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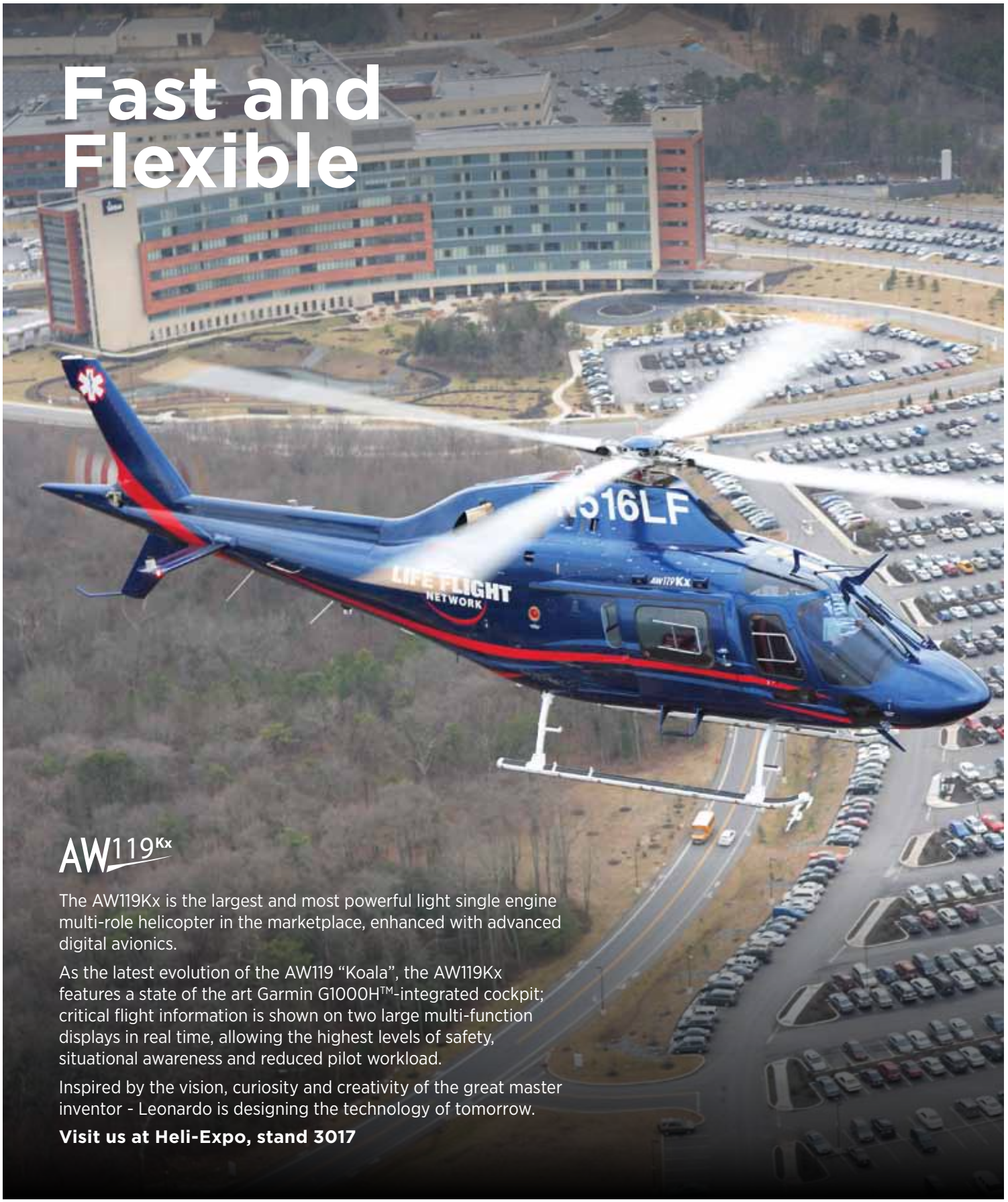

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Cover

A Firehawk Helicopters Sikorsky S-70 Firehawk and Airbus AS350 B3 fly in formation near the operator's facility in Leesburg, Florida. Firehawk has been operating S-70s for more than 20 years.

DAN MEGNA PHOTO

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Our Publications

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The Team

GROUP PUBLISHER
Mike Reyno ■ mike@mhmpub.com

GROUP PUBLISHER
Linda Reyno ■ linda@mhmpub.com

ASSOCIATE PUBLISHER
Derek Kast ■ derek@mhmpub.com

EDITOR-IN-CHIEF
Oliver Johnson ■ oliver@mhmpub.com

SPECIAL PROJECTS EDITOR
Elan Head ■ elan@mhmpub.com

ASSISTANT EDITOR
Ben Forrest ■ ben@mhmpub.com

JR. EDITOR
Sarah Grandy ■ sarah@mhmpub.com

SALES & MARKETING DIRECTOR
Tim Muise ■ tim@mhmpub.com

MARKETPLACE SALES MANAGER
Carla McKay ■ carla@mhmpub.com

CIRCULATION MANAGER
Leanne Willis ■ leanne@mhmpub.com

PRODUCTION MANAGER
Jen Colven ■ jen@mhmpub.com

GRAPHIC DESIGNER
Kaytlyn Wismayer ■ kaytlyn@mhmpub.com

SR. WEBMASTER
Christopher Zimmermann ■ christopher@mhmpub.com

WEBMASTER
Shawn Pieters ■ shawnp@mhmpub.com

CONTRIBUTING EDITORS:
Jen Boyer, Ed Brotak, John Carinha, Thierry Dubois, Geoff Goodyear, Guy R. Maher, Dan Megna, Bob Petite, Skip Robinson, Andy Roe, Howard Slutsken, Kenneth I. Swartz

CONTRIBUTING PHOTOGRAPHERS:
Oscar Bernardi, Rob Brown, Eugen Burgler, Dirk Collins, Jerome Deulin, Chi Yin Liao, Guy R. Maher, Dan Megna, Heath Moffatt, Christopher Moss, Brittany Mumma, Arden Oksanan, Anthony Pecchi, Mike Reyno, Skip Robinson, Julien Sollberger, Vitek Zawada

Vertical

In Canada:
500 Trillium Dr., Unit 23, Kitchener, ON N2R 1E5

In the United States:
701 S. Main Street, Fall River, WI 53932

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COLUMN

FOCUS ON SAFETY | **GEOFF GOODYEAR**

WRESTLEMANIA — NEWFOUNDLAND STYLE

While many of our safety management efforts are generated by and for specific companies, we work in a regulated industry and are answerable to regulators for much of what we do. We have a lot of stakeholders in our workplace, including passengers, suppliers, pilots and maintainers. But the regulator holds a special place in our work lives, and it plays a key role in the effectiveness of our safety management efforts.

The relationship is an imposed one, and can sometimes be very complex. I recall a family anecdote concerning my grandfather that might help put this into perspective. Bear with me as I set the scene.

My grandfather was a very dynamic and original character. Everyone in town referred to him as "Skipper Ken," which was a local term of respect and endearment. I knew him as the patriarch of the family business.

Before my time, he served in the First World War with his brothers, and was wounded in France at Beaumont Hamel during the Battle of the Somme. A bullet had taken out the better part of an elbow, and the attending field surgeon had insisted that the arm be removed. The Skipper was no doubt in a foul mood at the time, and after a heated exchange with the surgeon it was mutually decided that it was to be saved, but that my grandfather would be left with limited mobility in that arm. So be it.

Fast-forward to the 1920s in Newfoundland. Skipper Ken was very athletic and active in numerous sports, but eventually took up boxing. My grandfather never did anything by halves, and in due course became the heavyweight boxing champion of the Dominion of Newfoundland. He retired from the sport undefeated, and was eventually invested into the province's Sports Hall of Fame. Not bad for a wounded vet with a bad arm!

Now, in 1920s central Newfoundland, there was not a whole lot going on for entertainment — unless you liked watching pulp wood fall from a stacker (Grand Falls was a paper town). So, it generated no end of excitement when word arrived that professional wrestlers from mainland Canada were coming to town to put on a show. Ticket sales were brisk and the town could hardly contain its excitement. The only thing the promoters needed to confirm the event was someone to referee the match. The choice was obvious; the town's favorite son and champion boxer agreed to the request, and all was made ready for the contest of the century.

The wrestlers showed up in all their fighting finery and the match started off well enough. The wrestlers' embraces became more spirited as the match wore on, and the Skipper found himself having to intervene on more than one occasion. Then, as the match reached a fever pitch, one of the intrepid Canadian wrestlers took great umbrage to the Skipper's interventions. Clearly offended by being penalized or by being called out by a local ref (or both), the wrestler proceeded to make two mistakes in rapid succession. Number one: He took a swing at the Skipper. Number two: He missed.

The Skipper reacted instinctively. He planted two feet firmly on the mat and laid waste to the professional wrestler with one well-placed right hook. As the wrestler was flying through the air I can only image what was going through his mind… besides his jaw.

The second wrestler, seeing his excitable partner spread-eagled and unconscious on the mat, decided to give the Skipper a wide berth, and let the chips (or wrestlers) fall where they may. Clearly he was gifted with more common sense than his colleague.

Despite the unpredictable outcome and early end to the match, all attendees were satisfied with the outcome, as the local referee was the clear winner in what must have been a spectacle to watch.

No doubt, entanglements with regulators can sometimes get complicated and emotional, and like our malcontent wrestler, we will not always agree with their calls. But the regulator can provide some much-needed outside review of your operation and safety management efforts. Having a third party look at your processes and qualify your crews' training, while sometimes an angst-filled process, is not a bad idea — and will ultimately make our operations safer. My experience has been that if they know you are trying to be compliant and safe, they often do what they can to help. Thankfully, they rarely implement the dreaded right-hook procedure.

As my grandfather advanced in years he was often asked how he was doing. Or as we say here, "How are you gettin' on?" He would always reply, "Like Johnny Walker — I am improving with age!" In the spirit of continuous improvement and from someone who now qualifies for senior's discounts — may we all continue to improve with age!

Have a safe season.

Clearly offended by being penalized or by being called out by a local ref (or both), the wrestler proceeded to make two mistakes in rapid succession. Number one: He took a swing at the Skipper. Number two: He missed.

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FOCUS ON TRAINING | **ANDY ROE**

STORYTELLING

Storytelling is part of human culture, and helicopter pilots have no shortage of stories to tell about their adventures in the air. These stories can be good instruction, or simply whimsical entertainment. Hopefully your instructor is discerning enough to use a story as a good instructional tool.

The plethora of stories amassed throughout a helicopter career can be of great interest to everyone at social functions, but many may not have any instructional benefit. Student pilots are greatly entertained with on-the-job stories, but many instructors wander hopelessly off topic when they get themselves started on a flying story.

Aviation teachers must be very creative in how they present flight-related exercises and training information. Verbal communication — either in group format or better still, one-on-one — is the traditional method of information transfer. Student pilots also respond well to visual aids, metaphors, and other real-time comparisons. However, many instructors, especially those new to the career, crawl into the lobster trap of storytelling — and learning quickly stops.

Helicopter stories about special missions are always intriguing. The very first flying job I did (oh no, here comes a story!) was to take a group of geologists to and from a remote worksite every day for a week. At my next job, the customers were skeptical about my experience and asked how my summer had been going. I told them that my last job was quite intense and I had learned a lot about igneous rock formations and quartz veins from the geologists on board. The customers were relieved and thought I probably had a thousand hours or so. In fact, over and above my initial training, I had a grand total of 15 hours.

Most stories are of challenging jobs well done, but often the tales of these achievements have the pilot penetrating impossible weather conditions or flying an external load 500 pounds over the allowable helicopter gross weight. The stories tend to become embellished at each telling, which certainly heightens interest with the audience, but paints the wrong picture if nascent student pilots are around.

Exciting bad weather stories probably have the pilot exceeding weather limitations. The message students will take from this is that weather minima are important to know, but in real life you're on your own. The hero with the heavy load may not have been aware that the certificate of airworthiness and the company's insurance policy were immediately null and void as soon as the gross weight was exceeded. Teaching braggadocio sends the wrong message; it's not very good instruction for budding student pilots.

A lot of helicopter flying work is both challenging and safe, and the successful completion of many tasks is an accomplishment. It is only natural that when pilots recount some of the flying missions they have been on, the weather gets worse, the loads heavier and the risks far greater than they really were at the time.

Helicopter stories play well on social media, but student pilots need thought-provoking images and information to help them learn all of the ground theory needed to become licenced. Stories should only be considered academic when they have a direct impact on positive learning.

A helicopter story with instructional merit might start with a pilot near the end of a power line patrol up the side of a steep mountain. The top of the mountain is covered in low stratus and the customer insists that the tower partially submerged in fog ahead was the highest one at the top of the hill, and if the pilot could just hover by the conductors, the line would immediately fall away into the clear sky on the other side.

The customer had flown the line for years, and yet the pilot left the foggy tower and whatever was beyond for another day. The following week, on a cloudless day, the pilot returned with a different lineman to inspect the tower and the remaining line. The "highest tower" was followed by three more rising up the hill. The pilot, a true professional, didn't even flinch because his decision the previous week was based on the big picture, not just one man's observation.

This story was short and to the point. Student attention was piqued because the important decision-making teaching point was told in story form and the lesson well retained.

Another example of a good teaching story has the pilot faced with a heavy load on a long flight with no fuel enroute. A quick calculation shows that the all-up weight will exceed limitations for the first 12 minutes of a three-hour flight. The straightforward decision is not to go. A pilot electing to proceed with the flight has taken into consideration the implications of the weight and balance, airworthiness, emergency landing characteristics and overall safety of the flight for a duration of 12 minutes.

Although not an endorsement to attempt the flight, the pilot who does in an effort to offer good customer service is most likely better prepared for an emergency, because of the known safety implications, than a pilot preparing for a more normal flight. What decision would you make?

Good instructors include good storytelling in their teaching "bag of tricks," along with good board/media presentations, and the effective use of helicopter training aids and manuals. Helicopter pilot stories that overly expound on one's personal prowess are better kept and rehearsed for the next government pilot workshop.

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FOCUS ON MAINTENANCE | **JOHN CARINHA**

KEEPING FOCUS

One of my favorite pastimes over the holiday season is to disconnect from all things Wi-Fi, cellular and social media, light a fire, and bury myself in a good book. My latest read, *Sway: The Irresistible Pull of Irrational Behavior* by Ori Brafman, has left me deep in thought since its opening chapter. Drawing on behavioral economics and social psychology, Sway reveals the dynamics that often derail rational thinking or muddle decision-making abilities.

The book opens with the story behind the deadliest collision of two aircraft in aviation history: KLM and Pan Am Boeing 747s at Tenerife airport in 1977. At issue was the decision by the seasoned KLM pilot to takeoff with what he assumed was takeoff clearance, but in fact wasn't. The ensuing result was his aircraft colliding with the Pan Am 747, which was still taxiing on the active runway. The crash resulted in the loss of 583 lives.

Curious, I Googled the next most deadly air disaster. This brought up the Japan Airlines (JAL) 747 crash outside Tokyo in 1985, which killed 520 people. The cause of this accident was attributed to an incorrect structural repair to the rear pressure bulkhead that effectively reduced the repair's resistance to metal fatigue to 70 percent. Post-accident, Boeing calculated that the repair would fail after approximately 10,000 flight cycles; the accident aircraft managed just over 12,000 prior to failure. In the months following the accident, the JAL maintenance manager and the engineer who inspected and approved the repair both committed suicide.

There is cause and effect to almost every action in life. The nature of these examples brings to light the proverbial chain of events and helps identify where the wheels came off in a process or sequence that ended with severe consequences.

In both situations, we can identify the point at which the effect of irrational behavior took control of events. In the KLM disaster, a veteran pilot, rated the best amongst his peers, allowed the pressure of duty cycles, an esteemed record, and gate times to influence his decision to respond to commands and verbal direction. He elected to takeoff without proper clearance. In the JAL disaster, a decision, albeit known or unknown, was taken to circumvent an approved repair scheme. Arguably an honest mistake, it came seven years before the inevitable and with the most extreme of outcomes.

I am a believer in silver linings. No matter the circumstance or outcome, one has to look for the "takeaways." What can I adopt in my own shop policies, attitude, and persona that will otherwise make me and/or my staff wiser, better, or smarter? Processing the two events, I came to one glaring conclusion. In both these scenarios, neither pilot nor engineer made a conscious decision to cause these accidents. They didn't begin their respective days thinking or hoping that they would make a mistake that would end with a high volume of death. So why then, did it still play out that way? To avoid severe consequences, it is important to mitigate distraction. This means recognizing the start of a sequence of events and taking pause to acknowledge when external factors interrupt rational thought — something easier said than done.

This highlights an ongoing challenge, both in my business and in daily life. We've had a longstanding policy with our employees where the use of cellphones is prohibited while working. The distractions offered by smartphones are too tempting. Whether a text message, email, or phone call, the desire to stay connected, and the new adage of "FOMO" (fear of missing out) becomes overbearing. As a business owner who is also hands-on, this proves challenging to balance. I was once told by a mentor that I should always answer my phone — it could be money calling. Nevertheless, research indicates that while using a cellphone, average reaction times increase from 333 milliseconds to 607 milliseconds. In aviation and flight, these mere fractions of time can impact life-or-death situations. This brings to light the Federal Aviation Authority's well-documented belief that 80 percent of maintenance mistakes involve human factors. It should be no surprise that distraction ranks fourth on their list of causes.

No one will ever know the thought process of the pilots or maintenance crews leading up to these crashes, but at some point in their sequence of thought, their flow was disrupted and their attention was swayed.

Even during times of focus and productivity in maintenance, simple distractions and minor interruptions can easily impede the flow of rational thought and behavior. Distractions may be unintended or created, but in the aviation industry, losing focus in critical areas results in an almost certain consequence. It is crucial to recognize any interruption or distraction as a significant opportunity for deadly error.

Even during times of focus and productivity in maintenance, simple distractions and minor interruptions can easily impede the flow of rational thought and behavior.


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Garin Klinker finds the perfect spot to land his PJ Helicopters Bell 407. PJ was contracted to conduct snow surveys from the Mount Lassen area down to the Buck Lakes area, east of Chino, California.

Cynthia Nubien caught Qwest Helicopters' SA365 N1 Dauphin taking off on a cold evening from the company's Fort Nelson, B.C., base.

Mason Mashon took this moody shot of Rob Gallagher of Coldstream Helicopters flying a Bell 212HP during the filming of the latest Teton Gravity Research film on the Cariboo Mountains at Silvertip Lodge Heliskiing.

Leonardo photographer, **Simon Pryor,** flew along with Her Majesty's Coast Guard in the U.K. to photograph their newest search-and-rescue aircraft, the AW189, which is operated by Bristow.

Paul Sadler sent in this snap of Toll Air Ambulance's new Leonardo AW139. Toll launched service in the southern zone of New South Wales, Australia, in January 2017.

Wesley Semeniuk of Eagle Copters took this photo of the company's most recent Eagle Single (a single-engine Bell 212) conversion while on a test flight South of Calgary, Alberta. The newly-converted helicopter went to a lucky private operator in the United States.

Konrad Dabkiewicz photographed this Swiss Air Force Airbus AS332M Super Puma flying through the Swiss Alps during a training mission.

Bell 505 certified; deliveries to begin

BY OLIVER JOHNSON & ELAN HEAD

The Bell 505 Jet Ranger X received type certification from Transport Canada on Dec. 21, narrowly meeting the company's most recent certification target of year-end. Approval from the Federal Aviation Administration (FAA) and European Aviation Safety Agency (EASA) is expected to follow "very soon" according to 505 program manager LaShan Bonaparte.

"We look forward to seeing the Bell 505 take to the skies in 2017," said Bell president and CEO Mitch Snyder as the manufacturer announced the landmark.

Production of the 505 will take place at Bell Helicopter's facilities in Mirabel, Quebec, after Bell announced in May it would be relocating the 505's final assembly line from a purpose-built facility in Lafayette, Louisiana. That facility will instead be used to support programs including the Bell 525 Relentless.

As *Vertical* went to press, Bell was anticipating production certification in early February, and was planning a production rollout ceremony in Mirabel on Feb. 9. The first production 505 achieved first flight on Jan. 22.

Ultimately, Bell hopes to be able to produce between 150 and 200 505s each year. This year will see an aggressive ramp-up of production with an estimated 75 aircraft leaving the line by the end of 2017, by which point the manufacturer hopes to be at the rate required to produce 150 aircraft annually.

Powered by a single Safran 2R engine, the Bell 505 fills the void in Bell's product line that was created when the Bell 206B JetRanger ceased production in 2010. The five-seat Jet Ranger X has a useful load of 1,500 pounds (680 kilograms) and a range of 360 nautical miles (667 kilometers), and features the Garmin G1000H integrated avionics suite.

The aircraft has been certified at a maximum cruise speed of 126 knots and a maximum gross weight of 3,680 pounds (1,669 kilograms) — representing an increase of 30 pounds over the original stated target. The official empty weight has not been finalized, but is expected to by in the range of 2,210 to 2,220 pounds (1,002 to 1,007 kilograms).

The manufacturer has received over 400 letters of intent (LOIs) for the aircraft, and is now in the process of turning those into firm orders, with waves of customers

Development of the five-seat Bell 505 was first announced at the Paris Air Show in June 2013, and an aggressive timeline saw the aircraft certified by the end of 2016. **Bell Helicopter Photo**

The first production Bell 505 takes flight at the manufacturer's facility in Mirabel, Quebec, on Jan. 22. The aircraft will be used to train pilots on the type at the Bell Training Academy.
Bell Helicopter Photo

invited to fly the 505 in Canada. According to Bell, the conversion rate from LOIs to orders is around 80 percent.

However, with a substantial number of aircraft on the order books, the lead-time for new orders is likely to be at least two years.

At the same time as it was working on type certification, Bell was also working on kit configurations for the 505. The first kit certified was the corporate configuration, which includes movable leather seats, carpet, a sliding window, dual controls, and an avionics upgrade package that has a terrain awareness and warning system, synthetic vision, traffic advisory system, an emergency locator transmitter, and a radar altimeter.

The second and third 505 prototypes will continue to work on other kit certifications, including a utility configuration that will include a cargo hook, cargo hook mirror, and cargo hook weighing system.

A third party — United Rotorcraft — is developing an emergency medical services configuration for the 505, but according to Bonaparte, no official partnership has been entered between the two parties to provide that as a Bell option.

TRAINING PLAN IN PLACE

The first two production aircraft were due to be delivered to the Bell Training Academy (BTA) in early February (joining the first 505 prototype, which will be used as a maintenance training aid), as the manufacturer prepared to launch its training program.

The field maintenance and avionics training programs will each be two weeks in length, while the pilot course will last one week. All three programs are due to be certified shortly, according to Ray Lamas, general manager of global customer training.

"We're getting ready to teach our first customers in the 505," said Lamas. "In pace with customer deliveries, we'll be getting certifications for both the flight and the technical training."

Also in place at the BTA is a 505 level 7 flight training device (FTD), which is awaiting the finalization of some of the aircraft's flight test data before it is certified. Built by fellow Textron company Tru Simulation (which recently completed the Bell 429 Level D full flight simulator in place at Bell's facility in Valencia, Spain), the FTD has a cockpit with a few degrees of movement for an enhanced training experience

The 505 uses the same rotor system as the 206L-4 LongRanger – and according to Ralph Gannarelli, the lead 505 training pilot, that legacy is felt in flight.

"It flies a lot like a LongRanger/a JetRanger, there's really not a lot of difference," he said. "If you can fly JetRanger or LongRanger you take right to it, without a problem. I was doing full-touchdown autorotations within the first half hour."

Ganarelli said the power of the Arrius engine was also particularly noteworthy.

"From a pilot's standpoint, the thing has a tremendous amount of power. I'm very impressed with that. It will be a great high altitude machine," he said. "It's like a lightweight L4. It's got all the power an L4 has, but with a lighter empty weight."

According to Snyder, the base price of the 505 remains around the $1-million mark targeted by former Bell CEO John Garrison when he first announced the aircraft's development at the Paris Air Show in June 2013.

"It's been a global demand for the aircraft," Snyder said. "To have 400 letters of interest has been an amazing response by the market. . . . Even though the market has been down, we've had a great response out of this."

The Airbus H160 during cold weather testing in Yellowknife, Northwest Territories, in early January. By the end of 2016, the aircraft had accumulated more than 300 flight hours. **Jerome Deulin Photo**

H160 completes cold weather trials

BY OLIVER JOHNSON

The Airbus H160 has completed its cold weather test program in northern Canada, as the aircraft continues its journey towards certification in late 2018 or early 2019.

The 5.5- to 6-tonne twin-engine aircraft, unveiled at HAI Heli-Expo in March 2015, is powered by the 1,200-horsepower Safran Arrano, and features a number of innovations, including a fully composite airframe, Airbus's proprietary Blue Edge rotor blades, electrical landing gear, a new canted Fenestron tail rotor, and a biplane horizontal stabilizer.

The H160 was ferry flown to the cold weather testing site in Yellowknife, Northwest Territories, in December 2016, and began flight trials in the first week of January.

Bernard Fujarski, head of the H160 program, said the team was looking to expose the aircraft to temperatures as low as -40 C during the tests.

"They are looking especially to assess the dynamic behavior of the aircraft, the performance in cold weather, and we are interested in performing several cold soaks and then starting the aircraft to see how the systems are working," he told *Vertical.*

While he wouldn't share specifics in terms of the aircraft's performance, he did say that the feedback from the flight team has been positive, and that the aircraft's systems are behaving as predicted.

Prior to travelling to Yellowknife, Airbus took the H160 to a climate chamber in Vienna, Austria, to complete some low and high temperature tests.

"It was an excellent dry run for the campaign," he said. "We had to make some little adjustments — not too much — and so far the results are according to our expectations. Especially the behavior of the engine is extremely good."

As *Vertical* went to press at the end of January, Airbus was planning to invite representatives from various airworthiness authorities, including the European Aviation Safety Agency (EASA), Transport Canada, and the Federal Aviation Agency, to visit the aircraft in Yellowknife in mid-February.

Also joining the Airbus crew of one pilot, two flight engineers, and five mechanics on location are representatives from its customer support division — speaking to the manufacturer's aim to launch the H160 with a high level of maturity in both performance and support.

"We started the program with a dedicated team performing concurrent engineering — at the same time we are developing the product, the industry [manufacturing], and the maintenance of the aircraft," he said. "So we're using

the [Yellowknife] campaign to also check what we are developing regarding the maintenance — the maintainability, the tooling, the procedures, the accessibility — in cold temperatures," he said.

PROGRAM PROGRESSION

By the end of 2016, the H160 program had accumulated more than 300 flight hours between its two flying prototypes — PT1 and PT2. The team had also completed the equivalent of 150 flight hours on its "Dynamic Helicopter Zero." Containing the aircraft's engines, transmission, rotors and tail boom, the platform is used for dynamic and power checks.

In July, the program passed a key milestone with the freezing of the aerodynamic configuration of the H160's dynamics assemblies, and the completion of load valuation flights.

"We've now got everything in our hands in order to design the serial parts," said Fujarski, adding that the helicopter was still to perform fatigue tests to determine the life limit of mechanical parts.

Progress has also been good on the manufacturing model to build the H160, with assembly beginning on the first station of the assembly line. For the serial aircraft, Airbus will use a "major component assembly" model, whereby separate modules (including tail boom, central and front fuselage, cockpit avionics bay, main dynamic components, and blades) are fully built and tested in parallel at various Airbus facilities around Europe, and then shipped to the H160's final assembly line (FAL) in Marignane, France.

"Our industrial model is validated with workshare between the sites of the [Airbus] group in Germany, Spain and France," said Fujarski. "We've also started the maturity checks regarding the industry — for instance, we have already used the manufacturing [system] to assemble the third prototype in order to check that the industrial process is well defined, and adjust what needs to be adjusted."

The third prototype (PT3) is now in final assembly, but is not due to fly until mid-year. This is because Airbus needs to validate the modifications it has implemented in PT3 from the previous prototypes.

According to Fujarski, the major changes were related with the relocation of avionics and some electrical equipment from the rear to the front in order to optimize the aircraft's center of gravity, while the air intakes and cowlings have also been reshaped, and a final main rotor mast length has been chosen.

Airbus plans to turn the letters of intent it has received for the H160 into firm orders once pricing and the aircraft's performance specifications are firmed up later this year. **Jerome Deulin Photo**

"PT3 is in what we call Standard One configuration, whereas PT1 and PT2 were built according to Standard Zero configuration," he said. "We are now working on Standard Two, which will be the standard certified and delivered on the first helicopter."

The H160 has already been assessed by a number of potential customers, with 15 pilots having the opportunity to fly the aircraft in September and December last year.

"So far the feedback was extremely good regarding the vibration level of the aircraft, the external and internal sound — which is extremely low, the visibility from the cockpit, and more generally speaking the maturity of the aircraft at that stage of the program," said Fujarski.

The manufacturer began taking letters of intent for the H160 in March at Heli-Expo last year, but has not disclosed the total it has received so far. It plans to turn these into firm orders once it has firmed up performance and pricing later this year.

Fujarski said they will be speaking with potential launch customers about the manufacturer's commitment regarding the H160's performance, delivery date, configurations, and commercial conditions in the coming weeks. He said this information will be publicly disclosed by mid-year.

In terms of the flight test campaign, one important outstanding element is to test the indirect effect of lightning, which will be done on PT3. The program will then begin certification tests and flights with the regulatory authorities.

ROTOR BITS

FAA CERTIFIES H125 FASTFIN

BLR Photo

The Federal Aviation Administration (FAA) has certified the BLR Aerospace FastFin on Airbus H125s, making it available to the aftermarket and as a factory-installed supplemental type certificate option on new aircraft.

FastFin uses advanced airflow management to increase the effectiveness of the H125 anti-torque system and the certified performance data shows up to 130 pounds (59 kilograms) increased useful load and a 10 percent improvement in pedal margins.

Additional benefits include a reduction in pilot workload, easier control in precision hover-hold operations and better management of the yaw axis when hovering in challenging crosswinds.

With FAA certification in place, additional approvals from the European Aviation Safety Agency, Transport Canada and Brazil's Agência Nacional de Aviação Civil (ANAC) are expected to follow by year-end.

FAA clears Super Puma return

BY OLIVER JOHNSON

The Federal Aviation Administration (FAA) approved the return to service of the Airbus Helicopters H225 (EC225LP) and AS332 L2 Super Pumas in December, achieved through an Alternate Means of Compliance (AMOC) notice.

The types had been grounded by the FAA since June 3, after the Accident Investigation Board of Norway released its third preliminary report on the fatal crash of an H225 off the coast of Turøy, Norway. That report indicated metallurgical findings of fatigue and surface degradation in the outer race of a second stage planet gear of the main gear box (MGB) epicyclic module, and while the investigation continued, the European Aviation Safety Agency (EASA) decided to temporarily ground the H225 and AS332 L2 fleets as a precautionary measure — a move adopted by the FAA the following day.

On June 29, while the fleet was still grounded by the regulators, Airbus issued an Emergency Alert Service Bulletin that called on operators to replace one of the two types of second stage planet gears in service in the H225 with the other; the reason being that one type was found to have increased damage tolerance and showed enhanced reliability.

EASA authorized the AS332 L2 and H225 Super Pumas to fly again on Oct. 7, issuing an Airworthiness Directive (AD) that ordered operators to complete the actions described in Airbus's EASB, as well as mandating a life reduction and more frequent inspection for certain parts in the MGB.

The FAA's AMOC (issued against AD 2016-21-51) is based on the same actions detailed in EASA's AD.

The move provided a boost for Airbus, which is fighting three separate lawsuits from owners of H225/AS332 L2 Super Pumas who are seeking remuneration for aircraft they claim are no longer airworthy. All three referenced the ongoing FAA grounding in their original petitions to support their claims.

However, grounding orders remain in place from the U.K. Civil Aviation Authority and its Norwegian counterpart, and earlier in December, Norwegian oil company Statoil stated it will not use the type in the future — even if Norwegian authorities decide to lift the type's grounding.

In December, the FAA approved the return to service of the Airbus H225, which had been grounded by the regulator since June 3, 2016. **Anthony Pecchi Photo**

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CHI gets CH-47D type certificate

CHI will be using the Boeing CH-47D for firefighting and super-heavy lift operations. **Skip Robinson Photo**

CHI Aviation has completed the Federal Aviation Administration's process for acquiring a type certificate (TC) for the Boeing CH-47D. The type certificate was granted to Tandem Rotor, an affiliated company of CHI Aviation.

"We are very pleased to have been awarded the TC for this extraordinary helicopter," said Chris Turner, president of CHI. "This now gives us the flexibility to continue to tailor this aircraft for missions it will excel at. As we continue to work under an agreement with Boeing, as well as in partnership with Summit Aviation, CHI will bring this aircraft to its full potential as a helitanker and in super-heavy lift external load applications."

Patrick Pilolla, CHI's director of business development, called the Chinook the "next generation" of aerial rotary-wing firefighting and super-heavy lift. "The timing is perfect as we are in the final stages of manufacturing and testing the latest concept in a constant flow internal fire suppression system for the CH-47D," he said. "With its increased payload and altitude performance, along with this new generation of fire tank, we are going to make our customers around the world very happy."

Incorporated in 1980, CHI is part of Heligroup Holdings LLC, which specializes in transportation of people and cargo by helicopter and fixed-wing, along with aerial firefighting, night vision goggle, search-and-rescue, HVAC placement, and aerial construction applications.

AStar Max View Kit certified

Swiss Rotor Solutions' Maximum Pilot View Kit (MPVK) for the Airbus H125/AS350 family has received a supplemental type certificate (STC) from the European Aviation Safety Agency (EASA).

The MPVK is billed as a next generation aerial work safety and visibility solution for the AStar, providing pilots with an uninhibited field of view below and to the right of the aircraft.

The kit comprises two main pieces, with a single-piece bubble door accompanied by a lower vertical window assembly and floor and fuselage insert/frame.

The bubble door offers a significant increase in lateral visibility and pilot headroom when leaning to the right — even when wearing a helmet. Below, the large lower viewing aperture and transparent fuselage window fairing increases the vertical field of view forward, aft, and directly underneath the aircraft by a factor of 10 compared to existing solutions, the manufacturer claimed.

The MPVK is designed to improve operational safety during demanding operations such as sling loading, firefighting, search-and-rescue, emergency medical services, confined area operations, aerial survey, seismic, law enforcement and any other tasks performed in close proximity to terrain, obstacles and ground crews.

The Maximum Pilot View Kit for the Airbus H125 includes a single-piece bubble door and a lower vertical window to increase the visibility forward, aft, and directly underneath the aircraft. **Swiss Rotor Solutions Photo**

Swiss Rotor Solutions obtained the STC with the support of its EASA 21J certification partner, GVH Aerospace, which will also support serial installations and continued airworthiness. The MPVK can be installed by any EASA part 145 with small rotorcraft H125/AS350 authorization with base maintenance capability.

To date, Swiss Rotor Solutions has received multiple orders and said it is ready to supply and support installation throughout Europe, Australia and New Zealand. The company said validation of the MPVK from regulatory authorities in the U.S., Canada, and Brazil is in progress and is expected shortly.

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Report puts price on crash resistance

BY ELAN HEAD

Requiring all newly manufactured helicopters to comply with existing crash resistance standards would cost the industry approximately $764 million over 10 years, a working group has found.

The estimate appears in a cost-benefit analysis report submitted to the U.S. Federal Aviation Administration's (FAA's) Aviation Rulemaking Advisory Committee (ARAC) by the Rotorcraft Occupant Protection Working Group. According to the report, the costs of mandating compliance with U.S. regulations for crash resistant seats, structures, and fuel systems are more than five times greater than the projected economic benefits, which were estimated at around $144 million over 10 years.

However, these figures should be regarded with caution. The industry working group arrived at its cost estimate using nonstandard methodology that may have resulted in a higher estimate than FAA cost calculations would have yielded.

Meanwhile, the working group used standard FAA methodology to calculate benefits, despite some members arguing that "current FAA methodology for calculating the economic costs of fatal and serious injuries significantly underestimates the actual societal costs of these injuries."

The FAA created the Rotorcraft Occupant Protection Working Group in late 2015, after high-profile fatal accidents — notably the fiery crash of a Flight For Life helicopter in Frisco, Colorado — drew attention to the fact that many new-build helicopters fail to meet safety standards that have been in place for decades.

The FAA adopted its current helicopter fuel system crash resistance standards in 1994, and dynamic crashworthiness standards in 1989. But because the standards do not apply to rotorcraft with type certificates approved before those dates, a majority of civil helicopters manufactured over the past two decades do not fully comply with these requirements.

In announcing the creation of the working group, the FAA noted that the numbers of U.S. fatal helicopter accidents and associated fatalities have remained "virtually unchanged" over the past decade, despite a decline in the total number of accidents.

"If the occupant protection improvement rules are not incorporated in new production helicopters," the FAA stated at the time, "there will be no meaningful reduction in the number of fatalities in helicopter accidents."

The helicopter industry has 20 members in the working group, including representatives from operators, manufacturers, and industry associations. Their first assigned task was to perform a cost-benefit analysis for incorporating existing occupant protection standards into newly manufactured rotorcraft.

To accomplish the task, the working group divided into two subgroups: a Cost Task Group, consisting primarily of manufacturer and operator representatives; and a Benefits Task Group, including accident investigators, accident analysts, and safety experts.

The working group submitted its initial cost-benefit analysis report to the ARAC on March 13, 2016, but was granted additional time to complete a more accurate and detailed report, which was submitted on Nov. 10 and accepted by the ARAC in December.

In performing its cost analysis, the Cost Task Group considered both the nonrecurring design costs and ongoing manufacturing costs likely to be incurred by manufacturers, as well as operator costs related to the reduction in payload, reduction in fuel load and range, and increase in fuel burn rate resulting from the design changes.

In its final report, the working group expressed the opinion that "current FAA standard methodology does not accurately consider the practical costs of aircraft modification," and stated that it "sought to correct this by using a methodology that

Bell Helicopter contended that "all in-production Bell models, whether certified to 27/29.952 or not, currently have CRFS as part of their basic aircraft offering." **Christopher Moss Photo**

it feels more accurately predicts actual industry costs."

According to an FAA statement attached to the report, the working group's operator cost methodology does not follow the method of accounting for impact on empty weight and useful load that is used in other ARAC and FAA economic impact analyses. The FAA also noted that non-recurring costs are not broken down to a level that allows review and validation of costs from each manufacturer, and that international development costs are not split out separately, as they typically are in the FAA's economic impact studies.

By contrast, the Benefit Task Group did use FAA methodology to calculate the value of the lives that would be saved and serious injuries avoided if crash resistant seats and structures (CRSS) and crash resistant fuel systems (CRFS) were fully implemented in newly manufactured helicopters. This methodology values the avoidance of a fatality at $9.6 million, the avoidance of a serious injury at approximately $2.4 million, and the avoidance of a minor injury at $28,800.

By analyzing accidents of rotorcraft manufactured between 2006 and 2015, the group was able to confirm that compliance with the CRFS standards of 14 Code of Federal Regulations 27/29.952 is "extremely effective at preventing post-crash fires and thermal injuries." The group found that there were no post-crash fires in survivable accidents involving compliant rotorcraft, and that fully compliant CRFS are moderately effective even in extreme impact crashes.

However, the working group noted that its analysis was "greatly inhibited by the fact that neither [the National Transportation Safety Board] nor FAA determine impact conditions in an accident investigation nor injuries for the involved occupants," and that "lack of these data render occupant protection analysis almost impossible."

In a statement of non-concurrence attached to the report, working group member Krista Haugen pointed to the Frisco Flight For Life crash as an example of how the absence of detailed injury data can lead to underestimating the value of safety improvements. In the group's analysis, the flight nurse who suffered serious injuries in that crash represented a net benefit valuation of $2.4 million, yet his medical expenses alone are likely to be much higher than that — and that's without taking into account his lost earnings, the impact on his quality of life, or the burdens placed on family members.

"The thermally injured survivor of this crash sustained full-thickness burns to 90 percent of his body because of the post-crash fire. He was hospitalized in the burn intensive care unit for 11 months, with total hospitalization time just over 12 months," Haugen stated. "He will require medical care for the rest of his life . . . and it must be emphasized that he literally would have walked away with minor blunt injuries, were it not for the post-crash fire."

The lack of detailed injury data also makes it difficult to determine the effectiveness of designs that are in partial compliance with existing standards. For example, David Shear of Robinson Helicopter Company noted that Robinson has performed voluntary dynamic seat testing that "showed that the existing occupant protection features on the R22 and R44 are very effective," meeting the head impact criteria, lumbar spine load, and seat belt tension load requirements of 14 CFR 27.562. For these models, he claimed, "there would be little to no benefit if the design revisions required to demonstrate full compliance with [the CRSS standards of] 27.561, .562, and .785 were incorporated."

Likewise, working group member John Wittmaak of Bell Helicopter contended that "all in-production Bell models, whether certified to 27/29.952 or not, currently have CRFS as part of their basic aircraft offering. . . . Bell Helicopter believes efforts to certify currently in-production CRFS systems provide no benefit and ultimately delay availability and increase costs associated to retrofit solutions for pre-CRFS aircraft."

In its report, the working group observed that "partial implementation of the subject regulations may provide a significant portion of the benefits while avoiding much of the costs." The group expects to study this further in its next task phases, which will include making specific recommendations on how to implement existing occupant protection standards, or proposing new, alternative performance-based safety regulations.

The FAA stated that it will continue to work with the group, "with the desire to create a more refined cost-benefit analysis which aligns with other ARAC and FAA economic analysis to support the next tasking actions."

ROTOR BITS

ALPINE AEROTECH ADDS LEONARDO CAPABILITIES

Mike Reyno Photo

Alpine Aerotech has expanded its maintenance capabilities to include Leonardo aircraft.

"We are dedicated to supporting our expanding customer base, and being able to service Leonardo models provides a more comprehensive maintenance offering," said Jeff Denomme, president of Alpine Aerotech. "We have established a great relationship with Leonardo and recently delivered the first AW139 airframe fixture to the Philadelphia facility. We continue to develop, certify and manufacture new solutions to support our customers."

Alpine Aerotech provides maintenance support for leading helicopter makes and models around the world, operating with a wide variety of airworthiness authorities.

HAI ANNOUNCES NEW DIRECTOR OF SAFETY

Helicopter Association International (HAI) has announced the appointment of Dr. Steve Sparks as director of safety. Prior to joining HAI, Sparks was an aviation safety inspector for the Federal Aviation Administration (FAA) with the general aviation and commercial division in Michigan.

As director of safety, Sparks is responsible for managing the association's existing aviation safety programs, and developing new safety initiatives to benefit HAI's membership and the international helicopter community.

R66 to get wire strike kit

Robinson hopes to have the wire strike protection kit certified on the R66 Turbine by HAI Heli-Expo in March 2017. **Skip Robinson Photo**

BY SKIP ROBINSON

Robinson Helicopter Company and Magellan Aerospace have partnered on the development of a new wire strike protection kit for the R66 Turbine helicopter.

Wire strike protection systems incorporate deflectors — which allow a wire to slide along the aircraft without snagging or damage to the aircraft — and cutter blades, which catch and sever the wire, affording a measure of protection to a helicopter and its occupants in the event of an accidental wire strike. Because the systems are required by many government and civilian contracts, the availability of a kit will allow the R66 to penetrate into new markets, in addition to enhancing safety.

The kit consists of two parts. The "provisions installation" comprises a strengthened windshield bow and cabin structure and mount points to which the wire cutters and deflectors are installed. The "wire strike components installation" includes an upper deflector and cutter, two lower deflectors and cutter, and a nose deflector, offering comprehensive protection that will still engage and cut a wire even if the helicopter is turning with roll.

In other notable design features, the kit does not impede use of ground handling carts, and the cutters and deflectors attached to the struts do not affect energy absorption during a hard landing — whereas some other designs limit landing gear deflection or require a break-away feature.

The provisions installation adds approximately seven pounds (3.2 kilograms) to the aircraft, while the components installation adds around 16 lbs. (7.3 kg), for a total kit weight of about 23 lbs. (10.5 kg). The provisions installation will be an option on new R66 helicopters and installed at the Robinson factory, while the wire strike components will be available from Magellan Aerospace. An aftermarket retrofit kit will also be available through Magellan distributors PAG, AAI, VTS, and Helimart.

In addition to the standard R66, the wire strike protection system will be available for the R66 Police helicopter and Newscopter, although the percentage of protected coverage will be somewhat reduced in these models due to the presence of the camera on the chin.

At press time, certification of the kit was expected by HAI Heli-Expo in March 2017, with the price yet to be determined. The R66 is currently the only Robinson model for which a wire strike protection kit is being developed, the company said.

ROTOR BITS

VECTOR EXTENDS ADS-B UPGRADES

Vector Aerospace has received Federal Aviation Administration (FAA) supplemental type certificate (STC) approval to extend its ADS-B solutions to cover the Airbus Helicopters H120/EC120, H125/AS350, H130/EC130 and H135/EC135 series, with operators able to choose from either the L3 Lynx NGT-9000 or Garmin GTX-345 transponders.

The L-3 ADS-B In/Out retrofit upgrade features an intuitive, panel-mounted touch-screen transponder, which replaces the aircraft's existing unit. Vector also offers a remotely-mounted transceiver with a compact cockpit control head.

Both ADS-B solutions offer ADS-B In/Out, internal GPS, 1090 megahertz extended squitter and UAT ADS-B In, along with Wi-Fi enabling for use with portable electronic devices (PEDs).

CANADIAN COAST GUARD RECEIVES FIRST BELL 412EPI

The first two of seven Bell 412EPI medium-lift helicopters were accepted into the Canadian Coast Guard fleet Dec. 8.

Helicopters are used in delivering key Coast Guard services, including ensuring the safety of marine traffic, performing icebreaking reconnaissance, maintaining aids to navigation and marine communications equipment, science and fisheries enforcement, and transporting personnel and cargo between ship and shore.

Bell Helicopter Photo

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525 to resume flight tests "within months"

BY OLIVER JOHNSON

Bell Helicopter is hoping to be able to resume flight tests of its 525 Relentless "witihin several months," and is coordinating with the Federal Aviation Administration (FAA) and National Transportation Safety Board (NTSB) on a return to flight date.

The program has been grounded since July 6, when the first 525 flight test vehicle crashed during flight testing, killing the two test pilots on board. The NTSB's investigation into the crash, which took place south of Bell Helicopter's XworX facility in Arlington, Texas, is ongoing.

"The NTSB and Bell Helicopter have focused the investigation on a sequence of events for which corrective actions are being implemented," said Larry Thimmesch, vice president of the Bell 525 Relentless program. "It's an important statement — it means we're moving forward. We're coordinating with the FAA and NTSB to resume flight tests in the next several months."

While the program is grounded, FTV2 and FTV3 are undergoing a variety of modifications, with the majority being production maturity changes typical of an aircraft development program, Thimmesch said.

However, "we do have some corrective action related to that accident," he added. "Obviously, we need to wait until the NTSB comes out with a summary of the findings to talk about what goes on; what we're doing as a corrective action process."

Bell is currently building aircraft 4 and 5, which will be the last two aircraft in the certification program, in full production configuration. Those aircraft will be used to certify the majority of the 525's kits and are scheduled to enter flight test in late summer or fall this year.

Thimmesch said Bell has been "integrally involved" with helping the NTSB with its investigation, and has taken the opportunity to forensically examine its own processes.

"It's a perfect opportunity for us to look at process improvement, just to validate everything that we're doing so that when we go back to the air, we're completely certain that we'll provide a safer, more reliable aircraft as a result of that," he said.

Despite the lack of flight activity, ground testing of the 525 has continued apace in the manufacturer's Relentless Advanced Systems Integration Lab (RASIL).

"Most of the testing that we do does not require the aircraft in the air," said Thimmesch. "I can test the entire aircraft with electrical tie-in, the actuation, all the avionics, all the hydraulics in that systems integration lab. . . . It is really game-changing in the capability that we have to learn to do those great things without flying the aircraft."

Before the accident, Bell had been targeting the end of 2017 for certification of the super medium 525, but the manufacturer is now looking to complete the process by the end of 2018.

Thimmesch said the remaining tests that had originally been scheduled to be completed by FTV1 have been reallocated to different aircraft — another reason the other two flight test vehicles required modifications.

"We had gone through the majority of our initial development envelope expansion, so we understand the aircraft very well, [and were] getting close to going to the next phase," he said.

In terms of technical support, the 525's maintenance manuals and flight manuals have been in development for some time, and have been used in flight test to validate the documents. On the maintenance side, 10 of the 13 maintenance training group meetings that are required for certification will have been completed by the end of this year, said Thimmesch.

Over at the Bell Training Academy, a 525 full flight simulator is now being installed and will be operational by the third quarter of this year.

The 20,000-pound gross weight 525 offers a standard seating configuration for 16 passengers and two pilots, with a typical cruise speed of 155 knots for distances of over 500 nautical miles. When certified, it will also be the first commercial fly-by-wire civil part 29 helicopter.

Flight test vehicles 2 and 3 for the Bell 525 Relentless program are undergoing modifications in anticipation of the resumption of flight test activity in a few months. **Bell Helicopter Photo**

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AW609 program presses ahead

Leonardo is now aiming to certify the AW609 tiltrotor in 2018. The aircraft first flew back in 2003.
Leonardo Helicopter Photo

BY THIERRY DUBOIS

Leonardo's Helicopter Division is gearing up for certification of the AW609 tiltrotor in 2018 — a delay of a year to the schedule it set prior to the fatal crash of the second prototype on Oct. 30, 2015.

Despite the accident, the manufacturer launched production late last year in Philadelphia, Pennsylvania, and has proceeded with initiatives to support regulation readiness at its entry into service.

Flight testing resumed in the summer, and the manufacturer will test the AW609 in flight behind a helicopter icing spray system (HISS) this winter, project pilot Gianfranco Cito said during the European Aviation Safety Agency's (EASA's) 10th rotorcraft symposium in Cologne, Germany, in December. HISS trials are required for flight into inadvertent icing certification, he explained.

To ensure EASA, Federal Aviation Administration (FAA), and International Civil Aviation Organization (ICAO) rules keep up with the advent of the first commercial tiltrotor, the Milan, Italy-based company has a roadmap for working groups to "analyze regulations." EASA's flight standards directorate organized a meeting about "the introduction of tiltrotor into EASA regulations" last July in Cologne. EASA intends to bring forward a rulemaking task for operations and licensing requirements, formally starting in 2017.

Next March, an expert group will discuss an ICAO convention Annex 16 amendment addressing environmental considerations. Formed by Leonardo, it will be supported by ICAO's committee on aviation environmental protection.

FAA baseline certification is expected in mid-2018, with the first delivery planned in the same year. In addition to the baseline approval, Leonardo has "a huge list of optional kits" to certify. One of them will be a maximum takeoff weight extension to 18,000 pounds (8165 kilograms), as the aircraft's appeal reaches beyond VIP transport operators, Cito said.

The AW609 first flew in 2003.

ROTOR BITS

WAYPOINT LEASES H225 TO GHS

Waypoint Leasing has agreed to lease one Airbus H225 to Global Helicopter Service GmbH (GHS), a German operator with a strong presence in Africa, for utility and humanitarian support missions.

"This transaction demonstrates Waypoint's confidence in opportunities for the H225, a modern, safe and efficient aircraft, which is increasingly displacing older, less capable aircraft in this market," said Ed Washecka, chief executive officer of Waypoint. "We believe that the performance and utility of the H225 put the helicopter in a strong position to deliver excellent capabilities in utility and humanitarian missions, and we are excited about working with GHS, a leading operator in the segment."

Robinson issues R22 safety alert

BY ELAN HEAD

Robinson Helicopter Company issued a new safety alert Dec. 22 after receiving a report of a cracked AO16-6 main rotor blade on an R22 helicopter used for cattle mustering.

The incident is also the subject of an airworthiness bulletin issued by Australia's Civil Aviation Safety Authority (CASA). According to the bulletin, the R22 Beta II was engaged in low-level, slow-speed operations when the pilot experienced an unusual increase in vibration levels and made a precautionary landing.

Subsequent inspection revealed a crack approximately 160 millimeters (6.3 inches) in length, emanating from the trailing edge and running chordwise toward the D-section spar. The bulletin notes that evidence of very minor corrosion was observed on the trailing edge of the blade, which had been in service for approximately 1,780 hours (of a life limit of 2,200 hours).

"The blade is currently being investigated by the ATSB [Australian Transport Safety Bureau] however at this stage details are limited with the root cause yet to be determined," the CASA bulletin states.

In its safety notice, Robinson identifies the area of the blade in which the crack occurred, and instructs R22 operators to perform a careful visual inspection of this area during the daily preflight inspection, using a stepladder if necessary.

The notice also states that if an unusual rotor system vibration is detected in flight, the pilot should land immediately and have the blades examined by a qualified technician. The CASA bulletin adds that "increased vibration levels should be reason to initially suspect a cracked blade," and cautions "against the practice of rebalancing the blade to enable return to service unless a thorough inspection of the blade has been carried out."

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ROTOR BITS

METRO AVIATION RECEIVES HELISAS STC FOR EC145E


Skip Robinson Photo

Metro Aviation, with the Genesys Group, has received a supplemental type certificate (STC) for the HeliSAS autopilot in the EC145e, a lightweight twin-engine aircraft maintaining the same power, performance and reliability of the legacy EC145.

The aircraft is now approved for two-axis autopilot. HeliSAS provides a full array of workload-reducing capabilities for visual flight rules pilots and provides situational stability, should pilots encounter instrument meteorological conditions in flight.

OUTERLINK RECEIVES NEW STC FOR EC145E

Outerlink Global Solutions has announced Federal Aviation Administration (FAA) supplemental type certificate approval of its fully integrated IRIS voice, video, flight data and broadband satcom system in the Airbus EC145e.

IRIS provides continuous aircraft and internal data, audio and video recording. The system can record up to 1,000 hours of data received from over 200 sources, depending on model type, giving the operator unprecedented insight into the operation of the aircraft. The system also includes internal, always-on wireless connectivity for electronic flight bags or for continuous data downloads.

IRIS is compatible with a full range of aircraft, from older analog models to the newest on the market. In addition, IRIS meets all aspects of the FAA 135.607 ruling.

Marenco founder steps down

Marenco Swisshelicopter is still aiming for certification of its SKYe SH09 by the end of 2017, despite the change of leadership at the company. **Eugen Burgler Photo**

Marenco Swisshelicopter CEO Martin Stucki has stepped down from his role at the company he created.

In a press release, Marenco Swisshelicopter's board of directors confirmed that Stucki "retired from his functions" at the company as of Dec. 5, 2016.

Effective Jan. 1, 2017, he was replaced by Andreas Loewenstein, who served in various roles at EADS and Eurocopter (now Airbus Group and Airbus Helicopters, respectively) before joining the French naval systems manufacturer DCNS in 2010.

Stucki is the visionary behind Marenco's flagship product, the SKYe SH09, a light single-engine helicopter that aims to compete with more established aircraft including the Airbus Helicopters H125 and Bell 407. An engineer and commercial helicopter pilot, Stucki began developing the concept for the clean-sheet SH09 in 2002, formally launching Marenco Swisshelicopter in 2007.

The company's identity is closely tied to Stucki. The name Marenco comes from "Martin Engineering and Consulting," and its headquarters in Pfäffikon, Switzerland, occupies a farmhouse that has been in Stucki's family for four generations, and continues to serve as Stucki's primary residence.

In its press release, Marenco's board of directors expressed its "gratitude to Martin Stucki for his visionary ideas, relentless efforts and entrepreneurial spirit that led [Marenco Swisshelicopter] from a most respected engineering bureau to the brink of becoming a full-fledged player in the helicopter industry."

The release went on to say, "The board of directors is convinced that Andreas Loewenstein together with the [Marenco Swisshelicopter] management and employees will accelerate the transition

from a technology pioneer to the first Swiss global helicopter provider and manufacturer."

The board confirmed that it remains committed to the company's Swiss roots and to expanding its business activities in Switzerland. A company spokesperson told *Vertical*, "The change of management does not affect our plans in terms of locations and we will continue as planned, specifically with Mollis where we have invested significantly and started the construction of the 4,000-square-meter [43,055-square-foot] assembly facility."

The spokesperson also told *Vertical* that the company continues to plan for initial type certification of the SKYe SH09 by the European Aviation Safety Agency in late 2017, with first customer deliveries in 2018. Swiss company Air Zermatt and Canadian operator Horizon Helicopters have previously been named as launch customers for the aircraft.

Loewenstein has 25 years of business development and strategy in the European helicopter and high-tech industries, having initially joined the French aerospace manufacturer Aérospatiale in 1991, according to his LinkedIn profile.

From 1994, he served as group vice president, strategy and business development for Eurocopter before overseeing the post-merger integration process of EADS Group from 1999 to 2002.

In the summer of 2002, he returned to Eurocopter, serving as deputy executive VP in charge of commercial programs and external relations, and then senior VP of strategy and company development. Since joining DCNS in 2010, he has served as executive VP of strategy and development, and executive VP of strategy partnership and innovation.

Eagle focuses on fleet management

BY ELAN HEAD

Eagle recently completed testing of the Eagle 407HP in the challenging environment of Papua New Guinea, where the manufacturer said it demonstrated impressive performance. **Rob Brown Photo**

For decades, Eagle Copters has been known as a leading helicopter leasing company and Bell Helicopter Customer Service Facility. Now, the Calgary, Alberta-based company is sharpening its focus on providing customers with comprehensive support solutions to help them manage costs and grow their profit margins in challenging market conditions.

At HAI Heli-Expo 2017, March 7 to 9 in Dallas, Texas, Eagle Copters is rolling out its new mission statement: "To partner with our customers to ensure they safely execute their missions by providing worldwide complete fleet management." Or, as Eagle vice president of sales and marketing Stephane Arsenault put it: "You fly, we do the rest."

According to Arsenault, "The current crisis the industry's going through prompted us to rethink what we were doing. . . . The reality is, the competition amongst operators has never been higher and the margins have never been lower. You have to think outside the box."

Eagle's diverse offerings, which include global parts and logistics support in addition to leasing, sales, avionics, and maintenance, repair and overhaul services, allow customers to do that. With offices in Chile and Australia, Eagle can support customers wherever they might be working.

"Right now, [operators] have to go where there is work," Arsenault said. "We have the capability with our network and our global footprint to support that."

The overarching goal is to help customers cut costs and maximize uptime by leveraging Eagle's capabilities and expertise. And Eagle has been applying that same efficiency-maximizing philosophy to its own operations — for example, by outsourcing its engine overhaul business to overhaul specialist Ozark Aeroworks.

"It was a difficult decision, but overall it was the right decision for us," Arsenault said of Eagle's joint venture partnership with Ozark Aeroworks, which launched in 2015. "We've been able to save on costs, which we've been able to pass on to our customers."

Meanwhile, Eagle is also seeing growing interest in its Eagle 407HP conversion, which replaces the Rolls-Royce C47 turbine engine in the Bell 407 helicopter with a Honeywell HTS900. At Heli-Expo, Eagle will display a 407HP recently converted for Helicopter Express — the eighth 407HP to be delivered, and Helicopter Express's second. Eagle recently placed an order with Honeywell for eight more HTS900 engines for additional conversions.

According to Arsenault, the increased hot-and-high performance of the 407HP is helping customers stand out in a crowded and competitive market. "It's a way for operators to differentiate themselves," he said. "The 407HP does provide a payload increase that operators can get paid for."

Robinson delivers 12,000th helicopter

On Dec. 23, 2016, an R66 (S/N 0763) became the 12,000th helicopter to roll off Robinson Helicopter's production line. "A nice way to end the year," said Robinson president, Kurt Robinson.

The R66 will be delivered to Hover Dynamics, one of three long-time Robinson dealers in South Africa. The helicopter was purchased by a new charter and tour operator, Fly Karoo Air Services, operating in the area of Graaff-Reinet.

Robinson's first two-place R22 was produced and delivered in 1979, the first four-place R44 in 1993, and the first five-place R66 in 2010.

The Robinson team celebrates the landmark deliver of its 12,000th aircraft at the manufacturer's facility in Torrance, California. **Robinson Photo**

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Airbus Reveals Helionix 'Step 3'

BY THIERRY DUBOIS

Airbus Helicopters is planning on having a new version of its Helionix avionics suite certified this year for the H135, H145 and H175. Improvements will focus on the helicopter terrain awareness and warning system (HTAWS) and synthetic vision systems (SVS) on all three models. The H175 will also benefit from a more advanced search-and-rescue (SAR) mode, as well as automated rig approaches.

The software update, dubbed "Step 3" on the H175 and "Maintenance Release 1" on the other two types, will be the same, except for those functions that require special equipment, such as for SAR.

HTAWS algorithms have been improved to recognize a situation when the helicopter is normally close to the ground, Christian Franot, manager of the Helionix program, told Vertical. A lot of false alarms are thus avoided.

The previous version of Helionix did include an SVS but it was only displaying terrain. Obstacles, helipads and objects like roads have been added. The pilot may want to declutter the display by removing some objects, Franot adds.

The digital map has been augmented, too. Ships and rigs are now identified thanks to their automated information system (the equivalent of a transponder). Information is displayed only at the altitude range that is useful for the crew. Moreover, in response to customer feedback, the avionics suite can hold larger maps.

Other customer feedback has also been taken into account. SkyTrack and SkyConnect — two solutions for an operator to locate their aircraft and receive maintenance notifications — can be integrated. The instrument panel has been simplified thanks to the replacement of "hard" radio controls with "soft" controls on a display.

For the H175, the main application of which is in offshore oil-and-gas, approaches and takeoffs have been automated. The GPS-navigation-assisted software program is the same as the H225's Rig'N Fly, now described as an Airbus family concept. It aims to make approaches and takeoffs safer and simpler at platform-based helipads. Rig'N Fly reduces pilot workload, allowing the rotorcraft's crew to focus on monitoring flight parameters and the outside environment. Once the approach is prepared, only two pilot inputs are required. The system can be used even if the oil platform has moved. Approach flight paths are thus much more standardized.

On the H175, pilot workload has been reduced for SAR operations, too. A search radar, an optronics system (including sensors in visible light and infrared) and a search light have been integrated.

The latest Helionix update will be available as a retrofit. "For software-related retrofit, we want customers to be able to do it themselves as a download, with a service bulletin," Franot said.

Helionix uses three displays on the H135 and the H145, and four displays on the larger H175. A two-display variant is being studied as a lighter, simplified version for a smaller helicopter.

Airbus sees VIP growth in slumping N. American market

Airbus sold 64 aircraft in North America in 2016, with the H125 AStar being the most popular choice among customers. **Anthony Pecchi Photo**

BY OLIVER JOHNSON

Airbus Helicopters released its annual results for North America in early February, revealing a total of 64 orders for the manufacturer in the U.S. and Canada as a slumping civil turbine helicopter market saw just 100 aircraft purchased across the continent in 2016.

Chris Emerson, president of Airbus Helicopters Inc. and head of North American operations, told *Vertical* that while he had expected it to be a tough year, the final figure represented just 50 percent of the 200 North American sales across the OEMs that the manufacturer had forecast at the start of the year.

The biggest seller was the H125 AStar, followed by the H145, H135 and H130, with a growing interest from the VIP/corporate sector. Of the 64 sales the manufacturer recorded, 20 were to new Airbus customers, and five were first-time helicopter owners. In previous years, Emerson said, Airbus would have added five such customers to its entire global fleet. And, of the 20 new customers, 75 percent were VIP clients.

"This was really hunting, it was intense, [and] it put us in a vulnerable situation at times, because we were talking to customers who really had a different expectation of us," said Emerson. "We were selling to customers who said they could only do training on the weekends — and we've never trained on the weekends. We had to gear up our whole training organization, and the flight line, because you have to have helicopters maintained to be available seven days a week. And, in January, we started our first ab initio training."

Emerson added that the sale of an H145 to Dallas Cowboys owner Jerry Jones showed the company that there was a realistic market out there of high net worth individuals who would purchase a helicopter to combat increasing commuting times — and this resulted in sales throughout the year.

In terms of other sectors, law enforcement sales were as the manufacturer predicted, the utility market was down, and so was the air medical segment.

"Of course, it was also an election year, and a lot of these [air medical] operators were not sure what was going to happen with Obamacare," said Emerson. "So I think a natural postponement of aircraft acquisitions was inevitable."

However, Airbus noted "a bit of a reversing trend" with a pickup in sales of light twins in the air medical market — after 2015 saw a general shift away from light twins towards single-engine aircraft.

Emerson pointed towards his company's efforts to control more of the completions process as part of the reason for its success with new clients, growing the amount of completions that it managed or performed from 30 to 90 percent.

"All of this goes to managing the customer experience," he said. "I don't want someone buying an Airbus helicopter and having a poor experience. I want them buying an Airbus helicopter and going back to their friends and saying, 'That was such a great experience — you should try it.' And, in a sense, that's what happened."

Other company initiatives included improving the availability of spares and enhancing its engineering capabilities, and Emerson said the company's efforts to improve its support services were recognized by its customers.

HOPE FOR AN IMPROVED 2017

The exact impact of the Trump administration may be hard to pinpoint at this early stage, but Emerson hopes it will result in sales to Customs and Border Protection, as well as an influx of military spending that could unlock some opportunities for the Lakota with additional Army orders and perhaps for initial pilot training for the Air Force.

"They do the Air Force initial pilot training in Fort Rucker where there are 200 Lakotas," he said. "Doesn't it make sense to have a Lakota [for the Air Force] as well, where you can benefit from the support infrastructure that Fort Rucker has?"

On the civilian side, Emerson said he was hopeful that Airbus would see some activity around the H160 this year, following discussions it has been having with "a lot" of operators about Airbus's new medium-lift aircraft.

However, the super medium H175, which made its debut in Europe back in December 2015, is still to enter service in North America.

"We've come to an agreement with the FAA [Federal Aviation Administration] on the certification of Helionix Step Two, which should occur in spring this year," he said. "With that, the 175 completes its certification in the U.S., and we are working on a handful of deals right now that one could see a delivery in the U.S. at the end of the year, maybe the beginning of next year."

A major recent development for the manufacturer's ever-popular H125 was the certification of the BLR Aerospace FastFin system for the aircraft, which will be offered as an option on new aircraft and as a kit for existing AStars.

"Obviously utility and air medical operators are very interested in it," said Emerson. "We haven't sold any yet, but we really haven't been actively marketing it yet."

Despite the challenges that lie ahead, Emerson was optimistic about the outlook for 2017. "My ambitions are even higher this year," he said. "I don't see any reason why we shouldn't end the year better than we did last year."

Precision Flight Controls Launches Bell 206 Sim

Precision Flight Controls, based in Rancho Cordova, California, in partnership with Ryan Aerospace of Southport, Australia, formally introduced its helicopter advanced aviation training device (AATD) at the 50th annual I/ITSEC Training and Simulation event held in Orlando, Florida. The conference is the world's largest training and simulation event of its kind. The HeliMax simulation system is based on the Bell 206 JetRanger and sports a full avionics suite including a fully functional G530 WAAS GPS with a second NAV/COM radio, ADF and transponder. The simulator is pending Federal Aviation Administration AATD approval and is expected to qualify as a Level 7 FTD in mid-2017.

ROTOR BITS

HELITOWCART REFRESHES PRODUCT LINE

Helitowcart Photo

Helitowcart has refreshed its product line with a new version of its sturdy wheels for Robinson helicopters. This new version allows a pair to be used both inside and outside skids to fit all Robinson versions from the early R44s to the latest R44s and R66s. The arms can also be used left or right and cranked forward or aft as preferred. Helitowcart said the design significantly improves efficiency and lowers operating costs.

The company also introduced an "Easy Roll" wheel type, made from high quality solid rubber to facilitate helicopter handling over hard surfaces.

SW-4 'SOLO' TAKES FLIGHT

The Leonardo SW-4 Solo took its first flight on Dec. 15, 2016, at the Taranto-Grottaglie Airport, beginning a test campaign to verify the remotely-piloted helicopter's operational characteristics and validate flight procedures in both normal and emergency conditions.

The Solo, derived from the SW-4 helicopter produced by Leonardo in Poland and equipped with advanced systems and sensors also made by the company in Italy and the U.K., is designed to operate with or without pilot on board. The aircraft recently returned from a successful demonstration campaign in the U.K., and is targeted towards activities such as hydrological and critical infrastructure monitoring, firefighting, search-and-rescue, patrol, and disaster relief activities.


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HAI names Salute to Excellence awards winners

Helicopter Association International (HAI) has announced the recipients of its 2017 Salute to Excellence Awards, which will be presented March 8 during Heli-Expo in Dallas, Texas.

The awards honor pilots, maintenance technicians, operators, safety professionals, and others who HAI determines have demonstrated a commitment to excellence that has enriched vertical aviation.

The recipient of the Bell Helicopter Lifetime Achievement Award is Dr. John Leverton, who is being recognized for his lifetime of service dedicated to the aviation industry. Leverton has spent his career studying and promoting helicopters, working with many manufacturers on aspects of noise measurement, environmental assessment issues, public acceptance of helicopters and civil regulations.

Robert Fournier and Trent Vick are the 2017 winners of the Appareo Pilot of the Year Award. While working on a fire in Riggins, Idaho, they received an emergency dispatch to the Copper King Fire. The two pilots worked several long days dipping water from a deep spot in the Clark Fork River near Thompson Falls, helping contain the fire that threatened ground crews and kept it from progressing to nearby homes.

The Trinidad and Tobago Air Guard is the winner of the Leonardo Humanitarian Service Award for providing an invaluable service far past its shores for the benefit of those in other Caribbean nations. It operates two Metro Merlin C-26B fixed-wing and four Leonardo AW139s, and has rescued lost hikers, airlifted victims of shark attacks and injured sailors, fought and extinguished threatening bush fires, helped vessels in distress, evacuated stranded individuals from otherwise inaccessible land, and conducted medical evacuations from vessels at sea.

The Airbus Helicopters Golden Hour Award will be awarded to Era Search and Rescue. Era pioneered the first U.S. commercial search-and-rescue (SAR) program, in partnership with Priority 1 Air Rescue. Era's SAR program has responded to more than 1,050 emergency calls from more than 70 companies in the Gulf of Mexico.

Vertical 911 contributor Jack H. Schonely is the winner of the MD Helicopters Law Enforcement Award, recognized for dedicating his professional life to promoting professionalism in, and the advancement of, helicopter use in airborne law enforcement in the U.S. and around the world.

Schonely, a nationally-recognized expert on suspect tactics and perimeter containment, spent more than 33 years in law enforcement. He worked as chief tactical flight officer and later command pilot at Los Angeles Police Department (LAPD), where he served until his retirement in June 2016.

The winner of the BLR Aerospace Safety Award is Bryan Smith, pilot for the Seminole County (Florida) Sheriff's Office and safety program manager for the Airborne Law Enforcement Association.

Smith has dedicated countless hours to developing and advocating safety solutions for pilots and operators worldwide. He has flown both fixed- and rotary-winged aircraft in law enforcement aviation for 11 years and has been a regular instructor at aviation events around the world for the last eight years.

Winning the W.A. "Dub" Blessing Flight Instructor of the Year Award is Nick Mayhew, senior program manager, L3 Link Simulation and Training. As chair of the U.S. Helicopter Safety Team (USHST) Training Work Group, Mayhew has been instrumental in leading major projects to completion, and he has been a strong advocate for improving pilot performance related to autorotations and emergency procedures training.

Finally, Carl Jones, Bell 205 and 412 crew chief at the National Research Council (NRC) of Canada, has been revealed as the winner of the Rolls-Royce Excellence in Helicopter Maintenance Award. Jones is described by colleagues as "a dedicated, hardworking individual who epitomizes the type of AME [aviation maintenance engineer] you want working on your helicopter."

A regular attendee at trade shows like Heli-Expo, Jones is said to always be on the lookout for new technology to increase his organization's capabilities — such as a new step and door roller system for a Bell 412 or a cycle counter system for a Bell 205.

The awards will be presented at the annual Salute to Excellence Awards dinner during HAI Heli-Expo 2017.

ROTOR BITS

BELL MAKES LANDMARK PRAGUE DELIVERY

Bell Helicopter has completed the first fully-customized aircraft from its new European state-of-the-art Customization and Delivery Center located in Prague, Czech Republic. The customer, Air Transport Europe of Slovakia, accepted three newly-customized Bell 429 emergency medical service (EMS)-configured aircraft at Bell Helicopter's delivery center in Prague.

The Bell Helicopter facility in Prague is the manufacturer's official regional customization, delivery and aftermarket service center in Europe — complemented by Bell Helicopter's extensive support and service network located throughout the region.

R66 TURBINE MARINE RECEIVES EASA APPROVAL

On Dec. 20, 2016, the European Aviation Safety Agency (EASA) issued final approval for the R66 Turbine Marine pop-out float installation.

After tests conducted in July demonstrated the pop-out float installation meets Sea State 4 requirements, EASA officially approved the Marine to be used in emergency situations and for commercial operations.

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Samantha Willenbacher has worked in several high-profile leadership positions for Bristow, including director of Bristow Academy (formerly Helicopter Adventures), director of U.K. SAR, and now as regional director for the Americas.

COLUMN

Q & A | **INTERVIEWED BY OLIVER JOHNSON**

SAMANTHA WILLENBACHER

***Vertical:* Had you had any involvement with helicopters prior to joining Helicopter Adventures?**

Samantha Willenbacher: I didn't have any aviation background other than a huge enthusiasm for it as a kid growing up in London. My brother was a cadet in the Air Training Corps, and my dad was the chairman of the local ATC civilian committee. My family would always go to the military shows as well, so as a kid I always loved aviation. We lived pretty close to Heathrow Airport, and Concorde was still flying, and I could never not look up when that aircraft was around. I had an administrative background, and my first introduction to rotary-wing aviation was working at Helicopter Adventures in mid 1998.

I knew one of the owners and at that time, Bristow Helicopters Ltd. in the U.K. had the training school out of Redhill, and they had already started discussions with Helicopter Adventures, Inc. (HAI) because it was considerably cheaper to do training out of the U.S. without a degradation of the standards. My first job was typing the manuals for the European approval so HAI could get CAA approval so that Bristow could contract with HAI for cadet training.

***V:* How did your position evolve over the years?**

SW: I was very fortunate to have a boss who gave me some great opportunities. I started working from a marketing perspective recruiting students specifically for the CAA program. That was quite a challenge at the time as well, because we were the first school outside of the U.K. or even outside of Europe, to be able to get that approval. So there was quite an educating process. Then I was given the responsibility to recruit students for all of the programs, and then I focused on our contract clients. Bristow acquired HAI in 2007, and I was appointed as director of the Academy in 2008, when the previous owner was moved to Houston to become part of Bristow's senior management team. It was a combination of a lot of hard work and being fortunate to work for someone who was willing to give me a chance.

***V:* Working to establish the new civil SAR program in the U.K. must have been quite a different challenge, though.**

S.W.: That was the most fun three years I've had in my career yet. We knew what the expectation was from the client as to what we were to deliver, but what a great opportunity to transition over a service with a huge amount of history and have a blank sheet of paper to structure it the way we needed it to make sure we were successful and try to enhance it a little. So, a lot of challenges, but as I kept on reminding the team, if it were easy, then everyone would be doing it and we in fact were the chosen ones. It was an amazing team that was focused on our vision and on our mission, and I think it was at the Prestwick opening I called up the management team — the core team that delivered U.K. SAR — and standing shoulder to shoulder they were the length of an S-92. That's not a lot of people when you look at what we created. It demonstrates what a small group of people can do when you're all pulling in the same direction.

***V:* Ahead of the transition, there was a bit of skepticism in the U.K. about the privatization of SAR. How did you approach that?**

S.W.: Well, we knew that we were basically going to have to walk our talk. We were going to have to demonstrate that we were the right organization by doing and delivering what we said we were going to do. And that started right from the very beginning with stakeholder engagement at all levels. The helicopter service that we provide is just one piece of the jigsaw puzzle that creates a successful mission — there are other volunteer organizations and emergency services, and we had to provide them an assurance, that yes, the helicopters were going to be in a different paint scheme, and yes, they were going to be a different style of aircraft, but that we would do a lot of things that the military had been doing so that there was a continuity of service. We wanted to highlight how we were also going to try to make the service just a little bit better based on the technology that we had available to us. We knew the importance of making sure that people were kept informed, so it was really constant communication and acknowledging that there are a lot more people that we needed to involve outside of the Bristow organization.

***V:* Is your move to regional director of the Americas an indication of the company's plan to grow civil SAR in the U.S.?**

S.W.: Absolutely, search-and-rescue and the medevac service is something that is a differentiator for Bristow U.S. in the Gulf of Mexico. The organization CHI integrated 100 percent into Bristow from Aug. 1 last year, and we are working hard to create a consortium environment for search-and-rescue and medevac services primarily to support the oil-and-gas industry, but with the addition of an S-76 with medevac capabilities as well. We're also able to offer our services at a time of national crisis. In August of last year, our SAR AW139 and crews from the Galliano base actually assisted with the historic flooding that was experienced in South Louisiana, so absolutely search-and-rescue is something we're focused on continuing to grow in our region. We've got rescue recovery service that we're doing for a major oil-and-gas client in Guyana, we have rescue recovery service that we provide for a major oil-and-gas client out of our operations in Trinidad, so it's not something that we're playing at — this is a serious part of our region.

V: What are your other areas of focus?

S.W.: Our core business has historically been support of the offshore oil and gas industry, and we've already talked about search-and-rescue. We're looking at our current footprint to see where else it would make sense for us to expand, and then how can we integrate as well with the portfolio that we're expanding for Bristow being an industrial aviation company. How can we work with our governments team to be able to win and support government contracts? How can we integrate the services of SkyFutures into what we do through the use of UAS in conjunction with our capabilities in the Gulf of Mexico? I would say that the Americas region, out of the four regions of Bristow — Europe, Asia-Pacific, Africa, and Americas — has the biggest opportunity for growth.

V: Your career progression sounds very organic, but is there something we should be doing to attract more women to careers in the rotary-wing industry?

S.W.: I've never looked at gender; I've never felt I've had to work harder because I'm a female in order to be able to get recognition and position within the organization. And nor have I ever felt like I have been offered a position because I am a female and because they want to try to encourage women to get into the operations side. That's actually a really tricky topic for me to answer. More on the flip side, I would encourage females who are interested in getting into aviation to not allow their gender to be a barrier. You have to show that you're worthy of the role regardless of whether you're male or female. And I think that's what people need to focus on rather than what the industry needs to do as a whole to attract more women.

V: How has the industry changed over the time you've been involved with it?

S.W.: You can't be a successful aviation company and not have safety ingrained at the core of what you do, but the fact that it has just become so ingrained in our culture and the fact that you see that throughout our whole organization, throughout all of our approximately 4,500 employees, I would say that that is a major success and something that is really visible throughout the whole organization. The other thing is the introduction of new technology. We've got the introduction of the enhanced S-92 from a search-and-rescue perspective, you've got the introduction of the AW189 into both oil-and-gas and SAR, we've got the H175 that will be coming in, and then the partnership with Leonardo in relation to the AW609. I think from a technology perspective and the enhancement of the service, and the capability that that provides the crews — I would say that those are some of the biggest developments I've seen in the 20 years that I've been in rotary.

V: What's the biggest challenge you're facing over the next year?

S.W.: It's no secret that we're in a downturn right now from an oil-and-gas perspective, so we have to make sure that we remain focused on our clients so that we are able to provide the best possible service, that we keep a focus on cost control, that we look for opportunities for growth, but that we never in all these challenges lose sight of making sure that we do this safely. Because if we can't do this safely, there's no point in doing it at all.

This interview has been edited and condensed.

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GETTING THE SCOOP

With a highly capable Ikegami HDL-F30 HD camera and Canon 22 to 1 HD lens, the R66 Newscopter will be able to work at higher altitudes, meaning quieter operation for those below.

Robinson is developing an electronic news gathering version of its R66 that it says will be the low-cost, four-place, turbine-powered helicopter that news organizations have been calling for.

Story & Photos by Skip Robinson

The helicopter electronic news gathering (ENG) sector has existed since the late 1950s, when cameramen carrying heavy cameras on their shoulders first captured images as they flew in different versions of Bell 47s. Then, in the late 1960s, the first turbine-engine ENG helicopters entered the market in the form of Bell 206 JetRangers, Fairchild-Hiller FH-1100s and Hughes 500s. Although the aircraft were more powerful and had higher speeds, they still relied on unstabilized shoulder-mounted camera systems that resulted in low-quality, shaky images.

It wasn't until the early 1990s that gyroscopically stabilized cameras arrived in the helicopter ENG market, having completed the migration from the military to the civilian world. Gyro-stabilized cameras revolutionized ENG by allowing the camera operator to stay inside the aircraft and work the camera from a console; it also allowed the crew to work from higher altitudes, providing better coverage and reduced noise. Superior lenses also resulted in higher-quality images. However, the weight of these early gyro-stabilized systems demanded fairly powerful turbine-engine helicopters, such as the Airbus AS350/H125.

More recently, as technological improvements have enabled lightweight and more capable camera systems, Robinson Helicopter Company has seen considerable success with its piston-powered R44 Newscopter. Now, Robinson is building on that legacy with the development of a four-place ENG version of its R66 Turbine helicopter. There are now over 700 of the Rolls-Royce RR300-powered R66s flying around the world in almost every environmental condition, with the aircraft proving itself to be a powerful, reliable, and economical helicopter.

According to Robinson, the decision to move forward with the R66 Newscopter was driven by customer demand, with many inquiries from prospective customers in the United States, Australia, Brazil, Europe, and Canada. However, the company expects the R66 Newscopter to ultimately stimulate interest in countries with smaller helicopter markets, too.

The R66 Newscopter will fill a gap in the market between the R44 and more expensive turbine helicopters, such as the Airbus H125. As Robinson president Kurt Robinson pointed out, many

The five-axis gyrostabilized camera system is capable of 360 degrees of rotation.

With a Garmin G500H-equipped cockpit, the R66 Newscopter has the latest avionics layout.

A belly-mounted datalink pod is part of the Newscopter ENG package.

Even with extensive rear cabin video screens and interior camera layout, the R66 Newscopter still has room for four people.

Robinson believes there is a gap in the market for the R66 — offering an option for ENG customers between the piston R44 Newscopter and more expensive turbines.

> **WE'RE LOOKING FORWARD TO THE R66 NEWSCOPTER FOR SOME OF OUR HIGHER-ALTITUDE LOCATIONS AND CUSTOMERS THAT STILL SPECIFY TURBINE-ENGINE AIRFRAMES. THE ABILITY TO SEAT PILOT-PLUS-THREE IS IDEAL FOR IN-COCKPIT INTERVIEWS AND POOLED NEWSGATHERING CONTRACTS.**
>
> ***- KEN PYATT, OWNER OF SKY HELICOPTERS***

news stations stipulate a turbine helicopter in their contracts, and "we wanted to be able to compete in those markets."

The R66 Turbine's substantial increase in performance over the R44 promises increased margins for ENG operators working in hot-and-high environments. "We know the R66 can easily work in the desert environment of Arizona during the summer, and around Denver on hot days — [and] these are the extremes in the U.S.," said Robinson.

He added that some news stations require a news aircraft to be able to accommodate four people — something the R44 Newscopter can't do, as the aft right seat is removed to accommodate the junction boxes for the camera equipment. "The R66's increased size and baggage compartment allow room for four people, and the junction boxes for the camera equipment have been moved underneath the center rear seat [with] some also in the baggage compartment," said Robinson.

Despite this increase in performance and capability, the R66 Turbine's acquisition and operating costs remain low compared to other turbine-engine helicopters on the market. "We felt we could reduce the operating cost for news stations significantly when compared to the Airbus H125 or the legacy Bell 206 and 206L helicopters," Robinson said. The R66 also maintains a fairly low noise signature, helping reduce the likelihood of noise complaints from the public.

EVERYTHING TO GET THE SHOT

The standard R66 Newscopter incorporates a five-axis gyrostabilized camera system capable of 360 degrees of rotation, with an Ikegami HDL-F30 HD camera and Canon 22 to 1 HD lens. The talent cameras feature the Marshall Electronics CV345 with a Fujinon lens, and can be pointed at the copilot seat, aft left seat, or aft right seat. The aircraft also has an HD "lipstick" camera mounted on the

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tail for exterior shots. Optional equipment includes a longer lens nose gimbal (Canon 40 to 1 HD lens, plus optical doubler), a multi-band scanner, AM/FM radio, and additional TV tuner provisions.

In the aft cabin, a 10-inch monitor on a swing mount can be stowed out of the way for takeoff and landing. Other notable features include a switcher that combines four functions into one (signal generator, distribution amp, down converter, and switcher); three FM two-way radios; a Nucomm ChannelMaster Lite microwave digital transmitter; peak 13.5 dB directional microwave pod; and TV tuner provisions.

Up front, the avionics package includes a Garmin G500H glass cockpit, Garmin GTR 225A radio with GTX 335 transponder; two Geneva digital audio panels; two seven-inch monitors; and the customer's choice of a Garmin GTN 650 or 750. Robinson will also make additional optional equipment available, such as air conditioning.

Vertical spoke with Larry Welk, president of Los Angeles, California-based Welk Aviation — and an operator of seven larger ENG helicopters in Southern California — about the potential of the R66 Newscopter. "I'm not totally familiar with the equipment installed on the R66 Newscopter, but economics are key in this industry," he said. "If the operating cost of the R66 is lower with the speed, endurance, performance, and camera/transmit package generally comparable to a AS350 B2 or Bell 206, I think Robinson might have a winner on its hands. When it is available to the market, the R66 Newscopter is an airframe package we will look at very closely."

Sky Helicopters in Dallas, Texas, will be the launch customer for the R66 Newscopter. "We've been operating the R44 Newscopters for nearly 20 years, and currently have 10 in service at various locations around the U.S.," Sky Helicopters owner Ken Pyatt told *Vertical.* "Our network news customers are thrilled with the helicopter's reliability and quality of the camera and newsgathering equipment. We're looking forward to the R66 Newscopter for some of our higher-altitude locations and customers that still specify turbine-engine airframes. The ability to seat pilot-plus-three is ideal for in-cockpit interviews and pooled newsgathering contracts."

Kurt Robinson said the success of the R44 Newscopter was hugely helpful in developing the R66 Newscopter, having recorded numerous hours in a variety of different operating environments, markets, and TV cultures around the globe. "With this we were able to discuss our operators' likes and dislikes, and requests for the future, in order to try to make the R66 Newscopter meet the needs of as many people as possible," he said.

Robinson expects certification of the R66 Newscopter shortly after HAI Heli-Expo 2017, held in Dallas, Texas, March 7 to 9.

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

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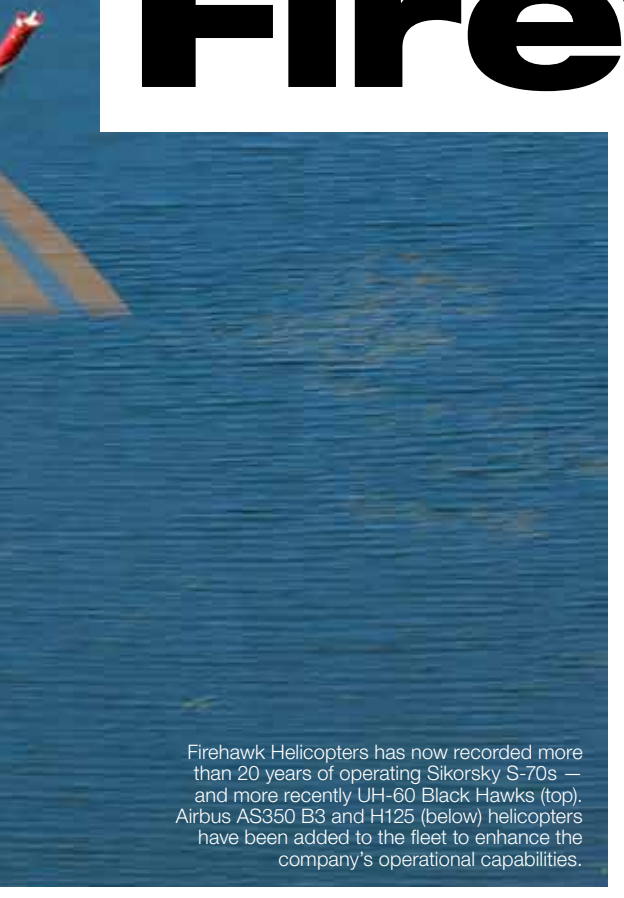
FIGHTING Fire with Fire

Firehawk Helicopters is the oldest member of the small but growing community of commercial Sikorsky Black Hawk operators. It wasn't an easy path to forge, but the type has more than proved its worth in utility and firefighting operations.

Story & Photos by Dan Megna



Firehawk Helicopters has now recorded more than 20 years of operating Sikorsky S-70s — and more recently UH-60 Black Hawks (top). Airbus AS350 B3 and H125 (below) helicopters have been added to the fleet to enhance the company's operational capabilities.

Supporting research and development projects for defense contractors has long been an important mission for the company. This recent project involved more than a dozen contractors to prove the concept of quickly configuring a utility Black Hawk into an armed attack aircraft.

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- ALEX ANDUZE, DIRECTOR OF EXPERIMENTAL FLIGHT, FIREHAWK HELICOPTERS

Presently, Firehawk provides four Black Hawks on exclusive use fire contracts and has two available as back-up aircraft.

The Sikorsky UH-60 Black Hawk has a long and distinguished history as a multi-mission military workhorse. First introduced in 1979, the Black Hawk's performance, ruggedness, reliability, safety and versatility continue to be held in high regard as it serves all branches of the U.S. Armed Forces.

The same capabilities that make the UH-60 so valuable to U.S. military operators hold a similar appeal to commercial operators. The S-70 — the commercial variant of the Black Hawk — has long been used by foreign governments for VIP transportation, medevac and military missions. But in recent years, the availability of the UH-60 to commercial operators has sparked wider interest in the aircraft within the civil helicopter industry, most notably among those involved in heavy-lifting and firefighting.

Of the small number of domestic commercial operators presently operating the Black Hawk, Firehawk Helicopters, based in Leesburg, Florida, stands out as the industry leader. Today it operates nine Black Hawks — five UH-60A models and four S-70s — and has the distinction of over 20 years of longevity and more than 14,000 accident-free hours.

"There is absolutely no better platform than the Black Hawk," said Alex Anduze, a former Army UH-60 pilot, Sikorsky test engineer and test pilot, and now director of experimental flight test at Firehawk. "And when somebody makes a statement like that, you have to ask, 'Well, what's the mission?' And that's the beautiful thing about the Black Hawk: it has incredible mission flexibility because of its power-to-weight and its ballistic tolerant design. It's the most durable and versatile and safe aircraft in the industry."

Company founder Chuck Brainerd is a former Army pilot who flew Bell UH-1 Hueys in Vietnam. "When I came home from Vietnam I had a desire to keep flying," he told *Vertical*. "But back in the early '70s there weren't a lot of helicopter jobs for the number of pilots that were out there, so I started out spraying orange trees, and from there when on to do some lift work for other operators in the area." He also flew research and development projects for defense contractor Martin Marietta, during


All four Firehawk AStars are now configured with the BLR FastFin, improving tail rotor effectiveness and aircraft stability, especially in high and hot conditions.


A standard Firehawk "unit" travels with an aircraft, pilot, co-pilot, crew chief and assistant crew chief; as well as mechanics, a crew truck, trailer, and a 5,000-US gallon fuel truck. **Skip Robinson Photo**

Three generations of Brainerds: Chuck (left), son Bart (middle) and Chuck's grandson.

which he developed a reputation for his skills, safety, and efficiency. He founded Brainerd Helicopters, Inc. in 1973, but continued to work for other operators for the first few years while his company established itself.

As Brainerd transitioned to focus all his efforts on his company, Martin Marietta offered him continued work if he could secure his own aircraft. So, in 1978, Brainerd arranged to lease a radial engine Sikorsky S-58 and began flying as an independent operator.

In the years that followed, Brainerd enjoyed a steady volume of research test flying with Martin Marietta and continued doing lift work throughout the South and East. In 1980, Brainerd took a decisive step in defining his future by purchasing the S-58. Six years later, he purchased a turbine-powered S-58T, and with it he launched an innovative helicopter emergency medical services (HEMS) program with Florida Hospital. The aircraft's large cabin accommodated a mechanical balloon pump for aiding cardiac patients and the program was heralded as the first of its kind in the country. After three years, Brainerd sold his interest in the operation and went back to flying for defense contractors.

DEVELOPING A FIREFIGHTING FOCUS

In 1987, Brainerd got his first taste of firefighting, and this would ultimately steer his business in a new direction. "We'd hang out wherever the fires were and try to get an order to go to work," he said. "That's how we fell in love with Boise; we'd hang out there to be near the action. So, we did fires and a little bit of lift work — just whatever it took to keep the doors open. It was a struggle. We should have been out of business about three times."

Firefighting became the core of Brainerd's business. But even with the addition of a second S-58T in 1990, he needed another aircraft to improve his company's capabilities. While the S-58Ts were good performers, they were also old and slow, and parts were limited.

"When we looked to replace the 58Ts, we had three primary criteria for what we were looking to buy: more speed, more lift, and less maintenance," said Bart Brainerd, Chuck's son and

Maintenance technician Levi Davis inspects and cleans main rotors after a busy fire season at the Boise, Idaho, base.

Senior maintenance technician Doug Boody joined Firehawk last year after 38 years with Sikorsky's Black Hawk program.

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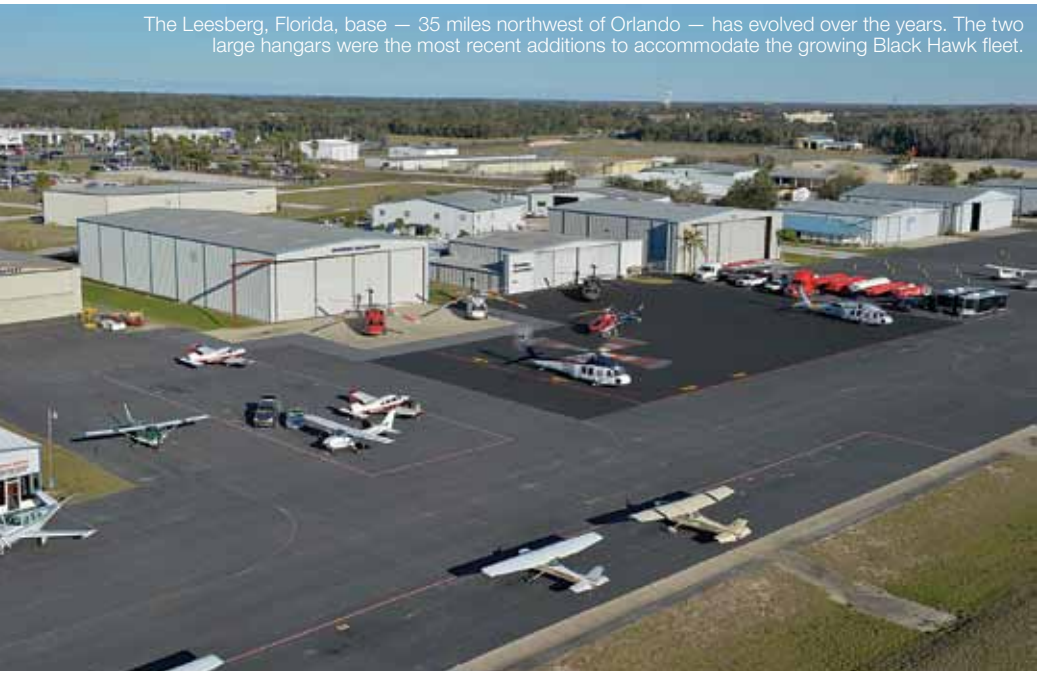
Firehawk acquired three UH-60As from the U.S. Army in 2012 through the Black Hawk Exchange and Sales Team program.

Brainerd bought his first S-70 in 1995, and it began firefighting operations in July 1996.

Brainerd/Firehawk Helicopters has been involved in aerial firefighting for 30 years, emigrating to the S-70 and UH-60 from the Sikorsky S-58T.



The Leesberg, Florida, base — 35 miles northwest of Orlando — has evolved over the years. The two large hangars were the most recent additions to accommodate the growing Black Hawk fleet.

Senior maintenance technician Roberto Velez, here inspecting a GE T700-GE-701C/D engine, is one of Firehawk's longest-tenured employees.

Jim Auxier is a maintenance technician and a sheet metal specialist.

Affectionally known as the "Hawk Nest," Firehawk's main hangar serves as the company's FAA-approved part 145 repair facility.

now the company president. "There are a lot of aircraft out there that are faster and carry more than a 58T, but none of them met the 'less maintenance' category. At the time, the Black Hawk was the only modern aircraft that seemed to change the game. It was significantly faster than the 58T, it carried twice the payload, it was a lot less maintenance, and it was a much safer aircraft."

In the mid '90s, when Brainerd first aspired to operate a Black Hawk, the aircraft had never been utilized by a commercial operator. The UH-60s were military assets, and the small number of S-70s that had been sold were in the hands of foreign operators: heads of state, governments and militaries. As a result, finding a used S-70 would require a global search for the proverbial needle in a haystack.

At HAI Heli-Expo in 1995, Chuck Brainerd asked around the Sikorsky booth to see if S-70s ever came up for sale. Sikorsky marketing manager Howard Whitfield told him of one in England that was originally owned by the company as a demonstrator. Engine manufacturer Rolls-Royce then leased it as an engine test bed for the RTM 322, and eventually purchased it. At the conclusion of the program, the engines were removed, and the aircraft then sat idle for two years.

Brainerd went to England to see the aircraft and made an offer on the spot. He then came home and put both of his Sikorsky S-58Ts up for sale. In August 1995, with one 58T sold, the deal for the S-70 was completed. It was loaded aboard a ship, transported to New Jersey, and trucked to Brainerd Helicopters' home base in Leesburg, Florida.

The company began a thorough refurbishment of the aircraft, but the problem remained of where to get the engines. Research revealed Westland had owned 12 GE T700 engines for its EH101 development program. As luck would have it, it had a pair of engines left over, and Brainerd made an offer to purchase them. Work on the S-70 was completed by Memorial Day the following year, and by July the aircraft was in the Western U.S. on its first firefighting contract. Brainerd Helicopters was rebranded as Firehawk Helicopters and became the first (and until two years ago, the only) commercial operator of the Black Hawk.

Three of Firehawk's hardworking firefighters: N2FH is an S-70C and once served as the Sultan of Brunei's personal aircraft; N17FH was acquired from the BEST program as a UH-60A that Firehawk upgraded to an A+ (the first in the civil world) with two T700-GE-701D engines; and N136BH is an S-70A that once served the Government of Hong Kong.

EXPANDING THE FLEET

By the end of the decade, Firehawk had added three Aérospatiale SA-319B Alouette IIIs to its fleet to complement its utility and firefighting work. These aircraft were operational until 2003, when the company transitioned to Airbus AS350 B3/B3es (H125s). Today, it operates five Airbus AS350s, including one belonging to Brown Helicopter and another belonging to the U.S. Fish and Wildlife Service.

Firehawk acquired its second S-70 in 2001 from Sikorsky. It had previously served as the Sultan of Brunei's personal VIP helicopter, and had been refurbished for one of his daughters. The exterior paint was a glossy "OD green" with gold stripes. Inside, the rear cabin was described by Bart Brainerd as "everything you might see in a head of state VIP airliner." It had a salmon-pink leather VIP interior with seating for seven, captains' chairs, mirrors, automatic door locks, granite counters, a heavy silk carpet, and an automated glass partition separating it from the front cabin. And then there was the cabin and cockpit hardware — according to Brainerd, gold plating had been layered on the seat belts, door handles and switches.

In 2002, Brown Helicopters, Inc., a leading aircraft parts supplier located nearby in Pensacola, acquired three S-70As via auction. They had been in use by the Government Flying Service of Hong Kong in a search-and-rescue role. After acquiring them, Brown held the aircraft in storage until 2004, when it partnered with Firehawk.

"We entered into an agreement with them to operate those aircraft for them," said Bart Brainerd. "We began refurbishing the aircraft and converting them, from the search-and-rescue role they had been built for, to the firefighting role." The first of these aircraft rolled out and entered service in spring 2006. The second and third followed, one each consecutive year.

By 2008, Firehawk was operating five S-70 Black Hawks, but military operations overseas were making spare parts scarce. "Because of the war in Iraq and Afghanistan, parts were becoming increasingly hard to come by," said Bart Brainerd. "So, we decided to strip an airframe, cannibalize it, use all the spares to keep the other four aircraft flying, and then we sold just the bare airframe." This sacrifice allowed Firehawk to maintain its fleet of four S-70s through 2014.

Two of Firehawk's "special use" aircraft: N9FH is a UH-60A from the BEST program that has been completely refurbished and is presently for sale. The gray 60XP (foreground) has been maintained in its original military condition and now serves as a dedicated research and development aircraft for contractors including Lockheed Martin and Boeing.

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In 2012, the U.S. Army began the Black Hawk Exchange and Sales Team (BEST) program, which allowed it to begin divesting 600 to 800 "obsolete and non-excess" utility A- and L-model Black Hawks over a period of 10 years. This created a pipeline for commercial operators to purchase the aircraft through federal General Services Administration (GSA) auctions.

This was how Firehawk acquired three UH-60As in 2014. A fourth was leased from Brown Helicopters as a dedicated research and development aircraft. The refurbishment required to bring the aircraft up to commercial firefighting standards brought about a new partnership between the two companies along with a third, Dynamic Aviation of Bridgewater, Virginia, to create BHI H60 Helicopters. Together, this alliance co-developed a restricted category supplemental type certificate to allow commercial operations of UH-60As for firefighting and special operations.

As part of the refurbishment, two aircraft were upgraded to the UH-60A+ configuration by the installation of twin GE T700-GE-701D engines. This was a first for an aftermarket user, and enhanced performance dramatically. "We were thrilled with the upgraded hot and high performance and believe we currently own the two highest available payload aircraft in hot and high conditions in the history of the Black Hawk program," said Bart Brainerd.

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A GROWING COMMUNITY

Today, Firehawk's primary focus is firefighting. Heavy-lift operations remain a strong sector with the balance of work spread between flight testing for the technology and defense industries, and television and film work. The company is home to nearly 70 employees, including 16 full-time and six seasonal pilots, 28 mechanics, and a dozen administrative and support personnel.

Among Firehawk's many notable missions over the years, two stand out as especially significant. In 2003, it provided an Aérospatiale SA-319B Alouette III for 45 days to recover debris after the Space Shuttle Columbia disaster. Then, in 2005, Firehawk committed two Black Hawks to New Orleans, Louisiana, immediately following hurricane Katrina. They initially performed hospital evacuations and rescues of flood victims, then remained for over a year on contract with the New Orleans, Louisiana, Fire Department for firefighting.

While Florida remains the company headquarters, Firehawk has established a second base in Boise, Idaho. "As firefighting became more and more important to the company, we realized we could basically pay for a base by not ferrying the aircraft back and forth," said Bart Brainerd. "So we started up the base in Idaho as a maintenance base in between contracts where the aircraft could go and be maintained in the winter time." He added that as the company has grown, Idaho has slowly become the center of gravity for the Firehawk's operations.

"For 19 years we've held distinction of being the world's first and only commercial operator of the Black Hawk," said Bart Brainerd. "Now, thanks to the BEST program, we are just the oldest member of a small but growing community. It's exciting to see the opportunities developing in the marketplace as the number of available aircraft continues to grow. We are encouraged how the market recognizes the potential and even more excited that the aftermarket recognizes the potential to develop more products for the Black Hawk to increase its capabilities and utility."

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

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High on ADVENTURE

Platinum Helicopteros has carved its own niche in the Chilean helicopter industry, offering customized services for adventure-seeking tourists, as well as performing a full range of utility operations.

Story by Jen Boyer | Photos by Anthony Pecchi

From the towering Andes Mountains to the rugged Pacific coastline and weather-beaten Cape Horn, Platinum Helicopteros is carving a unique niche in the Chilean helicopter industry. In addition to taking on many utility helicopter operations common to life on challenging terrain, Platinum is paving new inroads by creating access to bucket-list adventures and capturing adrenaline-junky activities on film to inspire future visitors.

From a Chilean beach while the aircraft was refueled between flights, Platinum Helicopteros owner and pilot Jordi Seron shared the philosophy behind the company that is carving a unique niche in the South American country.

"Most helicopter companies here focus on utility work," Seron said. "There are a few flight schools, but not a lot of other operations. I started Platinum Helicopteros to do new operations in addition to utility work. Platinum is a boutique helicopter company. Of course, we do a number of utility jobs, but we expand from there into film and adventure. We are not the most inexpensive operator. We don't negotiate on price, but we are good and get the job done."

Seron began his helicopter career 18 years ago, when he was 21. With dreams of being a helicopter pilot and one day owning his own company, he flew to Langley, British Columbia, to attend Heli-College Canada. There he earned his commercial Canadian rating and received mountain and sling-load training.

Upon returning home, he landed at Lassa, the largest utility operator in Chile with 22 aircraft. Seron flew the Bell UH-1H for Lassa in firefighting, heavy-lift, heli-skiing and mining operations. While there, he met a future business partner and started his own utility company. While that partnership later ended, he didn't lose his resolve. He started Platinum Helicopteros in 2013 with a Bell 206, with the new goal of filling a unique niche.

Not long after forming Platinum, his friend Max Acuña, an engineer who also owned his own helicopter, suggested a joint venture. Acuña and his helicopter would join the company and Acuña would run the business side while Seron flew the majority of work. The partnership paid off in more ways than one. While Acuña earned his commercial rating and began flying for Platinum, he also put his engineering expertise to work to take Platinum the next level.

A Platinum Helicopteros Bell 407 returns to base with a setting sun behind it. The operator has bases in Santiago and Concepción, Chile.

HELI-BIKING IN THE ANDES

Tourists seeking outdoor adventure year-round come to Chile, drawn by the rugged Andes. Seron saw an opportunity to cater to this unique set with once-in-a-lifetime downhill biking trips.

"We started out joking about a company, HeliBikeChile.com, but we soon realized we could really make it happen," Acuña said. "But first we needed the equipment."

The trick was getting the bikes to the top of a 10,000-foot mountain where no roads existed. A supplemental type certificate (STC) for a specialized bike rack was available for the AS350, but not for Platinum's current Bell 206L or Bell 407.

Acuña went to work in early 2015 designing a rack, then applying for an STC through the Dirección General de Aeronáutica Civil (DGAC) — Chile's regulatory agency — for the Bell 407. The design allows for eight bikes, four on either side of the helicopter. The STC was granted in late 2015, allowing Platinum Helicopteros to begin providing the service that Chilean summer through HeliBikeChile.com.

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Platinum is looking to expand its fleet with the addition of a third aircraft — likely a Bell 407.

The company's Bell 207L is fitted with a Simplex spray system for agricultural spraying operations.

Platinum designed, built, and gained an supplemental type certificate for a bike rike for the Bell 407. It can carry up to eight bikes.

"The trip takes about 13 minutes up from Santiago, but the three-hour ride down is on single tracks that will blow your mind," Seron said. "That said, all of our trips are well planned and guided by very professional and medically-trained guides. The helicopter remains nearby should it be needed in an emergency as an extra level of support."

Using both helicopters, Platinum can take seven customers, a guide and eight bikes into the mountains for a heli-biking adventure.

With the success of the new venture, Platinum Helicopteros is now in the process of selling the heli-bike STC to DART Aerospace, making it available to other operators around the world while marketing the new adventure for a second season.

In the winter, Platinum shifts adventure gears to skiing. Seron, with his years of heli-skiing flight experience, and his guides know where the best virgin powder can be found. He flies customers, their equipment and a guide to remote spots between 14,000- and 15,000-feet for an Andes downhill run to remember.

"Just like our heli-biking, we only provide this service with a guide and all the safety equipment," Seron said. "It's an extreme downhill experience. I have to be honest, I'm a pilot, I have no idea how they do it, but the skiers love it," he added with a laugh.

In addition to ski and bike adventures, Platinum also offers chartered heli-fishing opportunities to places where there are no roads and the fishing is supreme. The company also advertises helicopter skydiving for those looking for an ultimate experience.

When it comes to aerial film work in Chile, chances are high Seron and Platinum Helicopteros are flying the camera. Platinum operates the only Bell 206 Cineflex mount in Chile, and has flown operations for heli-skiing movies, commercials, documentaries,

Platinum's focus during the winter months is on heli-skiing, and Seron knows the best spots for virgin powder at between 14,000 and feet.

The company flies about 1,500 hours of spray work each year, covering more than 12,000 hectares.

and even documents extreme events like the Red Bull's record breaking downhill bike race and Roberta Mancino's wingsuit flight over Chile's active Villarrica volcano with GoPro.

HAVE HELICOPTER, WILL TRAVEL

Operating out of Santiago and Concepción, Platinum Helicopteros also provides a range of utility, charter, and on-call services for a variety of customers.

Chile's fire season runs from November to April, and can often be fierce due to the terrain and high temperatures. Utilizing Bambi Buckets, Platinum puts both helicopters to work, flying an average of 100 hours a month on fires during the season.

The country's remote and rugged terrain also calls for helicopter support for multiple power line and utility equipment installations, repairs and inspections.

"We have a lot of work maintaining electricity and cell phone towers," Acuña said. "The towers have to be located in very remote places to serve the people of Chile. We perform a lot of long-line and support work in the mountains for those companies."

Fitted with a Simplex spray system, the company's 206L serves a number of agriculture clients in the spring and summer, first spraying fertilizer blends then returning later in the season with insecticides. On average, the company flies 1,500 hours annually spraying more than 12,000 hectares.

Between April and September, Platinum supports mining operations in the mountains, providing seismic surveys and avalanche control as well as supporting remote mining sites with delivery of food, fuel and other resources when roads become impassable.

In the more populated areas, Platinum offers a heli-banner service, flying helicopter banners for events, festivals and corporate advertising.

And, located as it is on the Ring of Fire with more than 30 active volcanoes (that have erupted 15 times in the past 20 years alone), Platinum stays busy with volcanic surveys and ferrying volcanologists and engineers to remote equipment sites.

"We're very busy helping scientists with the volcanoes," Acuña said. "They are always going up to the volcanoes to measure heat, gases and other factors to help predict what the volcano will do next or when it will erupt. These sites are very remote; some you can only access by foot or helicopter."

When an eruption does occur, Platinum swaps hats and answers the call of Chile's ONEMI (National Office of Emergency of the Ministry of the Interior) to provide evacuation, supplies, and any other type of support needed in emergency situations. The company's long-line capability also allows for large deliveries of food and medicine to stranded citizens as well, Acuña said.

As a part of ONEMI's helicopter pool, Platinum responds to other natural disasters in Chile, providing support based on the need. The company has assisted in the aftermath of large earthquakes, tsunamis and heavy rain-caused floods. In the past, Platinum's rescue response work has included bringing in rescuers who can dig through rubble, flying in supplies, and providing emergency air ambulance evacuations.

Business is going strong, and Seron has plans to add another Bell 407 to the fleet soon.

"We're working on inventing new things," Seron said. "I can't talk about them, but in the same way we developed our own heli-bike rack, we're looking at new opportunities to provide new services here in Chile."

POWER PEOPLE

Vertical visited Pratt & Whitney Canada's headquarters in Longueuil, Quebec, to get the story behind one of the oldest names in the aviation industry — and find out how the engine manufacturer plans to develop the next generation of power and customer support.

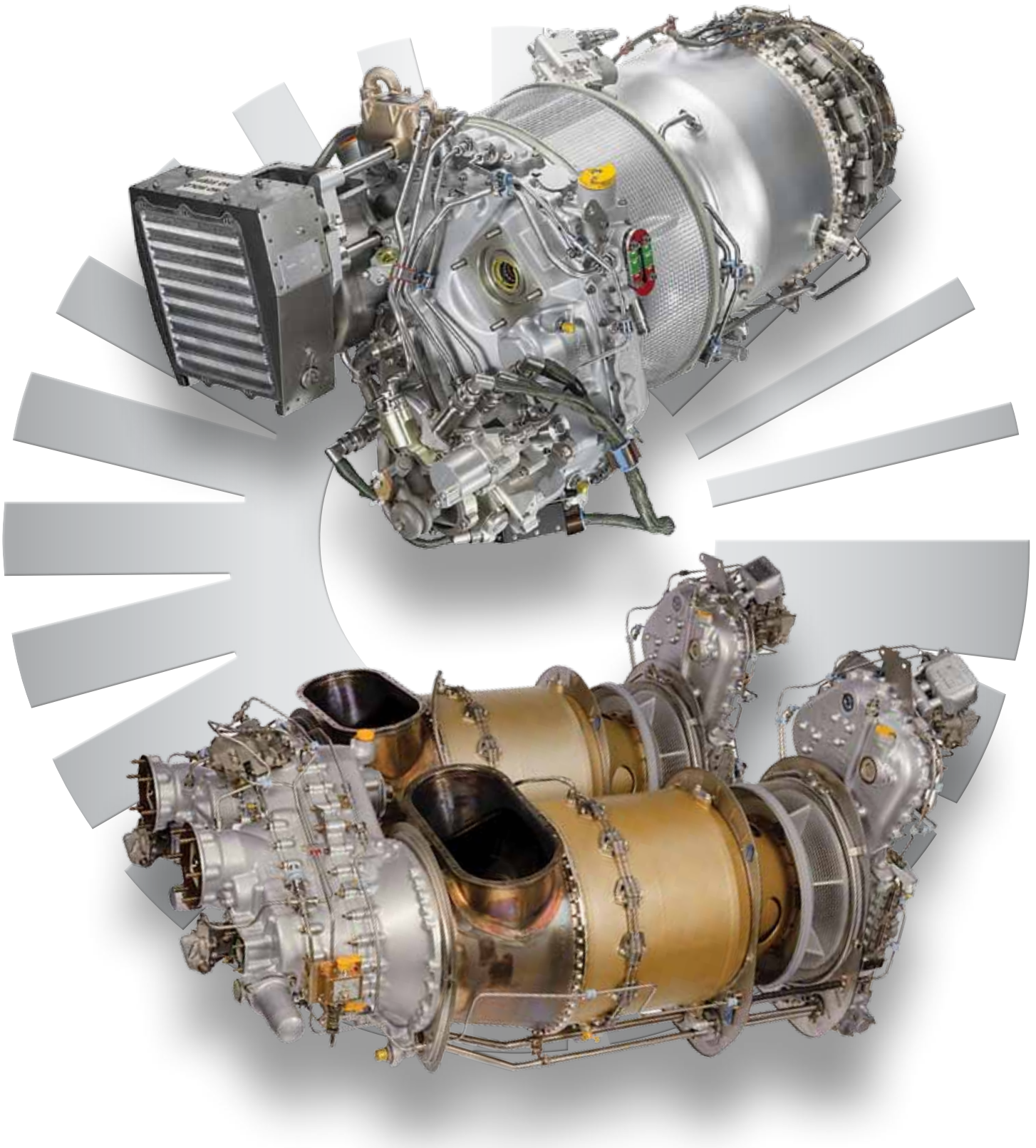
By Oliver Johnson

The waters of the mighty St. Lawrence River, the 1,190-kilometer (740-mile) arterial waterway that connects the Atlantic Ocean with the Great Lakes, almost seem to emanate history. Beginning with Jacques Cartier in 1535, the river was the basis for European exploration and settlement of the land that would eventually become Canada, with three of North America's oldest settlements — Quebec City, Trois-Rivières, and Montreal — founded along its banks. The latter is celebrating its 375th anniversary this year, the last century of which saw it play a key role in the development of the global aviation industry, and become one of the largest aerospace hubs in the world.

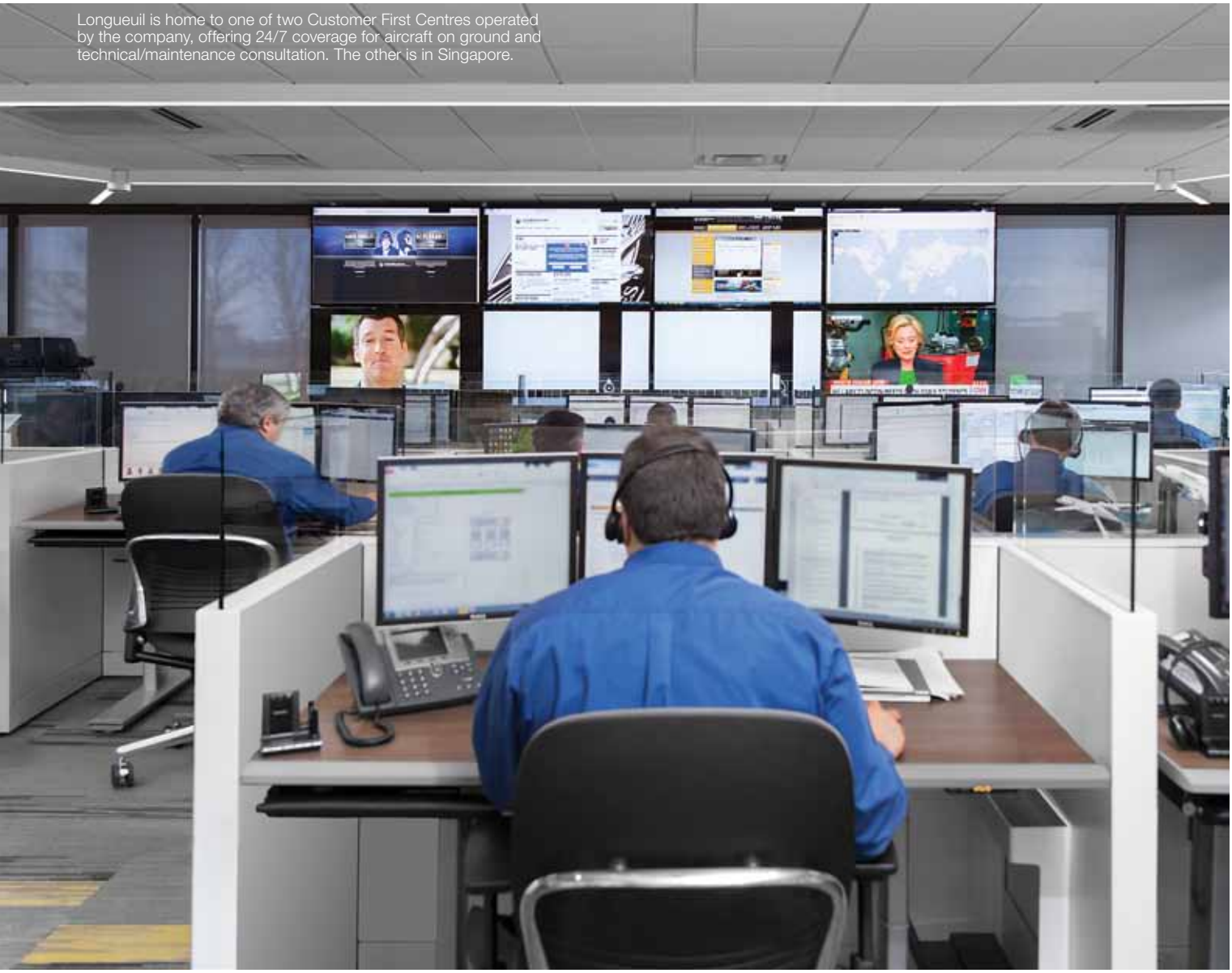
And it was because of this that I found myself standing on the south bank of the St. Lawrence on an unseasonably mild — but still frigid — January morning in Longueuil (a commuter city across the water from downtown Montreal). I was visiting one of the oldest and most familiar presences in aviation. Established in 1928, it will celebrate the production of its 100,000th engine this summer — 60,000 of which are still in service, operated by over 12,300 operators in 200 countries. Within the rotary-wing industry, its products power aircraft produced by Airbus, Bell, Leonardo, MD, Avic and Kazan. And in *Vertical's* first-ever engine manufacturer survey last year, you voted it the clear winner. That company is, of course, Pratt & Whitney Canada (P&WC).

The venerable manufacturer produces engines for four main business segments: general aviation, regional turboprops, business jets and helicopters; and also produces commercial auxiliary power units (APUs), including those previously manufactured by Pratt & Whitney in the United States. P&WC president John Saabas told *Vertical* that this diversity and industry experience give the company a competitive advantage.

ABOVE
From left: John Saabas, president of P&WC; Irene Makris, vice president of marketing at P&WC; and Tim Swail, vice president of customer programs at P&WC.



P&WC's presence in the rotary-wing market has been built around the PT6 (bottom, in its PT6T variant), which has a legacy stretching back over half a century. At the other end of the scale, the newest engine in its range is the PW210 (top), which received certification in 2011.



Longueuil is home to one of two Customer First Centres operated by the company, offering 24/7 coverage for aircraft on ground and technical/maintenance consultation. The other is in Singapore.

"Longevity itself doesn't mean anything, but the fact that we've been able to acquire new customers and develop new products — 100 new products in the last 25 years — gives us an edge," he said. "We have developed products that can cross all markets, we learn from all markets, and we bring that [knowledge] to each segment."

The company's sprawling Longueuil headquarters cover 165 acres, and include two main buildings that together span more than 1.23 million square feet. The facilities on this campus include P&WC's main manufacturing plant, its corporate and customer support offices, and the main engineering center where about half of the company's research and development (R&D) is completed.

In addition to its presence in Longueuil, P&WC has its main service center for engine repair and overhaul in St-Hubert, Quebec; its global flight test operations hub and engine assembly in Mirabel, Quebec; turbofan R&D and PW300 assembly and testing in Mississauga, Ontario; a specialized machining plant in Halifax, Nova Scotia; PT6 assembly and testing in Lethbridge, Alberta; an altitude testing facility in Ottawa, Ontario; and, together with Rolls-Royce, it operates the Global Aerospace Centre for Icing and Environmental Research in Thompson, Manitoba.

DEVELOPING A RANGE OF POWER

Over the years, P&WC has produced over 15,000 engines for helicopters, and about 9,000 of those are still in operation on 34 helicopter types. And of the 700 million flight hours accumulated across P&WC's product line, 55 million of those have been recorded in helicopters.

"The helicopter segment is a very important part of our business," said Saabas. "It's a segment that actually flies more hours per year than general aviation and business aviation, so it's one that has more activity through the maintenance cycle."

At the heart of P&WC's product line for more than 50 years has been the legendary PT6, and the engine's ties to the helicopter industry reach back to its earliest days — the first aircraft to have been powered solely by a PT6 was the experimental Hiller Ten99 helicopter.

The PT6B (1,000 shaft-horsepower), PT6C (1,600 to 2,000 hp), and PT6T (1,800 to 2,000 hp) product lines power aircraft including the Leonardo AW119 Koala, AW139, and AW609 Tiltrotor, the Bell 212 and 412, and the Airbus H175.

"The PT6 has stood the test of time in the sense of its reliability and durability," Tim Swail, P&WC VP of customer service, told *Vertical*.

The Airbus H175 — powered by the PT6C-67E. **Airbus Photo**

Two PW207D1 engines power the Bell 429. **Heath Moffatt Photo**

Two Era Leonardo AW139s take flight in the Gulf of Mexico. The aircraft's powerplants are PT6C-67Cs. **Dan Megna Photo**

A Sikorsky S-76D, flown by National Helicopter Services of Trinidad and Tobago. Providing the thrust are two PW210S engines. **Dan Megna Photo**

The L.A. Fire Department's Bell 412EP is powered by the PT6T-3D Twin Pac. **Skip Robinson Photo**

A P&WC engineer assembles a PW206C at the manufacturer's plant in Longueuil.

Looking out towards the mighty St. Lawrence River, P&WC's headquarters in Longueuil is in the heart of the aerospace hub surrounding Montreal, Quebec.

"It has very good features from a FOD [foreign object debris] tolerance and those perspectives, it fits into many configurations and we've continued — especially in the helicopter side — to insert material and component, manufacturing and technologies into the product to enable us to grow the power and improve the performance. We've then matched that with the evolution of the control system."

At the other end of the power scale is the PW200, which, although a relatively new engine compared to the PT6, recently celebrated 25 years in operation (the first application was in the MD 900).

Unlike the PT6, PW200 variants are only used to power rotary-wing aircraft, and it has proved a particularly popular choice among airframe OEMs for their light twin-engine platforms. The PW206 (430 to 560 hp) powers the Airbus EC/H135, MD 900 and Leonardo AW109 series; while the PW207 (570 to 650 hp) is used in the Bell 429, Bell 427 and the Kazan Ansat.

"They may not be our first engines, but we have a lot of legacy in them already," said Irene Makris, P&WC VP of marketing for helicopter engines. "We've got 3,500 [PW200 series] engines flying and 4,700 produced. We're pretty much 50 percent of the light twin market worldwide."

The newest engine in P&WC's product line is the 1,100-hp PW210, which flies in the Sikorsky S-76D and Leonardo AW169.

"The 210 brings together the architecture and some of the technologies we developed for the PW600 [turbofan], and some of the key features and lessons learned in 25 years of experience of the PW200, along with 25 years of FADEC [full authority digital engine control] experience from across regional and business aviation," said Swail. He added that the engine also has an APU mode, providing plenty of power even when the rotors aren't turning, and that this has been well received by air medical operators in particular, saving the cost and weight of an additional engine.

COMMITTING TO INNOVATION

The last five years have seen the PW210A, PW210S, and PT6C-67E all enter service (in the AW169, S-76D, and H175, respectively) — an indication of the investment made in innovation at P&WC. The company estimates that it spends about C$500 million each year on R&D across all business segments. Over the last 10 years, it claims to have invested more than C$3 billion in developing new products and technologies.

"We've never stopped investing simply because it's not a good year [in terms of revenue]," said Makris. "We're always looking at the future, always working with our OEMs, our operators, taking feedback and looking at developing the next engine that's going to meet their needs — and sometimes we're actually telling them what we have and where we need to go, and they actually will look at [building] the platform around our engine."

To address future requirements, P&WC is currently developing a new engine family that will produce power in the 1,400- to 2,200-hp range.

The PW210A, which powers the Leonardo AW169, achieved certification from the European Aviation Safety Agency in December 2014. **Simon Pryor Photo**

"The top end of that is the one place we don't play; the bottom of that is to replace our own products with more efficient engines," said Saabas.

Makris said the company's R&D department has already completed successful tests of new technology for the family, and has shared its progress with customers. Although it was reluctant to share too many details about programs still in development, P&WC did say that technology from its PurePower PW1000 and PW800 turbofans was being integrated into turboshaft engines on the drawing board.

The company is already working with a customer to launch the engine in a platform by around 2020, though Makris wouldn't share who that customer is. But, on the flip side, how early does an engine OEM become involved in discussions with an airframe OEM about the development of a new aircraft?

"We constantly have technology development discussions with all of our OEMs," said Swail. "Where are the trends? What are we working on? We're sharing with them the technology portfolios that we have, at a component, system, architectural and disruptive level. Where are we going? Where are they going? How do those things pair together? There's exchanges going on, starting with a quick analysis at a very preliminary level, moving up to increasingly detailed levels; it's a constant interaction."

While there continues to be industry pressure to develop engines that provide more power and greater efficiency, there is also an increasing focus on reducing their environmental footprint. To this end, P&WC has partnered with several leading Canadian universities to develop green technology, with different projects focusing on reducing emissions, noise, waste, and the use of certain chemicals and materials in the manufacturing process, and favoring suppliers who share the company's sustainability values.

In terms of green fuels, P&WC has been exploring the use of biofuels for decades, and believes their use will increase as the infrastructure to produce them is developed, and that with the right increase in scale, sustainable biofuel could be used by all commercial aircraft on a routine basis in five to seven years.

"We've demonstrated hybrid fuels on all our engines," said Saabas. "The bigger problem is you need to have aircraft and aircraft fuel systems, and a whole distribution network around alternative fuels to make it a viable thing long-term. But our

engines can tolerate biofuels. All you really need to do is do the maturity compatibility, and make sure the fuel flows are in line with the calorific content of the fuel. So you need a bit more fuel, because there's less energy in the fuel to get the same power."

And, as part of its push for greater production efficiency, P&WC has invested C$80 million in a Centre of Excellence for Advanced Manufacturing in Longueuil that features three advanced manufacturing cells, as well as C$60 million in Halifax for another two. Each cell is home to several robotic arms — similar to the type found in high-tech automobile production facilities — that machine parts as they work their way along the line. The level of precision of these cells is such that they achieve tolerances of less than one-fiftieth of the diameter of a human hair, resulting in a high-quality product with zero non-conformance — and therefore less waste.

> **"WE MAKE SURE THAT WE ARE WHERE OUR FLEETS ARE FLYING AND WHERE OUR CUSTOMERS NEED US. WHETHER IT'S A DOF [DESIGNATED OVERHAUL FACILITY], A SERVICE CENTER, TRAINING SCHOOL, OR PARTS DISTRIBUTION CENTER, WE STRATEGICALLY LOCATE TO MAKE SURE THAT WE'RE IN THE RIGHT PLACE.**
> ***- IRENE MAKRIS, VP OF MARKETING AT P&WC***

SUPPORTING THE PRODUCT

Out of 9,000 employees around the world, P&WC has 2,000 working in customer service — and the emphasis it places on supporting its products is something in which it clearly takes great pride.

"We make sure that we are where our fleets are flying and where our customers need us," said Makris. "Whether it's a DOF [designated overhaul facility], a service center, training school, or parts distribution center, we strategically locate to make sure that we're in the right place."

To that end, P&WC has over 30 company-owned and -designated overhaul facilities around the world; seven parts distribution centers; over 100 field support representatives (FSRs); 100 mobile repair team techs; over 850 rental/exchange engines covering 120 configurations; 13 customer training facilities in seven countries operated through FlightSafety International; and fully integrated aftermarket support at two Customer First Centres (in Longueuil and Singapore) that provide 24/7 coverage for aircraft on ground (AOG) and critical emergency services and technical/maintenance consultation.

Swail said the company is currently focusing its support on tailoring solutions to operators' individual needs, as well as reducing costs during a challenging time for the industry.

"We continue to evolve, but in the last two years we've put out the

A robotic arm on one of P&WC's cutting-edge advanced manufacturing cells at its Longueuil facility.

proof points that are showing our customers that we're willing to adapt to their specific business needs, and we've already done a lot," he said. "We've worked arrangements with companies saying, 'How can we help you through the oil-and-gas crisis? What are the specific things we can do together?' We've extended the TBO [time between overhaul] on the PW210 to 4,000 hours from 3,500, and dropped the pay-per-hour rates for the engine as well."

A key driving force within P&WC's support division at the moment is to move operators towards a planned maintenance environment, offering them greater predictability in their maintenance costs. "The next best thing to no maintenance is planned maintenance," said Saabas.

It has launched a suite of 30 service offerings under the "P&WCSMART" program — eight of which are directed towards the company's rotary-wing products. They include fleet maintenance programs across all product lines as well as solutions specific to certain engines, such as an engine exchange program for the PT6T3/3B. In addition, P&WC offers pay-by-hour maintenance plans for corporate operators and fleets. More than 10,000 engines are enrolled in these programs company-wide.

Among the diagnostic, prognostic and health management systems included within the program is P&WC's new Flight Acquisition Storage and Transmission (FAST) system, which is currently only available on the AW139 within its turboshaft unit. The FAST system automatically captures and analyzes a wide range of more than 80 engine and aircraft parameters and provides hands-free cellular transmission from the aircraft to P&WC. The results are then emailed directly to the operator within 15 minutes of the engines shutting down. The system is already in more than half of the Bombardier Q400 fixed-wing fleet, and Swail said P&WC is looking to expand it into other parts of the market.

"It's really bringing the HUMS [health and usage monitoring systems] experience and beyond that to the engine," he said. "It's getting very good customer response on the AW139, and we'll continue to make it available to other applications we have out there."

Another tool that will soon be at the disposal of maintenance technicians is P&WC's oil analysis program. Currently undergoing a customer trial across 3,100 engines, the program is billed as a next-generation solution for preventative maintenance. The system detects microfine metal particles in oil, allowing early identification of wear of individual oil-wetted components such as gears, bearings and seals.

"We're able to detect [at] minimum 100 hours sooner that the traditional SOAP [Spectrometric Oil Analysis Program]," said Makris. "And this is not going to be reserved just for us — we're sharing it with the industry, because safety is all of our responsibility."

The company expects the technology to be mature in the next 18 to 24 months.

Finally, the manufacturer is making strides in software support. Last year it rolled out MyP&WC Power — a new customer service portal, optimized for use from any device, that offers users the ability to manage almost any interaction with the manufacturer, from accessing technical publications and online tutorials, to ordering parts and submitting hours for maintenance programs.

Then, in November, it launched P&WC Onsite — an HD video collaboration system that essentially functions as a beefed-up and more secure version of Apple's FaceTime. It allows a customer with a maintenance issue to show the problem area via a live video link to a P&WC representative for advice — rather than having to wait for them to arrive in person. The technology even allows for a connection with a borescope through an adapter.

"Let's say they want us to sign off a repair, and we need to give them a letter to help their local authority to say, 'This is outside the manual, but it's ok,' " said Swail. "Now we have the detailed decision record instead of a paragraph, I've got a video image which is part of the record — and you can help make decisions faster. It's just another way we're trying to make sure we stay close to the customer and keep our reach at the most modern level."

And, according to Saabas, it's this drive to constantly improve its support — and the quality of its people — that are the keys to the P&WC's success. "The engine is very important, technology is very important, but it's new once and used forever," he said. "I think our support is our biggest advantage. Support comes down to the people you have, the relationships you have, and the availability. And the one comment we always get is that our people are great."

In an ever-changing industry landscape, P&WC has managed to stay on the leading edge of engine performance and customer support for almost 90 years. And, as it looks ahead to its century, its continued focus on innovation make its future look just as bright as its illustrious past.

Oliver Johnson | Editor-in-Chief of Vertical Magazine, Oliver has been covering the helicopter industry since joining MHM Publishing in 2012. He can be reached at at oliver@mhmpub.com. Follow him on Twitter @orjohnson_

Three variants of the EC135/H135 have been offered with either Pratt & Whitney or Safran engines. The latest is the EC135 T3/P3 (H135), powered on the Pratt side by PW206B3 engines. **Airbus Photo**

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RECORDING ISSUES

Helicopter flight data monitoring systems are now more capable and versatile than ever. Why has the industry been so slow to embrace them?

By Elan Head

As former U.S. Defense Secretary Donald Rumsfeld once notoriously observed, there are two kinds of unknowns: known unknowns, and unknown unknowns.

If you are a helicopter operator who employs pilots to fly your aircraft, you have a lot of known unknowns. You know that your pilots are flying from point A to point B at some altitude, along some route, and at some level of compliance with the flight manual. What exactly those altitudes, routes, and levels of compliance are, are unknowns — unless you have flight data monitoring (FDM) equipment to tell you. Then those known unknowns become knowns, and what you learn might surprise you.

There are a lot of benefits to be gained from turning known unknowns into knowns. If you know that pilots are consistently flying too low or aggressively, you can address those practices before they result in an accident or excessive component wear. Alternately, if you know that a pilot really was flying responsibly, you can use your evidence to disprove noise complaints or allegations of recklessness. For most operators who implement FDM, straightforward known unknowns like these are usually their primary focus.

Once they've implemented a proactive FDM program, however, many operators find that having a record of every flight is also invaluable for discovering unknown unknowns — "the ones we don't know we don't know," as Rumsfeld put it. And, in aviation as well as geopolitics, it's the unknown unknowns that tend to be the difficult ones.

Take a recent example from Fort McMurray, Alberta-based Phoenix Heli-Flight, whose president, Paul Spring, has been one of the helicopter industry's earliest adopters and most vocal champions of FDM. Two Phoenix Heli-Flight pilots aborted a night flight in an Airbus Helicopters EC135 when they noticed in flight that the rotor tachometer had failed. When questioned the next day, the pilots were certain that the tach had been working on takeoff. Cockpit video showed that the pilots had called it out as functioning on their pre-takeoff checklist — but incorrectly, as the tach had actually failed its startup self-test due to a simple electronic glitch.

For many years, flight data monitoring systems were only practical for large aircraft, but FDM equipment for light helicopters has now been available for over a decade. Even so, many helicopter operators have been reluctant to implement FDM. **Julien Sollberger Photo**

FDM has long since become a contract requirement for offshore oil-and-gas operators, but few customers outside of the offshore sector are aware of or interested in FDM.
CHC Photo

Thanks to the cockpit video recorder installed in conjunction with FDM equipment, not only did Phoenix Heli-Flight save the cost of a new rotor tach, its pilots were made aware of errors in their own cognition (an unknown unknown). Now, Spring said, "that crew has it in their mind that they can't just skim through their checks."

FDM is not a new concept. Under the name of flight operations quality assurance (FOQA) it has been used in commercial airlines since the 1970s. In the helicopter industry, it was first introduced in large, transport-category helicopters in the North Sea with the Helicopter Operations Monitoring Program (HOMP) trial in the late 1990s. Since then, it has become a standard contract requirement for most offshore oil-and-gas operators, and operators including Bristow and PHI have been using it in their light helicopter fleets for a decade.

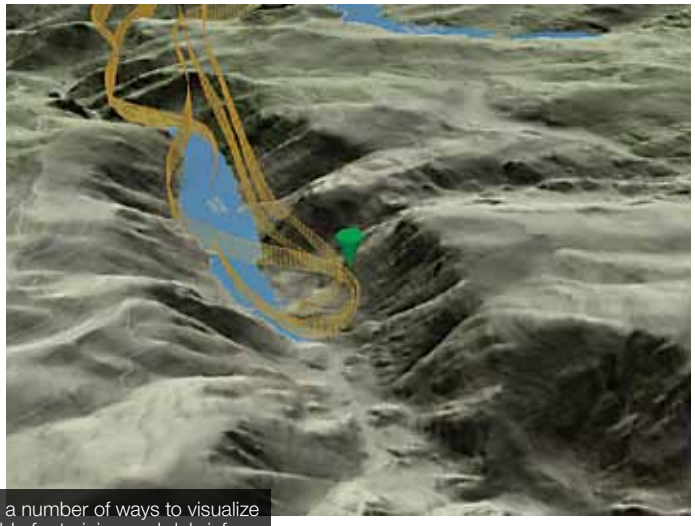
In recent years, the FDM technology available to operators of light and legacy helicopters has advanced dramatically. New FDM systems can monitor hundreds of parameters, and even transmit flight data via satellite in real time. Moreover, a number of third-party companies now offer flight data analysis services, making it easier than ever for small operators to start an FDM program.

While there can be legitimate concerns with the way in which any particular FDM program is implemented, the preventive safety benefits of FDM are widely recognized. In a worst-case scenario, FDM equipment can provide a wealth of evidence to accident investigators, eliminating uncertainty and allowing them to make informed recommendations on how to avoid similar accidents in the future.

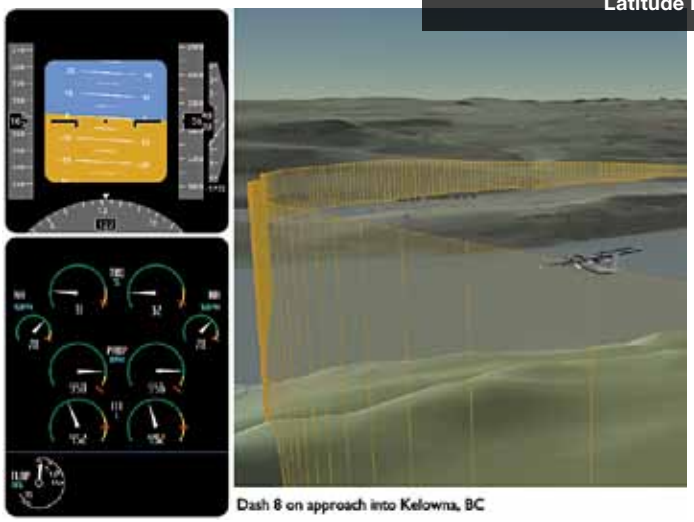
Yet, outside of a handful of sectors, the helicopter industry has been extremely slow to embrace FDM. Even many operators who have FDM equipment installed as standard in their helicopters have no interest in using it. What accounts for their reluctance? And what will it take to change their minds?

ADVANCING TECHNOLOGY

Because FDM does have such low penetration in the helicopter industry, it's worth revisiting what, exactly, it is. As the



FDM software programs provide a number of ways to visualize flight data, which can be valuable for training and debriefs.
Latitude Illustrations



Dash 8 on approach into Kelowna, BC

Helicopter air ambulance operator Metro Aviation was an early adopter of FDM, and its president and CEO, Mike Stanberry, has invested millions of dollars in improving FDM technology. **Dan Megna Photo**

International Helicopter Safety Team (IHST) defined it in a 2009 "Helicopter Flight Data Monitoring Toolkit," FDM is "a systematic method of accessing, analyzing, and acting upon information obtained from flight data to identify and address operational risks before they can lead to incidents and accidents."

All FDM programs have a hardware component — equipment that collects and records flight data from the aircraft — as well as a software component, to turn that data into usable reports. Operators define the "events" they want to monitor in terms of specific parameters. For example, an operator might want to know when a pilot is engaging in sustained straight-and-level flight below 300 feet above ground level, or banking in excess of 30 degrees.

The latest generation of FDM equipment combines FDM with other functions and satellite connectivity. **Outerlink Photo**

Once those events are defined, FDM software identifies when they occur. These occurrences are then validated by analysts, who confirm that the event was meaningful (and not the result of a recording problem or transient condition such as turbulence). Flight data can be used to identify specific unsafe incidents, but it can be just as useful in monitoring trends — for example, "normalizations of deviance" that occur when pilots consistently fly too low or push their fuel limits. These issues can then be addressed proactively with training or modifications to standard operating procedures, as appropriate.

For large, transport-category helicopters that are required to be equipped with flight recorders, FDM programs can use those recorders as a data source. For many years, those systems were too heavy to install on light helicopters, but compact, lightweight flight data recorders became available in the 2000s. The pioneer in the field was Appareo Systems, who came up with a small, self-contained unit that used internal gyroscopes, accelerometers, and GPS to measure basic flight parameters. With the addition of high-resolution image and ambient acoustic capture abilities, this became the Vision 1000, which has been installed on new helicopters delivered by Airbus Helicopters, Inc. since 2010.

According to Appareo sales manager Casey DeLanghe, although Appareo has made incremental enhancements to the Vision 1000 over the years, it is now a "mature product" that remains targeted to entry-level customers who are seeking a simple and affordable solution. "A lot of people

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are just getting into FDM," he said. For them, "the fewer hours you have to spend with it, the better."

Meanwhile, other companies have entered the market with more sophisticated hardware offerings that capture more parameters, more reliably. Modern digital aircraft have made it easier to record data from aircraft systems, allowing operators to leverage FDM for maintenance cost savings as well as enhanced operational safety. And, because many of the competitors in this space are established flight tracking companies, they've been able to bundle their FDM offerings with satellite connectivity, too.

For example, when Metro Aviation acquired the satellite tracking provider Outerlink in 2014, it combined Outerlink's tracking capabilities with FDM technology developed by North Flight Data Systems (which Metro acquired in 2008). The result was IRIS, an all-in-one solution that provides voice, video, and flight data recording along with broadband push-to-talk voice over internet protocol (VoIP) radio and high frequency satellite tracking.

IRIS uses the ViaSat network to stream data at a cost of just US$0.15 per kB. That makes it practical to transmit 10-second chunks of position and essential flight data, as well as in-cockpit warnings, at 10-second intervals, providing a continuous picture of aircraft health and usage activity. For more in-depth post-flight analysis, more than 400 different parameters (depending on aircraft model) are recorded from the time the aircraft powers on until it powers off.

Latitude Technologies, which started as a satellite tracking company, also offers FDM through its IONode systems. According to Latitude sales director David Thomas, the company's entry into FDM came when it began monitoring loads for

> **"THE COST JUSTIFICATION IS VERY IMPORTANT, AND IT'S VERY HARD TO NAIL DOWN THE RETURN ON INVESTMENT. FDM IS A LONG-TERM PAYOFF — YOU MAY NOT SEE THE VALUE OF IT FOR FIVE OR 10 YEARS.**
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> ***— DAVID THOMAS, LATITUDE TECHNOLOGIES***


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Just culture is key to the successful implementation of an FDM program. Pilots are likely to see the benefits of FDM when the data is not used punitively. **Dan Megna Photo**

the B.C. Ministry of Forests, and realized it could record and transmit virtually any parameter on the aircraft. As it expanded its hardware capabilities for FDM, it also began offering a web-based software solution in the form of Latitude Flight Data Analytics. Now, said Thomas, "We're offering a well-priced hardware product with well-priced analysis tools."

SkyTrac is another flight tracking company that has moved into the FDM marketplace, using its ISAT-200A data acquisition platform. SkyTrac vice president of sales Jan van der Heul said that the company focuses on providing customers with tailored, "end-to-end" solutions. SkyTrac offers full project management and implementation services, including data analysis through a relationship with the company Flight Data Services. For some customers who already had FDM programs in place, SkyTrac has helped them streamline those programs by eliminating manual data retrieval; rather than relying on quick access recorders, SkyTrac's systems can transfer data automatically via satellite or wirelessly back at the hangar. "Leveraging connectivity

Phoenix Heli-Flight president Paul Spring (left) has been one of the helicopter industry's most vocal champions of FDM. **Mike Reyno Photo**

is really a step toward streamlining the process," van der Heul said.

Honeywell has also now integrated FDM into its Sky Connect Tracker III, which provides satellite-based flight tracking, text messaging, and voice telephone services. In late 2016, Honeywell announced a major agreement with Air Methods to equip that company's fleet with the Sky Connect Tracker III system, upgrading Sky Connect Tracker II units and providing new units as required. In conjunction with that upgrade, the Honeywell partner Truth Data will be supplying Air Methods with FOQA and FDM analytics, information visualization, and reporting.

While early adopters of FDM had to develop flight data analysis capabilities in house, an increasing number of operators are finding it preferable to outsource analysis to third-party companies. "Over the last several years, I've seen people need this kind of service," said Truth Data president Pete Henrikson, a former U.S. Air Force F-16 pilot who gained his initial experience with FOQA programs in the military. Truth Data is a relatively new company, and while it is launching its services with the world's largest helicopter air ambulance operator, Henrikson said he aims to expand his business to smaller operators, too.

"I think the big thing for small operators is they assume this is for the Air Methods and PHIs of the world," he said. "But it can be for everyone."

SLOW IMPLEMENTATION

If FDM really is for everyone, why haven't more helicopter operators embraced it? There are several possible explanations.

Privacy concerns are often cited as an obstacle to FDM — the idea being that pilots don't want "Big Brother" looking over their shoulders. Those fears are not unfounded. Without controls in place, flight data can be used punitively, and most of the airlines and offshore operators who were early adopters of FDM have had to negotiate privacy guidelines with pilots' unions.

It's relatively easy to guarantee anonymity in a company that operates hundreds of aircraft, but for smaller operators, this may be difficult or impossible. The success of a small company's FDM program really comes down to its owner's commitment to just culture — and many proponents of FDM say that if

New-generation FDM technology combined with satellite connectivity can give operators a picture of aircraft health and usage activity in near real-time. **Metro Aviation Photo**

management doesn't have that commitment, they shouldn't bother with FDM. "The key always in an FDM program is just culture," emphasized SkyTrac's Jan van der Heul.

Provided that just culture is in place, however, many pilots find that FDM isn't as intrusive as they might have feared. And, audio and video coupled with data analysis can be used to productively understand the interaction of the pilot and flight crew in reported deviations from standard protocol. "Combining all the available tools afforded by FDM ensures that the operator gets the story right," said Metro Aviation managing director Milton Geltz. "Actions can then be taken to improve the safety and operation of future flights by re-training and re-establishing or establishing acceptable behaviors."

The fact is, though, that operators rarely give top priority to pilots' feelings when they're weighing business decisions. A greater obstacle to broader implementation of FDM may be cost, and a general reluctance among operators to invest in expensive safety programs without a customer requirement or regulatory mandate.

"The cost justification is very important, and it's very hard to nail down the return on investment," said Latitude's David Thomas. "FDM is a long-term payoff — you may not see the value of it for five or 10 years."

Just how much does FDM cost? Phoenix Heli-Flight's Paul Spring said that, while low-end installations are available in the range of US$15,000, some of his more sophisticated installations have cost around $60,000. "Still," he said, "if you amortize that over five years, it's not that much." Taking into account that five-year amortization and the cost of a part-time in-house data analyst, Spring estimates that his FDM program adds about $12.30 per flight hour. (Because his oldest installations have required little to no maintenance for nine years and counting, the actual cost may be even less.)

While that's not a huge additional cost, operators are unlikely to incur it unless they can see the value proposition — and most of them "lack the requisite imagination," Spring said. "They just can't get their head around, how is spending this money going to help us? You have to imagine the world with it and the changes in your operations and the benefits it brings."

Consequently, most of the helicopter industry's adoption of FDM to date has been driven by customer requirements, primarily in the offshore oil-and-gas industry. "Typically operators are unable to bid on offshore contracts unless they have HFDM programs in place," observed Mike Pilgrim, a former FDM manager for CHC Helicopter who now runs his own FDM services company, Helinalysis. For most other operators, he said, "it really comes down to a question of cost — many operators just don't seem to be able to see the benefits and therefore won't make the investment. But if it's a requirement, they do it and they find a way to do it."

A regulatory mandate could also drive FDM adoption. In fact, the U.S. Federal Aviation Administration's 2014 helicopter air ambulance (HAA) rule does require HAA operators to install FDM systems in their aircraft by April 23, 2018. However, while 14 Code of Federal Regulations 135.607 mandates installation of an FDM system, it does not require collection of data from that equipment, or development of data collection processes. And there are no

Despite the relatively low penetration of FDM in the helicopter industry thus far, it may eventually become a standard if customers and insurance companies start to demand it. **Mike Reyno Photo**

other regulations mandating FDM in helicopters.

Thus, for the time being, broader implementation of FDM in the helicopter industry will be up to those operators, customers, and insurance companies who understand it and see its value. However, Metro Aviation CEO Mike Stanberry is betting that the new generation of FDM technology — which offers more capabilities and opportunities for cost savings — will eventually become an industry standard. Metro was an early adopter of FDM for its HAA operations, and Stanberry's belief in its potential has led him to invest millions of dollars in making improved technology a reality.

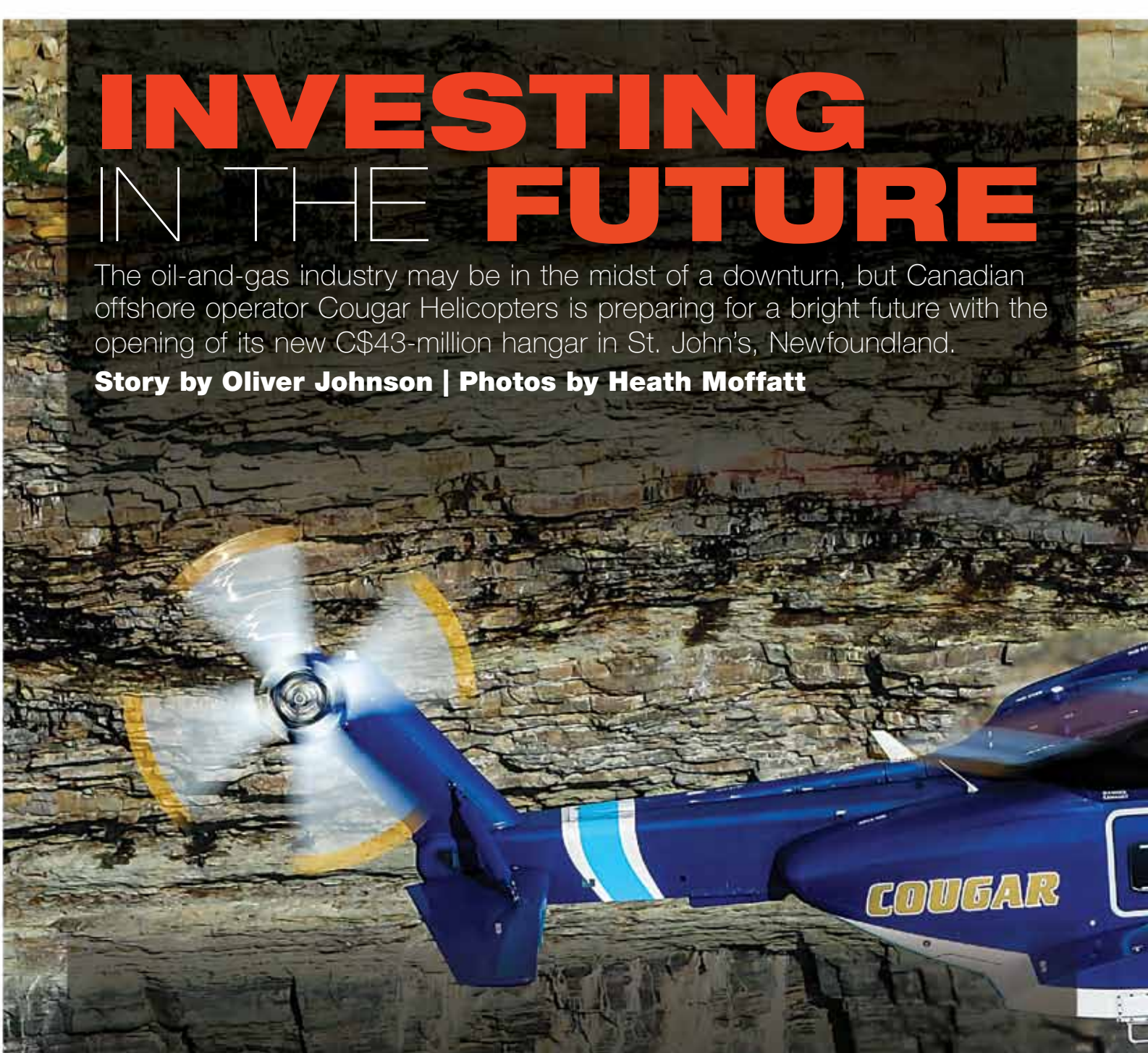
"There's no one silver bullet, but there are a lot of bullets — night vision goggles, helicopter terrain awareness and warning systems, enhanced operational control centers and oversight — and if you use all of them you're going to have a safer operation," he said. "With the new IRIS technology, for the first time an operator will know in near real-time if the aircraft is being operated within [original equipment manufacturer] limits and specifications, and that the pilot is operating the aircraft within the [Federal Aviation Regulations] and company procedures. When our clients and the insurance industry understand what's available, my prediction is it's going to be a requirement."

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

INVESTING IN THE FUTURE

The oil-and-gas industry may be in the midst of a downturn, but Canadian offshore operator Cougar Helicopters is preparing for a bright future with the opening of its new C$43-million hangar in St. John's, Newfoundland.

Story by Oliver Johnson | Photos by Heath Moffatt



There's no getting away from it: these are challenging times for the helicopter industry. While those supporting the oil-and-gas sector have been the most directly affected by the downturn in oil prices, the knock-on effect has been felt throughout the industry, from original equipment manufacturers (OEMs) to maintenance, repair and overhaul facilities (MROs) and those offering ancillary products and services.

Which is perhaps why it's refreshing to see someone in the industry — and especially someone working in the offshore oil-and-gas sector — that's not only talking optimistically about the future, but preparing for the eventual upturn with a multimillion-dollar outlay. In November, Cougar Helicopters — a giant in the Canadian offshore oil-and-gas transport world — celebrated the grand opening of its new C$43-million headquarters in St. John's, Newfoundland and Labrador. The facility has significantly increased its capacity to serve the oil-and-gas industry off Newfoundland's coast, in a region that presents some of the most challenging conditions encountered by regular helicopter service anywhere in the world.

The new development spans two enormous buildings at St. John's International Airport, with one containing a passenger processing terminal and the company's offices, and the other a hangar and office space for the company's maintenance team. Combined, the two facilities span close to 100,000 square feet, and, together with Cougar's existing search-and-rescue (SAR) hangar and its two ramps, give the company a footprint of about 17.46 acres across the "Cougar campus" it has created at the airport.

The buildings were officially opened Nov. 18 following a ribbon-cutting ceremony that saw Cougar's chief operating officer, Hank Williams, joined by executives from parent company VIH Aviation Group, partner Bristow Group, oil company customers, and Newfoundland and Labrador Finance Minister Cathy Bennett.

Cougar has been operating off the coast of Newfoundland from its base in St. John's since it won a contract to service the Hibernia platform in 1996. Today, it has four Sikorsky S-92s flying shuttle runs to offshore platforms, and a fifth dedicated to providing a search-and-rescue (SAR) service on behalf of its oil-and-gas customers. **Mike Reyno Photo**

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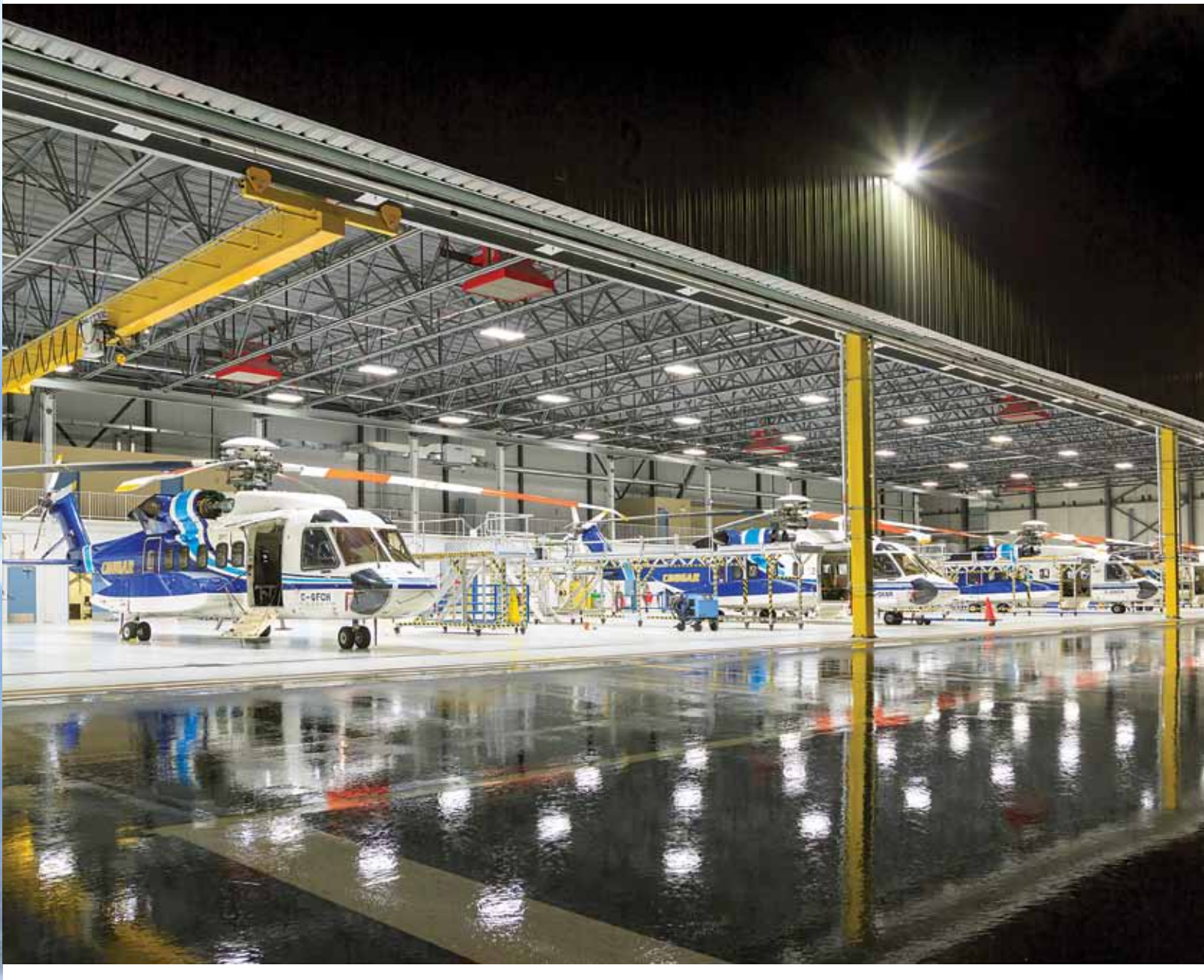
A Cougar SAR crew practices hoisting down to a small vessel off the coast of St. John's. The crew consits of two pilots, two rescue specialists, and a hoist operator. Many are ex-military.

Cougar's new hangar in St. John's is currently home to four S-92s, but it has room for a fifth without requiring any intermeshing of blades.



"This facility is an investment in Cougar's requirements for today, but I think more importantly, it is an investment in Cougar's requirements for the future," said Williams. "This facility is built with about 35 to 40 percent overcapacity for what we need for current operations. That represents Bristow, VIH and Cougar's belief in Newfoundland and Labrador, and more specifically the oil-and-gas sector, and where we believe it is going — and we want to be front and center [for] the entire Newfoundland offshore industry."

SETTING THE STANDARD

Cougar has been operating to oil-and-gas facilities off the coast of Newfoundland since it won a contract from ExxonMobil to service the Hibernia platform with an Airbus Helicopters Super Puma in 1996. From humble beginnings, it now has a staff of about 265, with four Sikorsky S-92s shuttling passengers between Newfoundland and offshore platforms, and a fifth S-92 in St. John's for search-and-rescue operations on behalf of its customers. It also has two S-92s serving the offshore sector from its facility in Halifax, Nova Scotia. And over the more than 20 years it has been conducting offshore operations, it has learned a lot.

"When Newfoundland first got into the oil-and-gas business, we saw a lot of people coming here from the North Sea or from the States [to offer their experience]," Williams told *Vertical.* "There's a lot less of that now because we developed our own expertise. Our standards are as high as they are anywhere in the world — if not higher in some areas."

Cougar's gradual expansion over the years caused it to fill its previous facility in St. John's, eventually needing to use some of the office space at the purpose-built SAR hangar it constructed at the airport in 2012.

THIS FACILITY IS BUILT WITH ABOUT 35 TO 40 PERCENT OVERCAPACITY FOR WHAT WE NEED FOR CURRENT OPERATIONS. THAT REPRESENTS BRISTOW, VIH AND COUGAR'S BELIEF IN NEWFOUNDLAND AND LABRADOR, AND MORE SPECIFICALLY THE OIL-AND-GAS SECTOR, AND WHERE WE BELIEVE IT IS GOING.

- HANK WILLIAMS, COUGAR COO

The company developed a partial SAR capability soon after launching its first offshore service, but the SAR service as it exists today came into being following the fatal crash of Cougar flight 491 off the coast of Newfoundland. The official enquiry that followed the accident determined that there was an urgent need for a SAR operation dedicated to the offshore industry; one that could crucially reach people in an emergency situation in a drastically reduced time.

Fully funded by oil companies, the service is provided from its own 27,500-foot hangar, with a specially-equipped aircraft and highly-trained rescue pilots and crews. The service provides for a 20-minute response time.

Fully compatible with night vision goggles, the SAR aircraft has a FLIR Ultra 8500XRT forward looking infrared camera, a 30-million candle power Spectrolab Nightsun searchlight, a

A Cougar maintenance technician performs routine system checks on a S-92 after the aircraft has completed a busy day of offshore flying.

The new hangar contains some of the most cutting-edge facilities in the industry, as well as things like underfloor heating to keep the workplace comfortable during the cold St. John's winters.

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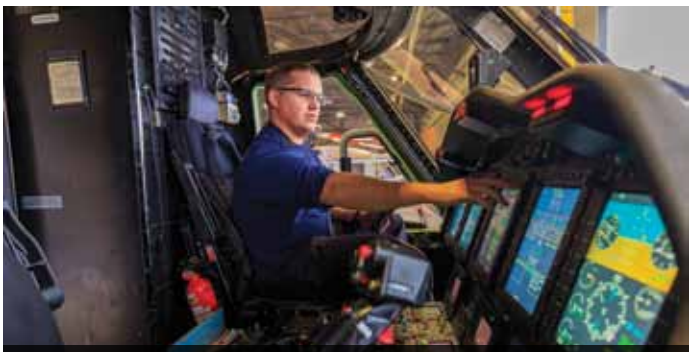
Rick Banks, Cougar's search-and-rescue program manager, stands in front of a SAR crew in the company's custom-built search and rescue hangar in St. John's.



Checking the avionics in an S-92. Cougar's avionics technicians now have their own dedicated room to perform their work at the rear of the hangar.

Cougar's Operational Control Centre schedules, plans, and dispatches flights. The facility's new design gave them an ideal view out over the company's ramps.

Cougar's maintenance team provided their input as to what would make their lives easier in the design of the new hangar, resulting in an extremely comfortable and intuitive working environment.

custom-built FLIR station/communications hub, full triage, oxygen air, respiratory distress, burn and hypothermic treatment kits, as well as tools for cardiopulmonary resuscitation (CPR) and a defibrillator.

In addition to this, it carries two survival kits that can be deployed from the air, each consisting of a 10-man life raft, and 250 feet of floating polypropylene rope connected to a supply bundle. The team uses a Goodrich dual rescue hoist, with 300 feet of usable cable and a maximum weight of 600 pounds — but with an overload capacity of 1,100 pounds. The rescue slings have a built-in strop to prevent a person slipping through, while a rescue basket and Stokes litter complete the recovery equipment carried. Two auxiliary fuel tanks allow the SAR team to take an extra 1,000 pounds of fuel, and provide the S-92 with an operating range of 290 nautical miles, with 30 minutes on the scene. Offshore refueling can increase this range if necessary.

Cougar works closely and keeps in regular contact with Canada's official SAR service in the region — the Royal Canadian Air Force's 103 Search and Rescue Squadron, and the Joint Rescue Coordination Centre (JRRC) in Halifax — and organizes annual training exercises with the unit.

CUTTING EDGE FACILITIES

When the oil companies for whom Cougar had been flying issued a new tender for service in 2014, the work scope of the contracts helped serve as the catalyst for Cougar's headquarters and passenger processing facility to make the move to a new home.

"The definition of the services we had to deliver was very clear that we could not do that from our old facility," said Williams.

Planning for the new facility began about three years ago during preparation for Cougar's response to the oil companies' request for proposals, with construction starting in December 2014. Cougar contracted Lindsay Construction to build the

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Ken Norie (right), president and CEO of Cougar Helicopters' parent company VIH Aviation Group, was part of the presentation team at the facility's grand opening in November. Cougar COO Hank Williams (left) watches on.


Norie cuts the ribbon to officially open the new hangar, joined by executives from Bristow, oil company customers, and provincial finance minister Cathy Bennett.

The opening ceremony drew quite a crowd, with attendees offered tours of the new hangar and passenger processing facility.

Construction of the new new hangar was completed three months ahead of schedule, thanks to efficiencies learned from previous builds.

facility; the two had previously worked together on Cougar's SAR hangar in St. John's and its passenger handling facility/office in Halifax.

"Over the past two projects, Lindsay acquired a knowledge of our operations and what we are doing," Allan Knight, Cougar's project manager for the construction of the facility, told *Vertical.* "So the two companies worked really well in identifying what needed to be done in the initial stages, and that helped a great deal in the reduction of change orders."

This experience allowed construction to be completed well ahead of schedule — six months early for the passenger terminal, and three months early for the hangar.

From its external appearance to the flow of people through the building, the new passenger building closely resembles a terminal at a commercial airport, with clearly demarcated and separate departure and arrival areas for passengers and family — and a third separate entrance for staff and office visitors to access the administration offices above.

The facility has six briefing rooms and four check-in counters — as compared to two in Cougar's previous passenger building — which will allow it to process up to four flights simultaneously. Central to the facility is a large seating area with several TVs, which is flanked by several rooms aimed to increase the comfort of passengers, including a games room, a communications/internet room, a quiet/rest room, and a lunchroom.

"The unfortunate thing with Newfoundland is our weather, so some people are here for longer periods of time," said Knight. "We accommodate our passengers as much as possible in terms of comfort. While the oil companies are our customers, the people that travel offshore — they are also our customers. They have to be happy, they have to be comfortable, and above all they have to be safe."

Next door, the maintenance hangar may not look as attractive on the exterior, but it contains some of the most cutting-edge facilities in the helicopter industry. The cavernous building is large enough to fit five Sikorsky S-92s side by side without requiring any intermeshing of blades.

LED lighting provides energy efficiency, while underfloor heating keeps the workplace comfortable — and avoids the risk of ice buildup on the building's fringes. Running underneath a mezzanine at the rear of the hangar are rooms (some with anti-static flooring) for various departments and maintenance activities — including a composites room; an avionics room; a petroleum, oils, and lubricants room; a battery room; fire suppression room and, underneath the maintenance offices at the far end of the building, a tool control room. An overhead crane


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Running along the rear of the hangar, underneath the mezzanine, are various rooms for different maintenance activities, such as avionics, composites, and batteries.

spans the width of the hangar (350 feet), allowing it to be used by mechanics working in every bay. Each bay also has access to an in-ground Cavotec utility system that contains everything the maintenance teams need to power and work on the aircraft, meaning cables don't need to be pulled across the floor from the wall.

"We learned a lot of lessons from the other hangars we have operated out of, and we were trying to make the job as easy and as efficient as possible, so there was a lot of input from everybody as to what they would like to see in this hangar," said Bob Pardy, Cougar's maintenance manager.

This included rethinking the water drainage grates, which had been at the center of a slight incline in the middle of the floor in the previous hangar.

"It made it difficult to put jacks on the floor to jack the aircraft level and keep the jack level," said Pardy. "So we put the drainage grate out the front of the hangar, just inside the hangar doors a bit, and the floor has a very small grade that goes out to that. When we get a jack on the hangar floor now to jack an aircraft, they are level on the floor, and the aircraft comes up much more level, and the jacks are much safer."

BUILDING FOR GROWTH

Williams said that despite challenging times in the offshore industry, Cougar has managed to stay somewhat insulated due to the fact that the vast majority of the work it's supporting is production rather than exploration — and it's the latter that has been severely cut by oil companies.

"This downturn hasn't changed the requirement for production activities," said Williams. "But it's impacting us from the point of view that it's more of


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A Cougar SAR S-92 completes a training operation under darkening skies. While the offshore sector may be going through difficult times now, Cougar believes brighter days are ahead. **Mike Reyno Photo**

a need today — even for the contractors — to reduce [the oil companies'] costs, so we've been working together with them on reducing their costs."

Together with this, it is focusing its efforts on ensuring it will be in the best position possible to win new contracts in the future.

"Having the right facilities does give you a competitive advantage in the marketplace, and it comes with a lot of belief and investment," said Williams. "Part of my role over the last two or three years was going to my board of directors and asking for the money to do this, and at the same time, there's a downturn in the industry. So it was about the belief in the future and the opportunities here on the east coast of Canada, and the belief that our future required this."

That belief is such that the foundations are already in place for a second five-bay hangar on the other side of Cougar's new maintenance offices.

"Typically in this business, you might get six-to-eight months' notice that there's a contract requirement coming up and aircraft are needed," said Williams. "So what we did is spend a fair amount of money prepping the second portion of the hangar so that within a year to 14 months, we could have that other building up quickly. We are poised to push that button as soon as the next project says we need that space."

Together with the new multimillion-dollar simulator and research center built and operated by CAE just a few miles down the road from Cougar in Mount Pearl *(see p.132)*, those working in the helicopter industry in Newfoundland now have access to some of the finest facilities in the world.

"There's still people investing in this province, in this industry, that see the future," said Williams. "It's always difficult when you talk about the future, because we've probably got companies and people worried about the next six months, but as a company the size of ours and what we do in offshore oil-and-gas, you've got to look beyond at what the next five, 10 years looks like. And we believe in Newfoundland and Labrador."

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3D printed parts slowly increasing in popularity in the helicopter industry. Above are a range of those used by Bell Helicopter.

THE SHAPE OF THINGS TO COME

3D printing has been around for years, but its use is still in its infancy in the helicopter industry. *Vertical* asked the major OEMs how they are getting to grips with the technology — and what its potential might be.

By Howard Slutsken

Imagine that your ink-jet printer has gone wonky. It's sitting on your desk, running its print head back and forth for hours, continually printing one word. Once the unruly piece of technology is under control, you manage to pull out the paper. You can see, and feel, that the word "ROTOR" has been built up from the paper's surface. If you scrape it off, the word will sit on your desk, like a paperweight. That's the essence of 3D printing.

In real life, it's more likely that your ink-jet would have seized up, and the ink would be a giant blob on the page, but true 3D printers have been available to hobbyists for years. Fed with plastic, metal or resin, these printers are driven by computer programs; and data files to produce just about anything can be found online.

3D printing is a form of additive manufacturing (AM), where layers of a material are built up to create a component. More familiar to most, subtractive manufacturing (SM) is the opposite of AM, where a block of a raw material, such as aluminum, is machined until the component reaches its final form. Where SM can be used to rapidly produce large quantities of parts, each AM part might take hours to create — at least, for now.

AM is being embraced by the aerospace industry, as a tool to develop, prototype, and create components for aircraft. In this look at AM, *Vertical* reached out to several helicopter OEMs, but there are also many smaller companies and subcontractors investing heavily in this manufacturing sector.

Concept Laser is one of the major producers of additive manufacturing devices, such as this M2 cusing system.

"This technology is very well suited to the helicopter industry. Compared to other industries, such as automotive, we live in the low volume, custom world," said Peter Sharpe, head of engineering, Airbus Helicopters Canada (AHCA). "We're using additive manufacturing primarily as a prototyping tool, and for manufacturing jigs and basic checking tools. We acquired a machine two years ago, and it makes ABS plastic parts. It does a great job, and it's proving to be a very useful tool. This allows us to quickly iterate and arrive at better, more accurate solutions for our customers."

AHCA certified its first AM metal part last year, a non-structural titanium clip that simplifies the process of removing and reinstalling the doors on an EC135. The printed part — which has a supplemental type certificate (STC) — replaces two other components on the lower hinge. Door installation has changed from needing two people, to a one-person job, without the need for tools, which reduces maintenance time for operators.

That part is made using one of the more prevalent AM processes, called DMLS — direct metal laser sintering. "It lays down a very thin layer of [titanium] power and then a laser sinters that powder, basically welding it to the previous layer," explained Sharpe.

A SIMPLIFIED PROCESS

A similar process is used by Safran Helicopter Engines to produce fuel injector nozzles for the Arrano, and combustor swirlers for the Ardiden 3 engines. Where DMLS heats the metal powder to the point that it binds to the previous layer, Safran uses selective laser melting (SLM), which melts each subsequent layer of a nickel alloy powder.

"Additive manufacturing simplifies the manufacturing process," said Frédéric Bonnet, Safran's head of strategy and industrial performance. "A traditional fuel-injector nozzle is made up from dozens of different pieces. The Arrano component is made from one single piece of material and features advanced injection and cooling functions."

Safran has been using AM since 2015 to make these components, which were previously made using the traditional manufacturing processes of machining, milling, and etching from forged and melted parts. "Unlike traditional processes which are based on material removal, additive manufacturing builds layers of fine metal powder to produce complex-shape parts," said Bonnet. "This process allows us to manufacture parts with very complex shapes that would not be possible with conventional processes. It really expands [the] boundaries of aero-engine design."

While Safran could shift the manufacture of parts solely to AM, the company is maintaining parallel lines, using traditional processes to make injectors of some engines. And, while recognizing that AM is still in development as a production technology, Safran has analyzed its product line to see where AM could be used.

"For the moment, our estimate is that 36 percent of a complete engine could be manufactured with 3D printing," said Bonnet. "Nonetheless, as of today, the technology is not sufficiently mature to produce rotating engine parts. Our main target, for the moment, is to expand additive manufacturing parts all along the engine, in low and high pressure modules, for static parts."

Sikorsky has multiple 3D printers throughout its organization, according to Bob Perchard, chief engineer, assembly and flight operations. The company's primary type of printer uses the fused deposition modeling (FDM) process, fed with spools of thermoplastics and nylon. In an FDM printer, the print head — like a glue gun — feeds the melted

Airbus Helicopters Canada purchased an additive manufacturing machine two years ago, and uses it to make ABS plastic parts — primarily for creating prototypes, but also for manufacturing jigs and basic checking tools. **Vitek Zawada Photo**

material onto a platform, and builds up the component with beads of material. The head moves in the X-Y axis with extreme accuracy, and the platform moves in the up-and-down Z-axis.

"We're also a beta test site for Carbon's new 3D printer, which builds components out of liquid polymers," said Perchard.

The company has not yet certified 3D-printed parts for flight use, and is focused on what it calls non-product and indirect components. "Currently we produce 3D-printed components which can be used during the aircraft build process, but are not used for final flight configuration," said Perchard. "Components which are to be used on flight aircraft have to go through a feasibility test and be designed for on-aircraft flight use. This is something we are actively evaluating as we design future aircraft."

Perchard explained that using AM parts during the build process "allows us to have fewer downstream build discoveries, and lower production cost through reduced assembly rework." Some AM examples include full-featured surrogate parts, assembly aids, tooling, and shop aids to reduce injury risk.

All of this has huge value to Sikorsky. "Turnaround time is days versus weeks or months, build cost is generally 75 percent less, and the ability to [rapidly] prototype and provide design validation before creating production parts is priceless," said Perchard.

> **"RIGHT NOW, IT'S HARD TO ECONOMICALLY QUALIFY A PRINTED PART THAT'S USED IN A STRUCTURAL APPLICATION. THAT'S A DETERRENT TO MORE WIDESPREAD USE OF AM IN OUR INDUSTRY.**
>
> ***- PETER SHARPE, HEAD OF ENGINEERING, AIRBUS HELICOPTERS CANADA***

EXPANDING THE USE OF ADDITIVE MANUFACTURING

Leonardo's Helicopter Division first used AM as a design validation tool, and has now progressed to the point where AM parts are used in baseline production aircraft. Secondary structures such as ducting, filters and covers, receptacles, and supports are being made from

various nylons, thermoplastics, and metals. However, the company notes that a different approach is required when implementing AM processes.

Leonardo's engineering team believes that significant changes both culturally and technically were and are still required in making the transition, with the biggest learning curve in the change in design philosophy when using 3D-printed parts. "Additive manufacturing has the potential to remove traditional manufacturing constraints and allows completely novel geometries to be produced — design for function as opposed to design for manufacture. However, AM introduces new process variabilities which the designer needs to account for and control and there are areas of concern for structural integrity," said a Leonardo spokesperson.

The company said that the biggest cost benefits involve tooling and support to its production lines, with savings of over 90 percent by using AM processes and parts, against traditional methods of manufacture.

Elliott Schulte, engineer III, stress and fatigue for Bell Helicopters, said that while the cost of tooling alone can justify the move to AM, transition efforts always realize multiple benefits. Giving the example of a de-fog nozzle in Bell's 429 and 412 helicopters, "where we went from conventional manufacturing to additive manufacturing, there was a cost avoidance of over $100,000 for tooling. As part of the process of going from conventional to AM, the number of parts formerly used to construct the defog nozzle were combined into a single component," explained Schulte. "We also have a lead-time savings of 75 percent, and eliminated rework."

Old and damaged tooling that can't reliably produce parts, material obsolescence, and minimum-buy requirements are also evaluated by Bell in determining a move to AM.

Bell uses AM components in every commercial and military helicopter that it makes, including thermoplastic air-handling components in environmental control systems. And the company is evaluating the use of metal AM components, according to Thomas Chiang, V-280 Valor manufacturing producibility lead.

"We're starting with experimental flight applications that are less critical," he said. "We see an opportunity for some metal components that might not have a business case today for production, but would have tremendous value in a development program. Since we're not in production, and this is an ongoing science and technology effort, a lot of AM development work in metal and plastics is going on beyond laser sintering. We've got a number of new-to-Bell additive processes and materials being evaluated in our V-280 Valor demonstrator."

Chiang also pointed to one of the issues facing the wider use of AM parts. "Certification of metal components requires a great amount of data and knowledge and testing before being certified for flight," he said.

AHCA's Sharpe agreed that there are issues surrounding certification. "That's a challenge for our industry — certifying structural components that are made using AM. Reliable material property data is in short supply. Right now, it's hard to economically qualify a printed part that's used in a structural application. That's a deterrent to more widespread use of AM in our industry," he said.

And your ink-jet printer? Well, there actually *is* a form of 3D printing that uses a print head that's similar to an ink-jet's. PolyJet printers spray layers of curable liquid photopolymers with incredible accuracy — in color!

Howard Slutsken | Howard's lifelong passion for aviation began when he was a kid, watching TCA Super Connies, Viscounts, and early jets at Montreal's Dorval Airport. He's a pilot who loves to fly gliders and pretty much anything else with wings. Howard is based in Vancouver, B.C.

Engineers at Safran Helicopter Engines take a look at the Arrano — the manufacturer's new 1,100- to 1,300-horsepower engine that powers the Airbus H160. Safran uses selective laser melting to create the Arrano's fuel injector nozzles. **Safran Photo**

TETHERED DRAGON

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The Chinese civil helicopter has grown extensively over the last few years — but what needs to happen for the country to become a global fleet leader?

By Kenneth I. Swartz

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Every day, Sky Shuttle Helicopters flies 20 scheduled round-trip flights between Hong Kong and Macau, and three flights between Macau and Shenzhen, with a fleet of Leonardo AW139s. The Leonardo AW139 was introduced in April 2009 to make the inaugural flight from the new Sky Shuttle Heliport in Hong Kong. **Chi Yin Liao Photo**

The Hong Kong Government Flying Service (GFS) is the launch customer for the search-and-rescue (SAR) version of the Airbus H175, ordering seven helicopters for delivery in 2017 and 2018. Airbus is now flight testing the GFS's first SAR H175 aircraft in France. **Anthony Pecchi Photo**

The People's Republic of China is poised to become the world's fastest growing helicopter market. It's a line we've heard many times before, but how close is it to actually happening? Since the mid-1990s, forecasts have claimed that China could soon have as many helicopters as Europe or the United States, but the country's helicopter industry remains tethered to the ground — even as its commercial airline industry has grown at an exponential rate.

The International Air Transport Association reports that China will surpass the U.S. to become the world's largest air passenger market in 2024, but the value of annual helicopter sales in China is only just approaching US$330 million — the list price of a new Boeing 777-300.

Vertical reached out to manufacturers and a few observers of the industry in China to learn more about the opportunities and nuances of the Chinese civil helicopter market — and see if anyone has an answer as to when the sleeping giant of the global helicopter industry might finally wake.

"They first started talking about a huge Chinese helicopter market when we delivered our first R22 and R44 to China in the mid-1990s," recalled Kurt Robinson, president of Robinson Helicopter, in an interview with *Vertical*. "But it has taken much longer than anyone ever expected for the market to develop. Officials said they were going to start opening up Chinese airspace to general aviation flights, but a lot of restrictions of flying still remain. The Chinese market is certainly getting busier every year, but it's not the explosive growth everyone has expected."

Twenty years ago, it took a minimum of week — sometimes a month — to get a flight permit from the Chinese army before you could file a flight plan with air traffic control — and many permit requests were rejected. And the National Business Aviation Association (NBAA) reports that private individuals and companies in China could not own an airplane or helicopter until as recently 2003.

The Chinese civil helicopter fleet started growing at double-digit annual rates about a decade ago and reached the 850-aircraft mark in early 2017. Late last year, it surpassed the mature market in Japan (813 registered helicopters) and it is now closing in fast on Germany (856), Italy (865) and New Zealand (876), in figures given on the *Rotorspot.nl* fleet website.

According to Airbus, the Chinese civil helicopter market will be the biggest in the world in the next 10 years in terms of increasing delivery rate. And Avicopter — the Chinese state-owned aerospace company — believes China's civil fleet will probably exceed 1,500 helicopters in operation by the end of 2020.

"Made in China 2025" is a national initiative to completely upgrade the Chinese manufacturing industry and it draws its direct inspiration from Germany's "Industry 4.0" plan. Western helicopter manufacturers have had an industrial presence in China for more than 35 years, "but China's helicopter industry also wants to sell its own designs in the domestic market," observed Michael Hirschberg, executive director of AHS International. "You might not see the Chinese helicopter market fully open up until domestic companies are producing the rotorcraft China needs."

CHINA RISING

China is the fourth largest country in the world in terms of area, behind Russia, Canada and the U.S. The population reached 1.37 billion in mid-2016, with 55.6 percent now living in urban areas.

Up until 1980, all civil helicopters in China were owned and operated by regional divisions of the Civil Aviation Administration of China (CAAC), which was flying aging Harbin Z-5s and Mil Mi-8s, along with Western models such as Aérospatiale Alouette IIIs and MBB Bo.105s.

When the U.K. handed Hong Kong to China in 1997, the territory was home to 17 turbine helicopters, and there were just two piston- and 81 turbine-engine helicopters registered in China.

The Chinese Ministry of Transport's Rescue and Salvage Bureau (Rescue China) now flies four SAR Airbus H225s and 16 SAR Sikorsky S-76s from four coastal bases, including eight recently-delivered S-76Ds. **WEIMENG Photo**

The Bell fleet in China recently passed the 100-helicopter mark, with the Bell 407GX the most popular aircraft. Bell is teaming with Shaanxi Aviation Industry Development and Xi'an Helicopter Company to establish a 407GX final assembly line in the country. **WEIMENG Photo**

A decade later, the Chinese fleet (including Hong Kong and Macau) numbered 32 pistons and 145 turbines, including the first private aircraft. Then things took off, with the piston fleet increasling threefold and the turbine fleet multiplying in size by 2.35 times in the past five years.

The Hong Kong-based Asian Sky Group reports that the Chinese civil helicopter fleet increased 18.7 percent in 2016, from 728 to 864 helicopters, based on extensive market research. The fleet grew 17.9 percent in 2015, and a record 26.8 percent in 2014.

Not surprisingly, the fleet is concentrated in the more populous and prosperous regions such as Guangdong, Beijing, Shanghai, Sichuan and Henan province. The registered fleet is 40 percent piston and 60 percent turbine, compared to 34 percent piston and 66 percent turbine five years ago.

The largest business segment is multi-mission (66 percent), followed by flight training (nine percent), law enforcement (eight percent), offshore (seven percent), SAR (four percent), charter (three percent), corporate (two percent), private (one percent) and EMS (one percent), reports Asia Skies Group.

The six largest commercial operators by fleet are Citic Offshore Helicopter (COHC), China Flying Dragon General Aviation, China Southern Zhuhai Helicopter Company, Reignwood, Sichuan Xilin Fengteng and China Eastern GA. The Chinese national police and State Grid have the largest parapublic fleets.

In terms of manufacturer representation, Robinson has the largest overall market share (33 percent), thanks to recent strong sales of the R44. Not surprisingly, Robinson has a 77 percent share of the piston fleet, followed by Sikorsky-Schweizer (seven percent). The first Guimbal Cabri G2 arrived in China two years ago, and there are now 13 active in the country. Other piston models include four Enstrom 280FX and two Chinese-built Brantly B2s.

Airbus leads with a 38 percent share of the registered turbine fleet, followed by Bell (20 percent), Leonardo (10 percent), Sikorsky (nine percent), Avicopter (eight percent), Russian Kamov/Mil (five percent), Enstrom (three percent), Robinson (three percent), and others (four percent).

The 13-ton Avicopter AC313 is an updated design based on the Harbin Z-8, which is itself a derivative of the Aérospatiale SA321 Super Frelon. **AVIC Photo**

Chongqing Helicopter Investment Co., Ltd. bought Enstrom Helicopters in December 2012. In January 2014, it delivered a new Enstrom 480B to the Lanzhou Police in Gansu province. **Enstrom Photo**

In 2014, 999 Emergency and Rescue Center of Beijing Red Cross acquired two H135 EMS helicopters, with the first entering service on Oct. 28, 2014 — a first for China. **Airbus Photo**

OFFSHORE CHINA

Development of the offshore sector was the foundation of China's civil helicopter renaissance. China needed oil to power its economy and the western oil industry had the money and technology to find new offshore energy reserves.

The China National Offshore Oil Corporation was formed to develop the offshore industry and acquired Bell 212s and Aérospatiale AS365N Dauphins in 1980 to support offshore drilling.

In 1982, 32 international oil companies submitted bids for Chinese drilling rights and 27 eventually signed contracts. Some of the companies that flew in China with CAAC approval were Okanagan Helicopters of Canada, PHI of the U.S., British Airways Helicopters of the U.K., and Asahi Helicopters of Japan — with the overall offshore fleet including Aérospatiale 330J Pumas and 332L Super Pumas, Bell 212s and 214STs, and Sikorsky S-76As and S-61Ns.

Today, China is the fifth largest petroleum producer after the Russia, Saudi Arabia, the U.S. and Iraq. Three CAAC successor companies — COHC, Zhuhai, and China Eastern GA — own a fleet of about 90 turbine helicopters that are primarily used to fly to drilling and production platforms off China's lengthy coast.

Most offshore drilling and development is focused in Bohai Bay off the northeast coast, East China Sea off Zhejiang province, the South China Sea in the Pearl River Basin off Hong Kong and Guangzhou province, and in the south off Zhanjiang and Hainan Island.

Since 2000, the Chinese offshore fleet has been renewed with Leonardo AW109SP GrandNews, Airbus EC155 B1s and EC225s, and Sikorsky S-76C+/S-76Cs and S-92s entering the market.

Helicopters of the three Chinese offshore companies also played an important humanitarian role after a magnitude-7.9 earthquake struck Sichuan province on May 12, 2008, killing an estimated 88,000 people and leaving 4.3 million people homeless.

TRAINING A GENERATION OF PILOTS

China has a fleet of 173 training helicopters operated by 33 flight schools, according to Asian Sky Group. Twelve Chinese flight schools provide fixed-wing and helicopter training, and 21 schools provide helicopter training exclusively.

Civil Aviation Flight University of China is the largest flying school in the country, with a fleet of 221 fixed-wing aircraft and 12 helicopters. Other large operators include Sichuan Xilin Fengteng (14 helicopters), Anyang Aero Sports School (12) and China Flying

Dragon (10). In addition to training, the companies use their piston aircraft for missions such as aerial photography.

In summer-2016, Robinson had a 68 percent market share of the training fleet (117 helicopters); Sikorsky/Schweizer a 22 percent share (38 aircraft); along with single-digit fleets of Bell, AVIC, Enstrom, and Airbus models.

Frasca International has been selling flight training devices and simulators to Chinese flight universities, colleges and private training centers for 20 years. The majority of the sales have been for fixed-wing aircraft, but demand for helicopter simulators has been strong the past two years, said company president John Frasca.

"Some Chinese flying schools are setting a high standard," he said. "In the past two years, we have received orders from three Chinese helicopter schools for four Level 5 flight training devices, which accurately represent a helicopter in a hover."

The Bell fleet in China recently passed the 100-helicopter mark, with growth supported by two independent sales representatives: Reignwood Aviation and Aerochine Aviation Limited.

"As China's airspace continues to open to commercial aviation, helicopter deliveries will continue to climb," said Patrick Moulay, Bell Helicopter's executive vice president of global commercial sales and marketing. "China has one of the fastest growing civilian helicopter fleets in the world. From an overall industry standpoint, we expect continued investment in training schools and training school aircraft in China, as there remains a lack of instructors, pilots and maintainers. China's investment in helicopters that provide governmental services, including disaster relief, should continue."

DEVELOPING AERIAL FIRST RESPONSE

The development of helicopter emergency medical services (HEMS) in China is in the very early stages, and it is still unclear which business model will ultimately prevail.

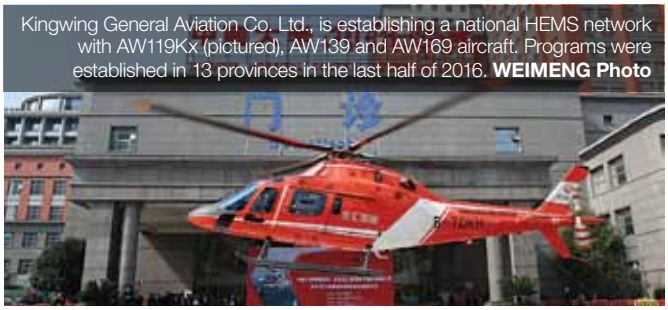
"Comparing with developed countries, China's HEMS is still in its infancy," said an Airbus spokesman. "If you look at the ratio of EMS helicopters per one million people, the index in China is nearly zero. The HEMS requirement in China could [reach] 1,000 to 2,000 helicopters if you use the measure of one or two helicopters per one million citizens."

In 2014, 999 Emergency and Rescue Centre of Beijing Red Cross acquired two H135 EMS helicopters, with the first entering service on October 28, 2014 — a first for China. Today, Beijing 999's helicopters are primarily used for inter-provincial ICU transportation between Beijing, Tianjin, Hebei, Inner Mongolia and Shandong province.

HEMS999, an air ambulance operator subsidiary of MIT Group, has introduced nine H130s throughout the coastal province of Shandong to respond to emergencies including automobile accidents.

Guangdong Province Public Security Department flies an Airbus H225 for security, SAR and firefighting missions. It is equipped with a 600-US gallon (2,270-liter) Simplex Model 316 fire attack tank. **Airbus Photo**

There are 19 Leonardo Helicopters flying with nine different police agencies, including several AW139s. **Oscar Bernardi Photo**



Kingwing General Aviation Co. Ltd., is establishing a national HEMS network with AW119Kx (pictured), AW139 and AW169 aircraft. Programs were established in 13 provinces in the last half of 2016. **WEIMENG Photo**

Leonardo has also had recent major success in the country. In the past two years, Sino-US has ordered 80 Leonardo helicopters for China, with the majority allocated to new EMS programs operated by Kingwing General Aviation Co. Ltd., which has established a dedicated EMS project called China Helicopter Air Ambulance (CAAH).

The first HEMS base for this opened in Shanghai last summer, and by year-end there were AW119Kx or AW109SP GrandNew aircraft in service at 13 provinces.

"There is no business precedent for the development of HEMS services in China," said Stefano Zalonis, Leonardo's vice president of sales, China. "They haven't determined if the program should be single- or twin-engine, or single- or dual-pilot and the CAAC has not yet taken a position. And the best business model will be determined at a later time."

Leonardo's first success in China was in the law enforcement market, when it sold 19 single and twin turbine helicopters that would eventually fly for eight different agencies. The run-up to the 2008 Summer Olympics in Beijing helped get the city's aviation squad off the ground, and today it is the largest unit in China with a fleet of five aircraft: three AW109Es and two AW139s.

> **"CHINA HAS ONE OF THE FASTEST GROWING CIVILIAN HELICOPTER FLEETS IN THE WORLD. FROM AN OVERALL INDUSTRY STANDPOINT, WE EXPECT CONTINUED INVESTMENT IN TRAINING SCHOOLS AND TRAINING SCHOOL AIRCRAFT IN CHINA, AS THERE REMAINS A LACK OF INSTRUCTORS, PILOTS AND MAINTAINERS.**
>
> ***— PATRICK MOULAY, BELL HELICOPTER EXECUTIVE VP OF GLOBAL COMMERCIAL SALES AND MARKETING***

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"The Beijing Police have the same capabilities as law-enforcement agencies in the U.S.," and their pilots have been trained at our facilities in Italy and the U.S.," said Zalonis.

In September 2015, there were 28 police helicopter squads across 18 provincial regions in China flying a total of 66 helicopters.

China's Ministry of Public Security expects that that by 2020 there will be about 50 helicopter squads with a fleet of about 100 helicopters.

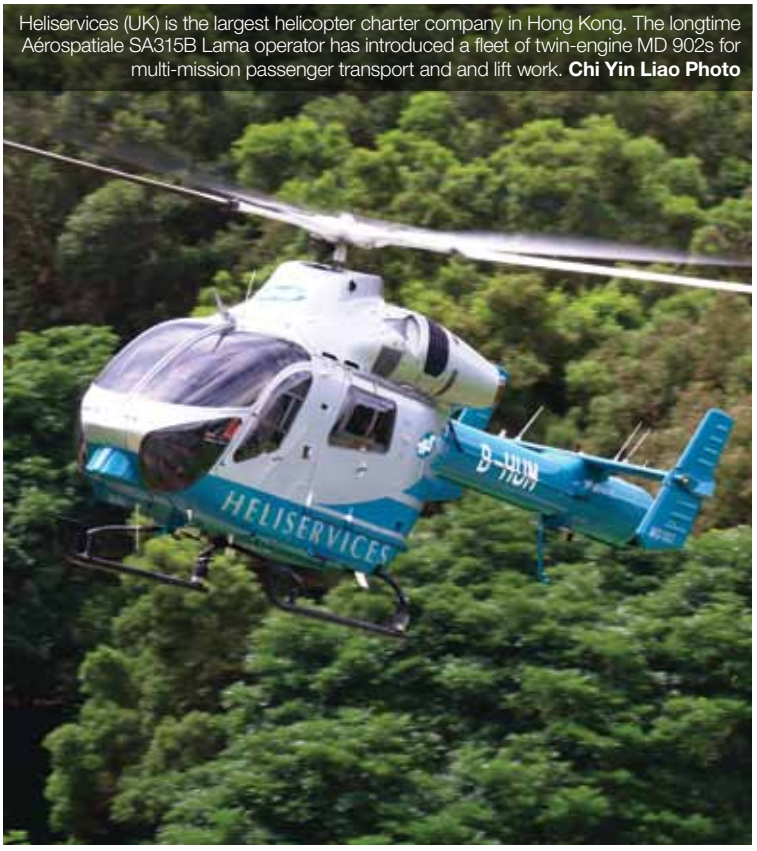
The current police forces operate helicopters from almost every helicopter manufacturer active in China, with police operations less encumbered by the airspace restrictions imposed on other general aviation aircraft.

Several police units fly a dozen Airbus helicopters, including the Shanghai Police with two EC135s and one H155, Dalian Police with two H155s, and the Guangzhou Police with China's first H145 on order.

In the heavy class, the Guangdong province flies an H225 for security missions, and it is equipped with a Simplex Aerospace Model 316 fire attack tank with a 600-US gallon (2,270-liter) capacity.

THE DOMESTIC PLAYER

China's domestic helicopter industry is now under the umbrella of Avicopter, which was established in 2009 and co-funded by the Tianjin Port Free Trade Zone and the Aviation Industry Corp of China with a US$1.2 billion



Heliservices (UK) is the largest helicopter charter company in Hong Kong. The longtime Aérospatiale SA315B Lama operator has introduced a fleet of twin-engine MD 902s for multi-mission passenger transport and and lift work. **Chi Yin Liao Photo**

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investment. The new company integrated the activities of two old and established helicopter makers: Changhe Aircraft Industries Corp. (CAIC) and Harbin Aircraft Industry Group Co., Ltd.

Avicopter is now headquartered at a brand new state-of-the-art helicopter manufacturing, maintenance, research and development, and heliport facility about three miles (five kilometers) east of Tianjin Binhai International Airport.

All new Avicopter civil helicopters carry three-digit designations that begin with a lucky "3." The middle digit represents the level of technology and the final represents the number of engines. (Some Chinese helicopters carry a "Z" designation assigned by the military.)

The two-tonne class AC311 (Z-11) is powered by a Honeywell LTS101-700D-2 or the WZ8D, a local version of the Safran Arriel 2B1A. (The AC311 resembles the AS350.)

Avicopter's four-tonne AC312 is powered by two Safran Arriel 2Es, and is a derivative of the Z-9, which is the Chinese-built version of the AS365N Dauphin.

Next, the seven-tonne AC352 (Z-15) first flew at Harbin on Dec. 20, 2016. Powered by two Chinese WZ16 engines based on the Safran Ardiden 3C, it's the Chinese counterpart to the Airbus H175, which has Pratt & Whitney Canada (P&WC) PT6C-67E engines, and first flew in 2009.

Finally, the 13-tonne AC313 is an updated Harbin Z-8, which is a derivative of the Aérospatiale SA321 Super Frelon. Designed for high altitude operations, it incorporates a great deal of composite material, and is powered by three P&WC PT6B-67As.

Most of the recent Avicopter civil helicopter sales have gone to Chinese police departments and government agencies active in forest firefighting and natural disaster response. For example, deliveries of the AC313 began in 2013 to Flying Dragon, a joint venture between Avicopter and the Chinese Ministry of Land and Resources. Simplex is supplying six Model 380A Fire Attack tanks for the AC313 that will hold 1,000 US gallons (3,785 liters) of water that can be filled using a retractable hover pump system similar to that on the Sikorsky S-70 Firehawk and the H225.

UNLOCKING THE AIRSPACE

Most would agree that the key to growing the helicopter industry in China is opening the low-level airspace to general aviation. China didn't follow the traditional model of general aviation development, whereby fleet growth followed economic development. There were too many barriers in the way of normal general aviation development, and it has proven to be a major challenge to clear them.

The Chinese government originally imposed rigid military control over its national airspace to defend the country from attack, and when independent Chinese airlines and helicopter companies were established in the late 1980s, only 20 percent of Chinese airspace was open to civil aviation. New Chinese aviation companies

CITIC Offshore Helicopter Company Ltd. is China's largest commerical operator and flies more than 60 helicopters, including this Airbus H135. COHC is a partner in a new venture to assemble H135s in China. **Airbus Photo**

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had to apply a long time in advance for flight approvals; landing, handling and flight planning fees were excessive; and Chinese private aircraft ownership strictly prohibited until as recently as 2003.

The Chinese government's "Five-Year Plans" began to acknowledge the benefits of general aviation for the first time in the new millennium, with the reform of the country's low altitude airspace gradually expanded to cover the whole country in 2015.

Simplified flight approvals were introduced in some areas, but 24-hour advance notice is usually required and some approvals have taken much longer. For example, when Avicopter opened its new helicopter factory in Tianjin 2013, it was still waiting for approval to operate helicopters from its own heliport.

Helicopter industry executives are reluctant to go on record regarding airspace restrictions for fear of offending the regulator, which may be one of the reasons the topic seems rather obscure.

"The People's Liberation [Chinese] Army is the most powerful institution in China, but it doesn't always heed what's in the five-year economic plan," said one China-based aviation executive.

History shows that when regulations relax or a new business opportunity appears, Chinese businesses will move very fast to capitalize on the opportunity.

"But the military is reluctant to relinquish its control of low level airspace, and the CAAC is cautious about taking on the responsibility, because they are afraid there will be chaos in the skies and a lot of accidents and the CAAC will be blamed," said another U.S. based helicopter executive.

The International Civil Aviation Organization has held a lot of workshops in China on civil-military air traffic management and flexible use of airspace to help prepare the groundwork for eventual change, and organizations like Helicopter Association International (HAI) have been working with Chinese operators and government agencies to share industry best practices.

"There are many different jobs waiting to be done by helicopters in China — such as EMS, forestry, firefighting, law enforcement, agricultural and construction — and we have highlighted the benefits in our conversations with various government agencies," said Matt Zuccaro, president of HAI.

For the skies to open, many now believe it has to come from the top down.

"If the current Chinese leadership wants airspace restrictions relaxed, they seem to have more power to sway the military (than past leaders) to bring about the desired change," added the executive in China.

It took 70 years for the helicopter industries in North America and Europe to reach the current level of maturity, requiring a lot of learning by trial and error to create a vibrant entrepreneurial "helicopter culture." The notion that China can compress seven decades of rotary-wing development into a year or 10 without hitting turbulence is certainly optimistic, but there will come a day in the not-too-distant future when the Chinese helicopter dragon will finally be set free.

Kenneth I. Swartz | Ken has spent most of his career in international marketing and PR with commercial aircraft manufacturers, airlines and helicopter charter operators. An award-winning aviation journalist, he runs Aeromedia Communications, and can be reached at kennethswartz@me.com.

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Teton County Search and Rescue (SAR) of Jackson, Wyoming, is one of the busiest SAR teams in the U.S., conducting more than 100 rescues a year. **Dirk Collins Photo**

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BACKCOUNTRY RESCUE

Teton County Search and Rescue prepares to make its small screen debut in *Backcountry Rescue* — a new reality TV show that documents the work and lives of the team based in Jackson, Wyoming.

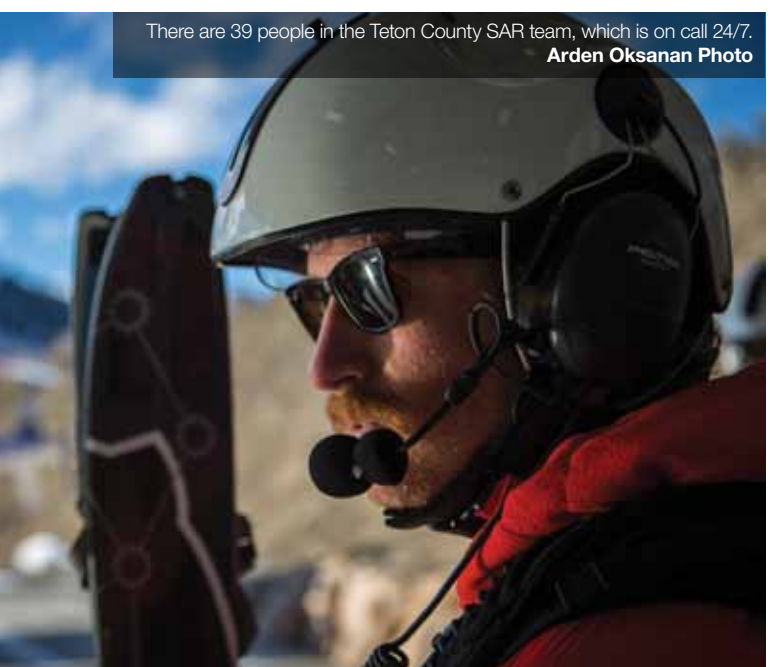
By Jen Boyer

The Teton County SAR team is prepared to complete a range of rescues, including short-haul, swift water, avalanche recovery, and finding lost hikers.
Dirk Collins Photo

To ensure an accurate portrayal of the work they do, three local film crew members were embedded with the SAR team and added to the call out list. **Dirk Collins Photo**

Teton County SAR contracts with Hillsboro Aviation for a Bell 407 and pilot for use in rescues from October to May. **Brittany Mumma Photo**

There are 39 people in the Teton County SAR team, which is on call 24/7. **Arden Oksanan Photo**



In a world where rock, snow, ice, wildlife and mountain views attract more than three million visitors a year, one volunteer search-and-rescue (SAR) team with their contract helicopter and pilot is tasked with making sure everyone goes home alive.

If you think that sounds like a film trailer voiceover, you're not far off; it's the story of Teton County Search and Rescue of Jackson, Wyoming, which has become the star of a new TV show, *Backcountry Rescue*, airing on the Outdoor Channel Feb. 6.

One of the busiest SAR teams in the U.S., Teton County — overseen by the Teton County Sheriff's Department — conducts more than 100 rescues a year, including assisting the National Parks Service in Grand Teton National Park. Formed in 1993, the 39-member team remains on-call 24/7, prepared for a range of rescues including short-haul, swift water, downed aircraft, dive accidents, lost hiker, avalanche recovery, and cave rescue.

The team employs a number of rescue tools of the trade, from snowmobiles and skis to climbing gear and ATVs. Yet, with 4,200 square miles (9,200 square kilometers) of rugged, remote terrain, the toolbox couldn't possibly be complete without a helicopter.

Between October and May, the team contracts with Hillsboro Aviation for a Bell 407 and pilot to assist with rescues. During the summer, contract firefighting aircraft based in Jackson are available for support when needed.

"It doesn't matter what you do, we're trained to come rescue you," said Tim Ciocarlan, Teton County SAR chief advisor to the sheriff and one of the original team members. "And when it comes to the helicopter, this is our ambulance. Our 4,200-square-mile playground is very remote and it's extremely difficult to get a hurt person 15 miles out of the wilderness. The helicopter is our best option to move people without furthering injuries."

The helicopter, piloted primarily by Hillsboro's Nicole Ludwig for the duration of the contract, is hangared with the team while Ludwig stays nearby in a rented apartment, working a one-month-on, two-weeks-off shift. A relief pilot covers in her time off. In total, the helicopter can fly between three and 20 hours in rescues in seven months, totalling a dozen or so actual rescues.

"Five or six years ago, we used to do far more rescues, but that is down because there is less snow, which itself is concerning," Ludwig said. "Back then we'd do week-long searches."

Regardless of the number of rescues, the helicopter is used in 30 hours of training throughout the contract period, some of which Ludwig designs and provides directly to the 38 volunteers and one paid coordinator for the SAR team.

"Because we fly so few rescues, it is difficult to maintain proficiency, so I work to train the team every two weeks," Ludwig said. "We have one large training [session] at the beginning of the season for the whole team. After that it is up to the pilot for specialty training, so sometimes team members request certain training and other times I identify what we need to refresh — litter training, movement around the helicopter, emergency procedures, for instance. It's short haul training that we do the most, though, because that is what we do on many rescues."

MAKING A SHOW OF IT

Breathtaking scenery, fit and passionate outdoor folks, an element of danger and adrenaline, and all the "big kid toys" at work make Teton County SAR a very attractive subject for Hollywood's reality TV market. For years, reality TV producers approached the sheriff requesting permission to create a show around the unique local men and women who volunteer their time to learn, train and perform rescues in some of the most dangerous situations and environments. For years, this serious and dedicated team turned them down — citing often over-dramatized and even film-crew incited events to create "exciting" TV that would put the program in a poor light, or, even worse, create a safety hazard during a rescue.

Producer Dirk Collins' pitch was different.

"[As] a resident of Jackson who knows many of the team members, I understand the importance of this team to Teton County," Collins said. "They were very leery of 'reality TV' and what being involved with something like that could do to the image of Jackson, Teton Valley and the team. I suggested a documentary that told the true story of the team, highlighting the community and region. This team has regular jobs and lives, yet they drop everything to go out and save lives of people they don't know. The show tells that whole story."

For more than a year Collins met with the team and sheriff's office. "Because of the professional, technical and legal responsibilities of the team, the sheriff only agreed to sign off on the show if it could review each episode," Collins said. He agreed to the terms.

With the Teton County SAR blessing in hand, Collins then had to shop the idea to networks. He partnered with Warm Springs Productions in Missoula, Montana, a production house with numerous outdoor, documentary and reality shows under its belt and the contacts to shop the show.

The reality show stigma hurdle is real. National Geographic, the Discovery Channel and the like weren't interested in the show as approved by Teton County SAR. "They all wanted reality TV with guaranteed tension and drama," Collins said. "That wasn't going to work. This team is professional and that's not how they're going to act."

But as luck would have it, the Outdoor Channel was looking to broaden its offerings and audience. The idea of a documentary of a professional SAR team was just the ticket. The show was a go.

RESCUE FILMING

In order to ensure an accurate capture of the team and the work they do, Collins embedded three local film crew members with the SAR team that were active, outdoor types familiar with the helicopter and other vehicles as well as mountain environments. The film crew was added to the call out list, receiving the call to a rescue at the same time as the rescuers.

"The film crew and team knew we'd take them whenever we had room, but there would be times when we couldn't, and they respected that," Ciocarlan said. "And then there were times that we were already gone by the time the film crew arrived. In all, they worked really well with our team and they didn't compromise safety or ask us to do things we'd not normally do for the sake of television drama. It was a very positive experience."

Knowing they might not be alongside the rescuers at all times, Collins mounted cameras on their helmets, in the helicopter and on vehicles. He also arranged for the crew to participate in the team's regular trainings.

"Initially having a film crew was a little awkward as there was concern it would slow down our process, but I have to say, the times they did come, I didn't notice them," Ludwig said. "They were not invasive at all. Cameras mounted in the helicopter ran all the time. No one was putting a camera in my face as I was working or doing anything else to distract me. I really appreciated that. And they didn't make us recreate

With 4,200 square miles of rugged terrain to cover, Teton County's work is made a lot easier with the use of a helicopter — especially when they need to get someone with an injury out of the wilderness. **Brittany Mumma Photo**

The helicopter is primarily piloted by Hillsboro Aviation's Nicole Ludwig during the contract, and it can fly between three and 20 hours of rescue in seven months. **Arden Oksanan Photo**

a rescue. They captured what they could get at the time."

In addition to capturing the action as it happened, Collins arranged for one-day use of a second helicopter. Using a Shotover external camera system, the helicopter gathered aerial footage of the region, shots of the team training with Ludwig in the helicopter, and scenic images of the SAR helicopter in flight to be used throughout the season, as well as in opening credits.

THE FINAL PRODUCT

Running at eight 30-minute episodes with an option for a second season, *Backcountry Rescue* delivers the element of drama and urgency experienced in a rescue situation and sprinkles it with side stories about the rescuers themselves. Viewers meet some of the team and see them in their day jobs and hobbies. The Teton County SAR team members are shown to be dedicated, passionate and

The team trains every two weeks to maintain proficiency, with the helicopter used for 30 hours of training during Hillsboro's contract period.

highly trained, with a deep sense of community.

The show is also sprinkled with facts appearing on the screen, describing the region, hazards, history and medical references to help viewers understand the hazards and conditions relevant to the rescue.

During the first season, rescues range from a teen in a snowmobile accident with a dislocated hip and an avalanche victim to an injured skier and man who tumbles off a 200-foot cliff. Viewers are also introduced to a number of the team members, see the level of training they perform, and are shown snow bombing from the helicopter for avalanche control.

"When people get hurt in the back country, it's real and it's real serious," Ciocarlan told *Vertical*. "I've seen some of the show and I feel they captured that honestly."

Jen Boyer | Long-time communications professional Jen Boyer is a commercial instrument helicopter pilot with flight instructor and instrument instructor certificates. A member of the Whirly-Girls, she runs her own aviation industry strategic communications business.

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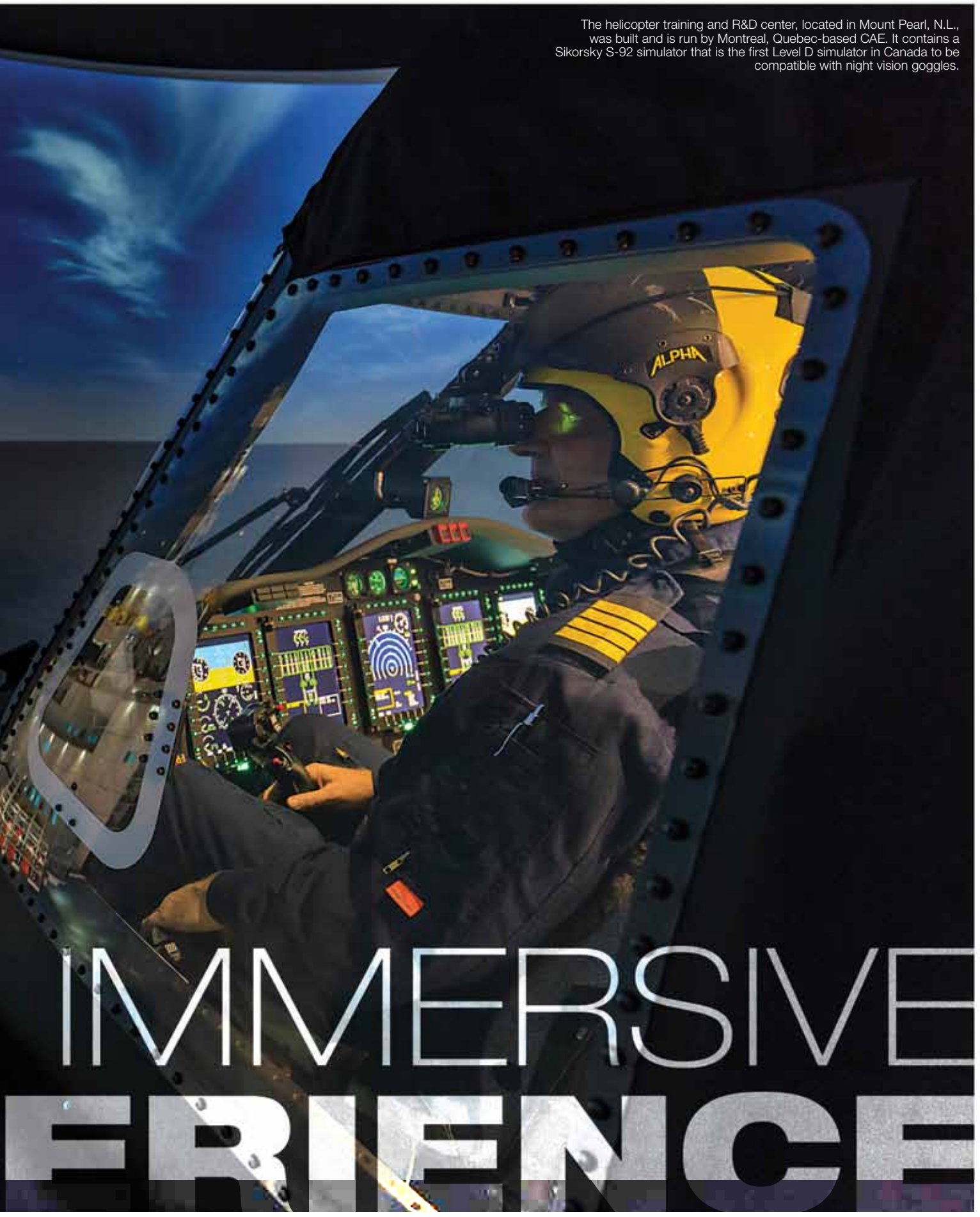
AN EXP

A C$16-million helicopter training and R&D facility near St. John's, Newfoundland and Labrador, is bringing a new level of fidelity to Cougar Helicopters' simulator training.

Story by Oliver Johnson
Photos by Heath Moffatt



The helicopter training and R&D center, located in Mount Pearl, N.L., was built and is run by Montreal, Quebec-based CAE. It contains a Sikorsky S-92 simulator that is the first Level D simulator in Canada to be compatible with night vision goggles.

IMMERSIVE ERIENCE

Roughly 350 kilometers (220 miles) southeast of St. John's, Newfoundland and Labrador, deep under the tempestuous waters of the North Atlantic, lies the Hebron oil field. The Hebron project — to recover the estimated 700 million barrels of resources contained within the field — is one of the key offshore projects in the region, utilizing a 680,000-tonne platform.

Sitting in the back of the Cougar Helicopters Sikorsky S-92 just a few hundred meters from the structure, the sheer scale of the construction, standing seemingly immovable above the crashing waves, was impressive. The platform's blinking lights reflected off the sea as the skies began to darken. But something wasn't quite right. And not least the fact that the Hebron platform doesn't quite exist yet.

"Can we make it about 15 minutes later?" asked *Vertical* photographer Heath Moffatt, who was leaning out the side of the cabin. The technician to my right tapped a few buttons and the skies instantly darkened.

"Oh, great! But maybe another five minutes?"

A few more increments took us to 4:36 p.m., which, it turned out, provides just about the perfect ambient light for a photograph of the inside of a simulator. Yes, despite our view, we were on dry land, and just a few minutes' drive from Cougar's headquarters in St. John's at a new helicopter training and research and development (R&D) center in nearby Mount Pearl.

Fully funded by the Hibernia Management and Development Company and the Research & Development Corporation, and operated by Montreal, Quebec-based CAE, it contains the first Level D full flight simulator (FFS) with night vision goggle (NVG) compatibility in Canada, as well as two classrooms, a virtual simulator, and an instrument procedures trainer. The virtual simulator is a computer program that allows students to explore a fully-functional S-92 cockpit, while the instrument procedures trainer is a fixed simulator with a number of screens around two pilot seats that display the S-92's controls.

The simulator was certified in March 2016, and recurrent courses for Cougar — the center's major customer — began the following week. Cougar uses the facility for its initial training on the type, as well as its recurrent, night proficiency, and search-and-rescue (SAR) training. Prior to the center opening, Cougar's pilots had been travelling to FlightSafety International's facility in Lafayette, Louisiana; and then to Oslo, Norway, to perform their simulator training. Having such a facility so close provides obvious financial and logistical benefits.

The simulator replicates the cockpit of Cougar's search-and-rescue S-92 to exact detail, down to that aircraft's registration number — C-GIKN — appearing on the name plate on the simulator's dash.

Paul Carter, Cougar's chief pilot, said the operator worked closely with CAE to develop the simulator. "It's almost a custom sim," he told *Vertical*. "They built and replicated our auxiliary fuel tank system, which is a VIH design and modification . . . they have our quick position alert button, the Blue Sky tracking system built in on the overhead, and they have all our offshore routes, all the installations we fly to in the right positions. And they now have

Cougar Helicopters is the center's major customer, The cockpit of the simulator is an almost exact replication of Cougar's search-and-rescue Sikorsky S-92 — down to the registration C-GIKN appearing on the name plate on the simulator's dash.

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the Hebron platform — which is to set sail in spring — in the actual latitude and longitude that it's going to end up in, in June. We're already landing on it and it's not even operational."

THE SECRET TO SUCCESS

CAE is a major presence in the international flight training market, providing its services to 120,000 pilots across its various fixed- and rotary-wing training facilities. It now has five S-92 Level D FFSs in operation around the world — and their distribution is truly global. In addition to Mount Pearl, there are S-92 FFSs in São Paolo, Brazil; Oslo, Norway; Zhuhai, China; and Brunei in Southeast Asia. However, the simulator in Mount Pearl is the first to be compatible with night vision goggles (NVGs).

But what goes into creating such a realistic product — one that incorporates and seamlessly blends advanced mechanical and software engineering? In terms of numbers, about 250 people will work on a simulator before delivery, said Peter Cobb, CAE's business development leader for helicopter training, but more fundamentally, it requires a deep understanding of how the helicopter operates.

"Certainly a lot of data gathering is required, so we flight-tested several S-92s in order to gather the necessary data that we needed to simulate the systems and the performance of the aircraft," said Cobb. "Then of course we've got a strong baseline capability — we delivered the first Level D simulator to the Australians over 20 years ago now — so we've got a broad level of capability around helicopter simulation, which is quite specific."

Cobb said the introduction of CAE's 3000 Series, about five years ago, ushered in a new era of immersive mission training in helicopter simulators. "One of the things we did . . . was move to direct projection domes as opposed to the columnated visuals that you see in fixed-wing simulators. And those direct projection domes allow you to give a bigger field of view, which is particularly important for helicopter pilots, because they're looking down much more than they're looking straight ahead. It provides very accurate feedback in terms of where you are with regards to the ground or the water."

According to CAE, its simulators can replicate up to 400 malfunctions in an aircraft — and the ability to introduce these during training is a huge benefit to pilots. But for Cougar, it's the ability to fly not just in the

CAE said its Series 3000 simulators can replicate up to 400 malfunctions. Cougar uses it for initial, recurrent, night proficiency, and search-and-rescue training.

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Cougar chief pilot Paul Carter (left) and chief training pilot Barry Steeves (right) stand alongside the simulator in Mount Pearl. Cougar expects to fly over 1,000 hours each year in the simulator, which is just a short drive from its headquarters in St. John's.

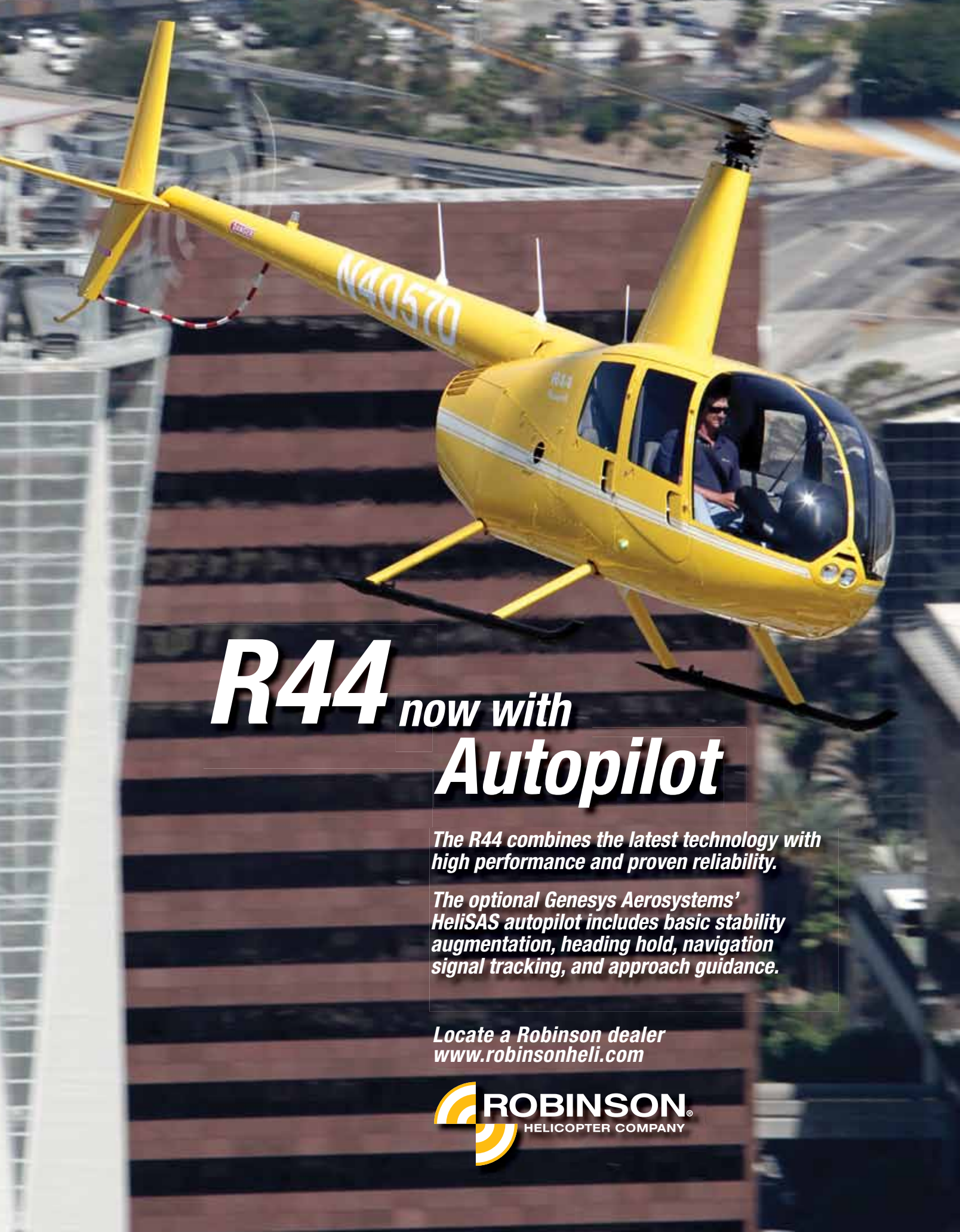
North Atlantic environment, but the exact geography off the coast of Newfoundland — with the oil rigs and platforms in their exact location — that's a unique draw.

"The more realistic simulator training is, the more value the training is going to have . . . so we're pleased as punch with this," said Barry Steeves, chief training pilot at Cougar. "They've modeled turbulence through the [oil rig] structure, which is a big thing for us, and the vessels move with sea states, so when we train, it allows us to train in a really contextual environment."

The team can even call up Cougar's dispatch center and have them create a flight plan to and from a offshore vessel — and they will then fly that mission with the weather and conditions exactly as they are outside.

Of course, a huge benefit of training in a simulator as opposed to a real aircraft is in practicing emergency operations. "We can do things in this simulator that we could never hope to do in the aircraft, as far as training goes," said Steeves. "Everything from the classic engine failures, to practicing autorotations to the sea, to doing ditchings, to landing on moving platforms. So the fidelity is the key with this simulator that puts it a little step ahead."

> **"THE MORE REALISTIC SIMULATOR TRAINING IS, THE MORE VALUE THE TRAINING IS GOING TO HAVE . . . SO WE'RE PLEASED AS PUNCH WITH THIS.**
>
> ***- BARRY STEEVES, CHIEF TRAINING PILOT AT COUGAR***



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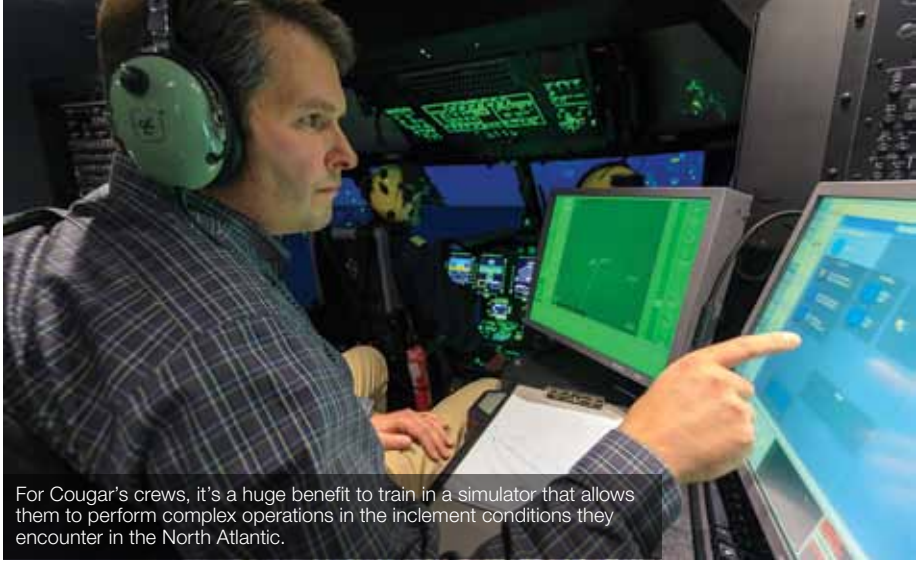

For Cougar's crews, it's a huge benefit to train in a simulator that allows them to perform complex operations in the inclement conditions they encounter in the North Atlantic.

MORE THAN A SIMULATOR

CAE has four full-time staff running the center. While Cougar is clearly the major customer, projected to fly over 1,000 hours a year in the simulator, HNZ and CHC have also made use of it. CAE hopes the simulator will ultimately complete 1,500 training hours annually.

But the center's purpose is to provide more than just a home for simulator training. There are five ongoing research projects at the facility, each exploring various aspects of pilot performance in the offshore flight environment. The trials are supported by Cougar (which supplies the majority of the pilots for the tests) and in partnership with local firm M2M Consulting.

They include an investigation into the various factors that might influence pilot performance, such as fatigue, temperature, or alcohol consumption — whether recent or in the near past. One of the tools the team is able to utilize at the center is a climate chamber. This allows pilots to be exposed to high or low temperatures and then taken to the simulator to fly, to monitor the impact on their responses and ability. The overall aim of the project is to develop an offshore helicopter aircrew health monitoring guide.

Another project is looking at helmet fatigue — a particularly relevant issue for Cougar's SAR pilots who fly with NVGs on their helmets — to explore what the parameters are in which pilots become fatigued and develop strategies to alleviate it.

Other projects are exploring ways to optimize crew resource management and taking a more empirical look at the first office induction process.

The establishment of such a world-class facility in Canada has been no mean feat, and Cobb said he's particularly proud that two great Canadian companies have been able to partner together to make it happen. "We've been talking to Cougar for a long time about getting a Canadian training capability for them, so it was certainly very satisfying personally and I think also satisfying from a Canadian professional perspective."

Editor's note: A version of this story appeared in the January-February edition of Skies Magazine — Vertical Magazine's sister publication.

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A Bell 429 operated by Advanced Flight of New Zealand flies with some threatening cloud in the distance. Understanding how weather forecasts are made, and the tools available to operators, can help make the "go/no-go" decision easier. **Christopher Moss Photo**

TIME TO CHECK THE FORECAST

Ever wondered how aviation forecasts are made? *Vertical's* resident meteorologist, Ed Brotak, explains the science behind the predictions and the tools available to help you get a better understanding of what to expect.

Helicopter operations are extremely dependent on the weather. Of utmost concern is safety: can the flight be accomplished without an undue amount of risk? The "go/no-go" decision is often based on observed and predicted weather conditions. Visibility, winds, and turbulence are the major factors, but air density can also be critical.

Aviation meteorology is a distinct branch of the science. Meteorologists who make aviation forecasts have undergone specialized training, and they will tell you that making these forecasts is extremely difficult — much more so than compiling a standard public forecast. This is because they have to be much more precise. The weather elements they are forecasting — such as wind, sky condition, and visibility — are inherently more variable. And, of course, the stakes can be much greater. If people are caught in an unforecast shower, they'll get a little wet. If an aircraft inadvertently enters instrument meteorological conditions (IMC), the results can be disastrous.

In determining current and future weather conditions, helicopter pilots face a much more difficult problem than most aviators. Fixed-wing aircraft typically go from airport to airport, where weather information and forecasts are readily available. Helicopters, on the other hand, can be required to takeoff and land from any location that they're safely able to access, so direct weather information is often lacking. Many helicopter operations also take place at low levels, where weather conditions are typically more extreme and variable.

It's easy to check the current weather conditions if you're dealing with airports. The weather is monitored constantly and

Radar will show you where precipitation is happening, but it can't detect clouds or fog — the main causes of instrument meteorological conditions (IMC). **Anthony Pecchi Photo**

reports are sent out hourly (the standard METAR) — or more often if critical weather factors change — and all of these reports are readily available online. Of course, these observations are surface-based. You could get a ceiling height, but you would have to extrapolate the surface visibility and winds to conditions aloft.

If you're dealing with heliports, all should have, at minimum, a wind cone to show the direction and magnitude of the wind. Automated weather observing systems (AWOS) can also be installed and provide the full array of readings typical at government-monitored sites — and the data can be accessed remotely.

What can we tell about conditions between airports, where there are no direct weather observations? Radar will show you where precipitation (and likely IMC) is currently occurring. But radar can't detect fog or clouds, the main causes of IMC. Satellite imagery can show clouds and fog, but the processing time often makes the available images far from current.

Pilot reports (the standard PIREPS) can provide useful information, especially in terms of hazardous weather, but helicopter operations are often away from standard flight corridors. Typically, one has to extrapolate from known conditions at nearby airports to estimate conditions elsewhere.

USING THE TOOLS AVAILABLE

Once you know the current conditions, then you'll want to know how things will change — and how fast. Now we're in the realm of weather forecasting. In terms of official aviation weather

“IF YOU'RE DEALING WITH HELIPORTS, ALL SHOULD HAVE, AT MINIMUM, A WIND CONE TO SHOW THE DIRECTION AND MAGNITUDE OF THE WIND. AUTOMATED WEATHER OBSERVING SYSTEMS (AWOS) CAN ALSO BE INSTALLED AND PROVIDE THE FULL ARRAY OF READINGS TYPICAL AT GOVERNMENT-MONITORED SITES.

forecasts, we have the standard terminal aerodrome forecasts (TAFs) in the U.S. Updated every six hours, these are 24-hour forecasts that include wind speed and direction, visibility, present weather, ceilings, and low-level wind shear. The TAFs are for specific airports and areas within a five-mile radius. Aviation area forecasts (FAs) cover a much larger region and are less specific. These are issued every eight hours and consist of a 12-hour forecast with an additional six-hour outlook.

A SIGMET (which stands for significant meteorological information) is a four-hour forecast of potentially hazardous conditions, such as severe icing, extreme turbulence, dust or sandstorms reducing visibility, or volcanic ash. SIGMETs cover a fairly large area — at least 3,000 square miles. Convective SIGMETs are forecasts covering two hours and imply dangerous weather due to convection. AIRMETs also advise of possibly hazardous weather conditions but not as severe as SIGMETs. These would include instrument flight rules (IFR) and mountain obscuration, moderate turbulence or strong surface winds, and moderate icing. AIRMETs are issued for six-hour periods.

The National Weather Service (NWS) Aviation Weather Center (AWC) in the U.S. has a number of graphical products to help those looking to get a better understanding of the forecast. The G-AIRMET (aviationweather.gov/gairmet) is a graphical advisory of potentially dangerous weather conditions — turbulence, low-level wind shear, strong surface winds, icing, freezing level, IFR,

The HEMS Tool was designed specifically to help helicopter air ambulance operators with ceiling and visibility assessment in areas with limited surface observation data. **Mike Reyno Photo**

and mountain obscuration. It is issued every three hours or updated as is needed. The Experimental Aviation Forecast (GFA) webpage (testbed.aviationweather.gov/areafcst) was designed to provide aviation interests with a complete weather picture from 14 hours in the past to 15 hours in the future in a graphical format. It covers the lower 48 states and a few stations in Canada.

The NWS also offers the HEMS Tool (aviationweather.gov/hemst), which was designed specifically for the helicopter air ambulance sector. However, the information it can provide would apply to many helicopter operations, especially at low altitudes. As described by the NWS, the HEMS Tool is "a graphical flight planning tool for ceiling and visibility assessment along direct flights in areas with limited available surface observations capability."

North of the border, Nav Canada's Aviation Weather Website (flightplanning.navcanada.ca) also provides graphical products such as the Graphic Area Forecast (GFA) to go along with the standard alphanumeric data.

This AWOS was installed on ExxonMobil's Harmony offshore platform to support helicopter supply flights.

PREDICTING THE FUTURE

How are aviation forecasts produced? In the U.S., TAFs are produced locally at one of the 122 NWS Forecast Offices. A trained aviation forecaster is on duty 24 hours a day. A central facility, the AWC in Kansas City, Missouri, provides the FAs, SIGMETs, and AIRMETs, as well as running the AWC website. In Canada, the Canadian Meteorological Aviation Centre has two offices — one in Edmonton and one in Montreal — that provide all of the aviation forecasts and products for the country. Other countries have similar arrangements.

To make an aviation forecast, meteorologists start with the current conditions. They start with the large-scale weather patterns,

such as location of the jet stream, and positions of high, lows, and fronts. They then take this down to the local scale to see what actual weather conditions are like, especially in terms of flight factors.

Although TAFs go out to 24 hours, the first six-hour forecast period is the most critical, and forecasting for the short term requires a different approach. There are actually a couple of simple techniques forecasters use. The first is persistence, and this simply means the weather won't change and it's amazingly good for an hour or two. If it's foggy at 4 a.m., it will probably be foggy at 5 a.m. and even 6 a.m. Obviously at some point persistence will be wrong, and determining when is the key.

Continuity is another simple way of forecasting the weather in the short term. We make the assumption — and it's usually valid — that weather systems will move at a consistent speed and in a consistent direction. In this way, you can follow an area of precipitation or approaching cloud cover over a short period of time to determine its speed and direction of movement and use this to forecast how soon it will affect operations. Incorporation of weather radar data is crucial for short-term forecasts, and indeed for all flight safety.

Convection, of course, poses one of the greatest threats to aircraft. It is also, unfortunately, one of the most difficult things to forecast in advance. The best that the science can do at this point is to give a general idea if convective development is likely. There is no way to know exactly where or when dangerous convective cells will form; they are too small and short-lived. Because of the extreme danger posed by thunderstorms, they tend to be overforecast in advance. The best advice for any pilot is to check the latest radar imagery to see if and where thunderstorms may have developed.

TAFs are still written by hand by the aviation meteorologist. As in many areas, there is a push in aviation forecasting to develop graphical forecast tools rather than text products. This would require more automation. Products could be generated quicker and with less "man hours," but most graphical displays depend mostly, if not entirely, on computer output. Leaving the human input out of the forecast process likely will lessen the forecast accuracy at this point.

For longer-range forecasts out to 24 hours, there are some computer models whose output is useful, but aviation forecasters will tell you when it comes to making accurate forecasts, nothing beats local knowledge and experience. Knowing what typically occurs in your area is crucial. Climatology is the official term for the study of prevailing weather conditions over time at a particular location. Experienced forecasters don't even have to look up this information; it's embedded in their conscience.

Ed Brotak | Ed Brotak, Ph.D., is a retired professor of atmospheric sciences at the University of North Carolina, Asheville. His specialties include weather effects on aviation, marine operations, and ground transportation.

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A Robinson R66 flies off the coast of California near the manufacturer's plant in Torrance. **Skip Robinson Photo**

SAFETY FIRST

Vertical's Guys Maher joins the Robinson Helicopter Company's Safety Course to discover how the R66 — and a new vortex ring state recovery technique — have been incorporated into the bustling program.

Story & Photos by Guy R. Maher

The course includes both classroom and flying instruction. **Skip Robinson Photo**

Discussion of the vortex ring state — and countering recovery techniques — form an interesting part of the Robinson Helicopter Safety Course. **Skip Robinson Photo**

The author (left) with Robinson chief instructor Tim Tucker, who is a great believer in the use of the "Vuichard Recovery" to exit vortex ring state.

Last summer, almost six years after my last visit, I once again walked through the doors of the Robinson Helicopter Company Safety Course (RHCSC). Having been to a number of these classes, I had a pretty good idea what my next three to four days would entail — except for one thing. This time my emphasis would be on the R66 Turbine and how the course has changed to accommodate the additional model.

During my previous RHCSC visit, the R66 was still completing certification flight tests. And although I did fly the R66 during that visit for a *Vertical* pilot report, the accompanying safety course had obviously not been developed. Today, the R66 is fully integrated into the ground and flight curriculums.

The RHCSC has come a long way since it began in 1982 as a course intended only for flight instructors who taught in the R22. That was a once-a-month program that reached an average of 12 students per class. Now the RHCSC is open to any pilot of Robinson helicopters and is conducted twice as often with a typical class size — such as the one I was in — of 48.

Robinson Helicopter Company (RHC) president Kurt Robinson follows the tradition established by his dad and company founder Frank Robinson of opening the class. "Your whole relationship changes

when you take somebody flying, whether they are a pilot or not," he admonished the class.

Robinson has had upwards of 18,000 students come through the course, with the huge majority of them being first time attendees. This held true in my class, as the clear majority were young pilots — most with less than 200 hours of flying time — in the midst of their journey towards a career as a professional pilot.

Day one included an in-depth review of Robinson helicopter accidents, a factory tour, helicopter theory, and a discussion on critical flight conditions. The anchor for the day was Robinson chief instructor Tim Tucker, who has been involved with the RHCSC since its inception. He bought the first production R22 in 1979, and is so steeped in flying experience and Robinsons it would take a separate article to cover it all.

RING AROUND THE ROTOR

One subject that Tucker delved into in great detail was vortex ring state, also referred to as "settling with power." And that was Tucker's first order of business — to discuss the mixing of terms and confusion that's caused when vortex ring state is improperly referred to as "settling with power." The controversy stems from a condition — completely different from vortex ring state — in which engine power required exceeds engine power available, and the helicopter settles while under power.

Vortex ring state, however, occurs when a hovering helicopter descends at greater than roughly 300 feet per minute, entering a condition where the rotor is still directing air downward, but some air below it is forced out radially and up outside the rotor disc. Some of this upward-flowing air is drawn in and back down through the rotor, forming a large circulating pattern.

The confusion between the terms isn't helped by the fact that the FAA uses "settling with power" in its discussion of vortex ring state in both the Rotorcraft Flying Handbook and the Practical Test Standards. As Tucker explained, the picture is much clearer outside the U.S., with most simply using the term "vortex ring state" — and that's the approach that he takes, too.

Definitions aside, Tucker discussed the origin and methods of a new way to recover from vortex ring state. He was introduced to the technique while teaching a Robinson Pilot Safety Course in Neuchatel, Switzerland, in June 2011. Attending that class was

Over 18,000 students have come through the safety course, with the vast majority being first-time attendees. The author was one of 12 in the R66 class on the three-day course he attended. **Skip Robinson Photo**

Claude Vuichard, a senior flight inspector/examiner for the Swiss Federal Office of Civil Aviation. Vuichard is a helicopter pilot of — at the time of the class — more than 35 years and 16,000 flight hours.

During the flight portion of that course, Tucker demonstrated the standard vortex ring state recovery technique of forward cyclic and reduced collective that has been taught to pilots in the U.S. for more than 60 years. Vuichard then asked if he could show Tucker a recovery technique he had developed over his years of flying in the Swiss Alps.

Rather than reducing the collective, he increased it to climb power, added sufficient left pedal to keep the nose straight, and applied right cyclic. The combination of tail rotor thrust and right bank moved the aircraft to the right — and almost instantly out of the vortex ring state. With a little practice, Tucker himself was making recoveries from a fully developed vortex ring state with only 20 to 30 feet of altitude loss.

tail rotor accidents and design, autorotations, a course review, and a final exam.

And then there was the flying session — mine was with Tucker. For as long as I've known him, I've never had the pleasure of flying with him.

The Vuichard recovery technique consumed a good portion of our pre-lesson briefing, and with start-up and checklist complete, it was time to go. We repositioned to a grass area near the RHC pad for some warm-up hover work. Then we performed a northeast departure from Torrance. Tucker had me hold 55 to 60 knots then pull in 95 percent torque. We easily hit 2,000 feet per minute in the climb. He just wanted to show off the R66's climb abilities. But he cautioned me to remain below 65 knots while in the yellow takeoff power range.

As we proceeded northeast, Tucker took the controls to position us for some air work. He didn't waste time in getting to the Vuichard

The author is joined by classmates during his recent participation in the Robinson Helicopter Company Safety Course. Launched in 1982 as a once-a-month program with 12 students in a class, it now runs twice as often with a typical class size of 48.

Tucker was so impressed that for the past two years, RHC instructors have been teaching what he has coined the "Vuichard Recovery" with great success in the safety courses, and it has also been included in the maneuver guides for the R22, R44, and R66.

COMPLETING THE COURSE

On day two, the 12 of us who were in the R66 class moved over to the maintenance training room, where we covered the Pilots Operating Handbook, performance, limitations, and emergency procedures.

Day three had us back in the R66 class and in the hands of Pat Cox, RHC service manager. The fact that the R66 class was in the maintenance course training room was a plus. Cox had plenty of R66 components and a Rolls-Royce RR300 engine for all of us to closely examine and for Cox to illustrate many important points. There's nothing like doing a preflight inspection on an R66 — one component at a time. However, we did proceed out to the flight line to examine a complete helicopter, as well.

Day four was a mix of classroom and flying. We were all back in the one classroom and the work covered in-depth discussions of

The fact that the R66 class was in the maintenance course training room is a plus. **Skip Robinson Photo**

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THE PULSE OF THE HELICOPTER INDUSTRY

The RHCSC has grown and evolved over the years to match the increasing demand for quality training — but safety remains the core objective.
Skip Robinson Photo

technique for recovering from vortex ring state.

What he likes to do, if possible, is to set up the helicopter in an out of ground effect (OGE) hover with the tail into the wind. (It's much easier to get into vortex ring state with a tailwind.) The winds were light on the day of our flight, but Tucker did find the proper positioning to place us in a tail wind condition.

He explained that he likes to perform his demonstration in two steps. He began by slowing the helicopter down and reducing torque to around 35 percent to get us into vortex ring state. We eventually felt the shuddering — indicating the loss of effective translational lift. Holding the position, we then felt the descent rate begin to build as we added some power. Then it felt like the bottom fell out.

Tucker immediately put in some right cyclic — he likes to see 10 to 20 degrees of bank — and added collective along with left pedal. The descent stopped immediately and we were out. One crucial point is to make sure you add sufficient pedal to counter the torque of the added power and keep the nose pointed straight ahead. This allows maximum advantage of the tail rotor thrust that helps reduce the escape time and gets you back into clean air.

I asked Tucker to demonstrate the traditional recovery technique of forward cyclic and down collective for recovery. Then I had him follow-up with using the Vuichard technique again.

With the traditional method, we lost about 250 feet from the start of the maneuver to completion — and this was with little wind. The more tail wind encountered in this condition, the longer it would have taken to fly out of the dirty air and be able to increase collective to arrest the descent. Starting the maneuver again with the Vuichard technique, from the exact same altitude and flight conditions, we were fully recovered and maintaining altitude with about 50 feet of loss.

Now it was my turn to try it. I entered the OGE hover and let the descent begin. As soon as I felt the bottom begin to fall out from under me, I popped the cyclic to the right while adding collective and left pedal. The descent stopped immediately in about 50 feet of drop.

One thing about this technique is that it feels a little bit unnatural. The traditional technique follows a more normal pattern of movement performed in maneuvers such as takeoff and go-arounds. Recovering sideways feels different, and therefore should be practiced a little more regularly to become ingrained.

And this includes simulating the maneuver down low. Certainly, you do not want to intentionally enter a full blown vortex ring state at a couple of hundred feet above the ground. But what Tucker did point out was that you can get the helicopter on a slow and stabilized approach and practice the side cyclic and collective inputs — simulating the recovery. This way, the pilot becomes more comfortable with taking that specific action if needed low to the ground.

There is no mistaking the instantaneous recovery and return of positive control. You can feel the aircraft "pop" right up and back to positive altitude control. And consider, too, that we were letting the vortex ring state condition get fully developed. If you should happen to notice the descent begin while still adding collective but not fully developed, early recognition and recovery will take up minimal lateral space and consume even less altitude.

With vortex ring state recoveries out of the way, we proceeded to a nearby airport for some autorotations. Tucker talked me through all sorts of scenarios with varied starting positions.

We were directly over our intended landing spot and used zero airspeed and side flight along with pivot turns to reposition prior to establishing a more normal glide to finish the maneuver. We also employed the R66's extended glide capabilities by flying a long final

with 90 knots and 90 percent rotor rpm. Following a wide variety of autos with both power recoveries and full touchdowns, we wrapped up the session with some hydraulics-off practice.

PUTTING IT TO PRACTICE

As it turned out, I had a chance to put the Vuichard technique to practical use the following day. I was flying the R44 Cadet for a photo shoot and hovering the Cadet OGE close to and pointing at the camera ship — another R44 — that was a little higher than me. I must have caught a little of the camera ship's rotor wash and/or just let the Cadet begin to descend, because I could feel the beginning of the exact same "dropping out" experience I felt the day before with Tucker.

Previous to this training, I would have lowered collective, and turned away from the camera ship to recover and then returned to my position. This time however, I applied just a touch of right cyclic while adding collective, and the condition stopped immediately. I also remained pretty much in position. With a slight adjustment and minimal climb, we were back to our photo shooting. I'm a believer.

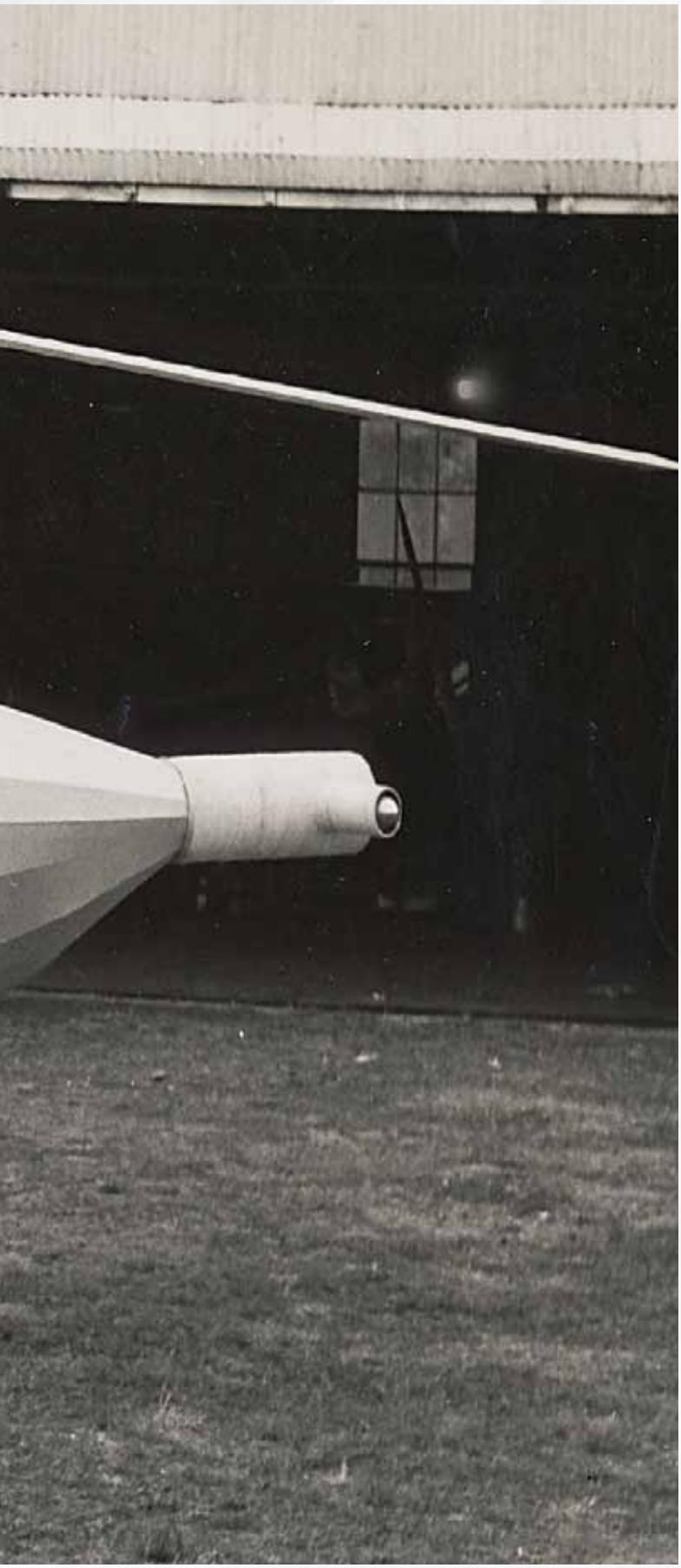
Tucker is working very hard to make this an accepted recovery technique. And it is gaining good traction. Since he first brought this technique to the industry's attention, Tucker has taught the technique on courses in about a dozen countries, and it has been well received.

Like Robinson helicopters themselves, the RHCSC has clearly evolved, grown, and improved to match the ever-increasing demands for quality training. But through all of this growth and change, one thing has remained the same — and that's the core objective of safety.

Unless you are a bag of hammers, you can't possibly come away from this course — whether it's your first or 10th time attending — without gaining a strengthened foundation of knowledge, an enhanced tool kit of procedures, and a solidified culture for operating safely. Frank's influence has not left the building.

Guy R. Maher | Guy has recorded than 16,000 flight hours as a dual-rated pilot and flight instructor with helicopter, airplane and instrument ratings. He runs Lanier Media Aviation Services, a company he founded in 1978. He can be contacted at guy@verticalmag.com


Gazda HELICOSPEEDER



THE GAZDA HELICOSPEEDER

How a flamboyant Austrian-born entrepreneur attempted to develop a high-speed helicopter with a revolutionary anti-torque system in 1940s Rhode Island.

By Bob Petite

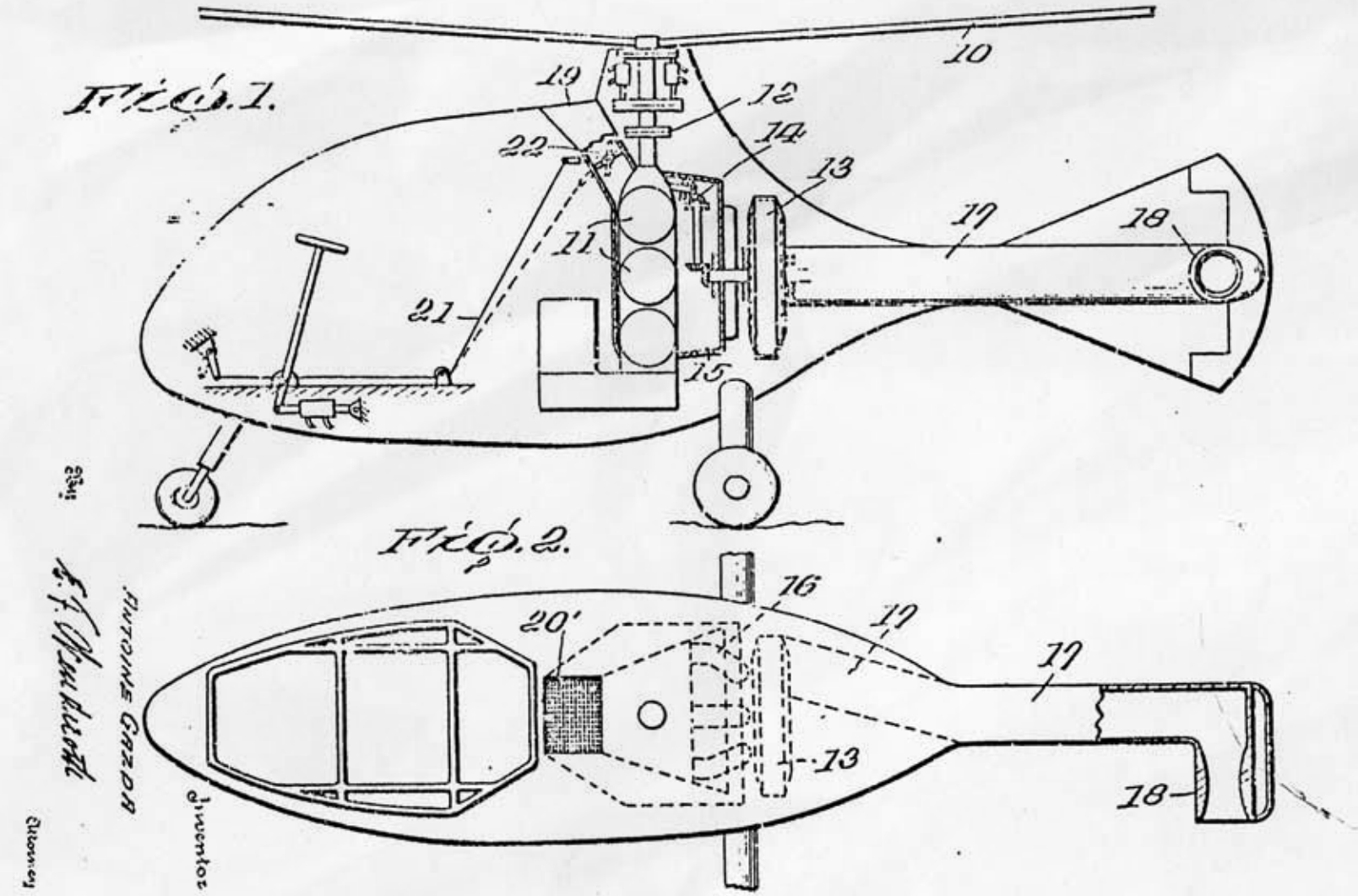
During the latter years of World War II, New England was the setting for a little known attempt to develop a radically different type of helicopter design — one that is not recorded in early rotary-wing books.

The story centers around a man named Antoine Gazda. Born in Vienna, Austria, on June 5, 1895, the multi-talented Gazda was a World War I Austrian air force pilot, a race car and motorcycle driver, owned an airplane factory in Switzerland, and became a prominent armaments dealer — as well as being an inventor and engineer. Well known as a gifted salesman, he marketed the Fairchild 24 aircraft in Europe, and was heavily involved in the worldwide sale of the 20-milimeter anti-aircraft cannons produced by the Oerlikon Machine Tool Works in the years leading up to World War II.

Gazda immigrated to the U.S. in 1940 with the specific intention of manufacturing the weapon for the British Admiralty, establishing the American Oerlikon Corporation in Providence and Wakefield, Rhode Island. There, he produced vast numbers of the new type of cannon for the U.K.'s Royal Navy and, having later convinced the U.S. military to purchase it, the U.S. Navy. The weapon provided the fleets with a powerful defense against the dive-bombing tactics of their enemies.

The original version of the Gazda Model 100 Helicospeeder helicopter with a two-bladed main rotor and a jet exhaust anti-torque system at the back.
Jeff Evans Collection Photo

A copy of Gazda's patent drawing, dated October 25, 1949, showing the anti-torque flow of gases towards the tail of the aircraft. **Jeff Evans Collection Photo**



His connection to helicopter history followed a chance meeting with Harold (Hal) Lemont, an early helicopter engineer. The two first met when Lemont acted as a consultant for Gazda on the design of expendable gliders with extended ranges in 1942, and while this project ultimately wasn't feasible, they crossed paths again a year later at a train station in Providence.

At the time, Lemont was working with Igor Sikorsky on his wartime VS-300 helicopter development in Stratford, Connecticut. His meeting with Gazda resulted in a discussion about helicopters and their wartime use. Gazda became excited and asked Lemont to design and build a helicopter for him — incorporating some new ideas that he believed could aid the technology's development.

The two soon reached an agreement that would see Lemont design and construct a one-place helicopter called the Gazda Model 100 Helicospeeder, which was to be produced by Gazda's Helicopter Engineering and Construction Corporation. The design work was carried out during July 1943, with former engineering students Jim Fitzpatrick and Harold Sadler assisting in the details. Work began on the construction of the Model 100 in November that year.

The team submitted an application to the United States Patent Office detailing a helicopter with an "antitorque reaction jet" on Dec. 14, 1943. The helicopter's fuselage was made of welded steel aircraft tubing, while the two main rotor blades were a steel tubular spar with a wooden leading edge and a wire cable trailing edge. (The design was later changed to incorporate a three-bladed main rotor.) The fuselage and blades were covered with aircraft fabric. The Model 100 had cast aluminum gear cases and industrial gears, bearings, pulleys, and belts, while its wheels were taken from a Piper Cub airplane.

Powering the aircraft was a Continental A75 75-horsepower engine. Unusually, the Model 100 had no conventional tailrotor; instead, it used a unique jet exhaust system with piping extensions set horizontally and perpendicular to the fuselage to counter torque. The helicopter was steered by varying the intensity of the lateral jets. It was an innovative development during the early years of helicopter design.

The Cierva-type rotor hub had hydraulic interconnected links between the main blades, which helped to prevent ground resonance. The helicopter contained an internal swash plate below the main rotor gearbox, along with internal main rotor push rods, and,

Antoine Gadza, sitting on the right in the Model 100 cockpit, explains the various instruments to military and civilian visitors. **Jeff Evans Collection Photo**

GAZDA PLANNED TO FLY THE PROTOTYPE, BUT WHILE HE WAS A PILOT, HE HAD NO ROTARY-WING FLYING EXPERIENCE. THIS DECISION TURNED OUT TO BE A COSTLY ERROR.

in the cockpit, had a single wheel with stick control. One raised the collective to rise; pulled fore, aft and sideways for cyclic control; and turned the wheel for directional control.

The helicopter was 19 feet (5.79 meters) long; 8 feet 4 inches (2.54 meters) high; with a rotor diameter of 25 feet (7.62 meters). Its fully loaded weight was 1,200 pounds (544 kilograms). The aircraft's cruising speed was estimated to be 140 miles per hour (225 kilometers per hour), and its maximum speed was 100 m.p.h. (160 km/h). Gazda's goal was a helicopter with a projected speed of 300 m.p.h. (483 km/h) — unheard of in the early days of helicopter development.

But while Gazda proposed the production helicopters at a cost of only US$5,000, no firm sales ever materialized.

A SHORT-LIVED PROGRAM

Assembly of the helicopter took place at the Providence Airport in Seekonk, Massachusetts, and it was completed by airport manager Arnold Chamberlain along with two aircraft mechanics. Work also continued on the jet propulsion anti-torque system, but initial ground testing soon determined that using air to counter torque

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was not going to work effectively. The system simply couldn't produce enough thrust.

As a result, the helicopter was redesigned with a tailrotor. The design gave the pilot the ability to turn the tailrotor 90 degrees so that he or she could use it as a push propeller to produce extra forward thrust. The experimental prototype that was ultimately produced owed much of its final design — approximately 80 percent — to the work of engineer Lemont.

Gazda planned to fly the prototype, but while he was a pilot, he had no rotary-wing flying experience. This decision turned out to be a costly error. During an early flight test, Gazda jumped the helicopter into the air after speeding up the engine and pulling up on the collective. The helicopter rose up and immediately settled tail down onto the ground. Gazda was unhurt, but Lemont was demoralized. "It was a total destruction of my confidence in the success of the project," he stated in *Recollections of my Association with Antoine Gazda* — a booklet he published years later.

The aircraft was rebuilt in two weeks. This time, during a run-up test, the team made an attempt to see if the helicopter could hover. Gazda followed instructions, and lifted the Model 100 into the air for about a minute. He then set it down — although a little shakily. Then he decided to try to fly the helicopter around the field.

Lemont did not think that this was a good idea. The ensuing argument ended with Lemont handing in his resignation — he did not want to be responsible for Gazda getting hurt or worse flying in a helicopter that he had designed.

Ultimately, Gazda himself came to realize that flying helicopters was beyond his capabilities, and it was not long before he decided to shut down further development on the Model 100 due to the projected costs to get it into production. He had also planned to manufacture a second version of the aircraft (a two-person helicopter called the Gazda Model 101), but work on that project never began. The existing prototype Model 100 was put into storage for many years.

Gazda, left, explains how the anti-torque reaction jet system works to interested visitors.
Jeff Evans Collection Photo

Gazda passed away on Sept. 19, 1957. His estate, including his research laboratories and warehouse — along with his Model 100 experimental helicopter — were put up for public auction on May 31, 1958, in Wakefield, Rhode Island. Vincent Colicci, who owned Rhode Island helicopter operator Copters Unlimited, was the winning bidder on the aircraft.

Two years later, Colicci sold the Model 100 to Carroll Voss of AgRotors, an agricultural spraying operator in Gettysburg, Pennsylvania, in exchange for some crop dusting equipment. Stanley Hiller, a helicopter pioneer, happened to see the Model 100 in storage at Voss's facility, and offered to restore the helicopter for Voss back in Northern California for display in his proposed helicopter museum in San Carlos. Voss agreed.

Eventually, the restored Gazda Model 100 Helicospeeder was returned to Voss, who displayed it at a Helicopter Association International Heli-Expo convention. Later, the Model 100 was given to the Owls Head Transportation Museum for permanent display in Camden, Maine. It was a fitting final resting place for this historic piece of helicopter history — one with a design that was way ahead of its time.

Bob Petite | Bob is a member of the Twirly Birds, AHS International, the Canadian Aviation Historical Society, the American Aviation Historical Society and the Bell 47 Helicopter Association, Inc. He is the author of *The Bell 47 Helicopter Story.*

A close-up of the tail of the Gazda Model 100, showing the area where the flow of gases helped to counter torque. **Jeff Evans Collection Photo**

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COLUMN

THERE I WAS... | **BY HARRY V. SOWLE, AS TOLD TO DAN MEGNA**

AN UNDERWATER EXIT

I started flying helicopters in the 1970s as a U.S. Army pilot in Vietnam. I flew OH-6s, often working alongside Cobras as an element of a "hunter/killer" team. After my military service, I wanted to continue flying, and in 1984 was hired as a commercial helicopter pilot with a Louisiana-based operator supporting the oil-and-gas industry in the Gulf of Mexico.

As a new employee, my company required I take a water survival course, which took place at the University of Louisiana's Lafayette Marine Survival Training Center. At the time, I thought the idea of being taught how to survive in the water was ridiculous; I considered it a waste of my time and the company's money. I believed there was no way I was ever going to have to escape from a sinking aircraft; I thought I was way too good of a pilot and way too smart to get into that kind of trouble.

After 20 years in the Gulf, I had logged almost 10,000 hours without an accident or incident. I had performed thousands of takeoffs and landings and safely transported many thousands of passengers. In just a few years, I'd take my retirement and just enjoy life and dote over my grandchildren. But on the morning of Nov. 16, 2003, I was dealt a terrifying reality check.

I was flying a Bell 407, shuttling a team of engineers between offshore platforms. The day was beautiful, the winds were light, and the sea was calm. At 10:27 a.m., I lifted from the platform's helideck for a short flight to another rig. From a stable three-foot hover, I began increasing torque, initiating a slow climb, and then I gently nosed the aircraft over to transition to forward flight.

Just as we entered translational lift, the aircraft was rocked by a violent "BANG" followed by a horrendous grinding howl. A catastrophic failure of the Rolls-Royce M250-C47 engine's power turbine assembly had occurred at the third stage turbine wheel, exploding jagged shrapnel through the aircraft's fuselage. I was unaware the blast had also severed the tail rotor driveshaft.

Chris Rohrmoser Illustration

The helideck on this particular rig was in the center of the platform, which is uncommon in the Gulf. That meant I was 30 feet from the edge of the platform, with almost no airspeed and a decaying rotor. I had to clear the railing before I could even think about autorotating the 150 feet to the water. I was in the worst possible position to recover and land safely.

I was petrified, but my instincts took over. I knew making the water was our best chance for surviving. So I held the pitch I had, hoping it would be enough to clear the platform, but I knew I was using up valuable rpm. Then, when I felt I was clear of the structure, I dove for the water, hoping I'd recover some rpm in the flare.

I remember cursing because I had stuffed in full right pedal yet the nose was yawing uncontrollably to the left. I had also been unsuccessful in deploying the aircraft's floats; a large metal ring on the collective surrounding the float activation button prevented my finger from depressing it.

Just before impacting the water, I pulled collective all the way to the stop. We hit with enough force to shatter the chin bubble. The helicopter immediately rolled right, turned upside-down, and began to sink. I found myself hanging upside-down from my seat harness underwater. I reached for my door handle, but it was no longer where I thought it was supposed to be. I was pissed! I couldn't find the damn thing! So, I was underwater getting mad at a door — which I realized wasn't very productive.

I began to panic. I knew it was impossible to break the window and escape, but I tried anyway. I only succeeded in cracking the window and cutting my hand. That bout with desperate stupidity then got me thinking about sharks.

The Gulf water was warm and the sound of escaping air bubbles seemed pleasant, almost comforting. I began thinking about my wife and daughter.... Then, as if I was shaken from a dream, my mind rebounded back to that "ridiculous" water survival training — and I thought: NEVER STOP LOOKING FOR A WAY OUT!

I had been underwater for perhaps a minute when I turned and looked to my left. Through the murky water, I saw my front seat passenger was gone, and noticed the outline of the open passenger door. It was getting darker and harder to think clearly, but I knew I had to unlatch my harness and make my way to the open door. I did exactly what my survival course had taught me: "Get one hand on the door frame and pull yourself out. Never mind anything else. As you clear the door, use your other hand to inflate your life jacket. It will take you where you need to go."

I didn't know which way was up or down, but a few seconds later I splashed to the surface and saw my passengers floating safely in their life jackets just a few feet away. My next thought was, "Wow, those instructors were right. The training worked!"

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