Aviation Investigation Final Report

Location:	Parkers Parairie, Minnesota	**Accident Number:**	CEN13FA172
Date & Time:	February 20, 2013, 18:20 Local	**Registration:**	N9229Y
Aircraft:	Maule MXT-7-180	**Aircraft Damage:**	Substantial
Defining Event:	Fuel starvation	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation		

Analysis

The pilot was returning home from a cross-country business trip when the accident occurred. A witness reported hearing a "loud pop" that sounded like an "engine backfiring" followed by the sound of impact. Another witness reported seeing the airplane flying low and hearing the engine sputter just before the airplane impacted terrain. The airplane impacted a snow-covered field and traveled about 300 ft before it came to rest. First responders reported smelling fuel near the main wreckage. A postaccident examination of the airplane and engine did not reveal any mechanical anomalies that would have resulted in the accident.

The airplane's fuel tanks were filled before departure. Each main fuel tank held 20 gallons of usable fuel, and each auxiliary fuel tank held 15 gallons of fuel. The main fuel tanks supplied fuel to the engine. The fuel selector was found in the "both" position. The auxiliary fuel tanks replenished the main fuel tanks via transfer pumps that were turned on by switches in the cockpit when needed; the fuel transfer pump switches were not located in the wreckage. The airplane's estimated fuel consumption rate was about 9 gallons per hour. According to the tachometer, the flight was 4.1 hours long, which would have used about 37 gallons of fuel plus additional fuel for taxi and climb. Thus, it is likely that the pilot did not transfer fuel from the auxiliary fuel tanks to the main fuel tanks in a timely manner, which resulted in the engine being starved of available fuel.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The pilot's failure to transfer fuel from the auxiliary fuel tanks to the main fuel tanks in a timely manner, which resulted in fuel starvation to the engine.

Findings

Aircraft	Fuel - Fluid management
Personnel issues	Use of equip/system - Pilot

Factual Information

History of Flight

Enroute-cruise	Fuel starvation (Defining event)
Landing-flare/touchdown	Collision with terr/obj (non-CFIT)

On February 20, 2013, about 1820 central standard time, a Maule MXT-7-180 airplane, N9229Y, was substantially damaged when it impacted a snow covered field in Parkers Prairie, Minnesota. The private pilot was fatally injured. The airplane was registered to and operated by the pilot under the provisions of 14 Code of Federal Regulations Part 91 as a business flight. Visual meteorological conditions prevailed for the flight and no flight plan was filed. The flight originated from the Greater Peoria Regional Airport (PIA), Peoria, Illinois at 1438. The intended destination was a private field in Ottertail, Minnesota.

The pilot was en route home following a business trip to PIA earlier in the week. According to the pilot's brother, the pilot contacted him via his cell phone during the flight. The pilot was also in contact with his wife during the flight via text messaging. The pilot reported being over the Quad Cities area around 1510. He sent a text message saying that he would be "flying over home" at 1825 and stated that he would land if it was light enough. The pilot later contacted his brother asking if the landing strip at the farm where they kept the airplane had been plowed. The pilot's brother responded that it was plowed and the pilot responded "OK." The pilot's brother stated he received this message at 1805 and it was the last contact he had with the pilot.

A witness, who lived on the property where the accident occurred, heard the airplane prior to the accident. He reported hearing a loud "pop" which he stated sounded like an engine backfiring followed by the sound of the impact. He went outside, saw the wreckage and stated he could smell fuel.

Another witness who lived about a ½ mile from the accident site reported seeing the airplane approach from the south and it flew over their property then made a left 180 degree turn. The witness stated it was dark at the time, but estimated the airplane's altitude to be about 30 feet above the ground. The airplane was traveling fast and the engine initially sounded normal, but it sputtered just prior to the airplane impacting the terrain.

Pilot Information

Certificate:	Private	**Age:**	41
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Right
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:**	September 3, 2009
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	November 25, 2011
Flight Time:	(Estimated) 539 hours (Total, all aircraft), 53.4 hours (Total, this make and model), 504.8 hours (Pilot In Command, all aircraft)		

The pilot, age 41, held a private pilot certificate with a single engine land airplane rating. He was issued a third class airman medical certificate on September 3, 2009. The pilot held a Medical Waiver Certificate- Statement of Demonstrated Ability, due to congenitally short arms and contractures at the joints. The pilot demonstrated his ability during a medical flight test in a Cessna 150. During the test the pilot flew the airplane from the right seat as his right arm was stronger than his left. The pilot's brother stated the pilot flew the accident airplane from the right seat.

The pilot's most recent logbook contained entries from October 19, 2004, through February 17, 2013. According to the logbook, the pilot had a total flight time of 539.1 hours, of which 53.4 hours were in the accident make and model of airplane. The pilot had recorded having 49.4 hours of night flight time.

Aircraft and Owner/Operator Information

Aircraft Make:	Maule	**Registration:**	N9229Y
Model/Series:	MXT-7-180	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	14026C
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	October 18, 2012 Annual	**Certified Max Gross Wt.:**	
Time Since Last Inspection:	30.6 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:		**Engine Manufacturer:**	LYCOMING
ELT:	Installed, not activated	**Engine Model/Series:**	O-360-C1F
Registered Owner:	On file	**Rated Power:**	180 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The accident airplane was a 1993 Maule MXT-7-180, serial number 14026C. It was a high wing, single-engine airplane, with fixed tricycle landing gear. The airplane was powered by a 180-horsepower

Lycoming O-360-C1F reciprocating engine, serial number L-33266-36A. The airplane was issued a normal category airworthiness certificate on January 21, 1993. The pilot and his brother were co-owners of the airplane which they purchased on August 23, 2012.

The aircraft and engine logbooks showed that the last annual inspections were performed on October 18, 2012, at a tachometer time of 1,349.6 hours, and a Hobbs meter time of 1,496.8 hours.

In order to accommodate the pilot's medical condition, the throttle control was modified and the flap handle was extended. Logbook records show a new throttle friction lock was installed on August 30, 2012, and an EZ Flap extension, Supplemental Type Certificate SA02246LA, was installed on September 7, 2012.

According to records obtained from a fixed base operator (FBO) at PIA, the pilot requested the airplane be "topped off" and the airplane was fueled with 34 gallons of 100LL aviation fuel. FBO personnel reported that prior to departing PIA, the pilot preheated the engine and then flooded the engine during the attempted start up. They put the airplane in a hangar, removed, cleaned, and checked the spark plugs, checked the mag timing, and charged the battery. No anomalies were noted so they closed the cowling and the pilot was able to start the engine. The tachometer reading was noted as 1,376.1 on the invoice. The tachometer reading at the time of the accident was 1,380.2.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Dusk
Observation Facility, Elevation:	AXN,1425 ft msl	**Distance from Accident Site:**	27 Nautical Miles
Observation Time:	17:53 Local	**Direction from Accident Site:**	194°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	5 knots / None	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	100°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.35 inches Hg	**Temperature/Dew Point:**	-13°C / -19°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Peoria, IL (KPIA)	**Type of Flight Plan Filed:**	None
Destination:	Ottertail, MN	**Type of Clearance:**	None
Departure Time:	14:38 Local	**Type of Airspace:**	Class G

Weather conditions recorded by the Automated Surface Observing Systems (ASOS), located at the Chandler Field Airport (AXN), Alexandria, Minnesota, 27 miles south of the accident site were:

At 1753: wind 100 degrees at 5 knots, visibility 10 miles, clear sky conditions, temperature minus 13 degrees Celsius, dew point minus 19 degrees Celsius, and altimeter 30.35 inches of mercury.

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:**	46.238334,-95.251663(est)

The airplane impacted the terrain in an open snow-covered field. The airplane continued to travel about 300 feet through the field, across a rural driveway, and into a wooded area where it came to rest. The wreckage path was along a 300 degree heading. First responders reported the smell of fuel was present near the main wreckage.

The initial impact was about five feet long and contained pieces of green glass similar to the right wing navigational light. Approximately 15 feet to the west of the initial impact mark was an impact mark that was 3 feet long. Directly in front of and perpendicular to this mark was an 18 inch long slash mark in the snow. Just west of the 3 foot long mark was another ground impact mark that was approximately 5 feet long. Numerous pieces of wreckage were scattered between the initial impact mark and the main wreckage. These pieces included sections of both wings, the right wing lift struts, the upper engine cowling, the propeller ring gear, the baggage door, the right wing auxiliary fuel tank, the right main landing gear, the nose gear, and the propeller. The left main landing gear and the inboard sections of both wings were located near the main wreckage.

The cockpit was destroyed by impact forces. The elevator trim control was set to a slight nose down trim setting. The trim cables were attached to the trim sprocket and were separated in the empennage. The flap control cables were attached to the flap control lever. The cables were separated at the pulleys in the fuselage. The aileron cables were connected to the chain drive which connected the control yokes. The chain drive remained connected to the left control yoke. The right control yoke was separated from the wreckage. The rudder control cables remained attached to the rudder crossover bar and the cables were separated in the aft fuselage area. The elevator control cables remained attached to the pulley chain in the cockpit and the cables were separated in the aft fuselage area. All of the separated control cables exhibited signatures consistent with overload separations. The fuel selector was positioned to the "Both" position. The fuel transfer switches were not located.

The empennage was separated from the fuselage aft of the seats. The vertical stabilizer tubing was intact. The top portion of the rudder was separated and found along the wreckage path. The rudder balance weight remained attached to the top of the rudder. The left horizontal stabilizer and elevator remained attached to the empennage. The outboard section of the left side of the elevator was bent. The inboard section of the right horizontal stabilizer remained attached to the empennage and the remainder of the stabilizer was destroyed.

Both lift struts on the left wing were attached to the wing and were pulled free of the fuselage. The fuselage attach bolts remained attached to the struts. Both bolts displayed signatures of overload.

The left flap remained attached to the wing at the two inboard attach points. The outboard attachment

bracket was pulled from the flap. The right wing was separated into two sections just inboard of the outboard fuel tank. The inboard fuel tank remained attached in the wing. The outboard tank was found along the wreckage path. The aileron was separated from the wing and was located up against a tree near the main wreckage. The aileron balance weight remained attached to the aileron. The aileron was bent downward at mid-span. The aileron cables remained attached to the bell crank, which was separated from the wing.

The right wing was destroyed. Both fuel tanks were separated from the wing. The inboard tank was ruptured. The aileron was separated at its attach points. The aileron balance weight was attached to the aileron. The inboard and outboard ends of the aileron were both bent upward. The flap was separated from the wing. Both lift struts were separated from both the fuselage and wing. The forward wing spar was separated into two sections. The separation was immediately inboard of the strut attach point. The front spar was bent and twisted upward and rearward. The rear spar was bent 90 degrees forward just outboard of the strut attach point.

The propeller blades and hub were separated from the engine crankshaft and was located along the wreckage path. Both propeller blades remained attached to the propeller hub and both were twisted and bent aft. One blade tip was missing. Both blades had nicks in the leading edges along with chordwise scratching and polishing.

The engine separated from the fuselage and was found near the main wreckage. The wreckage was relocated and the engine was examined on February 22, 2013. The spark plugs appeared normal when compared to the Champion Aviation Check A Plug chart AV-27. The exhaust and right side induction tubes were separated from the engine. The left side induction tubes were crushed. The rear accessories, valve covers, and top spark plugs were removed from the engine. A lighted borescope was used to examine the cylinders, pistons, and valves which appeared normal. The crankshaft was rotated at the vacuum pump drive and continuity was established to the accessory gears and the cylinders. Thumb compression was noted on all cylinders. Both magnetos sparked on all leads when rotated by hand. The oil pick-up and propeller governor screens were clear of contaminants. The vacuum pump rotated freely when turned by hand. The pump was opened, and the rotor block and vanes were intact. The carburetor was broken free of the engine and the carburetor inlet screen was not located. The carburetor was opened and no anomalies were noted. The control linkages were broken off of both the propeller governor and the carburetor. The fuel pump was broken off the engine.

Communications

There were no known air traffic control communications with the airplane during the en route portion of the flight.

Medical and Pathological Information

An autopsy was performed on the pilot at the Lake Region Healthcare facility in Fergus Falls, Minnesota. The cause of death was attributed to trauma sustained from the aircraft accident.

Toxicology testing was performed by the Federal Aviation Administration Civil Aerospace Medical Institute. Testing results were negative for all substances in the screening profile.

Additional Information

Each main fuel tank held 20 gallons of usable fuel and each auxiliary tank held 15 gallons of fuel. The main fuel tanks supplied fuel to the engine. The auxiliary (outboard) tanks replenish the main fuel tanks via transfer pumps which are turned on by switches when needed.

According to the pilot's brother, they had calculated that the engine fuel consumption averaged 9 gallons per hour. Their normal procedure for fuel management was to use the main fuel tanks until they were ½ full. They would then turn on the fuel pumps to replenish the main tanks from the auxiliary tanks. The pilot's brother stated the fuel transfer rate from the auxiliary tanks to the main tanks was very slow and that it would barely be enough to keep the engine running.

Based on the tachometer time recorded on the paperwork provided by the FBO and the tachometer time at the accident site, the flight was 4.1 hours long.

The pilot's iPhone 3GS was recovered from the accident site and sent to the NTSB Recorder Laboratory for examination. No Global Positioning System historical information was discovered on the phone; however, there was evidence that the pilot used an aviation application, ForeFlight (version 4.7.2) during the flight.

Two ForeFlight flight plans correlating to the accident flight were discovered. One flight was direct from PIA to the "Menze-Aaron" private airport, with a calculated distance of 430 nautical miles. The other was from PIA to the Wadena Municipal Airport (ADC), Wadena, Minnesota, which had a calculated distance of 422 nautical miles. The ForeFlight screen for the flight from PIA to the Menze-Aaron private airport showed a course of 327 degrees magnetic, a planned fuel burn of 35.9 gallons, total time en route of 3 hours 35 minutes, and a message "Winds aloft not included."

The pilot's brother stated that he experienced the engine backfiring once when he was flying. He stated the throttle was retarded for landing and the engine backfired when he advanced the throttle.

Administrative Information

Investigator In Charge (IIC):	Sullivan, Pamela
Additional Participating Persons:	Kevin Morris; FAA-MSP-FSDO; Minneapolis, MN Dave Nelson; FAA-MSP-FSDO; Minneapolis, MN Troy Helgeson; Lycoming; Williamsport, PA
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