NO TIME TO SPARE ?

Air Medical Services Save Lives

Photo courtesy of the U.S. Coast Guard

STORY BY DAVE HIGDON

The accident occurred on a stretch of the Kansas Turnpike miles from the nearest access point, even farther from a trauma center. Fortunately for the sole victim, an ambulance staffed with trained, certified emergency medical technicians (EMTs) was close by after attending to another relatively minor accident, and it arrived at the site of the SUV rollover crash quickly enough to assess the situation.

Speeding southbound on the toll road when a front tire exploded apart, the SUV rolled and tumbled multiple times before coming to rest upright but crushed and caved in on every side. The driver's injuries threatened his life; the emergency personnel feverishly worked to cut open the wreckage to extract the patient as gently as possible given the extent of his injuries.

When the patient's heart stopped, the EMTs revived him and worked to stabilize him, worrying the injured man wouldn't survive the 60-mile trip to a suitable care center. Unless — a doctor at the trauma center intoned on the radio — they could get the gravely injured man to a trauma center within the next 30 minutes, his chances of survival would greatly diminish. Providing someone could attend to his injuries well enough to keep him alive that long.

Fortunately, the state trooper's medical training prompted him to call for an aerial evacuation of the patient to a trauma center nearly 60 miles away — a full 45 minutes at even the breakneck speeds possible on the turnpike. With highway times the injured man's worst enemy at this point, aviation served as his last best hope of survival.

A helicopter arrived minutes after the doctor's instructions and the injured man was quickly loaded. The air medical service helicopter lifted off with the patient and caregivers heading to a level-one trauma center.

Twenty-five minutes later — after another code blue incident and another successful revival attempt — the patient lay in a treatment room where the combined skills of the doctors and nurses kept the man alive long enough to move him to emergency surgery.

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On that day, this particular patient benefited from a convergence of unrelated actions by others, actions that resulted in putting a helicopter on the southbound lanes of a four-lane highway.

Without the astute field assessments of the state trooper and the EMTs, and without the airborne nurse and a trauma specialist, the doctors later confirmed the accident victim likely would have bled to death in the ambulance.

"Minutes save lives," a local doctor/pilot likes to say.

"When there's no time to spare, we go by air. Speed translates to time, flying has speed — and the time saved gives us a fighting chance to save a life," he said.

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Moving Patients to Better Care Faster

Air medical services are hardly new, but the profile of this aspect of aviation continues to grow. From tending to individual crises, such as highway or mountain-climbing accidents, to mass-mobilization in response to natural disasters, such as hurricanes and wildfires, the medical/rescue helicopter is ubiquitous in the images portraying these events.

Studies dating back years and military experience beginning in World War II document the value of aviation in moving patients to locations of better care.

The medical community knows earlier definitive treatment and in-transport intervention saves lives. For hundreds of thousands of Americans and millions around the world each year, the rotor beat of an air medical helicopter is a soothing sound. It means no traffic jams, blocked intersections or accident backups can block the medical transportation. Other times, it might be a fixed-wing aircraft moving a patient from a difficult site of initial care to one with specialized or advanced capabilities.

Aviation began aiding medical patients more than 80 years ago, according to historical data. The first recorded, according to the Association of Air Medical Services (AAMS), came in 1926, in Central America, when the U.S. Army Air Corps used a converted de Havilland to move a patient from Nicaragua 150 miles to the France Army Base in Panama.

In 1928, a flight provided by the then-fledgling Royal Flying Doctor Service in Australia, inaugurated aviation medical flying as a national service for citizens. This service continues 81 years later, the longest continuous service by any air medical operation.

Today, estimates put the number of air medical helicopter flights in the U.S. at 400,000 annually, according to AAMS. The association estimates another 150,000 fixed-wing flights on top of the helicopter ops.

The U.S. Coast Guard flies more than 1,000 airlifts annually, a perfect example of a situation in which "surface travel" at boat speeds pretty much precludes using marine travel for any urgent needs.

But the flexibility of helicopters and airplanes, as well as the urgency of the missions, sometimes conspire to create their own tragedies. In recent years, the number of fatal air medical helicopter crashes has grown to a level prompting the National Transportation Safety Board to convene special hearings.

When you consider the situations, however, the accidents — tragic as they can be — sometimes occur because of a pilot's determination to save a life.

The Big Challenge for Helicopters

Rooftop and ground-level helipads servicing medical facilities enjoy the benefits of some standards set by both the FAA and the medical airlift community — standards for lighting, size, clearances, instrument approaches and, soon, WAAS/GPS instrument approaches.

But even the latest in GPS tools can-

not alone improve safety in aeromedical helicopter operations. Non-standard operating environments serve as an industry standard for pick-up points. The sites of accidents and tragedies don't adhere to FAA heliport guidelines — and this often is the biggest challenge.

By definition, air medical helicopter pilots often must fly in difficult weather and at night. While weather and night issues challenge fixed-wing flights, the airport needs of most fixed-wing flights precludes these crews from facing the most-threatening variables helicopter crews face.

As with so many things, the dominant issue relates primarily to three things: location, location, location.

The ideal circumstance gives the pilot a safe landing area where the pilot can get down and back up without exposure to nearby trees and nearly invisible telephone or electrical lines. Remote sites also can sport fences, antennae, buildings or surface traffic. Mixing the fast-spinning main- and tail-rotor blades with anything can spell tragedy when working to get into or back out of a landing area close to an accident site.

Between the pick-up point and the clinic landing pad reside other risks: hillsides, mountaintops, broadcast towers and high-voltage transmission lines. Again, pilots often make these trips at night and in bad weather.

Another danger also lurks: other traffic. Although mid-air threats remain rare, recent records include one instance of two air medical helicopters colliding while maneuvering to land on the same hospital helipad at the same time.

Despite all these challenges, pilots line up for these jobs.

Thankfully, technology continues to add to the tools helicopter pilots can use to reduce risks.

The Potential of Potent Technology

The recent spate of air medical helicopter accidents — 27 accidents killing 34 people in 2006 and 2007; 61 accidents killing 54 people between 2000 and 2006 — has heightened interest in technologies with promise to improve safety and end crashes.

Many of these technologies existed years earlier for fixed-wing aircraft, but have become available for helicopter use only in the past couple of years.

Let's take a look at the top systems and why they offer help.

Cat Eyes: Seeing in the Dark

Night-vision goggles (NVG) entered the military cockpit years ago, but only recently began to find a home in the cockpits of air medical helicopters as approved equipment.

While not a perfect solution, NVGs do help pilots avoid dangerous obstacles. But they are expensive, they can suffer from sensitivity issues around bright lights, and not all pilots find them comfortable or useful.

Two other technologies — both with their own maturity levels — bring to the cockpit the eyes in the skies more useful more of the time.

Synthetic vision systems (SVS) work through a powerful computer processor using GPS position data, direction and height above the ground (internally or externally generated) from which the SVS computer generates images of the terrain ahead from its landscape database.

SVS systems must be fast enough to keep up with the aircraft's speed and maneuvers; they must be detailed enough to give the pilot a real-world portrayal of ground, buildings, obstacles, helipads and runways — all from

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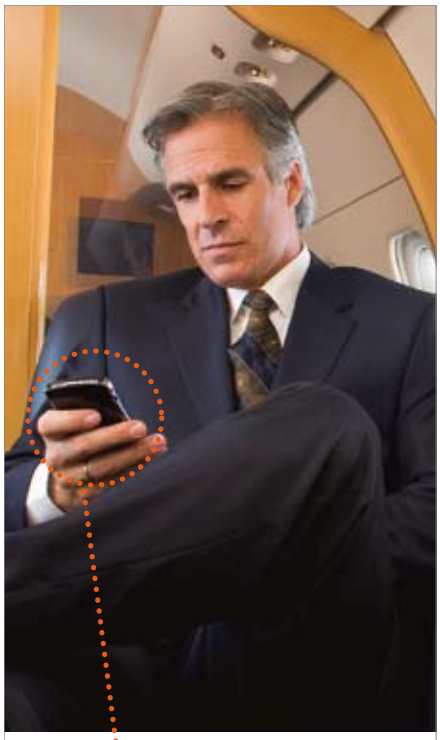

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software code-written to reflect the terrain mapping that backbones the SVS.

SVS cannot, however, portray a stray vehicle on a runway or a fence; a newly erected obstacle won't show up on the screen until after an update of the system's database. SVS can't portray anything transient or not programmed into software.

For real-time help, pilots need real night vision — what we know as enhanced vision systems (EVS).

EVS employs an infrared camera sensor to capture the heat signature of objects in its field-of-view and transmits a monochromatic image of what it sees on a display screen in the cockpit — sometimes on an multi-function display, other times on a dedicated display or even a heads-up display.

New-generation EVS sensors can work night and day, giving pilots a daylight view even through smoke, fog and light precipitation.

Weather Avoidance: Knowing What's Out of Sight

The advent of the modern cockpit multi-function displays provides pilots with ways to view many hazards — ground, traffic and weather, to name the most deadly.

The data-link images complement the lighting and turbulence indicators available today, thanks to the arrival of spherics systems approved for helicopter use.

On one hand, satellite data-link weather systems provide the big-sky view low-flying pilots need to be informed about the weather just a few miles ahead — not tomorrow's weather, which remains hundreds of miles away.

Similarly, lightning detection systems offer special help when their outputs overlay the weather and terrain-map images. And there are various spherics solutions for lightning avoidance.

The result of employing both data-link and lightning-detection gear can offer a fresh look at weather just a few miles ahead in detail and in near real-time, allowing the air medical helicopter pilot to make the kind of tactical weather-avoidance responses that save lives.

Avoiding Things That Go Bump

EGPWS, or enhanced ground proximity warning systems, can be thought of as a vision-restricted version of SVS because EGPWS uses database information on terrain elevation and obstacles — towers, tall buildings, transmission lines — and a GPS position plot to warn pilots away from controlled flight into terrain (CFIT) or out of conflict with an obstacle.

Sensitive to heading, speed and altitude, EGPWS also is smart enough to know when you're maneuvering for a runway and wise enough to give you warnings at 1,000, 500, 100 and 50 feet, in some cases.

Coming Soon to Helipads Everywhere

Many a helipad in the U.S. has an instrument approach to help inbound flights and their passengers with procedures to provide them with a safe arrival.

Unfortunately, weather often exceeds the approach minima for the helipad, which can force a helicopter to land far away from the hospital and finish the transport by ambulance. Not a popular option among EMTs, doctors or pilots.

Thankfully, the advent of the wide area augmentation system (WAAS) and the completion of its network mean it's now possible to create IFR approaches using WAAS/GPS and LPV-like approaches.

With steeper descents and much lower ceiling restrictions, these approaches stand to increase mission completion rates to the target hospital — potentially saving more lives.

Since starting the project, the FAA has written about 7,500 WAAS and LPV approaches, and is trying to add about 1,500 per year.

Work to approve steeper approaches for medical helipads with these approaches holds promise for improving the safety of flight as well as saving the lives of patients.

New Advances in Collision Avoidance

The history of mid-air collisions shows the vast majority occur within 25 miles of an airport, many within five miles.

One mid-air in recent years involved two air medical helicopter flights maneuvering for a common helipad at a hospital. Mistakes were made, communications weren't clear or complete, and the pilots failed to see-and-avoid. Blind spots exist for every aircraft and instances occur when none of the occupants of two aircraft can see the other aircraft.

Any pilot busy in the cockpit handling radios and coordinating an arrival would welcome help. New advances in active collision-avoidance systems now make them available for helicopters — rounding out the toolbox of hazard-avoidance hardware needed for an air medical pilot to enjoy the maximum capability to safely fly a mission.

Demanding Profession Demands Pro Tools

The debate among safety regulators, investigators and operators centers on how best to approach improving the challenged safety record of air medical flying.

With the air medical industry continuing to grow steadily, the public might begin insisting the services employed

by local hospitals or government units deploy all the tools available to help ensure safety of these life-critical missions.

Air medical service providers naturally want to avoid any expensive mandates that threaten to take down their businesses' financial foundations. However, over time, as the National Transportation Safety Board continues to push for equipment improvements, such as collision, weather and terrain avoidance, EVS and night vision, to be made mandatory, the airlift community could help its reputation by, as many operators have done, undertaking a program to proactively and progressively upgrade their helicopters to the level needed to help prevent another remote-site accident from occurring.

Airframe Specialization

Modifiers and OEM companies alike offer solutions for the air medical market, both in fixed- and rotary-wing machines, up to and including aircraft finished to serve as full-function ambulances-of-the-air and trauma-transit systems-of-the-sky.

Modifications can include special doors for handling patient gurneys, medical oxygen systems and storage for the most-needed trappings of treating trauma victims. And the extent of such work can vary from convertible interiors for dual-purpose aircraft to fully dedicated medical ships — some as large as the DC-10 Flying Eye Hospital of Project Orbis.

Fixed-wing aircraft often are fitted to transport patients in need of specialized care and resemble an aerial intensive-care unit, complete with equipment to monitor vitals, administer medications and revive patients with defibrillators.

Air medical helicopters more often receive custom makeovers to give them all the fittings of a road-based ambulance. But making and winning approval for an installation of this equipment present all the same challenges of other aspects of aviation: lighter, stronger and more portable.

Fortunately, dozens of companies offer the products that make saving lives one of general aviation's most important services. ❑

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