National Transportation Safety Board
Aviation Accident Final Report

Location:	Idaho Falls, ID	**Accident Number:**	WPR13LA416
Date & Time:	09/19/2013, 1553 MDT	**Registration:**	N191TP
Aircraft:	BEECH C90 - A	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (total)	**Injuries:**	1 Serious, 2 Minor
Flight Conducted Under:	Part 91: General Aviation - Business		

Analysis

The airplane was equipped with two main fuel tanks (132 usable gallons each) and two nacelle fuel tanks (60 usable gallons each). In normal operation, fuel from each nacelle tank is supplied to its respective engine, and fuel is automatically transferred from each main tank to its respective nacelle tank. While at the airplane's home airport, the pilot noted that the cockpit fuel quantity gauges indicated that the nacelle tanks were full, and he believed that the main tanks had fuel sufficient for 30 minutes of flight. The pilot did not verify by any other means the actual fuel quantity in any of the tanks. Thirty gallons of fuel were added to each main tank; they were not topped off. The airplane, with two passengers, then flew to an interim stop about 45 miles away, where a third passenger boarded. The airplane then flew to its destination, another 165 miles away. The pilot reported that, at the destination airport, he noted that the cockpit fuel quantity gauges indicated that the nacelle tanks were full; he surmised that the main fuel tanks were not empty but did not note the actual quantity of fuel. Forty gallons of fuel were added to each main tank. Again, the main tanks were not topped off, and the pilot did not verify by any other means the actual fuel quantity in any of the tanks.

The return flight to the interim stop was uneventful. The third passenger deplaned there, and the airplane departed for its home airport. While on final approach to the home airport, both engines stopped developing power, and the pilot conducted a forced landing to a field about 1.2 miles short of the runway. The pilot later reported that, at the time of the power loss, the fuel quantity gauges indicated that there was still fuel remaining in the airplane.

Postaccident examination of the airplane revealed that all four fuel tanks were devoid of fuel. The examination did not reveal any preimpact mechanical anomalies, including fuel leaks, that would have precluded continued flight.

The airplane manufacturer conducted fuel-consumption calculations for each of the two city pairs. Because the pilot did not provide any information regarding flight routes, altitudes, speeds, or times for any of the flight segments, the manufacturer's calculations were based on direct routing in zero-wind conditions, nominal airplane and engine performance, and assumed cruise altitudes and speeds. Although the results are valid for these input parameters,

variations in any of the input parameters can significantly affect the calculated fuel requirements. As a result, although the manufacturer's calculations indicated that the round trip would have burned less fuel than the total available fuel quantity that was derived from the pilot-provided information, the lack of any definitive information regarding the actual flight parameters limited the utility of the calculated value and the comparison.

The manufacturer's calculations indicated that the accident flight leg (from the interim airport to the home airport) would have consumed about 28.5 gallons total. Given that the airplane was devoid of fuel at the accident site, the pilot likely departed the interim airport with significantly less than the manufacturer's minimum allowable departure fuel quantity of about 39.5 gallons per side. The lack of any observed preimpact mechanical problems with the airplane, combined with the lack of objective or independently substantiated fuel quantity information, indicates that the airplane's fuel exhaustion was due to the pilot's inadequate and improper pre- and inflight fuel planning and procedures.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's inadequate preflight fuel planning, which resulted in departure with insufficient fuel to complete the flight, and consequent inflight power loss due to fuel exhaustion.

Findings

Aircraft	Fuel - Fluid level (Cause)
Personnel issues	Fuel planning - Pilot (Cause)

Factual Information

HISTORY OF FLIGHT

On September 19, 2013, about 1553 mountain daylight time, a Beech C90-A twin-turboprop airplane, N191TP, was substantially damaged when it impacted a field short of the runway at Idaho Falls Regional Airport (IDA), Idaho Falls, Idaho, during its final approach to the airport. The commercial pilot and one passenger received minor injuries, and one passenger received serious injuries. The airplane was owned and operated by WE FLY LLC of Idaho Falls. The business flight was conducted under the provisions of Title 14 Code of Federal Regulations Part 91. Visual meteorological conditions prevailed, and no Federal Aviation Administration (FAA) flight plan was filed for the flight.

According to the pilot, the airplane was based at IDA, and he and two passengers originated the day's flight sequence at IDA on the morning of the accident. The airplane was flown first to Pocatello Regional Airport (PIH), located about 45 nautical miles (nm) from IDA, where a third passenger boarded. The airplane then flew to Boise Air Terminal/Gowen Field (BOI), located about 165 nm from PIH, where the passengers deplaned to attend a meeting. About 5 hours after landing in BOI, the pilot and same passengers departed BOI for IDA, with an interim stop at PIH to drop off the one passenger. The flight from BOI to PIH was uneventful. The pilot and two remaining passengers reported that the flight from PIH to IDA was "bumpy" or "turbulent."

The pilot reported that when the airplane was on its final approach to runway 2 at IDA, a "master warning or caution" annunciator light illuminated, and the pilot was "pretty sure" that it was related to a fuel quantity/distribution issue. He stated that he then checked the fuel quantity gauges, and recalled that they indicated that the airplane still had fuel. He did not provide any elaborating information to the investigation regarding the fuel quantity or distribution in the airplane at the time of the event. The pilot did not recall anything else about the event, except that he "saw the ground coming up fast" and instructed his passengers to "hold on." One of the passengers recounted a similar version of the sequence of events.

PERSONNEL INFORMATION

FAA records indicated that the pilot held a commercial pilot certificate with airplane single- and multi-engine land ratings, and an instrument-airplane rating. According to information provided by the pilot, he had approximately 3,975 total hours of flight experience, including about 2,500 hours in the accident airplane make and model. His most recent flight review was completed in June 2013, and his most recent FAA first-class medical certificate was also issued in June 2013.

AIRCRAFT INFORMATION

FAA information indicated that the airplane was manufactured in 1989, and was equipped with two Pratt & Whitney Canada PT6A turboshaft engines.

Airplane manufacturer's information indicated that the airplane was equipped with one wing (main) fuel tank and one nacelle tank per side (left and right). The usable fuel quantity for each

main tank was 132 gallons, and the usable fuel quantity for each nacelle tank was 60 gallons, for a total usable fuel quantity of 384 gallons. In normal operation, fuel for each engine is supplied from its respective nacelle tank, and electrically-powered boost pumps automatically transfer fuel from each main tank to each respective nacelle tank. A cockpit-display annunciator light system indicates when fuel pressure in the transfer system drops to a pre-determined level, essentially indicating that the main tank no longer contains any usable fuel. The annunciator light bears the text "NO FUEL XFR."

The airplane was equipped with two fuel quantity indication gauges in the cockpit, one for each side of the airplane. A two-position switch was used to select the quantity displayed on the gauges; the switch positions would cycle the gauge display between either the amount of fuel in each of the nacelle tanks, or the total fuel (nacelle and main tanks) on each side of the airplane.

The airplane manufacturer's operating manual contained the following text in the Limitations section: "Do not take off if fuel quantity gages indicate in yellow arc or indicate less than 265 pounds in each wing system." This equates to a minimum takeoff fuel quantity of about 39.5 gallons per side.

METEOROLOGICAL INFORMATION

The IDA 1553 automated weather observation included wind from 210 degrees at 3 knots, visibility 10 miles, clear skies, temperature 17 degrees C, dew point 0 degrees C, and an altimeter setting of 30.19 inches of mercury.

COMMUNICATIONS

The airport was equipped with an air traffic control tower (ATCT), which was staffed and operating at the time of the accident. According to information provided by the FAA, the pilot first contacted IDA ATCT when the airplane was about 18 miles southwest of IDA; the pilot advised that he was operating under visual flight rules, and that he was inbound for landing with the appropriate airport arrival information. The controller asked the pilot whether he was "better set up" for left or right traffic for runway 20. The pilot responded that although he was better set up for right traffic for runway 20, he preferred runway 2. The controller advised the pilot of another arriving aircraft, and instructed the pilot to report when he was 5 miles south of the airport, which the pilot acknowledged.

After the other airplane landed, the controller queried the pilot of N191TP as to his current location. The pilot responded that he was 8 miles south of IDA. The controller cleared the pilot for a straight-in approach to, and landing on, runway 2, which the pilot acknowledged. However, the pilot then requested confirmation of the instructions. The controller advised the pilot that the airplane was in sight, and again cleared the pilot to land on runway 2. When the airplane was on about a 2-mile final, the controller advised the pilot to check that the landing gear was extended, which was a common practice at the IDA ATCT. The pilot did not acknowledge that transmission, or a subsequent one. The controller then observed the airplane yaw airplane-right, and descend to the ground, more than a mile short of the runway. The controller then alerted "crash fire rescue" via the "airport crash phone."

AIRPORT INFORMATION

According to FAA information, IDA was at an elevation of 4,744 feet above mean sea level. It was equipped with two paved runways, designated 2/20 and 17/35. Runway 2/20 measured 9,002 feet by 150 feet, and runway 17/35 measured 4,051 feet by 75 feet.

WRECKAGE AND IMPACT INFORMATION

The airplane impacted a level plowed field about 1.2 miles short of runway 2, struck an irrigation ditch and berm approximately perpendicular to the direction of travel, and came to rest about 60 feet beyond the ditch. The initial ground scars were located about 150 feet prior to the final resting point, and the ground scars and the airplane longitudinal axis were oriented approximately towards the runway. The airplane remained upright, and the landing gear and left propeller were separated from the airplane. The right engine was partially separated from the right wing, and the aft fuselage was buckled and torn. Landing gear damage was consistent with the gear being extended/down at the time of impact.

One nacelle tank was breached, but the other three fuel tanks were intact. The filler neck caps on all four tanks remained securely installed. The on-scene inspector stated that there was "no fuel observed" in either of the main tanks, and noted that the nacelle tanks "were both empty." The recovery personnel obtained a total of about 1/2 gallon of fuel from the airplane, and stated that there were no indications that "any significant" amount of fuel had leaked from the breached nacelle tank. There were no indications of pre- or post-impact fire.

ADDITIONAL INFORMATION

Airplane Fuel Loading

According to the pilot, prior to beginning the flight from IDA, he determined that the nacelle tanks were full, and that he then had 30 gallons added to each main tank. He did not visually determine the fuel quantities in any tanks; he based his determination of the nacelle tank fuel quantities on the fuel gauge indications.

The pilot reported that after landing at BOI, he again determined that the nacelle tanks were full, and that the main tanks were not empty. He based those determinations respectively on the fuel gauge indications, and the fact that the "NO FUEL XFER" annunciation light had not illuminated during the flight from PIH to BOI. The pilot then had 40 gallons added to each main tank while at BOI.

Although requested by the investigation, the pilot did not specifically report how much fuel was in each main tank, either before or after the addition of the fuel at IDA and BOI. The pilot's only statement regarding the fuel quantity in the main tanks was that "the wing tanks had about 30 minutes worth of fuel" prior to the initial upload at IDA, but he did not provide the basis for that assertion. The pilot stated that the airplane fuel consumption "averages" 70 gallons per hour.

The pilot did not provide any information regarding the onboard fuel quantity for the takeoff from PIH on the accident leg of the return trip.

Airplane Manufacturer's Fuel Consumption Estimate

In response to an NTSB request, the airplane manufacturer provided the estimated fuel consumption quantities for the two city pairs. The calculations assumed direct flights between the airports, a cruise altitude of 8,000 feet for the segment between IDA andPIH, and 12,000 feet for the segment between PIH and BOI. Those altitudes were suggested by the manufacturer as normal altitudes for the segment lengths. The calculations were predicated on direct routing, zero-wind, and nominal airplane and engine performance at normal cruise speeds.

Based on those conditions, the IDA-PIH segment would have consumed about 28.5 gallons, and the PIH-BOI segment would have consumed about 68.5 gallons. The calculated total fuel burn for the full round trip flight sequence was 194 gallons.

The manufacturer calculated that the segment between IDA and PIH would have taken 0.22 hours (about 13 minutes), and that the segment between PIH and BOI would have taken 0.74 hours (about 44 minutes). The calculations yielded a total one-way trip time of 0.96 hours (about 58 minutes), but did not did not include start-up or taxi allowances.

The manufacturer indicated that a visual flight rules fuel reserve of 30 minutes would have required about 46 gallons, which would result in a total trip fuel quantity requirement of 240 gallons.

Manufacturer's data indicated that for altitudes 12,000 feet and below, fuel consumption rates ranged between about 92 and 102 gallons per hour in cruise, and between about 104 and 120 gallons per hour in climb.

Fuel Consumption Quantity Reconciliation

No records regarding the actual flight times, routes, altitudes, speeds, or fuel quantities were provided for the investigation.

Calculations based on the pilot's statement that, prior to the first flight of the day, the main tanks contained about 30 minutes' worth of fuel, and his stated fuel consumption rate of 70 gallons per hour, yielded a pre-fueling main tank quantity estimate of about 35 gallons total.

Calculations based on the pilot's reported information of the initial main tank quantity (35 gallons), full nacelle tanks (120 gallons), and the two fuel uploads (140 gallons), indicated that a derived fuel quantity of 295 gallons was available for the overall round trip. That value was 55 gallons more than the airplane manufacturer's calculated required quantity (including reserves), and 101 gallons more than the manufacturer's estimated required quantity, excluding reserves.

The investigation derived an available fuel quantity for the return trip that was based on presumed near-empty main tanks (for conservatism), the pilot's report of full nacelle tanks, and the upload of 80 gallons. Based on those conditions, the calculated pre-departure minimum available fuel quantity for the return trip would have been 200 gallons.

History of Flight

Prior to flight	Preflight or dispatch event Aircraft servicing event
Approach-VFR pattern final	Loss of engine power (total) (Defining event)
Uncontrolled descent	Fuel exhaustion

Pilot Information

Certificate:	Commercial	**Age:**	35
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 1 Without Waivers/Limitations	**Last FAA Medical Exam:**	06/19/2013
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	06/25/2013
Flight Time:	3975 hours (Total, all aircraft), 2500 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	BEECH	**Registration:**	N191TP
Model/Series:	C90 - A	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Normal	**Serial Number:**	LJ1223
Landing Gear Type:	Retractable - Tricycle	**Seats:**	8
Date/Type of Last Inspection:	05/03/2013, Continuous Airworthiness	**Certified Max Gross Wt.:**	10500 lbs
Time Since Last Inspection:		**Engines:**	2 Turbo Prop
Airframe Total Time:	4468 Hours as of last inspection	**Engine Manufacturer:**	Pratt& Whitney
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	PT6A-135
Registered Owner:	WE FLY LLC	**Rated Power:**	750 hp
Operator:	WE FLY LLC	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	IDA, 4780 ft msl	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	1553 MDT	**Direction from Accident Site:**	20°
Lowest Cloud Condition:	Clear	**Visibility**	10 Miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	3 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	210°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.19 inches Hg	**Temperature/Dew Point:**	17°C / 0°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Pocatello, ID (PIH)	**Type of Flight Plan Filed:**	None
Destination:	Idaho Falls, ID (IDA)	**Type of Clearance:**	None
Departure Time:	1530 MDT	**Type of Airspace:**	

Airport Information

Airport:	Idaho Falls (IDA)	**Runway Surface Type:**	N/A
Airport Elevation:	4744 ft	**Runway Surface Condition:**	Dry; Rough; Soft
Runway Used:	N/A	**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Forced Landing; Straight-in

Wreckage and Impact Information

Crew Injuries:	1 Minor	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Serious, 1 Minor	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Serious, 2 Minor	**Latitude, Longitude:**	43.513611, 112.070556 (est)

Administrative Information

Investigator In Charge (IIC):	Michael C Huhn	**Report Date:**	10/05/2015
Additional Participating Persons:	Scott Hartley; FAA FSDO; Salt Lake City, UT		
Publish Date:	10/05/2015		
Note:	The NTSB did not travel to the scene of this accident.		
Investigation Docket:	http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=88087		