facility, Elevation:</b>	KFSM, 449 ft msl	<b>Distance from Accident Site:</b>	22 Nautical Miles
<b>Observation Time:</b>	20:53 Local	<b>Direction from Accident Site:</b>	194°
<b>Lowest Cloud Condition:</b>	Clear	<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	None	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	/	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>		<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	30.15 inches Hg	<b>Temperature/Dew Point:</b>	26°C / 21°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Muskogee, OK (MKO )	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	Pickens, SC (LQK )	<b>Type of Clearance:</b>	VFR flight following
<b>Departure Time:</b>	08:27 Local	<b>Type of Airspace:</b>	

The 1900 Surface Analysis Chart depicted a developing stationary front that extended from Kansas southeastward through northeast Oklahoma and into Arkansas in the immediate vicinity of the accident site. A col (or neutral point) in the pressure field was identified between two high pressure systems and where the stationary and cold fronts changed identity. The accident was in the immediate vicinity of the stationary front and on the cool air side of the front, and to the northwest of the col. The 1500 Convective Outlook expected a general risk of air mass type thunderstorms across the eastern Oklahoma and Arkansas.

Drake Field Airport, near Fayetteville, Arkansas, about 16 miles to the north of the accident site, and Fort Smith Regional Airport (FSM), near Fort Smith, Arkansas, about 22 miles south of the accident site, reported visual meteorological conditions around the time of the accident. In the observation about one hour before the accident, FSM reported lightning in the distant north.

The 2100 high-resolution rapid refresh (HRRR) sounding indicated that the equilibrium level, or expected top of convective clouds, was at 42,500 ft. The HRRR sounding supported clouds between the lifted condensation level (about 2,408 ft msl) and 10,000 ft msl and was classified as unstable with a moderate risk of air mass type thunderstorms. The maximum vertical velocity of potential updrafts was estimated at 56 meters/second or 109 kts, and the T2 Gust of any potential outflow winds was 31 kts. The precipitable water content was 1.70 inches.

Satellite data showed an area of cumulonimbus clouds in the immediate vicinity of the accident site with tops near 38,000 ft, with another larger area located 70 miles to the southeast with tops near 42,000 ft based on the HRRR sounding. The radiative cloud top temperature or brightness temperature over the accident site corresponded to tops near 18,260 ft based on the HRRR sounding, with higher cloud tops located immediately east of the accident site.

The 2056 Geostationary Lightning Mapper depicted significant lightning flashes from the cumulonimbus cloud to the south-southeast of FSM and to the north in the vicinity of the accident site.

Weather Surveillance Radar-1988, Doppler (WSR-88D) composite reflectivity image depicted light intensity echoes of 15 to 20 dBZ along the flightpath, when the airplane entered echoes above 20 dBZ and reversed course. The airplane then turned north-northwest, remaining in echoes of 20-30 dBZ, before entering a descending right turn near the edge of higher reflectivity, without entering the moderate to intense echoes.

Base reflectivity images showed the accident site located along the edge of a larger cluster of echoes with maximum reflectivity near 58 dBZ northwest through east of the flight track. A review of the lower elevation scans indicated very light intensity echoes of 20 dBZ from the lowest 0.4° through the 1.7° elevation scans or below approximately 7,000 ft, and echoes of 15 dBZ or less through the 3.03° elevation scan or through 8,800 ft near the accident airplane's altitude.

Lightning data showed 19 total lightning flashes recorded in an approximate 10-mile radius of the accident site. The closest in-cloud lightning flashes were detected approximately 2 miles northeast of the accident site, with no lightning flashes detected along the flight path.

A pilot flying an emergency medical flight nearby about the time of the accident reported that the storm he observed had almost constant lightning such that the storm could be seen easily from Little Rock, which was about 115 miles from the accident site. He estimated that the tops were near 40,000 ft or higher and it looked like a hot air balloon being lit from the inside by a very bright lamp. The pilot indicated that it was the most intense lightning in any storm that he had ever seen in his 25-year aviation career.

A Convective SIGMET was issued at 1955, including the area of the accident site, for a line of thunderstorms with tops to 42,000 ft with movement to the southeast at 5 kts.

The sun set at 1939, and the moon had not risen at the time of the accident.

The FAA contract flight service provider had no contact from the pilot for any weather briefing services, or in-flight contacts. ForeFlight indicated that the pilot requested a standard weather briefing at 0026 on September 4, 2020. The request was for the route of flight between MKO and LQK with a planned altitude of 7,500 ft, a planned estimated time of departure of 1730, an estimated time enroute of 4:08, and an estimated time of arrival at 2238 EDT. Foreflight indicated that the pilot did not request or open any other weather imagery in the Foreflight app before the flight. There were no records of any requests for any updates before the accident.

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 Fatal	<b>Aircraft Damage:</b>	Destroyed
<b>Passenger Injuries:</b>	3 Fatal	<b>Aircraft Fire:</b>	On-ground
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	4 Fatal	<b>Latitude, Longitude:</b>	35.686111,-94.252502(est)

The airplane impacted wooded terrain about 22 miles north of FSM. A section of upper tree canopy exhibited fuel blighting. The wreckage path descended about 30° through the woods from the upper canopy to the main wreckage on a heading of about 220°. Charring and discoloration consistent with a small ground fire was present on items in the impact area. The propeller was separated from the engine, and one propeller blade was separated just outboard of its hub. The remaining two blades exhibited leading edge nicks and gouges. A portion of the CAPS parachute was strewn in the debris field northeast of the impact area and the remainder of the CAPS parachute was observed in its deployment bag. The CAPS rocket was found in a ravine about 200 ft north of the impact site. Components of the wings, engine, empennage, and fuselage were identified at the accident site. The cockpit instrumentation was fragmented and revealed no useful information.

The fuselage exhibited fragmentation consistent with impact with trees and terrain and discoloration consistent with post-impact spot fires. Flight control cable continuity could not be confirmed due to the damage and sections that were not present; however, the cable separations revealed signatures consistent with overload.

The pitch trim motor remained attached to its fuselage station and its pitch trim position was between neutral and nose up pitch trim.

All observed CAPS components exhibited impact and thermal damage. The CAPS parachute was extracted from the D-Bag. The slider assembly remained near the base of the canopy. The D-Bag and incremental bridle remained attached to the parachute canopy. The incremental bridle remained zipped. The rear harness stitching remained snubbed.

The engine crankcase had fractured and its internal components were visible through the openings in the fractured crankcase. The engine could not be rotated due to the impact damage. Removed sparkplugs displayed normal combustion signatures when compared to a Champion check-a-plug chart.

The three-bladed propeller separated from its crankshaft propeller flange. The spinner was fractured into several pieces. The observed spinner pieces exhibited spiral crushing. Sections of all propeller blades exhibited chordwise scratches and gouges. Two propeller blades exhibited S-bending.



No preimpact anomalies were detected that would have precluded normal operation of the airplane.

## Medical and Pathological Information

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According to the State Crime Laboratory, Medical Examiner Division, Little Rock, Arkansas, autopsy report, the cause of death was multiple traumatic injuries, and the manner of death was accident. The examination was limited by the extensive injuries.

Toxicology testing performed by the FAA Forensic Sciences Laboratory on the pilot's muscle tissue was positive for ethanol at 0.023 grams per hectogram (gm/hg). No other tested for drugs were detected in 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.

## Additional Information

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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.*

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Malinowski, Edward
<b>Additional Participating Persons:</b>	Andrew S Finne; Federal Aviation Administration; Little Rock, AR Brannon D Mayer; Cirrus; Duluth, MN Kurt Gibson; Continental Motors; Mobile, AL Rick Beach; Cirrus Owners & Pilots Association; Las Vegas, NV
<b>Original Publish Date:</b>	June 28, 2022
<b>Last Revision Date:</b>	
<b>Investigation Class:</b>	<a href="#">Class 3</a>
<b>Note:</b>	The NTSB did not travel to the scene of this accident.
<b>Investigation Docket:</b>	<a href="https://data.ntsb.gov/Docket?ProjectID=101918">https://data.ntsb.gov/Docket?ProjectID=101918</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](#).