



National Transportation Safety Board Aviation Accident Final Report

Location:	Bethel, AK	Accident Number:	ANC08LA027
Date & Time:	12/18/2007, 0856 AST	Registration:	N5187B
Aircraft:	CESSNA 208B	Aircraft Damage:	Substantial
Defining Event:		Injuries:	1 Serious, 1 Minor
Flight Conducted Under:	Part 135: Air Taxi & Commuter - Non-scheduled		

Analysis

About 0800, the commercial pilot did a preflight inspection of the accident airplane, in preparation for a cargo flight. Dark night, visual meteorological conditions prevailed. He indicated that the weather conditions were clear and cold, and frost was on the airplane. He said the frost was not bonded to the skin of the airplane, and he was able to use a broom to clean off the frost, resulting in a clean wing and tail surface. He reported that no deicing fluid was applied. After takeoff, he retracted the flaps to about 5 degrees at 110 knots of airspeed. The airplane then rolled to the right about three times in a manner he described as a wave, or vortex-like movement. He applied left aileron and lowered the flaps to 20 degrees, but the roll to the right was more severe. The pilot said the engine power was "good." He then noticed that the airplane was descending toward the ground, so he attempted to put the flaps completely down. His next memory was being outside the airplane after it collided with the ground. The airplane's information manual contains several pages of limitations and warnings about departing with even small amounts of frost, ice, snow, or slush on the airplane, as it adversely affects the airplane's flight characteristics. The manufacturer requires a visual or tactile inspection of the wings, and horizontal stabilizer to ensure they are free of ice or frost if the outside air temperature is below 10 degrees C, (50 degrees F), and notes that a heated hangar or approved deicing fluids should be used to remove ice, snow and frost accumulations. The weather conditions included clear skies, and a temperature of -11 degrees F. Postaccident examination of the airplane revealed no observed mechanical malfunction. An examination of the engine revealed internal over-temperature damage, and minor external fire damage consistent with a massive spike of fuel flow at the time of ground impact. Damage to the propeller blades was consistent with high power at the time of ground impact. The rolling/vortex motion of the airplane was consistent with airframe contamination due to frost.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to adequately remove frost contamination from the airplane, which resulted in a loss of control and subsequent collision with terrain during an emergency landing after takeoff.

Findings

Occurrence #1: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: CLIMB - TO CRUISE

Findings

1. (C) FLIGHT CONTROL SURFACES/ATTACHMENTS - CONTAMINATION
2. (C) ICE/FROST REMOVAL FROM AIRCRAFT - INADEQUATE - PILOT IN COMMAND

Occurrence #2: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: EMERGENCY LANDING AFTER TAKEOFF

Findings

3. TERRAIN CONDITION - SNOW COVERED

Factual Information

On December 18, 2007, about 0856 Alaska Standard time, a Cessna 208B, N5187B, sustained substantial damage when it collided with terrain, about 2 miles west-northwest of Bethel, Alaska. The airplane was being operated as a visual flight rules (VFR) cross-country nonscheduled cargo flight under Title 14, CFR Part 135, when the accident occurred. The airplane was operated as Flight 218, by Arctic Circle Air Service Inc., Fairbanks, Alaska. The commercial certificated pilot received minor injuries. The passenger, a ground support employee of the operator, received serious injuries. Dark night, visual meteorological conditions prevailed, and VFR company flight following procedures were in effect. The flight originated at the Bethel Airport, about 0854, and was en route to Hooper Bay, Alaska.

During a telephone conversation with the National Transportation Safety Board (NTSB) investigator-in-charge (IIC) on December 18, the director of operations for the operator reported that the pilot of the airplane indicated that after departure, he began a climb to cruise altitude. The airplane was climbing about 500 feet per minute, and the pilot retracted the flaps. The pilot told the director of operations that the engine was losing power, accompanied by two or three "wobbles" from the engine area, with each one getting progressively worse. The airplane began to lose altitude, and the pilot added power, but the airplane continued to descend. The airplane collided with snow-covered terrain, and received structural damage to the wings and fuselage.

A Federal Aviation Administration (FAA) inspector, Anchorage Flight Standards District Office (FSDO), Anchorage, Alaska, responded to the accident scene, and examined the airplane. He reported that the right wing was torn loose from the fuselage, and folded aft against the fuselage. The landing gear and belly cargo pod were destroyed. The fuselage was torn open along the right side, and the left wing was bent upward at the tip. The engine propeller blades are fiberglass composite, and all three of the blades were sheared off at the base of each blade, just outboard from the propeller hub.

On December 20, the FAA inspector interviewed the pilot, who indicated that the airplane was initially climbing with 20 degrees of flaps after departing runway 36. He retracted the flaps half way at 100 knots of airspeed, and then fully retracted the flaps at 110 knots. The pilot said that the airplane then began to roll to the right in a manner he described as a wave, or vortex feeling. He corrected the roll, lowered the nose of the airplane, and it again rolled to the right, which he again corrected. The airplane rolled to the right a third time, and the pilot saw that the airplane was descending to the ground. He attempted to lower the flaps just before the airplane collided with the ground.

The NTSB IIC interviewed the pilot via telephone on February 1, 2008. The pilot said that he arrived at the operator's facility about 0800. He indicated that the weather conditions were clear and cold, and frost was present on the airplane. He said the frost was not bonded to the skin of the airplane, and he was able to use a broom to clean off the frost, resulting in a clean wing and tail surface. He reported that no deicing fluid was necessary and was not applied.

The pilot said the accident flight takeoff and climb with 20 degrees of flaps was smooth, and the fuel selector was on "Both." During the climb, he retracted the flaps to about 5 degrees at 110 knots of airspeed. The airplane then rolled to the right, as if in a vortex. He applied left aileron and lowered the flaps to 20 degrees, but the roll to the right was more severe. The pilot said the engine power was "good." He then noticed that the airplane was descending toward

the ground, so he attempted to put the flaps completely down. His next memory was being outside the airplane after it collided with the ground.

Company Information

Operational control of company flights is listed in the company Flight Operations Manual, Section 4. Personnel listed are the director of operations, chief pilot, director of station operations, and station managers. In addition, flight coordinators are delegated operational control to coordinate aircraft loads, assignment of crews, acceptance and coordination of charter flights, and flight following.

The company's facility at Bethel was supervised by a station manager/pilot.

Aircraft Information

Section 2, Limitations, of the airplane's information manual, states, in part: "Preflight - Takeoff is prohibited with any frost, ice, snow, or slush adhering to the wings, horizontal stabilizer, vertical stabilizer, control surfaces, propeller blades, or engine inlets. WARNING - Even small amounts of frost, ice, snow, or slush on the wing may adversely change lift and drag. Failure to remove these contaminants will degrade airplane performance and may prevent a safe takeoff and climb out."

Section 4, Normal Procedures, states, in part: "Preflight Inspection - 1. Wings - Visual and tactile inspection to make sure clear of ice and frost. 2. Horizontal Stabilizer - Visual or tactile inspection to make sure clear of ice and frost. 3. Vertical Stabilizer - Visual inspection to make sure clear of ice and frost."

Section 9, Supplement S1, states, in part: "General - The in-flight ice protection equipment is not designed to remove ice, snow or frost accumulations on a parked airplane sufficiently enough to ensure a safe takeoff or subsequent flight. Other means, (such as a heated hangar or approved de-icing fluids) must be used to ensure that all wing, wing strut, landing gear, cargo pod, tail, control, propeller, and windshield surfaces and the fuel vents are free of ice, snow, and frost accumulations, and there are no internal accumulations of ice or debris in the control surfaces, engine intakes, pitot-static system ports, and fuel vents prior to takeoff. WARNING - If these requirements are not accomplished, aircraft performance will be degraded to a point where a safe takeoff and climb out may not be possible."

Supplement S1, Limitations, also states, in part: "Visual/Tactile Check - To assure the absence of frost, a tactile check of the wing leading edge and upper surface per Section 4 of the POH is required in addition to a visual inspection if the outside air temperature (OAT) is below 10 degrees C, (50 degrees F). During ground icing conditions, takeoff must be accomplished within 5 minutes of completing the tactile inspection unless the airplane is operated per 14 CFR 135.227(b)(3) [An FAA prohibition of takeoff under icing conditions unless the pilot has received training in icing conditions, and the operator has an approved de-icing program]."

According to Supplement S1, Ground icing conditions are defined as: "1. the OAT is 2 degrees C, (36 degrees F) or below, and visible moisture is present (i.e. rain, drizzle, sleet, snow, fog, water is present on the wing, etc.), or, 2. The OAT is 5 degrees C, (40 degrees F) or below and conditions are conducive to active frost formation (i.e. clear night with a dew point temperature/OAT difference of 3 degrees C, (5 degrees F) or less). Takeoff is prohibited if frost, ice or snow may reasonably be expected to adhere to the airplane between the tactile check and takeoff."

The airplane has a low airspeed awareness system, described in Supplement S1, which states, in part: "An advisory annunciator is installed just above the annunciator panel and is labeled Below Icing Min Spd. This annunciator illuminates when the propeller anti-ice switch is in the Auto position, and the indicated airspeed is less than 110 knots... This system does not function with Prop Anti-ice in Manual, or Off modes."

Weather Information

At 0853, an aviation routine weather report (METAR) observation at the Bethel Airport was reporting, in part: Wind, 330 degrees (true) at 10 knots; visibility, 10 statute miles; clouds and sky condition, clear; temperature, -11 degrees F; dew point, -18 degrees F; altimeter, 29.71 inHg.

Wreckage Examination

After recovery, an examination of the airplane wreckage was done on January 29, 2008, at a recovery yard in Wasilla, Alaska. The parties to the investigation participated in the examination.

Airframe

The fuselage, aft of the left side cargo door, was twisted to the right about 20 degrees. The lower aft right side of the fuselage was buckled inward. The right side of the fuselage was torn open from the wing to the right rear door. The empennage received minor damage. The upper portion of the fuselage was torn open and displaced to the right, and was crushed downward from the aft side of the wing carry through.

The main landing gear struts were torn off the airplane. The nose gear strut was broken at the wheel casting. The belly cargo pod was torn off the airplane.

The outboard end of the left wing was bent upward, about 20 degrees. The right wing was torn off the airframe. Control continuity was established from the cockpit, including operation of each wing aileron spoiler.

The engine power lever was full forward. The propeller control lever was full forward. The fuel condition lever was in the "run" position. The emergency power lever was in the "normal" position, with its safety wire intact. The fuel shutoff control was in the "on" position.

The right side of the engine, adjacent to the exhaust tube, had localized fire damage and sooting. The exhaust tube was crushed and flattened, and had interior sooting. The extended exhaust tube was crushed and flattened. The interior side of the extended exhaust duct/cowling, had blistering and sooting.

Propeller

All the propeller blades were sheared off the hub at the base of each blade. The blades had extensive destruction with shattering and delaminating of the blade surfaces.

Engine

The engine was partially disassembled by the engine manufacturer representative. Continuity of the engine was established throughout, and rotational rubbing and scoring signatures were observed in the turbine section. Sooting was present inside the combustion chamber liner. The compressor turbine blade tips were burned and melted. Several of the second stage power turbine blades were fractured and burned. The remainder of the blades had blade tip rubbing

signatures. The power turbine guide vane ring had metal splatter. The ignition plugs and fuel nozzle tips were sooted.

Additional Information

The airplane wreckage, located at Wasilla, Alaska, was released to the operator on February 21, 2008.

Pilot Information

Certificate:	Flight Instructor; Commercial	Age:	39, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land; Single-engine Sea	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	Airplane Single-engine; Instrument Airplane	Toxicology Performed:	No
Medical Certification:	Class 2 Without Waivers/Limitations	Last FAA Medical Exam:	04/01/2007
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	10/01/2007
Flight Time:	4054 hours (Total, all aircraft), 190 hours (Total, this make and model), 3700 hours (Pilot In Command, all aircraft), 244 hours (Last 90 days, all aircraft), 68 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	CESSNA	Registration:	N5187B
Model/Series:	208B	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	208B0270
Landing Gear Type:	Tricycle	Seats:	2
Date/Type of Last Inspection:	11/01/2007, AAIP	Certified Max Gross Wt.:	8750 lbs
Time Since Last Inspection:	82 Hours	Engines:	1 Turbo Prop
Airframe Total Time:	12204 Hours as of last inspection	Engine Manufacturer:	Pratt & Whitney Canada
ELT:	Installed, activated, did not aid in locating accident	Engine Model/Series:	PT6A-114A
Registered Owner:	Arctic Air Group Inc.	Rated Power:	675 hp
Operator:	Arctic Circle Air Service Inc.	Operating Certificate(s) Held:	Commuter Air Carrier (135); On-demand Air Taxi (135)
Operator Does Business As:		Operator Designator Code:	ACSA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Night
Observation Facility, Elevation:	PABE, 126 ft msl	Distance from Accident Site:	2 Nautical Miles
Observation Time:	0853 AST	Direction from Accident Site:	115°
Lowest Cloud Condition:	Clear	Visibility	10 Miles
Lowest Ceiling:	None	Visibility (RVR):	
Wind Speed/Gusts:	10 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	330°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29.71 inches Hg	Temperature/Dew Point:	-24°C / -28°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Bethel, AK (BABE)	Type of Flight Plan Filed:	Company VFR
Destination:	Hooper Bay, AK (PAHP)	Type of Clearance:	VFR
Departure Time:	0854 AST	Type of Airspace:	

Airport Information

Airport:	Bethel (PABE)	Runway Surface Type:	
Airport Elevation:	126 ft	Runway Surface Condition:	
Runway Used:	N/A	IFR Approach:	None
Runway Length/Width:		VFR Approach/Landing:	Forced Landing

Wreckage and Impact Information

Crew Injuries:	1 Minor	Aircraft Damage:	Substantial
Passenger Injuries:	1 Serious	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Serious, 1 Minor	Latitude, Longitude:	60.795000, -161.888333

Administrative Information

Investigator In Charge (IIC):	Scott R Erickson	Report Date:	12/11/2008
Additional Participating Persons:	Terrence Musick; FAA-AL-ANC FSDO 03; Anchorage, AK Frank Neitz; Arctic Circle Air Service Inc.; Fairbanks, AK Marc Gratton; Pratt and Whitney Canada; Longueuil, Canada, Peter Basile; Cessna Aircraft Company; Wichita, KS		
Publish Date:	11/17/2009		
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinquiry@ntsb.gov , or at 800-877-6799. Dockets released after this date are available at http://dms.nts.gov/pubdms/ .		

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