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Cover Story

056 | In the Valley of the Kings

In northern British Columbia, a diverse fleet of helicopters is creating a transmission line over some of the most challenging terrain imaginable. **STORY BY OLIVER JOHNSON | PHOTOS BY BRYAN DUDAS**

In Every Issue

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cover

COVER "Jerry" — an Erickson S-64E Aircrane — places a load at the site of a transmission tower in the remote mountains of northwestern British Columbia. The transmission line is being built to provide power to the Brucejack mine, which will be drilling for gold in the mineral-rich ground of the "Valley of the Kings." **BRYAN DUDAS PHOTO**

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***Vertical* is proud to be a member of**

by Geoff Goodyear

Advance & Be Recognized!

It is always nice when a bit of recognition comes your way — assuming, of course, it is of a positive nature. However, whether positive or otherwise, it stands to reason that when one is recognized, one is also being observed. And as our industry engages in a generational change, there will be lots of young, impressionable and career-minded entrants who will be watching.

My grandfather and his brothers served with the Royal Newfoundland Regiment during the First World War. Fast forward to 1943, and his daughter Sheila (my aunt) was getting ready to ship overseas with the Royal Canadian Air Force. Her journey started with a train trip from Grand Falls to Botwood, where one boarded a paper boat to England. Our province was part of Great Britain at the time. My grandmother and grandfather were both at the train station to give a tearful farewell.

My grandfather was far less emotional, and seemed to be preoccupied and distracted throughout the process. He eventually asked my grandmother to get off the train, as he wished to have a private word with Sheila. My aunt recalls that she braced herself for what she thought would be the classic father-daughter talk dispensing concern and moral advice to see her through her wartime service.

She was quite taken aback as the conversation progressed.

"Sheila, you are on your way to France and will be in a war theater."

"Yes Dad," she replied.

"I was over there with your uncles in 1914, also in wartime."

"Yes Dad."

"You know that we travelled extensively through France for several years."

"Yes Dad."

He paused for effect, then passed on his key advice.

"Don't tell another living soul your surname is Goodyear!"

He then got up and walked off the train.

Fast forward again — this time, to 2016. My wife Alison and I travelled to France to participate in the 100th anniversary commemoration services for the Battle of the Somme and Beaumont Hamel. We were two amongst thousands who had made the trip. We drove through numerous checkpoints and arrived at a parking lot full of cars from all over Europe. As I stepped out of the car and prepared to lock the door, a voice from behind said, "Are you Geoff Goodyear?"

Oh no! Had 100 years of anonymity just been tossed aside? Was I being confronted by some unknown cousin? The inquirer immediately noticed my wife Alison. "So you must be Lucy's daughter!"

I was saved by my wife's family's connection with every other person on the planet.

> As senior crews and industry leaders, we have a wonderful opportunity to positively affect our junior charges through our actions and examples. Indeed, I would suggest it is our responsibility.

While my immediate anonymity was safe, it highlights an issue that all of us senior crews and managers must bear in mind. We don't have to be high profile or well up on the organizational chart to attract attention. Indeed, if you try to fly under the radar it will not work. Tenure is all that is required to be in their sights. We are always being watched, and most likely mimicked and referenced by all those coming behind us. Whether we like it or not, our bad habits or — as is most likely in my grandfather's case — spirited behavior, is being observed and noted, and such observations transcend generations.

In a related anecdote, my uncle also served in World War II and had an interesting and accelerated route to joining up. The morning war broke out, he hopped aboard one of those paper boats and headed for England to join the Royal Air Force. He later recounts that he had just finished writing his public high school exams back in Newfoundland, and was most certain of a poor showing. As a future aviator, he assessed that the risk of flying de Havilland Mosquito night fighters in Europe was far less than facing his father when the exam marks were published! Through several generations, the Goodyear males are not noted for their academic prowess.

As senior crews and industry leaders, we have a wonderful opportunity to positively affect our junior charges through our actions and examples. Indeed, I would suggest it is our responsibility. Try as we might to avoid attention, my family's experience would suggest it is not possible. Let's try our best to make it positive attention.

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by Andy Roe

The Visual Flight Rules

What are the visual flight rules (VFR)? In a nutshell, VFR is flight controlled by a pilot who is in constant visual contact with the terrain below. VFR flight is always conducted in weather good enough to see, referred to as VMC (visual meteorological conditions). Flight where reference to the visual outside world is not possible is another ballgame entirely, and is conducted under the instrument flight rules (IFR). IFR flight can be conducted in IMC (instrument meteorological conditions) without ground contact, or in VMC.

In VMC, the airspace is shared by both VFR and IFR aircraft; in IMC, you should only have IFR certified aircraft, aircrews and route structures in operation. Inadvertent flight into IMC conditions by VFR pilots (or IFR pilots in aircraft certified for VFR-only) is an extreme hazard and should be avoided entirely. This is an opinion many pilots and instructors adhere to, but is not universal in acceptance. The other opinion is that you can fly VFR in unintended IMC with adequate instrument training. One very surprising benefit of being instrument rated is that it confirms that you must remain in VMC when operating VFR. Non-IFR rated pilots often mistakenly think they can fly in IMC.

The IFR rules cover many things that pilots should and should not do, as well as how the aircraft should be flown. Airspeeds, altitudes, rates of climb and descent, track and glide slope alignments, minimum altitudes for adequate ground separation, and radio reception are some examples. The visual flight rules specify what pilots should know about airspace, air regulations, and weather — but the flying part of VFR is pretty much a free-for-all. Collision avoidance, adequate separation from the surface below and ahead, airspeeds, altitudes, descent profiles and so on, are all left to the VFR pilot's ability to use common sense and apply good decision-making. Good VFR pilots are most likely products of exemplary initial flight training.

We all know the image of the IFR airline pilots with the shirts and ties and gold epaulettes parading through the airport terminal, who are looked upon with almost superhero adornment. The lowly VFR pilot just doesn't have the same image, but in my opinion the cognitive skills required to fly VFR safely are just as complex as they are in the IFR world — and maybe even more so. One of the reasons I was so keen on acquiring an Airline Transport Rating early on was to qualify me to make statements like this. Otherwise there would have been an endless onslaught of rebukes such as, "What does he know? He's only a VFR pilot!"

There really are no visual rules on how to fly your helicopter other than the guidelines and limitations as laid out in the Flight Manual/Pilot Operating Handbook, and the instructional guidelines in the training materials you studied when you first got your license. And don't forget the myriad do's and don'ts from your instructor and the sometimes questionable opinions of other pilots. The best advice for VFR pilots is to scrutinize everything you hear. If you hear something that you didn't think of before, but feel is a sound idea, then try it out — but if it sounds erroneous, maybe park that idea in the recycle bin for a while.

If VFR helicopter flight were to have a few more specific in-flight rules, one of them might be consideration of a minimum airspeed. Many VFR operations require the pilot to slow down in forward flight at altitude to a complete hover, so publishing a minimum VFR speed outright wouldn't make any sense given the unique capability of a helicopter to hover in or out of ground effect. IFR helicopter flight has a minimum operating speed consideration in some flight manuals at around 40 to 50 knots. At speeds less than this, considerable forward momentum is lost, forward progress is greatly diminished, and instruments begin to lose their ability to accurately register speeds, turns, climbs and descents. But the IFR helicopter pilot needs to break out into VMC to be able to hover, so the minimum IFR speed would only apply to IMC.

My thought on a minimum VFR speed would be more of a cautionary idea. Operating a helicopter at slow speeds at altitude, especially for flight within the shaded area of the height velocity diagram (for example, during long line operations), requires the pilot to have a thorough understanding and appreciation of the complex aerodynamics of flying below, at, and ahead of effective translational lift, as well as the hazards of the vortex ring state and loss of tail rotor effectiveness.

Good VFR training should place a major importance on teaching good decision making practices and how to avoid the mistakes brought on by human factors. These are the real visual flight rules of the air. On top of this, good helicopter instructors should make sure that each student fully understands the aerodynamic dangers that can occur in slow speed flight, and the vital importance of remaining in VMC at all times and never losing sight of the ground. Flying VFR is just as much of a challenge as IFR flight, and a useful side benefit is that you get to wear more comfortable clothes!

> Good VFR training should place a major importance on teaching good decision making practices and how to avoid the mistakes brought on by human factors.

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by John Carinha

Preparing for the Unexpected

Travel is an inherent component of a career in the helicopter industry. One of the greatest gifts this industry has given me is the ability to see different parts of the world and the cultures they contain. For me, when the destination is one that brings a certain level of unknowns, there is always a desire to travel — especially since the work aspect is typically universal.

A few years ago I secured a job in the Middle East that required several flights to arrive at my ultimate destination. During the penultimate leg, the onboard flight map showed that we were high over Iraq. As I gazed out the window, I saw nothing but darkness. There was the odd light, but for the most part it left me in wonderment. It was oddly unsettling to know that the skies below me had been the subject of heavy warfare. As I made my way to my final destination, I was traveling with a media-influenced perception of what I might find when I arrived.

The job itself involved upgrading a fleet of Bell 412s with generator modifications that required the installation of an OEM kit. We had quoted a total time of eight days on site, but by the end of day two, we were on pace to finish much earlier than we had originally thought. The following day, I was summoned to the general's office. This was concerning as I figured for somebody of such grand stature, why on earth did he want to entertain anything from me? Once I was able to see past the plume of smoke from his thick cigar, his message became clear: slow down, sunshine. In an effort to save face with his superiors, we needed to drag out the work so that we didn't indirectly make anyone appear misguided in terms of the time estimated to complete the job. Suffice it to say I complied, as painstaking as the process became.

During our workday, on at least five different occasions, prayers were observed over the public address system. We were asked to simply refrain from playing any music or being loud in any capacity whether it was operating tools or just generally conversing.

At lunch, which was always catered, I found myself hard-pressed to find any formal cutlery — short of whittling something out of wood or employing two screwdrivers as rudimentary chopsticks. Glancing around, I saw my newfound mates were all eating with their hands. Specifically, their right hands. I learned that it's a common practice among Muslims to eat with the right hand, and use the left hand for other tasks.

In the evenings, I found myself at the hotel bar listening to a Canadian cover band light the place up. As the liquid courage was poured, it became more evident that a disproportionate amount of women were going out of their way to say hello. Feeling flattered, but engaged, I thought, "What the hell? There's nothing wrong with dancing!" Naïve would be an understatement. Needless to say, in very short order, I realized it wasn't me they were interested in, but rather the thickness of my wallet and my willingness to open it.

On my last day, I arrived at the military base prepared to wrap up the minutia of the final work order. With suitcase in tow, I breezed past the security checkpoint — just as I had done the entire week before — except this time I was clad in shorts. I was immediately greeted by an armed guard, who tried communicating with me all the while pointing his automatic rifle at my legs. Bare skin is frowned upon. As I shimmied left, he followed. As I shimmied right, he reciprocated. Eventually, a pair of very oversized coveralls remedied the concern, and we were both soon smiling.

Work travel brings with it the ability to place oneself in a new experience, but with the purpose of seemingly doing a common or familiar task. When we step outside of our proverbial box of norms and comfort levels, we're allowing ourselves to be vulnerable. But no matter what culture you come from, no matter what faith you practice, and no matter what job you do, if all we have in common is respect, then anything is possible.

> Work travel brings with it the ability to place oneself in a new experience, but with the purpose of seemingly doing a common or familiar task.

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A Royal Navy AgustaWestland AW101 Merlin and AW159 Wildcat take part in a “Commando Assault” exercise during Yeovilton Air Day 2016 in the U.K. **Ben Stanley Hall** Photo

James Williams sent in this photo of him flying a Robinson R44 near the Carr Boyd Range in Western Australia.

Location, location, location. **Christopher Moss** took this spectacular image of a Bell 429 operated by Advanced Flight of Auckland, New Zealand, off the coast of the Coromandel Peninsula.

Here's an environmentally friendly way to complete a compressor wash! **Johnny Nyheim** weathered the storm for this picture of a CHC Helikopter Service Airbus EC225 at Sola Heliport near Stavanger, Norway.

Onnis Gian Luca captured this Star Work Sky Aérospatiale SA 315B Lama as it fought a forest fire in Sardinia.

ROTORBEAT
INDUSTRY ■ OPERATOR ■ OEM ■ UAS ■ INTERNATIONAL

Leonardo provides AW009 update

by Elan Head

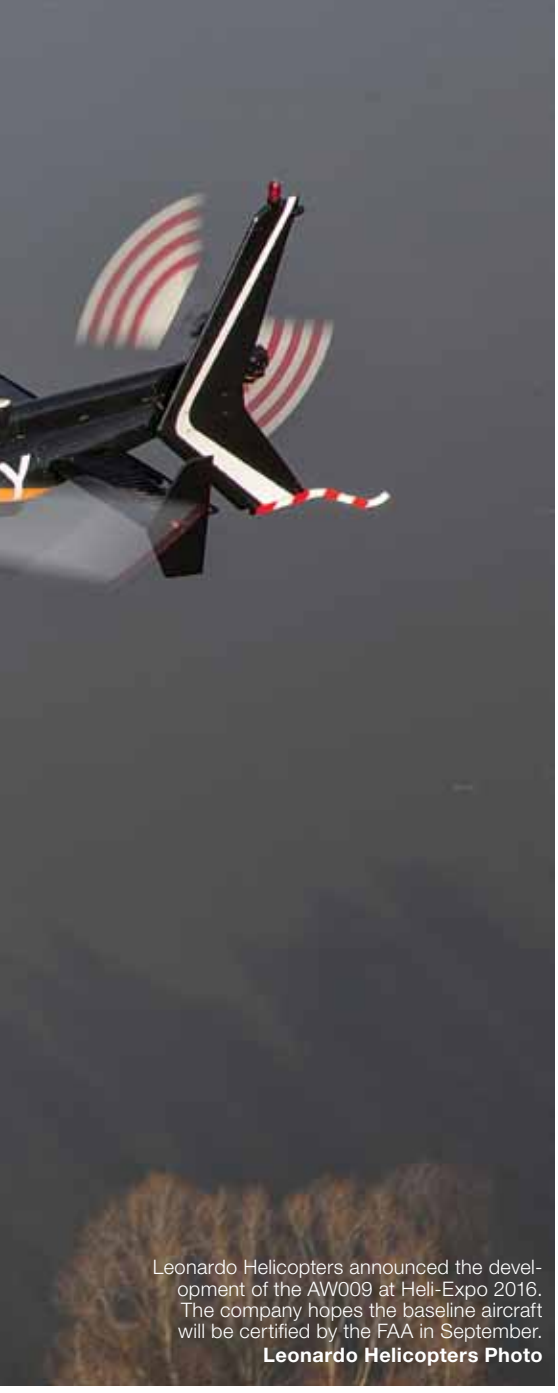
Leonardo Helicopters and AAL USA anticipate Federal Aviation Administration (FAA) certification of the AW009 helicopter in September of this year, and approval for key avionics and engine upgrades in the second quarter of 2017, the companies said at the Airborne Law Enforcement Association (ALEA) Expo 2016 in July.

Launched at HAI Heli-Expo 2016 in Louisville, Kentucky, earlier this year, the AW009 made another public appearance at the ALEA Expo in Savannah, Georgia, where Leonardo touted its appeal for law enforcement operators. The light, single-engine helicopter is a commercial evolution of the PZL SW-4, which is produced by Leonardo's Polish subsidiary PZL-Świdnik and operated by the Polish Armed Forces as a trainer. The aircraft received type certification from the European Aviation Safety Agency (EASA) in 2007, but has had limited penetration into the civilian market.

To launch the model in the United States, Leonardo teamed with Huntsville, Alabama-based AAL USA, which holds FAA Organization Designation Authorization. Once the FAA validates EASA's type certification of the model, Leonardo and AAL USA will pursue upgrades to the aircraft as supplemental type certificates (STCs).

One of those upgrades is the replacement of the aircraft's current Rolls-Royce M250-C20R (SP) engine with a more powerful M250-C30P model, which is expected to significantly improve the aircraft's hot-and-high performance. Currently the model has hover-in-ground-effect and hover-out-of-ground-effect ceilings of 4,232 and 2,690 feet, respectively, but the C30 is expected to boost those figures to over 10,000 and 7,300 feet. According to Leonardo Helicopters manager of business development Michael Bucari, STC approval for the C30 engine installation is expected early in the second quarter of 2017.

That should be closely followed by STC approval for installation of modern avionics from Genesys Aerosystems.



Leonardo Helicopters announced the development of the AW009 at Heli-Expo 2016. The company hopes the baseline aircraft will be certified by the FAA in September. **Leonardo Helicopters Photo**

Leonardo and AAL are also looking at incorporating an engine parameter display similar to the Airbus Helicopters First Limit Indicator or the Bell Helicopter Power Situation Indicator, according to AAL USA director of commercial programs Brett Harlow. He added, "We feel that we're going to gain some useful [load] as well when we get all the steam gauges out."

The aircraft already incorporates some key upgrades over the original SW-4. These include the addition of a redundant hydraulic accumulator in the main gearbox compartment, which provides up to 20 minutes of boosted control following a hydraulic pressure loss in the primary accumulator supply chain.

Leonardo also installed a mast vibration absorber with single arm local vibration absorbers, and modified the installation of the main gearbox, to reduce vibration and improve occupant comfort. These improvements have already been certified by EASA.

Additionally, Leonardo and AAL are working with vendors to develop an airborne law enforcement mission equipment package for the AW009, which will likely include a FLIR Systems Star SAFIRE 380-HDc imaging system with minimum 15-inch display; a Spectrolab SX-16 Nightsun searchlight; a Power Sonix dual-horn public address system; a Technisonic Industries TDFM-9000 radio; a Vislink downlink system; and a Churchill Navigation moving map system. Aircraft will be completed at the AAL USA facility, and "we'll be able to market this as a turnkey package ready to go," said Harlow.

Leonardo Helicopters sees the AW009 as a particularly good fit for the airborne law enforcement market, and Bucari indicated that a law enforcement operator would likely be the aircraft's North American launch customer. The aircraft has a maximum gross weight of 3,968 pounds (1,800 kilograms) and a useful load of 1,652 lbs. (750 kg), which is around 130 lbs. (59 kg) greater than the useful load of the competing MD Helicopters MD 500E. While the AW009 is a few feet longer than the MD 500E, its footprint is smaller than that of other short light singles, including the Airbus Helicopters H120 and the Bell 505 Jet Ranger X. It also offers around 20 cubic feet more cockpit and cabin volume than the MD 500E, with easy access for passengers through two rear sliding doors, and a generous 30-cubic-foot baggage compartment.

"It's got a lot of versatility for an aircraft of this size and weight," said Bucari, noting that, in addition to airborne law enforcement, the aircraft should be appealing for sightseeing, personal transportation, and light utility operations. The AW009 has a cargo sling rated to 1,433 lbs. (650 kg) and will be able to carry a 120-U.S. gallon (450-liter) Bambi Bucket for firefighting.

Other selling points of the aircraft include five crashworthy seats, and a crash-resistant fuel system. The estimated base price of the aircraft is US$1.3 million, with first deliveries expected in summer 2017.

■ RotorBits

GARMIN G500H
AVAILABLE ON R44 MODELS

The Garmin G500H avionics display system is now an option on new R44 Raven II and Cadet helicopters. Previously available only on the R66 Turbine helicopter, the G500H system is a combination primary flight display and multifunction display (PFD/MFD), which provides flight instrumentation, moving map navigation, and situational awareness on dual screens.

Garmin's helicopter synthetic vision technology is an option for the PFD, and either Garmin FliteCharts or Jeppesen Chartview instrument charts are options for the MFD. The G500H system screens are centered in a newly designed instrument panel that also includes traditional instruments.

A Garmin GTN 650 or 750 navigator is required with the G500H and sits just below the displays. The list price for the G500H system is $35,700, not including the required GTN navigator.

EAGLE 407HP
IBF APPROVED

Eagle Copters has received a Federal Aviation Administration (FAA) supplemental type certificate (STC) for an inlet barrier filter (IBF) for the Eagle 407HP.

"This is certainly an important milestone for the maturing Eagle 407HP program," said Stephane Arsenault, vice-president, Sales and Marketing, Eagle Copters Ltd. "Operators have been looking forward to this feature since the inception of the program and by providing this level of engine protection, the Eagle 407HP will continue to expand into both new parapublic and traditional general utility helicopter markets."

The Eagle 407HP is a Bell 407 powered by the Honeywell HTS900 engine — enabling 22 percent more shaft horsepower, 19 percent payload increase, lower engine direct maintenance costs, and lower fuel burn. It also has a dual channel FADEC.

Flight tests suspended after 525 crash

by Oliver Johnson

Two Bell 525 prototypes were working on the flight test program at the time of the crash, with a third set to join the effort shortly. **Bell Helicopter Photo**

Flight testing of the Bell 525 Relentless remains on hold as the investigation continues into the fatal crash of the first prototype aircraft on July 6, which killed test pilots Erik Boyce and Jason Grogan. Bell Helicopter confirmed the crash took place as the aircraft was "conducting developmental flight test operations" south of the company's Xworx facility in Arlington, Texas.

Scott Donnelly, president and CEO of Bell Helicopter's parent company, Textron, told analysts in a conference call that Bell was assisting the National Transportation Safety Board's (NTSB's) in its investigation.

"We've suspended flight test activities on the program until we determine the cause of the accident," he said. "In the meantime, we're proceeding with all non-flight related certification and program activities."

Donnelly said the company couldn't provide an estimate as to when flight testing might resume or the length of delay in certification or first deliveries. "We do remain committed to the Bell 525 program and we'll work to ensure the aircraft will be a safe, reliable and high-performance helicopter," he said.

In a statement about the crash, Bell Helicopter said it was a "devastating day" for the company. "We are deeply saddened by the loss of our teammates and have reached out to their families to offer our support," the company stated.

"At this time we ask for your understanding as we work through all of the details. We will continue to provide updates as more information becomes available."

Photos of the crash site showed a compact debris field, with only small fragments of the fuselage visible. *WFAA* reported eyewitness claims that the aircraft hit a power line and exploded, but the Texas Department of Public Safety said the aircraft did not strike the line and electricity transmission was unaffected.

One of the new breed of "super medium" class helicopters, the 525 Relentless was publicly unveiled at Heli-Expo 2012. The 20,000-pound gross weight class helicopter 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 certified part 29 helicopter.

The aircraft that crashed was one of two prototypes working on the manufacturer's flight test program, with test ship number three set to join the certification effort shortly. As of March, the test program had completed 130 flight test hours, putting it 40 percent ahead of schedule in test points to be accomplished for its targeted certification in late 2017.

▪ RotorBits

STRATUS
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Appareo's Stratus ESG transponder has received Technical Standard Order (TSO) authorization from the Federal Aviation Administration (FAA).

Stratus ESG is a panel-mounted 1090 ES transponder that helps aircraft owners meet the FAA's 2020 mandate by providing ADS-B Out and built-in WAAS GPS in one box.

"We're excited to be offering a new kit option to include both ADS-B In and Out," said Kris Garberg, director of sales at Appareo. "This kit will enable a lot of non-glass panel aircraft owners to enjoy the benefits of ADS-B In while complying with the 2020 mandate for ADS-B Out — affordably."

CHE LAUNCHES
AIRBUS ALLIANCE

Chicago Helicopter Experience (CHE) has announced a strategic alliance with Airbus Helicopters, Inc., having received an H130-series helicopter from the manufacturer.

"This enhanced aircraft type will become the core of our fleet as we work towards converting our entire fleet exclusively to H130 helicopters," said Trevor Heffernan, founder and CEO of Chicago Helicopter Experience. "With this new helicopter, we are looking forward to more passengers from all over the world flying with Chicago Helicopter Experience to discover the very best vantage point of our beautiful City of Chicago."

DONALDSON DRY
MEDIA IBF CERTIFIED

Donaldson has received Federal Aviation Administration (FAA) certification for its dry media inlet barrier filter for the Bell 407, becoming the company's first commercially-certified dry media solution.

"By offering dry media to the commercial market, Donaldson is ensuring that operators have a range of quality options," said Matt Fortuna, general manager of Donaldson Aerospace & Defense.

Flight & duty regs due in 2017

by Oliver Johnson

Transport Canada now aims to introduce changes to flight and duty regulations as one amendment, covering all air taxi, commuter, and airline operators. **Heath Moffatt Photo**

Transport Canada has told industry leaders to expect a new draft of flight crew fatigue management regulations in Canada Gazette I in spring 2017, but has not revealed what may be in the latest version of the controversial proposals that have now been six years in development.

But while the extent of the proposed changes to flight and duty time regulations is unknown, Transport Canada has laid out a clear timeline for the regulatory process going forward — with helicopter operators having at least until 2022 to bring themselves into compliance with the new regulations.

In a meeting held June 21 with stakeholders, and in a subsequent letter to Canadian Aviation Regulation Advisory Council (CARAC) members, Michel Béland, director of policy and regulatory services at Transport Canada, said the regulator was "now in a position to confirm the policy direction being taken by the department to develop regulations that will respond to pilots' and air operators' concerns, as well as Canada's international obligations."

Béland said Transport Canada is proceeding with the amendment of the prescriptive flight and duty time limitations as well as the introduction of fatigue risk management systems (FRMS) that were first announced in a notice of proposed amendment (NPA) in September 2014.

That NPA received staunch opposition from a dozen industry associations that quickly mobilized against it, with many claiming that they had been "blindsided" by its publication on 48 hours' notice, Helicopter Association of Canada (HAC) president Fred Jones told *Vertical* at the time.

Among the contentious provisions in the NPA were a drop in the maximum length of a flight duty period (FDP) to between nine to 13 hours (depending on the start time of the flight duty); a reduction in the maximum tour length from 42 days to 15; and a removal of the ability to reset a pilot's accumulated 30-consecutive day, 42-consecutive day, and 90-consecutive day flight times to zero after five consecutive days free of duty.

The FRMS suggested by the NPA gives operators the option of implementing that rather than adhering to the prescriptive requirements. Similar to a safety management system, an FRMS would need to satisfy specific requirements and be approved by Transport Canada, but could afford those operators who have challenging scheduling requirements with some much-needed flexibility.

HAC's Jones, who was present at the June 21 meeting, said he was told by Transport Canada that it had adjusted the provisions in the amendment to reflect industry feedback from the NPA.

"We don't know how many changes have been made, but my belief is they will be tinkering around the fringe of this, they will not have addressed the substantive concerns that have been raised by HAC and others," said Jones.

He added that his biggest concern is the implementation of a "one-size-fits-all" approach that is designed primarily with airlines in mind. "They claim that it's because pilots are pilots are pilots — and they need the same regulation and same working hours, but it doesn't recognize the unique circumstances of the different industry segments," said Jones. "They're treating float[plane] pilots and helicopter operators the same way they're treating airline pilots, and they're very, very different. And even if you still respect the principles as they relate to human fatigue, you can address them in different ways for different segments of the industry to avoid forcing a round peg into a square hole the way they have been doing, I believe, with helicopter operators and others."

In August 2015, the NPA was followed by a notice of intent (NOI) to amend the Canadian Aviation Regulations (CARs) to address flight crew fatigue management, which suggested a change to the flight and duty regulations in two phases: the first phase to apply to CARs Subpart 705 airline operators; the second phase to apply to all air operators.

In last week's update from Transport Canada, it revealed that it is now aiming to introduce the regulatory changes as one amendment covering all air taxi, commuter, and airline operators (CARs Subparts 703, 704 and 705, respectively). The amendment will not apply to private or aerial work operators (CARs Subparts 604 and 702).

"They want the same rules, more or less, to apply to 703, 704 and 705 operations, and it just doesn't work," said Jones.

According to Transport Canada's timeline, the industry will have 60 days from the publication of the draft proposals in Canada Gazette I to submit written comments to the regulator. Transport Canada will then take a period of time — likely several months — to work through the comments, and provide their rationale for accepting or rejecting each one. It will then publish the final regulations in Canada Gazette II, which will mark the start of a phased implementation process — with CARs Subpart 705 operators having 12 months to bring themselves into compliance, and CARs Subpart 703 and 704 operators having 48 months to do so.

"The idea that it is probably going to be 2023 before it touches the helicopter community at all is some comfort," said Jones. "However, HAC's own view is, unlike wine, bad news never gets better with time."

Jones said that the advance notice would at least give the various associations an opportunity to get ready ahead of the amendment's publication in Gazette I.

"This has been, for the last three years, the single biggest regulatory catastrophe affecting our industry," said Jones. "If it looks like the September 2014 NPA with some window dressing, it's just going to be devastating to our industry. We already have a shortage of experienced helicopter pilots — and this is just going to aggravate it."

Composite S-64/CH-54 blades take flight

Erickson said the composite main rotor blades will increase performance at high elevations and temperatures, and improve fuel efficiency. **Erickson Photo**

Erickson Inc. and Helicopter Transport Services (HTS) have announced the first flight of advanced composite main rotor blades for the S-64 Aircrane and CH-54 Skycrane.

"As a legacy aircraft services provider, we are constantly seeking ways to innovate and improve upon existing platforms to ensure these aircraft stay competitive," said Dale Roberts, senior director of plant operations at Erickson Inc.

"The composite main rotor blade program is a great example of our team's engineering and manufacturing breadth and depth."

The company expects flight testing to continue for several months, with certification to follow later this year.

"Overall, we wanted to create a composite blade that would significantly improve aircraft performance, and our composite main rotor blade program includes several elements to meet that goal," said Roberts. "Primarily, the program was designed to develop a single main rotor blade that was able to be installed on four different aircraft models: CH-54A&B and the S-64E&F."

Mark Pilon, general manager of HTS, said the first flight of the composite blades was a "momentous achievement" for the team. "We are excited about our investment in innovating improvements for our heavy lift fleet and look forward to introducing the benefits of these blades to the market," he said.

Erickson said it expects the new rotor blades to significantly increase aircraft performance at high elevations and temperatures as well as increase fuel efficiency, reduce manufacturing costs and reduce maintenance costs.

The rotor blade is designed to bolt onto the existing rotor heads of the CH-54B/S-64F and requires a minor main rotor head modification for the CH-54A/S-64E.

The blade program was initiated by Erickson and HTS in 2010, with the design finalized in 2013. Last year, Erickson designed and completed the construction of a 12,000 square-foot composite manufacturing facility in Medford, Oregon, where the blades are now produced.

Bell opens new customization building

Bell Helicopter has opened a new customization building at its Piney Flats, Tennessee, location.

"Expanding our facilities allows us to implement new technologies and processes to ensure a high quality customization and delivery process for our customers," said Glenn Isbell, executive vice president, customer support and services for Bell Helicopter.

Converted from an existing 150,000-square-foot warehouse, the new facility co-locates all of Bell's current Piney Flats customizing operations under one roof, which the company said allows it to increase capacity, and improve efficiencies and the overall training experience of its workforce. The new facility gives the capacity for the Piney Flats location to customize more than 200 aircraft per year.

It also allows for an increased employee workspace, improving support and the overall safety of the program, the company said.

"The new facility allows talent and resources to be more easily shared, and further streamlines our operations," said Chad Nimrick, general manager for Bell's U.S. sites.

A new flight line has also been added to accommodate all Bell aircraft in both day and night operations. The manufacturer has also acquired approximately 41 acres of land next to the new building, which it said would allow it to continue uninterrupted flight operations.

In addition to customization, Bell's facility in Tennessee provides maintenance, repair and overhaul capabilities including structural repairs, engine maintenance, window replacement, custom interiors and upgrades, avionics upgrades, customizing and refurbishment.

▪ RotorBits

SIKORSKY SIGNS 10-YEAR S-92 SUPPORT AGREEMENTS

Sikorsky has signed 10-year agreements with Babcock Mission Critical Services Ltd. and Bristow to provide extended support for the operators' S-92 fleets.

The manufacturer said the Total Assurance Program provides Bristow and Babcock with continued aftermarket support to operate their S-92 fleets within a known budget, reducing the risk of unplanned costs.

Sikorsky has delivered more than 275 S-92 helicopters worldwide, and the global fleet recently surpassed one million flight hours.

Sikorsky Photo

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FAA unveils UAS pilot certificate details

by Jen Boyer

The FAA's new operating rules for UAS include the creation of a new Remote Pilot Certificate, which will be required for a pilot to fly a small UAS for commercial purposes in the U.S.
SHOTOVER Camera Systems Photo

Earlier this summer, the Federal Aviation Administration (FAA) published new operating rules for unmanned aerial systems (UAS) under part 107 of the Code of Federal Regulations. In short, the rules outlined operating rules for small UAS, which included the creation of a new Remote Pilot Certificate with a Small UAS Rating. Starting Aug. 29, 2016, this new rating will be required for a pilot to fly a small UAS or drone for commercial purposes in the United States.

Once in possession of the new Remote Pilot Certificate with a Small UAS Rating, a pilot will be allowed to operate a registered small UAS under 55 pounds for commercial purposes in Class G airspace, within visual line of sight, during the day, and below 400 feet above ground level. UAS are required to yield to manned aircraft at all times.

The new rules also specifically forbid UAS pilots from flying above 100 m.p.h., over people, in restricted areas, or from a moving vehicle.

RECEIVING THE CERTIFICATE

Since the announcement of the new certificate and rating, the FAA and testing centers have been flooded with inquiries, highlighting significant interest.

"The phones have been ringing off the hook since the new rules came out, and we booked 45 test reservations in the first two days after the FAA announced the Aug. 29 date," said Claudia Herrera, FAA test center supervisor and proctor at Group 3 Aviation in Van Nuys, California. "The rating is required the day testing begins, so people are setting their test reservations early."

According to the FAA's Remote Pilot – Small Unmanned Aircraft Systems Airman Certification Standards, pilots must have knowledge of several key areas to be a UAS pilot. These areas include regulations, airspace classification and operating requirements, weather, loading and performance, and operations.

In part 107, the FAA outlines two ways pilots can demonstrate their knowledge to receive their certificate. Current FAA Part 61 pilots can take the FAA's online training option and submit proof with their applications. New pilots, however, are required to take the FAA knowledge test for the rating.

CURRENT PILOTS

Current Part 61 pilots (those having had a biennial flight review in the past 24 months) interested in the rating can complete the FAA's online training course, "Part 107 small Unmanned Aircraft Systems (sUAS) ALC-451." This course is already available on the FAA FAASTeam website (faasafety.gov). The training is required every two years to remain a current UAS pilot.

Upon completion of the training, pilots complete FAA Form 8710-13 (available through the FAA's Integrated Airman Certificate and/or Rating Application System (IACRA) starting Aug. 29) and bring it, with proof of the training and government issued photo identification, to an FAA Flight Standards District Office (FSDO), airman certification representative (ACR), designated pilot examiner (DPE) or FAA-certificated flight instructor (CFI) for identity confirmation and signature.

Those electing to work with the FSDO, ACR or DPE will leave with a temporary Remote Pilot Certificate with a Small UAS Rating. Those working with a CFI will be sent the certificate once the FSDO has signed it off and sent it to the FAA pilot registry office.

NEW PILOTS

People without a Part 61 certificate are required to pass a biennial FAA knowledge test with 70 percent passing grade. The FAA knowledge test will be available through FAA-authorized computer testing centers across the U.S. on Aug. 29, and many sites are already taking reservations.

Once applicants have passed the test, they log onto the FAA's IACRA website (iacra.faa.gov/IACRA/Default.aspx) to create an account, then follow the instructions to apply for the rating. The FAA's computer system will not have access to test scores until 48 hours after the test has been taken, so the FAA recommends logging in two days after taking the test to complete the process.

INFORMATION AND TEST PREPARATION

The FAA has stated on its website that no ground school is required to take the knowledge test and no past training or courses taken will count toward the certificate. However, the FAA does encourage self-training, online training or taking a course to become familiar with the regulations in preparation for the test.

The FAA has posted information on the steps to take toward the rating, test preparation materials, sample test questions and frequently asked questions on its UAS website (faa.gov/uas).

Investigators identify 'likely cause' of Norway H225 crash

by Oliver Johnson

On April 29, LN-OJF — an Airbus Helicopters H225 — crashed near Turøy, Norway, killing all 13 on board. Investigators said they now believe a fatigue fracture in the main gearbox was the most likely cause.
RW Aviation Photography

Norwegian investigators have said a fatigue fracture in the main gearbox (MGB) was the most likely cause of the fatal Airbus Helicopters H225 crash near Turøy, Norway, on April 29, and said the fracture propagated in a manner unlikely to be detected by existing mandatory or supplementary systems.

The information was released in the Accident Investigation Board of Norway's (AIBN's) June 28 preliminary report — its fourth since the investigation began — in which it said the fracture was in one of the aircraft's second stage planet gears, but said the cause of the fracture had not yet been determined.

The aircraft (LN-OJF), operated by CHC Helicopter, had been returning to Bergen Airport Flesland from the Gullfaks B platform in the North Sea when a catastrophic failure resulted in its main rotor head and mast detaching in flight. The aircraft crashed into a small island near Turoy, exploding on impact. All 13 on board were killed.

The latest report drew comparisons to the fatigue fracture found in the second stage planet gear in the epicyclic module of an Airbus Helicopters AS332 L2 (G-REDL) that crashed off the coast of Peterhead, Scotland, in 2009. In that instance, a catastrophic failure of the helicopter's main rotor gearbox caused the main rotor and part of the epicyclic module to separate from the fuselage, and all 16 on board were killed as the aircraft hit the sea at high speed. After an extensive investigation, the main rotor gearbox failure was found to be caused by a fatigue fracture of a second stage planet gear in the epicyclic module.

"Even though some differences are observed when comparing the LN-OJF accident with the G-REDL accident, the fatigue fractured planet gears, however, show clear similarities," the AIBN's report states.

Since the last report, released on June 1, investigators said they have completed further examinations into the three different failure modes under consideration for the cause of the crash — suspension bar (lift strut) attachment, the MGB, and conical housing — and, at this stage, it believed the fatigue fracture of the planet gear to be the most likely cause of the loss of the main rotor. "It is considered unlikely that this fatigue crack propagated as a consequence of a structural break-up of another component," the report states.

The AIBN said the accident aircraft's gearbox had been involved in a road accident in 2015 — though it had been inspected, repaired and released for flight by Airbus Helicopters before it was installed in the aircraft in January 2016. "Whether there is

Cont'd on p.26

Cont'd from p.25

a link between this event and the initiation and growth of a fatigue fracture, is being investigated," the report states.

The report said the AIBN has completed detailed metallurgical examinations on various components from the accident aircraft, with the participation of Airbus Helicopters, and said two pieces "have been of particular interest." These pieces represent about half of a second stage planet gear. "Examinations of these parts show that one of the fracture surfaces can be described as being close to 100 percent fatigue," the report states.

According to the report, the fatigue appears to have its origin in the outer race of the bearing (inside of the gear), propagating towards the web of the gear teeth. Scans from x-ray computed tomography showed several cracks below the surface of the outer race. One crack runs below the surface between areas of surface damage.

"An essential design philosophy regarding a possible failure inside the epicyclic module has been that propagation of a crack would be suppressed by the compressive surface stress," the report states.

"Thus a crack in the surface area should grow outboard and create spalling that would produce magnetic debris, which will be detected on the magnetic plugs (chip detectors). The optional HUMS [health and usage monitoring system] is an additional means for detecting developing degradation."

The AIBN notes that this issue was discussed in connection with the crash of G-REDL, and that measures were taken to improve the detection of spalling.

"No findings indicate any malfunctions to the magnetic debris detection system on LN-OJF, or [failure] to follow procedures for visual inspection and checks before flight. Neither are there any records of magnetic debris findings from inspections made since the gearbox was installed on LN-OJF in January 2016," the report states.

"The observed failure mode in this investigation seems to differ from what was expected or foreseen during certification. AIBN believes that a sub-surface crack has propagated without creating a significant amount of magnetic debris from spalling. Also, the HUMS appears unable to identify symptoms of such degradation in the epicyclic module."

In a statement from Airbus Helicopters, the manufacturer said it welcomed the "significant progress" made by the investigation. "We continue to focus our efforts on providing assistance to the investigation team and the authorities as they work toward the identification of the accident root cause," the statement read. "In parallel, we are putting precautionary measures in place to support our global customers and address potential initiating events."

Going forward, the AIBN said it will seek to determine the origin of the fatigue fracture and the mechanisms behind its growth. It said an extensive sea and land search for missing components had located parts key to the investigation, but that were still some important components missing, and it will consider a further sea search.

While the investigation continues, the global fleet of 179 Super Pumas remains largely grounded, with CHC, Bristow and Era among the operators who have grounded the type, while the Civil Aviation Authority of Norway and European Aviation Safety Agency have banned all flight with the H225/EC225LP and AS332L2.

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MD PARTNERS WITH HOWELL INSTRUMENTS

MD Helicopters, Inc. (MDHI) has selected Howell Instruments Inc. to engineer a customized engine instrumentation system for new production units of its single-engine helicopters. The engine instrumentation system, comprised of a data acquisition unit, two Aspen display units and a configuration model, will provide precise data in an all-glass format.

The MD 600N and MD 530F will be the first aircraft to feature the newly developed displays.

"Upgrading to the all glass cockpit will provide a platform baseline for a range of future performance enhancements for our single-engine fleet," said Craig Kitchen, chief commercial officer for MD Helicopters.

KATHRYN PURWIN APPOINTED HELINET CEO

Helinet Photo

Kathryn Purwin, jet and helicopter pilot and widow of Alan Purwin, has taken over as CEO of Helinet Aviation Services.

The company predicts growth for its technical division Helinet Technologies, which specializes in the delivery of digital and data transmission from airborne, marine and ground based platforms. The Helinet Technologies team has doubled in size to serve the growing number of local, state and federal government organizations utilizing real-time transmission and distribution of HD video and data.

"Alan was committed to helping law enforcement agencies across the country develop customized, turnkey solutions, that have been widely adopted among agencies nationally and internationally," said Purwin. "That's a legacy I am dedicated to building on."

Cabri makes U.S. East Coast Debut

United Kingdom-based helicopter training academy Helicentre Aviation has expanded into the United States, opening the first East Coast Guimbal Cabri G2 operation at Kissimmee Airport in Orlando, Florida.

The brand new aircraft was taken for its maiden flight in U.S. airspace after being shipped from the Guimbal factory in Marseille, France, and re-assembled by engineers from U.S. distributor Precision Helicopters. Helicentre chairman Chris Line flew the helicopter into Kissimmee Airport.

The operation has been initially set up to accommodate those in the hour-building phase of their professional career courses at the U.K. academy, including students undergoing the bachelor of science (Honors) degree course, and winners of the academy's scholarship program.

The facility will provide students with opportunities to broaden their aviation experience by operating the helicopter in a new environment, better preparing them for the global job market once qualified as professional pilots. Other benefits include significant cost savings and increased continuity for hour-builders, particularly during the U.K. wintertime.

However, the company said the two-seat piston-engine helicopter has already attracted a huge amount of local interest, and is making arrangements to expand the operation further. It plans to eventually conduct Federal Aviation Administration training as a part 141 facility, as well as provide European Aviation Safety Agency training under its existing U.K. approved training organizations (ATO) approval.

The Guimbal Cabri G2 has made its debut on the U.S. East Coast at a new operation established by U.K.-based Helicentre Aviation in Orlando, Florida.
Christopher Moss Photo

Training and R&D center opens in Newfoundland

Hibernia Management and Development Company Ltd. (HMDC), the Research & Development Corporation (RDC) and CAE have inaugurated a new helicopter training and research and development (R&D) center in Newfoundland and Labrador. Fully funded by HMDC and RDC, the center features the first civilian Level D helicopter simulator with night vision in Canada, and hosts five research projects.

The center is operated by CAE, a leading Canadian provider of training and simulation technologies. The simulator provides a high degree of realism for offshore facilities and local weather conditions. HMDC helicopter service provider Cougar Helicopters has started training its pilots at the center.

"CAE is proud to offer the highest quality flight and mission training to offshore and search-and-rescue [SAR] crews in the province, including Cougar Helicopters," said Nick Leontidis, CAE group president, Civil Aviation Training Solutions, at the inauguration event. "We also look forward to the research and development projects aimed at making helicopter training more efficient and safe."

Len Coughlan of HMDC said the center was specifically designed for Newfoundland's regional environment and offshore needs. "Having this facility in the region increases the level of research related to helicopter operations, which will contribute to improved operations and flight safety," he said.

Hank Williams, chief operating officer of Cougar Helicopters, said the simulator provides training for the operator's low visibility and offshore approaches and simulates turbulence and icing conditions accurately to match the conditions in which it operates. "Cougar Helicopters has very high flight crew training standards for our offshore oil-and-gas and SAR operations, and our pilots train multiple times annually to maintain that standard," he said.

The center is located in a new building in Mount Pearl, Newfoundland and Labrador, and is fully operational.

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HELI-ONE POLAND OPENS HELICOPTER STORAGE FACILITY

Heli-One has expanded its Poland facility by more than 6,000 square meters to accommodate helicopter storage for up to 40 heavy aircraft.

The facility offers a flexible set of storage service offerings, ranging from 45 days to 12 months or longer. Accepted aircraft platforms include the Airbus AS332 and H225; Sikorsky S-92 and S-76; and Leonardo AW139.

"We are pleased to open this dedicated storage facility to support operators who require maximum flexibility in aircraft storage solutions," said Anthony DiNota, president, Heli-One.

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First AW169 full flight sim certified

The AW169 full flight simulator is a CAE Series 3000 device, and will be operated by Rotorsim, the joint venture equally owned by Leonardo Helicopters and CAE. **Leonardo Helicopters Photo**

The first Level D full flight simulator (FFS) for the Leonardo Helicopters AW169 has been certified by ENAC (the Italian civil aviation authority) and the European Aviation Safety Administration (EASA). Based at the Leonardo Training Academy in Sesto Calende, Italy, the new simulator will be used to deliver advanced pilot training courses for customers from around the world.

The Level D standard allows one hour flown on the simulator to be equal to one hour flown in a real helicopter. The full flight simulator, jointly developed by Leonardo and CAE, is a CAE Series 3000 device, which will be operated by Rotorsim, the joint venture owned equally by CAE and Leonardo. The simulator features a high degree of realism for helicopter-specific mission training, including offshore, law enforcement, executive/private and other operations.

The simulator allows pilots to practice challenging procedures without risk, such as low-level flight, confined area operations, autorotation and landing on platforms at sea.

A dedicated training helicopter is also available for live flight training. Since AW169-dedicated customer training started in 2015, more than 85 pilots and 160 engineers have been trained on the new helicopter type, the manufacturer said.

The Sesto Calende Training Academy also contains Level D AW139 and AW189 FFS. Now in its 10th year of operation, the academy has a total of six FFS, three flight training devices and six full maintenance trainers covering the AW109 Power, AW109 LUH, AW109N, AW139, AW189, AW169 and NH90 helicopter models.

Since its opening, the academy has logged in excess of 130,000 flight simulator hours, more than 60,000 flight hours in helicopters, over 40,000 students trained, and become the first Federal Aviation Administration helicopter part 142 facility in Europe.

RotorBits

NATIONAL TEST PILOT SCHOOL IS EASA CERTIFIED

The European Aviation Safety Agency (EASA) has certified the National Test Pilot School (NTPS) in Mojave, California, as the first part-ORA approved training organization (ATO) for Part-FCL flight test training.

"This is a great milestone for NTPS, our customers, and test pilots in Europe and around the world," said NTPS president and CEO Dr. Allen Peterson. "This certification is the culmination of several years of extremely hard work by a great number of people at both NTPS and EASA and I'm very proud of the team."

EASA EXPANDS S-76D VALIDATION

Sikorsky Photo

The European Aviation Safety Agency (EASA) has completed a second phase of validations for new capabilities and expanded performance of the Sikorsky S-76D.

The Silencer wall panel system is approved for the eight-passenger deluxe VIP/executive interior for improved cabin acoustics, along with C4 air conditioning to provide advanced climate control. The TopDeck avionics suite is also approved for the field loadable V400 software upgrade.

"This expanded validation gives commercial operators a wide range of desirable features in the S-76D VIP aircraft and allows operations in various conditions," said Sikorsky vice president for strategy and business development Nathalie Previte.

Expanded performance profiles now include Category A ground-level helipad procedures, Category B takeoff and landing procedures and 15,000-foot envelope expansion. Outside air temperature limits have also been increased to ISA+ 34 C (120.2 F) and cold weather to -35 C (-31 F).

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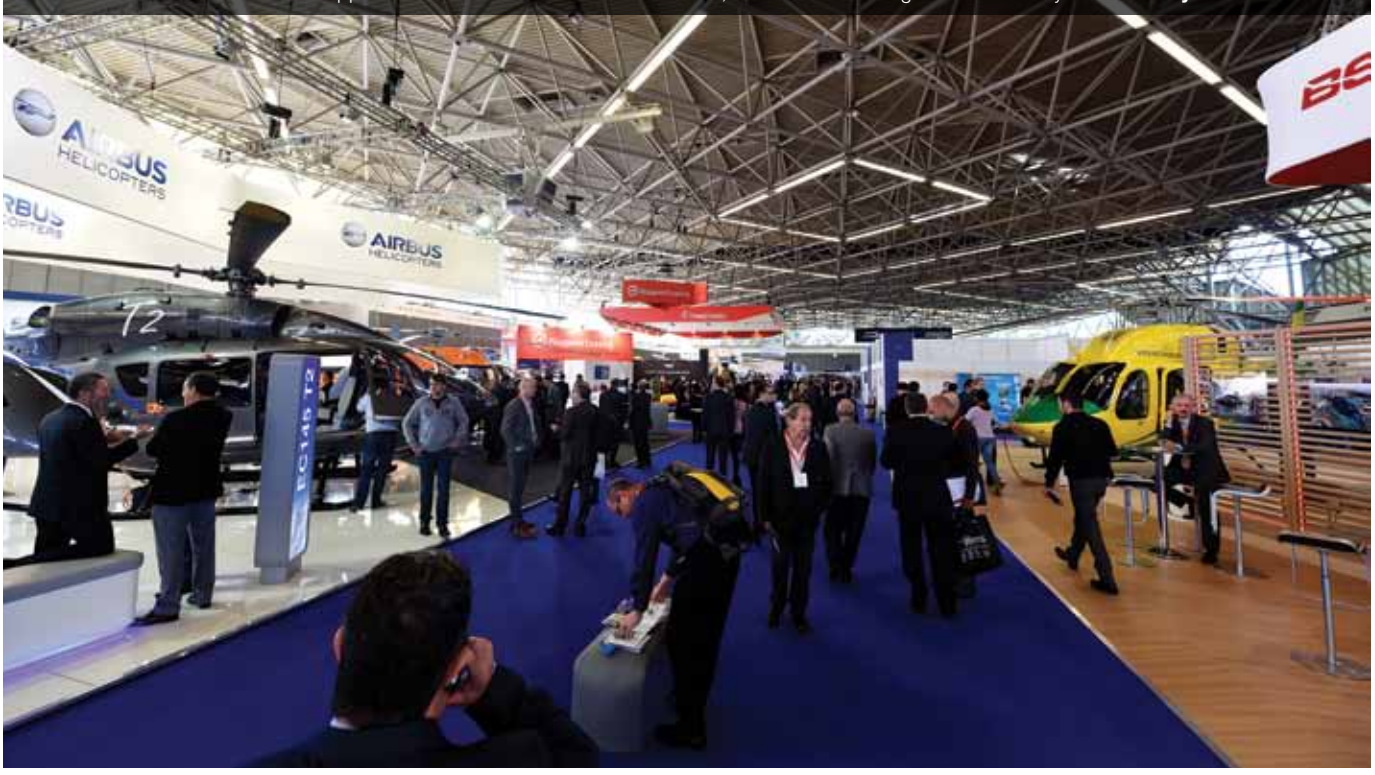
Helitech returns to Amsterdam

Helitech International made its first appearance at the Amersterdam RAI in 2014, and will be returning in October this year. **Mike Reyno Photo**



Helitech International, Europe's leading business event for the rotorcraft industry, returns to Amsterdam, the Netherlands, later this year with a new program of seminars and workshops running alongside what's expected to be a busy tradeshow floor, with over 200 businesses set to attend.

Run in association with the European Helicopter Association (EHA), Helitech will take place from Oct. 11 to 13 at the Amsterdam RAI, and promises a program that will present manufacturers, suppliers, buyers and engineers with a unique opportunity to source the latest equipment, while learning about the trends shaping the future of the sector.

Industry leaders and smaller start-up businesses will be showcasing the latest helicopters, parts, services and accessories, while the insight seminars, business leaders forum, technical workshops, operators forum, safety workshop and EHA rotorcraft seminars will provide advanced technical information, updates on emerging trends, and information on the latest safety regulations.

New to this year's event is the operators forum, where operators from across the globe can network and discuss the evolving rotorcraft industry and ways of improving missions. Held over a working lunch on Oct. 11, attendees can set the agenda by submitting topics in advance of the event.

Another new feature is the technical workshops, which will offer briefings on different types of technology, completions and missions. Delivered by leading businesses, including original equipment manufacturers such as Airbus Helicopters, Leonardo and Bell Helicopter, the sessions will enable operators to gain actionable insights before making purchasing decisions.

A final new addition is the insight seminars, where helicopter emergency medical services (HEMS), search-and-rescue operations, and unmanned aerial vehicles will be in the spotlight. On the first day, HEMS operators will be able to hear about future trends in emergency medicine and the impact they will have on air ambulances and mission equipment.

On Oct. 11, the EHA will once again run its rotorcraft seminars — a series of sessions that focus on rulemaking and legislation in the rotorcraft industry. As part of the program, the EHA will host an interactive session designed to tackle some of helicopter operators' main concerns.

Helitech's business leaders forum will provide a platform for some of the leading voices from the helicopter industry to discuss the most pertinent business and strategy issues facing their operations. Taking place on Oct. 12, the leaders will be joined by experts from across the rotorcraft supply chain to discuss key market insights and opinions on issues set to impact the industry's future.

The final day will see the return of the safety workshop. Hosted by the European Helicopter Safety Team and the International Helicopter Safety Team, this year's sessions will discuss the changing landscape of safety awareness as new and evolving threats emerge onshore and offshore.

"We are very excited to introduce a range of new content to the show this year," said John Hyde, exhibition director of Helitech International. "Helitech International is all about bringing together the rotorcraft industry, allowing operators, key decision makers, exhibitors and like-minded individuals the chance to network and make new connections."

RotorBits

ABLE AEROSPACE OPENS MAINTENANCE CENTER

Able Aerospace Services has completed a significant expansion with the opening of the Able Maintenance Center (AMC). The AMC grows Able's industry presence with a full suite of rotorcraft airframe services including maintenance, inspections, airframe repair, avionics upgrades and paint.

"The AMC evolved in the very trademark Able way: We identified a market need and recognized that we could fill that need with our own on-site network of experts and resources," said Tony Mitteer, business strategy for Able Aerospace Services.

The AMC launched with a focus on Bell helicopters but will soon expand its capabilities to include Airbus AS350 and AS355 aircraft.

HILLSBORO AVIATION DEBUTS NEW HQ

Hillsboro Aviation Inc. has unveiled its new headquarters at the north end of the Portland-Hillsboro Airport. The facility is in phase two of a four-phase, 425,000-square-foot, long-term development project.

The new building is home to the company's fixed-base operator (FBO) services, helicopter and airplane charter division, aircraft sales, maintenance and avionics services, and parts sales.

The company now boasts a contemporary 51,000-square-foot FBO facility with four acres of ramp space to accommodate transient needs, including a 32,000-square-foot hangar for its maintenance, avionics, parts sales, and charter fleet operations.

AW189 FIPS certified

The European Aviation Safety Agency (EASA) has certified the AW189's full ice protection system (FIPS), clearing the way for the aircraft to operate in full icing conditions. It also means the aircraft has overcome the last major hurdle that prevented its use as part of the U.K. search-and-rescue (SAR) fleet, operated by Bristow on behalf of the Maritime and Coastguard Agency.

The EASA certification comes after three years of flight trials in Northern Europe and North America, during the winter months, to gather data and test the effectiveness of the system, which includes electrically heated main and tail rotor blades, heated windscreens and an ice detection system.

The standard AW189 helicopter already includes an engine air intake heating system. The system is fully automatic once switched on by the pilot, allowing the pilot to concentrate on other flying activities.

The FIPS is critical for operators flying in Northern Europe, Canada, Russia and the northern United States where icing conditions are common during the winter months. Almost 30 AW189s are today in service in demanding operational conditions in Europe, the United States, Middle East and South East Asia.

The FIPS system is now available as an option on the AW189 and follows certification of the limited ice protection system (LIPS) in September 2015.

A full ice protection system is now available as an option on the AW189. **Simon Pryor Photo**

LIPS permits flight within a known and defined envelope of icing conditions provided that the capability to descend into a known band of positive temperature is available throughout the intended route.

Leonardo has logged approximately 150 orders for AW189s from customers worldwide.

▪ RotorBits

COPTERSAFETY ORDERS 5 NEW FFS

Coptersafety has ordered five new full flight simulators (FFS) and announced the construction of a new flight training center near its existing facility near Helsinki Airport, Finland.

The company has selected TRU Simulation + Training to deliver the Level D FFS, which will include the Airbus Helicopters H125 and H145, and the AgustaWestland AW169 and AW189.

The fifth FFS will be decided in the coming months in response to market conditions, the company said. All the new simulators are expected to be ready for training by late 2018.

Coptersafety's new training center will provide the very latest facilities and host up to eight simulator bays.

HELIFLITE AUSTRALIA RECEIVES FIRST R44 CADET

Robinson Helicopter Company has delivered its first two production R44 Cadet helicopters to Heliflite Australia, a longtime Robinson dealer. The two-place R44 Cadet received Federal Aviation Administration certification on May 6, 2016.

The base price for the R44 Cadet is $339,000 and $367,000 for the float-equipped version. Current lead times are 10 to 12 weeks, the manufacturer said.

SIKORSKY OPENS FORWARD STOCKING LOCATION IN AUSTRALIA

Sikorsky has announced the opening of a forward stocking location in Brisbane, Australia, at the Sikorsky Helitech facility. The manufacturer said the in-country warehousing of spare parts will provide Australian S-76 and S-92 operators quicker access to materials and was part of its effort to improve customer support.

"By positioning inventory parts closer to customers, we are able to deliver parts in hours rather than days," said Joe Triompo, vice president, Sikorsky customer support. "This expediency improves aircraft readiness and reduces the operators' overall expenses."

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Valencia training center named

Bell Helicopter and TRU Simulation + Training Inc. have announced the official name of their training center in Valencia, Spain: Bell Helicopter Training Academy (BTA) – Valencia, Powered by TRU Simulation + Training.

BTA – Valencia is designed to serve the training needs of European customers, beginning with pilot training on the Bell 429. Training will be conducted through a full flight simulator (FFS) designed and produced by TRU Simulation + Training.

The initial partnership announced in 2014 is nearing completion of its facility, which is on-track to be operational by the end of the year.

BTA – Valencia will contain a Level D Bell 429 full flight simulator, produced by TRU Simulation + Training. It is expected to be operational by the end of the year. **Bell Helicopter Photo**

RotorBits

RBHSL TAKES DELIVERY OF SECOND H130

Airbus Helicopters Photo

Royal Bhutan Helicopter Services Limited (RBHSL) has received its second H130. Similar to the first H130, the second helicopter comes equipped with additional optional equipment such as an integrated tracking system, cargo sling, bambi bucket firefighting system and an onboard medical stretcher enabling the company to perform medical evacuations. During the first seven months of operations, RBHSL has developed valuable experience in close to 46 medical evacuations and firefighting missions, evacuating about 40 patients and protecting natural forests.

"With the arrival of the second H130, our reliability in terms of delivering services has increased as opposed to having a single H130 in the fleet," said Chewang Gyeltshen, CEO of the Royal Bhutan Helicopter Services Limited.

If you would like to submit a press release or if you have a new product or service that you believe is newsworthy, please e-mail our news editor at news@verticalmag.com.

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Interviewed by Oliver Johnson

Harold Jager
Pilot

Photos by Xandro Media

Harold Jager left a career in the Dutch special forces to follow his dream of becoming a helicopter pilot. Today, he flies for German operator HeliService International — a role that includes flying support for Arctic and Antarctic scientific expeditions.

VERTICAL: *How did you get into flying helicopters?*

HAROLD JAGER: I was in the Army, but not as a pilot. I was in the special forces and spent a lot of time flying in big helicopters, small helicopters… I'd done a lot. After six and a half years, I decided to get out. I'd seen enough. It was time to do something else, and I'd always wanted to be a helicopter pilot. I went to the KLM flight academy, did my theoretical part, and did the practical part through another company. And from there, I started initially at Heli Holland, and then I had a corporate flying job for a very fancy guy who owned the helicopter. I actually flew for three guys, and got several thousand hours on light helicopters. I started my own business — I flew a lot with the Cineflex cameras, did a lot of commercials and filmed several dance music events. I gained a lot of experience with that, flying several hundred hours.

Then my partners bought me out, and I came to the company HeliService International GmbH, which is a German offshore company. They fly [Leonardo] AW169, and AW109, the MBB Bo.105 and BK-117, and the [Sikorsky] S-76. It is a good company, and it has grown very fast in the two and a half years I have been there. Currently, I am flying in the Arctic and Antarctic, and offshore flying to wind farms in the North Sea.

V: *What does the wind farm work involve?*

H.J.: We do some hoist operations. Most of the time it's just shuttle flights of cargo and people for the rigs. We fly eight or nine hours a day.

V: *What are the conditions like over the North Sea?*

H.J.: It is hostile. It's a challenge, but I love to do it. We do it with the S-76 at the moment, and in the near future, we will do it with the

HeliService International GmbH's MBB Bo.105 lands on the back of the German icebreaker *PolarStern.* A pilot's tour typically lasts between five and 10 weeks.

Jager said landing on the deck of the vessel during rough seas was one of the most challenging aspects of piloting on the expeditions.

The Bo.105 is largely used to support scientists, but also conducts ice thickness research and ice reconnaissance.

AW139. I won't be flying the AW139 myself, because it's company policy that if you have the AW139 rating then you are flying only offshore over the North Sea — so I wouldn't be able to do the Arctic and Antarctic work. As you can imagine, I like the experience of the Arctic and Antarctic.

V: *This is your second year of doing these expeditions?*

H.J.: Yes, I'm a very lucky guy. I'm nicknamed the Flying Dutchman. The vessel we're based on — *Polarstern* — is from the German government, and it's a big icebreaker. It's the only one in the world that goes to both the Arctic and Antarctic.

I'm on the next trip to the Arctic, starting in the beginning of September this year until the beginning of October. Then the Arctic expedition ends, and in December we will depart from Cape Town for the Antarctic.

V: *How does Antarctica compare to the Arctic?*

H.J.: The main difference of course is the Arctic is only ice; it's not land. The Antarctic is continental. It has mountains and it has different ice types. You have glaciers and also shelf ice — huge blocks of ice from mean sea level to approximately 30 meters high. And there's a wide variety of marine life: you see whales, you see sea lions, you see birds. The marine life is incomparable to the Arctic.

V: *How long are you with the expeditions?*

H.J.: It depends on what the program is from the scientists, but normally it's from between five to max 10 weeks.

V: *Are you based on the icebreaker throughout the rotation? Or do you also have bases on Antarctica or the Arctic?*

H.J.: Our home base is on the vessel. We

The *Polarstern* moors up during an expedition. About 120 people, from a variety of disciplines, take part in these research tours.

have two Bo.105s on the deck for the time being, but eventually we are going to fly with the BK-117. The reason behind it is that the scientists need more cargo, we need better performance, and the Bo.105 is an old helicopter — it's a very, very good helicopter, but it's an old one — and the research company told us they need another helicopter, and they've chosen the BK-117 for it. It will be operational at the end of this year, so we will be flying the BK-117 at Christmastime. As backup, we have the Bo.105.

V: *How is the Bo.105 well suited to the missions you fly?*

H.J.: It's a brilliant machine. It's like a Ferrari. It's an old concept, because it's from the '60s, but nevertheless, the Germans built a brilliant helicopter. And even today it is doing some marvelous maneuvers. You know Chuck Aaron from Red Bull — the helicopter aerobatics pilot? He was flying the Bo.105. It's very reliable, it's very versatile, and I love flying it.

V: *What are your tasks on these expeditions?*

H.J.: In the Arctic, it's mainly to do with the ice surface. We fly with special equipment underneath the helicopter — it looks a little bit like a torpedo — and it measures the thickness of the ice. We fly 40 feet above the ice for two and half hours to a certain place, and then we come back. That gives us data for the ice thickness. It's a lot of extreme flying. We do also ice reconnaissance, meaning we fly 50 miles ahead of the vessel to look for cracks and gaps in the ice, so that it's easier for the vessel to cross it. We also do lots of sling flying, lots of variety.

V: *And that's for general support of the researchers and scientists on the vessel?*

H.J.: Yes, but it depends on the weather and it depends on the scientists — what kind of program they have. Most of the time they are based always with a helicopter, and we fly the scientists to the ice or wherever they need to go.

V: *And what was your role on the Antarctic expedition?*

H.J.: Originally, it was only a water expedition, meaning that there would be no land work whatsoever. But they changed it due to the fact that the weather was so hostile. We went all the way to the northwest part of the Antarctic, to Elephant Island, South Georgia — all the islands of the Antarctic — and were flying along the coast, putting the scientists on land to conduct their research.

V: *How many pilots and maintenance personnel go on these expeditions?*

H.J.: We have a total team of four people: two pilots and two mechanics. For the pilots, one is flying and the other one is the flight leader. Meaning, he's on the bridge of the vessel and he's supporting you regarding the weather, regarding position reports, and he's guiding you through if something happens. One guy is out and the other guy is on deck to support you.

V: *What's the atmosphere like on the boat?*

H.J.: It's like family. It doesn't matter what nationality you are, because there is a variety — something like 20 nationalities on the vessel — but it's one big family. It's unbelievable; I've never experienced that before. There are at least 120 people on board, women and men.

V: *Operationally, what are the conditions like? What sort of precautions do you take?*

H.J.: It's hostile. Lots of whiteout conditions, a lot of icing conditions, and the situation can deteriorate in a minute. It's unbelievable. We have a survival kit for at least three days. If something happens and we have to survive for several days, we have supplies. But we also send a position report every 15 minutes. You push a button and it makes a marker, and sends it via satellite back to the vessel. And we always make a radio call every few minutes. We also have a satellite telephone of course, and EOPs [emergency operating procedures].

V: *What's the most challenging situation you've found yourself in so far?*

H.J.: The weather is always a challenge, of course. The Bo.105 is a relatively small helicopter, and if you've got waves approximately eight or nine meters high, like we had in Antarctica, and you have to land on the rear deck of the vessel, it's a challenge. The vessel is not only pitching, but it's rolling and yawing together. So it's a matter of timing, doing your thing, and putting the helicopter on the vessel. It's a very awkward and bizarre feeling because you're going all the way left, right, up and down. It takes some time to have the experience to say, 'OK, now I'm on top of it and I've no problems any more.' But still it's a challenge, I can tell you.

In the Arctic, the danger from my point of view are the whiteout situations and landing on ice. That's the tricky part, always. No matter how many landings you make, you always have to be careful because if something happens, then you have a real problem because you are so remote. You have to be very, very careful, and get it right when you put the helicopter on the ice in whiteout conditions. That's the biggest problem flying in the Arctic and Antarctic. If there's less contrast, less light in some conditions, you have no reference.

V: *What's the best part of these trips?*

H.J.: I've been to places where people have never ever been on the ground, especially not with a helicopter. I've had amazing experiences, and learned a lot. In terms of the flying, what I enjoy is the bird flying — taking the ice thickness measurements. I like that a lot because it's really hands-on flying, meaning you're flying all the time, 80 knots, 40 feet RADALT, and it's spot on. It's challenging because we have no backup systems, no stability augmentation systems, it's just hands-on flying, and it's very accurate flying.

V: *What's the best thing you've seen on your travels?*

H.J.: The Northern Lights. If there is a type of heaven, I have seen the gates. It's marvelous.

Jager said the Bo.105 is a "brilliant machine," and praised the aircraft's reliability and versatility.

While the B0.105 is well-suited to its role, it will be replaced by an BK-117 this year.

Jager said the *Polarstern* was the only icebreaker to go to both the Arctic and Antarctic.

PUSHING T

Few aircraft have had a longer gestation period than the first civilian tiltrotor. Today, this aircraft is known as the Leonardo AW609, but when it was first announced in 1996 it was the BB609, a joint venture between V-22 military tiltrotor partners Bell Helicopter and Boeing. Two years later, Boeing removed itself from the project and Bell teamed up with the Italian helicopter manufacturer Agusta, rebranding the aircraft as the BA609. In 2011, Bell exited from the program itself, leaving the company that was by then AgustaWestland (and is now Leonardo Helicopters) with full ownership of the program. The aircraft was rebranded once again, as the AW609.

Early on, certification of the 609 was ambitiously targeted for 2001, but the aircraft didn't make its first flight until 2003. Since then, the certification target has progressively slipped — from 2007, to 2011, to 2016. Last year, the program suffered a major setback when the second prototype experienced divergent oscillations during high-speed flight testing in Italy, resulting in a catastrophic in-flight break-up that killed test pilots Herb Moran and Pietro Venanzi. Flight testing was suspended through July of this year; now, the most optimistic estimates do not project certification before 2018.

There have been various reasons for the delays. Because the tiltrotor is a brand-new civil aircraft class with no previous basis for certification, putting it into service is a regulatory challenge as much as a technological one. Conquering these twin hurdles requires a level of

THE LIMITS

The fatal crash of the second AW609 tiltrotor prototype last year has raised new questions about this 20-year-old development program.

With its estimated price tag now above $20 million, the world's first civil tiltrotor has become a harder sell. Did modifications intended to enhance the AW609's marketability play a role in last year's fatal crash? **Story by Elan Head | Leonardo Helicopters Photos**

sustained commitment that the program has not always enjoyed.

However, one would expect that after 13 years and 1,300 flight test hours, the manufacturer would at least have a solid idea of how the aircraft flies. Indeed, a 2011 report on civil tiltrotors prepared for the National Aeronautics and Space Administration (NASA) claimed that "the aerodynamic characteristics of the BA609 are well understood and based on the results of wind tunnel testing substantiated by flight test."

Yet, in an interim statement on its investigation into the crash of the second AW609 prototype, released on June 23, 2016, Italy's National Agency for Flight Safety (ANSV) reported that "the aircraft behavior at high speed was not completely predicted by the manufacturer."

In fact, the engineering simulator (SimRX) that was used for development of the AW609's fly-by-wire flight control laws was unable to replicate the phenomenon that occurred during the accident flight. According to the ANSV, "the only way to obtain a reliable representation of the accident flight was, during the safety investigation, to input unrealistic geometric and aerodynamic parameters in the SimRX."

The ANSV notes that "the tiltrotor is a peculiar type of aircraft and its aerodynamic appears to be significantly complex." However, the lateral-directional oscillations that led to the in-flight breakup of the second AW609 prototype have not been a problem for the V-22 fleet, which has now surpassed 300,000 flight hours. That said, there are significant differences between the V-22 — which has

Leonardo announced an exclusive platform development agreement with offshore helicopter operator Bristow Group at HAI Heli-Expo 2015, with Bristow CEO Jonathan Baliff describing the AW609 as a way to take customers "faster and farther offshore." **Jay Miller Photo**

an H-tail with rudders — and the AW609, which has a rudderless T-tail and relies solely on differential collective pitch for yaw control in high-speed flight. Moreover, in 2013, Leonardo substantially modified the shape of the aircraft's rear fuselage and vertical fin, the original design for which had been carefully developed through wind tunnel testing to compensate for the T-tail's low inherent directional stability.

According to the ANSV, last year's fatal crash occurred during the first flight in which the 609 with modified rear fuselage and tail fin achieved an extreme maximum dive speed of 293 knots, although the model had apparently demonstrated comparable speeds in its original configuration. By introducing modifications intended to enhance the aircraft's performance and marketability, did Leonardo inadvertently compromise its airworthiness?

DESIGNING FOR THE MARKET

While a certified tiltrotor has yet to enter the civilian market, the concept is not a new one. The AW609 is a direct descendant of Bell's first tiltrotor, the XV-3, which performed its initial hover trials in 1955 and conducted flight testing into the mid-1960s. The XV-3 was succeeded by the considerably more successful XV-15, which began flight tests in 1977, laying the groundwork for the V-22. The V-22, of course, had a long and painful gestation period of its own, with 18 years elapsing between its first flight, in 1989, and its entry into U.S. military service in 2007. (That difficult development program, which included several high-profile fatal accidents, may have adversely affected the progress of the parallel 609 program.)

Even after six decades of advancements in conventional helicopter technology, the siren song of the tiltrotor remains as seductive as ever, promising vertical takeoff and landing capabilities with speed and range that no conventional helicopter can match. But no matter how appealing the technology, for a tiltrotor to find success in the commercial market, it has to make financial sense. Thus the development of the 609 has always reflected a concern for marketability as well as safety.

From the beginning, the 609 was designed to meet a target maximum cruise speed of 275 knots and a range of 750 nautical miles. Early stages of testing used a Cessna Citation Jet (CJ) fuselage and empennage for the baseline configuration to explore the potential for using an already available airframe. Although the design was ultimately modified, this CJ lineage is apparent in the 609's overall appearance and dimensions.

The 609's T-tail also harkens back to the CJ, although two other configurations were also evaluated in wind tunnel testing: a conventional airplane tail, and an H-tail similar to that on the XV-15 and V-22. According to a 2001 paper by Bell aerodynamics engineer Ted Trept, the company had adopted the aerodynamically effective H-tail on these earlier tiltrotors after XV-15 testing indicated that the high wing configuration resulted in "inherently low levels of directional stability when using more conventional tail configurations with single vertical stabilizers."

For the 609, however, the T-tail was chosen in order to place the horizontal stabilizer farther from the main rotor wake, resulting in lower three-per-revolution loads during airplane-mode cruise flight, and less rotor-induced download at the tail during low-speed sideslip

maneuvers. Yet, as Trept noted in his paper, "the selection of the T-tail as the baseline required that the low inherent directional stability be addressed." As the design progressed and the empennage went through a weight reduction program, aerodynamicists evaluated variations on vertical tail sweep, taper ratio, aspect ratio, thickness ratio, and area "in an effort to yield a lighter configuration without sacrificing aerodynamic effectiveness."

Weight, along with certification concerns, also played a role in the decision to control yaw in airplane-mode flight using differential collective pitch rather than the rudders that were used on the XV-15 and V-22. As described in a 2005 paper by Bell technical resource and engineering specialists Carlos Fenny and David Schultz, analysis showed that each 609 flight control needed the ability to be powered by one of three hydraulic systems in order to achieve the Mean Time Between Flight Critical Failure probability required for certification by the Federal Aviation Administration (FAA).

To achieve this, the 609 has true triplex redundancy, with three parallel and independent hydraulic systems powering separate actuator cylinders for each critical flight control. This is in contrast to the V-22, which also has three hydraulic systems, but in a more conventional architecture, with two primary systems powering two hydraulic cylinders for most of the critical flight controls. The third system is a backup, which can be engaged into one of these cylinders using a switching valve.

The 609's triplex system eliminates the need for switching valves and power transfer units, and results in less degradation of control following a single failure. But as Fenny and Schultz noted, "independent of the benefits provided by having three hydraulic cylinders to power each flight control, implementation of this triplex architecture would have caused weight and cost penalties to the BA609 had the elimination of lateral rotor and rudder flight control actuation requirements not been possible." By relying instead on differential collective pitch for roll control in helicopter mode and yaw control in airplane mode, the 609 can get away with fewer hydraulic cylinders and motors than the V-22 while satisfying an appropriate standard of redundancy. The authors cautioned, however, that these benefits "come at the cost of increased collective control criticality and control precision requirements."

The 609 flight test program made slow but significant progress in the years following first flight. By August 2007, the first prototype had logged 170 flight hours, expanding the flight envelope to 25,000 feet altitude and 310 knots true airspeed, and demonstrating 35 knots in sideward and rearward flight. The second prototype had by then logged more than 30 flight hours and demonstrated 290 knots true airspeed. But as time passed, and it became evident that the 609's selling price would be much higher than the US$8-10 million originally targeted, prospective customers began to question the relevance of the tiltrotor to their missions. By 2011, Bell had decided that its resources would be better invested elsewhere.

Leonardo introduced modifications (above) to the AW609's rear fuselage and tail fin in 2013. The original design (below) was the product of extensive wind tunnel testing early in the program.

AgustaWestland had been advocating for more investment in the program for years. In taking the reins, the company expressed confidence that prospects for the 609 remained strong, with then-CEO Bruno Spagnolini stating, "the business and sales model case for the AW609 fits consistently with the AgustaWestland extensive, modern product range of dual-use aircraft." The company didn't seem daunted by Bell's more pessimistic view of the program; after all, Bell had also withdrawn from their joint venture on the AB139, which, as the AW139, had gone on to become a best seller.

By this point, however, it had been 15 years since the civil tiltrotor was first unveiled. The 609 was by now an old design, yet its projected price tag had more than doubled over the course of the long effort to bring it to market. It became clear to the manufacturer that the 609 needed some upgrades if it was to compete as a 21st-century aircraft.

CHASING PERFORMANCE

In July 2013, two years after buying Bell out of the program, AgustaWestland undertook the first flight of a modified vertical tail fin on the second AW609 prototype at its Cascina Costa facility in Italy. The new, thinner tail fin was part of a package of aerodynamic improvements that also included a new design for the engine exhaust nozzles and changes to the prop-rotor spinner cones. Together, according to the manufacturer, "these modifications reduce the drag factor of the AW609 tiltrotor by approximately 10 percent, as well as delivering a significant weight reduction, with a resulting performance increase."

The company highlighted other improvements for the 609, too, including an upgraded version of its Pratt & Whitney Canada PT6 engines, a fully integrated cockpit based on the Rockwell Collins Pro Line Fusion system, and an upgraded BAE Systems flight control computer, which would include not only the AgustaWestland flight control laws but also the digital engine control system. "These modifications are an integral part of the overall AW609 tiltrotor program re-baselining aimed at reducing customer acquisition and operating costs, coupled with delivering performance and technology improvements," the company said at the time. To accommodate the improvements, the latest certification target was pushed back from 2016 to 2017, with AW609 program manager Clive Scott telling *Vertical* at the time, "It makes sense to wait one year more . . . to get the aircraft you want."

Meanwhile, the first AW609 prototype, which did not immediately receive the aerodynamic modifications, continued to pursue envelope expansion activities from the company's base in Arlington, Texas. Significantly, in March and April 2014, the prototype successfully completed autorotation trials, performing more than 70 power-off conversions from airplane mode to helicopter mode over the course of 10 dedicated flight hours. Leonardo declined to confirm whether the autorotations were conducted with the original tail configuration, but the photo sent with the company's press release at the time shows the older tail.

At HAI Heli-Expo 2015 in Orlando, Florida, where the first AW609 prototype was on display with the modified tail, test pilots Dan Wells and Paul Edwards reported an expansion of the flight envelope to 30,000 feet. At the same time, the manufacturer announced an increase in the maximum takeoff weight to 18,000 pounds (8,165 kilograms) and the development of auxiliary fuel tanks that would boost the aircraft's maximum range to 1,100 nautical miles (2,038 kilometers). Also announced was an exclusive platform development agreement with offshore helicopter operator Bristow Group, whose president and CEO Jonathan Baliff described the 609 as a way to "provide more value to clients" with "one aircraft type that will take them faster and farther offshore."

Then, disaster struck. On Oct. 30, 2015, the second prototype, N609AG, broke apart in the air near the town of Tronzano Vercellese, Italy. According to the ANSV statement, the accident flight was the first in which the modified rear fuselage and tail fin had reached a maximum dive speed of 293 knots indicated airspeed as required for certification; previous build-up tests with the new configuration had achieved only 285 knots.

The aircraft was executing its third maximum-speed dive when the pilot-in-command felt the onset of oscillations on the roll axis of the aircraft. Moran tried to correct the oscillations by maneuvering the aircraft on the roll axis, which "is the way that is assumed correct according to normal flying technique," the ANSV stated. "However, the flight control laws of the aircraft are currently designed in a way that this kind of maneuvering input on roll axis is in fact also generating a control on the yaw axis to compensate for expected aerodynamic effect of flaperon control surface motion on yaw axis."

The result was a phenomenon described by investigators as "like an augmented Dutch roll." A Dutch roll is an out-of-phase combination of rolling and yawing movements; in aircraft design, it typically results from a mismatch between natural directional and lateral stability components. In this case, the forcing function apparently introduced by the control laws caused the oscillations to reach extreme divergence within seconds of their initial onset. The ANSV statement

The third AW609 prototype was impounded by Italian prosecutors in May 2016 as part of their investigation into last year's fatal crash. It was returned to Leonardo in July and will be shipped to the company's facilities in Philadelphia for certification flight testing activities later this year. Meanwhile, Leonardo announced on Aug. 3, 2016, that the first AW609 prototype had resumed flight testing in Arlington, Texas.

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“In 1997, Bell predicted a market of up to 1,000 Model 609s over the next 20 years. Today, Aboulafia estimates that this 20-year market will likely be no more than 200 to 250 aircraft, depending on price, which he estimates will be in the neighborhood of $22-25 million.

is vague about the resulting accident sequence, but a map of the accident debris — which shows the right-hand nacelle, left-hand nacelle, and fuselage in three separate locations, and evidence of light foam and blade tip pieces at a substantial distance from the main wreckage — suggests that the proprotors may have hit the wings and caused the in-flight breakup.

According to the ANSV statement, previous flight data showed that both the first and second prototypes had experienced oscillations in roll and yaw well before the accident flight, but this phenomenon “was considered to be slight and not dangerous, being assessed as self-damping.” The ANSV statement does not mention a previous proprotor-wing contact incident during flight testing, but multiple sources indicated to *Vertical* that one had occurred. Last year, *HELiDATA News* reported that the second prototype had experienced a severe sideslip and apparent blade strike on the wing due to a reported in-flight software failure, resulting in an emergency diversion to the nearest airfield. A Leonardo spokesperson was unable to confirm or deny the report, explaining that the company is limiting comment out of respect for the ongoing accident investigation.

In its interim statement, the ANSV made several safety recommendations based on the information it had gathered to date. One was for the FAA and European Aviation Safety Agency (EASA) to “verify that the aerodynamic behavior of the aircraft at high-speed conditions will be reviewed, if necessary making use of wind tunnels tests in addition to updated models and simulations that can be representative of the complex flight conditions of this peculiar aircraft.” The ANSV also recommended verification “that the control laws of the aircraft will be reviewed in the management of the extreme flight conditions in which the aircraft could possibly fly,” with a particular emphasis on ensuring “the effectiveness of the flight controls inputs given by the pilot avoiding the possibility of unexpected and uncommanded coupling effects.”

AN UNCERTAIN FUTURE

Over a three-week period in late June and early July, *Vertical* submitted numerous questions to Leonardo for this story. In addition to the earlier flight testing incident, the company was asked about what modeling and testing activities had been conducted for the new tail fin and other aerodynamic modifications before they were added to the second prototype, what associated changes had been made to the aircraft’s flight control laws, and what tail configuration the program’s SimRX software reflected. Leonardo was also asked whether it would be retaining these performance-enhancing modifications going forward, and whether the aircraft’s maximum speed would be lowered as a result of the accident. However, the company declined comment on all of these questions pending release of the ANSV’s final report.

Instead, the company provided the following statement: “As noted in the interim report, all activities and tests performed during experimental flights of the AW609 have been conducted in accordance with the certification process outlined by the FAA and EASA. While Leonardo-Finmeccanica awaits the final report and its accident conclusions, the company fully endorses — and already assumed as its own commitment — the initial safety recommendations issued by ANSV. Leonardo-Finmecannica has already begun implementing them in its continued certification work. Following such implementation, the company will meet the previously announced and expected program schedule.”

Although the ANSV has yet to release more details on the cause of last year’s accident, the phenomena described in its interim statement — an onset of lateral-directional oscillations, and the inability of the control laws to permit an effective recovery — are not entirely surprising given the complexity of managing yaw with differential collective. Whether these deficiencies should or could have been predicted is a question for the accident investigation. Whether Leonardo has adequately addressed them remains to be seen.

Whether the market will embrace Leonardo’s ultimate solution is another question entirely. The tiltrotor concept has ardent champions, but the business case for it remains questionable. Teal Group vice president Richard Aboulafia, for one, believes that if the AW609 survives, it will find itself in a narrow civil niche. “The value proposition is still difficult,” he told *Vertical*.

Despite Bristow’s vote of confidence in the aircraft, Aboulafia suggested that its small cabin will limit its overall potential in the offshore market. Meanwhile, he said, the corporate market is generally conservative, and unlikely to have early adopters in large numbers. And, although Era Group recently signed a platform development memorandum of understanding to explore potential for the AW609 in the emergency medical services (EMS) market, Aboulafia noted that the EMS market is fairly price-sensitive. Factoring in a high acquisition cost as well as higher training and logistics expenses, “it takes a lot of different economic thinking to adjust to the idea of a 609 for EMS,” he said.

Aboulafia did see more potential for search-and-rescue (SAR) and other government applications, as reflected in the recent selection of the AW609 by the United Arab Emirates Joint Aviation Command for its SAR requirement. “The UAE order was substantial,” he said. “But if governments don’t step up in a big way, you could be getting back to a civil market of fewer than 100 aircraft.”

In 1997, Bell predicted a market of up to 1,000 Model 609s over the next 20 years. Today, Aboulafia estimates that this 20-year market will likely be no more than 200 to 250 aircraft, depending on price, which he estimates will be in the neighborhood of $22-25 million.

“It’s not the multi-billion annual market some have predicted, but it’s better than nothing,” he wrote in a Teal Group briefing. “Then again, given the risks, nothing might still be an option.”

Elan Head | An FAA Gold Seal flight instructor with helicopter and instrument helicopter ratings, Elan holds commercial helicopter licenses in the U.S., Canada and Australia. She is also an award-winning journalist who has written for a diverse array of magazines and newspapers since the late-1990s. She can be reached at elan@mhmpub.com.

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IN THE VALLEY OF THE KINGS

A gold mine in remote northwestern B.C. promises great returns — but powering it requires the construction of a transmission line over some of the most challenging terrain imaginable. An extremely diverse fleet of helicopters is making it happen.

By Oliver Johnson

In northwestern British Columbia lies the Valley of the Kings. Like its namesake near Luxor in Egypt, the Canadian version contains extraordinary riches. But while the value of the artifacts within the tombs of the pharaohs lies primarily in their historical and cultural worth, the value of the Valley of the Kings in the Pacific Northwest lies in the size and quality of the precious metal it contains: an estimated 6.9 million ounces of gold.

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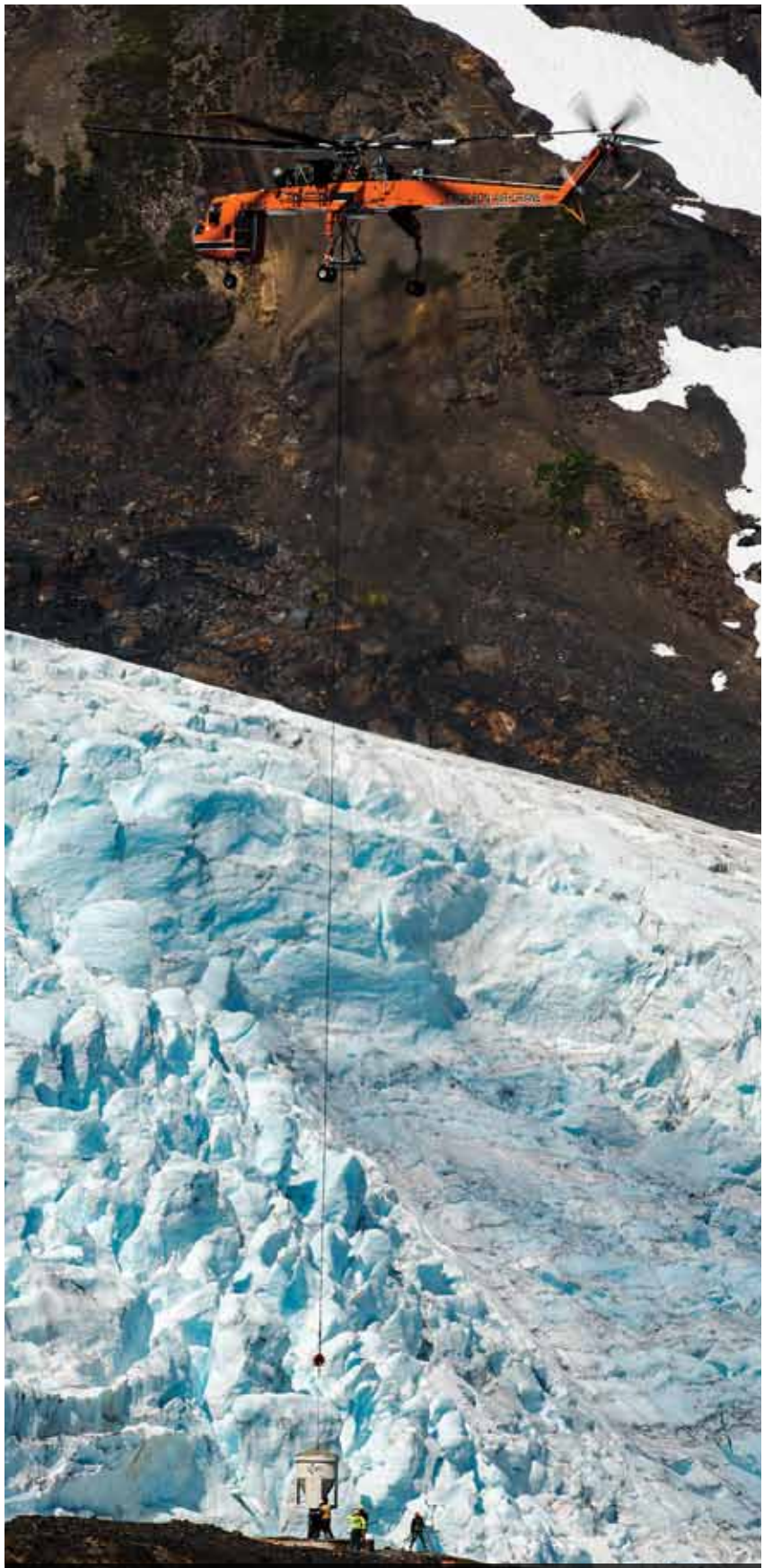
An Erickson S-64F Aircrane makes its way over mountains running alongside the Knipple Glacier in northwestern British Columbia. This Aircrane was one of two being used on the construction of a transmission line in the region.
Bryan Dudas Photo



Rokstad Power, the contractor in charge of creating the transmission line, insisted on having an S-64F on the job for the duration of the project. "We gain a lot of schedule progression having the F-model here," said Rokstad construction manager Chad Hepburn. **Bruno Long Photo**

In a period of tremendous strain within the natural resources sector, with exploration and development budgets almost universally slashed, the Brucejack Gold Project to mine the Valley of the Kings is one of the few bright spots for those working in and supporting the mineral exploration industry. Located about 40 miles (65 kilometers) north of the town of Stewart, B.C., and just 25 miles (40 kilometers) from Alaska's border, the Brucejack Gold Project consists of 122,133 hectares, with proven and probably mineral reserves of 13.6 million tonnes grading at 15.7 grams of gold per tonne — a very high level. Owners Pretium Resources Inc. hope to start commercial production at the US$697-million mine in 2017, and over its anticipated 18-year lifespan, the company believes the mine will produce at least US$2.36 billion of gold.

However, being northwestern B.C., taking the mine from concept to reality is far from straightforward. The logistical challenges of creating such a mine in these remote climes are extreme. The physical geography that isolates the mine — including precipitous mountains, icefields, and enormous glaciers — is compounded by the extreme weather the region experiences, with some of the heaviest snowfall levels in Canada resulting in avalanche hazards on routes to construction camps and the mine itself.

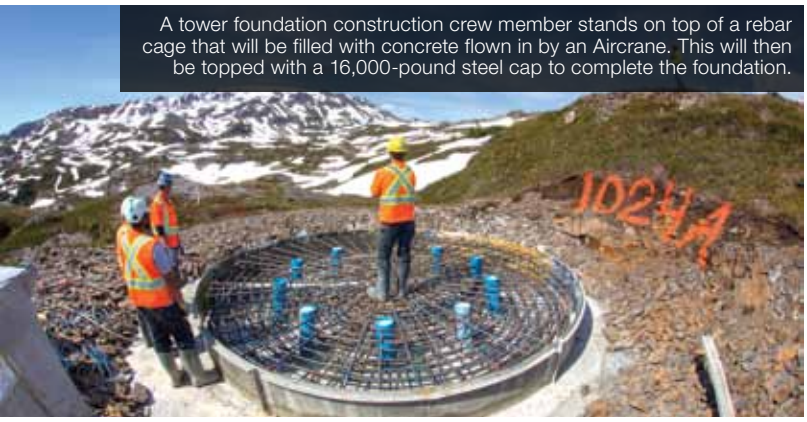
And then there's the issue of connecting the mine to the grid. Pretium considered several power supply options for the mine, including on-site diesel generation, as well as hydro, wind, and solar power, but the only technically feasible solution was to build a transmission line from the mine to the Long Lake Hydro line near Stewart. And because of the inaccessibility of the route along which the line will be built, it will be entirely reliant on helicopter support for its construction.

BREAKING NEW GROUND

Stretching 35 miles (56 kilometers), the 138-kV line will be carried by 132 single steel monopole towers across some of the most rugged terrain in B.C. — including a 1.4-mile (2.2-kilometer) span across a glacier that requires the construction of the highest transmission tower in Canada. Work on the foundations began in April this year and the line is set to be finished in September/October. Because of the severity of the winter weather in this part of the world, that deadline is firm.

So far, the project has already seen the appearance of a Kamov Ka-32A11BC, two Erickson Aircranes (an S-64E and an S-64F), several variants of the Airbus Helicopters AS350 AStar, a Bell 204 and 212, an MD 530FF, an Eagle 407HP, and an Eagle Single. A Bell 214 was set to join the construction fleet shortly after *Vertical* went to press.

The contractor hired to oversee the creation of the transmission line is Rokstad Power, an



A tower foundation construction crew member stands on top of a rebar cage that will be filled with concrete flown in by an Aircrane. This will then be topped with a 16,000-pound steel cap to complete the foundation.

An S-64F delivers concrete to a transmission line tower foundation site on the Brucejack tranmission line. Rokstad's Hepburn said the the team was typically pouring 100 cubic meters of concrete an hour on some of the sites nearer to the base.

All told, about 20 million pounds of concrete will be moved to construct the foundations for the transmission towers. **Bryan Dudas Photos**

experienced power line construction and maintenance company who, for the last two years, has served as the main contractor during the construction of the 155-mile (250-kilometer) Interior to Lower Mainland (ILM) 500 kV transmission line in B.C. The company's experience on that project made its bid for the Brucejack transmission line particularly strong, said Rokstad construction manager Chad Hepburn.

"Over the last two years, we flew 8,600 flight hours on the ILM project, with no loss or injuries," he told *Vertical*. "We did around 13,000 hoists and close to 13,000 touch-and-go's. We've done things that have never really been done."

That ability to safely break new ground has come in useful when tackling some of the herculean feats required to build the Brucejack transmission line. In the six-month construction window, about 20 million pounds of concrete and 5.3 million pounds of steel will be moved — the latter requiring 391 tower picks for the S-64F Aircrane.

"There's certain things that have been built into the transmission line making it some of the tightest wire and longest spans in North America," said Hepburn.

The 1.4-mile span across Knipple Glacier requires the highest altitude placement of towers in Canada — beating a record set on the ILM project by about 100 feet. The 250-foot tall towers will be placed on mountaintops either side of the glacier, with the highest being 6,400 feet. The glacier itself sits about 2,000 feet below.

There will be 17 different styles of tower used across the line, with each assembled in sections designed to be around 19,000 pounds (8,620 kilograms) a pick. For Hepburn, there was only one aircraft he wanted to use to place the towers.

"Our work proposal early on stated that we needed an Aircrane here — an F model — every day," he said. "Costwise I'll say it's a wash to using 214s, a K-Max, 212 Singles, or even S-61s, because then you get into productivity, and we can do an average of four cubic meters of concrete every six minutes [with the S-64F] , and we typically pour 100 cubic meters an hour on some of the closer sites. You know you're going to get into bad weather working in the northern part of B.C. and Alaska here, so in order to capitalize on the good weather, you've got to be as effective as you can during those good weather days, so we gain a lot of schedule progression having the F model here."

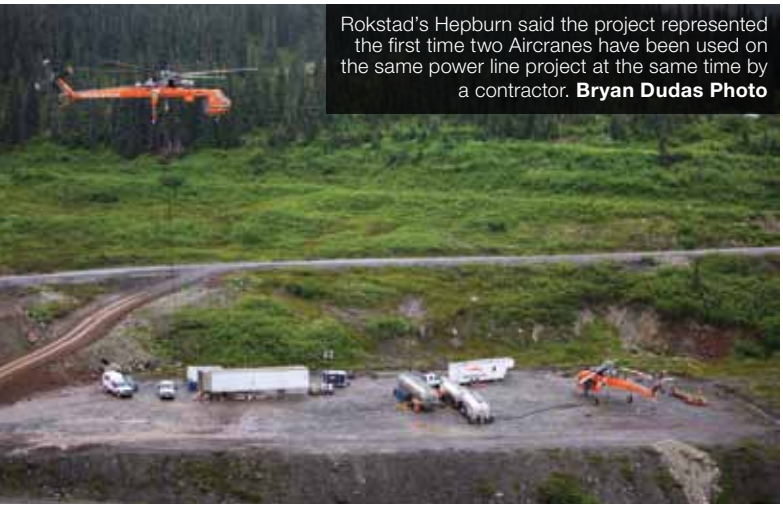
Indeed, poor weather conditions delayed the start of the project to such a degree that a second Aircrane — an S-64E — has been brought in to help compress the construction schedule. (Hepburn believes it's the first time two Aircranes have been used on the same power line construction project by a contractor.) "We were fighting avalanches just to set the camp up," he said. "There's a 45-kilometer-long road and seven different avalanche routes on that road, so we had to send guys out early on with charges to try and initiate the avalanches before we could go through and clear the snow, and the snow on the road was 20 feet deep in some places."

VIH's Ka-32s were among the first aircraft on the project in April, and were largely used to move Rokstad's excavators to help clear the snow. The construction company then contracted Mustang Helicopters for crew moves, primarily using the operator's AS350 B2s and B3e.

"We're reliant heavily on B2s and B3s," said Hepburn. "We operate anywhere from 3,000 to 6,400 feet, so typically with a B2 or B3 they've got the performance to be able to do that, and they've got a nice interior for moving crews — you can usually move five people at a time."

Erickson, VIH, Yellowhead, Ascent and Mustang have all been used on the project, as well as Lakelse Air through its parent company Bear Creek Group. **Bryan Dudas Photo**

Rokstad is heavily reliant on AS350 B2s and B3s on the project, due to the aircraft's performance at high altitude and ability to move five crewmembers at a time. **Bruno Long Photo**



Rokstad's Hepburn said the project represented the first time two Aircranes have been used on the same power line project at the same time by a contractor. **Bryan Dudas Photo**

Lakelse Air partnered with Pacific Western Helicopters to become the Bear Creek Aviation Group in December 2014. Here, one of the company's AS350 B2s works on the Brucejack project. **Anthony Bouchard Photo**

THE FOUNDATION CREW

Rokstad hired Bear Creek Group — parent company of Lakelse Air — as the civil works contractor, giving Bear Creek the responsibility of constructing the foundations and anchors on the line. Lakelse uses five AS350 B2s and D2s (the latter powered by an upgraded Lycoming LTS101-700 engine) on the project, as well as a Bell 204 and 212.

Where possible, the foundation sites have been located in bedrock. In locations where there isn't enough bedrock, Bear Creek needs to create micropiles. The first stage of preparation for this requires the site to be drilled or blasted to create a depression in the bedrock, and this is then leveled with fill-crete — a flattening compound that is essentially a low-strength concrete. A rebar cage is then placed on top with a form around it. The Aircrane dumps concrete over the cage and into the form, and then a 16,000-pound donut-shaped steel cap is placed on top of the concrete foundation. Bear Creek's crews drill holes through the caps all the way into the bedrock, then seal and grout them, creating the rock anchor. The foundation is then ready for a tower.

According to James Carr, director of business development at Bear Creek Aviation Group, Lakelse's role is to support Bear Creek's crews by flying them to the tower sites, transporting fuel for the excavators that clear the sites, and on occasion flying the fill-crete to the site.

"The logisitics of it are the most demanding part of it, but the flying is pretty standard for the operations we conduct," said Carr. "We do a lot of exploration drilling in the area in northwest B.C., and it's very similar in a lot of aspects. One of the things is the increased aircraft traffic, obviously in the [transmission line] corridor. Some of our guys may not be used to that, but they're figuring it out."

Lakelse has a coordinator on site to assist in controlling the flow of traffic around the line. "Any aircraft that go into that workspace, they'll let our coordinator know that they're there and he'll tell them where the [Air]crane is, or where our aircraft are, or what part of the project they're on," said Carr.

The main concern Lakelse had going into the project was the weather. "We've actually had a very good run of weather recently, but that part of the world can be very rainy and foggy, with low ceilings," said Carr. "There's a fair amount of work at altitude, which brings into play weather, and obviously now we're into summer and when it does get warm, density altitude starts to play a factor as well."

The standard shift pattern for Lakelse's crews is two to three weeks on site in one of the camps surrounding the project. Carr said duty days are averaging about 12 hours, with four or five flight hours a day per aircraft.

"It's nice to be set up on a project for five months so that we can establish the ground ops, and have a 52-foot trailer there that's all set up with our maintenance spares and a place for guys to hang out," said Carr. "When you're not in and out in two weeks or a month, it gives you time to establish a work base."

BRINGING THE MUSCLE

The first Aircrane — the F model — arrived on the project in May, but due to the late snow, an E model was brought in (along with an additional foundation crew) to help speed up the workflow, with the two cranes working from opposite ends of the line towards the middle. The primary difference between the two

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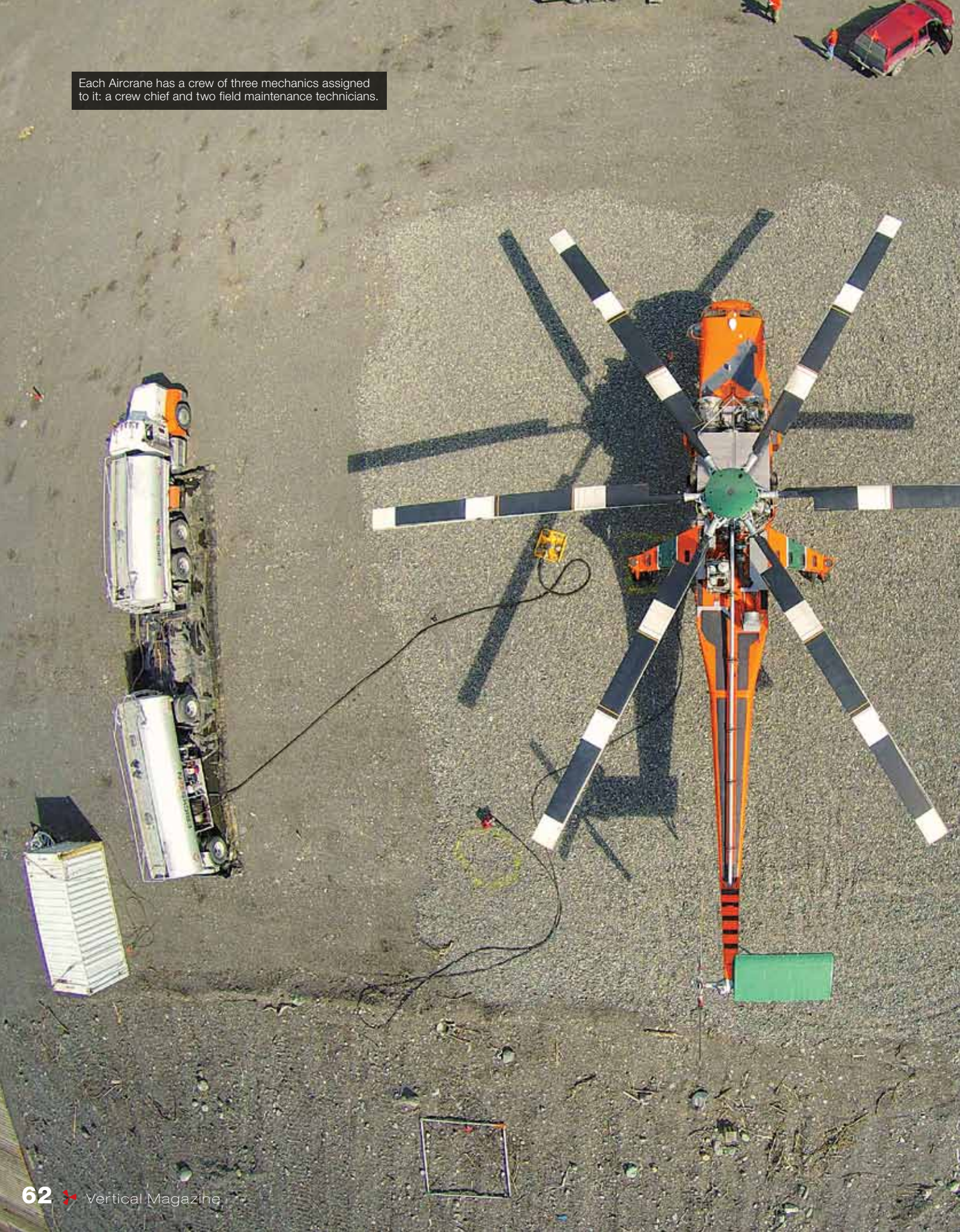


Each Aircrane has a crew of three mechanics assigned to it: a crew chief and two field maintenance technicians.

Erickson's Jeff Stein said the S-64's aft pilot station and its anti-rotation rigging system made it well suited to its role on the Brucejack project.

Above and below: The aircraft working on the project have included a Kamov Ka-32A11BC, two Erickson Aircranes (an S-64E and an S-64F), several variants of the Airbus Helicopters AS350 AStar, a Bell 204 and 212, an MD 530FF, an Eagle 407HP, and an Eagle Single.

A VIH Kamov Ka-32A11BC was used in the early stages of the project, primarily to move Rokstad's excavators to help clear the snow. **Heath Moffatt Photo**

Construction crew members pose for a photo in front of "Bubba" — the S-64F working on the project. **Bryan Dudas Photo**

A Lakelse Bell 204B lifts a load during work on the Brucejack transmission line project. **Anthony Bouchard Photo**

variants is the lift capacity; the S-64E can lift 20,000 pounds (9,000 kilograms), compared to the S-64F's 25,000 pounds (11,340 kilograms).

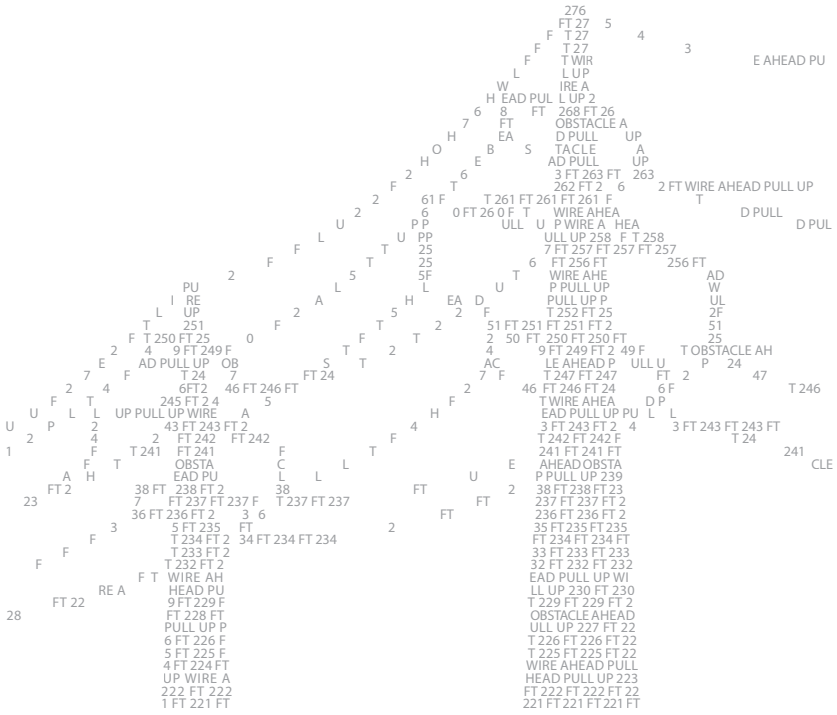
On the Brucejack project, the Aircranes have four basic roles: moving the excavators, flying the concrete, placing the cap on the foundation, and then setting the towers. There are 16 mini excavators on the project that each weigh 13,000 pounds, and another two that weigh 20,000 pounds — and all are moved by the S-64F.

The aircraft have a crew of two to three pilots depending on the type of work they're completing. If they're doing long line work from the left seat, only two pilots are required. Precision placement, for tasks such as placing the micropile caps or towers, requires three pilots — two up front and one in the aft seat.

Jeff Stein, powerline sales manager at Erickson Inc., said the tower assembly promised to be the most challenging aspect of the project for the Aircranes. "These are tubular steel structures, and they are very heavy duty," he said. "Obviously the environment they're placed in sees a lot of snow, a lot of ice, a lot of freezing and thawing, and a lot of wind, so the towers have to be very, very stout, which makes them heavy. The tubular steel design does require the creation of specific guides to help us align the pieces, and it's requiring our most experienced aft-seat precision placement pilots to do the tower assembly."

While Erickson works with many transmission line contractors who provide the ground crews for tower erection, the most difficult jobs require Erickson's own ground crews to take control. "It's best for the pilot in the aircraft to be working with somebody on the ground that he's worked with many times before to ensure the communication is consistent," said Stein. "Our ground crews understand how to construct towers, but they also understand how the aircraft is operated and all the things the pilots are managing in addition to building the tower."

Stein said the aircraft's aft-seat pilot station and its anti-rotation rigging system made it particularly well suited to its role. "Those two features make it the best precision placement machine ever designed and built," he said. "Together with that tool, it's really



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The first Aircrane arrived on the project in May, and it will remain on the job until its completion, likely in October. **Bryan Dudas Photo**

Nestled in among the mountains is one of the base camps for those working on the construction of the transmission line. **BJG Photo**

The project is breaking new ground with the placement of the highest tower in Canada. The 1.4-mile span between towers either side of Knipple Glacier is believed to the be the longest in North America. **Bryan Dudas Photo**

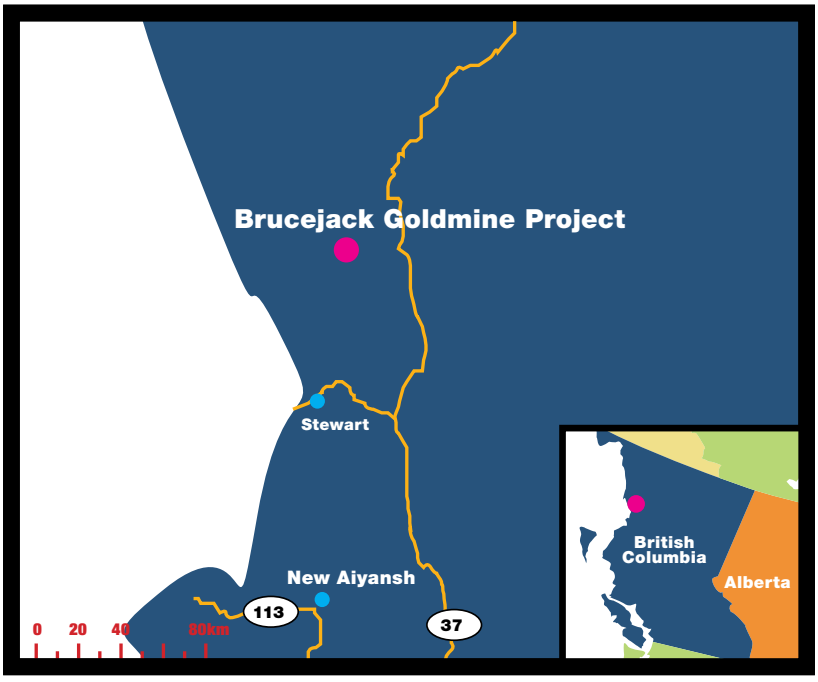
Construction also continues at what will become the hub of mining operations — the Brucejack mill and camp site, alongside Brucejack Lake. **BJG Photo**

our crews. Without that, we wouldn't be able to do this level of precision work."

In terms of support, each aircraft has three mechanics assigned to it, and the crews assigned to the aircraft —mechanics and pilots — are typically on a two-week rotation. "In total, we can easily have upwards of 35 or 40 total crew rotating in and out for both aircraft," said Stein. "They've got long daylight up there and they're trying to utilize that, so we sometimes have to split the shifts up a little bit, and then we'll also have one of our project managers to coordinate all the activities and work directly with the customer."

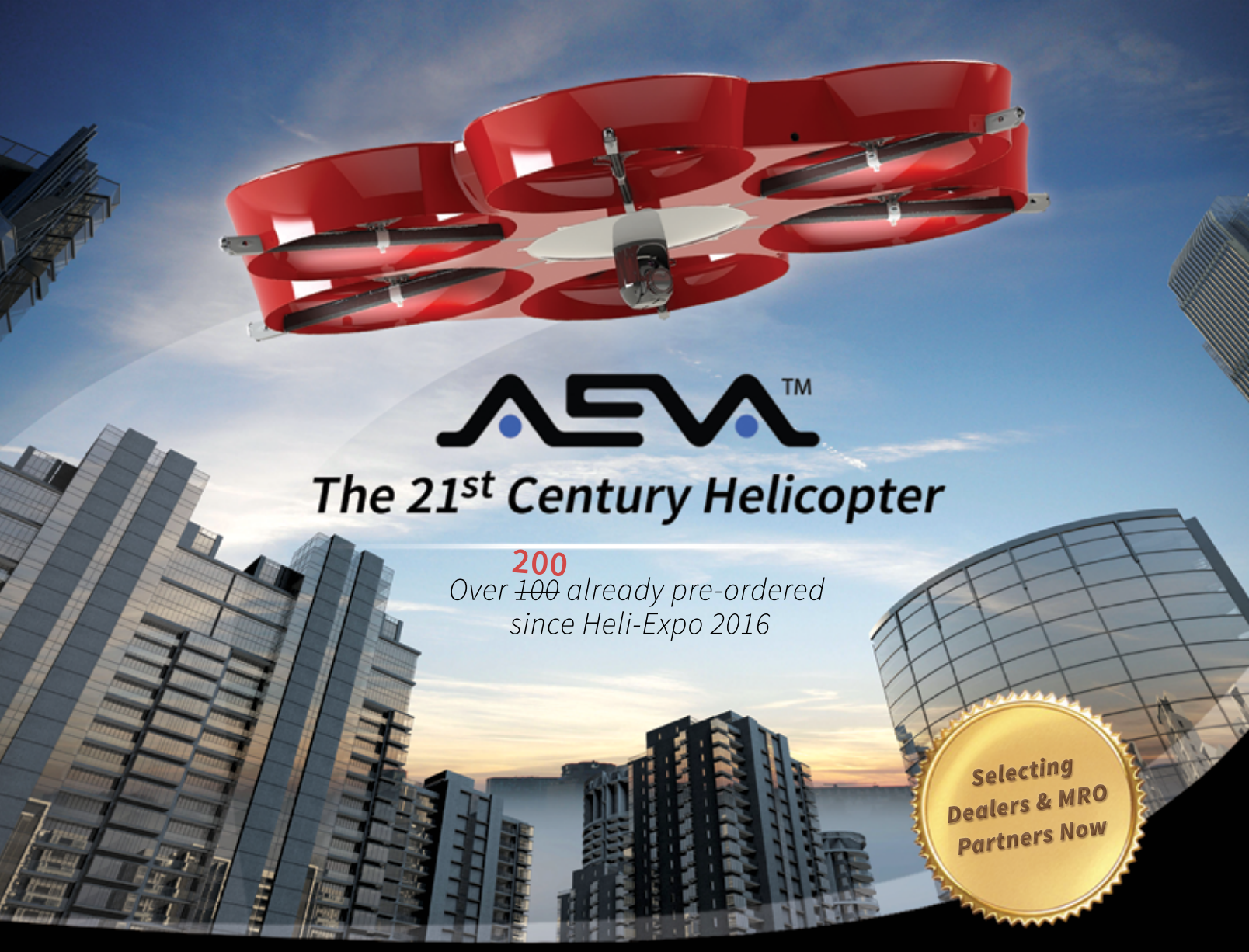
One of the mechanics working on the project is Bryan Dudas, who has been with Erickson for nine years as a field maintenance technician. He works with another mechanic and a crew chief on the S-64F.

"We take care of the aircraft by doing its preflight inspections, postflight inspections, 30-hour phase inspections, and any maintenance that's required, such as component changes," he said. "We also refuel the aircraft, clean it, and move the support equipment around, too."



The maintenance teams work out of a trailer that contains an enormous variety of parts and components — including spare main and tail rotor blades. "It provides everything we need," said Dudas. "Our parts inventory has a lot of parts that might need replacing every once in a while, like a pressure switch or transducer, or polyurethane abrasion tape on the main rotor blade."

Dudas said he has seen a wide variety of wildlife while working on the project, including grizzly bears, black bears, and marmots. "I've worked in Greece, Australia, and in these parts before on a similar power line project, but it was more flatlands rather than glaciers and mountains. This is probably the most scenic project I've worked on in my career," he said.



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The S-64F can lift 25,000 pounds, while the S-64E can lift 20,000 pounds. They have four basic roles on the project: moving the excavators, flying the concrete, placing the cap on the foundation, and then setting the towers. **Bryan Dudas Photo**

LONGSTANDING INVOLVEMENT

Yellowhead Helicopters is another operator working on the Brucejack project, but it has been hired directly by Pretium rather than through Rokstad. It has four aircraft contracted on the job: two Eagle 407HPs and two AS350 B2s. The B2s are working primarily on the powerline, flying support for Pretium's quality assurance, surveying and administration staff, while the 407s are conducting exploration work as well as assisting in avalanche cannon construction.

Yellowhead's involvement with the project began last fall when the transmission line's right of way was cleared, during which it used one aircraft to fly the timber fallers. Jim Beise, Yellowhead's assistant director of operations, said the weather was particularly challenging at that time. "One thing with the falling that's not like the construction, they're more flexible with where they can work," he said. "If we weren't able to get to a certain area, we'd readjust some equipment and prep in an area where the weather was a little better, at a lower elevation."

The avalanche cannon construction also began last year. "We used the helicopter to sling in the concrete and equipment for these propane cannons they were putting in," said Beise. "They're expanding that this year into another area. It's quite extensive."

In addition to the four aircraft contracted to the job, Yellowhead has also been asked to bring its Eagle Single (a single-engine Bell 212 powered by a Honeywell T53-17B engine) to help move communications equipment to enable a repeater link up to the mine (allowing Pretium a cheaper alternative to using expensive satellite phones).

Beise said that, weather aside, communication was the biggest challenge faced by those working on the transmission line. "The radio is really busy, so there are definitely some challenges with communications

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AN S-64F moves a section of tower into position. **Bryan Dudas Photo**

because there's so much traffic on the frequencies," he said. "The guys have to prioritize the air-to-air channel and they use that for traffic separation for the most part. And then there's a procedure for calling in to the logistics and letting them know where you want to go, what you're doing and how long you're going to be."

THE STRINGING SPECIALISTS

The final piece of the Brucejack transmission line puzzle will be provided by Ascent Helicopters. Utilizing its MD 530FF (a MD 500E with an upgraded Rolls-Royce M250-C30 engine) and its brand-new AS350 B3e, it will string the wire and hang the conductors once the towers are completed.

The MD 530FF is a wire-stringing specialist, and is designed to pull sock line from the side of the aircraft — a much safer way of operating. The B3e will be used to transport crews to and from the job site as well as setting smaller steel or glass pieces. "We have, I believe, quite a few towers above 6,000 feet, so definitely we want the performance of the B3e," said Trent Lemke, president of Ascent Helicopters. "It's a great aircraft for that work, absolutely. For precision long line work, everybody loves it. The 530FF, of course, is a [MD] 500 that's on steroids — it's quite an amazing performing aircraft."

Lemke said the type of work Ascent undertakes called for hugely experienced pilots. "A lot of our guys are older experienced guys," he said. "We have probably five to 10 pilots over the 10,000-hour mark. A lot of these guys have flown the 500 and the 530 way back when the 500s were super popular. So bringing it back online was actually quite an easy decision."

A strong working relationship with Rokstad was key to making the operation

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Ascent Helicopters' MD 530FF is a wire stringing specialist. The operator is also using its new AS350 B3e on the project. **Bill Campbell Photo**

Looking down the line underneath an S-64. While much of the project is relatively routine for Erickson's pilots, the placement of the towers will require its most experienced aft-seat precision placement pilots. **Bryan Dudas Photo**

a success, said Lemke. "There have been a lot of high profile accidents in the wire environment and also there's a multitude of factors that could cause them. We try to eliminate as much as possible by having certain systems in place," he said. "Probably the first four or five days up there will be just figuring out the stringing program to make sure that everybody is well set up and understanding and trained and the SOPs [standard operating procedures] are in place. So, there's really nothing that you do that isn't rehearsed at some point or other or that we haven't done before."

Lemke said Ascent was excited to get started on the project. "It's pretty dramatic scenery, and it's quite the power line to be built in that geographic area," he said. "This one is definitely a feather in everybody's cap, for sure."

When the power line is connected and switched on, it will mark the beginning of an exciting new phase of development at the Brucejack Gold Project. Thanks to an extraordinarily mixed fleet of aircraft, and some of the most experienced and specialized crews in the industry, the promised riches of the Valley of the Kings will soon be brought within reach.

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There aren't many bigger aircraft for a helicopter mechanic to work on than a Sikorsky CH-54. Here, a mechanic takes a look at one belonging to Helicopter Transport Services, based in Aurora, Washington. **Heath Moffatt Photo**

MEETING THE *Mechanic Crunch*

With the industry now facing a shortage of qualified mechanics, operators and manufacturers are getting creative in order to attract — and retain — new talent. **By Jen Boyer**

Concerns over a shortage of mechanics are rumbling through the helicopter industry, keeping hiring mangers up at night with the fear of a dried-up talent pipeline. The shortage is affecting operators and manufacturers differently across the industry, making a single fix virtually impossible. And, looking closely, simply increasing the number of schools or encouraging more people to consider aviation maintenance as a career won't solve the problem. The issue is more complicated.

While employers across a number of helicopter sectors are reporting difficulty in finding and retaining skilled and qualified helicopter airframe and power plant (A&P) mechanics, others cautiously note having mechanic applicants to spare. The difference is due to a mixture of company culture, partnerships with organizations and schools, and straight up creativity and dedication to keeping a supply pipeline open.

At Robinson Helicopter Company in Torrance, California, company president Kurt Robinson said he is finding both a decrease in skilled A&Ps and the number of schools to train them.

"Frank [Robinson] founded the company in Southern California because of the large pool of skilled aerospace workers, but that was in the late '70s and early '80s when McDonnell Douglas and other big manufacturers were here," Robinson said. "The landscape has changed and we've certainly seen a reduction in the number of schools teaching aviation mechanics. Northrop University, for instance, was a very large source of our A&Ps."

Northrop University closed in the '90s and Long Beach City College, which provided a steady flow of graduates as well as offering night courses for Robinson employees, recently discontinued its A&P program. Today, Robinson works with Spartan College of Aeronautics and Technology and Embry Riddle Aeronautical University in Arizona for new talent.

"It is a constant battle to find people in our field and to retain them," Robinson said. "We work with the schools because a 10-year A&P doesn't typically want to come to work at a factory. They're headed toward airlines at that point in their careers."

Robinson seeks to maintain an average of 50 A&P mechanics by working directly with schools and putting new employees through a reengineered internal training program. The helicopter manufacturer hires newly-minted A&P mechanics and puts them to work in subassembly. From there they move up and advance in the company. "We identify strong employees early and move them up in the company sooner in an effort to maintain retention," Robinson said. "Overall, we see the most loss between two and five years with us as they move on in their careers. If they're with us six years, they tend to stay."

Air Evac Lifeteam, which operates more than 130 Bell 206L helicopters across 15 Midwest and southern states, is in a similar boat. "Over the years it has been challenging out there to find good people, but recently it seems to be much harder with not a lot of qualified people," said DJ Bates, assistant director of maintenance at Air Evac. "There are a lot of young people out there, but they don't have the experience we need — two years of helicopter experience to be a base mechanic, and three years in type to work at our maintenance facility."

Bates said retention is fairly strong at Air Evac; benefits and pay are comparable with the rest of the industry, and many bases are fairly rural, attracting candidates who like the lifestyle and appreciate the lower cost of living. However, Air Evac is growing, and with growth comes the need for more employees.

"We started working with an aviation employment agency for contract labor," Bates said. "They seem to have a large pool of folks looking for jobs, and we work with them to bring on folks for a 90-day program as contract for hire. This gives us the opportunity

Companies and manufacturers across the industry are concerned about a potential shortage of mechanics, making the ability to attract and retain qualified personnel a prime concern. **Mike Reyno Photo**

Fred Polak of the International Association of Helicopter Maintenance Professionals would like to see the FAA establish official internship and apprenticeship programs to encourage new mechanics to enter the field.
Mike Reyno Photo

Columbia Helicopters aims to be a long-term employer of choice among its workers, offering various incentives to encourage its staff to remain with the company.
Dan Sweet Photo

The potential cost of lost personnel, in terms of the expense of searching for and hiring a replacement, retraining, and lost productivity, is a real incentive for employers to ensure their staff remain engaged in their company.
Dan Megna Photo

to see what these mechanics can do, and often we do offer permanent employment at the end of the contract."

EDUCATION IS KEY

Fred Polak, president and CEO of the recently formed International Association of Helicopter Maintenance Professionals (IAHMP), sees education, both in the form of training mechanics and in educating the industry to change, as key in maintaining the A&P pipeline.

"First off, the regulatory agencies are out of step," Polak said. "Take the U.S. and Canada for example. The U.S. has the airframe and power plant — A&P — [qualification], while Canada has the aircraft maintenance engineer, or AME. Both require significant training and skill, yet someone who holds one of these certificates can't work in the other country without testing and achieving the separate certificate. We would like to see Transport Canada and the FAA [Federal Aviation Administration] work together to make these reciprocal as a means to keep the pipeline open."

Polak said he'd also like to see the FAA work toward official internship and apprenticeship programs to help new mechanics enter the field and assist companies in hiring new mechanics. "We, as an industry, need to help ourselves on several fronts," he said. "Allowing interns and apprentices to work on aircraft under supervision, with regulatory support, would help alleviate the pressure."

On the educational institution front, colleges and associations are working to increase the visibility of aviation maintenance careers. Helicopter Association International (HAI), through the Aviation Technical Education Council, is working to better integrate rotorcraft into technical school programs, said HAI president Matt Zuccaro. Helicopter Foundation International, a nonprofit organization dedicated to preserving the heritage of vertical flight and educating future generations of helicopter industry professionals, is partnering with manufacturers and operators to help supply unused components and equipment to maintenance schools.

At the same time, associations like HAI and IAHMP are working to bring information to middle and high schools about career options in aviation maintenance.

Despite support from the industry, pressures of a different sort are providing challenges for these schools. At South Seattle College in Seattle, Washington, program administrator Ellen Gordon struggles to make the A&P program attractive to graduating high schoolers. "There are a lot of people from our college and others going into middle and high schools to instill interest in aviation maintenance early on, yet the obstacle we're seeing for these students is the very rigorous and expensive training," she said. "Kids just out of high school fail the first few tests because honestly, high school isn't aimed at college-level achievement, especially for a rigorous FAA-regulated program. We also see students aren't interested in an eight-quarter program with the costs of an A&P program's supplies and tests."

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Columbia's Scott Sloat said the company hasn't had a lot of difficulty finding mechanics due to a strong pipeline from the military. He said veterans understand the missions and aircraft the company flies. **Dan Sweet Photo**

Because of the rigorous requirements of FAR part 147 — the FAA regulations overseeing A&P training — there is often no room to rearrange the curriculum to assist students in their success, Gordon said. Until the FAA can look at this issue and offer schools options to rewrite their training programs, it doesn't look like that demographic will change, she said.

"As a result, despite attempts, we don't see a lot of young people entering the program," Gordon said. "Our students on a whole are typically adults retraining for new jobs."

However, one source of maintenance students that is proving to be valuable in several ways is the military — and several organizations are working directly with the armed forces to prepare veterans and those getting ready to leave the service for immediate careers in aviation maintenance.

Joint Base Lewis-McChord (JBLM) in Washington state operates a large number of helicopters, from Kiowas and Apaches, to Black Hawks and Chinooks. Mechanics working on these aircraft during their service have the hands-on training and experience employers seek — but don't exit the military with an A&P.

South Seattle recently obtained a grant through the U.S. Department of Labor and partnered with retraining program Camo2Commerce to develop an eight-week course designed to prepare JBLM mechanics and veterans for jobs in the civilian sector.

"We developed our program to assist those in service, offering lectures two days a week on base, a career specialist, resources and interview practice, and then on Fridays and Saturdays, the students come to our SSCC campus in Seattle to work in our labs specifically on areas where they don't have experience," Gordon said.

The first cohort of 13 students graduated in December 2015, with most finding work right away, Gordon said. The second cohort graduated in June, and at the time of writing, many were interviewing for positions in the helicopter industry.

"It makes sense to work with people coming out of the military," Gordon said. "They have the passion, dedication and make really good employees. Many joined to be helicopter mechanics and want to continue that career when they leave."

Scott Sloat, operations and human resources manager at Columbia Helicopters in Portland, Oregon, couldn't agree more. He hired five of SSCC's first class and is considering more. Columbia's Chinook aircraft, being so similar and in some ways identical to what JBLM veterans know, made the SSCC class graduates very attractive employees.

"Veterans understand the missions we fly and understand maintaining our aircraft," Sloat said. "And they understand working in the field. In most of our operations, the mechanics live and work in the field, which is very similar to their life in the military. It ends up being a very good match for both the company and the veteran."

Sloat said Columbia hasn't had a lot of difficulty finding mechanics due to the strong military pipleline. However, due to Columbia's willingness to promote and move employees to maintain their interest and passion, there are often openings around the company, from specific shops in the company headquarters to field work.

"We work to not only be an employer of choice, but a long-term employer of choice," Sloat said. "We do this through relocation assistance, higher than industry-average benefits, and working with our employees on achieving their career goals, whether they want to travel, move into management, or stay close to home. We've heard from veterans who reach out to us after they leave the service that they talked with Columbia employees on missions where Columbia supported the military. They heard great things and wanted to join the team."

COMPETITION

Just as in any supply-and-demand situation, the competition for skilled and passionate mechanics is fierce. The practice of operators recruiting employees away from each other is as old as the industry, but now it's coming from all directions. As supply dwindles, the fixed-wing industry is also feeling the pressure, and is looking to attract mechanics from lower paying helicopter positions.

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The competition for qualified maintenance staff is higher from ever — and not just from within the aviation industry. **Dan Sweet Photo**

The military continues to provide a strong pipeline of personnel for civilian maintenance jobs, and several organizations are working to maximize the number of people making the transition between the two. **Mike Reyno Photo**

"There are other industries out there looking for the same qualifications as the helicopter industry, but they pay more," IAHMP's Polak said. "The theme parks, for instance, have learned FAA-certificated graduates are highly desirable because the training involved [to become FAA-certified] requires a tremendous amount of training and skill."

He's also seen newly minted A&Ps find lucrative work in the oil industry, pneumatics, NASCAR, electronics, wind turbine repair and even the automobile industry.

"Demographics plays a lot into attracting and retaining a good mechanic, as does company culture," he said. "A $100,000-a-year job with benefits is great in Pittsburgh, but not so hot in New York City. Helicopter maintenance is a passion, and some would prefer to be in that field. The helicopter operator has to be creative in how they attract and retain those folks."

In the end, it could be a dedication to creativity that makes or breaks a retained workforce.

Tim McAlbin, director of maintenance at Hillsboro Aviation in Portland, joined the company earlier this year, moving over from Columbia. His team at Hillsboro may be small compared to the shop he ran at the larger operator, but it's highly skilled.

"Almost all of the guys here have more than 10 years of experience," McAlbin said. "I'd be in a world of hurt if I lost one of them."

Upon joining Hillsboro, McAlbin put together a cost of attrition report for the company's executives, highlighting how the loss of one mechanic could cost the company $24,000 a month in retraining, productivity and the expense of searching for and hiring a new person. He recommended a program to recruit the company's current employees as a way to gauge job satisfaction and career goals, and then tie them into company goals in an effort to retain employees.

"A part of my job here is to build up our service center, a company goal, and I'm looking into adding a component overhaul shop," he said. "The team here is interested in that. It adds diversity for the employees, helps them build new skills, and breaks up the monotony. The company grows and we increase retention and job satisfaction. Sometimes it isn't about the money. I've been very lucky that the leadership here is receptive of these recommendations."

Jen Boyer | Long-time communications professional Jen Boyer is a 1,500-hour helicopter pilot with commercial instrument, flight instrument and instructor instrument certificates. When not flying, writing or spending time with her husband and two kids, Jen mentors current and future Whirly-Girls.

Better situational awareness makes flying safer for all of us. That's why, early this year, the FAA enacted new rules for commercial adoption of both radar altimeters and HTAWS (Helicopter Terrain Awareness and Warning Systems). Radar altimeters will be required for all Part 135 operators – and air ambulance operators will also be required to equip with HTAWS – by April 24, 2017. What's more, most aircraft flying in U.S. controlled airspace will also need ADS-B "Out" capability by year-end of 2019. All of these technologies are aimed at helping pilots keep their distance from flight path hazards: With visual and aural advisories. Crisp 5-color terrain shading displays. Real-time traffic alerts. And with voice callouts that announce height above terrain when descending below 500 feet. For all these must-have solutions, Garmin is your go-to source. So why wait? Call your dealer now to avoid that last-minute scheduling crunch.

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The two-seat Robinson R44 Cadet gained certification from the Federal Aviation Administration in May 2016. **Skip Robinson Photo**

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It has taken a while,

but Robinson Helicopter Company has entered the world of glass panels and flight control systems in a big way. For a time, the only way to get such technology into one of the manufacturer's products was through aftermarket sources. This was how the Aspen EFD 1000 and some other systems originally found their way into a few R44s, as Robinson held off adopting them into their factory offerings.

We then saw the Aspen EFD 1000 line enter Robinson's option list a while back for the R44 and R66. This was then followed by the Garmin G500H for the R66 and R44 Raven II and Cadet.

And then came the autopilot. If ever there was a piece of avionics gear that screamed "Robinson," it is the Genesys Aerosystems HeliSAS. Certified for the R44 and R66, the HeliSAS — in my opinion — is the essential component to an avionics suite for a Robinson helicopter, tying it all together into one nice highly functional package.

Today, Robinson's optional avionics and instruments price list is slammed full of the latest in avionics from Garmin, Aspen, and Genesys Aerosystems. I was recently offered the opportunity to explore all of this gear in depth — working together — in both an R66 and an R44 Raven II. Robinson test pilot Scott Woolums was my guide for the two flights.

COMING OF AGE

Glass panel options and a full featured autopilot add a new range of functionality and utility to the R44 and R66 series of Robinson helicopters.

Story & Photos by Guy R. Maher

The Garmin G500H has been available as an option in the R66 for a while, but only became available for the R44 Raven II and Cadet in July 2016.

IN THE COCKPIT

Since my primary interest in the flights was to evaluate how well the HeliSAS flew the Robinson products, that will be the focus of this piece. And in the interest of space, this report will focus on the R66 flight — the first of my two flights — noting any additional points from the R44 flight.

The R66 was equipped with the Garmin G500H system and included Helicopter Synthetic Vision Technology (HSVT) and Chart View. The primary communications and navigation were provided by a Garmin GTN 750 installed just below the G500H in the center of the panel. The HeliSAS control panel was mounted just below the GTN 750.

The R44 was also equipped with the GTN 750. But it was in a separate pilot side console mounted on a cross bar to the right of the main instrument panel. In the center of the main instrument panel was the dual screen Aspen Evolution 1000H Pro primary flight display (PFD)/multifunction flight display (MFD). The HeliSAS control panel was mounted at the top of the remaining avionics stack on the lower subpanel.

Having a decent amount of operational experience with all of this gear, the ground checks went pretty quickly — mainly performing the HeliSAS checks prior to departure.

We set up for GPS navigation first, entering an easy local flight plan in the GTN 750 and watching it pop up on the G500H. The latter is highly customizable through the menu pages. Although you can go deep into these, the pages you normally need the most are immediately available with minimal button pushing.

The key is obviously to set up the three displays (GTN 750 screen and two G500H screens) in advance to maximize the available information presented without screen redundancy or the need to do a lot of button pushing while in flight.

The GTN 750 is touchscreen, but the G500 is not. So things like METARs can be found with buttons and knobs on the 500 or touchscreen on the 750. That's good to have on a bumpy day when the 750 is a little more work intensive.

PUTTING IT TO THE TEST

We departed the Robinson pad and went to a nearby grass area for hover work. The HeliSAS has three modes: completely off; SAS mode; and full autopilot. For most non-autopilot operations, the SAS mode would be turned on. I found a sweet spot in the hover and tapped the HeliSAS trim button on the pilot's cyclic. This is essentially an attitude reset button. (It works like a force trim release/reset button for those familiar with what I mean.)

The HeliSAS maintained an incredibly impressive hands-free hover attitude. By no means is this an "auto-hover" feature. But it surely did a nice job keeping the R66 (and R44) very stable.

I performed a pretty robust pedal turn and it held on fine. Initially Robinson had issues with aggressive maneuvering and the SAS shutting off, but that has been corrected for all but the most extreme maneuvering.

I left the HeliSAS on for takeoff and found it very easy to "fly-through" the control pressure and reset it as needed with no control bump at all. At 200 feet prior to the selected cruise altitude, the G500 issued an audio warning — two beeps — then again at reaching target altitude.

I selected the altitude hold function on the HeliSAS. I also hit the attitude sync to recenter the PFD attitude when in normal cruise attitude. (The Aspen 1000H also has this feature, whereas on the fixed-wing version it's set by the avionics shop.)

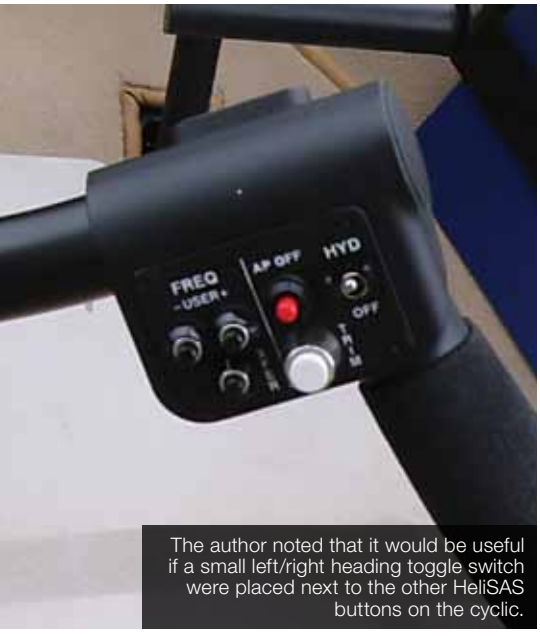
During climbs and descents, hitting altitude hold will cause the HeliSAS to grab the altitude but fly through it for 50 feet or so before returning to the selected altitude. The HeliSAS doesn't have the provision for capturing a preselected altitude.

Turning to a heading is a simple matter of rotating the heading bug to the desired setting. The helicopter then assumes about a 20-degree bank until it rolls out smoothly on heading. I wish there was a small left/right heading toggle switch on the cyclic next to the other HeliSAS buttons. That is the most frequently used function for autopilots and it would be nice if the pilot didn't have to reach across the T-Bar cyclic every time a heading change is needed.

A neat new GTN 750 software feature is that it can hold at any "direct to" waypoint you have entered. I tried it and when reaching the waypoint, the 750 guided the HeliSAS around in a perfect holding pattern.

UNUSUAL RECOVERIES

Out over the water and clear of any traffic and noise sensitive areas, we began the tests I really was waiting for — how this HeliSAS flies the R66 (and R44) in unusual attitude recoveries. The SAS limits are 11 degrees nose up, five degree of bank, and six degrees nose down.



The author noted that it would be useful if a small left/right heading toggle switch were placed next to the other HeliSAS buttons on the cyclic.

The glass cockpit inside the R44 Raven II. The Garmin GTN 750 is mounted in the pilot-side console on the right. The dual screen Aspen Evolution 1000H Pro PFD/MFD is in the center of the main instrument panel.

> "The HeliSAS maintained an incredibly impressive hands-free hover attitude. By no means is this an "auto-hover" feature, but it surely did a nice job keeping the R66 (and R44) very stable.

First was the nose up test. I had a preset attitude of level flight and then began pulling back on the cyclic to raise the nose up to about 10 degrees. When I released the cyclic, the HeliSAS smoothly returned the helicopter to the level preset attitude. There was no heavy pitch over and I felt no lightness in the seat.

I then pushed nose down to about 10 degrees, but this time reset the SAS and let it go. It immediately — and smoothly — pitched up to the preset limit of six degrees down.

Next, I turned the SAS completely off and placed the helicopter into a high nose attitude and steep right bank. I then engaged the SAS and it smoothly returned the helicopter to the preset five-degree bank, and 11 degrees pitch up. The same procedure brought the same result in the R44.

Another feature is that in order to use any of the autopilot functions, the helicopter must be above 44 knots and below 140 knots. Otherwise, the HeliSAS kicks off any autopilot function, but still remains in SAS mode. I tried this in cruise on a selected heading and began lowering collective. The HeliSAS maintained perfect heading and altitude until I hit 44 knots and it reverted to SAS only.

FLYING THE R44 CADET

While at the Robinson Helicopter Company headquarters this past June, I was afforded the opportunity to fly the new R44 Cadet (certified by the Federal Aviation Administration on May 6) with Robinson chief test pilot Doug Tompkins.

The preflight walk-around is all R44 Raven I. One noteworthy difference was that the strut fairings have a small taper from the top to the bottom. I figured it was some sort of engineering trick to reduce weight, but when I asked Robinson VP of engineering Pete Riedl about them, he simply answered: "We think it looks better." He added that the company intends to change to the increased taper for all R44 models.

The Cadet I flew had three noteworthy options. The first was the Aspen Evolution 1000H primary flight display. This is the basic system with no navigation/horizontal situation indicator functions since the demo Cadet had no navigation equipment installed. (I attached my iPad to the Ram mount bar, which included USB power ports.) But for those who want horizon and directional gyro information, the Aspen 1000H makes most sense in that it adds just a little over $1,000 versus the mechanical instruments.

The demo Cadet also sported a Spidertracks flight tracking device. It provides real-time satellite tracking, as well as automatic alerting and two-way text messaging. And — saving the best for last — air conditioning! Yes, although not available on the Raven I, the Cadet, with its lighter weight and better hot weather margins, can handle it. And as soon as I conducted a normal R44 startup, that air conditioner was dumping nice cool air into the cabin.

With takeoff checks complete, we hovered out to position for takeoff. With Tompkins, me, and full fuel on board, we were about 65 pounds below maximum takeoff weight. With an outside air temperature of 75 F (24 C), 22 inches of manifold pressure (mp) was required for hovering, which was about 2.5 inches less than maximum allowed for takeoff.

On takeoff, I pulled in full climb power to quickly get to a fly neighborly altitude. The best rate of climb speed is 55 knots. But even at the 60 knots I was using, I saw 1,010 feet per minute on the Aspen 1000H.

In cruise at 22 inches mp, the indicated airspeed was 107 knots — that's only a couple of knots less than the Raven I. Robinson literature says to expect around 14 gallons per hour in fuel consumption for both the Raven I and the Cadet at cruise. But with 20 less horsepower being generated in cruise than the Raven I (and 15 horsepower less at takeoff), it will be interesting to see what the real numbers run for high cruise.

Slowing it to 90 knots, the fuel flows should drop to pretty close to what the R22 Beta II burns at 90 knots, which is around 10 gallons per hour. So, if flight schools want to reduce their Cadet fuel costs for normal training, it should be pretty easy by just slowing down.

Tompkins and I conducted the flight just like a normal training session. A normal approach and landing was first. On a maximum performance takeoff, I held a much more steep departure angle but still saw 880 feet per minute prior to reaching 55 knots.

Then we quickly moved into straight-in autorotations to a power recovery for warm-up. I was enjoying the Cadet for what it is — a great trainer. And having Tompkins as my instructor was the icing on the cake. He tweaked my touchdown technique on a straight-in autorotation, then after a decent full-down 180, we looked at each other and almost in unison said, "It's a 44." And that is a good thing.

Another good thing is the Cadet numbers on the bottom line. The Cadet is $40,000 less than the equally standard-equipped Raven I. Yes, it's still almost $47,000 more than a comparably equipped R22 Beta II — the industry leader for training. But on the line as a trainer it's much more versatile.

The Cadet, with its longer tail, bigger blades, and higher cruise speeds, is more like the aircraft students will be flying in the commercial world. And finally there is a trainer that can be fully equipped with glass panels and GTN avionics from Garmin — plus a full featured autopilot — and still carry students and instructors who enjoy burgers and fries. These students will be able to easily fly instrument approaches at the real world speed of 90 knots while gaining valuable glass cockpit and automatic flight control experience.

Plus, with its lighter weight and additionally de-rated Lycoming O-540 engine, the time between overhaul interval is increased by 200 hours. This has got to grab the attention of many flight schools — especially those operating the out-of-production and harder-to-maintain Sikorsky 300 series helicopters.

Consider, too, that until the Cadet, the only piston helicopter one could buy with air conditioning was the R44 Raven II. Even for the many schools where air conditioning could almost be considered a necessity, the purchase and operating costs were out of reach. However, with a purchase price that's $122,000 less than the Raven II — and with a 10 percent lower hourly operating cost — flight schools and personal owners could find that aspect the coolest thing yet about the R44 Cadet.

The author noted the R44 Cadet's utility as a training aircraft, allowing students to fly an aircraft more similar to those they will encounter in the commercial world.

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The R44 lines up for landing. **Skip Robinson Photo**

The author gets to grips with the glass cockpit as featured in the Robinson R66 he flew in the demonstration flights. It featured the dual screen Garmin G500H above the GTN750 in the center of the panel.

The R44 Cadet replaces the rear seats of an R44 Raven I with an increased cargo space.

The cockpit of the R44 Cadet, as flown by the author, featuring the Aspen Evolution 1000H primary flight display.

It was time to head back for a coupled instrument landing system (ILS) approach. I used the heading and altitude modes while being vectored around for the intercept. At the 45-degree intercept heading, I engaged the NAV function and the associated light lit up white — indicating it was armed. When the localizer captured, the NAV light turned to green.

The glideslope came alive so I hit the VRT button (for "vertical") to arm for glideslope capture. (The HSVT was doing an outstanding job of displaying the many towers at the shipping docks that surrounded our approach path.)

At glideslope capture, the VRT light went from white to green, and I gently reduced collective to approach power. The HeliSAS flew it about a half of a dot below the glideslope during capture before it returned back to dead center, where it stayed throughout the rest of the approach. At minimums, I disconnected the autopilot and landed.

I duplicated the above tests in the R44. For the most part, it performed exactly the same. I did sense a little more cyclic action from the HeliSAS as it was flying the R44. But it wasn't noticeable in how the aircraft flew. The steep pitched unusual attitude recoveries by the HeliSAS were equally smooth. Any doubts I may have had about the HeliSAS and low-G pushovers were squashed.

I concluded the R44 flight with a coupled area navigation (GPS) approach to localizer performance with vertical guidance (LPV) minimums. Like the R66, the HeliSAS flew the approach beautifully. I finished the R44 flight with a 180-degree autorotation with the autopilot engaged in altitude and heading mode just to see how it felt if the pilot forgot to disarm it during an engine failure. It was a non-event. I could feel the pressures — but only because I was looking for them.

Robinson has come a long way from the hard and fast rules of years gone by, which appeared to dictate that its helicopters should be minimally equipped for "eyes outside" priority flying. Yes, these are still visual flight rules helicopters and "eyes outside" should remain the master mantra. But the advent of some exceptional new avionics — and market demand — has certainly prompted Robinson to finally increase its offerings. It was worth the wait.

Guy R. Maher | A 16,000+ hour dual-rated pilot and flight instructor for helicopter, airplane and instrument ratings, Guy recently retired after 24 years as a HEMS pilot. He continues to run his aviation services company — Lanier Media — established in 1978, and in addition to being a FAASTeam representative, Guy is frequently called upon to provide consultation on aircraft sales, operational, and safety issues, and litigation support. He can be contacted at guy@verticalmag.com

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A Ventura County Sheriff Bell UH-1H Huey uses a Simplex Aerospace Fire Attack system to help combat a fire in California.
Skip Robinson Photo

Innovation as Standard

We go behind the scenes at Simplex Aerospace as it celebrates 70 years as a leader in the design, manufacture, and certification of aviation mission equipment.

Story by Jen Boyer | Photos by Heath Moffatt

Simplex recently certified a 3,050-gallon Fire Attack system for the CH-47D Chinook. The system has a 2,800-gallon water reservoir. **Dan Sweet Photo**

A Simplex engineer tests one of the company's aerial spray application systems at its facility in Portland, Oregon.

Simplex said the Model 347 Fire Attack System is the largest helicopter fire-fighting system in the world. It includes a 12-foot-long, 10-inch diameter hover pump that can refill the tank in less than one minute. **Dan Sweet Photo**

All the company's spray systems are manufactured from high-strength, low-weight and chemical resistant composite material. **Skip Robinson Photo**

Simplex's belly tanks are made from carbon fiberglass material for durability and low weight. All systems are ground fill and hover fill capable, and can carry foam retardant or water.

The Simplex management, from left: Larry Lichtenberger, executive vice president; Dan Wright, vice president of operations; Michael Finnegan, director of product sales; Mark Zimmerman, president and CEO.

Simplex Aerospace's 70-year legacy began with a single bilge pump. Founder Dorsey Liebhart was building Liberty ships in Portland, Oregon, during World War II, when he had an idea for an effective "lightweight" pump. He designed a 20-pound prototype and began shopping it around shipping yards. It didn't catch on in maritime circles, but a local crop duster heard about it and inquired about its use on an airplane to efficiently spray fertilizer over fields. The experiment was a success and, in 1946, Simplex Manufacturing Company was born.

From its humble beginnings not far from the Oregon Shipbuilding Corporation where Liebhart assembled wartime ships, Simplex (now Simplex Aerospace) has grown into an international multi-million dollar aviation equipment leader, offering close to 200 Federal Aviation Administration (FAA) supplemental type certificates (STCs) for systems flying in more than 100 countries.

Although the company has moved from a family-run to investor-owned firm, Simplex has never lost sight of the innovation and customer relationships that led to its creation. Liebhart's crop dusting customer was only the first in a long line of individuals and companies who came to Simplex with ideas that have developed into successful products.

"I believe the secret to our success is our commitment to the industry — working with customers to develop and certify new missions and better equipment — and [the] continued diversification of our products," Mark Zimmerman, president and CEO of Simplex Aerospace, told *Vertical* during a recent visit to the company's facility. "We've developed wonderful relationships with aircraft manufacturers and our customers, and recognize they are the best source for new ideas."

For 70 years, Simplex has responded to customer requests, developing and refining products for agricultural spraying, firefighting, powerline and wind turbine cleaning and deicing, and cargo

The company has moved from a family-run to an investor-owned firm, but the dedication to innovation and building customer relationships that led to its success are still central to its business model.

Simplex now holds over 180 STCs for its products from different regulatory authorities around the world.

A test rig holds a Simplex tank above a water reservoir at the company's headquarters.

A tank goes through final assembly, where its top and bottom covers are attached.

A Simplex Model 516 Sky Cannon sub assembly component.

Simplex provides 24/7 AOG support from its seven service centers around the world.

A Helicopter Transport Services Skycrane fills up during a firefighting operation.

The 3,050-gallon Fire Attack System is placed in the cabin of a Chinook.

Thanks to a recent expansion into foreign markets, Simplex's systems are now in operation in over 100 countries around the world.

With an expanded product line and move into new markets, the company has grown to eight times the size it was 15 years ago.

transport, maintaining much of Liebhart's initial philosophy for the company. From the beginning, demand was high for spray equipment, but Liebhart kept production simple and manageable for a reason. "Dorsey ran the business to be small to assure quality and [a] customer-service focus," said Larry Lichtenberger, Simplex vice president. "When his daughter Nancy's husband, Dan Conti, took over the business in 1963, he maintained that philosophy. That is evident today as our systems from 50 years ago are still flying. Quality and durability are attributes customers know to expect from Simplex."

Though the company has increased production substantially from its early days, this philosophy stays strong. Its FAA-certified carbon fiber tanks are crafted in-house under close quality control checks. Every part is tested and the final product goes through multiple quality control tests in the assembly plant. "Nothing leaves here until we're satisfied it will last," Lichtenberger said as he pointed out a fire suppression tank being tested. On the rig it struggled with one of its doors. "This one for instance will undergo several more adjustments before it's ready for delivery to our customer. It won't leave until it's perfect."

This philosophy has paid off in other ways, too. "We're very proud of our outstanding safety record," said Zimmerman. "We've never lost an aircraft as a result of our products. That dedication resonates with our employees and customers."

The customer service dedication established by Leibhart is also a key element of the company's success. "Dorsey knew the value of customer service," Lichtenberger said. "This has stayed with us for 70 years and we've assured it remains strong for our customers all over the world." Today, Simplex provides 24/7 aircraft on ground (AOG) support with seven service centers around the world stocked with parts ready to ship at a moment's notice.

BUILDING A LEGACY

In the beginning, family-run Simplex developed pumps and other equipment for the fixed-wing agriculture spray industry. As helicopters came on the scene, Simplex received its first STC in the 1950s for the Bell 47 agricultural spray system — a system that continues to fly to this day and is still serviced by Simplex.

After taking the helm in 1963, Conti continued the legacy, building up the company's product offerings and developing uses in new sectors of the industry that resulted in the company outgrowing its first home.

In 1982, Simplex moved to its current location, a light industrial building a stone's throw from Portland International Airport, to accommodate increased growth and demand.

As Conti led the company forward, a growing market in helicopter aerial firefighting led to the development of Simplex's notable Fire Attack tank system in the early 1990s. An original Korean order totaling 90 tanks for the Kamov Ka-32, yet another customer request that resulted in an innovative design, began Simplex's path toward fire suppression system leadership. Not long after the Korean order, Japan ordered tanks for the Airbus Helicopters AS365 Dauphin, and U.S. firefighting agencies and companies began requesting tanks for the Bell UH-1H Huey. Available today with STCs for nearly 20 aircraft base models, the fire suppression systems brought a big jump in national and international business to Simplex, quickly outpacing agricultural spray sales.

"Our Fire Attack system is the largest portion of our business," Lichtenberger said. "When it was first developed, it was a vast improvement over the current fire suppression equipment available at the time — a bucket on a 50-foot line. With a tank you experience better accuracy, higher effectiveness, and control over your release. You can release the load much faster than a bucket, or choose to spread it out. One big thing many operators like is the ability to fight fires at night, unlike a bucket system."

In response to customer requests, Simplex certified their Fire Attack systems for night flight — essentially ensuring the tank did not obstruct landing and position lights and offering night vision goggle (NVG) compatible controls.

Further customer-led innovations have advanced Simplex's dominance of the fire suppression tank industry. "As our systems became more popular, individual agencies and companies had specific requests to meet their operating procedures and policies, and we worked to accommodate them," said Mike Finnegan, director of product sales at Simplex. "For instance, some operators only want to have direct visual contact with the tank, others want mirrors, and we even had requests for a camera system so the pilot can have visual [contact] via a screen."

Additionally, Simplex has accommodated requests for dual pilot controls, ground fill ports on both sides of the tank to eliminate tailwind landings into confined areas, and a remote control in the passenger cabin for a fire boss.

One specific request, however, led to a considerable jump in sales and popularity of the Simplex systems, Lichtenberger said. When a hover pump (the hose used to draw water up into the tank) is installed, the aircraft is restricted to flight crew only. British Columbia-based Wildcat Helicopters requested a way to stow the hover pump, allowing passengers to be carried without removing the system.

Working with current customer Los Angeles City Fire and their Bell 412, Simplex developed and certified the FAA-certified Aft Hook, which allows an operator to secure the hover pump, permitting passengers to be transported in the helicopter while the pump is still attached. Once the STC was secured, Simplex received reciprocal certifications in other countries allowing Wildcat to use the system.

"The Aft Hook is available for the Bell 412 currently, but we will certify it for other models as customers request it," Lichtenberger said.

There doesn't seem to be an end to fire system demand in sight for Simplex. If anything, it's increasing. In the '90s, customers required 300-gallon tanks. As helicopters, fires and fire seasons grow, demand for volume is also on the rise. Typical tank needs now run between 800 and 3,050 gallons, Lichtenberger said. Orders for Simplex's largest tank, a more than $1-million 3,050-gallon system for the Boeing CH-47, are on the rise.

Orange County Fire Authority's Bell 412EPs and UH-1H Super Hueys in operation with their Simplex Fire Attack belly tanks. **Ted Carlson Photo**

Every part on every product is tested at the assembly plant, and nothing leaves the facility until its perfect.

Simplex will soon be moving into a new, more modern home, to accommodate the company's need to expand beyond its current 50,000-square-foot facility.

The company recognizes that its customers are the best source of new product ideas, and continually innovates to develop products that meet their requirements.

EXPANDING A LEGACY

In 1996, Conti sold Simplex, ending a 50-year family-held legacy, and the company changed hands one more time in 2000 to a group of investors who hired Zimmerman. In 2012, the name changed to Simplex Aerospace to more accurately reflect the company's vision.

Since becoming president and CEO, Zimmerman has led the company through extensive growth, building the company to eight times its size in 15 years. The 50,000-square-foot manufacturing facility the company has been in since 1982 is bursting at the seams, and the search is on for a new, more modern home that can handle increased volume, larger products, and an expanded engineering team.

Simplex's last decade of growth is due not only to the growth of its Fire Attack systems (both in volume and size), but also to the company's expansion into new sectors of the industry and foreign markets.

With the world's growing demand for power, paired with both an aging power grid and new energy technologies, Simplex developed the aerial cleaning and deicing system for cleaning powerline insulators, and deicing and cleaning wind turbines. The system includes the company's high-strength, low-weight composite water tank and high-pressure spray boom certified for the Bell 407, and the Airbus Helicopters AS350 (H125) and 355 series. "With the growing appetite for power in the world's middle class, there is a definite need to keep our current power equipment running, and our cleaner sources of power maintained," Lichtenberger said.

Simplex's newest product is an expansion of the Fire Attack system. The patented SkyCannon allows a helicopter to essentially become a fire truck on rotors; designed to fight fires on high-rise buildings, its high-pressure spray boom offers the same power as a hose from a fire truck.

"A fire truck can spray 160 gallons a minute up to 40 meters. That was our criteria and we met it when we developed this technology," Lichtenberger said. "During our first customer demonstration, we were prepared to spray for about 30 seconds at the fire department testing center. The fire was out in about six seconds so we had to be creative in showing what it could do after that to fill the time. It was that effective."

The SkyCanon works with Simplex tanks to deliver up to 1,000 gallons to the top of the world's tallest skyscrapers. The SkyCanon's launch customer in Toyko, Japan, has trained its aviation fire teams in preparation for the first high-rise fire, demonstrating the value of this new technology, Zimmerman said.

INTERNATIONAL GROWTH

Simplex has developed a strong international presence and today conducts more than 80 percent of its business overseas. The company maintains 30 agents around the world and operates an office in China, where Simplex conducts robust business.

Lichtenberger attributes the company's strong overseas presence to good relationships with the FAA and foreign agencies. Every STC must first be secured in the U.S., and then taken to overseas agencies for acceptance of the FAA certification. Having worked closely with most countries now on initial STCs, the process runs more smoothly and relationships are strong, Lichtenberger said.

"We have to credit the U.S. government for that," said Zimmerman. "They've been very helpful in getting our STCs accepted abroad. As a result of that relationship, we've also developed opportunities to help other non-competing businesses enter foreign markets. Export-Import Bank of the U.S. has come to Simplex to learn about our positive relationships abroad and how to assist other U.S. businesses in expanding overseas."

As countries develop their aviation industries around the world, Simplex continues to see exceptional growth opportunities.

"I see China's aviation industry today where the United States was in the 1950s," Lichtenberger said. "There are huge opportunities there, but also challenges. It's a different regulatory environment. They lack the infrastructure — airports and heliports — as well as VFR rules and other regulatory oversight, but it will evolve."

Simplex continues to keep an eye on the future. It is currently developing offerings in two growing helicopter industry sectors where such products are not currently available. Unable to share more details, Lichtenberger only said early customer response has been positive — and the company's officers are optimistic they will be a success.

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Hard W

Through hard work and vision, Australian operator Becker Helicopters has built a hugely successful business offering initial rotary-wing training to military and government clients from around the world.

Story by Marcus Hocking | Photos by Paul Sadler

Yakka

Mike Becker, co-founder, chief pilot, and chief flying instructor of Becker Helicopters, stands alongside the flight line at his facility near Brisbane, Australia.

Based on the doorstep of Australia's stunning Sunshine Coast, the success story that is Becker Helicopters is a prime example of what can be achieved through vision and "hard yakka" — an Australian term for hard work. Specializing in contracted military helicopter pilot training, Becker Helicopters has built up its niche business over more than two decades. The quality of its offering today is perhaps best displayed by the fact it is trusted by militaries around the globe to train their pilots.

Husband and wife duo Mike and Jan Becker co-founded the company in 1996, and over the years have developed a scalable training model that can take on a large number of students, using any platform required, for a client wanting to outsource its accelerated initial entry rotary-wing (IERW) pilot training.

"We are finding that outsourcing is the model for military organizations around the world now, as most have been told to cut budgets to save money," Mike Becker told *Vertical* during a recent visit to the company's facility a little over an hour north of the Queensland capital, Brisbane. "Instead of wasting millions of dollars on creating their own infrastructure, purchasing helicopters, and supplying instructor pilots dedicated only to training, they can out-source and send their ab initio pilots to us. The training is done with a firm fixed price in 10 months. They then go back to their conversion units and convert on to type."

Today, with Mike serving as chief pilot and chief flying instructor, and Jan as CEO (she is also a commercial helicopter pilot and a board member of Helicopter Association International), Becker Helicopters flies around 230 sorties a week with a fleet of 17 aircraft

(15 Bell 206B-3 JetRangers, an Airbus Helicopters AS350D, and a Bell 47G), and delivers over 15,000 flight hours of training each year.

But Becker Helicopters is no overnight success. The Beckers established the helicopter flight training school 20 years ago after returning to Australia from Papua New Guinea, where they had been performing helicopter utility work in the country's challenging mountainous environments. The company began with a small fleet of Bell 47s, Hughes TH-55s and Robinson R22s.

The early years were quite tough, but the pair soon realized this was the norm for any new aviation business. However, things were about to change thanks to a bold new strategy. Taking off their "small helicopter school" hat and thinking bigger picture, the Beckers formulated a business plan that focused on gaining corporate and allied military and government clients — with the aim of providing more advanced training and growing the company's student numbers. This "can do" Aussie attitude would secure them a contract with a country in the Middle East in 2008.

"It took a lot of mud to stick on a lot of walls before we had one organization take a chance on us," said Mike Becker. "It's easy to say you can do something, but it's a different thing to actually go out and deliver the product. But we were committed 100 percent with all the money we made always going back into the company, back into our machinery, and back into our people. That actually paid dividends because we were able to perform for the client."

Training foreign students to become military aviators has its challenges. In some instances, ab initio students can spend up to a year at Becker Helicopters learning English before they even get airborne. Then, once competent in English, students will climb into a JetRanger's right-hand seat and be taught the basics of helicopter flight. Progressing through navigation and a full instrument flight rules (IFR) course, along with a night unaided phase, the students are fully trained as IFR and night visual flight rules (VFR) pilots before they start their training with night vision goggles (NVGs). Prior to graduation, the students will also do some sessions of basic formation flying, as well as advanced maneuvering and handling techniques in the JetRanger.

"We are imparting knowledge, skills and behaviors in accordance with each client's requirements," said Mike Becker. "All of our students are a long way from home, they're in a foreign country communicating in a foreign language and learning to fly helicopters — it's a massive ask in anyone's language."

UNDER ONE ROOF

From maintenance to manuals, Becker Helicopters keeps every function it can control in-house. The Beckers have written all of their own internal documentation, manuals, checklists and exam preparation collateral. "Anything that was a cost center and that we couldn't control, we decided to turn into a profit center and be a part of our business model," said Mike. "Maintenance, we do; documentation,

Students on Becker Helicopters' accelerated initial entry rotary-wing training course are fully trained as instrument flight rules and night visual flight rules pilots before they start their training with night vision goggles.

Becker has four "home grown" Level C JetRanger fixed-base simulators. They are designed to replicate the unique customization of the operator's Bell 206B-3 JetRangers.

Since the company signed its first contract with a foreign customer in 2008, students have arrived at Becker from around the world. Some ab initio students begin their time at Becker learning English before they can get airborne.

Not all of Becker's instructors are ex-military, but to ensure a similar level of training, they undergo a standardization process after they join the company.

we do; intellectual property development, we do; the standardization of instructors, we do. It was very important for us to manage everything 100 percent in-house."

To meet client requirements, and to keeps costs at manageable levels, Becker Helicopters has created its own training platform using the JetRanger. "When you are training to a military standard and to meet consistent quality in our training, it is very important that we not only standardize our instructors, but we standardize our platform," said Mike. "If you don't standardize your platform, then you can't standardize your training materials, your checklists or your processes — and therefore you can't standardize your output product."

Becker Helicopters invests hundreds of thousands of dollars in every second-hand JetRanger brought into the fleet, keeping the company's team of engineers busy remanufacturing them and bringing them up to the company's exacting standards. "We've sourced JetRangers from quite a number of operators and have striped them right back, rewired, repainted, and fully refurbished them to a near-new factory condition and are all standardized," said Mike. "At the same time, we are configuring them with the avionics and equipment that we require, and are making every helicopter in our fleet 100 percent identical."

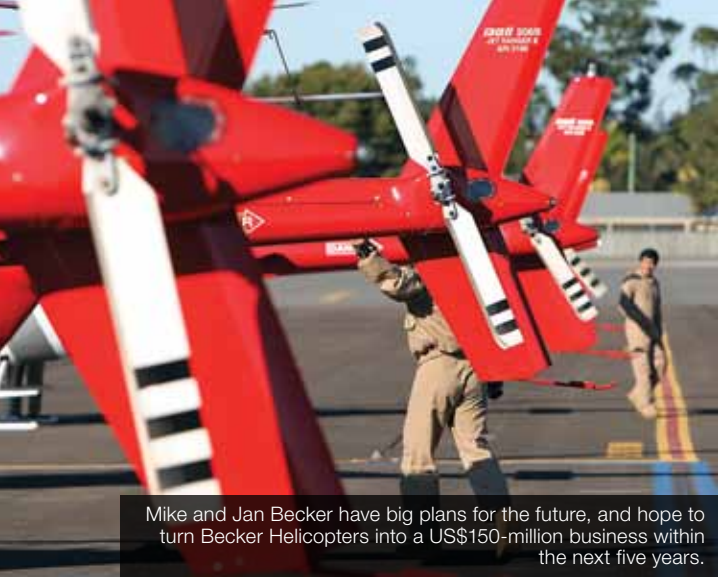
So identical, in fact, that every helicopter has a different colored band painted around its fuselage and engine cowling for easier identification. Each NVG-certified JetRanger is fitted with Aspen Evolution 2000H multi-function and primary flight displays, interfacing with a two-axis Genesys HeliSAS, a Garmin 430W GPS/Nav/Comm, a Trig TT31 ADS-B transponder, and a Freeflight RA-4500 radar altimeter.

"This is a major investment for the company," said Mike. "If we are putting ourselves up to deliver a product that no one else can deliver then we have got to do things that no one else has done or is doing. We need to treat ourselves as a military unit and a military unit would not accept aircraft all configured differently trying to do the same job."

However, quality student output comes from quality instruction. Captain Scott Summers, a former Australian Army special operations Black Hawk pilot, leads Becker Helicopters' team of instructors and overall school operations. While not all Becker Helicopters' instructors are ex-military, they all undergo an extensive standardization process, regardless of their experience and the number of hours in their logbook, to ensure students receive a similar level of training. "We find some of the ex-military instructors are excellent because they have the right ethos — they know what the product is that we want to deliver and they have seen that side of it already," said Mike. "By the same token, we have trained many civil pilots up over the last 20 years and they have turned into fantastic instructors now able to deliver a military standard aviator."

The instructors learn how to teach the Beckers' way and will spend 10 hours in the JetRanger where they learn the practical teaching style to impart what needs to be delivered. They will also be trained up to deliver night VFR and instrument rating instruction — if they don't already have those qualifications. "We have a massive internal training burden just to be able to meet our commitments," said Mike. "But again, that's part of our success, too. We're not shy on doing that for the right people."

Given the cultural differences and language barriers that can exist between students and instructors, it is very important for the



Mike and Jan Becker have big plans for the future, and hope to turn Becker Helicopters into a US$150-million business within the next five years.

The company has a fleet of 17 aircraft, including 15 customized Bell 206B-3 JetRangers. Across the fleet, the aircraft complete over 15,000 flight hours of training each year.

Beckers to find the right match in terms of personality. “You’re going to have instructors and students that occasionally don’t work well together,” said Mike. “We have to move on that very quickly.”

IN A SIM

Becker Helicopters attained Australian Civil Aviation Safety Authority (CASA) certification for the first of its “home grown,” Level C JetRanger flight simulators in April 2015. Through its affiliate company, Off-Planet Simulation, Becker Helicopters now has four fixed-base simulators approved for a range of qualifications including a private pilot license, commercial pilot license instrument training, IFR training and renewals, night VFR training, airline transport pilot license multi-crew cooperation, and instructor training.

Features include a realistic, full-sized JetRanger cockpit fitted with avionics displays, gauges, and switches, plus a genuine cyclic, a collective and anti-torque peddles representative of Becker’s 206B-3 JetRangers. A continuous visual display provides a 210-degree lateral and 68-degree vertical field of view, projected in high definition onto a curved screen in front of the fuselage. Students can conduct hovering and visual operations, as well as in-flight emergency training, including full engine-off touchdown autorotations.

“Simulation is really important to us, and it is important in the training cycle that the simulator replicates as much as possible the actual helicopter being used,” said Mike. “Because we modify all our own helicopters, we needed our simulators to mirror them 100 percent. We can now run through all the core training materials in the simulator because it has such high fidelity. This makes our training much more efficient and productive.”

Simulating aided night flight using NVGs has been Becker Helicopters’ latest

achievement. Using a 3D printer, its dedicated simulation engineers have handmade their own night vision devices that clip onto a student's flight helmet, just like a real set. With the screen blackened out and helmets connected with head tracking software, students can look though the goggles and see the visuals while still being able to use the cockpit instrumentation. "It also allows us to simulate NVG emergencies such as black spots and single tube failures," said Mike. "It certainly adds to the simulator's overall fidelity and capability."

Valued at around US$1.5 million each, the self-contained JetRanger simulators are now awaiting final regulatory approval for night VFR instructor training and visual circling approach training. "With our next simulator, we are going to install full motion," said Mike. "This will sell for around US$2 million. Although we're just a bit busy at the moment, but we plan to take them to market within the next 12 months."

NO PLACE LIKE HOME

Walking along the flight line while a quadrant of JetRangers start up for another training sortie, Mike talks of the future and plans to build Becker Helicopters into a US$150-million business over the next five years. While it still does some utility work on the side, Becker Helicopters' main focus is training with large groups for big clients, and they are firmly focused on expanding their training programs.

"We have a LLC company base in America and we'll have some mobile training teams that can go into a foreign country to do some top-up training," said Mike. "The goal is to have the primary basic training always here in Australia because that is our core training base. We need to expand on our current model and form partnerships with OEMs [original equipment manufacturers] because we can deliver the IERW and transition training in their products. We are not stuck on a platform. We have got a very unique model that has been built over 20 years and it has great potential globally."

With the U.S. to Australian dollar conversion rate making it around 30 percent cheaper to train '"Down Under," Mike boasts Australia is the best environment in the world to train pilots. "We don't have the airspace issues that they have overseas because our population base is so small," he said. "We have guaranteed sunshine here and excellent expertise in-country. This is a great benefit to our current and future clients."

Going forward, the company will be offering students an opportunity to take even more away from their experience with Becker Helicopters by offering a Bachelor's degree course for military organizations. "They can come to us, do their training and go through a Bachelor program before going home very proud having achieved their aviator wings," said Mike.

Any Heli-Expo delegates who have attended one of the training seminars Mike has delivered at the exposition over the years will certainly be familiar with the name Becker Helicopters. "We talk about touchdown autorotations and get some good dialogue going," he said. "Next year we are looking to do a tour around the U.S. with an OEM and we are looking for people to register their interest on our website for us to come and spend a week with them delivering the training that I speak about at Heli-Expo."

From a small helicopter school to an internationally-recognized IERW training provider with a fleet of 17 helicopters and almost 100 staff, Becker Helicopters has won several highly esteemed accolades for their business locally. Stalwarts of the Australian helicopter industry, without a doubt Mike and Jan Becker run the busiest civil helicopter operation in Australia — and there's plenty more hard yakka ahead for these quiet achievers.

Hundreds of thousands of dollars are spent on each second-hand JetRanger to make them identical in operation. The only difference in appearance (other than registration number) is the color of a band painted from the top of the fuselage to the belly.

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THE FLYING LIFEBOAT'S SECOND LIFE

Over 50 years ago, the Sikorsky HH-52A began a quarter of a century of service in the U.S. Coast Guard's fleet. Now an enterprising operator is showing that there's still life in the groundbreaking amphibious aircraft.

Story & Photos by Skip Robinson

Over 50 years since its first flight, the S-62/HH-52 is still a graceful aircraft and looks contemporary.

From the early 1960s till the late 1980s, the Sikorsky HH-52A (S-62C) was the U.S. Coast Guard's (USCG's) primary Short Range Recovery Helicopter. By the mid-1980s, the HH-52A began to be replaced by the Aérospatiale HH-65A Dolphin at air stations around the U.S. By September 1989, the conversion from the HH-52A was complete, but the aircraft has never been forgotten. For one aircraft, this has led to a whole new life after retirement, thanks to an enterprising operator in Riverside, California.

The story of the HH-52A begins with the USCG's intended procurement of 96 Sikorsky HUS-1Gs — a military version of the Sikorsky S-58 — in 1959. After the first six were put into service, two unexplained ditching accidents within an hour of each other in Tampa Bay, followed by another airframe loss in a crash in the Gulf of Mexico, forced the USCG to cancel the procurement. The search began for a different aircraft to meet the mission requirements. The new amphibious Sikorsky S-62 was examined, and almost perfectly fit the USCG's needs. With a boat hull fuselage, it was able to land and taxi on water, and it also had a cabin large enough to carry 10 survivors. The fact that it had an economical and reliable turbine engine, as well as the proven drivetrain of the Sikorsky S-55, gave the USCG the confidence it had a winner. The aircraft was tested and refined with the USCG's equipment, including a three-channel Automatic Stabilization Equipment (ASE) system. Other Coast Guard additions included a hydraulic rescue hoist, a rescue basket, and a

sea rescue platform that allowed the crew to recover victims while on the water by sliding them into the cabin. In January 1962, with final testing complete, the USCG put an order out for 99 HH-52A Seaguards (or HU2S-1Gs, as they were known at that point). The first was delivered on Jan. 15, 1963, and the last on Jan. 17, 1969.

After procurement, the HH-52As were based at air stations and on ships, including Coast Guard cutters and icebreakers. The HH-52A traveled the world performing missions for the USCG, from the Arctic to the Antarctic and everything in between. Over the years, it was credited with rescuing over 15,000 people — at the time, the most of any helicopter in the world. The Seaguard worked for the Apollo space program during training scenarios, during post-hurricane rescue operations, and on daily and nightly rescues across the U.S. The aircraft flew its last operational USCG flight on Sept. 12, 1989, after which the airframes were either sent to museums, testing facilities, or the "boneyard" at Davis-Monthan Air Force Base in Tucson, Arizona.

STARTING A NEW LIFE

Today, a surviving HH-52A Seaguard still flies with Aris Helicopters of Riverside, California. "We've been operating older Sikorsky helicopters since the early 1990s, when we bought two piston radial engine S-58 helicopters to do lift work," Scott Donley, owner of Aris Helicopters, told *Vertical*. "We flew these workhorses till until 2004,

This particular airframe (1403) started its career in the U.S. Coast Guard at Air Station Los Angeles in 1964.

The HH-52A sits beside its replacement, the Aerospatiale MH-65 series. This HH-52A did yeoman's work at Air Station Los Angeles for a few years in the 1960s.

N52NP (formerly airframe 1403) now belongs to Aris Helicopters. Here, it cruises its old patrol area off the coast of Los Angeles.

and stayed with the S-58 series, but upgraded to the PT-6 Twin-Pac Turbine powered S-58T."

Today, the company still operates two S-58Ts — and recently added to its fleet of Sikorsky helicopters when the opportunity arose to purchase a standard category Sikorsky S-62A from an operator in Australia, and a flyable Sikorsky HH-52 from a company in Alaska.

From Aris's records the last USCG operational base of the HH-52 (ship number 1403) was New Orleans. It was bought by Northern Pioneer Helicopters of Alaska in 2000, and operated by the company until 2006. Two owners later, Aris found the aircraft for sale. The company flew up to Alaska to inspect the aircraft, bought it, and then trucked it straight down to California. The flight to Australia to inspect the S-62A soon followed, and, following an inspection, Aris purchased the aircraft, disassembled it, and packed it into a container for shipment across the Pacific.

"When 1403 arrived at our hangar, we disassembled it, did inspections and repairs, sent the engine in for inspections and updates, and then the HH-52A was reassembled," said Donley. "After this two-year process, the aircraft was repainted into Aris company colors, all the details sorted out, and finally test flown. The helicopter flies great, and now we are progressing to making a water landing."

In terms of its size, the main rotor diameter of Aris Helicopters' HH-52A is 53 feet (16 meters), its overall length is 62 feet and three inches (19 meters), and the static ground height to the top of the rotorhead is 14 feet and two inches (4.3 meters). The aircraft has a large main cabin — large enough to allow a person to stand and have room to move about. This helped reduced fatigue during search-and-rescue missions. Aris's HH-52A sits at an empty weight of 4,927 pounds (2,235 kilograms), giving a useful load of 3,373 lbs. (1,530 kg) with no fuel. The helicopter has two fuel tanks: one forward that has a 187-US gallon (708-liter) capacity, and one aft at 138 US gallons (522 liters).

"With a total of 325 [US] gallons [325 liters] and an optimal best burn rate of 70 gallons [264 liters] per hour, we can fly about four hours before needing to refuel," said Steve Bull, a pilot at Aris Helicopters. Bull has recorded many hours in both the S-58 and S-58T, and has also spent time in the Sikorsky S-55B and CH-54A Skycrane — as well as flying the latest members of the company's fleet, the HH-52A and S-62A.

In a lifting role, the aircraft's cargo hook system is rated at 3,000 lbs. (1,360 kg). "We're confident [that] with a light fuel load it can lift 2,500 to 2,800 lbs. [1,134 to 1,270 kg] without problem," Bull added.

He said the most unique characteristic of the HH-52A is its ability to land and taxi on water. "In calm seas it could be shut down if needed," he said. "It's truly a flying lifeboat. Although other helicopters followed its lead, the S-62A series were the first amphibious helicopters to fly."

THE PILOT'S PERSPECTIVE

The history behind the Seaguard made flying it "an honor" said Bull. "In many ways, it's like flying any other helicopter with the typical cyclic between the legs for the right hand, pedals to control the tail rotor with your feet, and a collective with two throttle grips on the pilot's left side for the left hand," he said. The furthest forward throttle works as the primary, and is very similar to a typical throttle, said Bull. The other, located immediately behind the primary on the same collective, is an emergency throttle, and serves as a backup in case of a primary fuel control problem.

The aircraft is powered by a General Electric T58-GE-8 turboshaft, capable of producing 1,250 shaft-horsepower on a standard sea level day. When installed in the HH-52A, the engine is de-rated to 730 shaft-horsepower due to the limitations of the helicopter's dynamic components. This was accomplished by derating the fuel control and limiting fuel flow to a maximum of 575 pounds per hour.

A historic family picture before USCG Air Station Los Angeles closed in May 2016.


N52NP

Despite being over 50 years old, the HH-52 still has plenty of life left in it.

The HH-52A banks away for the camera.

The HH-52 uses the Sikorsky S-55 drivetrain and a single T-58 turbine engine, as used in the SH-3 Sea King.

The intake for HH-52A's General Electric T-58-GE-8 turbine engine.

Aris mechanics work on the tail rotor of the HH-52A. Overall, they said the helicopter is easy to maintain.

Aris's HH-52A arrives for a visit at Air Station Los Angeles.

"During engine start, the engine can have the rotor brake applied while at flight idle," said Bull. "After verifying all the items on our flight checklist, we can release the rotor brake and allow the rotors to start slowly turning at engine idle speed. We then verify the primary and aux hydraulic system are functional per the checklist, freewheeling unit check 'split the needles,' and we can then gently and smoothly roll up the throttle to the detent position, setting NR to 100 percent, and [we then] release the wheel brakes, unlock the tail wheel by pushing in the knob between the pilot and co-pilot seat, and start our ground taxi out to the runway. Or, if desired, we can pick up into a hover like a skid-type helicopter and make a normal departure, or a vertical takeoff to clear an obstacle if in a confined area."

Bull said the aircraft's flight characteristics were somewhere between the other Sikorskys that he has flown. "The HH-52A is left-seat pilot certified and looks like a Sikorsky and feels like a Sikorsky both inside and out," he said. "The S-62/HH-52 were designed by many of the same engineers as the S-58, so if you understand one, you'll know the other. What I have noticed with the HH-52A are the three main rotor blades turn comparatively slowly."

Bull said this was the reason the HH-52A sounds like a Bell UH-1H when it comes in for a landing. Calculating the comparative blade movements, he said the Huey's two blades turn at 325 rotations per minute (for a total of 650 "whops" each minute), and the HH-52A's three blades turn at 221 rotations per minutes (a total of 663 "whops" each minute).

"It's also a bit sluggish to cyclic inputs compared to the four-bladed S-58T that I fly," said Bull. "It's like comparing the Hughes 500D to the Bell 206B-3, which, like all helicopters, have their own particular handling characteristics. Its not that one is better than the other — just different."

Overall, Bull said the HH-52A is a stable and predictable flying machine without showing any bad tendencies. "It also has amazing visibility from the cockpit, and even the cabin with as many windows as it has must have been an excellent search platform with its excellent internal and external visibility," he said. "The turbine engine has good power and the rotor system is very smooth, quiet, and relatively responsive. That said, the HH-52A is no speedster with a maximum never exceed speed of 109 knots at sea level at a gross weight below 6,500 lbs. [2,950 kg]. Bring it to its maximum gross weight of 8,300 lbs. [3,765 kg] and you need to slow it down to a never exceed speed of 88 knots."

The HH-52 is a classic helicopter, and despite being over 50 years old, it still has some life left in it. "We're not sure what the future holds for HH-52A 1403, but its nice to see the old bird still flying," said Bull.

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THE WAYWARD WIND

The aerodynamics of helicopter flight make rotary-wing aircraft particularly susceptible to the turbulent nature of the wind. According to the Federal Aviation Administration Helicopter Flying Handbook, wind is one of the three major factors that affect performance (along with air density and the weight of the aircraft), with wind direction and velocity affecting hovering, takeoff, and climb performance.

Translational lift occurs when there is relative airflow over the rotor disk — whether through the forward motion of a helicopter in flight, or with a headwind. The amount of translational lift increases with the wind speed. Crosswinds and tailwinds can decrease this lift, meaning that more power is needed for takeoff or hovering. In such a scenario, more distance is required to accelerate through translational lift, and this can be problematic if obstacles are in the flight path. The danger increases with heavier loads and in high density altitude situations. So, in some situations, wind direction can be critical.

There are other helicopter-specific problems caused by strong winds. Strong, gusty crosswinds, for example, increase the risk of a dynamic rollover. Once airborne, extreme wind conditions can result in the loss of tail rotor effectiveness and possible loss of control of the aircraft.

And, of course, there are the typical control problems all aircraft have when they are being "tossed around" by strong winds through turbulence and wind shear.

Unfortunately, wind is the most capricious of weather elements. Wind speed can change almost instantaneously even when the overall weather pattern is seemingly the same. And when the weather situation does change, it can bring about rapid changes in wind direction. Wind is, indeed, a complicating factor for all helicopter operations.

First, a basic primer on wind. Wind is simply air in motion. What causes wind? Temperature differences. One could say that the "job" of the atmosphere is to move heat around to try to balance the difference between hot and cold. Physically, temperature differences cause

Wind is one of the major factors affecting helicopter performance — but what causes strong gusts or turbulence? What conditions are likely to lead to a change in wind direction? *Vertical* meteorologist Ed Brotak explains the physics behind the phenomenon. **by Ed Brotak**

Turbulence is caused by three things: wind shear, obstruction of airflow by an object, and convectively-induced vertical motions. **Christopher Moss Photo**

differences in atmospheric pressure, and this is what causes air to move from areas of higher pressure to areas of lower pressure. Unfortunately, energy transport in the atmosphere is not regular. It can best be described as bursts and lulls, and this is one of the main reasons for the often-erratic nature of the wind.

On your standard weather map, isobars are lines illustrating equal pressure. When these lines are close together, the pressure gradient — the horizontal change in pressure with distance — is tight, and winds are strong. A weak pressure gradient yields light winds. By their nature, low-pressure areas typically have tighter pressure gradients and stronger winds. High-pressure areas have lighter winds, especially as you move closer to their center.

Besides pressure differences, on the large scale, wind direction is also affected by the Coriolis effect. Literally, this is the earth's surface rotating underneath the atmosphere. If you are on the surface, this rotation seems to make airflow curve to the right in the Northern Hemisphere and to the left in the Southern Hemisphere. This explains why the air doesn't simply just flow from high to low pressure. The deflection is so great that we end up with air circulating clockwise around a high and counterclockwise around a low (again, reverse this for the Southern Hemisphere).

It would be great for pilots if airflow — the wind — was consistent (what physicists call laminar flow). But because of the energy flow described above, as well as differences in air density and frictional effects, the flow becomes very inconsistent both in terms of velocity and also direction (in all three dimensions).

UNDERSTANDING THE TERMINOLOGY

First, looking at wind velocity, what exactly is a wind gust? To start, the "wind speed" is officially defined as the two-minute average of the speed. A "wind gust" is defined as a rapid fluctuation in wind speed, with the peak wind being at least 10 knots higher than the lowest speed over a measured interval of 10 minutes. The speed of the gust is the maximum instantaneous wind speed noted. Gusts may only last for a few seconds but speeds can be 50 percent higher (or more) than the average wind speed. This is critical since the force or power of the wind increases exponentially with its speed. Current observations of the wind and wind forecasts will typically give the "wind speed," and will also highlight wind gusts.

Wind shear is another aspect of the wind field that can be particularly dangerous for helicopter pilots. Whenever the wind speed or direction changes in the horizontal or vertical, we have wind shear. This can be in the form of speed shear, directional shear, or both. When these changes occur over a small distance, or over a short period of time, aircraft in flight can be significantly affected.

I described turbulence — chaotic vertical air movements — in my article on low-level flying (*Vertical, February/March 2015*) and noted how it could "abruptly change the altitude and/or attitude of an aircraft." The three causes of turbulence are wind shear itself, obstruction of airflow by an object, and convectively-induced vertical motions.

Vortices in the atmosphere are primary producers of the constantly changing winds. Think of the high and low pressure areas on a typical weather map. That's at the surface. Above this, miles above the earth's surface, there are still closed circulations, with high and lows that are much larger than your typical surface features. On the smaller scale, often less than a mile across, a tornado is a vortex with exceptionally strong winds. Waterspouts and dust devils are even smaller, and fortunately weaker. In fact, smaller vortices are always out there; you just can't see them unless they pick up something like leaves or dirt. And those are just the horizontal vortices. There are also vertical vortices that generate up and down flows, and these are associated with turbulence of varying magnitudes. And, whenever you have vertical mixing of the atmosphere, you can bring stronger winds down to lower levels.

BREEZY PROBLEMS

Low-pressure areas or cyclones typically have tight pressure gradients and strong winds, and also usually produce the clouds and precipitation that cause instrument meteorological conditions (IMC). They include winter-type storms, tropical cyclones such as hurricanes and typhoons, and, down in size, tornadoes. Maximum wind speeds can range from near to 100 miles per hour (160 kilometers per hour) in the strongest typical lows, to 200 m.p.h. (320 km/h) with the strongest tropical systems, to 300 m.p.h. (480 km/h) in the strongest tornadoes.

A front is another feature that can produce IMC and wind problems. Fronts are also associated with low pressure, although not a closed circulation. For both fronts and cyclones, large pressure changes over a short period of time are indicative of strong winds. When a front passes at the surface, there will also be an abrupt change in wind direction — by as much as 180 degrees.

Pilots must keep in mind the vertical structure of fronts. When you fly through the sloping frontal surface, there will be an abrupt

Anyone in the business of fighting wildfires will tell you that dry cold fronts can produce some of the worst wind conditions. **Skip Robinson Photo**

wind shift. Although fronts are often accompanied by clouds and precipitation, that is not always the case. The production of clouds, precipitation, and strong winds are often related, but they are not the result of the same processes and can occur separately. Anyone in the business of fighting wildfires will tell you that dry cold fronts can produce some of the worst wind conditions.

In my article on thunderstorms (*Vertical 911, Spring 2014*), I described the wind and turbulence hazards associated with this extreme convection. Certainly all helicopter pilots know to stay out of a thunderstorm cloud. But the downdrafts coming out of the base of the cloud can also produce a serious hazard to aircraft. When these intense downdrafts hit the ground, they spread out in all directions, sometimes tens of miles/kilometers from the parent storm. Horizontal wind speeds can exceed 100 m.p.h. (161 km/hr). The leading edge of this outflow, the outflow boundary or gust front, acts as a small-scale front. When it passes, wind direction can change almost instantaneously. Wind shear actually came to the forefront in the late 1970s and early 1980s, after a series of major air carrier crashes in the United States were caused by strong thunderstorm downdrafts.

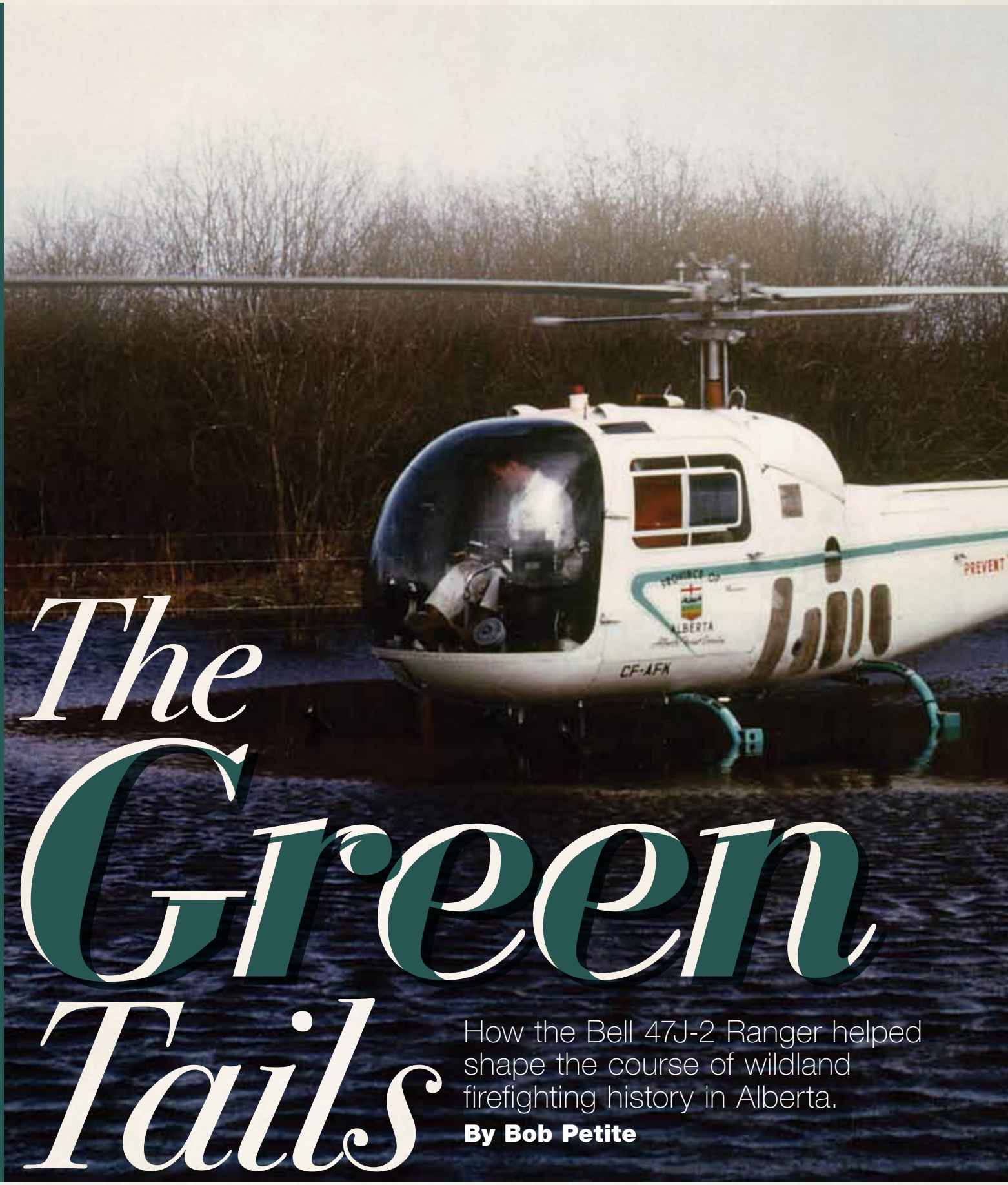
Any type of physical obstruction to airflow can also produce fluctuations in the wind, including wind shear and turbulence. Such obstructions include buildings and topographic features. Mountainous terrain is notorious for wind problems. First, as you go up in elevation, wind speed typically increases. Then there are the physical effects of the topography, with valleys channeling and accelerating the wind. Typically the windward side of mountains has the strongest winds and the leeside is sheltered. But under the right conditions, you can get an enhanced downslope flow. The air is being compressed as it sinks and wind speeds increases. The Santa Ana winds of southern California are a good example of this, as are the chinook winds on the leeside of the Rockies and other mountain ranges. In the most extreme cases, wind speeds can approach or even exceed 100 m.p.h. (161 km/h). Mountain waves, open waves, or even closed vortices are sometimes found on the leeside of mountains *(Vertical October/November 2104)*. The extreme turbulence with these waves poses a great threat to helicopters.

What typically appears as a benign weather situation can also harbor wind shear problems. Often on fairly calm, clear nights, as the earth's surface radiates heat out into space, the air is cooled from below to form an inversion layer — the "nocturnal inversion." This "decouples" the lowest layer from the air above and won't allow the vertical mixing that would bring stronger winds down. Often the top of the inversion layer is marked by a low-level jet. In such circumstances, a helicopter could takeoff in calm conditions, but then suddenly encounter strong winds not far above the surface.

How can helicopter pilots avoid problems caused by the wind? Once you get beyond an airport facility, current wind information is often lacking. Even for aviation forecasts, most wind predictions are for the surface and then thousands of feet above. The HEMS Tool of the Aviation Weather Center (http://new.aviationweather.gov/hems) does provide a more detailed forecast of lower-level winds. General knowledge of where you may have problems with the wind as described above would help. Beyond that, local knowledge and experience are your best bets.

Ed Brotak | Ed Brotak, Ph.D., is a retired professor of atmospheric sciences at the University of North Carolina, Asheville. His specialties include aviation weather hazards and wildfire weather.

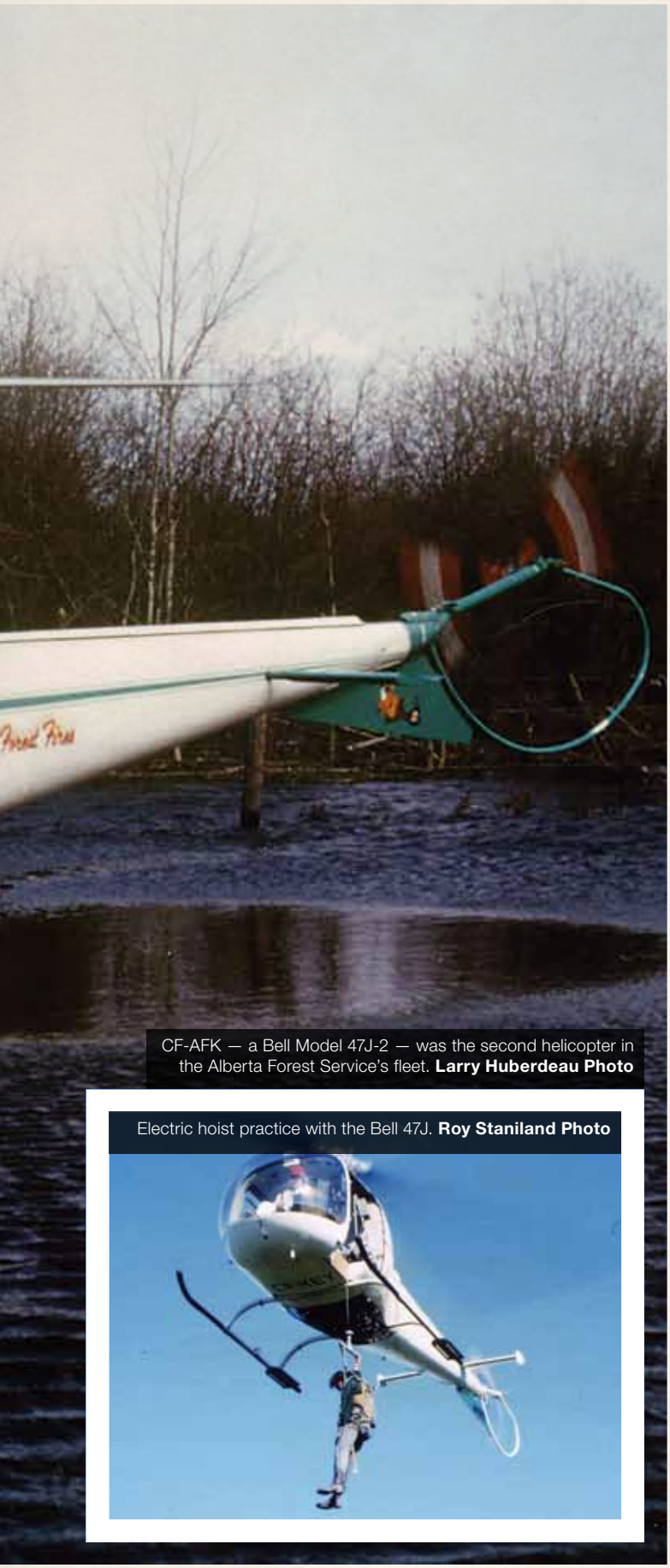
Intense downdrafts coming out of a thunderstorm can pose a serious hazard to aircraft. In July 2016, Chopperguy photographer Jerry Ferguson, working with pilot Andrew Park, captured this dramatic image of a microburst near Phoenix, Arizona, with winds reportedly in excess of 80 m.p.h.
Chopperguy Photographer Jerry Ferguson and Pilot Andrew Park



The Green Tails

How the Bell 47J-2 Ranger helped shape the course of wildland firefighting history in Alberta.

By Bob Petite



CF-AFK — a Bell Model 47J-2 — was the second helicopter in the Alberta Forest Service's fleet. **Larry Huberdeau Photo**

Electric hoist practice with the Bell 47J. **Roy Staniland Photo**

While helicopters are now an integral part of wildland firefighting operations around the world, the early years and gradual development of the rotary-wing firefighting sector are well illustrated in story of the "Green Tails" of the Alberta Forest Service (AFS). The Forest Protection Branch of the Alberta Forest Service (AFS) was first introduced to helicopters for wildland firefighting in 1956. The commercial helicopter industry was only 10 years old at the time.

The date was May 3, 1956, and the target was a 10-acre wildfire, which had spread from a rubbish pile that was burning on a campsite during the construction of a radar site. AFS ranger E. A. Johnson and eight firefighters were transported via a military Sikorsky S-55/H-19 helicopter to the fire.

Between May and July that year, helicopters were used with success on 13 forest fires throughout the province. The helicopters were used with the permission of oil companies, who had contracted the aircraft from Okanagan Helicopters and Associated Helicopters to carry out exploration programs. They were used for reconnaissance and assessment, to move firefighters and equipment, and to place crews along the fire line. The helicopter's ability to get to the fires when they were still small and more easily controlled was well appreciated by ranger staff.

At the time, there were only a total of 69 helicopters on the Civil Aircraft Register across the country, but Associated Helicopters already had seven years' experience in Western Canada. In November 1956, the AFS approached Associated to see if they would check out the new four-place Bell Model 47J helicopter for its suitability, reliability and performance in a variety of forest roles. "I was dispatched to the Bell factory in Texas and completed a thorough evaluation on the basis of the Forest Service's fire suppression needs," wrote Tellef Vassjo, chief pilot of Associated Helicopters, in a later letter to the AFS. "The conclusions were satisfactory, and the AFS made a decision to contract a Bell 47J for a two-month period in 1957, and, as a result, Associated Helicopters purchased one aircraft."

The Bell 47J Ranger was a great fit for forest protection work. Cruising at 85 miles per hour (138 kilometers per hour) with a 750-pound (340-kilogram) payload, the aircraft carried three passengers, had internal loading for freight, and could be equipped with an electric hoist.

"For fire suppression work, there is no doubt the helicopter is superior to other fixed-wing aircraft," Forest Protection Branch superintendent Ted Hammer noted in his annual report in 1956. "It is the combination of the two [that] is now considered the most effective method."

A MOST IMPORTANT ADVANCE

Helicopters were used on 19 wildfires during the 1957 fire season. The Associated Bell 47J contract during May and June was very successful in enabling rangers to get to fires in a much shorter period of time.

"For scouting fires, the helicopter is again so advanced of anything the Forest Service has ever done," Hank Ryhanen, the Edson Division forest superintendent, wrote in a letter to the Edmonton headquarters. "Numerous lightning strikes were spotted with ease and close inspection and pinpointing was possible after travelling along storm paths. The advent of air travel in the Forest Service is by far the most important advance in its history."

However, the charter of helicopters was very difficult in Alberta, as most were under contract to the federal government and the oil-and-gas industry. After careful review and studies, the AFS decided the best option was to purchase its own helicopter for fire suppression work. On March 19, 1958, Bell Helicopter sold a new Model 47J Ranger helicopter (CF-KEY) to the Lands and Forests Department for US$72,720. The department became only the second provincial government agency to purchase helicopters for forest protection work in Canada. (The Ontario Department of Lands and Forests purchased a Bell 47D-1 for firefighting evaluation in 1953.)

Alberta Forest Service staff look over a new Bell 47J helicopter at a southern Alberta ranger station. **Lloyd Anderson Photo**

The Alberta Forest Service's first helicopter, a 47J (registration CF-KEY), in late 1958. **B. Simpson Photo**

The aftermath of the disastrous accident to the Forest Service's first helicopter on June 21, 1966, north of Fort McMurray. **Associated Helicopter Photo**

Associated Helicopter pilot Lloyd Anderson stands next to the Alberta Forest Service's second helicopter. **Lloyd Anderson Photo**

Delivered with a hoist kit and rotor brake, the 47J was designed for transportation of personnel, equipment and supplies, and for general utility missions. Associated Helicopters supplied the aircraft's pilots and maintenance.

The Bell 47J featured a Lycoming VO-435 250-shaft-horsepower engine, allowing it to perform at high altitudes on hot days. It also had hydraulic boost control, which eased pilot handling and reduced fatigue. A synchronized tail elevator provided increased center of gravity latitude. The main rotors were made of wood, while the tail rotor was metal. The aircraft's cruise speed was 87 to 94 m.p.h. (140 to 151 km/h) with a maximum range of about 190 miles (305 kilometers). Its service ceiling at gross weight of 2,565 pounds (1,163 kilograms) was 13,050 feet (3,977 meters), while its useful load was 1,027 pounds (465 kilograms). It had a fuel capacity of 29 imperial gallons using 80/87 gas.

There was seating for three passengers on a bench seat behind the pilot, while a baggage compartment in the tail handled up to 200 pounds (90 kilograms). The new helicopter was painted white and Glasspar green.

During its first season, CF-KEY was flown by Associated Helicopter pilots Tellef Vassjo and Lloyd Anderson. Its first job was opening fire towers in the Whitecourt Division. The forestry helicopter actioned four fires in May, while a second leased Associated Bell 47J worked on two more fires. In late July, both Bell 47J helicopters were used on a 150,000-acre fire in Peace River Division in western Alberta. The fire continued into the late fall.

By October, the forestry helicopter had over flown over 500 hours, and had been well received by rangers in the field. It had been one of the worst wildfire seasons in memory, and helicopters had played a big part in helping to combat the flames.

The following year, helicopters were used on 42 wildfires, with the forestry Bell 47J working on 12. Two Bell 47J helicopters were leased from Associated, and the greater use of aircraft in fire suppression resulted in lightning fires being suppressed while still small in size. The AFS decided to add a second Bell 47J to its helicopter fleet in 1960, as it deemed the aircraft to be the most suitable choice for fire suppression duties.

A new Bell 47J-2 Ranger (CF-AFK) was ready for pickup in April that year, at a cost of US$76,480. Improvements over the first Bell 47J included a 305-s.h.p. Lycoming VO-540 engine, new metal main rotor blades, hydraulic boost control, larger capacity fuel tanks, fixed horizontal stabilizer, and an electric 400-pound (180-kilogram) hoist kit.

The first major job for CF-AFK was assisting in the construction of Cline Lookout near Abraham Lake southwest of Nordegg. During 1960, helicopters took action on 43 fires in the province, of which the forestry-owned helicopters were used on 25. Two additional Bell 47J helicopters were again leased from Associated Helicopters. The Timber Management Branch also began to use the helicopters for timber work along with the Fish and Wildlife Branch, who used them to complete game surveys.

In just five years, the Forest Protection Branch had expanded from one leased helicopter to five Bell 47J helicopters available for firefighting. Helicopters were making a major impact in the field on how fires were fought in Alberta.

A THREE-PRONGED ATTACK

In 1961, 29 helicopters were used on forest fires in the province. The forestry helicopters actioned 70 fires, flying 107 hours. CF-AFK proved itself superior in performance to CF-KEY, to the extent that the AFS looked at modifying it to the standard of the Bell 47J-2.

The AFS decided to add a third Bell 47J-2 to its fleet in 1963. It purchased this aircraft (CF-AFJ) from Associated Helicopters. The 47J-2's

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electric hoist was replaced in 1964 with the Sky Genie for rappelling by rope. The new system was much lighter and cheaper, and one was able control his or her descent to the ground.

CF-AFJ was involved in an accident near Edson, Alberta, on June 26, 1964, when it hit a power line. The incident badly damaged the aircraft's bubble and broke off its left tail rotor control pedal, but the pilot was able to land safely and no one was hurt.

After a relatively quiet year in terms of wildfires in 1964, the following year saw 250 fires burn 54,334 acres. The Forest Service Bell 47J-2 helicopters flew 1,542 hours with CF-KEY recording 684 hours, CF-AFJ flying 446 hours, and CF-AFK logging 412 hours.

Unfortunately, CF-KEY was severely damaged in an accident north of Fort McMurray near Johnson Lake while working a wildfire on June 21, 1966. As it landed on a hastily-built landing pad, part of the pad gave way, tipping the helicopter forward. The main rotor hit the ground, and the impact fractured the tail section. The front of the helicopter erupted in flames, but the pilot, Ralph Huff, was able to escape without injury. The helicopter, which had recorded 4,030 hours, was a write-off.

By the end of July, Associated Helicopters located a used Bell 47J-2 for sale for US$38,000 in the U.S. The helicopter was purchased by the forest service, and registered as CF-AFI. It was back to owning three helicopters and, in late-1966, Associated Helicopters converted the forestry Bell 47J-2 helicopters with a supercharged engine installation, greatly increasing their performance and safety.

Busy firefighting years in 1966 and 1967 were followed by a disastrous year for fires in Alberta in 1968. The forestry helicopters flew 2,128 hours, with CF-AFI logging 797 hours; CF-AFK, 459 hours; and CF-AFJ, 872 hours. In addition, 44 charter helicopters flew 3,838 hours.

By 1969, the AFS helicopters had found a niche in their ability to transport water to forest fires using helibuckets slung underneath, becoming an effective way to waterbomb small fires with pinpoint accuracy.

The following year, 828 fires burned 124,905 acres in Alberta. Fire suppression costs totaled C$1,848,292 — showing a rapid increase with the greater use of aircraft on wildfires. The three forestry helicopters flew 2,136 hours in 1970.

END OF AN ERA

At the end of the 1972 fire season, the AFS looked at replacing the Bell 47J-2 fleet. The aircraft was still doing an excellent job for the forestry service, but it was time for a larger and faster light turbine helicopter. The Bell 206 JetRanger was the helicopter of choice. CF-AFI was sold to Rocky Mountain Helicopters on March 31, 1973, and the AFS received a new Bell 206B (CF-AFH) in April. The AFS purchased three additional Bell 206 JetRangers in 1974, bringing its turbine fleet up to four helicopters. That year, 599 fires burned 45,450 acres in Alberta, with 166 aircraft working on 326 fires. Bell 47J-2 CF-AFJ flew 102 hours, and CF-AFK logged 911 hours. The four new JetRangers flew a total of 3,383 hours.

In June 1975, all government-owned aircraft in the AFS were brought together under the new Alberta Government Services for administration purposes. In addition to two fixed-wing aircraft, the AFS retained control and dispatch of six helicopters during the fire season. The six government helicopters flew 3,980 hours that year; with the four JetRangers flying 2,795 hours of those, and the Bell 47J-2 Rangers logging the remainder.

The AFS had started with one helicopter back in 1958, at a time when operators and aircraft were scarce in Alberta. By the start of 1975, 17 years later, its fleet had grown to six helicopters. It was the end of an era when the fleet was turned over to Alberta Government Services. The AFS had seen many changes over the years in regard to the utilization of the timber resources, land management, and forest protection, evolving into a fire control organization recognized across Canada.

Alberta Government Services operated the two Bell 47J-2s up to 1978, and both were sold in 1979. Today, CF-AFK is in storage at the Reynolds-Alberta Museum in Wetaskiwin awaiting restoration back to AFS colors.

The Alberta Forest Service Bell 47J-2 Ranger helicopters flew for 20 years in government service. The aircraft, affectionately called the "Green Tails," were an effective and efficient forestry helicopter carrying out sterling work — and they gave many rangers their first introduction to rotary-wing flight.

Bob Petite | An associate member of the Twirly Birds and a Gold Member of the American Helicopter Society International, Bob is a current member of 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.*

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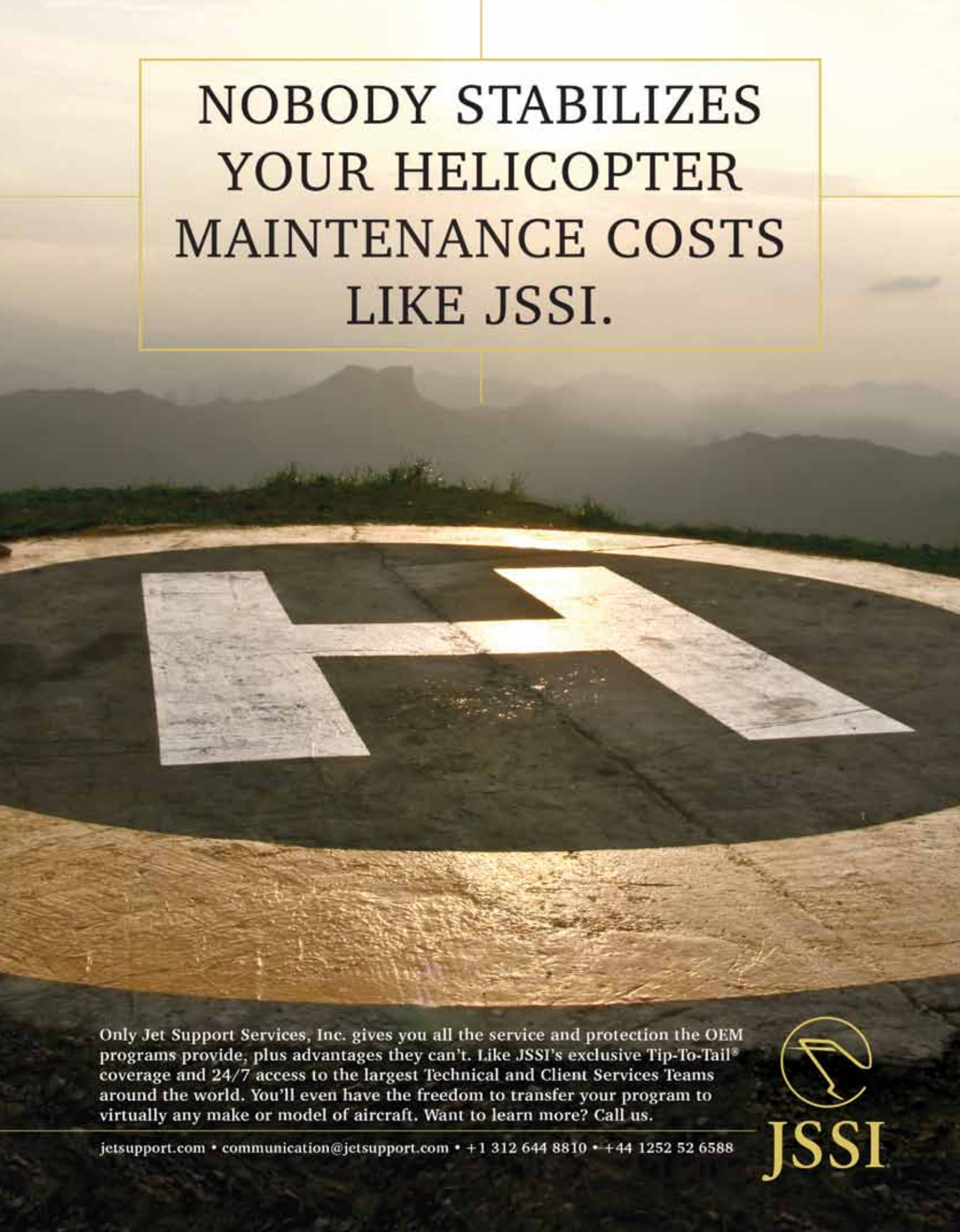
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StandardAero saves the day

THE COMPANY HAS ESTABLISHED ITSELF AS ONE TO TRUST, WITH MORE THAN A CENTURY OF COMMITTED CUSTOMER SERVICE BEHIND IT.

BY LESLIE WU

When the fate of a kidnapped two-year-old hangs in the balance, there's no time to waste. In 2014, StandardAero got the call from the Sonoma County Sheriff's Office that their helicopter was needed to track a carjacking.

Thanks to StandardAero's quick delivery on the maintenance turnaround, the result was a helicopter being available for the rescue.

"It was mission ready at the right time," wrote Paul Bradley, chief pilot at the Sonoma sheriff's office, in a thank you email to StandardAero after the child was quickly located and brought to safety.

Although customer deadlines come in all shapes and sizes, StandardAero's dedication to customer service sets it apart in the field of helicopter engine maintenance, repair and overhaul. Focusing on the Rolls-Royce M250, StandardAero's commitment to this prolific gas turbine began in 1967 at the company's Winnipeg location.

"We've been in the market since the engine's inception, and we're in it for a lifetime," said Brian Hughes, director of sales, marketing and business development for StandardAero helicopter programs. "We're also really excited about being one of the few companies selected to maintain the Rolls-Royce RR300 engine, which powers the Robinson R66 Turbine powered helicopter."

StandardAero's leadership in the service field has been recognized by Rolls-Royce seven years in a row with its Rolls-Royce Customer Satisfaction Award, in part due to StandardAero's careful tracking of customer feedback in a multi-pronged approach called "voice of the customer."

The in-house team uses a combination of phone interviews and email surveys to measure on-time delivery, communication during work process, quality of work and invoice accuracy. The most important metric is the "likelihood to recommend" score, where customers can use a one-to-10 scale to rate how likely they would be to recommend StandardAero's service — whether training, overall maintenance repair work or field service work — to other operators.

"On our overall service level, we're over 95 percent," said Cory Waldmo, StandardAero's director of service and customer programs for helicopters and SACS Canada.

The company's strict adherence to excellence extends beyond customer service into other facets of its business. As one branch of a large, multinational business with over 3,500 employees and 13 regional support centers across the globe, StandardAero's helicopter division draws on those resources while providing a unique and tailored experience to each customer.

StandardAero standaero.com | (204) 788-2293

"We've been in the market since the engine's inception, and we're in it for a lifetime"

— Brian Hughes, director of sales, marketing and business development

"We're a small business within a big business," said Hughes. "I've always felt we've built the best engines and our customers have responded to that by giving us the number one market share position because we think that in this industry, people do gravitate to quality."

Founded in 1911, StandardAero was acquired by New York-based equity firm Veritas Capital in 2015. Today, the company reaches customers in the United States, Canada, Europe, Singapore and Australia through its global service network.

Those resources mean that StandardAero has in-house capabilities to do all necessary repairs without subcontracting.

"How does that benefit the customer? That keeps your turnaround time down and your process controls in check, guaranteeing the quality of every step along the way. It is better to go to a shop that does it all rather than someone who takes your engine apart and sends every part to a different shop," said Hughes.

"In a time-is-money economy, operators are asking for lengthened intervals between maintenance events, and StandardAero is listening. The company uses an optimal build process to manage fits and clearances to get engines that run cooler and last longer installed in the helicopters, providing the best value and saving operators money on a cost-per-hour basis," said Hughes.

StandardAero also prides itself on its deep inventory and rental support, with over 50 engine equivalents in its rental and exchange pools.

"We understand that we need to keep operators flying and they are reliant on those lease assets to help them while their engines are being overhauled and serviced," said Waldmo. "We recognize that the pool is large because of the work that we need to have to support and keep operators flying."

Although StandardAero has a longstanding reputation, the company isn't content to rest on its laurels. It brings in engineering, finance and marketing interns from local institutions regularly to infuse fresh new ideas into the company.

Helping and mentoring tomorrow's generation of aviation is one way that StandardAero shows that the company is in it for the long haul, looking forward each step of the way.

"We're a 100-year-old company and we hope to do another 100 years," said Waldmo.

With EMS and other government and emergency responders depending on its expertise, StandardAero brings a commitment to the quality of its work, turnaround time and customer service that strives for a new standard every year. After all, when it comes to its customers, StandardAero aims to save the day with each and every engine.

The Future is here

IRIS IS THE NEXT GENERATION OF ROTORCRAFT MONITORING, HERE TODAY

BY JAMES CARELESS | PHOTOS COURTESY OF OUTERLINK

IRIS is truly the next generation of rotorcraft monitoring and communications — period. Powered by a single, streamlined system designed by Outerlink, IRIS provides remote observers with unprecedented real-time insight into their fleet's in-flight performance and status.

With IRIS on board, a full range of customer-selected operating parameters are measured and then transmitted directly to communication centers or operational control centers every 10 seconds, including GPS location, air speed, altitude, and aircraft performance indicators. Upon landing, the onboard voice, video and flight data recorder allows users to literally see and hear what happened during flight with up to three linked video cameras and an audio mic. Add IRIS' ability to connect to the ViaSat and backup Iridium satellite networks, and you have the only system with dual satellites and backup capability, providing assured access to remote observers no matter where their aircraft may be flying around the globe.

"If this isn't enough, we have equipped the IRIS suite with a push-to-talk [PTT] VoIP radio function capability that operates like a global VHF radio," said Jeff Warner, director of sales and marketing at Outerlink Global Solutions. "The pilot just keys their microphone, and — depending on what group has been selected — they can talk to entire groups at the same time anywhere in the world, both on the ground and in the air."

Collectively, IRIS is the first commercial rotorcraft application to deliver a high level of situational awareness to pilots and ground observers comparable to military technology. "IRIS delivers an uninterrupted connection with constant communication, real-time flight tracking, constant vehicle operational monitoring (CVOM), immediate alerts and warnings and global push-to-talk," said Warner. "When you factor in IRIS' small form and competitive price, this is a significant advance over what has been available to owners/operators." The system also includes a full software suite to make sense of the multitude of data collected from the aircraft.

IRIS provides Wi-Fi inside and outside the aircraft. Passengers and crew can easily access the IP link and communicate with such places as a hospital or the home office, and send and receive data directly to their tablet. The special satellite antenna developed for IRIS can deliver voice and data at broadband speed, providing the large pipeline needed to support such two-way traffic in flight. ViaSat's phased array, dual-element antenna automatically maintains a constant connection between the aircraft and

the ground, while most legacy satellite technology employs burst transmissions.

Of course, even with a system as advanced as IRIS, obsolescence is always a concern for operators. "However, because IRIS' functions are software-defined, the system can be updated to stay in step with technological advances without the need for new hardware," said Warner. "If satellite providers come up with faster service in other bands, IRIS users can adapt by simply changing their antennas."

All of this power is built into IRIS' single system, reducing the amount of weight that an aircraft has to carry when compared to the many boxes needed to support each of IRIS' functions separately. "Better yet, our system is compatible with a full range of helicopters, from older analog models to the newest models," said Warner. "Even with a mixed fleet of rotorcraft from different manufacturers and model years, operators can create an integrated monitoring/communications system using IRIS."

There is a strong business case for installing or retrofitting the IRIS system. Apart from the savings of the number of components onboard, there is a huge cost savings in eliminating the operations and support costs of multiple aging devices from different vendors. All the different software apps associated with the old equipment are reduced to one fully integrated application that syncs everything together with seamless integration. In addition, IRIS meets all aspects of the Federal Aviation Administration (FAA) 135.607 ruling.

Outerlink has signed up commitments for over 700 IRIS systems. Its roster includes industry heavy-hitters such as PHI, Inc. and Air Medical Group Holdings, plus Metro Aviation's own fleet. "They see IRIS as a very good investment, especially with our data transmission rates being six times lower than comparable plans," said Warner.

All told, IRIS is a cost-effective, comprehensive solution to the problem of real-time in-flight helicopter monitoring. It is in production now, with more than seven helicopter supplemental type certificates (STCs) planned for completion by mid-2016. "IRIS is a fraction of the price you would pay for each component it replaces," Warner concluded. "As a result, IRIS is a smart investment for fleet operators of any size."

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And Then There Were Five

By Zaron Welch

One summer, I was working on a seismic job in northern Louisiana. I'd been flying the AStar for about a year, and was finally coming to terms with the insult of having to use a small window in the floor to see my load. The area was mostly flat, predominated by a mix of tree farms and a triple canopy of underbrush, oak, and pine. While it was certainly picturesque, it didn't make the task of seeing through that window any easier.

We were using a Rupert's Land Automatic Bag Runner; its bulk helped it punch through the occasional branch that the crew always seemed to find when they chose where to setup the cone. This type of bag runner uses a shudder system to automatically grab onto steel pins attached to equipment bags. Picking up bags with a Rupert's Land system has its own challenges, rewards, and colorful language, but our customer also insisted we deploy the bags with the bag runner. While possible, I generally considered this a bad idea. This was mainly because the maintenance on the machines wasn't exactly stellar, and I thought other systems were better suited to the task.

One morning, when the shadows were long, I was laying out a rack of bags. This was an RSR job, with each bag normally containing some cables, phones, and "the box." The box was a car battery-sized cube with a three-foot fiberglass pole sticking out the top. A typical load included six bags, each one topped with one of these cursed antennas.

Chris Rohrmoser Illustration

Dutifully following my Kodiak, I lowered the bags down through the trees to the path below and punched the release. No response. Typical. I started the dance with the cantankerous bag runner: more pressure, less pressure, pull to the side, bounce the bags, drag the bags… nothing worked. So I hit the release again. Nothing. All the swearing I could muster did nothing to resolve the situation. From 150 feet above the ground, looking through the floor window into the shadows below, all I could tell was that all the bags were still on. Something was broken, or an antenna was stuck in the shudders of the bag runner. After various acts of violence were levied against the bags below me to ensure they were secure, followed by a visual inspection, I picked up to fly back to the landing zone (LZ). I wasn't about to drop the long line off in the woods for what could be a broken plug.

I was far enough in front of the crew that I wouldn't have to worry about flying over anyone, so I followed the grid back to the LZ. As I flew, I watched the bags in the mirror. About three miles from the LZ, as I looked into the mirror to check on the load, one of the bags took offense to my flying and decided to get off. I watched in horror as the first load I'd ever dropped fell silently into the trees. I punched the button on the Kodiak to mark the spot. I circled and circled, but couldn't see the bag trough the trees. I landed back at the LZ, defeated. An inspection of the remaining bags revealed them to be tied in knots, which had prevented them from releasing from the bag runner. As evidence of what had happened, the small cap from an antenna was stuck inside the shudders. The rogue bag had managed to release, but the jammed antenna prevented it from dropping until I was well on my way back.

I was probably harder on myself than the crew was. Lost and broken equipment was just the cost of doing business, as long as that cost was low. A few guys were sent to look near the point I marked, but I knew that was just a rough guess, and the forest was thick. I continued laying out bags, and by lunchtime I was several lines ahead of the crew. A couple of hours later, I checked into the Kodiak base station to see if the crews had seen anything. The operator happened to be talking to one of the ground crews about an extra bag. They were confused because it was on station, between two other bags that I had laid out right before lunch. "That's the bag!" I exclaimed! But it didn't have a box in it. Our missing bag had a box — a very expensive box — and this one did not. A crew of six guys looked all around the bag, but couldn't find a box, and the bag was right on the station. It had to have been placed there. "Did they look up?"

A flurry of Spanish over the radio as the operator asked them to look in the trees. He then started to laugh, and translated for me. The box was about 30 feet up, wedged into the crook of an oak tree. Not only had the equipment survived the drop from 500 foot above the trees, but it had torn through the branches, ripped the tether off the box, and landed with such accuracy on station that, frankly, it made the rest of my drops look bad. For whatever reason, my suggestion of using this newfound talent to increase our bags per hour was met with lackluster enthusiasm.

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