



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: November 13, 2009

In reply refer to: A-09-131 through -133

[Public Helicopter Emergency Medical Services Operators, see attached list]

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating transportation accidents, determining their probable cause, and making recommendations to prevent similar accidents from occurring. We are providing the following information to urge your organization to take action on the safety recommendations in this letter. The NTSB is vitally interested in these recommendations because they are designed to prevent accidents and save lives.

These recommendations address flight risk evaluation programs, formalized dispatch and flight-following procedures, and terrain awareness and warning systems (TAWS). The recommendations are derived from the NTSB's accident investigation of the crash during approach to landing of a Maryland State Police (MSP) emergency medical services (EMS) helicopter in District Heights, Maryland, on September 27, 2008. As a result of this investigation, the NTSB has issued nine new safety recommendations and reiterated three previous recommendations. Three of the new recommendations are addressed to your organization and other public helicopter emergency medical services (HEMS) operators. Information supporting these three recommendations is provided below. The NTSB would appreciate a response from you within 90 days describing the actions you have taken or intend to take to implement our recommendations.

The NTSB also issued safety recommendations to the Federal Aviation Administration (FAA), the MSP, six organizations whose members are involved in search and rescue operations, and Prince George's (PG) County, Maryland.

On September 27, 2008, about 2358 eastern daylight time, an Aerospatiale (Eurocopter) SA365N1, N92MD, call sign Trooper 2, registered to and operated by the MSP as a public medical evacuation (medevac) flight, impacted terrain about 3.2 miles north of the runway 19R threshold at Andrews Air Force Base (ADW), Camp Springs, Maryland, during an instrument landing system (ILS) approach.¹ The commercial pilot, one flight paramedic, one field provider, and one of two automobile accident patients being transported were killed. The other patient

¹ The National Transportation Safety Board's full report, *Crash During Approach to Landing of Maryland State Police Aerospatiale SA365N1, N92MD, District Heights, Maryland, September 27, 2008* (NTSB/AAR-09/07), will be available online at http://www.nts.gov/publicn/A_Acc1.htm.

being transported survived with serious injuries from the helicopter accident and was taken to a local hospital. The helicopter was substantially damaged when it collided with trees and terrain in Walker Mill Regional Park, District Heights, Maryland. The flight originated from a landing zone at Wade Elementary School, Waldorf, Maryland, about 2337, destined for Prince George's Hospital Center (PGH), Cheverly, Maryland. Night visual meteorological conditions prevailed for the departure; however, Trooper 2 encountered instrument meteorological conditions en route to the hospital and diverted to ADW. No flight plan was filed with the FAA, and none was required. The MSP System Communications Center (SYSCOM) was tracking the flight using global positioning system data transmitted with an experimental automatic dependent surveillance-broadcast (ADS-B) communications link.²

When the pilot received the request for the flight from the SYSCOM duty officer (DO), he specifically mentioned the weather conditions at College Park Airport, College Park, Maryland, and Ronald Reagan Washington National Airport (DCA), Washington, DC. The weather reports for both of these locations met the MSP criteria for acceptance of a night medevac flight. However, College Park Airport was at the 800-foot minimum ceiling³ for acceptance of a flight and was reporting a 0° temperature/dew point spread. The pilot's conversation with the DO indicated that the pilot was hesitant to accept the flight, as he was unsure he could make it to PGH due to deteriorating weather conditions. However, despite his misgivings, the pilot decided to accept the flight. The pilot remarked that he had just heard a medevac helicopter operated by a private company complete an interhospital transfer flight in the same area, and then said, "if they can do it we can do it."

It appears that the pilot based his decision to launch solely on the weather observations at College Park and DCA and the suitable conditions implied by the other medevac helicopter's completed flight. Other pertinent weather information, such as the low temperature/dew point spreads at ADW and College Park Airport, an AIRMET⁴ for instrument flight conditions encompassing the route of flight, and the continuing deterioration of the weather conditions as the evening progressed, was either not obtained or discounted by the pilot. If the pilot had obtained and reviewed all of the available weather information, it is likely he would have realized that there was a high probability of encountering weather conditions below MSP minimums on the flight and this would have prompted him to decline the flight.

When the pilot was unable to reach PGH due to deteriorating weather conditions, he appropriately made the decision to divert to ADW and request ground transport for the patients. When the pilot contacted ADW tower, he reported to the controller that he was "on the localizer for runway 19R." At this time, the helicopter was about 6 nautical miles from the runway and

² ADS-B is a surveillance system in which an aircraft is fitted with cooperative equipment in the form of a data link transmitter. The aircraft periodically broadcasts its global positioning system-derived position and other information, such as velocity, over the data link, which is received by a ground-based transceiver for use by air traffic control and other users.

³ The cloud ceiling is the height above the ground of the base of the lowest layer of cloud covering more than half the sky.

⁴ AIRMETs are weather advisories issued concerning weather phenomena that are of operational interest to all aircraft and potentially hazardous to aircraft having limited capability because of lack of equipment, instrumentation, or pilot qualifications. An AIRMET for instrument flight conditions is issued when ceilings of less than 1,000 feet and/or visibilities less than 3 miles are forecast to affect a widespread area.

tracking the localizer course at an altitude of 1,900 feet msl. Approximately 1 minute and 20 seconds after his initial call to ADW tower, the pilot reported that he was “not picking up the glideslope.” The controller responded that her ILS equipment status display was indicating no anomalies with the equipment.

Radar and ADS-B data indicated that at the time of the pilot's transmission, the helicopter was maintaining a descent consistent with following the glideslope. Additionally, a postaccident flight test conducted by the FAA revealed no anomalies with the instrument approach equipment, and NTSB testing of the helicopter's navigation equipment found no deficiencies that would have precluded the pilot from capturing the glideslope. The NTSB was unable to determine which navigational frequencies the pilot had selected or what the pilot was seeing on his instruments. No evidence was found that suggests that the glideslope was not functioning properly.

Even if the glideslope had failed, the accident pilot could have continued the approach, following the localizer-only guidance and assuring terrain clearance by remaining at or above the localizer-only minimum descent altitude (MDA) of 680 feet mean sea level (msl). However, the pilot requested an airport surveillance radar (ASR) approach, which the controller stated that she was unable to provide because of her lack of currency on the procedure.⁵ Once the controller denied the ASR approach, the pilot still had many options available to conduct a safe landing in instrument conditions. He could have declared an emergency, which would have prompted the ADW controller to provide assistance, possibly including the surveillance approach. Also, he could have executed a missed approach and attempted the ILS approach a second time to determine if the glideslope failure was a perceived failure or a legitimate one. Additionally, there were 11 other instrument approaches at ADW, any of which he could have requested.

About 27 seconds after the controller stated that she was unable to provide a surveillance approach, upon the helicopter reaching an altitude of about 1,450 feet msl on the glideslope and at a distance of about 4.0 miles north of the runway threshold, the helicopter's rate of descent increased rapidly from about 500 feet per minute to greater than 2,000 feet per minute. The helicopter continued the descent, passing through the MDA for the localizer approach (407 feet above ground level [agl]), the alert height set on the radar altimeter (300 feet agl), and the decision height for the ILS approach (200 feet agl), before impacting trees and terrain about 3.2 miles north of the runway threshold. Data recovered from the power analyzer and recorder computer⁶ indicate that the helicopter impacted with the engines near idle power, the main rotor system at 100 percent rpm, and an indicated airspeed of about 92 knots. No evidence was found to indicate that the pilot made any attempt to arrest the helicopter's descent before impact.

The NTSB determined that the probable cause of this accident was the pilot's attempt to regain visual conditions by performing a rapid descent and his failure to arrest the descent at the MDA during a nonprecision approach. Contributing to the accident were (1) the pilot's limited recent instrument flight experience, (2) the lack of adherence to effective risk management

⁵ The FAA requires controllers to complete three airport surveillance radar approaches every quarter, including one no-gyro approach, to remain current (qualified) for that type of approach.

⁶ The power analyzer and recorder computer monitors and records turbine engine parameters for engine health trending and maintenance diagnostics.

procedures by the MSP, (3) the pilot's inadequate assessment of the weather, which led to his decision to accept the flight, (4) the failure of the Potomac Consolidated Terminal Radar Approach Control (PCT) controller to provide the current ADW weather observation to the pilot, and (5) the increased workload on the pilot due to inadequate FAA air traffic control handling by the DCA Tower and PCT controllers.

Flight Risk Evaluation Programs

According to the MSP Aviation Command safety officer, at the time of the accident, the MSP did not have a formal risk management program in place. The safety officer explained that there was optional guidance available to pilots in the form of a risk assessment matrix. However, the MSP operations manual stated the flight crew would apply the matrix and, based on the risk assessment, increase visibility and ceiling minimums "to the crew's comfort level prior to accepting the mission." The matrix indicated that a temperature/dew point spread of less than 2° C, a condition that was present at ADW when Trooper 2 departed, raised the flight risk from low to medium risk. Although the matrix indicated that no flights were to be made if the risk level was high, it provided no instructions concerning medium risk flights. There is no evidence to indicate whether or not the accident pilot consulted the matrix before the flight. However, if he had referred to it, the pilot might not have changed his decision to accept the flight, since the matrix did not provide clear guidance on medium-risk flights.

The NTSB notes that following the accident, MSP designed a new mission-specific flight risk assessment tool, and pilots are now required to use this tool before all flights. In addition to classifying the risk level as low (green), medium (yellow), or high (red), the new tool calculates a percentage associated with the operational risk. High-risk flights are now required to be approved by the director of flight operations or a designee before they can be accepted. When medium-risk flights fall near the high end of the yellow range, the flight crew informs SYSCOM that any change in flight conditions, such as deteriorating weather, could make the flight high risk so that approval would be required to continue the flight or that the flight could be cancelled. Moreover, under the new procedures, SYSCOM notifies the requesting agency that the estimated arrival time could be increased or the flight cancelled if there is an increase in operational risk.

If this program had been in place at the time of the accident, then, when the pilot completed the risk assessment, he would likely have determined that the risk level was near the high end of the medium-risk range, which would have triggered the procedures described above, and the ensuing discussion may have resulted in cancellation of the flight. Therefore, the NTSB concludes that had a formal flight risk evaluation program been in place at MSP before the accident, it may have resulted in the cancellation of the flight.

On February 7, 2006, as a result of an NTSB special investigation of a number of aviation accidents between January 2002 and January 2005 involving aircraft performing EMS operations,⁷ the NTSB issued Safety Recommendation A-06-13, which asked the FAA to require all EMS operators to develop and implement flight risk evaluation programs. The FAA has provided guidance on the development and use of flight risk evaluation programs by EMS

⁷ For more information, see NTSB, *Special Investigation Report on Emergency Medical Services (EMS) Operations*, Special Investigation Report NTSB/SIR-06-01 (Washington, DC: NTSB, 2006).

operators but has not required that all EMS operators implement flight risk evaluation programs. As a result, Safety Recommendation A-06-13 was classified “Open—Unacceptable Response.” The NTSB believes that this accident demonstrates the need for all EMS operators, both public and civil, to develop and implement flight risk evaluation programs. Since the FAA does not have the authority to regulate public operators, even if the FAA were to require flight risk evaluation programs for HEMS operators, public operators would not be required to comply. Therefore, the NTSB recommends that all public HEMS operators develop and implement flight risk evaluation programs that include training for all employees involved in the operation, procedures that support the systematic evaluation of flight risks, and consultation with others trained in HEMS flight operations if the risks reach a predefined level.

Formalized Dispatch and Flight-Following Procedures

The MSP uses SYSCOM for dispatch and flight-following functions. SYSCOM is a cooperative effort between the Maryland Institute for Emergency Medical Services Systems (MIEMSS)⁸ and the MSP. It controls and coordinates all aeromedical emergency responses in Maryland using a 24-hour operations center that provides central aircraft dispatching and emergency communications liaison among 911 centers, police stations or barracks, hospital systems, responding aircraft, and ground units. SYSCOM is staffed at all times with an MSP DO and two communications operators from MIEMSS. The duties of SYSCOM include processing calls, flight tracking, aircraft and crew accountability, and airspace coordination. According to the standard operating procedures, pilots are required to monitor the weather; however, if pilots are unable to obtain a weather update (for example, if they are already on a flight), the DO has access to the HEMS weather tool⁹ and may assist pilots. Additionally, the DO is required to obtain a statewide forecast at the beginning of each 12-hour shift (0545 and 1745).

Following the accident, MSP developed new procedures that involve the DO in flight risk assessment decisions. Before the accident, whenever a flight request was received, the DO passed the request directly to flight crews. Under the new procedures, the DO evaluates the local and regional weather conditions displayed on the HEMS weather tool and can make a no-go decision based on this evaluation before the flight crew is notified. Also, as discussed previously, the DO is notified by the flight crew if the crew determines the flight risk is near the high end of the yellow range, and the DO is then responsible for notifying the requesting agency that the helicopter’s arrival could be delayed or the flight cancelled if there is an increase in operational risk.

As a result of the aforementioned NTSB special investigation of aviation accidents involving aircraft performing EMS operations, the NTSB issued Safety Recommendation A-06-14 on February 7, 2006, asking the FAA to require all EMS operators to use formalized dispatch and flight-following procedures that include up-to-date weather information and

⁸ According to its fact sheet, MIEMSS “oversees and coordinates all components of the statewide EMS educational programs, operates and maintains a statewide communications system, designates trauma and specialty centers, licenses and regulates commercial ambulance services, and participates in EMS-related public education and prevention programs.”

⁹ At the request of the FAA, the National Weather Service’s Aviation Digital Data Service development team created the HEMS weather tool specifically designed to show weather conditions for the short-distance and low-altitude flights that are common for the HEMS community.

assistance in flight risk assessment decisions. The FAA has published detailed guidance about the creation and operation of operations control centers for HEMS operations, and pending FAA action to require that all civil EMS operators follow the guidance, the NTSB classified Safety Recommendation A-06-14 as “Open—Acceptable Response.” The NTSB notes that MSP does have formalized dispatch and flight-following procedures, which are functions of SYSCOM, and that the SYSCOM DO has access to the HEMS weather tool, which provides up-to-date weather information. The NTSB further notes that the MSP postaccident changes, which involve the DO in flight risk assessment decisions, are in accord with Safety Recommendation A-06-14. However, the NTSB is concerned that other public HEMS operators may not have dispatch and flight-following procedures, such as those provided by SYSCOM, or include weather information and assistance in flight risk assessment decisions. Therefore, the NTSB recommends that all public HEMS operators use formalized dispatch and flight-following procedures that include up-to-date weather information and assistance in flight risk assessment decisions.

Terrain Awareness and Warning Systems

The accident helicopter was not equipped with TAWS. NTSB investigators asked a manufacturer of TAWS to determine what pilot alerts would have been likely if the accident helicopter had been equipped with TAWS. The manufacturer ascertained that three aural terrain alerts would have been generated at 7, 4, and 2 seconds prior to tree impact, and an aural glideslope alert would have been generated 24 seconds prior to tree impact if a valid glideslope signal was being received. It is unlikely the glideslope warning would have caused the pilot to arrest his descent since it appears that he intentionally deviated from the glideslope. However, if the helicopter had been equipped with TAWS, the aural terrain alerts of “Caution Terrain,” “Warning Terrain,” and “Pull-up,” would have been provided. These would have been more salient than the alert provided by the radar altimeter¹⁰ and likely would have caused the pilot to attempt to arrest his descent. Although it is unknown whether the pilot could have recovered in time to avoid hitting the trees, this scenario illustrates the potential benefit of TAWS.

Issued on February 7, 2006, as a result of the NTSB special investigation into accidents involving EMS-related flights, Safety Recommendation A-06-15 asked the FAA to require EMS operators to install TAWS on their aircraft. The FAA has not yet issued a rule to mandate the installation and use of TAWS on EMS flights, and as a result, on January 23, 2009, Safety Recommendation A-06-15 was classified “Open—Unacceptable Response.” Because the FAA does not have the authority to regulate public operators, even if the FAA were to require TAWS for EMS operators, public operators would not be required to comply. Therefore, the NTSB recommends that all public HEMS operators install TAWS on their aircraft and provide adequate training to ensure that flight crews are capable of using the systems to safely conduct HEMS operations.

¹⁰ The helicopter was equipped with a radar altimeter, which should have alerted the pilot when he descended below 300 feet agl, about 6 seconds before impact with the trees. However, there was no decrease in the helicopter’s descent rate after it passed through 300 feet agl.

Recommendations

The National Transportation Safety Board, therefore, recommends the following to your organization:

Develop and implement flight risk evaluation programs that include training for all employees involved in the operation, procedures that support the systematic evaluation of flight risks, and consultation with others trained in helicopter emergency medical services flight operations if the risks reach a predefined level. (A-09-131)

Use formalized dispatch and flight-following procedures that include up-to-date weather information and assistance in flight risk assessment decisions. (A-09-132)

Install terrain awareness and warning systems on your aircraft and provide adequate training to ensure that flight crews are capable of using the systems to safely conduct helicopter emergency medical services operations. (A-09-133)

In response to the recommendations in this letter, please refer to Safety Recommendations A-09-131 through -133. If you would like to submit your response electronically rather than in hard copy, you may send it to the following e-mail address: correspondence@ntsb.gov. If your response includes attachments that exceed 5 megabytes, please e-mail us asking for instructions on how to use our secure mailbox. To avoid confusion, please use only one method of submission (that is, do not submit both an electronic copy and a hard copy of the same response letter).

Chairman HERSMAN, Vice Chairman HART, and Member SUMWALT concurred in these recommendations.

[Original Signed]

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