Aviation Investigation Final Report

Location:	Fort Carson, Colorado	**Accident Number:**	CEN14TA126
Date & Time:	January 29, 2014, 14:32 Local	**Registration:**	N959DA
Aircraft:	DIAMOND AIRCRAFT IND INC DA20-C1	**Aircraft Damage:**	Substantial
Defining Event:	Loss of control in flight	**Injuries:**	2 Minor
Flight Conducted Under:	Part 91: General aviation - Public aircraft - federal		

Analysis

This report was modified on 1/22/2015. Please see the public docket for this accident to view the original report.

According to air traffic control (ATC) audio recordings, a tower controller cleared an airplane for takeoff about 23 seconds after a UH-60 helicopter was cleared for takeoff from a midfield location. The tower controller ensured that a runway separation standard of 3,000 feet was present and did not give a wake turbulence advisory. The flight instructor reported that she was aware of the helicopter's takeoff and that she perceived adequate separation from the helicopter. The flight instructor incorrectly identified the helicopter as a Bell UH-1, which weighs less than the UH-60. Shortly after takeoff, the airplane encountered the wake vortex of the helicopter and entered a steep left bank. The flight instructor attempted to counteract the left roll with full right aileron inputs, but she was unable to maintain control. The airplane impacted terrain near midfield and came to rest inverted. A review of ATC audio recordings and airplane performance data revealed that the airplane trailed the helicopter by about 48 to 63 seconds at the midfield location and was about 150 to 200 feet above ground level when it encountered the helicopter's wake vortex.

Current Federal Aviation Administration (FAA) ATC guidance does not require specific wake turbulence separation criteria for a small airplane following a helicopter nor does it require a controller to give a wake turbulence advisory for a small airplane following a helicopter. Current FAA pilot guidance, including the Airman's Information Manual and an advisory circular on aircraft wake turbulence, also do not recommend separation criteria for a small airplane following a helicopter.

Probable Cause and Findings

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

The flight instructor's loss of control after takeoff following a wake turbulence encounter from a preceding helicopter. Contributing to the accident were the flight instructor's misidentification of the helicopter type and a lack of Federal Aviation Administration wake turbulence separation criteria for a small airplane following a helicopter.

Findings

Environmental issues	Wake turbulence - Decision related to condition
Aircraft	(general) - Attain/maintain not possible
Organizational issues	Adequacy of policy/proc - FAA/Regulator
Personnel issues	Aircraft control - Pilot
Personnel issues	Identification/recognition - Pilot

Factual Information

History of Flight

Initial climb	Loss of control in flight (Defining event)
Initial climb	Collision with terr/obj (non-CFIT)

HISTORY OF FLIGHT

On January 29, 2014, at 1432 mountain standard time, a single engine Diamond DA20-C1 airplane, N959DA, was substantially damaged after impact with terrain at Butts Army Airfield (KFCS), Fort Carson, Colorado. The flight instructor (CFI) and student suffered minor injuries. The airplane was owned by Doss Aviation Incorporated and operated under contract for the United States Air Force (USAF). The airplane was departing on a training flight for Pueblo Memorial Airport (KPUB), Pueblo, Colorado. Visual meteorological conditions prevailed for the 14 Code of Federal Regulations Part 91 public use flight.

According to air traffic control (ATC) audio recordings, the KFCS tower controller cleared the DA20 for takeoff from the approach end of Runway 13 about 23 seconds after a Sikorsky UH-60 helicopter was cleared for takeoff from a midfield location. The tower controller ensured a runway separation standard of 3,000 feet was present, as required by Federal Aviation Administration (FAA) ATC guidance. The controller did not give a wake turbulence advisory, which was not specifically required by FAA ATC guidance.

According to the CFI and student, the airplane entered into a steep left bank soon after liftoff. The flight instructor attempted to counteract the left roll with full right aileron inputs, but was unable to maintain control. The airplane impacted terrain near midfield and came to rest inverted.

PERSONNEL INFORMATION

Flight Instructor

The CFI, age 59, held an airline transport pilot certificate with airplane single and multiengine land, airplane instrument ratings. The CFI's flight instructor certificate included airplane single and multiengine land ratings. She had flown 17,047 hours, including 823 hours as a flight instructor in the DA20 and 22 hours of rotary wing hours early in her career.

The CFI stated with certainty that she perceived the preceding helicopter to be a Bell UH-1, which weighs less than a UH-60. Interviews with tower controllers and other helicopter pilots operating in the KFCS pattern at the time of the accident confirmed the departing helicopter was a UH-60.

Student

The student was a USAF officer with limited flying experience. His previous flight time included about 15 hours in the T-53A (a Cirrus SR-20 variant) at the USAF Academy's Powered Flight Program. The student progressed normally through the initial flight screening (IFS) syllabus-directed program and had flown about 14 hours in the DA20 previous to the mishap sortie.

AIRCRAFT INFORMATION

The accident airplane was manufactured by Diamond Aircraft Industries, Inc. in 2007 and equipped with a Continental IO-240-B engine. The last annual and 100-hour inspections were completed on December 18, 2013. During the postaccident examination, no anomalies were noted with the engine, flight controls, or other airplane systems. The CFI and student did not observe any anomalies with the airplane.

METEOROLOGICAL INFORMATION

The weather observation station at KFCS reported the following conditions at 1458: wind 170 degrees at 3 knots, visibility 10 miles, broken clouds at 17,000 feet above ground level (AGL), temperature 5 degrees Celsius (C), dew point negative 8 degrees C, and altimeter setting 29.76.

WRECKAGE AND IMPACT INFORMATION

The left wingtip of the aircraft struck the terrain 118 feet left of the runway centerline. The airplane cartwheeled and the main cockpit/fuselage came to rest inverted 2,511 feet from the approach end and 285 feet left of runway centerline, with the aft fuselage fractured.

SURVIVAL ASPECTS

When cockpit structure came to rest inverted, the CFI and student found they were unable to egress from the airplane, as only a few inches of space existed between them and the terrain. Because of this, the CFI and student had difficulty accomplishing post-accident actions to minimize the risk of fire. On-scene witnesses and rescue personnel considered 'flipping' the airplane, but re-considered after confirming the airplane's electrical system was de-energized, the fuel system was not compromised, and a lack of injuries of the crewmembers. On-scene personnel waited for airfield crash/fire/rescue, who utilized pneumatic pillows to effectively extract the CFI and student.

TESTS AND RESEARCH INFORMATION

Utilizing DA20-C1 performance data, the accident airplane would have reached the midfield location about 25-40 seconds after the ATC takeoff clearance, having climbed to about 150-200 feet AGL. Based on this estimate and ATC audio tapes, the DA-20 trailed the UH-60 about 48-63 seconds at the midfield location.

ORGANIZATIONAL AND MANAGEMENT INFORMATION

Doss Aviation Inc., owner of the accident airplane and employer of the CFI, has operated the IFS program under contract with the USAF since 2006. In September 2008, a Doss Aviation DA20 encountered the wake turbulence of a C-130 during final approach to Doss Aviation's home airfield. Flying 56 to 62 seconds behind the C-130's flight path, the crew was unable to recover from the effects

of the wake turbulence vortices. Following that accident, Doss Aviation had placed additional emphasis on the inherent risks of the DA20's very lightweight design and the avoidance of wake turbulence.

In the months leading up to this accident, an Army Combat Aviation Brigade (CAB) had started to arrive at KFCS. About three weeks prior to the accident, increased exposure to helicopters was briefed as a safety topic during a Doss Aviation continuation training (CT) meeting. The briefing focused on risks associated with rotorwash/wake turbulence and the different types of helicopters expected to be located at KFCS as part of the CAB. The briefing provided 'rules-of-thumb, to include a 2 minute wake turbulence spacing in trail from helicopters, although Doss did not make this mandatory. The accident CFI attended the CT briefing on helicopter hazards.

At the time of the accident, a warning in the IFS In-Flight Guide for operations at KFCS read as follows: "WARNING: Use extreme caution operating in the vicinity of helicopters. Do not takeoff or land with helicopters hovering or taxiing within 500 feet of the runway. Consider wind direction to predict wake vortex movement, and use greater than 500 feet separation if required. Make an early go-around decision when required to avoid wake turbulence."

Following the accident, Doss Aviation released guidance requiring their pilots to maintain a wake turbulence separation of 2 minutes behind 'small plus' aircraft, which included UH-60 and AH-64 helicopters, two of the primary aircraft assigned to the CAB. Also since the accident, the USAF operations group overseeing the IFS program regenerated the Southern Colorado (SOCO) Front Range Airspace Working Group (FRAWG), which had been more active when IFS was initially stood up, but had waned recently. The charter of the FRAWG, comprised of SOCO military/civilian flying and ATC organizations, is to reduce congestion risks and optimize efficient use of the available airspace.

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-53E ….were 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.

FAA ATC guidance

Current FAA ATC guidance published in FAA order 7110.65M places all helicopters in the same wake turbulence category as small aircraft. Based on this, FAA ATC wake turbulence guidance does not require an in-trail distance or timing separation for a small airplane following a helicopter, nor is a controller specifically required to give a wake turbulence advisory for a small airplane following a helicopter. Current FAA ATC guidance states: "issue cautionary information to any aircraft if in your opinion, wake turbulence may have an adverse effect on it".

FAA Pilot guidance

Similarly for FAA pilot guidance, the 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."

Flight instructor Information

Certificate:	Airline transport; Flight instructor	**Age:**	59
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Glider	**Restraint Used:**	4-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 None	**Last FAA Medical Exam:**	March 4, 2012
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	December 18, 2013
Flight Time:	17047 hours (Total, all aircraft), 842 hours (Total, this make and model), 8421 hours (Pilot In Command, all aircraft), 83 hours (Last 90 days, all aircraft), 29 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Student pilot Information

Certificate:	None	**Age:**	21
Airplane Rating(s):	None	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	4-point
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 Unknown	**Last FAA Medical Exam:**	
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	29 hours (Total, all aircraft), 14 hours (Total, this make and model), 1 hours (Pilot In Command, all aircraft), 14 hours (Last 90 days, all aircraft), 14 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	DIAMOND AIRCRAFT IND INC	**Registration:**	N959DA
Model/Series:	DA20-C1	**Aircraft Category:**	Airplane
Year of Manufacture:	2007	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	C0469
Landing Gear Type:	Tricycle	**Seats:**	2
Date/Type of Last Inspection:	December 18, 2013 Annual	**Certified Max Gross Wt.:**	
Time Since Last Inspection:	28 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	3597 Hrs at time of accident	**Engine Manufacturer:**	Continental
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	IO240B3B
Registered Owner:	DOSS AVIATION INC	**Rated Power:**	125 Horsepower
Operator:	DOSS AVIATION INC	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KFCS,5838 ft msl	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	14:58 Local	**Direction from Accident Site:**	140°
Lowest Cloud Condition:		**Visibility**	10 miles
Lowest Ceiling:	Broken / 17000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	3 knots /	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:	170°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.76 inches Hg	**Temperature/Dew Point:**	5°C / -8°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Fort Carson, CO (KFCS)	**Type of Flight Plan Filed:**	VFR
Destination:	Pueblo, CO (KPUB)	**Type of Clearance:**	VFR flight following
Departure Time:	14:32 Local	**Type of Airspace:**	Class D

Airport Information

Airport:	Butts Army Airfield KFCS	**Runway Surface Type:**	Asphalt
Airport Elevation:	5838 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	13	**IFR Approach:**	None
Runway Length/Width:	4572 ft / 75 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	2 Minor	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Minor	**Latitude, Longitude:**	38.678611,-104.754997

Administrative Information

Investigator In Charge (IIC):	Folkerts, Michael
Additional Participating Persons:	Dave Carroll; Denver Flight Standards District Office; Denver, CO Marty McKinnon; Doss Aviation Inc.; Pueblo, CO James Claborn; U.S. Air Force; Colorado Springs, CO
Original Publish Date:	September 24, 2014
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=88739