

## Unsaved – The Deadly Medical Helicopter Accident Record

By David Evans, Air Safety Consultant

On the flight to or from the hospital, one should not run the greater risk of maiming or death. Yet that is precisely the mortal dilemma, based on two fatal accidents involving emergency medical service (EMS) helicopters in June.

On the moonless night of 8 June 2008, a Bell 407 helicopter, operated as “Med 12” and owned by PHI, Inc., crashed in heavily forested terrain near Huntsville, Texas. The pilot, flight nurse, flight paramedic and one passenger were killed and wreckage was strewn over an area of some 600 feet; traveling at cruise speed of 106 knots, the accident was a classic “controlled flight into terrain,” or CFIT. There’s no evidence that the pilot took any avoidance action to clear terrain.

On the afternoon of 29 June 2008 two Bell 407s, one operated by Air Methods and the other by Classic Helicopters, collided while on approach to land at Flagstaff Medical Center at Flagstaff, Arizona. Six people were killed and a flight nurse was in critical condition. Coming from opposite directions, the accident was a mid-air collision that resulted in broken bodies and bent, fractured aluminum spread over a 500-yard area. As the National Transportation Safety Board (NTSB) investigation develops, it seems likely that one or both pilots in the two helicopters never saw the other.

And these two accidents came a month after a 10 May 2008 crash of a Eurocopter EC 135, operated by the University of Wisconsin Hospital Med Flight, at LaCrosse, Wisconsin. After dropping off a patient, the pilot, a surgeon and a nurse were killed.

There have also been non-fatal accidents recently:

- ✓ On 29 May an Aero Med helicopter crashed on the roof of Spectrum Hospital in Grand Rapids, Michigan. The pilot and an observer from the Federal Aviation Administration (FAA) were able to get out of the aircraft before it was consumed by fire. Jet fuel leaked into the top floors and most of the hospital was closed as a result.
- ✓ On 6 June Lehigh Valley’s MedEvac 7 crashed into a freight yard in Pottsville, Pennsylvania, while en route to a motorcycle accident. Fortunately, the crewmembers suffered only minor injuries and were removed from the wreckage by citizens who came to their aid.

The year could be the deadliest ever for the nation’s fleet of about 750 emergency medical service helicopters. With six months left in the year, already 16 people have died in EMS helicopter crashes, just two shy of the record 18 deaths in 2004.

“Unfortunately, we are moving toward a record-breaking year here,” NTSB Chairman Mark Rosenker said after traveling to the scene of the Flagstaff accident. “We are hoping that this accident will sensitize the industry and the regulators to immediately begin a recognition of what is necessary to prevent these accidents.”

What Rosenker did not say is that the safety record posted by EMS operators is astonishingly bad. The fatal accident rate for EMS flights is some 6,000 times higher than that of commercial airliners. When all accidents, incidents, forced, precautionary, hard landings, maintenance problems and other operating anomalies are factored in, the safety record is beyond scandalous – it is tragic, and unnecessary. Military evacuation by helicopter of battlefield casualties (“dust-off”) has a long tradition of controlled risk-taking tempered by urgency. The civilian equivalent in a peacetime environment should be subject to a stricter risk regimen, but that discipline appears to be absent.

There is certainly a thick dossier of studies, fact sheets, advisory circulars and assorted literature attesting to the safety problem of EMS flights. The recommended actions have not been implemented. In any event, the recommendations seem carefully crafted to avoid looking at the full range of alternatives or to impose changes that would drive up the cost of the flights while at the same time reducing the number of helicopter evacuations that could be safely undertaken by ground ambulances.

Consider four major studies. After a spate of EMS accidents in the late 1970s and early 1980s, the NTSB conducted a special study of EMS operations in 1988. Then, after a similar spike in accidents in the 1990s and early in this decade, the NTSB prepared another “Special Investigation” of EMS operations in 2006. As a result of its latest inquiry, the NTSB issued in 2006 four recommendations to the FAA:

Require EMS operators to comply with Part 135 operations specifications, which are more rigorous than Part 91. The Federal Aviation Administration (FAA) told the NTSB that Part 135 flight rules will only be required when medical crew are on board, and EMS flights will be exempt from the requirement for weather reporting at their destination. The NTSB considered this approach an acceptable alternative. The FAA, in my opinion, scores one here for slow-rolling the recommendation.

Requires EMS operators to implement a flight risk evaluation program, said form to be completed before the flight to assess whether the risk (e.g., from poor visibility) outweighs the benefit of aerial medical evacuation. The FAA replied that risk assessment would be added to company Operations Specifications (OpSpecs). Although this has yet to be done, the NTSB has classified the recommendation as “Open” with an acceptable response. Score two here for the FAA again slow-rolling the NTSB.

Require EMS operators to use formalized dispatch and flight-following procedures. Response: the FAA is examining the role that a “communication specialist” could play in performing dispatch and flight following activities. This response studiously avoids the establishment of dispatchers at EMS flight operations centers, as they have for the airlines – where dispatchers and pilots share joint responsibility for safe conduct of a flight. By the way, dispatchers at the airlines follow a flight on radar from takeoff to landing, and are in constant communication with the flight crew regarding weather, traffic delays, and the myriad other problems that can impact the flight schedule. However, it must be said that flight-following an aircraft by scheduled stops at accredited airports is a wholly different proposition to vague and distant moral support for a helicopter operating into ad hoc traffic accident locations. One could argue that dispatcher flight following is even more important for EMS operations. Score three here for the FAA successfully avoiding imposing anything approaching an airline standard to EMS operations.

Require EMS operators to install terrain awareness and warning systems (TAWS) on their aircraft. The FAA has yet to issue a Notice of Proposed Rulemaking (NPRM) imposing such a requirement on EMS operators. Score four here for the FAA’s benign regulatory neglect.

It should be noted that for airliners, the FAA has required two warning systems: TAWS to provide flight crews an alert of threatening terrain or obstacles (e.g., cliffs, power line towers), and TCAS (Traffic Alert Collision Avoidance System) to warn of other aircraft nearby and the need to take avoidance action. TCAS might have alerted one or both helicopter pilots in the Flagstaff disaster. Although this is the first mid-air collision involving EMS helicopters, these flights often occur in the vicinity of local airports, where fixed-wing aircraft operate. I am betting that when the NTSB sorts through the dynamics of the Flagstaff mid-air collision, one or both pilots never saw the other helicopter. It is not unknown for both participants in a midair collision to have been motoring along with each aircraft resident in the other’s blind spot. Only a minimalist TCAS, radar-based air traffic control, satellite based surveillance (ADS-B, explained below) or an actively defensive lookout could avoid that pitfall.

A major study of EMS operations was also completed in November 2002 by the Air Medical Physician Association (AMPA). This effort did not culminate in recommendations, but rather it collated comprehensive statistics on EMS operations. For instance:

“Pilot error was attributed as the direct or indirect cause of EMS accidents nearly three times more often than mechanical failure.” You then have to discern whether that pilot error relates to negligence, nonchalance, fatigue, lack of third-party support, inexperience, lack of operational currency, of a fatal potpourri of each, which the study goes on to discuss.

And,

“Main cabin occupants have nearly 4.5 times the risk of serious injury (especially back injuries and head injuries) or death in survivable crashes when compared to a comparable population of occupants in the cabin of non-EMS air taxi helicopters.”

The Helicopter Association International hosted an EMS safety summit in 2001, and it proposed a number of “interventions” to enhance safety. These included improved training, equipping aircraft with radar altimeters, installing TAWS, and other stratagems. The training needed to be mission oriented. If the pilot is expected to find and land in an LZ (landing zone) in the mountains on a pitch-black foggy night or land in a dusty or snowy LZ, regular and recurrent training should meet that requirement, as opposed to practicing on sterile runways or helipads, the study said.

Many in the helicopter community argue that night vision goggles would enhance safety. The NTSB has not recommended the goggles, going only so far in its 2006 report to say, “If properly used, night vision imaging systems could help EMS pilots identify and avoid hazards during nighttime operations.”

However, the Safety Board did not formally recommend the use of night vision goggles, as they are not useful in “populated areas with ambient light and numerous streetlights.”

The lack of safety in EMS operations is not unique to the United States. Here is a 2005 comment on the situation in Australia:

“[The] supervision provided by CASA [Civilian Aviation Safety Authority] varies with the category of operation. HEMS [helicopter emergency medical services] is situated at the lower end of the oversight spectrum ... resulting in a level of scrutiny that, given the complexity and risk involved, is lower than perhaps required ... Given the low level of regulator scrutiny ... the industry has recognized a need to enforce its own standards by commissioning aviation safety experts to conduct independent safety audits. For example, in high-risk areas, such as the off-shore oil industry, oil companies conduct independent safety audits of contracted helicopter operators as frequently as every couple of months. Although HEMS carry greater risk than off-shore oil work, at least one Australian state government is yet to conduct any independent audits of its contracted HEMS operators, despite this being a requirement of contract.”

From the litany of shortcomings, it is possible to put together a list of suggested corrective actions far more comprehensive than anything yet proposed by the NTSB:

- How about hospitals served by EMS operators retain aviation safety experts to conduct the independent safety audits bi-monthly of the type performed by the off-shore oil industry in Australia?
- Perhaps the wisdom of contracting medical evacuation flights to private companies merits assessment. In the state of Maryland, the function is performed by the aviation department of the state police. Maryland is the only state to opt for government-provided service, thus assuring coverage of small towns and remote areas throughout the state (unless coverage of these areas

is mandated in the contract, the private EMS aviation firms are going to concentrate on the areas of greatest population density).

‣ To what extent does competition for business among private EMS providers result in pressure to evacuate patients by air? One account indicates that many patients without life-threatening and/or time-sensitive injuries could be evacuated by ground ambulance. Bad weather and darkness should be determining arbiters of need. Both factors loom large in the accident statistics' scenarios.

‣ Should EMS companies maintain a full-time dispatcher capability along the lines of airline operations centers? Having a 911 operator perform this function borders on the irresponsible, as those operators are not familiar with aviation, do not have access to real-time weather reports, etc. The risk assessment for each flight should be jointly conducted by the pilot and the dispatcher, with either one empowered to say "no" to the justification (or qualifications/specifications required) for a flight.

‣ Is one pilot in the helicopter sufficient, given the workload and nature of the mission, where the pick-up point is not a hospital helipad but a parking lot, highway or remote clearing? The helicopters were designed for two-pilot operation, with duties divided between the pilot flying (PF) and the pilot not flying (PNF). For example, the PNF assumes radio and safety monitoring duties while the PF focuses on the aviating and airmanship aspects of the flight. Two pilots are required for airline and most air taxi operations, but not for EMS helicopters (the Maryland state police operate with two pilots per helicopter, we should note).

‣ EMS helicopters should be equipped with cockpit voice and flight data recorders (CVR/FDR). Analysis of what happened in a crash would help to prevent future accidents. The typical NTSB report of an EMS crash tries to reconstruct the flight path from radar data and eyewitness accounts. Probable causes are often suppositional.

‣ Pilots and controllers should be able to anonymously report safety hazards through an Aviation Safety Action Program (ASAP). The absence of such programs among EMS operators means that insights into latent hazards, time pressures, and other factors, is lost.

‣ The minimum equipment list (MEL) at all EMS operators should be evaluated for effectiveness and relevance. For example, while many operators have equipped their helicopters with radar altimeters, the altimeters do not always work, and flying with an inoperative radar altimeter is permitted. In a 2005 crash into the Potomac River in Washington DC, the radar altimeter, which was functioning the night before, was inoperative the night of the crash, when the same pilot from the night before lost spatial awareness.

‣ Dispatchers for EMS operations need the capability to follow the flight throughout. This is not possible with ground-based radar, as the helicopters often fly at low altitude and hence below radar coverage. However, a satellite-based system, automatic dependent surveillance – broadcast, or ADS-B, could provide full-time flight-following capability and awareness of other air traffic (and a timely alerting of mid-air potentials).

The impression one gets of the EMS industry is of a general apathy towards development of a voluntary safety culture, and a reluctance to invest in those programs and technologies that support safety. Night vision goggles have been adopted by some operators, but they are only for limited application. ASAP programs, equipping with TAWS and TCAS, and staffing for two-pilot operations would go considerably further in improving safety.

The earliest acid test of medicine – "first, do no harm" – can be applied to EMS operations. This timeless medical precept is violated too often in aeromedical evacuation, as evidenced by the

grim and extensive mishap history. The EMS industry is often perceived to be more like the fourth horseman of the Apocalypse than an angel of mercy. □