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ON THE COVER

Two privately owned Mil Mi-24 helicopters fly in formation near Lancaster, Texas. These Soviet-era gunships are now being used for adversary orientation training for the U.S. military.

SKIP ROBINSON PHOTO

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BY ELAN HEAD

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Congratulations, Taylor Loughran

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Publishers

GROUP PUBLISHER	Mike Reyno, mike@mhmpub.com
GROUP PUBLISHER	Linda Reyno, linda@mhmpub.com
ASSOCIATE PUBLISHER	Derek Kast, derek@mhmpub.com

Editors

EDITOR-IN-CHIEF	Oliver Johnson, oliver@mhmpub.com
VERTICAL 911 EDITOR	Elan Head, elan@mhmpub.com
ASSISTANT EDITOR	Ben Forrest, ben@mhmpub.com
JR. EDITOR	Dayna Fedy, dayna@mhmpub.com
COPY EDITOR	Amitav Dash, amitav@mhmpub.com

Sales

SALES & MARKETING DIRECTOR	Tim Muise, tim@mhmpub.com
MARKETPLACE SALES MANAGER	Carla McKay, carla@mhmpub.com
CIRCULATION MANAGER	Leanne Willis, leanne@mhmpub.com

Design & Web

PRODUCTION MANAGER	Jen Colven, jen@mhmpub.com
GRAPHIC DESIGNER	Kaytlyn Wismayer, kaytlyn@mhmpub.com
WEB DEVELOPER	Shawn Pieters, shawn@mhmpub.com

Contributing Writers

MJ Brickey, Jon Duke, Dan Foulds, Tony Kern, Karen Mahany, Dan Megna, Mario Pierobon, Skip Robinson, Hilary Romig, Bill Winn

Contributing Photographers

Sheldon Cohen, Kari Greer, Lloyd Horgan, Kelly Koopmans, Jeff Muth, Skip Robinson, Mike Salas, Matt Udkow

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Column

Focus on Professionalism // **Tony Kern**

Swimming Upstream

Every once in a while, I get an email from a reader that evokes a visceral reaction from me. A few weeks back, this one came through.

"Just finished reading *Going Pro* and although I'm trying hard to be a fully compliant and improving professional, the culture I'm in *won't allow it*. Do you have any ideas?"

My first thought was to ask this person if he had really *finished* reading the book, as I address the challenges of operating in a poor culture towards the end — but apparently not in sufficient depth. I suspect there are many who find themselves in a similar situations, trying to do their best in a world that doesn't appreciate it, or worse, won't allow it.

Culture is one of those soft words people in our industry throw around haphazardly, without a full understanding of its meaning and a lack of respect for its power. It has been described vaguely as "the way things are done around here." Not good enough by half.

Culture is an influential force that often trumps policies, procedures, and the best plans of organizational leaders. It saps the enthusiasm out of those who — like the gentleman who emailed me — try to improve themselves and their organization only to be frustrated by cultural norms of sloppiness and noncompliance.

Think of your culture as a fast-flowing river that sweeps everything downstream in its powerful hydraulics. If it is a positive force, things are easy. If it's not, positive change is nearly impossible, good employees disengage, and safety margins are eroded. But even the largest rivers are formed by small tributaries. This truth is where individuals who feel like they are swimming against the current of a poor culture can anchor their efforts.

THREE OPTIONS

When we find ourselves in a situation where we feel this way, we need to make a conscious choice of how we are going to respond. There are basically three options.

Go along to get along. This is the lazy path of the professional coward. A person who chooses to lower their personal standards to those of others who set lower cultural norms becomes a part of the problem. The danger here is twofold. First, substandard performance is extremely dangerous in first responder world, both to ourselves and those we serve. Secondly, succumbing to lower standards dulls your professional edge *forever*. Once you compromise, you've damaged your personal integrity, and are far more likely to begin to rationalize your actions as somehow justifiable in future situations.

Start the change. Be the small stream of excellence that can begin to change the course of the cultural river. Even if you can't change the course of a negative torrent, you preserve your personal integrity. Others may notice, and join you. Each time this happens, the forces of compliance and excellence strengthen, and eventually change the river's course altogether.

Leave. Sometimes the best option is to find somewhere else to work. I've seen organizations that are so far gone that mere exposure to them for any prolonged period is damaging. Leaving a job is always a difficult decision, but it can be a wise choice.

A FINAL WORD FOR SUPERVISORS

I'm finishing up this short column where most culture discussions begin — at the top — with a very simple message to all supervisors and managers.

What you permit, you promote.

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Column

HAA Corner // **Bill Winn**

AAA(-A) Safety

I had difficulty deciding whether to call this the Triple-A, or the Quad-A safety discussion. I believe that neither the American Automobile Association nor the Army Aviation Association of America would object to anything that follows. So just take your pick, because either one sounds better than the "Aptitude/Application/Attitude Approach" to flight safety.

APTITUDE

When we speak of flight aptitude in general, we refer to an individual's ability to understand, to perform, and then to internalize the skills and the knowledge required to control the aircraft and to comply with the all the rules and procedures associated with safe flight in both routine and emergency circumstances.

For the last 22 years of my 27 years as a U.S. Army helicopter pilot, I served as an instructor pilot. During those years, I learned that not just anyone could learn how to fly a helicopter with competence. Many flight students failed their final checkrides, and were either eliminated from flight training, or were set back a class for a "one time only second chance." Some were successful on their second attempt, some were not. Those who failed a second time moved on to serve honorably in other branches of the Army.

The Army Aviation Training Center at Fort Rucker, Alabama, also provided helicopter pilot training to members of the armed forces from other countries. We occasionally bent the rules for some of these foreign flight students. When I was an instructor pilot there in 1978, the story went around that a young officer from a prestigious family from a Far Eastern country was set back not once, but three times in succession before he was finally eliminated from flight training and sent back to his home country — without his wings.

The report was that when he arrived home after failing to learn to fly, he was ceremoniously executed for disgracing both his family and his country. The story (which I have always believed) goes on to state that after that young man's fate became known, no student pilot from that country ever again failed to receive his wings at the Army Aviation Training Center. Instead, their wings were pinned on no matter how many attempts it took to "pass" a final checkride.

Since retiring from the Army in 1996, I've spent 21 years working in the air medical transport industry. Whenever there is a need for a new pilot, I have observed a process of reviewing resumes, selecting candidates for personal interviews, and then flight testing selected final candidates in a manner that leaves no question about their level of aptitude or competence.

APPLICATION

Unfortunately, there is ample evidence that the selection of competent and experienced pilots has not made the air medical industry immune to accidents, including accidents in which pilot error was a major contributing factor. In fact, a review of the National Transportation Safety Board accident reports shows that many air medical helicopter accidents involve faulty decision-making. In short, most of these accidents were preventable.

Whereas "aptitude" relates to a pilot's skills and knowledge, "application" is defined more by decision-making, judgment, and compliance. Air medical flights are conducted with minimal prior notice at any hour of the day or night. Scene flights often involve an ad hoc route in uncontrolled airspace to a destination and landing area that is mostly a mystery until arrival. There are also a variety of factors associated with air medical ops that can combine to apply pressures to complete a flight, somewhat like the pressures associated with military combat operations.

This is an environment that can adversely affect the decision-making, judgment, and compliance behavior of many of the typically "Type-A" pilots who fly air medical helicopters. The sum of the pressures and adverse conditions in such scenarios may be enough to undermine the proper application of the skills, judgment, and limitations that should be applied in determining how to safely proceed when risk increases, or whether to proceed at all.

ATTITUDE

With so little time to thoroughly prepare for the typical patient transport flight, and with so many unknowns associated with many of those flights, an air medical transport pilot and crew must establish and nurture a shared attitude with respect to controlling the risks, both typical and exceptional, that are associated with flight operations. This attitude is founded on a shared recognition of the limits of safe operations as established by protocols, regulations, and established policies.

Whenever such limits are pushed, the pilot and crew must select an alternate course of action that keeps them within the established limitations for operations. When circumstances arise in which the flight cannot be continued within the established boundaries of safe operations, a decision to abort is required.

We should also note that it is not likely that such a shared attitude of conservatism will spontaneously establish itself within an air medical provider organization. This attitude will need to be taught during initial and recurrent training and consistently nurtured by managers at all levels of the organization. And, although I feel that pilots should take the lead as champions of conservative decision-making, I also recognize that there are occasions when a pilot may be the person who most needs to be coached by other crewmembers to make the safest choice when faced with increasing risks during a flight.

Bill Winn is the general manager of the National EMS Pilots Association.

"Unfortunately, there is ample evidence that the selection of competent and experienced pilots has not made the air medical industry immune to accidents, including accidents in which pilot error was a major contributing factor.

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Column

Focus on Safety // **Dan Foulds**

Don't Tickle the Dragon

I wish I could describe what real terror feels like. Words don't suffice. Either you have been there, or it's hyperbole.

Recently, my neighbor lost track of his three-year-old. He ran through his house, gradually becoming frantic. No kid. He ran over to my house, opened the door and yelled, "Is he here?"

"No." We both went out front, and he yelled for his son at the top of his voice. The anguish and despair apparent in that call were very powerful. I witnessed full-blown terror in another human being. I have felt it in myself.

My moments of terror took place in a Chinook in 1987. I was a young co-pilot, and my pilot-in-command (PIC) and I had flown from Fort Bragg, North Carolina, to an airshow in Virginia. The hot humid summer day wore on, and clouds began to build. As we prepared to depart in the gathering dusk, he told me that we would return to base under instrument flight rules.

We planned and filed and got ourselves into the clouds headed home. Unfortunately, we didn't have airborne weather radar and data-linked radar didn't exist. I learned about embedded thunderstorms that day. We were in a large, powerful aircraft — we weighed around 32,000 pounds against a max gross weight of 50,000. We had lots of reserve power. We had heading-select and altitude-hold. We had each other. *We got our butts handed to us.*

When you stumble into a worsening storm two things come to mind. How bad will this god-awful hammering get? And how strong is this helicopter? Thank God Boeing builds a mighty strong machine. I have never been so scared — before or since — as I was that evening. I was so scared I started giggling. And then I started flying away from the course line on the horizontal situation indicator (HSI). My brain quit. If we had been in a light helicopter, the kind we use for helicopter emergency medical services (HEMS), I would be dead.

We turned off altitude hold and gave up on maintaining an altitude. We got slammed up, down, and sideways. The wind gusts put the blades out of phase and the helicopter shook mightily. The rain on the windshield and forward pylon made a roaring sound that mixed with the blood roaring in my head. It was all I could do to maintain aircraft control. My PIC started shaking his head, the expression on his face was one of pure dread.

You only have to learn that lesson once. *Don't mess with a thunderstorm.* When I remember that flight, it invokes imagery. *Don't tickle the dragon!*

I came into HEMS fresh from duty as a flight-lead in the U.S. Army 160th Special Operations Aviation Regiment (SOAR), with an attitude that was spring-loaded to the "go" position. I was a real "can-do" guy. I used to run to the helicopter, and I made inadvertent entries into instrument meteorological conditions twice in my first year of HEMS flying. I was going to *get it done*.

I felt that being a can-do guy made me a better pilot than many of my peers. I was willing to do things that others weren't. There are still people like that in our industry today, and I fear for their safety — and the safety of the teams who climb in with them.

Now, let's talk about thunderstorms. Tangle with a thunderstorm and your aircraft may indeed buffet wildly and might disintegrate. The *Aeronautical Information Manual* covers the topic in detail, but it's hard to get the full effect of what they are saying when you are reading the text safe and warm in an easy chair.

The authors write, "avoid by at least 20 miles any thunderstorm identified as severe or giving an intense radar echo," and also "above all, remember this: never regard any thunderstorm 'lightly' even when radar observers report the echoes are of light intensity. Avoiding thunderstorms is the best policy." I cannot over-emphasize the importance of taking this to heart, but not everyone does.

A HEMS pilot decided that he was going to get home after dropping a patient at a distant hospital. A peer warned him about storms approaching the destination, and the victim ignored the warning. He almost only killed himself, but as he was preparing to depart, the crew popped out of a door and waved to come aboard.

From the National Transportation Safety Board (NTSB) report: "Although the pilot encountered an area of deteriorating weather, this did not have to occur as the pilot could have chosen to stay at the hospital helipad. The pilot, however, decided to enter the area of weather, despite the availability of a safer option. Based on the pilot's statement to the oncoming pilot about the need to 'beat the storm' . . . he was aware of the storm and still chose to fly into it."

The initial mistake was in leaving the distant hospital. The pilot had been offered a van ride and turned the offer down. As he proceeded, he was probably evaluating conditions — thinking he could stop if it got too bad. As he crept closer and closer to the dragon, he might have been thinking, "Well, we made it this far and now we are almost there." He could have decided to land anywhere along the way, but as he was in for a penny, he was in for a pound.

The helicopter crashed in an open wheat field about 2.5 miles east of the home base, killing the pilot and two flight nurses on board.

The pilot in this accident wasn't bad, and neither were the pilots in many similar accidents that can be found in the NTSB's archives. None of them were dumb. These were good, smart souls who fell prey to a bad choice. If you fly, you owe it to yourself to try and understand what it was that led to these choices. You should understand that these folks were just like us. And if they could make a bad choice, so might we.

These pilots tickled the dragon and it ate them. Don't tickle the dragon.

"You only have to learn that lesson once. *Don't mess with a thunderstorm.* When I remember that flight, it invokes imagery. *Don't tickle the dragon!*

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Appeals court sides with U.S. Army on Lakota helicopter buy

The UH-72A Lakota was competitively selected by the U.S. Army in 2006 for operations in non-hostile, non-combat environments. The Army is now using it as a primary training helicopter. **Skip Robinson Photo**

BY ELAN HEAD

The U.S. Court of Appeals for the Federal Circuit has cleared the way for the Army to sole source 16 additional UH-72A Lakotas from Airbus Helicopters, overturning a lower court's injunction against the purchase.

In a decision issued on Jan. 23, 2018, the Federal Circuit found that a Court of Federal Claims judge erred in finding that the Army violated the Competition in Contracting Act (CICA) when it declared the Lakota as its institutional training helicopter. Judge Susan Braden also abused her discretion when she supplemented the administrative record to reach her conclusions, the appeals court found.

The ruling comes after more than three years of legal wrangling in the wake of the Army's Aviation Restructure Initiative (ARI), which, among other things, called for replacing the Army's aging fleet of single-engine Bell TH-67 training helicopters with UH-72A Lakotas.

The Army had competitively selected the Lakota as its Light Utility Helicopter in 2006. The ARI envisioned using existing Lakotas to replace TH-67s, but the Army ultimately determined that to comply with the restructure initiative it would need to increase its Lakota fleet by 110 helicopters, from 317 to 427.

In September 2014, the Army published a sources sought notice declaring its intention to purchase 155 Lakotas on an "other than full and competitive basis." (According to the Federal Circuit ruling, the Army sought Lakotas in excess of its 110-aircraft requirement for potential sales to foreign militaries or other government agencies.)

However, when AgustaWestland North America (now Leonardo Helicopters) filed a legal complaint, the Army instead chose to exercise the remaining options on its 2006 contract with Airbus. When that contract expired, the Army was still 16 helicopters short, and in December 2015 it issued a Justification and Approval (J&A) to sole source those Lakotas from Airbus.

AgustaWestland didn't back down, and in a ruling issued in August 2016, Judge Braden sided with the company. She found that the Army's declaration of the UH-72A as its institutional training helicopter was essentially a procurement decision in violation of CICA, and issued a preliminary injunction giving the Army six months to proceed

with a competitive procurement or issue a revised J&A.

Instead, the Army appealed to the Federal Circuit, arguing that Braden exceeded her jurisdictional authority in questioning an Army policy decision, the ARI. The Federal Circuit agreed with the Army, finding that because the ARI did not direct or even discuss procurement of UH-72A Lakotas, it was not a procurement decision and therefore not subject to Braden's review.

Furthermore, the Federal Circuit found that the Army's J&A was not arbitrary and capricious, but instead provided a "coherent and reasonable" explanation of its decision to sole source the 16 Lakotas. The appeals court therefore reversed Braden's decision and vacated her preliminary injunction.

The ruling is welcome news for Airbus, as it allows UH-72A production to continue at its manufacturing facility in Columbus, Mississippi. In early January, only three Lakotas remained to be delivered under all prior contracts with the Army.

In a statement provided to *Vertical 911*, Airbus declared, "We hope that the appellate court's ruling today will finally end a two-year saga of one contractor attempting to wrestle business from a customer by holding Army readiness hostage. This ruling also removes the threat that Leonardo has held over the heads of our American workers in Mississippi — more than 40 percent of whom are U.S. military veterans — as it has tied up Army procurement long enough to nearly shut down our American production line."

Even as it waited on the ruling, the Army appeared to be taking steps to procure additional Lakotas on the basis of language in the 2017 Defense Appropriations Act, which provided $187 million to purchase 28 Lakotas in support of ongoing mission requirements at the Army Aviation Center of Excellence at Fort Rucker, the Combat Training Centers, and the Army Test and Evaluation Center.

The Army is likely to seek even more Lakotas in the future. In May 2016, it advised the Court of Federal Claims that it had identified a need for an additional 97 Lakota helicopters, although it had not yet decided when or how it would procure them.

When contacted by *Vertical 911* on Jan. 23, a Leonardo Helicopters spokesperson said that the company did not immediately have comment on the matter.

Aurora demonstrates fully autonomous helicopter system

Aurora Flight Sciences recently conducted a successful demonstration of its autonomous helicopter system, which was developed under the Autonomous Aerial Cargo Utility System (AACUS) program of the U.S. Office of Naval Research.

At the Urban Training Center of Marine Corps Base Quantico in Virginia, an AACUS-enabled UH-1H (AEH-1) conducted multiple flights, showcasing its ability to autonomously execute re-supply missions in relevant and austere settings.

AACUS is designed to be an "aircraft agnostic" hardware and software suite, which means it will work on other helicopters and vertical takeoff and landing (VTOL) vehicles, not just the test Huey. AACUS will enable a Marine on the ground, with no advanced training on the system, to utilize a handheld tablet to request and instruct the delivery of supplies.

AEH-1 is fitted with onboard Lidar and camera sensors that enable it to detect and avoid obstacles and evaluate the landing zone. The system processes this information to perform onboard mission, route and path planning to enable autonomous mission execution.

While previous demonstrations have showcased the system's autonomy and interactions with trained operators, this was the first demonstration in which the aircraft performed cargo and utility missions in an operationally relevant training environment with Marine interaction. As part of the demonstration, Marines loaded supplies for the aircraft before clearing the autonomy system for autonomous takeoff.

"The Marines' vision for the future of vertical-lift operation and support is optionally-piloted aircraft," said AACUS program manager Stephen Chisarik. "Aurora's system enables any rotary-wing aircraft to detect and react to hazards in the flight path, and make appropriate adjustments to keep the aircraft safe."

Said Lt.-Gen. Robert Walsh, commanding general, Marine Corps Combat Development Command: "We've developed this great capability ahead of requirements and it's up to us to determine how to use it. The young Marines today have grown up in a tech-savvy society, which is an advantage. We've got to keep pushing and moving this technology forward."

Aurora has developed multiple technologies under the AACUS program, including the digital flight control system that enabled the UH-1/AEH-1 to fly autonomously, and the Tactical Autonomous Aerial Logistics System autonomy technology.

The AEH-1 was granted a special airworthiness certificate by the Federal Aviation Administration in October 2017, allowing it to operate autonomously with only a safety pilot onboard to monitor the controls.

The flights that took place on Dec. 13, 2017, served as the final demonstration to the Office of Naval Research, Department of Defense representatives and other senior officials. It was the culmination of a highly successful five-year Innovative Naval Prototype program. Having completed the third and final phase of the program, AACUS will now transition to the Marine Corps for experimentation and potential acquisition.

Among its other projects, Aurora, which was acquired by Boeing late last year, will be working on electrically powered VTOL taxis for Uber.

Aurora Flight Sciences has installed its AACUS hardware and software suite on a UH-1H, but AACUS technologies will work on other helicopters and VTOL aircraft, too. **Aurora Photo**

New customers, capabilities for CNC Technologies

CNC Technologies was recently selected by the Metro Atlanta Urban Areas Security Initiative to implement a comprehensive airborne counterterrorism solution. **CNC Photo**

BY MJ BRICKEY

The aviation technology and wireless communications company CNC Technologies has recently added a number of new law enforcement and public safety agencies to its growing client roster, while also expanding into work with small unmanned aircraft systems (sUAS) and pre-owned aircraft refurbishment and sales.

Launched in January 2016, CNC provides law enforcement, government, and military agencies with a wide range of surveillance, microwave video downlink, data transmission, and technical support services. As CNC managing partner Ron Magocsi explained, "airborne assets are a critical element in managing public safety efforts," and the services provided by CNC maximize the ability of these assets to provide real-time information to personnel on the ground.

In addition to existing contracts with the New York Police Department, Texas Department of Public Safety, and Swedish National Police, CNC has secured new business with the Los Angeles County Sheriff's Department, Los Angeles Police Department, Michigan State Police, Ohio State Highway Patrol, and Broward County Sheriff's Office.

CNC also recently announced its selection by the Metro Atlanta Urban Areas Security Initiative (UASI) to implement a comprehensive airborne counterterrorism solution. Funded by the U.S. Department of Homeland Security, UASI is a grant program that helps high-density urban areas protect against threats from terrorism.

For the Metro Atlanta UASI, CNC is developing a mission suite designed to enhance regional preparedness and improve emergency response. The turnkey system will support real-time sharing of HD video and data between multiple law enforcement agencies in DeKalb, Clayton, and Gwinnett counties, and in the city of Atlanta, Georgia.

The system will allow law enforcement helicopters to stream live video and data to ground-based command sites, and to authorized users via PCs and mobile devices, explained Alex Giuffrida, who is also a managing partner with CNC. Aerial assets will be able to track ground assets as well, he added.

Meanwhile, CNC is working with Michigan State Police (MSP) to deploy a mobile video network to support the agency's airborne law enforcement operations, including unmanned operations. CNC will design, deploy, and provide ongoing support for the mobile video network, which will centralize live video streams from MSP's Aeryon SkyRanger sUAS fleet and helicopter assets.

Integrated within MSP's mobile command center truck, the system will allow officers to immediately distribute up to four simultaneous feeds to HD monitors, PCs, and handheld devices via local WiFi and satellite, improving their ability to share actionable aerial intelligence.

CNC has also started the process of purchasing pre-owned aircraft from public safety agencies that are upgrading their fleets. The company intends to refurbish and upgrade the mission equipment on these aircraft, then offer them to sale at a competitive price to other agencies looking to expand their capabilities.

"This gives affordable options to agencies all over the world," said Giuffrida.

Giuffrida and Magocsi have extensive backgrounds in aerial surveillance and electronic news gathering. In January 2016, they teamed with Sgt. Eric Weidner — who recently retired from the Ontario Police Department in California — and investor Clay Thom to launch CNC Technologies, with a focus on the public safety sector.

CNC can integrate its technology solutions into customers' existing aircraft, as well as into new aircraft. In addition to its operational clients, CNC has secured contracts with original equipment manufacturers Bell Helicopter, Textron Aviation, and Pilatus Aircraft, and with completion and integration providers Rotor Resources, Sterling Helicopter, Metro Aviation, and AeroServices.

New air medical applications for Flightcell DZMx

Working with Zoll Medical and GCH Aviation, Flightcell has demonstrated the ability of its DZMx to transmit patient information to receiving emergency departments while in flight. **Flightcell Photo**

GCH already uses the Flightcell DZMx to help locate lost people and get weather reports en route. **Flightcell Photo**

BY MJ BRICKEY

The Flightcell DZMx is an all-in-one communications device that streamlines a pilot and crew's ability to connect and exchange vital information with anyone from anywhere. Among other things, the device can now connect to onboard medical monitors by a Wi-Fi connection, enabling the crew to send patient information ahead to receiving emergency departments and physicians.

"Zoll Medical New Zealand Pty. Ltd. worked with [Flightcell] to test their equipment, setting up a Wi-Fi connection on the X Series monitor that communicated with the DZMx and connected Wi-Fi router," said Michael Eddy, Flightcell marketing and communications manager.

He said the device can send 12-lead electrocardiogram (ECG) record data files via a cellular data connection to an email account, and in the near future the Zoll X Series will be able to live-stream this information. All 12-lead ECGs are securely archived in the cloud. The information and files are encrypted and password-protected, and the transfer and storage of the patient information complies with HIPAA and HITECH guidelines.

"Bench testing has been successfully completed with the Zoll X Series monitor and the LifePak 15 monitor — this technology is ready to be rolled out worldwide," he said. "The DZMx device will work with any monitor that is Wi-Fi capable."

According to crewmember Carl Babe of New Zealand's GCH Aviation, "It's going to be of real benefit to the patient if we can transmit ECG data earlier. It's also going to reduce our workload upon arrival."

Eddy explained that the DZMx is permanently installed in the cockpit of an airplane or helicopter hardwired to the aircraft intercom system, enabling pilots and crew to use their microphones with it.

Pilots can initiate and receive telephone calls from anywhere. They can also send and receive messages from anywhere and access the Internet when in cellular range. "It's popular for HEMS [helicopter emergency medical services] to also have a DZMx remote head installed in the cabin so the crew can also make [simultaneous] calls," Eddy added.

The device transmits and receives through cellular networks, when in range, and through the Iridium satellite network, when out of range of a cellular network.

Eddy explained how the device can work during outbound operations. "A crew can receive waypoint information to go direct to the scene," he said. "And, it is becoming increasingly common for the crew to talk directly with people on the ground who are lost or who are injured — if the injured parties have a mobile phone with them and cellular coverage."

GCH and other search-and-rescue [SAR] organizations have used the device to find people by having the lost person direct the helicopter to their location. GCH crews also use the Internet connection to get weather reporting and decide what is the best route.

The device has been used many times by rescue teams to directly communicate with people in the difficult mountainous regions of the United Kingdom. Bristow Group uses the DMZx in its offshore oil-and-gas operations throughout the North Sea, Nigeria, and U.S. Gulf of Mexico, and in its U.K. SAR operations.

"Every one of our U.K. SAR helicopters has a Flightcell DZM unit on board for satellite and cellular telephone communications, but its primary use is in providing 'in flight' real-time tracking of our SAR helicopters," explained Ian Middleton, a Bristow engineering manager, in a written testimonial for Flightcell.

The device reports the aircraft's position every 15 seconds when in cellular range using Flightcell's Cellular IP Tracking technology. This is cheaper than cellular SMS and significantly cheaper than satellite tracking.

Eddy expects that the device will be able to transmit GPS-tracking data to meet the Federal Aviation Administration's helicopter air ambulance mandates coming this year.

Ka-226T sees growing market success

The first serial produced Ka-226T, "241 Black," has been used for aircraft trials. It was unveiled to members of the media in a medical configuration in Mil Moscow Helicopter Plant in November 2017. **Babak Taghvaee Photo**

BY BABAK TAGHVAEE

With a firm order from India for 197 examples, the light twin-engine Kamov Ka-226T helicopter is seeing growing success in the international as well as domestic Russian market.

Designed by Russian Helicopters' Kamov Design Bureau, the coaxial-rotor Ka-226T (NATO reporting name Hoodlum D) is an advanced modification of the Ka-226, which saw only limited success within Russia and the Ukraine due to its inadequate performance. The Ka-226T is equipped with a pair of Safran Helicopter Engines Arrius 2G1 turboshaft engines, each delivering 580 shaft horsepower for improved performance in hot, high, and humid environments.

Compared with Ka-226, the Ka-226T has a higher cruise speed of 185 kilometers per hour (100 knots) and a maximum speed of 220 km/h (119 kts). Its service ceiling has increased to 5,700 meters (18,700 feet), and it can hover in ground effect at a maximum altitude of 4,900 m (16,075 ft). Its maximum range is 470 km (290 miles).

The Ka-226T has a maximum takeoff weight of 3,600 kilograms (7,935 lbs). It can carry up to seven passengers in a passenger-carrying configuration, or one patient and two medical personnel in an intensive care medical configuration. The aircraft can also be used for search-and-rescue (SAR) or police work with mission equipment including a searchlight, rescue hoist, loudspeakers, forward-looking infrared camera, datalink system, and night vision goggles.

According to Sergey Mikheyev, chief designer of the Kamov Design Bureau, the Ka-226T's compact footprint and lack of tail rotor — both enabled by its coaxial main rotor design — make it ideal for medevac operations in urban areas. Sergey Mikhailuk, another member of Ka-226T design team, added that the absence of a tail rotor and presence of dual vertical stabilizers on the tailboom provide great stability in mountainous regions, especially during hovering operations.

Following to success of the Ka-226T trials in India, a binding order for 197 helicopters was signed in October 2016, calling for 60 helicopters to be produced in Russia and the rest in India under license by Hindustan Aeronautics Limited (HAL). Of these aircraft, 133 will enter service with the Indian Army, while the remainder will be used by the Indian Air Force for various missions including medevac and SAR.

Russian Helicopters CEO Andrey Boginsky said that the final contract for joint production of 137 Ka-226Ts in India is expected to be signed in first quarter of 2018. HAL will hold a 50.5 percent share in the joint venture, while Russian Helicopters will hold the remaining 49.5 percent, he said. Russian Helicopters and HAL are also pitching a Naval variant of the Ka-226T to the Indian Navy.

Iran has also expressed interest in the aircraft for use by the Iranian Ministry of Health as an air ambulance. In 2016, Iran's Industrial Development and Renovation Organization Group and Russian Helicopters signed a memorandum of understanding for licensed production of the Ka-226T by Iranian Aircraft Manufacturing Industrial Company; however, no contract has been signed due to Iran's severe financial difficulties.

Other potential customers for the aircraft include Kazakhstan and Jordan, which have reportedly expressed interest in an air medical version of the aircraft; China, which may be interested in a passenger-carrying version; and Mexico, which may have use for an agricultural version. Additionally, Egypt, which is now operating Russian Helicopters' Ka-52K naval attack helicopter, may procure at least 24 Ka-226Ts for pilot training and SAR missions.

Despite being targeted primarily toward the international market, the Ka-226T has also drawn the attention of Russia's Ministry of Emergency Situations and the natural gas company Gazprom, which ordered 16 and 18 examples, respectively. All told, the Ka-226T has now logged 231 firm orders, with more on the horizon.

TSB determines cause of 2015 Helijet near-collision

In an investigation report (A15P0217) released on Dec. 20, 2017, the Transportation Safety Board of Canada (TSB) determined that flying under night visual flight rules (night VFR or NVFR) without adequate visual reference to the ground, along with a lack of crew coordination and ineffective standard operating procedures (SOPs), led to a Sikorsky S-76 nearly colliding with terrain in Tofino, British Columbia.

On Nov. 15, 2015, a Helijet International S-76C+ departed from Vancouver, B.C., on a night VFR medevac flight to Tofino-Long Beach Airport with two pilots and two paramedics on board. The intended landing area was a temporarily lit helipad at the airport.

While on final approach to the landing area, the flight crew lost control of the helicopter, which descended about 67 feet below the landing area along the nearby shoreline. The crew managed to regain control of the helicopter three feet above ground over the beach. They then flew back up to conduct a second approach, while still experiencing flight control difficulties. On the second approach, the helicopter landed successfully. There were no injuries.

The investigation found that the NVFR flight was conducted without sufficient ambient or cultural lighting (e.g., lights on buildings and roads) needed to maintain adequate visual reference to the ground. In addition, the flight crew did not conduct the required briefings. As a result, by the time of the final approach, neither crewmember had developed a correct or complete understanding of the characteristics and challenges of the landing site.

When the pilot who was flying the helicopter realized the location of the landing area was closer than expected, the large control inputs made to adjust descent angle and speed resulted in a hazardous approach profile. As both flight crewmembers were occupied with maintaining visual reference, the danger went unrecognized.

The investigation also found that the company's SOPs provided little guidance in a number of areas. This contributed to poor decision-making and coordination.

The TSB said the investigation again highlights the risks of flying under NVFR without lighting sufficient to maintain adequate visual reference. Transport Canada (TC) regulations do not clearly define what visual references are required at night. Many pilots believe that it's acceptable to fly at night as long as the reported weather conditions are suitable, regardless of lighting conditions.

During the investigation (A13H0001) of a 2013 fatal helicopter accident, the TSB made a recommendation (A16-08) for TC to clearly define the visual references required to reduce the risks associated with night VFR flight. TC indicated that it would initiate educational activities and a regulatory amendment. However, until specific details about the proposed regulatory changes are fully known, the TSB said it couldn't evaluate whether those actions would fully address the safety deficiency. As such, TC's response was assessed as having "satisfactory intent."

The TSB said the Helijet occurrence was the result of the risks of night operations not being effectively mitigated by the crew, and more broadly by the company. It said this highlights the larger, ongoing concern of safety management and oversight, an issue that continues to be on the TSB Watchlist.

While Helijet had implemented a safety management system, at the time of the occurrence it was not fully developed and had not been assessed by TC.

Following the occurrence, Helijet reviewed its SOPs and increased employee training, specifically on crew resource management, night VFR operations, the black-hole effect and unprepared landing sites. The company also developed a risk management plan for NVFR operations and will be providing night vision goggles to its flight crews.

The Tofino-Long Beach Airport, meanwhile, has installed the necessary infrastructure for night operations and was fully night-certified by TC in January 2017.

AW109 Trekker receives EASA certification

In December 2017, Leonardo announced that its AW109 Trekker had received type certification from the European Aviation Safety Agency and that deliveries were to begin in the first quarter of 2018.

Leonardo's new light-twin has been designed to further strengthen the company's position in this key market segment — and meet the demand for greater capability, versatility and cost-effectiveness in public service and utility missions.

The Trekker is based on the AW109/Grand range of helicopters, and is the company's first light-twin to come with skid landing gear. The Genesys Aerosystems glass cockpit can be configured to meet a variety of customer requirements, from single-pilot VFR (visual flight rules) to dual-pilot IFR (instrument flight rules). To help reduce pilot workload in challenging environments and demanding weather conditions, the cockpit display system has been designed to provide pilots with only necessary information for that part of the flight.

Leonardo said the AW109 Trekker shares the same characteristics of its other light twin-engine helicopters. This includes high productivity, excellent performance and flying qualities, high maneuverability, robustness, advanced navigation capabilities, and high inherent safety. Power is provided by two FADEC (full-authority digital engine control) equipped Pratt & Whitney Canada PW207C turbine engines.

The cabin is the same size as the Grand/GrandNew and can accommodate up to six passengers, or either one stretcher with three to four medical attendants or two stretchers with two medical attendants. An additional passenger can be carried in the cockpit, if required, as the new model is capable of single-pilot operation.

Designed with a high level of safety in mind, the Trekker features a crash-resistant fuel system, crash-resistant crew and passenger seats, and a crash-resistant cocoon-type airframe. Other safety features include full Category A Class 1 performance in hot environments and a 30-minute run-dry main gearbox.

Leonardo has received orders for more than 40 AW109 Trekkers.
Leonardo Photo

New features enhance 135ACM aviation management software

BY MARIO PIEROBON

Safety is a matter of control, and clear and comprehensive oversight of flight operations leads to improved safety and regulatory compliance. There are multiple core elements associated with the control of flight operations: pilot compliance, aircraft airworthiness, flight conditions, and risk assessment.

The role of information technology (IT) is to automate and integrate all these elements. One of the limitations of aviation IT, however, is that software solutions often come from different suppliers using legacy technologies that are not immediately compatible, resulting in barriers to integration. It is with the aim of providing integrated, real-time data in all key areas that the 135 Air Carrier Management (135ACM) software suite has been created.

"With 135ACM we wish to redefine aviation control and oversight systems," said Wolf Zon, senior design and development director for 135ACM. "Core to its development is the fact that this system has been created by a [14 Code of Federal Regulations part] 135 air carrier operator with decades of experience in the industry."

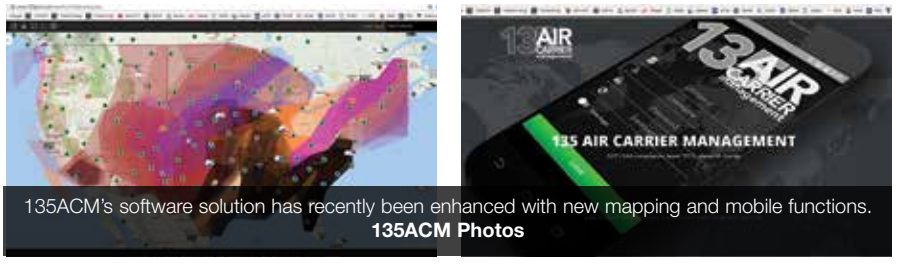
He continued, "I remember trying to manage a large air ambulance fleet via Excel and FileMaker Pro. We were so severely limited by a lack of technology that a massive white board on the wall was our principal key maintenance status indicator, along with stacks of Excel documents and grabbing all of the pilot record books. Locking four people in the conference room for days preparing for an FAA [Federal Aviation Administration] audit was the rule. Tribal knowledge and the hard work of many people was all that kept us safe and legal."

135ACM is an integrated solution for aviation organizational management, flight operations oversight, maintenance, and associated requirements. It provides an array of competencies including pilot, crew, and flight tracking; record keeping; aircraft maintenance; command and control; dispatch; and operations control. The software further enables flight quoting, scheduling, mobile apps, finance, and reporting, and also includes a safety management system (SMS) program.

135ACM was recently enriched with a new standard in aviation mapping solutions, the company's proprietary "NexGenMap." This feature is particularly noteworthy as it provides significant benefits to helicopter emergency medical service (HEMS) operations; it combines all of the facets needed to plan, coordinate, oversee, and manage airborne flight operations.

When a HEMS call is received and the mission dispatched, the flight can be planned and the team has the opportunity to identify the HEMS landing zone on the map. They can even zoom in on the site to street-view mode, allowing an actual "walk-through" by moving their personal device around. The NexGenMap also automatically calculates the minimum safe altitude for a helicopter flight given the terrain conditions along the route and all the specific obstructions.

"The 135ACM suite is built utilizing the latest developments in code technology. Our software development approach has always been to write in the language of mobility. As a result, we have the ability to evolve to meet client needs and requests," added Zon.



135ACM's software solution has recently been enhanced with new mapping and mobile functions.
135ACM Photos

Saving lives through advanced training

BY HILARY ROMIG

Orlando, Florida-based The Rescue Company 1 (TRC1) continues to expand its education offerings for emergency, flight, and transport medicine professionals.

Founded in 2015 with the goal of providing a variety of crucial courses in one place, TRC1 is open to physicians, nurses, paramedics, and respiratory therapists. "We are a one-stop shop, able to provide all the required education for any medical professional wanting to work in the critical care flight transport environment," said TRC1 founder Carlos Tavarez.

Each course offering aims to advance knowledge and skill sets for emergency situations. The most comprehensive offering is the Critical Care Transport Academy, designed to prepare paramedics and nurses for the realities of critical care transport teams. The course meets online for seven days, followed by five-days of in-person training. It includes National Association of Emergency Medical Technicians (NAEMT), American Heart Association (AHA) and Neonatal Resuscitation Program (NRP) certificates, as well as shallow water and helicopter underwater egress training.

TRC1 also offers a five-day, 40-hour air medical crew course that covers topics such as aircraft and landing zone safety and crew communications, in addition to patient assessment and management of medical emergencies. Other, specialized offerings include an advanced airway management class, exam review classes, and advanced cardiovascular life support (ACLS) and pediatric advanced life support (PALS) classes.

Tavarez is a registered nurse with 12 years of nursing experience, 18 years of paramedic experience, and a long list of certifications. He is also a motivational speaker and seminar leader, and is the primary educator for the company. Joshua and Tim Granada are additional qualified instructors who specialize in paramedics and medical technology.

Courses are augmented by a patient simulator. "The simulator is the same [dimensions as] an EC135 patient care area and teaches how to provide excellent medicine in difficult places," said Tavarez. The goal is to provide realistic training that better prepares students for the field — with the ultimate aim of saving lives through advanced training.

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Life Flight Network: Celebrating 40 Years of Service

Life Flight Network, which began operations in 1978, was one of the country's first West Coast, hospital-based air ambulance programs.

STORY & PHOTOS BY SKIP ROBINSON

As Life Flight Network (LFN) prepares to celebrate its 40th anniversary, we look back on the evolution of this lifesaving service.

LFN, which began life in 1978 as Emanuel Life Flight in Portland, Oregon, was one of the first West Coast, hospital-based air ambulance programs in the United States. Utilizing an Aérospatiale Alouette III, a light single-engine helicopter, LFN flew 121 patients in its first year of operation.

Today, Life Flight is the largest non-profit air ambulance company in the United States. It has 23 rotorcraft bases across four Western states (Washington, Oregon, Idaho and Montana) and employs nearly 600 people. However, its mission profile is the same as it has always been: to provide critical care transportation to ill or injured patients in as safe and efficient a manner as humanly possible.

Legacy Emanuel Medical Center (then Emanuel Hospital) founded Life Flight in response to community need, and the firm belief that trauma victims could be saved by reducing the transit time to a hospital and its specialized care. After several years of successful operation, three major health systems in Oregon brokered a deal to form a consortium flight program. As a result, in 1993, Emanuel Life Flight merged with Aircare, a Providence Health System flight program, and joined forces with Oregon Health & Science University to create Life Flight Network.

The next major change occurred in 2006. To strengthen itself within a changing air medical market, the three healthcare providers behind the program decided to change the governance of LFN from a hospital structure to a standalone company. On Oct. 1, 2007, Life Flight began operating as its own entity.

In 2009, Saint Alphonsus Life Flight of Boise, Idaho, joined Life Flight Network. This well-known program, which operated in Idaho and Oregon, had begun in 1986 and had its own strong reputation within the communities it served.

From 2009 to 2016, several more bases were added to LFN's four-state operating area. This includes six (five in Washington state, one in Montana) that were added in 2016 when Northwest MedStar became part of LFN. Northwest also added in-house neonatal transport capabilities to Life Flight Network's existing services. And it brought its own rich history: Northwest had formed in 1994 when Sacred Heart's Heartflight and Deaconess's Lifebird air transport programs merged.

LFN's helicopter fleet currently includes 21 Leonardo AW119Kx models, one Leonardo AW109E and seven Airbus H135s. The company also has nine Pilatus PC-12NG fixed-wing aircraft and several ground ambulances. LFN operates under its own U.S. Federal Aviation Administration part 135 air carrier certificate; however, its Boise-based fixed-wing service is provided by Jackson Jet Center.

Already accredited by both CAMTS (Commission on Accreditation of Medical Transport Systems) and NAAMTA (National Accreditation Alliance of Medical Transport Applications), in 2017 LFN gained Level 2 accreditation from IS-BAO (International Standard for Business Aircraft Operations). These achievements highlight the company's ongoing commitment to pursuing the safest operations possible.

LFN transports around 15,000 patients a year and has been recognized for its public outreach: it completed over 600 events in 2016 alone. Letting the public see the aircraft and talk to the crews gives people the ability to ask questions and gain a better understanding of what Life Flight Network does on a daily basis.

LFN's employees have also been key to its success over the past 40 years. Its team of nearly 600 employees supports the organization's efforts in the air and on the ground. All are passionate about the mission and the safety of its patients.

For eight years in a row, LFN has been recognized as one of the best large non-profits to work for in Oregon. In 2016, for the second time in five years, it was ranked No.1 (out of 22,000 eligible organizations). Michael Griffiths, chief executive officer, explained why this honor is so significant: "The culture within Life Flight Network is something our employees are very proud of. We come to work every day and give our best effort, and it shows in our employees and the service we provide to our patients and customers."

The past 40 years have been a long but constructive journey. As LFN's leaders look ahead, there are great opportunities to expand the company's footprint and enhance the air medical services it provides. However, the end goal will always be to provide patients with exceptional care and to help save the lives of those who might not survive without the intervention of Life Flight Network.

LFN has consistently been ranked as a top place to work, reflecting the passion of its employees for the air medical mission.

With bases across four Western states, LFN currently transports around 15,000 patients a year.

RotorBits


A DJI Phantom 4 small UAS collided with a U.S. Army Black Hawk in September 2017. **NTSB Photo**

NTSB says drone operator errors caused collision

In a report published on Dec. 14, 2017, the National Transportation Safety Board (NTSB) in the United States determined that the operator of a drone that collided with a U.S. Army helicopter was at fault. The operator failed to see and avoid the helicopter as he was intentionally flying the drone out of visual range and did not have adequate knowledge of regulations and safe operating practices.

The incident took place near Hoffman Island, New York, on Sept. 21, 2017, when a DJI Phantom 4 small unmanned aircraft system and a U.S. Army Sikorsky UH-60M Black Hawk collided at an altitude of about 300 feet.

The helicopter landed safely but the drone was destroyed. A 1.5-inch dent was found on the leading edge of one of the helicopter's four main rotor blades and parts of the drone were found lodged in the helicopter's engine oil cooler fan.

The drone operator was unaware of the collision until an NTSB investigator contacted him. The operator was also not aware of temporary flight restrictions that were in place at the time because of presidential travel and a United Nations General Assembly session.

The drone operator was flying recreationally and did not hold a Federal Aviation Administration remote pilot certificate.

The full investigative report is available on the NTSB website by searching for Incident No. DCA17IA202A.


A 1.5-inch dent was found on one of the Black Hawk's main rotor blades. **NTSB Photo**

Austrian MoD takes flight with DART floats

BY OLIVER JOHNSON

The Austrian Ministry of Defence is now able to perform missions over water with its fleet of 23 Agusta-Bell AB212s thanks to a customized flotation and life raft system developed and manufactured by DART Aerospace.

The aircraft are typically used by the Austrian MoD to respond to emergencies that require the transport of troops or civilians, or a medevac capability.

The need for the floats came from a United Nations request for the Austrian MoD to operate their AB212s in a medevac role in regions requiring flights over sea — which necessitated a flotation system. Procuring and installing the required medevac equipment was a relatively straightforward process; installing a flotation system was less so.

"We looked into what we can do through our general staff to bring a flotation system into our helicopter, but it would be a long project and expensive," said Alexander Deim, an airframe project manager with the Austrian Armed Forces. "In 2015 we came to Adrien [Dillard, DART's territory manager EMEA & Russia]. He met us in Austria, and we started the project that September."

The flotation system is comprised of a bag system and life raft, mounted on customized skids, and fixed provisions within the helicopter — including switches, wiring, and the ability to switch out the aircraft's standard skids with the customized versions carrying the flotation bags. DART has installed the fixed provisions required to operate the floats on each of the Austrian MoD's 23 AB212s, and the service will ultimately have four sets of the customized skid/bag systems for use across its fleet.

The development process was completed in three phases, said Dillard. The first was to complete in-depth discussions with the Austrian MoD to understand what exactly they wanted to do with the helicopters, and what the configuration of the system needed to be to achieve it.

Simplicity of operation was key to the Austrian MOD.

"It had to be very simple for us, with few parts; we wanted one special switch within a box that could operate the whole system — nothing more," said Deim. "[The system] also had to be interchangeable between each helicopter."

The Austrian Ministry of Defence worked with DART Aerospace to develop a customized flotation and life raft system for its AB212 fleet. **DART Photo**

The second phase was to establish the differences between DART's standard flotation system and the flotation system required for the customized aircraft.

"Because this is a heavily modified aircraft, we couldn't install our system straight in — we had to modify it," said Dillard.

The modifications included making the system night vision compatible, and adjusting the position of one of the two bottles used to provide helium to the floats and life raft.

The third phase was completing the manufacturing and modifications in-house. Dillard said the Austrian MoD was very interested in the manufacturing and maintenance process, so DART hosted them at its facility in Vista, California.

"We organized a visit to show them the manufacturing process, to show them how it's done, how it's maintained," he said. "We also performed an inflation test of the system in the facility, all to show them exactly what it is."

The first installation of the entire system took about three weeks, with a good part of that time spent ensuring the modifications worked well with the helicopter's existing systems. In March 2017, the first aircraft performed a flight test with the system.

For the Austrian MoD's pilots, the new system required a bit of adaptation due to the new height of the landing gear — which was about 8.5 inches (22 centimeters) taller than the standard landing gear to give space to deploy the flotation system — and a slight shift in the aircraft's center of gravity to the skid's different length.

"There was no problem, though," said Arnold Gratzer, an airframe engineer with Austrian Armed Forces. "The pilot said it was quite silent to fly, there were no vibrations — it was good."

The height of the new skids did present a challenge during the design process, though — the previous skids were so low that no step was required on the skids themselves to access the cabin. The new skids called for a step to be designed — one that could automatically fold up when the float inflates.

According to Austrian MoD, it takes about five hours to switch their AB212s standard skids with the flotation skids.

The installation of the flotation system is the latest in a series of modifications the Austrian military has made to its AB212 fleet. Most recently, it performed a major upgrade to the aircraft's avionics systems in 2014.

The debut of the new system in the fleet last year represents the continuation of a 30-year relationship between the Hawkesbury, Ontario-based aviation solutions provider and the Austrian MoD. Previously the two have worked together to develop Bear Paws for the Austrian fleet, and looking ahead, DART is now developing a cargo floor for the service.

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LEONARDO HELICOPTERS

S-70i Firehawks headed to SoCal

The L.A. County Fire Department is supplementing its existing fleet of S-70A Firehawks with new S-70i models. San Diego will also be acquiring an S-70i for firefighting. **Skip Robinson Photo**

In December 2017, at a ceremony in Coatesville, Pennsylvania, Sikorsky delivered two S-70i Black Hawks to representatives from the County of Los Angeles. Each Black Hawk will be customized to a Firehawk configuration to meet L.A. County Fire Department (LACoFD) specifications.

Firehawks are designed to primarily to perform aerial firefighting duties, but can also plan missions, direct other firefighting aircraft, and provide emergency medical service transport, search-and-rescue and logistical support.

The S-70i Black Hawks will each receive a 1,000-US gallon (3,785-liter) water tank, extended landing gear, single-pilot cockpit layout and a medically equipped interior. Once both ships are completed, LACoFD will have a fleet of five multi-role Firehawks.

The S-70i variants will differ from the department's existing S-70A aircraft in several ways. The S-70i model has: wide-chord rotor blades, which increase payload and maneuverability; enhanced engine power; a stronger airframe; a digital cockpit with flight management system, which benefits situational awareness; and an integrated vehicle health management system, to monitor the aircraft's operational health. Among the improved safety features, the S-70i has a terrain and obstacle avoidance system, which alerts aircrews to the proximity of potential hazards on the ground.

"We are very happy to take delivery of these two new Firehawk aircraft," said Thomas Ewald, deputy fire chief of LACoFD's air and wildland division. "With the recent catastrophic wildland fires in L.A. and the Southern California region, the need for additional, effective firefighting resources, such as the S-70i Firehawk, is readily apparent.

"These two additional aircraft will enhance our existing fleet and strengthen both our day and night aerial firefighting capability, ultimately improving our ability to protect the lives and property of our citizens."

Soon after the LACoFD delivery, Sikorsky received notice that the City of San Diego intended to purchase one S-70i Black Hawk in a baseline configuration. After delivery, the helicopter will be modified to a Firehawk configuration and will have equipment and capabilities similar to the LACoFD's new machines.

Brian Fennessy, fire chief for the San Diego Fire-Rescue Department, said the Firehawk configuration is the most-capable multi-mission firefighting helicopter available, and has proven military-grade capabilities, making it the kind of helicopter required for today's firefighting missions. "Fires are spreading faster and getting larger," said Fennessy. "The need for aircraft to carry more water has become critical."

"When configured for its aerial firefighting mission," said Dan Schultz, president of Sikorsky, "the Firehawk helicopter will give the city of San Diego a state-of-the-art platform proven to fight fires from the air and perform other life-saving missions. This aircraft's military pedigree, unique equipment and advanced onboard systems will enable San Diego to perform these high-endurance missions with safety and reliability."

Commenting on the city's decision to purchase the S-70i, Mayor Kevin L. Faulconer said: "As wildfires continue to ravage our state, we must do everything in our power to make sure the San Diego region is as prepared as possible for the next major fire. We must continue to ensure our firefighters have the most advanced tools at their disposal to keep San Diegans safe. This new Firehawk helicopter is going to take our aerial firefighting capabilities to the next level."

Salute to Excellence Awards recognize life-saving achievements

Riverside County Sheriff's deputies Eric Bashta and Jerry Osterloh are among the winners of this year's HAI Salute to Excellence Awards. **HAI Photo**

The Riverside County (California) Sheriff's Department, LifeFlight of Maine, Christchurch Helicopters, and Caribbean Buzz are among the organizations represented by this year's Helicopter Association International (HAI) Salute to Excellence award winners.

The awards, which recognize outstanding achievements in the helicopter industry, will be presented during HAI Heli-Expo 2018, Feb. 26 to March 1 in Las Vegas, Nevada.

Riverside County Sheriff's deputies **Eric Bashta and Jerry Osterloh** will receive the MD Helicopters Law Enforcement Award for actions they took on the night of Jan. 11, 2017, when they responded to a call for assistance by a California Highway Patrol officer who had stopped a suspected intoxicated/reckless driver.

According to an account supplied by HAI, as the helicopter approached the scene, tactical flight officer Osterloh observed the driver remove a rifle from the cab of his pickup truck and fire shots at the patrol officer and his vehicle before fleeing.

Bashta and Osterloh pursued the suspect's truck, broadcasting its location, speed, and direction over the radio. The suspect left the freeway and entered a suburban neighborhood, stopping in front of a residence. At that point, the suspect began firing at the helicopter orbiting 600 feet overhead, shooting 60 to 80 rounds at the deputies.

The deputies held position, continuing to broadcast the suspect's actions and location as he entered the home, then came back outside repeatedly. After approximately 30 minutes, a SWAT deputy witnessed the suspect exit the building and engaged him, ending the threat. Due to Bashta and Osterloh's efforts, no officers or members of the public were injured, and the suspect's girlfriend and children, who had been in the truck with him, were also uninjured.

Jonathan "JR" Roebuck, Remote Access Project manager for Lifeflight of Maine and MedComm, will recieve the Airbus Helicopters Golden Hour Award for his work in the creation of more than 120 remote access landing zones (LZs), all on private land, that provide sites where helicopters can land to assist in rescue operations.

With an extensive Atlantic shoreline, hundreds of coastal islands, dense forests, mountains, and extreme temperatures, LifeFlight of Maine operates in one of the most complex aviation environments in the country. In many cases, it previously took up to eight hours for a patient to reach a hospital. In dire situations, minutes literally make a difference between life and death, and the Remote Access Project LZs provide helicopters with space to land in remote areas.

Christchurch Helicopters (CH), of Christchurch, New Zealand, will receive the Sikorsky Humanitarian Service Award for work the operator performed in the aftermath of a devastating 7.8-magnitude earthquake, which shook New Zealand's South Island Nov. 14, 2016. Ruptures occurred on multiple fault lines in a complex sequence that lasted for about two minutes, causing massive landslides and destroying roads and rail links.

CH crews were among the first to arrive in Kaikoura, a seaside tourist community that was completely cut off from the rest of the country. Thousands of residents and tourists were stranded in an area with damaged infrastructure and no way of replenishing supplies. Within six hours, CH was transporting urban search-and-rescue personnel to Kaikoura, and starting to rescue more than 130 stranded Chinese tourists.

Subsequently, CH worked with New Zealand's Ministry of Civil Defence & Emergency Management on a coordinated aerial response program, which involved the transportation of roughly 1,300 workers, delivery of vital cancer medications, and flying a plumber to an isolated farmhouse where a young mother was stranded with her baby and had no water or sewage.

Maria Rodriguez, of St. Thomas, U.S. Virgin Islands (USVI), an owner/operator and pilot with Caribbean Buzz, will receive the Appareo Pilot of the Year Award. In late summer 2017, Rodriguez's home of USVI was in the path of both major Caribbean hurricanes — Hurricane Irma first, followed by Hurricane Maria a few weeks later.

With roads impassable after Hurricane Irma, she hiked for two hours from her safe shelter to reach the airport. Her hangar was damaged, but the helicopters had survived unscathed. She rolled them onto the ramp and immediately began to fly support missions wherever she could.

As Hurricane Maria bore down upon her home again, Rodriguez moved her helicopters to a reinforced hangar in Puerto Rico. As quickly as possible after the storm passed, she returned to the USVI to again fly support missions.

Also being recognized this year are **John H. Williams**, recipient of the W.A. "Dub" Blessing Flight Instructor of the Year Award; **Charles "Chuck" Hagen**, recipient of the Rolls-Royce Excellence in Helicopter Maintenance Award; **Frank Colucci,** recipient of the Lightspeed Aviation Excellence in Communications Award; **Claude Vuichard**, recipient of the BLR Aerospace Safety Award; and **James Russell Spray**, recipient of the Bell Helicopter Lifetime Achievement Award.

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Ventura County Aviation Unit's Copter 7, a Bell 205 "Super Huey," led the initial nighttime attack of the devastating Thomas Fire. **Skip Robinson Photo**

ATTACKING THE FIRESTORM

Ventura County helicopter crews were the first on scene at the Thomas Fire, the largest of the devastating wildfires that swept through Southern California in December. They told us what it was like to face "the Armageddon of all fires."

By Dan Megna

1

In Southern California, the forecast of a Santa Ana wind event is a sobering prognostication, especially for public safety officials and those living in the wildland-urban interface. These most often occur in the cooler months, bringing multi-day periods of strong, erratic northeast winds, hot dry conditions and single-digit humidity to the mountains, inland valleys and coastal regions, creating exceptionally dangerous fire conditions.

On Dec. 2, 2017, the National Weather Service (NWS) issued a "red-flag warning" for an especially strong and long-duration Santa Ana event to affect the coastal and mountain areas of Southern California, from Santa Barbara to San Diego.

In Ventura County, around 40 miles northwest of Los Angeles, officials implemented their action plan for such instances: increasing staffing of critical public safety personnel and strategic positioning of resources to maximize emergency response.

By Dec. 4, the region was experiencing the effects of the Santa Ana winds. While those in coastal communities and lower elevations may not have necessarily been enduring their full wrath, just a few miles inland, winds were significantly stronger, blowing 30 to 50 miles per hour (50 to 80 kilometers per hour) and forecast to increase after dark.

That evening, just after sunset, Ventura County Fire Dispatch began receiving calls of a fire start in a rugged canyon north of

the community of Santa Paula, 12 miles (20 km) east of Ventura. This is a rural and agricultural setting nestled between steep mountains and miles of rolling hills extending west all the way to the coast.

Fueled by exceedingly dry grasses, brush and chaparral, and pushed by winds gusting to 70 mph (113 km/h), the flames rapidly spread southwest across the terrain. This was the beginning of the Thomas Fire — a blaze which, for over one month, wrought terror and destruction over an expansive two-county area, ultimately earning the distinction as the largest wildfire in the state's history.

Within minutes, fire crews were racing to the scene to mount an initial attack. Ten miles south at the Camarillo Airport, crews at the Ventura County Aviation Unit (VCAU) had already pushed two of their firefighting helicopters from the hangar and were spooling up.

During these red flag events, VCAU staffs two helicopters 24/7, each equipped with 375-gallon Simplex tanks. One aircraft is assigned as a dedicated fire asset crewed by a pilot and a Ventura County firefighter specially trained for the role of fire manager and helicopter coordinator (HELCO). The second is similarly crewed for the fire mission, but also has a three-person rescue and medevac team.

RISK VS. GAIN

"The winds were crankin' that night — 30, 35 knots at the airport," recalled senior pilot Ken Williams, who was piloting Copter 7, a Bell Super Huey. "We took off out of here on goggles just after 1830. Even from a distance I could see the fire clearly. It was in the 'front country,' just below 4,000-foot peaks. With the size of the fire already and the wind conditions I thought, 'Oh no, this is not going to be a good thing."

Pilot Alex Keller and firefighter/paramedic Randy Gilbert were in trail behind Williams in Copter 8, a Bell 205B, and made a similar assessment. Keller recalled, "From the time we were just a couple miles out, I knew it was gonna be a long night. We saw the glow, saw the fire, and it was moving faster than any fire I had ever seen."

1 // In describing the fire behavior over the first few days, Ventura County pilot Alex Keller said, "This was a fire that burned 100 percent aggressive every day and night." **Skip Robinson Photo** **2 //** The dry vegetation and strong Santa Ana winds made the fire explode overnight, driving it over 10 miles through ranch lands and neighborhoods and ultimately into downtown Ventura. **Jeff Muth Photo** **3 //** In its first days, the Thomas Fire demonstrated extreme fire behavior, at times burning at a rate of nearly an acre per second. **MSAVI Photography** **4 //** Ventura's Copter 7 is shown hot refueling at the Santa Paula Airport on the first night of the Thomas Fire. **MSAVI Photography**

Once on scene, Williams attempted to position Copter 7 so his partner, Fire Captain Mel Lovo, could provide fire assessments to the incident commander. This relatively straightforward mission would prove to be a daunting task, however. Williams said, "As I started to make my way around the fire I got into some 'roll-out' from the winds that were just plain violent!

"I can't tell you how intense the up and down drafts were," he continued. "And I was thinking to myself, at what point are you going to exceed some of the limitations of the aircraft? Torque limits and just the stress to the airframe and components... It's the risk/gain analysis we always talk about and asking yourself how productive are we really going to be?"

Given the conditions, Williams concluded they could not safely commence water-dropping operations. So, while they waited for a helispot to be readied at the Santa Paula Airport for ground fill operations, both helicopters took up orbits at the edge of the fire, remaining close enough to continue making reports on the fire's progress.

Shortly after landing at the helispot, reports came in of a second fire start just a few miles north of the first fire, near the community of Ojai. While some suspected this was a spot fire emanating from the Thomas Fire, both helicopter crews believed it was unrelated and indeed a second ignition. Regardless, this second start was now a priority. Both aircraft took on loads of water and departed to assess the new blaze.

Arriving in Ojai, the crews estimated the fire had grown beyond 15 acres. Again, the winds were howling across the steep, rugged terrain, wreaking havoc with aircraft controllability. Williams said, "I went in for a drop and the wind was so violent I ended up punching the load of water off. The power changes in the aircraft were too substantial to control so in the interest of safety we punched the water off and

1 // A large number of Type-1 helicopters, including civil and National Guard Black Hawks, were critical to bringing the fight to the Thomas Fire. **MSAVI Photography** **2** // During the first week of the Thomas Fire, National Guard helicopters were supporting firefighting efforts on at least five other fires burning in Southern California. **Jeff Muth Photo** **3** // The Santa Paula Airport served as the main helibase for the fire, providing home to at times over 20 helicopters. **MSAVI Photography** **4** // During the first weeks of the fire, smoke conditions severely limited the access of aircraft to flame fronts. **Greg Doyle Photo** **5**// From left, senior pilot Ken Williams, Fire Captain Mel Lovo, firefighter/crewchief Jeff Golden, and senior deputy/crew chief Ryan Poynter, representing VCAU's more than 50 professionals serving the region with multi-mission public safety capabilities. **Skip Robinson Photo**

5

declined to take any further action." Keller had a similar experience.

About this time an L.A. County Fire Department S-70 Firehawk arrived to provide support. The Ventura crews explained their aircraft's performance and control experiences and asked the Firehawk crew, with their larger, more powerful Type-1 machine, to fly into the scene and make their own assessment. They came to a similar conclusion.

The Firehawk was ultimately released to return to L.A. County for fires that were occurring there. Even the Santa Barbara County Sheriff's Air Support Unit, which sent one of its Hueys for initial attack, was forced to turn around and go home. All three agencies are among a growing number authorized to conduct nighttime firefighting operations using night vision goggles (NVGs) under California's FIRESCOPE night flying guidelines.

Keller said, "I knew, even with our helicopters and even if we got everything L.A. County has, we weren't stopping this. Wind-driven fires typically don't get put out by man or machine. They get put out

Cont'd on p.39

AFTER THE FIRE, FLOODS

BY SKIP ROBINSON AND ELAN HEAD

In early January, heavy winter rains brought the month-long, 281,000-acre Thomas Fire to full containment. However, those rains had devastating consequences for the many thousands of people living downstream from the burned area: flooding and mudslides that, as of Jan. 14, had resulted in 20 confirmed fatalities and the destruction of 65 homes.

The loss of vegetation that occurs in high-intensity wildfires exposes soil to erosion, increasing water runoff and moving sediments and debris that can damage homes and infrastructure and threaten community water supplies. The area burned by the Thomas Fire simply had no time to recover before it was inundated with rain starting on Jan. 8 (with Ventura County reporting five inches of rain over a three-day period).

As with the Thomas Fire, helicopters played a critical role in responding to the natural disaster. The first aircraft on scene was an Airbus MH-65 Dolphin from U.S. Coast Guard Forward Operating Base Point Mugu, which was called out to the Carpinteria/Montecito area east of Santa Barbara. The initial request for assistance had come from the Santa Barbara County Air Support Unit, which is based at the Santa Ynez Airport and was still grounded due to weather.

"Our location at Point Mugu was nearly 60 miles away and our weather had already started to improve," recalled pilot LCdr Joe Heal, who was in the aircraft along with pilot-in-command Rolla Boggs, flight mechanic Dylan Langley, and rescue swimmer Josh Piasecki. Even so, he told *Vertical 911*, "the sun had not yet risen and visibility was poor, so the other pilot and I were on and off night vision goggles as we flew northwest toward Montecito."

The crew was tasked first with evacuating two burn victims in the San Ysidro Canyon area whose home had caught fire in a gas leak caused by a mudslide. "As we patrolled the area on subsequent sorties, much of the destruction was immediately evident," Heal said. "Rivers of mud had slashed through neighborhoods, cutting paths more than a hundred yards wide from the foothills all the way to the shoreline three miles south."

Meanwhile, as the worst of the storm passed, the Santa Barbara Air Support Unit was able to launch two hoist-equipped Bell UH-1 Hueys, "Copter 308" and "Air 3," each with a pilot, crew chief, and paramedic. These were the second and third helicopters on scene, and their crews also began conducting medical evacuations and hoist rescues, still in very challenging conditions.

"Ceilings were around 300 feet [with] low visibility," recalled Copter 308 pilot Matt Udkow, noting that he had to delay on the hospital helipad after his first medical evacuation due to a heavy downpour. "It was very difficult to fly, let alone rescue people."

Pilot LCdr Wayne O'Donnell responded to the incident in a Sikorsky MH-60T Jayhawk from U.S. Coast Guard Air Station San Diego. Arriving on scene in Montecito, his crew was directed to a home that had been engulfed in mud.

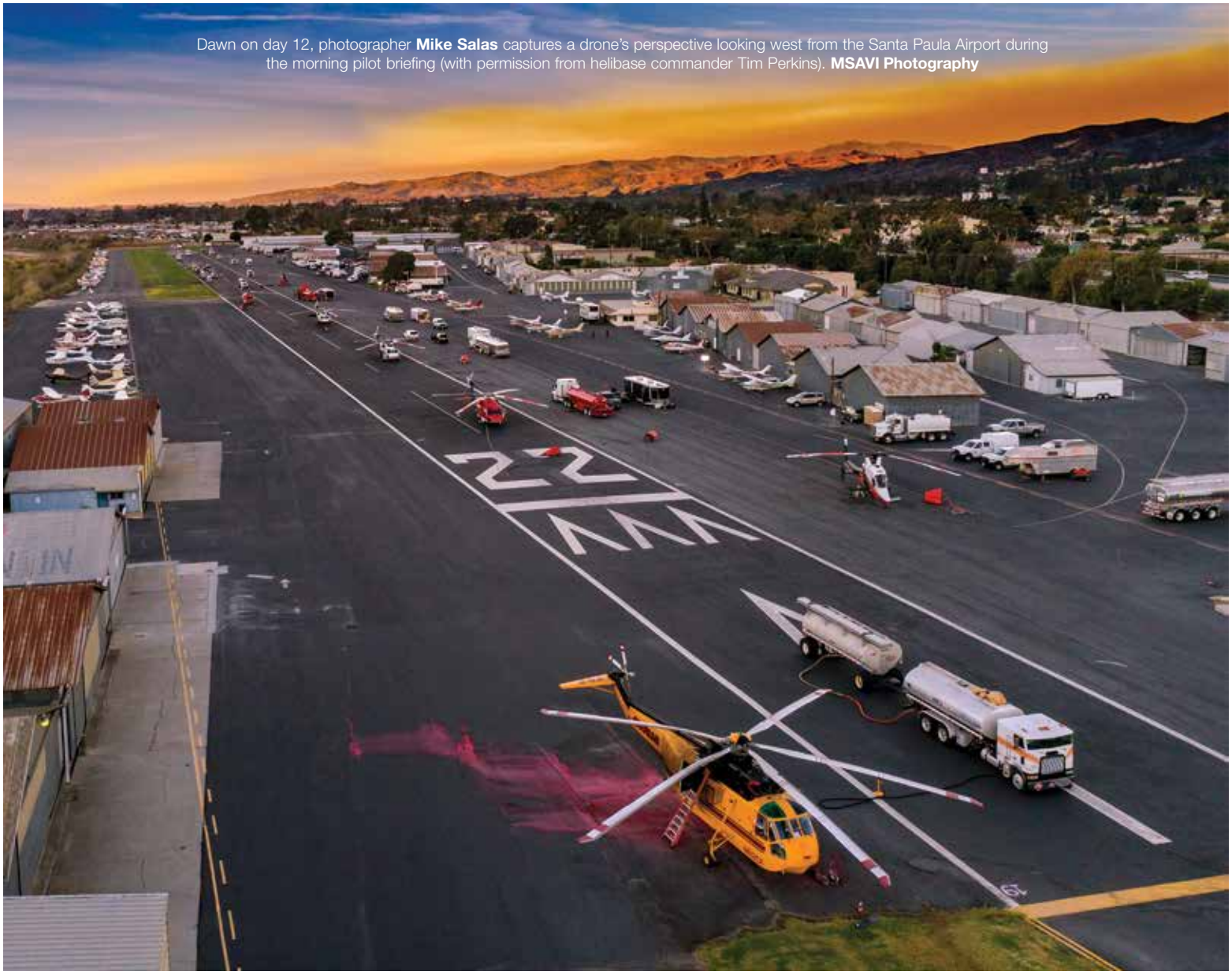
"With visibility of one-half mile in pouring rain, my co-pilot began his first-ever rescue hoist by lowering our rescue swimmers down to the roof of the damaged home from a 110-foot hover, armed only with the knowledge that a family of five were trapped in their attic," he said. The crew extracted all five family members, along with two family dogs, and delivered them safely to the Santa Barbara Airport.

"Copter 6," a Ventura County HH-1H Super Huey, was another one of the first air assets on scene, and conducted rescues as well as reconnaissance flights to update ground commanders on the evolving situation. A total of four Coast Guard helicopters responded to the incident that day, and California National Guard UH-60 helicopters also arrived later in the day to assist with evacuations.

With numerous aircraft operating in close proximity to each other and in poor weather, good communication and a history of collaboration helped keep everyone safe.

"Prior to this event, our Air Station [had] developed an incredible partnership with these entities, which made it easier to coordinate tasking and de-conflict flight paths," explained Heal. "It also paid big dividends in that we understood each other's communications plans and assets' capabilities."

A Santa Barbara County Air Support Unit Bell UH-1H hovers over a neighborhood affected by the mudslides on Jan. 9. "The devastation was widespread and epic in its proportions," said Santa Barbara pilot Matt Udkow, who flew one of the first aircraft to respond to the disaster. **Matt Udkow Photo**



Dawn on day 12, photographer **Mike Salas** captures a drone's perspective looking west from the Santa Paula Airport during the morning pilot briefing (with permission from helibase commander Tim Perkins). **MSAVI Photography**

Cont'd from p.37

when the wind stops. So our goal at that point was to do what we could to help limit the destruction of property and the evacuation of people."

Copter 7 and 8 crews discussed the situation and agreed, with the existing wind conditions and the location of the fires, there was no way to be safe or effective. The decision was made to suspend any plans for air attack any time soon. Instead, they elected to return to their base and wait for conditions to improve. "And it's a good thing we did," said Williams. "Because the conditions worsened into the night where the winds were gusting to 70 mph. Several times it sounded like the roof of our hangar was getting ripped off!"

OUT OF CONTROL

Several hours later, around 3 a.m., Copter 7 and 8 decided to again launch to assess conditions in hopes of returning to the fight. By this time the two fires had merged and exploded into a raging firestorm. Burning embers were being blown miles ahead of the main fire front, creating spot fires that were blowing up into new flame fronts.

> "I KNEW WE WEREN'T STOPPING THIS. WIND-DRIVEN FIRES TYPICALLY DON'T GET PUT OUT BY MAN OR MACHINE. THEY GET PUT OUT WHEN THE WIND STOPS."
>
> *– ALEX KELLER*

In just a few hours the rapidly advancing flames had raced across nearly 10 miles of terrain, incinerating everything in their path, including entire neighborhoods. In spite of the best efforts of 1,000 firefighters on the ground, the fire had now consumed more than 80 square miles and fire officials were reporting zero containment. The front lines of this fight were now in the heart of downtown Ventura and burning to within blocks of the beach.

A new helispot was established in Kimball Park and a Santa Barbara Sheriff's Huey returned to join Copter 7 and 8 for their second attempt to attack the fire. The Santa Barbara aircraft and Copter 8 coordinated ground filling and water dropping operations while Copter 7 maintained the overall aerial coordination.

By mid-December, the Thomas Fire had consumed more than 242,000 acres, becoming the fourth-largest wildfire in modern California history (it would eventually become the largest). **Kari Greer Photo**

Air and ground fire personnel pause for a multi-county funeral procession for Cal Fire engineer Cory Iverson, who lost his life when overtaken by erratic fire behavior while working the Thomas Fire on Dec. 14. **Kari Greer Photo**

A K-MAX from HeliQwest joined the fight on the Thomas Fire for 33 days, including several days of flood mitigation after the January rains. **Kari Greer Photo**

Firefighters from nine surrounding states responded to the Thomas Fire, including 10 strike teams from throughout Oregon. **Kari Greer Photo**

But instead of specific objectives to engage, it was largely up to the individual flight crews to seek targets of opportunity for immediate-need structure protection.

"It was really hectic," said Williams. "You're looking at two other aerial assets on scene and no one else flying. You're under NVGs, in those crazy conditions and you're just trying to do the best that you can. It's a lot of multi-tasking and mental, and at some point physical fatigue, because of how long you're flying, the fact you're under goggles, that you're trying to control an aircraft in wind conditions that are probably on the borderline of exceeding limits. So again, it goes back to are you being safe and effective?"

Complicating things further was what the wind was doing to all that smoke. "With a wind-driven fire, the smoke lays down horizontally and the fire just runs beneath it," said Keller. "That does two things. It gives you really clear air on the flanks because all the smoke is going in one direction. But the bad thing, there's no way you're ever going to get to the front of it or catch up with it because that smoke is too bad.

"I never saw the head of the fire that night because it was too smoky to get into those areas. So this thing is burning full speed toward the beach and we're just picking up what we can along the sidelines. And the sidelines for us that night was the whole front country of Ventura City where we were actively losing structures all throughout the city and in the surrounding hillside neighborhoods."

Keller, who has lived in Ventura most of his life, said, "To see that kind of event, with that kind of wind, where homes in the front country with ocean views are being taken out, that was something I thought would never happen. Some of these homes that were lost, I would have never thought in a million years would have burned from a brush fire. But it was one of those things where, once one house goes with that wind behind it, it turned into a blowtorch the size of a home, going into the next home, and continuing into the next home. And that went on and on and on..."

The ground and air fight continued throughout the early morning hours. By dawn, however, the winds again increased, grounding all air assets. For Williams, Keller and their crews, their first operational period on the Thomas Fire lasted 24 hours, during which time they made a total of 49 water drops, all on NVGs.

VCAU maintained its round-the-clock air assault until day three, by which point numerous Cal Fire and commercial assets were well established on scene. But for the first 14 days of the fire, as the wind shifted and steered the flames north through the coastal mountains toward Santa Barbara, VCAU continued round-the-clock staffing for two aircraft.

While the day shift saw relatively little activity, the night NVG aircraft were kept busy for structure protection only.

The dedicated rescue/medevac helicopters responded to four mission requests, which involved a hoist evolution, a medevac and the recovery of a Cal Fire engineer who lost his life fighting the fire. For the entire incident, which ran through early January, VCAU aircraft flew a total of 73 hours. All told, the Thomas Fire consumed more than 281,000 acres (440 square miles), and destroyed more than 1,060 structures, over 500 in Ventura.

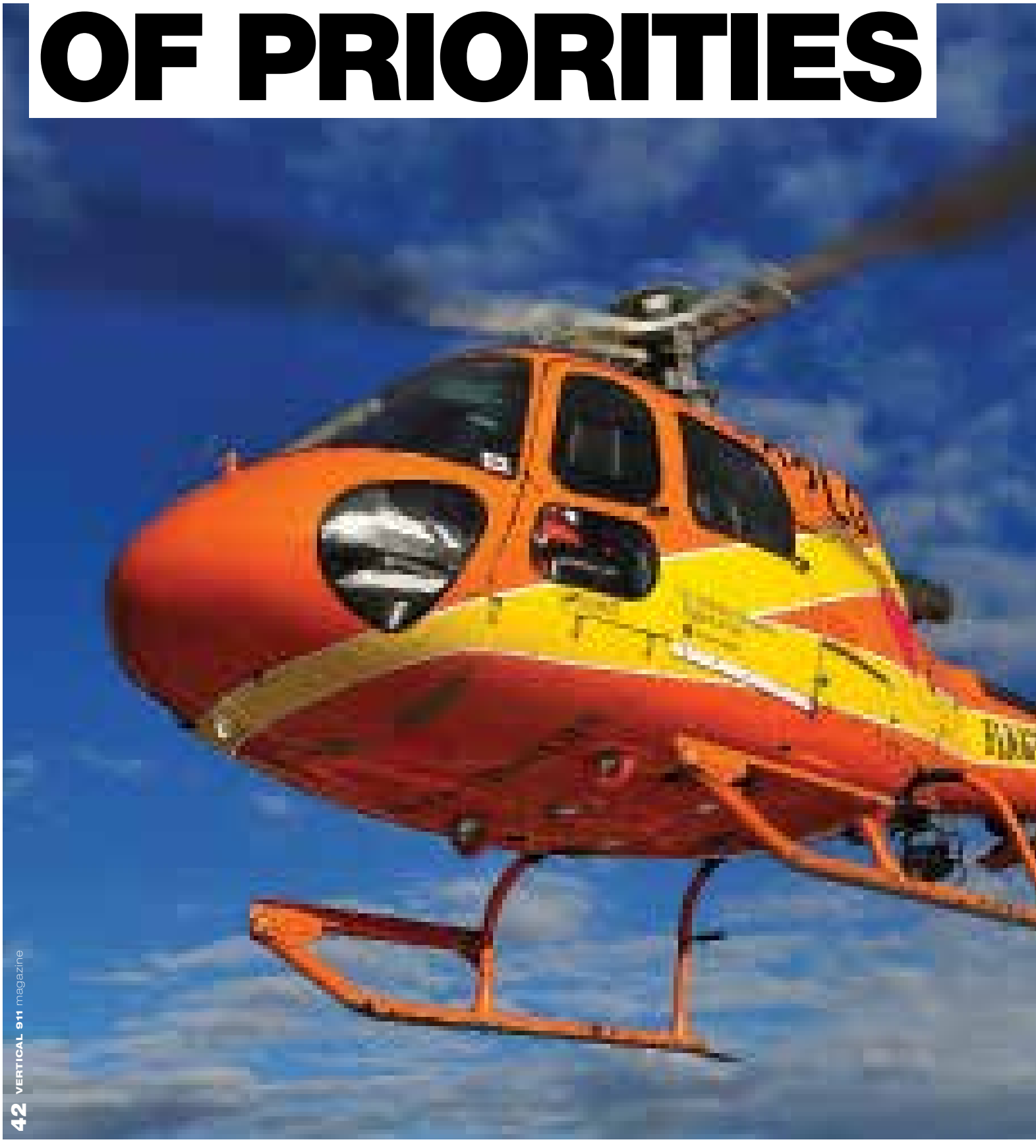
"This was one of those fires where the entire period of the wind event, which ended up being 12 or 13 days of strong winds, it was constantly at the edge of the limitations of the aircraft," said Keller. "There were nights and days where you might have to land and shut down multiple times because the wind just got too intense to operate safely."

Keller, who started his career as a wildland firefighter at age 18, and flew helitack with the U.S. Forest Service before coming to Ventura County, won't forget the Thomas Fire anytime soon.

"I've seen a lot of different topography and a lot of different fire models," he said, "and this was, in my opinion, the Armageddon of all fires that I've seen personally."

Dan Megna | Dan served nearly 20 years of a 30-year law enforcement career as a helicopter tactical officer, pilot, and flight instructor with a large Southern Californian sheriff's department. He has been a regular contributor to *Vertical* since 2004.

A QUESTION OF PRIORITIES



The civil helicopter industry has become increasingly aware of the need for improved occupant protection, but achieving that goal will be a lengthy process.

By Elan Head

In many ways, the fatal Flight For Life accident that occurred in Frisco, Colorado, in July 2015 was not unique.

The hydraulic system design implicated in that crash had already been linked to several previous incidents and accidents in Airbus Helicopters H125s, including one involving Flight For Life operator Air Methods. And many earlier civil helicopter accidents had resulted in catastrophic post-crash fires; in fact, between 1994 and 2013, the National Transportation Safety Board (NTSB) investigated at least 135 helicopter accidents in the United States that resulted in a post-crash fire.

Unlike those previous accidents, however, the Flight For Life crash and its fiery aftermath — which killed pilot Patrick Mahany and seriously injured flight nurses David Rephser and Matthew Bowe — was dramatically captured on surveillance video. Broadcast in an investigative series by KUSA 9NEWS reporter Chris Vanderveen, the horrific footage forced the civil helicopter industry to confront the consequences of decades of relative indifference to crash safety.

The Federal Aviation Administration (FAA) had adopted tough new fuel system crash resistance standards in 1994. But because the standards did not apply to rotorcraft with type certificates approved before those dates, many new helicopters, including the Flight For Life H125, continued to be built with fuel systems that were dangerously susceptible to post-crash fires.

Less visibly but no less significantly, many new-production helicopters were also exempt from the dynamic crashworthiness standards that the FAA had adopted in 1989. According to an FAA analysis of helicopter accident data from 2008 to 2013, even in accidents in which a post-crash fire was present, blunt force trauma accounted for 80 percent of fatalities.

In the aftermath of the Flight For Life crash, many air medical operators voluntarily committed to installing crash-resistant fuel systems (CRFS) in all new helicopters, and equipping current aircraft with CRFS as retrofit kits become available. Patrick Mahany's widow, Karen Mahany *(see p.45)*, has become an outspoken advocate for helicopter crash safety, helping to raise awareness of the issue with lawmakers and the general public.

Meanwhile, the FAA convened a Rotorcraft Occupant Protection Working Group (ROPWG) to study the feasibility of incorporating existing occupant protection standards on, first, newly manufactured helicopters, and then existing rotorcraft. Representing a diverse cross-section of the helicopter industry, the group has already completed a cost-benefit analysis for the former task, and is scheduled to deliver specific recommendations for newly manufactured helicopters to the FAA's Aviation Rulemaking Advisory Committee (ARAC) this January.

Early indications are that the group will lean toward partial compliance or performance-based solutions, rather than strict compliance with the prescriptive standards in 14 Code of Federal Regulations (14 CFR) §27.952 or §29.952 (for fuel system crash resistance) and §27/29.562 (for dynamic crashworthiness).

Because meeting the letter of the law can be difficult and expensive for legacy rotorcraft designs, performance-based standards could allow for swifter adoption of life-saving enhancements in newly built helicopters. They would also reward the efforts of manufacturers who have already incorporated effective crash safety enhancements in their aircraft, even though those enhancements may not fully comply with the provisions of 14 CFR.

However, that will still leave the problem of what to do with the thousands of helicopters that are currently flying without adequate

A high-profile fatal accident involving a Flight For Life helicopter in July 2015 called attention to the civil helicopter industry's shortcomings in addressing crash safety. Now, the FAA is feeling pressure to act. **Mike Reyno Photo**

occupant crash protection. The solution will likely involve a strong voluntary component on the part of the civil helicopter industry — which, despite a growing awareness of the importance of crash safety, has yet to actually prioritize it.

LEARNING THE HARD WAY

Dr. Dennis Shanahan is the chair of the FAA's ROPWG. A former U.S. Army flight surgeon and commander of the Army Aeromedical Research Laboratory, Shanahan has dedicated his career to improving occupant safety, first in military aviation, and more recently in the civilian world.

As Shanahan recounted, the Army's emphasis on helicopter crash safety had its origins in the experiences of the Vietnam War.

"We learned the hard way," he said. "Historically, the crashworthiness requirements came out of Vietnam, where we were having a lot of crashes of helicopters, both due to enemy action and due to other problems. We were seeing fires [in which] people burned up when they otherwise would have survived; we were seeing some types of injuries like spinal injuries that inhibited egress of the helicopter."

When the Bell UH-1 Huey came up for replacement, the lessons of Vietnam were still fresh in the minds of Army decision-makers, and crashworthiness became a priority for the Army's next utility helicopter, the Sikorsky UH-60 Black Hawk.

Although the Black Hawk design was substantially complete when Shanahan was assigned to the Army's Biodynamics Research Division in the late 1970s, "the crashworthiness people who I was working with pretty much had carte blanche in putting what they felt was necessary in that helicopter," he recalled. "So the Black Hawk was really a monumental change in thought. Basically it was built as a crashworthy helicopter."

However, because the Army was primarily concerned with outcomes, its crashworthiness requirements were performance-based, rather than prescriptive. As Shanahan noted, there's a practical reason for that.

"When you're prescriptive, you're bypassing good old American ingenuity," he said. "You're telling manufacturers and suppliers exactly how they will build a certain mousetrap. And when you do that, you're limiting ingenuity tremendously. You can rely on American engineering by and large to come up with some brilliant solutions if you give them the leeway."

The FAA was much slower to adopt tougher standards for crash

1 // The Bell 429 is one of the helicopter models recently identified by the FAA as having a CRFS fully compliant with the latest standards. Bell Helicopter converted all of its production helicopters to CRFS by 1991, although it didn't certify the systems in its legacy aircraft to the standards of §27/29.952. **Sheldon Cohen Photo** **2 //** As a recently certified helicopter, the Robinson R66 Turbine has a CRFS fully compliant with §27.952. Robinson has seen a dramatic reduction in post-crash fires in its legacy helicopters, the R22 and R44, since introducing partially complaint CRFS for those models. **Skip Robinson Photo** **3 //** The NTSB has investigated more than 135 helicopter accidents resulting in a post-crash fire since 1994, the year that the FAA adopted new fuel system crash resistance standards. **Kelly Koopmans Photo** **4//** Robertson Fuel Systems and StandardAero recently received FAA STC approval for a retrofittable crash-resistant fuel tank for Airbus AS350 series helicopters. **Robertson Photo**

2

resistance in helicopters. When these finally came in 1989 and 1994, they were much more prescriptive in nature, and complying with them was expensive. Even manufacturers who made occupant safety enhancements to legacy helicopter models often didn't bother certifying these enhancements to the standards of §27/29.952 and .562.

For example, Bell Helicopter, which had converted all of its production helicopters to CRFS by 1991, didn't certify the fuel systems in its legacy models to the latest standards. According to a statement by Bell manager of air vehicle systems and ROPWG member John Wittmaak, "Bell Helicopter believes efforts to certify currently in-production CRFS systems provide no benefit and ultimately delay availability and increase costs associated to retrofit solutions for pre-CRFS aircraft."

The first report generated by the ROPWG — a cost-benefit analysis of requiring all newly manufactured helicopters to comply with existing crash resistant seat, structure, and fuel system regulations — confirmed the high costs associated with these prescriptive requirements. According to the report, strict compliance with existing standards in newly manufactured helicopters would cost the industry approximately $764 million over 10 years.

This figure should be taken with a grain of salt, as the task group that evaluated costs used nonstandard methodology to arrive at its estimate. Even so, it's apparent that complying with the regulations isn't cheap.

However, compliance may not be an all-or-nothing proposition. In May 2017, to satisfy a request from Congress, the ROPWG submitted an interim analysis of CRFS effectiveness to the FAA. That study found that even CRFS models that were partially compliant with the standards of §27.952 were just as effective as fully compliant models at preventing post-crash fires and thermal injuries.

As a result of this finding, the working group recommended to the FAA that it *not* pursue a requirement that all newly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manufactured helicopters meet the full requirements of §27.952 and associated advisory circulars. Instead, for those helicopters that are not already being manufactured with CRFS, "achieving partial compliance at a level similar to current partially compliant models will be less costly and far less disruptive than meeting full compliance," the group stated.

The ROPWG is scheduled to deliver a final report on its recommendations for newly manufactured helicopters — encompassing both CRFS and dynamic crashworthiness requirements — on Jan. 28, 2018. Shanahan was not able to discuss specifics of the report in advance, but confirmed that the working group is still recommending partial compliance with the existing regulations. "Our group is certainly looking much more at performance than prescription," he said.

COMING TOGETHER

After the ROPWG finalizes its recommendations for newly manufactured helicopters, it will turn its attention to how to incorporate crash safety improvements on existing rotorcraft. Due to the sheer number and diversity of legacy helicopters in the U.S. fleet, "that's going to be a very complicated issue," Shanahan said.

Even if the FAA does choose to mandate crash safety retrofits on legacy helicopters, such a requirement could take years to take effect. If the industry is going to achieve meaningful improvements in crash safety in the meantime, voluntary efforts will be critical.

It remains to be seen whether there is a will to make those improvements, but at least there is increasingly a way. While some manufacturers, including Bell Helicopter, have made CRFS retrofit kits available for their aircraft for years, such kits were simply unavailable for some helicopter models, including the Airbus AS350 series.

After the Flight For Life crash, Airbus prioritized development of a rupture-resistant fuel tank for the H125 (formerly known as the AS350 B3e), which has been available as an option since 2014. In December 2017, Robertson Fuel Systems and StandardAero finally achieved FAA supplemental type certificate approval for a retrofittable crash resistant fuel tank applicable to most models of the AS350 series, including the AS350 B3e and EC130 B4.

"It's not a simple effort," Robertson director of engineering Bill York said of the certification process. Robertson has more than four decades of experience designing and manufacturing CRFS for the military market, but the company had not designed a civil system for many years. Meeting the FAA's current standards was a three-year project that necessitated several design iterations.

According to York, one of the most challenging and costly aspects of the certification was a 50-foot drop test of the tank installed in the structure of the aircraft. Robertson regularly conducts drop tests of fuel bladders at its facility in Tempe, Arizona, but the military does not require in-structure tests (and the ROPWG has also recommended that in-structure tests not be required).

After more than a dozen development drop tests, Robertson performed a successful drop test of the tank in the aircraft with the cargo swing installed, leading to supplemental type certification

Designed in the 1970s, when the lessons of Vietnam were still fresh in the mind of Army decision-makers, the original Sikorsky UH-60A reflected an emphasis on occupant safety that has been carried forward into subsequent Black Hawk variants. **Skip Robinson Photo**

of the tank in full compliance with §27.952. The company has already started deliveries to Air Methods, which is one of the air medical operators that has voluntarily committed to retrofitting all of its aircraft with CRFS as systems become available.

Robertson declined to specify a price for the tank, but with all of the engineering work that went into the system, it's safe to say it isn't cheap. Cost is one of the biggest obstacles to operators voluntarily adopting crash safety enhancements. Another, closely related issue is weight; in a light helicopter like the AS350, the 50 pounds (23 kilograms) added by the Robertson fuel system can make or break a contract in the absence of a common industry standard.

"It's hard for one operator to do something unilaterally and still remain competitive with others who choose not to do it," Shanahan pointed out. "It really takes the whole community to come together."

While raising awareness among people who operate helicopters is one step toward that goal, educating the customers who contract with helicopter operators may be even more important. In its investigation into the Flight For Life crash, the NTSB found that "those without an extensive aviation background were unaware that most newly manufactured helicopters were not required to meet the latest helicopter crashworthiness requirements."

In its recommendations resulting from that investigation, the NTSB called on the Association of Critical Care Transport (ACCT), in conjunction with the Association of Air Medical Services (AAMS) and the Air Medical Operators Association (AMOA), to develop guidelines for those who purchase, lease, or contract for helicopters "regarding the equipment and systems that would enhance the helicopters' crashworthiness, including, at a minimum, a crash-resistant fuel system and energy-absorbing seats."

According to LifeFlight of Maine executive director and ACCT project lead Tom Judge, the organizations hope to have those guidelines ready in the second quarter of this year. The working group assigned to the effort has been pursuing an "interrogatory" format, recognizing that there are many different factors that must be weighed and balanced in the selection of any aircraft.

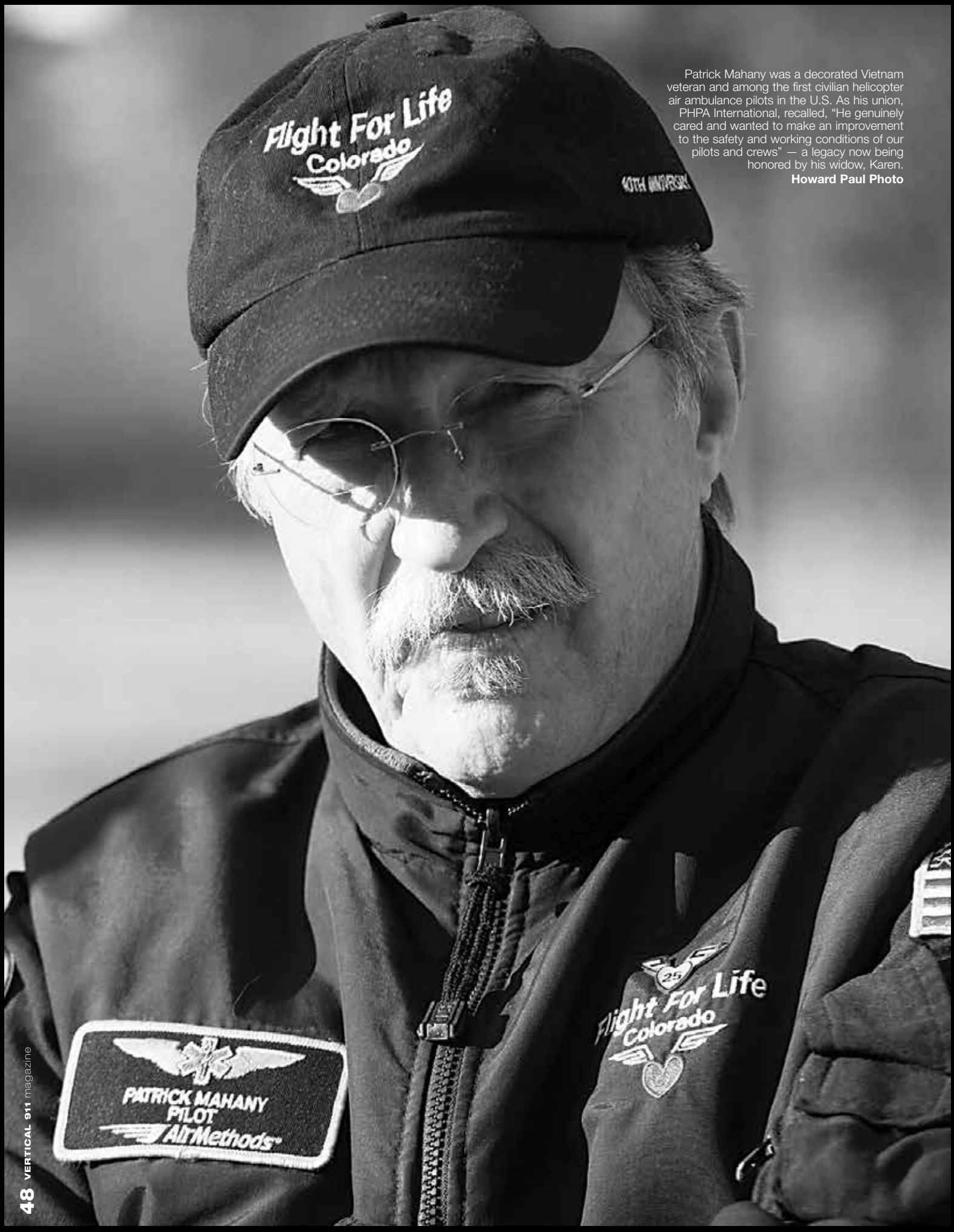
"What we're trying to do is give people a framework for asking the questions, rather than prescriptively saying 'you need to do this, you need to do that,'" he said. "This is something that I think can turn up the light and help people get to the best technology."

Shanahan, who has been advocating for improved occupant safety for decades, said he's encouraged by recent developments.

"What's been heartening [is] now everyone seems to be getting much more knowledgeable about these issues and what can be done," he said. "I think the industry as a whole is getting behind this and looking at this larger picture."

Of course, the industry is also facing more pressure than it has in the past, he added. "There is this looming threat that if they don't do it on their own, that it's going to be regulated."

Elan Head | An award-winning journalist, Elan is also an FAA Gold Seal flight instructor with helicopter and instrument helicopter ratings, and has held commercial helicopter licenses in Canada and Australia as well as the U.S. She is on Twitter @elanhead and can be reached at elan@mhmpub.com.



Patrick Mahany was a decorated Vietnam veteran and among the first civilian helicopter air ambulance pilots in the U.S. As his union, PHPA International, recalled, "He genuinely cared and wanted to make an improvement to the safety and working conditions of our pilots and crews" — a legacy now being honored by his widow, Karen.
Howard Paul Photo

NO GREATER LOVE

FLIGHT FOR LIFE PILOT PATRICK MAHANY LOVED HIS CREW LIKE FAMILY. NOW, HIS WIDOW IS TRYING TO HONOR HIS LEGACY BY MAKING HELICOPTERS SAFER FOR ALL OF US.

BY KAREN MAHANY

Editor's Note: On July 3, 2015, Air Methods pilot Patrick Mahany, Jr. was killed when the Flight For Life Airbus Helicopters H125 he was piloting crashed shortly after lifting off from the Summit Medical Center Heliport in Frisco, Colorado. In its report on the accident, the National Transportation Safety Board (NTSB) — which attributed the crash to the design of the aircraft's dual hydraulic system — determined that the impact forces were survivable. However, the recently manufactured aircraft was not required to comply with dynamic crashworthiness standards adopted by the Federal Aviation Administration (FAA) in 1989, or with fuel system crash resistance standards adopted in 1994, and was destroyed in a post-crash fire (see p.39).

Mahany sustained numerous blunt force trauma injuries as well as significant thermal lung injuries from the post-crash fire, which according to the NTSB directly contributed to his death. Meanwhile, flight nurse Matthew Bowe sustained a permanent sacral spinal cord injury, and flight nurse David Repsher received burns over 90 percent of his body; both will face lifelong medical complications.

Mahany's wife, Karen, was at Patrick's side when he died in the hospital a short time after the crash. This is her story.

Originally, I wasn't supposed to have the day off. But the day before, my boss made a change to my schedule, so I was there, just minutes away, when the crash happened.

I got the phone call and raced to the hospital. Patrick had been rescued from the aircraft and was already in the emergency department. He had a breathing tube in when I rushed to his side, and the emergency department staff and doctors were starting chest compressions because they had lost a pulse.

I said into his ear that I was there and I begged him to come back to me. And within minutes, they had gotten a pulse back. And so I knelt down next to his bed and started whispering in his ear: thanking him for loving me, thanking him for choosing me, thanking him for being the most amazing husband, father, pilot, and person that I had ever met. I continued to talk to him, to touch his head, and to let him know that I was there. However, as the minutes went by, his pulse got weaker, and then they started to do chest compressions again.

When they finally held compressions, he had flat-lined and he was gone. It was one of the most beautiful moments of my life, to be there with the love of my life as he walked into heaven.

Shortly after, I was handed all of his belongings, including his wallet. Inside his wallet was a piece of paper. Now, I know husbands think that wives know everything that's inside their wallets, but really we don't. I didn't know this piece of paper was in there. It was tattered; it had obviously been in his wallet for some time. It read: "No greater love hath a man than to lay down his life for another." It was from the Bible, John 15:13.

HE SHOULD HAVE SURVIVED

"Mrs. Mahany, you know this was a survivable crash, right?" said the NTSB investigator. "This would have been survivable if your husband's aircraft had had the safety equipment onboard that it should have had."

This was said to me several months after Patrick's crash in what is known as the "72-hour widow interview." The NTSB wanted to find out as much as they could about the 72 hours before the accident to understand Patrick's state of mind, and they wanted to talk to the person who knew him best, his widow: me.

I had known this interview was coming. Years before, Patrick and I

had been talking about another crash that had happened. Looking off into the distance, Patrick had said, "First they take your life, then they take your legacy." Then he looked me square in the eye, and he said, "If anything ever happens, Honey, you'll be the only one to protect me. You'll be the only one who can speak for me. You understand that, right? Please don't let them destroy my legacy."

Going into this interview, I had known that this would be one of the more important things that I would do for Patrick: letting them know the person he was, the pilot he was. But little did I know that what they would say to me would send me into a tailspin.

Having them tell me that Patrick should have survived made me rethink everything that had happened. What did they mean, "He wasn't provided the safety equipment that he should have had?" This sent me into a flurry of reading and trying to understand, and, most importantly, reaching out to one of the world's leading experts on helicopter crashworthiness, Dr. Dennis Shanahan.

I spoke on the phone to Dr. Shanahan, who is a retired U.S. Army flight surgeon and former commander of the Army Aeromedical Research Laboratory. Early in his career, he was tasked with helping to make the UH-60 Black Hawk helicopter the gold standard in rotorcraft survivability. When he retired and went into the civilian world, he started looking at civilian aircraft and how to improve their survivability.

Dr. Shanahan helped me understand how in 1989 and 1994, the Federal Aviation Administration (FAA), with the best of intentions, passed regulations meant to improve protections for helicopter occupants in the event of a crash. I call these things the "big three": first, the structure of the aircraft should promote survivability; second, the seating and restraint system should promote survivability; and third, the fuel tank should minimize the chance of a post-crash fire, giving occupants time to get away from the crash.

This is all well and good, except the lobbyists got the FAA to change one word; one word that changed everything, and ended up causing the death of my husband. Instead of the regulations applying to helicopters *manufactured* after a certain date, they applied only to helicopters *certified* after that date.

To put this into perspective, my husband's helicopter was manufactured in 2013 and crashed in 2015. It was almost a brand-new aircraft, but the design had originally been certified back in 1977. And so it was given a pass, a loophole, not to comply with the "big three" standards for occupant protection. The regulations that applied to it dated back to the 1960s, when crash-resistant fuel systems were not required and helicopter seats were only required to protect occupants up to 4 g.

These days, a Subaru car in a 30-mile-per-hour crash will protect its occupants from forces up to 30 g. Lightweight Indy Cars incorporate safety features that have allowed drivers to walk away after 100-g-force crashes. When helicopter manufacturers say that better crash safety features would make their aircraft too heavy, they're not being truthful. It's not that they can't do it, it's that they haven't had to do it. They haven't put the research into making their aircraft safer.

Patrick was a Vietnam veteran who was awarded a Purple Heart and Bronze Star for his service. He flew Hughes OH-6 Scout helicopters, which were built like a small cage. He was shot down three times in 1971-72, and was uninjured in all three crashes. But in 2015, in an almost brand-new aircraft, a fall from less than 100 feet killed him.

HONORING PATRICK'S LEGACY

In May 2016, I was getting ready to go to Washington, D.C., because Patrick was going to be inducted into the National EMS Memorial. In talking with Air Methods, Patrick's employer, I told them that I really wanted to talk to members of Congress. Somebody needed to do something to improve helicopter crash safety, and the aircraft manufacturers weren't going to do it on their own.

Air Methods helped me arrange multiple meetings with different members of Congress, in both the Senate and the House. I met with Illinois Representative, now Senator Tammy Duckworth, a former U.S. Army Black Hawk pilot. I met with members of the Colorado delegation, including Representative Ed Perlmutter, and I also met with Arizona Senator John McCain. Originally, I was only supposed to have a photo op with Senator McCain, but he had his staff look up Patrick, and when they saw that he was a helicopter pilot and Vietnam veteran they gave me a meeting.

In that meeting with Senator McCain I told him what had happened, and he looked me right in the eye and he said, "This has to change. We're going to do something. You go home, you go back to Colorado. You meet with the Colorado delegation. You make a list of what needs to happen. You work with the Colorado delegation, and we will push this through. We will make the aircraft safer for the crews because it's the right thing to do."

And so, since leaving D.C., that's exactly what I've done. I've opted not to litigate because that would eliminate my ability to talk in public, to talk to members of Congress, to voice my outrage that helicopter crews and passengers continue to die and nothing is being done about it.

Now the FAA has developed a working group to look into the regulatory loopholes, and they have found that even a partial retrofit of a crash-resistant fuel system eliminates almost 100 percent of post-crash fires.

In the meantime, Colorado Representatives Perlmutter and Jared Polis have introduced the Helicopter Fuel System Safety Act, which would require all new helicopters to have a crash-resistant fuel system. Colorado Senator Cory Gardner has added an amendment to the FAA Reauthorization Act that would require the FAA to expeditiously certify crash-resistant fuel system retrofit kits and notify helicopter owners about their availability.

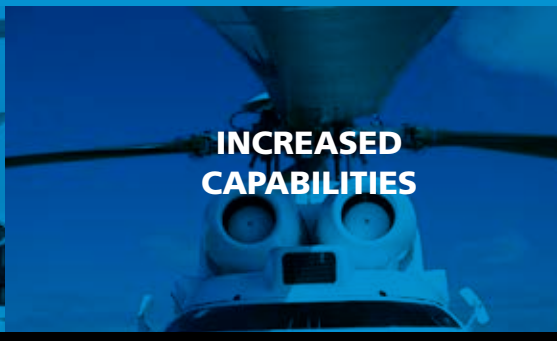
Addressing the fuel system issue is just the start. It's a great start, but we need to continue to push. More than 80 percent of people who die in what should have been survivable helicopter crashes die from blunt force trauma. (Blunt force trauma was the primary cause of Patrick's death.) We need to fix all of the "big three" problems: the structure, the seating, *and* the fuel systems. Human error happens, and crashes happen, but when they do, we can at the very least give crews and passengers the chance to survive and go home to their families.

Patrick's legacy was one of safety. He was always willing to stand alone, arms crossed, and say, "It's not the safe thing, it's not the right thing, it's not what we should do." I knew that Patrick loved his crew just as much as family. When he asked me to protect his legacy, that's what he tasked me with, to protect the crews. "No greater love hath a man than to lay down his life for another."

And so I ask you, what are you willing to do for your crews? Are you willing to call your Congressman? Are you willing to stand up and say, "Not one more crew, not one more death in what should have been a survivable crash?" I look forward to your help and assistance in moving this effort forward.

To reach out to Karen and be updated on legislative progress, email her at SaveOurCrews@gmail.com.

Karen Mahany | Karen became a registered nurse (RN) in 1992 and began working as a Flight For Life Colorado flight RN in 1998. While a flight nurse, Karen met and flew with pilot Patrick Mahany. They married in 2003. Karen left flight nursing in 2005 to return to bedside nursing, and to return to school to become a certified registered nurse anesthetist (CRNA). She graduated with her master's in nurse anesthesia in 2014. Karen currently lives and works as a CRNA in the Denver, Colorado, metropolitan area.



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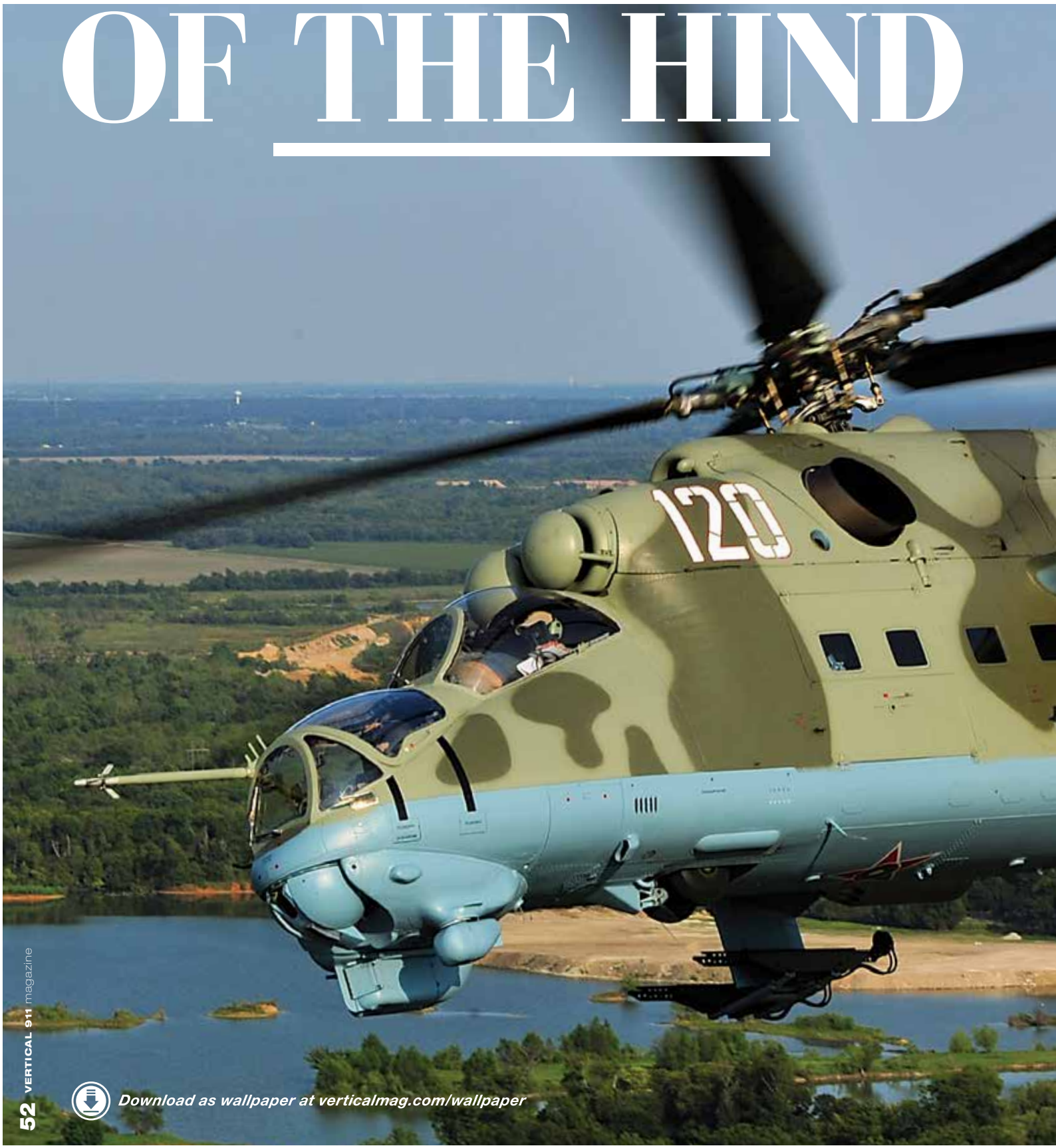
GETTING IN FRONT OF THE HIND



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The Mil Mi-24 Hind is a rare sight in North America. We had a chance to take one for a spin — and learn more about the model's history with the U.S. military.

The Mi-24 Hind is unusually versatile for a gunship. As S3 instructor pilot John Totty noted, "Unlike an Apache, you can put eight troops in the back."

The first time I saw a Mil Mi-24 Hind attack helicopter was at Forward Operating Base Ghazni, Afghanistan, in late 2008. I was an embedded journalist tagging along with a U.S. Army Black Hawk medevac crew, and as we waited on the ramp for our patient — a young private with a blasting cap injury who would be flown back to Bagram Airfield — a Polish Hind came in to land.

"What is *that*?" I remember asking, transfixed by the strange and sinister aircraft on approach. I knew it was friendly, but the thing just *looked* mean, and I had a sudden inkling of how terrifying it must be to be on an attack helicopter's receiving end.

A decade later, I can definitively confirm that, yes, it is better to be in the cockpit of a Hind than outside looking up at one.

My chance to get behind the controls of this formidable Soviet-era aircraft came not in a war zone, but in Lancaster, Texas, in the form of a privately owned former Bulgarian Air Force Mi-24D. It is one of two flying Hinds that were associated with the Cold War Air Museum before that organization ceased operations at the end of 2017; you may have seen it on display at last year's HAI Heli-Expo in Dallas.

Recently, the owner of the Hinds has made them available for adversary orientation training for the U.S. military through a partnership with Tacoma, Washington-based VTS Aviation LLC (VTSA), and System Studies & Simulation (S3) Inc. out of Huntsville, Alabama. The training continues a legacy that started during the Cold War, when the U.S. Army operated Hinds as part of a classified exploitation program.

To do that, however, first the Army had to learn how to fly them — without the benefit of an instructor or authorized flight manual. And, as I discovered for myself, the Mi-24 differs in some significant ways from the Western helicopter models that most of us are used to.

A VERSATILE GUNSHIP

The Mi-24 was designed under the direction of legendary Soviet aerospace engineer Mikhail Mil, and the prototype aircraft made its first flight in 1969, the year before Mil's death. Derived from the Mil Mi-8 transport helicopter, the Mi-24 is unusually versatile for an attack platform, capable of carrying up to eight troops in its cabin in addition to the pilot and co-pilot/gunner (CPG) positions.

Over the past five decades, more than 40 variants of the Hind (the NATO reporting name for the Mi-24) have been operated by militaries around the world. The Mi-24D, which introduced the tandem cockpit configuration that is now typical of the series, entered production in 1973. It was succeeded later that decade by a closely related upgraded version, the Mi-24V (or Mi-35 in its export designation).

The basic Mi-24D model has a maximum takeoff weight of 11,800 kilograms (26,015 pounds) and is equipped with two Klimov TV3-117 engines, each delivering an impressive 2,200 shaft horsepower. That puts the Mi-24D in roughly the same category as the Sikorsky UH-60M Black Hawk, which has a max takeoff weight of 22,000 lbs (9,980 kg) and two GE T700-GE-701D engines rated at 2,000 shaft horsepower.

However, that's where the similarities end. The Hind is radically different in appearance, distinguished not only by its tandem cockpit but also by the anhedral, cantilever wings extending from the fuselage. The wings provide approximately 25 percent of the lift in forward flight, enabling fast dash speeds of up to 181 knots indicated airspeed.

Additionally, the wings support up to three weapons stations per side, for a total payload of 1,500 kg (3,300 lbs) of external stores. The Mi-24D can carry four 57-millimeter or 80-mm rocket pods (for a total of 128 smaller rockets, or 80 larger ones) and up to four AT-2 missiles. The aircraft is also capable of carrying most Russian bombs up to 500 kg (1,100 lbs) on its inner pylons.

Up front, the Mi-24D is equipped with a four-barrel Yakushev-Borzov Yak-B 12.7-mm gun and electric gun turret. Defensive systems include an ASO-2V flare/chaff system, L-006LM radar detecting set, L-166V infrared (IR) jammer, and exhaust IR suppressors.

The Mi-24 follows the same general mechanical and aerodynamic principles as most Western helicopters: it has a conventional (albeit clockwise-rotating) main rotor and anti-torque tail rotor, as well as familiar cyclic, collective, and pedal controls. But it also has a number of design peculiarities that could catch Western pilots by surprise.

I started getting a sense of this a few weeks before my flight in September of last year, while studying the U.S. Army Threat Systems Management Office (TSMO) flight manual that had been

1 // The Mi-24D airframe is all metal and steel-reinforced, with armored forward fuselage, engine compartments, and gearboxes. **2 //** The Hind's cabin pressurization system maintains a positive pressure differential of 0.7 to 0.9 psi in the crew and cargo compartments, intended to facilitate flight in areas of nuclear or other contamination. **3 //** From left, VTSA chief pilot Steve Davidson, the author, and S3 instructor pilot John Totty.

1 // The Mi-24D has a four-channel automatic flight control system, although Doppler and radar altimeter systems must be operable for hover and course hold. **2 //** The pilot's compartment contains all flight instruments and controls, plus PKV and S-17 weapons sights. **3 //** The CPG compartment is primarily a weapons station, and includes a KPS-53AV gun/bomb sight, and a missile sight.

provided to me by S3 instructor pilot John Totty. Take, for example, this excerpt from the engine start sequence: "APU [auxiliary power unit] at normal RPM, main rotor brake lever full down (disengaged), engine condition lever centered, throttle full left…"

Wait a minute, *full left*? I had flown helicopters with all manner of rotor systems — clockwise-rotating, counter-clockwise-rotating, tandem, and intermeshing — but never one in which full left was the closed throttle position. I realized that some of my deeply ingrained piloting reactions could be a liability in the Hind.

Still, at least I would have an instructor pilot backing me up. That wasn't the case for members of the Army's Foreign Material Test Team, who in the 1980s had to figure out how to fly purloined Mi-8 and Mi-24 helicopters on their own. Among them were Jeff Stayton, who is now director of aviation systems for VTSA, and Steve Davidson, the company's chief pilot and senior subject matter expert (who in 2014 was inducted into the Army Aviation Hall of Fame). I met both of them during my visit to Lancaster.

"Those were always humbling but very interesting times," Davidson told me, recalling their then-classified work in the exploitation of Soviet rotorcraft technology. "Everything that we knew intuitively on how to fly was 180 degrees out."

According to Davidson, the pilots proceeded very deliberately with their task, taking the approach that, "Everything you see is going to be new, it's going to be different, and it's going to be empirical. . . . Rule No. 1 was at the end of the day, we wanted to be alive."

Meanwhile, Stayton said, the aircraft were heavily instrumented for data collection and accompanied by "an army of clipboard-carriers collecting every parameter they could." Although the team had gotten its hands on some stolen manuals, they independently validated every specification, flight limit, and maintenance procedure more than once — an effort that became the basis for the Army's own manuals. As relations with Russia improved during the '90s, the team began to communicate directly with the Mil Design Bureau, and "we were pleasantly surprised at how close our books were," Stayton recalled.

By the time the project was turned over to the TSMO in 2003, the Army had three flyable Hinds and a wealth of operational and performance data on the aircraft, which it used to inform its own aviation tactics.

"What's most important going into the battle is the intelligence of the enemy, and not only how they're going to fight, but what they're going to fight with," said Davidson, noting that among Western forces, a reputation had developed around the Hind that wasn't entirely accurate. "There's great satisfaction [in] being able to dispel some of those myths and develop better tactics, techniques, and procedures."

THE NEED FOR SPEED

Those objectives — dispelling myths and informing better tactics — form the basis of the Mi-24D adversary orientation training that VTSA and S3 are offering to the military. A class of U.S. Air Force weapons officer undergraduates had gone through the training just a few days before my own visit to Lancaster, and Totty gave me a sample of what they had experienced in their ground and flight training.

We started with a cockpit orientation, mostly because I just

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couldn't wait to climb into one of the Hinds. The Mi-24 pilot and CPG compartments sit high above the ground, and getting into them is tricky enough that the TSMO flight manual devotes a full page of text to explaining the process. (In the hangar, I had stepladders to simplify things.)

The pilot's compartment is located above and behind the CPG compartment, and is accessed from the right side of the aircraft, whereas the CPG compartment is accessed from the left. This cockpit contains all of the instruments and controls necessary for piloting the aircraft in all phases of flight, plus PKV and S-17 weapons sights that are used for launching unguided rockets or firing the gun in the fixed forward position.

The CPG compartment, where I would be spending my time, is primarily a weapons station, as the CPG has primary control of all armament systems except the unguided rockets and gun pods. Directly in front of the CPG seat — and occupying a significant amount of real estate — is a KPS-53AV gun/bomb sight, which is used to aim and fire the turret gun system and acquire targets for aerial bombing. The CPG also has a missile sight on the right side of the compartment. (Of course, there were no actual weapons on my Hind, so I wouldn't be able to get too carried away).

While the CPG compartment does have flight controls, these are mostly intended for emergency use. Normally, the cyclic is stowed forward and to the right, while the pedals are hidden in the sides of the compartment. When a trigger lever is squeezed on the CPG's collective, hydraulic pressure moves the cyclic and pedals into the active positions.

My cockpit orientation complete, Totty and I moved into the classroom for an overview of aircraft systems and performance. Adversary orientation training is not intended as a substitute for full pilot transition training, so Totty kept the emphasis on the Mi-24D's strengths and weaknesses relative to the Western aircraft it might be flying against.


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1 // In the cabin, six window/gun ports allow small arms to be fired from swivel mounts, which are elevation- and azimuth-limited due to the presence of the main rotor and wings. **2 //** The Mi-24D can carry four 57-millimeter or 80-mm rocket pods. (Of course, no actual weapons are installed on these FAA-registered aircraft.) **3 //** Maneuverability is not the Hind's strong suit. In the D-model, moving from max bank angle on one side to the other takes five to eight seconds, which is "an eternity" in combat, said John Totty.

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Unlike most Western helicopters, the Mi-24D does not have a torque gauge. Power limits are defined by engine N1, turbine inlet temperature, and relative engine pressure ratio.

In the "strengths" category are the aircraft's fast cruise and dash speeds, good turn performance at higher speeds, and excellent climb performance, all thanks to its cantilever wings. "It's super fast; that's what they designed it to do," Totty explained. From the perspective of an Mi-24 pilot, "going into the fight, I'm faster," he said. "But [that performance] also gives me the opportunity to separate and not get into a fight if I don't have to. It limits my vulnerability."

However, the wings, which are prone to stalling, also limit the aircraft's maneuverability. Rolling into a turn, the wings tend to continue the banking action and must be counteracted with lateral cyclic; beyond a certain angle of bank, that cyclic authority simply runs out. "From an agility standpoint, Western helicopters have an advantage," Totty said. "A turning fight is not where the Hind pilot wants to be." In the Mi-24D, the aircraft's low-pressure hydraulics also impose constraints on

maneuverability (a shortcoming that has been remedied in the latest Mi-24 models).

Moreover, the TV-117 engines in the Mi-24D tend to be relatively underpowered at high density altitudes, and are slow to deliver power. “I call it phone-ahead power,” Totty said. “If you’re going to need power, you need to be thinking about that early.”

Back in the “strengths” column, the aircraft is ruggedly built, with a high operational readiness rate and multi-mission versatility. It is heavily armored, and has a reliable, high-rate-of-fire gun and an accurate missile system. Totty also counts the aircraft’s formidable reputation as a tactical advantage. As he put it, “You can’t look at it and not feel a little awe.”

BEHIND THE CONTROLS

Awe is certainly what I felt when we were standing on the ramp at the Lancaster Regional Airport, preparing for our flight. Totty and I would be flying in one Mi-24D, N118NX, while Davidson piloted a second Hind, N120NX (the helicopters are registered with the Federal Aviation Administration as experimental aircraft).

The plan was to take off and fly in formation for an air-to-air photo shoot, with *Vertical 911* photographer Skip Robinson and Ken Pyatt of Sky Helicopters in a Robinson R44. Then, while Davidson and Pyatt’s aircraft continued the shoot, Totty and I would break away to give me the chance for some stick time.

With no weapons to tend to, there wasn’t much for me to do in the CPG compartment during start-up, but Totty narrated his checklist for me. After setting the cockpit switches, he started the aircraft’s AI-9V APU, which is used to supply compressed air for starting the main engines. The main engine starting sequence is initiated by selecting the desired engine (left or right) and then pressing a “start” button on the panel. The air starter shuts off automatically when N1 RPM reaches 60 to 65 percent (or after 55 seconds if the start is unsuccessful).

Totty had me activate my flight controls while we were still on the ground; the pedals and cyclic moved readily into position. When everything was set for takeoff, he ground taxied the helicopter to the runway for a rolling takeoff. Contrary to some lore, the Mi-24 can hover, although that’s not where it’s most comfortable. So we were up and away into forward flight as quickly as possible, settling on an airspeed at the upper end of what the R44 photo ship could handle, but below the Hind’s preferred 135-knot cruise speed.

Our aircraft took the lead for the formation flight, which gave me the opportunity to witness first-hand something that Totty had mentioned in the classroom: the CPG’s very limited field of view. In combat, that means the CPG must rely on the pilot or wingman to call out threats. While the pilot’s cockpit has a larger field of view, it is partially obstructed on the right-hand side by the canopy design. That fact, combined with the clockwise rotation of the main rotor, means that Mi-24 pilots tend to break left, and position the flight lead on the left-hand side.

Once we had completed the formation shots, Totty and I did, in fact, break left to return to the airport, where he handed the controls over to me for a few laps around the traffic pattern. The pilot and CPG cyclic controls in the Mi-24 incorporate a force trim system, which took me a while to feel out. Likewise, it took some effort to stay on top of the pedals when transitioning out of forward flight, particularly since the CPG’s controls aren’t designed for ergonomic comfort. Still, I performed a couple of patterns to rolling landings without too much concern. The Mi-24 may have its quirks, but it still flies like a helicopter.

Sadly, we had to wrap things up there for a very typical reason: we were running low on fuel. The Mi-24D has an average fuel burn rate of around 1,600 lbs (725 kg) per hour, giving the standard aircraft an endurance of roughly two hours with reserves. It’s the ideal helicopter for flying from one fuel refinery to another.

Although I didn’t want the flight to end, I climbed out of the aircraft with a huge grin on my face. According to Totty, that reaction is typical of the U.S. service members who complete adversary orientation training in the aircraft. “They all love it,” he said.

And who wouldn’t? The Mi-24 is a remarkable helicopter that relatively few people have the privilege to fly, the global distribution of the model notwithstanding. For those of us in Western countries, its mystique is even greater. And if you’re going to come face-to-face with a Hind, it’s far better to do it on your own terms than have your first encounter on the battlefield.

Take my word for it.

How Germany's automobile club went from being unlikely pioneers of helicopter EMS to operating a globally renowned academy on the subject.

Story by Jon Duke
Photos by Lloyd Horgan, Vortex Aeromedia

GERMANY'S YELLOW ANGELS

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One of ADAC's EC135s returns to its base in Aachen, close to the border with the Netherlands.

Automobiles have long been a cornerstone of German culture, but the late 1960s saw them become a national liability as road accident fatalities in West Germany peaked at nearly 20,000.

Academics called for professionalizing emergency medical services (EMS) in what would become known as the Franco-German EMS model; rather than whisking the patient off to the hospital, they advocated rushing a doctor to the patient for treatment in situ. While academic institutions provided the doctrine, its implementation would come, perhaps unexpectedly, from a national institution of an entirely different kind.

The Allgemeiner Deutscher Automobil-Club (German General Automobile Club, or ADAC) stepped up to the plate in 1968. Given Germany's rural landscape, ADAC evaluated the utility of helicopters for emergency care, chartering a Bell 206A JetRanger from Süd-Helicopter for the trial. Operating from the Munich airport, it adopted the moniker "Christoph Munich" after Saint Christopher, the patron saint of transportation and all those traveling. ADAC retains the call sign today.

It might seem strange for a motoring club to be early adopters of helicopters for rescue purposes, but the organization has a heritage of assisting motorists stretching back to 1903. By the '60s, ADAC patrolmen were carrying blood plasma alongside the toolkits that equipped their bright yellow Volkswagen Beetles. These "Yellow Angels" were perhaps more familiar than anybody with the bloody reality of the issue at hand.

Opinions on using helicopters to improve patient outcomes were divided. Rescue flights by other agencies were too few to provide convincing data — with many ruling out the concept purely on economic grounds — but ADAC was not to be deterred. Its thorough

approach brought support and interest from the aviation community, but also highlighted the need for a sustainable financial model, and a different helicopter.

In 1970, ADAC began operation of its first Messerschmitt-Bölkow-Blohm (MBB) Bo.105, the aircraft's design having been directly influenced by its 1968 trial. By 1975, eight bases were operating Bo.105s procured by the German Ministry of the Interior, with one other purchased with funds from an ADAC public appeal. There was no going back. In the following years, systems and methods to develop helicopter air rescue into a mature public service were devised.

Today, with the exception of 12 bases served by the Ministry of the Interior, the provision of helicopter emergency medical services (HEMS) aircraft, aircrew, base facilities, and training is contracted out by each federal state in order to provide complete coverage of Germany. With ADAC having been instrumental in the system's inception, it is no surprise that ADAC Luftrettung (Air Rescue) fulfills the majority of these contracts. As road accident survival rates have dramatically improved since the '60s, today, it is more common for an ADAC Luftrettung helicopter to be called out for an accidental injury or medical emergency.

The Bo.105 proved to be a great aircraft for the HEMS mission, and served as the basis for development of the larger BK117 and then, under Eurocopter (now Airbus Helicopters), the EC135 (now H135). ADAC Luftrettung quickly adopted both, and today operates 55 aircraft in the BK117/H145 and H135 series from 37 bases.

The provision of a service at this scale demands significant investment in infrastructure, particularly given that German law stipulates the repair or replacement of unserviceable HEMS aircraft within three hours. Three major engineering support facilities under ADAC Luftfahrttechnik (ALT) complete major maintenance work, and are all Airbus Helicopters service stations. ALT also maintains its own European Aviation Safety Agency (EASA) Part-21 organization, holding several supplemental type certificates relating to HEMS.

1 // A flight doctor and nurse stand in front of a hovering EC135 at ADAC's Aachen rescue station. **2 //** H145 (left), EC145 (middle) and EC135 simulators are housed in a large hangar at the academy. **3 //** The view from the director's station of a full-scale BK117 mock-up on the left, and on the right the shock-room that provides the medical training element of the HEMS Academy. **4 //** ADAC today operates 55 aircraft from 37 bases.


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Each rescue station is equipped with all the necessary supplies to sustain day-to-day operations and accommodate the three-person crew: one pilot, along with medical crew seconded from a local hospital. A consultant anesthetist specializing in emergency medicine (known as a *notarzt*) is assisted by a *rettungsassistent* or *notfallsanitäter*: non-physician emergency medical professionals who receive a high degree of training in emergency care.

The crew are at three minutes' notice to be airborne throughout the day from 6 a.m. (or sunrise, in the winter) until 30 minutes after sunset. Some rescue stations, mainly those responsible for intensive care inter-hospital transit, are equipped for night operations using night vision imaging systems (NVIS) and instrument flight rules (IFR). Most are day visual flight rules (VFR) operations only, although their lower visibility limit is just 800 meters (one-half mile), so they are rarely grounded for weather.

Michael Schneider, pilot and base manager at the rescue station that I visited at Aachen, said that maintaining medical cover is always the priority. "When the helicopter can't fly, the medical crew will be on the road in an ambulance," he explained. With each station responsible for just a 50-kilometer (26-nautical mile) radius, the response time when crews can fly is impressive. "It takes us no more than 15 minutes usually to get to the patient," he said. "Most of our sorties are shorter, with only five or six minutes en route."

SHARING THEIR EXPERTISE

From plucking casualties from Alpine pinnacles or wind turbine nacelles at sea, to landing within the confines of an Autobahn junction, the ADAC Luftrettung operation treats on average 130 casualties per day and accounts for an estimated three percent of all HEMS operations globally. Operating at this tempo in such a variety of environments places ADAC Luftrettung among the world's HEMS experts, which in 2009 led to the organization opening the world's first HEMS Academy near Bonn in Western Germany.

Originally established to focus on initial and recurrent training for ADAC Luftrettung crews, the ADAC HEMS Academy now attracts clients from across the globe, who come to make use of the academy's well-developed capability to provide task and situation-based training.

At the center of the academy's training philosophy is a whole-mission, whole-crew approach. This is born out of the recognition that the HEMS mission places a small team into situations that are simultaneously highly demanding for each of them. In order for only three people to meet these challenges, much crossover knowledge and expertise is necessary.

"It was very important to create integrated training for the whole team," explained Thomas Gassmann, head of business development at the ADAC HEMS Academy. "We teach them situational awareness, and how to face constantly changing situations. We have full-scale mock-ups of an EC135 and BK117 situated next to an emergency shock-room with a director's station, so we can train transport of patients and information from the helicopter to the emergency room."

This impressive facility allows the whole team to practice loading and transferring patients, using medical simulator mannequins with the capability to emulate all manner of human malfunctions. By co-locating mockup aircraft with sophisticated medical simulators, the pilots, doctors, and paramedics who go through the academy are better prepared for the complex environments in which they actually operate. Making procedures and protocols second nature undoubtedly produces safer actions and better decisions in the huge variety of circumstances that cannot be specifically trained for.

This approach is why the ADAC HEMS Academy has also attracted external clients from outside of the air medical sector, including offshore, VIP, police, and parapublic operators. The academy now offers aircraft and instrument type ratings, NVIS instruction, and training for inadvertent entry into instrument meteorological conditions (IIMC) for Airbus EC135/H135 and BK117-C2/H145 operators worldwide, independent of their mission background.

Two full flight simulators (FFS) from QinetiQ cueSim each replicate the EC135 P2e or T2e, and the BK117C-2 (better known as the EC145), both certified not only to EASA Level A, but also by Brazilian, Argentine and Russian aviation regulators. These are supplemented with the HeliSys 135 system trainers from Boeing Peters Software, which use touchscreens to replicate the avionics and aircraft system switching to assist in learning procedures. They simultaneously display system diagrams and detailed 3D models of components, clearly illustrating the complex interrelation between systems during various phases of aircraft operation.

As with the HEMS-specific training, the emphasis of simulator training at the HEMS Academy is on the mission, rather than

1 // The author during a demonstration of a HEMS training sortie in the EC135 simulator. **2** // Thomas Gassmann demonstrates the Boeing Peters software Helitrainer 135 at the HEMS Academy. **3** // Two full flight simulators from QinetiQ cueSim, replicating the EC135 P2e or T2e and the BK117 C-2, are certified to EASA Level A.

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Pilot and base manager Michael Schneider sits in the cockpit of an EC135 at the Aachen rescue station.

flying technique. As Gassmann explained, “We work hard to ensure that we deliver learning experiences, whatever the student’s background. All of our training is bespoke to the individual’s experiences and scenarios are customized to ensure that they see something that they can learn from, and that they never see the same situation twice.”

INTO THE FUTURE

In 2014, ADAC Luftrettung replaced its legacy BK117 B2s and C2s with the Airbus Helicopters H145, a development that Gassmann described as a “game changer.”

“The H145 provides more power, and more performance,” he said. “It is mainly used in intensive care transport where we need to take more equipment, or in offshore and mountain environments. When you’re hovering here in the mountains at 2,500 meters [8,000 feet], it’s good to know you have OEI [one engine inoperative] performance.”

The H145 clearly represents a significant advance from legacy BK117 variants, most obviously in the incorporation of the Helionix avionics suite. Continuing to rely on the existing FFS modules was not an option for the ADAC HEMS Academy, so it began the process of acquiring a simulator that would represent as much of a step forward in synthetic training as the new aircraft did in the air.

The specification called for certification at EASA Level D, the highest possible fidelity, but the academy also needed to incorporate a level of fidelity in the scenarios and environmental system that was, at the time, not available. It was faced with having to build its own simulator, and with most aircraft manufacturers closely guarding their flight data as proprietary intellectual property, that meant a rigorous flight test program simply to generate the simulation data model. After partnering with Reiser Simulation and Training, the two companies set about the challenge.

The levels of flight simulation fidelity incorporate a vast array of criteria that must be met within specific tolerances: from the visual system through to vibration, control feel, and system behavior under specific conditions. While achieving the Level D certification was important from a commercial aspect, at least as much effort was poured into creating a system specifically to meet the requirements of the ADAC HEMS Academy’s training philosophy. Every switch and circuit breaker is functional, allowing the instructor

to create complex compound malfunction scenarios that more closely mirror the progression of real-world emergencies.

"We needed it to be Level D to attract outside clients, and to conduct type-specific training," Gassmann told me. "Just as important to us was the ability to create and modify scenarios, and those things are not part of the certification process."

Michael Happel, head of training at the HEMS Academy, demonstrated the creation of a basic scenario on the touchscreen briefing system. These discrete systems allow several instructors to be simultaneously creating scenarios, briefing students, and operating the simulator, resulting in more efficient sim usage. The software is mirrored on an instructor operating system within the simulator itself, meaning that scenarios can then be altered, or even created from scratch, during training.

Moving into the H145 simulator, Happel guided me through a HEMS scenario. Given that the German aviation authority, the Luftfahrt Bundesamt (LBA), had just approved certification at Level D — and having no personal experience whatsoever on the H145 — I elected to take their word that the flight dynamics were up to spec. I concentrated instead on the scenario modeling.

With a 240-by-80 degree field of view from an array of 15 Barco projectors, the resolution and graphic fidelity gave more than enough visual reference to provide complete immersion. After I avoided a hilltop shower en route to the scene, the software was able not only to create an authentic-looking truck wreck, but also to cause dynamic traffic jams that necessitated real consideration in landing-point selection. The weather was poorer now — the shower had worsened and been blown directly over our route — but conditions were still easily VFR, at least until we began our transit to the hospital.

At this point, in the fading twilight, it became hard to discern what the visibility actually was and where precisely the indistinct cloud base began. As I negotiated the high ground around the hospital, it struck me that the visual engine handles weather superbly. It was exactly the kind of deceptively borderline conditions in which only a very subtle distraction would be necessary to risk an inadvertent entry into IMC, without obvious, sudden, and unrealistic degradations to prompt an abort decision.

> "IT WAS VERY IMPORTANT TO CREATE INTEGRATED TRAINING FOR THE WHOLE TEAM. WE TEACH THEM SITUATIONAL AWARENESS, AND HOW TO FACE CONSTANTLY CHANGING SITUATIONS."
>
> — *THOMAS GASSMANN, HEAD OF BUSINESS DEVELOPMENT, ADAC HEMS ACADEMY*

Modeling such marginal conditions is essential to this training approach, predominantly because decision-making is not tested when the correct action is obvious, but when the situation is ambiguous; when circumstances rest on a boundary between go and no-go, or conditions deteriorate insidiously. A thorough knowledge of the rules is essential, of course, but decisions in

1 // ADAC partnered with Reiser Simulation and Training on its new H145 full flight simulator. 2 // The emphasis of simulator training at the HEMS Academy is on the mission, rather than flying technique.


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these circumstances must be made based on sound judgment. Training of this nature helps both the individual and the organization, as exposure to marginal scenarios will very quickly identify gaps in standard operating procedures or operational policy.

Pilots, doctors, and paramedics do not attend the ADAC HEMS Academy to learn their profession, but how to apply it specifically. The aim therefore is not to train procedure itself, but to rehearse situations, make mistakes safely, and learn. It is a training mindset common to many elite operators, from special operations forces to high-performing sports teams. Familiarizing team members with the situations in which they will operate commits the correct routines and actions, however small, to their subconscious. Doing so frees up their conscious mind to solve complex problems and make difficult decisions that are highly situation-dependent, rarely repeated, and impossible to predict. It is a hallmark of highly professional training.

At press time, the ADAC HEMS Academy was scheduled to open its H145 FFS for its first students in the second week of January 2018. It was clear they would be in very good hands.

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Final Approach

interviewed by Elan Head | **Nick Lappos**, Sikorsky Senior Technical Fellow

Over a 50-year career, Sikorsky senior technical fellow Nick Lappos has had an enormous impact on the helicopter industry, both as an experimental test pilot and a development engineer. Lappos is officially retiring this year, although he plans to stay involved with the industry in a consulting role. We asked him to reflect on his career and the future of vertical lift.

Vertical 911: You've had an amazing career in the helicopter industry. Can you tell me about just a few moments in your career that, for whatever reason, really stand out to you?

Nick Lappos: So I joined the Army in 1968, because I just wanted to fly. I had to fly. And they had a great program for taking kids in the Warrant Officers Flight Training Program. By April of '68, I was in the Army, and by June, I was flying helicopters. And I still remember my first flight at Fort Wolters, Texas. I was in an H-13, a Bell 47, and lifted the aircraft off into a two-foot hover, and I still remember the grass waving in the stage field; the long fronds of grass waving in the rotor wash and the feeling that I actually was sitting there flying. It was a very powerful heady feeling that has never left me.

[Beyond that] I've had two or three major coalescences of the kind of work that we do. I remember sitting in a meeting one time in the 1980s talking about developing a new type of machine and realizing — for the 12 or so of us that were trying to form the vision for what was later to become the [Sikorsky] S-92 — that it's something wonderful to be there right at the beginning when an idea forms. It's a great feeling to be part of a team that can make something grand happen and to do it as a collective, where everyone works together.

V911: So what is it like for you now, seeing the S-92 in action, doing all of these incredible missions around the world?

NL: There's a great deal of pride. In fact, I would often say that to groups of people trying to motivate them: to recognize that the things we're working here in our drawing boards will eventually be on TV. And then you'll have your grandkids in your lap, and you'll have a chance to point at the TV screen and say, I helped make that happen.

V911: Tell me a little bit more about the process of getting from brainstorming to the final product. What kind of collaboration goes on in that development process?

NL: Well, it's an ever-refining situation. You start off with basically parametrically derived possibilities from a technical standpoint. As you get more and more knowledge, that parametric data, which is rather wide and approximate, becomes narrower and more sharply focused. But at the same time that you're looking at the possibilities for what this machine could be, you have to look at what the customer's asking for, and also what the customer may want if they knew what to ask for. So it's a game that involves not only refining the technical end of the vehicle, but also refining what you think the customer would like, and what they'll buy, and what the value proposition is.

V911: So obviously that whole process is full of challenges. What are some examples of challenges that your teams have faced and overcome?

NL: Well, almost always, the biggest challenges are to meet the promises you made. You agree that you can make something, and you're going to make it as light as you can and as strong as you can. And then, as you start to build and test it, you realize that it isn't what it should have been. And you have to do something to get that back, because if you don't, then it takes away from the payload or the speed of the aircraft and in some way damages its marketability.

I must say, too, that a team that can lay out a plan that is slam dunk in every corner, usually it is a plan that has very little in the way of actual technical growth; very little in the way of reaching for something. So often it's a real interplay between the risk involved and the net fitness of the machine when you're finished making it.

For the S-92, we had a number of occurrences like that, sometimes for the better. We discovered that we had 600 or 700 pounds more performance in the [main] rotor than we thought we did, because the rotor was better than we thought it was. And then we're left with the idea, well heck, we've got two years to go until certification. How much of this can we grab and put into

the package? Our team agreed we would grab at least half of the performance and put it back in the aircraft, which meant we would have to stretch the structure of the aircraft to take the extra weight. And we did. We ended up with something that carried two more passengers than it should have under the circumstances, and that made it more competitive in the marketplace.

V911: What are some of the biggest changes that you've seen in the helicopter industry over your career, and where do you think we're heading in the future?

NL: Well, the one thing I would point out is that the ability to use computer-based tools, and the ability to gather knowledge and be more precise about it, is amazing. And it's meant that we can get much more refinement and much more performance out of a machine.

As to where I think we're going in the future, it seems to me that there are four major places where we in the rotorcraft industry will be challenging ourselves. The first one is that these computer tools allow us to have intelligent machines that are much more easily controlled. You can go to a mall now and spend $35 on a helicopter that stands in place, and hovers, and only moves when you command it to move. This is amazing. And those control systems are showing up now on these air taxi concepts that you're seeing all over.

So that means that we're going to have helicopters that don't require extremely well trained men and women to be the pilots. That means that we'll have a much more democratic way of thinking about flying, and that any one of us could climb into these vehicles and move from place to place. So that's number one, and that's an enormous change.

Number two is that electrical propulsion, electrical motors, and energy storage are changing a great deal about what the helicopter looks like mechanically, so that we end up having fewer components in the transmission or maybe no transmission at all, because electrical components could take the place of the mechanical components and hydraulics that we're using now. So electrical propulsion has the chance to make things much simpler and therefore cheaper to maintain; cheaper to build to begin with.

Nick Lappos was involved with the design of the S-92 helicopter from its earliest stages. "It's a wonderful feeling to be part of an enterprise that can do something good, and do something hard that is good," he said.
Skip Robinson Photo

Sikorsky has installed its Matrix autonomy technology on an S-76 demonstrator. When it comes to embracing future technologies in vertical lift, "I do believe Sikorsky is doing the right things," Lappos said. **Sikorsky Photo**

A third thing is that once we get that kind of control that we're talking about, it is entirely possible to create a family of helicopters that doesn't have controlled flight into terrain. With the intelligence that's part of that flight control system and sensors, it may be entirely possible to build machines that don't hit things.

And I think there's a fourth thing, too. Once these factors all take place, then I think we're going to find that helicopters move much closer to becoming prime movers. Up to today, helicopters have been an interesting and useful side function, complex and expensive. Once the complexity drops, and the expense drops, and with the ubiquity of being handled by regular folks, helicopters might become prime movers in themselves, like the air taxi things that are being talked about but also kind of like the movie Avatar, where everything that that military force did was moved by vertical machines. We may find that the helicopters of the future in our combat units are much closer to what armored personnel carriers and tanks are today.

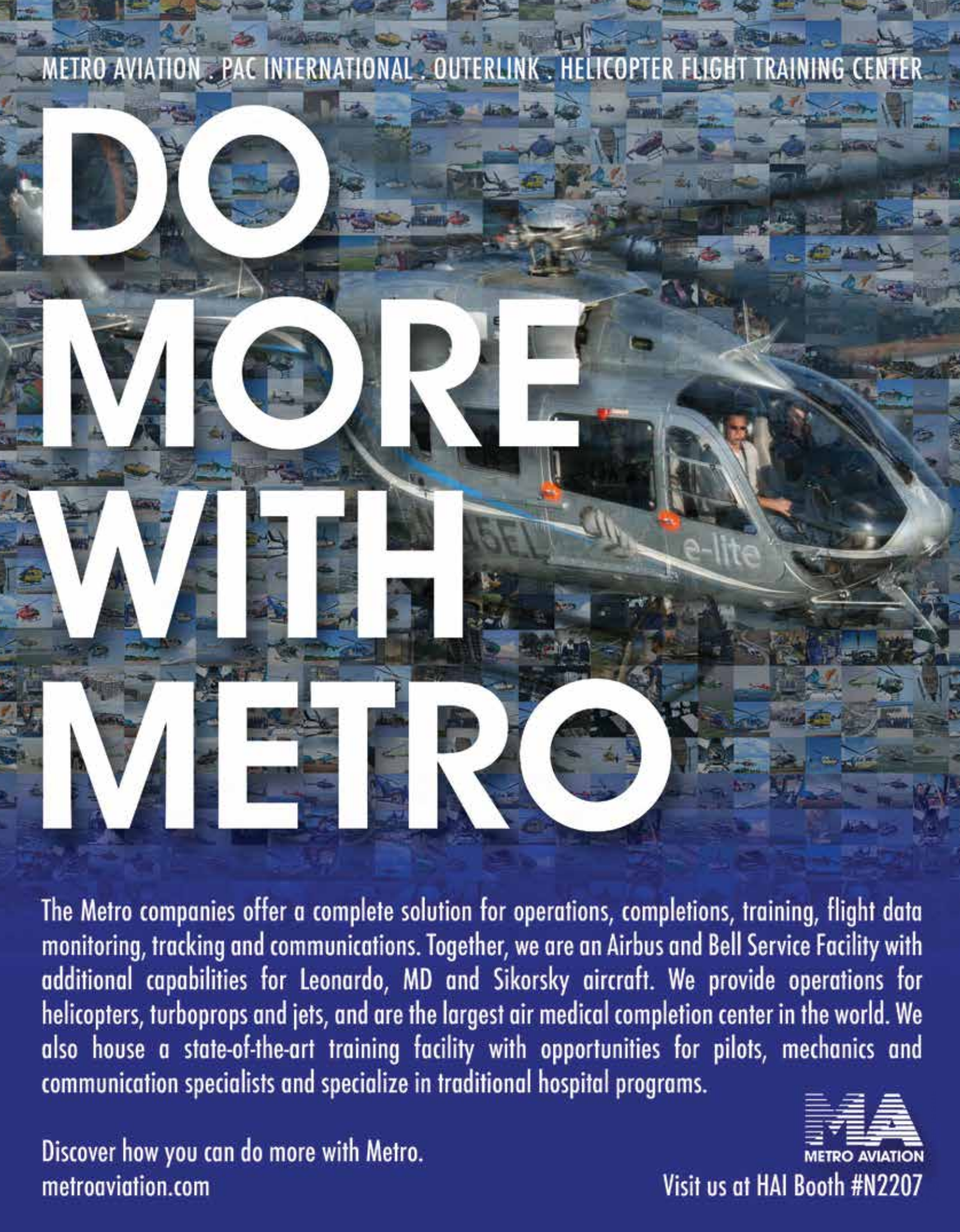
V911: So how do you see traditional helicopter manufacturers dealing with these new technologies and the entrance of new players into this vertical-lift market?

NL: There's going to be a real shake-up perhaps, depending on which OEMs can adapt and recognize these enormous changes, which move in non-traditional directions. I see tremendous pressure coming from money from other sources, from Internet sources, that is feeding folks with great ideas and perhaps not as much experience in how to actually make a qualified flying machine, but an awful lot of energy and an awful lot of good technology.

What happened to Polaroid cameras and Kodak when digital cameras came out? We're in exactly the same kind of shift that's occurring. I do believe Sikorsky is doing the right things. Lockheed Martin recognizes this, and we have tremendous potential in the artificial intelligence and electrical helicopter world. It will be interesting to see if all of us can make the shift so that we can compete with the small startups that are obviously very energetic and very well backed.

V911: Given all of these prospects on the horizon, what advice do you have for people who are going into the industry and interested in a development career like yours?

NL: It's hard to give advice, though I would say this: all of us have to follow our dreams. If you like flying machines and want to get involved, then it's probably a better time now than ever. We may look on the changes that are taking place and think that they changed today's system. Yes, but we're also going to be looking at the fact that if vertical lift machines become prime movers, there will be 10 times or 100 times more of them than there are today. So in fact, it's an enormous field: a field for people to repair them, a field for people to design and build them, and for selling them, and for servicing them on the tops of buildings and at hospital helipads. It will be an enormous marketplace for people and ideas.



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