Aviation Investigation Final Report

Location:	Chatlottesville, Virginia	**Accident Number:**	ERA14FA075
Date & Time:	December 18, 2013, 11:10 Local	**Registration:**	N3705Z
Aircraft:	Beech A36TC	**Aircraft Damage:**	Substantial
Defining Event:	Fuel starvation	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

About 1 hour 30 minutes into the cross-country flight and while on approach to the destination airport, the pilot reported a loss of engine power. The pilot was unable to glide the airplane to the airport, and it subsequently impacted trees and the ground in a residential area about 3 miles from the airport.

The pilot had completely fueled the airplane before departure, and adequate fuel remained onboard at the time of the engine power loss. Examination of the wreckage revealed that the three-position fuel selector handle was positioned in between the left and right tank detents, which would have restricted fuel flow to the engine. A subsequent test run of the engine was performed successfully, and no evidence of mechanical malfunctions or failures was found that would have precluded normal engine operation. The airplane's before landing checklist instructed the pilot to move the fuel selector valve to the fuller fuel tank for landing. It is likely that, while on approach and preparing the airplane to land, the pilot switched fuel tanks and then inadvertently failed to ensure that the fuel selector handle was fully positioned in the detent of the fuel tank he intended to select.

During the impact sequence, the pilot's shoulder harness separated, and his cause of death was attributed to blunt force trauma to the torso. The autopsy also reported a near-complete transection of the thoracic aorta. If the pilot's shoulder harness had remained intact, the risk of traumatic transection of the aorta would have been significantly reduced and, thus, the pilot likely would only have incurred serious, not fatal, injuries.

Examination of the shoulder harness revealed that the belt had separated about 31 inches from where the fastener connected to the lapbelt. The location of the separation corresponded approximately to where the belt would pass through the D-ring behind the pilot's shoulder. The belt separation area exhibited about 0.25-inch fraying on one edge and 1.25-inch fraying on the other edge along a total area of about 7.75 inches. The shoulder harness manufacturer's component maintenance manual states that the acceptable limit for webbing fraying was a 6-inch area. Microscopic examination of the separated fibers revealed that they had separated in overload. The airplane's maintenance manual and a Federal Aviation

Administration advisory circular contained information pertaining to the inspection of shoulder harnesses during 100-hour or annual inspections. The accident airplane's most recent annual inspection was completed about 1 month before the accident.

Although the pilot's toxicology report was positive for pain medication, the medication was not detected in his blood; thus, it is likely that the pilot took the medication many hours before the accident flight and was not impaired during the flight.

Probable Cause and Findings

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

The pilot's failure to position the fuel selector handle in a fuel tank detent, which resulted in a total loss of engine power due to fuel starvation. Contributing to the pilot's fatal injuries was the separation of his shoulder harness due to overload in an area of excessive fraying.

Findings

Personnel issues	(general) - Pilot
Aircraft	Fuel selector/shutoff valve - Incorrect use/operation
Aircraft	Fasteners - Not specified

Factual Information

History of Flight

Approach	Fuel starvation (Defining event)
Approach	Loss of engine power (total)
Emergency descent	Off-field or emergency landing
Emergency descent	Collision with terr/obj (non-CFIT)

On December 18, 2013, about 1110 eastern standard time, a Beech A36TC, N3705Z, was substantially damaged when it impacted terrain near Charlottesville, Virginia, while on approach to Charlottesville-Albemarle Airport (CHO), Charlottesville, Virginia. The commercial pilot was fatally injured. The flight departed from Woodbine Municipal Airport (OBI), Woodbine, New Jersey, about 0946, and was destined for CHO. Visual meteorological conditions prevailed and an instrument flight rules flight plan had been filed. The personnel flight was conducted under the provisions of 14 Code of Federal Regulations Part 91.

Review of air traffic control information, provided by the Federal Aviation Administration (FAA), revealed that the pilot contacted CHO tower at 1104 and reported that he was 13 miles from CHO at 4,300 feet mean sea level. A CHO tower controller instructed him to enter a left base leg for runway 21 and report 3 miles out from the airport. At 1108, the pilot declared an emergency. The controller asked for the nature of the emergency and the pilot reported his engine was "dying." The controller then asked the pilot the number of people onboard and fuel remaining. The pilot replied one person onboard and 2 hours of fuel. The pilot's last transmission to CHO tower was at 1110 when he stated he was not going to reach the airport.

Pilot Information

Certificate:	Commercial	**Age:**	52
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	June 20, 2013
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	(Estimated) 2185 hours (Total, all aircraft), 999999 hours (Total, this make and model)		

The pilot held a commercial pilot certificate with ratings for airplane single-engine land, airplane multiengine land, and instrument airplane. His most recent FAA second-class medical

certificate was issued on June 20, 2013. At that time, the pilot reported a total flight experience of 2,185 hours; of which, 32 hours were flown during the previous 6 months. The pilot's most recent logbook was not recovered.

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	**Registration:**	N3705Z
Model/Series:	A36TC	**Aircraft Category:**	Airplane
Year of Manufacture:	1980	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	EA-146
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	November 23, 2013 Annual	**Certified Max Gross Wt.:**	3651 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	5554.6 Hrs as of last inspection	**Engine Manufacturer:**	Continental
ELT:	C91A installed, not activated	**Engine Model/Series:**	TSIO-520
Registered Owner:	GREGORY VOIT	**Rated Power:**	300 Horsepower
Operator:	GREGORY VOIT	**Operating Certificate(s) Held:**	None

The six-seat, low-wing, retractable tricycle gear airplane, serial number EA-146, was manufactured in 1980. It was powered by a Continental TSIO-520, 300-horsepower engine equipped with a three-blade Hartzell constant-speed propeller. According to the aircraft logbooks, the airplane's most recent annual inspection was completed on November 23, 2013. At that time, the airplane had accumulated 5,554.6 total hours of operation and the engine had accumulated 863.6 hours since factory rebuilt. The pilot purchased the airplane in 2002.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	CHO,639 ft msl	**Distance from Accident Site:**	3 Nautical Miles
Observation Time:	11:18 Local	**Direction from Accident Site:**	250°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots / None	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:	230°	**Turbulence Severity Forecast/Actual:**	/ N/A
Altimeter Setting:	30.17 inches Hg	**Temperature/Dew Point:**	4°C / -8°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Woodbine, NJ (OBI)	**Type of Flight Plan Filed:**	IFR
Destination:	Charlottesville, VA (CHO)	**Type of Clearance:**	IFR
Departure Time:	09:45 Local	**Type of Airspace:**	

The 1118 recorded weather observation at CHO, elevation 640 feet, included wind from 230 degrees at 7 knots, visibility 10 miles, sky clear, temperature 4 degrees C, dewpoint minus 8 degrees C, altimeter 30.17 inches of mercury.

Airport Information

Airport:	Charlottesville-Albemarle Arpt CHO	**Runway Surface Type:**	
Airport Elevation:	639 ft msl	**Runway Surface Condition:**	Unknown
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	38.157222,-78.392219(est)

The accident site was located in front of a residence, about 3 miles east of CHO. The initial impact point was identified by several damaged tree limbs, and a wreckage path about 200 feet in length, oriented approximately 090 degrees magnetic, extending through the impact area. Browning vegetation was observed along the wreckage path. Fragments of the airplane, including portions of the outboard right and left wings were located along the wreckage path. The engine remained attached to the fuselage, and all three propeller blades exhibited postcrash impact damage with minimal leading edge and rotational signature damage.

The airplane remained upright and the cockpit remained intact, but the pilot's shoulder harness had separated. The harness was forwarded to the NTSB Materials Laboratory, Washington, D.C., for further examination.

Further review of the cockpit revealed that the fuel selector was found positioned between the left and right tank detents. A placard on the fuel selector stated: "WARNING POSITION SELECTORS IN DENTENTS ONLY. NO FUEL FLOW TO ENGINES BETWEEN DETENTS." Further examination of the fuel selector was conducted at a recovery facility, under the supervision of an NTSB investigator, on April 2, 2014. The examination did not reveal any preimpact mechanical malfunctions with the fuel selector.

The engine was subsequently test-run at the manufacturer's facility on April 8, 2014, under the supervision of an NTSB investigator. The engine started on the first attempt without hesitation and ran continuously at different power settings, including full power for 5 minutes (for more information, see Engine Operational Test Report in the NTSB Public Docket).

A JPI EDM-700 engine monitor was recovered from the cockpit and forwarded to the NTSB Vehicle Recorder Laboratory, Washington, D.C. Data were successfully downloaded from the unit and plotted. Review of the plot revealed that the monitor recorded cylinder head temperatures and exhaust gas temperatures for each of the six cylinders. The plot also revealed that those temperatures began to drop at 1103:08. The engine monitor did not record fuel quantity or fuel flow (for more information see Engine Data Monitor and GPS Factual Report in the NTSB Public Docket).

A handheld Garmin GPSMAP 196 was also recovered from the wreckage and forwarded to the NTSB Vehicle Recorder Laboratory, Washington, D.C. Data were successfully downloaded from the unit and plotted for the entire accident flight. Review of the plot revealed that the last data point was captured at 1110:41, indicating a GPS altitude of 535 feet at a location about 225 feet east of where the main wreckage came to rest.

Medical and Pathological Information

An autopsy was performed on the pilot on December 19, 2013, by the State of Virginia Office of the Chief Medical Examiner, Richmond, Virginia. The cause of death was noted as "Blunt force trauma of the torso." The report also noted a near-complete transection of the thoracic aorta.

Toxicological testing was performed on the pilot by the FAA Bioaeronautical Science Research

Laboratory, Oklahoma City, Oklahoma. Review of the toxicology report revealed:

"0.068 (ug/mL, ug/g) Dihydrocodeine detected in Urine
Dihydrocodeine NOT detected in Blood
0.883 (ug/ml, ug/g) Hydrocodone detected in Urine
Hydrocodone NOT detected in Blood
0.558 (ug/mL, ug/g) Hydromorphone detected in Urine
Hydromorphone NOT detected in Blood
Ibuprofen detected in Urine
140.1 (ug/ml, ug/g) Salicylate detected in Urine."

Tests and Research

The pilot's shoulder harness was manufactured in November 1979 by Pacific Scientific Company and was subsequently repaired in July 1999 by Safety, LTD. NTSB Materials Laboratory examination of the shoulder harness revealed that the belt had separated about 31 inches from where the fastener connected to the lapbelt. That location of the separation corresponded approximately to where the belt would pass through the swivel ring (D-ring) behind the pilot's shoulder. Additionally, in the area of separation, the belt exhibited about .25-inch fraying on one edge and 1.25-inch fraying on the other edge, along a total area of approximately 7.75 inches. Review of the shoulder harness manufacturer's component maintenance manual revealed that the acceptable limit for webbing fraying could not exceed a 6 inch area. Microscopic examination of the separated fibers revealed that they exhibited mushroom filament ends, consistent with overload (for more information see Materials Laboratory Factual Report in the NTSB Public Docket).

Review of the airplane manufacturer's maintenance manual, for the make and model airplane, "100-Hour Or Annual Inspection…C. Cabin Inspection…15 Seats, Seat Belts And Shoulder Harnesses" revealed:

"Inspect cabin seats, seat belts and shoulder harnesses for proper operation, condition and security of attachment…"

Review of FAA Advisory Circular 43.13-1B, "Acceptable Methods, Techniques, and Practices – Aircraft Inspection and Repair" Chapter 9-46, "Miscellaneous Equipment" revealed:

"The webbing of safety belts, even when mildew-proofed, is subject to deterioration due to constant use, cleaning, and the effects of aging. Fraying of belts is an indication of wear, and such belts are likely to be unairworthy because they can no longer hold the minimum required tensile load."

In December, 2013, the NTSB released Safety Alert SA-027, "Check Your Restraints…Carefully follow restraint system maintenance and replacement guidance to prevent death and injuries."

Additional Information

According to fueling records and GPS data, prior to the accident flight, the airplane flew uneventfully from CHO to OBI on December 1, 2013. At the completion of that flight, the airplane was completely fueled and not flown again until the accident flight.

Review of the "Before Landing" checklist in the airplane's pilot operating handbook revealed: "…2. Fuel Selector Valve – SELECT TANK MORE NEARLY FULL…"

Administrative Information

Investigator In Charge (IIC):	Neylon, John
Additional Participating Persons:	Jay Venable; FAA/FSDO; Richmond, VA Mike Council; Continental Motors; Mobile, AL Paul Yoos; Beechcraft; Wichita, KS
Original Publish Date:	March 24, 2015
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=88566