Aviation Investigation Final Report

Location:	Boonville, Missouri	**Accident Number:**	CEN15FA060
Date & Time:	November 30, 2014, 08:57 Local	**Registration:**	N6629V
Aircraft:	Bellanca 17-30A	**Aircraft Damage:**	Substantial
Defining Event:	Fuel starvation	**Injuries:**	1 Fatal, 3 Serious
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The commercial pilot was on a cross-country flight when the airplane encountered deteriorating weather conditions. A surviving passenger reported that the pilot decided to divert to a nearby airport. The airplane experienced a loss of engine power in the airport traffic pattern shortly after the pilot extended the landing gear during the base-to-final turn. The pilot was able to restore engine power briefly by advancing the throttle, but the engine quickly experienced a total loss of power. The passenger stated that the airplane entered an aerodynamic stall about 250 ft above the ground. The airplane subsequently impacted terrain in a near-level attitude. The pilot likely failed to maintain adequate airspeed following the loss of engine power, which resulted in the airplane exceeding its critical angle of attack and a subsequent aerodynamic stall at a low altitude.

A postaccident examination did not reveal any mechanical malfunctions that would have precluded normal engine operation; however, the right main fuel tank was void of any usable fuel, and the left main fuel tank contained about 1.5 gallons of usable fuel. Additionally, no fuel was recovered from the supply line connected to the fuel manifold valve, and only trace amounts of fuel were recovered from the engine-driven fuel pump outflow line. A first responder reported that the main fuel selector was positioned to draw fuel from the auxiliary fuel tanks. Although placarded for use during level flight only, both auxiliary fuel tanks contained sufficient fuel to maintain coverage over their respective outlet ports during maneuvering flight, and would have provided fuel to the engine. As such, it is likely that the main fuel selector was positioned to draw fuel from the right main fuel tank when the airplane initially experienced a loss of engine power due to fuel starvation. The pilot then likely switched to the right auxiliary fuel tank while attempting to restore engine power; however, there was likely insufficient time and altitude to re-establish fuel flow to the engine.

Although the airplane had experienced an alternator malfunction during the previous flight, a possible charging system failure would not have affected engine operation during the accident 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 maintain adequate airspeed during a forced landing following a total loss of engine power due to fuel starvation, which resulted in the airplane exceeding its critical angle of attack, and an aerodynamic stall at a low altitude. Contributing to the accident was the pilot's improper fuel management.

Findings

Personnel issues	Use of equip/system - Pilot
Aircraft	Fuel - Fluid management
Personnel issues	Aircraft control - Pilot
Aircraft	Angle of attack - Not attained/maintained

Factual Information

History of Flight

Approach-VFR pattern final	Fuel starvation (Defining event)
Approach-VFR pattern final	Loss of control in flight
Approach-VFR pattern final	Aerodynamic stall/spin

On November 30, 2014, about 0857 central standard time (CST), a Bellanca model 17-30A single-engine airplane, N6629V, was substantially damaged when it collided with terrain during landing approach to runway 36 at Jesse Viertel Memorial Airport (VER), Boonville, Missouri. The commercial pilot was fatally injured and his three passengers were seriously injured. The airplane was registered to and operated by the pilot under the provisions of 14 Code of Federal Regulations Part 91 without a flight plan. Day marginal visual meteorological conditions prevailed for the cross-country flight that departed Spirit of St. Louis Airport (SUS), Chesterfield, Missouri, about 0740, and was originally destined for Charles B. Wheeler Downtown Airport (MKC), Kansas City, Missouri.

The day preceding the accident, the pilot had flown from MKC to SUS. After landing, about 1207, the pilot told a fixed-base operator (FBO) line technician that he had a depleted battery because of an unspecified charging system malfunction. The pilot, who also was an aviation mechanic, removed the battery from the airplane to have it charged. About 1800, the pilot returned to the FBO with the recharged battery. After reinstalling the battery, the pilot started and ran the engine for about 5 to 7 minutes. Following the engine run, the pilot removed the cowling and began adjusting a subcomponent of the alternator control unit (ACU). After adjusting the ACU, the pilot performed another engine test run that lasted about 10 minutes. Following the second engine test run, the pilot told the FBO line technician that the airplane's ammeter was still showing a slight discharge while the engine was running, and that he was uncomfortable departing at night with a charging system issue. The pilot asked if he and his passengers could stay the night in the pilot's lounge so they could depart early the following morning. The pilot also asked for the airplane to be towed to the self-serve fuel pumps because he did not want to deplete the battery further with another engine start.

The pilot prepaid for 20 gallons of fuel at the self-serve fuel pump. According to the line technician, the pilot nearly topped-off the right inboard fuel tank with 13 gallons before switching over to the left inboard tank. Upon a visual inspection of the left inboard tank, the pilot told the line technician that it contained less fuel than he had expected. The pilot proceeded to add the remaining 7 gallons of the prepaid 20 gallons to the left inboard fuel tank. The line technician noted that after fueling the left inboard fuel tank, the fluid level was about 2 inches from the top of the tank. The pilot did not purchase any additional fuel and told the line technician that both outboard "auxiliary" fuel tanks were nearly full. The line technician then towed the airplane back to the ramp for the evening. The line technician reported that the airplane departed FBO ramp the following morning.

According to air traffic control (ATC) data, the first radar return for the accident flight was shortly after the airplane departed from runway 26L at 0740:50 (hhmm:ss). The airplane initially transmitted a visual flight rules (VFR) beacon code (1200) during accident flight. The plotted radar track revealed the

airplane flew west-northwest from SUS toward the planned destination. At 0751:03, the airplane stopped transmitting a 1200 beacon code and continued as a primary-only radar target. The location of the final 1200 code was about 21.5 miles west-northwest of SUS at 2,400 ft mean sea level (msl). The lack of a reinforced beacon return was consistent with the pilot turning the airplane transponder off. The primary-only radar track continued west-northwest at an unknown altitude. (The airplane's transponder transmits altitude data to the radar facility; a primary-only radar return does not include altitude data) At 0832:04, the airplane was still traveling west-northwest and was about 5 miles south of Jesse Viertel Memorial Airport (VER). At 0836:21, the airplane descended below available radar coverage about 11 miles west-southwest of VER. There was no radar coverage with the airplane for about 19 minutes. At 0855:30, the radar facility began tracking a VFR reinforced beacon return (1200) about 2.3 miles north of VER descending through 1,500 feet msl. The time and location of the radar returns are consistent with the accident flight maneuvering to land at VER. The airplane entered a left downwind for runway 36 at 1,200 feet msl. At 0856:49, the last recorded radar return was about 0.9 mile southwest of the runway 36 threshold at 1,100 feet msl (about 400 feet above the ground).

According to one of the surviving passengers, while enroute at an altitude of 2,000 to 3,000 ft msl, the airplane encountered a line of "dense clouds" near Sedalia, Missouri. The pilot attempted to navigate beneath the clouds, at an altitude of about 1,500 ft msl, before deciding to make a course reversal and divert to a nearby airport. The pilot told the passenger, who was seated in the forward-right seat, to be on the lookout for towers and obstructions because of their low proximity to the ground. The passenger reported that after flying east for a few minutes the pilot identified VER on his Apple iPad Mini. The flight approached the airport traffic pattern from the west and made a left base-to-final turn toward runway 36. The passenger reported that the landing gear extended normally. However, when the pilot reduced engine power, in attempt to reduce airspeed, the engine experienced a loss of power. The pilot was able to restore engine power briefly by advancing the throttle, but the engine quickly lost total power. The passenger reported that the pilot then began making rapid changes to the engine throttle and mixture control without any noticeable effect to engine operation. The passenger stated that as the pilot prepared for a forced landing the airplane encountered an aerodynamic stall about 250 ft above the ground. The passenger did not recall the airplane impacting the ground.

Pilot Information

Certificate:	Commercial; Flight instructor	**Age:**	63,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Lap only
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	April 11, 2014
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	November 12, 2014
Flight Time:	3036 hours (Total, all aircraft), 2955 hours (Pilot In Command, all aircraft), 10 hours (Last 90 days, all aircraft), 3 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

According to Federal Aviation Administration (FAA) records, the 63-year-old pilot held a commercial pilot certificate with single engine land, single engine sea, multiengine land, and instrument airplane ratings. He also held a flight instructor certificate with single engine, multiengine, and instrument airplane ratings. The pilot's last aviation medical examination was on April 11, 2014, when he was issued a third-class medical certificate with a limitation for corrective lenses. A search of FAA records showed no previous accidents, incidents, or enforcement proceedings. The pilot completed a flight review, as required by FAA regulation 61.56, on November 12, 2014, in a single-engine Cessna model 180 airplane.

The pilot's flight history was reconstructed using his pilot logbook and a computer spreadsheet. The last flight entry in the pilot logbook was dated January 8, 2012. The computer spreadsheet was last updated on November 16, 2014, at which time he had accumulated 3,036 hours total flight time, of which 2,955 hours were listed as pilot-in-command. He had accumulated 2,428 hours in single engine airplanes and 608 hours in multi-engine airplanes. Additionally, he had logged 43 hours in actual instrument meteorological conditions, 175 hours in simulated instrument meteorological conditions, and 233 hours at night.

According to available logbook documentation, the pilot had flown 19 hours during the previous 6 months, 10 hours during prior 90 days, and 3 hours in the month before the accident flight. According to a flight-monitoring website, FlightAware.com, the pilot had flown 1.3 hours during the 24-hour period preceding the accident flight.

Aircraft and Owner/Operator Information

Aircraft Make:	Bellanca	**Registration:**	N6629V
Model/Series:	17-30A	**Aircraft Category:**	Airplane
Year of Manufacture:	1970	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	30312
Landing Gear Type:	Retractable - Tricycle	**Seats:**	4
Date/Type of Last Inspection:	November 1, 2014 Annual	**Certified Max Gross Wt.:**	3325 lbs
Time Since Last Inspection:	5.2 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	2858.7 Hrs at time of accident	**Engine Manufacturer:**	Continental Motors
ELT:	C91 installed, not activated	**Engine Model/Series:**	IO-520-K
Registered Owner:	On file	**Rated Power:**	300 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The accident airplane was a 1970 Bellanca model 17-30A, Super Viking, serial number 30312. The Super Viking is a single-engine, low wing monoplane with an all-wood wing construction and a fabric covered steel-tube fuselage. A 300-horsepower Continental Motors model IO-520-K reciprocating engine, serial number 209048-70K, powered the airplane through a constant speed, three blade, Hartzell model HC-C3YF-1RF propeller. The airplane had a retractable tricycle landing gear, was capable of

seating the pilot and three passengers, and had a maximum gross weight of 3,325 pounds. The FAA issued the accident airplane a standard airworthiness certificate on October 23, 1970. The pilot purchased the airplane on July 5, 2014.

The airplane's recording tachometer meter indicated 621.4 hours at the accident site. The airframe and engine had accumulated a total service time of 2,858.7 hours. The engine had accumulated 1,429.7 hours since the last major overhaul completed on December 10, 1976. The engine had accumulated 206.1 hours since a top overhaul that was completed on December 8, 2007. The last annual inspection of the airplane was completed on November 1, 2014, at 2,853.5 total airframe hours. The airplane had accumulated 5.2 hours since the last annual inspection. A postaccident review of the maintenance records found no history of unresolved airworthiness issues.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	VER,715 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	08:55 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:		**Visibility**	10 miles
Lowest Ceiling:	Broken / 2600 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	13 knots / 16 knots	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:	310°	**Turbulence Severity Forecast/Actual:**	/ N/A
Altimeter Setting:	29.81 inches Hg	**Temperature/Dew Point:**	11°C / 7°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Chesterfield, MO (SUS)	**Type of Flight Plan Filed:**	None
Destination:	Kansas City, MO (MKC)	**Type of Clearance:**	None
Departure Time:	07:40 Local	**Type of Airspace:**	Class G

The National Weather Service (NWS) Surface Analysis Chart for 0900 CST depicted a strong cold front immediately east of the accident site. The front stretched across Missouri between the departure airport and the planned destination. The cold front was associated with a defined wind shift and low stratiform clouds behind the front. There were several weather stations located near the accident site that had surface visibility restrictions in fog and mist. Weather radar imagery did not depict any significant weather echoes in the area of the accident site; however, the weather radar did detect a fine line of very light intensity echoes associated with the cold front. Satellite imagery depicted a band of low stratiform clouds extending over the accident site westward through the Kansas City area. The cloud band was located along and behind the cold front. The NWS 12-hour Surface Prognostic Chart depicted a cold front along the planned route of flight, a strong pressure gradient behind the front supporting strong north-northwest winds, and an extensive portion of Missouri that had marginal visual flight rules (MVFR) weather conditions.

At 0855 CST, an automated surface weather observation station located at Jesse Viertel Memorial Airport (VER), Boonville, Missouri, reported: wind 310 degrees at 13 knots, gusting 16 knots; broken cloud ceilings at 2,600 ft above ground level (agl) and 3,400 ft agl, overcast ceiling at 4,100 ft agl; 10

mile surface visibility; temperature 11 degrees Celsius; dew point 7 degrees Celsius; and an altimeter setting of 29.82 inches of mercury.

At 0853 CST, the weather conditions at Sedalia Memorial Airport (DMO), located near where a passenger reported the accident flight had encountered a line of "dense clouds", included a broken ceiling at 1,700 ft agl, another broken ceiling at 2,400 ft agl, and an overcast ceiling at 3,000 feet agl.

At 0854 CST, a surface observation made at the planned destination (MKC), included instrument flight rules (IFR) weather conditions, including an 800 ft agl cloud ceiling and 4 miles surface visibility with mist.

A review of weather briefing requests made to Automated Flight Service Stations (AFSS) and Direct User Access Terminal Service (DUATS) vendors established that the pilot did not receive a formal weather briefing before departure.

Airport Information

Airport:	Jesse Viertel Memorial Airport VER	**Runway Surface Type:**	Asphalt
Airport Elevation:	715 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	36	**IFR Approach:**	None
Runway Length/Width:	4000 ft / 75 ft	**VFR Approach/Landing:**	Forced landing;Traffic pattern

The Jesse Viertel Memorial Airport (VER), located about 3 miles southeast of Boonville, Missouri, was served by a single runway: 18/36 (4,000 ft by 75 ft, asphalt). The airport elevation was 715 ft msl.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:	3 Serious	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal, 3 Serious	**Latitude, Longitude:**	38.935276,-92.684165

A postaccident examination revealed that the airplane impacted a harvested soybean field on a 305-degree magnetic heading. The initial point-of-impact consisted of three parallel depressions in the field that were consistent with the spacing of the airplane's three landing gear. The main wreckage was located about 24 ft from the initial point-of-impact in an upright position. The accident site was located along the extended runway centerline about 0.4 miles south of the runway 36 threshold. Flight control continuity was confirmed from the cockpit controls to the individual flight control surfaces. The wing

flaps were about 1/2 of their full deflection. The landing gear selector switch was in the DOWN position; however, all three landing gear assemblies had collapsed during the impact sequence. The main fuel selector was in the OFF position; however, a first responder had moved the fuel selector from the AUX position to OFF during rescue efforts. Additionally, the first responder turned the engine magneto/ignition key to OFF and disconnected the battery terminals after hearing the sound of an electric motor located under the floorboards. (The sound of an electric motor was later identified to be the electrohydraulic motor for the landing gear extension/retraction system.) The auxiliary fuel tank selector was in the RIGHT position. The electrical master switch was in the ON position. The digital transponder was in the ON/Altitude Encoding position. The electric fuel pump switch was in the OFF position. There were no anomalies identified during functional tests of the electric fuel pump and the aerodynamic stall warning system. The postaccident airframe examination revealed no evidence of a mechanical malfunction or failure that would have precluded normal operation.

The airplane was equipped with two inboard main fuel tanks and two outboard auxiliary fuel tanks. The reported capacity of each main fuel tank was 19 gallons, of which 15.5 gallons were usable per tank. The reported capacity of each outboard auxiliary fuel tank was 17 gallons; however, according to a cockpit placard, the auxiliary tanks were for use during level flight only. A visual examination of the four fuel tanks revealed no damage or evidence of a fuel leak. The left main tank contained about 5 gallons of fuel. The right main tank contained 3-1/2 pints of fuel. The left auxiliary tank was near its 17-gallon capacity. The right auxiliary tank contained about 11 gallons of fuel. There was no fuel recovered from the supply line connected to the inlet port of the engine-driven fuel pump; however, the gascolator drain had fractured during impact and there was evidence of a small fuel spill underneath the gascolator assembly at the accident site. There was a trace amount of fuel recovered from the engine-driven fuel pump outflow line. There was no fuel recovered from the fuel supply line connected to the fuel manifold valve.

The engine remained partially attached to the firewall by its engine mounts and control cables. Mechanical continuity was confirmed from the engine components to their respective cockpit engine controls. Internal engine and valve train continuity was confirmed as the engine crankshaft was rotated. Compression and suction were noted on all cylinders in conjunction with crankshaft rotation. The upper spark plugs were removed and exhibited features consistent with normal engine operation. Both magnetos provided spark on all leads when rotated. There were no obstructions between the air filter housing and the fuel control unit. The three blade propeller and crankshaft flange had separated from the engine. The propeller blades exhibited minor burnishing of the blade face and back. One blade appeared straight. Another blade exhibited a shallow S-shape bend along its span. The remaining blade was bent aft about midspan. The postaccident examination revealed no evidence of a mechanical malfunction or failure that would have precluded normal engine operation.

Medical and Pathological Information

On December 1, 2014, at the request of the Cooper County Coroner, the Boone/Callaway County Medical Examiner's Office located in Columbia, Missouri, performed an autopsy on the pilot. The cause of death was attributed to multiple blunt-force injuries sustained during the

accident. The FAA's Civil Aerospace Medical Institute located in Oklahoma City, Oklahoma, performed toxicology tests on samples obtained during the autopsy. The toxicological test results were negative for carbon monoxide, ethanol, and all drugs and medications.

Tests and Research

Four personal electronic devices were recovered at the accident site and sent to the National Transportation Safety Board (NTSB) Vehicle Recorders Laboratory in Washington D.C. for potential non-volatile memory (NVM) data recovery.

An examination of the pilot's Apple iPad Mini revealed it had the ForeFlight application installed. The application's map page displayed route information for a flight from SUS to MKC. The specifics of the flight included a calculated distance of 186 nautical miles between SUS and MKC, a calculated course of 281 degrees magnetic, an estimated time enroute of 1 hour 10 minutes (calculated using 160 knots true airspeed without the effect of winds aloft), and an calculated fuel consumption of 17.4 gallons. There was no track history for the accident flight; the option to record a track history was not selected for the accident flight. The most recent track history was for a flight completed on August 24, 2014. Further examination of the device established that the text messages, photos, and internet browser history did not contain any information pertinent information to the investigation. According to a passenger, the pilot had used the iPad Mini to navigate during the accident flight.

An examination of a passenger's Samsung Galaxy S III smartphone revealed that there were four photos taken during the accident flight between 0826:47 and 0831:51. During the five-minute period of recovered photos, the observed cloud cover near the airplane increased from clear skies to low-level, overcast stratocumulus clouds. Further examination of the device established that the text messages did not contain any information pertinent information to the investigation.

The remaining two devices, a Motorola Droid Smartphone and an Apple iPod Touch, did not contain any data pertinent to the accident investigation.

Additional Information

According to available air traffic control data, the accident flight was at least 1 hour 17 minutes in duration. According to the airplane's owner manual, the expected fuel consumption rate at 2,500 ft msl and 77-percent power was 16.1 gallons per hour. At 77-percent engine power, the accident airplane would have used at least 20.7 gallons of fuel; however, engine operation above 77-percent power and/or insufficient leaning would have consumed additional

fuel.

Administrative Information

Investigator In Charge (IIC):	Fox, Andrew
Additional Participating Persons:	Steven Davis; Federal Aviation Administration - Kansas City FSDO; Kansas City, MO Chris Lang; Continental Motors, Inc.; Mobile, AL
Original Publish Date:	March 8, 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=90432