



AVIATION



HIGHWAY



MARINE



RAILROAD



PIPELINE

Aviation Investigation Final Report

Location:	Brownstown, Indiana	Accident Number:	ERA19LA022
Date & Time:	October 20, 2018, 00:30 Local	Registration:	N5581Z
Aircraft:	Piper PA22	Aircraft Damage:	Destroyed
Defining Event:	Loss of engine power (total)	Injuries:	1 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The student pilot was conducting a night, solo, cross-country flight, and while en route with the landing and taxi lights on, the cockpit panel lights on bright, and his cell phone and tablet charging from the electrical system, the airplane lost all electrical power, followed by the loss of all engine power. Subsequently, the student cycled both the electrical system master switch and the engine magneto switch twice, but electrical and engine power were not restored. The student navigated to a dark area below the airplane's flightpath hoping it was an open field, but the airplane subsequently impacted a heavily wooded area and then came to rest upright. The student was not injured, but the airplane was destroyed.

The airplane's electrical system was equipped with a master switch that when turned on, routed all power through either a main or spare fuse. Postaccident examination of the airplane revealed that the when the master switch was positioned to the spare fuse position the electrical system would not turn on because spare fuse had blown. The main fuse was intact, and when the electrical system was activated by toggling the master switch to the main fuse position, the electrical components powered on normally.

Based on the student's account of the flight and the blown spare fuse, it is possible that, during the flight, the electrical load drew an excessive current through the selected spare fuse, which resulted in it blowing and interrupting electrical power. The student's reported inability to restore electrical power by selecting the main fuse with the master switch could not be duplicated during postaccident testing. Further, postaccident examination of the engine did not reveal any evidence of preimpact mechanical malfunctions or failures that would have precluded normal operation. The reason for the loss of engine power could not be determined. The investigation determined that the student had not received a flight endorsement for the solo flight; thus, he should not have been conducting the flight; however, having an endorsement would not have better prepared the student to deal with the reported engine issue.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The total loss of engine power for reasons that could not be determined because postaccident examination of the engine revealed no mechanical malfunctions or failures that would have precluded normal operation. Contributing to the outcome was the student pilot's improper decision to conduct a solo cross-country flight at night, which resulted in the airplane being destroyed when it impacted a wooded area that the student thought was an open field.

Findings

Not determined	(general) - Unknown/Not determined
Personnel issues	Decision making/judgment - Student/instructed pilot
Environmental issues	Dark - Effect on personnel

Factual Information

History of Flight

Enroute-cruise	Electrical system malf/failure
Enroute-cruise	Loss of engine power (total) (Defining event)
Enroute-cruise	Attempted remediation/recovery
Enroute-cruise	Collision with terr/obj (non-CFIT)

On October 20, 2018, about 0030 eastern daylight time, a Piper PA-22-108, N5581Z, was substantially damaged when it impacted wooded terrain during a forced landing near Brownstown, Indiana. The student pilot was not injured. The airplane was operated by the pilot under the provisions of Title 14 Code of Federal Regulations Part 91. Night visual meteorological conditions prevailed at the accident site, and no flight plan was filed for the flight, which departed from Indianapolis Metropolitan Airport (UMP), Indianapolis, Indiana, on October 19, 2018, about 2230.

According to the student pilot, he departed from his home airport of Crossville Memorial Airport-Whitson Field (CSV), Crossville, Tennessee, about 0730 on October 19, 2018, destined for UMP. He reported that the flight was uneventful, and he had the fuel tank topped off when he arrived at UMP. He spent the remainder of the day in the Indianapolis area for business. About 2230, after a normal preflight inspection and run-up, he departed to return to CSV.

While enroute, about 60 miles south of UMP flying southbound at 3,000 ft mean sea level, he had just completed maneuvering around restricted airspace, and suddenly the airplane lost all electrical power. He stated in an "instant" everything went "black." Then, a few seconds later, the "engine just went quiet." He reported that he cycled the master electrical switch "up and down" from the spare fuse to the main fuse, and the engine starter switch from the both to off position a "couple of times," but power was not restored to either system. He reported that it was "very dark" when the failure occurred, and the only light he could see inside the cockpit was from his dimmed tablet computer. He subsequently navigated to a dark area below his flight path, hoping that it was an open field. The airplane impacted a heavily wooded area, and just prior to impact, he observed 68 knots groundspeed displayed on his tablet computer.

The student pilot reported that his flight instructor was not aware of his solo cross-country flights, nor had his instructor provided him with logbook endorsements for the solo cross-country flights.

An airframe and powerplant mechanic reported that the student pilot discussed the accident flight with him, two days after the event. The mechanic reported that the student pilot told him, while enroute with the landing and taxi lights on, the cockpit panel lights on bright, and his cell phone and tablet charging from the airplane's electrical system, the cockpit suddenly went black. In response, he said that he reached up and turned the magneto switch off. The student said the propeller was spinning at this time. The student said he subsequently moved the electrical master switch's position, and the magneto switch's position, but electrical power, nor engine power, were restored.

According to a Federal Aviation Administration (FAA) inspector who examined the airplane at the accident site, the airplane impacted a heavily wooded area and came to rest upright. The engine was co-located with the firewall, and both wings had separated from the fuselage and were found along the debris path. The empennage remained attached to the fuselage and sustained impact damage. The single fuel tank was breached, but a residual amount of fuel remained in the tank and the accident site smelled of aviation fuel. The fuel selector was found in the ON position. The throttle, mixture, and carburetor heat levers were all found full forward.

The propeller remained attached to the propeller hub. When visually examined, fuel was observed in the carburetor bowl. The propeller was rotated by hand, and thumb-compression was confirmed on all cylinders, with exception to the number 3 cylinder. The engine had sustained impact damage and could not rotate through a complete revolution. The top spark plugs were removed and examined, and each were consistent with normal operating wear. The bottom number 1- and 3-cylinder spark plugs appeared oil soaked, which was attributed to how the engine came to rest on its right side. The bottom 2- and 4-cylinder spark plugs were consistent with normal operating wear. Both magnetos were removed and each produced spark when rotated by hand.

None of the electrical system's resettable circuit breakers were found extended. The main and spare fuses were located under the pilot seat. The master switch was found in the down position, which coincided with a selection to the spare fuse. When examined at the accident site, the spare fuse was found to be blown, and the electrical system would not turn on when tested with the switch selected to the spare fuse. When the electrical system was operated on the main fuse, the system powered on. The main fuse was removed and placed in the location where the spare fuse was located, and when the master switch was selected to the main fuse now installed in the spare fuse location, the electrical system powered on.

According to FAA airman records, the pilot held a student pilot certificate. He was issued a third-class medical certificate in April 2018. The student pilot reported that he had about 120 hours of total flight time, all of which were in the accident make and model airplane.

According to FAA airworthiness records, the high-wing airplane was powered by a Lycoming O-235-C1 engine and had 2 seats. The most recent annual inspection was completed in January 2018.

The airplane's owner manual stated in part:

Electrical System

Electrical power for the Colt is supplied by a 12 volt, direct current system. For all normal operations, power is provided by a 12 volt, 25 ampere generator. A 12 volt, 24 ampere hour battery is used in the system to furnish power for starting and as a reserve power source in case of generator failure.

The electrical system description in the airplane owner's manual also described that the fuse block contained two 30-amp fuses. The manual did not state which fuse normal operations should be conducted with. The accident airplane was equipped with a placard located next to the master switch that stated the main fuse was in the up position, off was in the center position, and the spare fuse was in the down position. The owner's manual did not provide procedures for an electrical failure.

The weather conditions reported at 0035 at Madison Municipal Airport (IMS), Madison, Indiana, about 28 miles east of the accident site, included an overcast ceiling at 500 ft, visibility 7 statute miles, wind from 250° at 7 knots, temperature 10°C, and dew point 9°C. Weather conditions reported at 0053 at Monroe County Airport (BMG), Bloomington, Indiana, about 30 miles northwest of the accident site, included an overcast ceiling at 300 ft, visibility 6 statute miles, mist, wind from 250° at 7 knots, temperature 9°C, and dew point 9°C. The student pilot reported that the visibility was good in the area he was operating, he remained clear of clouds, and had ground contact for the entire flight.

According to FAA Advisory Circular 61-65, Certification: Pilots and Flight and Ground Instructors, a student pilot must have an endorsement for each solo cross-country flight. Review of the student's logbook revealed he was not endorsed for outbound or return (accident) solo cross-country flight. The student's flight instructor reported that he was not made aware of the student's solo cross-country flights until after the accident.

Student pilot Information

Certificate:	Student	Age:	31, Male
Airplane Rating(s):	None	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	Unknown
Instrument Rating(s):	None	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 3 Without waivers/limitations	Last FAA Medical Exam:	April 17, 2018
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:	(Estimated) 120 hours (Total, all aircraft), 120 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	Registration:	N5581Z
Model/Series:	PA22 108	Aircraft Category:	Airplane
Year of Manufacture:	1962	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	22-9383
Landing Gear Type:	Tricycle	Seats:	2
Date/Type of Last Inspection:	January 18, 2018 Annual	Certified Max Gross Wt.:	1650 lbs
Time Since Last Inspection:		Engines:	1 Reciprocating
Airframe Total Time:	2524.6 Hrs as of last inspection	Engine Manufacturer:	Lycoming
ELT:	Installed, not activated	Engine Model/Series:	O-235-C1
Registered Owner:		Rated Power:	135 Horsepower
Operator:	On file	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Night/dark
Observation Facility, Elevation:	KIMS,790 ft msl	Distance from Accident Site:	28 Nautical Miles
Observation Time:	00:35 Local	Direction from Accident Site:	100°
Lowest Cloud Condition:	500 ft AGL	Visibility	7 miles
Lowest Ceiling:	Overcast / 500 ft AGL	Visibility (RVR):	
Wind Speed/Gusts:	7 knots /	Turbulence Type Forecast/Actual:	None / None
Wind Direction:	250°	Turbulence Severity Forecast/Actual:	N/A / N/A
Altimeter Setting:	30.02 inches Hg	Temperature/Dew Point:	10°C / 9°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Indianapolis, IN (UMP)	Type of Flight Plan Filed:	None
Destination:	Crossville, TN (CSV)	Type of Clearance:	None
Departure Time:	22:30 Local	Type of Airspace:	Class G

Wreckage and Impact Information

Crew Injuries:	1 None	Aircraft Damage:	Destroyed
Passenger Injuries:		Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 None	Latitude, Longitude:	38.842777,-86.063888(est)

Preventing Similar Accidents

Manage Risk: Good Decision-making and Risk Management Practices are Critical

Although few pilots knowingly accept severe risks, accidents can also result when several risks of marginal severity are not identified or are ineffectively managed by the pilot and compound into a dangerous situation. Accidents also result when the pilot does not accurately perceive situations that involve high levels of risk. Ineffective risk management or poor aeronautical decision-making can be associated with almost any type of fatal general aviation accident.

By identifying personal attitudes that are hazardous to safe flying, applying behavior modification techniques, recognizing and coping with stress, and effectively using all resources, pilots can substantially improve the safety of each flight. Remember that effective risk management takes practice. It is a decision-making process by which pilots can systematically identify hazards, assess the degree of risk, and determine the best course of action. Pilots should plan ahead with flight diversion or cancellation alternatives and not be afraid to change their plans; it can sometimes be the difference between arriving safely late or not arriving at all.

See http://www.nts.gov/safety/safety-alerts/documents/SA_023.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):	Gerhardt, Adam
Additional Participating Persons:	Dale Hoff; FAA/ FSDO; Indianapolis, IN
Original Publish Date:	December 16, 2019
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=98520

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).