Aviation Investigation Final Report

Location:	Newberry, South Carolina	**Accident Number:**	CHI04MA182
Date & Time:	July 13, 2004, 05:32 Local	**Registration:**	N503MT
Aircraft:	Bell 407	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	4 Fatal
Flight Conducted Under:	Part 135: Air taxi & commuter - Non-scheduled - Air Medical (Unspecified)		

Analysis

A single-engine emergency medical services (EMS) helicopter was destroyed after impacting trees in a national forest about 0532 eastern daylight time. Night visual meteorological conditions with mist and light fog prevailed in the area of the accident site. The flight crew was contacted about 0452 to determine if they could accept the mission. The pilot performed a weather check and accepted the mission about 0455. He departed about 0502. The helicopter arrived at the accident scene and landed on the interstate highway near a rest stop about 0523. The helicopter departed the scene about 10 minutes later, flying toward the national forest located north of the interstate. A witness reported that the helicopter made no abrupt maneuvers and that the engine "didn't sound like it was missing, sputtering, or any other kind of power loss." He reported that the helicopter was straight and level then it "pitched forward to go forward." He reported the helicopter was "flying level" as it descended into the trees. He reported that the helicopter's searchlight was on and that fog and mist were visible at treetop level. Postaccident inspection of the helicopter revealed no preexisting anomalies that could be associated with a pre-impact condition. Download of the engine's electronic control unit nonvolatile memory indicated that the engine was operating at 98 percent Ng when it impacted the trees. Three other EMS helicopter operators had turned down the mission, including one who had attempted it but had to return because of fog conditions. However, the accident pilot was not informed that other pilots had declined the mission because of fog.

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 terrain clearance as a result of fog conditions. A contributing factor was inadequate weather and dispatch information relayed to the pilot.

Findings

Occurrence #1: IN FLIGHT ENCOUNTER WITH WEATHER
Phase of Operation: TAKEOFF - INITIAL CLIMB

Findings
1. (F) WEATHER EVALUATION - INADEQUATE - PILOT IN COMMAND
2. (F) INFORMATION - INADEQUATE - DISPATCHER
3. (F) LIGHT CONDITION - NIGHT
4. (F) WEATHER CONDITION - FOG

Occurrence #2: IN FLIGHT COLLISION WITH OBJECT
Phase of Operation: DESCENT

Findings
5. (C) CLEARANCE - NOT MAINTAINED - PILOT IN COMMAND
6. (F) OBJECT - TREE(S)

Occurrence #3: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Findings
7. TERRAIN CONDITION - GROUND

Factual Information

HISTORY OF FLIGHT

On July 13, 2004, about 0532 eastern daylight time, a Bell 407 helicopter, N503MT, operated by Med-Trans Corporation (MTC) collided with trees shortly after takeoff from interstate highway 26 (I-26) near Newberry, South Carolina. The pilot, flight nurse, flight paramedic, and patient were killed, and the helicopter was destroyed by impact and postcrash fire. The 14 Code of Federal Regulations Part 135 emergency medical services (EMS) flight was en route to Spartanburg Regional Medical Center, where it had departed about 0502. Night visual meteorological conditions with mist and light fog prevailed in the area of the accident site. A company flight plan had been filed, and flight-following was being provided by the Spartanburg County Communications 911 Department of the Spartanburg County Office of Emergency Services.

The accident pilot was notified of the EMS mission about 0452. After performing a weather check, he accepted the mission about 0455. The accident helicopter departed the Spartanburg Regional Medical Center helicopter pad about 7 minutes later en route to the accident site, which was located at the 64-mile marker rest stop on I-26. The accident pilot reported that three people were on board and that he had 2 hours of fuel. He estimated that they would arrive at the accident site in 18 to 20 minutes. The direct distance from the helicopter pad to the rest stop was about 42 miles. The helicopter cruise speed was about 130 knots.

The accident pilot reported that they were on-scene about 0523. Emergency personnel at the accident site reported that the helicopter's "night sun" searchlight was on as it approached the landing zone. The helicopter circled the landing zone once before landing in front of a fire truck in the eastbound lane of I-26. The witnesses reported that there was light ground fog in the area and that it was foggier above the treetops, which was evident when the helicopter descended with its searchlight on. Emergency personnel reported that the helicopter was on-scene about 10 minutes before it departed across the westbound lanes of I-26 and climbed above the trees.

A truck driver who was stopped on the eastbound lane of I-26 reported during a postaccident interview that he was about 75 to 100 yards from the helicopter when it landed. He reported that he observed the helicopter takeoff from the landing zone, proceed across the westbound lanes of I-26, climb above the trees, and turn toward Spartanburg. He reported that with the helicopter's searchlight on, he could see the helicopter's silhouette and that there was slight fog and haze in the area. He reported that the helicopter made no abrupt maneuvers and that the engine "didn't sound like it was missing, sputtering, or any other kind of power loss." He reported that the helicopter was straight and level then "pitched forward to go forward." He reported the helicopter was "flying level" as it descended into the trees. At 0531:55, the

Spartanburg County 911 dispatch desk recorded about 1 second of a "keyed" microphone, but no voice transmission was recorded when the microphone was activated.

About 0538, the Newberry County Communications Center 911 contacted Spartanburg County 911 dispatch and reported receiving a call that the helicopter had crashed. Spartanburg County 911 dispatch and Newberry County 911 began to try to locate and communicate with the accident helicopter. About 0629, Newberry 911 informed Spartanburg County 911 dispatch that emergency personnel had located the helicopter wreckage.

PERSONNEL INFORMATION

The pilot was hired by MTC in April 2003 and had worked for another EMS operator previously. Company records indicated that the pilot held a commercial pilot certificate with a helicopter rating and an instrument rating in helicopters. He had about 2,133 total flight hours, which were all in helicopters and had flown about 104 hours in the Bell 407. He had flown 14.7 hours in the last 90 days, and 6.1 hours in the last 30 days. He had logged 250 hours of total night flight. He had flown 5.7 hours of night flight in the last 90 days, and 2.7 hours of night flight in the last 30 days. He had logged 48 hours of simulated instrument flight with .9 hour of simulated instrument flight in a Bell 407. There was no record of flight in actual instrument conditions.

Pilot flight records indicated that the pilot had logged about 1,095 hours in a Robinson R-22 helicopter, 443 hours in a Robinson R-44 helicopter, and 530 hours in a Bell 206 helicopter.

The pilot's MTC training records indicate that he completed initial new hire ground and flight training between April 15 and April 20, 2003. During initial flight training, he received 6.6 hours of flight training in a Bell 407 of which 1.6 hours were at night and 0.2 hour was simulated instrument flight. He completed recurrent training in a Bell 407 on August 28, 2003, receiving 1.3 hours of flight instruction of which 0.2 hour was simulated instrument flight. He next completed recurrent training in a Bell 407 on April 19, 2004, receiving 1.2 hours flight instruction of which 0.3 hour was simulated instrument flight. On April 27, 2004, he satisfactorily completed the required 12-month 14 CFR 135.293 competency check and the 14 CFR 135.299 line check in a Bell 407 lasting 0.9 hour.

Pilots and flight crewmembers at the MTC base in Spartanburg described the accident pilot as being very conscientious and conservative. Crewmembers reported that he sometimes referred to himself as a "weather chicken" because he was so cautious about flying in weather. One pilot reported that the accident pilot would not have flown a mission "if he couldn't see the ground," adding that he was not a "push the weather kind of guy." Another pilot reported that he was surprised that the accident pilot had departed with a temperature/dew point spread of 0. He reported that the accident pilot had turned down previous missions with similar temperature/dew point spreads.

AIRCRAFT INFORMATION

The single-engine Bell 407, serial number 53498, was manufactured in 2001, had seating for five, and was configured for EMS operations. It had a maximum gross weight of 5,250 pounds. The engine was a 650 horsepower Rolls-Royce 250-C47B engine. The last approved aircraft inspection program (AAIP) inspection was conducted on July 5, 2004; the helicopter had flown 8 hours since the AAIP inspection and had a total time of 710 hours.

A Federal Aviation Administration (FAA) airworthiness inspector examined the aircraft's maintenance records and reported that no discrepancies were found.

METEOROLOGICAL INFORMATION

The closest weather reporting station was Greenwood County Airport (GRD), located about 24 miles southwest of the accident site. The 0456 reported weather at GRD was: winds calm, visibility 5 miles in mist, sky clear below 12,000 feet, temperature 22 degrees Celsius (C), dew point 21 degrees C, altimeter 29.94 inches of mercury.

The 0556 reported weather at GRD was: winds from 200 degrees at 6 knots, visibility 4 miles in mist, ceiling broken at 300 feet, temperature and dew point 22 degrees C, altimeter 29.95 inches of mercury.

The 0604 reported special weather observation at GRD was: winds from 210 degrees at 4 knots, visibility 1.75 miles in mist, ceiling broken at 300 feet, temperature and dew point 22 degrees C, altimeter 29.95 inches of mercury.

The next closest weather reporting facility was at the Greenville-Spartanburg International Airport (GSP), located in Greer, South Carolina, 38 miles northwest of the accident site. The 0413 reported special weather observation at GSP was: wind calm, visibility 1.5 miles in mist, sky clear below 12,000 feet, temperature and dew point 21 degrees C, altimeter 29.93 inches of mercury.

The 0443 reported special weather observation at GSP was: wind calm, visibility 6 miles in mist, sky clear below 12,000 feet, temperature and dew point 22 degrees C, altimeter 29.93 inches of mercury.

The 0453 reported weather observation at GSP was: wind calm, visibility 1 mile in mist, sky condition missing, temperature and dew point 21 degrees C, altimeter 29.93 inches of mercury.

An EMS helicopter pilot from Med-Trans One, based in Greenville, South Carolina, reported that Med-Trans One departed about 0628 to search for the accident helicopter. The helicopter accident site was about 45 miles from Med-Trans One's base. The pilot reported that he had to return to base about 25 miles into the flightbecause of heavy ground fog. He reported that the fog "extended from the surface to about 500 feet and was a solid blanket as far as I could

see on the horizon."

WRECKAGE AND IMPACT INFORMATION

The wreckage was located in a heavily wooded area within the Sumter National Forest about 0.47 nautical mile northwest of the 64-mile marker rest stop on I-26. The helicopter initially impacted trees and came to rest about 256 feet from the initial tree impact point on about a 330-degree magnetic heading. The initial ground impact point was about 52 feet from the main wreckage, which was found at coordinates 34.41975 degrees north, 81.7101 degrees west.

Most of the fuselage was consumed by postcrash fire, including the seats, seat belts, and shoulder harnesses. The cockpit area received heavy fire damage. Portions of the fuselage not consumed by fire included the servo supports and associated roof section, instrument panel, and the overhead circuit breaker panel.

The engine was located with the main wreckage and exhibited extensive fire and compression damage. The accessory gearbox was consumed by fire. All gears and bearings within the accessory gearbox were intact but damaged by fire. The compressor impeller displayed evidence of foreign object damage, with multiple impeller blades found torn, notched, and bent opposite to the direction of travel. The 4th stage turbine wheel was intact with no damage noted. The engine's electronic control unit (ECU) was removed and sent to its manufacturer for downloading. The transmission exhibited fire damage. The transmission was rotated by hand and it rotated freely. The mast was intact and the rotor head/hub was securely mounted to the mast.

The KFLEX rive shaft was found outside of the fire zone. The flexure arms were bent and fractured at both the forward and aft ends. The external surface of the shaft exhibited rotational scoring. The internal surface of the drive shaft did not exhibit evidence of contact with the anti-flail/secondary torque-transmitting feature. The freewheeling unit received fire damage and the unit outer case was melted. The freewheeling unit would not rotate by hand.

The main rotor system exhibited impact damage. All four blades exhibited damage to the leading edge, as well as crush damage.

The rotating and non-rotating swashplates were intact. The rotating swashplate rotated freely with the rotor system. The rotating drive links were bent and fractured. The tail rotor drive system was fractured in several sections and exhibited evidence consistent with overload fractures. All four hanger bearings rotated freely. The number 1 and number 2 forward oil cooler bearings had been exposed to post impact fire and could not be rotated. The bearing housing was intact. The tail rotor gearbox rotated freely. The chip plug was removed and was free of debris. No pre-impact anomalies were noted in the tail rotor drive system. The tailboom was found separated into three sections. No pre-impact anomalies were noted with the tailboom.

Both the collective and cyclic received extensive fire damage, which prevented establishing complete control continuity. The collective stick and the collective jackshaft were found together. The spline at the end of the collective was disconnected from the jackshaft. The pilot's and copilot's anti-torque pedals were found embedded in the ground near the initial ground impact point. Wood material was found embedded in the pedal assembly. The control tube from the pilot's pedals to the center console was fractured with signatures consistent with overload.

The vertical tunnel assembly that housed the four flight control tubes received fire damage. The four control tubes were destroyed. The connecting linkage hardware to all three roof mounted servo actuators exhibited fracture surfaces consistent with overload fractures. The collective and cyclic servos exhibited impact damage but were not fire damaged. The control linkages from the actuators to the rotor head were observed with bends and fractures that were consistent with overload fractures.

The tail rotor pitch control tubes located on the top of the roof structure were intact except that the aft end of the tube was fractured where it attached to a bellcrank. Fractures of the long tail rotor control tube in the tailboom corresponded to locations of tailboom fractures. The tail rotor output shaft and tail rotor control tube were bent. The tail rotor pitch links were securely attached but bent.

The instrument panel was found outside of the fire zone. The radar altimeter was found intact. The radar altimeter bug was found set at 300 feet. The airspeed indicator was at zero. The warning and caution panel was separated from the instrument panel, but it exhibited no impact damage. It was shipped to the aircraft manufacturer for inspection.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy was performed on the pilot at Newberry Pathology Associates, Newberry, South Carolina, on July 13, 2004. A Forensic Toxicology Fatal Accident Report was prepared by the FAA Civil Aeromedical Institute. The results were negative for all substances tested.

TESTS AND RESEARCH

The caution and warning panel was sent to Bell Helicopter for inspection. The National Transportation Safety Board's (NTSB) investigator-in-charge provided oversight to the inspection. The panel contained 3 bulbs for each of the 36 caution and warning indicators, for a total of 108 bulbs. None of the bulb filaments were broken or significantly stretched. Two bulb filaments from the hydraulic system indicator exhibited a small amount of stretch from an undetermined origin.

The engine's ECU was sent to Goodrich Pump & Engine Control Systems, the manufacturer, for inspection. An NTSB systems specialist provided oversight to the inspection. The download

of the ECU's nonvolatile memory recorded five incidents (snapshots) in a chronological sequence that lasted less than 1.5 seconds. The recorded data indicated that the engine performance was normal and was operating in a steady state condition before the first incident. The five snapshots revealed that the engine gas producer (Ng) remained in the 97 to 99 percent range throughout the 1.5-second sequence. The five snapshots revealed the following:

Snapshot 1) The ECU detected a torque rate incident, indicating that torque was increasing at more that 1,500 percent per second.

Snapshot 2) The ECU detected a rotor drop incident as the rotor speed (Nr) fell below the incident limit of 92 percent to 76 percent.

Snapshot 3) The ECU detected a high torque incident as torque climbed above the incident limit of 109 percent.

Snapshot 4) The ECU detected a high power turbine (Np) incident as Np increased to 109 percent. The rapid turnaround in Np, even as Nr continued to decay, indicated that the power turbine shaft had failed.

Snapshot 5) The ECU detected an overspeed incident as the overspeed solenoid was activated in response to Np reaching the 118 percent trip point.

COMPANY INFORMATION

MTC was issued an operating certificate by the FAA in 1995 to conduct on-demand air taxi operations under the provisions of 14 CFR Part 135. At the time of the accident, MTC had air ambulance operations in the states of Tennessee, Kentucky, South Carolina, Texas, Arizona, California, South Dakota, North Dakota, and Nebraska. The corporate headquarters was located in Bismarck, the Director of Maintenance was located in Bismarck, the Director of Operations was located in Tucson, Arizona, and the Chief Pilot was located in Johnson City, Tennessee. The Part 135 operating certificate was managed by the FAA Flight Standards District Office in Scottsdale, Arizona. The FAA-approved company operation specifications did not allow flights to be conducted in IMC.

MTC provided training for its pilots in accordance with its FAA-approved Helicopter Operations Training Manual. The manual specified that during the third of six training periods, a trainee was required to "demonstrate the ability to navigate and control the aircraft with reference to instruments only and recover from unusual attitudes by reference to instruments only." No other requirements for instrument flight were specified in the training manual.

On November 16, 2003, the Chief Pilot at MTC sent an e-mail to all MTC Base Managers that contained a discussion of "the company philosophy when it comes to flying in less than optimum weather" and included the following statement:

"... know that when you abort a mission for weather, make an unscheduled landing because of weather, or decline a mission due to weather, you will enjoy full company support in your decision."

During interviews with the MTC pilots assigned to the MTC Spartanburg base, the pilots reported that they especially appreciated two things about working for MTC: 1) the Bell 407 helicopters they flew were new and they enjoyed good maintenance, and 2) they never felt any pressure from the base manager or from the company to fly in adverse weather conditions. The pilots reported that if they turned down or aborted a mission due to weather, they were never questioned or second-guessed by company personnel.

ADDITIONAL INFORMATION

Dispatch and 911 Communications

About 0429, the Newberry County Communications Center 911 first notified Palmetto Health Richland, Columbia, South Carolina, that an accident had occurred at the 64-mile marker rest stop on I-26. Newberry 911 requested that the CareForce EMS helicopter be put on standby to launch to the accident site. About 0440, Newberry 911 requested that CareForce launch to the accident site. CareForce departed about 0443, but after 2 minutes of flight, CareForce returned to base due to fog in the area. About 0446, CareForce dispatch notified Newberry 911 that CareForce had returned to base due to fog.

About 0448, the Newberry 911 dispatcher contacted MTC One dispatch located in Greenville, South Carolina. MTC One dispatch informed Newberry 911 that MTC One was operating in condition "red" status, meaning that no flights would take off until weather conditions improved (the MTC One pilot had notified dispatch about 0025 that MTC One was out of service due to the developing fog in the area). The MTC One dispatcher turned down the Newberry 911 request without contacting the MTC One pilot. About 0449, the Newberry 911 dispatcher contacted Life Reach 1, located in Columbia, South Carolina, to determine if that operator could accept the mission. The Life Reach 1 pilot initially accepted the mission but declined it when he learned that CareForce had returned due to fog.

About 0450, the Newberry 911 dispatcher contacted Spartanburg County 911 dispatch requesting services. The Spartanburg County 911 dispatcher asked Newberry 911 for information about the accident scene, such as location, coordinates, and frequencies. The Spartanburg County dispatcher then checked the flight status of the Spartanburg MTC helicopter and determined the status was "yellow," which meant the pilot had to be contacted so that he could perform a weather check before accepting a mission. The Newberry 911 dispatcher informed the Spartanburg County 911 dispatcher that other operators had declined the mission, stating "Greenville couldn't fly cause the fog was too bad. Columbia couldn't fly..." The Spartanburg County dispatcher responded, "It may be the same...give, ah..." The Newberry 911 dispatcher continued to provide information about the launch request.

About 0452, as the Spartanburg County 911 dispatcher continued to collect information about the launch request, another Spartanburg County dispatcher telephoned the accident flight crew and asked if they were available to fly. The dispatcher informed the flight nurse that MTC One was not flying and that there was an EMS mission in Newberry County. The flight nurse informed the second dispatcher that the pilot would have to perform a weather check before he could accept the mission. The accident pilot accepted the mission about 0455. Neither Spartanburg County 911 dispatcher was aware that CareForce had aborted the mission due to fog or that Life Reach 1 had turned down the mission, and therefore, could not inform the accident pilot of this information.

Parties to the investigation were the FAA, Bell Helicopter, Rolls-Royce, and Med-Trans Corporation.

The aircraft wreckage was released to U.S. Aviation Underwriters.

Pilot Information

Certificate:	Commercial; Flight instructor	**Age:**	41,Male
Airplane Rating(s):	None	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	Helicopter	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 None	**Last FAA Medical Exam:**	September 1, 2003
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	April 1, 2004
Flight Time:	2133 hours (Total, all aircraft), 104 hours (Total, this make and model), 2069 hours (Pilot In Command, all aircraft), 15 hours (Last 90 days, all aircraft), 6 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Bell	**Registration:**	N503MT
Model/Series:	407	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	53498
Landing Gear Type:	Skid	**Seats:**	5
Date/Type of Last Inspection:	July 1, 2004 AAIP	**Certified Max Gross Wt.:**	5250 lbs
Time Since Last Inspection:	8 Hrs	**Engines:**	1 Turbo shaft
Airframe Total Time:	710.6 Hrs at time of accident	**Engine Manufacturer:**	Rolls-Royce
ELT:	Installed, not activated	**Engine Model/Series:**	250 C47B
Registered Owner:	AVN AIR LLC	**Rated Power:**	650 Horsepower
Operator:	Med-Trans Corp.	**Operating Certificate(s) Held:**	On-demand air taxi (135)
Operator Does Business As:	Regional One	**Operator Designator Code:**	M3XA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Night
Observation Facility, Elevation:	GRD,631 ft msl	**Distance from Accident Site:**	24 Nautical Miles
Observation Time:	04:56 Local	**Direction from Accident Site:**	210°
Lowest Cloud Condition:	Clear	**Visibility**	5 miles
Lowest Ceiling:		**Visibility (RVR):**	
Wind Speed/Gusts:	/ None	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.94 inches Hg	**Temperature/Dew Point:**	22°C / 21°C
Precipitation and Obscuration:			
Departure Point:	Spartansburg, SC	**Type of Flight Plan Filed:**	None
Destination:	Spartansburg, SC	**Type of Clearance:**	None
Departure Time:	05:32 Local	**Type of Airspace:**	

Wreckage and Impact Information

Crew Injuries:	3 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	On-ground
Total Injuries:	4 Fatal	**Latitude, Longitude:**	34.416942,-81.699996

Administrative Information

Investigator In Charge (IIC):	Silliman, James
Additional Participating Persons:	Marty Crouch; FAA-Columbia FSDO; West Columbia, SC Mark Stuntzner; Bell Helicopter; Fort Worth, TX John Swift; Rolls-Royce; Indianapolis, IN Russell Braddock; Med-Trans Corporation; Bismarck, ND Matthew Rigsby; FAA; Fort Worth , TX
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Note:	
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