Aviation Investigation Final Report

Location:	Anchorage, Alaska	**Accident Number:**	ANC11LA061
Date & Time:	July 9, 2011, 15:16 Local	**Registration:**	N9129M
Aircraft:	Cessna U206E	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (total)	**Injuries:**	3 Minor, 2 None
Flight Conducted Under:	Part 135: Air taxi & commuter - Non-scheduled		

Analysis

The pilot was returning from a remote lodge when the airplane's engine lost power, resulting in an off airport emergency landing. During the landing, the airplane nosed over. The pilot reported that prior to departure from the lodge, there were 26 gallons of fuel in the right main fuel tank, and 8 to 10 gallons in the left main fuel tank. He commonly used the fuel in the right tank for the flight, and the left tank fuel was the reserve supply. When the engine lost power, he switched fuel tanks, and held the emergency fuel boost pump on for about 3 seconds. When the engine did not respond, he moved the fuel lever back and forth, turned the boost pump on, and moved the fuel mixture control to the full rich position. Unable to restart the engine, he made an off airport emergency landing.

The right front seat passenger said that prior to takeoff, he asked the pilot if they had enough fuel, because all four fuel gauges were on or near the empty mark. An examination of the airplane revealed that the right main fuel tank was empty, and about 3 inches of fuel remained in the left main fuel tank. The left header tank was full, and the right header tank contained a small quantity of fuel and water. No mechanical anomalies were found with the fuel system. The engine was test run and it operated satisfactorily.

According to the airplane's Pilot Operating Handbook (POH), the minimum fuel for the flight (without the required VFR reserve) would have been about 26.8 gallons. The POH treats the running of a fuel tank below a usable level in-flight as a normal operating procedure, but has very specific guidelines for engine restart. The pilot did not follow those procedures. The POH does not discuss the altitude lost or time required for a successful engine restart.

Considering the witnesses' observations, the postaccident examination of the fuel system and the successful engine operation, it is likely that the pilot inadvertently ran the right main fuel tank below a usable level. Due to the low altitude, time available, and his incorrect restart procedure, he was unable to get the engine restarted to avoid an off-airport landing.

Eighty-nine fuel related accidents involving Cessna single-engine airplanes were reviewed, disclosing that 52 of those accidents were initiated by a fuel tank either being intentionally or unintentionally run below a usable level. All 89 accidents resulted from the pilot not being able to get the engine restarted. Of the major airplane manufacturers producing piston engine powered airframes, Cessna is the only one that places a loss of engine power due to intentionally running a fuel tank below a usable level in the "Normal" operating section of its POH.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's decision to depart with minimal fuel and his improper fuel management and engine restart procedures, which resulted in a loss of engine power due to fuel starvation. Contributing to the accident was the Pilot Operating Handbook did not provide the altitude or time that would be lost in the event of an engine restart.

Findings

Personnel issues	Decision making/judgment - Pilot
Personnel issues	Use of equip/system - Pilot
Organizational issues	Adequacy of policy/proc - Manufacturer
Aircraft	Fuel - Fluid level

Factual Information

History of Flight

Enroute-cruise	Loss of engine power (total) (Defining event)
Enroute-cruise	Fuel starvation
Emergency descent	Loss of engine power (total)
Landing-landing roll	Landing gear collapse
Landing-landing roll	Nose over/nose down

On July 9, 2011, about 1516 Alaska daylight time, a Cessna 206 airplane, N9129M, sustained substantial damage during a forced off-airport landing, about 6 miles northwest of Anchorage, Alaska. The airplane was operated by Great Northern Air, Anchorage, as a visual flight rules, cross-country passenger flight under the provisions of 14 Code of Federal Regulations, Part 135, when the accident occurred. The commercial pilot and one passenger were not injured; the three other passengers received minor injuries. Visual meteorological conditions prevailed, and company flight following procedures were in effect. The flight departed the Lake Marie Lodge, about 80 miles northwest of Anchorage.

During a telephone conversation with the National Transportation Safety Board (NTSB) investigator-in-charge (IIC) on July 9, a representative for the operator said that the pilot reported a complete loss of engine power while in cruise flight. He said the pilot was unable to get the engine restarted, and landed the airplane in a tundra bog. During the landing the airplane nosed over, and received structural damage to the wings and tail.

In a written statement to the NTSB dated July 10, the pilot reported that prior to his departure to the lodge, he fueled the airplane, and that there was 26 gallons of fuel in the right main fuel tank, and 8-10 gallons in the left main fuel tank. His common practice was to use the fuel in the right tank for the flight, and the fuel in the left tank was held in reserve. He reported the round trip to the lodge was about 72 minutes (1.2 hours), with about 9 minutes (0.15 hours) of taxi time, and that at 24 inches of manifold pressure and 2400 rpm the engine burned fuel at the rate of 16 gallons per hour in cruise flight. The flight to the lodge was uneventful. On the return flight, about 8 minutes from the destination airport, the pilot said the right front seat passenger questioned him about the fuel gauges reading empty. He said he explained to the passenger that he (the passenger) was looking at the auxiliary fuel tank gauges, and that those tanks were not being used. About 2 minutes later the engine lost power. The pilot reported switching fuel tanks, and holding the emergency fuel boost pump on for about 3 seconds, but there was no response from the engine. He said he moved the fuel lever back and forth, turned the fuel boost pump on and left it on, and moved the fuel mixture control to the full rich position. Unable to restart the engine, he concentrated on the landing approach. The airplane landed in a bog, and nosed over.

In a telephone conversation with the NTSB IIC on December 8, the right front seat passenger said prior to takeoff, he asked the pilot whether they had enough fuel to make the flight. The passenger said he knew the difference between the auxiliary fuel tank gauges and the main fuel tank gauges, and that all four gauges were on or near the empty mark. He said the pilot ignored his question, and continued the takeoff. After the engine lost power, he said the pilot attempted to restart the engine, but they were so close to the ground he had to turn his attention to the landing.

During a telephone interview with the NTSB IIC, the pilot-rated passenger in the right rear seat said he was not able to see the gauges from his position, but when the engine lost power, past experience lead him to believe they had run out of fuel. He said none of the passengers were wearing headsets, and he could not hear what was going on in the front.

Airplane Examination

After recovery, the airplane was examined by the NTSB IIC and an FAA inspector. The right main fuel tank was dry, and about 3 inches of fuel remained in the left main fuel tank. The left header tank was full, and the right header tank contained a small quantity of fuel and water. There was fuel in the fuel injection lines of the engine. The fuel vent system appeared to be clear and functional, and the fuel selector functioned normally. Although the airplane was inverted after the landing, there was no sign of substantial fuel loss from leakage.

Engine Examination

A clean fuel supply was attached to the engine, and the engine started and ran normally throughout various engine speeds and propeller loads. An examination of the airplane and engine logbooks did not reveal anything abnormal.

Pilot Operating Handbook (POH)

According to the POH, each main fuel tank contains 2 gallons of unusable fuel. It also states that to account for the additional fuel used during each start, taxi, and takeoff, 2 gallons should be added to fuel consumption calculations. The pilot reported climbing to 1,800 feet above sea level, and according to the POH, at climb power that would require an additional .8 gallons per takeoff. Given the air temperature and airplane weight reported, the fuel burn at 24 inches of manifold pressure and 2400 rpm would be about 14 gallons per hour. The POH further calls for a 10% increase in fuel for each 10 degrees above a standard temperature day. After fueling the airplane, the pilot made 2 takeoffs and landings. Accordingly, the minimum fuel required for the flight (without the required 30 minute VFR reserve) would have been about 26.8 gallons.

Additional Information

In the Cessna 206 POH, in the fuel system section, the procedure for exhausting a fuel tank in-flight is discussed. If the pilot "desires to completely exhaust a fuel tank quantity in flight," the

procedure for restarting the engine after the engine has quit due to fuel starvation is, "immediately switch to a tank containing fuel at the first indication of fuel pressure fluctuation and/or power loss. Then place the right half of the auxiliary fuel pump switch in the ON position momentarily (3 to 5 seconds) with the throttle at least 1/2 open. Excessive use of the auxiliary fuel pump and full rich mixture can cause flooding of the engine." The POH does not address the minimum altitude above ground level, or time required to obtain a successful restart after the engine loses power due to fuel starvation, whether intentional or unintentional.

As a result of a similar accident (ANC08LA085), the IIC surveyed 89 fuel related accidents involving Cessna, single-engine airplanes. The survey showed that 11 accidents were associated with intentionally running a fuel tank dry in-flight, and 41 accidents were associated with unintentionally running a fuel tank dry in-flight. These accidents accounted for 56% of the accidents surveyed, and all 89 of the accidents resulted from the pilot's inability to restart the engine after starving it of fuel in-flight.

The same written procedure was found in all Cessna single-engine, fuel-injected, airplane pilot operating handbooks. A survey of Piper and Beechcraft handbooks showed that these two manufacturers treat running a fuel tank dry in-flight as an emergency procedure, and do not advocate exhausting fuel from a tank in-flight as a normal procedure. The FAR/AIM, and two basic flight instruction manuals surveyed, direct pilots to follow the manufacturer's fuel management procedures.

Pilot Information

Certificate:	Airline transport	**Age:**	58
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 2 Without waivers/limitations	**Last FAA Medical Exam:**	April 5, 2011
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	June 1, 2011
Flight Time:	15000 hours (Total, all aircraft), 4500 hours (Total, this make and model), 14900 hours (Pilot In Command, all aircraft), 150 hours (Last 90 days, all aircraft), 40 hours (Last 30 days, all aircraft), 4 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N9129M
Model/Series:	U206E	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	U20601529
Landing Gear Type:	Tricycle	**Seats:**	6
Date/Type of Last Inspection:	July 8, 2011 100 hour	**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	11845 Hrs at time of accident	**Engine Manufacturer:**	CONT MOTOR
ELT:	C126 installed, activated, aided in locating accident	**Engine Model/Series:**	IO 520 SERIES
Registered Owner:	CRATTY TERRY R	**Rated Power:**	285 Horsepower
Operator:	GREAT NORTHERN AIR LLC	**Operating Certificate(s) Held:**	On-demand air taxi (135)
Operator Does Business As:	Great Northern Air	**Operator Designator Code:**	G2HC

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:		**Distance from Accident Site:**	
Observation Time:		**Direction from Accident Site:**	
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	3 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	90°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:		**Temperature/Dew Point:**	19°C
Precipitation and Obscuration:			
Departure Point:	Lake Marie Lodg, AK	**Type of Flight Plan Filed:**	Unknown
Destination:	Anchorage, AK (MRI)	**Type of Clearance:**	None
Departure Time:	14:45 Local	**Type of Airspace:**	

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	3 Minor, 1 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	3 Minor, 2 None	**Latitude, Longitude:**	61.210655,-149.890472(est)

Administrative Information

Investigator In Charge (IIC):	Lewis, Lawrence
Additional Participating Persons:	Ray Lesane; FAA FSDO-03; Anchorage, AK
Original Publish Date:	April 24, 2012
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=81074