National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: June 10, 2011

In reply refer to: A-11-60 through -63

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The National Transportation Safety Board (NTSB) is an independent U.S. Federal government agency charged by the U.S. 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 making these recommendations because they are designed to prevent accidents and save lives.

These recommendations, which address aviation industry safety standards, policies, and procedures; risk assessment and management procedures; and the installation of 406-megahertz (MHz) emergency locator transmitters (ELT) and flight-tracking equipment on aircraft, are derived from the NTSB's investigation of the June 9, 2009, aviation accident in which a New Mexico State Police (NMSP) Agusta A-109E helicopter crashed in mountainous terrain during a public search and rescue (SAR) operation and are consistent with the evidence we found and the analysis we performed. As a result of this investigation, the NTSB has issued 15 safety recommendations, 4 of which are addressed to the National Association of State Aviation Officials (NASAO). Information supporting the recommendations is discussed below. The NTSB would appreciate a response from you within 90 days addressing the actions you have taken, or intend to take, to implement our recommendations.

On June 9, 2009, about 2135 mountain daylight time,[1] an Agusta S.p.A. A-109E helicopter, N606SP, impacted terrain following visual flight rules flight into instrument meteorological conditions (IMC) near Santa Fe, New Mexico. The commercial pilot and one passenger were fatally injured; a highway patrol officer who was acting as a spotter during the accident flight was seriously injured. The entire aircraft was substantially damaged. The helicopter was registered to the New Mexico Department of Public Safety (DPS) and operated by the NMSP on a public SAR mission under the provisions of 14 *Code of Federal Regulations*

[1] All times in this letter are mountain daylight time based on a 24-hour clock.

Part 91 without a flight plan. The helicopter departed its home base at Santa Fe Municipal Airport (SAF), Santa Fe, New Mexico, about 1850 in visual meteorological conditions; IMC prevailed when the helicopter departed the remote landing site about 2132.

The NTSB determined that the probable cause of this accident was the pilot's decision to take off from a remote, mountainous landing site in dark (moonless) night, windy, instrument meteorological conditions. Contributing to the accident were an organizational culture that prioritized mission execution over aviation safety and the pilot's fatigue, self-induced pressure to conduct the flight, and situational stress. Also contributing to the accident were deficiencies in the New Mexico State Police aviation section's safety-related policies, including lack of a requirement for a risk assessment at any point during the mission; inadequate pilot staffing; lack of an effective fatigue management program for pilots; and inadequate procedures and equipment to ensure effective communication between airborne and ground personnel during search and rescue missions.[2]

Background

A hiker contacted NMSP personnel to report that she was lost in a wilderness area about 20 nautical miles (nm) northeast of SAF. When the pilot was contacted about conducting an aerial search for the hiker,[3] he initially declined the mission, citing his concerns about strong and gusty winds in the mountainous search area. However, minutes later, after he checked the weather, he accepted the mission. Subsequently, while SAR personnel were initiating a ground search for the lost hiker, the pilot and the spotter departed SAF in the helicopter to conduct an aerial search for her. According to the spotter, the weather at SAF at the time was warm, sunny, and not very windy.

About 1 hour 20 minutes after they left SAF, the pilot and the spotter located the hiker in a small clearing in the woods. When the pilot landed the helicopter at the nearest suitable landing site, a ridge about 0.5 mile uphill of the hiker, it was getting dark and the weather was deteriorating, with strong, cold winds; clouds; and freezing precipitation. Because the hiker would not walk to the helicopter, the pilot walked down the heavily forested slope, found the hiker, and carried her back uphill to the helicopter. About 9 minutes after the pilot and hiker reached the helicopter, the pilot took off for the return trip to SAF.

At 2134:10, the pilot radioed the dispatcher, stating that he "…struck a mountainside…going down." Radar data showed that the helicopter then flew erratically and eventually struck terrain at an elevation of 11,970 feet about 1 nm north-northeast of the remote landing site. The helicopter then tumbled down a steep, rock-covered slope; during this descent, the pilot and hiker were ejected. The seriously injured spotter took shelter inside the helicopter's wrecked fuselage overnight and was subsequently located by SAR ground teams about 1155 the

[2] For more information, see *Crash After Encounter with Instrument Meteorological Conditions During Takeoff from Remote Landing Site, New Mexico State Police Agusta S.p.A. A-109E, N606SP, Near Santa Fe, New Mexico, June 9, 2009*, Aircraft Accident Report NTSB/AAR-11/04 (Washington, DC: National Transportation Safety Board, 2011), which is available on the NTSB's website at <http://www.ntsb.gov/publictn/2011/AAR1104.pdf>.

[3] An aerial search was deemed advantageous because there were no roads into the search area and ground SAR teams would have to hike in, which would delay the rescue.

next day. SAR ground teams located the helicopter's wreckage about 1816 and found the bodies of the pilot and the hiker the following day.

The NTSB determined that it was reasonable for the pilot to accept the SAR mission. However, after accepting a SAR mission involving flight at high altitudes over mountainous terrain with darkness approaching, the pilot should have taken steps to mitigate the potential risks involved in the mission, such as ensuring that night vision goggles were on board the helicopter before they departed SAF. Investigators found that the pilot's decision to land at the remote landing site in windy conditions after sunset was questionable. However, his subsequent decision to take off from the relative security of that landing site in mountainous terrain and dark, windy, instrument meteorological conditions was ill-advised and was likely affected by his fatigue (due to his duties as pilot, chief pilot, and public information officer), self-induced pressure to complete the mission, and situational stress.

Organizational Issues: Risk Assessments and Safety Management Systems

A number of organizational and management issues, including NMSP aviation section staffing, pilot flight and duty time and rest period limitations, and safety management system (SMS) programs and policies,[4] were identified in this accident investigation. Although they may not have directly caused the accident, these latent deficiencies represented a culture and foundation of organizational pressures that contributed to a reduction in the safety of flight operations conducted by the NMSP on a daily basis.

Investigators noted that, at the time of the accident, the NMSP aviation section did not have an SMS program. Additionally, the aviation section did not require its pilots to perform a structured, systemic risk assessment before accepting a mission or to reassess risks during a mission. Such risk assessments would have helped the pilot identify and mitigate some of the factors that affected his decision-making. For example, although it was warm and sunny when the pilot left SAF, the forecast for the accident flight included strong wind conditions, lowered ceilings, and precipitation (freezing at higher elevations). If the pilot had completed a structured risk assessment checklist that included obtaining and evaluating the weather conditions, the approaching darkness, and the potential for pilot fatigue, he may have elected to bring a second pilot along on the flight or wait until morning to search for the hiker. At the very least, a structured preflight risk assessment process would likely have prompted the pilot to mitigate potential risks by bringing night vision goggles[5] and cold-weather survival gear on the accident flight. Further, if the NMSP aviation section had implemented a thorough risk assessment program that included interim risk assessments, the accident pilot would have evaluated the associated risks before landing at the remote site and (if he determined that such a landing was prudent) again before departing the remote landing site. The lack of such a risk assessment

[4] The Federal Aviation Administration defines SMS programs as "…the formal, top-down business approach to managing safety risk, which includes a systemic approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures."

[5] Night vision goggles would provide the wearer with visual images with increased levels of illumination in low ambient light conditions (such as moonless nights), which might have allowed the pilot to better maintain outside visual references during the accident flight. However, the benefits of the night vision goggles would have been reduced by the precipitation at the time.

allowed the decision-making errors that manifested themselves in this accident situation to occur. (Since the accident, the NMSP aviation section has implemented a risk assessment checklist.)

Upper management plays a key role in any safety program because, ultimately, management has control over the personnel and resources that generate exposure to risk. The safety management approach places a responsibility on senior management to develop a formal safety policy, establish safety objectives, develop standards of safety performance, and take the lead in fostering an organizational safety culture. It specifies that management should take responsibility for an organization's safety performance by designating a senior manager as the executive who is accountable for safety performance. Research has shown that this kind of management involvement plays a key role in the success of organizational safety programs.[6, 7]

The New Mexico DPS policies placed responsibility for safety exclusively on pilots and aviation maintenance technicians. No organizational policy established a formal management commitment to safety. The DPS cabinet secretary was the senior manager who devoted the most attention to the aviation section and seemed to have the greatest influence over it. He did not, however, take responsibility for the safety performance of the aviation section, nor did he take the initiative to ensure that it had an effective safety program. In fact, he engaged in behaviors that were actually detrimental to safety. In 2006, when the former chief pilot declined to send two inexperienced helicopter pilots on a SAR mission in mountainous terrain in poor weather and dark lighting conditions, the DPS cabinet secretary relieved the former chief pilot of his chief pilot duties (and associated launch decision-making authority). According to interviews with NMSP aviation section pilots, the DPS cabinet secretary demanded an explanation whenever a pilot declined a SAR mission and complained vigorously when New Mexico National Guard pilots launched on a mission that NMSP pilots had declined. Aviation section pilots stated that the DPS cabinet secretary sometimes asked NMSP pilots to continue checking the weather when they had already decided that the weather was not good enough for an executive transport flight. The NTSB believes that this pattern of behavior sent a message to NMSP pilots that the highest-ranking official in the DPS prioritized mission completion over flight safety and that he was closely monitoring their decisions.

There is no evidence that the DPS cabinet secretary or any NMSP manager advised the pilot to accept the accident mission or that they urged him to take off from the remote landing site. The accident pilot had previously engaged in behaviors that demonstrated a high degree of risk tolerance, and his judgment was likely degraded by a combination of fatigue, stress, and self-induced pressure. These factors are sufficient to explain his decision-making. The DPS cabinet secretary's history of inappropriately involving himself in pilot launch decisions, however, encouraged NMSP pilots to accept higher levels of risk without ensuring that appropriate controls were in place to mitigate those risks. NMSP management's lack of attention to safety management resulted in the absence of an effective safety program. The NTSB concludes that, although there was no evidence of any direct NMSP or DPS management

[6] M.J. Smith and others, "Characteristics of Successful Safety Programs," *Journal of Safety Research*, vol. 10, no. 1 (1978), pp. 5–15.

[7] H.S. Shannon, J. Mayr, and T. Haines, "Overview of the Relationship Between Organizational and Workplace Factors and Injury Rates," *Safety Science*, vol. 26, no. 3 (1997), pp. 201–217.

pressure on the pilot during the accident mission, there was evidence of management actions that emphasized accepting all missions, without adequate regard for conditions, which was not consistent with a safety-focused organizational safety culture, as emphasized in current SMS guidance.

The NTSB has previously discussed the benefits of risk assessment and management programs and issued related safety recommendations. For example, in 2009, as a result of the NTSB's public hearing on helicopter emergency medical services (HEMS) safety and the investigative findings of several 2008 HEMS accidents,[8] the NTSB issued safety recommendations related to the incorporation of SMS programs, including risk assessment and management practices.

Although the NTSB has noted the need for all operators—both public and civil—to develop and implement flight risk assessment and evaluation programs, public operators would not be required to comply with such programs because the Federal Aviation Administration (FAA) does not have the authority to regulate public operators. The NTSB concludes that if operators of public aircraft implemented structured, task-specific risk assessment and management programs, their pilots would be more likely to thoroughly identify, and make efforts to mitigate, the potential risks associated with a mission.

The incorporation of the policies, procedures, and guidelines published by the Airborne Law Enforcement Association (ALEA) in its "Standards for Law Enforcement Aviation Units" and related material would provide an organization like the NMSP aviation section with a comprehensive foundation upon which to build a thorough, explicit set of policies and procedures. However, the NTSB's evaluation of the NMSP aviation section's policies indicated that they did not conform to ALEA's standards. Because state and/or public organizations would benefit from incorporation of industry standards and policies, such as those developed by ALEA, the NTSB recommends that NASAO encourage its members to conduct an independent review and evaluation of their policies and procedures and make changes as needed to align those policies and procedures with safety standards, procedures, and guidelines, such as those outlined in ALEA guidance. In addition, because state and/or public organizations would benefit from the incorporation of risk assessment and management procedures and policies, the NTSB recommends that NASAO encourage its members to develop and implement risk assessment and management procedures specific to their operations.

Emergency Locating Equipment

The accident helicopter was equipped with an ELT that transmitted on both the 406- and 121.5-MHz frequencies. The ELT's signal was not received by the two geostationary operational environmental satellites most likely because of the topography of the crash site and the relative positions of the two satellites. However, ELT signals were received by low-Earth polar orbiting

[8] The associated safety recommendation letter cited the following accidents: NTSB case numbers DFW08FA062, CHI08FA128, DEN08FA101, DEN08MA116A and DEN08MA116B, MIA08MA203, and CEN09MA019. The briefs for these accidents can be accessed online at <http://www.ntsb.gov/ntsb/aviationquery.index.aspx>.

satellites. Within about 1 hour of the accident, SAR personnel had an ELT location that allowed them to focus their search efforts in the region where the accident occurred instead of the helicopter's last known location (near the hiker's location). The SAR ground teams' use of the information provided by the accident helicopter's 406-MHz ELT allowed them to identify and reach the accident location as soon as practical, especially given the challenging conditions (for example, the remote location, rugged and snowy/icy terrain, adverse weather, and nighttime conditions) under which the SAR efforts were conducted. The NTSB concludes that the 406-MHz ELT signals received from the accident helicopter's 406-MHz ELT were primarily responsible for focusing searchers on areas near the accident site and for eventually locating both the survivor and the helicopter wreckage. Because of the benefits of 406-MHz ELTs, the NTSB recommends that NASAO encourage its members to install 406-MHz ELTs on all of their aircraft.

At the time of the accident, the NMSP did not use a flight-following system to ensure consistent tracking of its aircraft. The NTSB has advocated the installation and use of such systems. For example, as a result of its 2006 special investigation of emergency medical services (EMS),[9] the NTSB recommended that the FAA require EMS operators to use formalized dispatch and flight-following procedures. Additionally, in its report on the September 27, 2008, accident involving a Maryland State Police helicopter,[10] the NTSB expressed concern that HEMS operators may not have dispatch and flight-following procedures and issued a related recommendation.

Low-cost units that use satellite-based technology to follow flights are commercially available. The satellite tracking data obtained by these units can be downloaded as frequently as desired by the operator (depending on the supporting program's subscription) and can be viewed on a communications or dispatch center computer.[11] Given the remote locations of many of the NMSP SAR missions and the possibility that the location of the accident helicopter and its occupants could have been identified more rapidly if it had been equipped with a flight-following technology, such a system would be invaluable to the NMSP. Since the accident, the NMSP purchased a portable flight-following unit, which it primarily intends for use in its helicopter. The flight-following unit service plan purchased by NMSP automatically provides updated helicopter position information at 5-minute intervals and every time the helicopter stops. The NTSB concludes that, although it is unlikely that the use of flight-tracking systems would have resulted in a different outcome in this case, the use of such systems, which provide real-time information regarding an agency's assets, could shorten search times for downed public aircraft and their occupants. Therefore, the NTSB recommends that NASAO encourage its members to install flight-tracking equipment on all public aircraft that would allow for near-continuous flight tracking during missions.

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[9] For additional information, see *Special Investigation Report on Emergency Medical Services Operations*, Special Investigation Report NTSB/SIR-06-01 (Washington, DC: National Transportation Safety Board, 2006) at <http://www.ntsb.gov/Publictn/A_Stu.htm>.

[10] For additional information, see *Crash During Approach to Landing of Maryland State Police Aerospatiale SA365N1, N92MD, District Heights, Maryland, September 27, 2008*, Aircraft Accident Report NTSB/AAR-09/07 (Washington, DC: National Transportation Safety Board, 2009) at <http://www.ntsb.gov/Publictn/A_Acc1.htm>.

[11] Flight-following devices transmit self-contained global positioning system coordinates to satellites instead of relying on signal triangulation as occurs with an ELT.

Therefore, the National Transportation Safety Board makes the following recommendations to the National Association of State Aviation Officials:

> Encourage your members to conduct an independent review and evaluation of their policies and procedures and make changes as needed to align those policies and procedures with safety standards, procedures, and guidelines, such as those outlined in Airborne Law Enforcement Association guidance. (A-11-60)
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> Encourage your members to develop and implement risk assessment and management procedures specific to their operations. (A-11-61)
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> Encourage your members to install 406-megahertz emergency locator transmitters on all of their aircraft. (A-11-62)
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> Encourage your members to install flight-tracking equipment on all public aircraft that would allow for near-continuous flight tracking during missions. (A-11-63)

The National Transportation Safety Board also issued three safety recommendations to the governor of the state of New Mexico, four safety recommendations to the Airborne Law Enforcement Association, and four safety recommendations to the International Association of Chiefs of Police.

In response to the recommendations in this letter, please refer to Safety Recommendations A-11-60 through -63. 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 Tumbleweed secure mailbox procedures. 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 Members SUMWALT, ROSEKIND, and WEENER concurred with these recommendations.

[Original Signed]

By: Deborah A.P. Hersman
Chairman