National Transportation Safety Board
Aviation Accident Final Report

Location:	Port Huron, Michigan	**Accident Number:**	CEN18FA371
Date & Time:	September 5, 2018, 23:47 Local	**Registration:**	C-GLKX
Aircraft:	Cessna 340A	**Aircraft Damage:**	Substantial
Defining Event:	Fuel starvation	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation		

Analysis

The private pilot of the multi-engine airplane was conducting an instrument approach during night visual meteorological conditions. About 1.3 nautical miles (nm) from the final approach fix, the right engine lost total power. The pilot continued the approach and notified air traffic control of the loss of power about 1 minute and 13 seconds later. Subsequently, the pilot contacted the controller again and reported that he was unable to activate the airport's pilot-controlled runway lighting. In the pilot's last radio transmission, he indicated that he was over the airport and was going to "reshoot that approach." The last radar return indicated that the airplane was about 450 ft above ground level at 72 kts groundspeed. The airplane impacted the ground in a steep, vertical nose-down attitude about 1/2 nm from the departure end of the runway. Examination of the wreckage revealed that the landing gear and the flaps were extended and that the right propeller was not feathered. Data from onboard the airplane also indicated that the pilot did not secure the right engine following the loss of power; the left engine continued to produce power until impact.

The airplane's fuel system held a total of 203 gallons. Fuel consumption calculations estimated that there should have been about 100 gallons remaining at the time of the accident. The right-wing locker fuel tank remained intact and contained about 14 gallons of fuel. Fuel blight in the grass was observed at the accident site and the blight associated with the right wing likely emanated from the right-wing tip tank. The elevator trim tab was found in the full nose-up position but was most likely pulled into this position when the empennage separated from the aft pressure bulkhead during impact. Examination of the airframe and engine revealed no evidence of mechanical malfunctions or failures that would have precluded normal operation.

Although there was adequate fuel on board the airplane, the pilot may have inadvertently moved the right fuel selector to the OFF position or an intermediate position in preparation for landing instead of selecting the right wing fuel tank, or possibly ran the right auxiliary fuel tank dry, which resulted in fuel starvation to the right engine and a total loss of power. The airplane manufacturer's Pilot Operating Handbook (POH) stated that the 20-gallon right- and left-wing locker fuel tanks should be used after 90 minutes of flight. However, 14 gallons of fuel were found in the right-wing locker fuel tank which indicated that the pilot did not adhere to the POH procedures for fuel management. The fuel in the

auxiliary fuel tank should be used when the main fuel tank was less than 180 pounds (30 gallons) per tank. As a result of not using all the fuel in the wing locker fuel tanks, the pilot possibly ran the right auxiliary fuel tank empty and was not able to successfully restart the right engine after he repositioned the fuel selector back to the right main fuel tank.

Postaccident testing of the airport's pilot-controlled lighting system revealed no anomalies. The airport's published approach procedure listed the airport's common traffic advisory frequency, which activated the pilot-controlled lighting. It is possible that the pilot did not see this note or inadvertently selected an incorrect frequency, which resulted in his inability to activate the runway lighting system. In addition, the published instrument approach procedure for the approach that the pilot was conducting indicated that the runway was not authorized for night landings. It is possible that the pilot did not see this note since he gave no indication that he was going to circle to land on an authorized runway. Given that the airplane's landing gear and flaps were extended, it is likely that the pilot intended to land but elected to go-around when he was unable to activate the runway lights and see the runway environment. However, the pilot failed to reconfigure the airplane for climb by retracting the landing gear and flaps. The pilot had previously failed to secure the inoperative right engine following the loss of power, even though these procedures were designated in the airplane's operating handbook as "immediate action" items that should be committed to memory. It is likely that the airplane was unable to climb in this configuration, and during the attempted go-around, the pilot exceeded the airplane's critical angle of attack, which resulted in an aerodynamic stall. Additionally, the pilot had the option to climb to altitude using single-engine procedures and fly to a tower-controlled airport that did not have any landing restrictions, but instead, he decided to attempt a go-around and land at his destination airport.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's improper fuel management, which resulted in a total loss of right engine power due to fuel starvation; the pilot's inadequate flight planning; the pilot's failure to secure the right engine following the loss of power; and his failure to properly configure the airplane for the go-around, which resulted in the airplane's failure to climb, an exceedance of the critical angle of attack, and an aerodynamic stall.

Findings

Personnel issues	Use of equip/system - Pilot
Aircraft	Fuel - Fluid management
Aircraft	Fuel - Fluid level
Personnel issues	Flight planning/navigation - Pilot
Personnel issues	Incorrect action performance - Pilot
Aircraft	Airspeed - Not attained/maintained
Aircraft	Angle of attack - Capability exceeded
Personnel issues	Aircraft control - Pilot
Personnel issues	Use of charts - Pilot
Personnel issues	Use of checklist - Pilot

Factual Information

History of Flight

Approach-IFR initial approach	Fuel starvation (Defining event)
Approach-IFR missed approach	Aerodynamic stall/spin
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On September 5, 2018, about 2347 eastern daylight time, a Canadian-registered Cessna 340A, C-GLKX, impacted terrain during an instrument approach to St. Clair County International Airport (KPHN), Port Huron, Michigan. The pilot received fatal injuries, and the airplane sustained substantial damage. The airplane was owned by Flex Air, Inc., and was being operated by the pilot as a Title 14 *Code of Federal Regulations* Part 91 business flight. Night visual meteorological conditions prevailed at the time of the flight, which was operating on an instrument flight rules (IFR) flight plan. The flight departed St. Thomas Municipal Airport (CYQS), St. Thomas, Ontario, Canada, about 2304, and was enroute to KPHN.

Flight track data obtained from the Stratus 2S unit onboard the airplane indicated that, the day before the accident flight, the pilot completed three flights for a total of 3 hours 37 minutes of flight time. A fuel receipt showed that the airplane was fueled with 106 gallons of fuel at 1836 on the day of the accident at Carp Airport (CYRP), Ottawa, Ontario, Canada, where the airplane was based.

The owner of the airplane reported that the pilot intended to fly to fly to KPHN to clear US Customs before proceeding to his destination in Wisconsin on the day of the accident for business purposes. He stated that the departure from CYRP was delayed about 4 hours because the airport was out of fuel and the pilot had to wait for a fuel truck to arrive.

Flight track data indicated that the flight departed CYRP for KPHN about 1929 and climbed to 23,000 ft; however, according to the aircraft owner, the pilot encountered adverse weather conditions and diverted to CYQS. The flight from CYRP to CYQS lasted about 2 hours 23 minutes. There was no record of the airplane refueling at CYQS.

The pilot subsequently departed CYQS about 2304 and climbed to 4,000 ft mean sea level (msl) and maintained a 290° heading toward WYDUK, the initial approach fix for the RNAV (GPS) RWY 22 approach at KPHN. Review of air traffic control (ATC) information indicated that, about 2335, the pilot confirmed that he was inbound to WYDUK at 4,000 ft mean sea level (msl).

About 2337, the controller informed the pilot that the airplane was no longer in radar contact (the airplane had descended below the floor of the radar coverage available for that area).

About 2342, the controller asked the pilot if he had passed WYDUK; the pilot confirmed that he had and was inbound for runway 22. The controller then instructed the pilot to cross the ZORIX waypoint at or above 2,200 ft, cleared the flight for the RNAV (GPS) RWY 22 approach, and approved a frequency

change to the airport's common traffic advisory frequency (CTAF); the airport was not staffed with a tower controller. Radar track data indicated that the airplane was at 4,000 ft msl at 127 kts groundspeed at that time. At 2343:23, the engine data monitor recorded a rapid decrease in fuel flow to the right engine with a coinciding decrease in EGT and engine rpm. The airplane was about 1.3 nautical miles (nm) from ZORIX. The engine data recorded a brief spike in fuel flow to the right engine a few seconds after the initial fuel flow drop; the EGT and engine rpm displayed coinciding spikes.

About 2344:01, the airplane crossed the final approach fix, ZORIX, at 3,500 ft msl at 118 kts groundspeed. Another spike in fuel flow, EGT, and engine rpm was recorded, and the engine rpm returned to 600. No other spikes were recorded.

About 2344:33, about 3,200 ft msl, the pilot contacted the controller and advised him that he had "just lost my right engine." When the controller asked if he would still make the landing, the pilot stated, "I'm gonna work on it."

About 2346:41, the airplane was at 1,700 ft msl at 100 kts groundspeed; the pilot stated, "I see no lights at the runway, uh, and I tried to turn them on. They don't turn on." The controller responded that he did not have control over the lights and there were no NOTAMs concerning the runway lighting. The controller then asked if the pilot could see the airport, and he responded, "Negative."

About 2347:20, at 1,300 ft msl and a groundspeed of about 93 knots, the pilot stated, "I'm right above the airport on, uh, one engine, so I'm gonna make a slow turn (unintelligible) to reshoot that approach." The radar data indicated that the airplane was above the airport environment.

The controller asked again if the pilot could see the airport. About 2347:32, the pilot responded, "There's nothing lit up here, sir." Radar data indicated that the airplane was at 1,200 ft msl at 84 kts groundspeed.

About 2349:35, the ATC controller tried contacting the pilot, but there was no response. The last radar return indicated that the airplane was at 1,100 ft msl at 72 kts groundspeed and had turned right to a westerly heading.

Pilot Information

Certificate:	Private	**Age:**	51,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	4-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 None	**Last FAA Medical Exam:**	August 15, 2017
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	May 12, 2018
Flight Time:	690 hours (Total, all aircraft), 51 hours (Total, this make and model)		

The 51-year-old pilot held a Canadian private pilot certificate with single-engine airplane, multi-engine

airplane, and instrument airplane ratings. His first-class airman medical certificate, issued on January 22, 2018, listed no limitations. The pilot's logbook indicated about 690 total hours of flight experience, including about 51 hours in the accident airplane.

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	C-GLKX
Model/Series:	340A	**Aircraft Category:**	Airplane
Year of Manufacture:	1981	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	340A1221
Landing Gear Type:	Retractable - Tricycle	**Seats:**	
Date/Type of Last Inspection:	May 16, 2018 Annual	**Certified Max Gross Wt.:**	5990 lbs
Time Since Last Inspection:		**Engines:**	2 Reciprocating
Airframe Total Time:	4038.4 Hrs as of last inspection	**Engine Manufacturer:**	Continental
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	TSIO-520 NB
Registered Owner:		**Rated Power:**	335 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The airplane was a low-wing, twin-engine Cessna 340A that was manufactured in 1981. The airplane was equipped with two Continental TSIO-520-NB9A engines modified with the RAM conversion (STC-SE4327SW) in March 2007, which increased the engine horsepower to 335 horsepower. The airplane's maximum takeoff weight was 6,390 lbs. The airplane originally seated six, but one passenger seat had been removed. The last annual inspection was conducted on May 16, 2018, at a total aircraft time of 4,038.4 hours. The last flight recorded into the airplane's journey log was the day before the accident, which noted an aircraft total time of 4,161.1 hours and 1,095.5 hours since major overhaul for both the left and right engines.

Fuel System

The airplane's fuel system comprised two 50-gallon main tanks mounted on each wingtip, two 31.5-gallon auxiliary tanks located between the spars in the outboard wing, and two 20-gallon wing locker tanks, for a total of 203 gallons. Two fuel selectors, one for each engine, were located between the pilot and copilot seats and were mechanically connected to fuel valves located in each wing. The right fuel selector allowed selection of the right main fuel tank, the right auxiliary fuel tank, crossfeed, and OFF. The left fuel selector was similar, allowing selection of the left tanks.

The Cessna 340A Pilot's Operating Handbook (POH) provided procedures for fuel management. The procedures stated the following:

1. Set fuel selector valves to left main tank for left engine and right main tank for right engine in takeoff,

descent, landing, emergency, and first 90 min. of flight.
2. Takeoff and land with auxiliary fuel pumps on.
3. Use full rich mixture and auxiliary fuel pumps on "LOW" when switching tanks.
4. Operate on main tanks until fuel quantity is less than 180 pounds per tank.
5. Transfer wing locker fuel while operating on main tanks in straight and level flight.
6. Turn transfer pumps off when lights illuminate.
7. Use fuel crossfeed system to balance main fuel quantities if one wing locker does not transfer.
8. Switch to auxiliary tanks when main fuel is again less than 180 pounds per tank.

Engine Inoperative Procedures

The POH procedures for Engine Failure During Flight (Speed above Vmca) were:

1. Inoperative Engine – Determine.
2. Operative Engine – Adjust as required.
3. Fuel Flow – Check. If deficient, position auxiliary fuel pump to ON.
4. Fuel Selectors – Main Tanks (Feel for Detent).
5. Fuel Quantity – Check.
6. Oil Pressure and Oil Temperature – Check.
7. Magneto Switches – Check On.
8. Mixture – Adjust. Lean until manifold pressure begins to increase, then enrichen as power increases.

Note: The first 8 items are outlined in black in the POH. According to the POH, these items are "immediate-action items and should be committed to memory."

If Engine Does Not Start, Secure as Follows:

9. Inoperative Engine – Secure.
a. Throttle – Close.
b. Mixture – Idle Cut-off.
c. Propeller – Feather.
d. Fuel Selector – Off (Feel For Detent).
e. Auxiliary Fuel Pump – Off.
f. Magneto Switches – Off.
g. Propeller Synchrophaser – Off.
h. Alternator – Off.
i. Cowl Flap – Close.

10. Operative Engine – Adjust.

a. Power – As Required.
b. Mixture – Adjust for power.
c. Fuel Selector – As Required (Feel for Detent)
d. Auxiliary Fuel Pump – On.
e. Cowl Flap – As Required.

11. Trim Tabs – Adjust 5° bank toward operative engine with approximately 1/2 ball slip indicated on the turn and bank indicator.

12. Electrical Load – Decrease to minimum required.

13. As Soon as Practical – Land.

The POH procedures for Engine Inoperative Go-Around (Speed Above 91 KIAS) were:

1. Throttle – Full Forward (38.0 Inches Hg.)
2. Positive Rate-of-Climb – Establish.
3. Landing Gear – Up.
4. Wing Flaps – Up, if extended.
5. Cowl Flap – Open.
6. Climb at One Engine Inoperative Best Rate-of-Climb Speed – 100 KIAS.
7. Trim Tabs – Adjust 5° bank toward operative engine with approximately 1/2 ball slip indicated on the turn and bank indicator.

The first 4 items in this checklist were designated as immediate action items.

The POH indicated that, given the estimated weight of the airplane at the time of the accident (5,471 lbs) at 21°C, with one engine inoperative, landing gear retracted, wing flaps retracted, the inoperative propeller feathered, and with a 5° bank toward the operative engine, the service ceiling was about 16,000 ft msl.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Night
Observation Facility, Elevation:	KPHN,650 ft msl	**Distance from Accident Site:**	
Observation Time:	23:35 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Scattered / 5000 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	Broken / 12000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.15 inches Hg	**Temperature/Dew Point:**	21°C / 20°C
Precipitation and Obscuration:	N/A - None - Rain		
Departure Point:	St. Thomas (CYQS)	**Type of Flight Plan Filed:**	IFR
Destination:	Port Huron, MI (KPHN)	**Type of Clearance:**	IFR
Departure Time:	23:04 Local	**Type of Airspace:**	

At 2335, the surface weather observation at KPHN included calm wind; 10 miles or greater visibility; moderate rain; scattered clouds at 5,000 ft and 7,000 ft; broken ceiling at 12,000 ft; temperature 21°C; dew point 20°C; and an altimeter setting of 30.16 inches of mercury.

A convective SIGMET was issued at 2255 and was valid for the accident location and time.

A Meteorological Impact Statement was issued at 2045 and valid until 0800 the following day. For Central/Eastern Michigan, it advised of scattered thunderstorms moving from west-southwest at 35 knots with tops to FL450 (45,000 ft), ending at 0500 on September 6, 2018.

Airport Information

Airport:	St. Clair County Int'l Airport KPHN	**Runway Surface Type:**	Asphalt
Airport Elevation:	650 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	22	**IFR Approach:**	RNAV
Runway Length/Width:	5104 ft / 100 ft	**VFR Approach/Landing:**	Go around

The field elevation at KPHN was 650 ft msl. Runway 22 was 5,104 ft long and 100 ft wide and was equipped for nonprecision instrument approaches. Runway 22 was equipped with high-intensity runway lights and a four-light precision approach path indicator (PAPI) system (3.00° glide path) located on the left side of the runway.

The notes on the KPHN area navigation RNAV (GPS) Rwy 22 instrument approach chart stated that the pilot-controlled lighting was on frequency 123.05 MHz, which was also identified as the airport's CTAF. The runway lighting and the PAPI were activated by the pilot with clicks from a radio tuned to the CTAF. The runway lights illuminated to low intensity with the three clicks, medium intensity with five clicks, and high intensity with seven clicks. The PAPI and runway lights were on a 15-minute timer that started upon first activation. The timer reset every time the radio was clicked three times within a 30-second time frame.

The morning after the accident, airport staff checked the lighting at KPHN and determined that all lighting, including the pilot-controlled lighting, was operational. There were no records of reports of inoperable lighting at KPHN on the day of the accident. Federal Aviation Administration (FAA) air traffic control personnel also verified the operation of the pilot-controlled lighting system and determined that the indications for the PAPI were within tolerance.

The notes section of the instrument approach chart for the RNAV (GPS) RWY 22 approach indicated that night landings on runways 10, 22, and 28 were not authorized. The KPHN airport authority reported that the night landing restriction for those runways was due to tree obstructions. Only runway 4 was usable at night, as it was the only runway equipped with an ILS precision instrument approach.

ATC Procedures

FAA Order JO 7110.65Y, *Air Traffic Control*, Chapter 4, IFR stated in part:

4−8−1. Approach Clearance

2. Approach clearances are issued based on known traffic. The receipt of an approach clearance does

not relieve the pilot of his/her responsibility to comply with applicable Parts of Title 14 of the Code of Federal Regulations and the notations on instrument approach charts which levy on the pilot the responsibility to comply with or act on an instruction; for example, "Straight-in minima not authorized at night," Procedure not authorized when glideslope/glidepath not used," "Use of procedure limited to aircraft authorized to use airport," or "Procedure not authorized at night" or Snowflake icon with associated temperature.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	42.90361,-82.550277

The airplane impacted a grass field at a baseball complex 0.67 nautical mile from the departure end of KPHN runway 22 on a 266° bearing. Damage indicated that the airplane impacted the ground in a nose-down, vertical attitude before it came to rest upright on a heading about 145°. The right propeller separated from the engine and remained embedded in the ground about 14 ft from the right engine. One of the left engine's propeller blades separated from the left engine propeller hub and remained embedded in the ground about 8 ft from the left engine. The nose cone separated from the airplane and remained in the initial impact crater. The ground impact marks of the left and right engine propellers, fuselage nose cone, and the left and right wing tip fuel tanks indicated a direction of travel about 298°. The empennage was separated from the fuselage at the aft pressure bulkhead. It remained loosely attached by the flight control cables.

The nose, instrument panel, and cockpit were crushed aft and the bottom side of the outboard section of the left wing's leading edge exhibited aft crushing. The metal compression indicated an approximate 50° to 70° nose-down impact angle. The left and right wing fuel tip tanks exhibited ground impact compression damage. The left main fuel tank, auxiliary fuel tank, and wing locker fuel tank sustained postimpact fire damage. The right wing did not exhibit any fire damage. The right main and right auxiliary fuel tanks were breached. The right wing locker fuel tank remained intact and contained about 14 gallons of fuel. Blue fuel streaking was observed on top of the wing locker fuel tank and baggage locker.

The grass at the accident site displayed fuel blight. In the area around the left wing, fuel blight was observed in front of the wing where the left wingtip main fuel tank initially impacted the ground. The fuel blight aft of the left main tank and auxiliary tank formed a roughly semi-circular pattern in the grass and remained within a few feet of the wing. The fuel blight observed from the right main tip tank stretched from the initial impact point to 54 ft and was 8 ft wide in the direction of travel. There was an area of fuel blight behind the right outboard section of the wing.

Aileron cable continuity was established from the flight controls to the control surfaces. Elevator and

rudder control cable continuity were confirmed from the forward cabin floor area to the aft elevator bellcrank and rudder horn. The elevator trim indicator was found between the neutral and full nose-down position. The elevator trim actuator was found extended about 1 inch, which equated to a trim tab position greater than the full 17° tab-down travel position. The down elevator trim tab cable was found separated in overload near the aft pressure bulkhead. The elevator trim tab hardware was in place on the actuator and the tab. The elevator trim tab was found in the down (nose-up) position. The rudder trim indicator and actuator were found in the neutral position. The rudder trim tab was found in the neutral position. The aileron trim indicator was found about halfway between the neutral and full right position; the aileron trim actuator was found in the neutral position. The aileron trim tab was found in the neutral position.

The left and right engines' throttles, propeller controls, and fuel mixture controls were all found in a mid-range position. Neither of the propeller controls were found in the feathered position.

The wing flap indicator was found in the 45° flap position. The flap handle was found between the 30° and 45° position. The flap actuator indicated that the flaps were extended between 15° and 25°.

The nose landing gear and the left and right main landing gear were found in the extended position. The landing gear were bent aft and compressed into the underside of the airplane. The landing gear actuator indicated that the landing gear was extended at the time of impact. The landing gear handle was found in the retracted position.

Examination of the fuel system revealed that the left fuel selector handle was found between the LEFT MAIN and LEFT AUX tank position. The right fuel selector handle was found on the RIGHT MAIN tank. The left and right fuel selector valve arms located in their respective wings were found in the OFF position. The auxiliary fuel boost pump switches were found in the Low position and were crushed down and to the left. The left fuel transfer switch was separated by impact forces; the right fuel transfer switch was found in the OFF position and was also bent down and to the left. The airframe fuel system continuity was checked, and no discrepancies were noted.

The left engine propeller hub remained attached to the left engine and two blades remained attached to the hub. One of the blades was separated from the left hub and was found in the impact crater located 8 ft in front of the left engine nacelle. That blade displayed some twisting toward low pitch and chordwise paint burnishing. The two blades that remained attached to the hub exhibited S-bending and blade twist toward low pitch.

The right engine propeller was separated from the propeller flange and was found embedded in the ground 14 ft forward of the engine. The spinner was displaced to one side of the hub. Two blades displayed damaged pitch change links and the blades could be independently rotated in their hub. The propeller blades did not appear to be in a feathered position and there was little to no rotational damage noted.

Examination of the left engine established crankshaft and camshaft continuity, and "thumb" compression was obtained from each cylinder. Borescope examination of the cylinders revealed normal combustion deposits on the internal components with no signs of operational distress. The turbocharger inlet housing displayed rotational scoring and the blades were twisted and torn. The magnetos produced spark from

each terminal in firing order when their drive shafts were rotated. The fuel system components sustained fire and impact damage that precluded functional testing.

Examination of the right engine established crankshaft and camshaft continuity, and "thumb" compression was obtained from each cylinder. Borescope examination of the cylinders revealed normal combustion deposits on the internal components with no signs of operational distress. The fuel pump mounting flange was fractured, and the pump was displaced from its mounting pad. The pump drive coupling was intact but bent. Rotation of the drive coupling resulted in smooth, unbound rotation of the pump. A few drops of residual fuel exited the pump when it was removed from the accessory end of the engine. The fuel line between the engine nacelle firewall and the fuel pump inlet was removed at the nacelle. About one teaspoon of fuel was captured. The return fuel line between the engine-driven fuel pump vapor return fitting and the nacelle exit was removed at the nacelle and about one tablespoon of fuel was captured. The return line between the metering unit and the fuel pump was empty.

The right engine was sent to the manufacturer for additional testing. Teardown examination of the engine and its fuel system components and functional testing of the magnetos revealed no preaccident anomalies. The turbocharger impeller housing was fractured and displaced. The impeller blades were displaced by impact but exhibited no signs of rotational damage.

The airplane's radios were examined, but impact damage precluded obtaining the last frequencies used. The handheld radio found in the airplane did not have KPHN's CTAF selected.

Additional Information

The owner of the airplane reported that the airplane had 6.5 hours' flight endurance with full fuel tanks. He stated that the airplane typically burned 65 gallons of fuel per hour (gph) while climbing and burned 28 gph of fuel in cruise flight. Using a climb rate of 1,000 ft per minute, the airplane would have consumed about 81 gallons of fuel during the 2 hour and 23-minute flight from CYRP to CYQS. The calculated fuel consumption for the 43-minute flight from CYQS to KPHN was about 23 gallons; the total estimated fuel used for both flights was about 104 gallons.

The airplane owner reported that, with both engines operating in the traffic pattern with the gear down and flaps at 30°, about 28 to 29 inches of manifold pressure (75% power at 105 kts) was needed to maintain level flight. He stated that, with one engine inoperative and with the gear and flaps extended, the airplane could not maintain level flight.

Medical and Pathological Information

An autopsy of the pilot was performed by the St. Clair County Office of the Medical Examiner, Port Huron, Michigan. The cause of death was multiple blunt impact injuries.

Toxicology testing performed at the FAA's Forensic Sciences Laboratory was negative for carbon monoxide and ethanol in the blood. No drugs tested for were detected in the urine.

Tests and Research

The G4 Insight Graphic Engine Monitor and memory card were recovered at the accident site. The memory card was downloaded, and it provided engine performance data for both the left and right engines that included exhaust gas temperatures (EGT) for all cylinders, tachometer reading (rpm), fuel flow, and manifold pressure. The data indicated that the left engine maintained power until the time of ground impact.

Administrative Information

Investigator In Charge (IIC):	Silliman, James
Additional Participating Persons:	Douglas Peterson; Federal Aviation Administration; Detroit, MI Nicole Charnon; Continental Motors; Mobile, AL Peter Basile; Textron; Wichita, KS Rick Roper; RAM Aircraft; WACO, TX
Original Publish Date:	November 6, 2019
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=98251