



AVIATION



HIGHWAY



MARINE



RAILROAD



PIPELINE

Aviation Investigation Final Report

Location:	Detroit, Michigan	Accident Number:	CEN18FA236
Date & Time:	June 24, 2018, 19:57 Local	Registration:	N3896P
Aircraft:	Cessna P210N	Aircraft Damage:	Substantial
Defining Event:	Fuel exhaustion	Injuries:	2 Fatal, 1 Serious
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

As the pilot approached his destination after a cross-country flight, the airplane's landing gear did not fully extend. Over the next 7 minutes, the pilot attempted to troubleshoot the landing gear in the airport traffic pattern before he reported to the tower controller, "Well, I just burnt outta fuel, we're totally out bud." The tower controller immediately cleared the pilot to land; however, there were no additional communications from the pilot and the final radar return was recorded about 180 ft above ground level and about a mile northwest of the runway. The airplane impacted trees and an electricity service line in an urban residential area.

A postcrash fire destroyed most of the forward fuselage and cockpit. The landing gear motor/pump assembly and the hydraulic fluid lines were damaged during impact and the fire, which precluded comprehensive testing of the landing gear extension/retraction system. The landing gear selector handle and the emergency extension handle were destroyed during the fire. The nose and right main landing gear were found fully extended and secured by their respective downlocks. The left main landing gear was found fully retracted in the wheel well and secured by its uplock. There were small tree branches and leaves observed in the wheel well between the left landing gear leg and the fuselage, indicating that the left landing gear was partially extended and was pushed up into the wheel well during the accident. Both main landing gear moved freely by hand between the retracted and extended positions without any anomalies, and their respective up- and down lock assemblies secured both landing gear as designed. All three landing gear actuators functioned normally when hydraulic pressure was applied using a hand-actuated pump. The extensive impact and fire damage to the landing gear extension/retraction components precluded determination of why the landing gear did not fully extend during the flight. A postaccident engine examination did not reveal any evidence of mechanical malfunction that would have precluded normal operation during the flight.

Although the pilot had departed on the flight with enough fuel to reach his intended destination, he did not have enough fuel remaining to adequately address the landing gear malfunction before the airplane had a total loss of engine power due to fuel exhaustion. Federal regulations stipulate that daytime flights under visual flight rules depart with enough fuel to reach the intended destination plus at least 30

minutes of flight at a normal cruising speed. Based on the recorded transmissions between the pilot and the tower controller, the airplane only had about 7 minutes of fuel remaining when the pilot first reported the landing gear malfunction to the tower controller. The pilot should have diverted earlier in the flight to another airport to ensure that the airplane had an adequate fuel reserve.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: A total loss of engine power due to fuel exhaustion. Also causal was the pilot's failure to divert earlier in the flight to another airport to ensure that the airplane had an adequate fuel reserve, and the malfunction of the landing gear extension system for reasons that could not be determined with the available information.

Findings

Aircraft	Fuel - Fluid level
Aircraft	Gear extension and retract sys - Malfunction
Personnel issues	Lack of action - Pilot
Personnel issues	Decision making/judgment - Pilot
Personnel issues	Fuel planning - Pilot

Factual Information

History of Flight

Approach	Fuel exhaustion (Defining event)
Approach	Off-field or emergency landing
Approach	Collision with terr/obj (non-CFIT)
Post-impact	Fire/smoke (post-impact)

On June 24, 2018, about 1957 eastern daylight time, a Cessna P210N airplane, N3896P, was substantially damaged when it was involved in an accident in Detroit, Michigan. The pilot and one passenger were fatally injured, and one passenger sustained serious injuries. The airplane was operated as a Title 14 *Code of Federal Regulations (CFR)* Part 91 personal flight.

The cross-country flight originally departed from Baytown Airport (HPY), Baytown, Texas, and the pilot refueled at West Memphis Municipal Airport (AWM), West Memphis, Arkansas, before proceeding toward Coleman A. Young Municipal Airport (DET), Detroit, Michigan.

According to the fixed-base operator (FBO) employee who fueled the airplane at AWM, the pilot requested that 30 gallons of 100 low-lead aviation fuel be added to each wing tank (60 gallons total). The FBO employee stated that after he had refueled the airplane to the pilot's specifications, the fuel level was about 1/4 inch below the top of the right tank and 1 to 2 inches below the top of the left tank.

Radar data revealed that the airplane departed AWM about 1642 and proceeded on course toward DET at 11,500 ft and 9,500 ft mean sea level (msl) (with a brief intermediate climb to 14,000 ft msl) before entering a descent toward the destination. At 1948:26, the pilot established radio contact with the DET tower controller and was subsequently cleared to land on runway 33.

At 1949:50, the pilot transmitted, "... we don't have a green light on our gear down here, we might have to circle if ya don't mind?" The tower controller offered to observe the landing gear position if the pilot made a low-altitude flyby over runway 33. At 1950:05, the pilot transmitted, "all right, looks like we're partial down, I just don't think we're all the way down, I'll try to cycle it again, we're coming over." At 1951:24, the pilot transmitted, "... we got a partial down tower, but it's not all the way down, we don't have a green light." At that time, the airplane was on a 1 mile final approach for runway 33.

The pilot then conducted a low pass over runway 33, during which the controller reported that the right main landing gear appeared to be "still up." The pilot indicated that he was going to attempt to re-cycle the gear and would make a left turn to remain in the airport traffic pattern.

At 1954:59, the pilot transmitted, "doesn't appear we're making any progress with the gear whatsoever." The controller asked what the pilot's intentions were. The pilot replied, "well, if we can't make anything happen, I guess we can land in the grass just, uh, on the infield there, just parallel with three three huh?" The controller stated that he would prefer the airplane to land on runway 7/25 and that he could not clear

the airplane to land in the grass. At 1955:52, the pilot asked the controller, "so, the west side of one five is not good in the grass?" The controller replied, "I can't clear you for a landing there, but you, if that's where you have to put it down, that would be, uh, ya think it would be better to land in the grass than on the runway?" At that point, the airplane had climbed to 2,500 ft msl and was flying northbound, parallel to runway 33.

At 1956:23, the pilot asked the controller, "ya want me on seven?" The controller subsequently cleared the pilot to land on runway 7, adding that the pilot could keep circling while he arranged for airport fire rescue equipment to meet the airplane on the runway. At 1956:38, the pilot reported, "Well, I just burnt outta fuel, we're totally out bud."

At 1956:42, the tower controller replied, "okay, well, I don't want to keep you circling either so, uh, runway 7 cleared to land." At that point, the airplane had descended to 1,800 ft msl and was about 0.84 miles north-northeast of the runway 15 displaced threshold and 1.75 miles north of the runway 7 displaced threshold. There were no additional communications received from the pilot.

According to radar data, the airplane continued to descend in a left turn toward a left base leg for runway 7. At 1957:52, the final radar return was recorded at 800 ft msl (180 ft above ground level) about 0.92 mile northwest of the runway 7 displaced threshold and about 0.3 mile northwest of the accident site.

The surviving passenger reported that he had slept for most of the flight and that he woke while the airplane was in the traffic pattern at DET. The passenger heard the pilot communicating with the tower controller about a landing gear malfunction but did not recall seeing the position of either main landing gear and did not recall seeing any lights or hearing any sounds coming from the cockpit. From his seat in the back of the airplane, he could not see much of the cockpit or what actions the pilot had attempted to extend the landing gear. He did recall hearing the pilot tell the tower controller that the airplane had run out of fuel.

Pilot Information

Certificate:	Private	Age:	54, Male
Airplane Rating(s):	Single-engine land	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:	Yes
Medical Certification:	Class 3 With waivers/limitations	Last FAA Medical Exam:	October 18, 2017
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:	(Estimated) 650 hours (Total, all aircraft)		

According to Federal Aviation Administration (FAA) records, the 54-year-old pilot held a private pilot certificate with an airplane single-engine land rating. The pilot's most recent FAA third-class medical certificate was issued on October 18, 2017, with a limitation for corrective lenses. On the application for his current medical certificate, the pilot reported having

accumulated 650 total hours of flight experience and 0 hours within the previous 6 months. A review of previous medical certificate applications revealed that the pilot did not report any flight time during the 20-year period before his current medical application in 2017. A pilot logbook was not located during the investigation, and his recent flight experience could not be determined.

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	Registration:	N3896P
Model/Series:	P210N N	Aircraft Category:	Airplane
Year of Manufacture:	1978	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	P21000071
Landing Gear Type:	Retractable - Tricycle	Seats:	6
Date/Type of Last Inspection:	January 29, 2018 Annual	Certified Max Gross Wt.:	4000 lbs
Time Since Last Inspection:		Engines:	1 Reciprocating
Airframe Total Time:	2486.3 Hrs as of last inspection	Engine Manufacturer:	Continental
ELT:	C91 installed, activated, did not aid in locating accident	Engine Model/Series:	IO-550P
Registered Owner:		Rated Power:	310 Horsepower
Operator:	On file	Operating Certificate(s) Held:	None

The airplane, a 1978 Cessna P210N (Centurion), serial number P21000071, was of conventional aluminum construction with a retractable tricycle landing gear and wing flaps. The airplane had a pressurized cabin configured to seat six people and a total fuel capacity of 90 gallons (89 gallons usable) distributed between two wing fuel tanks. On April 22, 2014, the airplane was modified in accordance with Vitatoe Aviation Supplemental Type Certificate SA02918CH with a turbo-normalized system on a stock Teledyne Continental IO-550P engine. The engine provided thrust through a constant-speed, three-blade, Hartzell HC-J3YF-1RF/F8068-2 propeller. The pilot purchased the airplane on April 18, 2018, at 2,487.8 total airframe hours.

The airplane's hour meter was destroyed by the postimpact fire, which precluded a determination of the airplane's total service time at the time of the accident. According to available maintenance documentation, the last annual inspection of the airplane was completed on January 29, 2018, at 2,486.3 total airframe hours. As of the last annual inspection, the engine had accumulated 65 hours since new. The maintenance logbook entry for the last annual inspection indicated that the landing gear was successfully cycled four times using the normal extension/retraction system and extended once using the emergency procedure with no anomalies. On February 21, 2018, the landing gear was cycled at least 20 times without any issues after a diode was replaced in the landing gear hydraulic power pack. On April 27, 2018, the left main landing gear leg was removed to replace the hydraulic fluid transfer fitting to the

left brake. The left main landing gear leg was reinstalled with new seals.

The pilot reported to his insurance company that the oil gauge rod fractured on May 6, 2018, during a flight from Richard Lloyd Jones Jr. Airport (RVS), Tulsa, Oklahoma, to Pearland Regional Airport (LVJ), Houston, Texas. The pilot consulted an aviation mechanic at LVJ who found the fractured oil gauge rod after the pilot reportedly had an issue getting the oil filler cap to seat properly. The mechanic stated that when he removed the oil filler cap there was only about 2 inches of the oil gauge rod still attached, and that he was able to extract another 3 inches of the oil gauge rod from the tube. The mechanic stated that a borescope inspection revealed tick marks on the inside surface of the crankcase. The oil filter was removed and cut open to check for metal contamination. The mechanic reported that the oil filter contained significant metal debris, and that he told the pilot that the engine needed to be overhauled. The pilot told the mechanic that he had just purchased the airplane and that he could not afford to overhaul the engine. The mechanic then placed a red "Do Not Fly" placard on the pilot-side yoke. The mechanic stated that a couple of weeks later the pilot returned with another oil filter for inspection. The pilot told the mechanic that he had researched online on how to remove metal from an engine by flushing it with diesel fuel. The mechanic stated that there was no metal present when he cut open the oil filter for inspection. The mechanic again told the pilot that he should not fly the airplane until the engine had been overhauled.

According to Vitatoe Aviation, the turbo-normalized engine produced 262 brake horsepower at 2,500 rpm with a manifold pressure of 30 inches of mercury (inHg) or less and had a fuel flow of 17.6 gallons per hour (gph). The lean-of-peak cruise setting of 17.6 gph produced a true airspeed of 185-190 knots at 10,000 ft on a standard day. The same lean-of-peak cruise setting produced a true airspeed of about 215 knots at 22,000 ft on a standard day. The maximum operating altitude was 23,000 ft.

According to Vitatoe Aviation, to establish cruise power at the desired cruise altitude, the pilot should allow the airplane to stabilize in straight and level flight and reduce engine speed to 2,500 rpm. After the engine speed has stabilized, the pilot should reduce the throttle setting to no more than 30 inHg and reduce fuel flow to 17.6 gph. The pilot should then monitor cylinder head temperature (CHT) readings and close the cowl flaps. If any CHT approaches 380°F or higher, the pilot should gradually reduce fuel flow about 0.3-0.4 gph to maintain CHT below 380°F. On very hot days, it may be necessary to open the cowl flaps slightly to maintain CHT readings below 380°F.

Data recovered from the airplane's J.P. Instruments EDM-730 engine monitor and an Appareo Stratus 2S device indicated that, the pilot flew 6 confirmed cross-country flights since he purchased the airplane on April 18, 2018. Further review of the data revealed that the pilot's leaning method during cruise flight differed from the lean-of-peak method recommended by Vitatoe Aviation. According to the recorded engine data, during cruise flight, the pilot would lean rich-of-peak, with an average fuel flow of about 21 gph. During the previous flight leg from HPY to AWM, the average fuel flow was about 21 gph during cruise flight at 2,530 rpm, 27 inHg manifold pressure, and a hottest CHT of 390°F. During the accident flight, the average fuel flow was about 21 gph during cruise flight at 2,500 rpm, 25 inHg manifold pressure, and a hottest CHT of 380°F. At 1956:36 during the accident flight, the engine had used 71.6 gallons of fuel when the recorded fuel flow suddenly dropped to zero, along with a corresponding drop in rpm, CHT, and exhaust gas temperatures.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	DET,626 ft msl	Distance from Accident Site:	1 Nautical Miles
Observation Time:	19:53 Local	Direction from Accident Site:	90°
Lowest Cloud Condition:	Scattered / 3000 ft AGL	Visibility	10 miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	8 knots /	Turbulence Type Forecast/Actual:	None / None
Wind Direction:	20°	Turbulence Severity Forecast/Actual:	N/A / N/A
Altimeter Setting:	30 inches Hg	Temperature/Dew Point:	23°C / 15°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	West Memphis, AR (AWM)	Type of Flight Plan Filed:	VFR
Destination:	Detroit, MI (DET)	Type of Clearance:	VFR flight following
Departure Time:	15:42 Local	Type of Airspace:	Class D

Visual meteorological conditions prevailed at the accident site.

Airport Information

Airport:	Coleman A. Young Municipal DET	Runway Surface Type:	
Airport Elevation:	626 ft msl	Runway Surface Condition:	Dry
Runway Used:		IFR Approach:	None
Runway Length/Width:		VFR Approach/Landing:	Forced landing;Traffic pattern

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Substantial
Passenger Injuries:	1 Fatal, 1 Serious	Aircraft Fire:	On-ground
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 Fatal, 1 Serious	Latitude, Longitude:	42.407222,-83.025001

The main wreckage was located in a vacant residential lot; the 240-ft-long wreckage debris path was oriented on a 137° magnetic heading. There were multiple broken tree branches and a severed electricity

service line found along the debris path. The propeller separated from the engine and was found at the base of a tree about 75 ft from the main wreckage. An area of burnt ground surrounded the main wreckage, which comprised the fuselage, empennage, both wings, and the engine. The main wreckage was found inverted and facing northwest. Most of the forward fuselage, including the cockpit and instrument panel, was destroyed during the postcrash fire. Flight control cable continuity was established from each flight control surface to its respective cockpit control. The wing flap actuator measured 2.6 inches, consistent with a 10° flap extension. Both wing fuel tanks were damaged during the accident. The fuel filter assembly was not located in the wreckage and was likely destroyed during the fire. The fuel selector valve was positioned to draw fuel from the right fuel tank. A functional test of the fuel selector valve did not reveal any anomalies.

The nose and right main landing gear were found fully extended and secured by their respective downlocks. The left main landing gear was found fully retracted in the wheel well and secured by its uplock. There were small tree branches and leaves in the wheel well between the left landing gear leg and the fuselage. Both main landing gear could be easily moved by hand between the retracted and extended positions without any anomalies, and their respective up- and downlock assemblies secured both landing gear as designed.

The landing gear selector handle and emergency extension handle were not located in the wreckage and were likely destroyed during the postcrash fire. The landing gear motor/pump assembly was damaged during the fire and its hydraulic fluid reservoir was breached. The hydraulic fluid lines for the landing gear extension/retraction system were significantly damaged during impact and the fire. There was no evidence of an internal hydraulic fluid leak or any mechanical damage to either main landing gear actuator. The nose landing gear actuator exhibited thermal damage from the postcrash fire. The landing gear actuators were removed for functional testing, and all three landing gear actuators extended and retracted normally when hydraulic fluid was pumped through the actuators.

The left main landing gear downlock switch plunger appeared bent and jammed in the closed position, and the plunger did not contact the left gear leg when the gear was fully extended. A continuity check with a multimeter confirmed that the left downlock switch was stuck in the closed position. The right downlock position switch functioned normally when tested with a multimeter. The left main landing gear uplock switch plunger did not contact the left gear leg when the gear was fully retracted. There were no electrical anomalies noted with either main landing gear uplock switch when tested with a multimeter.

The engine remained attached to the firewall. The propeller remained attached to the propeller flange, which had separated from the engine crankshaft. All three propeller blades remained attached to the propeller hub and exhibited minor spanwise S-shape bending and chordwise scratching. Internal engine and valve train continuity were confirmed as the engine crankshaft was rotated through a rear accessory gear. Compression and suction were noted on all cylinders in conjunction with crankshaft rotation. A borescope inspection of each cylinder revealed no anomalies with the cylinders, pistons, valves, valve seats, or lower spark plugs.

The left magneto remained partially attached to its installation point and provided spark on all posts while the crankshaft was rotated. The right magneto had separated from the engine; however, it provided a spark on all posts when rotated by hand. The upper spark plugs exhibited features consistent with

normal engine operation.

The mechanical fuel pump remained attached to the engine and the fuel pump drive coupling was intact; however, the pump exhibited thermal damage and significant resistance when the pump was rotated by hand. The fuel pump was partially disassembled and the internal components exhibited thermal damage. The fuel metering unit remained partially attached to the engine through fuel lines and control cables. The fuel manifold valve remained attached to the engine and exhibited impact-related damage. None of the engine fuel lines contained residual fuel.

The propeller governor remained attached to the engine and exhibited impact-related damage. The turbocharger remained attached to the engine, and the compressor was capable of normal rotation and exhibited normal operation signatures. There were no anomalies noted with the turbocharger wastegate, controller, or overboost valve.

The oil pump remained attached to the engine and exhibited thermal damage from the postaccident fire. The oil sump was dented and crushed during impact. The oil sump was removed, and no metallic material was observed within the sump. The oil pick-up tube and screen were clear of contamination. The oil filter remained attached to the remote filter adapter. The oil filter housing was cut open and no metallic material was observed on the filter pleats. The oil filler cap remained attached to the engine; however, when the oil filler cap was removed from the engine, the lower portion of the oil gauge was missing. The missing portion of the oil gauge rod was not found within the oil sump.

The six engine cylinders were removed from the crankcase. The interior of the cylinders, intake and exhaust valves, and pistons exhibited features consistent with normal operation. The crankcase halves were separated for additional examination. The interior of the crankcase halves contained 3 small metal pieces that were consistent with remnants of the fractured oil gauge rod. Additionally, there were numerous scratches on the interior crankcase surface near cylinder Nos. 3 and 4. The observed scratches were consistent with the remnants of the oil gauge rod contacting the interior surface of the crankcase in conjunction with the movement of the connecting rods. The crankshaft, camshaft, connecting rods, and piston pins appeared normal with no evidence of oil starvation. The crankshaft bearings exhibited signatures of normal wear with no evidence of excessive heat or oil starvation.

The postaccident engine examination did not reveal any mechanical malfunctions or failures that would have precluded normal operation during the flight.

Additional Information

Title 14 *CFR* 91.151 stipulates that no person may begin a daytime flight in an airplane under visual flight rules conditions unless (considering wind and forecast weather conditions) there is enough fuel to fly to the first point of intended landing and at least 30 minutes at a normal cruising speed.

Medical and Pathological Information

The Wayne County Medical Examiner's Office, Detroit, Michigan, performed an autopsy on the pilot that attributed the cause of death to multiple blunt-force injuries.

Toxicology testing by the FAA Forensic Sciences Laboratory was not possible because the as-received condition of the samples precluded analysis. However, toxicological testing was completed on additional samples sent to a contract laboratory used by the Wayne County Medical Examiner's Office in conjunction with their autopsy. The results indicated the presence of caffeine in peripheral blood, but did not indicate any positive findings of toxicological significance for alcohol, carbon monoxide, or illicit drugs.

Administrative Information

Investigator In Charge (IIC):	Fox, Andrew
Additional Participating Persons:	Richard K Neibert; Federal Aviation Administration-East Michigan FSDO; Belleville, MI Edward S Janos; Federal Aviation Administration-East Michigan FSDO; Belleville, MI Henry J Soderlund; Textron Aviation; Wichita, KS Kurt Gibson; Continental Motors; Mobile, AL
Original Publish Date:	August 11, 2020
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=97560

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](#).