

Helicopter emergency medical services (HEMS) missions in the United States have among the highest fatal accident rates in the aviation industry, and their pilots and medical crews are more likely to be killed in crashes, a medical data specialist has told a federal panel probing the recent surge in HEMS accidents.

“You can’t manage what you can’t measure,” Dr. Ira Blumen, program and medical director of the University of Chicago Aeromedical Network, said, telling a U.S. National Transportation Safety Board (NTSB) public hearing on HEMS safety issues that efforts to prevent HEMS accidents have suffered because of incomplete accident data.

Blumen said that a detailed analysis found that 146 HEMS accidents, including 50 fatal accidents, occurred between 1998 and 2008. Of the 430 people in the accident helicopters, 131 were killed, including 111 crewmembers, 16 patients and four others.

In 2008 — the most deadly year on record for HEMS in the United States,

with 13 crashes, nine of them fatal, and 29 fatalities — the fatal accident rate was 2 per 100,000 flight hours, he said (Figure 1, p. 17, and Figure 2, p.17). In 2007, according to calculations based on a 10-year average, the fatality rate was 113 per 100,000 HEMS crewmembers. In comparison, according to U.S. government data for 2007, workers in what typically is the highest-risk occupation in government statistics — fishing — were killed at a rate of 111.8 per 100,000. A study of data from 1980 through 2008 showed that HEMS patients died at a rate of 0.76 per 100,000 patients flown, Blumen said.

“We’ve crunched a lot of numbers,” he added. “I truly believe that we have the ability to save lives, but unfortunately, we also have the ability to take them.”

NTSB member Robert Sumwalt, who headed the four-day hearing in early February, called the recent accident record “alarming and unacceptable,” and added, “The safety board is concerned that these types of accidents will continue if a concerted effort is not made to improve the safety of emergency medical flights.”

The motivation for the hearing, Sumwalt said, was “to find innovative ways to improve HEMS safety.” He said the hearing might lead to an updated study of HEMS operations, issuance of new safety recommendations or development of a “white paper” that addresses HEMS safety issues and provides guidelines for resolving them.

In recent years, the NTSB has issued numerous recommendations aimed at improving HEMS safety, many of them calling for regulatory action by the U.S. Federal Aviation Administration (FAA). Several of those recommendations currently are included in the NTSB’s list of “Most Wanted” safety improvements:

- Conduct all flights in which medical personnel are on board in accordance with Federal Aviation Regulations Part 135, which governs charter aircraft operations — not general aviation operations, which are subject to more lenient weather and visibility restrictions;

# Closing the

BY LINDA WERFELMAN

# LOOP



**Alarmed by a surge in fatal accidents in 2008, the NTSB is spearheading an effort to identify new safety measures for helicopter EMS operations.**



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report analyzed the crashes of 55 EMS aircraft, concluding that 29 of the 55 could have been prevented if the four safety actions recommended had already been in place.

Nineteen other recommendations were issued in 1988, after a safety study that evaluated 59 earlier HEMS crashes.<sup>2</sup>

John Allen, director of the FAA Flight Standards Service, said that the FAA is “working with the NTSB to close the loop on an industry that is safe but not as safe as it could be.” Allen noted that most of the nation’s more than 830 EMS helicopters have flown for years without a fatal crash — and many have never experienced any type of accident.

Nevertheless, he cited accident statistics — especially the increases recorded in 2008 in HEMS

- Develop and implement programs to evaluate the safety risks of each flight;
- Require formalized procedures for dispatch and flight-following, including the use of current weather information; and,
- Install terrain awareness and warning systems (TAWS) on all EMS aircraft.

These recommendations were issued previously, in a 2006 special investigation report by the NTSB on airplane and helicopter EMS operations.<sup>1</sup> The

accidents and fatalities — as proof that intensified safety efforts are needed. Allen credited an earlier round of safety initiatives with a reduction in HEMS accidents in the years preceding 2008 and said that, because of the decrease, the FAA had not implemented new regulations.

“We believe the existing regulatory structure is safe; the numbers prove it,” Allen said. “However, the upward trend in 2008 has prompted a more aggressive response to this problem.”

## FSF Endowment Will Aid HEMS Research

Flight Safety Foundation has received a \$1 million gift, part of which will be used to develop ways to improve the safety of helicopter emergency medical services (HEMS) operations, and the remainder to endow the Foundation's new Manuel S. Maciel Chair for Aviation Safety Research.

The gift was from the estate of Maciel, the founder of Manny's Sonoma Aviation, a full-service fixed base operator at the Charles M. Schulz Sonoma County Airport in Santa Rosa, California, U.S. Maciel died in 2005.

"The research he has funded will drive safety improvements in HEMS for years to come," said Foundation President and CEO William R. Voss.

— LW

The FAA's efforts have included not only regulations but also the establishment of a task force responsible for implementing safety initiatives, revised operations specifications for increased weather minimums and the development of incentives for operators to equip their EMS helicopters with night vision goggles (NVGs) and helicopter-TAWS (H-TAWS), designed especially for the low-altitude flight paths typically flown by helicopters, Allen said.

"Technology alone does not and cannot solve the problem," he said. "We routinely seek voluntary compliance on safety advances while we are considering rule making as a dual-prong approach to safety enhancement."

### 'Zero Tolerance'

In a joint statement delivered to the NTSB hearing, three industry associations — the Association of Air Medical Services (AAMS), Helicopter Association International (HAI) and the Air Medical Operators Association (AMOA) — said that they "maintain a position of zero tolerance for accidents." Nevertheless, the associations said, a review of HEMS accidents during 2007 and 2008 showed that "no service model, category of operator (for-profit, not-for-profit, civilian or government) or geographic area is immune to accidents.

"We must establish effective safety solutions that allow for the continuance of this necessary service — a service that has become an integral part of the health care system," they said, asking the NTSB to consider a series of recommendations, including a requirement that all night EMS flights be conducted either with NVGs or another form of enhanced vision system, or under instrument flight rules (IFR).

Other recommendations called for use of automated weather observation systems and instrument approaches at hospital helipads and airports used for air medical transport, establishment of a "dedicated low-altitude helicopter IFR infrastructure," accelerated implementation of automatic dependent surveillance-broadcast infrastructure in HEMS operating environments, a study of fatigue in HEMS operations and establishment of flight operational quality assurance programs for HEMS operators.

In addition, the associations endorsed recommendations to apply the same federal safety standards and oversight provisions to commercial HEMS operators and government, or public-use, operators; to eliminate response time requirements, which promise a response to calls within a prescribed time period; to increase management oversight of crew performance; and to address "helicopter shopping," the

practice in which one HEMS operator after another is contacted — typically in instrument meteorological conditions (IMC) — until one accepts a mission.

The associations said that a recent AMOA survey found that eight Part 135 operators, whose 700 helicopters account for more than 90 percent of those involved in HEMS operations nationwide, have equipped 35 percent of their aircraft with NVGs. The survey also found that operators planned to equip 90 percent of their aircraft with NVGs by 2011.

A separate survey submitted to the NTSB by the National EMS Pilots Association (NEMSPA) showed that of 380 HEMS pilots questioned, 334 (88 percent) said they agreed with a statement that the use of NVGs "has improved the safety of HEMS night operations."

NEMSPA President Gary Sizemore said that the survey respondents did not recommend H-TAWS as a viable alternative to NVGs, noting, "Although these systems may well have a role in improving the safety of HEMS night operations, they only warn the pilot of hazards that he cannot see. With NVGs, the pilot can see, identify and avoid hazards in much the same manner that he does during daylight flight."

T.K. Kallenback, vice president of marketing and product management at Honeywell Aerospace, said that the Helicopter-Enhanced Ground Proximity Warning System (H-EGPWS) — one of Honeywell's TAWS products — was developed from the EGPWS used for several years in airplanes and designed specifically for helicopters operating very near terrain and obstacles.

FAA documents presented to the NTSB panel said that because H-TAWS is sensitive not only to the proximity of terrain but also to excessive sink rate, it is especially effective against controlled flight into terrain and against

some approach and landing accidents. “Because the accident scenarios against which H-TAWS would be effective tend to have severe outcomes, it would reduce the risk of fatal accident by 20 percent,” the FAA said.

Matthew Zuccaro, president of HAI and co-chairman of the International Helicopter Safety Team, told the NTSB panel that his organization promotes not only the use of NVGs but also H-TAWS, and other technological advances, as well as development of a strong safety culture and other related human factors advances.

“But there is no magic bullet,” he said, noting that previous HEMS fatal accidents have involved helicopters with advanced cockpits and two-pilot, IFR-qualified crews, and have occurred during visual flight rules (VFR) operations as well as in IMC.

### VFR vs. IFR

Larry Buehler, an aviation safety inspector in the FAA Flight Standards Service, said that night flights and inadvertent entry into IMC are among the greatest challenges facing HEMS pilots and that conducting a flight in accordance with instrument flight rules is the best countermeasure for the risk of controlled flight into terrain.

One-third of HEMS operators are authorized to conduct IFR flights, he said; for those that must fly under VFR, compliance with regulations and proper preflight planning — with special attention to establishing a minimum safe altitude — are crucial, he added.

Tony Bonham, chief pilot for Air Evac EMS, which conducts VFR flights from 84 bases in 14 states, said that VFR and IFR flight are both safe for HEMS.

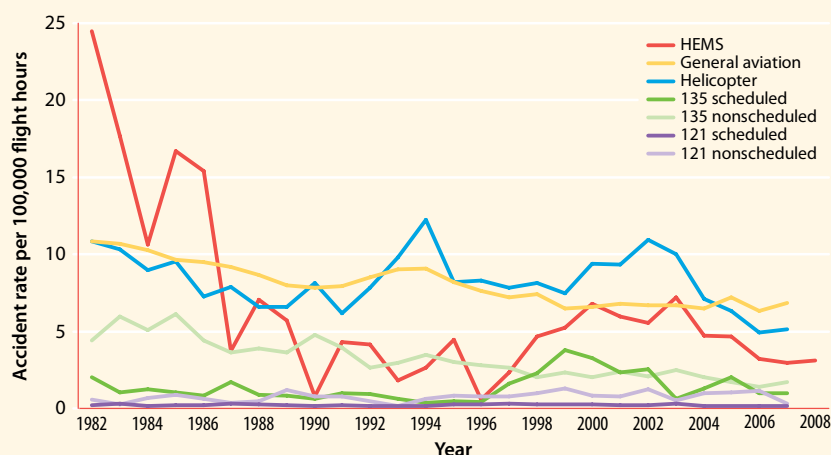
“Our first mission is to follow the rules and regulations and procedures for

safe flight,” Bonham said, adding that Air Evac EMS operates under Part 135, equips all helicopters for recovery from inadvertent entry into IMC and plans to install NVGs in helicopters at all its bases.

### More, and Better, Training

Several of the 40 witnesses testifying before the NTSB panel identified crew training — including crew resource management (CRM) training for pilots

#### U.S. Aviation Accident Rates, 1982–2008



HEMS = helicopter emergency medical services

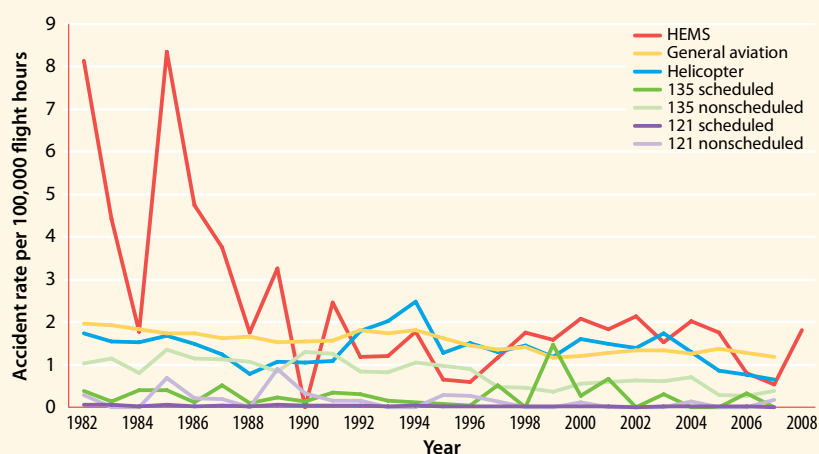
Part 121 = U.S. Federal Aviation Regulations Part 121, “Air Carriers and Commercial Operators”

Part 135 = U.S. Federal Aviation Regulations Part 135, “Commuter and On-Demand Operations”

Source: Ira Blumen, M.D.

Figure 1

#### U.S. Aviation Fatal Accident Rates, 1982–2008



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Part 121 = U.S. Federal Aviation Regulations Part 121, “Air Carriers and Commercial Operators”

Part 135 = U.S. Federal Aviation Regulations Part 135, “Commuter and On-Demand Operations”

Source: Ira Blumen, M.D.

Figure 2



and medical crewmembers — as crucial in improving HEMS safety.

Bruce A. Webb, Eurocopter’s chief flight instructor, described himself as “certainly an advocate of technology” but added that technology alone is not the solution to the problem. “That’s training,” Webb said.

Training requirements vary, depending in part on the complexity of the helicopter and the operator’s weather minimums, Webb said, adding that an annual training session probably is adequate for pilots of basic VFR helicopters who comply with conservative weather minimums. “But twice a year is better,” he said. For pilots of technologically advanced helicopters, he recommended quarterly training.

“Scenario-based training is where we must go to stop accidents from occurring,” Webb said. “Most people think their IFR recovery skills are better than they really are.”

Terry Palmer, an instructor and manager of rotorcraft programs for FlightSafety International, agreed that “training is key. These are perishable skills that need to be reinforced. The best way to do that is with scenario-based training in a simulator.”

Kevin High, a registered nurse and president of the Air/Surface Transport Nurses Association, cited mandatory CRM training as one of the HEMS community’s most pressing needs.

“The culture has improved a lot” in recent years, with the advent of the notion that there must be agreement among the pilot, flight nurse and flight paramedic that conditions are right for any particular flight, High said, noting the popularization of the phrase “three to go, one to say no.”

Nevertheless, High and James P. Riley, a paramedic and president of the International Association of Flight

Paramedics (IAFP), said that many medical crewmembers are reluctant to be the sole crewmember to suggest refusing a mission because of safety concerns.

Riley also voiced concern that, in a July 2008 survey of IAFP membership, 30 percent of respondents reported that pilots were well aware of the nature of the request for each flight.

“This opens the door for human factors to be taken into account when deciding whether it is safe to fly,” he said, noting that pilots who are told about the critical condition of a patient may feel pressure to accept a flight in bad weather.

“We can try not to consider that the patient is a sick child or we are the last chance for the survival for the patient,” Riley said. “However, with over 70 percent of the air medical crashes being human-factor related, the IAFP is not comfortable with this process of informing the pilot of patient information.”

### ‘Helicopter Shopping’

Dan Manz of the National Association of State EMS Officials (NASEMSO) and state director of EMS in Vermont, described “slow but steady growth” in HEMS operations from the 1970s, when operations began, until 2000, when the Centers for Medicare and Medicaid Services developed a new formula to reimburse operators. The growth period that followed the centers’ action resulted in a doubling of the number of EMS helicopters from fewer than 400 in 2000 to about 830 today. Many of the new programs are private, for-profit operations, instead of the non-profit hospital-based programs that predominated before 2000, Manz said.

His organization told the NTSB panel that the influx of helicopter and airplane EMS programs has resulted in “coordination and confusion issues” in

some areas, with more aircraft than are needed to transport patients. The states should work with the federal government to coordinate oversight of EMS operations, NASEMSO said.

Dr. David Thompson of AAMS, who also is the national medical adviser for PHI Air Medical, said that HEMS operations often function as backup medical care in small communities that lack hospital services, medical specialists or ambulances to provide ground transportation to distant medical facilities.

He denounced the concept of helicopter shopping, suggesting that patients and operators alike would benefit from increased cooperation; for example, a VFR operator that rejected a flight because visibility was below minimums might refer the job to an IFR operator.

### Indispensable

Regardless of what other steps are implemented, a number of participants told the NTSB panel, establishment of a strong safety culture within each operation is crucial.

“A safety culture is the indispensable context for enabling technology,” said the FAA’s Allen. “When a management team establishes a corporate culture that supports the decision-making skills of the pilots and treats each flight as safe passenger transportation and not as an emergency evacuation mission, the risk of an accident is reduced dramatically.”

### Notes

1. NTSB. *Special Investigation Report: Emergency Medical Services (EMS) Operations*, SIR-06/01. Jan. 25, 2006.
2. NTSB. *Commercial Emergency Medical Service Helicopter Operations*, SS—88-01. Jan. 28, 1988.