National Transportation Safety Board
Aviation Accident Final Report

Location:	COLO SPRINGS, CO	**Accident Number:**	FTW98FA074
Date & Time:	12/21/1997, 0626 MST	**Registration:**	N100BE
Aircraft:	Beech A100	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	2 Fatal, 1 Serious
Flight Conducted Under:	Part 135: Air Taxi & Commuter - Non-scheduled		

Analysis

The pilot was cleared for an ILS DME approach to runway 17L. During the final stage of the approach, the aircraft entered fog and disappeared from view of the control tower personnel. Radar and radio communications were lost also. After searching for 31 minutes, the aircraft was found by airport operations personnel over half way down the runway and 600 feet east of the runway. There was no evidence the aircraft touched down on the runway. The aircraft was configured with the landing gear up and the flaps deployed. Missed approach procedures require the flaps and landing gear to be retracted after initiating the procedure. The decision height for the approach is 6,384 feet msl (200 feet above ground level) and the required RVR for a 14 CFR Part 135 flight to commence and approach is 2400 (1/2 mile). When on the glide slope, the decision height is 0.4 miles from the runway touchdown zone. Examination of the airplane did not disclose evidence of mechanical malfunction..

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: Failure of the pilot to follow IFR Procedures and maintain the minimum descent altitude (MDA). A related factor was fog.

Findings

Occurrence #1: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: MISSED APPROACH (IFR)

Findings
1. (F) WEATHER CONDITION - FOG
2. (C) IFR PROCEDURE - NOT FOLLOWED - PILOT IN COMMAND
3. (C) MINIMUM DESCENT ALTITUDE - NOT MAINTAINED - PILOT IN COMMAND
4. TERRAIN CONDITION - OPEN FIELD

Factual Information

HISTORY OF FLIGHT

On December 21, 1997, at 0626 mountain standard time, a Beech A100, N100BE, operated by Aviation Charter, Inc., Eden Prairie, Minnesota, impacted terrain during a missed approach at the Colorado Springs Municipal Airport, Colorado Springs, Colorado. The commercial pilot and one passenger received fatal injuries, and the other passenger serious injuries. The aircraft was destroyed. The flight was operating in accordance with Title 14 CFR Part 135 and an IFR flight plan was filed. The flight originated from Flying Cloud Airport, Eden Prairie, Minnesota, at 0430, with a passenger stop at Minneapolis. All times are mountain standard time unless otherwise specified.

The flight was a charter carrying two Northwest Airlines mechanics to Colorado Springs, to repair a Northwest aircraft that had a mechanical problem.

The aircraft was conducting an instrument landing system (ILS) approach to runway 17L. The west local controller observed the aircraft fly into fog and controllers were then unable to contact the aircraft and it disappeared from radar. The aircraft was found by airport personnel approximately 31 minutes following the accident approximately 6,000 down runway 17L and 600 feet east of the runway. The delay in locating the aircraft was due to fog.

PERSONNEL INFORMATION

The pilot held commercial pilot certificate number 469841139, dated September 12, 1996, with ratings in single and multiengine land. He also held flight and ground instructor certificates bearing the same certificate number. He was certificated to conduct flight instruction in single and multiengine airplanes and instrument instruction in airplanes. He was certified to conduct advanced ground instruction and ground instrument instruction.

He held a first class medical certificate issued March 21, 1997, with no restrictions or limitations.

According to his employer, Aviation Charter, Inc., he had accumulated 3,400 hours of flight experience as a pilot with 1,900 hours as pilot-in-command (PIC). He had 2,100 hours of multiengine flight experience, 700 hours of which was as PIC. His experience in the accident aircraft make and model was 65 hours, all of which was as PIC.

Aviation Charter, Inc. provided information that the pilot had accumulated 160 flight hours in the 90 days preceding the accident, 46 of which were in the accident make and model aircraft. He had flown 50 hours in the preceding 30 days, with 10 hours in make and model and 3.5 hours, all in the accident make and model, the day of the accident.

The company also provided information that the pilot had accumulated 900 hours of night flight time and 500 hours of actual instrument time.

AIRCRAFT INFORMATION

The Beech A100 is a low wing, twin engine, turbo propeller powered, retractable tricycle landing gear aircraft with a maximum gross weight of 11,500 pounds. The accident aircraft, serial number B221, was manufactured in 1978 and had accumulated 8,651.2 hours of flight time. The last inspection was done 10.6 hours prior to the accident flight. Total fuel capacity on this aircraft was 470 gallons.

Two Pratt and Whitney PT6A-28 turbine engines, rated at 750 shaft horsepower each, powered the aircraft.

The cabin was configured with five individual seats, three of which were rear facing, a side-facing bench seat and a side-facing lavatory.

A partitioned cargo area, with cargo netting available, was installed in the cabin aft of the main entrance door.

The flight deck was configured for two pilots; however, the aircraft is certified for single pilot operation.

METEOROLOGICAL INFORMATION

Observed Colorado Springs weather at 0624 was 100 foot overcast skies, calm winds, and a temperature/dew point of 45 degrees Fahrenheit. At 0625, the pilot of N100BE was informed by ATCT that the RVR (runway visual range) on runway 17L was down to 1,800 feet and still deteriorating. Witnesses and the tower reported dense fog in the area at the time of the accident.

AIDS TO NAVIGATION

The primary navigation aid serving the facility is Black Forest VORTAC (very high frequency omnirange station with distance measuring equipment {DME}).

The pilot was cleared for an ILS DME approach to runway 17L. The decision height for the approach is 6,384 feet msl (200 feet above ground level) and the required RVR for a 14 CFR Part 135 flight to commence and approach is 2400 (1/2 mile). When on the glide slope, the decision height is 0.4 miles from the runway touchdown zone. A copy of the approach plate is attached.

COMMUNICATIONS

Transcripts of all pertinent communications are attached. They begin at 0617 when the pilot of N100BE reported on the Colorado Springs Terminal Air Traffic Control (ATCT) frequency while in a descent to an assigned altitude of 11,000 feet msl. The transcripts end at 0657, which is when Colorado Springs Municipal Airport operations personnel found the downed aircraft. Contact with the aircraft was lost at 0626.

The transcripts provide information that there was a misunderstanding on the part of the pilot of N100BE as to whether he was cleared for approach and landing to runway 17R or 17L, and information concerning the deteriorating visibility conditions. The air traffic controller working the flight pointed out these misunderstandings to the pilot.

AERODROME INFORMATION

Colorado Springs Municipal Airport is located at N38 48.3 and W104 42.0. on the east side of the city. Airport elevation is 6,184 feet above mean sea level (msl). The airport has three runways, 17L/35R, 17R/35L, and 12/30. It is served by both precision and non precision instrument approaches and has a low level wind shear alert system (LLWAS) installed, and (RVR) equipment for runways 35R and 17L.

Runway 17L, the runway used by the accident flight, is 13,500 feet in length, 150 feet in width, and is constructed of grooved concrete. The touchdown zone is 6,184 feet msl and the lighting consists of high intensity runway lights (HIRL), medium intensity approach lights with runway

alignment indicator lights (MALSR), and a 3 degree slope precision approach path indicator (PAPI). There is 12,300 feet of runway remaining at the ILS touch down point.

WRECKAGE AND IMPACT INFORMATION

According to witness marks, the aircraft's first point of contact with the ground was approximately 6,500 feet south of the approach end of runway 17L displaced 613.8 feet east of the runway centerline. No evidence was found that the aircraft touched down on the runway. The wreckage scatter pattern was on a base course of 143 degrees and extended 427.5 feet from the initial impact point to where the fuselage came to rest oriented on a heading of 280 degrees. The fuselage was 736.9 feet east of the runway centerline where it came to rest, and the width of the debris pattern was 60 feet at the widest point with the most debris east of the scatter pattern base course. (Refer to the attached diagram).

The impact track started with a 12-foot long ditch-like gouge, which contained portions of the ventral fin. Some sheet aluminum, and what appeared to be fiberglass, was scattered along this path to a red lens light, which was located 45 feet from the initial impact point.

The horizontal and vertical stabilizers were located 53 feet along the scatter pattern displaced 15 feet west of the base course. They were intact and separation occurred at the forward portion of the base of the vertical stabilizer just aft of the aft pressure bulkhead. The horizontal stabilizer trim actuator measured 4 1/2 inches which, according to Beech Aircraft, corresponds to 2 degrees leading edge up.

Both propellers with their associated gearboxes and spinners separated from the aircraft and were located along the scatter pattern track.

The left propeller was found 115 feet down the scatter pattern and 15 feet west of the base track. The propeller blades exhibited forward bending, 'S' curves, leading edge scarring, and chordwise scratches on the blades. All blades remained in the hub.

The right propeller was located 120 feet down the scatter pattern and 35 feet east of the base track. It exhibited like damage as described concerning the left propeller.

The right wing separated from the aircraft at the outboard edge of the engine nacelle and was located 158 feet down the scatter pattern 12 feet east of the scatter pattern base track. The aileron and outer portion of the flap separated from the wing and were located adjacent to where the wing came to rest. The inboard flap remained attached to the right wing stub. The wing was devoid of fuel, except residual fuel, due to fuel cell compromise. Control continuity was intact within the wing. The right flap actuator measurements were: inboard 3 3/8 inches, which corresponds to 13 degrees; outboard 4 1/2 inches, which corresponds to 26 degrees of flap deflection.

The left wing remained attached to the aircraft. The engine remained attached to the wing, as did the flaps and aileron. The left wing flap actuators were measured at 2.0 inches on the inboard flaps and 15/16 inches on the outboard flaps. These measurements correspond to the flaps being in the up position, and control continuity was established within the wing. Residual fuel was found in the fuel cell, which was compromised by impact forces. The left engine propeller shaft was separated aft of the flange and bore evidence of tortional damage. Rotational damage was found in both the compressor and turbine sections of the engine and fuel was found in the lines, strainer, and fuel control. The left main landing gear was in the up position.

The inner portion of the right wing containing the engine nacelle and inboard flap remained attached to the fuselage. The engine remained partially attached to the mounts. The propeller shaft bore scarring opposite rotation at the flange, and both the compressor and turbine sections of the engine exhibited counter rotation damage. The inboard flap was extended 4.5 inches which, according to Beech engineering, equals a flap extension of approximately 25 degrees. Forces associated with the impact and breakup of the aircraft disconnected the flap drive at the fuselage junction point. The right main landing gear was in the up position.

The fuselage remained intact except the nose cone, which was found on the scatter pattern centerline 102 feet from the initial impact point. The left side of the nose and nose landing gear bay were crushed in and up and the nose section at the forward pressure bulkhead was distorted to the left. The nose landing gear was in the up position. The left cockpit area was crushed inward from the side and front and the area around the rudder pedals was crushed upward. The seat belt on the pilot's side was found to be severed during the on scene examination. The right side of the cockpit bore little evidence of distortion.

Documentation of the cockpit was as follows:

Overhead Panel

Windshield wiper between park and low Pilot instrument lights bright Master cockpit lights on Engine instrument lights on bright Pilot gyro lights on bright Instrument indirect lights on bright Radio panel lights on bright Copilot gyro lights on bright Overhead map light off Sub panel and console lights on medium Copilot instrument lights on medium

Lower Right Panel Landing gear handle up Propeller low pitch indicator CB popped Pressure bleed air valves closed Pressure decrease neutral Air ground switch ground Cabin temperature selector 1100 o'clock position Battery charger CB in Overhead lights CB popped Instrument indirect lights CB in Cabin lights CB in Gyro instrument lights CB popped Sub panel and pedestal lights CB popped Engine instrument lights CB popped Landing gear relay CB in

Radar Selector switch standby (With the selector switch in standby no other switch positions are pertinent.)

Radio and navigation equipment Digital and no useful information was retrieved.

Lower right CB panel

Cabin air CB popped Pressurization control CB in Left bleed air valve in Right bleed air valve CB popped Communications and navigation CB's in Phone audio CB in Propeller governor CB in T&SL CB in Flap and stabilizer CB in Avionics CB popped Communications 2 CB popped Yaw damper CB in Audio speaker CB in Propeller sync CB in Enunciator panel CB in Windshield wiper CB in Landing gear warning CB in The remaining CB's on the lower right CB panel were in.

Cabin altitude was set at 7,000 feet and aircraft altitude on the Cabin pressure instrument was at 2,000 feet

Pitch trim main switch was in the on position. Standby was neutral. Power Quadrant (Center Console) Power levers full forward Propeller levers full forward Condition levers bottom of yellow band Aileron tab neutral Flap handle the flap handle was in the full down position. Flap position gauge needle at the 1000 o'clock position Cabin pressure differential pressure 2.4 psi Cabin altitude needle at the 100 o'clock position Fire detection test switch off Right instrument panel Airspeed 0 Artificial horizon in excess of 20 degrees nose up and at 20 degrees right wing down Altimeter 6,540 feet @ 30.12 Course deviation indicator 300 degrees needles centered Radio magnetic indicator 295 degrees Vertical speed indicator 700 feet up Turn and bank indicator needle centered, ball full left Cabin air 0

Lower right side panel Gyro suction needle at the 0800 o'clock position Pneumatic pressure 0 Oxygen supply pressure 1,600 psi Hobbs meter 1484.4 hours Pilot's static air source normal (safety guard in place)

Lower left forward panel (outboard) Battery off Generator 1 off Generator 2 off Inverters unreadable Ignition and engine start unreadable Left voltmeter 0 Right voltmeter 0 De-ice amps 0 Defrost air on Left side panel Left firewall fuel valve on Right firewall fuel valve on Left firewall valve CB popped Standby pump CB popped Left aux. transfer CB in Left fuel pressure warning CB in Left fuel quantity CB in Crossfeed valve CB in Right fuel quantity CB in Right fuel pressure warning CB in Right aux. transfer CB in Right standby pump CB in Right firewall valve CB in Left standby pump off Left transfer pump off Left fuel gauge 2,500 pounds Crossfeed closed Right fuel quantity 2,900 pounds Lower left circuit breaker panel Invert CB's both in Avionics CB's both in Takeoff out of trim CB in Main trim CB popped Sub panel feeders CB's in (4) Trim in motion CB in Standby trim CB in Blower power CB in Landing lights CB's in (2) Flap motor power CB in Pilot windshield CB in Igniters CB's in (2) Lip anti-ice CB's in (2) Anti-ice function test CB's in (2)

Lower left forward panel (inboard) Windshield anti-ice off (2) Fuel vent heat off (left and right) Bar switch in the down position Auto feather armed Landing lights off Beacon off Nav lights off Left Pitot heat off Right Pitot heat and stall warning off Other switches on the panel were unreadable

Left Instrument Panel Airspeed 0 Artificial horizon 15 degrees nose up, 20 degrees left wing down Altimeter 5,660 feet @29.65 Horizontal situation indicator heading 175 degrees, course line set at 175 degrees Vertical speed indicator 600 feet down Turn and bank indicator damaged-unreadable Bottom center of panel instrument broken out and destroyed

Engine Instruments Left ITT below 200 Right ITT 400 Left torque 950 Right torque 1,100 Left propeller rpm 0 Right propeller rpm 150 Left gas generator rpm 100 Right gas

generator rpm 370 Left fuel flow 220 lbs./hr Right fuel flow 260 lbs./hr Left oil pressure 0 Right oil pressure 0

The cabin area was intact and the seats remained attached to the floor, (they were cut out by the fire department to access the cockpit.) The floor was buckled upward; however, it remained intact and was "spongy" to walk on. The lavatory, located in the aft right part of the cabin across from the entry door, was crushed and the galley, located behind the pilot, was also crushed. The interior walls of the cabin exhibited numerous gouges and dents. The cargo tie downs around the circumference of the rear cabin were intact and no evidence they were in use was found. The cargo tie down netting was folded on the rear cabin floor and attached to the aft bulkhead by a snap ring.

At the time the aircraft was examined following the accident, two toolboxes, a tool box dolly, a wrapped aircraft part (later identified as a Boeing 727 leading edge device actuator), and some interior debris were found in the aft cabin. Emergency response crews had placed them there in order to facilitate access to the aircraft interior. The toolboxes were partially crushed and exhibited impact damage. The boxes weighed approximately 80 pounds each. (See attached photographs.)

MEDICAL AND PATHOLOGICAL INFORMATION

According to the El Paso County, Colorado, Medical Examiner, the fatally injured passenger exhibited multiple blunt force trauma injuries and fractures to the extremities. Toxicology results were negative.

The medical examiner found massive craniocerebral trauma and fractures to the lower extremities in his examination of the pilot. Toxicology tests on the pilot provided evidence of Phenylpropanolamine in the blood and urine, and Naphazoline was detected in the urine. According to Dr. Mitchell Garber, of the NTSB Office of Research and Engineering, both substances are over-the-counter decongestants and neither medication has a significant adverse effect on performance.

SURVIVAL ASPECTS

The cockpit area was compromised on the left side and lower forward area limiting the occupiable space to less than that required for an occupant to inhabit the space without experiencing exposure to injury. The pilot seat belt and shoulder harness remained intact and were cut by rescue personnel.

The cabin area was intact and the seats remained attached to the floor. The restraint devices were not compromised.

The 'g' forces encountered during the impact sequence are unknown.

TESTS AND RESEARCH

The seat belt from the pilot's side of the cockpit was sent to the NTSB Materials Laboratory for examination. The examination provided evidence that the lap belt was cut.

The flap system was examined on scene by the Investigator-In-Charge with the assistance of an engineering representative from Beech Aircraft at the facilities of Beegles Aircraft Services, who recovered the aircraft. The on scene examination provided evidence that the electrically driven flap drive to the left wing remained intact and that electrical power could be applied to the system after the accident. The right flap drive was found disconnected at the fuselage/wing

junction. The flap handle is located on the center counsel and could be inadvertently changed to any position by a person entering the cockpit. Given the evidence found during the examinations, the flaps (left flap only because of attachment) appear to have been inadvertently retracted by rescue personnel when they were accessing the cockpit.

A review of the balked landing procedure as depicted in the FAA approved flight manual was conducted. It is a four step process as follows: (1) Power - Takeoff; (2) Airspeed - Balked Landing Climb Speed; (3) Flaps - Up; (4) Landing Gear - Up. In addition, the balked landing procedure in the Pilot's Operating Handbook was reviewed. It is a six-step procedure as follows: (1) Power - As Required; (2) Propeller RPM - Full Increase; (3) Climb at Balked Landing Climb speed; (4) Airspeed - Accelerate to 100 Knots; (5) Flaps - Up; (6) Gear - Up.

ADDITIONAL DATA

The wreckage was released to the owner's representative, Beegles Aircraft Services, on March 6, 1998. A seat belt and shoulder harness from the left pilot's seat, and a flap actuator were retained for further analysis. These items were returned directly to the owner's representative following examination.

Pilot Information

Certificate:	Commercial	**Age:**	36, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**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 Multi-engine; Airplane Single-engine; Instrument Airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	03/21/1997
Occupational Pilot:		**Last Flight Review or Equivalent:**	
Flight Time:	3400 hours (Total, all aircraft), 65 hours (Total, this make and model), 1900 hours (Pilot In Command, all aircraft), 160 hours (Last 90 days, all aircraft), 50 hours (Last 30 days, all aircraft), 3 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	**Registration:**	N100BE
Model/Series:	A100 A100	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Normal	**Serial Number:**	B221
Landing Gear Type:	Retractable - Tricycle	**Seats:**	8
Date/Type of Last Inspection:	12/15/1997, AAIP	**Certified Max Gross Wt.:**	11500 lbs
Time Since Last Inspection:	11 Hours	**Engines:**	2 Turbo Prop
Airframe Total Time:	8651 Hours	**Engine Manufacturer:**	P&W
ELT:	Installed, not activated	**Engine Model/Series:**	PT6A-28
Registered Owner:	BEECH TRANSPORTATION	**Rated Power:**	750 hp
Operator:	AVIATION CHARTER, INC.	**Operating Certificate(s) Held:**	On-demand Air Taxi (135)
Operator Does Business As:		**Operator Designator Code:**	ABOA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument Conditions	**Condition of Light:**	Night/Dark
Observation Facility, Elevation:	COS, 6184 ft msl	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	0545 MST	**Direction from Accident Site:**	340°
Lowest Cloud Condition:	Clear / 0 ft agl	**Visibility**	0.3 Miles
Lowest Ceiling:	Overcast / 100 ft agl	**Visibility (RVR):**	0 ft
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29 inches Hg	**Temperature/Dew Point:**	-7°C / -7°C
Precipitation and Obscuration:			
Departure Point:	EDEN PRAIRE, MN (FCM)	**Type of Flight Plan Filed:**	IFR
Destination:	(COS)	**Type of Clearance:**	IFR
Departure Time:	0330 CST	**Type of Airspace:**	Class C

Airport Information

Airport:	COLO. SPRINGS MUNICIPAL (COS)	**Runway Surface Type:**	Concrete
Airport Elevation:	6184 ft	**Runway Surface Condition:**	Dry
Runway Used:	17L	**IFR Approach:**	ILS
Runway Length/Width:	13500 ft / 150 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	1 Fatal, 1 Serious	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Fatal, 1 Serious	**Latitude, Longitude:**	

Administrative Information

Investigator In Charge (IIC):	NORMAN F WIEMEYER	**Report Date:**	11/17/1999
Additional Participating Persons:	TOM SCIACCA; DENVER, CO		
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/.		