Aviation Investigation Final Report

Location:	Bahama, North Carolina	**Accident Number:**	ERA15FA023
Date & Time:	October 21, 2014, 10:44 Local	**Registration:**	N64GM
Aircraft:	Beech D95	**Aircraft Damage:**	Substantial
Defining Event:	Loss of control in flight	**Injuries:**	1 Fatal, 1 Serious
Flight Conducted Under:	Part 91: General aviation - Instructional		

Analysis

The flight instructor, who had recently purchased the multiengine airplane, was providing flight instruction to a non-multiengine-rated private pilot (the student). A witness reported that the flight departed uneventfully, and radar data indicated that the airplane climbed to and leveled off about 1,000 ft above ground level. The airplane's calculated airspeed initially increased to about 130 knots (kts) and then, about 3 minutes into the flight, began to decrease. About 30 seconds later, the airplane began to climb while continuing to lose airspeed. For the final seconds of the flight, the airplane's calculated airspeed was less than 50 kts and close to its expected stall speed. The airplane then entered a rapid descent, and its track deviated to the left.

Examination of the accident site revealed that the airplane impacted trees and terrain in a near-vertical attitude. The airplane's rapid loss of altitude and vertical impact were consistent with the airplane's decaying airspeed resulting in the exceedance of its critical angle-of-attack and a subsequent aerodynamic stall. Examination of the wreckage revealed no evidence of any preimpact mechanical malfunction or failure of the airframe or either engine.

The airplane was equipped with a single throw-over-type control wheel (for elevator and aileron control) and two sets of rudder pedals. The control wheel was found positioned to the left seat, where the student was seated. The student survived the accident but was unable to recall any of the events that transpired during the flight. Thus, the specific sequence of events that resulted in the airplane's eventual aerodynamic stall could not be determined. Regardless, the configuration of the airplane's control wheel would not have allowed the flight instructor to take control of the airplane in order to prevent or recover from the stall.

Probable Cause and Findings

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

The pilots' failure to maintain adequate airspeed during climb, which resulted in the airplane's wing exceeding its critical angle-of-attack and a subsequent aerodynamic stall. Contributing to the accident was the flight instructor's decision to conduct a training flight in an airplane equipped with a single throw-over-type control wheel.

Findings

Aircraft	Airspeed - Not attained/maintained
Aircraft	Angle of attack - Not attained/maintained
Personnel issues	Aircraft control - Student/instructed pilot
Personnel issues	Aircraft control - Instructor/check pilot
Personnel issues	Decision making/judgment - Instructor/check pilot

Factual Information

History of Flight

Enroute-climb to cruise	Loss of control in flight (Defining event)
Enroute-climb to cruise	Aerodynamic stall/spin
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On October 21, 2014, at 1044 eastern daylight time, a Beech D95A, N64GM, was substantially damaged when it impacted trees and terrain near Bahama, North Carolina. The flight instructor was fatally injured and the private pilot receiving instruction (student) was seriously injured. Visual meteorological conditions prevailed, and no flight plan was filed for the local flight, which originated from Lake Ridge Aero Park (8NC8), Durham, North Carolina, about 1040. The instructional flight was conducted under the provisions of 14 Code of Federal Regulations (CFR) Part 91.

According to a friend of both occupants, the flight instructor owned and operated the accident airplane. He had purchased it about 3 months prior and had accumulated about 12 total hours of flight time in the airplane, including at least 10 takeoffs and landings that were required for insurance purposes.

The friend stated that the purpose of the accident flight was for the flight instructor to provide multiengine flight instruction to the student, who held a private pilot certificate with an airplane single-engine land rating. The student arrived at 8NC8 around 1010, after which the pilots performed a preflight briefing, taxied to runway 32, and departed about 1040. The friend described that the engines sounded "strong" as the airplane departed, and he noted that the landing gear remained extended until the airplane was about 3 miles away from the airport.

Review of radar data provided by the Federal Aviation Administration (FAA) showed a radar target with a 1200 transponder code near the departure end of runway 32, at a reported altitude of 400 feet mean sea level (msl), at 1040. The target continued climbing toward the northwest until a final radar target was observed at 1044:31, at an altitude of 1,300 feet msl, in the vicinity of the accident site. No further radar targets were observed, and no other primary or secondary radar targets were recorded in the vicinity at that time.

The student contacted emergency responders at 1224 and reported the accident. During a postaccident interview, the student stated that he was unable to recall any of the events that transpired on the day of the accident.

Flight instructor Information

Certificate:	Airline transport; Flight instructor	**Age:**	77,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	Lap only
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 None	**Last FAA Medical Exam:**	December 19, 2013
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	23000 hours (Total, all aircraft)		

Student pilot Information

Certificate:	Private	**Age:**	64,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Lap only
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	November 17, 2011
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	December 6, 2012
Flight Time:	1589 hours (Total, all aircraft)		

The flight instructor, age 77, held an airline transport pilot certificate with ratings for airplane single and multiengine land, along with numerous type ratings. He also held a flight instructor certificate with ratings for airplane single and multiengine land, and instrument airplane. His most recent FAA second-class medical certificate was issued in December 2013, and at that time he reported 23,000 total hours of flight experience.

The student, age 64, held a private pilot certificate with ratings for airplane single-engine land and instrument airplane. His most recent FAA second-class medical certificate was issued in November 2011, and at that time he reported 1,200 total hours of flight experience.

In a postaccident interview, the student stated that he had been friends with the flight instructor for about 20 years, and that he had been the student's flight instructor since around 2000. Shortly after the flight instructor purchased the accident airplane, he and the student flew on several occasions during the month preceding the accident flight. The student further described that about 1 week prior to the accident flight, he and the flight instructor flew the accident airplane to Pearson County Airport (TDF), Roxboro, North Carolina. At TDF, the student moved from the right to the left seat, and he and the flight instructor flew around the airport traffic pattern. After landing, he and the flight instructor again switched seats before returning to 8NC8.

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	**Registration:**	N64GM
Model/Series:	D95 A	**Aircraft Category:**	Airplane
Year of Manufacture:	1964	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	TD-592
Landing Gear Type:	Retractable - Tricycle	**Seats:**	5
Date/Type of Last Inspection:	July 21, 2014 Annual	**Certified Max Gross Wt.:**	4200 lbs
Time Since Last Inspection:	9 Hrs	**Engines:**	2 Reciprocating
Airframe Total Time:	1780 Hrs as of last inspection	**Engine Manufacturer:**	Lycoming
ELT:	C91 installed, activated, did not aid in locating accident	**Engine Model/Series:**	IO-360B1B
Registered Owner:	Carolina Barnstormers Inc	**Rated Power:**	180 Horsepower
Operator:	Carolina Barnstormers Inc	**Operating Certificate(s) Held:**	None

According to FAA airworthiness and registration records, the airplane was manufactured in 1964, and was equipped with two Lycoming IO-360-B1B engines. Its most recent annual inspection was completed on July 21, 2014. At the time of the inspection the airframe had 1,780 total flight hours, with an additional 9 hours between that date and the accident flight.

The airplane was equipped with a throw-over type control wheel arm for elevator and aileron control, which could be locked in position at either the front left or front right pilot seating positions. Optional right seat pilot rudder pedals were also installed. The airplane was equipped with an electrical stall warning indicator triggered by a sensing vane on the leading edge of the left wing, which activated a warning horn. The stall warning system was protected by a single push-to-reset circuit breaker, which could be manually extended to de-energize the circuit.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KTDF,609 ft msl	**Distance from Accident Site:**	9 Nautical Miles
Observation Time:	10:55 Local	**Direction from Accident Site:**	320°
Lowest Cloud Condition:	Scattered / 200 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots / None	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	280°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.94 inches Hg	**Temperature/Dew Point:**	18°C / 10°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Durham, NC (8NC8)	**Type of Flight Plan Filed:**	None
Destination:	Durham, NC (8NC8)	**Type of Clearance:**	None
Departure Time:	10:40 Local	**Type of Airspace:**	

The 1055 weather conditions reported at TDF, located about 9 nautical miles northwest of the accident site, included wind from 280 degrees true at 6 knots, 10 statute miles visibility, a temperature of 18 degrees C, a dew point of 10 degrees C, and an altimeter setting of 29.94 inches of mercury.

Wreckage and Impact Information

Crew Injuries:	1 Fatal, 1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal, 1 Serious	**Latitude, Longitude:**	36.165,-78.859443

The accident site was located about 160 feet south of the final observed radar target, and all portions of the airplane were accounted for at the scene. Numerous broken tree branches and trunks were found immediately above and surrounding the wreckage. There was no discernable horizontal wreckage path. Four 3-inch diameter tree trunks penetrated the bottom of the fuselage, and one 3-inch diameter tree trunk penetrated the right wing. The left and right wings, left and right horizontal stabilizers, and vertical stabilizer remained attached.

The airplane's throw-over control wheel was positioned to the left seat pilot station. Control continuity was confirmed from each flight control surface to the control column. Detailed examination of the flight

control column linkage mechanism in the vicinity of the instrument panel showed no evidence of any binding, chafing, or other impediment to full range movement of the control beyond impact-related structural damage. The elevator trim tab was displaced 10 degrees trailing edge down (nose up), while the rudder trim tab was displaced 10 degrees trailing edge left (nose right). Measurement of the flap actuators correlated to the flaps retracted position, and all three landing gear were retracted.

All of the instrument panel circuit breakers were engaged, with the exception of the "STALL WARN" circuit breaker, which was extended. Functional testing of the circuit breaker revealed that it operated normally when a short circuit was applied.

The left engine fuel tank selector was set to the auxiliary position, and the right fuel tank selector was set to the right main position. About 16 gallons of 100LL aviation gasoline were recovered from the right main fuel tank. Unquantified amounts of fuel were observed leaking from the left main, and left and right auxiliary fuel tanks. The airframe fuel strainer, drain bowls, and engine fuel system components were absent of water, debris, or contamination, and contained fluid consistent with 100LL aviation gasoline.

Rotation of each engine's crankshaft produced compression and suction on all cylinders. All of the spark plugs' electrodes displayed normal wear and were gray in color. Powertrain and valvetrain continuity was confirmed from the propeller flange to the rear accessory gears, and at each cylinder. Both engines' oil systems were absent of debris. Functional testing of both magnetos from the left engine and the right engine's left magneto revealed no abnormalities. The right engine's right magneto was impact-damaged and could not be tested.

The left propeller remained attached to the crankshaft flange. One blade exhibited torsional twisting and curling at the propeller tip, while the other blade exhibited torsional twisting, chord-wise scratches, and was bent aft about 80 degrees, about 10 inches from the tip. The right propeller remained attached to the crankshaft flange. One blade was bent forward about 20 degrees, about 4 inches from the tip and the other blade exhibited torsional twisting and chord-wise scratches.

Medical and Pathological Information

The flight instructor was recovered from the right front seat of the airplane. An autopsy was performed on the flight instructor by the North Carolina Department of Health and Human Services, Office of the Chief Medical Examiner, Raleigh, North Carolina. The medical examiner determined that the cause of death was blunt force injuries.

Toxicological testing performed by the FAA's Civil Aerospace Medical Institute found no trace of ethanol, carbon monoxide, or other drugs present in the samples submitted for the flight instructor. Toxicological testing of hospital admission blood samples from the student were negative for the presence of ethanol and drugs.

Additional Information

Aircraft Performance Study

An aircraft performance study was undertaken utilizing radar data derived from the FAA ASR-9 (airport surveillance radar) at Raleigh-Durham International Airport (RDU), Raleigh-Durham, North Carolina. The data were sampled at a rate of once every 4.5 seconds. The radar site was located approximately 18 nautical miles from the accident site. Interpolated wind data were applied to the airplane's radar-derived positions, and its approximate airspeed was calculated for the flight.

According to the study, the airplane climbed and gained speed from takeoff to about 1042, when the altitude leveled off around 1,300 feet msl. About 1043, the airplane descended to about 1,200 feet for about 45 seconds, before climbing again to 1,700 feet by 1044:23. From 1043 until near the end of the flight, the airplane's airspeed decreased from about 130 to about 45 knots at 1044:27, when the airplane entered a rapid descent.

At 1044:23, the peak of the airplane's final climb, the equivalent airspeed was calculated to be less than 50 knots and slowing. For a gross weight of 4,200 pounds (maximum take-off weight), 50 knots was below any of the landing gear and flaps up stall speeds, that were published in the airplane owner's manual. An exact accounting of the airplane's weight at the time of the accident could not be calculated; however, the empty weight of the airplane was 2,555 pounds; at that weight, the power-on stall speed would be expected to reduce from 53 to 41 knots.

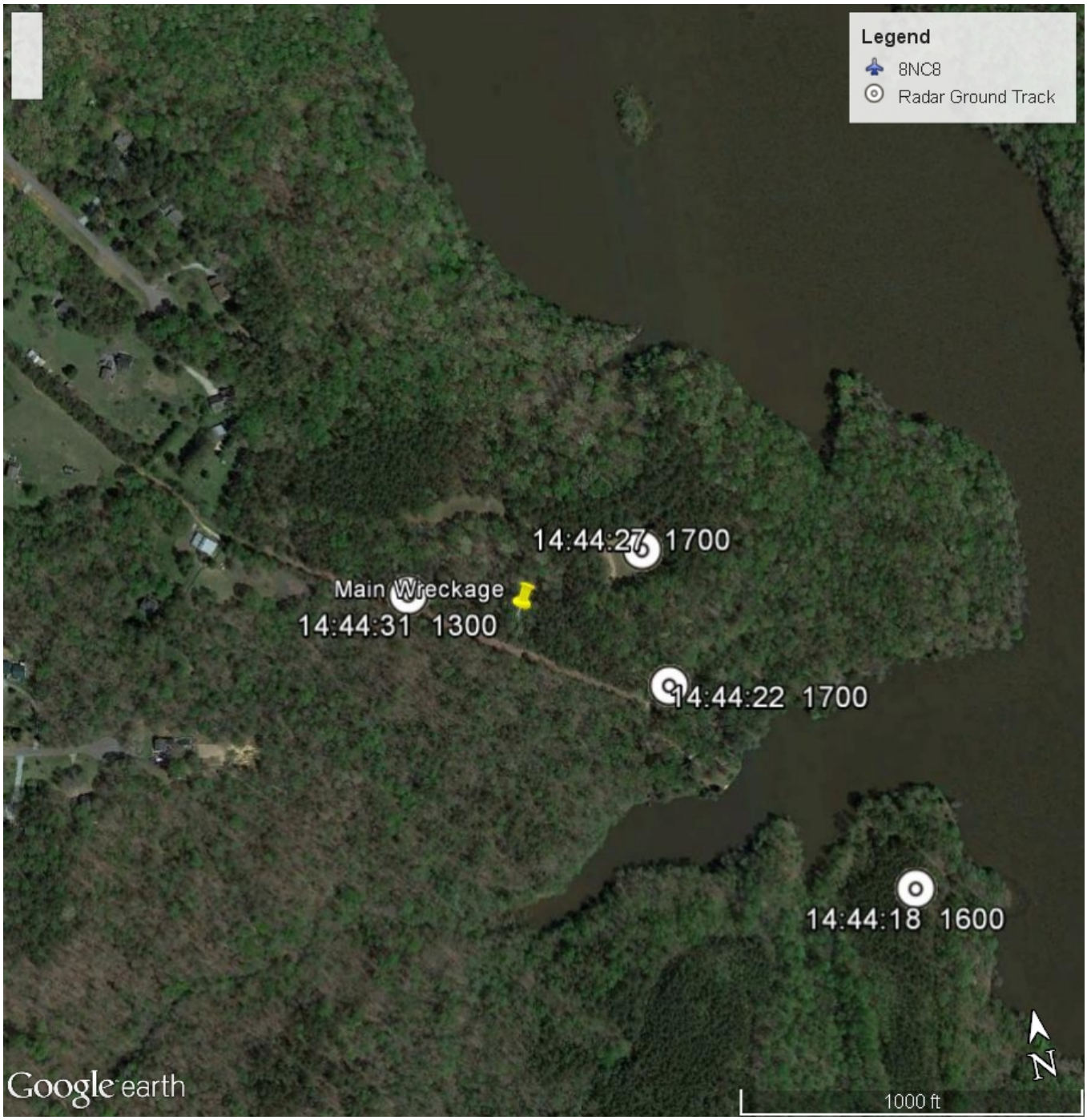

Figure 1 - Radar and Accident Site Plot

CFR 91.109

CFR Part 91.109 states in part: "No person may operate a civil aircraft (except a manned free balloon) that is being used for flight instruction unless that aircraft has fully functioning dual controls."

Administrative Information

Investigator In Charge (IIC):	Diaz, Dennis
Additional Participating Persons:	David Hintz; FAA/FSDO; Greensboro, NC Brian Weber; Textron Aviation; Wichita, KS Andrew Hall; Textron Aviation; Wichita, KS James M Childers; Lycoming Engines; White, GA
Original Publish Date:	January 11, 2017
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=90285