Aviation Investigation Final Report

Location:	Georgetown, South Carolina	**Accident Number:**	ERA18LA258
Date & Time:	September 22, 2018, 15:15 Local	**Registration:**	N435RB
Aircraft:	Beech 35	**Aircraft Damage:**	Substantial
Defining Event:	Flight control sys malf/fail	**Injuries:**	2 Minor
Flight Conducted Under:	Part 91: General aviation - Instructional		

Analysis

While approaching the airport for landing during an instructional flight, the airplane entered an uncommanded yaw and roll to the right and began to pitch up. The flight instructor was able to maintain some control of the airplane by applying left rudder, left aileron, and forward elevator pressure, and trimming the airplane nose-down. The instructor noticed that the airplane's right yaw increased as the airplane's speed decreased, and it became "impossible" to maintain alignment with the runway centerline. Upon touching down on the runway, the airplane immediately veered to the right about 90° and collided with trees, resulting in substantial damage to the firewall, fuselage, and both wings.

Examination of the flight control system revealed that the left seat's left rudder pedal arm clevis was fractured in multiple sections. Metallurgical examination identified cracks and voids created during the casting (manufacturing) process. The presence of these voids, cracks, and oxide layers reduced the cross-sectional area that could withstand the force applied over the pedal arm clevises. Once a high enough load input was applied to the pedal arm, the remaining material fractured in overstress. The separation of the pedal arm from the pushrod subsequently resulted in a failure of the rudder control system. Review of the airframe logbooks revealed that the rudder pedal arm was original to the airplane and had accrued a total of 6,203.62 flight hours.

Probable Cause and Findings

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

A loss of directional control during landing due to overstress failure of the left seat's left rudder pedal arm clevis, which occurred as a result of manufacturing defects.

Findings

Aircraft	Rudder actuator - Failure
Aircraft	Directional control - Attain/maintain not possible

Factual Information

History of Flight

Maneuvering	Flight control sys malf/fail (Defining event)
Landing	Loss of control on ground
Landing	Collision with terr/obj (non-CFIT)

On September 22, 2018, about 1515 eastern daylight time, a Beech V35 airplane, N435RB, was substantially damaged when it was involved in an accident near Georgetown, South Carolina. The flight instructor and the private pilot sustained minor injuries. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 instructional flight.

The flight instructor stated that he was providing instruction to the pilot for a complex/high performance endorsement. They flew for about 30 minutes before returning to the airport, and the flight instructor took control of the airplane so the pilot could get a drink of water. During that time, the airplane entered an uncommanded yaw and roll to the right and started to pitch up, and the instructor confirmed with the pilot that he was not touching the controls. The instructor was able to maintain some control of the airplane by applying left rudder, left aileron, and forward elevator pressure. He also trimmed the elevator nose down, which helped relieve some of the airplane's right-turning tendency. As he prepared to land on runway 11, the instructor noticed that the right yaw increased as the airplane's speed decreased. As the airplane slowed down to 80 mph, it became "impossible" to maintain alignment with the runway centerline and the airplane began to drift to the right. Once the airplane touched down, it immediately veered to the right about 90° and collided with trees, resulting in substantial damage to the firewall, fuselage, and both wings.

Postaccident examination of the flight control system revealed that the left seat's left rudder pedal arm clevis was fractured in multiple locations. Metallurgical examination of the fractured pieces identified cracks and voids created during the casting (manufacturing) process. The presence of these voids, cracks, and oxide layers reduced the cross-sectional area that could withstand the force applied over the pedal arm clevises. Once a high enough load input was applied to the pedal arm, the remaining material fractured in overstress. The separation of the pedal arm from the pushrod subsequently resulted in a failure of the rudder control system.

Review of the airframe logbooks revealed that the rudder pedal arm was original to the airplane, installed at the time of manufacture in 1966. At the time of the accident, the airplane had accrued a total of 6,203.62 flight hours.

Flight instructor Information

Certificate:	Commercial; Flight instructor; Private	**Age:**	76,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	**Toxicology Performed:**	No
Medical Certification:	Class 2 Without waivers/limitations	**Last FAA Medical Exam:**	February 15, 2017
Occupational Pilot:	UNK	**Last Flight Review or Equivalent:**	
Flight Time:	30000 hours (Total, all aircraft)		

Pilot Information

Certificate:	Private	**Age:**	38,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Lap only
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 Without waivers/limitations	**Last FAA Medical Exam:**	October 31, 2016
Occupational Pilot:	UNK	**Last Flight Review or Equivalent:**	August 14, 2018
Flight Time:	60 hours (Total, all aircraft), 2 hours (Total, this make and model), 35 hours (Pilot In Command, all aircraft), 20 hours (Last 90 days, all aircraft), 8 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	**Registration:**	N435RB
Model/Series:	35 V35	**Aircraft Category:**	Airplane
Year of Manufacture:	1966	**Amateur Built:**	
Airworthiness Certificate:	Utility	**Serial Number:**	D-8355
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	October 16, 2017 Annual	**Certified Max Gross Wt.:**	
Time Since Last Inspection:	159 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	6203.62 Hrs at time of accident	**Engine Manufacturer:**	Continental Motors Inc
ELT:	Installed, not activated	**Engine Model/Series:**	IO-520-BA2
Registered Owner:		**Rated Power:**	270 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	GGE,39 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	14:35 Local	**Direction from Accident Site:**	0°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	130°	**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	30.09 inches Hg	**Temperature/Dew Point:**	28°C / 21°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Georgetown, SC (GGE)	**Type of Flight Plan Filed:**	None
Destination:	Georgetown, SC (GGE)	**Type of Clearance:**	None
Departure Time:	14:30 Local	**Type of Airspace:**	Unknown

Airport Information

Airport:	Georgetown Co. GGE	**Runway Surface Type:**	Asphalt
Airport Elevation:	395 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	11	**IFR Approach:**	None
Runway Length/Width:	4539 ft / 150 ft	**VFR Approach/Landing:**	Full stop

Wreckage and Impact Information

Crew Injuries:	2 Minor	**Aircraft Damage:**	Substantial
Passenger Injuries:	N/A	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Minor	**Latitude, Longitude:**	33.311389,-79.320274(est)

Administrative Information

Investigator In Charge (IIC):	Read, Leah		
Additional Participating Persons:	Cornelius J Baker; FAA/FSDO; Columbia, SC		
Original Publish Date:	June 10, 2021	**Investigation Class:**	3
Note:	The NTSB did not travel to the scene of this accident.		
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=98340		