Aviation Investigation Final Report

Location:	Thompson's Station, Tennessee	**Accident Number:**	WPR18FA053
Date & Time:	December 21, 2017, 13:07 Local	**Registration:**	N929GB
Aircraft:	BROWNING GREGORY S ZODIAC 601XL	**Aircraft Damage:**	Substantial
Defining Event:	VFR encounter with IMC	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The sport pilot was picking up his airplane following maintenance and intended to return the airplane to its base 57 nautical miles away. The owner of the maintenance facility cautioned the pilot about the weather along the route of flight and stated that the conditions at the departure airport included overcast clouds at 400 ft above ground level (agl). The pilot replied that the weather was improving and that he was familiar with the area. There was no record of the pilot having obtained a weather briefing prior to departure. The maintenance facility owner watched as the pilot subsequently took off from a taxiway and made a steep left banking turn to depart on course to his destination. About 25 minutes after departure, a witness saw the airplane flying between 150 and 200 ft agl with the engine running at a high-power setting.

The airplane impacted trees and terrain about 34 nautical miles from the departure airport and oriented toward the departure airport. A nearby resident stated that the weather in the area at the time of the accident included low clouds about treetop level with very limited visibility. Review of reported weather conditions from nearby airports about the time of the accident revealed cloud ceilings ranging between 400 ft and 1,400 ft agl.

Examination of the airplane and engine revealed no mechanical anomalies that would have precluded normal operation. The pilot's decision to depart and continue flight in instrument meteorological conditions resulted in controlled flight into terrain. As the airplane impacted a stand of trees in a wings-level attitude prior to impact with the ground, this supports the position of controlled flight into terrain rather than that of spatial disorientation.

Autopsy of the pilot revealed evidence of severe cardiovascular disease with an implanted defibrillator; however, interrogation of the pacemaker revealed no anomalies and it is unlikely that the pilot's cardiovascular disease contributed to the accident. Toxicology testing revealed that the pilot had used a potentially impairing medication, clonazepam, at some time before the accident; however, the blood

level was well below the therapeutic and impairing level and therefore did not affect the pilot's decision-making or directly contribute to the accident.

The pilot's physician documented a caregiver's concerns for the pilot's impulsive behavior and difficulty remembering where he was while driving. The pilot's actions and decision to attempt to fly his airplane in poor weather conditions that exceeded his skill and ability are consistent with the reported impulsive behavior. Review of the pilot's medical history was unable to determine whether the pilot's baseline history of poor decision-making and airmanship as assessed by a previous flight instructor was solely responsible for the circumstances leading up to the accident, or the assessment of his impulsive decision-making by undiagnosed neuropsychiatric deficit, contributed to the circumstances of this accident.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The sport pilot's decision to depart in and continue flight in instrument meteorological conditions, which resulted in controlled flight into terrain.

Findings

Personnel issues	Decision making/judgment - Pilot
Environmental issues	Below VFR minima - Decision related to condition
Environmental issues	Below VFR minima - Effect on personnel
Personnel issues	(general) - Pilot

Factual Information

History of Flight

Takeoff	VFR encounter with IMC (Defining event)
Maneuvering	VFR encounter with IMC
Maneuvering	Loss of visual reference
Maneuvering	Controlled flight into terr/obj (CFIT)

On December 21, 2017, about 1307 central standard time, a Zodiac 601XL experimental, amateur-built airplane, N929GB, was substantially damaged when it impacted terrain while maneuvering at low altitude near Thompson's Station, Tennessee. The sport pilot sustained fatal injuries. The airplane was owned by the pilot, who operated it as a Title 14 *Code of Federal Regulations* Part 91 personal cross-country flight. Instrument meteorological conditions prevailed at the time of the accident, and no flight plan was filed for the flight, which departed Bomar Field-Shelbyville Municipal Airport (SYI), Shelbyville, Tennessee, about 1230, with an intended destination of Whifferdill Airport (TN77), Chapmansboro, Tennessee.

According to a family member, the pilot completed the 57-nautical-mile flight from TN77 to SYI a few weeks earlier to have an autopilot system installed in the airplane. On the day of the accident, the family member drove the pilot to SYI so the pilot could fly the airplane back to TN77. The owner of the maintenance facility where the work was completed stated that he was surprised to see the pilot, as the pilot had not informed him of his intention to pick up the airplane that day. Additionally, the weather conditions were well below visual flight rules (VFR) minimums. The maintenance facility owner asked the pilot if he had looked at the weather, to which the pilot replied that it was improving, and it would be fine. The maintenance facility owner then informed the pilot that the current weather at SYI was 400 ft overcast and not good for flying and that Nashville, located almost directly between SYI and TN77, was reporting the same. When he suggested that the pilot come back and get the airplane after the weather had improved, the pilot replied, "No. I will get it today. The weather is fine, and I know the area I am flying to." The owner subsequently assisted the pilot with fueling the airplane; airport records revealed that the pilot purchased 8.5 gallons of 100LL aviation fuel.

The maintenance facility owner saw the pilot board the airplane; after starting the engine, the pilot taxied the airplane away from the ramp, then turned the airplane onto the taxiway. The pilot did not perform a pretakeoff engine run up. He advanced the throttle to full power, and, about 3 to 4 seconds later, as the airplane accelerated in its takeoff roll, the maintenance facility owner saw dust flying and heard the airplane rattling loudly as it departed the left side of the taxiway into the grass; the airplane continued through the grass. The maintenance facility owner reported that, during the departure, "…the engine sounded to be running wide open." He heard "a very loud bang" just before the airplane became airborne, as if the airplane had hit something. During the initial climb, the airplane entered a very high nose-up attitude and appeared to be "wallowing" left and right. The maintenance facility owner also stated that, at this time, he could clearly see something venting from the left wing, which he thought may have been fuel. As the airplane continued to climb, its nose lowered, and it gained speed as it

proceeded south at low altitude. Before reaching the south end of the runway, the airplane entered a steep left turn at an altitude about 200 ft above ground level (agl) while reversing course to a northwest heading.

A witness about 0.3 mile north of the accident site reported that he saw a small, white airplane with red trim flying west about 1/4-mile ahead of him. The witness stated that the airplane had just cleared the high-tension power lines that cross the highway between 150 ft and 200 ft agl. When he first observed the airplane, it was flying northeast to southwest, parallel to and directly above the highway. As the airplane flew over his location, he heard the engine running at high rpm as the airplane continued to fly toward the west. The witness mentioned that, at this time, he saw the airplane dip slightly then pull up in a banking turn; he was not sure which direction it was turning.

About 35 minutes after departing SYI, the airplane impacted a stand of trees and terrain about 35 nautical miles northwest of SYI on a magnetic heading of about 120°. The airplane came to rest upright and mostly intact just off a rural residential road, on a magnetic heading about 130°. A first responder who lived nearby reported that she heard a very loud noise outside of her residence, after which she saw that an airplane had crashed. She stated that the weather in the area at the time of the accident consisted of low clouds about treetop level with very limited visibility.

Pilot Information

Certificate:	Sport Pilot	**Age:**	78,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Sport pilot With waivers/limitations	**Last FAA Medical Exam:**	April 4, 2005
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	1000 hours (Total, all aircraft), 10 hours (Total, this make and model)		

The sport pilot had previously possessed a private pilot certificate, which he surrendered in 2012 following an airplane accident. His most recent Federal Aviation Administration third-class medical certificate was issued on April 4, 2005, with a limitation for corrective lenses and that the certificate was not valid for night flying or by color signal control. On the application for that certificate, the pilot reported 1,000 total hours of flight experience, with 25 hours in the previous 6 months.

A flight instructor, who reported that the accident pilot contacted him for transition training in the accident airplane, stated that he provided the pilot 2 hours of training over a 2-week period in November 2016. The next time he saw the pilot was on February 15, 2017, when he was again scheduled for training. When the pilot arrived, instead of doing the training as scheduled, the pilot stated that he was taking the airplane home; the instructor told him that was not a good idea. Two hours later, the pilot called the instructor to inform him that he had made it home. The instructor stated that he typically

requires 5 hours of transition training for a signoff, which the pilot did not want to pay for. The instructor stated, " He was behind the airplane; it was too fast for him. He could not judge distance, and he was always cutting the [traffic] pattern short and low."

Aircraft and Owner/Operator Information

Aircraft Make:	BROWNING GREGORY S	**Registration:**	N929GB
Model/Series:	ZODIAC 601XL XL	**Aircraft Category:**	Airplane
Year of Manufacture:	2009	**Amateur Built:**	Yes
Airworthiness Certificate:	Experimental (Special); Special light-sport (Special)	**Serial Number:**	66785
Landing Gear Type:	Tricycle	**Seats:**	2
Date/Type of Last Inspection:	October 10, 2017 Condition	**Certified Max Gross Wt.:**	1300 lbs
Time Since Last Inspection:	1 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	541.5 Hrs as of last inspection	**Engine Manufacturer:**	JABIRU
ELT:	C91A installed, activated, did not aid in locating accident	**Engine Model/Series:**	3300A
Registered Owner:	On file	**Rated Power:**	160 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The accident airplane was a two-seat, side-by-side, low-wing, tricycle-gear airplane with a maximum gross weight of 1,300 lbs and an empty weight of 695 lbs. The airplane was equipped with two wing fuel tanks with a total capacity of 24 gallons. According to maintenance records, the airplane's most recent condition inspection was performed on October 10, 2017, at a total time of 541.5 hours.

The airplane was also equipped with a Jabiru 3300A, six-cylinder, horizontally opposed, air-cooled, direct-drive, reciprocating engine, serial number 33A1341, capable of developing 120 horsepower at 3,300 rpm. It was also equipped with a Sensenich 2-blade propeller, model W64ZK49. The engine had accumulated about 541.5 hours total time since the most recent condition inspection.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	BNA,600 ft msl	**Distance from Accident Site:**	26 Nautical Miles
Observation Time:	13:03 Local	**Direction from Accident Site:**	44°
Lowest Cloud Condition:	Unknown	**Visibility**	10 miles
Lowest Ceiling:	Overcast / 100 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	9 knots /	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	120°	**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	30.03 inches Hg	**Temperature/Dew Point:**	13°C / 11°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Shelbyville, TN (SYI)	**Type of Flight Plan Filed:**	None
Destination:	Chapmansboro, TN (TN77)	**Type of Clearance:**	None
Departure Time:	12:30 Local	**Type of Airspace:**	Class G

The Surface Analysis Chart for 1200 showed a west-to-east-oriented stationary front in northern Tennessee immediately north of the accident location. Station models in the area identified overcast sky conditions and generally southerly winds of 10 knots or less; some models denoted dew point depressions of 0°C.

An Automated Weather Observing System (AWOS) located at SYI, about 34 miles southeast of the accident site at an elevation of 800 ft indicated overcast ceilings between 1,100 and 1,400 ft agl, visibilities of 10 statute miles or greater, and dew point depressions of 2°C during the times surrounding the accident.

An AWOS located at Maury County Airport (MRC), Columbia, Tennessee, about 17 miles south-southwest of the accident site at an elevation of 681 ft indicated overcast ceilings between 400 and 600 ft agl, visibilities from 7 statute miles to 10 statute miles or greater, and dew point depressions of 0°C during the times surrounding the accident.

Weather observations from John C. Tune Airport (JWN), Nashville, Tennessee, about 23 miles north-northeast of the accident location at an elevation of 501 ft, identified overcast ceilings between 600 and 800 ft agl, visibilities from 8 to 10 statute miles or greater, and dew point depressions of 1°C and 2°C during the times surrounding the accident.

An Area Forecast Discussion (AFD) was issued at 1147 by the NWS Weather Forecast Office in Nashville, Tennessee. The Aviation section of that AFD stated:

Widespread IFR ceilings have been slow to lift and expected to generally remain this way, although some breaks into MVFR are likely later this afternoon, at least for a few hours. IFR expected to redevelop later this evening and overnight ahead of precipitation that will overspread the region early Friday. This activity will initially begin light, possibly as drizzle, then increase in intensity by late

Friday morning and last through much of the day and evening. Prolonged IFR or LIFR is likely through this time.

(For additional information, refer to the NTSB Weather Study, which is appended to the docket for this accident.)

There was no record of the pilot having obtained a weather briefing prior to departure.

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:**	35.819168,-87.046943

The airplane came to rest intact except for the main landing gear and some small pieces of fuselage. First responders reported the presence of fuel upon initial arrival at the accident site.

The initial impact point was a stand of trees about 60 ft high and about 115 ft northwest of the main wreckage site. The second impact point, about 35 ft southeast of the first impact point, was with another stand of trees about 40 ft high. The airplane subsequently came to rest upright in an open field next to a residential rural dirt road.

Postaccident examination of the airframe and engine revealed no mechanical anomalies that would have precluded normal operation.

An iFLY 740 portable GPS, serial number VH16050313, and a Lowrance AIRMAP 1000 GPS receiver, serial number 100660358, were sent to the NTSB Vehicle Recorder Division for examination and potential data download.

Examination of the iFLY 740 revealed that data extracted from the unit included about 3 minutes 39 seconds of the accident flight data. The data corresponded to the flight's takeoff, but the recording ended shortly thereafter, possibly due to the device being powered off.

The Lowrance AIRMAP 1000 contained data from 41 previous flights, none of which were associated with the accident.

Medical and Pathological Information

The Office of the Medical Examiner, Center for Forensic Medicine, Nashville, Tennessee, conducted an autopsy on the pilot. The cause of death was determined to be "multiple blunt force injuries." The autopsy revealed a significantly enlarged heart with left ventricular and septal hypertrophy. Additionally, the pilot had significant coronary artery disease with a stent in the right coronary artery. The mid left circumflex coronary artery showed up to 75% narrowing and the mid left anterior descending and proximal first diagonal coronary arteries each showed 50% and 60% narrowing, respectively. Interrogation of a Medtronic implanted defibrillator did not identify evidence of a heart rhythm that would have resulted in defibrillation around the time of the accident.

Toxicology testing performed at the FAA's Forensic Sciences Laboratory was negative for ethanol and carbon monoxide. Testing for drugs revealed the following: Naproxen was detected in urine; metoprolol, rosuvastatin were detected in urine and blood; clonazepam was detected in urine and blood; 0.019 (µg/mL, µg/g) amino-clonazepam (7-) was detected in blood and a nonquantified amount was in urine; 0.332 (µg/mL, µg/g) sertraline was detected in blood and a nonquantified amount was in urine; 0.418 (µg/mL, µg/g) desmethylsertraline was detected in blood and a nonquantified amount was in urine, and clopidogrel detected in blood and urine.

Naproxen is a non-narcotic pain medication, metoprolol is a blood pressure medication, clopidogrel is a blood thinner, and sertraline is an antidepressant. These medications are generally considered not to be impairing. The potentially impairing Schedule IV benzodiazepine (clonazepam) and its metabolite were detected below quantifiable/therapeutic levels.

On September 18, 2017, the pilot's family physician worked with the pilot's caregiver to coordinate rehabilitation care due to weakness following a knee replacement. The patient was not present for the evaluation, but the caregiver, stated that the pilot was often short-tempered and impulsive, would occasionally hear something that no one else did, and needed help with directions while driving along a route that he traveled many times. Based on this history, the physician wrote in the pilot's medical record that the pilot had possible early dementia with heightened impulsivity. The physician referred the pilot to a rehabilitation center and prescribed 0.5 mg clonazepam with up to 2 pills every 12 hours. The patient terminated care with the physician's office on October 11, 2017, when he was told the physician was not available to refill medications; no additional primary care treatment records were available.

Records from the rehabilitation center from September 20 through October 4, 2017, were reviewed. The pilot was admitted due to progressive weakness at home following his total knee replacement. During his stay, he underwent physical therapy and his strength and mobility improved. He was noted to have anxiety treated with clonazepam. Neurologic and psychiatric examinations during his rehabilitation documented no abnormalities; however, the pilot declined a formal neuropsychiatric evaluation during his rehabilitation stay. He was discharged to outpatient physical therapy. No additional post-rehabilitation progress or neuro-psychiatric evaluations were available.
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Preventing Similar Accidents

Reduced Visual References Require Vigilance (SA-020)

The Problem

About two-thirds of general aviation accidents that occur in reduced visibility weather conditions are fatal. The accidents can involve pilot spatial disorientation or controlled flight into terrain. Even in visual weather conditions, flights at night over areas with limited ground lighting (which provides few visual ground references) can be challenging.

What can you do?

- Obtain an official preflight weather briefing, and use all appropriate sources of weather information to make timely in-flight decisions. Other weather sources and in-cockpit weather equipment can supplement official information.
- Refuse to allow external pressures, such as the desire to save time or money or the fear of disappointing passengers, to influence you to attempt or continue a flight in conditions in which you are not comfortable.
- Be honest with yourself about your skill limitations. Plan ahead with cancellation or diversion alternatives. Brief passengers about the alternatives before the flight.
- Seek training to ensure that you are proficient and fully understand the features and limitations of the equipment in your aircraft, particularly how to use all features of the avionics, autopilot systems, and weather information resources.
- Don’t allow a situation to become dangerous before deciding to act. Be honest with air traffic controllers about your situation, and explain it to them if you need help.
- Remember that, when flying at night, even visual weather conditions can be challenging. Remote areas with limited ground lighting provide limited visual references cues for pilots, which can be disorienting or render rising terrain visually imperceptible. When planning a night VFR flight, use topographic references to familiarize yourself with surrounding terrain. Consider following instrument procedures if you are instrument rated or avoiding areas with limited ground lighting (such as remote or mountainous areas) if you are not.
- Manage distractions: Many accidents result when a pilot is distracted momentarily from the primary task of flying.

See https://www.ntsb.gov/Advocacy/safety-alerts/Documents/SA-020.pdf for additional resources.

The NTSB presents this information to prevent recurrence of similar accidents. Note that this should not be considered guidance from the regulator, nor does this supersede existing FAA

Regulations (FARs).

Administrative Information

Investigator In Charge (IIC):	Little, Thomas
Additional Participating Persons:	Lynn Heath; Federal Aviation Administration; Nashville, TN Thomas Lenne; Australian Transport Safety Board; Civi Square ACT 2608
Original Publish Date:	December 16, 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=96528