National Transportation Safety Board
Aviation Accident Final Report

Location:	HELENA, MT	**Accident Number:**	SEA98FA100
Date & Time:	06/16/1998, 1800 MDT	**Registration:**	N446JR
Aircraft:	Aero Commander 680FL	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	1 Fatal
Flight Conducted Under:	Part 135: Air Taxi & Commuter - Non-scheduled		

Analysis

The pilot of the Part 135 cargo flight was executing the 'full' ILS runway 27 approach at Helena Regional Airport in a non-radar environment. Although the approach calls for the pilot to maintain 7,000 feet until intercepting the glideslope, the aircraft impacted the terrain at 5,300 about 1.5 miles prior to reaching the point where the pilot should have crossed the Hauser NDB at an altitude of 6,741 feet. According to the approach plate, the aircraft should not have descended to an altitude below 5,400 feet until reaching the outer marker, which is located about five and one-half miles west of the impact site.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to maintain the correct altitude while turning inbound during a procedure turn to the ILS final approach course. Factors include hilly/mountainous terrain and clouds in the area where the course reversal was performed.

Findings

Occurrence #1: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: APPROACH - IAF TO FAF/OUTER MARKER (IFR)

Findings
1. (C) PROPER ALTITUDE - NOT MAINTAINED - PILOT IN COMMAND
2. (F) TERRAIN CONDITION - MOUNTAINOUS/HILLY
3. (F) WEATHER CONDITION - CLOUDS

Factual Information

HISTORY OF FLIGHT

On June 16, 1998, approximately 1800 mountain daylight time, an Aero Commander 680FL, N446JR, impacted the terrain while on approach to runway 27 at Helena Regional Airport, Helena, Montana. The commercial pilot, who was the sole occupant, received fatal injuries and the aircraft was destroyed. The 14 CFR Part 135 cargo flight, which departed Kalispell, Montana, about 55 minutes earlier, was operating in instrument meteorological conditions at the time of the accident. The aircraft, which was owned and operated by Corporate Air, of Billings, Montana, was on an IFR flight plan, and the ELT transmissions that were triggered by the impact played a role in locating the wreckage.

On the day of the accident, the pilot departed Kalispell, Montana, about 1705, for the first segment of a multi-leg cargo flight. After departure, he climbed to 15,000 feet, and about 15 minutes after departure reported that he was accumulating traces of rime ice. About 30 minutes after takeoff, he requested a lower altitude, and Salt Lake Center cleared him to 13,000 feet. About 1740, Center terminated radar service and instructed the pilot to contact Helena Approach, a non-radar facility. About one minute later, the pilot contacted Helena Approach and advised that he was at 13,000 feet on the 300 radial of Helena VOR at 27.9 DME. Approach asked the pilot to reduce his speed for sequencing, and advised him to remain at 13,000 feet. About 30 seconds later, the pilot advised that he was picking up some ice, and Approach advised that they would try to get him a lower altitude. About one minute later, Approach cleared the pilot to 12,000 feet, and about 90 seconds after that cleared him to 11,000 feet. Just after being cleared to 11,000 feet, the pilot asked if he should be expecting a "...back course Charlie approach" and was advised that the controller would probably not be able to clear him for that specific approach. During that same radio transmission, the controller told the pilot that he was "...cleared to the Helena VOR via a 13 mile arc and the 270 degree radial..." and asked him to report intercepting the arc. The controller also reminded the pilot to "... keep your speed back." The pilot incorrectly read the clearance back as "... cleared to the VOR on a 270 and report the VOR." About 10 seconds after the read-back, the controller responded with " If it don't work right you can plan a no delay on a VOR Alpha or an ILS." There were no further communications between the controller and pilot for a little over three minutes. Then, about 1747, the pilot advised Approach that he was at 10 DME. The controller responded with "Airspur 31, I thought you were going to fly the arc," and the pilot stated "Negative, thought I was going direct to the VOR." The controller then advised the pilot that it was "no problem" and that "...we'll fix it up." The controller immediately changed the clearance for Airspur 31 to "...cleared to the Helena VOR, hold west, expect further clearance at 2355," while maintaining 11,000 feet. The pilot read back that clearance correctly, and about one minute later, the controller asked the pilot if he would like to fly the ILS. When the pilot responded affirmatively, the controller issued a new clearance of "... descend and maintain 9,500, cleared to the Hauser radio beacon via the VOR, direct Hauser, report crossing the VOR, expect approach at that time, resume normal speed." The pilot then incorrectly read back the clearance as "... descend and maintain 9,500, cleared to Hauser VOR and expect further clearance at that time..." The controller clarified the fact that the clearance was "...via the VOR, direct Hauser," and the pilot read back the clarification. At 1751, the controller issued the final clearance for the pilot to "...cross Helena VOR at or above 9,500, cleared ILS approach via the VOR direct Hauser, report leaving 9,000 feet." The pilot read that clearance back as "... cross

the VOR at 9,500, cleared for the ILS, report leaving 9,500 feet..." About one minute later, the pilot reported crossing the VOR and leaving 9,500 feet, and the controller instructed him to report Hauser inbound. About two minutes after giving the pilot his approach clearance, the controller asked him his altitude, and the pilot reported that he was out of 8,500 and was at 6.9 DME (1.5 miles west of Hauser). About four and one-half minutes later the controller asked the pilot what his position was, and he responded that he was "... over Hauser, just turning inbound, out of 7,000." The controller then instructed the pilot to switch to tower and to report FERRI (the outer marker). When the pilot had not contacted the tower after about one and one-half minutes, the tower transmitted "Airspur 31, say altitude passing." The tower attempted two more times to contact Airspur 31, and at 1759:35 (about two minutes after the pilot had been instructed to switch to tower), the pilot transmitted "Airspur 31. Go ahead." The tower again asked what altitude he was leaving, and the pilot responded with "... Airspur 31 is out of 5,500." The tower then cleared the pilot to land on runway 27, and the pilot repeated the clearance. About one minute later, the tower transmitted "Airspur 31, say your distance." There was no response to this transmission, and there was no further contact with the aircraft.

WRECKAGE AND IMPACT INFORMATION

The aircraft impacted the terrain about 500 feet north of and 150 feet below the top of the highest ridge of the Spokane Hills. The accident site, which was located at 46 degrees 34.12 minutes North, 111 degrees 43.03 minutes West, was located about one and one-half mile east of the Hauser NDB. The aircraft initially impacted several trees about 75 feet above the ground, and settled into a dense forest on a northerly heading. Except for the right engine and the left propeller, the complete aircraft came to rest at one location. The right engine had come to rest about 40 feet north of the main wreckage, and the left propeller was found about 25 feet west. The fuselage, from the aft part of the cabin to the nose of the aircraft, was almost completely consumed by the intense post-crash fire. The aft portion of the fuselage, including the empennage, was extensively damaged by fire, but remained as an identifiable structure. The right wing, outboard of the engine nacelle, had been torn off and was located just behind and to the east of the empennage. The inboard portion of the right wing had been shredded and torn into numerous small pieces and was extensively damaged by the fire. The left wing, from just outboard of the engine nacelle, had separated into two distinct sections, both of which had been torn, crushed and distorted by impact with the trees. Both of these sections, as well as the inboard portion of the wing, had been extensively damaged or melted by the fire. The position of the nose gear could not be determined because of the extent of damage, but both main gear were in the up position. The position of the flaps, most of which had been torn from the wings during the impact sequence or destroyed by the post-impact fire, could not be determined. Aileron control system continuity could not be established due to the extent of damage, but elevator and rudder continuity was established from the aft portion of the cabin to the flight controls themselves. Both propeller hubs had separated from their crankshafts, and one blade of the right propeller had separated from the hub at the hub-to-blade clamp. Two of the three blades of the left propeller showed a numerous leading edge gouges and indentations. The third blade showed only light leading edge indentations, but contained chord-wise scarring on the outboard third of its span. Both of the blades with significant leading edge damage also showed longitudinal twisting, and on one about two inches of the tip had been torn off. All three blades of the right propeller showed varying degrees of leading edge indentations and gouging. Two of the three blades showed S-bending, and all three showed longitudinal twisting of their span. One of the blades that remained in the hub was missing the outboard two inches

of its tip.

The right engine had been thrown clear of the fire, but the left engine remained with the main wreckage and suffered severe thermal damage to its external components and accessories. Both engines showed mechanical continuity from the crankshaft, to both the rocker/valve assembly and the accessory section. The magnetos on the left engine were destroyed by the fire, and one of the magnetos on the right engine was rendered inoperative by impact damage. The other magneto on the right engine produced a spark when rotated by hand. The inside of the crankcase on both engines was inspected, and there was no indication of contamination, lack of lubrication, or component failure. Spark plugs from both engines were removed and inspected, and there was no evidence of contamination, excessive lead buildup, or unusual electrode wear. The dry vacuum pumps were removed from the accessory section of both engines, disassembled and inspected. There was no evidence of contamination, pre-impact rotor or vane damage, restriction of the air orifices, or unusual wear of the housing walls.

METEOROLOGICAL INFORMATION

The surface observation (METAR) taken at Helena Airport at 1756, approximately five minutes before the crash, indicated wind 290 at 17 knots, visibility six statute miles, light rain, mist, broken ceiling at 2,600 feet AGL, overcast at 3,200 feet, temperature nine degrees Celsius, dewpoint eight degrees, altimeter 29.81 inches of mercury. The METAR taken at 1815, about 15 minutes after the accident, reported wind 270 degrees at 17 knots, visibility eight statute miles, light rain, mist, few clouds at 2,500 feet, broken ceiling at 3,000, overcast at 3,800, temperature nine degrees Celsius, dewpoint eight degrees, and altimeter of 29.81. The pilot of another aircraft that landed at Helena soon after the accident reported that his aircraft had picked up light rime ice during the descent, but that it had all melted off by the time he descended through 10,000 feet.

AERODROME AND APPROACH INFORMATION

Helena Regional Airport, altitude 3,874 feet MSL, sits on the western edge of a large flat valley. Because Helena Approach is not radar equipped, during instrument approaches into the airport, the controller is unable to directly monitor the position, heading, and altitude of the aircraft executing the approach. The approach that this pilot was cleared for, ILS runway 27, called for him to proceed directly to the VOR at or above 9,500 feet. After crossing the VOR, the pilot was to proceed directly to the Hauser NDB, which is located 8.4 DME from the VOR, while descending to 8,200 feet (see attached approach plate). At the NDB, which is the initial approach fix (IAF) for this approach, the pilot was free to descend to 7,000 feet while executing a holding pattern in lieu of a procedure turn. The holding pattern course reversal requires a one minute outbound leg, with a turn to intercept the ILS localizer inbound course of 267 degrees. Unlike some ILS procedure turns that allow descent to a lower intermediate altitude once established inbound on the localizer, this approach requires that the pilot maintain 7,000 feet until intercepting the glideslope just outside of the Hauser beacon. Then after intercepting the glideslope at 7,000 feet, the pilot is free to begin his descent. An aircraft established on the glideslope during this approach would cross the Hauser beacon, located 1.5 miles west of the impact site, at 6,741 feet. It would not descend below 5,400 feet until passing the outer marker (FERRI), which is located approximately five and one-half nautical miles west of the accident site.

MEDICAL AND PATHOLOGICAL INFORMATION

A final anatomic autopsy was performed by Dr. D. A. Schultz, MD, and the cause of death was listed as blunt force injuries and extensive thermal injuries as the result of an aircraft accident.

A forensic toxicology analysis was completed by the FAA's Toxicology and Accident Research Laboratory, and no ethanol or drugs were detected in the pilot's urine. Tests for carbon monoxide and cyanide were not performed due to a lack of suitable specimens.

The wreckage was released to USAIG, a representative of the owner, on June 19, 1998, at Helena, Montana.

Pilot Information

Certificate:	Commercial	**Age:**	42, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	03/18/1998
Occupational Pilot:		**Last Flight Review or Equivalent:**	
Flight Time:	1506 hours (Total, all aircraft), 344 hours (Total, this make and model), 1480 hours (Pilot In Command, all aircraft), 199 hours (Last 90 days, all aircraft), 54 hours (Last 30 days, all aircraft), 5 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Aero Commander	**Registration:**	N446JR
Model/Series:	680FL 680FL	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Normal	**Serial Number:**	1325-10
Landing Gear Type:	Retractable - Tricycle	**Seats:**	2
Date/Type of Last Inspection:	05/07/1998, AAIP	**Certified Max Gross Wt.:**	8500 lbs
Time Since Last Inspection:	85 Hours	**Engines:**	2 Reciprocating
Airframe Total Time:	17972 Hours	**Engine Manufacturer:**	Lycoming
ELT:	Installed, activated, aided in locating accident	**Engine Model/Series:**	IO-720-B1B
Registered Owner:	CORPORATE AIR	**Rated Power:**	400 hp
Operator:	CORPORATE AIR	**Operating Certificate(s) Held:**	On-demand Air Taxi (135)

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	KHL, 3874 ft msl	**Distance from Accident Site:**	10 Nautical Miles
Observation Time:	1756 MDT	**Direction from Accident Site:**	270°
Lowest Cloud Condition:	Unknown / 0 ft agl	**Visibility**	6 Miles
Lowest Ceiling:	Broken / 2600 ft agl	**Visibility (RVR):**	0 ft
Wind Speed/Gusts:	76 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	290°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29 inches Hg	**Temperature/Dew Point:**	9°C / 8°C
Precipitation and Obscuration:			
Departure Point:	KALLISPELL, MT (FCA)	**Type of Flight Plan Filed:**	IFR
Destination:	HELENA, MT (HLN)	**Type of Clearance:**	IFR
Departure Time:	1705 MDT	**Type of Airspace:**	Class D

Airport Information

Airport:	HELENA REGIONAL AIRPORT (HLN)	**Runway Surface Type:**	
Airport Elevation:		**Runway Surface Condition:**	
Runway Used:	0	**IFR Approach:**	ILS
Runway Length/Width:		**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	N/A	**Aircraft Fire:**	On-Ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	

Administrative Information

Investigator In Charge (IIC):	ORRIN K ANDERSON	**Report Date:**	01/11/2000
Additional Participating Persons:	DON PAUL		
Publish Date:			
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 pubinq@ntsb.gov, or at 800-877-6799. Dockets released after this date are available at http://dms.ntsb.gov/pubdms/.		