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# AirMaintenance UPDATE

The Magazine for Aircraft Maintenance Professionals

Transport Canada Approved for R/T

## The Raytheon Solution:
electrical power systems gain momentum

## Airworthiness by Design:
pump gas vs. “mogas”

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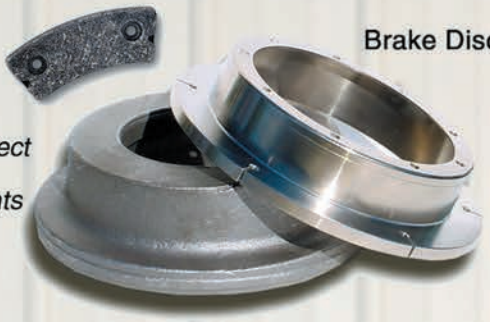

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# Up in the Air

In 2016, more than 20 percent of the global helicopter fleet was operated in Asia-Pacific, where complicated geo-political situations boost the need for military helicopters. The region's economic growth and use of rotorcraft for law-enforcement are expected to increase by more than 20 percent in the next decade. Global helicopter market growth tendencies are promising as well; it is expected to increase by at least 10 percent annually. This increasing demand for helicopters imposes the additional need for technical capabilities. According to experts at Helisota, an international provider of integrated MRO and training services for rotorcraft aviation, during the last years, the number of inquiries regarding technical training has significantly increased, giving rise to the benefits of in-house technicians. On-site technicians are familiar with the aircraft and are acquainted with maintenance history. And continuous performance of equipment maintenance allows technicians to foresee failures in advance.

Cost-saving is another benefit of available technicians. When maintenance is required, time and money for transporting rotorcraft to the maintenance station is saved, with inner staff available 24/7. A team of technicians can be trained two ways: procure training via on-site training, or by sending the trainees to a training organization. Helisota says that when it conducts training at a client's site, costs are usually saved.

Generally, two Helisota training specialists visit the client's site. Additionally, their on-site training incorporates a flexibility factor. Practical training is conducted on the helicopters that are used afterwards in day-to-day operations and duties execution. This type of training can be flexibly adjusted to the needs of the client or targeted only for practical training. A number of additional services such as audit, preparation of an individual training plan based on unique client's needs and future development goals, invitation of third party training partners, are possible when conducting on-site training.

On the other hand, training at the school's base involves a variety of benefits. Trainees become familiar with global real-case examples, and they can consult with experienced professionals at the training school. In some cases, trainees even get the chance to boost their knowledge during hands-on training while studying at the real MRO. ■

## Departments




## Features



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# Upcoming Events

## National Battle of Britain Ceremony

As noted in the listing on this page, during the month of September the Royal Canadian Air Force, in conjunction with the Royal Canadian Air Force Association, the Canada Aviation and Space Museum, Vintage Wings of Canada, the Canadian Warplane Heritage Museum, and the National Air Force Museum of Canada, invites members of the public in the National Capital Region to show their appreciation to veterans, especially Canadians, who participated in the Battle of Britain, by attending the National Battle of Britain ceremony.

The annual commemoration of the Battle of Britain honours the airmen who fought and died during the battle and recognizes those who continue to serve in the Royal Canadian Air Force today. The ceremony, including the parade, takes place on the third Sunday in September.

More than one hundred Canadians flew in the Battle of Britain between July and October 1940 and 23 lost their lives; an unknown number also served as groundcrew. Historians have described the Battle, which involved almost 3,000 Allied airmen, as a turning point of the Second World War. The victory, described by Sir Winston Churchill as Britain's "finest hour," halted a planned invasion of Great Britain and gave hope to a demoralized Britain and northern Europe. It was the first battle to be won by air power.

**Aerospace, Defence & Security Expo**
August 10 – 11, 2017
Abbotsford, British Columbia
www.adse.ca

**Edmonton Air Show**
August 19 – 20, 2017
Edmonton, Alberta
www.edmontonairshow.com

**National Battle of Britain Ceremony**
September 17, 2017
Ottawa, Ontario
www.rcaf-arc.forces.gc.ca

**Air Show London**
September 22 – 24, 2017
London, Ontario
www.airshowlondon.com

**NBAA 2017**
October 10 – 12, 2017
Las Vegas, Nevada
www.nbaa.org

**Canadian Aerospace Summit**
November 7 – 8, 2017
Ottawa, Ontario
www.aerospacesummit.ca

**HAC 2017 Convention & Trade Show**
November 10 – 13, 2017
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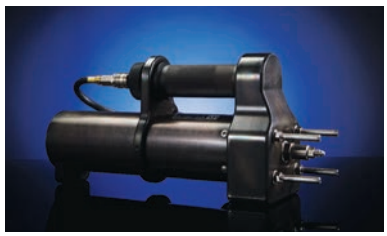
# STCs & new products

## TSO issued for Concorde's battery family


**Concorde Battery Corporation** has announced receipt of a Technical Standard Order authorization for the RG24-15, RG24-15M, and RG24-16 13.6 Ah family of sealed lead acid batteries. This authorization confirms that the batteries meet the Minimum Operational Performance Standards set forth by the Federal Aviation Administration and Radio Technical Commission for Aeronautics. Concorde says that its Platinum series batteries are capable of dependable starting performances in temperatures from -40C to 70C, longer battery life, and extra reserve capacity in the case of a generator failure.

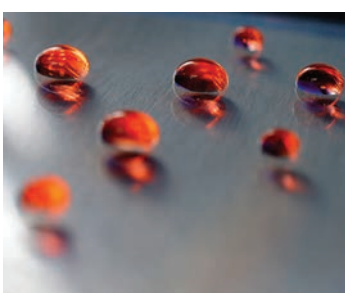
**For information visit** www.concordebattery.com

## Aerospace sealant injection tool for channel seals



**PPG** has launched a high-pressure aerospace sealant injection tool that addresses the application requirements of channel sealing aircraft wings for prevention of fuel leaks during flight. The SEMCO 1010 HP high-pressure injection tool has a pressure limiting mechanism, and is certified for use in potentially volatile environments. The tool is ATEX Class II certified, is said to be salt fog resistant, and weighs 19 pounds (8.6 kilograms). **For information visit** www.semcopackaging.com

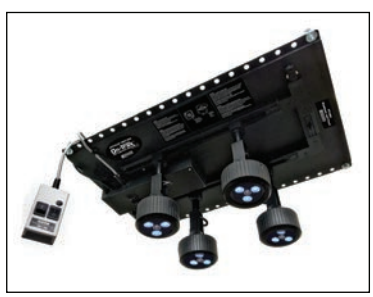
## Clear coating developed for aircraft purposes



**Enviro-tech company UltraTech International** has recently added a clear hydrophobic Gentoo coating to its product line. This clear coating is said to repel water as well as most oils and solvents and be able to withstand significant abrasion without sacrificing performance. Originally developed to keep military jet fighter canopies clean and free of rain, dirt and debris, Gentoo reputedly performs well in many other applications including windows, weather protection of electronics/avionics, and anti-icing.

**For information visit** www.ultratechbrands.com

## White light where it's needed



**Spectronics' s** ONT-365 On-Trak NDT inspection system features UV-A and white light LEDs attached to a mountable platform. This system can be used in NDT inspection booths, and for pre-inspections and screening applications requiring uniformity of coverage over a large area. There are four broad-beam lamp heads and each has three UV-A (365nm) LEDs for NDT inspection and one white light LED for general illumination. The system allows inspectors to move the lamp heads anywhere along the tracks so that beam patterns can be made to fit specific needs.

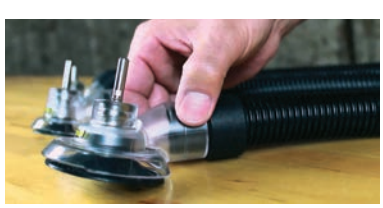
**For more information visit** www.spectroline.com

## Landing gear service unit for Embraer E Series


**The Flightmaster** GSE landing gear servicing unit is a custom-engineered fluid dispensing system designed in collaboration with Liebherr to meet the service requirements of Embraer's E Series aircraft. The company claims that this unit can be modified to service the landing gear systems used on any commercial aircraft and that it conforms to mil-spec requirements.

**For more information visit** www. fluidtran.com

## Clear shroud protects techs from dust



**The Clear Revolution** shroud from Clayton Associates allows technicians to grind and sand without exposure to hazardous dust. It fits any grinder and connects to any vacuum. It also provides dust control, FOD control, excellent visibility, and comes with a lifetime warranty. It is available in two- and three-foot discs. **For information visit** www.vacuumsanding.com

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## BELL 505 JET RANGER X FINDS CANADIAN CUSTOMERS

Three Canadian customers recently accepted delivery of their 505 Jet Ranger X aircraft during a function at Bell Helicopter's facility in Mirabel, Quebec. The deliveries follow type certification from Transport Canada Civil Aviation in December and Federal Aviation Administration certification in June. The helicopters are configured for corporate and utility missions to support the business operations of the customers.

"It has been a particularly significant week for Bell Helicopter as three Bell 505 built in Canada take flight with these first Canadian customers," Cynthia Garneau, president, Bell Helicopter Textron Canada Ltd. said at the time. "The Bell 505 symbolizes our return to the short-light-single market, a segment that Bell Helicopter defined 50 years ago. For Bell Helicopter, our employees and our customer base, there's a lot to be excited about with this aircraft."

## AIRBUS RACER PROTO POPS UP IN PARIS

During this summer's Paris Air Show Airbus Helicopters unveiled the aerodynamic configuration of the high speed demonstrator it is developing as part of the Clean Sky 2 European research program. Codenamed Racer, for Rapid And Cost-Effective Rotorcraft, this demonstrator will incorporate a host of features including a claimed cruise speed of more than 400 kmh. Final assembly of the demonstrator is expected to start in 2019, with a first flight the next year.

"Today we unveil our bold vision for the future of high-speed rotorcraft," Airbus Helicopters CEO Guillaume Faury said at the show, adding that the Racer demonstrator will be built around a "box-wing" design that is intended to provide lift in cruise mode while isolating passengers during ground operations from the "pusher" lateral rotors that generate thrust in forward flight.

Incorporating a low acoustic signature, these lateral rotors as well as the main rotor will be driven by two RTM322 engines, and hosted by a metallic-composite airframe. It will also be equipped with a new high voltage direct current electrical generation, which will contribute to weight reduction.

Building upon the X3 demonstrator, which has a "compound" aerodynamic configuration — a combination of a traditional main rotor and innovative lateral rotors — the Racer project is intended to bring this concept closer to an operational design and demonstrate its suitability for a wide spectrum of missions, including emergency medical services and search and rescue operations, as well as for public services, commercial air transport and business aviation.

## STANDARDAERO MAKES PLAY FOR VECTOR

StandardAero Aviation Holdings, Inc. and Airbus SE announced in early July that they have entered into exclusive negotiations with respect to an acquisition by StandardAero of Vector Aerospace Holding SAS from Airbus. Vector is a global aerospace maintenance, repair and overhaul company, providing support for turbine engines, components, fixed- and rotary-wing aircraft.

The company generated revenues of US $704.8 million in 2016 and employs approximately 2,200 people in 22 locations across Canada, the United States, the United Kingdom, France, Kenya, South Africa, Australia and Singapore. The proposed transaction is subject to workers' council consultation, signing of definitive agreements and customary approvals, such as regulatory clearances.

## LITHIUM-ION NOW AN OPTION AT ROBINSON


The Robinson Helicopter Company has added the TB17 Lithium-ion battery to its R66 options. TB17 by True Blue Power will theoretically offer customers substantial weight savings, improved starter performance and longer life. At 16 pounds the TB17 is significantly lighter than the R66's standard battery, which weighs 42 pounds and the optional high-capacity battery, which weighs 52 pounds. Lithium-ion chemistry is said to hold a higher charge voltage and provide a more constant discharge rate than lead-acid, and offer more reliable turbine starts. The battery's internal heater enhances functionality in cold temperatures as low as -40C. Typical battery life is eight years with minimal required

maintenance (visual inspection and capacity check) every two years. A cockpit indicator warns the pilot if a battery fault is detected. During fault conditions, the battery automatically takes itself off-line. Built-in circuitry prevents overcharge and/or overheating, and the TB17's Nanophosphate chemistry is supposedly much less susceptible to thermal runaway than many other Lithium-ion batteries. The TB17 battery is now available on new aircraft. The cost is US $6,900.

## TRANSPORT CANADA CERTIFIES THE H145


Airbus Helicopters Canada has announced the Transport Canada Civil Aviation certification of its H145, which features a compact size and large cabin that can be used for a variety of civil missions, particularly in high-and-hot conditions.

"We are pleased to enhance our customers' aircraft portfolios, through the availability of the recently Canadian certified H145," said Romain Trapp, president of Airbus Helicopters Canada. "The H145 represents a major evolution in terms of flight performance, mission capability and flight safety for our operators."

Main missions for the H145 include law enforcement, emergency medical services, offshore oil and gas transport, business and commercial aviation as well as utility aerial work. The H145 has technologies such as Human Machine Interface, Helionix avionics, Safran Arriel 2E engines and an enhanced transmission system and Fenestron antitorque-device. A range of interchangeable optional equipment such as emergency floats, rescue hoist, searchlight and cargo hook is available for the H145. An alternate gross weight of 3,800 kilograms is also available as a selectable option and allows H145 operators to take off with up to 100 kilograms more useful load, offering the possibility of carrying additional fuel, mission equipment or passengers.

The H145 is said to be the most advanced member of Airbus Helicopters' multi-purpose twin-engine category. The EC145/H145 family combines a total of more than four million flight hours and more than 1,100 rotorcraft are in service worldwide.

## GREEN LIGHTS FOR HONDAJET IN CANADA

Honda Aircraft announced in June that its HondaJet has now received its type certificate from Transport Canada. The approval paves the way for the company to begin deliveries to Canadian registration customers as HondaJet production continues ramping up.

"We are proud to achieve Canadian certification for the HondaJet, which signifies it meets the high safety standards governed by Transport Canada," said Honda Aircraft Company President and CEO Michimasa Fujino. "With multiple orders in the pipeline, achieving this important milestone will now allow us to begin HondaJet deliveries to our Canadian registration customers."

Canadian type certification for the HondaJet follows approvals in the United States (FAA), Europe (European Aviation Safety Agency), and Mexico (Directorate General of Civil Aviation). To provide sales, service and support for customers in Canada, Honda has partnered with Skyservice Business Aviation. The company has facilities in Montreal, Toronto, Calgary and Ottawa.

With a maximum cruise speed of 422 knots (486 mph) the HondaJet is the fastest jet in its class; it soars highest in its class with a maximum altitude of 43,000 feet; and it is the most fuel-efficient light jet in its class.

## TRAINER PISTON HELICOPTER RAMPING UP

The Enstrom Helicopter Corporation says that its TH180 program now has two prototypes of the trainer aircraft in the certification program. One is in flight test and the other is engaged in a 100-hour ground run which is a rugged test of the drive system and controls. Several tests have been completed and the program is steadily progressing toward certification by the end of this year. Enstrom, together with its ownership in China, continues finalization of the design based on results from the development flight test program.

Flight-testing of the TH180 will continue to ramp-up as test plans are completed and approved by the FAA. Enstrom is working closely with the FAA and EASA for concurrent certification of the TH180.

"The TH180 will provide a safe, reliable, efficient, and best-value solution for the piston-powered light helicopter training market and we look forward to completing the certification program with the airworthiness authorities," said Orlando Alaniz, TH180 co-program manager and director of sales and marketing.

## GLOBAL AIRLINES WILL SEE BIG GROWTH: RESEARCHER

The global airlines industry is set to rise from $569.5 billion in 2016 to $828.3 billion by 2021, representing a compound annual growth rate of 7.8 percent, according to research firm MarketLine.

The company's latest report states that the emerging dynamic of the Asia-Pacific region — which accounts for 33.9 percent of the global industry, combined with signs of reduced rivalry in the European airline industry — are driving accelerated growth in global terms. ■


# Electrical Power Systems:

BY RICHARD GARDNER

As the world transitions to alternate power options, components that were once pneumatic- or hydraulic-driven are increasingly being replaced by electrically generated versions. As in all matters though, there are problems (as well as fixes).

**Above left: A look inside the GEnx engine.**
**Above right: General Electric GEnx turbofan engine with its cowl open.**

# THE RAYTHEON SOLUTION

Much has been written about the coming of the more-electric aircraft (MEA), especially in the context of Boeing's leap into the innovative, higher-risk era with the 787 Dreamliner. The Dreamliner product line broke with tradition and adopted systems that rely more on electrically generated power than pneumatic and hydraulic solutions that harness engine bleed-air. It was a bold step to take, and it brought initial problems when the first deliveries entered regular service. But, with a massive early back-log of orders to fill, it was clearly an issue that would have to be solved without delay (and it was with an interim fix).

Every major step forward in aerospace innovation has issues that arise before the product can fully mature in everyday usage. And, as new designs emerge, the trend toward using electrical power systems (EPSs) is going to gain momentum. EPSs offer improved performance and reliability while saving weight, which in turn has an impact on the customer's bottom line. The key to unlocking significantly greater performance from onboard EPSs is at the heart of the aerospace initiatives currently being undertaken by Raytheon in the U.K.

Raytheon has invested considerable funds into developing innovative EPSs for a range of industrial applications,

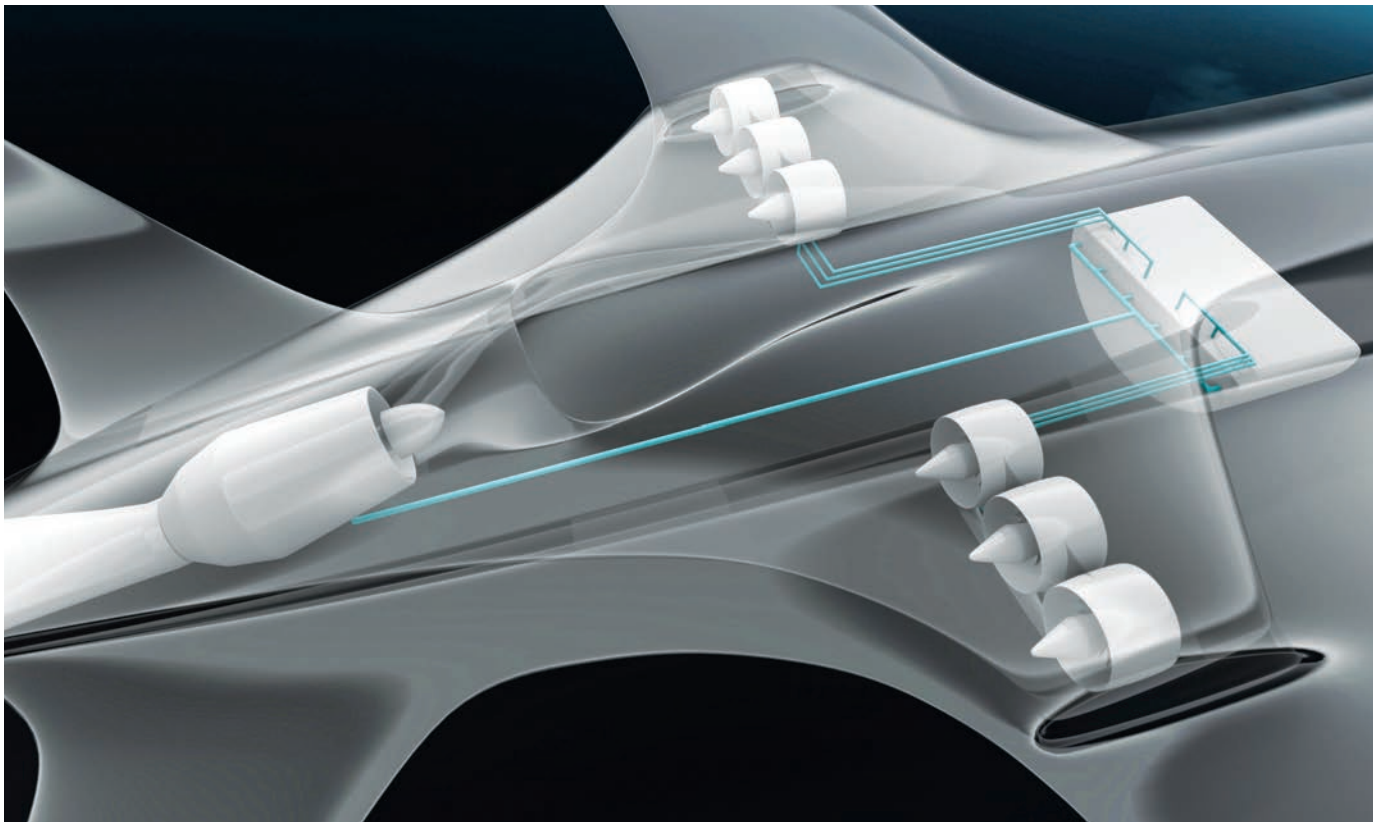

**Above: Boeing 787 ballast tanks. Miles of wiring are found on the Dreamliner, but Raytheon's ultimate goal is to reduce not increase weight with the introduction of electrical systems.**



especially those demanding new standards of operation in harsh environments. Its family of EPSs are smaller, lighter, and more efficient than legacy systems, with products that include primary and secondary stage power conversion, solid state distribution and switching, electrical engine start, and motor drives.

"Everyone in the sector is keenly aware that this market is becoming deeply competitive with new and emerging providers taking share," said Steve Clerkin, Head of Aerospace Power Systems at Raytheon Integrated Power Solutions. "The rapid increase of aircraft in service drives a focus on procurement cost, operating profitability, and legislative environmental boundaries."

Raytheon — one of the first worldwide to achieve the BS11000 partnering and collaborative working standard—is performing fundamental materials research through



**Airbus's E-Thrust concept, developed as part of Airbus Innovations' partnership with Rolls-Royce, is a long-term vision for a hybrid electric distributed propulsion system.**

software algorithm developments that are being applied to control actuation sub-systems, cyber and intelligence solutions, big data developments, and other programs. The company is aiming higher with a whole new generation of integrated power systems utilizing silicon carbide (SiC).

Processing capabilities and expertise has grown enormously over the last decade. Raytheon is partnering with many leading aerospace customers and research academia as new applications are added. An advanced SiC manufacturing technology has been developed—high-temperature SiC (HiSiC)—to produce complementary metal–oxide–semiconductor (CMOS) integrated circuits capable of operating above 250C. This method has been developed for sensors, instrumentation circuits, and gate-drivers operating in extremely harsh environments where existing silicon-based semiconductors fail.

To meet the technological challenges associated with MEA, Raytheon has demonstrated a scalable Technology Readiness Level (TRL) 5 primary power converter. Demonstrated at 90 kW, the bi-directional non-isolated power supply can convert three-phase 115-VAC generator-supplied power into 540-VDC to meet the broad electrical network requirements of MEA. It can also convert DC into three-phase AC required for engine starting using novel high-frequency SiC power semiconductor inverters.

Raytheon's philosophy is to move away from traditional one-way power distribution in favour of a more versatile and intelligent power architecture, making use of electricity as a

common energy carrier. More efficient and higher density conversion technology is seen as the key to making the most of new opportunities for reducing weight.

These demonstration converters were developed during a series of U.K. research and development initiatives undertaken by the Aerospace Technology Institute and the government-supported Innovate U.K., which included projects led by Rolls-Royce (Siloet2) and Airbus (the Integrated Power and Propulsion Architectures project). These projects, which have also embraced partners from the U.K.'s leading experts in aircraft electrical systems, are aimed at providing aerospace engineers with the data needed to optimize future aircraft electrical architectures and systems for greater efficiency, while reducing emissions and operating costs.

The role that Raytheon has played in these projects has been to help identify how the future power architecture can best be modeled. By operating in environments where traditional silicon-based gate driver circuitry cannot cope with the heat, the new HiTSiC-module capability represents a major industry breakthrough. The result should be fit-for-purpose,

reliable, and high-density power converters; other products will be ready for OEM decisions on the configuration and specification for the next generation MEA.

"The benefits of lighter, more fuel-efficient aircraft with lower emissions and greener systems will deliver these goals, but the drive toward more electric solutions has been relatively slow in reality. While investment in future technologies that push the boundaries has risen, there are obsolescence issues in today's market that affect our customers in different ways," said Clerkin.

It's a question of balance for many in the industry: many current civil aircraft will remain in service for the next 20-30 years. Thus, there is a need to look at lower-risk technology insertions that might bring greater efficiency through having lighter systems.

"The OEMs are always looking at improvements including system upgrades and this extends into such areas as power electronics, galley equipment, in-flight entertainment, baggage handling systems, global connectivity, and new cabin lighting, and these needs can generate new business for us," said Clerkin. "They are not all safety-critical items, but fitting and enabling more and more electronic devices on the aircraft may require a revision of onboard power requirements."

"Large segments of existing aircraft do not have distributed electrical systems and need a solution that does not add more weight in delivering extra electrical power," he said. "We believe that there is also a significant market for upgrading regional aircraft and here lower risk programs may be a practical solution. Solid state switching might be a vanguard for new applications and we are looking closely at the technologies best suited for these changes."

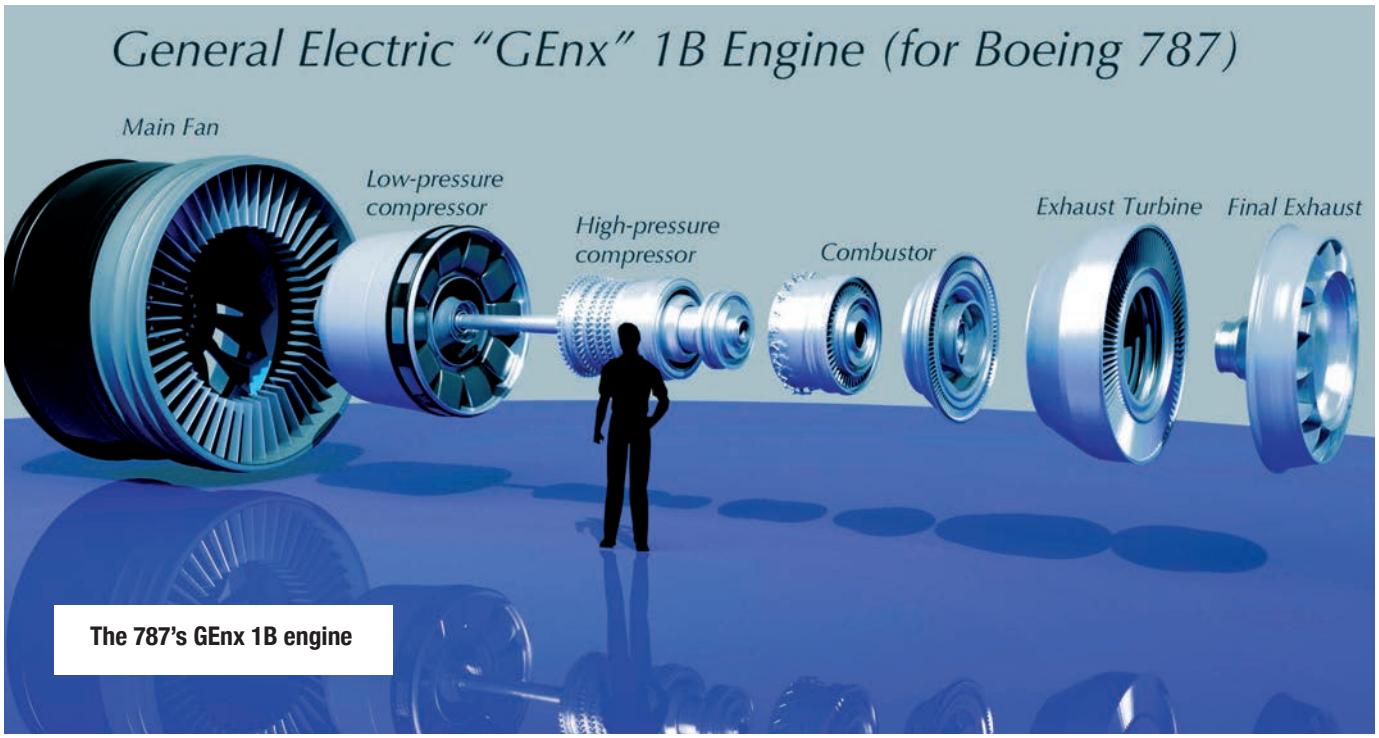
Raytheon is working directly with R&D groups, with new funded programs, and looking at more electric architectures so that its engineers can better understand future customer requirements.

"These studies are examining what applications are needed and so we are doing the homework now for products needed in the mid-2020s," said Clerkin. "Some of this work is evolutionary and there is genuine interest feeding back from customers who are starting to realize that they may be missing out on not leveraging the real weight savings that can be made. These solutions will be lighter and with a lower cost of entry, so despite a degree of inertia in the market at present, we are considering how further exploitation of even current technology might move things on."

Additionally, because HiTSiC is all about working in extremes, there is growing recognition that devices mounted adjacent to very high temperatures, such as for taking measurements beside an engine, could bring big weight-saving advantages in the OEM market.

"The battery problems that received much publicity when the 787 entered service changed the dynamic on other programs and manufacturers stepped back from adopting such a radical dependency on electric systems and Li batteries," said Clerkin. "The early adoption of these features caught the attention of a wide audience as boundaries on a very advanced design were being pushed and stretched. The good news is that the risk has been brought to the surface and development

**The battery problems that received much publicity when the 787 entered service changed the dynamic on other programs.**




**The 787's GEnx 1B engine**

work is continuing on charging systems and more technical solutions beyond strengthened containment. We believe that silicon carbide products represent the way forward and we are not just setting out to compete with traditional solutions but will raise performance and make a difference in the size and weight challenge."

In regard to HiTSiC weight reduction benefits, the higher the power density, the lighter the solutions could be, further reducing thermal stresses and the need for cooling systems and components. Density was a function of three important principles—quality, reliability, and efficiency. With a need to cover safety critical requirements, a power density ratio of six-10 kW/kg was achievable, but while a six kW/kg ratio will do the job, beyond those numbers more sophisticated systems would be needed. Systems such as electrical starting are critical and can be improved, and the OEMs expect better performance solutions to become available through innovation.

Further applications include electric taxiing systems at airports. Electric options have been shown to work on 737s and A320s and the OEMs are looking at this closely. Although some products have entered the market, uptake is slow, and it is evolutionary.

"No doubt powered systems, such as the electric wheel, can do the job and some high-level innovation could make this more widely adopted, but I think that before that happens more of today's aircraft will first have to be consigned to history," Clerkin said. "Airlines don't have to immediately change the way they taxi but in the future they may be subject to more pressure on this and then a suitable technological solution will emerge. It is probably a matter of when this is likely to arrive, rather than if."

Asked if Raytheon was actively talking with OEMs about participating at the design stage of future aircraft, Clerkin remarked, "Yes we are and it is ongoing. The OEMs will be looking for reusable architectures, solid state solutions, good partners, and trying to keep things as simple as possible—not over-complex. Technical research will bring forward big improvements at the high end; this might include aspects such as full system redundancy, modular and "smart" systems that reconfigure gracefully so as not to lose service. Self-healing architectures will also be made possible by system management software where the protocol tells you what to do, but corrective action can be made manually or automatically."

Clerkin believes embedding power systems into the structure might become commonplace with sensors placed about the aircraft collecting and distributing data and then reacting directly with other systems, such as actuators.

"These electrical devices will be controlled and supported by multi-task systems that will deliver plenty of power where it is needed but within a reduced physical space," he said. "Fault-finding aboard an aircraft will be made easier, and as the systems and resulting data will be integrated it will be available to pilots and also communicated to the ground for both planned and unscheduled maintenance. New tools will be needed in a commercial aircraft to counter the cyber threat that will grow with ever-expanding open connectivity, and this is being studied at system levels."

There can be little doubt that the essential technological groundwork for the more-electric aircraft is being tested very comprehensively and is very much on-going, in this instance ahead of the development of the aircraft, which is as it should be to help de-risk one of the most crucial aspects of what will be the next game-changing step in the story of commercial aviation. ■

*(Richard Gardner writes for SAE International)*


# avgas replacement fuels:

As the FAA's plan to identify unleaded avgas replacement fuels moves closer to its 2018 goal, pilots and AMEs alike are becoming increasingly interested in what a switch in fuel could mean for them. Here, Michael J. Kraft, Senior Vice-President of Lycoming Engines, discusses the topic with observations on the distinct differences between pump gas and Lycoming's designer "mogas".


**Above left: The past decade has seen dramatic increases at the pump for end-users of petroleum-based products. But given the EPA mandate to remove 100 low-lead octane, aircraft operators have crossed fingers that replacement fuels don't add to their budget.**

**Above right: The ultimate solution for inexpensive, readily available fuel for aviation might be automotive gasoline, but that creates its own set of challenges. In attempting to find solutions, Lycoming approved a blend of mogas for some applications.**

# Airworthiness by Design

The bottom line to Lycoming Engines' position on automotive fuels is that it's possible to make automotive gasoline "fit-for-purpose" for aviation. However, in doing so, you deviate from "pump gas" and end up creating a low octane unleaded aviation fuel from automotive gasoline blend stock: "mogas."

Why do we need to have fuels "fit-for-purpose" for aviation? You achieve Airworthiness by design, not by luck. Using pump gas from the corner gas station is achieving airworthiness by luck.

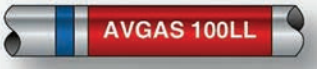
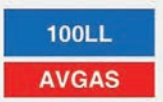
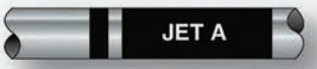
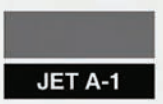
At EAA AirVenture 2008 Lycoming Engines presented one of its most information-packed press conferences ever. New products, new services, new initiatives — including one that stated Lycoming would seek unleaded automotive gasoline approval for its standard-compression parallel valve O-360 and IO-360 engines.

Automotive gasoline. The ultimate solution for inexpensive, readily available fuel for aviation. The easy answer to replacing leaded avgas for 70 percent of the existing fleet. Since 2008, we've received a lot of questions about when the approval was going to be ready. One would think we would have shouted it from the rooftops when available.

Last summer we published an update to our "Approved Fuels" Service Instruction 1070. Yes, Lycoming approved automotive gasoline (mogas) on several 360 engine models and we did not splash the news out in a press release.

There are several reasons Lycoming refrained from the "end zone dance":

1. We firmly believe that the much bigger issue is making certain we identify and bring to market unleaded aviation grade replacements for 100LL — a solution that would serve the entire fleet

| Fuel Type and Grade | Color of Fuel | Equipment Control Color | Pipe Banding and Marking | Refueler Decal |
|---|---|---|---|---|
| AVGAS 82UL | Purple |   |   |   |
| AVGAS 100 | Green |   |   |   |
| AVGAS 100LL | Blue |   |   |   |
| JET A | Colorless or straw |   |   |   |
| JET A-1 | Colorless or straw |   |   |   |
| JET B | Colorless or straw |   |   |   |

**Color-coded labeling and markings on fueling equipment distinguish the various octanes. It seems like common sense, but the question remains: what will ultimately replace 100LL as a suitable option for the current workhorse and recreational fleet?**

2. Our mogas approval was for the engine only. In order to be legally used in certificated aircraft, the aircraft must also be approved via TC or STC for utilization of automotive gasoline.

3. The automotive gasoline Lycoming approved controls specifically four parameters to values required to maintain airworthiness of the engine without mechanical modifications or operational limitations. These parameters are also controlled for ground transportation vehicles but in different form.

4. We did not approve pump gas. People cannot think that they can simply drive down to the local gas station and purchase automotive gasoline that is known to provide the same level of airworthiness as aviation gasoline.

5. Before we move further into the subject of automotive gasoline's potential place in aviation, let's repeat why Lycoming believes our existing fleet needs an unleaded replacement to 100LL avgas. First and foremost, the "workhorse" aircraft that drive our industry's economics are mostly designed around 100LL octane capability. If the workhorse demand goes away we will all suffer higher costs and reduced FBO service levels. Second and no less important, octane capability is just one element of avgas. Not all aircraft and engines need 100 MON octane. However, it's the parameters beyond octane that enable us to achieve airworthiness for the specified operating envelopes of the aircraft we fly today. Third, the fleet that we fly today—both workhorse and recreational —is about 50 times larger than annual new aircraft production and is based on technology designed around avgas properties. We cannot abandon the existing fleet.

The preceding words might be controversial to some, but let's leave this as Lycoming's opinion and return to the discussion about automotive gasoline and "pump gas". Broadly speaking, both of these are fuels conform to ASTM Specification D4814 or Euronorm Specification EN228. These fuels are designed for ground vehicles and controlled to ensure proper startability, driveability, seasonal emissions control and of course, performance. As ground transport fuels, they are highly influenced by environmental regulations (EPA). They are not subject to aviation regulations (FAA).The specifications change on an almost yearly basis in response to changing environmental regulations and political mandates such as ethanol inclusion. What is available to the market for retail consumption is pump gas, which is NOT "fit-for-purpose" for aviation because it is controlled for ground transportation purposes.


**Using automotive fuel blends in aviation is possible for certain engine models if you put the correct controls in place, and those controls are not in place for pump gas, says Lycoming Engines Senior Vice-President Michael J. Kraft.**

So how did Lycoming, self-admittedly one of the most conservative engine companies in the world, approve mogas and what exactly did we approve?

Lycoming approved mogas by controlling automotive gasoline properties differently than what is done for ground transport vehicle pump gas. The specifics:

**A.** 93 AKI for detonation margin (hot day OAT and 500F cylinder heads).
**B.** Vapor pressure Class A-4 to prevent vapor lock.
**C.** No ethanol and maximum one percent oxygenates.

That's pretty specific stuff and only one of those values is listed on the filling station pump. These parameters are what fuel wholesalers control when ordering pump gas. In order to get to aviation fit-for-purpose, Lycoming controlled those same parameters (differently) and locked in the fuel specification revision to avoid a moving target.

Long story short: This isn't your corner market pump gas. It is automotive specification fuel with carefully controlled characteristics that help repurpose it from a ground mission in automobile fuel systems (pump gas) to a flight mission in aircraft fuel systems – (mogas). It can be done, but you need to sweat the details. The other detail to sweat is that Lycoming's approval is for the engine only, not the airframe. TCs and STCs are still needed to be legal on certificated aircraft.

### Pump gas is not mogas

Automotive fuel from the pump is NOT the same everywhere you go. There are summer blends, winter blends, geographical blends within the seasonal changes, varying levels and types of oxygenates (not just ethanol) and when tanks are switched over a mixture of "in between". The pump labeling is accurate for octane, and in some parts of the world, the maximum percentage of ethanol. It doesn't tell you everything you need to know to make pump gas fit-for-purpose for aviation and it's not just about octane and ethanol. We need to control a wider range of fuel properties for aviation. Equipment and lives depend on it.

Let's walk through exactly what Lycoming did in authorizing mogas for our engines. It's also suggested that you read the latest revision to Lycoming Service Instruction 1070: Specified fuels for spark-ignited gasoline aircraft engine—and read it carefully.

First, notice that we specified 93 AKI as the octane level. This octane level provided the required detonation margin without modification of our engine FAA Type Design allowances, including cylinder head temperature limits. 93 AKI is "Super Premium" fuel. That AKI rated octane is what is needed to achieve the exact same power performance on the approved engines as 100LL avgas. 93AKI is produced worldwide, but not necessarily distributed worldwide.


**Today's fleet of workhorse and recreational aircraft is about 50 times larger than annual new aircraft production and is based on technology designed around avgas properties. "We cannot abandon the existing fleet," says Michael J. Kraft of Lycoming Engines.**



Next, Lycoming limited vapor pressure to Class A-4. This was done to prevent vapor lock and A-4 was chosen as it overlaps with avgas properties. The Class A-4 convention arrives from the U.S. Environmental Protection Agency's influence on the automotive gasoline specification and the need to control emissions on ground vehicles.

The automotive fuel spec has a method that allows us to control when vapor lock would occur and lends predictability to fuel evaporation through all phases of the aircraft operating envelope. Ground transportation gasoline, heavily influenced by EPA, controls vapor pressure for emissions, startability and driveability on a seasonal and local geographic basis. Vapor pressure is not labeled for retail pump gas but is controlled via the wholesale distribution chain. To make fit-for-purpose aviation mogas, you need to control vapor pressure and you need to know that it matches what your equipment needs.

### No ethanol

Most assume that the restrictions on ethanol are related to corrosion. That is just one factor. The other equally important parts are:

**(a)** that the automotive gasoline specifications allow vapor pressure to rise outside of the base control limits as you add ethanol and

**(b)** ethanol reduces the energy density of the fuel, increasing fuel consumption. Lycoming restricted ethanol more for vapor pressure control and fuel burn rates than corrosion.

When you add ethanol, at certain percentages the automotive fuel spec vapor pressure is allowed to increase. Fuel consumption rates increase from what the POH may indicate as you add ethanol because the energy density drops. Retail pump gas is not labeled for exactly how much ethanol or oxygenates are included — maybe a maximum in some places — thus you do not know if it is matching what your equipment needs and consistent with POH performance curves. To make fit-for-purpose aviation mogas, you need to control the exact amount of ethanol and you cannot allow ethanol inclusion to grant a "bye" on vapor pressure.

Lastly, in approving mogas Lycoming locked in the revision of ASTM D4814 to 09b and EN228 to 2008:E. Automotive specifications change frequently, almost yearly, in response to changing environmental regulations and political mandates such as ethanol inclusion. Freezing our mogas specification in time gives refiners a fixed standard and one that matches against the stated performance of the engine.

### Predictability

Lycoming is well aware that other aviation equipment manufacturers have allowed pump gas, in some cases with ethanol. Notice that in the details they provide warnings and cautions addressing the issues we have raised, leaving it to the operator to assess risk in using a fuel where they do not know its core properties other than octane. We do not agree with that approach.

Lycoming approval provides details on how to specify a fit-for-purpose aviation engine fuel from fuel that is designed to start and run ground transport engines. The controls we have placed on the fuel are necessary for engines in the currently existing fleet that were designed and certified for operation with avgas. Yes, you can maintain performance ratings on some engines. Yes, the Lycoming mogas might be in the tanks at your corner market or local gas station. No, you cannot determine if the retail pump gas is controlled as it needs to be for aviation because filling station pumps do not provide the information needed to match it to mogas requirements. Yes, it is produced under existing ASTM and EN automotive fuel specifications and can be ordered wholesale, but we do not believe that it can supplant the 100LL avgas that is widely distributed already.

What our mogas approval really says is that using automotive fuel blends in aviation is possible for certain engine models if you put the correct controls in place and those controls are not in place for pump gas. It's an option to consider that would eliminate lead emissions and bring the potential for more fuels flexibility to customers, who would still need an airframe TC or STC to operate.

### Avgas by any other name is...avgas

Lycoming tests every engine that rolls off our assembly line. We take them into one of our test cells, attach a propeller and appropriate sensors, and then operate them through a range of tests. These tests can last from an hour up to four hours.

We also use our test cells to evaluate components and new products. Every year we do this for about 3,000-4,000 engines. Lycoming purchases and consumes a lot of avgas. So Lycoming has something in common with every owner and operator out there. We all experience pain at the pump. The price of fuel is going up for everyone, regardless of your mode of transportation. Fuel prices rose dramatically in the last decade and have made General Aviation more expensive. Coupled with the desire to move piston aviation to unleaded fuel and avgas distribution availability outside the Americas and Europe, the cost issue has created significant pressure to find ways to tap into the economies of scale that come from using higher volume lower-cost fuels like pump gas.

Lycoming's automotive gasoline approval, however, did not allow pump gas. We simply can't approve pump gas for our existing products if the first objective is airworthiness. What we did approve is a fuel from the pump gas production sources that is controlled well enough to provide predictable behavior on the engine: mogas. Airframers would need to do the same. Lycoming believes companies advocating the distribution and use of automotive gasoline in aircraft ought to consider these same controls. Airworthiness by Design.

The Lycoming mogas is an option for the fleet that could use low octane fuel. It might be less expensive than 100LL, but we all know that retail price and production costs are two different things. We also know that the expenses for the "free" services provided by our FBOs need to be covered somehow, and that somehow is in the cash they generate from fuel sales. In the end the Lycoming mogas is a low grade aviation fuel from automotive blend stocks. The same angle was previously attempted more than a decade ago with the ASTM 82UL avgas effort.

You might have noticed that no FBO offers 82UL. That's an indicator that even when presented with an option, demand has not been sufficient to support a two-grade aviation gasoline fuel system.

Environmental challenges, price pressures and availability are all considerations for every owner and operator.


**Currently the two principal types of fuel used in Aviation are Avgas 100LL and Jet A-1; Jet A-1 for turbine engines and Avgas for spark ignition piston engines. Some new Cessnas are approved to use 82UL, but most aircraft types currently do not have manufacturer's approval.**

It's the reason why Lycoming approved mogas, but it's not pump gas. It's an unleaded option that could be considered for aviation, but we fear the applicability is too low to be a universal solution and you will pay a premium over pump gas.

In our plant, we evaluate our performance as a business using five metrics. Four of these are ranked; in order they are: Safety, Quality, Delivery and Cost. The fifth is Leadership and Teamwork. Safety comes first and Cost comes fourth. We applied that same philosophy to our mogas approval where we designated the specification of pump gas such that we arrived at Lycoming's mogas.

THAT is how we achieve Airworthiness by design, rather than by luck. We did not publicize it, because our fifth metric, Leadership and Teamwork, demands that we consider all the angles, and we did not conclude that industry and owners would be served by a distractive argument on mogas because in the end it's a low grade aviation gasoline with a limited broad application.

In conclusion, Lycoming's goal as an engine manufacturer is to provide as much fuel flexibility for our customers as possible without compromising airworthiness. A mogas option could be possible for the existing fleet. In the end, if we all agree that Airworthiness by design is the primary objective, pump gas cannot be an option for the existing fleet of aircraft.

The ongoing dialog that we are engaged in now regarding the distribution and use of unleaded automotive fuels in piston powered aviation needs to be solidly based upon the Airworthiness by design consideration.

It is an equally applicable argument in the use of jet fuels in Diesel or Otto cycle piston engines. You'll find the same consideration at the core of the FAA's Unleaded Avgas Transition ARC charter. Airworthiness by design and the overall considerations outlined in this story are why Lycoming continues to believe that piston general aviation is best served in total by pursuing an unleaded aviation specification fuel to replace 100LL. ■

# Western AME Association

## Excerpts from WAMEA Newsletter: President's Message

As the new president of the Western Aircraft Maintenance Engineers Association, let me welcome you to the first edition of what will be our quarterly newsletter. With a new board starting, we made our first order of business to redefine our value as an organization, and formulate a strategy to maximize our objectives. As such, we have decided to prioritize a few key areas, which have the greatest impact in achieving our goals.

During the most recent annual general meeting, we heard from many people who took advantage of the opportunity to express their concerns, demonstrating that we have an organization of enthusiastic members wishing to be engaged. In the preceding year however, we have heard very little if anything from association members, and we have not had channels in place by which members could contact the board. Clearly communication is lacking between industry/association members and the governing body of WAMEA, so this initiative has been launched as one way to rectify that.

Look forward to finding news and information pertinent to AMEs in each edition of WAMEA Quarterly. Upcoming events will be posted as they are announced, including our own symposium and AGM scheduled for March 21-23 2018, which is already in the works. Regulatory changes, enforcement findings, and news releases will also be regularly shared here.

As this newsletter is meant to be as interactive as possible, we encourage any members who wish to contribute to do so. Space is available for you to share an article, an editorial, or any other contributions that you feel may be of value to the readers. Ad space can be purchased, with a discounted rate for WAMEA members, and employers looking for staff members can post job ads at no cost. Also, feel free to share with your fellow AME's any highlights in your life. A new licence, rating, promotion, retirement, or any other landmark event can be shared here, so let us hear from you!

— Jarrah Elhalabi
President, WAMEA

## Growing challenges in a changing economy

Like most economic activities in Alberta, one factor currently has the greatest impact on aviation operations: the downturn in energy commodity prices. Oil is ubiquitous in Alberta; entire industries are built around servicing it while the secondary spin-off industries rely on them to stay profitable. Aviation is no exception, with enormous entities directly servicing oil operations, up to and including airlines whose sole business is transporting personnel to energy sites. The new reality, however, has threatened the future and prosperity of all of these ventures. The concern used to be that peak oil meant oil production would reach maximum levels while demand was still rising. Very few people predicted the opposite to be true, that demand would peak while production continued to rise. A combination of new discoveries, new extraction methods, and the rise of alternative energy sources has radically displaced the position of oil producers from the top of the energy food chain. By the summer of 2014, this perfect storm coupled with disastrous attempts to mitigate these effects has left oil prices in a seemingly endless slump, with the economic future of Alberta bogged down with it.

However, one only needs to look to Morocco as an example of how investment in aerospace can turn an economy around. As fate would have it, Morocco is the one country in North Africa that is not an energy rich oil exporter. In fact, with the exception of olive oil, there's not a drop of the stuff to be found in the entire country.

This has forced the government to find other areas to invest in, including alternative energy, tourism, specialty agriculture and most successfully; aerospace. Over 100 companies, tens of thousands of employees and billions of dollars of exports have been developed seemingly overnight. Governmental support in education and infrastructure has even led the Canadian company Bombardier to be the most recent company to announce its presence in Morocco, relocating its manufacturing operations from Ireland. There they will also join Airbus, Boeing, Safran, Thales, and a host of other companies.

So, could we do something similar in Alberta? Alberta is quite well positioned for such an enterprise and as AMEs we have a major role to play. AMEs in Alberta are well trained with a world class polytechnic school on site, highly experienced, and possess a varied skill set that distinguishes them from similarly rated professionals in other jurisdictions. The knowledge capital held by these individuals has this human capital resource well primed to become the core of a new high tech industry in Alberta.

In addition to the personnel, infrastructure, business environment that could attract investors to Alberta, the provincial government is also eager to look at ways to exploit this potential. The Alberta Ministry of Economic Development and Trade, and its various divisions are willing to invest logistical and promotional support to expand and diversify the industry. Looking beyond only fossil fuels, the motto now is to "capitalize on resources to support your export success." The opportunity is here; the time is now, so it's up to us to see how these challenges are faced.

No doubt, Alberta has plenty of oil. But if the environmentalists don't dictate it, economics will: most will stay in the ground. It has been said that, "the Stone Age did not end because we ran out of stones, and the oil era will not end because we run out of oil." Nowhere is this truer than in Alberta. However, with ingenuity, coordination, and support the aviation industry can be just one of many generators of a new high tech economy. The oil may stay in the ground; we will be in the sky.

— Jarrah Elhalabi
President, WAMEA

## News from the Rock: Hundreds flock to ARAMC 2017

**By Mel Crewe**

Hello AMEs, apprentices, students and corporate members. It's that time once again for my newsletter article and an update on things at this end of the rock. Well, the big thing these days is the 39th. Annual Atlantic Region Aircraft Maintenance Conference was held at the Delta St. John's Hotel and Conference Centre April 26-28, 2017. Delegates, Displayers and other attendees began arriving on Tuesday and Wednesday April 25 and 26, 2017.

Some early attendees attended a Human Factors course on Wednesday, April 26 with Instructor Norbert Belliveau. The course contained new content more related to the operational, organizational and occupational elements of aircraft maintenance. With the new content and touching base with the Dirty Dozen, the course was approved as meeting the Transport Canada CARS 573.06 requirements of recurrent training.

The one-day seminar had 29 students and from all reports, it was well received. A course will be held in Goose Bay, Labrador in late November, early December and if your company is interested, contact me as soon as possible to register for the course. The cost will be dependent on the number of participants and the cost will be shared. So far, Universal Helicopters, PAL Airlines and Nalcor have expressed an interest in sending their employees on the course. The class-room size of 30 students is fine.

On Wednesday, the Registration Desk opened at 12 noon with Secretary Elaine Hutchings with her team of Paula Whittle, Sherry Pardy, Mary Matthews and Ron Pittman gearing up for the influx of delegates, Displayers and students. They were also assisted by Administration Chairperson Brenda Huber. The registration Desk remained open until 6 pm.

On Wednesday afternoon, Displayers began assembling their booths in Salons B, C and D and in the Crush Lobby. There were 38 booths in salons B, C and D and 3 booths were erected in the Crush Lobby area. The displayers were assisted by Displayer Chairperson Mark Evans and Assistant Tim Sheppard when required.

The Meet and Greet commenced at 7:30 pm in Salon A and was very well attended and delegates had the opportunity of renewing old acquaintances and meeting new ones. Delegates enjoyed the wonderful spread of hot and cold hors d'oeuvres and spirits. Many stayed until 11:30 pm. Before dispersing for activities on George Street.

On Thursday morning, the conference was officially opened at 8 am. With Co-Chairperson Bob Pardy emceeing the activities. The Welcoming address from the City of St. John's was delivered by Councillor Danny Breen. Mr. Breen's comments were well received and he spoke of the conferences theme "Safety Management: Everyone Contributes. Upon completion of his remarks, he was presented with a beautiful book of Newfoundland and Labrador photographs by well-known photographer Brian C. Bursey. Before departing the hotel, he visited all of the Displayers and committee mem-bers welcoming them to our beautiful city and encouraged them to enjoy our wonderful historic properties and delightful scenery of the city and outlying areas Thank you Councillor Breen.

Technical sessions commenced at 0830 with Moderator Uli Huber and the TC panel consisting of Associate Director, Operations Keith Whalen, and Team Leader Lloyd Taylor from Regional Headquarters in Moncton and Team Leader Keith Parsons from the St. John's office. The panel gave an update on regulatory changes and implementations in the region. Although there were no members from Ottawa, the regional representatives will forward any concerns to the national office. Travel and budgetary restraints restricted staff from attending. There were many questions for the panel and Uli had a barrage of items prepared for panel members.

After the coffee break, Dana Ladd of Hope Aero gave an interesting update on Vibration Analysis. It was an opportunity for Engineers, apprentices and students to get a high quality update on vibration problems in the rotary and fixed wing sectors of the industry.

At 11:00 am Boyd Parsons of Air Canada gave an interesting talk on the Boeing 787 Dreamliner and the implications that it will have on our profession, our future, our choice. With the aging staff and many employees opting for retirement, Air Canada will have to hire, train many engineers, students in the near future. Job prospects look very promising for graduating students from the colleges in the region. The colleges in Dartmouth and Gander can expect a lot of inquiries from Air Canada in the future. Glass cockpits and electronic operating systems are the latest thing in the new modern aircraft. After his presentation, all the delegates, displayers and students were treated to the Displayer sponsored luncheon in Salons B, C and D.

After a feast of wraps, sandwiches and cookies, delegates returned for an afternoon of technical sessions, which included Survival Equipment with Blake Musgrave of DSS Aviation and Aircraft Battery Airworthiness with Bob Burkel of Concorde Battery Ltd. Both sessions were well attended and interesting. At 3:00 pm, the AME Association (Atlantic) Inc. held its' annual general meeting in the Conception Bay room. This meeting Lasted a little over an hour and dele-gates prepared for the Cocktail hour and Awards banquet.

Cocktails and drinks were served from 6-7 pm. and the Banquet Ticket holders filed into Salon A for the 39th. Annual Awards banquet. One hundred and fifty-five (155) delegates attended and were treated to a wonderful, tasty meal. And a delightful evening of presentations, door prizes and entertainment. Emcee for the evening was Co-Chairperson Bob Pardy, who also is Awards Chairperson. Bob introduced the special guests, Hon. Al Hawkins, Minister of Transportation and Works, representing the Government of Newfoundland and Labrador and Miss Jacquelyn Howard, Director of Communications for the Department of Transportation and Works. Miss Shelley Neville and Mr. Peter Halley, entertainers for the evening. Bob also introduced the organizing committee of ARAMC 2017.

After the Welcoming address by the Hon. Al Hawkins, Minister of Transportation and Works, of the Government of Newfoundland and Labrador, the delegates were treated to a wonderful meal following the Invocation which was delivered by Mr. Lloyd Taylor.

After the dinner, Awards Chairperson Bob Pardy commenced with the presentations.

The first award was the Earl Blakney Aviall Canada Ltd. award presented annually to the individual/s who has shown outstanding performance in the aircraft maintenance field. This year's recipient was Mr. Morris Kendell of Cougar Helicopters Inc. Morris was presented with his award by Pascal Caporicci – Aviall Canada Ltd. representative.

The second award was the Roger Richard Memorial award presented annually to the retired AME who has distinguished himself/herself in their aviation career. This year's winner is Uli Huber. Jacques Richard presented the award to Uli on behalf of the Richard family.

The third award presented was the Newfoundland Government Air Services Memorial award presented annually to an individual/company for their outstanding support of the ARAMC / AME Association (Atlantic) Inc. This year's winner is Bruce Truesdale of Air Dynamics. Bruce was not in attendance to accept his award due to medical issues and Sean McKernan of NDT Products accepted the award on Bruce's behalf. Derrick Butt, Director of Maintenance of Newfoundland Government Air services presented the award.

The next two awards to be presented were the AME Association (Atlantic) Inc. bursary awards presented annually to a student from the Nova Scotia Community College and a student from the College of the North Atlantic (Gander cam-pus). These awards recognize academic achievement and are selected by a bursary committee in consultation with instructors.

- The winner from the NSCC was Megan Clarke.
- The winner from the College of the North Atlantic was Anika Schingnitz.

The bursaries were presented by Uli Huber, President of the AME Association (Atlantic) Inc.

Before the entertainment began, there were three draws for door prizes and a special draw for the Displayer representatives. The first draw for a night's accommodation compliments of the Delta St. John's Hotel and Conference Centre was won by Christopher Clavierre. The second draw was for a tour of St. John's (for two) compliments of Newfoundland Tours Ltd. was won by Wilson Tulk. The third draw was a framed piece of artwork compliments of Adam Young (Newfoundland artist) was won by Zachary Rolls.

The special draw for Displayers only was for a framed piece of artwork of the Dornier DO-X flying boat donated by Newfoundland artist Trevor Bradley. This draw recognizes the outstanding contribution of the Displayers to the conference. Their support has been fantastic over the years. The winner was Pascal Caporicci of Aviall Canada Ltd. and the ticket was drawn by the Hon. Al Hawkins.

The guest speakers for the evening were Shelley Neville and Peter Halley. They gave an outstanding performance of music/comedy to the delight of the over 155 attendees at the banquet. The one-hour performance really showcased the talent of these individuals. A fantastic performance, which received many accolades from the audience.

## Past President

In retiring this spring, Uli Huber has left the Association in excellent condition, both financially and operationally. We are very grateful for Uli's leadership and dedication during his mandate. Following Uli's retirement from the Atlantic AME Presidency he remains fully engaged in AME Associations at the National level as President of CFAMEA. The task of maintaining the union of all Canadian Regional AME Associations and blending them into a strong National Federation is no easy task.

In the past year he has worked diligently to maintain the bond between the regions into the strong national alliance, which continues to represent AME's and AMO's interests and concerns.

Dave Hall was elected as our new President at the 2017 AME Association AGM, following Uli's resignation. Dave's background is filled with an impressive amount of technical positions as well as senior administration positions with CBAA and advisory positions with various OEMs.

**www.atlanticame.ca**



# Central AME Association

## About CAMEA

The Central Aircraft Maintenance Engineer Association is an organization dedicated to maintaining and enhancing the standards, rights and privileges of all AME members in the central region of Canada. Our chapter is one of six similar associations across Canada that collectively supports the national body CFAMEA (Canadian Federation of Aircraft Maintenance Engineers Association). Our organization works with Transport Canada in the formulation of new rules and regulations and provides a collective viewpoint for all AMEs. CAMEA is a not-for-profit organization run by a volunteer group of AMEs. We elect members of our organization to be part of our Board of Directors. Members of CAMEA are comprised of AMEs, AME apprentices, students, non-licensed persons working in the industry and corporate members.

**www.camea.ca**

# AME Association of Ontario

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ONTARIO

## Survey Results

Early this year the AME Association of Ontario surveyed its members about their opinions for a stronger and more active national AME association. We have now tabulated the results and comments.
Ninety percent of the respondents thought that it is beneficial to them that they are members of a national AME association. However, 80 percent indicated that they see an advantage to being members of a regional AME association. Most would be willing to pay higher dues to have a national AME association with paid administration positions.

Comments received stressed the need for regional associations for ease of attendance at local conferences. But also the comments were for a national association that "will have a bigger say and provide more consistency than regional association." Others wrote thoughts such as these:

- "Together nationally we are stronger."
- "All AME associations should be part of a National group to advocate for us with T-Canada."
- "A national AME association would have a much stronger voice in relation to aviation and be able to provide members with improved services and update training."
- "It is always beneficial to our profession to be a member of both a regional and national association."
- "I am in favour of a National Association and would be willing to pay $100 a year for dues."

Some of our fellow AME regional associations are checking with their members for their opinions regarding an expanded mandate. We look forward to the CFAMEA meeting scheduled for October where we will discuss the more active role we anticipate for more encompassing national AME association.

## Annual AME Conference

The annual Ontario AME Conference will be held November 1-2 at the Hilton Meadowvale Resort and Conference Centre. This is a perfect opportunity to take in the networking opportunities, participate in training sessions, meet with vendors and check out new tools and products.

This year our two-day training program will see several changes. Expanded participation by the major airlines will allow training and information sessions to be more accessible on both days. The full schedule will be available on our web site.

The annual awards banquet will see a change as well. The evening will be less formal and will allow more socializing.

Members of any AME Association will receive a discount for the show registration. Please check our website www.ame-ont.com for updates and registration forms. We expect an excellent event this year! Expect to see you there.

— Submitted by Stephen Farnworth
For the Board of Directors

# PAMA SoCal Chapter

PAMA SOCAL

## April 2017 Meeting Wrap

The SoCal Chapter thanks Mr. Jim Taylor, Crewmember Emergency Training, Steve Phillips, Sales Manager and all at HRD Aero Systems for their time and generosity in hosting the April 2017 Chapter dinner meeting and excellent technical presentation on "Going Back to the Fundamentals of Emergency Equipment "at the 94th Aero Squadron Restaurant in Van Nuys, California. To learn more about HRD, visit www.hrd-aerosystems.com or contact Jim at jim@hrdaerosystems.com or Steve at stephen@hrd-aerosystems.com.

**www.socalpama.org**

**Does your professional association have some interesting news or upcoming events you'd like to make your members aware of?**

**Contact AMU's editor, John Campbell, at: amu.editor@gmail.com**

# Hartzell at One Hundred


This summer Hartzell Propeller celebrated its 100th anniversary. This kind of longevity is a remarkable feat for a production company in any sector, but adding to the significance of the occasion is Hartzell's continuing pace as an industry leader. During this summer's AirVenture Oshkosh, the company trotted out some of the designs driving its current success.

In the past year, Hartzell Propeller has expanded its global reach across the spectrum of general aviation's propeller equipped aircraft. Through a multiyear, multimillion dollar investment in aerodynamics and manufacturing techniques using state-of-the-art composite and aerospace grade materials, the company today reigns as a clear industry leader as it begins its second century of propeller making.

Many of these developments were seen on display at the Experimental Aircraft Association's AirVenture Oshkosh in July. And at EAA, Hartzell Propeller celebrated a significant milestone—100 years of building propellers, beginning with the wood propellers for the Wright Brothers, and culminating with its high performance propellers that today support more than 500,000 props for many aircraft types.

On exhibit at AirVenture were Hartzell's two-blade composite Trailblazer, three-blade Bantam and Raptor applications, four-blade aluminum and composite options, and five-blade carbon fibre propellers for various aircraft models. Hartzell Propeller has been active since the 2016 EAA AirVenture with a number of developments, including:

### Pilatus PC-12

Hartzell Propeller has delivered more than 50 new Top Prop five-blade composite swept tip props for the Pilatus PC-12 fleet since their introduction less than two years ago. In addition, Hartzell has delivered more than 160 of these propellers to Pilatus for new PC-12NG aircraft over that time period, bringing to more than 200 the total PC-12s flying with Hartzell's carbon fibre five-blade propellers.

New Pilatus PC-12 NG aircraft feature the specially designed five-blade, 105-inch diameter composite propeller as standard equipment. The propellers are available under Hartzell Top Prop program for the Pilatus PC-12 fleet, which totals more than 1,500 business aircraft.


### Supervan 900

Airplane modifier Texas Turbine Conversions has received a Supplemental Type Certificate (STC) for Hartzell Propeller's four-blade composite swept prop designed for single-engine Supervan 900 aircraft. This Hartzell and Texas Turbine collaboration links engine upgrades for converted Cessna Caravans with Hartzell's structural composite propellers especially engineered for the Supervan 900. The 110-inch diameter propeller, is 60 pounds lighter than the prop it replaces.

### Piper M600

Hartzell Propeller's new five-blade composite swept tip prop has received FAA approval for installation on the Piper M600 turboprop aircraft. Hartzell's propeller was designed specifically for the top-of-the-line Piper M600. It features thin, maximum efficiency airfoils providing increased performance and outstanding ramp appeal. This prop is also available on new Piper M500s, as well as the legacy Meridian and M500 fleets.

### Cessna C-177RG Cardinal

Hartzell Propeller's composite Trailblazer prop has received an STC for Cessna Cardinals through General Aviation Modifications Inc. (GAMI). The approval covers retractable gear normally aspirated and turbonormalized C-177RG Cardinals with IO-360s and IO-390s engines. Hartzell also received a Top Prop STC for the Cessna Cardinal RG fleet featuring a blended airfoil two-blade metal scimitar propeller. This conversion is available directly through Hartzell and the Top Prop program.

### Super Cub

Hartzell Propeller's 83-inch composite Trailblazer propeller has received an STC for Super Cub PA-12 and PA-18 aircraft. Hartzell Propeller worked closely with Professional Pilots Inc., which owns the STC, and is marketing the conversion program from its Lowell, Indiana facility.

### HTT-40

Hartzell's four-blade lightweight aluminum propeller was selected by Hindustan Aeronautics Ltd. for its HTT-40 two-place turbine basic trainer aircraft. The new indigenous HTT-40 is designed and built by HAL.

### Daher TBM

Hartzell has delivered over 230 swept airfoil five-blade props for Daher TBM 700/850/900/930 aircraft since FAA approval in 2014. Hartzell's high performance structural composite propellers are now flying on roughly 30 percent of the entire Daher TBM fleet after less than three years on the market.



### XCub

CubCrafters selected the Trailblazer as standard equipment on its newest Flagship the XCub. Trailblazer props are claimed to be lighter, faster and stronger than any competitor. The unlimited life Hartzell Trailblazer features a field replaceable nickel-cobalt leading edge, ensuring it can withstand demanding backcountry and bush flying.

### Top Prop Warranty

In an aviation industry first, Hartzell Propeller extended the warranty on its Top Prop conversion propellers all the way through first overhaul. This is the longest warranty for propellers offered anywhere in the general aviation industry.

### Turbine Evolution

Evolution Aircraft completed extensive performance and noise testing confirming the performance improvements of the new Hartzell five-blade composite swept tip constant speed prop for the Turbine Evolution. The new technology 82.5-inch diameter five-blade propeller is available as an optional performance upgrade in place of the four-blade Hartzell aluminum prop.

### Cessna Caravan

Hundreds of single-engine Cessna Caravan 208 aircraft are now eligible for conversion to three-blade aluminum props from Hartzell Propeller through an amended STC. The propeller is available with a TKS ice protection system approved for Flight Into Known Icing (FIKI). ■

> . . . the global helicopter market will offer a healthy 4.5 percent compound annual growth rate during the period of 2017 to 2022 and reach an estimated $1.6 billion.

**A new study concludes that the current sharp edge on the helicopter blades segment is not likely to dull any time soon.**

### Carving up the market

The India-based firm Stratview Research has announced the launch of a new research report on the global helicopter blade market. The report is broken down by helicopter type (civil, military, and civil/military), by engine type (turbine and piston), by blade location type (main rotor and tail rotor), by design type (symmetrical and under cambered), by material type (carbon composites, hybrid composites, and others), by manufacturing process (sandwich construction and others), by end-user type (OE and aftermarket), and by region (North America, Europe, Asia-Pacific, and RoW), trend, forecast, competitive analysis, and growth opportunity: 2017-2022.

The 280-page report studies the blades market in the global helicopter industry over the period 2011 to 2022, and concludes that the global helicopter blades market will offer a healthy 4.5 percent compound annual growth rate during the forecast period of 2017 to 2022 and reach an estimated $1.6 billion in 2022. The report goes on to say that increasing deliveries of helicopters, advancement in the blade technology such as electric tail rotor systems, continuous shift from heavy metal blades to lightweight composite blades, and rising helicopter fleet size are major growth drivers of the global helicopter blades market.

The research's findings suggest that military and civil/military segments currently dominate the helicopter blades market, driven by high deliveries of helicopters and large fleet size. However, the civil and para-public segment is projected to witness the highest growth during the forecast period, driven by increasing demand for light single-engine and intermediate and medium twin-engine civil helicopters.

In terms of material type, composites are likely to remain the largest and fastest-growing material type during the forecast period. Helicopter manufacturers have long recognized the potential of these materials in structural applications. Major players are increasingly adopting composite blades in their upcoming models. At the same time, there is also an increasing demand for composite blades in the aftermarket.

Based on blade location type, the main rotor blade is projected to remain the largest type during the forecast period. Both main rotor and tail rotor blades are likely to witness similar growth over the next five years. There is an increasing penetration of composite materials in both the blade types.

In terms of region, Europe is projected to remain the largest and fastest-growing market for helicopter blades during the forecast period. The region is the manufacturing capital of the helicopter industry with the presence of Airbus Helicopters, Leonardo Helicopters, and Russian Helicopters. All the major helicopter manufacturers are producing blades in Europe only.

There are independent rotor and tail blade manufacturers as well as OEMs with in-house blade manufacturing capability. The key helicopter blade manufacturers are Bell Helicopter, Boeing Helicopter, Carson Helicopters, Airbus Helicopters, Hindustan Aeronautics Limited, Kaman Aerosystems, Robinson Helicopter Company, Sikorsky Aircraft Corporation, and Van Horn Aviation. New product development, collaboration with OEMs, and long-term contacts are the key strategies adopted by the key players to gain a competitive edge in the rotorcraft blades market. ■

# The Cold Snows of Winter

## Blowing snow and melting ice will poke insidious fingers into uncovered parts, as this tragedy involving a police helicopter sadly illustrates.

On January 17, 2012 at 1351 Pacific Standard Time, Air Five, the Royal Canadian Mounted Police Eurocopter AS 350 B3 helicopter (registration C-FMPG) with only the pilot on board, took off from an open field near Cultus Lake, British Columbia, on the outskirts of the city of Chilliwack. The helicopter slowly travelled nearly 260 feet to the north, and then hovered at about 80 feet above the ground for approximately 30 seconds. Suddenly, a distinct noise and a puff of grey/white vapour from the engine area occurred, followed by a rapid loss of rotor revolutions per minute. The helicopter descended quickly, and within seconds, landed heavily on the snow-covered terrain. Upon impact with the ground, the helicopter fuselage collapsed and the fuel tank ruptured. There was no fire. The helicopter was destroyed, and the pilot was fatally injured. The accident occurred in daylight at an elevation of about 650 feet above sea level.

On the day of the accident, Air Five had departed the Vancouver International Airport and landed at a Department of National Defence property, about 1.5 nautical miles east of Cultus Lake, at 0930. At 1145, the helicopter took off and carried out human external transportation system training over open and partially treed terrain. The flight was conducted during periods of intermittent, light snowfall. Approximately 35 minutes later, the helicopter returned to the landing site and was shut down so that the pilot could get some lunch and prepare for the afternoon's training flights.

When the helicopter was shut down for lunch it was not snowing, and the engine air inlet covers, which were on board, were not installed. During the lunch break, heavy snow started to fall and lasted for approximately 15 to 20 minutes. The pilot did not return to the helicopter to install the engine air inlet covers. At 1315, the pilot decided to cancel the remaining training and return to CYVR. Since shutdown, there appeared to be a significant accumulation of snow on the helicopter; the snowfall, however, had by then diminished to very light or none at all. The temperature was approximately –10C.

After the helicopter was reconfigured for the flight to CYVR, the pilot entered the cockpit and prepared for start-up. At the same time, two ground crew members removed the snow accumulation from the two front windscreens. At 1349, the pilot started the helicopter, and the snow was flung off the blades. A significant amount of snow remained on the upper surfaces of the fuselage and tail boom.

After lifting off into a hover, the helicopter climbed to approximately 50 feet above ground level, and slowly travelled up and forward about 260 feet in a straight line before hovering for about 30 seconds at a height of 80 feet agl. Soon afterward, there was a muffled bang and a puff of grey/white vapour from the exhaust area, and the rotor revolutions per minute decayed immediately. At the same time, the customary and familiar sounds from the engine rapidly disappeared, and the regular slapping sound of the rotor blades quieted significantly. The helicopter began to descend, turned quickly to the right about 150 degrees, pitched nose-down briefly, and then descended more rapidly. During the final moments of the flight, the helicopter descended almost vertically, colliding with the terrain in a nose-down, right-side-down attitude. In all, the helicopter had been running for about three minutes.

Within 30 seconds of the impact, several ground crew members reached the helicopter. The pilot's helmet had come off, and the pilot was unconscious. The ground crew members extracted the pilot from the cockpit and performed first aid. Although the fuel tanks had ruptured at impact and fuel had spread beneath the wreckage, no fire occurred. Despite rapid onsite paramedic attention and response, the pilot did not regain consciousness and died as a result of severe injuries.



## Damage

Due to the force of the impact with the ground, the right landing skid broke, and the cabin, engine/transmission platform, and main airframe structure collapsed. The internal fuel cell was also shattered by contact with the attached belly hook and sling unit upon ground impact. The tail boom and tail-rotor blades struck the ground, buckling the whole structure. Two of the main-rotor blades were intact and exhibited little damage, whereas the third rotor blade suffered extensive ground-impact damage. The tail-rotor blades were both damaged. One blade showed no damage except for evidence of wood in its striker tab. The other blade was almost completely fractured near its root/hub. The main-rotor and tail-rotor blade damage was characteristic of extremely low rotor rpm at impact.

However, there was no mechanical indication of any pre-accident malfunction of any flight control or rotor drive system on the helicopter that could have contributed to a loss of control of the helicopter.

The helicopter had been operated by the RCMP since new. The investigation determined that it was equipped, modified, and maintained in accordance with existing regulations and approved procedures, and that it was within its weight and centre-of-gravity limits.

The helicopter air intake had been equipped with a Eurocopter air particle separator (QB0550), more commonly referred to as the sand filter, to protect the engine from ingestion of airborne particles. By design, no part of the air intake system was heated.

## Turbomeca Arriel 2B engine

The engine was a Turbomeca gas turbine Arriel 2B model (serial no. 22007), rated at 747 shaft horsepower. Its fuel flow, among other things, is managed by a DECU, which provides proper engine operation and specification performance, and its main functions are starting, rotor speed control, and operational limits protection. The Arriel engine does not have an automatic re-ignition capability, nor is this required by regulation. Therefore, if the Arriel engine flames out, it will result in a total power loss.

Engine maintenance logs record that the engine had a total of 7,779 hours in service. The engine was certified and maintained in accordance with existing regulations and procedures. All component lives and cycles were within the manufacturer's approved limits.

Moreover, the airframe wreckage was examined, and no indication was found of any pre-accident anomaly or malfunction with the flight controls, the drive train, or other aircraft system that could have contributed to the accident.

Visual examination of the engine inlet section revealed damage to one of the compressor blades. The investigation determined that the blade became bent during the loss-of-power event. However, nothing prevented engine test cell runs following the occurrence.

### Engine examination

The engine was removed from the accident helicopter and examined at the Transportation Safety Board Regional Wreckage Examination Facility (RWEF). During this examination, the DECU and VEMD were removed and subjected to further examination and analysis. Examinations of the compressor, turbine, and gearbox assemblies revealed that, at the time of impact, the engine was rotating at an rpm considerably less than self-sustaining speed.



After the engine was examined at the TSB RWEF, it was sent to an approved engine overhaul facility in Grande Prairie, Texas, where it was examined, run in a test cell, and disassembled under the direct supervision of the United States National Transportation Safety Board (NTSB).

### Engine compressor blade damage

The TSB Laboratory examined the engine compressor components to assess the cause of the blade damage observed during the initial engine examination and the subsequent test cell run. All of the compressor blades were found bent forward of the vertical plane of rotation normally travelled by the blade tips, but only one blade was bent significantly and was visibly obvious.

The Laboratory examination of the noticeably bent compressor blade did not reveal any evidence typical of foreign object damage, such as sharp dents, gouges, tears, or material transfer. The examination did determine that the appearance of the bent blade was similar to that of the blades bent during the water/snow/ice instantaneous ingestion testing for engine certification.

Given the similarities in blade damage, the Laboratory report concluded that the damage to the axial compressor blade, as well as the flame-out of the engine, occurred as a result of the ingestion of accumulated snow or ice, or both, into the engine compressor after take-off.

The damage appeared similar to the bending incurred by the axial compressor blade(s) during certification testing when snow and ice was purposely ingested in the engine at maximum continuous power.

The bending of the accident compressor blade was somewhat greater than that seen in the test compressor blades, so the TSB concluded that the engine in C-FMPG was operating in a similar, high power condition when the ingestion occurred.

### Turbomeca Arriel air consumption

According to the manufacturer, the Turbomeca Arriel 2B gas-turbine engine consumes about five pounds of air per second; this translates into an air flow of about 330 feet per second passing into the engine axial compressor disc. If the engine inlet (approximately 5.75 inches in diameter) becomes blocked, it could cause a loss of power.

As well, as a result of the airflow speeds entering the plenum and engine intake, a reduction of air temperature takes place as the air moves through the engine's intake air plenum toward the engine compressor. Turbomeca computation results indicate the temperature at the engine mouth would be around –12C.

### Snow accumulation and plenum temperature trial

The TSB, in concert with the RCMP ASB, and with technical support from Eurocopter Canada Limited (ECL), carried out an environmental simulation trial on an identical AS 350 B3 helicopter in mid-February 2012. In preparation for the trial, four temperature probes and a digital recording device were attached to the engine inlet plenum. As well, two laser temperature guns were used to monitor various external engine and airframe temperatures.

The helicopter was first started in clear conditions, and then run on the ground at flying rotor rpm for 15 minutes. During this time, the engine temperatures were monitored and recorded, both with the sand filter P2 bleed air off, and with it activated.

The temperature at the inlet face of the sand filter stabilized at near 0C with the engine running, yet it dropped by 0.9C when P2 bleed air was turned ON and rose again to slightly above zero when P2 bleed air was turned OFF. The helicopter was then shut down normally. The engine was then run again to confirm the function of the temperature recorder and, after about 10 minutes, the engine was shut down.

The team created a snowfall environment for the test helicopter using a large capacity, commercial snow-making machine. After the helicopter was shut down, the snow machine began to lay snow onto the helicopter, and for the next 90 minutes, the temperatures in the plenum and engine compartment were

recorded every five minutes. After 90 minutes, the accumulated snow had built up to an amount similar to that seen on the accident helicopter before start. With the outside air temperature remaining at –10C throughout the test, this process closely replicated the conditions on the day of the accident.

During the trial, it was noted that, in the cold outside air, the inlet grill and sand filter unit at the top of the engine cowling did not cool down after engine shutdown. Instead, following engine shutdown, the temperatures increased quickly from 0.2C at shutdown to 10C, dropping only to 8.5C at the 90-minute mark.

Similarly, the temperatures inside the plenum itself, after peaking to about 33C, fell to no lower than 17C during the test. During testing, an opening appeared in the snow layer on the top of the engine cowling and engine intake grill. This opening was created by rising hot air from the engine, which passed up the plenum and out of the intake, causing a small area of melting in the layer of snow that had formed.

## Analysis

The accident investigation revealed no indication of a preexisting mechanical defect in the helicopter or its engine. In addition, the pilot was certificated and qualified for the flight, and there were no indications that the pilot's performance was in some way degraded. In this occurrence, the facts support the conclusion that there was an engine power loss due to a sudden change in air/fuel ratio.

There have been a number of engine power-loss accidents associated with ice/snow/water ingestion involving the AS 350 over the past 25 years. The design of the Turbomeca Arriel engine is such that, if the right conditions exist, such as during snow and rain, it may not be possible to prevent the accumulation of water and/or snow/ice in the air intake system before take-off.

While aircraft covers are designed to protect the aircraft from the elements, there may still be an opportunity for moisture to enter the plenum on the AS 350. The risks associated with soft ice ingestion were well understood by Eurocopter and Turbomeca, and they had provided procedures and instructions to reduce these risks.

The available protective covers for the airframe and the engine air intake were not installed when the helicopter was shut down or when heavy snow began falling. In addition, preparation of the helicopter for flight, by removal of the accumulated snow from the airframe or the air intake, was not carried out. The AS 350 B3 rotorcraft flight manual (RFM) requires removal of all snow, ice, or water from the engine intake system before start. However, in this occurrence, those instructions were not carried out. Water accumulated in the engine air intake plenum, which allowed soft ice to build up after start. Tests and previous accidents have shown that under certain winter conditions, the air flow into the engine progressively deposits ice or slush contamination onto the rear wall of the intake plenum, thereby creating a buildup of snow/ice/water mixture (soft ice), which eventually detaches and

strikes the inlet axial compressor disc, bending blades, interfering with the airflow, and causing the engine to shut down.

### Findings as to causes and contributing factors

1. The available protective covers for the airframe and the engine air intake were not installed when the helicopter was shut down or when heavy snow began to fall. In addition, preparation of the helicopter for flight, by removal of the accumulated snow from the airframe or the air intake, was not carried out as required by the rotorcraft flight manual.
2. Water accumulated in the engine air intake system, and ice or compacted snow built up in the engine air intake plenum after start. The helicopter experienced a complete loss of engine power resulting from a sudden change in air/fuel ratio caused by ingestion of the contaminant.
3. The helicopter's power loss occurred at an altitude and airspeed that did not permit an autorotation, which led to a rapid loss of main-rotor rpm and an extremely high rate of descent.
4. As the helicopter descended, the rapid decay in main-rotor rpm resulting from the engine power loss reduced the effectiveness of the flight controls, leading to an impact with terrain that was beyond human tolerances.

### Findings as to risk

1. If an aircraft has been exposed to conditions in which moisture that may not be detected by the pilot can collect in the engine inlet filter components, then there is a risk of engine flame-out even with the engine covers in place.

2. Compliance with the requirements for making sure that the air intake system is dry is impractical for field operations. Nevertheless, unless AS 350 operators fully follow the manufacturer's instructions, there is an increased risk that passengers and pilots will be exposed to an engine flame-out shortly after take-off during winter operations.

3. Exemptions that allow human external transportation system operations by single-engine helicopters engaged in law enforcement, fire-fighting and rescue in the avoid area of the airspeed-height envelope place pilots and passengers at increased risk in the event of an engine power loss.

4. If detailed risk assessments are not carried out when introducing a new aircraft type into an operation, there is an increased risk that associated hazards will go undetected.

5. If critical safety-related maintenance and operational information is not properly disseminated and risk management strategies not applied, pilots and passengers travelling on those aircraft will be at increased risk.

6. The lack of auto-ignition systems for ingle-engine helicopters like the AS 350 places pilots and passengers at increased risk for accidents following an engine power loss at low altitude due to snow, water, and/or ice ingestion.

*(The above are selected excerpts from the Transportation Safety Board's investigation into this occurrence. The Board authorized the release of this report on March 12, 2014. It was officially released on May 28, 2014.)* ■

## Aviation Services

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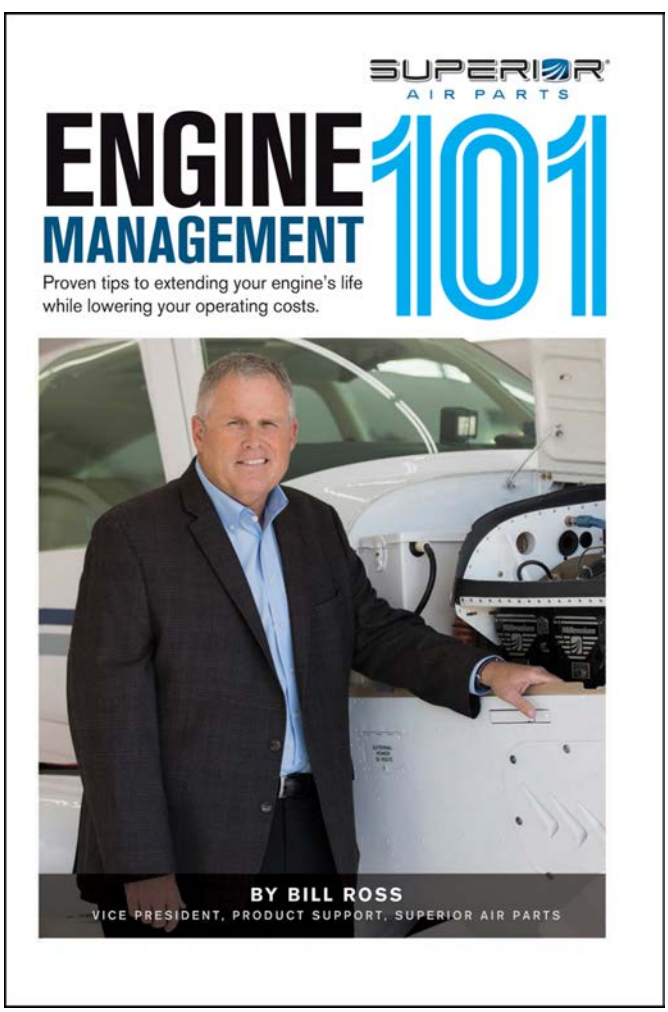
# Little bit of book learnin'

**Pilot and technician Bill Ross has a new book that offers tips and insights into how to get more performance, reliability, and value out of a piston aircraft engine.**

This year Superior Air Parts is celebrating 50 years of producing FAA-approved PMA parts that help make flying more affordable, says Scott Hayes, Vice President of Sales and Marketing for Superior Air Parts, Inc., who also announced in June that to help mark the occasion the company has published Engine Management 101 written by its V.P. of Product Support, Bill Ross. "What better way to highlight our commitment than to capture all of Bill's knowledge and experience in ways to extend the life of a airplane engine and put them in a book that's both educational and fun to read?"




With over 32 years of experience as an FAA A&P/IA technician and thousands of hours as a pilot and aircraft owner, Bill Ross has quite an interesting story to tell.

"I've spent my entire career around piston aircraft engines, either as a charter pilot, A&P/IA or working for an aircraft engine manufacturer," says Ross. "I've seen just about everything an owner can throw at their aircraft engine and have learned the right ways to operate and maintain an engine to avoid all the major problems. That's the insight I've put in this book."

Ross says that Engine Management 101's 144 pages, which are divided into 11 chapters, are packed with valuable information on a variety of subjects, ranging from Choosing the Right mechanic to Improving Engine Operations, Cylinder cCmpression Testing, How PMA Parts Help Owners Save Money, and much more. The emphasis of the book is on the importance of scheduled maintenance.

"There's a lot of great information in the book. But, when you distill it all down, my message is simple: 'The purpose of scheduled maintenance is to prevent unscheduled maintenance. While it may go against the grain of some so-called engine experts, that's what I truly believe."

"That's why getting this book into the hands of other pilot/owners is a dream come true for me," Ross explains. "If it helps just a few owners get their engines safely to TBO, then it has done its job."

Engine Management 101 made its debut at this year's Oshkosh AirVenture as part of Superior Air Part's 50th anniversary and ongoing forum series. Everyone who attended a Superior Forum received a free copy of the 144-page book.

"From our Millennium Cylinders to our FAA-PMA replacement parts, to our XP-Engines, Superior is all about providing exceptional products at true value prices," says Scott Hayes. "Our forums are an opportunity for Bill to share his valuable insights during AirVenture, and Engine Management 101 is a way for owner/pilots to continue to learn long after forums are over."

Superior Air Parts, Inc. is a subsidiary of the Superior Aviation Group, and a manufacturer of FAA-approved aftermarket replacement parts for Lycoming and Continental aircraft engines. The company also manufactures the FAA certified Vantage engine and the XP-Series engine family for experimental and sport aircraft builders. ■

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