Aviation Investigation Final Report

Location:	Aurora, Illinois	**Accident Number:**	CEN09MA019
Date & Time:	October 15, 2008, 23:58 Local	**Registration:**	N992AA
Aircraft:	Bell 222	**Aircraft Damage:**	Destroyed
Defining Event:	Controlled flight into terr/obj (CFIT)	**Injuries:**	4 Fatal
Flight Conducted Under:	Part 135: Air taxi & commuter - Non-scheduled - Air Medical (Medical emergency)		

Analysis

The emergency medical services (EMS) helicopter was on a night cross-country flight in visual meteorological conditions and was transporting an infant patient from one hospital to another when the accident occurred. During the flight, the pilot contacted DuPage Airport's (DPA) air traffic control (ATC) facility, reported the helicopter's position and altitude of 1,400 feet above mean sea level (about 700 feet above ground level in Aurora, Illinois) to the air traffic controller, and asked permission to pass through the airspace surrounding the airport. The controller acknowledged the transmission and cleared the helicopter through DPA's airspace but did not give the pilot specific instructions regarding his flight route because the pilot was flying under visual flight rules and had chosen his specific route of flight on a direct course from the departure point to the destination. (During preflight planning, the pilot should have identified the obstacles along the route of flight, including the radio station tower.) Subsequently, the helicopter struck a radio station tower while flying at the same altitude that had been reported to ATC. Video and still image evidence obtained during the investigation indicated that the strobe lights attached to the radio station tower were operational at the time of the accident.

The accident helicopter was not equipped with a terrain awareness and warning system (TAWS). TAWS detects terrain or other obstructions along the flightpath and provides pilots with an alert to take corrective action. On February 7, 2006, the National Transportation Safety Board (NTSB) issued Safety Recommendation A-06-15, which asked the Federal Aviation Administration (FAA) to require EMS operators to install terrain awareness and warning systems on their aircraft and to provide adequate training to ensure that flight crews are capable of using the systems to safely conduct EMS operations. The FAA responded that, while it would work with industry to address issues related to the installation of TAWS on EMS aircraft, it would address the issue of controlled flight into terrain by emphasizing effective preflight planning. The FAA further stated that the Radio Technical Commission for

Aeronautics established a committee tasked with developing helicopter TAWS (H-TAWS) standards and that, in March 2008, the commission completed the development of minimum operational performance standards for H-TAWS. On December 17, 2008, the FAA published Technical Standard Order C194, "Helicopter Terrain Awareness and Warning System," based on the commission standards. On January 23, 2009, the NTSB indicated that the continuing delays in development of a final rule to require H-TAWS were not acceptable. Pending issuance of a final rule to mandate the installation and use of TAWS on all EMS flights, Safety Recommendation A-06-15 was classified "Open—Unacceptable Response." On November 4, 2009, the FAA responded by indicating that it was developing a notice of proposed rulemaking (NPRM) to address this recommendation and that it planned to complete work on the NPRM in January 2010; the NPRM had not been issued as of March 2010. On November 13, 2009, the NTSB reiterated Safety Recommendation A-06-15 in its report regarding the September 27, 2008, accident involving an Aerospatiale SA365N1, N92MD, operated by the Maryland State Police, which crashed during approach to landing near District Heights, Maryland. Safety Recommendation A-06-15 is on the NTSB's Most Wanted List of Transportation Safety Improvements.

The radio station tower was depicted on the Chicago Aeronautical Sectional Chart, the Chicago Visual Flight Rules Terminal Area Chart, the Chicago Helicopter Route Chart, and as an obstruction on the air traffic controller's radar display. Radar data obtained during the investigation showed the helicopter at a constant altitude and on a straight course to the point of impact with the tower.

The radar information was available to the air traffic controller. Additionally, the position and height of the tower were included in training materials that were to be memorized by the controllers at the ATC facility. According to interviews conducted of the controller on duty at the time of the accident, the accident helicopter was the only aircraft traffic in the area at the time. The controller reported that he was attending to administrative duties at the time that the accident occurred. FAA Order 7110.65, "Air Traffic Control," paragraph 2-1-2, Duty Priority, states that issuance of safety alerts to aircraft takes first priority over other duties. Further, FAA Order 7110.65, paragraph 2 1-6, Safety Alert, states that controllers should issue a safety alert to an aircraft if they are aware that the aircraft is at an altitude that places it in an unsafe proximity to terrain, obstructions, or other aircraft and notes that "while a controller cannot see immediately the development of every situation where a safety alert must be issued, the controller must remain vigilant for such situations and issue a safety alert when the situation is recognized." Evidence such as the controller's failure to notice when the helicopter disappeared from the radar display after striking the antenna indicates that the controller was not monitoring the aircraft's progress sufficiently to watch for hazards and issue safety alerts as required. While the NTSB recognizes that it was the pilot's responsibility to "see and avoid" the radio tower, the controller also had a responsibility to issue an alert as required by FAA directives. Review of recorded communications showed that no warnings were issued to the

pilot before the accident.

In addition, on August 28, 2007, as a result of an accident involving a Bombardier CL 600-2B19, N431CA, that crashed during takeoff from Blue Grass Airport, Lexington, Kentucky, the NTSB issued Safety Recommendation A-07-48, which asked the FAA to revise Federal Aviation Administration Order 7110.65, “Air Traffic Control,” to indicate that controllers should refrain from performing administrative tasks when moving aircraft are in the controller’s area of responsibility. The FAA responded that it would convene an internal work group to review the safety issues identified in this recommendation as they relate to ATC responsibilities and the impact of reassigning those duties to another position. This recommendation was classified “Open—Acceptable Response” on August 22, 2008. On April 10, 2007, the NTSB issued Safety Recommendation A-07-34 also as a result of the Lexington, Kentucky, accident, which asked the FAA to require all air traffic controllers to complete instructor-led initial and recurrent training in resource management skills that will improve controller judgment, vigilance, and safety awareness. The FAA responded that it had delivered crew resource management workshops, posters, and follow-up support to some larger ATC facilities. The NTSB responded that it was encouraged by the FAA’s actions but that such training should also be provided at smaller ATC facilities. This recommendation was classified “Open—Acceptable Response” on August 28, 2007. On January 15, 2009, the FAA responded that it was conducting training for controllers at larger facilities but did not indicate how it would perform training at smaller facilities.

Vice Chairman Hart did not approve this brief and filed a dissenting statement. The statement can be found in the public docket for this accident.

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 clearance from the 734-foot-tall lighted tower during the visual night flight due to inadequate preflight planning, insufficient altitude, and a flight route too low to clear the tower. Contributing to the accident was the air traffic controller's failure to issue a safety alert as required by Federal Aviation Administration Order 7110.65, “Air Traffic Control.”

Vice Chairman Hart did not approve this probable cause and filed a dissenting statement. The statement can be found in the public docket for this accident.

Findings

Environmental issues	Tower/antenna (incl guy wires) - Awareness of condition
Personnel issues	Flight planning/navigation - Pilot
Aircraft	Altitude - Incorrect use/operation
Personnel issues	Lack of action - ATC personnel

Factual Information

History of Flight

Enroute-cruise	Controlled flight into terr/obj (CFIT) (Defining event)
Uncontrolled descent	Collision with terr/obj (non-CFIT)

HISTORY OF FLIGHT

On October 15, 2008, at 2358 central daylight time, a Bell 222 helicopter, N992AA, operated by Air Angels Inc., and piloted by a commercial pilot, was destroyed when it impacted a radio station tower and the ground in Aurora, Illinois. The tower stood 734 feet above ground level. A post crash fire ensued. The emergency medical services (EMS) transport flight was conducted under 14 Code of Federal Regulations Part 135, and was en route from the Valley West Hospital Heliport (0LL7), Sandwich, Illinois, to the Children's Memorial Hospital Heliport (40IS), Chicago, Illinois, when the accident occurred. Night visual meteorological conditions prevailed in the area of the accident site. All four occupants, including the pilot, a flight paramedic, a flight nurse, and the 14 month old patient, were fatally injured. The flight originated about 10 minutes prior to the accident.

Reach dispatch (Air Angels flights were dispatched by Reach Air Medical Services in Santa Rosa, California) was notified of the need for EMS transport at 2112 and opened a case record at that time. At 2113, the flight was accepted by Air Angels; however, the flight did not depart the Air Angels base in Bolingbrook, Illinois until 2254. The flight had been delayed until a receiving hospital could be identified. At 2311, N992AA arrived at 0LL7. At 2338, the pilot made a flight following call to Reach dispatch as required in Reach/Air Angels protocol. The flight following call included the helicopter's takeoff weight of 7,635 pounds, the helicopter's center of gravity of 251.7 inches, center of gravity range of 247.65 to 256.0 inches, the planned initial heading of 080 degrees, distance of 38 miles, estimated time en route of 18 minutes, 4 people on board, 1.5 hours of fuel on board, and Children's Memorial Hospital as the destination. The flight following call was made prior to takeoff from 0LL7.

At 2355, the pilot checked in with the DuPage Airport (DPA) air traffic control tower (ATCT) and reported his position as "over Aurora," and that the helicopter was at 1,400 feet above mean sea level (msl). Radar data showed that at the time of the radio call to DPA ATCT, the helicopter was about 12 nautical miles (nm) northeast of the departure heliport. Radar data showed that the helicopter continued on a 072-degree magnetic course. The radar data showed the helicopter on a steady course at a constant altitude of 1,300 feet MSL. The radar track ended at 2358:25 and the location of the last radar return coincided with the location of a radio station antenna tower.

PERSONNEL INFORMATION

The pilot, age 69, held a commercial pilot certificate with rotorcraft-helicopter and instrument helicopter ratings. The certificate also listed private pilot privileges for single-engine land airplanes. The pilot's most recent second class medical certificate was issued in January 2008 and stated that the pilot must wear corrective lenses for near and distant vision.

The pilot was hired by Air Angels in July 2006. A review of the pilot's Air Angels training records indicated that he had accumulated 3,564.7 flight hours total time, including 3,182.7 hours in helicopters and 382 hours in fixed wing aircraft. While employed by Air Angels he had accumulated 282.7 hours in the Bell 222, including approximately 50 hours and 23 hours in the preceding 90 and 30 days respectively. During the month of October the pilot had flown 5.7 hours at night and made 20 night landings in Bell 222 helicopters.

Training records showed that the pilot completed new hire and initial training in July 2006 and his most recent recurrent training was accomplished in August 2008. The pilot's most recent annual line check (FAR Part 135.299) was completed on September 25, 2008.

The pilot resided in Carmel, Indiana, approximately 200 miles southeast of the Air Angels base of operations. Due to this, the pilot would not commute to his home during his duty week and would stay in a bunk room located at the Air Angels facility. On the night of the accident, the pilot was one day into his second week of night shift work. The pilot did not fly on the night before the accident and his most recent flight was on October 13, 2008, with 54 minutes of flight time. A review of the pilot's activities during the 72 hours prior to the accident revealed that he maintained his normal routine and stayed in the bunk room at Air Angels during the day. According to other employees at Air Angels, the pilot appeared well rested and his demeanor seemed normal when he reported for his shift on the accident date.

The Air Angels Director of Flight Operations (DFO) reported that the accident pilot was a very experienced helicopter pilot having flown helicopters during the Vietnam War. The DFO reported that the pilot looked forward to flying each day, was conscientious, and flew landing approaches in a slow meticulous manner. The DFO reported that during the pilot's most recent line check, they received a call for a patient transport and the pilot performed the flight in accordance with the company’s general operating manual. He observed that the pilot did use the helicopter's autopilot function during the en route phase of the flight.

AIRCRAFT INFORMATION

The helicopter was a Bell 222, serial number 47062. It was configured for medical transport of a single patient on a gurney. Air Angels acquired the helicopter in February 1999. The crew consisted of a single pilot, flight nurse, and paramedic. A review of the helicopter's maintenance records revealed that it had 5,302.6 hours total time as of October 14, 2008. The helicopter had two Honeywell (Lycoming) LTS-101-650C engines. The number 1 engine had 5,694.0 hours total time, and the number 2 engine had 3,717.1 hours total time. The most recent phase inspection was performed on September 24, 2008, at 5,270.9 hours total airframe

time.

During the flight-following radio call to Reach Dispatch, the pilot reported the weight of the helicopter as 7,635 pounds, the center of gravity (CG) at 251.7 inches and a CG range of 247.65 to 256.0 inches. The Bell 222 Flight Manual, limitations section listed the maximum gross weight for takeoff and landing as 7,850 pounds. Referring to the Bell 222 Flight Manual gross weight center of gravity chart, the CG that the pilot reported was within the normal operating limits as defined by that chart.

The helicopter was equipped with a Garmin GNS 430, which has a combined GPS, navigation, and communications radio that was mounted into the instrument panel. The maintenance records included a FAA form 337 (Major Repair and Alteration) that documented the GNS 430 installation on April 8, 1999. According to the entry, a placard reading "GPS not approved for IFR operation" had been placed on the instrument panel. The GNS 430 software was updated on January 9, 2008. The DFO and Director of Maintenance (DM) stated that the GNS 430 was configured with the Jeppesen aviation database, last updated on June 1, 2008. Although the GNS 430 could display terrain and obstacles, the software for that function had never been installed. The DFO stated that the GNS 430 was their primary source of navigation information.

The helicopter was equipped with four communication radios, which were normally set to the following: local air traffic control (ATC) frequency, dispatch, and 123.025 (helicopter air-to-air common). The medical crewmembers had a Technisonic radio in the cabin that they would use to communicate with the hospital.

COMPANY INFORMATION

Air Angels Inc was a commercial on demand air taxi operator. The company was established in 1998 and operated out of Clow International Airport, Bolingbrook, Illinois. Air Angels received its FAR Part 135 Operating Certificate, number X34A833I, on March 11, 1999. The company provided air and ground critical care transportation throughout Northern Illinois and Northwest Indiana.

At the time of the accident Air Angels operated two Bell 222 helicopters and had recently purchased an additional Bell 222 that was being outfitted for medical transport. In June 2007, Reach Medical Holdings, Inc. acquired Air Angels. Reach was a California based company that operates numerous medical transport companies throughout the United States. Air Angels employed 3 pilots, 3 full time mechanics, 1 part time mechanic, and 10 to 12 full time medical personnel. The company's Chief Pilot had just left the company one week prior to the accident to pursue different employment. The Director of Air Operations took on the responsibilities of the Chief Pilot until they could find a replacement.

Air Angels operated in accordance with FAA approved Operations Specifications (Ops Spec) for Part 135 operations under certificate number X34A833I. The latest Ops Spec revision was dated August 8, 2008. Contained in the Ops Spec was authorization for visual flight rules (VFR)

day and night operations with nine or less passengers. Conducting flights under instrument flight rules (IFR) was not authorized when exercising their Part 135 certificate.

Air Angels utilized an approved training program as required by 14 CFR Part 135.341. The training manual contained sections addressing new hire training, initial aircraft training, recurrent training, requalification training, transition training, and upgrade training. Within each of these training categories, subject matter regarding ground training, emergency training, flight training, differences training, testing and checking were outlined. Additionally an appendix contained maneuver diagrams, check airman and instructor training, a list of company instructors, and company training forms. The FAA approved the training manual on October 5, 2001, and the latest revision was dated August 1, 2008.

The DFO managed and exercised operational control over Air Angels aviation operations and was responsible for crew scheduling. The DFO started working for Air Angels early in 2004. He became the Chief Pilot in June 2004, and then became the DFO in July 2006. He was a former Army aviator and the majority of his 6,900 flight hours were in helicopters. He held an airline transport pilot certificate (ATP) and was the company's check airman. The pilots were normally scheduled for one week on (7 days), one week off (7 days) schedule, with a crew day consisting of a 12-hour shift, from 0700 to 1900, and 1900 to 0700. The duty schedule consisted of alternating a week of day shift, followed by a week of night shift. When the Chief Pilot left the company the number of company pilots was reduced from four to three. To cover the schedule with three pilots, the DFO requested the other two pilots perform an extra week of duty until another pilot could be hired, effectively extending one of their duty periods from 7 days to 14 days. The accident pilot volunteered to extend his week on the night schedule an additional week.

Air Angel flights were dispatched from the Reach Air Medical Services office in Santa Rosa, California. The dispatch office received requests for medical transport and helped coordinate with the sending and receiving facilities. Reach dispatch kept a detailed log of all coordinating activities and aircraft status. Once a receiving facility was identified dispatch would contact the duty pilot via a dedicated cell phone and brief him regarding the sending and receiving facility details. The duty pilot would check the weather along the route of flight and report back to dispatch accepting or rejecting the flight based on weather. A formal risk assessment was not an action required to be performed by the pilot. Once the flight had been accepted, dispatch then briefed the medical crew about the condition of the patient being transported. Once airborne, the pilot communicated with dispatch utilizing a dedicated radio in the helicopter that transmitted to a repeater, which then routed the communications through a VOIP (voice over internet protocol) connection to Santa Rosa. While en route to the sending facility, the paramedic usually sat in the right hand seat and assisted the pilot with radios and visual lookout. While transporting the patient, both the flight nurse and paramedic were in the cabin with the patient.

Before takeoff, the pilot was required to check in with dispatch. The call included the following information; total take-off weight, helicopter center of gravity (CG) and CG range, destination,

estimated time en route (ETE), souls on board, and fuel (time). Every 15 minutes the pilot was required to send dispatch a position report. The position report included the following information; latitude, longitude, estimated time of arrival (ETA), ground speed, and heading.

The chief pilot said that he had never experienced a problem communicating with dispatch using this system. The en route segment of the flight was usually flown around 1,500 feet mean sea level (msl) during the day and 1,500-1,700 feet msl at night; 1,800 feet msl would usually provide 1,000 feet agl for the local area. Airspeed was normally between 125 and 130 knots, 90% engine torque.

COMMUNICATIONS

At 2338:25, the pilot contacted Reach dispatch for his pre-takeoff flight following call. The call included the following information: Initial heading 080 degrees; distance 38 miles; estimated time en route 18 minutes; destination-Children's Memorial Hospital; 4 people onboard; 1.5 hours fuel onboard.

The helicopter was being operated in night visual flight rules (VFR) conditions and was outside of the DuPage Airport (DPA) class D airspace. However, at 2355:21, the pilot, identifying the flight as Lifeguard Angel 1, contacted DPA ATCT. The controller acknowledged the transmission. At 2355:28, the pilot stated, "Ah sir we are just over Aurora en route to Children's Hospital ah downtown Chicago at about 1,400 feet." At 2355:36, the controller responded, "Lifeguard Angel 1 cleared through the delta current altimeter 3014." The pilot acknowledged the altimeter setting at 2355:42. At 2358:26, an unidentified transmission similar to "ahhhhhhhh" was heard on the frequency. There were no further contacts with the aircraft.

The tower radar display at DPA shows information from the Chicago ASR-9 radar. Radar data from the Chicago ASR-9 radar was obtained for the approximate accident time. Examination of the data revealed an aircraft using the VFR transponder beacon code, 1200, whose track corresponded to a direct flight route from 0LL7 to 40IS. The first return was recorded at 2353:48. The aircraft's position was about 8 nautical miles and 063 degrees from 0LL7, and its altitude was 1,400 feet msl. The radar data showed that the aircraft proceeded from this location in a straight line for about 10 nautical miles before radar contact was lost. The final return was recorded at 2358:25. During the recorded portion of the flight, the aircraft's altitude remained consistent at 1,300 to 1,400 feet. The recorded track was just north and parallel to a direct route from 0LL7 to 40IS. The location of the radio station tower was in line with the flight path depicted by the recorded radar track.

Federal Aviation Administration (FAA) Order 7110.65, "Air Traffic Control," provides direction to controllers on duty priority and actions to take in response to potential hazards affecting aircraft. Paragraph 2-1-2, "Duty Priority," states in part:

a. Give first priority to separating aircraft and issuing safety alerts as required in this order. Good judgment shall be used in prioritizing all other provisions of this order based on the

requirements of the situation at hand.
REFERENCE
FAAO JO 7110.65, Para 2-1-6, Safety Alert.
NOTE-
Because there are many variables involved, it is virtually impossible to develop a standard list of duty priorities that would apply uniformly to every conceivable situation. Each set of circumstances must be evaluated on its own merit, and when more than one action is required, controllers shall exercise their best judgment based on the facts and circumstances known to them. That action which is most critical from a safety standpoint is performed first.

Paragraph 2-1-6, "Safety Alert," states in regard to terrain and obstruction hazards:

Issue a safety alert to an aircraft if you are aware the aircraft is in a position/altitude which, in your judgment, places it in unsafe proximity to terrain, obstructions, or other aircraft. Once the pilot informs you action is being taken to resolve the situation, you may discontinue the issuance of further alerts. Do not assume that because someone else has responsibility for the aircraft that the unsafe situation has been observed and the safety alert issued; inform the appropriate controller.
NOTE
1. The issuance of a safety alert is a first priority (see para 2-1-2, Duty Priority) once the controller observes and recognizes a situation of unsafe aircraft proximity to terrain, obstacles, or other aircraft. Conditions, such as workload, traffic volume, the quality/limitations of the radar system, and the available lead time to react are factors in determining whether it is reasonable for the controller to observe and recognize such situations. While a controller cannot see immediately the development of every situation where a safety alert must be issued, the controller must remain vigilant for such situations and issue a safety alert when the situation is recognized.

2. Recognition of situations of unsafe proximity may result from MSAW/E-MSAW/LAAS, automatic altitude readouts, Conflict/Mode C Intruder Alert, observations on a PAR scope, or pilot reports.

3. Once the alert is issued, it is solely the pilot's prerogative to determine what course of action, if any, will be taken.

a. Terrain/Obstruction Alert. Immediately issue/ initiate an alert to an aircraft if you are aware the aircraft is at an altitude which, in your judgment, places it in unsafe proximity to terrain/obstructions. Issue the alert as follows:
PHRASEOLOGY
LOW ALTITUDE ALERT (call sign),
CHECK YOUR ALTITUDE IMMEDIATELY.
THE (as appropriate) MEA/MVA/MOCA/MIA IN YOUR AREA IS (altitude), or if an aircraft is past the final approach fix (nonprecision approach), or the outer marker, or the fix used in lieu of the outer marker (precision approach), and, if known, issue THE (as appropriate) MDA/DH IS

(altitude).

Additionally, DPA ATCT training materials obtained during the investigation show that the antenna tower that was struck was included in a list of obstructions that tower controllers were required to memorize.

According to interviews conducted of the ATC controller who was on duty at the time of the accident, the accident helicopter was the only aircraft traffic in the area at the time. The controller reported that he was attending to administrative duties at the time that the accident happened.

METEOROLOGICAL INFORMATION

At 1152, the reported weather conditions at the DuPage Airport, about 8 nautical miles north of the accident site, were: winds 330 degrees at 8 knots; visibility 10 statute miles; clear skies; temperature 9 degrees Celsius (C); dew point 5 degrees C; altimeter 30.14 inches of Mercury (in. Hg).

At 1152, the reported weather conditions at the Aurora Municipal Airport, about 10 nautical miles west of the accident site, were: winds 340 degrees at 5 knots; visibility 9 statute miles; clear skies; temperature 7 degrees C; dew point 6 degrees C; altimeter 30.15 in. Hg.

At 1151, the reported weather conditions at the O'Hare Airport, about 20 nautical miles northeast of the accident site, were: winds 350 degrees at 11 knots; visibility 10 statute miles; 3,300 feet overcast ceiling; temperature 10 degrees C; dew point 5 degrees C; altimeter 30.13 in. Hg.

At 1145, the reported weather conditions at the Lewis University Airport, about 12 nautical miles southeast of the accident site, were: winds 340 degrees at 9 knots gusting to 14 knots; visibility 10 statute miles; 1,900 foot broken ceiling, 2,400 foot overcast ceiling; temperature 11 degrees C; dew point 8 degrees C; altimeter 30.12 in. Hg.

WRECKAGE AND IMPACT INFORMATION

The helicopter impacted the ground in a forest preserve. The terrain at the location was flat with prairie grass that stood about 6 feet high

The helicopter had impacted the 734-foot tall radio station tower on its west side about 50 feet from the top of the tower. The tower structure had buckling of the vertical structural members. The tower was supported by guy-wires that extended from the tower structure at an outward angle toward the ground. The uppermost guy-wire on the west side of the tower was severed and found lying on the ground. The tower was equipped with a high intensity strobe lighting system with the one set of strobes installed at the top of the tower and another set installed about 2/3 of the height of the tower. The conduit that contained the electrical wiring that

supplied power to the strobe light system was severed about 50 feet from the top of the tower and the strobe lighting system was not operational after the accident. The distance and direction from the radio station tower to the main wreckage site were about 1,250 feet and 070 degrees respectively.

The helicopter was severely fragmented and sustained damage due to a post impact fire. The vertical tail and portions of the tail rotor and gearbox were found near the initial impact point of the main wreckage. Both engines, the helicopter transmission, and the majority of the fuselage were found farther along the wreckage path. The helicopter's main rotor mast had separated at the point where the shaft entered the transmission. The separated portion of the rotor mast, along with the rotor head and rotor blades was found about 450 feet and 210 degrees from the main wreckage. The rotor head remained intact with the large portions of both rotor blades still attached. The main rotor blades exhibited damage along their entire span. The tips of both blades along with their respective counterweights had separated from the inboard portions of the blades. The blades exhibited delamination of the composite skins and fracture of the honeycomb core material aft of the metal leading edge. Pieces of honeycomb core material, composite skin and the counterweight tips from the blades were recovered from an apartment complex located adjacent to the location of the tower.

Examination of the helicopter remains after removal from the accident site revealed no defects that could be determined to have existed prior to the impact.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy was performed on the pilot by the DuPage County Coroner's Office. The report listed multiple severe traumatic injuries of the head and body as the cause of death. 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 radio station tower was depicted on the Chicago Aeronautical Sectional Chart, the Chicago VFR Terminal Area Chart, and the Chicago Helicopter Route Chart. The height of the tower was listed as 734 feet agl and the elevation of the top of the tower was listed as 1,449 feet msl.

Video surveillance and still image recordings from two nearby locations were obtained for the night of the accident. One of the recordings was video footage from a local train station surveillance camera. On this video, a strobe light from the tower is visible in the frame and ceases to function about the time of the accident. Only the lower level of the tower's strobe light system was visible in the frame because the canopy of the train station platform obscured the view of the upper level of strobes. In addition, due to an error in the clock setting of the recording, the exact time that the strobe ceases to operate was not determined.

A nearby hospital parking lot surveillance camera recorded still images of the tower's strobe light system in operation during the night of the accident. Due to the still nature of the images, and the fact that the camera was set up to pan and tilt along a pre-programmed path, images of the strobe lights at the exact time of the accident were not obtained. However, images were obtained from these stills that showed that earlier in the night both sets of strobe lights on the tower were operational.

Using information from the accident flight, Honeywell International performed a simulation using their helicopter terrain awareness warning system (H-TAWS). According to Honeywell, the simulation indicated that the H-TAWS system could have provided the pilot a "Caution Obstacle" prompt about 34 seconds before impact with the tower, and a "Warning Obstacle" prompt about 23 seconds before impact with the tower.

OTHER INFORMATION

The weather conditions that existed at the accident site during the time of the accident were recorded to be night visual meteorological conditions. The helicopter was not equipped with a terrain awareness warning system (TAWS). The pilot was not utilizing a night vision imaging system (NVIS) during the flight. A radar altimeter was installed on the helicopter. The accident flight was being tracked by a flight following program and did receive flight dispatch services prior to the initiation of the flight. A formal flight risk assessment was not performed prior to the flight.

On February 7, 2006, the NTSB issued four safety recommendations to the FAA addressing EMS operations. They are as follows:

NTSB Recommendation No. A-06-12 - Require all EMS operators to comply with 14 CFR Part 135 operations specifications during the conduct of all flights with medical personnel onboard.

NTSB Recommendation No. A-06-13 - Require all EMS operators to develop and implement flight risk evaluation programs that include training all employees involved in the operation, procedures that support the systematic evaluation of flight risks, and consultation with others trained in EMS flight operations if the risks reach a predefined level.

NTSB Recommendation No. A-06-14 - Require EMS operators to use formalized dispatch and flight-following procedures that include up-to-date weather information and assistance in flight risk assessment decisions.

NTSB Recommendation No. A-06-15 - Require EMS operators to install terrain awareness and warning systems on their aircraft and to provide adequate training to ensure that flight crews are capable of using the systems to safely conduct EMS operations.

These four recommendations were also placed on the NTSB's "Most Wanted List of Safety Improvements" in October 2008.

Additionally, the NTSB stated in its January 2006 Special Investigation Report on EMS Operations that they were pleased that the FAA encouraged the use of night vision imaging systems in EMS operations, and that the NTSB would continue to monitor the applicability and usage of these devices in the EMS industry.

Also, on December 21, 2007, the NTSB issued two safety recommendations to the FAA regarding the use of radar altimeters in EMS night operations. They are as follows:

NTSB Recommendation No. A-07-111 - Require helicopter EMS operators to install radar altimeters in all helicopters used in HEMS night operations.

NTSB Recommendation No. A-07-112 - Ensure that the minimum equipment lists for helicopters used in helicopter EMS operations require that radar altimeters be operable during flights conducted at night.

Pilot Information

Certificate:	Commercial; Private	**Age:**	69,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	January 15, 2008
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	September 25, 2008
Flight Time:	3565 hours (Total, all aircraft), 283 hours (Total, this make and model), 50 hours (Last 90 days, all aircraft), 23 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Bell	**Registration:**	N992AA
Model/Series:	222	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	47062
Landing Gear Type:	Retractable - Tricycle	**Seats:**	
Date/Type of Last Inspection:	September 24, 2008 Continuous airworthiness	**Certified Max Gross Wt.:**	7850 lbs
Time Since Last Inspection:	32 Hrs	**Engines:**	2 Turbo shaft
Airframe Total Time:	5271 Hrs as of last inspection	**Engine Manufacturer:**	Lycoming
ELT:	Installed, not activated	**Engine Model/Series:**	LTS-101-650C
Registered Owner:	AIR ANGELS INC	**Rated Power:**	618 Horsepower
Operator:	AIR ANGELS INC	**Operating Certificate(s) Held:**	On-demand air taxi (135)
Operator Does Business As:		**Operator Designator Code:**	X34A

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Night
Observation Facility, Elevation:	DPA,759 ft msl	**Distance from Accident Site:**	8 Nautical Miles
Observation Time:	23:52 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	8 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	330°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.13 inches Hg	**Temperature/Dew Point:**	9°C / 5°C
Precipitation and Obscuration:			
Departure Point:	Sandwich, IL (0LL7)	**Type of Flight Plan Filed:**	None
Destination:	Chicago, IL (40IS)	**Type of Clearance:**	VFR
Departure Time:	23:48 Local	**Type of Airspace:**	

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	3 Fatal	**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	On-ground
Total Injuries:	4 Fatal	**Latitude, Longitude:**	41.769443,-88.245552

Administrative Information

Investigator In Charge (IIC):	Brannen, John
Additional Participating Persons:	Bob Hendrickson; FAA; Washington, DC Marlin J Kruse; Honeywell Aerospace; Pheonix, AZ Dave Dosker; Bell Helicopter; Fort Worth, TX
Original Publish Date:	March 11, 2010
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=69291