RotorHub

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America's gate guardians

US Customs and Border Protection

THAT GOLDEN HOUR

HEMS interiors

WHO'S OUT THERE?

Night vision technology

BACK TO SCHOOL

Training and simulation

RotorHub

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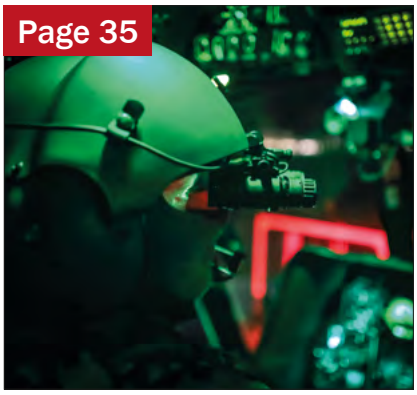


Front cover: A US Customs and Border Protection agent surveys hurricane damage in South Carolina from the door of a UH-60 Black Hawk. (Photo: Ozzy Trevino/CBP)

In the next issue

- Cockpit technology
- Crew safety
- Oil and gas
- EO/IR systems

Glenn Sands, Managing Editor

Electric dreams

The long-held idea of electrically powered helicopters and rotary-powered craft may now finally be drawing closer and moving beyond all those concept sketches and fantasy-style promotional videos that I regularly get shown at media presentations.

Whilst many different companies are keen to be the first to develop such technology, even I can see that some of the proposed designs would be more at home in *Star Trek* than as a practical urban or regional platform.

But, surprisingly, one of those cool-looking concepts has caught my eye. UK company Vertical Aerospace has unveiled its VA-1X aircraft. If all goes to plan, it will be the first certified winged electric vertical take-off and landing (eVTOL) air taxi.

The VA-1X is a five-seat passenger aircraft for routes of up to 160 km. Equipped with a distributed propulsion system that employs lithium-ion batteries, it will be able to use existing helipads and airports, and the developer claims that, in terms of noise levels, it will be 30 times quieter than a traditional helicopter.

Leading the race

A statement from the company indicates that assembly work will begin "shortly", with the first test flight expected to take place next year. Certification and operational service is scheduled for early 2024.

Vertical Aerospace's founder, Stephen Fitzpatrick, has conducted numerous air tests with scale models and full-scale eVTOL prototypes. Fitzpatrick has extensive experience in leading technology businesses, having established the Manor F1 team, and he has drafted in engineers with motor racing industry experience to work on the VA-1X project.

The prospect of combining F1 technology with the latest aerospace developments is a mouth-watering proposition, and it might well be time to regard the VA-1X as less 'James Bond' and more a real and practical solution to what has been a hot topic for debate over the last decade.

As improvements to conventional helicopters continue to be developed, it's going to be a fascinating few years ahead as the two types each try to find where they can fit into this competitive market. ■

Vertical Aerospace is hoping that the VA-1X will enter commercial service in 2024. (Image: Vertical Aerospace)

ACH130 Aston Martin Edition wins orders

The Aston Martin Edition is attracting interest around the world. (Photo: Airbus)

Customers on three continents have signed firm contracts for the ACH130 Aston Martin Edition helicopter since its launch at the beginning of this year.

The helicopter, which Airbus describes as "one of the most distinctive sights in the skies", is already flying in Latin America, and will enter service in North America and Asia-Pacific over the coming months.

Launched early in January, the Aston Martin Edition is a special version of the ACH130 featuring a range of stylish interior and exterior design features created by Aston Martin.

According to Airbus, the aircraft should "delight helicopter owners who appreciate the thrill of piloting and the pleasure of driving luxury sports cars".

In Latin America, the model has just entered service with an undisclosed VIP customer in Guatemala. The first order from the Asia-Pacific region came from an existing Airbus customer in New Zealand. That aircraft will be used privately, as well as in VIP charter operations.

Most recently, an undisclosed private customer in Canada signed up for one of the special edition helicopters. It will be completed by skilled craftsmen and craftswomen in the UK, where the OEM manages and engineers this model, and delivered from the Airbus Customer Centre in Fort Erie, Canada.

The aeronautical designers at Airbus Corporate Helicopters (ACH) and the automotive designers at Aston Martin worked closely on the new ACH130 variant for over a year, marrying ACH's key values of excellence, quality and service with Aston Martin's commitment to beauty, handcrafting and automotive art.

Frédéric Lemos, head of ACH, said: "We are delighted with the market reaction to this superb new helicopter. These orders across the world clearly demonstrate the excitement generated by our collaboration with Aston Martin."

By Glenn Sands, Farnborough

Nakanihon Air signs up for first H215

Airbus Helicopters has received an order from Nakanihon Air, one of Japan's largest helicopter operators, for a single H215. It is the first time that Nakanihon has acquired this Super Puma type.

The new aircraft will be used for utility and aerial work, joining 45 other Airbus helicopters in the Nakanihon fleet. The company performs passenger and cargo transportation, electronic news gathering and EMS missions within Japan.

Taku Shibata, president of Nakanihon, commented: "We are looking forward to receiving Airbus's mission-proven H215 to support our wide-ranging activities in Japan. We believe the H215 offers the enhanced precision and stability we require, which will not only boost mission readiness but will also build up our fleet capabilities. We are happy to further this partnership with the Airbus Helicopters team in Japan that understands our needs and has supported our operations for many years."


Nakanihon Air is adding an H215 to its large Airbus fleet. (Photo: Airbus)

For the manufacturer's part, Guillaume Leprince, managing director of Airbus Helicopters in Japan, stated: "We are pleased to support Nakanihon Air's growing business. We thank our customer for their continued confidence in our long-lasting relationship as demonstrated by this first H215 order."

Nakanihon operates an OEM-approved H135 maintenance centre, whereas Airbus Helicopters can inspect Super Pumas at its maintenance facility in Kobe.

According to the OEM, there are currently 28 Super Puma helicopters operating in Japan, shared among civil, parapublic and military operators.

By Gordon Arthur, Christchurch

Miami-Dade Fire Rescue receives AW139

Miami-Dade Fire Rescue (MDFR) has recently taken delivery of its first Leonardo AW139 helicopter.

MDFR ordered four AW139s in December 2019 for fire suppression, emergency medical services, and search and rescue missions. The remaining three aircraft are expected to be delivered by the end of 2020. Each one will have a cargo hook, a rescue hoist and a Bambi bucket.

The 13 October handover included a small ceremony at Miami Executive Airport in Miami-Dade County, Florida. County officials, including Mayor Carlos Giménez, spoke at the event.

"As a former firefighter, I've been very impressed with this world-class search and rescue helicopter," Giménez said. "Replacing antiquated helicopters, the new AW139s will be a vital addition to Miami-Dade Fire Rescue's fleet. They will provide a heightened level of safety and security for our Fire Rescue workers and those whose lives they work to save."

Miami-Dade is the most populous county in Florida, with over 2.7 million people, and covers more than 2,000 square miles (larger than the states of Rhode Island and Delaware). MDFR operates 71 fire-rescue stations within the county and serves 29 municipalities. Due to the impressive scope of its rescue operations, the agency's Air Rescue unit frequently provides support to neighbouring counties, including Monroe, Collier, Broward and Lee.

Miami-Dade Fire Rescue is due to have a fleet of four AW139s by the end of this year. (Photo: MDFR)

In the United States, existing AW139 customers include the Los Angeles Fire Department, New Jersey and Maryland State Police, and many other operators. The US Air Force will soon introduce the AW139-based Boeing MH-139 to replace its UH-1N fleet.

By the RotorHub team, Farnborough

Bristow's UK SAR contract extended to 2026

Bristow Helicopters' contract to provide search and rescue coverage across the UK has been extended through to the end of 2026. The company will continue to support Her Majesty's Coastguard, the emergency response service of the Maritime and Coastguard Agency, with a fleet of 11 AW189s and 10 S-92As.

Bristow was originally awarded the contract in 2013. It currently operates from 10 bases around the UK, which are strategically located to allow it to respond to incidents across the country on behalf of HM Coastguard.

"Bristow's specialist teams have worked tirelessly, diligently and with unquestionable pride to ensure the transition from a military and coastguard operation to a fully commercialised SAR helicopter service," said Alan Corbett, CEO of Bristow Helicopters and Bristow Group's senior vice-president for Europe, Africa, Middle East, Asia, and search and rescue.

Bristow provides UK SAR coverage with S-92s and AW189s. (Photo: Bristow)

"The extension of the current contract allows us to cost-effectively introduce new capabilities into the existing helicopter fleet and to explore technologies that may be of benefit in future contracts," he added.

By Glenn Sands, Farnborough

Russia delivers up-engined Mi-171 to Chinese operator

Russian Helicopters announced in September that it had delivered an Mi-171 helicopter powered by VK-2500-03 engines to a civil aviation company in China.

The customer for the Ulan-Ude-built Mi-171 aircraft was not disclosed, but the OEM noted that this was the second Chinese aviation company to order the type.

There are approximately 200 Mi-171s operating in China (mostly for military use), according to Russian Helicopters, but it was only last year that the Civil Aviation Administration of China issued a type certificate for the upgraded Mi-171 with VK-2500-03 engines.

Manufactured by UEC-Klimov, the engines are more powerful than the TV3-117VM units they replaced. Furthermore, the platform's high-altitude performance is improved, this being an important consideration in China, since it has high plateau areas in the west of the country.

Leonid Belykh, managing director of U-UAZ, commented: "The key advantages of the helicopter, the high thrust-to-weight ratio and operational safety in mountainous regions, caught the attention of potential buyers at the end of 2018, when the Mi-171 was demonstrated in China."

In late 2018, Russian Helicopters toured its Ansat and Mi-171A2 models around Asia. In addition to China, there were demonstration stops in Cambodia, Malaysia, Thailand and Vietnam.

A second Chinese aviation company has ordered the Mi-171 with VK-2500-03 engines. (Photo: Gordon Arthur)

Belykh continued: "The Civil Aviation Administration of China and the leadership of the Ministry of Emergency Situations were impressed by the helicopter's capabilities for transporting goods on an external sling and emergency response, as well as by the ability to quickly load and unload rescue and firefighting personnel."

Russian Helicopters claimed: "The use of VK-2500-03 engines in Mi-171 helicopters ensures higher load capacity and increases the operational and hovering ceiling. Greater available engine power in an emergency mode ensures greater safety during flight with one running engine." The engines are controlled by the BARK-78 digital automatic control system.

Russia is continuing to seek sales opportunities for both its civil and military helicopter platforms in China.

By Gordon Arthur, Christchurch

More Surions for South Korean police

The South Korean government has signed a KRW47.1 billion (US$39.7 million) contract with Korea Aerospace Industries (KAI) for two additional Surion helicopters.

The aircraft carry the nomenclature KUH-1P, representing parapublic variants of the Surion destined for the police. KAI stated that they would be delivered by February 2023.

Five KUH-1Ps were in service with the Korean National Police Agency at the end of 2019, out of a total of eight ordered. This latest order will give the agency a fleet of 10 Surions.

The KUH-1P variant is equipped with an electro-optical/infrared imaging system, searchlights and medical equipment so it can perform EMS missions.

As of the end of 2019, KAI had built approximately 130 Surion helicopters, the vast majority of which had gone to South Korea's armed forces.

The manufacturer has failed to register a single export order for the Surion so far. KAI originally expressed hopes of achieving as many as 300 overseas sales for the type.

The South Korean parapublic helicopter market is still dominated by foreign platforms, but KAI hopes that customers will increasingly turn to indigenous types like the Surion.

By Gordon Arthur, Christchurch

NCCH and RotorSky establish training partnership

Norwegian Competence Centre Helicopter (NCCH), based at Stavanger Airport in Norway, has entered into a training partnership with Austrian helicopter flight school RotorSky.

NCCH operates state-of-the-art Level D full-flight simulators for the H145 D2 (BK117 D2) and, from this October, the H135 T3 (EC135 T3H), incorporating Helionix Step 2 and 3 avionics capabilities. The simulators, designed and built by Reiser Simulation and Training, feature a third crewmember station to enable crew coordination training.

RotorSky is a flight school with more than 15 years of experience in all kinds of helicopter pilot training.

NCCH's CEO, Dr Michael Mayrhofer, commented: "Merging the competencies of NCCH and RotorSky was a logical way forward to provide full training solutions at the highest standards to the market."

Christian Gruber, CEO of RotorSky, added: "Our instructor staff are highly motivated and focused on excellent training delivery. Many of the instructors have both a military and civilian operations background, as well as many years of experience in flying and teaching."

NCCH and RotorSky believe that their new partnership will allow them to deliver comprehensive, high-quality pilot and crew training solutions that will be particularly attractive to H135 and H145 operators around the world.

By Glenn Sands, Farnborough

Hong Kong's GFS reaches H175 milestones

The Government Flying Service in Hong Kong has a fleet of seven H175s. (Photo: Gordon Arthur)

Airbus Helicopters announced in September that the H175 helicopter fleet belonging to Hong Kong's Government Flying Service (GFS) had reached a cumulative total of 5,000 flight hours and carried out 3,000 missions.

The GFS was the first operator of the public services variant of the H175, having ordered seven in 2015. Deliveries began in 2018, and the final airframe entered service in September last year.

Airbus noted: "The public services version enlarged the mission capability of the H175, enabling 18 different missions to be conducted, such as onshore and offshore search and rescue, emergency medical services, law enforcement and firefighting."

Delivery of the final H175 was delayed because improvements were implemented that were not in the original contract, one example being modifications to the main gearbox. These same enhancements are being retrofitted to the organisation's existing H175 fleet.

Prior to the arrival of the H175s, the GFS had four H155/EC155 B1 Dauphins, purchased in 2002, and three AS332 L2 Super Pumas, dating from 2001. The Super Pumas are to be retired by year's end, but the agency decided to retain two Dauphins that underwent modernisation in Hong Kong. This reduces risk in case the H175 fleet has to be grounded for any reason.

Captain Karl KT Chan, chief pilot (corporate safety) and the person in charge of the H175 programme at the GFS, told RotorHub: "Our operational transition to the H175 helicopter has been smooth so far. We consider that the fleet of H175s is technically and operationally capable of taking over the roles of EC155 and AS332 L2 Super Puma helicopters in all missions."

To enhance training quality, the GFS issued a tender in December 2019 for a full-flight simulator for the H175. The tender closed in March and, according to the document, the simulator should be delivered within 24 months of a contract being awarded.

To date, the training of pilots has taken place in both Hong Kong and France. By next year, the number of helicopter pilots in the GFS should reach 56, which represents an increase of more than 50% compared to 2019.

To reduce costs, the GFS has proposed creating a flight simulator training centre within the Hong Kong International Airport precinct. Budgeted at HK$512.1 million (US$66.1 million), the facility is predicted to save the service HK$44.8 million annually, largely as a result of reductions in overseas training expenses and aircraft wear and tear.

Government data for 2019 listed a total direct operating cost per flight hour of HK$26,310 for the H175, which compares favourably with the HK$28,950 figure for the Super Puma.

The global H175 fleet has achieved 85,000 flight hours to date.

By Gordon Arthur, Christchurch

Mi-171A2 achieves certification in South Korea

The Ministry of Land, Infrastructure and Transport in South Korea has issued a type certificate for Russian Helicopters' Mi-171A2 helicopter.

This is a significant milestone for Russian Helicopters, which has a loyal following in the South Korean parapublic market. As the OEM pushes its latest version of the Mi-171, validation of this certificate confirms compliance with local flight safety regulations and permits its operation in South Korea.

Andrey Boginsky, director general of Russian Helicopters, said: "South Korea is the largest foreign operator of the Ka-32 helicopter and also has a track record of using the Mi-8/17 in police operations. Validation of the Mi-171A2 certificate proves that the country has high demand for and trust in Russian helicopter designs."

Boginsky added: "I am confident that our Korean partners will appreciate the outstanding flight performance and modern on-board equipment of the Mi-171A2. Negotiations about its delivery are already under way."

Kazakhstan was the first foreign nation to operate the Mi-171A2 helicopter, and type certificates have been issued in India and Colombia. Certification is also being sought in China, Brazil, Mexico, Peru and several other countries, according to the manufacturer.

South Korea had 233 civil and parapublic helicopters in operation at the end of 2019, according to the Asian Sky Group. Of this figure, 62 aircraft were Russian Helicopters units, giving the OEM a 27% stake, and therefore the largest share of the South Korean market.

By Gordon Arthur, Christchurch

Avy drones to assist first responders

Avy, a leading Dutch aviation company, is developing drone technology that will provide first responders with reliable delivery of medical items up to 2 kg in weight and also offer greater situational awareness of any incident.

In just five years, the company has gained exclusive certification to fly long-range drones over urban areas across Europe. The goal of Avy is the development of autonomous, zero-emissions aircraft to offer better connectivity.

Currently, Avy's long-range drone response network is offering breakthrough solutions for medical delivery with minimal logistical equipment. The current integrated kit comprises a drone, a drone station/box and a central command system. Able to fly over 60 km, the VTOL drone can also be equipped with a gimballed camera.

The operation profile of the drone is started when the control room receives a notification that a first-response or medical delivery drone is required. Pre-positioned in boxes across any city, the drone will be alerted automatically and fly out of its box to the incident site. Once its task is completed, it will return to its box for charging, ready for the next call.

Avy's drones will be pre-positioned so they can respond immediately to any tasking. (Photo: Avy)

Avy is part of the Medical Drone Service, a Dutch consortium comprising ANWB Medical Air Assistance, PostNL, Erasmus MC (a Rotterdam-based hospital), Isala (a hospital in Zwolle), Certe (a medical diagnostics company) and Sanquin (a blood bank). Avy is aiming to undertake a three-year trial scheme during which the company's drones will be able to provide medical assistance anywhere, anytime across the Netherlands.

By the RotorHub team, Farnborough

For more news, visit ***www.rotorhub.com***

High hopes for Hill's HX50

The HX50's sleek curves emphasise that style is as important as substance as far as its developer, Hill Helicopters, is concerned. (Images: Hill Helicopters)

RotorHub's editor, **Glenn Sands**, sits down with Hill Helicopters' Mischa Gelb to find out more about the recently announced HX50, which looks like being one of the most dynamic helicopters to enter the five-seat single-engine market in decades.

"There's going to be nothing else like it on the market, and let's be honest, there's been no major innovation within the light helicopter market for about the last 40 years," says Mischa Gelb, ambassador for sales and marketing at UK-based Hill Helicopters, as we discuss the company's plans for the new HX50. It's a bold statement, but looking at what Hill is offering, it might well be a fair one.

Given how crowded the private commercial helicopter market is, is there a demand for another model from a manufacturer that's new to the global market? Having looked over the expected performance figures and statistics, I certainly think there is. Gelb explains the idea behind the HX50.

"So the vision for the helicopter came from a couple of different areas. Frank Robinson was the last guy to bring any real change to the market, with the R22 and R44. So when we thought about the market and introducing a new type, we knew we would be able to capitalise on the last 40 years of innovations that, from our point of view, no one had really taken advantage of.

"Although the EC120 came on to the market, it didn't really capture the idea of what this type of helicopter should be – it was too heavy and expensive to operate in my opinion. It didn't fill the niche for certain people. It just didn't look right."

Jason Hill, the designer of the HX50, is a firm believer that "art and science can walk together hand in hand", and from the concept drawings, it's clear that he's followed this belief to the letter.

Gelb explains: "The people that the HX50 is aimed at may well have a wealthier status than most, have an Aston Martin or a Bentley in the garage. But they then get into their 40-year-old Robinson or JetRanger, and there's just a huge disconnect between that and the beauty, comfort and luxury you should expect from a modern helicopter.

The luxurious interior of the HX50 is designed to appeal to wealthy private customers.

"So it's Hill's mission to merge these two sectors of beauty and comfort into one helicopter design that's also capable of high performance."

With an estimated cruise speed of 140 kt and a range of 700 nm, it seems that the HX50 is seeking to be the grand tourer (GT) of the air, akin to the GT cars of today.

While Gelb is reluctant to reveal specific pricing details for the HX50, he states that it will be highly competitive compared to what's already out there and predicts that the helicopter will cause the same impact and disruption to the market as Frank Robinson's designs did 40 years ago. For customers, this can only be a good thing in terms of choice and competition.

Gelb is passionate about what the HX50 will offer. "Jason has come along and redefined this area of the market. It's just feasible that, given the performance of the HX50, it'll start diving into the territory of light aircraft sales, which will be a whole new area. What I mean is that customers can feasibly get the same performance as from, say, a Cessna 172, but with the HX50, which offers greater flexibility."

Gelb clearly believes that the market is ready for a change, and that Hill's design ticks all of the necessary boxes for a helicopter aimed at this market. For a five-seater, it must be powerful, comfortable and get away from the utilitarian look of the current models out there.

The design team included individuals who had come over from the automotive industry, and they had a major role in the final look of the HX50. Gelb explains: "The two different design processes worked really well together. It's like when you see an advertisement for a car, and as it rolls out of the garage, the light flickers over the bodywork, showing its lines. It takes countless hours to develop just the right aerodynamic curve and line. We applied the same design principle to this helicopter. Aerodynamics played a significant role in its look, and I know when a customer pulls it out of their hangar, they will likely see this effect. It's design magic, I guess."

In terms of performance, the HX50 will carry 90 kg of luggage and fuel for a three-hour flight. Reduce the luggage and it can fly for five hours, meaning pilots won't have to factor in a fuel stop during many journeys.

With regard to the current state of orders for the new aircraft, Gelb is reluctant to talk about specific customers, but he does reveal that 75 potential clients have requested a presentation on the HX50 and all of the feedback has been "very positive". The majority of the interest has come from the US and UK markets, he reports.

There is a feeling of great anticipation for the HX50, as it just might be the next big thing to hit the helicopter market. It's the first model in a long time to be designed with the luxury private customer in mind. With 80% of Robinsons operating in private hands, it's clear that the client base is there.

Marketed as the sports car or GT of the skies, the HX50 won't look out of place on the back of a superyacht or flying into a polo match, and it's likely to be an attention grabber for its first few years at least.

With a 20-year plan in place and deposits already being taken for helicopters that are scheduled to be delivered in 2023, the company anticipates a production rate of up to 10 aircraft per week, depending on demand.

After looking at the specifications of the HX50 and speaking with Gelb, I'm left wondering if 10 per week will be enough. ■

AMERICA'S GATE GUARDIANS

A US Customs and Border Protection Black Hawk patrols the waters around southern Florida. (Photo: James Tourtellotte/CBP)

Viewed as America's front line, US Customs and Border Protection operates a fleet of UH-60 Black Hawks that plays a key role in the agency's efforts to protect the homeland. Crewed by air interdiction agents, the work is dynamic, at times high risk, but tremendously rewarding. Pilot Edgar Anzaldua speaks to Glenn Sands about what it takes to be on that front line.

It's an organisation that's responsible for detecting, intercepting and apprehending criminals at and beyond US borders. It's a tough job, but the men and women of US Customs and Border Protection's Air and Marine Operations section are on call 24 hours a day, 365 days a year, and supported by the best technology in the business.

Many personnel within the organisation's ranks have previous military service, and they are mixed with others who have chosen to answer the call to protect their homeland against illegal immigration, narcotics and contraband trafficking, and acts of terrorism.

The air component of US Customs and Border Protection (CBP) operates fixed-wing aircraft, helicopters and unmanned aerial vehicles in order to monitor, disrupt and prevent illegal activities. Missions include conducting regular border air patrols and providing air support during raids, and the backbone for these types of operations within the rotary division is the Sikorsky UH-60 Black Hawk. For those that fly what they describe as an "awesome piece of kit", it's the go-to helicopter that's able to ferry agents, carry aerial snipers and provide the heavy punch against the increasingly sophisticated threats faced by the United States.

Black Hawk boys

Many of the helicopter pilots, who are referred to as air interdiction agents, see the job as a calling. Those that are ex-military are keen to remain flying and generally have a liking for the command structure that CBP offers, with the added bonus of working with people who have one focused, common goal: not climbing a corporate career ladder or seeking profit and bonuses, but simply protecting their homeland.

Air interdiction agent Edgar Anzaldua, currently serving with the McAllen Air and Marine Branch, is one of those ex-military pilots, having previously flown Black Hawks with the US Army. With eight years on the type, thousands of hours and countless deployments, joining CBP's Air and Marine Operations (AMO) section was the perfect career move for Anzaldua, allowing him to get behind the controls of a Black Hawk again. ▶

MAJOR DUTIES

The work of US Customs and Border Protection's air interdiction agents is wide-ranging. As far as their main duties are concerned, agents are required to:

- perform aviation law enforcement operating fixed-wing aircraft, helicopters and unmanned aircraft systems to detect, interdict and prevent acts of terrorism and unlawful movement of people, illegal drugs and other contraband toward and across US borders;
- perform investigative duties including intelligence gathering, apprehending suspects, testifying and acting as liaison with other federal, state, local, tribal and foreign law enforcement agencies;
- develop strategies to track aircraft, vessels and people to accomplish an effective and successful interdiction.

"I joined AMO in 2017," he explains. "I had been a US Army pilot, then joined the commercial fixed-wing environment for a while and served with the airlines. It was during a summer break while I was working as a flight instructor that I came into contact with an AMO pilot who was looking to get his fixed-wing transition so he could fly commercial types. So I guess the interest stemmed from there."

For those with the relevant flying qualifications, the road to becoming an air interdiction agent is still a relatively long process. All applicants must have a commercial pilot's rating and be in possession of an FAA first-class medical certificate. The rating can be for either fixed- or rotary-wing aircraft, as the agents will likely be instructed on additional aircraft types once they are within the AMO training organisation.

Anzaldua recalls the entry process. "The hours rating does vary – I think you needed a minimum of 1,500 hours when I came in, but this can change based on the needs of the service. When I first looked into the service, you needed 1,000 hours of flight experience, with some sub-categories such as night and instrument ratings.

"Every candidate undergoes a thorough background check and a polygraph examination. Additionally, there's a thorough medical, as well as drug tests. Once I had passed these, I was sent to Oklahoma City, to CBP's National Air Training Centre, for what's best described as a five-part interview process. The first is a records review and an introduction to AMO. The second stage is an examination on basic aviation knowledge, after which the third stage is the flight evaluation phase.

"The fourth part is in front of a review panel, which puts forward different scenarios to test how a candidate would respond and what they have learnt along the way whilst visiting the facility. The panel places great emphasis on how a candidate would act in certain situations, whether they would be able to remain calm when experiencing extreme pressure in the job.

"The final stage is where the panel determines whether you have been accepted to the agency. Overall, the entire process takes about three to four hours, so it's a busy half-day, and this includes the flight evaluation as well.

"Personally, it was challenging," Anzaldua recollects, "as every stage is conducted by a different instructor, and they don't give you too much feedback at each stage – you're simply told to progress on to the next stage as the morning or afternoon goes on."

Air and Marine Operations and Border Patrol agents apprehend a group of illegal immigrants, who had dressed in camouflage in the hope of avoiding detection. (Photo: Jerry Glaser/CBP)

Air interdiction agent Edgar Anzaldua is one of the many ex-military pilots now flying for US Customs and Border Protection.

A typical day

Much like any military service or state agency, there is a familiar format to each day at AMO, although the times and schedules are governed by any operations that are planned or ongoing. Each shift normally begins with a mass briefing, or 'muster'. Personnel will go over that day's assignments and add in any new intelligence that has been passed across from other agencies. It is during this time that the availability and deployment of air assets is discussed.

Anzaldua explains the process. "Many of us are rated on more than one aircraft, so we can launch at any time, and we'll get told at the main briefing what type we have been assigned to and when to attend a follow-up briefing.

"A little while after the muster, we will show up for the follow-up briefing, and this is when we're told our patrol sector and where we will be flying over. Of course, we'll also have to be available to respond to any emergency calls if they come in.

"Down here in the Rio Grande Valley, it can be an incredibly busy sector, from the moment we launch until we recover. But these are not the only types of missions we fly.

"We also have an investigative unit which works hand in glove with other federal agencies, as well as state and local partners. These operations are typically driven by human intelligence from our ground agents. Air support for such operations needs to be very carefully coordinated, as they require support at a specific time."

Within the Rio Grande area, the main focus for the air patrols is to reduce human trafficking and smuggling of narcotics. Over the last few years, CBP has seen a steady increase in these illegal activities, with 2019 being a record year for illegal immigrants, many arriving from Central and South America.

The agency's efforts to disrupt such activities and catch the people behind them have led to what Anzaldua describes as a cat-and-mouse approach. "We'll catch on to their tactics, techniques and procedures, and launch an effective operation against them. It'll go quiet for a while, I guess whilst they regroup and come up with another way to conduct their business. And we'll have to react to their new methods." ▶

U.S. Customs and Border Protection

US Customs and Border Protection is one of the world's largest law enforcement organisations, employing over 60,000 people. Its size reflects the scale of its role, which combines customs, immigration, border security and agricultural protection responsibilities. To carry out its mission, CBP has three operational components: Air and Marine Operations, the Office of Field Operations and the US Border Patrol.

Air and Marine Operations is dedicated to serving and protecting the American people through advanced aeronautical and maritime capabilities. It conducts its mission at and beyond the US border, and within the nation's interior. AMO interdicts unlawful people and cargo approaching the borders, investigates criminal networks and provides domain awareness in the air and maritime environments, as well as undertaking other taskings as required.

The Office of Field Operations has a broad law enforcement role at official ports of entry (air, land and sea) relating to national security and the screening of foreign visitors, returning US citizens and imported cargo entering the country.

The US Border Patrol is responsible for securing the nation's borders between the official ports of entry. It is tasked with stopping the entry of terrorists and their weapons, as well as preventing illegal immigration and the illegal trafficking of people and contraband. Its specific duties include patrolling the Mexican and Canadian land borders and the coastal waters surrounding the Florida peninsula and Puerto Rico.

Air and Marine Operations helicopters are frequently called upon to support rescue and relief efforts following natural disasters. (Photo: Alexander Zamora/CBP)

The varied nature of AMO operations means that, aside from standard airborne patrols, it's difficult to describe what a 'typical' mission is like, Anzaldua points out, although he is able to offer some general observations.

"We'll have an intelligence briefing, and if there's an ongoing operation, this will drive our aircraft operations, and we will launch immediately. But if there isn't a current op, the aircrew will always check in prior to departing the airport environment to let the communication centre know they are available.

"If there are ground agents that are performing an operation, they will submit an air support request, which will be pending up until we take off, after which we will then support. We'll fly to the area and provide assistance.

"But there are occasions when things are happening so fast that we can be supporting numerous federal agencies at different locations. So, at times, it can be an extremely dynamic operating environment.

"This is one of the reasons why we have made some modifications to our Black Hawks," he remarks. "We've added internal Robertson auxiliary fuel tanks which give us the ability to stay airborne for up to four hours. We also have the ability to launch multiple flights of Black Hawks, so we can effectively saturate an area for a long period of time if necessary.

"We've a Star Safire FLIR camera system and a moving-map display in the cockpit, so we can overlay the city streets, which allows us to see our agents on the ground. This has proved extremely useful when conducting a chase of a vehicle that has failed to stop for some reason."

Chasing runaway vehicles may seem to be an unlikely scenario for the air assets of CBP, but it happens more often than expected, according to Anzaldua. "State or police troopers may be following a vehicle for a particular reason, and when they hit the sirens, the suspect vehicle fails to yield. Rather than run the risks that come with a high-speed chase, we can provide an air overwatch and monitor the suspect's vehicle on high. Throughout the process we'll be in touch with ground agents, and the use of the FLIR and map display means we can radio down the location directly to them.

"In this job, we can find ourselves supporting a number of federal agencies at different times, so we effectively become their eyes and ears for certain operations."

Drug-busters

CBP's air operations have changed over the last few years, with far greater air support being given to the Drug Enforcement Administration and the Federal Bureau of Investigation, along with other intelligence-gathering agencies associated with monitoring illegal activities. A Black Hawk will undertake an overwatch role and supply a real-time video downlink allowing ground agents to execute arrest warrants, or it will simply be on hand to provide a strong presence during a raid. As Anzaldua states: "It's hard to hide when there's a Black Hawk hovering over the roof of your house, with little or no warning!"

Like many government agencies, CBP is divided into branch stations, positioned ▶

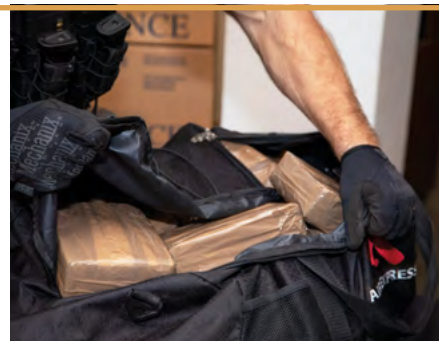
around the United States' borders, with all having a contingency to operate 24/7, although many have policies in place that ensure aircrews remain fresh and rested.

Anzaldua explains: "We have your regular-style shifts, with each branch deciding what works best, but this has to remain flexible at times based on known intelligence coming in. The agency is keen to retain some sense of normality, though, so people are able to function properly throughout the week. For me, it's a five-day working week. But the days off are not necessarily the same, so it's not always a weekend."

Learning the law

Once qualified as an air interdiction agent, the training doesn't stop. Due to the varied backgrounds of the pilots, some have just the minimum qualification requirements and need to add additional flying hours and command experience.

Across the flight crews, there are differing experience levels and, of course, it's not necessarily law enforcement experience. So, once they have passed the review board and been accepted for training as an air interdiction agent, alongside the flying training, there is a 16-week training academy which teaches constitutional, immigration and federal law.



CBP agents are in the thick of the fight against drug traffickers. (Photo: Ozzy Trevino/CBP)

Students must also learn the use of weapons available to the agency, as they may have to defend themselves during a raid. It's clear from Anzaldua's reaction when discussing the training that those individuals who graduate are prepared for any situation.

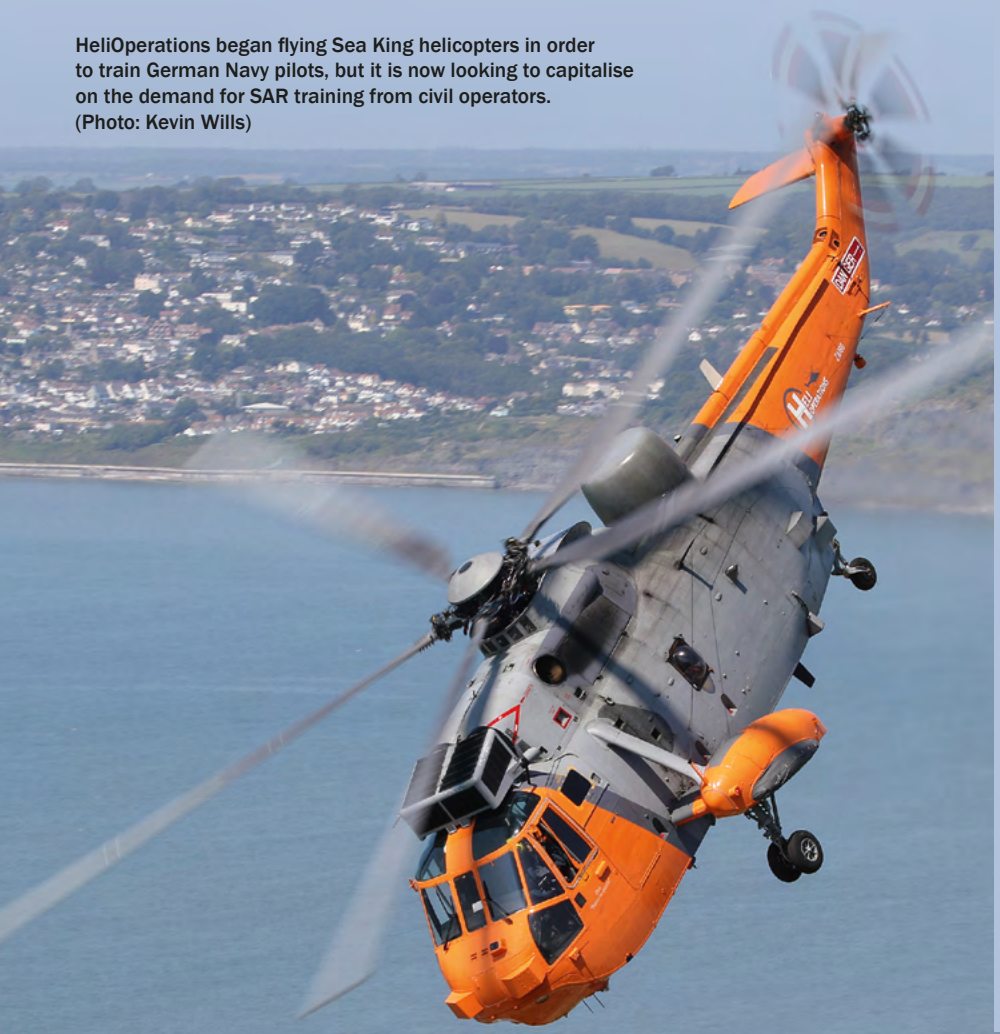
He continues: "Once you graduate from basic training, students head to the National Air Training Centre in Oklahoma City – there are other centres depending on which types you are going to fly or be trained on. For those that have served within the military, the training style will be familiar, like learning emergency procedures, airframe capabilities and so on.

"Once you pass this, you're released to conduct initial operating experience with a senior pilot, who you will fly with in order to learn tactics, techniques and procedures which can only really be taught on daily missions. Later comes the NVG training, which is based on the number of hours accumulated by the graduate, so it can be tailored. The experience they gain governs how they progress through the law enforcement system."

Anzaldua concludes: "For an ex-US Army pilot, to be reunited with the Black Hawk is fantastic, and for the role of interdicting narcotics and human smuggling, it's the perfect platform." ■

HELPING HANDS AT HELIOPS

With skill sets that are among the world's best for teaching helicopter disciplines such as SAR and landing aboard luxury yachts, the future is looking bright for UK-based HeliOperations. CEO Steve Gladston and senior pilot Andy Tillion give a brief overview of current developments to **Glenn Sands**.



HeliOperations began flying Sea King helicopters in order to train German Navy pilots, but it is now looking to capitalise on the demand for SAR training from civil operators. (Photo: Kevin Wills)

Few people within the helicopter training industry have the foresight and experience of Steve Gladston, CEO and founder of HeliOperations (HeliOps). Since its beginnings in 2005, when the company provided contract SAR aircrew to Bristow and CHC in support of their contracts with the UK and Irish coastguards, HeliOps has expanded its capabilities to include a range of highly regarded helicopter training and operational management services.

Along the way, the company has become a military-regulated operator of former Royal Navy helicopters, and it will soon begin civilian search and rescue training with a UK SAR air operator's certificate (AOC) that is due to be issued in early 2021.

Responding to the needs of the industry, HeliOps offers more than just courses for those destined for careers in SAR. Its training syllabuses now cater for helicopter superyacht operations, extending to the instruction of deck crew and landing officers.

The company trains and manages helicopter crews to support LIMSAR operations for the oil and gas industry. It has the ability to take oil and gas aircrews and teach them the skills needed to reach a SAR Level Two capability. It also offers instruction in the use of rescue hoists over water or a vessel, as well as mountain and cliff rescues.

To deliver such a wide range of courses to pilots and rear crews, you need the best instructors in the business with all the necessary certifications, and HeliOps has put together a very strong team.

Andy Tillion, a senior pilot for HeliOps, describes his role and the current training status. "I oversee all the flying operations at Portland and the various training evolutions along with Steve, who's effectively responsible to the Military Aviation Authority, in terms of ensuring all the necessary safety rules are followed.

"We've got a fairly small team, but it's highly experienced, with most coming from the military, and there's experience on types such as the Sea King, Merlin and S-92. We're predominantly providing pilot training for the German Navy in support of their SAR operations at Nordholz." ▶

It was in 2016 that the German Navy sought to outsource the last few years of its Sea King training as it prepared for the introduction of the replacement NH90. The UK Ministry of Defence (MoD) enquired whether HeliOps would be able to deliver the required military-style training, using ex-military instructors on ex-military Sea King helicopters. Within 16 months, the company had brought two Sea Kings and a number of ex-Royal Navy instructors out of semi-retirement to deliver a bespoke course developed with German Navy instructors.

The company expects to continue to deliver this training for a few more years yet and has recently purchased 19 ex-MoD Sea King helicopters, as well as a flight simulator which is still situated at Royal Naval Air Station Culdrose in Cornwall.

The Sea King has proven to be an excellent platform for teaching search and rescue skills, HeliOperations says. (Photo: Lloyd Horgan)

A satisfied customer

Gladston describes the HeliOps/German Navy partnership as demanding, successful and rewarding. Its military client has praised the company for "delivering an outstanding turnkey solution which they operate in a transparent, fair and cost-effective manner".

Tillion continues: "We're training ab initio pilots who have completed an EC135 course, and we provide the transition to the medium/heavy helicopter types of the German Navy.

"We use the Sea King, which is an older platform, but this is what the customer requested. The advantage of using such a platform is that it allows the basic techniques and principles to be developed, which can later be applied to all aircraft, whether a legacy or more modern type. The thought processes needed to develop into a SAR captaincy role are the same.

"We've delivered three courses this year, and we have two going at the moment which are due to be completed early next year," Tillion notes.

With the ability to use civilian and military training facilities, students will initially spend a few weeks at Culdrose in a simulator undergoing what is best described as an intensive technical course, delivered by HeliOps ground instructors, for conversion to the Sea King. Students undertake a basic conversion, a general handling course and instrument rating procedures, before moving on to SAR-orientated roles and requirements.

Tillion explains: "The way we train is within a modular style approach, with instrument flying and general handling. This takes place at Portland before the students return to Culdrose for the next stage of their sim or ground training.

"Owning our own simulator has been a really strong asset for us. It means that we have additional options in the future to increase our capability for new pilots. Although, at present, the Germans have not requested this, we'll have the ability to provide NVG training which can be taught on the sim.

"Although the Sea King is an older platform, the same SAR principles apply, so it's an excellent teaching aid," Tillion confirms. "We are able to develop a training pace that's suitable for each individual student. Each will fly around 100 hours with us, and we have the capability to allocate extra hours for a student if they're struggling with one particular aspect, which I think makes us stand out from other training schools.

"Within the military system, the student would have possibly fallen by the wayside where they are restricted on the hours and the system doesn't have the ability to add more. We're far more agile and flexible," he points out.

"Our approach has taken a significant burden off the German Navy. We're providing a very cost-effective solution and are able to adapt if there's a change in the customer's particular requirements."

The training given by HeliOps has both breadth and depth, with its ex-military instructors having significant post-military experience in EASA-regulated civilian (coastguard) specialist helicopter flying and instruction. Indeed, HeliOps' EASA TRE/TRI SAR instructors have recently delivered NVIS training to CHC aircrew operating S-92 SAR helicopters on behalf of the Irish Coast Guard at four bases in Ireland. The whole process was set in place under the guidance of the Irish Aviation Authority.

Tillion explains: "We developed a simulator package for them in order to meet the basic NVIS requirements, along with a training course for the S-92 to cover SAR and HEMS requirements. We managed to deliver two courses before COVID-19 struck, but we've had to stop for the moment due to the travel restrictions and challenges that currently exist."

Technical support

But it's not just about the pilots. HeliOps has already foreseen a future shortage of rear crew for SAR operations. With those currently fulfilling the role often coming from a military background and many due to retire in the next few years, this is likely to become a significant issue for operators.

HeliOps addressed this need in the training course for the Irish S-92 contract. Tillion explains the structure: "Each course has two pilots and two rear crew, winch operators – we call them technical crew – all of whom are instructed under AOC approval. What this does mean is that we can take an ab initio student who has no previous experience on SAR operations and train them from the beginning. It will remove the burden of demand in the future."

Away from SAR training, HeliOps is capable of taking on a range of challenging assignments. For instance, it has delivered

management services to the owner of a Cayman Islands-registered helicopter operating from a Marshall Islands-registered superyacht in airspace controlled by France. A result of this was the company being awarded Aviation Inspection Body status by the Marshall Islands flag registry, which enables it to provide ICAO helideck certification services on behalf of the Marshall Islands.

Future UK requirements

With his company's headquarters situated in Portland, Dorset, Steve Gladston is already looking towards the future and what HeliOps can offer its home country.

The current contract for the provision of the UK's search and rescue helicopter service still has a few years to run, but the Maritime and Coastguard Agency (MCA) is already discussing its requirements for the country's next-generation SAR service, known as UKSAR2G. The MCA and the Department for Transport have an aspiration to engage with small and medium-sized enterprises (SMEs) and, indeed, have gone further, with the MCA's director of aviation, Damien Oliver, speculating that a small operator could partner with an OEM to deliver the solution.

Since HeliOps is expected to achieve a UK AOC (SAR) by the first quarter of 2021 to commence SAR training, including helicopter hoist operations, it seems well placed to play a role. Gladston explains: "The UK's future SAR operations are due to be offered to the wider industry, and civilian operators are asking us to train their crews. We've taken the plunge and have a UK AOC (SAR) application with the Civil Aviation Authority – it will likely be the first national AOC that's awarded.

"I see that within the current SAR contract that Bristow is delivering, there is a requirement for the Coastguard to have a dedicated training school. Traditionally, trainees are taught on the duty aircraft by the duty crew, which is impractical. When the next contract is awarded, I don't think the operator will be allowed to do this.

"So we are going to be offering ourselves as a SAR training school to support that contract, by partnering with a prime contractor. The next contract states that it is preferable to involve SMEs, like an operator with SAR experience teaming up with a major prime to offer a dedicated training capability – and not only to UK SAR, but Irish SAR and all the other operators that request our services around the world.

"We are also using our simulator to teach Ukraine aircrews SAR techniques," Gladston notes, "although this may not be the same type of aircraft that they will operate. So we can now take an experienced operator, put them in our generic helicopter simulator and, with the necessary graphics, simulate dust-out landings, NVG flying and whatever they request specifically."

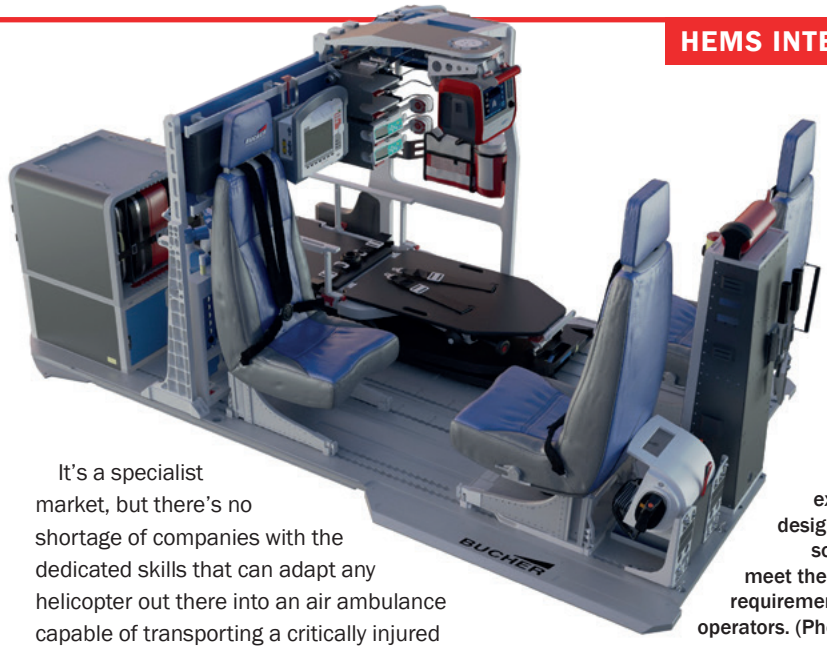
It's clear that many SAR crews, both military and civilian, are likely to pass through the capable hands of HeliOps in the coming years. For those unfortunate enough to need rescuing in the future, that can only be a very good thing indeed. ■

That GOLDEN hour

Configuring a HEMS cabin is one of the most complex and design-intensive modifications currently made to helicopters. Everything has to work first time – a patient's life might well depend on it. **Glenn Sands** speaks to the leading HEMS interior specialists that are rising to meet the challenge.

Germany's DRF Luftrettung has been relying on Bucher to satisfy its HEMS interior needs for many years. (Photo: Airbus)

You're basically trying to keep a patient alive whilst flying in a helicopter – travelling as fast and safely as you can, in order to get them the additional medical attention that they deserve. It's one of the most time-sensitive and critical roles for a helicopter. No wonder so much planning and thought goes into the design of helicopter emergency medical services (HEMS) platforms.



Bucher has extensive experience of designing interior solutions that meet the demanding requirements of HEMS operators. (Photo: Bucher)

It's a specialist market, but there's no shortage of companies with the dedicated skills that can adapt any helicopter out there into an air ambulance capable of transporting a critically injured patient to hospital.

The way helicopters are designed has changed in recent years. Designers are factoring in the need to be able to perform HEMS roles from their inception, so the ergonomics of the cabin and cockpit are better adapted to the loading of patients, while allowing the space for medical technicians to work.

Jan-Marc van Dam, director of completions for Specialist Aviation Services, explains the initial design process. "As a HEMS operator with 30 years' experience, we fully understand the needs of the patient are critical. The interior must support the medical team in providing first-class clinical care.

"As a company, we appreciate it can be quite difficult for the client to write a detailed specification of their definitive set of requirements for the HEMS interior. They have a clear idea in their minds of what they want, but putting that on paper, in terms equally understood by medical specialists and aerospace engineers, can be a challenge.

"At the start of a typical project, Specialist Aviation Services assign a design engineer as the main point of contact who gathers from the client's senior clinicians how they would wish to operate," Van Dam notes. "This is an iterative process typified by frequent communications between the customer and designer until the requirements and a basic concept are formally agreed at the preliminary design review. The project then moves on to a more detailed design process which culminates in the critical design review (CDR). The certification process runs in parallel to the design process.

"Once the CDR has been completed, drawings are released and manufacturing starts. Helicopter downtime is coordinated such that all of the major components are available on arrival and the certification route is clear in order to reduce any operational impact.

"Flexibility and future-proofing is an important part of the process," Van Dam points out. "If the interior is designed solely around the organisation's current way of operating, there is a danger that you will just end up with another version of your present interior."

Modular designs

The approach is similar to that which Mecaer Aviation Group (MAG) follows. Its customers may be aircraft OEMs or end users, though in most cases input comes from both. One innovation that the company has adopted is the use of modular units. EMS equipment requirements around the world vary considerably, so MAG focuses on modular, replaceable solutions that can be adapted for medevac, SAR and any type of hospital transport.

According to the company, this technique leads to exceptional weight savings and is popular with HEMS operators. It means there is no degradation in the performance of the helicopter when in the hover or operating at low altitudes and slow speeds.

Swiss EMS interior specialist Bucher goes as far as making a full-scale mock-up of the rear cabin to show the client, so that any ▶

minor alterations required can be identified and made prior to any tool-cutting.

Once a specific EMS configuration has been finalised, the structural modifications of the helicopter's interior needed for installation will depend on the complexity of the requests and whether a standardised 'entry-into-service package' has been selected. This can all impact the timeline of the work schedule.

According to Specialist Aviation Services, which holds five type certificates for the popular Leonardo AW169, the entire process from design and certification to completion can be achieved within 12 months, with the helicopter's downtime being just two months or less.

While the demand for HEMS is rising globally, many countries are not in a position financially to offer a dedicated air ambulance service and rely on helicopter operators that also provide services such as corporate and VIP transport.

Dual role

While it opens up the possibility of not being able to provide an immediate reactive emergency response, Specialist Aviation Services does see this approach as a practical solution in some cases. Van Dam explains: "Our AW169 EMS interior is modular and utilises quick-release fittings throughout, so it can be installed and removed in a relatively short time. This, combined with the range and baggage capacity on the AW169, allows the interior to be optimised for each individual EMS or air ambulance, depending on the patient's specific needs.

However, he notes: "Although the COVID-19 pandemic has resulted in many utility helicopters being used in an air ambulance role to move patients between medical facilities, we have not seen a rise in 'quick change' interiors for switching between a corporate/VIP helicopter and an EMS platform."

In contrast, Bucher has just recently finished work on a convertible interior that allows a helicopter to be a VIP platform in the morning and a HEMS helicopter in ▶

THE QUICK-CHANGE OPTION

Alexander Hudson, business development and marketing manager for Austria's Air Ambulance Technology (AAT), regards installing EMS interiors in helicopters as one of the most challenging and rewarding jobs in aviation.

Hudson comments: "Before we start designing an interior for a specific helicopter, the customer is presented with a questions catalogue. Their answers provide us with valuable information that allows us to offer them the right configuration for their mission profile.

"For example, which type and model aircraft do they need the interior for? What will be the main mission? Hospital-to-hospital patient transfers or SAR? Will any other missions be flown? Have any alterations been made to or in the helicopter cabin? Is air conditioning to be installed at a later date? Depending on the mission, what medical devices are needed?

"There are numerous questions which have to be asked and answered prior to any design work. After the questions catalogue has been completed, the project is then passed to our design and engineering teams for review."

Similar to other providers of EMS interiors, AAT seeks to reduce the downtime of the helicopter to an absolute minimum. Hudson explains that the company's EMS conversion kits can mean that "a time of around 20 minutes is all that's needed for a medium-sized helicopter such as an H135 or H145 to be converted into a full EMS configuration. A SAR kit conversion takes approximately five minutes to install. We do have a customer who can install their H145 full EMS kit in 11 minutes."

Surprisingly, all of AAT's medical interiors are installed without any structural modifications to the airframe, except in the case of the H125/AS350. This aircraft requires one small hole to be drilled on the rear panel of the cabin.

The ability to quickly adapt a helicopter interior to create an EMS platform using AAT's solutions is a point that Hudson is keen to stress. "Air Ambulance Technology has been designing and manufacturing quick-change interiors for nearly 28 years now. Egon Kuntner, the founder of the company, was way ahead of his time with an aircraft interior that could be removed if required.

"When it comes to quick conversion, I think you can honestly say that no other company does it better than Air Ambulance Technology," he asserts.

"Looking back over the past few years at SARS, Ebola and more recently COVID-19, being able to remove and disinfect an interior is proving to be very valuable for many of our customers."

An H145 configured for EMS by Air Ambulance Technology. (Photo: AAT)

The EpiShuttle protects medical personnel and crew members flying with an infectious patient. (Photo: EpiGuard)

SAFE PASSAGE FOR PATIENTS

The transportation of patients suffering from infectious diseases is an issue that's been thrown into the spotlight by the COVID-19 crisis. But Norwegian medical technology company EpiGuard was addressing the problem long before the current pandemic began.

EpiGuard was established in 2015 by a group of doctors at the Oslo University Hospital in Norway, together with co-founders Inven2, Eker Group and Hansen Protection.

The varied backgrounds of those involved mean the company's product development has been able to draw upon extensive 'real world' medical experience in the fields of intensive care, infectious diseases, internal medicine, anaesthesiology and transport medicine.

The first product developed by EpiGuard was the EpiShuttle, which was created by clinical experts with first-hand experience in providing advanced treatment and movement of patients with highly infectious diseases, including Ebola.

The EpiShuttle is a single-patient isolation and transport system. It protects the medical professionals treating an infected patient, and can also be used when a vulnerable patient needs to be kept safe and comfortable during transport. In the confined space of a helicopter cabin, these capabilities can be particularly important.

EpiGuard is looking to build on its success with the EpiShuttle and continue its development of equipment for the safe transportation of contagious patients.

the afternoon. Called the AC67 Flex, this system is proving popular with operators outside Europe, where the demand and financial support for a 24-hour air ambulance helicopter service isn't there.

Whether a modular approach or a permanent modification, the delicate equipment required for the HEMS role requires careful handling, as Van Dam discusses. "By far the most challenging aspects of the equipment installation are those associated with the therapeutic gases. We have to ensure that the flight crew are in no danger if there's a significant leak. Additionally, the access to data on the medical devices containing lithium-ion batteries can be an issue, but many of these problems can be overcome. Being an operator ourselves means we have daily direct contact with medical specialists who can assist with our queries and offer solutions in many cases."

MAG points out that keeping up with advancements in medical equipment is one of the biggest challenges for all helicopter interior providers. Currently, though, its work is centred on the development of new patient loading systems, which are attracting a lot of attention in the market. The company also reveals that it is shortly due to add two new features to its H145 EMS interior: liquid oxygen and rolling stretcher systems. Both of these new modifications are commonly requested within the North American market.

Airframe adjustments

There are two different schools of thought with regard to modifying the helicopter's actual airframe when installing a HEMS interior. Specialist Aviation Services is very much of the view that this is necessary. Van Dam explains: "The installation of a medical interior involves some structural modifications – for example, we modified existing hard points in the AW169 aft of the cabin to install a rear medical bulkhead.

"However, converting a 'green' helicopter into a mission-capable EMS platform involves more than installing the interior," he emphasises. "Typically, Specialist Aviation Services installs a searchlight,

NVIS-compatible cockpit and cabin lighting, new power outlets and communications equipment such as Tetra radios and a satellite communications suite."

Bucher follows a similar approach and makes similar minor adjustments to the internal structure of the rear cabin. It's important that any changes take into account the need to ensure weight reduction, an optimised workflow when airborne, space for the medical technicians to work and, once the sortie is completed, an easy-to-clean area. The latter has become a critical focus given that many helicopters have been pressed into medical service to deal with the current global pandemic.

No matter what the wider global situation, Specialist Aviation Services is able to offer a solution that perhaps others cannot at the moment, as Van Dam points out. "The flexibility of the modular set-up of our EMS interiors allows changes at any point in the product life cycle, ensuring our customers remain at the forefront of clinical innovation. Having created our own interiors, we can easily adapt to changing operational needs without having to involve a third party.

"We do not offer a catalogue of off-the-shelf products. Our design and completions team works closely with our customers' clinicians to tailor every aspect of the EMS interior in order to suit their working practices and exact requirements.

As a HEMS operator itself, Specialist Aviation Services has a clear understanding of what makes a good medical interior. (Photo: Specialist Aviation Services)

"Presently, we operate nine AW169s in seven different EMS configurations, which is a clear indication of my point. Any of these configurations can deal with a medical emergency when called on," Van Dam stresses.

Popular types

Given the vast range of helicopter models out there, HEMS operators have tended to stick rigidly to certain types. The leading choice as far as Bucher is concerned ▶

is the Airbus H145, especially the D3 variant. The company currently holds the biggest market share for HEMS equipment on the H145, with more than one third of its HEMS kits delivered specifically for this model.

For Specialist Aviation Services, it's the AW169 that remains a popular choice for several reasons. Its payload, range and speed are particularly favoured by HEMS operators. The rear cabin is large enough to allow full 360-degree access to the patient, an option that many other types are not capable of providing. Being one of the newest models out there, it has the latest design innovations and safety features.

For MAG, its focus is primarily on twin-engine helicopters, which most HEMS operators favour, although it acknowledges that there is strong competition from light twin-engine fixed-wing aircraft. An area where this is readily apparent is Australia, where fixed-wing aircraft are able to cover the larger distances involved far quicker than any helicopter.

Van Dam highlights that, as Specialist Aviation Services is an operator, the daily trials and demands of a working HEMS environment provide it with immediate and exceptional experience which can be fed back directly to the designers of the interiors. The communication lines between the paramedic and designer in this case are very short.

Listening to customers

Specialist Aviation Services is committed to helping any clinical partner it works with to complete missions safely and efficiently, and, most importantly, save lives.

"It's the small changes that can make a huge difference to medical staff," Van Dam says. "Often these can be implemented in a matter of days, but some, for example those which involve machining new parts, naturally take longer."

The success of Mecaer Aviation Group's work with its launch customer on the development of its EMS interior resulted in a follow-on order for 20 kits.

With the helicopters located around the world, MAG tailored several features to meet the specific requirements of medical staff who were selected to work in the cabin. Immediately after delivery, feedback was provided that allowed minor modifications and improvements to the interiors then on the production line, and a retrofit kit was supplied for the helicopters in service.

For Bucher, customer feedback has been immense, as evidenced by the response to its EMS design for the H145, which is now being used by two of the largest HEMS operators in Germany. The paramedics with both organisations have openly stated that it's the best medical interior that they have ever worked with.

For those critically injured and requiring an urgent medical airlift, the technology is now available to accomplish this safely and quickly in what is effectively a flying ambulance with the capability to land anywhere and avoid any traffic jam in order to save a life. ■

POWERFUL CONNECTIONS

The ability to pass information swiftly, be it verbally or electronically, is critical for flight operations. **Gerrard Cowan** highlights some of the new and improved capabilities that are now available thanks to the latest advances in on-board connectivity.

There has been a range of advances in the helicopter connectivity space in recent years, according to industry experts, from tracking to health management and satellite communications. These developments have been underpinned by a huge increase in data, which is creating new opportunities for operators in various markets.

Guardian Mobility's core focus is on tracking systems, primarily through its G4 family of products and services. The company's work in the area originally concentrated purely on tracking, says chief operating officer Stephane Momy, with users wishing to locate an aircraft through GPS when it went beyond line-of-sight or other communication systems.

However, there has been a growing interest in data exploitation over the last five years or so, Momy reports, with operators keen to "get more information and data out of the aircraft. The technology has moved forward enough to make this possible, while still keeping the systems small, cost-effective and affordable for the smaller rotary-wing aircraft that we deal with."

The nature of Guardian's products allows operators to choose an option that meets their particular needs, Momy notes, both from a capability and a cost perspective. The basic version of the system is a portable device that is brought into the aircraft and plugged into auxiliary power.

Market forces

Beyond this, text communication is increasingly being demanded for some tracking devices, as well as flight data monitoring (FDM) services. The flight tracking systems can also offer satellite and cellular communications, along with real-time aircraft-generated event reporting for early warning of any issues, making them far more versatile than tracking alone, he explains.

Momy believes that the growing focus on increased data exploitation is being driven by a number of trends in the broader market, such as the evolution of the smartphone. "Operators want to have the same kind of functionality and run more efficient, streamlined operations. This data allows them to do that."

The evolution of the systems and the emphasis on increased data is also being driven by new mandates in a number of markets. For instance, Guardian has a particular focus on supporting aerial firefighting helicopter operations, Momy says. In North America, Australia and some other countries, aircraft undertaking such roles must now report a range of operational information using Additional Telemetry Unit (ATU) capabilities integrated into tracking systems. The company's G4MX product and associated GMI Connect App are designed to address these requirements. ▶

Reliable global connectivity can bring a range of safety and operational benefits for helicopter operators.

Momy expects that customers will continue to demand increasing amounts of cost-effective data, and he notes that Guardian is developing new product lines and services to meet these needs.

Blue Sky Network produces the SkyRouter platform, which provides dual-mode tracking, navigational maps and communication tools for real-time fleet monitoring in markets ranging from air medical services to oil and gas operations. Nick Tucky, vice-president of sales, says that over the past five to 10 years, technological advances have defined new trends in the area.

"The industry is relying on NextGen capabilities to provide a more connected and intelligent aircraft and to enhance safety and operational efficiency," Tucky tells RotorHub. "Helicopter companies are not only integrating tracking and two-way communications, but also FDM and health and usage monitoring systems (HUMS), thus providing robust, comprehensive operations."

Tucky also highlights the new Iridium Certus capability for aviation, which "provides high-performance broadband service that connects the entire aircraft, from cockpit to cabin".

Don Rucker, director of Outerlink Global Solutions, says that the evolution of inflight connectivity has provided improved margins for safety, beyond-line-of-sight communications and real-time aircraft health intelligence. Outerlink is the developer of IRIS, a combined voice, video and flight data recording and monitoring system that is integrated into a satellite communications platform.

"Today, from the cockpit, we can send the real-time status of fuel levels, engine health measurements, and the status of all of the caution and warning indicators," he notes, adding that his company's system includes Wi-Fi to support electronic flight bags and emergency medical equipment. "We can connect EMS medical crews to their hospitals, allowing them to communicate and send medical data. Tomorrow, as bandwidth increases, we will be able to stream video and support full telemedicine."

Blue Sky Network's SkyRouter fleet management platform provides global aircraft tracking, two-way communication and event reporting capabilities. (Image: Blue Sky Network)

Rucker also points to significant advances in the area of data intelligence. "Yesterday, we imagined what our training focus should be. Today, data intelligence brings a laser-like focus to flight training. We can quantify precisely how flight crews are performing," he explains.

"Airlines have used these technologies for years. Now they are available to operators of light aircraft, and our software tools are continually improving."

Meeting expectations

Michael Eddy, Flightcell International's marketing and communications manager, acknowledges that, like most industries, aviation has become more data-orientated, and "customers expect to be able to do in the air what they can do on the ground with their phones and tablets".

Flightcell's flagship product is the DZMx, an air-to-ground communication system offering voice, data and tracking services. The company will soon launch the DZMx Plus, which has the same functionality as the baseline system with a different form factor and the addition of non-battery power backup that enables position reports to be sent after power-off. The new version is designed to provide an easy upgrade option for operators with legacy satcom equipment.

Eddy says that operators "also expect to be able to connect their on-board operational equipment to the ground. There have been significant improvements in tracking technology, especially with the advent of hybrid satellite and cellular tracking, and audio quality has improved significantly as well."

TracPlus software is used with hardware from a variety of manufacturers to provide tracking and communication services for first responders, government agencies and other operators. Shawn Deaker, chief customer experience officer for TracPlus, explains that the company's major commercial markets include emergency services, law enforcement, aerial firefighting, agriculture and utility companies.

Deaker highlights a number of areas of evolution in recent years, including the introduction of dual-mode satellite and cell devices to reduce costs for clients, a significant increase in appetite for different types of FDM services, and a desire for greater integration with other software and systems. He also mentions a growing demand for communication options, including two-way messaging, voice and push-to-talk.

Guardian Mobility designed its G4MX product with Automated Flight Following and Additional Telemetry Unit requirements in mind. (Photo: Guardian)

Honeywell works across a number of technologies in the area of connectivity, including the Aspire 200 satellite communications system and the Sky Connect Tracker 3A. The company offers a variety of other products that utilise the growing data from helicopters, such as its new Recon HUMS.

Speaking to RotorHub, Honeywell's senior director for defence and space EMEAI, Cooper Cullen, points to a range of advances across such systems in recent years. He notes that the company addressed the problem of rotor blades interrupting and slowing communications through the development of the Aspire 200, for example.

In addition, Cullen says that technological developments have led to a significant improvement in the collection and processing power of systems like Recon, "enabling a world of new possibilities, including expanded capabilities to address holistic aircraft health monitoring beyond the traditional HUMS, evolution towards aircraft systems status reporting, advanced prognostics/analytics, increased data processing and dataset reduction for efficient data management".

Honeywell expects advances in these areas to continue in the coming years, Cullen says.

Bandwidth boost

Skytrac is a provider of satellite communications products, like its flagship ISAT-200A satellite transceiver, and Reuben Mann, the company's head of marketing, says that the increases in bandwidth transfer rates enabled by Iridium Certus are set to give these types of systems a major boost in the near future.

"As this technology is adopted by the industry, service providers and manufacturers will leverage the added bandwidth for new capabilities such as telemedicine applications, voice-over-IP communications, video streaming, FDR [flight data recorder] streaming and more," he comments.

Skytrac offers solutions for all segments of commercial aviation, Mann says, from EMS and SAR to VIP transport and offshore oil and gas. He explains that the precise mix of technologies depends on the industry in question. For example, most oil and gas operators are encouraged to have real-time HUMS and FDM systems on board their aircraft due largely to industry safety standards, though he notes that these can be useful to all operators.

Looking forward, Mann says that he expects "the connected aircraft/intelligent connectivity trend to continue. As access to broadband connectivity becomes more widely available for the rotary-wing segment, user adoption due to the operational, fiscal and safety functions of our technologies will continue to drive its growth."

Cobham focuses on a number of technologies that support helicopter communications, notably in audio and antennas. The company has developed a range of communications management products, including the Digital Audio ▶

Control System (DACS) and Titan, its latest audio management offering.

For more complex audio management systems, the trend of recent years has been towards installation flexibility, an expanded feature set, and smaller, lighter components to meet space and weight demands, says Alex Holt, head of marketing at Cobham Aerospace Connectivity. He points out that the company expects to see greater interconnectivity among aircraft systems in the coming years, including the audio systems.

Cobham also works in the antenna space – for example, through products such as its 935 and 938 Series direction finders. Such systems have had to align with evolutions in radio technology, Holt notes. Advances include "expanded frequencies, broader frequency coverages (broadband coverage) and even the adoption of LTE for mission-critical push-to-talk", he adds.

"As rotary-wing aircraft become faster, sleeker and more technologically driven, there will be a need to keep up with the aircraft design and technology, as well as the changes and trends in communications systems, for all aspects of both commercial and military aircraft," Holt acknowledges. "We expect to see more conformal, integrated and multi-function antennas in response to these trends."

Talking points

As a distributor of connectivity solutions for the civil and parapublic markets, Dallas Avionics works with a range of providers and technologies. From this vantage point, it has noted many developments in recent years, confirms Charles Noble, the company's director of sales for Asia-Pacific and Canada.

Perhaps most notably, the Iridium NEXT satellite constellation has provided a giant leap forward, Noble tells RotorHub.

"In addition to dial-up satellite calls, the ability to use push-to-talk just like a radio is becoming a favoured method for many operators," he indicates. He highlights the combination of push-to-talk and satcom technology, which he says is most relevant when it comes to natural disasters like hurricanes, which often destroy all ground communications infrastructure.

Noble also points to the move to digital radios and other developments such as the establishment of the FirstNet network in the US for first responders, which involves AT&T. This blends conventional frequency communication with the ability to send data over the cellphone network, he explains, and will relieve the stress on cellular and conventional radio systems should a disaster or terrorist event occur.

"In the past, when such events have taken place, both networks have been shut down by the lack of bandwidth on the systems, which has prevented the emergency services from being able to communicate, leading to a substandard response."

This is just one of many examples of how connectivity technology continues to evolve to meet the changing needs of today's users, with the aviation sector sure to benefit greatly from future advances. ■

A growing number of commercial and parapublic helicopter operators are being attracted by the obvious benefits of night vision systems. (Photo ASU)

Who's out there?

Being able to see in the dark has revolutionised the way helicopters are operated. **Emma Kelly** talks to some of the companies that provide night vision technology about developments in the field.

Night vision goggles (NVGs) are no longer for the exclusive benefit of military operators, with their use expanding over the last couple of decades into parapublic and commercial helicopter applications.

The technology is now well established in law enforcement, helicopter emergency medical response, and search and rescue, with more of these operators equipped than not. NVGs are bringing clear benefits to these sectors, both expanding the operational window and delivering significant safety improvements. Several new applications for night vision systems have also emerged in recent years, for missions such as aerial agriculture, bushfire monitoring and suppression, and even wildlife and poacher tracking.

Industry experts

As the night vision market has grown, suppliers have developed into one-stop-shop NVG specialists, offering a whole suite of services, including sales, maintenance and repair, in addition to training and securing the necessary approvals.

Gains from the ongoing development of legacy goggles from Elbit Systems of America – Night Vision and L3Harris for military customers will eventually work their way down to parapublic and civil operators. Civil customers of Elbit's F4949 NVGs, for example, will continue to benefit from developments for the military. At the same time, the manufacturer is exploring how its technology can help additional operators involved in different types of mission. Elbit has fielded approximately 75,000 of its F4949 aviation systems worldwide.

"Elbit Systems of America – Night Vision is always looking at adjacent markets and how our core expertise can service those requirements," says Darrell Hackler, its senior director of sales and marketing.

"We have multiple ongoing technology development efforts in the area of sensors, NVGs and augmented reality via connected systems and sensors," Hackler reports. "The civil aviation market will benefit from this increased capability development in ▶

WOULD YOU LIKE THAT IN WHITE OR GREEN?

Suppliers of NVGs offer both green and white phosphor solutions. White phosphor delivers the image in black and white, which may appear more natural to the eye and provide a greater contrast between objects, as well as higher image resolution at greater distances, in certain applications, according to Elbit Systems of America.

Green phosphor uses a wavelength which optimises the brain's perception of detail and contrast. As the colour green is in the middle of the eye's colour spectrum, it allows users to detect and interpret night-time scenery more easily, says Elbit.

"Both [green and white] have pros and cons," stresses Adam Aldous, president of Night Flight Concepts, depending on where the NVGs are being used – over mountains, cities or offshore, for example. "I cannot recommend one over the other," he says. Rather, NFC gives new customers the scientific data on both versions and allows them to evaluate the technology to determine which is best for their application. "We send them white and green versions, and ask them to fly for a while and see which one performs better for them."

Daniel Burnham, Aviation Specialties Unlimited's director of sales and business development, reports that a growing number of customers are opting for the higher performance white phosphor image tubes and systems.

White phosphor image intensifier tubes produce black and white images, which many users consider to be more natural to the eye. (Photo: Elbit Systems of America)

Elbit Systems of America's AN/AVS-9 (F4949) goggles provide pilots with enhanced visual clarity to enable them to clearly identify targets and avoid obstacles. (Photo: Elbit Systems of America)

support of the US Department of Defense." Operators in the future will be equipped with next-generation aviation binoculars which are lighter and have an improved centre of gravity to address usability and pilot fatigue, he predicts.

In addition, the next generation of goggles will have upgrade paths, allowing the inclusion of intrinsic full-colour displays to support true head-up display (HUD) functionality and symbology overlay. Elbit's experience with sensor fusion product development in support of the US Army, fusing different sensors and capabilities into the NVGs for improved situational awareness, could particularly benefit operators involved in aerial firefighting and monitoring, Hackler suggests.

While many parapublic and commercial operators continue to rely on the military-developed technology from Elbit and L3Harris, several innovative companies have come up with their own lighter-weight solutions for the growing non-military user base.

Weight advantage

One such company is US night vision specialist Aviation Specialties Unlimited (ASU), which is a one-stop shop providing NVG sales, maintenance and training. ASU's aviation NVG solution, the Element 3 (E3), is currently in its development phase, with production expected to start in mid-2021. The transition to production has been delayed by the COVID-19 pandemic and subsequent economic slowdown, says Chad St Francis, ASU's director of military programmes.

According to St Francis, the E3 will be the lightest aviation NVG product in the market, and he emphasises that the weight reduction has been achieved without sacrificing performance. It will be incorporated with ASU's AERONOX mount and battery combination, which has already received TSO certification from the FAA, and which is ruggedised and lighter in weight than legacy packs.

"The E3 is a novel approach to modifying existing 18 mm image tubes into a lightweight housing. This approach will save

Aviation Specialties Unlimited reports increasing interest in night vision systems from operators involved in agriculture and aerial firefighting. (Photo: ASU)

200 g of weight compared to the current fielded ANVIS systems," explains St Francis. "The E3 is easier to maintain, and scheduled maintenance will be less time-consuming as the unit is permanently collimated by the factory."

As well as being lighter, easing pressure on the user's neck and head, the design also has a higher tolerance and resistance to electromagnetic interference.

"The market has been very receptive to our design, and it has been tested by both commercial and military operators," he notes, with the low weight and ease of use particularly welcomed.

Safety first

It's clear what customers are seeking when it comes to NVGs, says St Francis. "Operators are looking for the best performing and most reliable NVG systems in the market today. Utilising the best night vision systems ensures that the most important asset to an operation, hands down, is human safety. Hardware is replaceable," he stresses.

"Human factors are also of importance as we strive for longevity for aircrews. Lighter systems bring less back and neck issues to those individuals who fly hundreds of NVG hours each year," he explains. "Light weight is a big request from the community, and we are looking to improve that dramatically."

ASU distributes the L3Harris M949 AN/AVS-9 exclusively for the US domestic market, as well as being the only L3Harris FAA Part 145 operation certified by the OEM to conduct maintenance and repairs. It also distributes Elbit's M4949 internationally, as well as providing scheduled maintenance and repairs.

Daniel Burnham, director of sales and business development for ASU, estimates that the company has sold more than 7,000 AVS-9 systems over the last 25 years. That's a conservative estimate, he points out. "We have well over 20,000 total NVGs sold worldwide."

In addition to law enforcement, EMS and SAR operations, ASU has seen more recent growth in NVG adoption for agriculture and aerial firefighting. "We recently sold 15 high-performance white phosphor goggles to Cal Fire [California Department of Forestry and Fire Protection]," reports Burnham.

ASU also provides custom aircraft lighting solutions for night vision operations. It has completed cockpit lighting modifications on more than 2,000 aircraft worldwide.

Many of ASU's customers opt for training from the company when launching new NVG programmes. "We offer custom-tailored courses for mission-specific needs, including military applications, air medical, search and rescue, high-altitude/mountain operations and aerial application for agricultural operations," Burnham says.

Australia's Point Trading is another company that has developed its own aviation NVG product, Night Eyes. The goggles were designed and are manufactured in Melbourne, while the image intensifier tubes come from Europe, meaning the product is not affected by US International Traffic in Arms Regulations (ITAR) controls.

Night Eyes has a modular, lightweight and ruggedised design, with a total weight of between 550 g and 600 g, depending ▶

PCO is a long-standing provider of night vision equipment to the Polish armed forces and other military customers, while its PNL-3M NVGs are EASA certified for civil use. (Photo: PCO)

OPTRONICS EXPERTISE IN THE EU

Among the European manufacturers of night vision technology is Poland's PCO, which has been a leading provider of optoelectronic devices, mostly to military customers, for several decades.

For the civil and parapublic helicopter market, the company offers its EASA-approved, dual-use PNL-3M Aviator's NVGs, which combine a rigid aluminium alloy body design with proven 16 mm 4G image intensifier tubes (IITs) from Photonis in France. PCO points out that the 16 mm IIT is the smallest and lightest night vision sensor equipped with an integrated auto-gating feature currently available on the market. The PNL-3M NVGs can be supplied with either green or white phosphor tubes, depending on the customer's preference.

PCO goggles are currently used by multiple military, parapublic and civil rotorcraft operators in Europe, Asia and Africa, according to Łukasz Zaskurski, head of the company's export department. "In the design process for our goggles, we have utilised our 40 years of experience in the manufacturing of night vision systems for the military. What we aim at now is to deliver a high-end, low-weight and compact-size product that features military-grade performance standards but is also available to specialised non-military users for HEMS, firefighting, SAR, transportation and heavy-lift operations.

"The fact that our goggles are designed and produced by PCO in the European Union makes it much easier for us to deliver them to law enforcement, parapublic and even civil users within the EU without lengthy and troublesome licensing procedures," Zaskurski notes.

on configuration. Its image intensifier tubes have a figure-of-merit performance range that extends up to 2,400 plus. Green and white phosphor versions are available. The ergonomic design, with an extended foldback position over the helmet, provides a reduction in neck stress.

"One of the main differences [from other NVGs] is our world-patented technology that records operational use of the goggles – an inbuilt pilot logbook and service records," explains Paul Prince, Point Trading's senior business development manager.

"Our helmet mount is the lightest in the world at 120 g, with a full safety breakaway mechanism. Our night vision is modular, so it can easily be upgraded."

Point Trading also offers the clip-on Galago head-up display designed for night vision operations, allowing waypoints and points of interest to be shown.

In the civil rotary-wing sector, Prince estimates that the company currently has more than 200 systems in operation, while in the military and law enforcement

markets, this figure is in the thousands, with the Australian Defence Force being a long-term customer.

Night Eyes has been successfully trialled by Kestrel Aviation in Australia's pioneering aerial firefighting missions using NVGs (as noted in the sidebar on this page), with glowing references from the operator. Also in Australia, Becker Helicopters, Rotor-Lift Aviation and Heliwest all use Night Eyes and provide training for other operators.

A growing market for Point Trading is South Africa. "We sell many units to South Africa for anti-poaching and wildlife safaris," Prince reveals.

Texas-based Night Flight Concepts (NFC), which was established in 2006 by former US Army aviators, is another one-stop-shop provider, but it has not gone down the path of developing its own NVGs.

"The technology has been around a long time. Big companies have much larger engineering and development capabilities," says NFC's president, Adam Aldous.

He notes that the existing systems have benefited from millions of dollars of investment for the military. In the area of light amplification in particular, a company like NFC could not achieve a better result than the current manufacturers, he believes.

"We'll see other companies make slight improvements – lighter, more compact solutions, for example. We could go down that path," says Aldous, although NFC has no plans to do so.

Proven product

NFC intends to stick to what it is good at – sales, maintenance and training. On the sales side, it markets Elbit's AN/AVS-9 (F4949) NVGs, selling on average 100 sets per annum.

The company has focused on Elbit's goggles due to the manufacturer's support system and warranties, the technology, and the fact it is based in the US, Aldous explains. "We just believe the product is by far the best," he says, speaking with 4,000-plus hours of NVG flying experience.

On the maintenance side, NFC supports over 3,000 goggles for US law enforcement operators alone. Around 95% of its maintenance customers are in the US, with 5% international. Due to ITAR and the cost and logistical issues involved in shipping ▶

TAKING THE FIGHT INTO THE NIGHT

One of the more recent applications for NVGs has been in aerial firefighting and monitoring, with the technology successfully tested in Australia, Canada and the United States.

Fire behaviour moderates at night thanks to lower temperatures, higher relative humidity and reduced winds, making aerial water and retardant drops more effective in conjunction with ground crews. Aerial firefighting operations at night are 10 times more effective than those during the day, according to Canadian aerial firefighting specialist Coulson Aviation.

In July, Canada's British Columbia Wildfire Service began its latest trials using helicopters equipped with night vision technology to monitor and fight fires at night. These followed on from successful tests during the bushfire season in 2019, when NVGs were used by helicopter crews for the aerial mapping of fires at night to identify hot spots.

Coulson sends its fixed- and rotary-wing aircraft, including Sikorsky S-61s, Boeing CH-47s and Sikorsky UH-60 Black Hawks, to fire regions around the world. It has been at the forefront of developments with NVGs and aerial firefighting. The operator first tested NVGs in the 1990s, but encountered issues with pilot depth perception. The technology has advanced considerably since then.

Coulson accelerated its efforts to deliver an effective night-time aerial firefighting system after the devastating Black Saturday bushfires in the Australian state of Victoria in 2009, when the operator was forced to park its S-61s at night despite fires raging.

It uses NVGs and a secondary FireWatch supervision helicopter, a Sikorsky S-76, to enable an aerial firefighting helicopter to hover-fill over open water sources, both speeding up the process and improving safety, as the aircraft does not need to land and take off to fill up. The FireWatch helicopter utilises thermal imaging data and guided drop zone technology, with the former allowing the crew to effectively monitor a fire's movement.

The operator says that it has successfully conducted more than 60 night-time aerial firefighting missions in Australia and Southern California, with the Orange County Fire Authority approving operations in 2019.

Australia's Kestrel Aviation, using Bell 412s and Point Trading's Night Eyes NVGs, has been involved with Coulson in Victoria's night fire-suppression trials during fire seasons since 2017. The trials have successfully demonstrated the feasibility of night firebombing using NVGs, as well as hover-filling at night. The latest trial, in the 2019-20 season, also considered the physical and mental parameters of aircrew involved in night operations.

The Australian trials, which are supported by Australia's Civil Aviation Safety Authority and the National Aerial Firefighting Centre, are aimed at progressively developing capability, according to Kestrel's managing director, Ray Cronin, with states across the country monitoring the results.

Kestrel Aviation has been heavily involved in night fire-suppression trials in Australia, employing Point Trading's Night Eyes NVGs. (Photo: Point Trading)

units back to the US for maintenance, the company trains and equips its international customers to maintain and repair their own equipment, which proves far cheaper, in addition to sending out mobile teams to customers if required. Overall, NFC has a growing international business, which currently accounts for up to 40% of its total revenue.

The company also provides full night vision training to aircrew, flight engineers, medics and management, as well as working with customers to meet local aviation requirements.

The bulk of NFC's business today is law enforcement, followed by EMS, with probably a 60:40 split between the two following a substantial growth in the use of NVGs by EMS operators over recent years. Back in 2006 and 2007, there were just a handful of EMS operators employing NVGs, but FAA rules concerning NVG training, proficiency and operations in 2009 resulted in a huge spike in civil use of the technology, says Aldous, who estimates that, today, only a handful of EMS and law enforcement agencies in the US are not flying with night vision systems.

The company has also seen the emerging use of the technology in new applications, such as aerial firefighting and monitoring, agricultural spraying, and even corporate aviation missions.

Night vision development efforts have typically focused on the needs of military users, but civil operators have benefited from the resulting improvements as well. (Photo: Elbit Systems of America)

NFC decided early on not to get involved in the required night vision cockpit lighting, instead partnering with specialist companies like Aero Dynamix and Rebtech, both based in Texas. "Our experience is as pilots and in maintenance. It made more sense to develop relationships with various lighting companies," Aldous asserts.

Rebtech, for example, provides complete cockpit, cabin and external NV-compatible lighting systems, and it has outfitted approximately 800 parapublic and civil helicopters. "We have STCs for 33 aircraft types, and can quickly and efficiently obtain STCs for additional models," says Craig Allison, the company's director of sales and marketing. The supplemental type certificates are from the FAA, Transport Canada and EASA, with Rebtech recently starting work on an STC from Brazil's ANAC. The approvals cover types ranging from the Robinson R44 up to the Sikorsky S-76.

Rebtech primarily works with operators engaged in airborne law enforcement, EMS, search and rescue, special operations, government transportation, commercial operations, firefighting, agriculture and anti-poaching. "Agriculture and firefighting are definitely markets that we see increasing," Allison remarks.

Technical training

The company provides customer-centric solutions based on the individual aircraft configuration, Allison explains. It offers a turnkey service which can include sending personnel to the customer's base to complete the installation, as well as training the customer's own technicians to service the components.

For its international clients, Rebtech provides all necessary documentation and helps them get approval from their local aviation authority. It has customers in the US, Canada, Europe, South Korea, South Africa, Paraguay and the Philippines.

According to Allison, there is increasing demand for dual-mode exterior lighting – visible and infrared. "Many of our customers are now requesting dual-mode exterior lights, such as landing and search lights, that enhance some of their mission capabilities," he reports. ■

Entrol's simulator range includes EASA Level 2 and 3 flight training devices in type-specific configurations. (Photo: Entrol)

Back to SCHOOL

The helicopter training and simulation sector is gradually starting to pick up from where it left off when the pandemic arrived, and it continues to develop innovative ways of reducing the cost and improving the effectiveness of pilot training, as **Peter Donaldson** reports.

While pilots are returning to their training after the initial COVID-19 shutdown, the medium- and long-term effects of the pandemic, the march of technological progress and changes in philosophy will transform the way helicopter crews are trained in the future, almost certainly for the better.

This is what RotorHub learned in conversation with training providers and simulator manufacturers in Europe and the United States including Coptersafety, Entrol, FlightSafety International, Frasca, Hillsboro Heli Academy, Norwegian Competence Centre Helicopter (NCCH), Thales and VRMotion. All have been affected, but have adapted their businesses and developed views on the future of helicopter training.

The picture that emerges from this is one in which the mix of real flight time, full-flight simulators (FFSs), fixed-base simulators, part-task trainers, virtual reality (VR), online and cloud-based tools, and even artificial intelligence (AI) will play into a new era of evidence-based training tailored to the individual needs of pilots and other crew members.

Most of the recent adaptations are those that have become familiar in everyday life. They involve strict control of access to facilities; rigorous cleaning regimes for aircraft, simulators and common areas; social distancing; masks and hand sanitiser for situations in which people must come together to train; and much greater adoption of remote working, online learning and web-based meeting tools.

The greatest impact of the pandemic on training organisations has been the reduction in the number of overseas students, but this has been softened in the United States at least by the inclusion of flight training in the list of activities being given exemptions on national interest ▶

grounds by the US State Department, as well as some simulator manufacturers being classed as strategic technology companies by individual state governors. Also, the European Union Aviation Safety Agency granted four-month extensions to pilot currency, while the US Federal Aviation Administration gave 90 days, providing leeway for training providers to adapt to the immediate crisis.

Looking ahead

At Coptersafety in Finland, customer service and marketing manager Adrianna Janusz comments that, over the medium term, the industry will have to learn to live in the new normal, accepting limitations and inconveniences while delivering more online learning.

Nacho Navacerrada, business manager for Spanish simulator manufacturer Entrol, notes that pilots are looking for alternatives to FFSs because of travel restrictions. "We expect to see an increase in local training." He adds that flight training devices (FTDs), flight navigation and procedures trainers (FNPTs), and new technologies such as VR and mixed reality (MR) are interesting low-cost options. "The best option will depend on the needs of each operator," he stresses.

Fabi Riesen, CEO of VRMotion in Switzerland, says that with increasing economic pressures on aviation, his firm's VR-based training "offers new opportunities for efficient, affordable and environmentally friendly training concepts from basic up to specialised and advanced tasks".

FlightSafety International's senior vice-president of operations, Brian Moore, emphasises that where the oil and gas industry was struggling, COVID-19 hasn't helped. "We think there is going to be some fairly long-term impact on that [sector] as operators look to downsize and consolidate their fleet."

Hillsboro's helicopter training school specialises in ab initio training on the Robinson R22. General manager Jared Friend sees the impact of COVID-19 as a double-edged sword. "We've had a decrease in enrolment, but on the other side of it, we've had a drastic increase in people enquiring about flight training." This he puts down to people re-evaluating their life goals in the wake of a major global event.

Friend notes that sightseeing operators have been hit very hard, with one company in Las Vegas recently laying off a couple of hundred pilots and having no plans to reopen any time soon. "That was a main pipeline for instructors to get their 1,000 hours," he observes. "It was typically the first place they would go."

While simulator manufacturer Frasca weathered the immediate crisis well thanks to a substantial backlog of orders for its diverse mix of products from a broad range of customers, CEO John Frasca is concerned about rebuilding that backlog, which the company is now working through.

Among Coptersafety's training devices is a Level D Airbus H145 simulator from TRU Simulation + Training equipped with a Rockwell Collins EP-8100 visual system. (Photo: Coptersafety)

However, he anticipates some interesting opportunities with simulators because they represent a controlled environment that is easy to keep clean and to which it is straightforward to control access, amplified by technology that allows the instructor to be practically anywhere other than in the cabin with the student.

There's no doubt that the pandemic has accelerated an existing trend towards delivering more training over the internet. Coptersafety, for example, is working on a new set of e-learning courses for pilots, says Janusz, with the aim of halving the number of ground courses that students must attend in person. One third of the recurrent training modules for the AW139 are ready, she reports, adding that type rating courses and material for other simulator types will follow.

Keeping it real

Online courses are good for teaching theory, checklists, basic cockpit procedures and maintenance, indicates Entrol's Navacerrada. He says that some schools have recorded videos of instructors flying in simulators, talking through key instruments and procedures.

Emphasising the need to make the most of the best tool for each training task, he cautions that not every task can be done online. "Students need to make muscle memories and learn to fly in a multi-crew environment. Therefore they need a training environment similar to the real helicopter."

VRMotion's Riesen highlights that his company's solutions depend on the internet, with the lesson preparation and post-lesson analysis carried out using web-based tools.

Hillsboro Heli Academy has taken advantage of the FAA's pandemic-induced change of heart that now encourages online learning. "We came up with a very basic structure for how that is to be completed, and so a lot of our ground training, the knowledge-based one-on-ones with instructors, has been done via Zoom calls and Microsoft Teams," reports Friend.

Similarly, FlightSafety has rolled out live learning for aircraft maintenance training in which instructors teach from their usual classrooms while students log on as they might to a Zoom or Webex meeting, but it has taken the technology a little further.

This AS350 B3e/H125 simulator from Frasca has a TruVision Global visual system with a 200° horizontal and 70° vertical field of view, along with features such as electric control loading and multi-channel sound simulation. (Photo: Frasca)

Moore explains that the company's software engineers have built on an existing popular online tool, integrating proprietary course work in the form of presentations, schematics and animations.

Moore sees a big opportunity to extend web-based training into the smaller end of the helicopter market for which the expense of coming for traditional simulator-based training has been too great.

Cloud connections

Even before the pandemic, John Frasca notes, operators wanted pilots away from home for as short a time as possible, so people were figuring out online training, preparing for simulator sessions at home before travelling to use the FFS.

He says that his company is now adapting simulators to that model by ensuring that the instructor can work remotely through what Frasca calls the connected simulator. The student flies the simulator from the cabin as normal, but both simulator and instructor are connected to the cloud, where services that support the simulator also reside. At the simplest level, these include the scenarios for each lesson, which can be downloaded to the simulator, and the results of each flight, stored with the student's records.

Michael Mayrhofer, CEO of Norwegian Competence Centre Helicopter (NCCH) and the head of regulatory and strategic affairs at Reiser Simulation and Training, recognises the value of the internet for conventional e-learning, but sees a lot more value besides. NCCH provides training to Norwegian Air Ambulance for its EMS operations in Norway, Sweden and Denmark, using H135 and H145 FFSs from Reiser in Austria. The training suite includes a virtual cockpit familiarisation trainer accessible via a web browser.

"While there are no knobs or haptic feedback, you can do almost 100% of procedures training on such a device," says Mayrhofer. "We also see a trend towards IFR training on web-based applications."

However, he cautions that you cannot do any kind of checking, such as line proficiency or operational proficiency checks, or line-oriented flight training refreshers.

Thales anticipated the growing need for web-based training, says helicopter simulation product line manager Joel Flinois, and was working on simulations that run in the cloud even before COVID-19. "The pandemic demonstrated very clearly that this is very important, and so we accelerated our development." Through a browser, BetterFly will provide access to virtual tools including avionics trainers and decision-making trainers, for example. The company is currently in discussion with its partner to define the content.

Before the pandemic, the training and simulation industry had been working to improve its offerings and reduce costs, efforts that are now picking up once more.

Coptersafety had begun to offer training on its H125 simulator (built by TRU Simulation + Training) and was constructing a new AW169 simulator at its Helsinki base, while working to obtain approval from the FAA in the US and Russia's Federal Air Transport Agency to serve pilots operating on their licences. The company was also introducing VR technology to give pilots a better understanding of any technical issues that arise in training, Janusz reports.

Entrol is focused on growing its portfolio of FTDs, with Navacerrada pointing to the reducing technology gap between them ▶

and full-flight simulators. "Industry is pushing for more credits for FTDs and other devices, such as FNPTs and VR/MR, to reduce costs and improve training," he says.

For example, Entrol recently certified an H135 FTD Level 3 sim for proficiency and operator checks. This offers a big cost saving, Navacerrada notes, as a Level 3 FTD is a fraction of the price of an FFS.

VRMotion's Riesen says that, prior to the pandemic, his company was experiencing high demand for risk-free ways to practise scenarios such as hydraulic failures, vortex ring states, inadvertent yaw and touchdown autorotation, as well as for more cost-effective training and checking.

Friend emphasises that ab initio training has been Hillsboro's bread and butter since 1980, and remains so, but it is updating its R22s to better reflect the helicopters that pilots will go on to fly later. "We have started integrating a lot of the new glass-panel training into our instrument flight training," he explains.

According to its CEO, Frasca continues to advance on a broad front, developing devices at different levels for various tasks. This still includes flight-testing aircraft to gather data for high-fidelity simulators and delivering ab initio entry-level devices, such as the Reconfigurable Training Device for schools that don't have big budgets. "We are working on a Level D sim for a large transport helicopter right now," John Frasca reveals. "We're doing a lot of EMS helicopters, delivering FTDs to the collegiate market and overseas ab initio schools."

The use of simulation technology continues to expand to meet a growing range of training needs, and fixed-base procedure and mission trainers have become increasingly important tools. (Photo: Thales)

Established two years ago with a Reiser H145 simulator to meet Norwegian Air Ambulance's training needs, NCCH initially had no plans to offer its services to third parties. This changed when Mayrhofer took over, as he saw an opportunity to provide web training to the large number of operators with just one, two or three aircraft. "I realised that about 50% of the helicopters were operated by smaller operators and most training providers had completely ignored them," he says.

With five H145 simulators in Europe, based in Frankfurt, Cologne, Munich and Stavanger, the company has begun to offer wet leases of the devices, along with complete training packages from type rating up to recurrent. COVID-19 interrupted its plans for a while, but the new services were launched in July and the first third-party customer signed up in August, Mayrhofer reports.

Thales has been doing a lot of work on new VR and MR technology, Flinois says, convinced of its importance to the future of simulation. "It will not replace what we can do with the full-flight simulator, it is more of a complement," he stresses. "The main value of this kind of trainer is to be able to deploy more small simulators everywhere."

Change of pace

Naturally, technology is enabling changes in the way pilots progress from ab initio training, some of which are caused or accelerated by changes in the economy. FlightSafety's Moore notes that the normal progression from initial qualification into construction, sightseeing and spraying jobs, for example – often on small piston-engined machines – has been disrupted as opportunities in those traditional routes shrink, and pilots are progressing more rapidly into the more complex aircraft.

"They are going into environments such as HEMS, offshore and SAR earlier," he observes. "They have to be prepared to address things they haven't experienced before, such as operating as part of a team with an air medical crew, for example."

At Entrol, Navacerrada points out that the adoption of glass cockpits in light singles, improving situational awareness and

INNOVATING TO DELIVER TRUSTED TRAINING

As a major player in the aviation training and simulation market, CAE has obviously felt the effects of the ongoing pandemic, but its wide customer base, which includes many military operators, and its innovative approach to training provision mean that the company is better placed than most to deal with the challenges.

As far as helicopter training is concerned, CAE is able to offer pilots and maintenance technicians some of the most advanced and respected programmes in the industry, covering a wide range of aircraft types. It can meet customers' needs for VFR, IFR, HEMS, SAR, offshore, military operations, NVG and other mission-specific training.

"Our pilot training programmes combine innovative methodologies which include interactive online systems trainers, live remote instructor-led training, virtual walk-arounds and advanced simulation technology," explains a CAE spokesperson.

"Our technical training solutions and operational troubleshooting tools are designed to help customers maximise their resources and generate more revenue, while enhancing the safety and efficiency of their operations.

"We understand scheduling conflicts and travel can make it difficult to provide the training that technicians need, so we can bring the training to the customer."

The spokesperson adds that, no matter what their requirements are, CAE can be relied on to provide pilots and technicians with consistent and standardised training of the highest calibre.

reducing workload, has meant that pilots are trained in more advanced skills earlier, such as cockpit resource management and multi-crew operations, with a shift towards competency-based training.

VRMotion's Riesen emphasises that with VR technology, the ab initio student can master basics such as hovering, flying approaches and autorotation in a safe and affordable environment before applying these skills to a real helicopter. Commercial pilots can practise advanced manoeuvres and scenarios, and even sling-load operations can be learned in a virtual environment, he says. "With a more competency-focused training concept, pilots are better prepared for their tasks, which improves flight safety significantly."

At Hillsboro, Friend points to a major expansion of instrument training. "Ten or 15 years ago, it was something that very few pilots had, but now if you don't have your instrument rating, and for that matter your instructor rating with the instrument ticket, it is going to be hard to find a job."

Mayrhofer believes that training device manufacturers have an obligation to produce cost-effective devices capable of delivering full IFR training, which is already allowed by the regulators, at a package price that comes in at €15,000 to €20,000. "Many pilots have to pay for their own licences, and today you will not get an IFR licence for less than about €80,000," he notes.

Solid evidence

Regardless of the skill level aimed for, basic or advanced and specialised, technology is beginning to enable a shift towards evidence-based training (EBT) and, potentially, more objective assessment. Thales' Joel Flinois argues that EBT and the technologies that support it, including AI, will provide the ability to customise training to meet each pilot's individual needs.

EBT will require new tools to help instructors to evaluate pilots' competencies and skills, and to judge whether they have passed or failed each task objectively. Thales has developed an eye-tracking tool, known as HUMANS, to contribute to this, Flinois explains. "For example, if the pilot does not look at the right instrument during an emergency, we are able to detect that automatically."

In future, aircrew performance will be assessed using recorded and analysed data from every training event on every training device, and probably from every operational flight also, scrutinised by AI as well as human instructors. Perhaps counter-intuitively, with machines increasingly doing the scoring, it could free instructors to become more like mentors who guide and support pilots and aircrew as they develop through their careers, training on simulators more and more.

John Frasca would like to move as much training as possible onto simulators for reasons of efficiency and productivity, but especially safety. "The goal is not a pilot as good as one trained in the aircraft," he states. "The goal is a better, safer pilot because he was trained in the simulator." ■

With the aviation industry still struggling to deal with the impact of COVID-19, **Peter Lewis**, the CEO of Swiss helicopter aftermarket parts distributor Alpine Air Support, issues a rallying call to the helicopter community.

Overwhelmed and underimpressed

Believe me, I'd love to be writing about anything other than the 2020 pandemic, but when we look back in a year or two, avoiding the subject that has affected our industry so severely would be seen as naive and irresponsible.

We in the helicopter industry like to consider ourselves at the forefront of modern aviation. Our industry is certainly adept at coining buzzwords and developing cutting-edge technology.

Yet, for all we thought we were, when it came to the crunch, handling what was probably our first big global test in most of our lifetimes, how did we do? I will go out on a limb and say not very well at all. Did we let the trailblazing acronyms blind us to our goals?

Falling short

We're probably still too close to the events to be able to put a historical spin on the subject just yet, but one thing is clear: society's response to COVID hasn't been worthy based on our abilities.

Under duress, we humans tread the well-known path of initial denial, followed by gradual acceptance and then some form of surrender. This is where we remain – in a no man's land of indecisiveness, looking for others to somehow point us in the right direction or blaming politicians who, for all their functions, are no smarter than anyone else studying videos from the University of YouTube.

Commercially, helicopter operators, maintenance facilities and OEMs have all been trying to keep their heads above financial waters. Aviation was hit in the face with COVID, make no mistake, and of all the industries that suffered, ours was among the most badly hurt. Airlines certainly took the brunt of the impact, but airports and fixed-base operators also saw their businesses crumble within a few weeks.

> ***"It's a belief that we won't allow our hard work and dedication to our beloved aviation industry to be erased by a virus."***

Helicopters didn't take quite the same loss, but our industry took a beating, especially as the oil and gas sector had already been left reeling after the OPEC nations and Russia sent the crude oil price tumbling, which had an immediate effect on offshore operators.

OEMs requested workers to run their administration from home over the net, and previous levels of poor service simply became truly atrocious service. It didn't have to be that way. Economically viable companies shouldn't just fold under the slightest pressure. Most of the air ambulance operators that we work with on a daily basis knew exactly what they had to do and proved this, whether with patient repatriation or hospital transfers. These specialists have contagious disease training and count medical staff as their employees.

Show of faith

Rebuilding an economy hit so hard and so quickly requires confidence. Confidence that what we've all been doing in our professions for decades wasn't some kind of fluke; businesses built on a strong foundation serving clients that need our products and services. It's a belief that we won't allow our hard work and dedication to our beloved aviation industry to be erased by a virus.

If no one felt that helicopters were critical one year ago, then the pandemic will at least have served one useful purpose: demonstrating that our industry is a vital cornerstone of emergency services and a key factor in modern-day transportation.

And even though it's going to take some time before tourists return to flying up and down the Grand Canyon with sightseeing helicopters, it's important that we try to leave the malaise and COVID excuses behind us as we stand behind our industry and move forward again. ■

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