Aviation Investigation Final Report

Location:	Dodge City, Kansas	**Accident Number:**	CHI04FA066
Date & Time:	February 17, 2004, 02:57 Local	**Registration:**	N777KU
Aircraft:	Beech B90	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	3 Fatal
Flight Conducted Under:	Part 91: General aviation - Positioning		

Analysis

The emergency medical services (EMS) airplane was destroyed by terrain impact and post impact fire about 7 nautical miles (nm) west of its destination airport, Dodge City Regional Airport (DDC), Dodge City, Kansas. The 14 Code of Federal Regulations Part 91 positioning flight departed the Wichita Mid-Continental Airport (ICT), Wichita, Kansas, about 0215 central standard time and was en route to DDC. Night visual meteorological conditions prevailed when the accident occurred about 0257 central standard time. The flight had been on an instrument flight rules (IFR) flight plan, but the pilot cancelled the IFR flight plan about 34 nm east of DDC and initiated a descent under visual flight rules. Radar track data indicated that the airplane maintained a magnetic course of about 265 degrees during the flight from ICT to DDC. The rate of descent was about 850 to 950 feet per minute. During the descent, the airplane flew past the airport on a 270 degree course. Witnesses in the area reported hearing the engine noise of a low-flying airplane followed by the sound of impact. One of the witnesses described the engine noise as sounding like the engines were at "full throttle." The on-site inspection revealed that the airplane impacted the terrain in a gear-up, wings-level attitude. The inspection of the airplane revealed no anomalies to the airframe or engines. A review of the pilot's 72-hour history before the accident revealed that it had been 14 hours and 32 minutes from the time the pilot reported for duty about 1225 central standard time until the time of the accident. It had been 20 hours 57 minutes from the time the pilot awoke (0600) on the morning before the accident until the time of the accident. No evidence of pilot impairment due to carbon monoxide, drugs, or medical incapacitation was found. The accident occurred during a time of day that was well past the pilot's normal bedtime and also at a time of day when the physiological need to sleep is especially strong. The findings from a Safety Board's human performance analysis indicates that the pilot was likely fatigued. A review of 14 CFR 135.267 indicated that the pilot had adhered to the flight time limitations and rest requirements specified in the regulation.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot failed to maintain clearance with terrain due to pilot fatigue (lack of sleep).

Findings

Occurrence #1: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - NORMAL

Findings
1. (C) CLEARANCE - NOT MAINTAINED - PILOT IN COMMAND
2. (C) FATIGUE(LACK OF SLEEP) - PILOT IN COMMAND

Occurrence #2: ON GROUND/WATER COLLISION WITH OBJECT
Phase of Operation: OTHER

Findings
3. TERRAIN CONDITION - BERM
4. OBJECT - BUILDING(NONRESIDENTIAL)
5. OBJECT - TREE(S)

Occurrence #3: FIRE/EXPLOSION
Phase of Operation: OTHER

Factual Information

HISTORY OF FLIGHT

On February 17, 2004, about 0257 central standard time, a Beech B90, N777KU, operated by Ballard Aviation, Inc., as EagleMed 4, was destroyed by impact with terrain and postimpact fire approximately 7 nautical miles (nm) west of Dodge City Regional Airport (DDC), Dodge City, Kansas. The pilot, flight nurse, and flight paramedic were killed. Night visual meteorological conditions prevailed for the 14 Code of Federal Regulations (CFR) Part 91 emergency medical services (EMS) positioning flight, which departed Wichita Mid-Continental Airport (ICT), Wichita, Kansas, about 0215 and was en route to DDC. The flight was on an instrument flight rules (IFR) flight plan, but the pilot cancelled the IFR flight plan at an altitude of about 12,000 feet mean sea level (msl) approximately 34 nm east of DDC and proceeded under visual flight rules.

The transcript of the radio transmissions between EagleMed 4 and air traffic control (ATC) during the accident flight indicated that EagleMed 4 received its IFR clearance about 0211 and departed ICT about 0215. The flight climbed to a cruise altitude of 12,000 feet msl on a magnetic course of about 265 degrees. At 0244:13, the pilot of EagleMed 4 reported that he had DDC in sight, and at 0244:22, ATC cleared EagleMed 4 for a visual approach to DDC. At 0244:27, EagleMed 4 stated, "Cleared for the approach (unintelligible). Go ahead and cancel IFR for Eagle Med Four." At 0244:37, ATC stated, "Eagle Med Four, roger, squawk one two zero zero. Frequency change is approved and have a good morning." The last recorded radio transmission from EagleMed 4 was at 0244:43, when the pilot stated, "You too." At 0244:48, EagleMed 4 began to transmit VFR transponder code 1200.

Radar track data indicated that EagleMed 4 maintained a magnetic course of about 265 degrees with a calibrated airspeed (CAS) of about 180 to 185 knots (kts) during the flight from ICT to DDC. The radar data indicated that the airplane initiated a descent on a magnetic course of 265 degrees. The rate of descent was about 850 to 950 feet per minute, and the CAS increased from about 180 to about 214 kts. The airplane flew past DDC about .8 nm to the north as it continued on a magnetic course of about 270 degrees. The last radar contact occurred at 0256:10, when the airplane was about 4.7 nm west of the airport at 3,200 feet msl. The airplane impacted the terrain about 7 nm west of DDC.

Witnesses in the area reported hearing engine noises consistent with a low-flying airplane followed by the sound of an impact. One of the witnesses described the engines as sounding like they were at "full throttle." Another witness reported seeing multiple "fireballs" on the ground after the impact.

PERSONNEL INFORMATION

The pilot was hired by Ballard Aviation in November 2002 as a Beech B90 pilot and was one of two pilots based out of Dodge City, Kansas. According to company records, he held a commercial certificate with single-engine and multiengine land airplane ratings and an airplane instrument rating. He was also a certified flight instructor with single-engine land and airplane instrument ratings and held a first-class medical certificate. He had about 3,066 hours of total flight time, including 2,166 hours in multiengine aircraft. He had about 666 flight hours in a Beech B90 and had flown about 102 hours in the last 90 days and 24 hours in the last 30 days.

According to Ballard, the duty schedule for the pilots based at DDC was 7 24?hour-days on and 7 days off. A review of the pilot's 72-hour history prior to the accident revealed that the he was off duty from flying on February 14 and February 15, 2004 (the off-duty period having begun February 10). On Saturday, February 14, the pilot went to sleep about midnight. On February 15, he awoke about 0830 and engaged in normal activities. He worked from 1700 to 2200 at his job as a valet and went to bed around 2300.

On Monday, February 16, he awoke about 0600. He commuted to Wichita, Kansas, as a deadhead passenger on an airfreight flight that departed Dallas about 0710 and arrived in Wichita about 1015. At Wichita, the headquarters for EagleMed, the accident pilot picked up his spare car and drove to Dodge City. He arrived there about 1225 (25 minutes after his shift began), having telephoned ahead to indicate that he would arrive late.

After arriving at Dodge City, the pilot was assigned a mission to deliver a patient from Lamar, Colorado, to Pueblo, Colorado. He departed DDC about 1426, arrived at Lamar about 1504, departed Lamar about 1628 with the patient, and arrived at Pueblo about 1654. After medical personnel returned from delivering the patient to the medical center, the pilot departed Pueblo about 1816 and returned to DDC about 1919.

Other employees of Ballard Aviation reported that it would have been normal for the pilot to return to the pilot watch house located at DDC so he could eat and rest in preparation for further missions. They reported that they found dirty dishes in the sink at the watch house, which would be consistent with the pilot eating a meal.

After receiving a new assignment to deliver a patient from DDC to Wichita, Kansas, the pilot departed DDC with the patient between 2130 and 2200 and arrived at Wichita's Jabarra Airport (AAO) between 2200 to 2215. According to his girlfriend, who spoke to him by telephone soon after he arrived, the pilot sounded in good spirits and indicated that he might remain on duty until as late as 0400. He had already received a new mission to transport a patient from Independence, Kansas, back to Wichita.

He departed AAO about 2258, arrived at Independence about 2339, departed with the patient about 0029, and arrived at ICT about 0102 on February 17. The pilot waited in the pilot lounge at EagleMed company headquarters while medical personnel delivered the patient to medical treatment and returned for the final flight leg back to DDC. Two pilots observed the accident

pilot in the pilot lounge and said that he was active, ate snacks, and seemed alert and normal. They reported that he did not rest on the available couches. After the medical personnel returned, the pilot departed ICT about 0215 with a scheduled arrival time at DDC of 0256. The accident occurred about 0257.

It had been 14 hours and 33 minutes from the time that the pilot had reported for duty at 1225 until the time of the accident. It had been 20 hours 58 minutes from the time the pilot awoke on February 16 until the time of the accident.

AIRCRAFT INFORMATION

The twin-engine Beech B90, serial number LJ377, was configured for EMS operations and had a maximum gross weight of 9,705 pounds. The engines were 550 horsepower Pratt & Whitney PT6A-20 engines. The airplane was part of an approved aircraft inspection program (AAIP) and was last inspected on February 13, 2004. The airplane had flown 8 hours since the inspection and had accumulated a total airframe time of 9,006 hours.

A Federal Aviation Administration (FAA) airworthiness inspector examined the aircraft records and applicable airworthiness directives and found no anomalies.

METEOROLOGICAL INFORMATION

The 0253 observed weather at DDC was as follows:

Winds 320 degrees at 6 knots, visibility 7 statute miles, clear sky, temperature - 6 degrees C, dew point - 8 degrees C, altimeter 30.39 inches of mercury.

WRECKAGE AND IMPACT INFORMATION

The airplane impacted the terrain about 7 nm west of DDC in a rural area that had been a World War II Army airfield. The wreckage path was about 0.26 statute miles long on about a 266 degree magnetic bearing. The main wreckage came to rest next to an old dump truck at coordinates 37 degrees 47.510 minutes north, 100 degrees 06.722 minutes west. The on-site inspection confirmed that the fuselage, empennage, wings, and all flight control surfaces were located at the accident site.

A four-wire power transmission line was located in a wheat field at coordinates 37 degrees 47.476 minutes north, 100 degrees 06.441 minutes west. A 10- to 12-inch section of one of the overhead wires was found frayed. Portions of the airplane's vertical stabilizer fairing and rotating beacon were found near the frayed wire.

The initial signs of ground impact were a series of 13 to 15 parallel ground strikes that covered about 60 feet in distance. Gray and white paint transfer marks were found in the dirt where the ground strikes were located. The ground strikes were consistent with propeller impact marks.

Using the propeller ground strike intervals, ground speed calculations indicated that the airplane's ground speed was 200 kts or greater when it impacted the terrain.

The wreckage path indicated the airplane began to fragment after impacting a berm at a west edge of the wheat field. The airplane then hit a concrete wall and tree line before contacting a line of trucks at a truck repair facility. (See the wreckage diagram and photographs in the docket for this accident.) The postimpact fire charred most of the main wreckage, as well as the ground and vegetation along the wreckage path.

The left wing was found in the debris field separated from the fuselage; postimpact fire had consumed most of its structure. The main landing gear upper struts were found in the up and locked position. The instrument panel was destroyed by impact forces and the postimpact fire. No instrument indications or readings were obtained. The airplane's electrical system, fuel system, environmental systems, ice protection system, avionics, and cabin interior were destroyed by impact and postimpact fire.

The pilot's seat back and seat cushion were found near the main wreckage. The pilot's seat mountings exhibited separation signatures consistent with overload. The seat back was found broken from the seat pan. The seat cushion with its red wool covering was found with the seat back. The seat belt and shoulder harness were still buckled and attached to the seat back. No cuts were made to the shoulder harness or seat belt webbing. The pilot's body was found with the pilot's seatback and seat cushion.

The entire copilot's seat and its mounting structure were found separated from the main wreckage and lying on the west side of a dump truck in the wreckage path. The copilot's seat remained intact and exhibited some fire damage. The seat belt and shoulder harness were found unbuckled, and the webbing had some fire damage.

The on-site inspection of the flight control system did not reveal any evidence of pre-impact failure or malfunction. Flight control continuity was established for the rudder and elevator controls cables from the control surfaces to the cockpit. However, the aileron control cables were not continuous from the flight controls to the control surfaces. Although the aileron control cables were found attached to the intact interconnect control chain in the cockpit, the interconnect chain was not connected to the control column sprockets. The aileron cables were traced to the wings where the cables were found separated with "broom straw" ends, a condition that is consistent with overload separation. Segments of the wing aileron control cables remained attached to the aileron bellcranks.

The trim controls in the cockpit pedestal were found separated from the main wreckage and destroyed. The elevator trim actuator measurement indicated a trim setting of 0 degree tab deflection. The rudder trim actuator measurement indicated a trim setting of 5 degrees nose right trim. The aileron trim tab actuator measurement indicated a trim setting of 0 to 5 degrees tab up, resulting in a slight right-wing-down trim.

An on-site inspection of the engines found that they exhibited similar characteristics. The compressor turbine, power turbine guide vane ring, and the power turbine all displayed circumferential rubbing and machining due to axial contact with their adjacent components under impact loads and external housing deformation. The compressor first-stage shroud, the compressor turbine shroud, and the power turbine shroud displayed circumferential scoring due to radial contact with their adjacent blades under impact loads and external housing deformation.

Inspection of both Hartzell three-bladed propellers revealed that they had sustained impact and postimpact fire damage. Both sets of blades exhibited deformation, chordwise scratches, gouges in the leading and trailing edges, and blade twist toward low pitch. The left propeller was found with two separated blades, which had broken outboard of the hub. The right propeller blades remained attached to the propeller hub and exhibited aft curling of the blades.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy of the pilot was performed at the Regional Forensic Science Center, Wichita, Kansas, on February 19, 2004. The FAA Civil Aeromedical Institute prepared a Forensic Toxicology Fatal Accident Report, which indicated negative results for all drugs and substances tested.

COMPANY INFORMATION

Ballard Aviation owns and operates EagleMed. At the time of the accident, EagleMed owned four fixed-wing airplanes and seven helicopters. It employed about 160 persons (pilots, medical personnel, and support staff). The company was headquartered at ICT in Wichita, Kansas, and conducted fixed-wing operations at ICT, DDC, Garden City, and Goodland, Kansas.

DDC was the only base with two pilots rather than three. When the pilots were scheduled to work, they wore a pager so that EagleMed dispatch, located at the Wichita headquarters, could notify them about missions to be flown. The pilots were required to ensure that they could accomplish a mission and adhere to the flight time limitations and rest requirements of Section 135.267 before accepting the mission. If the pilots determined that they could accept the mission, then they were expected to be airborne within 30 minutes after being notified. Ballard Aviation provided a watch house located at DDC for the pilots and medical personnel to use while they were scheduled to work.

According to EagleMed's chief pilot, pilots were responsible for monitoring and adhering to duty time requirements and telling dispatchers when they had reached their last permissible mission. He indicated that pilots sometimes called in sick or tired but that this was rare. EagleMed provided all new-hire pilots human fatigue training as part of a 2- to 4-hour segment on physiological factors. The company also provided recurrent training on fatigue, as required.

ADDITIONAL INFORMATION

Part 135 Flight Time and Rest Requirements

Title 14 CFR Section135.267, "Flight time limitations and rest requirements: Unscheduled one and two pilot crews," states, in part:

(b) Except as provided in paragraph (c) of this section, during any 24 consecutive hours the total flight time of the assigned flight when added to any other commercial flying by that flight crewmember may not exceed--

(1) 8 hours for a flight crew consisting of one pilot; or

(2) 10 hours for a flight crew consisting of two pilots qualified under this Part for the operation being conducted.

(c) A flight crewmember's flight time may exceed the flight time limits of paragraph (b) of this section if the assigned flight time occurs during a regularly assigned duty period of no more than 14 hours and--

(1) If this duty period is immediately preceded by and followed by a required rest period of at least 10 consecutive hours of rest;

(2) If flight time is assigned during this period, that total flight time when added to any other commercial flying by the flight crewmember may not exceed--

(i) 8 hours for a flight crew consisting of one pilot; or

(ii) 10 hours for a flight crew consisting of two pilots; and

(3) If the combined duty and rest periods equal 24 hours.

(d) Each assignment under paragraph (b) of this section must provide for at least 10 consecutive hours of rest during the 24-hour period that precedes the planned completion time of the assignment.

(e) When a flight crewmember has exceeded the daily flight time limitations in this section, because of circumstances beyond the control of the certificate holder or flight crewmember (such as adverse weather conditions), that flight crewmember must have a rest period before being assigned or accepting an assignment for flight time of at least--

(1) 11 consecutive hours of rest if the flight time limitation is exceeded by not more than 30 minutes;

(2) 12 consecutive hours of rest if the flight time limitation is exceeded by more than 30

minutes, but not more than 60 minutes; and

(3) 16 consecutive hours of rest if the flight time limitation is exceeded by more than 60 minutes.

(f) The certificate holder must provide each flight crewmember at least 13 rest periods of at least 24 consecutive hours each in each calendar quarter.

Part 135 requirements in EMS operations only apply when a patient is on board. Otherwise, flights are operated under Part 91, which does not impose flight time restrictions or crew rest requirements. Part 91 flights may continue as long as the pilot determines that he or she is physically and mentally fit for flight. However, Part 91 flight time counts toward the flight time limitations for any Part 135 flights conducted during the duty period. Section 135.267 is sometimes referred to as "24-hour look back" or "Rolling look back." According to these regulations, the rolling look back requires that a pilot's flight and rest requirements be continuously evaluated to determine that flight time limitations are not exceeded and that rest requirements are being met. Flight time can be added to the current day, minute by minute, as flight time from the previous day's flights expires.

After the accident pilot returned to ICT at 0102 on February 17, he had accumulated 3 hours 59 minutes of total flight time (flights conducted under Part 91 and Part 135) toward the maximum of 8 hours (under Part 135), and his 10-hour rest period (required for Part 135 flights only) was not required until 0225. In accordance with Part 135 regulations, the pilot could perform another Part 135 flight if it could reasonably be expected to be completed by 0225.

The accident pilot's final flight for this duty period was to reposition the airplane back to DDC. The repositioning flight was conducted under Part 91, so the flight time and rest requirements of Part 135.267 did not apply. The flight departed ICT about 0215 and was scheduled to arrive at DDC about 0256. If the flight had been completed as planned, the flight time would have been 41 minutes, resulting in a total flight time for the pilot of about 4 hours 40 minutes. According to FAA regulations, the pilot could continue to fly Part 91 operations indefinitely, assuming he was fit to fly.

The Federal Aviation Administration, Raytheon Aircraft Company, Pratt & Whitney, and Ballard Aviation were parties to the investigation.

The aircraft wreckage was released to Global Aerospace on February 18, 2004.

Pilot Information

Certificate:	Commercial; Flight instructor	**Age:**	31,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane single-engine; Instrument airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 Valid Medical--w/ waivers/lim	**Last FAA Medical Exam:**	July 7, 2003
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	December 30, 2003
Flight Time:	3066 hours (Total, all aircraft), 666 hours (Total, this make and model), 2866 hours (Pilot In Command, all aircraft), 102 hours (Last 90 days, all aircraft), 24 hours (Last 30 days, all aircraft), 5 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Beech	**Registration:**	N777KU
Model/Series:	B90	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	LJ377
Landing Gear Type:	Retractable - Tricycle	**Seats:**	8
Date/Type of Last Inspection:	February 1, 2004 AAIP	**Certified Max Gross Wt.:**	9705 lbs
Time Since Last Inspection:	8 Hrs	**Engines:**	2 Turbo prop
Airframe Total Time:	9005.7 Hrs at time of accident	**Engine Manufacturer:**	Pratt & Whitney
ELT:	Installed	**Engine Model/Series:**	PT6A-20
Registered Owner:	Ballard Aviation Inc.	**Rated Power:**	550 Horsepower
Operator:		**Operating Certificate(s) Held:**	On-demand air taxi (135)
Operator Does Business As:		**Operator Designator Code:**	IJAF

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Night/dark
Observation Facility, Elevation:	DDC,2594 ft msl	**Distance from Accident Site:**	5 Nautical Miles
Observation Time:	02:53 Local	**Direction from Accident Site:**	340°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots / 0 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	320°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.45 inches Hg	**Temperature/Dew Point:**	-6°C / -8°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Wichita, KS (ICT)	**Type of Flight Plan Filed:**	IFR
Destination:	Dodge City, KS (DDC)	**Type of Clearance:**	IFR
Departure Time:	02:15 Local	**Type of Airspace:**	Class E

Airport Information

Airport:	DODGE CITY REGIONAL DDC	**Runway Surface Type:**	
Airport Elevation:	2594 ft msl	**Runway Surface Condition:**	
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	3 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	On-ground
Total Injuries:	3 Fatal	**Latitude, Longitude:**	37.797222,-100.111663

Administrative Information

Investigator In Charge (IIC):	Silliman, James
Additional Participating Persons:	Jim Lamb; Federal Aviaiton Administration; Wichita, KS Thomas Berthe; Pratt & Whitney; South Burlington, VT Brian Cassidy; Raytheon Aircraft Company; Wichita, KS Allen Zon; Ballard Aviation Inc.; Wichita, KS
Original Publish Date:	January 26, 2006
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=58745