SPRING ISSUE 2018

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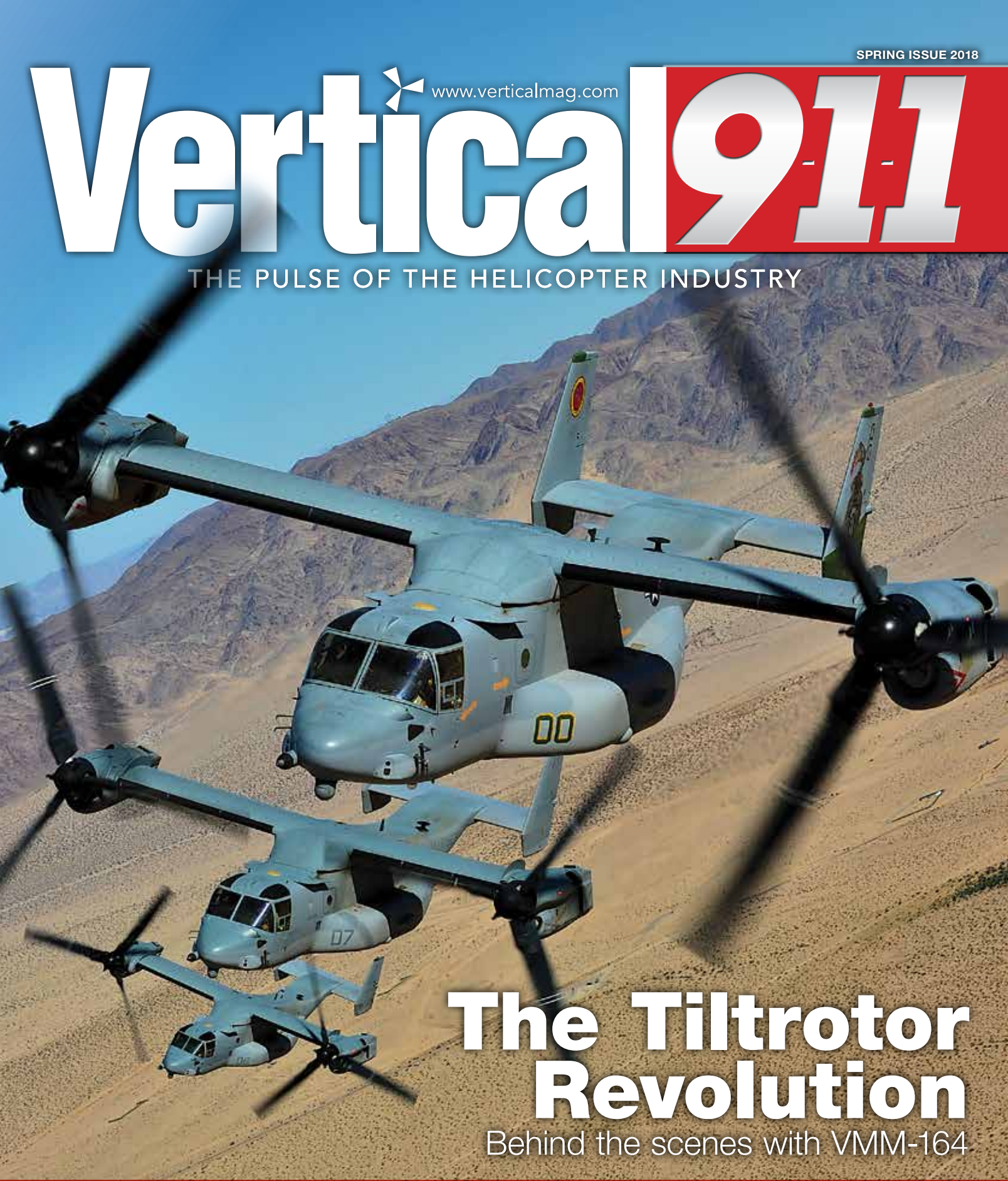
THE PULSE OF THE HELICOPTER INDUSTRY



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ON THE COVER

Three MV-22B Osprey tiltrotors operated by Marine Medium Tiltrotor Squadron 164 (VMM-164) fly in formation over the desert in California. Now with more than a decade in U.S. Marine Corps service, the tiltrotor has changed how the Marines do business. **SKIP ROBINSON PHOTO**

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THE TILTROTOR REVOLUTION

We went behind the scenes with the VMM-164 Knightriders to learn how the MV-22B Osprey has revolutionized U.S. Marine Corps Aviation.

BY SKIP ROBINSON

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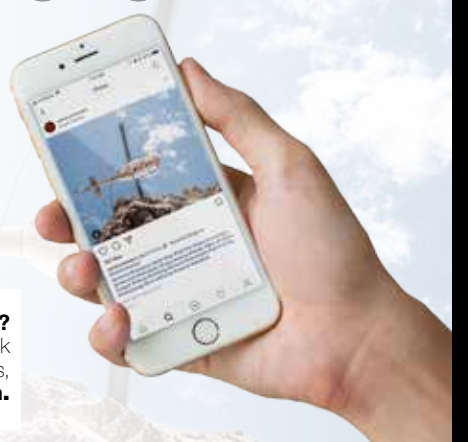

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Column

Focus on Professionalism // **Tony Kern**

Reasons or Excuses?

Recently, I've been studying the tragic increasing trend of military accidents plaguing the U.S. armed forces. According to a recent *Military Times* report ("The death toll for rising aviation accidents: 133 troops killed in five years," April 9, 2018, by Tara Copp) aviation deaths have collectively increased since 2013 by nearly *40 percent across all four services*. The result is the devastating loss of 133 fathers, mothers, husbands, wives, brothers, sisters, and friends.

In our emergency response world, we are all too familiar with a sudden and apparently unrelated rash of accidents. So what's going on here? And what can we learn from it?

There are many thoughts on why this is happening. In the *Military Times* article, former Defense Secretary Chuck Hagel said he believes the cause is the massive congressional *budget cuts* of 2013. "We stopped training, for months," he said. "Of course, all of that affected readiness . . . and that means, surely, accidents."

An unnamed active duty Air Force maintainer attributes the accidents to a *high operations tempo*. "The war machine is like any other machine," he said. "After 17 years of running this machine at near capacity, the tank is approaching empty."

Col. Anthony Bianca, head of Marine Corps aviation plans and programs, suggested that perhaps disgruntled personnel are to blame for the 2013 rise in numbers. "There was a lot going on at the time. And then sequestration hits. *Morale* was low between 2013 and 2015."

Or, offered Navy Capt. John Fischer, perhaps it is due to *inexperience*: "We were able to directly correlate . . . an increase in mishap rates as the level of years of service in supervisors went down." Bianca echoed, "We lost a lot of that middle management, that salty, very experienced sergeant."

Capt. David Koss, the Navy's top aviation readiness officer, targeted *funding* as a contributing factor: "From a readiness perspective, I can say that [budget pressure] has made it much more challenging to get readiness, which does increase undue risk."

Dan Grazier, a former Marine Corps captain who is now a military fellow with the Project on Government Oversight, believes *training* is the issue. "The lack of flight hours — that is the big thing I am hearing from my friends still in the service . . . that is where experience comes into play."

And lastly, John Pendleton, director of readiness and force structure issues at the Government Accountability Office, suggested that the enemy is a combination of the previously listed culprits. "Traditional readiness, at its core, is the sum of *equipping, manning, and training*. If you have an increase in mishaps, you likely have an issue in either training, equipping or manning, or possibly all three."

These are all smart, informed perspectives — *reasons why* — but not *excuses for*.

At the end of the day, every maintainer, dispatcher, manager, pilot, and crewmember is responsible for the safe operation of their aircraft and everyone on board it. We will always face some type of challenge. We will never have enough of everything we need. But we must always operate safely, regardless of those factors.

While researching for this article, I was drawn back to one of my favorite aviation books, *Fate is the Hunter*, by Ernest Gann. In the prologue, he states our challenge clearly.

"This is not a war story — and yet it is. Any tale in which the protagonists are so seriously threatened they may lose their lives demands an enemy capable of destruction. The difference between what is told here and familiar war is that the designated adversary always remains inhuman, frequently marches in mystery, and rarely takes prisoners. Furthermore, armistice is inconceivable and so is complete victory for either side."

When he wrote those words over 50 years ago, he fully understood our truest and most dangerous threat, our lack of vigilance against our own complacency — or worse yet, surrender — in the face of the challenges we face in the aviation industry.

As in nearly every other industry, aviators and maintainers face a daily onslaught of challenges; potential reasons for failure if not confronted and countered. Fatigue, high operations tempo, inexperienced personnel, lack of training opportunities and fiscal difficulties all plague our day-to-day operations in one form or degree.

Reasons are legitimate, excuses are not. Reasons are factors we must continuously identify and counter to ensure the safety of those we serve. Excuses are for Little Leaguers, not aviation professionals. The stakes are too high.

Special thanks to Vanessa Shawver for research assistance on this article.

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Column

HAA Corner // **Bill Winn**

Assembling the Pieces

Having reviewed the details of over 150 air medical helicopter accident investigation reports filed by the National Transportation Safety Board, I would like to comment on just four of the primary causative factors recognized in those reports.

1. *Pilot proficiency and decision-making*
2. *Crew resource management (CRM)*
3. *Safety culture (including elements of "just culture")*
4. *Safety management (i.e. involvement by managers in risk-control policies and processes)*

Many readers will quickly note the overlap that exists between these factors. In fact, each item on this list is directly affected by each of the items below it.

We all know too well that the majority of helicopter air ambulance (HAA) accidents are preventable. Most are related to causes 1 and 2. Pilot proficiency and decision-making are the result of skill, training, and practice. In many cases, managers assume that the pilots they hire are well trained and adequately skillful. They also assume that the constant stream of routine flights that these pilots perform provides all the training and practice needed to maintain proficiency.

For the most part that may be true, until a pilot encounters an aircraft malfunction or en route weather conditions that he or she is not prepared to deal with. Such events require additional training and practice in the aircraft or simulator and in the classroom — training that simulates any adverse conditions that might occur. Much of that training should also include other flight crewmembers who need to practice applying the principles of CRM to specific emergency situations.

Common barriers to this level of training and practice include the facts that it requires additional time and effort by all crewmembers, and that many of them don't really believe they will ever need to use the skills taught during such training. As a result, many (maybe most) flight crewmembers are content to take a pass on additional training for in-flight emergencies.

This is where elements 3 and 4 on the list come into the equation. Training for emergencies entails a considerable cost in terms of dollars, and in terms of the time and the effort required to prepare and deliver that training. And, for the most part, the return on the investment (ROI) for that training is invisible unless a flight crew deals successfully with an actual emergency that occurs during a patient transport. Even then, the ROI is somewhat nebulous, since it consists of the hypothetical costs that would have been incurred if the emergency had resulted in an accident.

Managers play a leading role in creating an organizational culture that places emphasis on operational safety and open communication between all members of the team. They must establish a non-punitive response to honest mistakes that turns potential problems into opportunities for continuous improvements in processes, training, and communication between all members of the team.

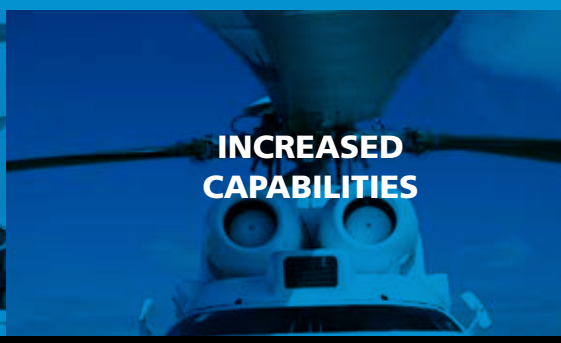
Managers must also implement appropriate measures to monitor the performance of flight crews. Flight data monitoring programs and an easily accessible and non-punitive incident reporting system play important roles in assuring the quality of all aspects of flight operations. Managers must also take time to monitor and evaluate the quality of training flights, as well as training in the classroom and in the simulator.

We have briefly shined a light on how factors associated with individual competence, with flight crew teamwork, with safety culture, and with leadership must be synchronized around a common goal of eliminating preventable accidents, and of dealing successfully with any non-preventable events that might occur.

In concluding this brief discussion, we should also note that there are additional layers of accident causation that can add considerably to this four-item list. I have limited this discussion to only those elements of safety management that lie within the direct control of each air medical provider organization — because it is at this level that we must recognize and control the many external factors that can also contribute to air medical helicopter accidents.

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

Managers play a leading role in creating an organizational culture that places emphasis on operational safety and open communication between all members of the team.



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Column

Focus on Safety // **Dan Foulds**

All the King's Horses

Humpty Dumpty sat on a wall,
Humpty Dumpty had a great fall.
All the king's horses and all the king's men
Couldn't put Humpty together again.

My friend Marcus called it. We were sitting at the National EMS Pilots Association (NEMSPA) booth at an HAI Heli-Expo trade show, and as I discussed our near year-long stretch of fatality-free helicopter emergency medical services (HEMS) flying, he said, "You know, Dan, there *will* be more fatal crashes. You know that, right?"

Sadly, he was to be proven right.

But why? Why must we take it for granted that some number of us will be killed each year? Why can't we emulate Delta, or American, or any other large air carrier? They haven't killed a passenger or crewmember in a long time. What is it that they do that we don't?

Is it their equipment? Is it their training? Is it because they have two pilots and we in HEMS overwhelmingly have one? I don't think so. I think the reason the larger airlines are so safe is due to how their pilots *think*. They think and act like "airline pilots." They make decisions based upon sound operating principles, with an ever-present eye towards safety. The mindset of the pilots and the safety culture of an airline is understandable. When they crash they kill a lot of people. Not one, or two, or four. A whole lot.

When Colgan Air, a smaller airline, crashed on February 12, 2009, a total of 49 people on board lost their lives, including the two pilots who were determined to be suffering from fatigue and a lack of proficiency. That sentinel event rippled throughout the air travel industry and caused major changes to operating procedures, standards, and experience requirements. Ask any chief pilot or director of operations; the Colgan crash changed the paradigm.

When airline pilots are found to not be thinking and acting like "airline pilots," then, by golly or by government, something gets done. I suspect that most of our crashes in HEMS occur because too many of us fail to behave like our Code of Federal Regulations part 121 brethren.

A friend of mine, with whom I used to fly the line, left HEMS and began to fly in the utility sector. One day he was ferrying an aircraft in the southeastern U.S. He landed in a field for weather, then made the decision to take off again. And pretty quickly he was dead from crashing into a river in bad weather. Another friend made a willful and conscious decision to fly into an area of storms after discussing these storms with another pilot and being offered a safe place to spend the night. He and his crew are dead. Another pilot elected to dispense with the sort of pre-takeoff challenge and response confirmation checks that help us make sure our aircraft is properly configured for flight. He had a switch set wrong on takeoff. He is dead too.

You can't undo dead.

I can't tell you how many times I have seen a pilot perform an aggressive "top gun" takeoff. And maybe I have done one or two of them myself. Delta doesn't do that. I was at the Caraway Hospital base in Alabama once, and I watched a pilot repositioning for fuel roll a 206 all the way over onto its side. Sure, he looked cool, but if that motor had quit during that showing-off stunt, he would be another Humpty Dumpty.

The common denominator with all of these pilots? They weren't thinking like airline pilots.

They weren't making choices the way an airline pilot would. In HEMS, we pilots and crews operate far away from the flagpole, from headquarters, from oversight — operational control centers (OCCs) notwithstanding. And we make lots of choices that have unbelievably severe repercussions. The altitude we fly at, the fuel reserve we operate with, the weather and winds we proceed into, the places we land and depart from and the manner in which we make those landings and departures; these decisions are super-important, and we should make them with one thing in mind.

"We will not crash and kill ourselves today."

That's how professional airline pilots think. And no matter whether we carry four people or 49, that's how we should think as well. Because some actions can't be undone. Some choices are forever. As we operate, perhaps we should ask ourselves, "Would a professional airline pilot make this choice?" If not, maybe we should take a more conservative path.

As we are out there on our own, we should never accept an undue risk because we think — or worry — that our peers would do it. And if we take pride in pressing on when "the other guys would have turned back," maybe we should remember that pride goes before destruction. When it's crunch time and you are wondering if the other pilots would do something, remember: they are not sitting there in your seat. You are. The safety of your crew and passengers trumps every other consideration.

If you find yourself wondering if something is a bad idea — it probably is. At the very least, avail yourself of one of the benefits a two-pilot crew has: the chance to bounce something off of another aviation professional. Call another ship, or your OCC if you have one, or even your next level of aviation management. Don't be afraid to ask for input. It makes you look wise and professional.

Like an airline pilot.

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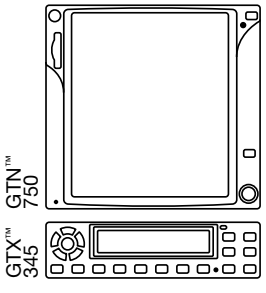

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U.S. Coast Guard prepares for MH-65E upgrade

By the end of next year, the U.S. Coast Guard will start upgrading its MH-65 Dolphin helicopters with new avionics, yielding MH-65E models with enhanced capabilities and extended service life expectancies. **Skip Robinson Photo**

BY ELAN HEAD

The Airbus H-65 Dolphin helicopters of the U.S. Coast Guard (USCG) have undergone multiple upgrades since the original HH-65A models entered service in the mid-1980s. Now, the USCG is preparing to upgrade its Dolphins once again, from MH-65D to MH-65E models with advanced digital cockpits.

The upgrade is being developed in partnership with Rockwell Collins, which will be equipping these "Echo" models with a version of the Common Avionics Architecture System (CAAS) that is already in use on the USCG's Sikorsky MH-60Ts.

Most visibly, the upgrade will enhance the MH-65 cockpit with four large multi-function displays (MFDs), incorporating new features and tools to enhance pilots' situational awareness and support their demanding missions. The upgrade will also meet the Federal Aviation Administration's standards for area navigation, allowing Coast Guard Dolphins to safely operate within congested civil airspace without sacrificing the efficiency of their missions.

Moreover, the system's modern electronics and open architecture are designed to accommodate further enhancements well into the future, which could keep these aircraft flying well past 2030.

"If you look at the 30,000-foot level down at this, this is going from an analog aircraft to a much more digital, modern aircraft," explained Duane Grave, Rockwell Collins' principal account manager for special operations and rescue helicopter systems.

"In doing that, we do the engineering work to take advantage of all the capability that a [modern digital cockpit] has in the civil world, and then we missionize it specifically for Coast Guard functions and specifically for the short-range rescue helicopter that is this MH-65."

All 98 of the Coast Guard's Dolphins will eventually receive the Echo upgrade in the course of undergoing periodic heavy maintenance at the USCG's Aviation Logistics Center (ALC) in Elizabeth City, North Carolina. The process of converting the entire fleet is expected to start in late 2019, and should take about five years to complete on the USCG's normal maintenance schedule.

In the meantime, there's a prototype aircraft in Elizabeth City, as well as an MH-65 that is more representative of the production Echo model at the USCG's Aviation Training Center (ATC) in Mobile, Alabama. The first "true" Echo is currently in production at ALC Elizabeth City, and is expected to roll off the line there in December.

Although the Echo at ATC Mobile lacks the standby attitude indicator and the full-color weather radar that will be installed on production MH-65Es, it's already getting rave reviews from the pilots who are tasked with developing training techniques and procedures (TTPs) for the model.

"[Since] I started flying the Echo I don't want to fly anything but it," said USCG Lieutenant Commander Brian Hedges. "Everything I need, flying wise, is right there within the CAAS the Echo has available to us. I think the crew down here

would probably agree that if we had a SAR [search-and-rescue] case today, we would want to go out in nothing but the Echo."

The Echo's large-format MFDs provide the ability to overlay terrain, traffic, and mission data onto a digital moving map, greatly enhancing pilots' situational awareness. The MFDs and flight management system (FMS) are also integrated with Rockwell Collins' DF-500 direction finder, which continuously scans for emergency beacons over a large frequency range, then highlights the location of any detected beacon on the digital display.

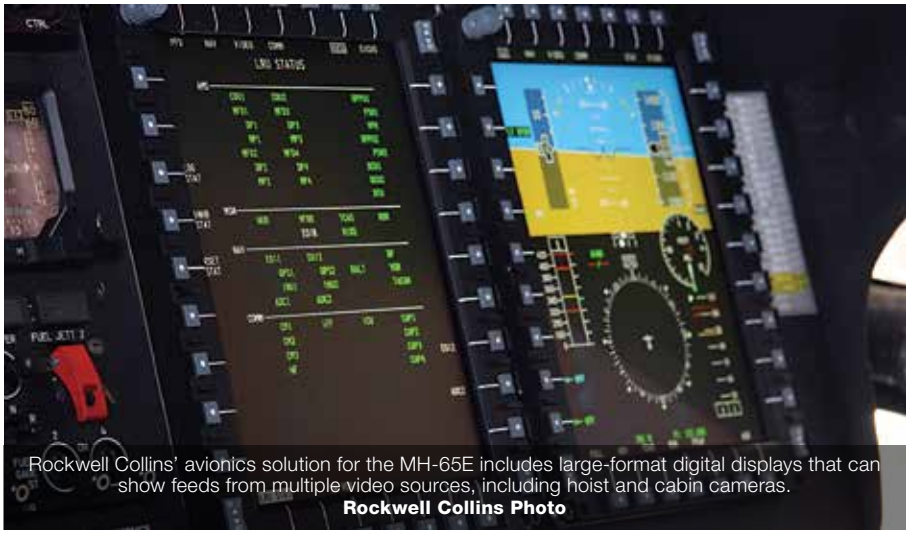
For beacons with embedded GPS coordinates, those coordinates will automatically populate in the FMS, making it easy for crews to fly directly to the beacon's location and center search patterns around it. Meanwhile, according to Grave, Rockwell Collins has significantly improved the coupling of the aircraft's autopilot and FMS, enabling new SAR functions, such as the ability for a crew to deviate from a search pattern in order to look at a potential target, then resume the pattern exactly where they left off.

Because the Echo also meets the Federal Aviation Administration's required navigation performance for area navigation (RNP RNAV), crews in Echo models will be able to fly those instrument approaches fully coupled with the autopilot. As Grave explained, "The RNP RNAV lets them fly more efficiently. They don't have to go around congested airspace or civilian-controlled airspace — they can fly through it."

USCG crews at ATC Mobile are particularly enthusiastic about the Echo's integrated performance planning capabilities, which should prove especially useful during complex, time-sensitive operations like those that followed Hurricane Harvey in Texas last year.

"We were going to location X to pick up two people, and then dropping them off at the next location, picking somebody else up and taking them elsewhere," recalled Hedges, who was among the USCG Dolphin pilots who responded to Harvey. With the Echo, he said, its avionics "will tell you what your hover power capability will be an hour into your flight," allowing flight crews to more rapidly plan such missions and evaluate new mission requests on the fly.

The Echo's more accurate fuel burn calculations will also help crews make critical time-on-station decisions with greater confidence. According to LCDR Adam Wolfe, who is also involved with the Echo program at ATC Mobile, "That process is now so dialed in in the Echo, that essentially it allows us to stay on scene longer [because we can be] more accurate in our minimums."



Rockwell Collins' avionics solution for the MH-65E includes large-format digital displays that can show feeds from multiple video sources, including hoist and cabin cameras. **Rockwell Collins Photo**

The enhanced reliability and situational awareness provided by the avionics in the MH-65E should be particularly helpful for crews in complex, large-scale rescue operations, like those that followed Hurricane Harvey last year. **Chris Ebdon Photo**

Enhanced communications interoperability with military, police, and fire assets is another feature of the Echo that should prove invaluable to USCG crews in situations like the response to Hurricane Harvey. Said Grave, "History has proven that during events such as hurricanes, police and fire interoperability is absolutely mandatory for them to do the search-and-rescue job in these major catastrophes."

Although Echoes won't see wider use in the Coast Guard until 2020, the team at ATC Mobile is already working hard to ensure that the MH-65E training curriculum will adequately prepare pilots to take advantage of the aircraft's impressive capabilities. They are particularly focused on making sure that pilots fully understand the sophisticated automation in the Echo, and have even reached out to the Human Systems Integration Division at NASA's Ames Research Center for help in developing an appropriate automation philosophy.

"It's such an advanced flight director and advancement in avionics for us," explained LCDR James Conner, who was previously at ATC Mobile and is now H-65 deputy program manager in the USCG's Office of Aviation Acquisitions. "We really wanted to bounce our ideas off other people and have somebody kind of challenge us, saying, 'Just because you've always done it this way, doesn't mean that's how you do it in a more automated aircraft.'"

Production continues on Norwegian AW101s

Norway has signed for at least 16 AW101 helicopters, which will be operated for search-and-rescue by the Royal Norwegian Air Force. **Greg Caygill Photo**

BY GREG CAYGILL

The production of the new Norwegian Leonardo AW101, known as Norwegian All Weather Search and Rescue Helicopter (NAWSARH), is now in full swing, with three aircraft having been accepted by the Norwegian Ministry of Justice and Public Security by the end of March 2018.

The program suffered a high-profile setback in November 2017, when the first delivered aircraft rolled over on its side during a ground run at the Royal Norwegian Air Force's Sola Air Station near Stavanger, Norway. Accident investigators reported in January that they had not identified any technical malfunction of the aircraft, and that their investigation was proceeding to focus on the interaction between personnel and the machine, including such factors as design, interface, documentation, procedures and training.

Norway signed a contract for the purchase of 16 AW101 helicopters, plus options for six additional aircraft, in December 2013. The aircraft will be operated by the Royal Norwegian Air Force's 330 Squadron and are equipped with an advanced SAR equipment package, including a multi-panel active electronically scanned array (AESA) radar system that provides 360-degree coverage; an obstacle proximity lidar system; and technology to track cell phone signals outside normal coverage areas.

The helicopters are being manufactured at Leonardo's Yeovil facility in the U.K. Although the accident aircraft (called ZZ103) was the first to be delivered, it was the fourth to be produced. The first production aircraft, called ZZ100, has been used for flight testing; it will be completed, painted and delivered in June of next year. ZZ101, also currently in use in Yeovil, will be delivered in June 2018. ZZ102 and ZZ104 have both been accepted by the customer, although ZZ104 remains in Yeovil for use in pilot training. ZZ105 is nearing completion, and may be ready in time for display at the Farnborough International Airshow outside London in July.

In addition to supplying the aircraft, Leonardo has a 15-year contract to provide integrated support and training for the Norwegian AW101 fleet, and has invested in an AW101 full flight simulator (FFS) to train the Norwegian aircrews. Jointly developed with CAE — and available to other AW101 customers — the FFS is located at Leonardo's AW101 Norway Training Center, which opened last June at the Stavanger Sola Airport.

RotorBits

CHC launches new hoist training facility

CHC Group has announced the launch of its new hoist training facility, certified to train offshore workers, search-and-rescue (SAR) hoist operators and technical crew members in on- and offshore hoist operations.

The facility, located within CHC's Den Helder base, has been designed to resemble a Leonardo AW139 cabin and can also be used to simulate helicopter hoist operations (HHO) conditions from a Leonardo AW169.

"We are delighted to see the new facility open and meeting the needs of new and existing customers," said CHC EMEA regional director Mark Abbey. "As a global helicopter operator, CHC has a long history of innovation, global standards and investment in new technology, and this is a perfect example of how we continue to diversify to meet the needs of our customers across the SAR, oil-and-gas and renewables markets.

"We have already received positive feedback on the training from our launch customers, which included one of the major global oil-and-gas super operators."

The one-day HHO course, with an optional second day on the aircraft, is designed to offer theory and practice to between four to six candidates.

"CHC is well known for its global oil-and-gas and search-and-rescue services," said Den Helder base manager Jan Lalkens. "We are now eager to show how our business and technical skills have transformed to support different industries as we drive CHC's long-term strategy to broaden our range of services to the energy market and continue to grow our renewables service."

Elbit Systems completes acquisition of Universal Avionics

Elbit's acquisition of Universal Avionics will allow the company to offer more complete cockpit solutions. **Elbit Systems Photo**

Elbit Systems Ltd. announced on April 11 that it has completed the acquisition of the assets and operations of the privately owned U.S. company Universal Avionics Systems Corporation for a purchase price of approximately $120 million.

Headquartered in Tucson, Arizona, and operating in several facilities across the United States, Universal Avionics is a developer and manufacturer of commercial avionics systems for the retrofit and forward-fit market, for a wide range of fixed- and rotary-wing aircraft types.

Universal Avionics' solutions include flight management systems (FMS), displays, communication systems, complete cockpit solutions and additional advanced commercial avionics systems, which are complementary to Elbit Systems' internationally successful commercial avionics systems, enhanced flight vision systems (EFVS) and head-up display (HUD) product line.

This acquisition will enable the company to offer a broad portfolio of advanced end-to-end cockpit solutions for commercial original equipment manufacturers and aftermarket customers.

Following the acquisition, Universal Avionics' business will continue to operate, with the same management and workforce and under the same name, as a wholly owned U.S. subsidiary of Elbit Systems.

"We have been providing unique enhanced flight vision and head up display systems for commercial aviation platforms for the last several years and see this business line as a key growth engine," said Bezhalel (Butzi) Machlis, Elbit Systems' president and CEO. "Elbit Systems and Universal Avionics share the same DNA of innovation and technological leadership, and our combined portfolio creates synergies that will strengthen our competitive position.

"I welcome the management and employees of Universal Avionics to Elbit Systems, and I believe that their skills and experience will greatly contribute to our activity in the commercial aviation area."

Pilot community calls for independent review of Irish safety oversight

The International Federation of Air Line Pilots' Associations (IFALPA) and the European Cockpit Association (ECA) are urging the Irish Minister for Transport to conduct an independent review of search-and-rescue (SAR) aviation operations within Ireland.

The associations' recommendation follows the recent publication by the Irish Air Accident Investigation Unit (AAIU) of a preliminary report and interim statement regarding the fatal crash "Rescue 116," a Sikorsky S-92A helicopter that was taking part in a SAR mission near Black Rock, County Mayo, on March 14, 2017. Four crewmembers were killed when the aircraft struck terrain at Black Rock while approaching Blacksod Lighthouse to refuel: pilot Capt. Dara Fitzpatrick, co-pilot Capt. Mark Duffy, and winch operators Paul Ormsby and Ciaran Smith.

Although the investigation into the accident continues, the AAIU's preliminary report and interim statement follows the International Civil Aviation Organization's Annex 13 Standards, which call for the state conducting the investigation to make an interim statement publicly available on each anniversary of the occurrence, detailing the progress of the investigation and any safety issues raised.

Among other interim safety recommendations, the AAIU has called for the Minister for Transport to "carry out a thorough review of SAR aviation operations in Ireland to ensure that there are appropriate processes, resources and personnel in place to provide effective, continuous, comprehensive and independent oversight of all aspects of these operations."

The AAIU has also recommended that the operator of the accident helicopter, CHC Ireland, conduct a review of its safety management system with external input to "ensure that the design of its processes and procedural adherence are sufficiently robust to maximize the safety dividend."

In a press release, IFALPA and ECA stated that they support the safety recommendations published by the AAIU so far, and encourage all regulators, operators, government agencies and equipment manufacturers to implement these recommendations without delay.

"To further improve the safety of SAR operations, and all Irish aviation, IFALPA and ECA urge the Irish Minister for Transport to conduct an independent review into the oversight of such operations. Effective safety oversight is crucial to identify safety risk and prevent such tragedies from happening again," the associations stated.

IFALPA and ECA are also recommending that the scope of this review be applied to the wider aviation sector in Ireland, adding, "Furthermore, any review should give consideration to the relationship, within all responsible state bodies, between commercial aspects and safety regulation."

How's your safety culture? CHAMPS aims to find out

BY MJ BRICKEY

The National EMS Pilots Association (NEMSPA) recently re-released the Cultural Health Assessment and Mitigation Program for Safety survey — CHAMPS — with new tools that help measure and compare the strengths and weaknesses of air medical programs across the globe.

"As a cultural survey designed specifically for air medical operators, CHAMPS is the product of a highly collaborative effort involving nearly every key player in the industry, and as a comparative tool can form the foundation for determining cultural weaknesses and strengths within individual organizations," said Kent Johnson, NEMSPA member and former president of NEMSPA.

NEMSPA president Miles Dunagan said CHAMPS gives a true glimpse into the safety culture of air medical programs and operations. "All operations are not necessarily created equally," he said. "Some employees may not feel they have a voice. They may feel to speak up might result in retribution. CHAMPS gives an opportunity to report with anonymity."

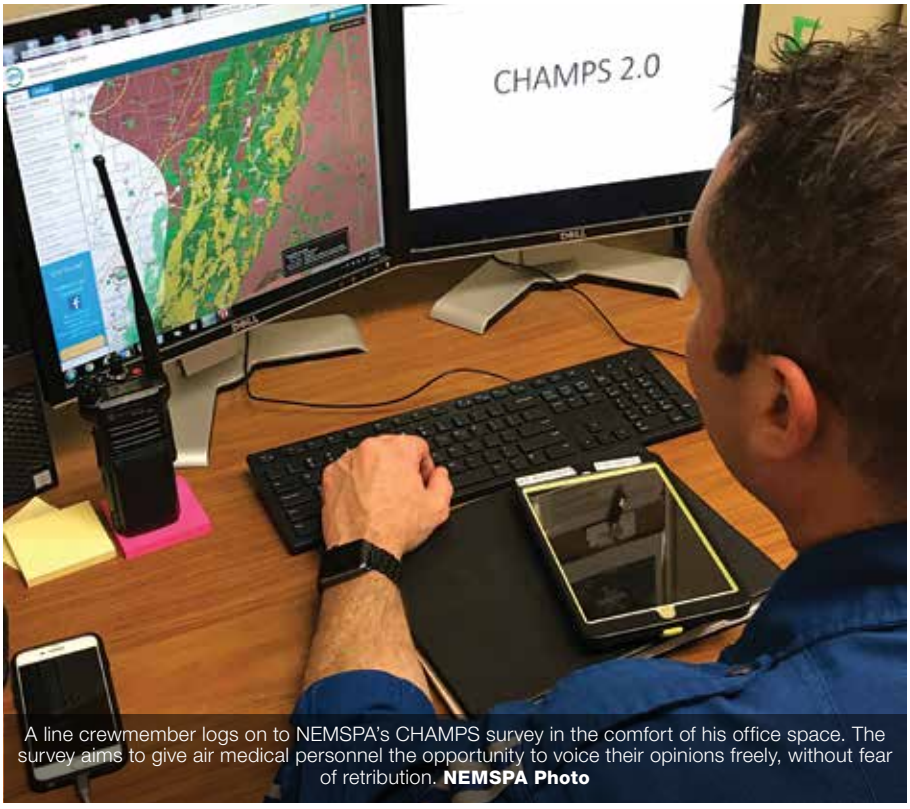
NEMSPA announced the relaunch and a partnership with Allianz at an opening reception during HAI Heli-Expo 2018 in Las Vegas, Nevada.

"Allianz has offered to pay for the base service fee for their ambulance operators to take the survey," Dunagan said, adding that Allianz has a history of supporting NEMSPA safety programs and initiatives.

David Watkins, the regional head of general aviation in North America for Allianz Global Corporate & Specialty, described CHAMPS as an "essential tool for EMS operators because it offers a deep dive into the safety culture of the organization." At Heli-Expo, he challenged other insurers to help pay for the survey as well.

Thomas Judge, executive director of LifeFlight of Maine and The LifeFlight Foundation, also spoke at the Heli-Expo reception.

"Providing 24/365 critical care air medical response is a huge undertaking. While we know this has demonstrated a benefit to patients, it comes with significant risk and potential of harm. While our aircraft, pilot training and performance, safety technologies are critical to delivering a safe system, ultimately the culture of our entire team is the heart of safety," Judge said. "Longitudinally understanding and continually developing our culture is critical to the safety of our team and our patients."



A line crewmember logs on to NEMSPA's CHAMPS survey in the comfort of his office space. The survey aims to give air medical personnel the opportunity to voice their opinions freely, without fear of retribution. **NEMSPA Photo**

NEMSPA developed the CHAMPS survey as part of its No Pressure Initiative, which came after the air medical industry suffered a particularly deadly year in 2008. The 2018 relaunch brings community support, new tools, options and clarified questions.

CHAMPS program manager Jill Dunagan explained that NEMSPA collected feedback from previous participants and made improvements to the survey. She noted, "Because the questions are designed for all disciplines in an air ambulance operation, results can be broken out for each discipline group [e.g. nurses, pilots or mechanics] or viewed together as a whole company, always keeping responses anonymous. Companies can also compare their cultural landscape to aggregate responses from across the industry."

She said many groups and associations including Helicopter Association International, the Association of Critical Care Transport, Air Medical Operators Association, Association of Air Medical Services, Air & Surface Transport Nurses Association, International Association of Flight Paramedics, National Association of Air Communication Specialists, Air Medical Physician Association and the Federal Aviation Administration participated in the development.

In refining the question set, CHAMPS leveraged the extensive backgrounds and experience of Dr. Justin Poll and Dr. Frank Thomas of Intermountain Healthcare, along with Dr. Steve Howard, co-director of the Patient Simulation Center of Innovation at the Veterans Administration (VA) Palo Alto Healthcare System — the VA's first simulation center.

Jill Dunagan said the CHAMPS survey implemented as part of an overall safety management system (SMS) can add significant layers of protection against real or perceived pressures on the pilot and medical crews.

Miles Dunagan added, "A safety culture survey is not usually required but is a recommendation — the survey is a way to improve safety culture. If a program or operation doesn't measure its culture, it doesn't know how it is doing. It also establishes transparency as a result of sharing the data collected."

Those interested in learning more about the CHAMPS survey can visit ChampsSurvey.com.

RotorBits

DRF Luftrettung Photo

DRF Luftrettung sees increase in night missions, capabilities

The German air medical operator DRF Luftrettung recently reported that it has rescued more than 2,300 patients at night in the past year.

In 2009, DRF Luftrettung became the first civil operator in Germany to adopt night vision goggles (NVGs) for helicopter emergency medical services (HEMS). The organization has been flying nighttime missions for more than 20 years, and currently operates nine sites with 24-hours-a-day, seven-days-a-week coverage.

The organization said that air rescue missions after sundown are becoming increasingly important. In a press release, DRF Luftrettung chairman Dr. Peter Huber stated, "Emergencies do not keep to office hours. If a person's life is at risk after a heart attack or a severe car accident, every second counts, whether it is day or night."

With the latest generation of high-tech NVGs, digital glass cockpits and sophisticated autopilot systems, DRF Luftrettung said its modern helicopters such as the new Airbus H145 are perfectly equipped for nighttime rescue missions.

"The DRF Luftrettung is making a key contribution in this sector and is well equipped and prepared for night rescue flights with professional highly experienced medical and flight personnel using the latest in up to date technology," Huber stated. "Our pilots have extensive experience with instrument night flying and the use of night vision devices."

Since its founding in 1973, DRF Luftrettung has flown more than 800,000 missions in total, and in 2017 was called out 38,509 times. It operates 31 HEMS bases throughout Germany and Austria.

Metro Aviation delivers first H145 to Boston MedFlight

Boston MedFlight's new Airbus H145s will replace the BK117 and two EC145s in its fleet.
Jay Miller Photo

Metro Aviation, under contract with Airbus Helicopters, recently completed a new H145 for Boston MedFlight, a critical care transport service in New England. This is the third aircraft Metro has completed for Boston MedFlight at its completion center in Shreveport, Louisiana.

The H145 is equipped with Metro's EMS kit and is MedFlight's first aircraft equipped with Outerlink's IRIS system for satellite tracking, push-to-talk radio, flight data monitoring and voice and video recording.

"From a safety perspective, the H145 is a great addition to our fleet," said Charles Blathras, chief operations manager for Boston MedFlight. "We have GPS approaches throughout the city of Boston, so the four-axis autopilot is a useful feature and the robust engines provide a significant margin of safety. The majority of landings at our receiving hospitals in the city are made on rooftops. We've had our eye on the H145 for a long time."

Airbus Helicopters announced at HAI Heli-Expo 2018 that Boston MedFlight had ordered three new H145 helicopters as part of a comprehensive plan to upgrade its fleet with more modern and capable aircraft. The new aircraft will replace Boston MedFlight's H145 predecessors: two EC145s and a BK117. Among other features, the H145 incorporates Airbus' modern Helionix avionics suite, rear-loading clamshell doors, and a large Fenestron shrouded tail rotor.

"We are proud that Boston MedFlight, one of this nation's leading critical care transport services, has once again placed its faith in helicopters from Airbus, as well as in our company's support and service team," said Chris Emerson, president of Airbus Helicopters, Inc. "We believe the H145 will be an excellent fit for the Boston MedFlight mission, and we look forward to our continued partnership."

The two remaining H145s will also be completed by Metro, bringing Boston MedFlight's fleet to three H145s, a Sikorsky S-76 and a King Air 200.

"Metro produces a high-end product and their customer support has been invaluable to us," said Blathras. "If we aren't flying, people in our service area aren't getting transported when they need us the most, and Metro is very responsive to our needs. They do a great job keeping us in the air."

Boston MedFlight was formed as a non-profit air transport service by a consortium of hospitals in 1985. The program annually transports close to 4,100 critically ill and injured patients from four bases, including approximately 1,800 by air. The nonprofit provides expert care to adult, pediatric and neonatal patients with a diverse range of diagnoses, including medical, trauma, and neurological, respiratory, cardiac and obstetrical concerns.

Wiltshire Air Ambulance lands at new airbase for first time

From left, paramedics Steve Riddle and Jo Gilbert, and pilot Nicky Smith, mark Wiltshire Air Ambulance's first landing on the helipad at the service's new airbase in Semington. **Wiltshire Air Ambulance Photo**

Wiltshire Air Ambulance carried out its first landing on the helipad at the charity's new airbase in Semington, near Melksham, England, on March 20.

This milestone was followed by the official handover of the airbase to Wiltshire Air Ambulance. The building will now be fitted out before the charity's fundraising, administrative and operational teams move in by this summer.

"Today has been a significant day in the history of Wiltshire Air Ambulance with the handover of our new airbase," stated David Philpott, chief executive officer of Wiltshire Air Ambulance, in a press release issued on the day of the event. "We are now in the final phase of the building work as we undertake the fitting and equipping of it before it becomes operational.

"Our primary contractors, Rigg Construction (Southern) Limited, and our architects and project managers, CMS, have ensured that our new home has the best possible facilities for our helicopter, our pilots, paramedics and our charity team to enable us to continue to save lives in the future.

"We have received amazing support from people for our new airbase, including donations, and we'd like to thank everyone for their backing."

Currently the charity leases offices in Calne for its fundraising and administrative team and leases the hangar at Wiltshire Police headquarters in Devizes for its helicopter and aircrew *(see p.76, Vertical 911, ALEA 2017).*

The new airbase has a flight and operations center for its aircrew, a hangar for the helicopter and medical equipment, offices for the charity team, training suite and a visitors' viewpoint.

Kevin Reed, head of facilities and security at Wiltshire Air Ambulance, has led the new airbase project on behalf of the charity, and said the site at Semington was chosen after an exhaustive search.

"When we became a stand-alone air ambulance three years ago, our aspiration was to find a location to build the best possible airbase to bring together our charity and operational teams and to have full control over our future," said Reed.

"The site at Semington is ideal because it is centrally located and will allow our helicopter to reach all parts of Wiltshire within 11 minutes, as it currently does now from its base in Devizes.

"In addition, as there is no ambulance station in Melksham, our paramedics with their critical care skills will provide enhanced medical cover for the area for emergencies such as road traffic collisions, cardiac arrests and strokes," he added.

RotorBits

Coptersafety's H145 simulator first to be certified with Helionix STEP 2

Coptersafety, an independent helicopter flight training service provider, has updated its H145 helicopter simulator avionics software with Helionix Step 2. Furthermore, it has now been certified by the Finnish Transport Safety Agency (Trafi) under European Aviation Safety Agency regulations.

Coptersafety said that it is the first in the world to offer simulator customers Helionix Step 2, the latest H145 avionics software, with the aim of providing the most immersive and realistic training experience available on the market.

"Most of the helicopters currently in service are already updated with the latest avionics software, Helionix Step 2. To offer as realistic and up-to-date training experience as possible, helicopter simulators also need to be updated correspondingly. We follow and react to our customers' needs and the industrial development," stated Jari Vilenius, head of simulators at Coptersafety.

Due to the Step 2 update, Coptersafety's H145 simulator training enables even more functionalities and training possibilities than before. The updated features offer additional elements such as new approach procedures — including LNAV, LNAV/VNAV and LPV approaches — and autopilot with hover capability.

"We strongly believe in synthetic training, and we strive for safer rotary-wing aviation. With this latest software update we improve helicopter operators' safety performance through more reliable, up-to-date simulator training and secure a safer helicopter operation for our customers," stated Mikko Dahlman, Coptersafety's CEO.

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ASU and Harris sign reseller agreement on new TSO NVGs

Aviation Specialties Unlimited, Inc. (ASU) and Harris Corporation recently entered into a distributor agreement, making ASU an authorized reseller for Harris' technical standard order (TSO) night vision goggles (NVGs).

This agreement authorizes ASU to sell, service, and repair Harris aviation NVGs for foreign civil and military aviation customers. An additional exclusive agreement for aviation and ground product sales in Colombia is in the final stages, as well as a basic ordering agreement (BOA) to further streamline purchasing for customers.

With the new agreements in place and the upcoming BOA, ASU said its customers can now expect quick and streamlined quoting, leading to faster purchasing and delivery.

The TSO assures operators that Harris NVG materials and parts meet or exceed Federal Aviation Administration (FAA) design and production standards for flight safety. The TSO certification also alleviates the need for part number specificity in approval for use.

"We are privileged to work with Harris as a leading manufacturer of TSO NVGs," stated ASU president Jim Winkel. "With Harris, we will continue to deliver exceptional product and service for our customers as they conduct life-saving operations, using Harris NVG technology."

ASU's long-lasting relationship with Harris has allowed the company to place more than 5,000 F4949 aviation NVGs over a span of nearly 25 years.

Harris Corporation, formerly ITT, first established an agreement with ASU in 1995. ASU worked closely with Harris staff for the last year to meet the TSO requirements. Harris received NVG TSO authorization from the FAA in December 2017.

"ASU's reputation of being a key distribution channel for Harris has a proven history of success," said vice president and general manager of Harris Night Vision Erik Fox. "We know that ASU goes beyond selling night vision goggles and assures that customers are properly trained on the use, maintenance and upkeep. Service after the sale is just as important to us at Harris, and we know ASU takes care of its customers."

Fresno County Sheriff's Office welcomes new MD 530F

Fresno's new MD 530F is the first to be equipped with MDHI's advanced glass cockpit solution. **MDHI Photo**

MD Helicopters, Inc. (MDHI) recently celebrated the delivery of a new custom-configured MD 530F to the Fresno County Sheriff's Office (FCSO).

With the February delivery, the Fresno County Sheriff's Office air support unit became the first airborne law enforcement unit in the U.S. to fly MDHI's advanced, Federal Aviation Administration-certified all-glass cockpit.

"Our law enforcement operators are part of the unshakeable foundation of MD Helicopters," stated Lynn Tilton, MD Helicopters, Inc. CEO, in a press release. "I could not be more proud that an air support unit with more than 20 years of providing over watch to their citizenry in MDHI-branded airframes is the first to fly our advanced, all-glass cockpit in the execution of law enforcement operations."

An MD Helicopters 500-series operator since its inception, the Fresno County Sheriff's Office Air Support Unit has amassed more than 30,000 flight hours in the execution of search-and-rescue missions, pursuit, and aerial surveillance in support of ground operations. When necessary, the air support unit also provides air support to other law enforcement agencies during life threatening, emergency situations.

"Our MD Helicopters aircraft patrol seven days a week, 365 days a year, and have played an integral role in ensuring the safety of all who live, work and visit Fresno County," said Margaret Mims, Sheriff, Fresno County Sheriff's Office.

FCSO's glass cockpit features the Garmin 500H EFIS flight display, Garmin GTN650H touchscreen GPS/navigation and communications panel, Aero Computers UC-6000 airborne mapping system, and a Garmin GTR 225 audio panel.

"Eagle 1" also boasts extended landing gear, a Fargo 21-gallon auxiliary fuel tank, wire strike protection system, and Talon LC Keeperless hydraulic release cargo hook for external loads up to 2,000 pounds (910 kilograms)..

CNC to develop custom mission suite for Ontario

CNC Technologies, an aviation technology and wireless communications company serving the law enforcement, military and government markets, announced on March 6 its selection by the Ontario Police Department, California, to deploy an airborne mission suite for the department's Air Support Unit.

Custom developed to support the Ontario PD's multi-faceted mission profile, the new solution enables real-time transmission of HD video and data to fixed and mobile receive sites across the Southern California region.

CNC is leading all aspects of the project, which includes design, integration, officer training and ongoing 24/7 service and support. The new system incorporates state-of-the-art image capture, transmission and receive technologies while also providing full interoperability with existing infrastructure and with the technology assets of regional partners.

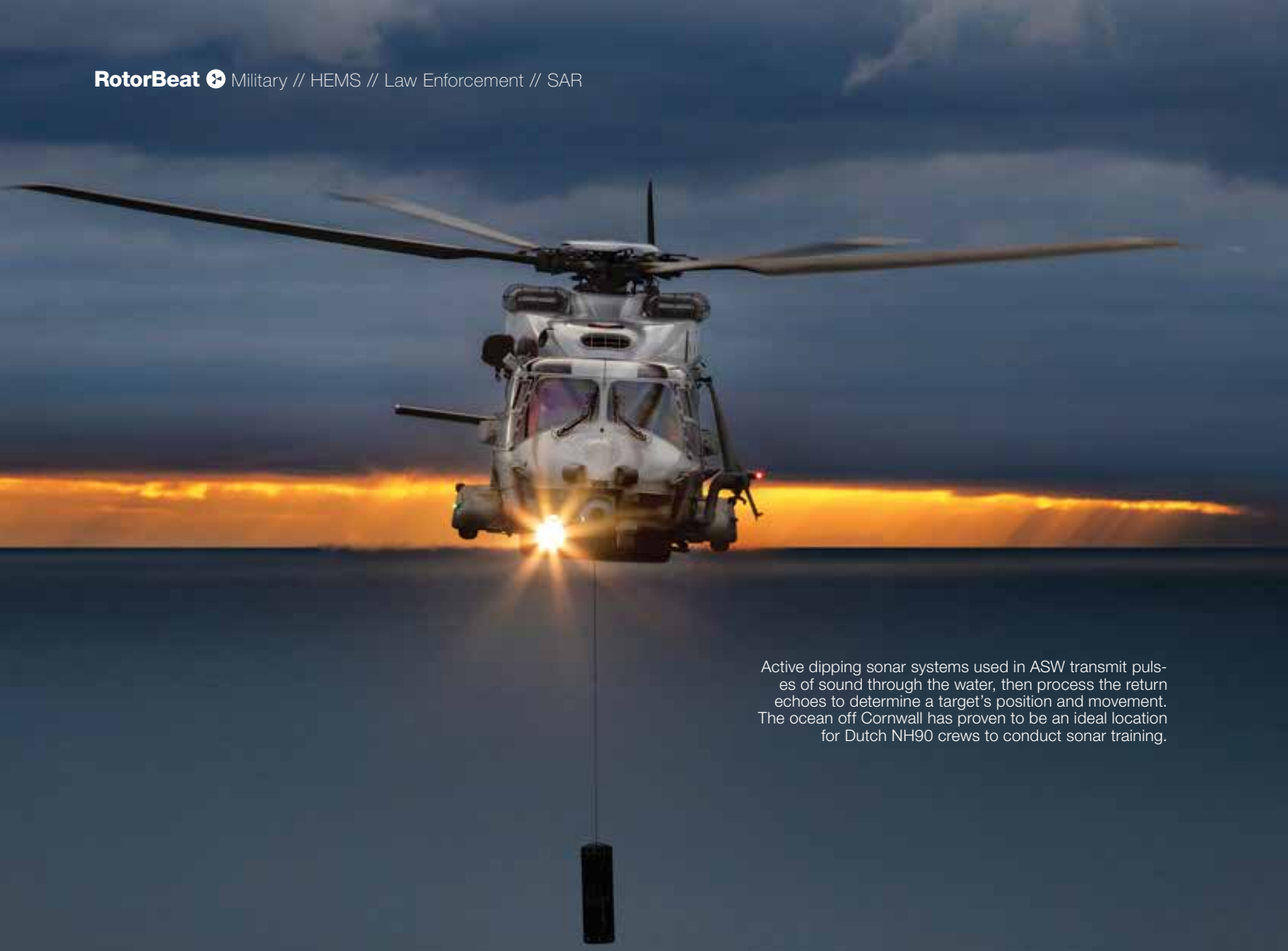
Additional functionality comes via an augmented reality-equipped moving map system, which enables air crews to overlay critical information such as street names and addresses on top of live video feeds.

"CNC Technologies brings unparalleled expertise developing and supporting robust airborne law enforcement and counterterrorism solutions for major metropolitan operators," said Sergeant Steve Valvo at the Ontario PD, in a press release. "We are pleased to partner with them on this new solution, which brings additional performance and capability to our airborne law enforcement and public safety efforts. CNC's always-on support structure will also help ensure we're operating the system at maximum efficiency."

CNC's solution for Ontario PD's Air Support Unit will enable real-time transmission of HD video and data to sites across the Southern California region. **CNC Photo**

"The Ontario Police Department is crucial to the Southern California law enforcement community, and we are honored to assist them in their public safety mission," stated Ron Magocsi, managing partner at CNC. "The new mission suite's flexible configuration is designed to provide best-in-class-functionality and user experience along with the ability to easily upgrade the system when new technologies become available."

CNC Technologies' experience ranges from implementing real-time microwave downlink capabilities, to building out a nationwide counterterrorism network encompassing aircraft, ground-based receive sites, imaging platforms and encrypted communications systems for sovereign state clients. The company is also involved with supporting Urban Area Security Initiative (UASI) projects funded by the U.S. Department of Homeland Security.



Active dipping sonar systems used in ASW transmit pulses of sound through the water, then process the return echoes to determine a target's position and movement. The ocean off Cornwall has proven to be an ideal location for Dutch NH90 crews to conduct sonar training.

Dutch NH90s visit U.K. for sonar training

STORY & PHOTOS BY GREG CAYGILL

Royal Naval Air Station Culdrose in Cornwall, United Kingdom, recently hosted some Dutch visitors: NHIndustries NH90 NATO Frigate Helicopters (NFHs) from the Royal Netherlands Air Force, which made the trip to southwest England for sonar training.

The aircraft, which are associated mainly with the Netherlands' 7(NL) and 860(NL) squadrons, conducted the training in association with the U.K.'s Flag Officer Sea Training (FOST), which provides operational sea training for all surface ships, submarines, and Royal Fleet Auxiliaries of the Royal Navy.

"We don't normally do any sonar operation in the Netherlands because of the shallow depth of the North Sea; is it isn't suitable for the sonar," explained a Royal Netherlands Air Force pilot from Naval Air Station De Kooy, who for security reasons asked to be identified only as "Chris."

According to Chris, when it comes to developing proficiency with the NH90's sonar systems, "You cannot just train people on the simulator; we need the real sonar. So coming to Cornwall for us is perfect."

The Dutch have 20 NH90 helicopters. All of the aircraft are equipped with a sophisticated fly-by-wire flight control system, four-axis autopilot, integrated avionics suite, and advanced mission systems. The NFH versions have an interchangeable anti-submarine warfare (ASW) mission system that includes maritime radar, electronic support measures, active dipping sonar (ADS), sonobuoys and torpedoes.

The NH90 has a minimum crew of two: a pilot in the right seat, and a tactical coordinator (TACCO) in the left. However, for ASW and other tactical missions the aircraft fly with a four-person crew: a pilot, TACCO, and two sensor operators. While Dutch NH90 pilots generally take full advantage of the NH90's autopilot capabilities, for the ASW mission, they do some hands-on flying, too.

"The autopilot is used with sonar, winching above water, but with ship winching we don't use any auto; do it manually," said Chris.

The NH90 has an endurance of around

four hours. A typical ASW sortie in the FOST areas might consist of a 15-minute one-way flight to the search area, followed by perhaps three-and-a-half hours of circling and sonar dipping before returning to the base or ship. "The flight time really depends, as with the intensive sonar dipping we cannot fly for hours because of all the hovering," Chris said. "With the sonar, the [helicopter] is quite heavy."

On their visits to Cornwall, the Dutch crews follow their own intensive three-week training schedule. They also help out in FOST scenarios and have the opportunity to cross-train with the Royal Navy.

"We are pretty happy we had the submarine HMNLS Walrus here, just for us, for two weeks," Chris said. "The Royal Navy heard about it and wanted to work with the submarine as well, because there wasn't any other available throughout the year."

As a result, the Dutch crews completed a couple of scenarios with the Royal Navy's Leonardo AW101 Merlin helicopters.

According to Chris, the intensive training in Cornwall pays off for everyone involved, but particularly for new crewmembers who are gaining their first exposure to the ASW mission.

"I think the best thing we have here off Cornwall, is that we have the opportunity to train all-new crews in ASW," he said. "We can do a lot of flying and everyone's focused on the flying."

The Royal Netherlands Air Force pilot "Chris" has more than 720 flight hours in the NH90, and over 2,500 hours of total flight time.

During ASW missions, Dutch NH90s fly with two sensor operators in the rear of the aircraft.

Chris has good things to say about the NH90's automation and handling qualities. "It's really, really fast in the controls, and it flies really nice when on a mission," he said.

West Coast Marines retire 'Whiskey' Cobra

Over three decades with the U.S. Marine Corps, the Bell AH-1W Super Cobra has played a valuable role in many combat and other missions. **Skip Robinson Photo**

BY SKIP ROBINSON

After more than 30 years of continuous service, many of them in direct combat, the distinctive two-seat, two-bladed Bell AH-1W Super Cobra has disappeared from the West Coast, as Marine Light Attack Helicopter Training Squadron (HMLAT) 303 has sent the last of its "Whiskey" Cobras to the boneyard.

The Whiskey was an upgrade from the hard-hitting but underpowered AH-1T Advanced Cobra, itself an improved version of the twin-engine AH-1J, with an extended tailboom and fuselage and an upgraded transmission and engines. With its new and considerably more powerful GE T-700-GE-401 engines, the AH-1W Super Cobra provided the hot and high performance the U.S. Marine Corps required.

The Marines have been flying the AH-1W Super Cobra since 1986, with the last delivered in 1998. As of 2014, there were 128 of the model in service. The AH-1W worked closely with the retired Bell UH-1N Huey and the current UH-1Y Venom in Marine Light Attack Helicopter (HMLA) squadrons, which form the backbone of the Marines' rotary-wing air-ground task force.

The AH-1W has provided valuable service as an on-call close air support platform. It has also been used as an airborne ground attack coordination platform, calling in fixed- or rotary-wing air support, and ground artillery or mortar support for Marine ground forces. The AH-1W has also been used as an escort aircraft for the UH-1Y, Sikorsky CH-53E Super Stallion, Bell-Boeing MV-22B Osprey tiltrotor, and even Landing Craft Air Cushion (LCAC) hovercraft during amphibious landings.

To accomplish this, AH-1Ws were armed with a nose-mounted turreted M197 20-mm Gatling cannon with adjustable rate of fire. On the wing stations, the aircraft were armed with a combination of Hydra 70 rockets, five-inch Zuni rockets, TOW guided missiles, AGM-114 Hellfire missiles, Sidearm anti-radiation missiles, and AIM-9 Sidewinder air-to-air missiles using the same LAU-7 rail launcher for self protection.

The AH-1W was upgraded to the night targeting system (NTS) AN/AWS-1(V)1 produced by Israel Aircraft Industries and Kollsman Corp. This NTS integrates a forward-looking infrared (FLIR) camera providing automatic target tracking with a laser designation/rangefinder and installed video recorder, giving the AH-1W both day and night weapons delivery capability.

Additionally, commencing in 1996, a communication/navigation upgrade, ECP 1686, incorporated an ARC-210(V) electronic protection radio, an ARN-153(V)4 TACAN, and an AN/ASN-163 global positioning system/inertial navigation system. Over the years, additional electronic and self protection packages were installed including the AN/AAR-47 missile warning system, AN/AVR-2 laser warning receiver and AN/APR-39A(V)2 radar detection system.

The AH-1W's first real combat test took place during the 1990-91 Gulf War, when many dozens of Marine Super Cobras deployed from squadrons on both the east and west coasts of the United States. These aircraft flew over 1,250 sorties in Iraq without combat losses, although three AH-1s were lost to accidents during and after the combat operations. During the 100-hour ground campaign, AH-1W Super Cobras took credit for destroying 97 tanks, 104 armored personnel carriers and other vehicles, and two anti-aircraft artillery sites.

Marine Cobras provided support in Somalia from 1992 to 1993, and then in Haiti in 1994. They were also used in former Yugoslavia during the 1990s, and two AH-1Ws (along with two CH-53Es) assisted in the rescue of U.S. Air Force F-16 pilot Captain Scott O'Grady in June 1995.

Beginning in the early 2000s, Super Cobras served in Operation Enduring Freedom in Afghanistan, and Operation Iraqi Freedom in Iraq. They have flown countless missions with Marine Expeditionary Units (MEUs) since their entry into service.

AH-1W Super Cobras are still being operated by Marine Aircraft Group 29, located at Marine Corps Air Station New River in Jacksonville, North Carolina. Over the next year or so, even these aircraft will be replaced with the more capable four-bladed AH-1Z Viper, which will continue the missions of the AH-1W into the foreseeable future.

However, don't expect the Super Cobra's distinctive two-bladed "whomp" and the scream of its T-700 engines to go completely silent, as surplus Whiskey Cobras will be offered through the U.S. government's Foreign Military Sales program. Given its outstanding performance with the U.S. Marines, it is likely that the Whiskey Cobra will continue on with other militaries well into the future.

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Three MV-22Bs with VMM-164 Knightriders fly formation in the desert in California. Now a decade into its service with the U.S. Marine Corps, the MV-22B has proven the value of the tiltrotor concept.

THE TILTROTOR REVOLUTION

We went behind the scenes with the VMM-164 Knightriders to learn how the MV-22B Osprey has revolutionized U.S. Marine Corps Aviation.

STORY & PHOTOS BY SKIP ROBINSON

After many years in development, a couple of cancellation attempts and some difficult times, the Bell Boeing MV-22B Osprey assault tiltrotor has now earned its place in U.S. Marine Corps Aviation with more than a decade of revolutionary service, and undoubtedly more to come.

The Boeing Vertol CH-46E Sea Knight (Phrog) helicopter that the Osprey replaced could move 15 troops within a 90-mile radius. By comparison, the MV-22B can move 24 troops over a 400-mile radius at more than twice the speed of a helicopter. With the MV-22B, a Marine commander can now place troops wherever they're needed — not just on a beachhead, but many miles inland as well.

However, it's not just in assault transport that the MV-22B has proved its worth. Although the Marines' Sikorsky CH-53E Super Stallion is a more efficient heavy lifter, the MV-22B is capable of moving loads of more than 10,000 pounds (4,535 kilograms) over short distances, making it a versatile asset for Marine commanders.

The MV-22B made its first deployment to a combat zone with Marine Medium Tiltrotor Squadron (VMM) 263 in 2007. Since then, it has been used for such diverse missions as retrieving a downed F-15 fighter crew in Libya, responding to the 2010 earthquake in Haiti, and assisting with last year's hurricane relief efforts in the Caribbean. It has proven to be the Marines' jack of all trades.

Recently, *Vertical 911* was able to spend time with the "Knightriders" of VMM-164, which is based at Marine Corps Air Station Camp Pendleton, California. This former Sea Knight training (HMMT) squadron operated the CH-46 for 50 years before transitioning to the MV-22B in April 2015.

With the Osprey now having logged more than 400,000 flight hours in fleet service, VMM-164 was able to tell us more about how the Marines' operations and training have evolved to take advantage of the tiltrotor's unique capabilities.

THE AIRCRAFT

The Marines consider the MV-22B to be a high-performance aircraft, and with its large prop rotors, instant throttle response, and a climb rate of over 4,000 feet per minute, it most certainly is. With a relatively lightweight composite build, and two powerful 6,200-horsepower Rolls Royce-Allison AE1107C turboshaft engines, it has more than enough power in airplane mode, which is the regime in which it spends most of its flight time. It also has good hover performance in helicopter/conversion mode, and positively leaps off the ground even at heavier weights at sea level on a warm day.

Ask any Osprey pilot, and they will tell you the MV-22B is not a helicopter but a turbo-prop that hovers. Converted into airplane mode, the aircraft climbs strongly and gets to cruise speed very quickly. The MV-22B can go from a hover to a normal cruise speed of 240 knots in seconds, continuing to a never-exceed speed of 280 knots. In conversion and helicopter modes, the MV-22B maintains speeds from 120 knots all the way down to zero, and can hover all day if necessary.

The Osprey design features sophisticated fly-by-wire flight controls and a glass cockpit, with four multi-function liquid crystal display (LCD) screens. These displays show system status, digital maps, imagery from the nose-mounted forward-looking AN/AAQ-27A electro-optic/infrared camera turret (FLIR), and navigation information (including TACAN, VOR, ILS, GPS, and INS). The flight director panel of the cockpit management system (CMS) allows for fully coupled autopilot approaches that can take the aircraft from forward flight into a 50-foot hover with no pilot interaction.

Critical systems on the aircraft, such as the hydraulic system, have triple redundancy, increasing safety and combat reliability.

The MV-22B's engines, transmissions, and prop-rotors are mounted inside each wingtip nacelle; an interconnecting drive shaft between the nacelles maintains power to both prop rotors if one engine fails. Because the Osprey was designed for shipboard use, its wing and nacelles rotate to fit lengthwise, and the prop rotors fold, too.

The MV-22B has progressed significantly over the years from the early Block A airframes, which served as training aircraft. MV-22B Block B aircraft were the first deployable Ospreys and provided improvements in maintainability. MV-22B Block C aircraft received additional improvements including weather radar, a forward-firing ALE-47 airborne countermeasures dispenser system, and a more effective environmental conditioning system. Over the years, these features have greatly increased the aircraft's capabilities.

Today, a typical MV-22B weighs in at around 36,000 lb. (16,330 kg) before fuel. A typical fuel load is around 11,000 lb. (4,990 kg, or 1,650 gallons) and the maximum vertical takeoff weight is 52,600 lb. (23,860 kg). For short field takeoffs, that weight increases to 57,000 lb. (25,855 kg), and the aircraft can take off from a runway at weights up to 60,500 lb. (27,440 kg).

A VMM-164 pilot told *Vertical 911*, "The MV-22 is built like a tank; the dynamic systems are extremely stout and over-built. As a flying machine the tiltrotor concept is well sorted out."

A GROWING MISSION SET

Since its 2007 introduction into fleet service, the MV-22B's mission set has grown. As the aircraft has become better understood, Marine commanders have been able to use its unique speed, range, and hover capabilities in different ways than they used the CH-46E helicopter it replaced.

Today's missions include medium-lift combat assault; expeditionary assault from land or sea; delivery of equipment both internally and as external loads; parachute drops of equipment and personnel; ground refueling support for ground vehicles and helicopters; and insertion, extraction and fast roping of reconnaissance teams

1 // Two VMM-164 MV-22Bs fly near a training area in the Imperial Valley. Day and night reduced visibility landings (RVLs) are practiced regularly by both new and seasoned flight crews. **2 //** Flying up the coast next to Camp Pendleton, a VMM-164 Osprey can use a variety of training sites within the sprawling base, including concrete landing areas, a concrete LHD ship practice pad, and confined area landing sites in the hills. **3 //** During assault landings, the Osprey will be armed with either a ramp mounted .50-caliber M2 (shown here) or 7.62mm M240 machine gun. **4 //** Aerial refueling gives the MV-22B enhanced range capabilities. Here, a VMM-164 Osprey receives gas from an Omega 707 tanker.

2

3

or special operations forces (SOF). A more mundane mission is transporting VIPs, officers and personnel to land bases and ships offshore. MV-22Bs are also cleared to carry two different types of vehicles internally: the ITV "Growler," a weapons-capable light-strike platform; and the Polaris MRZR-D light vehicle.

Another important mission set includes medical evacuations from the battlefield, and high-speed transfers of the wounded between hospitals or to an offshore hospital ship. The speed of the MV-22 greatly increases patients' chances of survival by transporting them to more capable facilities within the so-called "golden hour" following traumatic injury.

The MV-22B is also used for tactical recovery of aircraft and personnel. Better known as TRAP, this is a more constrained version of the Air Force's combat search-and-rescue mission; rather than searching for downed aircrews, the Marines only launch if they have positive information on the survivors' location.

One problem the MV-22B has for these missions is that no other model of aircraft is fully capable of escorting it. The McDonnell Douglas AV-8B Harrier II fighter jet is one candidate, but lacks the Osprey's endurance. Helicopters such as the Bell AH-1Z and UH-1Y don't have the speed to escort the MV-22B, so they need to launch early in order to be on scene for the Osprey's landings. Over the last few years, the V-22 has been tested with forward-firing rockets that would give it a self-protection/escort option, but this adds considerable weight to the aircraft. The optimal escort solution is still being studied.

Because the Marines specialize in amphibious warfare, many of the MV-22B's missions are conducted from U.S. Navy amphibious assault ships including the USS Wasp (LHD-1) and the USS America (LHA-6). Both ships have an 850-foot flight deck for aviation operations.

When a VMM squadron deploys as the aviation component of a Marine Expeditionary Unit (MEU), it will attach to a three-ship Amphibious Ready Group. The VMM squadron will then be reinforced with four CH-53E Super Sea Stallions from a Heavy Helicopter squadron (HMH); four UH-1Y Venoms and four AZ-1Z Vipers from a Helicopter Light Attack Squadron (HMLA); and six AV-8B Harriers or F-35B Lightning IIs from a Marine Attack, Vertical (VMA) squadron. The resulting reinforced composite squadron is then designated VMM (REIN).

4

"The MV-22B flies quite well in aircraft mode; it's both stable and smooth," said Commanding Officer Lieutenant Colonel Johnny J. Widener. Here, a VMM-164 Osprey soars past the Golden Gate Bridge in San Francisco, California.

VMM-164 LtCol Widener, left, poses with Sergeant Major Mario A. Aguero.

Day and night training is routine for MV-22B flight crews. The aircraft's glass cockpit features four multi-function displays for the pilots.

THE CREWS

A standard MV-22B flight crew includes two pilots, one of whom is the tiltrotor aircraft commander (TAC) and fully qualified in the aircraft. The aircraft is also flown with a co-pilot, who could be fully qualified or still training to higher levels on the aircraft.

The cabin crew includes a crew chief and an airborne observer/gunner (AO), both of whom are essential to the safe operation of the aircraft. The crew chief is trained on various aircraft systems and helps the pilots during preflight inspections. Before flight, the crew chief is responsible for the rear of the cabin, and controls all movements of embarked passengers and cargo and their placement and unloading.

Once airborne, both the crew chief and AO continuously monitor and inspect the aircraft systems and report any discrepancies to the cockpit. During all landings, particularly reduced-visibility landings, both the crew chief and AO maintain situational awareness of the landing zone and surrounding areas by checking for obstructions under the belly or near the nacelles.

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The most common aircraft used by the MV-22B for aerial refueling is the Marines' KC-130J (shown here), although it is also certified to refuel off the U.S. Air Force's KC-10A and the commercial Omega 707 tanker.

During combat operations, the AO is the designated gunner and can utilize either a rear- ramp-mounted 7.62 M240 machine gun, or the harder-hitting GAU16 or 21 .50-caliber M2 heavy machine gun. The chosen gun can be fired rearward and to the left or the right once the ramp is lowered, and is used during assaults to suppress ground fire. "Our enlisted flight crew members are critical to the safe operation of our aircraft and all take the job seriously," VMM-164 Sergeant Major Mario A. Aguero told *Vertical 911*. "I'm proud of how they accomplish these jobs on a daily basis."

ONE PROBLEM THE MV-22B HAS IS THAT NO OTHER MODEL OF AIRCRAFT IS FULLY CAPABLE OF ESCORTING IT.

When operating out of their home base at Camp Pendleton, the crews of VMM-164 train virtually every day in order to maintain their proficiency and bring new pilots up to standards. Daily training events take place within Camp Pendleton itself, but also range into the desert of the Imperial Valley and as far east as Yuma, Arizona. The squadron also regularly heads north to Marine Corps Training Center Twentynine Palms, and to the San Bernardino Mountains for local high-altitude training during both the summer and winter months.

With a longer flight, the squadron can reach the Sierra Nevada mountain range and the Marine Corps Mountain Warfare Training Center (MWTC) near Bridgeport, California. In addition to a hangar, sleeping facilities, and a food mess, this base provides crews with a large variety of training opportunities, including multiple confined area landing sites and realistic high-altitude performance training.

REDUCED VISIBILITY LANDINGS

Some of the most challenging training for MV-22B crews involves reduced visibility landings (RVLs). The aircraft produces large dust clouds when landing in desert conditions, often reducing visibility to zero. Captain Townsend, an RVL instructor with VMM-164, explained that crews take a stepped approach to RVL training, proceeding from Level 1 landings — in which there is light obscuration but visibility is maintained with the ground — all the way to Level 5 landings, in which obscuration is so heavy that visibility with the ground is lost by all crew members.

A MV-22B pilot's first experience with RVLs takes place in the simulator and is surprisingly realistic. The pilot then moves into the actual aircraft for flights encompassing Level 1 through Level 3 RVLs. Once proficiency is attained, another training flight for more challenging Level 4 and 5 RVLs takes place.

"The MV-22B has levels of automation that can be leveraged to achieve a safe landing," Townsend explained. "In the cockpit, we have a hover page on the screens that we bring up during landings; this allows us to center a 'pipper' on the screen which overlays a vector of our groundspeed over our waypoints.

"The pilot on the controls will call out when he is established on the hover page, and he will no longer look outside for the duration of the approach. The pilot not flying will monitor the instruments, back up the flying pilot on his scan, and use the hover page as well as any available ground reference to maintain the crews' situational awareness. The pilot not flying will also activate and monitor any automation being used for the conduct of the approach."

Meanwhile, Townsend noted, "The crew chief and AO are in the back scanning and talking us down. When under NVGs [night vision goggles] at night, RVLs become even more difficult and crew coordination needs to be even more precise."

Once a pilot masters RVLs, continuous training is imperative, Townsend emphasized. "We have found RVLs are a highly perishable skill."

AIR REFUELING

Because the MV-22B is capable of aerial refueling, it has the ability to range much farther from an ARG/MEU ship or fixed base. Today, launching a shipborne mission with KC-130 tanker support and flying a 1,200-mile one-way flight with air refueling, then returning to the ship with additional refueling evolutions in a single night, is entirely within the realm of possibility.

VMM-164 pilot Captain Ljunggren explained some of the nuances of aerial refueling with the MV-22B. "Each tanker platform the MV-22B is certified to refuel from (KC-130, KC-10, KC-707) has their own unique aerodynamic characteristics," he said. "We tank off the Marines KC-130s the most, as the C-130 is a little more compatible with our ideal refueling airspeeds and altitudes.

"The MV-22 airframe has a number of characteristics that make conducting air-to-air refueling a unique event," Ljunggren continued. "Due to the design of the wing and engine/prop rotor location, the aircraft will fly with a three- to five-degree nose-up attitude depending on the particular refueling

An MV-22B lands aboard a Japanese assault ship. The Osprey design is tailored to shipboard operations.

1 // Transporting troops and equipment is a primary mission of the MV-22B. 2 // Two MV-22Bs practice a TRAP mission in the California desert. This is a constrained combat rescue of downed aircrews. 3 // Fast roping is within the MV-22B's mission set, and is used in urban areas or other locations where the Osprey cannot land.

airspeed. This sometimes will pose an issue for pilots as they try to reconcile the slight nose-up attitude while trying to contact the basket.

"This issue is minimized by the location of the refueling probe almost directly in line with the right seat pilot and allows for a very natural sight picture for lining up the probe with the drogue. The probe location is helpful at night, when the pilots are using NVGs which have a restrictive field of view. The MV-22B has a light for its probe for use at night, which casts a shadow of the probe onto the basket for assisting with line-up."

MAINTAINING THE BEAST

There is no doubt the MV-22B is a complicated aircraft. As it has accumulated more flight hours and a broader set of missions over the years, its maintenance program has evolved to keep pace. The growing maintenance history on the aircraft has led to more refined inspection requirements, and also yielded service life extensions for some parts.

Master Sergeant Jamie Jenkins is the maintenance control chief at VMM-164 and explained, "flight times and maintenance records for each aircraft are tracked electronically, giving the maintenance depot center a clear understanding of which parts wear more often and what parts are holding up and wearing better than we thought." He continued, "The MV-22B is building hours quickly and is now getting to the point of being considered a mature aircraft. We aren't seeing many surprises, and are now able to predict things in advance. The aircraft has routine software updates, and with each update the aircraft's electronics get more refined."

During routine flight line operations, aircraft undergo a daily inspection that is valid for 72 hours. Additionally, a less intrusive "turnaround inspection" is performed after every flight. Other inspections are performed at 35, 70, and 140 flight hours, with major "phase" inspections after every 280 hours.

There are four major inspection cycles: A, B, C, and D. At each letter cycle, different areas of the aircraft are inspected, and any necessary repairs are completed. These inspections repeats themselves until the aircraft goes in for a major overhaul and re-paint.

Every unit has a shop called "maintenance control," whose senior planners are responsible for ensuring that the unit can meet all of its training and mission requirements without over-flying any required inspection. Jenkins described maintenance on the MV-22B as intensive. He noted, however, that maintenance tasks have gradually become easier and more end-user-friendly since he started working on the MV-22B program in 1999. "The nacelle redesign that was completed some years ago has been a game-changer in terms of speeding up maintenance actions. The maintainers have more direct access to components," he said.

Today, there are around 70 minor variations of the Osprey in service, which make maintaining them all a logistical challenge. Over the next five years, that number will be reduced through the V-22 Common Configuration-Readiness and Modernization (CC-RAM) program, in which Bell-Boeing will update older Block B standard MV-22 Osprey aircraft to the newer Block C standard. After the CC-RAM program is completed, there should only be around five configurations, streamlining support requirements.

The crew chief gets the best view in the house.

VMM-164's maintainers are critical to the success of the unit. "We have some of the brightest [people] I've ever had the pleasure to work with," said maintenance control chief MSgt Jamie Jenkins.

Caught off the shore of San Diego, a MV-22B flies into the sunset.

An MV-22B is pre-flighted before a night mission.

A MV-22B squadron consists of around 210 people; each of them has an important role to play in the unit's operations. Here, the men and women of the VMM-164 Knightriders, who have a long and proud history, stand in front of their aircraft.

LOOKING TO THE FUTURE

As the Marine Corps plans to operate the MV-22B for decades to come, the service will continuing to make improvements to the aircraft.

The Marines have revealed plans to test weapons using fuselage-mounted hard points, with the aim of giving the MV-22B new stand-off and precision weapons capabilities. These offensive capabilities include adaptation of the AGM-114 Hellfire, GBU-53/B SDB II, and the joint air-ground missile. The MV-22B has already successfully tested the Hydra 70 rockets, guided APKWS Rockets and AGM-176 Griffin missiles during Bell flight tests in 2014.

Another weapon system developed for the MV-22B is a belly-mounted, remotely operated gun turret system — named the Interim Defense Weapon System (IDWS) — which was installed on half of the first MV-22Bs that deployed to Afghanistan in 2009. However, the Marines found that the system's 800-lb. (360-kg) weight took away from critical payload in hot-and-high conditions, and consequently removed the system, although it remains in their inventory.

Meanwhile, a removable internal tanker system has been developed for the V-22, called the V-22 Aerial Refueling System, or VARS. This system has the ability to carry up to 10,000 lb. (4,535 kg) of fuel. Because of the V-22's uniquely flexible flight characteristics, it has the ability to refuel both helicopters — including CH-53E/Ks, the Air Force's Sikorsky MH-60G Pave Hawks, and Army Special Operations MH-47 Chinooks and MH-60 Black Hawks — as well as jets including the Lockheed Martin F-35B Lightning II, McDonnell Douglas F/A-18, and AV-8B Harrier. This capability will give the Marines additional flexibility worldwide.

Looking forward to the late 2020s, an MV-22C model could conceivably incorporate design features of the V-280 Valor tiltrotor now under development by Bell. Tiltrotor technology has advanced dramatically since the V-22 was first designed, and the next iteration of the V-22 could incorporate advances in engines and prop rotors, as well as avionics that move more information from the battle space into the cockpit, increasing crews' situational awareness.

When asked to share his thoughts about where the MV-22B Osprey community stands in 2018, Lieutenant Colonel John Widener, Commanding Officer of VMM-164, said, "As a transition pilot from the AV-8B Harrier community, I have been beyond impressed by the capabilities of the Osprey. Its unique capabilities has brought the United States Marine Corps to a place that could only be dreamed of 15 years ago. The MV-22B is the Marine Corps' first tiltrotor aircraft. Its speed and its unique capabilities allows us to bring the fight to the enemy and mass combat power faster than ever before.

"Of course, none of this would be possible without the well trained and motivated Marines from the maintenance and flying sides who keep the MV-22B in the fight," he added. "As the Knightriders' Commanding Officer, these young men and women who work on these aircraft are inspiring to watch. I am very interested to see what the evolution of tiltrotor aircraft holds in the future."

Skip Robinson | Skip has covered helicopter operations through photography for 25 years and has worked with *Vertical* Magazine for over a decade. His main interests are rescue, parapublic and military operations. Skip is based in Los Angeles, California.

THE ROAD TO BECOMING A **TILTROTOR AIRCRAFT COMMANDER**

What does it take to go from zero flight experience, to pilot in command of a U.S. Marine Corps Bell Boeing MV-22B Osprey? Captain Ross Studwell of the VMM-164 Knightriders walks us through the process from the beginning.

BY CAPT. ROSS STUDWELL
PHOTOS BY SKIP ROBINSON

U.S. Marine Corps pilots begin their path to flight school sometime before, during, or after graduating college. They contact a service academy recruiter, officer selection officer, or a Reserve Officer Training Corps (ROTC) recruiter to gain admission into one of the following commissioning programs: ROTC, Platoon Leaders Course (PLC), Officer Commissioning Course (OCC), or one of the service academies.

If, during the application process, officer candidates express interest in aviation, their cadre or recruiting officer should offer them the opportunity to test for an aviation contract, if one is available. The process for securing an aviation contract includes completing a Naval flight physical screening to ensure the physical ability to fulfill flight duties; scoring high enough on the Armed Services Vocational Aptitude Battery (ASVAB) test, which all military members take regardless of specialty; and passing a flight aptitude test called the Aviation Selection Test Battery (ASTB). The ASTB is a multi-subject exam that covers topics such as math skills, reading comprehension, aviation/nautical information, mechanical comprehension, an aviation trait inventory, an aviation skills demonstration (in a mock flight simulator), and a biographical inventory.

New Marine officers begin training after completing their bachelor's degree and accepting a reserve commission in the Marine Corps. They first report to Marine Corps Base Quantico, Virginia, to start active duty and complete a six-month basic infantry officer course called The Basic School (TBS). During TBS, new second lieutenants are exposed to a myriad of scenarios, weapons, tactical concepts, land navigation, and squad, platoon, and company level leadership exercises. If officers have aviation contracts, they will graduate with their TBS platoon and move to Pensacola, Florida, to begin flight school.

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Overwater operations are commonplace for the MV-22B Osprey, so pilots undergo intense shipboard operational training.

If an officer does not have an aviation contract, but still desires to become a pilot, he or she can speak up and try to secure a competitive aviation contract during TBS. This requires completing the same requirements as outlined above while at TBS, plus competing with others in their TBS class for however many spots are available at that time. Officers who are successful will find out when the rest of the ground contract Marines learn what their specialty will be (e.g. communications, artillery, or intelligence).

Arriving at Pensacola, new aviation students check in at a Marine Air Training Support Group (MATSG), which liaises for the Marine Corps at the Navy-run school. Oftentimes there is a waiting period, which can be due to any number of reasons: from aircraft maintenance, to government contract negotiation, to not having enough class seats available. If that is the case, the student can expect to be assigned to some sort of ancillary duty such as a funeral detail, or serving as an assistant student control officer.

During this time, students should also expect to begin introductory flight screening (IFS), which consists of 10 to 15 hours of dual instruction at a civilian flight school at any of the local airports. This is to ensure that students actually possess the ability to fly an aircraft, before the government puts them in much more powerful and expensive ones.

Upon completing an initial solo with a civilian instructor, students will wait for a seat at aviation preflight indoctrination (API). API is a six-week course consisting of four weeks of powerplant, aerodynamic, navigation, and meteorology classes including six tests; followed by two weeks of swimming, survival, and physiology courses. Upon completing API, the student will be assigned to primary flight training at either Training Wing Four, NAS Corpus Christi, Texas; or Training Wing Five, NAS Whiting Field, Florida. The course of instruction at either location is identical.

Primary flight training is a six-month course covering basic flight maneuvers, aerobatics, formation flight, instrument flight, and visual navigation. The training is conducted in the Beechcraft T-6B Texan II, a very nimble and capable tandem-seat, 1,100-horsepower, single-engine turboprop aircraft; as well as T-6B flight simulators. Upon completion of primary, the student pilot will be "selected" for a certain aircraft or training pipeline. There are four options: fixed-wing jets, fixed-wing cargo, rotary-wing, or tiltrotor.

LEARNING THE OSPREY

Pilots who are selected to fly tiltrotors spend another three to four months in an intermediate training squadron flying Bell TH-57B and TH-57C JetRanger helicopters. The topics covered in the intermediate course cover everything peculiar to rotary-wing flight, focusing on things like hovering and autorotations to start with, then moving on to instrument, formation, low-level, pinnacle and confined area landings (CALs), as well as external loads. At the conclusion of intermediate training, tiltrotor student pilots have about 40 hours of dual instruction in a helicopter.

The final stage before getting winged as a Marine aviator is advanced training on multi-engine aircraft in Corpus Christi, Texas. Here, students get another 80 hours of dual instruction in a TC-12B Huron (Super King Air 200), or the T-44 Pegasus (King Air 90). Topics covered include single-engine failures and approaches, formation and low-level flying, and advanced instrument training.

After finishing the three stages of flight school and obtaining the pilot's wings of gold, new pilots in the tiltrotor track move to Marine Corps Air Station New River, North Carolina, to learn to fly the MV-22B Osprey. Initially, the training is entirely in a simulator.

A normal MV-22B flight crew consists of a tiltrotor aircraft commander (TAC), a second pilot, a crew chief, and an airborne observer (AO). Each member is critical to the safe operation of the aircraft.

The advanced cockpit displays in the MV-22B give pilots a tremendous amount of information, enhancing their safety and situational awareness.

Typically there will be at least 30 hours of simulator time before flying the real thing, and then a two-hour simulator event for each flight of the same duration.

Most of the initial training in the Osprey involves getting used to flying a much larger machine than anything the pilots have flown previously, as well as the experience of flying an airplane, a helicopter, and then an airplane again in a span of less than three minutes during landing patterns. By the time aviators finish with the fleet replacement squadron (FRS) training, they will have completed a lot of familiarization flights, a couple flights of daytime formation flight, one day low-level flight, two night vision goggle (NVG) flights (one single ship, one two-ship formation), an instrument checkride, and a standardization checkride. After that, it's off to the fleet squadron as a brand new tiltrotor second pilot.

Training at the fleet begins with academic classes on subjects from how to use satellite communication to how to maneuver in a flight of two, three, or four aircraft. Then pilots start getting into classes and simulators with an instructor who is qualified to teach a certain type of event. New pilots are qualified in stages. Each stage has a set of academic classes that are required before simulator training events, and each simulator event is a prerequisite for an event of the same kind in the aircraft.

The first stage is confined area landings, which includes daytime simulators and flights in a single aircraft, then as a flight of two (a "section"), and as flight of three or four (a "division"). This stage includes a reduced visibility landing (RVL) event that exposes the student to levels 1-3 of RVLs, on a 5-point scale.

After pilots have completed CALs they will move on to low altitude tactics (LAT). LAT is defined as a regime in close proximity to terrain, either by terrain masking or flying a profile altitude that will take the aircraft within close proximity to terrain at some point. Again, the simulator is used to expose a new co-pilot to the tasks that have to be accomplished before moving to the same exercise in the aircraft. The stage begins as a single-ship event (sim, then flight), and then a section event (also sim, then flight). Once pilots complete all the events in this stage they are LAT-qualified and allowed to carry passengers during low-level flight.

After LAT comes the night systems qualification (NSQ) syllabus. It is split into a high light level (HLL) portion that must be completed before the low light level (LLL) portion. The high light and low light levels are defined by a certain level of ambient light that is generated by the moon and stars, which aid the NVGs in producing a clear image for pilots. Generally speaking, it will be high light during the nights surrounding a full moon, and low light during the nights before and after a new moon.

During this syllabus, students conduct a simulator and flight event each for CAL and LAT during HLL starting from a single ship, then section CALs and LAT, then as a division during the last event in each syllabus. Once pilots are HLL qualified they may carry passengers at night during high light level, and once complete with the LLL portion, may carry passengers at night for either light level.

The LAT and NSQ training will usually be finished anywhere from six months to a year after pilots check into their first squadron. At some point during this time the pilots will train to the more advanced levels of RVLs, including landings where no member of the crew has visual reference to the ground. For these types of landings, the pilots rely heavily on the aircraft's advanced systems and information that is displayed on the "hover page." The hover page is a very useful tool that shows pilots everything they need to land without being able to see outside, on one single display screen. This display includes a radar altimeter reading, sink rate, drift rate and acceleration, and a reference for the pitch and roll attitude.

For a new pilot, relying on a computer screen the size of a handheld tablet to land a 50,000-pound (22,680-kilogram) aircraft in the middle of

a self-induced dust storm can be quite overwhelming. A lot of repetitions in the RVL simulator can help, but the first few landings will probably be done with some level of automation from the autopilot, which is capable of bringing the aircraft into a stable hover by using the aircraft's three inertial navigation systems and radar altimeter. The training for RVLs is never really over because it is such a complicated task, and only gets more daunting at night and in unfamiliar landing zones.

BUILDING EXPERIENCE

After pilots finish LAT and NSQ, their priorities shift to being useful crewmembers during deployment and for various missions, as well as building flight hours and experience towards becoming an aircraft commander. Typically right after LAT and NSQ, pilots will be trained for tail gunnery (TG) and ground threat reaction (GTR), which are both necessary to be allowed to fly in an operational theater.

The TG training is short, and focuses primarily on the crew resource management (CRM) techniques used to communicate with the crew chiefs, who are the ones engaging targets with the ramp-mounted weapon. GTR is a more complicated task that involves a lot of CRM as well as a lot of dynamic maneuvering. The pilots are trained on how to interpret threats that the aircraft survivability equipment (ASE) detects, and what maneuvers should be utilized to counter said threat, as well as what types of chaff and flare are used.

After GTR, the training a pilot goes through is largely dependent on what sort of opportunities present themselves. For example, a squadron might be tasked to support an infantry battalion for a few months while that battalion is getting ready for its own deployment. The battalion will task the squadron to conduct anything from aerial delivery (AD) of supplies or personnel via parachutes, air delivered ground refueling (ADGR) to tanks or convoys, and alternate insertion/extraction (AIE) of personnel, just to name a few possibilities.

For any of these events, the squadron sends an instructor pilot up with a newer co-pilot who has never conducted that type of event before (but has practiced it in the simulator), and after completing the training requirements during the flight, the co-pilot is deemed proficient at that specific event. The same approach is used for other mission types including external lift, tactical recovery of aircrew and personnel (TRAP), aerial evacuation, air-to-air refueling, and mountain area training.

If there is an amphibious ship nearby with availability to provide training for new pilots, the pilot will first do daytime shipboard landings in a simulator, then on a landing pad painted to look like a ship, and then finally on the real thing. This will happen for both day and nighttime carrier landings, and after the night event is complete, the pilot is considered "carrier qualified."

The aircraft commander syllabus typically starts around two years after pilots check into their first squadron, or whenever they have been recommended by the senior instructors in the squadron and are nearing 500 hours of military flight time. The syllabus starts with an oral examination board of five of the most senior pilots in the squadron; they will deem whether a co-pilot is ready to continue on to the review flights and eventually qualification.

After the board, there are two review flights, one day and one night, that will be flown with a highly qualified instructor, each involving a different scenario that Osprey pilots might find themselves in during a deployment in a foreign country. If flown satisfactorily, the prospective aircraft commander will fly the final checkride with the squadron's commanding officer (CO), a lieutenant colonel, with years of experience in aviation and in leadership.

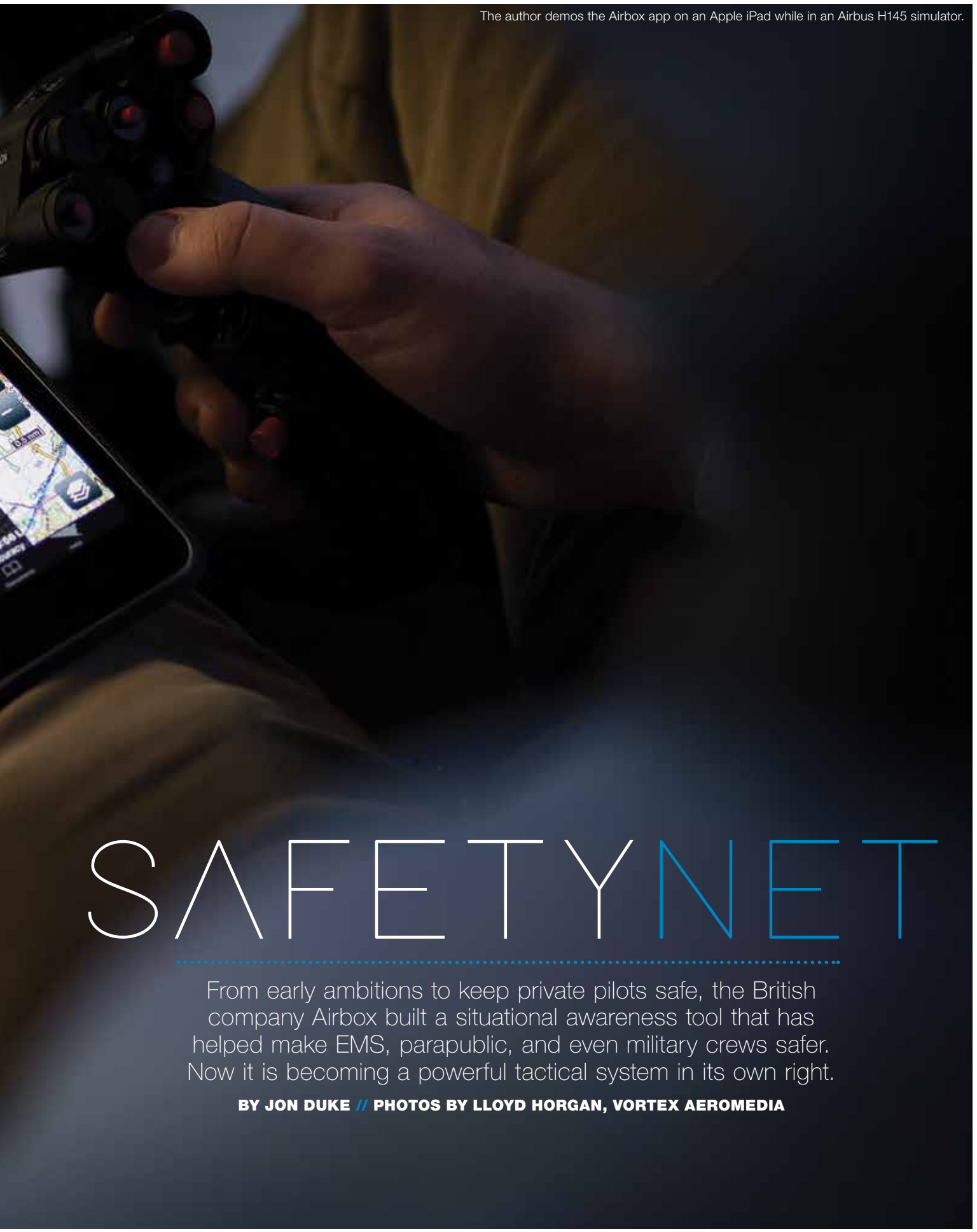
If the performance is up to the CO's standards for a young aviator, that pilot will soon be on the flight schedule to sign for an Osprey and be responsible for everything that happens during the flight.

Training for landings in both normal and low-visibility conditions provides flight crews with daily challenges.

According to VMM-164 Commander Lt Col. Johnny Widener, "the MV-22B flies quite nice in airplane mode."

After a day's flying, a VMM-164 MV-22B get a pre-flight inspection before going back into the air for a night training flight.


WARNING OBSTRUCTIONS
Airfields
NOTAMs
Route
Weather
Bookmarks
Battery
Lock
022°
100



The author demos the Airbox app on an Apple iPad while in an Airbus H145 simulator.

SAFETYNET

From early ambitions to keep private pilots safe, the British company Airbox built a situational awareness tool that has helped make EMS, parapublic, and even military crews safer. Now it is becoming a powerful tactical system in its own right.

BY JON DUKE // PHOTOS BY LLOYD HORGAN, VORTEX AEROMEDIA

Aviation has been a passion for Airbox co-founder William Moore since he first flew in a warbird as a freshly minted engineering graduate. Shortly after becoming a private pilot in 2008, he was introduced to designer and entrepreneur Tom Hedges, and together they started Airbox Systems with a view to making private flying safer.

The U.K. had experienced a threefold increase in airspace incursions over half a decade — mostly by privately flown aircraft — and the country's principal air navigation service provider, National Air Traffic Services (NATS), was looking for a solution. While aviation GPS navigation systems were available, most were certified units too large or expensive to be widely adopted, particularly by those operating in the burgeoning ultralight sector.

Moore and Hedges set about finding a lightweight solution that would be affordable for private pilots, while being able to provide effective warning of nearby airspace.

"I'm a terrible navigator, and I knew I'd get lost!" said Moore when *Vertical 911* visited the company's Oxfordshire headquarters. "There was no navigation system at the time that I felt was really good enough, so that was how we ended up developing our own product."

The system that they designed, while basic, was delivered in conjunction with NATS and was the lowest-cost solution available, winning them the Honeywell Bendix Trophy for Aviation Safety. But this proved to be just the beginning, as early on in the company's existence it became apparent that with some minor additions, the software could be tweaked to provide other operators with the tools they needed to stay safe.

With the advent of the Apple iPad came a reliable platform that allowed them to focus on the software, releasing the potential to execute the kind of features that they wanted to provide. "Originally it was just the two of us sitting in an office and trying to figure out how to do navigation," said Moore, "but along the way, we were introduced to Gerry Hill, who did 34 years in the SAS [Special Air Service] and ran counter-terrorism for them, so he came with a huge amount of tactical experience."

That tactical experience opened the door for Moore and Hedges to begin development of their ground-based software. Meanwhile, inter-

est in their aviation app was growing among parapublic helicopter operators, and the marketplace for navigation apps was becoming more and more competitive.

"Most of the products were for GA [general aviation] pilots," Moore said, "but there are a lot of hazards out there for guys operating at low-level that GA pilots don't have to worry about."

Chief among these hazards was the threat of power lines, which crisscross the patchwork British countryside in an apparently random fashion. High tension lines rise as high as 250 feet, but so-called "domestics," on 30- to 50-foot poles, can be just as lethal during the final approach to an ad hoc landing site. All can be extremely hard to spot in the kind of difficult lighting conditions that are typical under the leaden U.K. stratus.

Moore and Hedges, by now leading a small technical team, set about incorporating the entire U.K. database of vertical obstructions into their app. It was an instant hit with pilots who frequently found themselves making field landings at short notice, notably helicopter emergency medical services (HEMS) and search-and-rescue (SAR) operators.

Once the vertical obstruction warning system was fully developed, Moore and Hedges started looking at other ways to reduce the workload of the busy crews flying demanding missions in difficult conditions. The integration of Google Street View and aerial photography made it easier for HEMS crews to identify unsuitable proposed landing areas while en route, and the introduction of complex fuel planning calculations was arguably critical in securing the company's contract with the U.K. Search and Rescue provider, Bristow Helicopters.

For the U.K.'s National Police Air Service, data from recent crime statistics can be overlaid so that crews returning to base with fuel to spare can route over areas with higher recent criminal activity, with measurable deterrent effect.

REVOLUTIONARY POTENTIAL

As the company's experience grew, so did its size and the technical capacity to incorporate more diverse data streams, which in turn

Map or app? A pilot from the Royal Navy's 849 Naval Air Squadron uses the app whilst on a navigational sortie from Cornwall to the Oxfordshire area.

A critical care paramedic (CCP) from Wiltshire's Air Ambulance uses the app to check on the field landing area prior to their arrival.

The Airbox team at their office in Wantage, Oxfordshire.

attracted more customers. Meanwhile, smartphones and the ubiquity of social media — allied to a seemingly insouciant attitude of the general public about sharing their location — have generated even greater opportunities to deliver information to those who can use it for good, whether that is in locating those in peril or pursuing those who would do others harm.

Often now the first data that becomes available about developing large-scale emergencies emerges through social media. Hard-coded within it is often the precise coordinates of its originator, bringing an unprecedented ability to rapidly verify the ground truth, and better inform first responders.

FUNCTIONALITY NOW BEING IMPLEMENTED WILL ALLOW THOSE CAUGHT UP IN EMERGENCY SITUATIONS TO PROVIDE INFORMATION TO RESPONDERS WITHOUT EVEN HAVING SPECIFIC SOFTWARE INSTALLED ON THEIR DEVICES.

Functionality now being implemented will allow those caught up in emergency situations to provide information to responders without even having specific software installed on their devices. A text message will request permission to access their phone, which if granted gives the originator temporary access, via the Airbox app, to sensors integrated into the device. This promises to be a powerful aid to locating stranded survivors, or gathering intelligence from which to decide how and where to act.

The current iteration of the software is clearly a powerful tool that has come a long way from a moving map designed to aid the avoidance of airspace or inconveniently positioned power-grid infrastructure. Moore, however, is adamant that the core philosophy of the company remains consistent with his original vision, saying, "The real thrust of what we do is safety, and a lot of the other benefits flow from that.

"I think we've been able to make low-level flying a lot safer with our kit, and developed a lot of expertise doing so, so much so that we're starting to see larger avionics companies coming to us for that knowledge."

A COOPERATIVE APPROACH

The subject of larger avionics companies is an interesting one, because Airbox software is not certified by any aviation regulator. For a company that is still operated by an extremely small team, entering into competition with the established giants would be a commercial impossibility. Here again though, the company sees opportunities rather than threats, preferring a collaborative approach in preference to one of competition.

Operating in the highly regulated environment of aviation makes it inevitable that platforms operated by prospective customers will always require certified systems, and Moore explained why operating alongside them, and even cooperating with them, makes sense. "What we bring is agility," he said. "I can't even begin to list the number of new features that we would be able to deliver in the time it takes to incorporate them into a certified system.

"Let's say you're in law enforcement and you want to start locating stolen cashboxes and putting that location data in front of a pilot. There's no realistic way that I've seen to quickly and cost-effectively incorporate that capability into a certified system."

The partnership between small innovators like Airbox and the far bigger, well established names is not a one-way street, and each must bring value to the other. When dealing with the particular functionality in which Airbox has specialized, it is unlikely that sufficient customers exist to support the cost of complete integration into a certified system. Even if they did, the speed of development of feeder systems that are not subject to the same lumbering certification apparatus would rapidly render them obsolete.

Airbox's canniness in this regard is demonstrated by its development of related products serving ground operators, and working to establish them as part of national crisis-response infrastructure. In simultaneously developing two highly compatible but separately optimized systems, Airbox has become a gatekeeper of a rapidly establishing ecosystem into which larger companies see value in integrating. Network-enabled air/ground integration capability has hitherto been the sole preserve of the military. The emphasis here, Moore said, is on making it easily achievable across large, diverse teams of first responders.

"We work with a lot of ground guys, for example in counter-terrorist roles, and they've been really focused on the information sharing, but getting the air guys to link up when they're used to just using a radio has been a challenge," he said. "We're now seeing ground teams using it in the same roles that we've already got helicopter crews using it, and it's proving extremely powerful."

Anyone who has tried to coordinate activity on the ground from an aircraft will see the potential here. Descriptions of locations, people, or objects tend to be protracted, but radio transmissions must be brief. Meanwhile, communicating with the rest of the crew becomes difficult as you each try to pick the right moment to speak. Messages passed across various frequencies often become muddled, or bloated networks become log jammed as everybody tries to speak at once.

The power of a common situational picture, shared across all users and constantly updated, could be life-saving during complex parapublic missions involving a broad spectrum of responders. In this environment, a picture or line on a map is worth more than a thousand words and represents a far more valuable commodity: time.

At first glance, the role and purpose of Airbox's latest software is very different to its civilian progenitors, but a common thread runs between them in a way that is distinct to small companies with passionate leadership. At Airbox, that leadership has completely galvanized a small team around a common purpose, and anyone visiting their offices could be left in no doubt as to what it is. Photographs of HEMS customers bedeck the walls of the open areas, while kept in private are mementos from other clients whose organizations, while recognizable, prefer to go without recognition.

At the center of the company is a clear philosophy that with the application of careful thought, design, and innovation, a simple product can be turned into a tool that will protect those who keep the rest of us safe.

Jon Duke & Lloyd Horgan | Vortex Aeromedia provides specialist media services for the aviation, defense, and aerospace sector. Formed in 2015 by photographer Lloyd Horgan and helicopter pilot Jonathan Duke, Vortex Aeromedia draws on their unique blend of military aviation and media experience to deliver high-impact film, photography, and writing specifically to the defense and aerospace industry. They have flown with, photographed, and filmed for a variety of international military and civilian clients. For more information visit www.VortexAeromedia.com.

Elifriulia offers a variety of services, ranging from aerial work operations to highly sensitive medical flights. The company has been providing valuable pre-hospital care and medical transport services in support of local health authorities for more than two-and-a-half decades. Moving injured patients from accident scenes and transporting organs to and from hospitals by air saves time when it's most critical.

ON THE JOB WITH ELIFRIULIA

We paid a visit to Elifriulia near Trieste, Italy, to learn more about this versatile operator and its latest acquisitions — two air medical equipped Airbus H145s.

BY SAMUEL PRÉTAT
PHOTOS BY ANTHONY PECCHI

Established in 1971 by Luigi Coloatto, in the Italian province of Friuli-Venezia, Elifriulia started as a small agricultural spraying company. In 1981, Elifriulia began offering helicopter pilot training; two years later, it became Italy's exclusive agent for Robinson Helicopter Company's R22 helicopters.

Since that time, the company's activity has steadily increased, necessitating a move in 1990 to larger premises within the international airport of Ronchi dei Legionari — 25 miles (40 kilometers) northwest of Trieste. Today, the company's fleet consists of 14 helicopters and three planes and reflects the diversity of contracts granted to it by local administrations and private customers. These include significant contracts for public transportation, air rescue and fire suppression, which has led the company to operate Airbus EC135 P1/T1/T2/T2+ aircraft, plus a pair of brand-new Airbus H145s tasked with helicopter emergency medical services (HEMS) in the northern province of Trento.

Elifriulia is now ranked among the oldest and safest helicopter operators in the country; recognized for its high standards of quality and service by public and private sector customers alike. Coinciding with the company's launch of the H145 for HEMS operations, *Vertical 911* paid a visit to Elifriulia to discover the reasons behind the company's success.

Download as wallpaper at verticalmag.com/wallpaper

Elifriulia's rotary-wing fleet is exclusively composed of Airbus products — a choice dictated by the company's mission spectrum, explained CEO Federica dal Cin. "At Elifriulia, helicopters are first and foremost our 'tools of the trade,' so our goal is to provide our company with the most appropriate and efficient aircraft," she said. "This is a permanent quest, and we are constantly evaluating different offers from worldwide manufacturers."

Elifriulia's highly trained pilots are instrument-rated and able to fly night missions when required, making the company's HEMS operations more efficient and profitable for its customers.

The company purchased its two new Airbus H145s in 2016 in order to meet the EMS requirement of the Trento province. Although only one aircraft is needed for HEMS, most public rescue tenders in Italy call for a back-up helicopter to be available at any given time, in order to guarantee full-time service.

The company is active in forest fire prevention and suppression, using helicopters carrying underslung Bambi Buckets filled with water or retardant.

Elifriulia specializes in search-and-rescue (SAR) missions in hostile environments. With winch-equipped helicopters, crewmembers are able to save lives in places where an aircraft is unable to land.

Elifriulia offers pilot training and qualifications for both fixed- and rotary-wing aircraft. The company has also been active in developing the drone sector in Italy, delivering professional and worldwide recognized courses as the official partner of Italdron.

The H145 is a good fit for Elifriulia's diverse missions, according to dal Cin. "The H145 is extremely versatile and gives us the opportunity to operate in all our main activities, such as HEMS, wind turbine maintenance and, last but not least, short-range offshore missions. That's why we have decided to invest in this high-performance helicopter."

"Elifriulia is active on several international projects, in partnership with other helicopter companies," noted dal Cin. "In fact, we believe that collaboration in this market is a winning strategy." The company's most significant international partnerships are currently in Croatia (HEMS), in Spain (rescue services), in the Balkans (public sector pilot training) and in Germany (wind turbine support).

Headquartered in Ronchi dei Legionari, Elifriulia operates mainly in northern and central Italy. To widen its portfolio of customers, the company has opened four sub-bases throughout the country, which report to the main office. The bases are located in Tolmezzo, Cortina d'Ampezzo, Rome and Courmayeur, but the company will cover larger areas if contracts and public tenders are won.

Fourteen pilots, 12 maintenance technicians and 10 clerks currently compose the workforce of this dynamic business. While the management is highly experienced — some having been on Elifriulia's workforce for over three decades — many of the staff are young professionals, giving the company a fresh outlook and the ability to adapt to the ever-changing market.

The rear clam-shell doors are another practical feature of the H145, making it possible to load and unload patients on rolling gurneys in total safety from the shrouded tail rotor. These doors make the model a very effective EMS asset — much appreciated by medical personnel.

A major feature of the H145, differentiating it from its older sibling the EC145, is the Fenestron shrouded tail rotor. Said dal Cin, “From our point of view, the Fenestron offers a new level of helicopter safety, on the ground and in the air. That is why we have been using the EC135 for more than 10 years for HEMS, passenger transport and firefighting flights.”

“In the last two years, we have thoroughly analyzed our sector in order to focus on a specific direction,” dal Cin said. “We have always tried to combine experience with the vision of tomorrow, being aware that changes are mandatory to stay in the race. Elifriulia has made huge investments in the optimization of its services, on its fleet and on its organization. We have developed strategies to compete in Europe.”

Another benefit of the H145's Fenestron is its low noise level. "Today, we can operate the H145 at night, when the Fenestron is a real asset!" said dal Cin.

As Elifriulia evolves, dal Cin is confident that its core principles won't change. "There is a word that summarizes it all: 'quality,' which allows us to achieve full safety, itself an obvious factor where flying is concerned," she said. "The attention to details [is what] drives to quality: it is exactly the fulcrum of our development."

BEYOND THE FRAT

When it comes to risk management, there's always more to learn. Two veteran LAPD pilots recall their own journey toward better understanding and analyzing risk.

BY JACK H. SCHONELY AND MARK BOLANOS

While most pilots already adhere to basic safety policies and procedures, a good safety officer can give them new tools for evaluating and managing risk.
Skip Robinson Photo

Editor's Note: Jack Schonely recently retired after a 31-year career with the Los Angeles Police Department, including 18 years with its Air Support Division (ASD) as a tactical flight officer, pilot, and flight instructor. In this first of a two-part series, he and the ASD's former safety officer, Mark Bolanos, recall some experiences that caused Schonely to rethink his personal approach to risk management.

JACK SCHONELY: Have you ever met a pilot who didn't believe he or she was a *safe* pilot? I know I haven't met one. All of us have learned about safety from day one of our aviation training, whether it was from the military, the private sector, or a certified flight instructor at our units.

Basic safety policies and procedures are a big part of the process of becoming a certified pilot. These later become part of our everyday lives as pilots: doing a good pre-flight of the aircraft, completing a flight risk analysis tool (FRAT), checking weather, checking notices to airmen, examining the maintenance books, checking performance, making good "go/no-go decisions," and discussing safety with our co-workers.

All of that is great, but many pilots may be unaware of additional safety measures and techniques that are out there unless they have a good safety officer sharing the valuable information and at times even insisting that something change in the name of safety.

I believed that I was a safe pilot. No, I believed that I was a *very* safe pilot for many years. It wasn't until a very smart and dedicated safety officer at my unit, Mark Bolanos, began sharing information with me that I learned about some of these additional safety tools, including safety management systems (SMS) and in particular risk analysis.

To be honest, some of the things he would point out seemed ridiculous to me. They seemed very minor in the big picture and at times I dismissed them or we would have a verbal conflict of opinions. In hindsight, I feel really stupid for questioning the things Mark was sharing. He was telling me things that he believed were important to keep me, and everyone else, as safe as possible without inhibiting whatever we were doing. Unbeknownst to me, he was managing risk.

Luckily, I quickly realized that Mark knew much more about safety than I did, and I began to change. This change did not occur overnight nor did it occur from a single incident, but it did occur and I became a much safer pilot because of it.

Mark and I believe that journey is worth sharing so that all pilots can be more open-minded and look at their jobs in a different way. We are going to share a few operations that we worked on together and look at them from two points of view — the pilot side and the safety officer side — and demonstrate why we all need to improve on everyday risk analysis beyond the FRAT.

MARK BOLANOS: "In flying … carelessness and overconfidence are usually far more dangerous than deliberately accepted risks."

This quote adorns a wall at our heliport. We see it every day before we walk out to our aircraft to fly our next mission. Unfortunately, I doubt most of our pilots understand it, let alone live it; *I know I didn't*.

Like Jack, I thought I was a "safe" pilot. I didn't think I was careless or overconfident. I had learned about safety during flight training from very competent, certified flight instructors. It wasn't until I attended advanced safety training that I realized how much I really didn't know about safety, risk, or risk management. Today, I still don't believe I am careless or overconfident, but I know I am better at accepting risk!

AS A PILOT, MY FIRST REACTION WAS, "NO PROBLEM, LET'S DO IT." MY FIRST REACTION WAS NOT THE CORRECT REACTION AT ALL. IT'S THE "COP" REACTION, NOT THE REACTION OF AN AVIATOR.

The more I learned about safety and risk management, the more I wanted to share with my peers. Unfortunately, I knew it was a going to be a challenge. I was the new safety officer and one of my previous attempts at providing safety-related input didn't go too well. Jack and I got along but we had had a pretty big blow-out during a safety-related discussion.

Our safety discussion was in preparation for an upcoming fly-in. We needed to paint symbols on our flight deck to identify temporary landing zones (LZs). We discussed painting large shapes on our flight deck so that landing pilots could quickly and easily identify the correct LZ when directed by the tower operator.

I was concerned about a pilot mishearing landing instructions and attempting to land at the wrong LZ. Let's just say my suggestion that all of the symbols be different shapes, regardless of the location on the flight deck, was not well received. This event did not deter me in my efforts to share safety information with my peers and supervisors.

SWAT HAS A REQUEST

SCHONELY: As the lead for the cadre of pilots who fly SWAT missions, I was approached by a team leader from SWAT about a training evolution they were planning. They were requesting a "SIP mission," SWAT Insertion Procedure, in which four SWAT operators stand on the skids of an Airbus H125 and are transported to a rooftop destination for insertion.

This is something our unit has practiced for many years on various airframes, so this was not an unusual request. As a pilot, my first reaction was, "No problem, let's do it." My first reaction was not the correct reaction at all. It's the "cop" reaction, not the reaction of an aviator. Fortunately, Mark had taught me to slow down, get all of the details, complete a risk analysis, and *then* decide *if* we would be able to support the training mission.

The LAPD's Hooper Heliport is the site of regular fly-ins. Early in their professional relationship, the authors clashed over the best way to coordinate one such event. **Skip Robinson Photo**

An aerial view of the AON building in downtown L.A., a 62-story skyscraper with an approved helipad on its rooftop. **Photo courtesy of Mark Bolanos**

During their recon of the AON rooftop helipad, the authors realized that the elevated netting and lights posed the risk of a tail strike if pilots came in too fast. **Photo courtesy of Jack Schonely**

The details of the training mission were very simple to understand. SWAT was requesting two aircraft to transport eight operators from the department heliport to the rooftop helipad of the AON building in downtown Los Angeles. The AON building is a 62-story skyscraper with an approved helipad at 858 feet above ground level, and is a quick three-minute flight from our base.

The operators would depart the aircraft, enter the building, and deal with a simulated hostage situation several floors down. After the drop-off we would be done, so it was a basic SIP transportation mission, right? Now was the time for the flight leader and the safety officer to get together and decide whether we could safely support the request.

BOLANOS: Although our unit had flown this mission numerous times, I wanted to look at it from a new paradigm. I had received formal risk management training from the United States Navy when I attended the Aviation Safety Officer School in Pensacola. I wanted to incorporate what I had learned about risk management into our preparation for the training to ensure we could accomplish the mission with a minimum likelihood of loss.

The purpose of risk management is to identify and mitigate hazards — anything that might cause harm or jeopardize mission success. The objective was to reduce the likelihood of a negative occurrence and/or the severity of the occurrence.

I learned there are four basic principles of risk management:

A. Accept risk when benefits outweigh the cost
B. Accept no unnecessary risk
C. Anticipate and manage risk by planning
D. Make risk decisions at the right level

The risk management process consists of five basic steps. The first two steps include the risk assessment part of risk management and significantly improve awareness and understanding. The remaining steps provide the risk mitigation component of risk management.

The five steps:

1. **Identify the hazards**
2. **Assess the hazards**
3. **Make risk decisions**
4. **Implement controls**
5. **Supervise**

I recommended we analyze the mission in phases and apply the process in sequence. We broke the mission into four phases:

1. **Passenger loading**
2. **Flight**
3. **Passenger off loading**
4. **Return flight**

During each phase of the mission, we attempted to identify any and all hazards associated with people involved (man), equipment (machine), environment (medium), purpose of the flight (mission), and policies and procedures (management).

Some of the things we considered:

1. **Man:**
   a. Air crew: selection, performance, personal factors, training, qualifications, currency, proficiency, fatigue
   b. SWAT: training, currency, proficiency, role
2. **Machine:**
   a. Aircraft selection, design, ergonomics, maintenance time, weight and balance, holding straps, door configuration, seat cushions
   b. SWAT harnesses, weapons, loose equipment, radio communications
3. **Medium:**
   a. Weather, operational, departure area, landing area, suitability, barriers, approach, terrain, takeoff
4. **Mission:**
   a. Type of mission or purpose of the operation
5. **Management:**
   a. Policies, procedures, allocation of resources, standards

SCHONELY: If Mark had just provided me with that risk analysis outline and bullet points, I'm not sure how much impact that would have had on me. What he actually did was explain to me that risk analysis is a mindset and something that is easily applied to any situation that has hazards, which is everything we do. The outline just guides you through a process of identifying hazards and addressing them one by one.

Prior to learning more on this topic from Mark, I probably would have looked at the SWAT SIP mission request and thought it was an easy transport mission from our home base to a rooftop helipad and not given much thought to the AON building helipad. I had landed there before in a Bell 206 and did not recall anything unusual about this approved helipad. But I was open-minded to Mark's information and it was obvious to me that we had to do an on-site survey, or recon, of the AON pad. Mark was observing a change in me.

Mark and I flew an H125 helicopter to the AON building to begin our recon. Even though we had both flown over and around this building hundreds of times, we immediately noticed some significant issues with the pad and its surroundings. There were lots of obstacles on that rooftop that included antennas, air conditioning units, and window washing equipment. Our mindset of what we were doing gave us both a completely different view of the helipad from past experiences. After a thorough high and low recon I flew the approach into the pad and landed.

The plan was that we would each get out and take a look around, identifying hazards and snapping photos for a future safety brief. As I walked around the rooftop a few things popped out at me. First of all, this pad was not very big. As I made my way towards the rear I was stunned to see that the safety netting around the pad was not flush to the pad. It was slightly elevated and more importantly the pad lights were attached to the outside support of the netting and were much higher than I expected. This was a significant hazard that had always been there, but one that I never noticed before. Mark was able to see the same hazards before we departed the pad and returned to the heliport to start a thorough risk analysis.

We sat down and started to list all of the hazards we had observed — and they were numerous. Most of these hazards were low- to medium-risk and were easily mitigated to an acceptable level for a training mission. Even the elevated netting with the pad lights was mitigated to an acceptable level of risk. The mitigation was that both pilots flying the training mission would complete a recon landing prior to the training. They would fly a flat, stable, powered-up final approach to touchdown so the tail would not dip towards the obstacle and the landing would be as far forward on the pad as possible. These were very simple but effective mitigations.

What if we had *not* completed the recon of that pad? Something as simple as dipping the tail a bit just prior to landing on a pad 62 stories up could have been catastrophic. Mark was teaching me valuable lessons that would affect how I looked at everything I did as a pilot and even other activities outside of work.

Our team effort of a very thorough risk analysis paid off with an outstanding training day with no unforeseen circumstances. During the debrief for the event, we were all very happy with how it went and were thrilled that we were able to support the SWAT mission with confidence. That confidence was a direct result of planning, a good reconnaissance, and a thorough risk analysis — beyond the FRAT.

Jack Schonely | Recently retired after a 31-year career with the Los Angeles Police Department, including 18 years with its Air Support Division as a tactical flight officer and pilot, Jack now teaches tactical classes around the world. He is the author of *Apprehending Fleeing Suspects*. Find more information about his book and professional services at www.officertactics.com.

Mark Bolanos | Mark Bolanos has served 20 years of his nearly 30-year law enforcement career as a tactical flight officer, pilot, and aviation safety officer. He earned an Aviation Safety Certificate from the University of Southern California. He is also a graduate of the Aviation Safety Officer Course and the Crew Resource Management Instructor Course at the U.S. Naval School of Aviation Safety.

COLD FRONTIER

Tackling everything from search-and-rescue to counter-terrorism in sub-zero temperatures, the members of the Finnish Border Guard are no snowflakes.

BY JON DUKE // PHOTOS BY LLOYD HORGAN, VORTEX AEROMEDIA

The cult of celebrity does not exist in Finland. The country has produced more motor racing successes per capita than anywhere else in the world, but this is met with the same calm reservation with which Finns seem to regard everything. There is after all a famous Finnish proverb that translates: "Praise your horse tomorrow . . . and yourself never."

Underneath the stoic exterior, though, is a resilient and resolutely independent streak. Having maintained their borders ferociously during the Second World War, Finns later stood between the forces of the Soviet Union and NATO's northern flank, keeping up relations with both Moscow and the West throughout, while yielding to neither in terms of borders or sovereignty.

Unsurprisingly, the Finnish Border Guard *(Rajavartiolaitos)* enjoys a strong reputation among its own population. However, as a small organization it is required to turn its hand to a variety of tasks. While the Border Guard maintains specialist units on land and at sea, it is its Air Patrol Squadron that most demonstrates this flexibility, given the squadron's ability to cross both land and sea with relative ease.

ICE AND FIRE

As a paramilitary force, the Border Guard falls under the authority of the Finnish Ministry of the Interior and is responsible for internal security. However, the Air Patrol Squadron also provides

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Exhaust pours from the engines of a Finnish Border Guard Bell 412 as its crew flies above the most dominant features of Rovaniemi landscape, snow and trees.

The Airbus H215 is crewed by two pilots, a flight mechanic acting as hoist and systems operator, and two rescue swimmers.

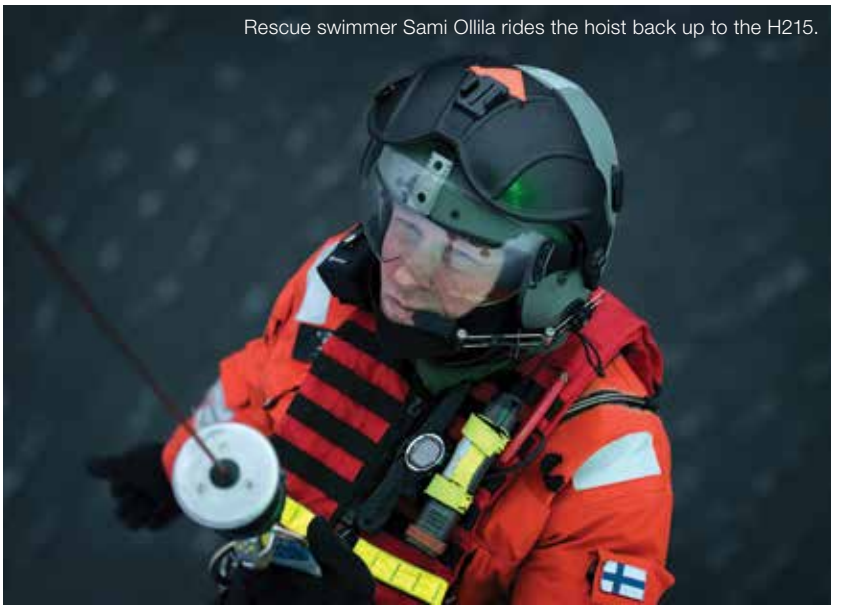
search-and-rescue (SAR) cover both within Finland and for its roughly 28,500-mile (46,000-kilometer) coastline. Much of its work involves assisting seafarers of all kinds who find themselves in difficulty, either in the busy shipping lanes of the Baltic or the frigid Gulf of Bothnia, which is covered in ice for up to five months of the year. Onshore, vast swathes of unspoiled taiga, or boreal forest, provide an environment in which it is just as easy for those who prefer ski-trekking or hiking to find themselves in trouble.

The density of the forests poses other risks. Lightning strikes can ignite forest blazes that would quickly become firestorms among the tightly packed pines, making rapid intervention essential but possible only from the air, due to the degree of isolation. The last truly large-scale conflagration was in 1960 and engulfed over 6,000 acres (2,430 hectares). Since then, control measures seem to have reduced the scale of forest fires, but with no way of preventing lightning, their frequency has remained stable. Using underslung SEI Industries Bambi Buckets to deliver water and retardant early on in a fire's life, the Air Patrol Squadron is a key factor in ensuring that fires don't spread out of control.

"Search-and-rescue at sea is our major duty, that's the one that is written in [international] law that we must do," said Roope Kauhanen, an Airbus H215 captain and head of training at the Border Guard's Helsinki base. "Of course, the police and fire department don't have their own air assets, so we must help them, too."

The Air Patrol Squadron has a long history stretching back as far as the '30s when the unit flew Junkers F.13s — the world's first all-metal cargo aircraft. Since then, the squadron has operated a mixture of Western and Eastern Bloc designs of fixed- and rotary-wing aircraft, ranging from de Havilland Canada DHC-2 Beavers (only retired in 1985), to Mil Mi-1s and Mi-17s that gradually gave way to Eurocopter (now Airbus Helicopters) AS332 L1 Super Pumas and Agusta/Bell (AB) 206 JetRangers and 412s.

While the Border Guard has maintained its AS332 L1s, the Air



Rescue swimmer Sami Ollila rides the hoist back up to the H215.

Crewmembers of the H215 from Helsinki perform a hoisting demonstration as the rescue swimmer is lowered down on the wire.

Patrol Squadron now operates a modern mixed fleet of helicopters. This includes four Leonardo AW119Ke Koalas and two Airbus H215s (formerly known as the AS332 L2), as well as a selection of AB 412s and 412EPs, two of which will continue in service after an upgrade program courtesy of Patria that will modernize their avionics and surveillance systems.

HOLDING THE LINE

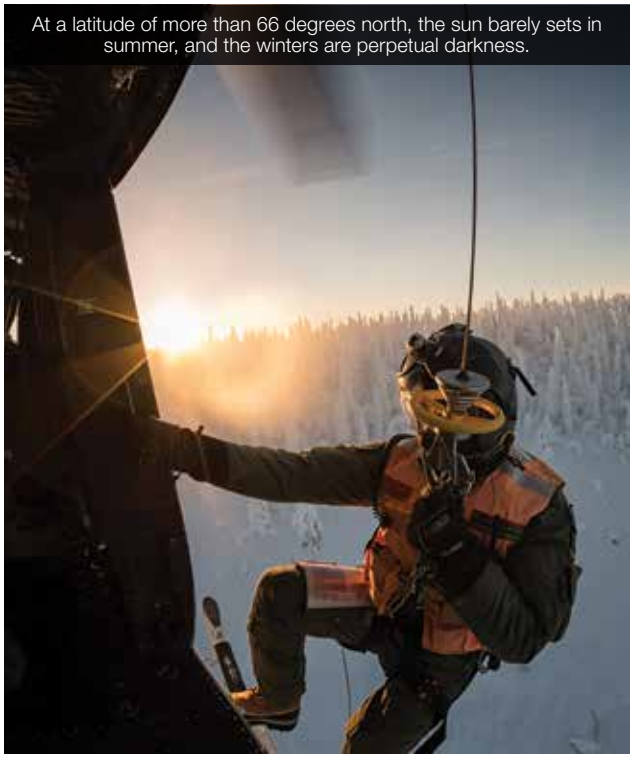
Since 1995, Finland has been a member of the European Union (EU) and shares its Western border with Sweden and Norway, with all three being Schengen states: European nations across which common domestic policy renders strict border control unnecessary, allowing the Border Guard to focus its aerial patrols along the eastern boundary.

Finland has maintained functioning border-crossing agreements with Russia, but it has still proven necessary to patrol this frontier to deter and prevent illegal entry by immigrants, many of whom have made a long and unpleasant journey from unspeakable horrors in their home country courtesy of criminal organizations with scant regard for their well-being.

The vast tundra border is most effectively patrolled from the air, a role mainly performed by Air Patrol Squadron's Koalas. The single-engine design provides a good compromise between performance, endurance and efficiency, and its skids are undoubtedly better suited to the environment than a retractable wheeled undercarriage. The Koalas also provide a platform on which the newer pilots and flight engineers can cut their teeth before progressing onto more complex multi-engine machines.

Illegal immigration is a felony in Finland, but the Border Guard's patrols do more than simply uphold the law — they also demonstrate the ability to scale up the tempo of operations, lest Finnish forbearance be mistaken as an opportunity for the country's

The flight engineer waits for the OK from the rescue swimmer before lifting him on the hoist and then lowering him down to the waist-deep snow below.



At a latitude of more than 66 degrees north, the sun barely sets in summer, and the winters are perpetual darkness.

Eastern neighbor to exert strategic influence. Such an opportunity was explored in the winter of 2015-16, when Russia inexplicably abandoned a decades-old understanding and began allowing third-country nationals access to the border to seek asylum in Finland.

Elsewhere, the Border Guard carries out security activities across the country, both to deal with niche internal smuggling such as the illicit trade in *snus* (a kind of tobacco snuff that is only legal to produce in neighboring Sweden) but also countering far more sinister threats.

"More and more the world is seeing an increase in terrorism, so we have to train with the police and our own task force for those kinds of operations," said Kauhanen. By "task force," Kauhanen was referring to the Border Guard's 5th Special Intervention Unit, a highly trained commando group that was established to ensure that Finland was prepared to meet any threats that emerged from the tinder box of lawlessness that followed the collapse of the Soviet Union. The role of this commando group has since evolved, and the Air Patrol Squadron now trains to support it with a variety of techniques — such as fast-rope insertion — that have proven utility in counter-terrorism scenarios.

GREAT COMPROMISE

Fulfilling such a wide variety of missions demands a correspondingly broad spectrum of capabilities that must be delivered

under the most extreme environmental duress. Finland's largest and northernmost region of Lapland has a population density of fewer than two people every square kilometer; that's sparser than Wyoming. When *Vertical 911* visited the Air Patrol Squadron base near the regional capital of Roveniemi, the ambient temperature was -34 C (-30 F), so both the aircraft and their crews need to be particularly resilient to operate here. At a latitude of more than 66 degrees north, the sun barely sets in summer, and the winters are perpetual darkness.

Simplicity is a real virtue in these conditions, and that is a key benefit of the Border Guard's AB412s and Koalas. Aviation being a game of compromises, these aircraft provide a good trade-off between capability, robustness and ease of maintenance. They are also relatively small, producing less downwash and much more manageable re-circulation — air being pulled around and around through the rotor disc, picking up snow into a whirling vortex that obscures the pilot's visibility. This can cause lethal disorientation during take-off and landing, particularly over low-contrast terrain with an indistinct horizon. The lighter the aircraft, the less pronounced this effect, but for all their virtues these smaller helicopters lack any form of airframe anti-icing system, which brings its own complications.

"It's always an issue in nighttime or with low clouds in winter," said Kauhanen. "With the 412 you have to go low, mind your step, and look out for all the obstacles like power lines and trees."

In this climate, the cloud can be just as deadly as the terrain. Unwary instrument flight rules (IFR)-rated pilots thinking that their "get out" option is up into the freezing murk, can quickly find that their instrument flying safety net has become an icy noose.

Kauhanen recalls flying the 412 in the offshore SAR role, which is now the sole preserve of the H215s. "We flew all the same profiles that we do now, but if the weather was bad enough and there was icing, we had occasions where we couldn't even take off. I think our mission profile now is safer. We can go up where there are no obstacles, and then down to the sea area."

Both H215s are operated from Helsinki, with practically tropical average temperatures just above freezing. These much larger and more complex aircraft are the Air Patrol Squadron's new workhorses, received from Airbus in 2016 and specified to be capable of every mission that might be demanded of them.

Since the principal role of the H215s is offshore SAR, they are equipped with Air Ambulance Technology's Medical Wall, which functions as an oxygen panel and is equipped with patient monitors and defibrillator, ventilation and suction, as well as a perfusion pump, which acts as an alternative to cold storage for transplant organs.

The avionics are supplemented with the maritime Automatic Identification System, which tracks shipping globally, as well as a 406MHz radio homing system. Externally, the L-3 Wescam MX-15 HDi multi-mode camera and Boeing Spectrolab Nightsun SX-16 searchlight are equally suited to SAR, border security and intervention missions; whereas the lateral fast-roping support beam is more single-mission focused.

The H215s are fully IFR-capable, equipped with full de-icing and Airbus Helicopters' renowned four-axis autopilot — a welcome addition for their pilots, as Kauhanen explained. "With the 412, we flew 90 percent by hand and 10 percent using the automation. With the 215 it is vice versa. The automation is fast, easy to use

and it is much more accurate than you can ever be by hand."

This too, however, comes with caveats. "It is also challenging for the pilot, because you have to understand the philosophy of the automation and its laws. If the aircraft has a failure you need to know what it is going to do," Kauhanen noted.

"I DON'T KNOW ANY OTHER OPERATORS THAT DO SO MANY DIFFERENT ROLES AS WE DO, AND OF COURSE IF YOU WANT TO WORK AT A PROFESSIONAL LEVEL, YOU HAVE TO TRAIN A LOT."

The H215 is undoubtedly a step up from the venerable AB412, but there are evidently still compromises. Even with all this capability, it is still down to a human being to play to the aircraft's strengths and navigate through the limitations to achieve the mission, which demands extreme proficiency.

THE HUMAN ELEMENTS

While maintaining this proficiency among trained crews is an obvious challenge, so too is providing them with the necessary expertise to operate in such complex roles early on in their career, especially considering that Finland does not have a large military from which to draw experienced personnel. The Air Patrol Squadron is therefore faced with the corollary challenge of sustaining sufficient throughput of personnel to allow steady progression on to more complex types.

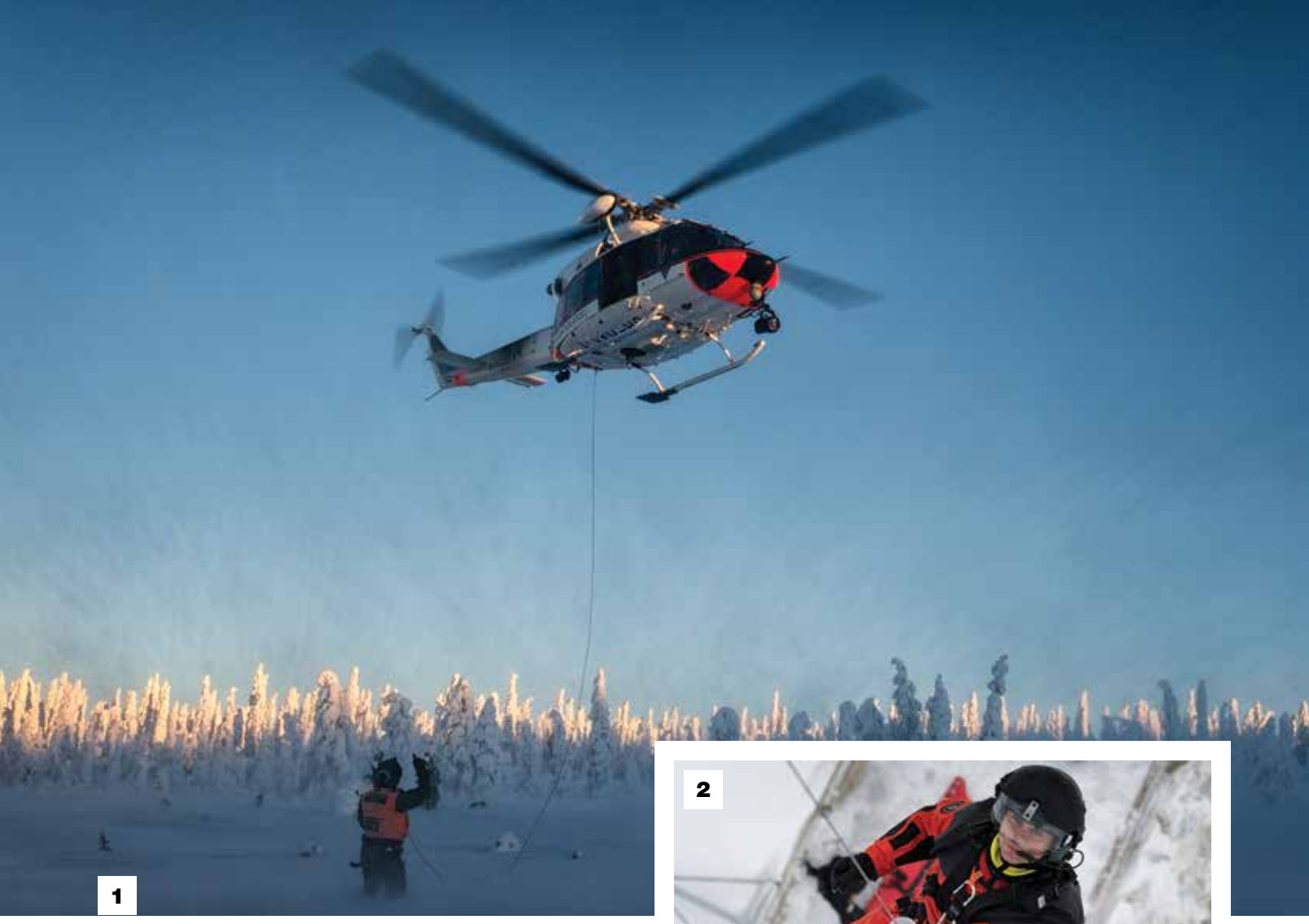
Careers for flight mechanics and pilots begin at the National Defense University, which the pilots join after their conscription service as flight students. Professional training for both then revolves around attaining the civil licenses necessary to operate: for flight mechanics, an EASA Part-66 license; and in the pilots' case, a Commercial Pilot License (CPL) for which training is contracted to Northern Helicopters of Sweden, operating the Guimbal Cabri G2 and Airbus EC120. Rescue swimmers are recruited and trained internally, with an emphasis on prior diving or rescue training, and many become flight paramedics as a parallel qualification.

Once qualified, personnel are posted to Border Guard units to begin specialist training before flying operational sorties. Flight mechanics will serve a couple of years conducting maintenance before being qualified to fly as crew. Alongside the pilots, their first type is usually the Koala, in which they will build their experience as part of a two-man crew before transitioning to more complex types. For pilots, the route from ele-

The Air Patrol Squadron is necessarily selective about the people it recruits for its demanding professional roles.

The view from the cockpit of an AB412 as the crew flies above the flat and snowy landscape of Rovaniemi.

The Air Patrol Squadron's H215 helicopters come fitted with the L-3 Wescam MX-15 HDi multi-mode camera and Boeing Spectrolab Nightsun SX-16 searchlight.



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mentary training to commanding one of the larger helicopters can be as long as 10 years.

Multi-engine helicopters have a crew of four, or five in the case of the H215: two pilots, a flight mechanic acting as hoist and systems operator, and one or two rescue swimmers whose job ultimately involves leaving the relative safety of the aircraft to deal with whatever emergency is unfolding at the scene of the rescue. For this they are equipped with the necessary diving gear, but with an understandable emphasis on protection against the cold; the average sea temperature around Finland is around 6 C (43 F). The Border Guard also draws on its long-established ethos of close cooperation with other civil and public bodies and services, frequently flying with doctors from FinnHEMS (the national helicopter emergency medical services provider) as well as divers from the fire department or police officers.

Once the crews are qualified, there is little respite from the training regime, as rescue swimmer Sami Ollila explained. “Typically, the on-duty crew performs a training flight during shift, depending on the needs of each individual and the environment. During fall, night training is a priority for example and in spring we have to prepare for fires by training with the Bambi Bucket. Rescue swimmers and flight mechanics also conduct firearms training,” Ollila said.

Rescue swimmers are also required to keep themselves in good physical shape, as while the job of the pilots can be cognitively

4

demanding, those descending to the scene are often placed in the most physical danger. Kauhanen described how missions that are demanding for one profession are often easier tasks for others: “If you have a big sea state but a steady wind, it’s easy to hover and put the rescue swimmer down. But he’s in trouble.” (There is a sense here of Finnish humility, as there are plenty of times when, low on fuel and in rough seas, things can be just as tough for the pilots.)

Faced with such a broad number of tasks and required to perform them in conditions that would challenge many simply to survive, the Border Guard are very selective about their people. As Kauhanen put it: “I don’t know any other operators that do so many different roles as we do, and of course if you want to work at a professional level, you have to train a lot.”

The environment and the missions clearly push the aircraft of the Air Patrol Squadron to the edge of their means. An aircraft perfectly tailored to this kind of operation does not exist and arguably is beyond design, at least within a conceivable budget. The helicopters, with all their intrinsic compromises, provide only the potential. It is through the proficiency of their operators that this potential becomes capability.

Maintaining these high levels of competency is of critical importance, not only to those who call upon them for help among the Arctic wilderness or out to sea, but also to their nation as a whole. While the Air Patrol Squadron’s core mission is to detect and deter illicit border crossings, it is also to demonstrate the quiet confidence and capability that forms a fundamental part of the Finnish character, to whomever may be watching.

1 // As the rescue swimmer is lashed by snow from the rotorwash, he signals to the flight engineer to begin hoisting him up. **2 //** Rescue swimmer Risto Leino brings up a simulated casualty who had fallen through the ice during an exercise with divers. **3 //** The view that would welcome a survivor brought up to the H215 on the hoist, as the flight engineer keeps the wire steady and prepares to reach out and pull them inside. **4 //** The vast tundra border is most effectively patrolled from the air, a role mainly performed by Air Patrol Squadron’s Koalas.

Air Greenland has operated Sikorsky S-61s in Greenland for over 50 years. Since 2012, it has used its S-61Ns to provide search-and-rescue services under a contract with the Danish government.

GREENLAND'S SAR RESPONDERS

Air Greenland uses Sikorsky S-61Ns to provide search-and-rescue services across the country's vast land area.

STORY & PHOTOS BY NEIL DUNRIDGE

In June 2017, Greenland suffered a major natural disaster when a mountain side collapsed into a fjord, creating a tsunami. Directly in its path was Nuugaatsiaq, a small settlement of 84 people.

Although some of the force of the wave had dissipated by the time it reached the settlement, the row of houses at the edge of the fjord was swept away, with four people losing their lives. Sadly, hundreds of sled dogs were tied up outside the buildings with no chance of escape — 150 died, and many of the 100 remaining dogs were injured.

Crews from Air Greenland Search-and-Rescue (SAR), operating a Sikorsky S-61N from Kangerlussuaq (Søndre Strømfjord), were gathered to assist in searching for survivors and to evacuate the remaining residents and dogs. The mission would become the biggest operation in the company's 50 years of flying the S-61.

Having been briefed by the Joint Rescue Coordination Centre (JRCC) under Joint Arctic Command, the S-61N departed with four pilots — two flying and two on crew rest — along with hoist operators and hoist assistants. Once at Nuugaatsiaq, each crew was on duty for 12 hours a day for nearly a week, supporting the dozens of residents who had been affected by the disaster.

In the following week, the crews' tasking changed from carrying people to dogs, as the residents rounded up all of the surviving animals. Supporting the effort were two Air Greenland Bell 212s and a Danish Navy Westland Lynx, with a Danish military ship providing air traffic services in the fjord.

WATCH VIDEO

Air Greenland operates with nine SAR pilots, nine hoist operators and three hoist assistants.

DOING WHAT IT TAKES

The Nuugaatsiaq mission highlighted the complex and unpredictable nature of SAR operations in Greenland, which are quite unlike those undertaken in many other parts of the world. The operating area for these missions is vast, but infrastructure is minimal, as Greenland's population of just 57,000 gives it the world's lowest population density. Individual SAR mission statistics are misleading, as missions could last an entire day or even up to a week.

The Danish Arctic Command, with its headquarters in Greenland's capital, Nuuk, is responsible for sea rescues outside of the small islands, while the mainland and islands remain the responsibility of the police. On the air asset side, JRCC Greenland (AIR) is in charge.

"We have a response time to be in the air within an hour both during the day and night," said Mark Henriksen, chief pilot for the SAR S-61N helicopter. "Often, we average 30 to 45 minutes. The reason we are not quicker is because of the planning for the people to support us — nurses, doctors or police — and we have to wait for them. Sometimes it will be necessary to fly along the coast to collect them from another settlement and the distances preclude fast response times."

The S-61 has operated in Greenland since 1965, and currently operates under the SAR contract with the Danish government — a contract Air Greenland has had since December 2012. The company operates two S-61Ns, and uses them for charter flights when they are not engaged in SAR missions.

Both S-61Ns have been operating in the Greenland climate since 1965, which has proven to be beneficial on the maintenance side, as the country's low humidity has forestalled corrosion. With the aircraft type operating in the same area for over 50 years, Air Greenland has accumulated a huge stockpile of spare parts, including a former Irish Coast Guard S-61.

Both helicopters have an internal auxiliary fuel tank, which increases

During the summer months, Air Greenland uses one of its S-61Ns for charter work, while the other is used for both charter and SAR.

endurance to a maximum of five hours and 10 minutes at a burn rate of 1,050 pounds per hour, for both engines. Very rarely will the helicopter be left full of fuel; operating in such cold temperatures, once the aircraft is towed into the warmer hangar the fuel expands and leaks onto the floor. In case there is a need to take on additional fuel while en route, fuel drums are placed around key locations in Greenland. The S-61 can also carry 53-gallon (200-liter) drums, which can be directly fed into the center tank, providing an extra 20 minutes of flying time when needed.

The S-61 can operate to a minimum temperature of -58 F (-50 C), with winter temperatures of -40 F (-40 C) being the norm. Because of these extreme cold temperatures, the S-61 is stored inside a hangar as much as possible. If it is outside for any amount of time, the helicopter has heating pipes that pump warm air into the cabin and around the gearbox to heat it up. Pilots can then rotate the blades a few times before starting the helicopter up. The main start-up checks are done in the hangar, with six to seven checks only possible outside. Opening the hangar doors unnecessarily would let a costly amount of heat out — it's an estimated 10 to 15,000 Danish Krone (US$1,657 to $2,485) to re-heat the hangar each time.

SMOOTH OPERATIONS

Air Greenland provides accommodations in houses on the opposite side of Kangerlussuaq airfield, so the crews, who spend three weeks on duty and three weeks off, are only minutes away from the hangar. During a live SAR mission, the crews will arrive at the hangar and pick up a shortened activation report that is sent direct to a specific email address, printing automatically.

Over the past four to five years, Air Greenland and Joint Arctic Command have built a strong working relationship. "We have found that the SAR operations here have improved immensely by working closely," Henriksen said. "We depend on the command for the information and we feed back what we have done during the mission."

Air Greenland operates with nine SAR pilots, nine hoist operators and three hoist assistants. "At the present time the mechanic is also the hoist operator, and we have a hoist assistant," Henriksen explained. "The hoist operators only have first aid training and even if the person is suffering from dehydration, they are not permitted to administer a drip."

At press time, one of Air Greenland's S-61Ns was in the process of being overhauled, with its General Electric CT58-140 turboshaft engines receiving an upgrade to 1,500 horsepower from Vector Aerospace (now StandardAero). Once that aircraft returns to service, one S-61N will remain at Kangerlussuaq while the other will be dedicated to charter work through the summer months.

In 2018, the SAR tender will be up for renewal. According to Henriksen, "It's a very complex situation. Everyone has views on what should or shouldn't be in the contract, but from an operating perspective it's essential to take in account Greenland's geography — the vast distances and [low] population define the SAR operation regardless of the contract owner."

Neil Dunridge | Neil Dunridge's passion for aviation began while living around Royal Air Force airfields. A three-year journey to author *A-10 Thunderbolt: 21st Century Warthog*led led him to Afghanistan, where his interest in combat helicopters and the search-and-rescue role developed. He is based near Oxford, England.

In addition to the pilots up front, a SAR crew includes a hoist operator and hoist assistant.

Greenland's vast, sparsely populated land area makes for complex missions that can last for many hours or days.

Nurses or doctors may accompany the SAR crews in order to provide more sophisticated medical care to patients.

Final Approach

written by Elan Head | Terry Hill, Medevac pilot and entrepreneur

Photo courtesy of Terry Hill

Terry Hill's life changed when the U.S. Army Black Hawk medevac helicopter he was co-piloting crashed in Afghanistan in 2010. But it took him years to realize just how profoundly that experience affected him.

"They called it a hard landing, but it was a crash," he recalled. "It was under red illume, so zero illumination, dust landing. By that point we had done dust landings probably hundreds of times. It was just one of those things, you know? But 2 a.m., down by the Pakistan border, we browned out and that's where it went south. No one was killed, but it left a lasting impression on a lot of our lives."

Hill sustained some injuries in the accident, but was able to finish his deployment. And he didn't slow down after he redeployed. Hill flew humanitarian missions in Montenegro. He was selected for maintenance test pilot training in Fort Rucker, Alabama. He spent two years in South Korea, where he served as commander of his aviation company and flew a number of high-profile missions in support of U.S. President Barack Obama. He then returned to Fort Rucker and worked as a research pilot, contributing to the Army's studies on flight in degraded visual environments.

By 2016, however, Hill had recognized that his crash had left him "a lot more banged up physically and mentally than I thought." Those effects had only been compounded by the daily pressures of serving as a medevac pilot. "I think whether you're civilian or [military], as an evac pilot, it definitely takes a toll on you," he said. "I mean, you're picking up people on the worst day of their lives, and it's a very noble job, but it affects you after a while."

Hill left the Army and returned home with his family to Oklahoma, where he commenced the process of coming to grips with the traumatic experiences he had been through.

"I think it takes a very special individual to be a [medevac] pilot," he said. "We have type A+ personalities and those are the ones that you want in the cockpit, but we're also very good at internalizing [problems] and just locking them away. We stick them on the back burner because we don't want to be viewed as weak or incompetent or grounded. . . .

"I think what probably hurt me the most was not taking a break right after the crash. I mean, I got right back into it; I was a young aviator. I wanted to make pilot in command and all this hoopla stuff, and that really was not healthy."

Hill recalled that on those occasions after the crash when he did realize he was struggling, he would talk himself out of seeking help. "I would tell myself I'm an Army aviator and I've flown all these missions and I'm not missing any legs, I'm not missing any arms like the guys that I picked up. Basically, 'quit being a baby' was my mindset."

And although that mindset persisted even after he left the Army, his wife finally put her foot down. "I was stuck in the mode, 'I'm fine, I'm OK,'" he recalled. "And she was like, 'No, you're not fine. You go to the store, you're trying to choose between two different breads, and you start crying.' And I'm like, 'OK, you're right.'"

Fortunately, when Hill did reach out for help, he quickly realized that the stigma he had feared for so many years mostly didn't exist. "Once you make that mind switch, it's really very, very positive because there's so many people out there that actually want to help you and they don't want to just yank your wings from you," he said. "They want to get you healthy so that you are in your right state of mind on those early morning missions, or under low visibility, bad weather conditions. So it's OK to get help — I mean, it really is."

For Hill, his own turning point came when he was paired with a service dog through Therapetics Service Dogs of Oklahoma, a nonprofit organization that, in addition to training mobility assistance dogs, places psychiatric service dogs with military veterans who have been diagnosed with post traumatic stress disorder (PTSD).

"The dog actually pairs to you; you don't get to pick a dog," Hill explained, recalling the day when he was chosen by his own dog, Jonsie. "I was having a pretty rough day one day at training, and there was a lot going on, and he just got up, walked right over to me, and leaned on me. I was like, 'Holy cow!' I'd never felt that in my life."

Hill called Jonsie "an absolute lifesaver, literally, physically. He's my daily co-pilot that goes around with me. I'm not sure if I would even be here if it wasn't for him — I mean, I was down that path, unfortunately."

Today, with his wife, daughter, and Jonsie by his side, Hill has found a new purpose in life with the launch of his own 3D printing company, Rapid Application Group LLC. By offering prototyping, additive manufacturing, and other rapid tooling services to the aviation industry, Hill believes he can contribute to the success of life-saving medevac missions, even now that he's out of the cockpit.

"If we can save, say, five pounds on the next aircraft coming out, or on an EMS platform, maybe that five pounds doesn't seem like a lot now, but when you're high, hot, and heavy, five pounds makes all the difference," he said. "We're able to give back to the EMS community and the rotary-wing community through additive manufacturing. I told myself that if I couldn't be directly saving people's lives, that I wanted to own a company where I could still reach out and be able to help save people's lives."

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