National Transportation Safety Board
Aviation Accident Final Report

Location:	Atqasuk, Alaska	**Accident Number:**	ANC11TA031
Date & Time:	May 16, 2011, 02:18 Local	**Registration:**	N786SR
Aircraft:	Beech B200	**Aircraft Damage:**	Substantial
Defining Event:	Loss of control in flight	**Injuries:**	3 Minor
Flight Conducted Under:	Public aircraft		

Analysis

The pilot had worked a 10-hour shift the day of the accident and had been off duty about 2 hours when the chief pilot called him around midnight to transport a patient. The pilot accepted the flight and, about 2 hours later, was on an instrument approach to the airport to pick up the patient. While on the instrument approach, all of the anti-ice and deice systems were turned on. The pilot said that the deice boots seemed to be shedding the ice almost completely. He extended the flaps and lowered the landing gear to descend; he then added power, but the airspeed continued to decrease. The airplane continued to descend, and he raised the flaps and landing gear and applied full climb power. The airplane shuddered as it climbed, and the airspeed continued to decrease. The stall warning horn came on, and the pilot lowered the nose to increase the airspeed. The airplane descended until it impacted level, snow-covered terrain.

The airplane was equipped with satellite tracking and engine and flight control monitoring. The minimum safe operating speed for the airplane in continuous icing conditions is 140 knots indicated airspeed. The airplane's IAS dropped below 140 knots 4 minutes prior to impact. During the last 1 minute of flight, the indicated airspeed varied from a high of 124.5 knots to a low of 64.6 knots, and the vertical speed varied from +1,965 feet per minute to -2,464 feet per minute. The last data recorded prior to the impact showed that the airplane was at an indicated airspeed of 68 knots, descending at 1,651 feet per minute, and the nose was pitched up at 20 degrees. The pilot did not indicate that there were any mechanical issues with the airplane.

The chief pilot reported that pilots are on call for 14 consecutive 24-hour periods before receiving two weeks off. He said that the accident pilot had worked the previous day but that the pilot stated that he was rested enough to accept the mission. The chief pilot indicated he was aware that sleep cycles and circadian rhythms are disturbed by varied and prolonged activity.

An NTSB study found that pilots with more than 12 hours of time since waking made significantly more procedural and tactical decision errors than pilots with less than 12 hours of time since waking. A 2000 FAA study found accidents to be more prevalent among pilots who had been on duty for more than 10 hours, and a study by the U.S. Naval Safety Center found that pilots who were on duty for more than 10 of the last 24 hours were more likely to be involved in pilot-at-fault accidents than pilots who had less duty time.

The operator's management stated that they do not prioritize patient transportation with regard to their medical condition but base their decision to transport on a request from medical staff and availability of a pilot and aircraft, and suitable weather. The morning of the accident, the patient subsequently took a commercial flight to another hospital to receive medical treatment for his non-critical injury/illness. Given the long duty day and the early morning departure time of the flight, it is likely the pilot experienced significant levels of fatigue that substantially degraded his ability to monitor the airplane during a dark night instrument flight in icing conditions.

The NTSB has issued numerous recommendations to improve emergency medical services aviation operations. One safety recommendation (A-06-13) addresses the importance of conducting a thorough risk assessment before accepting a flight. The safety recommendation asked the Federal Aviation Administration to "require all emergency medical services (EMS) operators to develop and implement flight risk evaluation programs that include training all employees involved in the operation, procedures that support the systematic evaluation of flight risks, and consultation with others trained in EMS flight operations if the risks reach a predefined level." Had such a thorough risk assessment been performed, the decision to launch a fatigued pilot into icing conditions late at night may have been different or additional precautions may have been taken to alleviate the risk.

The NTSB is also concerned that the pressure to conduct EMS operations safely and quickly in various environmental conditions (for example, in inclement weather and at night) increases the risk of accidents when compared to other types of patient transport methods, including ground ambulances or commercial flights. However, guidelines vary greatly for determining the mode of and need for transportation. Thus, the NTSB recommended, in safety recommendation A-09-103, that the Federal Interagency Committee on Emergency Medical Services (FICEMS) "develop national guidelines for the selection of appropriate emergency transportation modes for urgent care." The most recent correspondence from FICEMS indicated that the guidelines are close to being finalized and distributed to members. Such guidance will help hospitals and physicians assess the appropriate mode of transport for patients.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot did not maintain sufficient airspeed during an instrument approach in icing conditions, which resulted in an aerodynamic stall and loss of control. Contributing to the accident were the pilot's fatigue, the operator's decision to initiate the flight without conducting a formal risk assessment that included time of day, weather, and crew rest, and the lack of guidelines for the medical community to determine the appropriate mode of transportation for patients.

Findings

Aircraft	Airspeed - Not attained/maintained
Personnel issues	Aircraft control - Pilot
Personnel issues	Fatigue due to work schedule - Pilot
Organizational issues	Adequacy of policy/proc - Operator
Environmental issues	Below VFR minima - Contributed to outcome

Factual Information

On May 16, 2011, about 0218 Alaska daylight time, a Beechcraft B200 airplane, N786SR, sustained substantial damage during a collision with terrain about 7 miles southwest of Atqasuk, Alaska, while on an instrument approach to the Atqasuk Edward Burnell Senior Memorial Airport. The airplane was operated by the North Slope Borough, Barrow, Alaska, as a instrument flight rules (IFR), public aircraft medical transport positioning flight, under 14 Code of Federal Regulations (CFR), Part 91. The airline transport pilot received minor injuries, and the two North Slope Borough medical personnel aboard received minor injuries. Instrument meteorological conditions prevailed, and an instrument flight plan was in effect. The medical transport flight departed the Wiley Post/Will Rogers Memorial Airport, Barrow, Alaska, about 0148, and was en route to Atqasuk to transport a patient to Anchorage, Alaska.

During a telephone conversation with the National Transportation Safety Board (NTSB) investigator-in-charge (IIC), the chief pilot for the operator said the pilot reported to him that during the approach to Atqasuk, the airplane accumulated a large quantity of airframe ice, and he decided to discontinue the approach. He then retracted the landing gear, but the airplane failed to climb as anticipated, and struck the ground.

During the impact with terrain, the empennage was severed from the airplane.

Due to the remote location, the wreckage was not examined by the NTSB. No mechanical issues were reported by the operator or the pilot.

Photographs received from the operator, and reviewed by the NTSB IIC, showed that the airplane impacted flat, snow-covered tundra in a wings-level, tail-low attitude. The tail section aft of the passenger cabin was severed from the fuselage, and had upward crushing. Photographs of both propellers showed extreme torsional twisting and bending.

In a written statement the pilot said about 35 miles from the destination airport he received clearance for the RNAV (GPS) Rwy 6 approach (copy of the approach plate is contained in the public docket for this report). He started a descent, but remained above 2200 feet which was above the cloud tops. Prior to reaching the initial approach fix (IAF) FIBAK, he descended to 2,000 feet, which was mostly in the clouds. All of the anti-ice systems were turned on, and the deice boots were activated one time, prior to reaching intermediate fix (IF) DUVFU. From DUVFU he proceeded inbound to the final approach fix (FAF) IRIQU (8.7 miles), while descending to 1,700 feet. According to the pilot, the deice boots seemed to be shedding the ice almost completely, and everything was in order. About midway between DUFVU and IRIQU he extended the flaps, and about one mile from IRIQU he extended the landing gear. After extending the landing gear he added power, but the airplane continued to descend. He raised the flaps and gear, and applied full climb power. The airplane shuddered as it climbed through about 2,000 feet, and started to break out of the clouds, but the airspeed continued to decrease. The stall warning horn came on, and remained on continuously. He said he lowered the nose to increase airspeed. The airplane broke out of the clouds about 800 feet above the ground, but continued to descend, and impacted the snow-covered terrain.

Although the pilot told his supervisor that he was properly rested, and fit to make the flight, he had clocked in for duty at 1228 the previous day, and clocked out at 2207, less than 2 hours before he was called for the accident flight. During that duty period he had not flown any aircraft.

In a written statement, a passenger in a forward facing seat behind the pilot said she had a clear view of the center and right side cockpit instruments. During the final approach she said she saw the instrument panel, and noted the altitude, 1,400 feet, estimated time en route (ETE) 1:30 and decreasing, and speed 148 knots. The last time she looked at the panel she noted that the altitude was holding at 1,400, and the ETE was 1:26. She heard the power increase, and felt the airplane's nose pitch up. As the airplane's nose pitched up, the airplane began to roll from side to side. The attitude indicator showed rolls in both directions exceeding 45 degrees. The airplane broke out of the clouds momentarily, but then descended back into them. When the airplane broke out beneath the clouds, the left wing was pointed at the ground, greater than 45 degrees. The airplane impacted the snow-covered tundra. The passenger reported seeing rime ice on the right wing, behind the de-ice boot, from the center of the wing to the tip, after the accident. She reported there was no ice on the left wing. The passenger's statement is contained in the public docket for this report.

The accident airplane was equipped with external satellite tracking, and internal engine and flight control monitoring. The data was provided by the operator, and examined by the IIC. According to the airplane's pilot operating handbook (POH), section 4, page 23, the minimum safe operating speed for the airplane in continuous icing conditions is 140 knots indicated airspeed (IAS). The airplane's indicated airspeed dropped below 140 knots at 02:13:53, four minutes prior to impact. At 02:14:53 the IAS had dropped to 100.2 knots. At 02:15:53 the IAS was 85.9 knots, and at 02:16:53 the IAS had increased to 112 knots. During the last one minute of flight, the indicated airspeed varied continuously to a high of 124.5 knots to a low of 64.6 knots, and the vertical speed varied from +1965 feet per minute to -2464 feet per minute. The last data prior to impact, at 02:17:52, showed that the airplane was at an altitude of 67 feet, heading 216 degrees, indicated airspeed 68 knots, descending at 1651 feet per minute, and the nose was pitched up at 20 degrees.

Weather reported at the destination airport at the time of the accident was; ceiling 800 overcast, 3 miles visibility, temperature/dew point was 27/25,wind 070 degrees at 15, not gusting, and the altimeter was 29.78 inches of mercury.

The area forecast anticipated moderate icing in the area.

In a written statement the chief pilot wrote that borough pilots are on call for 14/24 hour periods. Then they are off two weeks. The accident pilot worked the previous day, but was the only pilot who had not flown any missions. He had clocked in at 1228 and out at 2207. According to the chief pilot, he was the most suitable pilot for the operation that began just after midnight. The chief pilot verbally queried him on his state of rest and currency to accept the mission, and he stated he was fine to take the flight. The chief pilot was aware that sleep cycles and circadian rhythms are disturbed by varied shift schedules and prolonged activity.

An NTSB study of flight crew-involved major accidents found that pilots with more than 12

hours (averaging 13.8 hours) of time since waking made significantly more procedural and tactical decision errors (mostly errors of omission) than pilots with less than 12-hours of time since waking.

A 2000 FAA-sponsored study found accidents to be more prevalent among pilots who had been on duty for more than 10 hours. Additionally, a study performed by the U.S. Naval Safety Center found that helicopter pilots who were on duty for more than 10 of the last 24 hours were more likely to be involved in pilot-at-fault accidents than pilots who had not accumulated as much duty time.

Although many EMS flights are flown under FAR Part 135, this flight was flown under CFR Part 91. FAR Part 135 and Part 91 differ regarding crew rest requirements. The provisions of Part 135 require that the flight crew obtain adequate rest before conducting an EMS flight with a patient on board, calling for a minimum of 9 consecutive hours of rest during the 24 consecutive hour period prior to the completion of the assigned flight. In contrast, Part 91 has no duty time restrictions. As noted, fatigue impairs performance and diminishes alertness.

According to the North Slope Borough's Assistant Fire Chief, the North Slope Borough's practice is to base the go/no-go decision solely on the ability to go, that is, crew, aircraft and weather, without considering the necessity to go, i.e., patient condition, or time of day.

The area hospitals/clinics do not typically triage a patient’s transportation; they simply request that they be transported. Following the accident flight, due to the non critical nature of the patient's injury/illness, the patient took a commercial flight to Anchorage the following morning for further medical treatment.

The following FAA advisory circulars are directed at commercial EMS patient transportation, and while they are not mandated for Part 135, Part 91, or Public Aircraft operations, they do outline certain professional protocols to be followed when transporting patients for hire.

FAA Advisory Circular (AC) 135-14A states in part:

(6) A decision whether or not to conduct a flight, or to continue a flight as planned, is required by regulation to be made by the pilot in command. This decision should be based on the information received from other elements involved and on his/her judgment as an experienced pilot. The decision should not be based solely on the condition of the patient.
(7) The final step is the decision to conduct the flight in a safe and timely manner.

AC 135-15

f. Judgment and Decisions

The decision making process should have input from all elements involved in an EMS operation. Aero medical directors, aircraft operators, the flight crew, medical personnel, and ground crew contribute to this process. The degree of input from each element depends upon the type and complexity of every mission.

Flight Time and Rest Requirements. Each operator should maintain records showing compliance with the flight and rest requirements of FAR Part 135.

(1) The certificate holder's manual should include policy regarding pilots on call with the use of remote paging devices. The manual should indicate how the use of these devices impacts duty time limitations.

History of Flight

Approach-IFR initial approach	Loss of control in flight (Defining event)
Approach-IFR initial approach	Collision with terr/obj (non-CFIT)

Pilot Information

Certificate:	Airline transport	**Age:**	62,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	Airplane; Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	October 6, 2010
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	December 19, 2010
Flight Time:	9000 hours (Total, all aircraft), 500 hours (Total, this make and model), 8500 hours (Pilot In Command, all aircraft), 43 hours (Last 90 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	**Registration:**	N786SR
Model/Series:	B200	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Normal	**Serial Number:**	BB-1016
Landing Gear Type:	Retractable - Tricycle	**Seats:**	11
Date/Type of Last Inspection:	November 16, 2010 100 hour	**Certified Max Gross Wt.:**	12500 lbs
Time Since Last Inspection:		**Engines:**	2 Turbo prop
Airframe Total Time:	9847 Hrs at time of accident	**Engine Manufacturer:**	U/A CANADA
ELT:	C126 installed, activated, did not aid in locating accident	**Engine Model/Series:**	PT6A SERIES
Registered Owner:		**Rated Power:**	850 Horsepower
Operator:		**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	**Condition of Light:**	Night
Observation Facility, Elevation:	PATQ,96 ft msl	**Distance from Accident Site:**	7 Nautical Miles
Observation Time:	02:30 Local	**Direction from Accident Site:**	76°
Lowest Cloud Condition:	Clear	**Visibility**	3 miles
Lowest Ceiling:	Overcast / 800 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	15 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	70°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.78 inches Hg	**Temperature/Dew Point:**	-3°C / -4°C
Precipitation and Obscuration:	N/A - None - Fog		
Departure Point:	Barrow, AK (PABR)	**Type of Flight Plan Filed:**	IFR
Destination:	Atqasuk, AK (PATQ)	**Type of Clearance:**	IFR
Departure Time:	01:48 Local	**Type of Airspace:**	

Airport Information

Airport:	Atqasuk Edward Burnell SR Mem PATQ	**Runway Surface Type:**	
Airport Elevation:		**Runway Surface Condition:**	
Runway Used:		**IFR Approach:**	Global positioning system
Runway Length/Width:		**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	3 Minor	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	3 Minor	**Latitude, Longitude:**	70.475555,-157.738891

Administrative Information

Investigator In Charge (IIC):	Lewis, Lawrence
Additional Participating Persons:	Brice Banning; FAA FSDO-01; Fairbanks, AK
Original Publish Date:	April 24, 2012
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=79107

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The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available here.