National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: November 13, 2009

In reply refer to: A-09-130 and A-06-13, -15, and -17 (Reiteration)

The Honorable J. Randolph Babbitt
Administrator
Federal Aviation Administration
Washington, DC 20591

On September 27, 2008, about 2358 eastern daylight time, an Aerospatiale (Eurocopter) SA365N1, N92MD, call sign Trooper 2, registered to and operated by the Maryland State Police (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 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 Federal Aviation Administration (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 communications (ADS-B) 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,

[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.ntsb.gov/publictn/A_Acc1.htm>.

[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.

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 ceiling[3] 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 Airport and DCA and the suitable conditions implied by the other medevac helicopter's completed flight. Other pertinent weather information, including the low temperature/dew point spreads at ADW and College Park, an AIRMET[4] for instrument flight conditions encompassing the route of flight, and the continuing deterioration of the weather conditions as the evening progressed, was either discounted by the pilot or not obtained. 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 less than 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 tracking the localizer course at an altitude of 1,900 feet mean sea level (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 National Transportation Safety Board (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. Thus, the NTSB concludes that no evidence was found that suggests that the glideslope was not functioning properly. Further, the lack of information regarding the accident airplane's navigation frequency settings and flight instrument indications precluded NTSB investigators from determining why the pilot believed he was not receiving a valid glideslope signal.

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[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.

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 msl. However, the pilot requested an airport surveillance radar (ASR) approach, which the controller stated 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 computer[6] 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.

On November 27, 2007, MSP Aviation Command changed its instrument training program. Before that date, pilots were required to perform six approaches every 6 months to maintain FAA currency. After that date, pilots received two instrument proficiency checks per year with instructor pilots in order to maintain FAA currency.[7]

In the year before MSP's change in its instrument training program, the accident pilot logged instrument time on 7 flights, accumulating 6.2 hours of instrument time, and completing 20 approaches. After the change and in the year prior to the accident, the pilot logged instrument time on only 2 flights, which included 2.1 hours of instrument time and 4 instrument approaches. In addition, the pilot had not flown at night under instrument conditions since October 29, 2006, 23 months before the accident. Although the pilot had conducted the majority (20 out of 24) of his instrument approaches in the past 2 years at ADW, only 4 of those were nonprecision approaches, and they did not include the localizer approach to runway 19R.

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

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[5] The FAA requires controllers to complete three ASR 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.

[7] Title 14 *Code of Federal Regulations* 61.57 (d), "Recent flight experience: Pilot in command," requires a pilot to perform either six approaches during a 6-month timeframe or an instrument proficiency check in order to maintain FAA currency.

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 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.

Lack of Federal Aviation Administration Oversight

During its investigation, the NTSB learned that the MSP has minimal oversight and surveillance by any outside organization. The Maryland state legislature oversees the MSP's budget but has no direct responsibility for the day-to-day operations of the MSP Aviation Command, nor does it have an aviation surveillance function similar to the FAA.[8] The FAA provides oversight of MSP's aviation maintenance practices through its surveillance of MSP's 14 *Code of Federal Regulations* (CFR) Part 145 maintenance repair station but had not conducted any recent surveillance of MSP aviation operations.

FAA Order 8900.1 requires a nominal level of surveillance for public aircraft operators. The order states that government-owned aircraft operators conducting public aircraft operations should be included in the flight standards district office's (FSDO) annual planned surveillance activities to ensure that the operator's public status remains unchanged. Additionally, the order states that government-owned aircraft operators holding any type of FAA certification will be included in the normal surveillance activities, such as spot inspections (ramp checks) of the aircraft and aircraft records. Since MSP aircraft have airworthiness certificates, the MSP should be included in normal surveillance activities. However, despite its own order requiring surveillance, the FAA had not conducted any recent operational surveillance of the MSP. If the FAA had performed the minimal amount of surveillance currently required by Order 8900.1, it is unlikely this would have prevented the accident. However, if the MSP had been operating under a 14 CFR Part 135 certificate, the FAA would have reviewed the changes that the MSP made to its instrument training program in November 2007 and may have required the program be modified to include conducting nonprecision approaches, night approaches, and more frequent instrument practice. Additionally, the FAA would have reviewed MSP's operations manual and required correction of any inconsistencies found between the manual and the actual procedures followed. These types of changes may have prevented the accident.

The NTSB learned that the MSP had informed the FAA's Baltimore FSDO that it wanted to seek 14 CFR Part 135 certification, and the NTSB learned that the initial verbal response to the MSP from the FSDO manager was not supportive. Later written guidance from the FAA associate administrator for aviation safety encouraged the MSP to proceed with the application process for Part 135 certification. Additionally, the associate administrator informed MSP that it could "immediately adopt, and comply with, the more stringent 14 CFR Part 135 regulations required by the FAA for 14 CFR part 135 air carriers without having such a certificate." The

[8] The legislature did conduct an audit of certain aspects of MSP's helicopter program in 2008; however, the scope of this audit did not include a review of aviation operational practices.

NTSB is reassured by the FAA's support of a voluntary request from a public operator for a higher level of oversight.

At the time of the accident, MSP considered its medevac flights "civil" aircraft operations operating under Part 91. A March 2008 memorandum from the commander to all personnel on the subject "Public Aircraft (Use) vs. Civil Aircraft (Part 91) Operations" explained the MSP's determination of which operations were "civil" and which were "public." Review of the memorandum indicated that the MSP made its determination by following the guidance provided in FAA Advisory Circular (AC) 00-1.1, "Government Aircraft Operations." Following the guidance in the AC, the memorandum identified "medevac operations, VIP transports, training flights, mechanic transports, photo flights, etc." as civil operations to be conducted in accordance with 14 CFR Part 91 and MSP policies and procedures. The memorandum identified "search and rescue missions and law enforcement support/homeland security operations, etc." as public operations to be conducted in accordance with MSP policies and procedures.

Prior to this accident, it appeared that the FAA also considered the MSP's medevac flights to be civil, based on the FAA's published positions in AC 00-1.1 and Order 8900.1 and on a letter sent in 2000 from the FAA to a Part 135 helicopter emergency medical services (HEMS) operator who requested an operational classification of MSP's interhospital patient transfers. In this letter, the FAA stated that, assuming the MSP's aircraft and pilots meet the requirements for civil aircraft operations, "so long as the MSP does not receive compensation from the hospital or patients for the air transportation portion of the interhospital transfers, these flights may be conducted as civil aircraft operations under Part 91." This statement is consistent with the medevac-related guidance in Order 8900.1 that excludes the "routine medical evacuation of persons due to traffic accidents and other similar incidents or hospital-to-hospital transfers" from the government function "search and rescue."

Despite the FAA's earlier opinion, during this accident investigation, the FAA provided to the NTSB a memorandum with a conflicting opinion on the operating status of MSP medevac flights. In this memorandum, dated March 13, 2009, the FAA stated that it believed the accident flight was a public aircraft operation. The FAA supported its determination by referring to the definition of public aircraft in 49 United States Code (U.S.C.) section 40102(a)(41)(C) and the exception provided in 49 U.S.C. section 40125(b), which states that a government-owned aircraft does not qualify as a public aircraft "when it is used for commercial purposes or to carry an individual other than a crewmember or a qualified non-crewmember." The FAA indicated that the accident victims are considered to be qualified non-crewmembers as they are individuals who are "associated with the performance of a governmental function," thus making the MSP's HEMS operations public operations.

The FAA did acknowledge in its memorandum that medevac flights are not specifically given as an example of a governmental function in the statute. However, the FAA stated that it considered "helicopter emergency medical services as akin to the 'search and rescue' function used as an example in the statute and as falling within the statutory intent of governmental function." This new opinion directly contradicts FAA Order 8900.1 regarding medevac flights, which states that, "the term 'search and rescue' does not include routine medical evacuation of persons due to traffic accidents and other similar incidents or hospital-to-hospital patient transfers." It also conflicts with AC 00-1.1, which states that the term "medical evacuation" is

not considered synonymous with "search and rescue." The FAA has noted that it was aware of these contradictions and that "internal agency materials" are being updated. As of the date of this writing, the guidance in FAA Order 8900.1 and AC 00-1.1 regarding medevac flights has not been revised.

The NTSB sees no basis for the FAA's determination that all medevac flights fall within the statutory intent of governmental function. Given that medevac flights are routinely conducted each day by numerous civilian operators, medevac cannot, as a general matter, be considered a governmental function. The NTSB finds persuasive the FAA's earlier guidance that routine medevac of persons due to traffic accidents or other similar incidents and hospital-to-hospital patient transfers are not governmental functions. Further, the NTSB notes that the earlier guidance provided in AC 00-1.1 and Order 8900.1 was comprehensive and consistent, whereas, to date, the FAA has provided no guidance beyond the March 13, 2009, memorandum regarding its new position.

The NTSB is especially concerned that the FAA's current position means that it does not consider patients carried by a public operator, such as MSP, to be passengers, but rather qualified non-crewmembers. Many of the patients carried by emergency medical services (EMS) aircraft have sustained life-threatening traumatic injuries and are in no condition to make a decision about whether or not to be transported by air. If these patients are transported on a public aircraft, the FAA medical rules, aircraft certification requirements, pilot certifications, aircraft maintenance requirements, and aircraft operator requirements do not apply, and the FAA provides no oversight and minimal surveillance of the operator. If the same patients are carried by a civilian aircraft, they would be considered passengers, the operator would be required to comply with the rules and requirements noted above, including the standards of 14 CFR Part 135, and the FAA would provide extensive oversight and surveillance of the operator. The patients carried by public EMS aircraft deserve the same level of safety as those carried on civil EMS aircraft.

Public Law 103-411 was enacted, in part, because Congress determined that government-owned aircraft, which engage in transport of passengers, should be subject to the regulations applicable to civil aircraft. Since the FAA has the statutory authority to regulate the operation and maintenance of civil aircraft, but not public aircraft, the law redefined public aircraft to exclude government-owned aircraft used for commercial purposes or engaged in the transport of passengers from operating as public aircraft. The purpose of this redefinition, as reflected in legislative history, was to mandate that FAA safety regulations, directives, and orders issued for civil aircraft be made applicable to all government-owned, nonmilitary aircraft engaged in passenger transport. The FAA's blanket classification of all medevac flights by government-owned aircraft operators as public operations does not appear to accord with the intent of Congress.

The NTSB concludes that the FAA's classification of all medevac flights by government-owned aircraft as public operations conflicts with its own earlier guidance, creates a discrepancy in the level of FAA safety oversight of HEMS aircraft operations carrying passengers, and is contrary to the intent of Public Law 103-411, which states that aircraft carrying passengers are excluded from operating as public aircraft. The NTSB recommends that the FAA seek specific legislative authority to regulate HEMS operations conducted using

government-owned aircraft to achieve safety oversight commensurate with that provided to civil HEMS operations.

Flight Risk Evaluation Programs

According to the MSP Aviation Command safety officer, at the time of the accident, MSP did not have a formal risk management program in place. He explained that there was optional guidance available to pilots in the form of a risk assessment matrix. However, review of the MSP Operations Manual revealed that it stated the flight crew "will 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 indicating that the accident pilot consulted the matrix before the flight. Even if he had referred to it, however, 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 green (low), yellow (medium), or high (red), the new tool calculates a percentage associated with the operational risk. High-risk flights now require approval from the director of flight operations or a designee before a flight 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, such as deteriorating weather, could put them into the red and approval would be required to continue the flight or it could be cancelled. Moreover, 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,[9] the NTSB issued Safety Recommendation A-06-13, which asked the FAA to require all EMS operators to 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. The FAA has provided guidance on the development and use of flight risk evaluation programs by EMS 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

[9] 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).

the need for all EMS operators, both public and civil, to develop and implement flight risk evaluation programs. Therefore, the NTSB reiterates Safety Recommendation A-06-13.

Terrain Awareness and Warning Systems

The accident helicopter was not equipped with a terrain awareness and warning system (TAWS). NTSB investigators asked a manufacturer of TAWS to determine the pilot alerts expected if the 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 altimeter[10] 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 does illustrate the potential benefit of TAWS.

As a result of the aforementioned NTSB special investigation of aviation accidents involving aircraft performing EMS operations, the NTSB issued Safety Recommendation A-06-15, which asked the FAA to "require emergency medical services (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 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." The NTSB believes that this accident demonstrates the need for all EMS operators, both public and civil, to equip their aircraft with TAWS. Therefore, the NTSB reiterates Safety Recommendation A-06-15.

Flight Recorder Systems

If a recorder system that captured cockpit audio, images, and parametric data had been installed on the accident helicopter, NTSB investigators would have been able to use the recorded data to determine additional information about the accident scenario, including navigation frequency settings and flight instrument indications. It is also possible that recorded images could have shown whether the pilot had the approach chart available to him; not having the chart may have been the reason he requested an ASR approach. The NTSB concludes that having a recorder system aboard the aircraft that captured cockpit audio, images, and parametric data would have aided the NTSB in determining the circumstances that led to this accident.

The helicopter was not equipped, and was not required to be equipped, with a cockpit voice recorder (CVR) or a flight data recorder (FDR). However, it would have been required to

[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.

have either these devices or a cockpit image recorder if the FAA had implemented NTSB Safety Recommendation A-06-17, issued March 7, 2006, which asked the FAA to do the following:

> Require all rotorcraft operating under 14 *Code of Federal Regulations* Parts 91 and 135 with a transport-category certification to be equipped with a cockpit voice recorder (CVR) and a flight data recorder (FDR). For those transport-category rotorcraft manufactured before October 11, 1991,[11] require a CVR and an FDR or an onboard cockpit image recorder with the capability of recording cockpit audio, crew communications, and aircraft parametric data.

The accident helicopter was a transport-category rotorcraft manufactured in 1988. When the NTSB issued this recommendation, it stated that transport-category helicopters should be equipped with flight recorders[12] in order to gather data critical to diagnosing shortcomings in the passenger-carrying helicopter fleet. Further, the NTSB stated that although the FAA had increased the stringency of flight recorder requirements on passenger-carrying airplanes over a period of years, it had not universally applied these more stringent requirements to helicopters. On May 22, 2006, the FAA stated that it would review changes in FDR technology since 1988 and consider changes to its regulations based on this review. On November 29, 2006, the NTSB indicated that it did not believe the FAA's study was necessary and that it should begin the rulemaking process. As a result, Safety Recommendation A-06-17 was classified "Open—Unacceptable Response."

The NTSB continues to believe that the FAA should require all rotorcraft operating under 14 CFR Parts 91 and 135 with a transport-category certification to be equipped with a CVR and an FDR. For those transport-category rotorcraft manufactured before October 11, 1991, the FAA should require a CVR and an FDR or an onboard cockpit image recorder with the capability of recording cockpit audio, crew communications, and aircraft parametric data. Therefore, the NTSB reiterates Safety Recommendation A-06-17.

Recommendations

Therefore, the National Transportation Safety Board recommends the following to the Federal Aviation Administration:

> Seek specific legislative authority to regulate helicopter emergency medical services (HEMS) operations conducted using government-owned aircraft to achieve safety oversight commensurate with that provided to civil HEMS operations. (A-09-130)

Also, the National Transportation Safety Board reiterates the following previously issued recommendations to the Federal Aviation Administration:

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[11] Several sections of the regulations were changed on October 11, 1991, to upgrade the flight recorder requirements to require that multi-engine, turbine-engine powered airplanes or rotorcraft having a passenger seating configuration, excluding any required crewmember seat, of 10 to 19 seats be equipped with a digital flight recorder.

[12] The term "flight recorders" refers to all crash-protected devices installed on aircraft, including but not limited to, FDRs, CVRs, and onboard image recorders.

Require all emergency medical services (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. (A-06-13)

Require all emergency medical services (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 safety conduct EMS operations. (A-06-15)

Require all rotorcraft operating under 14 *Code of Federal Regulations* Parts 91 and 135 with a transport-category certification to be equipped with a cockpit voice recorder (CVR) and a flight data recorder (FDR). For those transport-category rotorcraft manufactured before October 11, 1991, require a CVR and an FDR or an onboard cockpit image recorder with the capability of recording cockpit audio, crew communications, and aircraft parametric data. (A-06-17)

The NTSB also issued safety recommendations to the Maryland State Police, Prince George's County, 40 public HEMS operators, and six organizations whose members are involved in search and rescue operations.

In response to the recommendation in this letter, please refer to Safety Recommendations A-09-130 and A-06-13, -15, and -17 (Reiteration). 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]

By: Deborah A.P. Hersman
Chairman