



Aviation Investigation Final Report

Location:	Fort Collins, Colorado	Accident Number:	CEN15LA069
Date & Time:	December 5, 2014, 14:28 Local	Registration:	N407ND
Aircraft:	CIRRUS DESIGN CORP SR20	Aircraft Damage:	Substantial
Defining Event:	Loss of control in flight	Injuries:	1 Serious
Flight Conducted Under:	Part 91: General aviation - Instructional		

Analysis

The student pilot was conducting a solo flight in a Cirrus SR20 airplane at an uncontrolled airport. An airport video showed the student attempting to land on a runway about 30 seconds after the departure of a Sikorsky UH-60 helicopter. The student pilot reported that he was aware of the helicopter and that he attempted to land long. However, just before touchdown, the airplane encountered the wake turbulence of the helicopter and then entered an uncommanded steep left bank. The student attempted to counter the left bank and go around, but he was unable to maintain airplane control. The airplane subsequently impacted left of the runway and cartwheeled.

Current Federal Aviation Administration pilot guidance, including the Airman's Information Manual and an advisory circular on aircraft wake turbulence, does not recommend separation criteria for a small airplane following a helicopter. It is likely that the student pilot did not comprehend the significance of the wake turbulence that the helicopter would generate during departure.

Probable Cause and Findings

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

The student pilot's failure to comprehend the significance of the wake turbulence that a preceding helicopter would generate during departure, which resulted in a loss of airplane control during landing. Contributing to the accident was the lack of Federal Aviation Administration wake turbulence separation criteria for a small airplane following a helicopter.

Findings

Personnel issues	Understanding/comprehension - Student/instructed pilot
Aircraft	(general) - Attain/maintain not possible
Personnel issues	Aircraft control - Student/instructed pilot
Environmental issues	Wake turbulence - Effect on operation
Organizational issues	Adequacy of policy/proc - FAA/Regulator

Factual Information

History of Flight

Approach-VFR pattern final	Loss of control in flight (Defining event)
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On December 5, 2014, about 1428 mountain standard time, a Cirrus SR20 airplane, N407ND, impacted terrain during approach at the Fort Collins-Loveland Municipal Airport (FNL), near Fort Collins, Colorado. The solo student pilot was seriously injured and the aircraft was substantially damaged. The aircraft was registered to and operated by Cirrus LLC under the provisions of 14 Code of Federal Regulations Part 91 as an instructional flight. Day visual meteorological conditions prevailed for the local flight, which departed without a flight plan.

The student pilot stated that he entered the traffic pattern at FNL for a full stop landing on runway 33. He observed a Sikorsky UH-60 helicopter on downwind and delayed his turn to base until the helicopter was on final, abeam his position. While on final, the student pilot adjusted his aim point to land long, as he was concerned with wake turbulence and wanted to land beyond the helicopter's touchdown point. Just prior to landing, he encountered turbulent air, entered into an uncommanded steep left bank, and attempted to go around. The pilot was unable to maintain control and the airplane subsequently impacted terrain and cartwheeled, which resulted in damage to the fuselage and both wings.

An airport surveillance camera at FNL captured the accident airplane approaching the runway about 30 seconds in trail of the departing UH-60 helicopter.

Student pilot Information

Certificate:	Student	Age:	47
Airplane Rating(s):	None	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	5-point
Instrument Rating(s):		Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 2 Without waivers/limitations	Last FAA Medical Exam:	November 10, 2014
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:	29 hours (Total, all aircraft), 27 hours (Total, this make and model), 1 hours (Pilot In Command, all aircraft), 29 hours (Last 90 days, all aircraft), 4 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	CIRRUS DESIGN CORP	Registration:	N407ND
Model/Series:	SR20	Aircraft Category:	Airplane
Year of Manufacture:	2005	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	1598
Landing Gear Type:	Tricycle	Seats:	4
Date/Type of Last Inspection:	November 23, 2014 100 hour	Certified Max Gross Wt.:	3000 lbs
Time Since Last Inspection:	7.5 Hrs	Engines:	1 Reciprocating
Airframe Total Time:	3740 Hrs as of last inspection	Engine Manufacturer:	CONT MOTOR
ELT:	Installed	Engine Model/Series:	IO-360 SER
Registered Owner:	CIRRUS LLC	Rated Power:	210 Horsepower
Operator:	CIRRUS LLC	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	KFNL, 5016 ft msl	Distance from Accident Site:	0 Nautical Miles
Observation Time:	14:35 Local	Direction from Accident Site:	360°
Lowest Cloud Condition:	Clear	Visibility	10 miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	3 knots / None	Turbulence Type Forecast/Actual:	/ None
Wind Direction:	110°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30.21 inches Hg	Temperature/Dew Point:	14°C / 4°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Fort Collins, CO (FNL)	Type of Flight Plan Filed:	VFR
Destination:	Fort Collins, CO (FNL)	Type of Clearance:	None
Departure Time:	15:11 Local	Type of Airspace:	Class E

At 1435 the weather observation station at FNL reported the following conditions: wind 110 degrees at 3 knots, visibility 10 miles, clear sky, temperature 14 degrees C, dew point 4 degrees C, altimeter setting 30.22 inches of mercury.

Airport Information

Airport:	FORT COLLINS-LOVELAND MUNI FNL	Runway Surface Type:	Asphalt
Airport Elevation:	5016 ft msl	Runway Surface Condition:	Dry
Runway Used:	33	IFR Approach:	None
Runway Length/Width:	8500 ft / 100 ft	VFR Approach/Landing:	Full stop;Go around;Traffic pattern

Wreckage and Impact Information

Crew Injuries:	1 Serious	Aircraft Damage:	Substantial
Passenger Injuries:		Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Serious	Latitude, Longitude:	40.451946,-105.01139(est)

Survival Aspects

AmSafe airbag seatbelt assemblies were mounted in the two front crew seats of the accident aircraft. Neither of the two airbag seatbelts deployed as the airplane cartwheeled. On January 6, 2015, a wreckage review was conducted, which included examination of the crew seats and airbag seatbelt assemblies.

The AmSafe inflatable restraint system is self-contained and not connected to aircraft electrical power. Each restraint system includes an inflatable restraint harness (which includes the harness/seatbelt, an airbag inserted in the seatbelt webbing and a Kevlar inflator hose), an inflator assembly (which includes a helium gas canister) and an inflator interface cable. The two front crew seat AmSafe inflatable restraints are controlled by an electronics module assembly (EMA).

The EMA's dual crash sensors evaluate the acceleration and impact energy or crash pulse. The EMA's crash sensors only sense a longitudinal G input and require a continuous pulse of a minimum of 6+G's, which must load both sensors at the same time for 40-50 milliseconds before the system will send a crash pulse signal to the inflator. A review of data downloaded from the Primary Flight Display (PFD) revealed that longitudinal Gs necessary to trigger the EMA crash sensors did not occur during the accident sequence.

Examination of the right front crew seat revealed that the right airbag seatbelt's Kevlar inflator hose

assembly was chafed. The inflator hose was chafed in a location about 6 to 7 inches from the hose fitting. The chafed area created a hole approximately 2 inches in length, 0.5 inches in width and completely through the Kevlar and rubber layers of the hose assembly. The chafed area was immediately forward of a storage pocket attached to the back of the right seat. The examination did not determine the source of the chafing.

According to the AmSafe's Supplemental Instructions for Continued Airworthiness, a detailed visual inspection should be performed at least annually. The inspection requires a check of exposed hoses and cables for fraying and excessive wear of the hose and cable protective sleeving. Hose wear is acceptable as long as no holes are present. If any exposed hoses or cables show significant signs of fraying or excessive wear, such as holes, the assembly should be replaced.

Examination also revealed that the electrical diagnostic check failed. The inflator interface cables had either loose and/or broken wires on the connectors for each of the two crew seats. These cables require inspection and testing annually.

Additional Information

FAA Flight Test Report

In February 1996, the Federal Aviation Administration (FAA) Technical Center released a flight test report (DOT/FAA/CT-94/117) on the hazards of rotorcraft wake vortices in forward flight. The flight test utilized a laser Doppler velocimeter (LDV) to measure helicopter wake vortices. Four helicopters, with weights ranging from 7,600 to 70,000 pounds, were utilized as the wake vortex generating aircraft. The maximum duration for vortex life, as measured by the LDV, was 75 seconds for the UH-60. The FAA flight test report made the following conclusions:

--Medium weight helicopters, such as the S-76A and UH-1....can leave active, potentially hazardous vortices for up to 90 seconds. Separations for small aircraft behind these rotorcraft should therefore be in the 90-second range.

--Larger helicopters, such as the CH-47D and CH-53Ewere observed to have longer hazard times. A 120-second separation should be adequate for operations behind these rotorcraft.

--Information on the wake vortex hazard behind these rotorcraft, including delineation by class, should be included in the Airman's Information Manual and the Wake Vortex Advisory Circular.

The FAA flight test report is included in the public docket for this investigation.

FAA Pilot guidance

Current FAA airman information manual (AIM) and advisory circular (AC) 90-23G on aircraft wake

turbulence do not recommend an in-trail distance or timing separation for an airplane following a helicopter. The AC contains a general wake turbulence statement: "pilots should avoid helicopter vortices since helicopter forward flight airspeeds are often very low, which generate strong wake turbulence."

Administrative Information

Investigator In Charge (IIC):	Folkerts, Michael
Additional Participating Persons:	Brian Neal; Flight Standards District Office; Denver, CO Mike Council; Continental Motors; Mobile, AL Brannon Mayer; Cirrus Aircraft; Duluth, MN Jim Crupi; Amsafe; Phoenix, AZ
Original Publish Date:	November 5, 2015
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=90472

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](#).