Aviation Investigation Final Report

Location:	Oxford, North Carolina	**Accident Number:**	ERA13LA285
Date & Time:	June 13, 2013, 10:10 Local	**Registration:**	N3542R
Aircraft:	Beech A23	**Aircraft Damage:**	Substantial
Defining Event:	Fuel starvation	**Injuries:**	2 Minor
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

During the preflight inspection, the pilot/owner observed about 20 gallons of fuel in the left main fuel tank and significantly less fuel in the right main fuel tank. The pilot departed on a brief local flight with the fuel selector handle positioned to the left main fuel tank. About 10 minutes into the flight, the engine lost all power, and the flight instructor-rated passenger performed a forced landing to a field. During the landing, the airplane impacted a berm and sustained substantial damage to the left wing and fuselage. Examination of the wreckage revealed that the airplane's fuel selector handle was installed 180 degrees from its correct orientation. As such, when the handle portion of the selector was pointing at the desired tank, the pointer (arrow) was pointing in the opposite direction. Thus, when the pilot selected the left main fuel tank, the fuel selector valve was actually positioned to the right main fuel tank, which had little fuel at takeoff and was found empty after the accident.

Additionally, the fuel selector handle was missing its roll pin, which allowed it to be installed incorrectly. Due to the fuel system design of return fuel going to the left main fuel tank only, the pilot primarily flew with the fuel selector positioned to the left main fuel tank.

The fuel selector handle was often removed and reinstalled during maintenance inspections to allow access to the floor boards in the cockpit. An airworthiness directive (AD) for the fuel valve required repetitive inspection of the roll pin fuel valve during annual inspections per a manufacturer service instruction, or replacement of the roll pin valve with a D-handle type valve. Review of maintenance records revealed that about 38 years prior to the accident, a logbook entry indicated that the AD was complied with by installing a D-handle fuel valve; however, a roll pin type valve was installed at the time of the accident. Maintenance personnel performing subsequent inspections would assume, per the logbook entry, that the D-handle valve had been installed and any maintenance reference to the roll pin valve would not be applicable. The mechanic that performed the most recent annual inspection stated that he was not aware of a roll pin. The mechanic added that during the annual inspection, he removed and replaced the fuel selector handle to the same position he had found it. The pilot had owned the airplane for about 45 years and also performed some maintenance on it himself. The investigation could

not determine when during the airplane's history that the fuel selector handle was installed incorrectly or by whom.

Probable Cause and Findings

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

The failure to comply with an airworthiness directive by maintenance personnel and incorrect reinstallation of the fuel selector handle by unknown personnel, which resulted in fuel starvation.

Findings

Aircraft	Fuel selector/shutoff valve - Incorrect service/maintenance
Personnel issues	Replacement - Maintenance personnel
Personnel issues	Installation - Other

Factual Information

History of Flight

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

On June 13, 2013, about 1010 eastern daylight time, a Beech A23, N3542R, operated by a private individual, was substantially damaged during a forced landing to a wheat field, following a total loss of engine power during approach to Henderson-Oxford Airport (HNZ), Oxford, North Carolina. The commercial pilot and flight instructor incurred minor injuries. The personal flight was conducted under the provisions of 14 Code of Federal Regulations Part 91. Visual meteorological conditions prevailed and no flight plan was filed for the local flight that originated from HNZ about 1000.

The flight instructor reported that the commercial pilot had a medical condition for which his insurance carrier required him to fly with a certified flight instructor. The commercial pilot performed the preflight inspection of the airplane while the flight instructor retrieved headsets from a fixed based operator. As such, the flight instructor did not witness the preflight inspection. When the flight instructor returned, the commercial pilot told him there were 20 gallons of fuel in the left main fuel tank and "a lesser" quantity in the right main fuel tank, which was confirmed by the fuel gauges.

The airplane departed runway 24 uneventfully and the commercial pilot completed one touch-and-go landing. The flight instructor also completed one touch-and-go landing and then flew at an altitude about 2,000 feet above ground level toward a local navigational beacon for a practice instrument approach. About 1/2 mile from the beacon, the flight instructor noticed that the engine power decreased from 2,300 rpm to 2,000 rpm. The flight instructor performed a 180-degree turn back toward HNZ and noticed that during the turn, the engine power twice increased to 2,300 rpm, followed by a degrease to 2,000 rpm. At the completion of the turn, the engine lost all power.

While gliding toward the airport, the commercial pilot moved the fuel selector from the left main fuel tank position to the right main fuel tank position. Subsequently, the engine momentarily regained power to 2,000 rpm, but then lost all power again. The flight instructor turned on the boost pump and similarly the engine regained power to 2,000 rpm, followed by a total loss of power. The flight instructor was not able to glide the airplane to the airport and performed a forced landing to a field.

According to a Federal Aviation Administration (FAA) inspector, during the landing, the airplane impacted a berm and sustained substantial damage to the left wing and fuselage. The inspector observed that the right main fuel tank remained intact and did not contain any fuel. The left main fuel tank was compromised during the accident. About 2 gallons of fuel remained in the left main fuel tank; however, an undetermined amount of fuel leaked from the left wing after impact.

The wreckage was subsequently recovered to a hangar and examined under the supervision of an FAA inspector. The examination revealed that at some point in the airplane's history, the fuel selector handle had been reinstalled approximately 180 degrees from its correct orientation. As such, when the handle portion of the selector was pointing at the desired tank, the pointer (arrow) was pointing 180 degrees away from the desired fuel tank. The FAA inspector stated that the fuel selector handle was usually removed during maintenance inspections to facilitate access to the floor boards in the cockpit. Additionally, the fuel selector handle was missing its respective roll pin, which would allow it to be installed incorrectly. With the roll pin installed, the fuel selector handle could only be installed in one direction. When the left main fuel tank was selected, the fuel selector valve was actually positioned to the right main fuel tank. When the right main fuel tank was selected, the fuel selector valve was in the off position.

Review of the airplane owner's manual revealed that one 29.9-gallon capacity fuel tank was located in each wing. Due to the fuel return going to the left main fuel tank only, the owner's manual cautioned that 15 gallons must be used from the left fuel tank first. Therefore, the pilot primarily operated the airplane with the fuel selector positioned to the left main fuel tank.

Airworthiness directive (AD) 75-01-04 was issued by the FAA on January 7, 1975, to reduce the possibility of improper or unintentional movement of the fuel selector valve, prevent binding and ensure complete shutoff of the selector valve in the "Off" position. According to the FAA inspector that examined the wreckage, the AD was applicable to the accident airplane, and could have been complied with by either replacing a roll pin fuel selector valve with a D-handle valve, or inspecting the roll pin valve at every subsequent annual inspection per Beechcraft Service Instruction (SI) 0364-289 Rev III. An entry in the airframe logbook, dated April 2, 1975, stated that AD 75-01-04 was complied with by the installation of valve part number 169-380086-1(D-handle); however, an older roll pin valve was installed in the airplane at the time of the accident. Therefore, mechanics performing subsequent inspections would assume, per the logbook entry, that a newer D-handle valve had been installed and any reference to a roll pin fuel valve in the shop manual (maintenance manual) or SI would not be applicable as it was dated information and superseded by the AD.

Review of the airframe logbook revealed that the airplane's most recent annual inspection was completed on May 6, 2013. The airplane had accumulated about 1 hour of flight time since the most recent annual inspection. The FAA inspector interviewed the mechanic who completed the most recent annual inspection. That mechanic stated that he was not aware of a roll pin and there was no mention of a roll pin in the maintenance manual. The mechanic added that during the annual inspection, he removed and replaced the fuel selector handle to the same position he had found it. The FAA inspector further stated that the pilot had owned the airplane, which was manufactured in 1965, for 45 years and also performed some maintenance on it himself. The inspector could not be sure when during the airplane's history that the fuel selector handle was installed incorrectly or by whom.

Pilot Information

Certificate:	Commercial	**Age:**	81
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):	Airplane single-engine; Instrument airplane	**Toxicology Performed:**	No
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	January 3, 2012
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	March 1, 2011
Flight Time:	2220 hours (Total, all aircraft), 1900 hours (Total, this make and model), 2110 hours (Pilot In Command, all aircraft), 1 hours (Last 90 days, all aircraft), 1 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

Flight instructor Information

Certificate:	Commercial; Flight instructor	**Age:**	51
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 single-engine	**Toxicology Performed:**	No
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	October 31, 2011
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	September 9, 2011
Flight Time:	1088 hours (Total, all aircraft), 0 hours (Total, this make and model), 1025 hours (Pilot In Command, all aircraft), 140 hours (Last 90 days, all aircraft), 50 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	**Registration:**	N3542R
Model/Series:	A23	**Aircraft Category:**	Airplane
Year of Manufacture:	1965	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	M-710
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	May 6, 2013 Annual	**Certified Max Gross Wt.:**	2350 lbs
Time Since Last Inspection:	1 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	2201 Hrs as of last inspection	**Engine Manufacturer:**	CONT MOTOR
ELT:	C91 installed, not activated	**Engine Model/Series:**	IO-346
Registered Owner:	WEHE ALBERT H	**Rated Power:**	165 Horsepower
Operator:	WEHE ALBERT H	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	HNZ,526 ft msl	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	10:15 Local	**Direction from Accident Site:**	240°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	230°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.77 inches Hg	**Temperature/Dew Point:**	29°C / 22°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Oxford, NC (HNZ)	**Type of Flight Plan Filed:**	None
Destination:	Oxford, NC (HNZ)	**Type of Clearance:**	None
Departure Time:	10:00 Local	**Type of Airspace:**	

Airport Information

Airport:	Henderson-Oxford Airport HNZ	**Runway Surface Type:**	Asphalt
Airport Elevation:	526 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	24	**IFR Approach:**	None
Runway Length/Width:	5002 ft / 97 ft	**VFR Approach/Landing:**	Forced landing;Straight-in

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:**	36.361667,-78.529167(est)

Administrative Information

Investigator In Charge (IIC):	Gretz, Robert
Additional Participating Persons:	Clinton Festa; FAA/FSDO; Greensboro, NC
Original Publish Date:	June 2, 2014
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=87187