Aviation Investigation Final Report

Location:	Hopkinsville, Kentucky	**Accident Number:**	ERA17FA180
Date & Time:	May 12, 2017, 11:52 Local	**Registration:**	N1804E
Aircraft:	Beech A36TC	**Aircraft Damage:**	Destroyed
Defining Event:	VFR encounter with IMC	**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The noninstrument-rated private pilot and the passenger were on a personal cross-country visual flight rules (VFR) flight in the airplane, and the pilot was in contact with air traffic control and receiving flight following services as he deviated due to weather along the route of flight. The pilot talked with a controller about diverting to a nearby airport, but he opted to continue, stating that the flight would likely be clear of the weather shortly based on the information he was receiving from his on-board equipment. Weather radar and satellite imagery indicated that the flight encountered instrument meteorological conditions (IMC) before it departed from controlled flight and entered a steep descent that continued to terrain impact. Examination of the airframe and engine did not reveal evidence of any preimpact mechanical malfunctions that would have precluded normal operation.

The pilot had received about 71 hours of simulated instrument flight training and had accumulated about 16 hours in actual instrument conditions, though his most recent instrument training flight was more than 1 year before the accident. The pilot's decision to continue VFR flight into IMC may have been influenced by an overreliance on his limited instrument training that led him to underestimate the difficulty of maintaining airplane control in actual instrument conditions. After the airplane entered IMC, the pilot likely experienced spatial disorientation and lost control of the airplane. Although the pilot was using two medications (imipramine and doxylamine) that may have affected his aeronautical decision-making and increased his susceptibility to spatial disorientation, it could not be determined whether effects from these drugs contributed to the accident.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The noninstrument-rated pilot's intentional visual flight rules flight into instrument meteorological conditions, which resulted in a loss of airplane control due to spatial disorientation. Contributing to the accident were the pilot's overreliance on his limited instrument training.

Findings

Personnel issues	Decision making/judgment - Pilot
Environmental issues	Below VFR minima - Decision related to condition
Aircraft	(general) - Not attained/maintained
Personnel issues	Aircraft control - Pilot
Personnel issues	Spatial disorientation - Pilot
Personnel issues	(general) - Pilot
Personnel issues	Recent instrument experience - Pilot
Personnel issues	Use of medication/drugs - Pilot

Factual Information

History of Flight

Maneuvering	VFR encounter with IMC (Defining event)
Maneuvering	Loss of control in flight
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On May 12, 2017, about 1152 central daylight time, a Beech A36TC, N1804E, impacted trees and terrain near Hopkinsville, Kentucky. The private pilot and the passenger were fatally injured, and the airplane was destroyed. The airplane was owned by Cremair LLC and operated by the pilot under the provisions of Title 14 *Code of Federal Regulations* (CFR) Part 91. Instrument meteorological conditions (IMC) prevailed in the accident area, and the flight was receiving visual flight rules (VFR) flight following services from air traffic control (ATC). The flight originated about 0942 from Davenport Municipal Airport (DVN), Davenport, Iowa, and was destined for Northwest Alabama Regional Airport (MSL), Muscle Shoals, Alabama.

According to Federal Aviation Administration (FAA) ATC audio and radar information, after takeoff, the airplane proceeded in a southeast direction and climbed to about 5,550 ft mean sea level (msl). About 1106, the airplane began to climb to about 7,500 ft msl while continuing in the southeast direction. About 1109, when the airplane was about 3 nautical miles (nm) east-northeast of Johnson City, Illinois, and about 7,500 ft msl, its heading changed to a northeast direction. The airplane remained on the northeast heading for about 3 minutes and then proceeded in an east-southeast direction while maintaining about 7,500 ft msl. The airplane remained on the east-southeast heading until about 1131, and then, when it was near Henderson, Kentucky, the airplane turned to a south heading. The airplane maintained about 7,500 ft msl until 1138 when it began descending.

The airplane continued to head south while descending, and about 1141, while southwest of Madisonville, Kentucky and in contact with Fort Campbell Approach, was provided the altimeter setting of 29.84, which he correctly read back. The pilot then advised the controller that he was descending out of 5,000 ft msl, and the controller asked if he wanted to land somewhere. The pilot replied, "yeah uh we're gonna hold for this weather I guess ah." The controller provided the name of Outlaw Field Airport (CKV), Clarksville, Tennessee, which had a full-service fixed base operator, and about 1145, the controller asked the pilot his intentions. At this time, the airplane was about 3,500 ft msl, and the pilot responded, "…uh I am not sure yet here um I need to get down a little bit more here to see what we got." The controller acknowledged and provided the pilot with the 1053 hourly weather observation at CKV, which included a ceiling at 1,100 ft above ground level (agl). The pilot replied, "alright we'll see if we can do that." (Recorded radar data was not available from 1146 to the time of the accident.)

About 1148, the pilot advised the controller, "yeah uh I am looking at my uh weather here, if I don't land here uh it looks like I will be clear here in just a little bit is that correct." The controller provided the pilot information that included a ceiling of 6,000 ft agl, a ceiling of 7,000 ft agl, the wind, and visibility at MSL; the ceiling at an airport in Nashville, Tennessee; and concluded by stating, "…so it looks like it's much clearer down south." The pilot informed the controller that he intended to climb to 3,500 ft

msl, and the controller responded that VFR climb was approved and asked the pilot what heading would be appropriate for weather avoidance. About 1149, the pilot replied, "uh I'd say southeast." The controller instructed the pilot to fly a heading of 150°, and the pilot acknowledged.

According to the Fort Campbell Approach controller, about 1149, he noticed that the airplane was maneuvering erratically; it was descending and "making a sharp turn to the left, a change in direction to the north." The airplane then climbed to 2,100 ft msl and turned back on course. At 1152, the track went into coast and eventually dropped off radar. The controller repeatedly attempted to contact the pilot, but there was no reply.

A witness who was outside near his residence about 1.4 nm east of the accident site reported hearing a "high revving engine sound." He could not see the airplane because it was in the clouds, but the sound indicated that the airplane was in a steep dive. He then saw the airplane beneath the low overcast clouds moving "horizontally" at a high rate of speed in a westerly direction. He heard an impact about 15 to 30 seconds later, reported the accident, and then drove to the area where he thought the airplane had crashed. He advised the property owner who conducted a search of his property and located the wreckage.

The witness further reported he could not tell the pitch and roll attitudes of the airplane but stated it, "looked basically flat" adding, that he only saw the airplane for a short period of time, and could not even tell what type of airplane it was. He did indicate that the weather conditions become worse, but there was no thunder or lightning about that time. He did not hear any abnormal engine sounds. He described the sound he heard being similar to the sound made when a friend of his performs aerobatic maneuvers. He thought the pilot was in trouble, adding the, "weather was tough at the moment."

According to the property owner, the weather conditions at the time consisted of mist and overcast clouds with no wind.

Pilot Information

Certificate:	Private	**Age:**	69,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	March 1, 2017
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	October 24, 2015
Flight Time:	726.7 hours (Total, all aircraft), 19 hours (Last 90 days, all aircraft), 4.6 hours (Last 30 days, all aircraft)		

The pilot, age 69, held a private pilot certificate with an airplane single-engine land rating that was issued on September 20, 1997. He held a third-class medical certificate with a limitation to wear corrective lenses that was issued on March 1, 2017.

A review of the pilot's logbook, which contained entries from March 17, 1997, to April 25, 2017, revealed that he had logged 726.7 hours of flight experience of which 19 hours were in the accident airplane in the last 90 days. Between December 1999 and April 8, 2016, he logged 16.4 hours actual instrument flight time of which 2.1 hours were as pilot-in-command (PIC), with the latest dated May 31, 2013. Of the 16.4 hours actual instrument flight time, 11.8 hours were accrued between December 1999 and April 2000, while the remainder of the flight time (4.6 hours) were accrued during 6 flights between May 22, 2013 and April 8, 2016. Between April 1997 and April 2000, he logged 80.1 hours simulated instrument time. The remainder of his simulated instrument time consisting of 1.6 hours was accrued during 2 separate flights, one in 2005 and one in 2009. Of his 81.7 hours logged simulated instrument time, 10.6 hours were as PIC. His last flight review in accordance with 14 CFR Part 61.56 occurred on either October 24 or 25, 2015, as documented in separate locations of his logbook. The flight review was conducted in a Cessna 177, and the flight duration was 2.5 hours.

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	**Registration:**	N1804E
Model/Series:	A36TC UNDESIGNAT	**Aircraft Category:**	Airplane
Year of Manufacture:	1981	**Amateur Built:**	
Airworthiness Certificate:	Utility	**Serial Number:**	EA-231
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	April 4, 2017 Annual	**Certified Max Gross Wt.:**	3650 lbs
Time Since Last Inspection:	15 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	3182.57 Hrs as of last inspection	**Engine Manufacturer:**	Continental
ELT:	Installed	**Engine Model/Series:**	TSIO-520-UB
Registered Owner:	On file	**Rated Power:**	300 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The six-place, low-wing airplane, serial number EA-231, was manufactured in 1981. It was powered by a 300-horsepower Continental Motors, Inc., TSIO-520-UB(2) engine and equipped with a constant-speed, three-bladed Hartzell propeller.

The airplane was equipped with a portable Garmin GPS receiver, a JPI EDM 700 engine data monitor, and an Appareo Stratus 2S wireless ADS-B receiver. All three devices sustained extensive impact damage, and no data pertaining to the accident flight could not be recovered from the devices.

The Stratus 2S device provided in-flight weather information via Flight Information System-Broadcast (FIS-B), GPS information, ADS-B traffic information, and was compatible with the ForeFlight Mobile App.

Review of the airplane's maintenance records revealed that its last annual inspection was completed on April 4, 2017, at a recorded tachometer time of 3,182.57 hours. The tachometer reading at the time of the accident was 3,197.84 hours.

According to the manager/registered agent of the corporation that owned the airplane, he last flew the airplane on May 4, 2017, on two separate flights lasting about 20 to 30 minutes each. He reported that on the first flight, when he attempted to "lean [the mixture] to lean of peak," the No. 5 cylinder would reach peak exhaust gas temperature (EGT) too soon and would run rough before the other cylinders had even reached peak EGT, but the engine ran fine when the mixture was full rich. On the second flight, he was able to lean the mixture to lean of peak and had no issues with the No. 5 cylinder EGT.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	HOP,571 ft msl	**Distance from Accident Site:**	16 Nautical Miles
Observation Time:	11:53 Local	**Direction from Accident Site:**	159°
Lowest Cloud Condition:		**Visibility**	10 miles
Lowest Ceiling:	Overcast / 1100 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	Unknown / Clear air
Wind Direction:	360°	**Turbulence Severity Forecast/Actual:**	Moderate / Unknown
Altimeter Setting:	29.84 inches Hg	**Temperature/Dew Point:**	18°C / 18°C
Precipitation and Obscuration:	Moderate - None - Drizzle		
Departure Point:	Davenport, IA (DVN)	**Type of Flight Plan Filed:**	Unknown
Destination:	Muscle Shoals, AL (MSL)	**Type of Clearance:**	VFR flight following
Departure Time:	09:42 Local	**Type of Airspace:**	

There was no record that the pilot obtained a preflight weather briefing using either Lockheed Martin Flight Service Station or DUATS.

According to ForeFlight personnel, the pilot did not request any weather briefings on or around May 12, 2017. The pilot viewed some weather imagery on May 11 and 12; the images that the pilot viewed were extended convective forecast products. There was no record that the pilot used Foreflight to view any other weather information, such as weather observations or forecasts, that would have provided cloud cover or cloud ceiling information along the route of flight.

An AIRMET advisory for IFR conditions in southwestern Kentucky and northern Tennessee was issued at 0945 and valid at the accident time for the accident site. A visible image from 1215 showed extensive cloud cover with tops about 32,000 ft msl around the accident site.

The Fort Campbell, Kentucky, Weather Surveillance Radar-1988, Doppler (WSR-88D) base reflectivity images indicated that the airplane flew through an area of 5 to 25 dBZ reflectivity values, corresponding to light precipitation, during the last 5 minutes of the flight. The 0.5° and 1.5° elevation scans detected reflectivity values above the accident site between 800 ft msl and 5,000 ft msl. The reflectivity values

increased in area and intensity above the accident site between 1140 and 1200.

A visible satellite image from 1215 showed extensive cloud cover around accident site. The cloud tops were around 32,000 ft msl.

The closest upper air sounding depicted the freezing level well above 10,000 ft.

At 1153, a special surface weather observation taken at Campbell Army Airfield, located 16 nm south-southeast of the accident site, reported wind 360° at 6 knots, 10 miles visibility, moderate drizzle, overcast ceiling at 1,100 ft agl, temperature and dew point 18°C, and altimeter setting 29.84 inches of mercury.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Fatal	**Latitude, Longitude:**	36.926109,-87.608612

The accident site was located in a wooded area near a house. Examination of the accident site revealed damage to trees and tree limbs consistent with a steep vertical descent. The descent angle between the tree contact height and the ground impact was about 53°. A ground scar associated with the left wing was oriented on a magnetic heading of 015°. Located inboard of the left-wing ground scar was a crater that contained components of the engine, airframe, landing gear, fuel tank bladder, and left wingtip with wing structure; immediately adjacent to the crater was the left elevator counterweight. Fuel blight was noted to the leaves of several trees immediately adjacent to the main wreckage. A 3.5-inch diameter tree trunk exhibited a smooth cut at a 45° angle consistent with being cut by a rotating propeller.

The main wreckage consisting of the fuselage, section of wing, and empennage with attached flight control surfaces was located immediately adjacent to the crater. Outlying components of the airplane were found near the main wreckage. None of the components exhibited any evidence of fire. All components, including primary and secondary flight controls, necessary to sustain flight remained attached or were found near the main wreckage. Flight control cable continuity was confirmed for roll, pitch, and yaw except where cut for recovery or tension overload failure. Both elevator trim cables exhibited tension overload in the cockpit area, and both elevator trim tab actuators were symmetrically extended about 1 inch, which equated to 10° trailing edge tab up or airplane nose down. All flight control surface counterweights remained attached or were accounted for.

Both wings were fragmented. Both flap actuators were extended about 2 inches, which equated to flaps retracted. The emergency locator transmitter was fragmented; the switch was in the off position; and the switch back was missing.

Examination of the landing gear push rods at the landing gear gearbox indicated that the landing gear were retracted. Examination of the autopilot system components revealed impact damage, but there was no evidence of preimpact failure or malfunction.

The engine was inverted, exhibited severe impact damage, and was attached to the airframe by wires and control cables. The crankshaft propeller flange was broken off the crankshaft and remained attached to the propeller. Examination of the engine and engine accessories revealed extensive damage, which precluded operational testing. Examination of the powertrain, valve train, exhaust, induction, lubrication, fuel metering, fuel injection, and ignition systems components revealed no evidence of preimpact failure or malfunction. The upper and lower spark plugs exhibited normal coloration and wear when compared with the Champion Aviation Check-A-Plug chart. The drive coupling of the engine-driven fuel pump was fractured, and there was no evidence of preimpact failure or malfunction. The fuel pump was disassembled with no anomalies noted to the internal components. The engine was equipped with two vacuum pumps, which were separated from the engine and located in the debris path. Both vacuum pump drives were intact, and neither pump could be turned by hand. The covers of both pumps were removed, and the rotors and vanes were found fractured into several pieces. Extensive impact damage was noted to the turbocharger, which exhibited compressor blade bending opposite the direction of rotation and rotational scoring on the housing of the turbine wheel.

Examination of the three-bladed propeller revealed that two blades remained secured in the hub, and the third blade was separated from the hub. One of the two blades secured in the hub was fractured about 2/3 span, and the fractured piece was recovered at the accident site. Examination of the pieces of the fractured blade revealed that the portion secured in the hub exhibited chordwise and spanwise scratches on the blade face, and the fractured piece exhibited heavy gouges on the aft side of the blade. Examination of other blade secured in the hub revealed that it exhibited a gentle radius forward bend, a gouge on the leading edge, and spanwise scratches on the aft side near the tip. The separated blade exhibited leading edge twist, slight aft bending, multiple gouges on the leading edge, and gouges on the aft side.

Medical and Pathological Information

The Office of the Chief Medical Examiner, Louisville, Kentucky, performed an autopsy of the pilot. The cause of death was reported as blunt force injuries.

The FAA Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, performed forensic toxicology testing on specimens from the pilot. According to the toxicology report, testing for carbon monoxide and cyanide was not performed, and no ethanol was detected in muscle or liver specimens. Unquantified amounts of atenolol, atorvastatin, desipramine, imipramine, and valsartan were detected in liver and/or muscle specimens, and 0.385 µg/ml and 0.083 µg/ml doxylamine were detected in liver and muscle specimens, respectively.

Imipramine is a tricyclic antidepressant commonly marketed with the name Tofranil. It carries the warning, "may impair mental and/or physical ability required for the performance of potentially hazardous tasks (e.g., driving, operating heavy machinery)." Doxylamine is a sedating antihistamine

available over the counter in several products for colds, allergies, or to induce sleep. Atenolol and valsartan are prescription medications for blood pressure, and atorvastatin is a cholesterol lowering agent. None of these three medications are generally considered impairing.

Additional Information

According to the FAA's General Aviation Safety Enhancement Fact Sheet on Spatial Disorientation, pilots flying under both instrument and visual flight rules are subject to spatial disorientation and optical illusions that may cause a loss of aircraft control. Sight, supported by other senses, allows a pilot to maintain orientation while flying. However, when visibility is restricted (i.e., no visual reference to the horizon or surface detected) the body's supporting senses can conflict with what is seen. When this spatial disorientation occurs, sensory conflicts and optical illusions often make it difficult for a pilot to tell which way is up.

Contributing to these phenomena are the various types of sensory stimuli: visual, vestibular (organs of equilibrium located in the inner ear), and proprioceptive (receptors located in the skin, muscles, tendons and joints). Changes in linear acceleration, angular acceleration, and gravity are detected by the vestibular system and the proprioceptive receptors, and then compared in the brain with visual information. In a flight environment, these stimuli can vary in magnitude, direction, and frequency, resulting in a sensory mismatch that can produce illusions and lead to spatial disorientation.

Administrative Information

Investigator In Charge (IIC):	Monville, Timothy
Additional Participating Persons:	Stephen Travis; FAA/FSDO; Louisville, KY Ricardo J Asensio; Textron Aviation; Wichita, KS Christopher Lang; Continental Motors, Inc.; Mobile, AL
Original Publish Date:	February 26, 2019
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=95162