Aviation Investigation Final Report

Location:	Anchorage, Alaska	**Accident Number:**	ANC21LA033
Date & Time:	April 25, 2021, 18:28 Local	**Registration:**	N77219
Aircraft:	Cessna 140	**Aircraft Damage:**	Substantial
Defining Event:	Fuel starvation	**Injuries:**	2 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot reported that, after lining up on the final approach to landing and nearing the runway, he was unhappy with the approach, and elected to conduct a go-around. He applied full power, pushed in the carburetor heat, accelerated to 60 knots airspeed, and initiated a climb. When the airplane was about 100 ft above the treetops on the south end of the airport, the engine lost all power. He attempted to restart the engine but was not successful. The airplane touched down in an area of muskeg and bounced several times before it nosed over, sustaining substantial damage to the left lift strut.

The airplane Flight Manual, Power Plant Instrument, stated in part:

Fuel Quantity Gauge – Do not takeoff on a fuel tank less than ¼ full.

Examination of the wreckage by a mechanic found no anomalies to explain the loss of engine power and found the fuel selector placed to the right tank position. Although the right fuel gauge indicated less than 1/4 fuel, and the aircraft flight manual warned not to takeoff on a fuel tank less than 1/4 full, the fuel onboard at the time of the accident could not be determined due to the disposition of the wreckage. The airplane was equipped with 2 -12.5-gallon fuel tanks with left, right, or off, fuel selector positions.

According to a representative from the aircraft manufacturer, the fuel quantity limitation for takeoff was due to the location of the fuel pickup tubes in the fuel tanks. Fuel unporting was possible at takeoff and climb attitudes when the fuel was less than ¼ full. No markings were present on the fuel gauges to indicate a takeoff limitation when the fuel tank was less than ¼ full, which would be about 3.125 gal per fuel tank.

According to the operation manual for the airplane, a cruise power setting between sea level and 10,000 mean seal level would yield a fuel burn of about 4.2 gallons per hour. The pilot indicated that the 1.9-hour flight departed with 15 gallons of fuel and he performed numerous maneuvers during the flight. Flight track data showed the airplane's altitude varied between 7,400 ft and 100 ft. A 4.2 gph fuel burn

over a span of 1.9 hours equates to about 8 gallons of fuel burned, which would have left about 3.5 gal of fuel in each of the two wing fuel tanks if the fuel was used evenly between the two tanks.

Although a postaccident examination found some contaminates within the fuel system, the amount and size were not enough to cause a total loss of engine power. The temperature and dewpoint at the time of the accident placed the airplane on the edge of the regime for carburetor icing at glide power; however, carburetor icing is unlikely to have been an issue since the pilot applied carburetor heat during the approach to land. It is therefore likely that insufficient fuel remained for takeoff which resulted in unporting of the fuel pickups and a total loss of engine power.

Probable Cause and Findings

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

The pilot's mismanagement of fuel which resulted in fuel starvation and total loss of engine power during a go-around. Contributing to the accident was the improperly marked fuel quantity gauges that failed to indicate a fuel quantity takeoff limitation.

Findings

Personnel issues	Use of equip/system - Pilot
Aircraft	Fuel - Fluid management
Aircraft	Fuel quantity indicator - Related operating info

Factual Information

History of Flight

Approach-VFR go-around	Fuel starvation (Defining event)

On April 25, 2021, about 1828 Alaska daylight time, a Cessna 140, N77219, sustained substantial damage when it was involved in an accident near the Birchwood Airport, Birchwood, Alaska. The pilot and the passenger were not injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

The pilot reported that the cross-country flight originated at the Birchwood Airport (BCV) with stops at Quartz Creek Airport (JLA), Cooper Landing, Alaska, and a planned fuel stop in Homer Airport (HOM) Homer, Alaska. While in Homer, 13 gallons of fuel was added before the airplane departed at 1633 for BCV with a total of 15 gallons of fuel onboard (see figure 1).

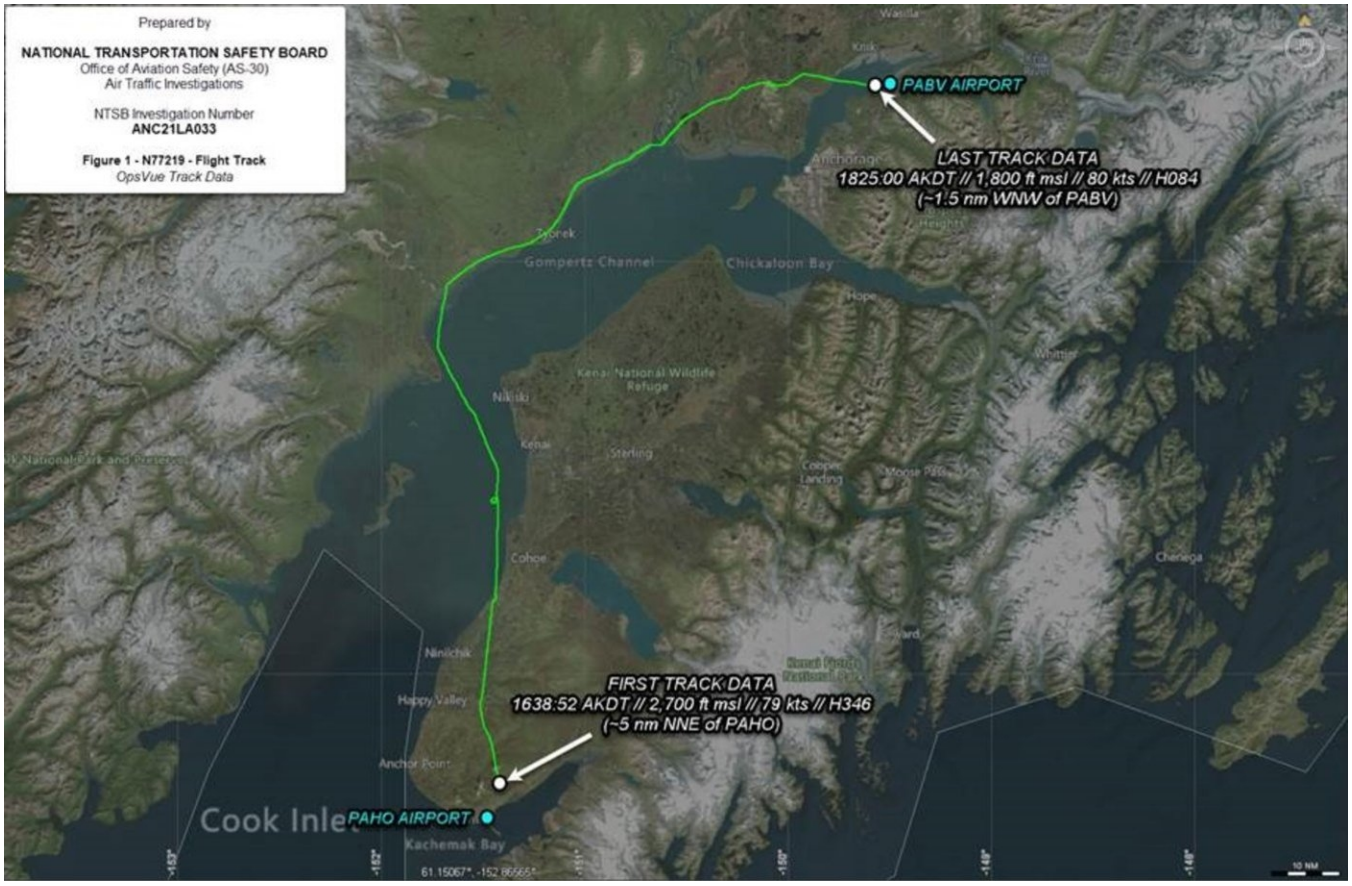

Figure 1 – Flight track for last leg of accident flight.

Before reducing the engine power and initiating the descent into BCV, the pilot applied the carburetor heat, which remained on throughout the entire descent and the traffic pattern for runway 20L. After

lining up on the final approach to land, he was unhappy with the approach, and elected to conduct a go-around by simultaneously pushing the carburetor heat to "cold" and applying full power before reducing the flap setting. He accelerated to 60 knots airspeed and initiated a climb. When the airplane was about 100 ft above the treetops on the south end of the airport, the engine lost all power. the pilot lowered the nose and banked the airplane towards an area of tidal mud flats. During the descent, he attempted to restart the engine but was not successful. The airplane touchdown in an area of muskeg and bounced several times before it nosed over, sustaining substantial damage to the left lift strut.

The airplane Fight Manual, Power Plant Instrument, stated in part:

Fuel Quantity Gauge – Do not takeoff on a fuel tank less than 1/4 full.

The airplane's Type Certificate Data Sheet did not contain a required placard for the fuel quantity no takeoff range; however, the drawing for the fuel quantity gauge from the manufacturer did contain markings for the no takeoff range. According to a representative from the aircraft manufacturer, the fuel quantity limitation for takeoff was due to the location of the fuel pickup tubes in the fuel tanks. Fuel unporting was possible at takeoff and climb attitudes when the fuel was less than ¼ full.

No markings were present on the accident airplane's fuel gauges to indicate a takeoff limitation when the fuel tank was less than 1/4 full.

The airplane was equipped with a Continental C-85 engine. The gascolator was drained and a very small amount of contaminants consistent with sand and a few drops of liquid consistent with water were found. A postaccident wreckage examination revealed no other mechanical irregularities or malfunctions with the airplane that would have precluded normal operation.

The pilot stated that he used a cruise power setting of 2200 rpm on the accident flight; however, he also stated that he performed numerous maneuvers, e.g., stalls, steep turns, etc. and flight track data revealed that the cruise altitude for the accident flight varied from 7,400 - 100 ft. According to the Operation Manual for the Cessna 140, a cruise setting between sea level and 10,000 mean sea level would yield a fuel burn of about 4.2 gallons per hour. The pilot indicated that the flight departed HOM with 15 gallons of fuel. The duration of the flight from HOM to BCV was about 1.9 hours for a total fuel burn of about 8 gallons, leaving about 7 gallons or 3.5 gallons per side of fuel remaining. The airplane is equipped with 2 -12.5-gallon fuel tanks with one tank located in each wing, for a total of 25-gallons with left, right, or off, fuel selector positions. One quarter of the total fuel would be about 6.25 gallons or 3.125 gallons per side. The exact amount of fuel remaining could not be determined due to the disposition of the wreckage.

Pilot Information

Certificate:	Private	**Age:**	29,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	4-point
Instrument Rating(s):	None	**Second Pilot Present:**	
Instructor Rating(s):	None	**Toxicology Performed:**	
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	May 21, 2020
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	August 23, 2020
Flight Time:	134 hours (Total, all aircraft), 38 hours (Total, this make and model), 105 hours (Pilot In Command, all aircraft), 57 hours (Last 90 days, all aircraft), 34 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N77219
Model/Series:	140	**Aircraft Category:**	Airplane
Year of Manufacture:	1946	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	11681
Landing Gear Type:	Tailwheel	**Seats:**	2
Date/Type of Last Inspection:	May 10, 2020 Annual	**Certified Max Gross Wt.:**	1450 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	2890.5 Hrs at time of accident	**Engine Manufacturer:**	CONT MOTOR
ELT:	C91 installed, not activated	**Engine Model/Series:**	C85 SERIES
Registered Owner:	William S Day	**Rated Power:**	85 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	PABV,96 ft msl	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	17:56 Local	**Direction from Accident Site:**	42°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:		**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	270°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.86 inches Hg	**Temperature/Dew Point:**	12°C / -4°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Homer, AK	**Type of Flight Plan Filed:**	None
Destination:	Anchorage, AK	**Type of Clearance:**	None
Departure Time:		**Type of Airspace:**	Class E

Airport Information

Airport:	BIRCHWOOD BCV	**Runway Surface Type:**	Asphalt
Airport Elevation:	83 ft msl	**Runway Surface Condition:**	Holes;Ice;Rough;Slush covered;Snow;Soft;Water-calm;Wet
Runway Used:	02R/20L	**IFR Approach:**	None
Runway Length/Width:	1800 ft / 50 ft	**VFR Approach/Landing:**	Go around

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 None	**Aircraft Fire:**	None
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	2 None	**Latitude, Longitude:**	61.409106,-149.52749

Administrative Information

Investigator In Charge (IIC):	Banning, David
Additional Participating Persons:	Hugh Youngers; Federal Aviation Administration; Anchorage, AK Casey Love ; Cessna Aircraft ; Wichita, KS
Original Publish Date:	November 4, 2022
Last Revision Date:	
Investigation Class:	Class 3
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=102986