



# Aviation Investigation Final Report

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<b>Location:</b>	Fairbanks, Alaska	<b>Accident Number:</b>	ANC21LA073
<b>Date &amp; Time:</b>	August 16, 2021, 14:52 Local	<b>Registration:</b>	N97HA
<b>Aircraft:</b>	Cessna 208	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Loss of control in flight	<b>Injuries:</b>	9 None
<b>Flight Conducted Under:</b>	Part 135: Air taxi & commuter - Scheduled		

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## Analysis

After departure, the pilot climbed the airplane with the autopilot engaged to her assigned altitude of 10,000 ft mean sea level (msl), where she encountered instrument meteorological conditions and “light rime” icing conditions. To exit the icing conditions, she climbed the airplane to 10,500 ft msl. However, she was unable to exit the icing conditions and began a gradual descent back to 10,000 ft msl. She noted that while en route, the airplane’s deicing boots, and heated propeller were operating normally by removing ice accumulations.

While in a gradual descent from 10,500 ft msl to 10,000 ft msl, the autopilot disengaged without warning, and the airplane entered an abrupt uncommand right bank followed by a steep, nose-down, spiraling descent. The pilot stated that during the upset, it felt as if the aileron controls were jammed as she tried to regain control of the airplane. After regaining control of the airplane, she declared an emergency and made an emergency landing back at the departure airport. The airplane sustained substantial damage to the wings and the right aileron during the upset.

Postaccident examination revealed no evidence of preaccident mechanical malfunctions or anomalies with the airplane that would have precluded normal operation. Flight control continuity was confirmed from the cockpit to all control surfaces. Additionally, testing of the autopilot and deice systems did not reveal any anomalies.

Weather soundings, forecasts, and experimental weather products indicated a 30% to 60% chance of light to moderate icing in the accident region with supercooled liquid water in the clouds from 7,000 ft to 13,000 ft and favorable conditions for supercooled large droplets (SLD). It is likely the airplane encountered SLD conditions that degraded the airplane’s performance, which resulted in the upset.

Graphical aviation forecast information that showed areas of icing (trace to severe/heavy) was available in Alaska. However, that information did not depict areas with potential SLD icing. If a product that included SLD icing information for Alaska had been available, the accident may have been avoided. As a result, the National Transportation Safety Board (NTSB) issued recommendations to the Federal

Aviation Administration (FAA) and the National Weather Service (NWS) to collaborate in the development of a graphical forecast showing the potential for SLD icing conditions in Alaska and to make this information available to pilots (Safety Recommendations A-22-21 and -22).

Although the airplane was equipped for flight into known icing conditions, the pilot's operating handbook (POH) and applicable supplements contained information that flight in freezing rain, freezing drizzle, mixed conditions, or conditions defined as severe were prohibited. In addition, the minimum speed for flight in icing conditions with the flaps up was 130 knots indicated airspeed with a maximum weight of 8,550 lbs. The POH further required that the autopilot be disconnected once every 10 minutes in icing conditions to check for any out-of-trim conditions caused by ice buildup.

Data obtained from the autopilot revealed that it was not disconnected every 10 minutes through the course of the flight as required. The indicated air speed was consistently below 130 knots, and it was below 100 knots in the seconds preceding the upset. Furthermore, the low airspeed alert activated at 107 kts about 16 minutes, 5 minutes and 2 1/2 minutes before the upset, respectively. Additionally, the estimated gross weight of the airplane at the time of the accident was about 293.5 lbs over its maximum approved gross weight and 805.5 lbs over its approved maximum gross weight for flight in known icing conditions.

For each flight in multiengine operations, Title 14 *Code of Federal Regulations (CFR)* 135.63(c) requires the preparation of a load manifest that includes, among other items the number of passengers, total weight of the loaded aircraft, the maximum allowable takeoff weight, and the center of gravity location of the loaded aircraft; one copy of the load manifest should be carried in the airplane, and the operator is required to keep the records for at least 30 days. Single-engine operations, such as the accident flight, are excluded from this requirement. Had the pilot been required to compute and record a weight and balance calculation, she may have been more aware of the airplane's limitations for flight in known icing conditions and its overweight condition.

The NTSB previously attempted to address this exclusion with the issuance of Safety Recommendations A-89-135, A-99-61, and A-15-29, which asked the FAA to amend the record-keeping requirements of 14 *CFR* 135.63(c) to apply to single-engine as well as multiengine aircraft. The FAA did not take the recommended action, and the NTSB classified Safety Recommendations A-89-135, A-99-61, and A-15-29 "Closed—Unacceptable Action" in 1990, 2014, and 2021, respectively.

## Probable Cause and Findings

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

The pilot's unexpected encounter with supercooled liquid droplets (SLD), which resulted in a loss of control due to ice accumulation. Contributing to the accident were: (1) the pilot's failure to maintain the minimum airspeed for flight in icing conditions, (2) the pilot's failure to disconnect the autopilot every 10 minutes to check for ice buildup, (3) the overweight airplane, (4) the lack of an SLD forecast product for the state of Alaska, and (5) the Federal Aviation Administration's failure to require weight and balance documentation for each flight in Title 14 *Code of Federal Regulations* Part 135 single-engine operations.

## Findings

<b>Personnel issues</b>	Aircraft control - Pilot
<b>Aircraft</b>	Airspeed - Not attained/maintained
<b>Aircraft</b>	Angle of attack - Not attained/maintained
<b>Personnel issues</b>	Use of automation - Pilot
<b>Personnel issues</b>	Weight/balance calculations - Pilot
<b>Personnel issues</b>	Weight/balance calculations - FAA or designated personnel
<b>Environmental issues</b>	Freezing rain/sleet - Awareness of condition
<b>Environmental issues</b>	Freezing rain/sleet - Effect on equipment

## Factual Information

### History of Flight

Enroute	Structural icing
Enroute	Loss of control in flight (Defining event)

On August 16, 2021, about 1452 Alaska daylight time, a Cessna 208B, N97HA, was substantially damaged when it was involved in an accident near Fairbanks, Alaska. The pilot and eight passengers were not injured. The airplane was operated as a Title 14 *CFR* Part 135 scheduled commuter flight.

According to the pilot, Wright Air Service flight 440 departed about 1424 from the Fairbanks International Airport (FAI), destined for Huslia, Alaska (HLA), located about 220 miles west-northwest of FAI. The pilot reported that after departure, she climbed the airplane to her assigned altitude of 10,000 ft msl, where she encountered "light rime" icing conditions. To exit the icing conditions, she requested and was assigned a block altitude from 10,000 to 12,000 ft msl. She subsequently climbed the airplane to 10,500 ft msl. She was unable to exit the icing condition and elected to begin a gradual descent back to 10,000 ft msl. She added that instrument meteorological conditions prevailed and that the autopilot was engaged. The pilot also noted that while en route, the airplane's deicing boots and heated propeller were operating normally by removing ice accumulations.

She reported that while in a gradual descent from 10,500 ft msl to 10,000 ft msl, the autopilot suddenly disengaged without warning, and the airplane entered an abrupt uncommanded right bank followed by a steep, nose-down, spiraling descent. The pilot said that during the upset, it felt as if the aileron controls were jammed as she tried to regain control of the airplane. After regaining control of the airplane, she declared an emergency to air traffic control and subsequently made an emergency landing at FAI.

Flight track data revealed that after departing FAI, the flight proceeded to the west-northwest for about 47 nautical miles cruising at an altitude of about 10,000 ft msl. Before the upset, a climb was initiated, and the flight reached an altitude of about 10,700 ft msl before descending to about 10,300 ft msl followed by an inflight upset with abrupt changes to altitude and speed. (See figure – Flight track.)

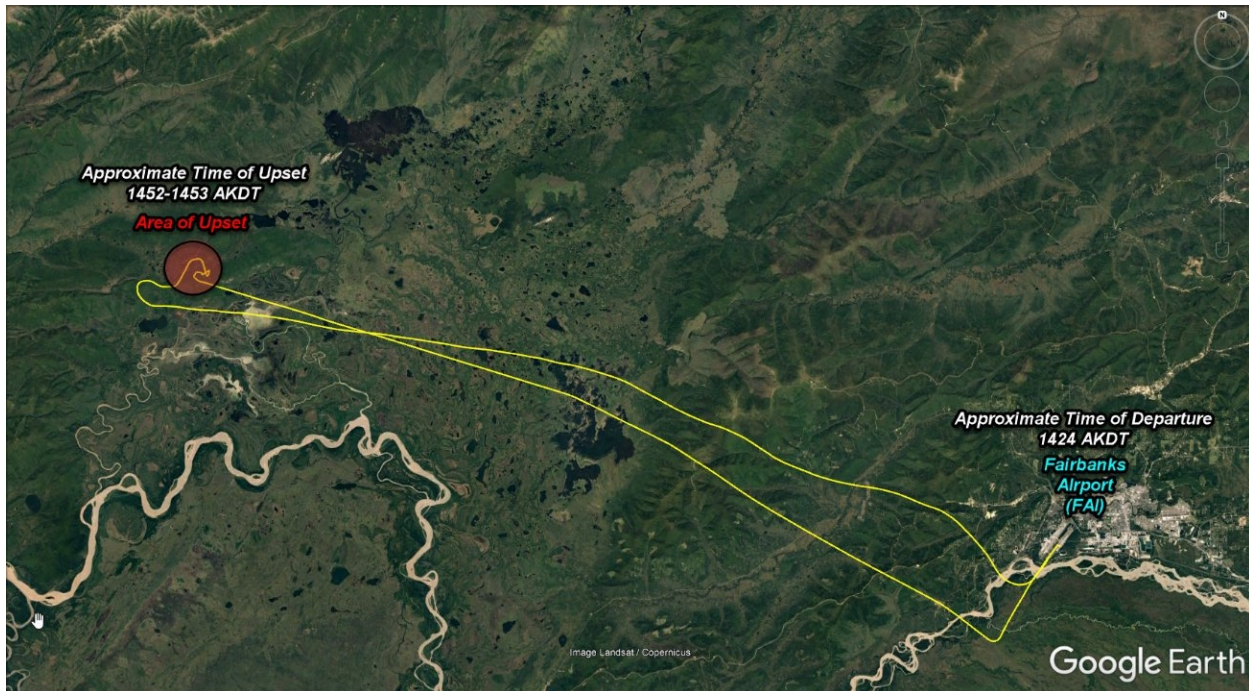


Figure - Flight track.

The Fairbanks upper air soundings indicated cloud cover was likely from 3,000 ft msl through 18,000 ft msl with moderate icing above 9,500 ft msl and the freezing level around 6,440 ft msl. The NWS Fairbanks/Pedro Dome (PAPD) weather radar depicted light to moderate precipitation moving southwest to northeast across the flight path throughout the accident flight with very light precipitation located near the accident location at the accident time. Experimental satellite cross section information further supplemented the Fairbanks sounding icing data, indicating supercooled liquid water located within the clouds from 7,000 ft msl through 13,000 ft msl between 1447 and 1500. Both the NWS Forecast Icing Product (FIP) and the NWS Current Icing Product (CIP) indicated a 30% to 60% chance of trace to moderate icing in the accident region; the CIP indicated an unknown probability of SLD between 8,000 ft msl and 11,000 ft msl at 1500. Additional information received from the National Center for Atmospheric Research indicated favorable conditions for SLD.

Several passengers on the flight provided their observations about the weather conditions. One of the passengers stated that around the time of the upset, the airplane felt like it was getting “slammed with ice” and in turbulence; this passenger viewed chunks or sheets of ice flying past the airframe while in descent after the initial upset. Another passenger stated that before the upset, there was ice built up on the front windshield, and they noticed “heavy moisture” on the strut throughout the entire flight. A third passenger stated that they observed snow and ice building up on their side window before the upset and that the accumulation was thick enough that they could not see through it.

A postflight examination of the airplane revealed substantial damage to the wings and right aileron. The examination revealed no evidence of preaccident mechanical malfunctions or anomalies with the airplane that would have precluded normal operation. Flight control continuity was confirmed from the cockpit to all control surfaces. Additionally, testing of the autopilot and deice systems did not reveal any anomalies.

A review of the airplane's pilot operating handbook (POH) and applicable supplements revealed that flight in freezing rain, freezing drizzle, mixed conditions, or conditions defined as severe were prohibited. In addition, the minimum speed for flight in icing conditions with the flaps up was 130 knots indicated airspeed with a maximum weight of 8,550 lbs. The POH further stated, "the autopilot must be disconnected once every 10 minutes in icing conditions to check for any out-of-trim conditions caused by ice buildup."

Data obtained from the Garmin GFC 600 autopilot revealed that the autopilot was not disconnected every 10 minutes through the course of the flight as required. The indicated air speed was consistently below 130 knots, and it was below 100 knots in the seconds preceding the upset. The low airspeed alert activated at 107 kts about 16 minutes, 5 minutes and 2 1/2 minutes before the upset, respectively. A review of the data did not identify any unexpected operation of the autopilot.

According to the weight and balance information for the airplane dated February 3, 2021, the basic empty weight of the airplane in the seating configuration of the accident flight was 5,202.5 lbs with a center of gravity of 188.2 inches. At the airplane's maximum takeoff gross weight of 9,062 lbs, the center of gravity range was 200.23 inches to 204.35 inches. At the airplane's maximum takeoff gross weight for flight into known icing conditions of 8,550 lbs, the center of gravity range was 197 inches to 204 inches.

The airplane's weight and balance at the time of the accident was estimated using the weight of the pilot from her most recent FAA medical examination (115 lbs) and the weights provided by the operator for the passengers and their baggage (1,606 lbs and 832 lbs, respectively). The pilot stated that the airplane departed with about 1,900 lbs of fuel. Assuming an average fuel burn of about 360 lbs/hr, about 30 minutes of flight time before the upset, and allowing for additional fuel burned during takeoff and initial climb, fuel onboard at the time of the accident was about 1,700 lbs. The gross weight of the airplane at the time of the accident, without accounting for the weight of any ice accumulation, was about 9,420 lbs, and the center of gravity was about 199.8 inches.

#### Previous Related Recommendations

During its investigation of this accident, the NTSB determined that the airplane encountered SLD. The pilot stated that before the accident flight, she reviewed weather information from several sources, including "multiple pages" on the NWS Alaska Aviation Weather Unit (AAWU) website. The NWS Aviation Weather Center (AWC) produces graphical forecast products (the CIP and the FIP) that depict the potential for significant icing, including SLD conditions, for the contiguous United States. However, a product depicting SLD was not available for the state of Alaska, and if it had been, the accident may have been avoided. As a result, the NTSB issued the following recommendations:

Safety Recommendation A-22-21 asked the FAA, in collaboration with the NWS, to develop a graphical forecast showing the potential for SLD icing conditions in Alaska and make this information available to pilots.

Safety Recommendation A-22-22 asked the NWS to work with the FAA to develop a graphical forecast depicting potential areas of SLD icing conditions in Alaska and make this information available to pilots.

Although neither Part 135 nor Wright Air Service's Operations Specifications required the operator to physically document the weight and balance for any flights conducted in the company's single-engine airplanes, 14 *CFR* 135.63 requires that operators using multiengine aircraft are "responsible for the preparation and accuracy of a load manifest in duplicate containing information concerning the loading of the aircraft." This load manifest must be prepared before each flight and include, among other items, the number of passengers, total weight of the loaded aircraft, the maximum allowable takeoff weight, and the center of gravity location of the loaded aircraft. Further, one copy of the load manifest is to be carried in the airplane, and the operator is required to keep the records for at least 30 days.

The NTSB attempted to address this exclusion with the issuance of Safety Recommendations A-89-135, A-99-61 and A-15-029, which asked the FAA to amend the record-keeping requirements of 14 *CFR* 135.63(c) to apply to single-engine as well as multiengine aircraft. The FAA did not take the recommended action, and the NTSB classified Safety Recommendations A-89-135, A-99-61, and A-15-029 "Closed—Unacceptable Action" in 1990, 2014, and 2021, respectively.

## Pilot Information

<b>Certificate:</b>	Airline transport; Flight instructor	<b>Age:</b>	34,Female
<b>Airplane Rating(s):</b>	Single-engine land; Single-engine sea; Multi-engine land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	Unknown
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	Airplane single-engine	<b>Toxicology Performed:</b>	
<b>Medical Certification:</b>	Class 1 With waivers/limitations	<b>Last FAA Medical Exam:</b>	September 22, 2020
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	May 27, 2021
<b>Flight Time:</b>	10000 hours (Total, all aircraft), 2000 hours (Total, this make and model), 9700 hours (Pilot In Command, all aircraft), 265 hours (Last 90 days, all aircraft), 127 hours (Last 30 days, all aircraft), 6 hours (Last 24 hours, all aircraft)		

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Cessna	<b>Registration:</b>	N97HA
<b>Model/Series:</b>	208 B	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>		<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	208B0610
<b>Landing Gear Type:</b>	Tricycle	<b>Seats:</b>	
<b>Date/Type of Last Inspection:</b>	August 13, 2021 AAIP	<b>Certified Max Gross Wt.:</b>	9062 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	1 Turbo prop
<b>Airframe Total Time:</b>	15382.7 Hrs at time of accident	<b>Engine Manufacturer:</b>	Pratt & Whitney
<b>ELT:</b>	C126 installed, not activated	<b>Engine Model/Series:</b>	PT6A-140
<b>Registered Owner:</b>	WRIGHT AIR SERVICE INC	<b>Rated Power:</b>	867 Horsepower
<b>Operator:</b>	WRIGHT AIR SERVICE INC	<b>Operating Certificate(s) Held:</b>	Commuter air carrier (135)

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Instrument (IMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	PAFA,432 ft msl	<b>Distance from Accident Site:</b>	12 Nautical Miles
<b>Observation Time:</b>	14:53 Local	<b>Direction from Accident Site:</b>	133°
<b>Lowest Cloud Condition:</b>	Few / 800 ft AGL	<b>Visibility</b>	5 miles
<b>Lowest Ceiling:</b>	Overcast / 3800 ft AGL	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	7 knots /	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>	170°	<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	29.79 inches Hg	<b>Temperature/Dew Point:</b>	11°C / 9°C
<b>Precipitation and Obscuration:</b>	Moderate - None - Mist		
<b>Departure Point:</b>	Fairbanks, AK	<b>Type of Flight Plan Filed:</b>	IFR
<b>Destination:</b>	Huslia, AK	<b>Type of Clearance:</b>	IFR
<b>Departure Time:</b>		<b>Type of Airspace:</b>	Class E



## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 None	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>	8 None	<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>		<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	9 None	<b>Latitude, Longitude:</b>	64.935913,-148.20412

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Banning, David
<b>Additional Participating Persons:</b>	Rett Leaf; Wright Air Service; Fairbanks, AK Casey Love; Textron Aviation; Wichita, KS Matthew Rigsby; FAA AVP-100; Fort Worth, TX
<b>Original Publish Date:</b>	April 26, 2023
<b>Investigation Class:</b>	<a href="#">Class 3</a>
<b>Note:</b>	The NTSB did not travel to the scene of this accident.
<b>Investigation Docket:</b>	<a href="https://data.nts.gov/Docket?ProjectID=103719">https://data.nts.gov/Docket?ProjectID=103719</a>

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, “accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person” (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB’s statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available [here](#).