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# AirMaintenance

The Magazine for Aircraft Maintenance Professionals

# UPDATE

Transport Canada Approved for R/T



## The Viking Solution

CL-515  
Fire Fighter

Landing on  
Hard Blue Ice

Desert  
Display

DUBAI  
AIRSHOW  
2021

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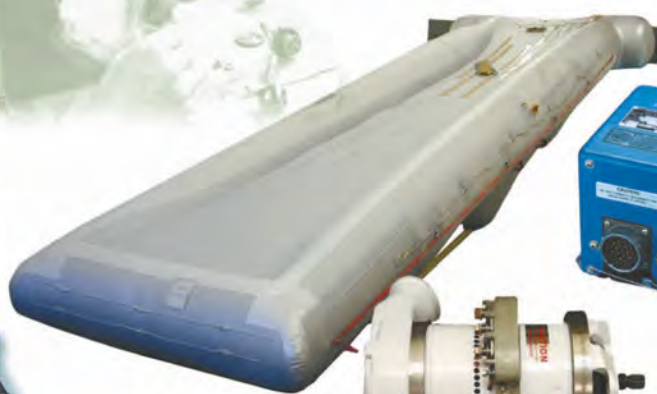
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## The Sound of Opportunity Knocking?



**I**T'S NO SECRET the aviation industry in Canada and the United States is starting down the barrel of a looming skilled labour crisis: many experienced Aircraft Maintenance Engineers are aging out of the trade and there's not enough young talent arriving to address the shortfall. A new survey from JMC Recruitment Solutions indicates the same is true in Europe and the United Kingdom, although there's a twist to the story. Instead of simply retiring, many aircraft techs are now moving into other trades, a scenario that might possibly open the door to new opportunities for North American AMEs willing to relocate overseas.

For its 2021 'Aviation Engineering Professionals Industry Survey,' JMC surveyed nearly 4,000 respondents in the UK and across Europe, in job categories such as B1 & B2 licensed Engineers, Aircraft Fitters/Mechanics, Sheet Metal Workers, to learn that a whopping 38 percent have moved to an industry outside of aviation.

Even before the pandemic, skilled, long-serving workers were exiting the industry, the UK-based aviation services talent and recruitment business observed. Since the pandemic, engineers have chosen to retire early, taking out excellent mentors to the next generation in the process. According to JMC's survey, only four percent of their respondents decided to retire.

The survey also claims that as the industry begins to recover, 50 percent of respondents believe that rates of pay will need to return to pre-Covid levels or increase by between five and 10 percent. JMC suggests the industry is starting to witness this already as airlines rebuild, put aircraft back into service, and start recruiting again.

Could that be the sound of opportunity knocking?

— John Campbell, Editor

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Hand-propping should only be considered a last option.

### AirMaintenance Update

Unit 7, 11771 Horseshoe Way  
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**fax:** (604) 214-9825

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**art director:** Cliff Vickstrom

**publisher:** Bill Carter

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# Upcoming Events

## CONCORDE'S SEMINAR REGISTRATION NOW OPEN

In 2021 nearly 3000 participants joined Concorde's virtual seminars. Viewer feedback was overwhelmingly positive with great suggestions for future events. To improve the experience for attendees in 2022, Concorde is offering FAA Approved IA Seminars focused on three distinct disciplines – piston, turbine and rotorcraft. All are welcome at these free events; IA status is not required.

Each seminar will be held over two days for four hours each day to fulfill the eight-hour IA training requirement. For the convenience of attendees, each day two sessions will be available at 8 AM to 12 PM EST or 5 PM to 9PM EST.

Registration is required and will be closed when capacity is met. Register online through Concorde's User Portal. In order to register for the events, you will generate a login. You can participate in one, two or all three events with the click of a button. The portal delivers visibility to your course registration and will provide you with an access key to the seminar.

After the seminar is over and participation has been validated, certificates will be loaded to the portal for your availability. You can access registration by visiting [www.concordebattery.com](http://www.concordebattery.com) and clicking on the 2022 IA Renewal Series graphic on the homepage. 📍

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Piston	January 13 & 14, 2022
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Rotorcraft	January 27 & 28, 2022

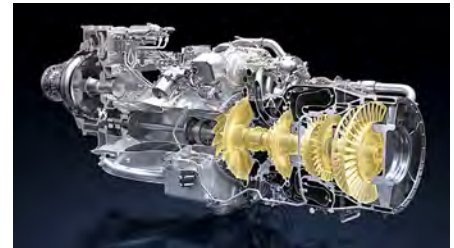
## P&WC Targets Regional Aircraft with New Engine Series

During the month of November, Pratt & Whitney Canada lifted the veil on its new turboprop PW127XT engine series, designed for regional aircraft. The company celebrated the launch with aircraft manufacturer ATR, which will re-engine its 42- and 72-600 twin-turboprops with the new PW127 powerplant and has secured long-term operator Air Corsica as launch customer with an order for five aircraft.

"Since its inception, ATR has exclusively turned to Pratt & Whitney to power its fleet of regional aircraft," said Maria Della Posta, president of Pratt & Whitney Canada. "We are pleased to launch this exciting new PW127XT-M engine with ATR. Optimized for the ATR 42/72 aircraft family, it will deliver a significant improvement in operating costs and sustainability of this regional turboprop.

"Launched as ATR is celebrating its 40th anniversary, the PW127XT engine series builds upon the success of the PW127M engine. We have injected into this new PW127XT-M engine the knowledge gained from Pratt & Whitney's history of transformation and continuous innovation to provide a step change in performance and customer service that helps regional airline customers achieve their business goals," said Della Posta.

P&WC says the PW127XT-M engine will offer increased savings to customers. Specifically, this means a factory-spec 40



The PW127XT engine is designed for regional aircraft. Partner ATR will build turboprop aircraft with the new engine.



percent extended time on wing by moving to the right the schedule for both engine overhaul intervals and hot section inspections compared to the PW127M. The company says there will be 20 percent less maintenance costs; with only two scheduled engine events over 10 years (based on typical mission lengths and 2,000 annual flying hours).

Regional turboprops consume an estimated 40 percent less fuel and emit 40 percent less CO2 emissions than regional jets on flights up to 400 nautical miles. The PW127XT-M engine builds on the economic and sustainable propulsion advantage of existing PW127M powered aircraft, with a three percent improvement in fuel efficiency. Like all P&W Canada engines, the PW127XT-Ms are certified for up to a 50 percent sustainable aviation fuel blend. 📍

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# STCs & new products

## GameBird is field approved for Talon

Aviator Sean D. Tucker has received FAA Field Approval for the Hartzell composite three-blade Talon performance prop for his certified aerobatic GB1 GameBird airplanes. The GB1 GameBirds are powered by 303 horsepower Lycoming AEIO-580 engines and are manufactured in the U.S. by Game Composites.



This aircraft features Hartzell Talon propellers in place of factory standard propellers. The all composite GB1 GameBird is an aerobatic competitor, and with a 1,200 mile range it is also capable for weekend trips. The Talon's design uses Hartzell's carbon fibre manufacturing process. [www.hartzellprop.com](http://www.hartzellprop.com)

## Wing tip light draws less current

Kadex Aero Supply has unveiled the Hyperion II, a new STC approved LED wing tip light assembly for the Beechcraft King Air 350. This product allows for plug-and-play installation into the 350 wing tip, as well as removal of the



high voltage power supplies. The light is said to be five times brighter with five times less current draw and comes with a five-year warranty.

Combined with the previously approved Orion 500 tail nav/strobe, the lights are available through Kadex Aero Supply at locations in Peterborough, Ontario and Calgary, Alberta. [www.kadexaero.com](http://www.kadexaero.com)

## Aircraft jack can lift 20,000 kilograms

GB Barberi produces a complete series of lifting jacks with a maximum load limit of 20,000 kilograms with a height range between 170mm closed to 4,000mm fully-extended. The range is composed of hydraulic jacks worked by a single or double hand-pump, and also electro-hydraulic, pneumatic-hydraulic and electro-hydraulic lifting systems controlled by a console capable of managing the entire aircraft lifting system simultaneously. All of the lifting kits can be integrated with electrical weighing kits. Specialized versions with different configurations are available on request. [www.gbarberi.com](http://www.gbarberi.com)



## High-pressure pump comes fully assembled

The Flightmaster two-gallon cowl-thrust reverse service pump is an open system hand operated bowser designed to service commercial and military aircraft. The pump handle has a medium knurl finish to provide a slip free grip. This high pressure bowser is appropriate for all MIL SPEC fluid requirements and comes fully assembled and ready for use. [www.fluidtran.com](http://www.fluidtran.com)



## EpiShuttle receives STC on CL-600s

FAI has obtained supplementary type certification for the EpiShuttle on CL-600 aircraft after undergoing tests on flammability, rapid decompression, and patient evacuation. The test was passed without complaints or remarks. Since FAI has



installed the EpiShuttle in the Bombardier Challenger 604 on a Spectrum Aeromed MedBase with a fixed adaption to a Spectrum Aeromed Cargo Stretcher, they no longer consider the EpiShuttle to be "loose equipment" compared to other mobile medical equipment. Due to this FAI wanted an STC for the CL-600-2B16 aircraft that included the EpiShuttle. [www.epiguard.com](http://www.epiguard.com)

## Weld inspection app minimizes delays

The new WeldSight Remote Connect app for the OmniScan X3 phased array flaw detector streamlines the weld inspection workflow by enabling users to perform every step via WeldSight software on a PC or laptop. Combined with Olympus scanners and probes, this phased array ultrasonic testing solution minimizes manufacturing delays caused by inefficient nondestructive testing methods. It provides manufacturers the flexibility to create customized equipment setups for new weld inspections in oversized parts as well as configurations using multiple groups and probes, scanners and monitors to maximize the flaw detection coverage and visualization. [www.olympus-ims.com](http://www.olympus-ims.com)



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## MICROLIGHT MAKES FLIGHT ON SYNTHETIC FUEL

Britain's Royal Air Force has set a new record by completing the first ever aircraft flight powered entirely by synthetic fuel. On November 2nd in the skies over Cotswold Airport in the UK, Group Captain Peter Hackett piloted an Ikarus C42 microlight aircraft fueled by a synthetic UL91 fuel made by British energy company Zero Petroleum. The fuel was manufactured by extracting hydrogen from water and carbon from atmospheric



carbon dioxide, using energy generated from renewable sources. The fuel used in this operation can potentially reduce the production of carbon by up to 90 per cent per flight.

## JOINT VENTURE TARGETS REGIONAL AIRCRAFT

Two Canadian companies, Mid-Canada Mod Center (MC2) and JD Aero, are combining forces on regional aircraft MRO. JD Aero will gain access to MC2's avionics integration expertise along with its portfolio of STC packages for regional aircraft, and an expanded scope of avionics repair capabilities. MC2's engineering division, ADS, will provide JD Aero clients with design, engineering and airworthiness support and structural repairs approvals through its Transport Canada Design Approval Organization. MC2 and ADS will be able to offer capabilities to JD Aero's client base while aircraft are down for scheduled and unscheduled mods and maintenance at the Sault Ste. Marie, Ontario CYAM JD Aero complex.

Air Canada to purchase SAF utilizing CE's technologies. As part of its climate targets to reach a goal of net-zero greenhouse gas emissions throughout its global operations by 2050, Air Canada has committed to invest in a variety of alternative fuel and carbon reduction solutions.



## ALPINE AIR KITS-OUT WITH WHISPER PROPS

BLR Aerospace has announced Utah-based Alpine Air Express as their global launch partner for the Beech 1900D Whisper Prop. Alpine Air Express has previously installed the Whisper Prop on two of 1900D aircraft. Developed in partnership with MT-Propellers, BLR's new FAA approved 1900 C/D five bladed Whisper Prop is said to be the smallest diameter and quietest composite propeller on the market. The Whisper Prop is a natural composite core covered with carbon and fiberglass skins. The composite core reduces the vibration by more than 50 percent and decreases the overall wear and cost of operation.

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## CANADIAN CARRIER SETS GOALS

Air Canada and Carbon Engineering announced a Memorandum of Understanding to identify potential opportunities in how CE's proprietary Direct Air Capture technology, which captures carbon dioxide from the atmosphere, can advance aviation decarbonization. The two Canadian companies plan to explore potential cooperation activities in sustainable aviation fuels, permanent carbon dioxide removal and innovation, including opportunities for



## FIRST PRAETOR 500 ARRIVES IN CANADA

Embraer has delivered the first Praetor 500 in Canada to AirSprint Private Aviation, a Canadian privately held Fractional Jet Ownership company. Earlier this year, the company converted two Legacy 450s to Praetor 500s and, with this addition, AirSprint will now have three





Praetor 500s in its fleet, and a total of nine Embraer jets. The Praetor 500 is said to be capable of non-stop flights of 3,340 nm at long-range cruise speed and has demonstrated remarkable runway performance under snowy and wet conditions. The AirSprint aircraft will provide non-stop flights from hundreds of airports coast-to-coast in Canada.



## ANOTHER BELL FOR CANADIAN COAST GUARD

Bell Textron Canada and the Canadian Coast Guard have announced the delivery of a new Bell 429 helicopter to the Coast Guard at Bell's Mirabel facility. The delivery, which occurred on September 15, marks an important milestone for both Bell Textron Canada and the Canadian Coast Guard. For Bell, it represents the 400th Bell 429 helicopter delivered, and for the Coast Guard, the completion of its light helicopter renewal program launched in 2014. These helicopters provide support to ships engaged in critical maritime work including Aids to navigation, environmental response, icebreaking operations, and in support of search and rescue operations.

## DRONE RESEARCH WILL CONTINUE

Research currently being conducted at Embry-Riddle Aeronautical University's College of Aviation could play a

major role in expanding restrictions on small Unmanned Aircraft Systems or drones, being flown beyond the visual line of sight of their operators — marking an important milestone that would pave the way for advancements like drone delivery and urban air mobility. “The proposed system would serve as a



‘backup’ to the primary flight computer, in the case of an in-flight loss of communications or control,” said Robert Moore, lead graduate researcher on the project and first-year student in the Unmanned and Autonomous Systems Engineering master’s program.



## BOEING TO OPEN CONVERSION LINE IN BC

As global demand for freighters continues to soar, Boeing has announced plans to add three conversion lines for the 737-800BCF across North America and Europe. In 2022, the company will open one conversion line at Boeing's London Gatwick Maintenance, Repair & Overhaul (MRO) facility, its state-of-the-art hangar in the United Kingdom; and two conversion lines in 2023 at KF Aerospace MRO in Kelowna, British Columbia, Canada. Boeing forecasts 1,720 freighter conversions will be needed over the next 20 years to meet demand. ■

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# The Viking Solution



Top and Above: The CL-515 First Responder at work.

*Firefighting crews around this stressed planet will welcome the versatile CL-515.*

**R**AMPAGING BUSH FIRES in Australia, the lingering heat dome that covered much of Canada this summer, historic floods in Europe and the United States and dangerously high temperatures in Asia and India are just some of the more recent incidents the international science community points to as effects of Climate Change. The abilities of First Responders to cope with one natural disaster after another have been stretched to the max. This is why many disaster-action crews will welcome the pending arrival of Viking Air's CL-515 First Responder, which is a new production multi-mission amphibian and purpose-built aerial firefighting aircraft.



**Building on the Canadair CL-415 platform, the CL-515 First Responder is the next generation of purpose-built aerial firefighter.**

The CL-515 First Responder is a further development of the design of the well-known amphibious aircraft Canadair CL-215 and CL-415. In 2016, Sidney, BC-based Viking Air acquired a program for the production of amphibious aircraft (turboprop CL-415 and its turboprop version CL-215T), including their type certificates and after-sales service, from the Canadian company Bombardier. The CL-215 and CL-415 aircraft are mainly used as firefighters, which will be the main application of the versatile CL-515.

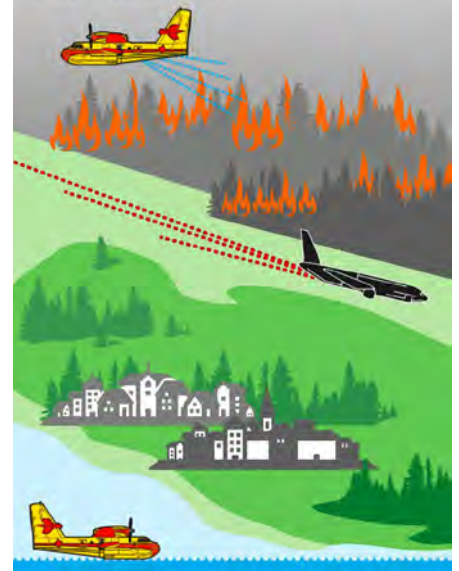
The Canadair CL-415 amphibious aircraft was manufactured by Bombar-

dier Aerospace (which absorbed Canadair in 1986) from 1993 to 2015, with a total of 95 aircraft built. In recent years, the production of CL-415 at Bombardier was carried out almost piece by piece and was reportedly unprofitable for the company. In 2012, Bombardier did not deliver a single CL-415 aircraft, and in 2013, 2014 and 2015, it delivered two aircraft a year. As a result, in December 2015, Bombardier announced the suspension of production of the CL-415 until it received new orders and closed the aircraft data acquisition centre, and then fully sold the program for their release to Viking Air.

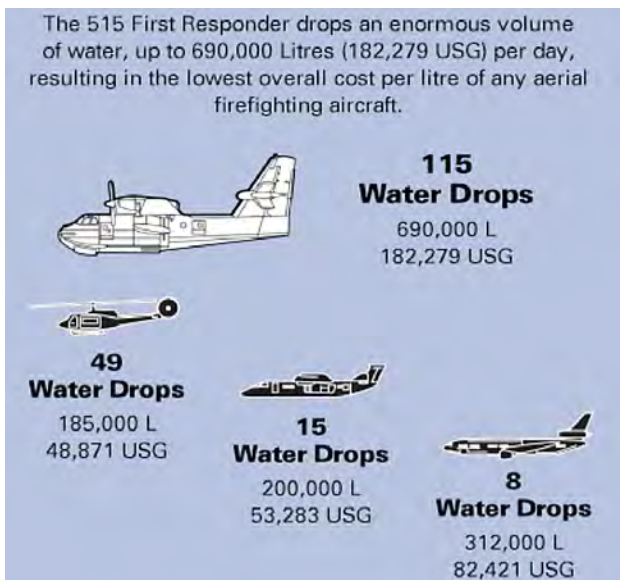
Viking's initial plan was to take over

**Complementary in Nature**

Canadair is a great addition to organizations that have land-based firefighting fleets, providing complementary support for larger fires. It's ability to travel far distances and attack the fire while other assets are repositioned, ensures initial attack effectiveness. Once in position, land-based aircraft can drop lines of retardant, while Canadair aircraft and helicopters can focus on attacking sections of the fire head-on. Further, with its low altitude drops and high drop accuracy, it can suppress the fires that have broken through retardant lines.



**The CL-515 First Responder is capable of dropping enormous amounts of foam injected fire retardant on a continual basis.**



## MOST EFFICIENT AERIAL FIREFIGHTER



Left: The CL-515 boasts better aerial firefighting productivity, by up to 15 percent.

the program that converted CL-215s into CL-215Ts and improve it. This idea was quickly abandoned in favour of developing the CL-415. Therefore, it comprised an engine refit with the piston engines replaced by turboprops (Pratt & Whitney PW123AFs), the installation of winglets and finlets, and took the CL-415's improved capabilities in terms of higher operating weights, a double-door drop system, and an increased capacity firebombing system with retardant and foaming agent capacities.

Building on the Canadair CL-415 platform, the CL-515 First Responder is the next generation of purpose-built aerial firefighter and multi-role amphibious aircraft. Through the incorporation of new technology and the integration of the Collins Pro Line Fusion digital avionics suite, the CL-515 provides operators with entirely upgraded situational awareness. The FAR/Part 25-certified Collins Pro Line Fusion avionics suite addresses current and future regulatory requirements and is a scalable software-based system while anticipating future expansion. The core avionics configuration features flight director, flight man-

agement system (FMS) coupled with SBAS-GPS and LPV capability, terrain awareness warning system (TAWS), ADS-B out, synthetic vision, crew alerting system display indicators, and a multi-functional keyboard panel with dual cursor controls.

The multi-mission CL-515 First Responder addresses obsolescence issues associated with the older CL-415 airframe and systems, while improving maintainability through its use of modernized materials and airframe systems enhancements. Its expanded 7,000-litre tank capacity (up from the current 6,000 litres on the CL-415) and ability to refill in 14 seconds from water sources in close proximity to wildfires allows the CL-515 to drop enormous amounts of foam-injected fire retardant on a continuous basis—up to 690,000 litres of water per day.

Requiring no runway to reload, the CL-515 is able to refill with water while flying as well as mix retardant in flight meaning it is able to make more frequent water-bombing missions, particularly in remote or difficult to access areas. All this translates into better aerial firefight-

ing productivity, by up to 15 percent.

The CL-415's twin Pratt & Whitney Canada PW123AF turboprop engines will also power the CL-515 First Responder, which is the only aerial firefighter and multi-mission amphibious aircraft built and supported by an OEM. The CL program which transferred CL-215, CL-215T, and CL-415 Type Certificates and



**Above: The CL-415 is the First Responder's predecessor.**

**Right: The CL-515 integrates a Collins Pro Line Fusion digital avionics suite.**



Work on the Canadair CL-515 program dates back to 2016 when Viking Air first acquired type certificates from Bombardier.



product support responsibility for the fleet of Canadair aerial firefighters also comes with complete full factory warranty, established world-class product support network, and factory-endorsed full motion level D flight simulator.

To facilitate the launch of the CL-515 amphibious aircraft manufacturing program, Viking applied to Canada's Strategic Innovation Fund (SIF) from the federal Department of Innovation, Science and Economic Development (ISED) for funding support. The SIF funding would be invested between British Columbia and Alberta's aerospace manufacturing, supply chain, academic, and skills training sectors, and provide program benefits to both provinces in Western Canada.

As the project moves ahead, Viking anticipates the first CL-515 will fly in 2024 and estimates production of four to five



CL-515 First Responder at work.

aircraft annually for 10 years. The company—which is a subsidiary of Longview Aviation Capital—recently signed a deal that sees the first six units off the assembly line headed to Indonesia.

Longview says it has had positive discussions with numerous potential customers from around the world since acquiring the Type Certificates for the Canadair amphibious aircraft program, including both governments and pri-

vate operators. An example of the global interest is Greece, which in June announced it will procure eight new Canadair aircraft (replacing CL-215s), and upgrade CL-415s to CL-515s. The aircraft are part of Greece's fire protection program budgeted at 1.76 billion euros that will replace old water-dropping airplanes and allow the hire of 3,000 permanent firefighters.

Viking says the aircraft is specifically



The multi-mission CL-515 First Responder addresses obsolescence issues associated with the older CL-415 airframe and systems.

designed for tight maneuvering at low airspeeds over challenging mountainous terrain and is capable of operating in difficult weather conditions and low altitudes. A low dropping altitude is vital to suppress wild fires. For safety reasons larger aircraft are required to fly at higher altitudes while dropping retardant. Because of its high lift wing and its turbo-prop engines that provide instant thrust, Canadair can safely attack the fire at lower altitude and lower speed

thus offering the highest precision. Its drop pattern and high-water density is such that it can suppress the fire faster, leaving the ground crew to safely extinguish hot spots.

The design's larger rear door could be useful when used as a cargo plane and for launching a small rescue boat when serving in a search and rescue role. Modern scanner pods could be hung under each wing, enhancing their ability to find those lost at sea in the search and

rescue role, or to identify smugglers, unregistered fishers, or vessels leaking pollutants in a maritime surveillance role. It can also be equipped with options such as a spray boom for insect control or oil spill dispersant.

During these wildly unpredictable years when Climate Change is at the front and centre of all global debates, the demand for versatile multi-purpose platforms such as the CL-515 will undoubtedly continue to grow. ■



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# Landing on Hard Blue Ice

By Carlos Mirpuri



Lisbon, Portugal-based Hi Fly made history this November for the first-ever landing of an Airbus A340 in Antarctica.

**T**HE CREW ASSEMBLED and departed the hotel in Cape Town at 5AM local. Transportation took 30 minutes to CPT airport. Processing through the airport took another 30 minutes and we arrived at the aircraft at 6AM, with two hours left to our STD (Scheduled Time of Departure). Engineers and Ground Operations staff had left the hotel an hour earlier, so when we arrived at the aircraft refueling was completed and cargo loading was underway.

We expected 23 passengers, all staff from the customer, and as this was the first flight of the season most of the ground sup-

port equipment we would need in WFR (Wolf's Fang Runway, Antarctica) was actually in our cargo compartments. The first two sorties are solely for the purpose of setting up the operation down in Antarctica, ahead of the 2021/2022 summer season.

The 2,500 nautical miles between CPT and WFR would take us five hours 10 minutes on the way down, and five hours 20 minutes on the return. As this was the very first flight, with limited support on the ground, we planned for a three-hour turnaround time in WFR.

As always we started with a crew briefing on arrival at the



*Lisbon, Portugal-based Hi Fly made history this November for the first-ever landing of an Airbus A340 in Antarctica. This is the story of their 2,500-nautical mile flight to one of the most forbidding environments on the planet.*



aircraft. This was not just another flight, there are specifics related to this very remote operation we were conducting, the harsh environment we would face, and the need to ensure proper protective clothing would be on board. While cabin checks and catering loading were undergoing, my crew and I inspected the aircraft, checking its systems, loading the route into the navigation computers, and briefing the details of our departure. Passengers arrived 20 minutes before STD. It was exactly 8AM local time when we pushed back from the gate.

We lined up on runway 01 but had to pause for a moment

before launching; I spotted intense bird activity over the runway and asked the tower to roll the truck in charge of scaring them out, and eventually they moved out of the way. The last thing we wanted was a bird strike and potential engine damage on any flight. At 8:19AM we were finally airborne. A beautiful morning in Cape Town with magnificent views.

We carried 77 tons of fuel: 9H-SOL is an A340-313HGW (High Gross Weight) with a maximum take-off weight of 275 tons. Its four engines redundancy and very long range make it the ideal airplane for this type of mission.

The route to WFR was almost direct. After complying with the instrument departure procedure clearance was issued by CPT air traffic control. Soon we were handed over to Johannesburg oceanic through CPDLC / ADS, avoiding therefore the tiring and noisy long range HF communication that dates back to the 1950s. Digital communication is the norm these days in



most air navigation regions. We only lost data link connection 250 miles before WFR, but at around 180 miles from destination we could reach WFR via VHF.

Also a plotting chart was used to ensure we were not drifting off course. During the route we received via ACARS (another digital system of communication), frequent weather reports from WFR passed to us through our operations in Lisbon. The guys at WFR have an Iridium Satphone, the only means to communicate from that part of the globe. Forecasters do a great job, and we only launch to Antarctica when the weather meets our



**Above: Working the runway requires special equipment.**

**Right: MBW Hifly Antarctica sits in the brightness of sunshine and reflecting snow and ice.**

**Below: Recording Airbus A340 history.**





dispatch requirements. But a forecast is a forecast, and when you fly to the end of the world you need frequent assurance that the actual weather meets the forecast.

Weather was looking great, and closing to the top of our descent they were also supposed to pass us runway friction reports. This is measured by a properly equipped car that covers the length of the runway taking measurements every 500 metres. The frictions were also all above what we considered as minimum, so we started our descent.

Carrying fuel to cover both ways means we would be land-

ing at maximum landing weight of 190 tons. Add the fact that we were operating toward an airfield carved out of blue glacial ice and one easily understands that the first-ever Airbus A340 landing there attracted a lot of attention and anxiety. But we were confident we had done our homework properly.

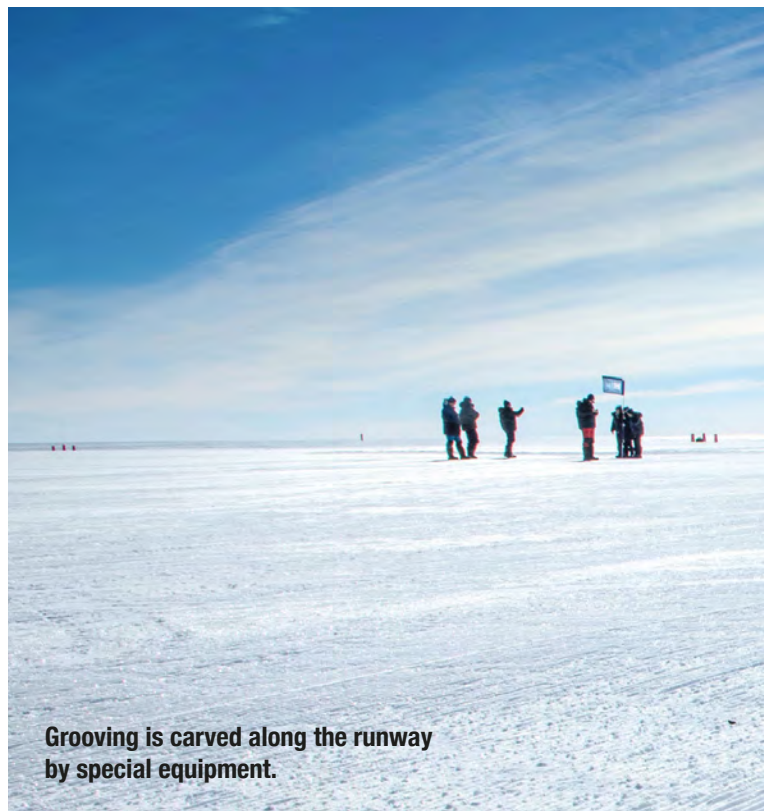
Even a visit to WFR on a business jet carrying scientists was performed by Captain Antonios Efthymiou two days before our flight. This is considered a C category airport, and except for this first flight all crew will have observed a flight from the cockpit before they operate.

A blue glacial ice runway is hard, and can stand a heavy airplane. Its depth is 1.4 kilometres of hard air-free ice. The next important thing is that the cooler it is the better. Grooving is carved along the runway by special equipment, and after cleaning and carving there was adequate braking coefficient; the runway being 3,000 metres long—landing and stopping an A340 that heavy on that airfield wouldn't be a problem. At least not on paper, as never before had an A340 landed on blue glacial ice.

The reflection was tremendous, and proper eyewear helped us adjust our eyes between the outside view and the instrumentation. The non-flying pilot had an important role in making the usual callouts, plus extra, especially in the late stages of the approach.

We finally spotted the runway alignment and started configuring early, selecting flaps and landing gear to be fully stabilized 10 miles before the runway. There is also no visual glide slope guidance and the blending of the runway with the surrounding terrain and the immense white desert around makes height judgment challenging, to say the least.

The altimeters in cold weather also suffer from temperature errors, and need adjustments. All this was accounted for. We flew a textbook approach to an uneventful landing, and the aircraft performed exactly as planned. When we reached



Grooving is carved along the runway by special equipment.

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# AirMaintenance UPDATE

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Challenges of flights to Antarctic include no visual glide slope guidance and the blending of the runway with the surrounding terrain.



taxi speed I could hear a round of applause from the cabin. We were joyful. After all we were writing history.

The turnaround time was much less than the planned three hours. Our flight ops and ground ops did an impeccable job and so did our engineers. Equipped for extreme cold we ventured outside, greeted people, and observed details of the runway for greater confidence in the system put in place. All looks good to launch repeatable operations to and from Antarctica.

The aircraft will be used this season to fly a small number of tourists alongside scientists and essential cargo to the white continent.

Take-off was uneventful, and so was the returning flight. Customer was happy, we were happy. All goals for this first flight were met. ■

*(Carlos Mirpuri was Flight HFM801/802 Commander)*

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**Dec-Jan 2013**

AMU Chronicles  
Aviation Terms – Part 2  
HPF Explained  
Human Factors  
The Regs

**Upcoming Events**

- 5 **Wed**
- 11 **Tue** Middle East Business Aviation Summit @ Al Maktoum International Airport
- 16 **Sat** Pacific AME 30th Year Celebration

**Features**

**AMU Chronicles**

Not So Boring – Binoculars A large part of our job maintaining aircraft is the never-ending task [...]

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**News Update:**

Victor Aerospace Hosts PTEA Victor Aerospace Hosted the PTEA Customer Day Event at Facility in Johannesburg, South Africa For Immediate Release - [...]

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# Pacific AME Association



## Corporate Members

Our corporate members are important to us. From supporting / sponsoring the Association's workshops to donating boardrooms for our meetings and training, we appreciate their hard work and dedication to furthering the industry.

## Corporate benefits

1. Work shop and meetings annually on topics of interest to AMEs.
2. Opportunity to meet and exchange ideas at our functions.
3. A representative of a corporate member has the right to attend and

speaking at all membership meetings, but is not entitled to vote or to hold office in the Association.

4. Corporate Members are entitled to advertise that they are members of AME Association.
5. Opportunity for employment networking at our workshops.
6. Free advertising of your company on our website.
7. Free job postings on our website.
8. Two corporate members able to attend our workshops.

[www.pamea.ca](http://www.pamea.ca)

# Western AME Association



## Purpose and Objectives

The purpose and objectives of this association are to:

1. Promote and protect the profession of the Aircraft Maintenance Engineer.
2. Develop, maintain and improve representation and consultation with regulatory bodies that affect or may affect the profession of the Aircraft Maintenance Engineer.
3. Represent the views and objectives of the membership of the Association.
4. Promote and develop the knowledge, skill and proficiency of the pro-

fession of the Aircraft Maintenance Engineer through education, publication and research.

5. Cooperate and associate with groups, associations and organizations on matters of mutual interest.
6. Promote honourable practices among the membership and between persons in the aviation industry.

The Association is non-union, non-sectarian and non-partisan.

[www.wamea.com](http://www.wamea.com)



# Central AME Association



## Association Objectives

1. To promote and protect the profession of the Aircraft Maintenance Engineer.
2. Develop, maintain and improve representation and consultation with regulatory bodies which affect the profession of the Aircraft Maintenance Engineer.
3. To represent the views and objectives of the membership of the association.
4. Promote and develop the knowledge, skill and proficiency of AMEs through education, publications and research.
5. Cooperate and associate with groups, associations and organization on matters of mutual interest.

6. To promote honourable practices among the membership and between persons in the aviation industry.

## Save the Date: annual Aviation Symposium

CAMEA will host the 26th Annual Aviation Symposium on March 3-4, 2022. The venue for this event is Canad Inns Polo Park in Winnipeg, Manitoba.

[www.camea.ca](http://www.camea.ca)





# AME Association of Ontario

c/o Skyservice F.B.O. Inc., PO Box 160, Mississauga, Ontario L5P 1B1  
tel: 1-905-673-5681 fax: 1-905-673-5681  
email: association@ame-ont.com website: www.ame-ont.com



## Ontario Aircraft Maintenance Conference

Approximately 300 people attended this year's Ontario Aircraft Maintenance Conference. The trade show and workshops were held Thursday and Friday October 28 and 29. Fifty exhibitor booths had been set up with vendors and representatives from a cross section of the many sectors of the aviation community. Twenty eight professional development seminars were held as well as a very exciting skills challenge competition.

This is the first year for a different location, the Delta Marriott Airport Hotel and Conference Center on Dixon Road. COVID rules were in place with all participants having to provide proof of immunization, masks were required and contact tracing was in force. Fortunately we did not have to worry about capacity limits as the Ontario government had lifted that restriction earlier in the week and we were allowed last minute and walk-in attendees.

The general atmosphere was upbeat with positive attitudes toward a return to in-person meetings and the resumption of activities. A "social" was held at the end of the day on Thursday. Beverages and snacks were served and everyone was happy to be able to mingle and catch up on the latest news.

The association took advantage of this gathering to award the Claire Leavens award to our hard-working membership chair, Robert Horne.

## 2021 AME Skills Challenge Wrap-Up

The third annual AME Skills Challenge was held on Thursday, October 28th at the AME Association of Ontario's Annual Aircraft Maintenance Conference. Seven Teams, each consisting of three AMEs from

aviation organizations or companies and one current ATO College student, competed in seven events over the day.

Elevate Aviation's "Just Plane Gorgeous" team won the \$2,000 first place prize. Winning the \$1,000 second place prize was the team from AAR Windsor. Third place, winning \$500, went to Elevate Aviation's "The Sisterhood of the Travelling Wrenches" team. In addition, the Best Team Uniform/Outfit award went to Elevate Aviation's "The Sisterhood of the Travelling Wrenches" team and Best Team Spirit went to Elevate Aviation's "Just Plane Gorgeous" team.

Nordia King of Centennial College was the Student Competitor with highest average in two events. She was awarded with a seat on a FlightPath International Type Rating Aircraft Maintenance Course, valued at approximately \$7,000!

The competitor with the highest score on the Composite Structure Repair Event received a seat on Advanced Composites Training's "Information on Composites Technologies" course, valued at approximately \$1,000. This prize was won by Hannah D. of the "Just Plane Gorgeous" team.

Thanks to generous support of the aviation industry. This is a great example of how industry and the Associations can come together to highlight the Skills that AMEs bring to the aviation world. Following their success at the competition, Elevate Aviation has announced that they will be entering a team in the Aerospace Maintenance Council's Aerospace Competition in Dallas, Texas scheduled for April 25-28, 2022.

Submitted by **Stephen Farnworth**, for the Board of Directors  
[www.ame-ont.com](http://www.ame-ont.com)

# Atlantic AME Association



## President's Message

By **Bob Pardy**

AMEC/TEAC, in cooperation with CCAA, are conducting a survey to identify the gaps in the current CARs 566 training requirement and the actual training required by the industry as it relates to the new generation aircraft that are being introduced into service. I would ask that you take some time to take part in the survey to give us your views toward your basic training and what you feel was missing. The survey can be found at <https://www.surveymonkey.com/r/AMEGAPSurvey>.

The planning is under way for our next Atlantic Region Aircraft Maintenance Conference (ARAMC) which is scheduled to take place at the Westin Hotel in Halifax, NS, in April 2022. I hope you will all mark this in your calendars and plan to attend this first in person conference in three years. Hope to see you there.

[www.atlanticame.com](http://www.atlanticame.com)

# Central Ohio PAMA



## FAA Virtual Airport Design Challenge Takes Off

The Federal Aviation Administration Aviation and Space Education Airport Design Challenge registration opened November 1, 2021. This annual competition is an opportunity for K-12 students studying science, technology, engineering and mathematics (STEM) subjects to meet aviation professionals and learn about the aerospace industry and STEM concepts and careers.

“The Airport Design Challenge is a perfect fit of science, technology, engineering and math which is so much a part of what we do at the FAA and so important to pass on to the next generation,” said FAA Administrator Steve Dickson.

The Airport Design Challenge helps students use the Microsoft game Minecraft to design virtual airports based on guidance from FAA aerospace and engineering experts.

Students will collaborate in small teams to learn about their local airports and to complete developmental tasks in Minecraft. During the five weeks of organized lesson plans, participants will cover topics ranging from airport layout, pavement and lighting to structures and

innovative growth. Program facilitators will use weekly knowledge-check quizzes and screen shots of students’ designs to assess progress and provide feedback.

“The one thing that I found most intriguing about this whole program, was that the Airport Design Challenge allows students of all ages to compete at a global level, while also being able to have fun and learn at the same time,” said Arjun Saini a lead on Team Aireos, which placed in the top three during last year’s Challenge.

Collaborative work between students, parents and facilitators will focus on applying STEM-based knowledge in math, engineering and career development. While participants are encouraged to form teams of up to five members, they may also participate individually.

The virtual event is open to both U.S. and international students. Last year, approximately 800 students participated and many more are expected this year. The FAA Airport Design Challenge website has more information about the competition and how to register.

[www.copama.org](http://www.copama.org)

# SoCal PAMA Chapter



## Who We Are

The purpose of SoCal PAMA is to promote a high degree of professionalism among aviation maintenance personnel; to foster and improve methods, skills, learning, and achievement in the field of Aviation Maintenance; to conduct local meetings and seminars; to publish, distribute, and disseminate news, technical bulletins, journals, and other

appropriate publications dealing with the trade of Aviation Maintenance; to collaborate with other organizations in aviation in the queries of governmental agencies pertaining to maintenance rules and guidelines.

[www.socalpama.org](http://www.socalpama.org)



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# Desert Display



*The aircraft industry demonstrates its resilience and optimism at Dubai Airshow 2021*

**The 2021 version of the Dubai Airshow was the largest since the emergence of COVID 19.**

**T**HE DUBAI AIRSHOW 2021 staged in late November was officially the biggest edition of the event since it first began in 1989, with an incredible USD \$78 billion worth of deals announced during the week. The mega event welcomed more than 104,000 attendees and witnessed a 50 percent increase in trade visitors. The airshow was bigger than the pre-pandemic 2019 edition in terms of visitor numbers and deals announced. It was also a significant milestone for the defence and space sectors which saw a range of deals and agreements declared.

Dubai Airshow 2021 was packed with everything you would expect to see at a global airshow and more. The edition featured 20-plus country pavilions, 371 new exhibiting companies, 80-plus startups along with a stunning aircraft display of over 160 commercial, military, and private jets including the latest Boeing 777x, Bombardier's Global 7500 and many more. The event also hosted 387 senior military and civil delegations from 148 countries along with 50 hours of thought-leadership content across cargo, sustainability, air traffic management and aerial mobility presented by 250 industry speakers.

Some of the notable deals which took place during the event included Airbus who announced orders and commitments totalling 408 aircraft (269 firm orders and 139 commit-



ments). The agreements covered the full range of commercial aircraft families, including a first commitment for the A350F freighter derivative. Airbus launched its latest global market forecast outlining progressively shifting demand from fleet growth to accelerated retirement of older, less fuel-efficient aircraft resulting in a need for some 39,000 new-build passenger and freighter aircraft. Of these, 15,250 aircraft (around 40 percent) are for replacements.

On the opening day of the show alone, Indigo Partners portfolio airlines placed a firm order for 255 A321neo Family aircraft, including 29 XLR. This included Wizz Air ordering 102 aircraft (75 A321neo and 27 A321XLR); Frontier 91 aircraft (A321neo); Volaris 39 aircraft (A321neo) and JetSMART 23 aircraft (21 A321neo and 2 A321XLR).

Boeing announced an order of 72 of its 737 Max from new Indian airline Akasa Air. It also announced orders for 11 of its 737-800BCF cargo planes from aircraft leasing company Ice-lease, nine converted 767-300BCF freighters from DHL, and orders for two of its long-range 777F freighters from Emirates SkyCargo. Boeing received four orders of passenger planes and freighters from Air Tanzania and three of its widebody 777-300 passenger jets from UAE-based aviation services provider Sky One FZE.



**Top right: Onlookers view an A350 XWB Airbus, part of the flying display at Dubai Airshow 2021.**

**Main photo: An aerial view of the massive static display at Dubai Airshow 2021.**

**Above: Dubai Airshow 2021 hosted 387 senior military and civil delegations from 148 countries.**



**This photo and below: The Saudi Hawks of the Royal Saudi Airforce perform at the Dubai Airshow.**

**Right: Dubai Airshow 2021 featured 20-plus country pavilions and 371 new exhibiting companies.**



**Private jet concept with sundeck and dance floor showcased at Dubai Airshow.**



**The aerobatics demonstration team Al Fursan lit the skies above Dubai Airshow 2021.**



The United Arab Emirate’s Ministry of Defence signed AED 22.5 billion worth of contracts with European, American and Asian contractors and suppliers at the Airshow. The UAE Air Force and Air Defence (Afad) on the first day awarded a contract worth Dh11 billion to Abu Dhabi-based advanced technology firm Edge Group’s subsidiary GAL for the maintenance, repair and overhaul (MRO), and specialized support services for the UAE Airforce and Air Defence.

Tawazun Economic Council (Tawazun) and Airbus signed a Memorandum of Understanding (MoU) under which the latter will establish a wholly-owned facility in Abu Dhabi. The formation of the subsidiary is part of Tawazun’s efforts to attract and promote long-term partnerships with major companies in the defence, aviation and aerospace sector. Tawazun also signed a Euro 216.9 million deal with Aeroter to purchase 100 VRT500 helicopters.

Dubai Airshow and the UAE Space Agency signed a Mem-

orandum of Understanding on the second day of the event. The two parties will collaborate to further position Dubai Airshow as a key platform for companies and investors in the space sector. The partnership will support organizations looking to establish a presence at future editions of the event and will enable space companies to benefit from the participation, engagements, networking and agreements created at Dubai Airshow. The agreement will deliver an increased focus on the space industry for future editions of the event highlighting the continued growth and development of the international space sector.

“It has been a truly incredible Dubai Airshow,” said Timothy Hawes, Managing Director at Tarsus Middle East, organizers of Dubai Airshow 2021. The event has been a real testament to the resilience, robustness and adaptability of the aviation and aerospace industries to come back with such strength after the pandemic.



“We have seen an industry transition with significant levels of innovation, technological advancement and digital transformation right across the show with many exhibitors displaying brand new solutions.

“There has also been greater commitments towards sustainability and decarbonization, which is of critical importance across the globe. The attendance levels of global senior executives from across the industries has also never been higher than this year.

“USD 78 billion worth of deals truly shows that the industry has an exciting and prosperous future with partnerships and collaboration at its heart.” ■

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# Propeller Peril

*Hand-propping should be considered only a last option. The maneuver is risky and can turn tragic, as illustrated by this seaplane incident on British Columbia's west coast.*



**The Beaver was designed to operate in all seasons and the majority of weather conditions; a large proportion were also equipped with floats.**

**ON** 07 DECEMBER 2020, the pilot of the Wilderness Seaplanes Ltd. de Havilland DHC-2 Mk. I aircraft (registration C-FDSG, serial number 892) planned to transport 3 passengers from Port Hardy Water Aerodrome (CAW5), British Columbia (BC), to a local logging camp.

At approximately 0745, the pilot arrived on the dock to begin preparing the





**Above: DHC-2 Beaver on floats, operated by Kenmore Air. This image: Photo of the occurrence aircraft at the Port Hardy Water Aerodrome, taken 56 minutes after the occurrence, showing the position of the plank.**

aircraft for departure at 0830. The pilot turned the aircraft battery master switch on and the aircraft electrical system momentarily flickered, but it did not stay powered up. The pilot suspected the battery was dead and, per the company operations manual, he notified the dispatcher and the person responsible for maintenance (PRM).

A closed-circuit television camera from a nearby building, located approximately 140 metres south-southwest of the aircraft, recorded the pilot moving to the front of the aircraft at 0759. The propeller was manually rotated, causing the engine to momentarily fire and accelerate the propeller. The pilot was struck by the propeller and then fell into the water at 0759:35.

Between 0800 and 0806, the 3 passengers arrived at the CAW5 parking lot and unpacked their luggage. At 0813, one of the passengers walked down to the dock and found the pilot face down in the water. The passengers recovered the pilot from the water, contacted 911, and administered first aid with guidance from the 911 operator. An ambulance arrived at 0823 and transported the pilot to the hospital. The pilot died from his injuries 32 hours later.



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## WATER AERODROME INFORMATION

CAW5 is located 5 nautical miles west-northwest of the Port Hardy Airport (CYZT), BC, and is a registered water aerodrome for public use. The single dock has access to aviation fuel, fresh water, and electrical shore power. The aircraft was moored on the right side of the dock with a plank spanning the front of the floats. There were no other people or aircraft at the water aerodrome at the time of the occurrence.

## PILOT INFORMATION

The pilot had been employed by Wilderness Seaplanes Ltd. from June 2019 to October 2019 and then returned in November 2020. He held a commercial pilot licence - aeroplane with a valid Category 1 medical certificate and had accumulated 2853.2 total flight hours with approximately 1388.1 flight hours on the DHC-2 aircraft.

The pilot also held a Transport Canada (TC) aircraft maintenance engineer licence; however, he was not working for the company in this capacity, and was only authorized to perform elementary work on the occurrence aircraft.

## AIRCRAFT INFORMATION

The occurrence aircraft was manufactured by de Havilland Aircraft of Canada Ltd. in 1953 and was equipped with a Pratt & Whitney USA R-985-AN-14B engine and EDO 679-4930 floats. Records indicate the aircraft was equipped and maintained in accordance with existing regulations.

The aircraft ignition system is independent of the battery master switch and the battery system. The ignition system uses 2 magnetos that are coupled to the engine crankshaft and an ignition switch that is mounted in the cockpit. The rotary ignition switch has 4 positions: OFF (OFF for both magnetos), R (ON for the right magneto), L (ON for the left magneto), and BOTH (ON for both magnetos). Under normal operations, there are only 2 conditions that must be met for one or both of the magnetos to function:

**The engine crankshaft must be rotating.**

**The ignition switch must be in one of the ON positions.**

When the ignition switch is in one of the ON positions, the engine crankshaft rotation and, consequently, the magneto rotation enable the magneto(s) to generate a high voltage and create the spark required for ignition. Therefore, the engine can be started with manual rotation of the propeller regardless of the position of the battery master switch or the charge of the battery.

## AIRCRAFT EXAMINATION

Approximately 45 minutes after the occurrence, the PRM examined the aircraft and found the battery master switch in the



Flight and ground crews are reminded to exercise extreme caution while working in close proximity to aircraft propellers.

OFF position and the aircraft engine controls configured for a normal engine start, as outlined by the airplane flight manual (AFM): the throttle lever was slightly open, the fuel mixture lever was in the full forward (rich) position, and the ignition switch was in the ON position for both magnetos. The investigation could not determine the exact time at which the pilot configured the engine controls for start.

**During this examination, the PRM also observed the following:**

- (i) The control column and the handwheel were locked by the left-hand seat belt as outlined in the AFM.
- (ii) The engine cover had been removed and was lying on the dock.
- (iii) A glove was resting inside the front of the engine cowling at the 6 o'clock position.

The PRM function tested the battery master switch and found that when the battery master switch was turned on, the master relay for that circuit would not connect the battery to the aircraft electrical system to supply electrical power. The

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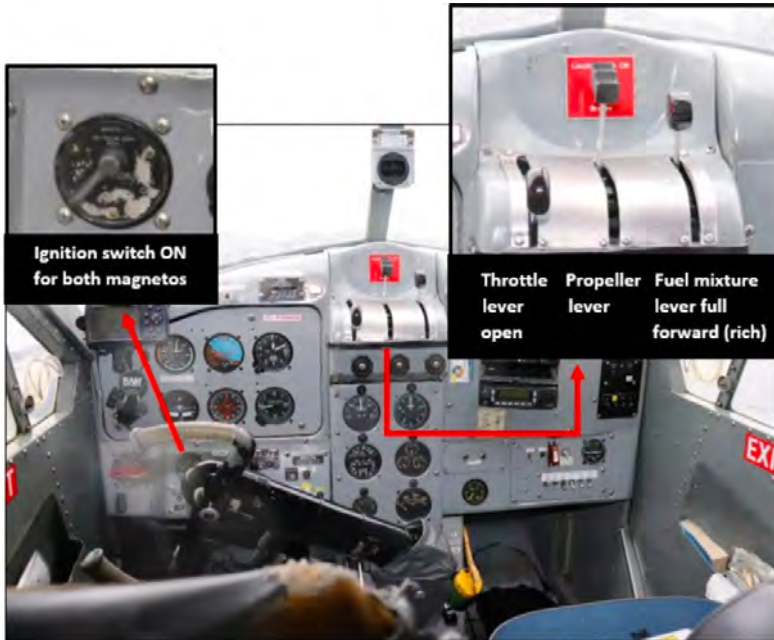
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The aircraft engine control positions as found by the person responsible for maintenance 45 minutes after the occurrence.

following day, maintenance replaced the relay and then tested the aircraft electrical system, including the battery master switch and the battery, with satisfactory results.

## PROPELLER SAFETY

During the daily inspection of the occurrence aircraft, the pilot had to check the propeller for water damage, per the company standard operating procedures (SOPs), but the procedure does not define the steps or the techniques used to complete the inspection. The AFM for the aircraft describes 2 cases in which the manual rotation of the propeller is warranted:

- (i) to ensure there is no hydraulic lock in the cylinders from excess oil; and
- (ii) to clear excess fuel from the engine if over-primed.

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The Beaver has been primarily operated as a bush plane and has been used for a wide variety of utility roles, such as cargo and passenger hauling.



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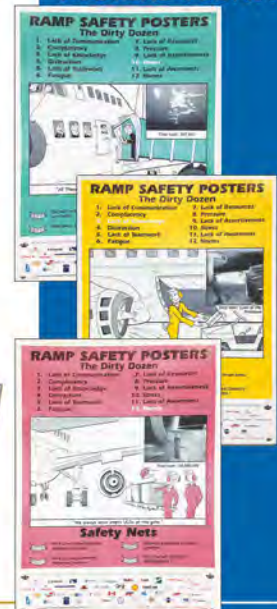
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**Left: The DHC-2 Beaver's single yoke can be handed over to the co-pilot, in flight**

**The de Havilland Canada DHC-2 Beaver is a single-engined high-wing propeller-driven short takeoff and landing aircraft developed and manufactured by de Havilland Canada**



In both cases, the AFM indicates that all switches must be off and the mixture lever must be set to idle cut-off to prevent an unintentional start during propeller rotation. TC's Flight Training Manual and From the Ground Up also identify that the aircraft ignition (magneto) switches must be off during any inspection or hand movement of the propeller before starting the engine.

Hand propping, the procedure wherein an aircraft engine is intentionally started by rotating the propeller by hand, is the only time the engine controls are set to the start position while the propeller is manually rotated. The FAA Airplane Flying Handbook warns that "a spinning propeller can be lethal should it strike someone" and that hand propping should be the last option to start an aircraft. The handbook also says that "[i]t is critical that the procedure never be attempted alone."

In the case of a floatplane, TC's Flight Training Manual adds that the propeller must be rotated from behind with the person standing and bracing on the right-hand float. The company SOPs and the aircraft AFM do not have a hand-propping procedure for the occurrence aircraft.

In this occurrence, the pilot was standing on a plank in front of the aircraft when the propeller was manually rotated with the engine controls configured for start, but the video resolution from the closed-circuit television camera was in-

sufficient to enable the investigation to determine whether the propeller rotation was intentional (oil scavenging, inspection, or hand propping) or unintentional (pilot bracing due to a loss of footing or falling).

## **SAFETY ACTIONS TAKEN**

In response to this occurrence, Wilderness Seaplanes Ltd. now requires all staff at CAW5 to wear a PFD while working on the dock and to complete propeller safety training.

## **SAFETY MESSAGE**

If an aircraft propeller is manually rotated, operators and crews need to be aware that inadvertent engine ignition can occur, potentially causing fatal injuries. Flight and ground crews are reminded to exercise extreme caution while working in close proximity to aircraft propellers. ■

*(These were excerpts from the Transportation Safety Board of Canada's investigation into this occurrence. The Board authorized the release of this report on 16 June 2021. It was officially released on 25 June 2021.)*

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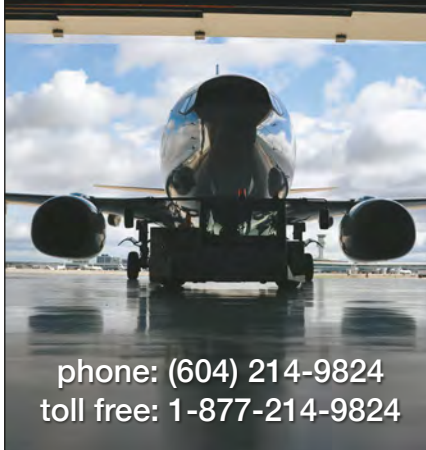
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## Band Together

*The aerospace industry is on high alert over potential 5G interference on radio altimeters.*



5G smartphones can interfere with aircraft altitude instruments.

**Aerospace Industries Association (AIA) is one of many industry voices calling for the delay of 5G deployment.**



**T**HE NATIONAL BUSINESS AVIATION ASSOCIATION has joined a coalition of organizations representing the world's leading aerospace manufacturers, airlines, pilots, and operators in calling for a delay to the deployment of 5G technologies to the C-band until the safety and efficiency of the National Airspace System is ensured.

In a letter to the National Economic Council, the coalition urges collaboration with the Federal Communications Commission and the Federal Aviation Administration to convene a joint industry working group to bring the aviation and telecommunications industries together to find a long-term solution that will protect the flying public by ensuring radio altimeters operate accurately while allowing 5G to roll out safely.

"We believe it is incumbent on the National Economic Council to work with the FCC and FAA to convene a joint industry working group and continue to delay the deployment of 5G technologies in this band until the safety and efficiency of the NAS is ensured. The goal of this working group would be to reach acceptable mitigations," they write. "Aviation will not be able to maintain the current level of public safety and economic activity without support from the Biden-Harris Administration and the implementation of mitigations by the cellular industry."

The letter comes on the heels of the FAA issuing a bul-

letin alerting manufacturers, operators, and pilots that action may be needed to address potential interference with radio altimeters caused by 5G systems. Radio altimeters are crucial systems used by every commercial aircraft and helicopter and many general aviation aircraft.

"NBAA remains committed to working with regulators and our industry partners to identify workable solutions for all parties," said Heidi Williams, NBAA senior director for air traffic services and infrastructure. "While high-speed data and communications hold many benefits, we must first and foremost ensure such systems do not compromise the safety and integrity of operations within our national airspace system."

Joining NBAA on the letter are the Aerospace Industries Association, Aerospace Vehicle Systems Institute, the Air Line Pilots Association International, the Airborne Public Safety Association, Airbus, the Aircraft Electronics Association, the Aircraft Owners & Pilots Association, Airlines for America, Aviation Spectrum Resources, Inc., the Boeing Company, the Cargo Airline Association, Collins Aerospace, the Experimental Aircraft Association, Free Flight Systems, the General Aviation Manufacturers Association, Garmin International, Inc., the Helicopter Association International, Honeywell International Inc., the International Air Transport Association, the National Air Carrier Association and the Regional Airline Association. ■

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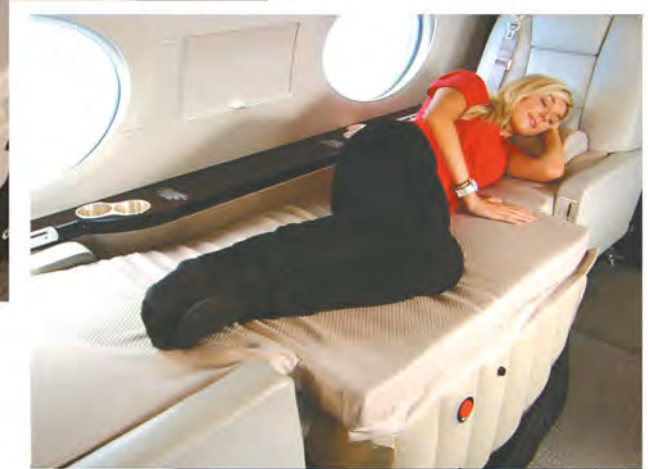
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