



# Aviation Investigation Final Report

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<b>Location:</b>	Knoxville, Tennessee	<b>Accident Number:</b>	ERA22LA089
<b>Date &amp; Time:</b>	December 16, 2021, 10:07 Local	<b>Registration:</b>	N162AM
<b>Aircraft:</b>	CIRRUS DESIGN CORP SR22	<b>Aircraft Damage:</b>	Destroyed
<b>Defining Event:</b>	Aircraft wake turb encounter	<b>Injuries:</b>	1 Fatal, 1 Serious
<b>Flight Conducted Under:</b>	Part 91: General aviation - Personal		

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## Analysis

According to the pilot, the event occurred on final approach when the airplane encountered wake turbulence from a landing Airbus A320. The pilot reported feeling a sudden bump, leading to an extreme roll of approximately 135°. The pilot instinctively applied corrective control inputs and commanded the pilot-rated passenger to pull the Cirrus Airframe Parachute System (CAPS). The passenger reached for the handle and pulled it just as they reached a near-level wing attitude with the nose pitched down. The pilot felt the deceleration of the parachute for a couple of seconds before they impacted the ground. A postimpact fire ensued and both occupants evacuated the aircraft. The pilot was seriously injured, and the passenger received fatal injuries.

A review of Air Traffic Control (ATC) communications revealed that all instructions and advisories were acknowledged by the flight crew of the Airbus and the pilot of the Cirrus as appropriate; however, ATC failed to provide a wake turbulence cautionary advisory to the pilot of the Cirrus as required by Federal Aviation Administration (FAA) order JO 7110.65Z, Air Traffic Control, for simultaneous same runway operations involving a small aircraft landing behind a large aircraft. Although the pilot was aware of the preceding Airbus, the very purpose of this advisory is to remind and emphasize to pilots the potential for dangerous wake encounters.

## Probable Cause and Findings

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

The pilot's encounter with a wake vortex from a preceding airplane, which resulted in a roll upset at an altitude too low for recovery. Contributing to the accident was the failure of ATC to issue a wake turbulence cautionary advisory.

## Findings

<b>Environmental issues</b>	Wake turbulence - Effect on operation
<b>Aircraft</b>	Descent/approach/glide path - Attain/maintain not possible
<b>Personnel issues</b>	Identification/recognition - Pilot
<b>Personnel issues</b>	Lack of communication - ATC personnel

## Factual Information

### History of Flight

Landing	Aircraft wake turb encounter (Defining event)
Landing	Loss of control in flight

On December 16, 2021, about 1007 central standard time, a Cirrus SR22, N162AM, was destroyed when it was involved in an accident near McGhee Tyson Airport (TYS), Knoxville, Tennessee. The private pilot received serious injuries, and the pilot-rated passenger was fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 as a personal flight.

According to the first responders, they observed an occupant of the airplane, later identified as the pilot-rated passenger, about 30 ft from the aircraft upon arrival at the accident scene. They reported that the passenger had third-degree burns on his body but was alert, conscious, and responsive to verbal commands. The passenger stated he was returning from a 45-minute flight and that he and the other occupant encountered wake turbulence on short final. He explained that the airplane lost lift, rolled inverted, and the ballistic parachute was activated. He mentioned that the airplane "hit the ground and burst into a fireball."

According to the pilot, he recalled they were on the second takeoff and were instructed by air traffic control (ATC) to make right traffic. The crosswind and downwind segments were uneventful. He stated that he was doing most of the flight control manipulation but was primarily focused on experiencing the heads-up display (HUD) that the passenger was demonstrating. The pilot reported that, approximately abeam the 1,000 ft markers for runway 23L, ATC advised them of an incoming Airbus on final. The pilot stated that they made visual contact with the Airbus, and he advised ATC, upon which they cleared them to land behind the Airbus. The pilot did not recall if they were cautioned about wake turbulence or not. The pilot continued the downwind leg and made the base turn. He recalled the base leg felt a bit further away from the runway than standard, potentially due to spacing from the Airbus. He also felt like they were a bit low for their distance from the runway. The pilot stated that the spacing from the Airbus did not feel unusual or "too close" compared to his experience with other landings behind large traffic. The pilot said that once he was established on final, "they felt a bump of wake turbulence." The passenger was alarmed and asked, "What was that?" to which the pilot stated, "it was wake turbulence." Around the same time, they heard the autopilot announce, "five hundred." Shortly after, the airplane rolled approximately 135° to the left in less than a second. The pilot applied corrective control inputs instinctively and then yelled, "PULL CAPS PULL CAPS PULL CAPS" as the passenger reached for the handle and pulled just as they reached a near-level wing attitude with the nose pitched down. They heard the CAPS

deployment rocket ignite and fire. He then felt the deceleration of the parachute for a couple of seconds before they impacted the ground. The pilot said the impact was relatively benign compared to his expectations, and for a moment he felt relief until the airplane caught fire seemingly instantaneously and on both sides of the airplane. He yelled "GET OUT GET OUT" as he quickly unlatched his seat belt and opened his door. He stood up in his seat, climbed onto the top of the airplane fuselage aft of the passenger doors, and jumped off the airplane behind the right wing. After exiting the airplane and running a safe distance away, he turned around and saw the passenger still struggling to get away. The passenger exited the airplane onto the ground just aft of the right wing.

According to ATC, the air traffic volume and complexity were described as moderate. At the time of the accident, there were two positions open in the tower. The Local Control (LC) position was standalone, while the Ground Control (GC) position was combined with the Flight Data and the controller-in-charge positions. This configuration was reported as normal for the time of day and volume of traffic. The weather conditions were calm wind, 10 miles visibility, few clouds at 4,300 ft, and a ceiling of 25,000 ft broken.

The pilot established communication with the GC controller and requested taxi with ATIS A. The GC controller instructed the pilot to taxi to Runway 23L at taxiway A8 via taxiway A. The pilot then established communication with the LC controller and was cleared for takeoff on Runway 23L and instructed to enter the left traffic pattern. Approximately 5 minutes later, the LC controller cleared the pilot for the option on Runway 23L. The pilot executed the approach on Runway 23L, and the LC controller instructed them to enter right traffic to Runway 23L. The pilot advised the LC controller that this would be their last practice approach.

While abeam the airport, the LC controller instructed the pilot to extend their downwind and issued a Traffic Advisory regarding (Allegiant) AAY2615, an Airbus A320 on a 3-mile final. The pilot informed the LC controller that they had the traffic in sight. About 1 minute later, the LC controller instructed the pilot to follow AAY2615 and cleared them to land on Runway 23L; however, a cautionary wake turbulence advisory was not issued.

The pilot turned onto the base leg approximately 1.8 miles behind AAY2615. Around 2 minutes later, the pilot was on a 1.5-mile final and was observed at 1,000 ft when the radar target disappeared. About 40 seconds later, the LC controller attempted communication with the pilot again without a response. The LC controller asked an uninvolved aircraft if the smoke ahead of the Cirrus was visible, and the aircraft replied in the affirmative, reporting smoke and flames.

A postaccident examination of the wreckage by an FAA inspector revealed that the airplane was destroyed by postcrash fire. A review of the flight data downloaded from a cockpit primary flight display did not reveal any anomalies with the engine before the accident. (see Recorded Flight Data Report)

Aircraft Separation Responsibility

FAA order JO 7110.65Z, titled "Air Traffic Control," comprehensively details the procedures and responsibilities of air traffic controllers. According to JO 7110.65W Section 2-1-1 (ATC SERVICE), the primary purpose of the ATC system is to prevent aircraft collisions and ensure a safe, orderly, and expeditious flow of traffic. The document highlights that, beyond its primary function, the ATC system can provide additional services within certain limitations. These limitations are influenced by various factors, including traffic volume, frequency congestion, controller workload, and higher-priority duties.

In JO 7110.65Z Section 2-1-2 (DUTY PRIORITY), guidance for ATC services in Class C airspace emphasizes giving first priority to separating aircraft and issuing safety alerts as required by the order. Furthermore, JO 7110.65Z specifies that when handling both instrument flight rules (IFR) and visual flight rules (VFR) aircraft simultaneously, the controller may transfer separation responsibilities to the VFR aircraft once the required radar separation minima are met, and visual separation criteria are or can be met.

#### Wake Turbulence Advisories

JO 7110.65Z Section 2-1-20 (WAKE TURBULENCE CAUTIONARY ADVISORIES): The guidance applied to arriving VFR aircraft that were not being radar vectored but were behind larger aircraft that require wake turbulence separation. The guidance required controllers to issue wake turbulence cautionary advisories "including the position, altitude if known, and direction of flight" to "VFR arriving aircraft that have previously been radar vectored and the vectoring has been discontinued." The guidance also stated, "Issue cautionary information to any aircraft if in your opinion, wake turbulence may have an adverse effect on it."

FAA Advisory Circular 90-23G, Aircraft Wake Turbulence, states the following:

"... if a pilot accepts a clearance to visually follow a preceding aircraft, the pilot accepts responsibility for both separation and wake turbulence avoidance. The controllers will also provide a Wake Turbulence Cautionary Advisory to pilots of visual flight rules (VFR) aircraft, with whom they are in communication and on whom, in the controller's opinion, wake turbulence may have an adverse effect. This advisory includes the position, altitude and direction of flight of larger aircraft followed by the phrase "CAUTION-WAKE TURBULENCE." After issuing the caution for wake turbulence, the air traffic controllers generally do not provide additional information to the following aircraft."

## Pilot-rated passenger Information

<b>Certificate:</b>	Private	<b>Age:</b>	64, 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>	3-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 3 Without waivers/limitations	<b>Last FAA Medical Exam:</b>	August 27, 2019
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>	1200 hours (Total, all aircraft), 1200 hours (Total, this make and model)		

## Pilot Information

<b>Certificate:</b>	Private	<b>Age:</b>	30, Male
<b>Airplane Rating(s):</b>	Single-engine land	<b>Seat Occupied:</b>	Right
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	3-point
<b>Instrument Rating(s):</b>	None	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	
<b>Medical Certification:</b>	Class 3 With waivers/limitations	<b>Last FAA Medical Exam:</b>	April 14, 2021
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>	75 hours (Total, all aircraft), 75 hours (Total, this make and model), 1 hours (Last 90 days, all aircraft)		

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	CIRRUS DESIGN CORP	<b>Registration:</b>	N162AM
<b>Model/Series:</b>	SR22	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>	2007	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	2724
<b>Landing Gear Type:</b>	Tricycle	<b>Seats:</b>	4
<b>Date/Type of Last Inspection:</b>	Unknown	<b>Certified Max Gross Wt.:</b>	3400 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	1 Reciprocating
<b>Airframe Total Time:</b>		<b>Engine Manufacturer:</b>	Continental
<b>ELT:</b>	C126 installed, not activated	<b>Engine Model/Series:</b>	IO-550-N
<b>Registered Owner:</b>	On file	<b>Rated Power:</b>	310 Horsepower
<b>Operator:</b>	On file	<b>Operating Certificate(s) Held:</b>	None

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	TYS,962 ft msl	<b>Distance from Accident Site:</b>	6 Nautical Miles
<b>Observation Time:</b>	10:07 Local	<b>Direction from Accident Site:</b>	261°
<b>Lowest Cloud Condition:</b>	Few / 4300 ft AGL	<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	Broken / 25000 ft AGL	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	/	<b>Turbulence Type Forecast/Actual:</b>	None / None
<b>Wind Direction:</b>		<b>Turbulence Severity Forecast/Actual:</b>	N/A / N/A
<b>Altimeter Setting:</b>	30.25 inches Hg	<b>Temperature/Dew Point:</b>	10°C / 6°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Knoxville, TN	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	Knoxville, TN	<b>Type of Clearance:</b>	VFR
<b>Departure Time:</b>		<b>Type of Airspace:</b>	Class C

## Airport Information

<b>Airport:</b>	MC GHEE TYSON TYS	<b>Runway Surface Type:</b>	Asphalt
<b>Airport Elevation:</b>	986 ft msl	<b>Runway Surface Condition:</b>	Dry
<b>Runway Used:</b>	23L	<b>IFR Approach:</b>	None
<b>Runway Length/Width:</b>	9000 ft / 150 ft	<b>VFR Approach/Landing:</b>	Full stop

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 Fatal, 1 Serious	<b>Aircraft Damage:</b>	Destroyed
<b>Passenger Injuries:</b>	N/A	<b>Aircraft Fire:</b>	On-ground
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	1 Fatal, 1 Serious	<b>Latitude, Longitude:</b>	35.833803,-83.860189(est)



## Administrative Information

<b>Investigator In Charge (IIC):</b>	Alleyne, Eric
<b>Additional Participating Persons:</b>	Robert Follis; FAA/FSDO; Nashville, TN Brad Miller; Cirrus aircraft; Duluth, MN
<b>Original Publish Date:</b>	February 8, 2024
<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.nts.gov/Docket?ProjectID=104416">https://data.nts.gov/Docket?ProjectID=104416</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](#).