Aviation Investigation Final Report

Location:	Skwentna, Alaska	**Accident Number:**	ANC19FA038
Date & Time:	March 6, 2019, 17:30 Local	**Registration:**	N7469A
Aircraft:	Cessna 172	**Aircraft Damage:**	Substantial
Defining Event:	Loss of control in flight	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot was conducting a cross-country flight through mountainous terrain from a hunting camp to his home airport. Forecast products and AIRMETs that were valid for the flight route indicated that mountain obscuration, marginal visual flight rules, instrument flight rules, and moderate icing conditions were expected. A friend of the pilot stated that snow showers began at the departure site shortly before the airplane departed. The radar track indicated that the pilot initially flew low through a mountain valley, about 4,000 ft mean sea level (msl) (2,500 ft above ground level), and then climbed to 6,900 ft msl while tracking east toward the destination. The last recorded radar data target indicated an altitude about 1,000 ft above the nearest mountain peak. When the airplane did not arrive at the destination, an ALNOT was issued and an extensive multi-agency search was conducted over the snow-covered mountain range; the search was terminated about 2 weeks later when the wreckage was not found. More than 4 months later, after the snow melted, the wreckage was discovered on a mountain ridge about 15 miles east of the last radar return point.

A postaccident examination of the airframe and engine revealed no evidence of mechanical malfunctions or failures that would have precluded normal operation. The damage to the airplane indicated that it impacted the ground in a nose-down, near-vertical attitude with a rear fuselage twist, which was consistent with an aerodynamic stall and spin.

A review of satellite imagery, sounding data, and radar reflectivity over the accident site revealed that an overcast cloud layer with approximate cloud-top heights of 20,000 ft was present at the accident time. Moderate rime icing conditions and light precipitation were likely present. Weather camera images near the accident site indicated obscured mountaintops in broken to overcast cloud layers. Given the weather information, it is likely that structural icing accumulated during the flight, resulting in the pilot's inability to maintain airspeed and/or altitude, which resulted in an aerodynamic stall and spin.

A search of official weather briefing sources revealed that the accident pilot did not request a weather briefing, and whether the pilot accessed weather information before the flight could not be determined.

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 into marginal visual flight rule conditions in mountainous terrain with the potential for icing, and the airplane's accumulation of structural icing, which resulted in the pilot's inability to maintain airplane control and the subsequent aerodynamic stall and spin into terrain.

Findings

Personnel issues	Decision making/judgment - Pilot
Environmental issues	Low visibility - Effect on operation
Environmental issues	Conducive to structural icing - Contributed to outcome
Aircraft	Angle of attack - Not attained/maintained

Factual Information

History of Flight

Enroute	Structural icing
Enroute	Loss of control in flight (Defining event)
Enroute	Collision with terr/obj (non-CFIT)

HISTORY OF FLIGHT

On March 6, 2019, about 1730 Alaska standard time, a Cessna 172 airplane, N7469A, sustained substantial damage when it was involved in an accident near Skwentna, Alaska. The pilot was fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

A friend of the pilot, who was hunting near Farewell, Alaska, stated that the pilot flew from Wasilla Airport (IYS), Wasilla, Alaska, to Submarine Lake to pick up bison meat and fly it back to IYS. The route was about 150 nautical miles (nm) through an area of remote mountainous, snow-covered terrain. The airplane arrived at the frozen Submarine Lake about 1600 and the pilot told his friend that he was delayed due to clouds near Skwentna and had difficulty navigating without his GPS. He also said that the weather was good for the remainder of the route. The pilot and his friend loaded the airplane with about 420 lbs of bison meat, and the pilot added 5 gallons of fuel into the airplane's fuel tanks, which according to the pilot was 2.5 hours of fuel onboard. The friend stated that the weather deteriorated while they were loading the airplane, with occasional light snow and reduced visibility, but the mountains were visible. Before he departed, the pilot agreed to send a text message to his friend's Garmin inReach satellite communication device when he arrived at IYS. The airplane departed to the east. Later that evening, the friend noted that no text was received from the pilot and he contacted a friend who filed an overdue airplane report with flight service.

The Federal Aviation Administration (FAA) issued an alert notice (ALNOT) at 2316. The Alaska Rescue Coordination Center (AKRCC) coordinated a joint-agency search operation in the Alaska Range that included units from the Alaska Air National Guard, Army National Guard, United States Coast Guard, Civil Air Patrol, Alaska State Troopers, and the National Park Service. There were no visual sightings of the airplane or pilot, and no emergency locator transmitter signals were received. On March 22, the search operation was suspended. On July 22, a helicopter pilot sighted the wreckage on a low ridge about 25 nm east of Rainy Pass.

A review of archived FAA primary radar data revealed that the missing airplane departed Submarine Lake at 1655 and flew south along the south fork of the Kuskokwim River at an altitude of about 4,000 ft mean sea level (msl) (about 2,500 ft above ground level [agl] and below surrounding mountain tops). See figure 1. The radar track ended about 10 miles south of Submarine Lake 8 minutes after takeoff. A target that was believed to be the missing airplane appeared 11 minutes later, 5 miles north of Rainy Pass, at an altitude about 6,700 ft msl, heading east. The airplane climbed to 6,900 ft msl before the

track ended 1.4 minutes later. At 1715:09, the last radar data target was recorded on a track of about 110°, a groundspeed of 102 knots, and an altitude about 1,000 ft above the nearest mountain peak. The highest terrain in the vicinity of the expected flight route was 6,500 ft msl, and then decreased to about 4,000 ft msl near the wreckage.

Figure 1. Radar flight track data (red) and wreckage location.

Pilot Information

Certificate:	Private	**Age:**	61,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:**	No
Medical Certification:	None None	**Last FAA Medical Exam:**	February 4, 2008
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	950 hours (Total, all aircraft), 950 hours (Total, this make and model), 950 hours (Pilot In Command, all aircraft)		

The pilot's logbook was not located. A review of FAA records indicated that the pilot did not have a current medical certificate. He reported flight experience of 950 total and 70 hours in previous six months as of his last FAA medical exam dated February 4, 2008.

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N7469A
Model/Series:	172	**Aircraft Category:**	Airplane
Year of Manufacture:	1956	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	29569
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	Unknown	**Certified Max Gross Wt.:**	2200 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	1983.41 Hrs at time of accident	**Engine Manufacturer:**	Continental
ELT:	C91 installed, not activated	**Engine Model/Series:**	O-300A
Registered Owner:		**Rated Power:**	145 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

Weight and Balance

Calculations using weight and balance documentation found in the airplane's FAA airworthiness records, the pilots' recorded weight from his most recent FAA physical, 25 gallons of fuel (based on the pilot's statement to the friend before departure), 420 lbs of bison meat, and 30 lbs of miscellaneous items, indicated that the airplane would have weighed about 2,136 lbs at takeoff, which was within the manufacturer's maximum gross weight limit of 2,200 lbs.

The pilot operating handbook indicated a center of gravity (CG) range between 86.0 and 98.0 inches aft of datum for a gross weight of 2,136 lbs. The airplane's estimated CG at takeoff was calculated with the bison meat in the rear seat, divided between the front seat and rear seat, and divided between the baggage compartment and rear seat. The CGs were 96.4, 90.2, and 96.6, respectively, which were within the manufacturer’s limits. The airplane would have burned about 5 gallons (30 lbs) of fuel before the accident, which would not have changed the CG significantly.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Unknown	**Condition of Light:**	Day
Observation Facility, Elevation:	PAPT,1837 ft msl	**Distance from Accident Site:**	16 Nautical Miles
Observation Time:	16:48 Local	**Direction from Accident Site:**	270°
Lowest Cloud Condition:	Unknown / 2700 ft AGL	**Visibility**	20 miles
Lowest Ceiling:	Broken / 2700 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	4 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	250°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.79 inches Hg	**Temperature/Dew Point:**	-1°C / -1°C
Precipitation and Obscuration:			
Departure Point:	Farewell, AK	**Type of Flight Plan Filed:**	None
Destination:	Wasilla, AK (IYS)	**Type of Clearance:**	None
Departure Time:	16:55 Local	**Type of Airspace:**	Class G

AIRMETs issued at 1204, valid for the airplane's route of flight at the time of the accident, warned of mountain obscuration conditions due to clouds and precipitation and occasional moderate icing conditions between 3,000 and 10,000 ft with the freezing level at 1,000 ft msl.

At 1202, the Alaska Aviation Weather Unit issued an area forecast for the accident site. The forecast indicated moderate icing and marginal visual flight rules (MVFR) to instrument flight rules (IFR) conditions, with precipitation in the form of snow and fog.

Archived images from FAA aviation weather cameras at Puntilla Lake, located 16 miles west of the accident site, depicted obscured mountain tops and visibility between 4.5 and 9.5 miles about the time of the accident (see figure 2).

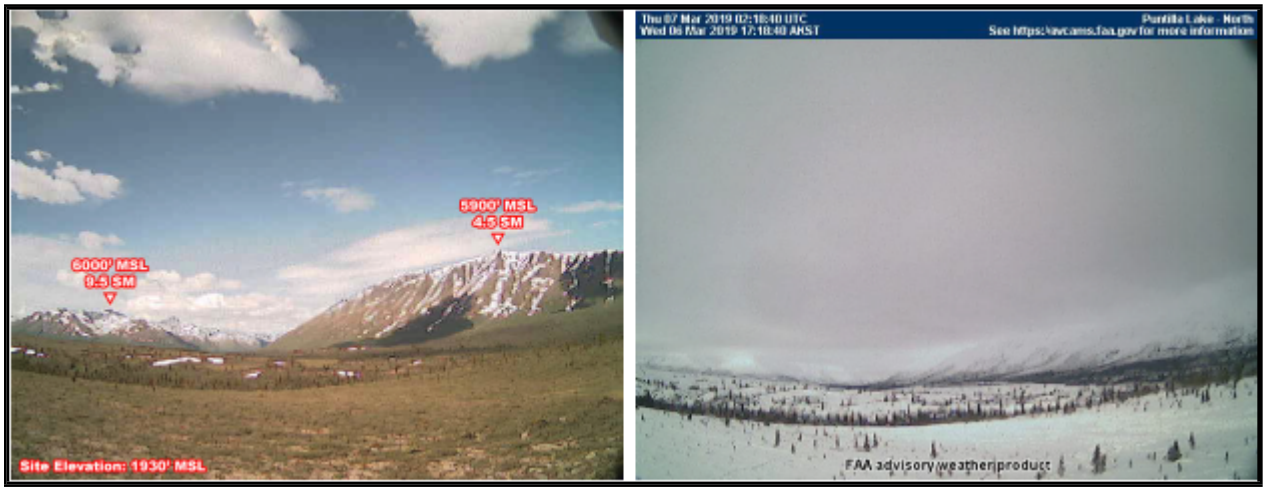

Figure 2. Images from the FAA Puntilla Lake -North weather camera on a clear day (left) and at 1718 on the day of the accident (right.)

A review of the 1730 satellite imagery and the 1800 Global Data Assimilation System sounding data over the accident site revealed that an overcast cloud layer was present, and the approximate cloud-top heights were 20,000 ft. Moderate rime icing conditions were likely between the surface and 2,000 ft msl, and light to moderate rime icing was likely between 2,000 ft msl and 3,000 ft msl, and above 8,000 ft msl. The Kenai Weather Surveillance Radar reflectivity values indicated very light precipitation over the accident site at the time of the accident.

A search of official weather briefing sources revealed that the accident pilot did not request a weather briefing. Whether the pilot accessed weather information before the flight could not be determined.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	62.110279,-152.16777(est)

The airplane came to rest on an open, grass-covered ridge, at an elevation of 3,241 ft, and a heading of 107°. The fuselage was about 80° nose-down, leaning left 30°. All major components were present at the site, and the debris was contained within a radius of 30 ft. The aft fuselage was twisted and displaced to the left with extensive buckling evident. The nose and engine section were displaced right and crushed into the ground. The wings were attached and exhibited extensive fore-to-aft leading edge deformation and compromised fuel tanks (see figure 3).

Figure 3. The airplane at the accident site.

The forward fuselage exhibited extensive buckling damage. The left (pilot’s) seat indicated fore-to-aft and upward crushing in the seat pan and cushions. The pilot's four-point restraint harness was hanging partially outside the front windshield opening with the lap belt buckle unlatched.

Flight control continuity was verified from the left (pilot's) rudder pedals to the rudder. Flight control continuity was established from the pilot's control column to the elevators and ailerons. The flap handle was in the down (retracted) position and the flaps were attached to the wings and in the retracted position.

The left outboard wing section exhibited extensive fore-to-aft and upward deformation. The inboard leading edge section indicated tension tears in the skin and the aft wing root section exhibited compression buckling. The left aileron was attached and deformed upward at the outboard section. The right wing remained attached at the forward fuselage connection and indicated compression signatures at the leading edge inboard skin. The rear inboard wing was detached and exhibited tension signatures. The right aileron was attached but fractured and deformed at its outer half.

The empennage was partially attached and hung down aft and left of the forward fuselage. The empennage section was separated behind the aft bulkhead, at the rivet line, with extensive buckling at the separation. The vertical stabilizer, rudder, left horizontal stabilizer, and elevator were intact. The right horizontal stabilizer was significantly damaged with outboard to inboard crush deformation.

The nose and right main landing gear assemblies were sheared from the fuselage at their attachments. The left landing gear was intact.

The engine was attached to the airframe at one mount and displaced almost 90° to the right. The propeller remained attached to the crankshaft and the blades exhibited aft bending, minor torsional twisting and scratches in various directions. The engine case, cylinders and accessories were intact. Mechanical continuity throughout the engine and valve train was established. The magnetos produced spark at all terminals when manually rotated.

No preaccident anomalies were noted with the airframe or engine that would have precluded normal operation.

A Garmin Pilot III GPS unit was recovered and evaluated at the National Transportation Safety Board Recorder Laboratory. The device's volatile track memory had no data due to a depleted internal battery.

Additional Information

Icing

FAA Advisory Circular 91-74B states that

…ice causes an increase in drag, which the pilot detects as a loss in airspeed or an increase in the power required to maintain the same airspeed. (The drag increase is also due to ice on other parts of the aircraft). The longer the encounter, the greater the drag increase; even with increased power, it may not be possible to maintain airspeed. If the aircraft has relatively limited power (as is the case with many aircraft with no ice protection), it may soon approach stall speed and a dangerous situation. Even a thin layer of ice at the leading edge of a wing, especially if it is rough, can have a significant effect in increasing stall speed.

Aerodynamic Stalls

The FAA Airplane Flying Handbook (FAA-H-8083-3A), chapter 4, stated the following concerning stalls:

A stall is an aerodynamic condition which occurs when smooth airflow over the airplane's wings is disrupted resulting in loss of lift. Specifically, a stall occurs when the AOA-the angle between the chord line of the wing and the relative wind-exceeds the wing's critical AOA. It is possible to exceed the critical AOA at any airspeed, at any attitude, and any power setting.

Medical and Pathological Information

An autopsy and toxicology tests of the pilot were not conducted.

Administrative Information

Investigator In Charge (IIC):	Price, Noreen		
Additional Participating Persons:	William Lowen; Federal Aviation Administration; Anchorage, AK		
Original Publish Date:	December 3, 2020	**Investigation Class:**	2
Note:	The NTSB traveled to the scene of this accident.		
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=99155		