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AirMaintenance UPDATE

The Magazine for Aircraft Maintenance Professionals

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Forecast 2021-2041

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Growth Through Acquisition

HARTZELL GAME PLAN

GIVEN THE GENERAL STATE OF confusion and uncertainty wrought by the global pandemic, it would be easy to overlook how busy the Hartzell family of companies has been of late, growing its corporate footprint with numerous although relatively unheralded acquisitions. Example: repair station Quality Aircraft Accessories with locations in Tulsa, Oklahoma and Ft. Lauderdale, Florida was acquired in 2019, while Aerospace Welding Minneapolis and Aerospace Manufacturing of Egan, Minnesota, were acquired in the same period.

In mid-July, Hartzell announced it had purchased the assets of Tanis Aircraft Products, a manufacturer of engine preheat systems for fixed and rotary wing aircraft, also with facilities in Minnesota. The company said Tanis will become part of Hartzell Propeller's heated products, which now includes systems for propeller de-ice, piston engine preheat, turbine engine preheat, helicopter preheat, battery, avionics, and cabin preheat.

The Hartzell lineup is spread across five states, employs more than 550 people and has a company roster that now includes Hartzell Propeller, Hartzell Engine Technologies (which is headquartered in Montgomery, Alabama and was formed in 2010) and the aforementioned Aerospace Welding Minneapolis, Aerospace Manufacturing, and Quality Aircraft Accessories.

And in the midst of COVID-19, the Hartzell family of companies certified and launched over a dozen new products, said Hartzell Propeller president JJ Frigge.

Where too many firms in the aviation sector have fallen or are currently reeling from the impact of the COVID-19 crisis, Hartzell has chosen to boldly invest in the future and for that the 100-year-old company must be saluted. ■

— John Campbell, Editor

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Upcoming Events

Preparing for a Roaring Return of Business Aviation

Companies expect flight departments to be ready to go so when they walk through the door, we need to be there for them.

The resilience and adaptability of business aviation have helped the industry weather the challenges imposed by the COVID-19 pandemic. Now, as demand soars for business aviation services, the industry must use those same skills to ensure a smooth and safe transition back to a new "normal," said a panel of industry experts during a recent National Business Aviation Association webinar that focused on three topics to guide operators back to recovery: operating under current COVID restrictions, creating a safety health check and returning flight departments to full service.

"Fortunately, very few flight departments cut staff or aircraft, but their flight activity has been way down, and airplanes have been parked so now they have to get things up and running again," said webinar panel member Joe Moeggenberg, president of ARGUS International. "You must look at the human factors, operating metrics, outsourced services, strategic planning and, most importantly, the safety management system. Everything has to be revisited and it's going to take time," he added. "If you're going from very little flight activity to a lot of flight activity, you have to consider that the flight departments could be a little rusty, so it helps to look at the operations as a new startup." And flight departments need to be prepared, said fellow panel member Jad Donaldson, aviation director/chief pilot at Harley-Davidson Motor Company.

"Companies expect flight departments to be ready to go so when they walk through the door, we need to be there for them," noted Donaldson. "It's the job of business aviation to take care of this, and I think all the directors, chief pilots and frankly everybody that works in business aviation intuitively knows that we have to be ready. Whether you're busy right now or not, one day you will be."

The pandemic's prolonged impact on operations must be appreciated as flight departments ramp up, said Donaldson. "Our industry did an outstanding job through the pandemic and probably is proving itself really worthy of that as we're moving out of the slowdown into this more aggressive bounce back," he said. :We owe it to each other to make sure we uphold standards and safety as high as we absolutely can, so we must approach this at a slow pace, one that acknowledges that we're not at the proficiency level we used to be."

The following is a list of Canadian airshow events tentatively scheduled for the month of August. If you plan to attend please remember COVID-19 will ultimately determine whether or not the various events can stay on track.

August 6-8, 2021
Abbotsford International Airshow
Abbotsford British Columbia
www.rcaf-arc.forces.gc.ca

August 14-15, 2021
Vanderhoof International Airshow
Vanderhoof, British Columbia
www.vanderhoofairshow.ca

August 20-22, 2021
Edmonton Airshow
Edmonton, Alberta
www.edmontonairshow.com

August 21, 2021
Gander Airshow
Gander, Newfoundland
www.rcaf-arc.forces.gc.ca

August 22, 2021
Snowbirds over Conception Bay
St. John's, Newfoundland
www.rcaf-arc.forces.gc.ca

August 25, 2021
Lunenburg Airshow
Lunenburg, Nova Scotia
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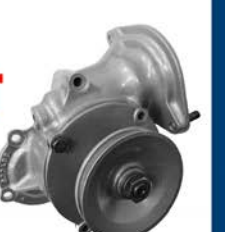

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Maintenance structure easily reconfigures

Aviation jet engine maintenance requires engineers to stand at many heights and positions to provide MRO. Many steel and aluminum maintenance structures have fixed height and widths and cannot be made wider or narrower without major rework. They have to be custom made for each project and are cumbersome to transport. Typically, they become redundant when the project comes to an end. One solution is the the LOBO System which can be easily reconfigured. By fitting a wheel kit, the system can be transported throughout the hangar. **www.lobosystems.com**

Vision system features thermal camera

Astronics Corporation announced that the United States, Canada, and EASA have approved its Max-Viz 1200 and 1400 enhanced vision systems for Airbus Helicopter EC130 B4 and T2 models. The systems are lightweight, solid-state, low power, and feature an uncooled thermal camera. The sensor image displays on any cockpit equipment that accepts NTSC or PAL/Analog RS-170 video signals, including multi-function displays and primary flight displays. It also shows well on standalone displays, including iPads and other tablets, depending on aircraft configurations. **www.Astronics.com**

Pocket light bends and turns red

The FLEXIT pocket light has a flexible neck that bends up to 180 degrees and an aluminum LED head with a housing that contains a center CREE spotlight and a ring of flood lights for wide-angle lighting. Use these flood and spot LEDs independently or at the same time to light the surrounding area and a focal point in the distance. The LED array even offers red LEDs. Red light doesn't dilate your pupils as much as white light, so use this mode to preserve your eyes natural night vision. **www.RiskRacing.com**

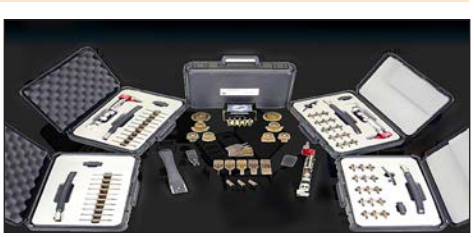
Kit includes soundproofing material

Skandia Incorporated has received final Federal Aviation Administration Supplemental Type Certificate approval of an acoustic soundproofing kit for all variants of the Dassault Falcon 900 business jet. The kit features soundproofing material choices which include baggage and floor damping, thermal acoustic insulation bags, overframe blanket and carpet pad. The company says that installation of the kit is simple and straightforward due to the intuitive kitting process of materials by Skandia as well as installation instructions and guidelines. **www.skandiainc.com**

Cabinets place tools in clear view

Snap-on Industrial's visual control cabinets place frequently used tools in clear view, giving technicians full sight lines of their tools for instant accountability and asset management. The cabinets are part of Snap-on's Level 5 tool control system and are available in both keyed or e-Lock keyless access for maximum security without the need to distribute keys; e-Lock that is programmable for up to 3,000 users, and can be networked together with LockView software. The cabinets can be mounted to walls, workbenches, carts or roll cabs. **www.snapon.com**

Maintenance tools keep their edge



EnduroSharp Torlon maintenance tools are non-metallic scraper tools designed to hold a superior edge but not damage composite structures like aluminum, fibreglass and carbon fibres. Constructed from a custom polyamidimide blend, they are durable, nonmetallic blades designed to remove elastomeric coatings, protective boots, tapes, sealants and adhesive residue and gap filler materials. **www.performanceplastics.com**

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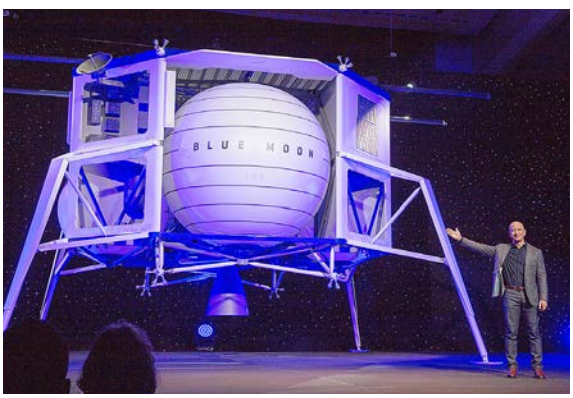
BEZOS BANKROLLS SMITHSONIAN AIR MUSEUM

Amazon founder Jeff Bezos has donated $200 million to the Smithsonian Institution to boost its National Air and Space Museum, the largest gift received by the



institution since its founding in 1846. The Smithsonian said $70 million of the money would support museum renovations. The other $130 million would go toward building a new education centre to promote innovation and explore careers in science, math and engineering. The donation came as Bezos prepared to fulfill his childhood dream of traveling to space on July 20 when his space exploration company Blue Origin was scheduled to make its first crewed flight.

WORK CONTINUES ON BETTER FUEL CELL

German clean aviation companies H2Fly and Deutsche Aircraft are joining forces to develop a hydrogen-fuel-cell-powered airliner capable of carrying 40 people, with a demonstration aircraft set to take its first flights in 2025. Deutsche Aircraft has acquired a Dornier 328, and signed an Memorandum of Understanding with H2Fly to work together on hydrogen fuel cell R&D targeted to power commercial regional

aircraft without the heavy weight and restricted range of lithium battery systems. The demonstrator plane will feature a 1,500-kW (2,012-hp) fuel cell, which the companies say will make it the most powerful hydrogen aircraft ever.

YAMAHA ENTERS SMALL AIRCRAFT BUSINESS

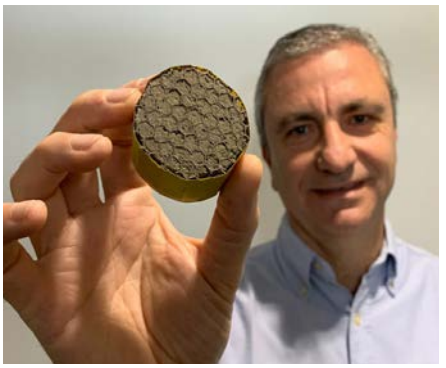
Yamaha Motor Company and ShinMaywa Industries have signed an agreement for the joint research of next-generation small aircraft. Under this agreement, Yamaha Motor will explore avenues for adapting its small-engine technologies to the aviation industry. ShinMaywa will provide its aircraft engineering technologies and expertise—garnered through the development of flying boats and various other aircraft—to designing concepts, constructing prototypes, conducting tests, verify autonomous technology and more for small aircraft. Both companies will use this joint research endeavour to explore possibilities for the commercialization of next-generation small aircraft.

BOEING AND NAVY MAKE REFUELING HISTORY

It was an aviation first this summer as the United States Navy and Boeing demonstrated air-to-air refueling using an unmanned aircraft. During a test flight June 4, Boeing's MQ-25 T1 successfully extended the hose and drogue from its U.S. Navy-issued aerial refueling store and safely transferred jet fuel to an F/A-18 Super Hornet. During the initial part of the flight, the F/A-18 test pilot flew in close formation behind MQ-25 – a maneuver that required as little as 20 feet of separation between the MQ-25 T1 air vehicle and the F/A-18 refueling probe.

NEW FEATHERLIGHT INSULATOR DAMPENS DECIBELS

An incredibly light new material that can reduce aircraft engine noise and improve passenger comfort has been developed at the University of Bath in the UK. It's described as a graphene oxide-polyvinyl alcohol aerogel that weighs just 2.1 kg per cubic metre, making it the lightest sound insulation ever manufactured. It could be used as insulation



within aircraft engines with almost no increase in overall weight while reducing the 105-decibel roar of a jet engine taking off to a sound closer to that of a hair-dryer. The aerogel's meringue-like structure is what accounts for its lightweight quality.

ALICE STILL ON TRACK FOR 2024

Eviation Aircraft has unveiled the design for its Alice all-electric aircraft, which is on track for first flight later this year. The production configuration is another step toward Alice's certification and entry by 2024. The nine-passenger, two-crew member aircraft produces no carbon emissions, significantly reduces noise, and costs a fraction of traditional aircraft to operate per flight hour the company says. The aircraft is powered by two magni650 electric propulsion units from magniX. The fly-by-wire system is made by Honeywell. The single-volume, high-energy density Alice battery system is made from current technologies.

AIRBUS A321XLR IS COMING TOGETHER

Less than two months after the start of structural assembly of the rear and centre fuselages in Germany, the first A321XLR has taken another significant production step with the delivery of the nose and front fuselages at Airbus's Saint-Nazaire facility in Western France. Six fuselage sections arrived per road convoy from STELIA Aerospace at Airbus Saint-Nazaire on July 1st. There they will be assembled including system equipment and flight test instruments installation in the third quarter 2021. "This is a key milestone for the A321XLR. We are on track to support the aircraft's entry into service by 2023" said Martin Schnoor, head of A321XLR Airframe Program.

HONDAJET NOW HAS ROOM FOR ONE MORE

Honda Aircraft Company has unveiled its freshly upgraded HondaJet Elite S with changes that include an increased maximum takeoff weight of 200 pounds, meaning the craft can now fly a factory-spec 138 miles further at a higher payload, or take an additional passenger during their typical mission. Additionally, the new avionics features of FAA DataComm and ACARS replace traditional voice commands with text-based messaging to improve the clarity and efficiency of communications. Combined with the newly introduced Advanced Steering Augmentation System (ASAS), the Elite S further reduces pilot workload. ■

Feature

Forecast 2021-2041

COVID-19 interrupted a decade of remarkable growth in the U.S. airline industry with the pandemic bringing a rapid end to the boom years. So, what happens next? A new report from the Federal Aviation Industry offers a forecast for the next 20 years. Here are some highlights, including a look at the future of fixed wing piston aircraft.

Opposite, top: Domestic passengers are forecast to return, on an annual basis, to 2019 levels in early 2024.

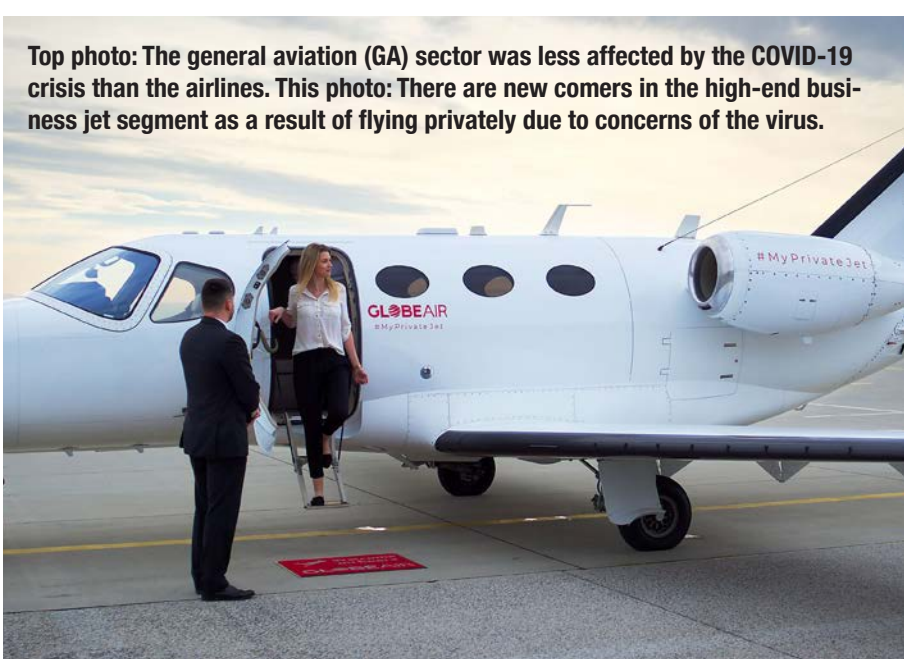
Opposite, bottom: Business modifications necessitated by the downturn will shape the industry for years to come.

U.S. airlines revamped their business models to minimize losses by lowering operating costs.

SINCE ITS DEREGULATION IN 1978, the U.S. commercial air carrier industry has been characterized by boom-to-bust cycles. The volatility that was associated with these cycles was thought by many to be a structural feature of an industry that was capital intensive but cash poor. However, the great recession of 2007-09 marked a fundamental change in the operations and finances of U.S. Airlines. Since the end of the recession in 2009, U.S. airlines revamped their business models to minimize losses by lowering operating costs, eliminating unprofitable routes, and grounding older, less fuel-efficient aircraft. To increase operating revenues, carriers initiated new services that customers were willing to purchase and started charging separately for services that were historically bundled in the price of a ticket.

The industry experienced an unprecedented period of consolidation with three major mergers in five years. The results of these efforts were impressive: 2019 marked the eleventh consecutive year of profitability for the U.S. airline industry. The outbreak of the COVID-19 pandemic in 2020, however, brought a rapid and cataclysmic end to those boom years. Airline activity and profitability tumbled almost overnight and without the financial and competitive strength built up during the boom, airlines would have faced even greater challenges. As it was, they were able to slash capacity and costs, and then, relying on their balance sheets, credit ratings and value inherent in their brands, to raise capital through borrowing and restructuring fleets allowing them to with-

Top photo: The general aviation (GA) sector was less affected by the COVID-19 crisis than the airlines. This photo: There are new comers in the high-end business jet segment as a result of flying privately due to concerns of the virus.



stand the period of losses into 2021. Although several small regional carriers ceased operations in 2020, no mainline carriers did.

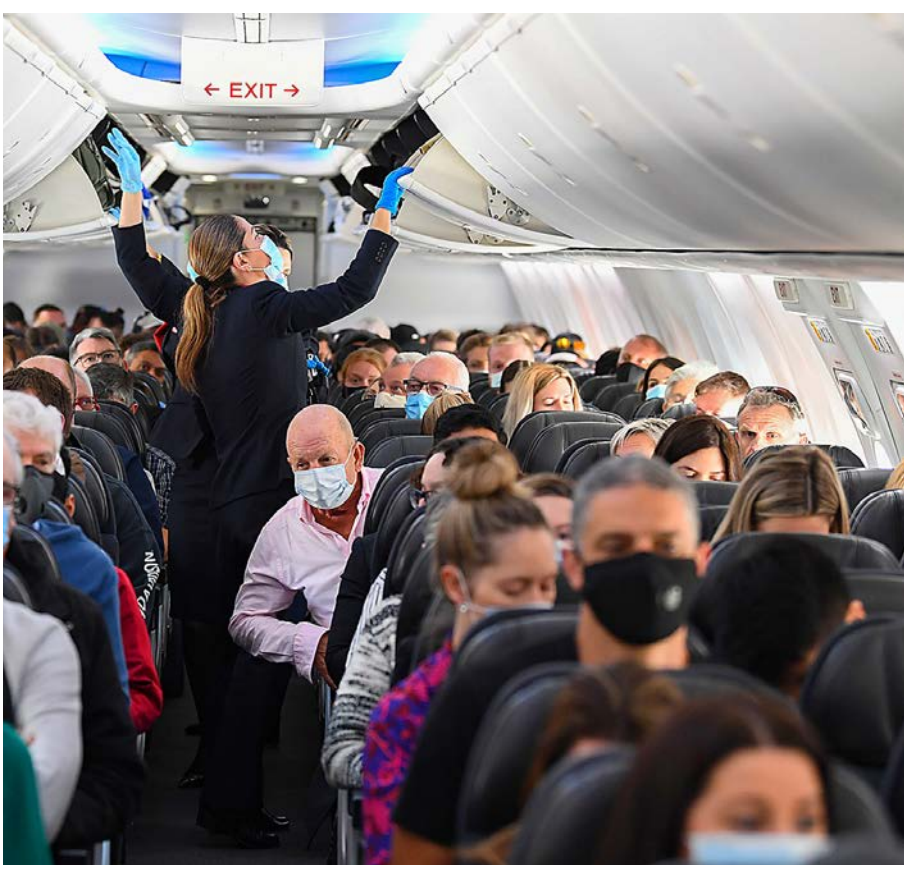
The business modifications necessitated by the downturn will shape the industry for years to come. Primarily, airlines will be smaller having retired aircraft and encouraged voluntary employee separations. Fleets, however, become younger and more fuel-efficient as retirements targeted the oldest and the least efficient aircraft. As airlines carry high levels of debt, capital spending and investment will be restrained which in turn holds back future growth. And even the unbundling of services took a small step backwards as carriers eliminated change fees for all but Basic Economy tickets.

In the medium-term, airlines will be focused on trying to foretell the recovery in demand and position themselves to meet it. To date, that demand recovery has been extremely uneven, driven by COVID-19 case counts, vaccinations, governmental restrictions and the degree of pent-up demand experienced by consumers. As expected, domestic leisure traffic has led the recovery and domestic business travel should begin to pick-up later in 2021. International activity will lag somewhat as individual country experience with the pandemic is varying so widely. As a result, airlines have initially shifted flights and routes to outdoor recreation areas but as the recovery progresses, their focus will gradually return to traditional markets and segments.

Long-term, the strengths and capabilities developed over the past decade will become evident again. There is confidence that U.S. airlines have finally transformed from a capital intensive, highly cyclical industry to an industry that can generate solid returns on capital and sustained profits. Fundamentally, over the long-term, aviation demand is driven by economic activity, and a growing U.S. and world economy provides the basis for aviation to grow.

The 2021 FAA forecast calls for U.S. carrier domestic passenger growth over the next 20 years to average 4.9 percent per year. This average, however, includes three double-digit growth years during the recovery from a very low base in 2021. Following the recovery period, trend rates resume with average growth through the end of the forecast of 2.3 percent. Domestic passengers are forecast to return, on an annual basis, to 2019 levels in early 2024. Oil prices averaged $43 per barrel in 2020 and are forecast to fall to $36 per barrel in 2021 before rising steadily to $94 by the end of the forecast period.

The FAA expects U.S. carrier profitability to remain under pressure for several years due to depressed demand and competitive fare pressures. As carriers return to levels of capacity consistent with their fixed costs, shed excess debt, and see rising yields, profitability



Top photo: The existing GA pilot population is flying piston aircraft in and out of small airports as well as larger airports that do not have as many commercial flights due to the pandemic. Below: The 2021 FAA forecast calls for U.S. carrier domestic passenger growth over the next 20 years to average 4.9 percent per year.

This photo: Airlines will become smaller firms having retired aircraft and encouraged voluntary employee separations. Bottom photo: The active GA fleet is forecast to increase slightly by 0.1 percent between 2021 and 2041, after recording a decline of 2.8 percent in 2020.

should gradually return. Over the long term, we see a competitive and profitable aviation industry characterized by increasing demand for air travel and airfares growing more slowly than overall inflation, reflecting growing U.S. and global economies.

The general aviation (GA) sector was less affected by the COVID-19 crisis than the airlines. There are new comers in the high-end business jet segment as a result of flying privately due to concerns of the virus. At the lower end new comers included student, private and commercial pilots, joining the existing GA pilot population. They are flying piston aircraft in and out of small airports as well as larger airports that do not have as many commercial flights due to the pandemic. The long-term outlook for general aviation thus is more promising than before, as growth at the high-end offsets continuing retirements at the traditional low end of the sector.

The active GA fleet is forecast to increase slightly by 0.1 percent between 2021 and 2041, after recording a decline of 2.8 percent in 2020 from the year before (active fleet shrinks 1 percent by 2041 from its 2019 level). Turbine aircraft, including rotorcraft is estimated to not experience a decline between 2019 and 2020, while the total of piston fleet is estimated to have decreased by 1.1 percent in 2020 from the previous year.

While steady growth in both GDP and corporate profits results in continued growth of the turbine and rotorcraft fleets, the largest segment of the fleet – fixed wing piston aircraft will continue to shrink over the forecast period.

Growth in turbine, rotorcraft, and experimental hours will more than offset a decline in fixed wing piston hours.

Against the marginally declining active GA fleet between 2019 and 2041, the number of GA hours flown is projected to increase by a total of 14.8 percent from 2019 to 2041 (an average of 0.6 percent per year), as growth in turbine, rotorcraft, and experimental hours more than offset a decline in fixed wing piston hours. When the period of 2021 to 2041 is compared, the total hours flown by the GA aircraft is forecast to increase by an average of 1.0 percent per year, after declining by 9.7 percent between 2019 and 2020, and recovering partially, with a growth of 4.9 percent in 2021 from the previous year.

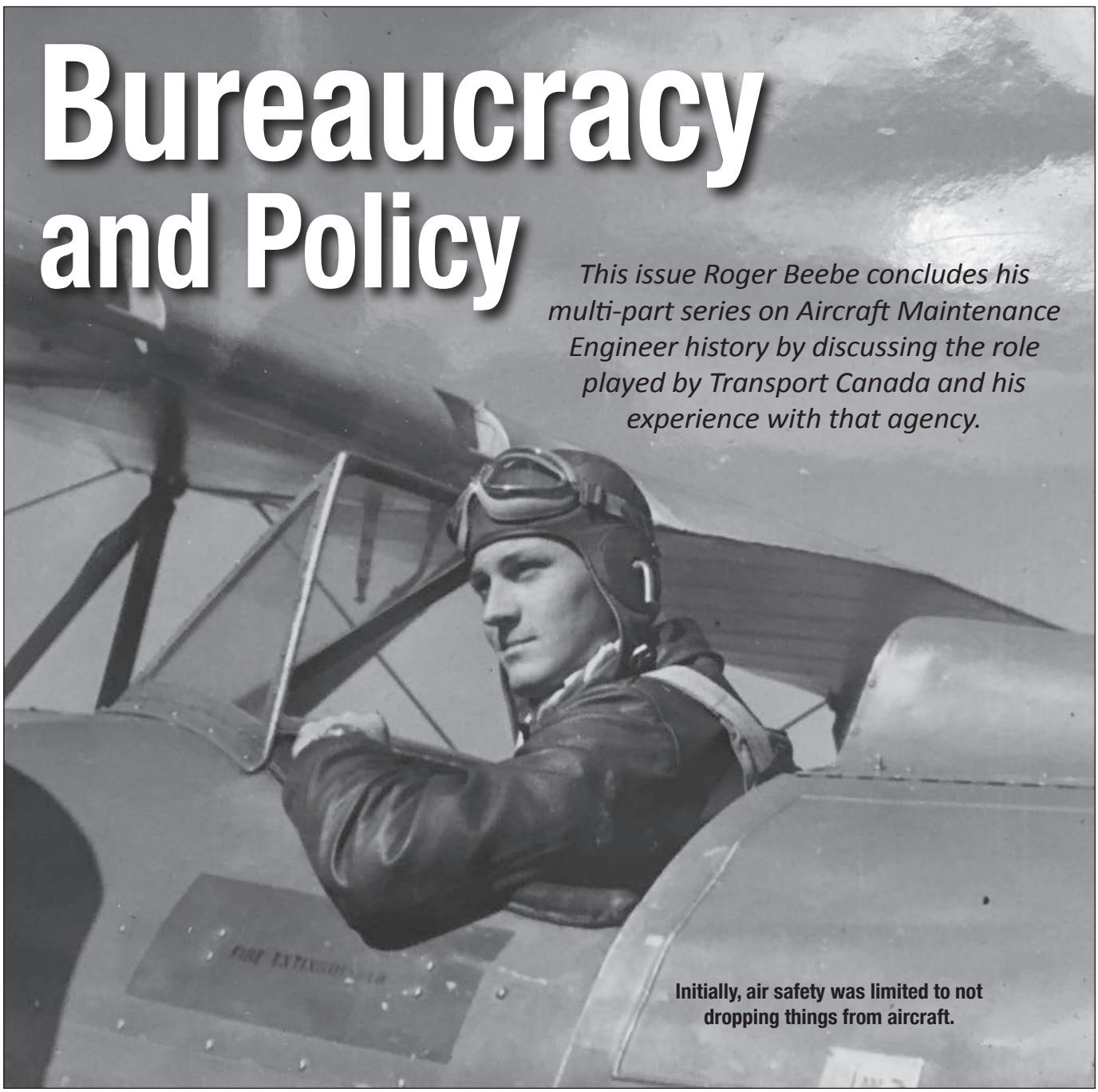
With the expected robust air travel demand growth between 2022 and 2026 due to the U.S. economy recovering from the impact of COVID, we expect increased activity growth that has the potential to increase controller workload. Operations at FAA and contract towers are forecast to grow 1.9 percent a year over the forecast period (FY2021-41) with commercial activity growing at approximately five times the rate of non-commercial (general aviation and military) activity.

The COVID recovery growth in U.S. airline activity is the primary driver. The U.S. commercial aviation sector has been hit by the pandemic much harder than the non-commercial sector. The pent-up demand is expected to drive the commercial operations back to the preCOVID level, hence leading to the stronger growth in the commercial sector. In particular, large and medium hubs will see much faster increases than small and non-hub airports, largely due to the commercial nature of their operations. ■

Part 4: By Roger Beebe

Bureaucracy and Policy

This issue Roger Beebe concludes his multi-part series on Aircraft Maintenance Engineer history by discussing the role played by Transport Canada and his experience with that agency.



Initially, air safety was limited to not dropping things from aircraft.

THE STORY OF AMEs and maintenance in Canada cannot really be told without setting out some of the history of what is known as Airworthiness in Canada. First I want to define what I mean by Airworthiness. …

When I joined the then Ministry of Transport in 1975 Airworthiness included design certification, manufacturing and maintenance. This somewhat followed the then current Air Force organizational structure. The American model in the Federal Aviation authority was somewhat different as Maintenance was in Flight standards, which is Flight operations and maintenance. These differences caused a lot of debate and some difficulty in arranging bilateral agreements and memorandums of understanding as we had to deal with two separate FAA branches in Washington. Most other aviation authorities tended to follow the FAA model. The reasoning was to better work with the FAA and to ensure maintenance and flight operations were tied close together as was the model in most air carriers. There was, however, a strong counter argu-

Above: Once the military became interested in aircraft they soon brought the usual military mind set and the need for standardization.

Right: AMEs can only maintain a level of safety originally designed in and manufactured.

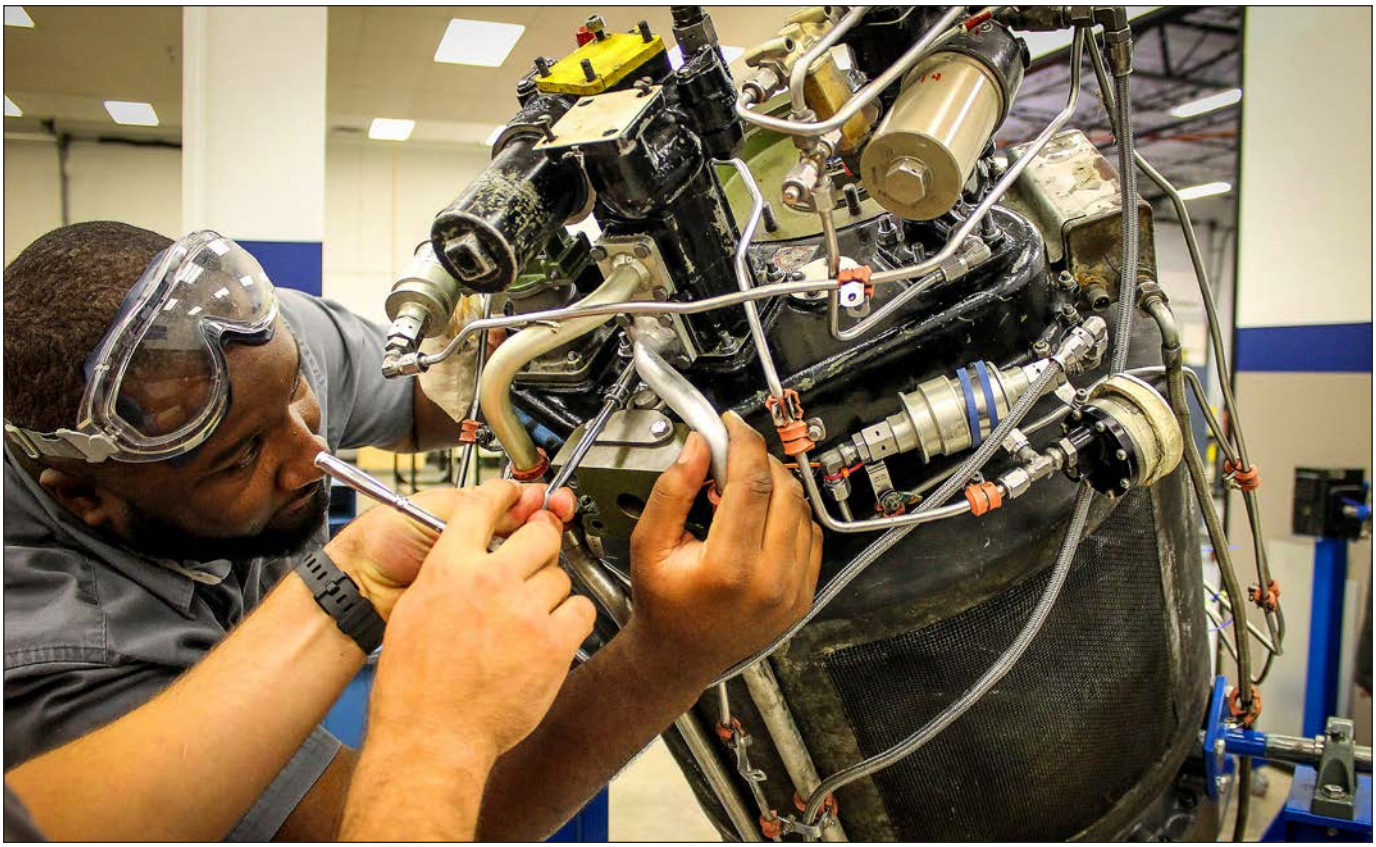
ment which supported the Canadian organizational structure. That is that the three elements — design, manufacturing, and maintenance — were mutually supportive. The advent of Continuing Airworthiness confuses the issue even further. Some defined Continuing Airworthiness as maintenance and design correction by Airworthiness Directives, and others simply as Maintenance.

By the early 1900s it was apparent that professional engineering and scientific discipline would have to be applied to flying machines if they were to become safe and reliable for civil and military purposes. It was not enough to be an enthusiastic fiddler and inventor. People soon needed to study and understand the theories of flight and flight control to say nothing of producing better, lighter and more powerful power plants. Once the early aircraft started to be produced as commercially available machines, the first air safety questions would arise. Initially they were limited to not dropping things from aircraft as the flying machines soon became known. Later local authorities started to think about the safety of the public on the ground, passengers, and the pilots as well. Once the military became interested in aircraft they soon brought the usual military mind set and the need for standardization, parts interchangeability, and repeatability of parts and processes. To achieve that, manufacturing processes must be consistent and standardized. This was a natural outcome from the early experimentation.

The pressures on politicians for standardization of engineering practices in other fields such as construction, railroads, and marine safety soon lead to governments passing legislation to establish engineering as a profession similar to law and medicine. In Canada this was done by the provincial governments under whose constitutional authority this fell. However, aviation was deemed to be a federal jurisdiction since it was evident very early on that aviation and the air did not respect provincial boundaries. However, the federal government did not create its own professional bodies, but followed and accepted by standard practice the provincial ones. You will find that today the standard practice is that the Professional Aeronautical Engineers in Transport Canada and elsewhere in the Federal public service must hold Provincial certification.

The Professional aeronautical engineering community was small in Canada in the 1920s and it seems most aircraft were certified in either the United Kingdom or the United States of America. Canada seems to have simply accepted them. This practice continued for many years until after a DC-8 accident near Toronto in the early 1970s. This accident soon lead to new emphasis on having enough Canadian aeronautical engineering skill and knowledge in Canada to evaluate Transport Category aircraft. Transport Canada Aircraft Certification would then make a finding as to whether those aircraft could be added to the Canadian civil register and thereby operate under the Canadian Flag.

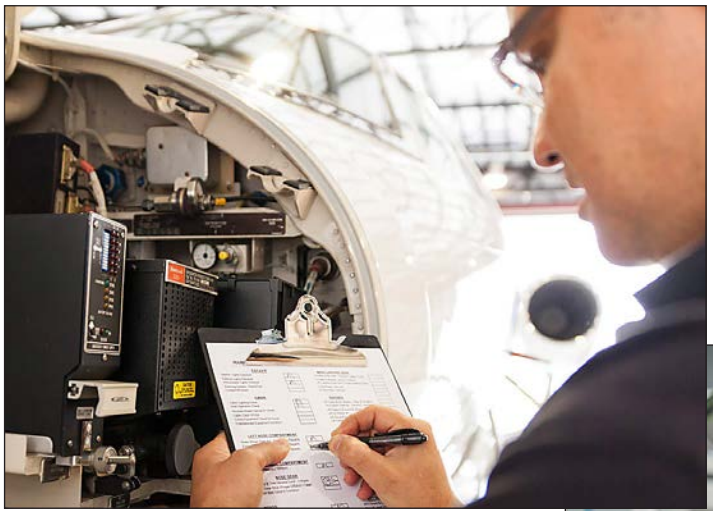
The man who was chosen to lead this effort was Walter McLeish, who came from an aeronautical engineering and flying background in the Air Force. His task was to set up a similar situation in The Ministry of Transport civil aviation. He began to rapidly build up the capability by bringing in



many professional engineers and test pilots. They were able to add special Canadian conditions in an effort to comply with the Transportation Safety Board findings of the Toronto accident. McLeish was rapidly promoted in the department and eventually ended up heading up the Air Administration. His work earned him selection to the Aviation Hall of Fame.

When I arrived in the Ministry of Transport Ken Owen was the Director of Airworthiness and was responsible for oversight of design certification, manufacturing, and maintenance for Canada. He was also a Professional Engineer and pilot. He carried out his duties through six regional managers, five of whom were Professional Engineers and one AME — John Cody in Atlantic regions. John Mew, also a Professional Engineer, was Chief, Maintenance and Manufacturing. John's division did not include AME licensing, as this was contained in the Licensing Branch which also licensed pilots and Air Traffic Controllers. Gord Rayner had been the Chief, and Canada's highest ranking AME prior to John Mew being in the position.

Sometime around the early 1980s or even late 1970s our name changed. As part of the great rush to be a Bilingual country the government began eliminating nearly everything linked to our old Anglo history including departmental names. So we went to Transport Canada. In 1936 we had been called the Department of Transport, then after the Second World War, the Ministry of Transport and now Transport



Opposite, left: AMEs carry out modifications that increase or restore safety margins under the guidance of using engineering approved data.

Above: Airframe and Powerplant Inspection.

Right: An FAA call to action.

Canada. Interestingly enough functions have remained much the same and until the SMS world arrived the organization was very consistent through the three changes.

The 1980s were a great time of work and expansion for all those associated with certification. There was a strong Engineering Division, a Test Flight Division, a Programs Division and a Standards Division. The Standards Division, headed up by Maher Kousam, was not only involved in standards work but also working on the new Airworthiness Manual. This team was headed up by John Mew and it took many years of hard work to complete. The renowned Justice Charles Dubin commission had recommended a rewrite of Canada's aviation regulations and standards, a task Airworthiness undertook with vigour. For reasons not known to me the Flight Standards side of Transport did not really begin this work until after the Justice Mohshansky Inquiry following a Kenora, Ontario F-28 accident.

The main certification efforts were directed towards Canada's growing aviation design and manufacturing industry notably Canadair, DeHavilland, Boeing, Pratt and Whitney, Bell helicopters, the large avionics and component manufacturers. There was also an extensive workload on the engineers and test pilots from new foreign manufactured aircraft and components being imported by Canadian air carriers. The domestic programs required thousands of hours of work and review of engineering submission from industry and a lot of meetings etc. There was also test flying to be done and witnessing of many industry qualification tests.

Even though there was in place a significant delegation system there was no shortage of work for Transport Canada staff. I can personally attest to the many meetings and trips needed to get this all done — all the while Canadian customers were restlessly waiting and of course the manufacturers were hoping to soon get their product certified and in service. One can only imagine the debates and technical work needed to certify a large aircraft such as the Boeing 767 or even the earlier Challengers. It was an impressive thing to watch and be part of. Canadians can be proud of the work done on their behalf.

SO HOW DOES ALL THIS AFFECT AMES?

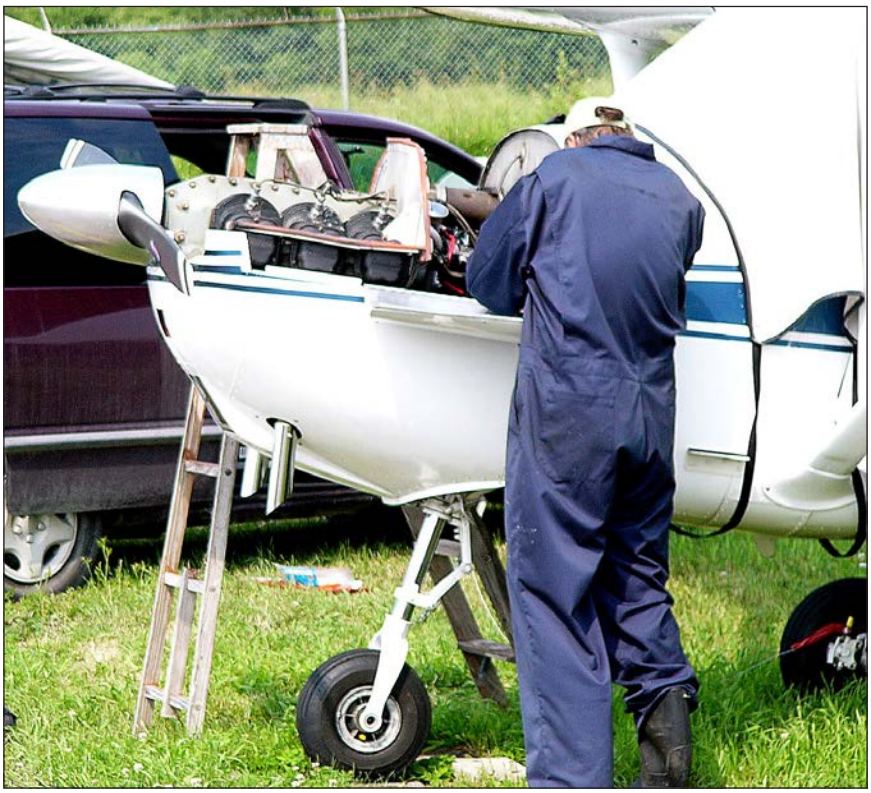
Well, to be frank, AMEs can only maintain a level of safety originally designed in and manufactured. Obviously AMEs carry out modifications that increase or restore safety margins under the guidance of using engineering approved data. This data can be pre approved as in generic industry standards found in such things as FAA circulars or manuals, AC 43-13 for example, or by STCs. One-off modification approvals exist. All this is to say that AMEs and maintenance technicians need to work to approved data of some sort and this all relates back to work done by the people involved in the basic certification process.

AMEs and maintenance technicians need to work to approved data of some sort.

This data includes the basic maintenance programs for new aircraft either manufacturer's recommendations or the results of Maintenance Review Boards. These two areas fell under the Chief, Maintenance and Manufacturing. This work was carried out by Transport Canada Airworthiness Branch, Maintenance Division AMEs in conjunction with the aircraft or component certification work. All this had to be completed to allow the Certificate of Airworthiness to be issued based on the Type Certificate. A lot of management and co-ordination was required which was the job of the Programs Division.

There also needed to be a Master Minimum Equipment List for dispatch use. This was developed mainly from the work of the Flight Test division with input from

It was not enough to be an enthusiastic fiddler and inventor. Standardized skills and procedures needed to be adopted to the AME trade.



NTSB inspectors examine a CFM56-7B turbofan.

AMEs have been involved in all phases of certifying an aircraft.

Engineering, Maintenance and Flight Standards. So AMEs were involved in all phases of certifying an aircraft. The manufacturing inspectors were not AMEs; they were highly skilled technicians, technologists and engineers of many types who had a critical role to perform in ensuring that aircraft and components were correctly manufactured.

Years later, after the Justice Mohshansky report, under the leadership of Don Spruceton, Director General Civil aviation, began to rewrite all the civil aviation regulations and standards and advisory material. After I left the Chief's position, Don Sherritt arrived from the Ontario Region where he had been Director of Airworthiness. Don arrived at a time of great change and brought new energy and ideas. I was in Western Region as Director of Airworthiness at the time. We began to discuss some organization changes which would hopefully clarify some areas of responsibility and accountability and to meet new demands. Transport Canada like other departments, faced budget issues which lead to major changes in the department. The creation of Nav Canada, the devolution of the airports and Coast Guard to name the big ones were carried out. I ended up being a part of this massive reorganization where we went from 25,000 employees to 5,000.

Spruceton decided to retire and to start a new career in the private sector and Art LaFlamme was selected to replace him. Art continued many of Don's initiatives including some reorganization internally. The entire Transport Canada organization change led to only five regions not six and I was selected to lead the combined western and central one, now known as Prairie and Northern Region.

This does not diminish certification since Canada is now the number four in aircraft and component manufacturing and is an immensely important industrial sector.

In the end the big question was where to best place maintenance and what was its mandate. It was ultimately decided to create an Aircraft Certification Branch and Maintenance Branch. Ken Mansfield was to lead Certification and Don Sherritt to lead Maintenance. This elevated Maintenance to a level not seen since the late sixties when the big push on aircraft certification was begun. This does not diminish certification since Canada is now the number four in aircraft and component manufacturing and is an immensely important industrial sector. It does allow maintenance, and by virtue of that AMEs and Maintenance Technicians, to take their place alongside flight operations easier than before, while still keeping the linkages to aircraft certification — this work mainly revolved around approving maintenance programs for new aircraft. It was decided to leave Continuing Airworthiness in Certification. After further reorganization to implement SMS and IMS under the direction of Merlin Preuss, who succeeded Art as the DGCA, Certification remains a separate Branch while Maintenance is part of Operating Standards and Standards. ■

(These have been excerpts from **Roger Beebe's** *compiled AME history. The entire text of this series can be found at his website,* ***www.planetalkconsulting.com****)*

PACIFIC

Pacific AME Association

PAMEA is a non-profit association comprised of aircraft maintenance engineers, aircraft maintenance personnel and aviation industry corporate members. PAMEA is an active member of the Aircraft Maintenance Engineers of Canada (AMEC).

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 speak 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

WESTERN

Western AME Association

About Our Assosiation

The Western AME Association is one of five similar associations across Canada, the others being the Atlantic, Ontario, Central and Pacific associations. These associations represent regional interests as well as concerns of national importance.

A separate committee, under the auspices of the association, runs an annual symposium/workshop. This workshop is a two-day event which features speakers on a variety of related topics, as well as an industry tradeshow with over fifty booths from various companies, suppliers, manufacturers and other organizations. Attendance at this and our various other smaller workshops may be counted towards the recurrent training requirements required by Transport Canada.

www.wamea.com

CENTRAL

Central AME Association

The association is formed for the following and other purposes:

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.

1. To provide a forum for Aircraft Maintenance Engineers resident or employed in the Central Region and more particularly to promote that species of knowledge which distinguishes the occupation of Aircraft Maintenance Engineer in the aviation industry.

2. To constitute a body through which the views and objects of Aircraft Maintenance Engineers may be represented, which body will be available for advice or consultation on all questions, policy matters, and all other areas of the aviation industry which affects an AME.

3. To constitute a body which will be recognized by the Minister of Transport regarding the regulation of any matter in the aviation industry which affects or may affect the occupation of Aircraft Maintenance Engineer.

4. To facilitate the interchange by members of the Association of their views in relation to the aviation industry, to the minister of Transport, or to any other matter of common interest to the members.

5. To promote honourable practices in the aviation industry, to repress malpractices, to settle disputed points of practice and to decide all questions on usage or courtesy among its members.

6. To promote, improve and generally advance the occupation of Aircraft Maintenance Engineer and to increase the knowledge of its member's relation to the aviation industry via education and research.

7. To print, publish and disseminate technical or other information which relates to the occupation of Aircraft Maintenance Engineer or to the aviation industry in general.

8. To maintain a high standard in the aviation industry, and in particular the occupation of Aircraft Maintenance Engineer and to further the status of the Aircraft Maintenance engineer at all times.

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

2021 Aircraft Maintenance Conference

The 2021 Ontario Aircraft Maintenance Conference is scheduled for October 27th-29th, in Toronto. Based on hotel guidance, the current vaccination rates and the re-opening plan of various provinces, we are moving forward with this year's event. Taking into account the restrictions of the past year, we know this year's conference is going to be different from years past, but we also know that our industry needs an event where we can safely gather.

During these hard times we would like to keep the costs for attendees to a minimum. Our plan is to host a "no frills" event so we can put exhibitor fees and any sponsorships directly towards lowering attendance fees.

This event would not be possible without the fantastic support from our sponsors and exhibitors. We would like to thank all those who have previously supported the event as an exhibitor, sponsor or both and we hope we can rely on your continued support. It is our hope that brighter days are ahead for all and we look forward to seeing you in October.

Stay safe and be well.

Strengthening AMEC/TEAC

Some members of our Board of Directors along with individuals in the other regional AME associations are working together to strengthen our ties within the Aircraft Maintenance Engineers of Canada / Technicians d'Entretien d'Aéroneufs du Canada (AMEC/TEAC). At the AMEC AGM held last November, new bylaws were adopted and agreements were made to merge some procedures. It is a slow process as we aim to increase our strength as a national organization without diminishing the regions' independence and individuality.

One of the first items is to standardize the membership process. Membership fees will be the same across the regions and a uniform membership card has been developed. Member benefits will be applied nationally with some regional differences based on location of the companies supplying the benefit.

There will be a cost saving as we will only have to pay for one web-based service to process memberships instead of the current six processes. An added advantage will be the establishment of an email database to communicate with our members either on a national or regional basis.

Submitted by **Stephen Farnworth**, for the Board of Directors

Atlantic AME Association

President's Message - By Bob Pardy

With the arrival of summer 2021 and the thought of a more open and active time ahead of us, we are looking forward to the aviation industry spooling back up to its pre-pandemic levels and our members getting back to work. There have been some areas of the business that saw a growth over the last year or so and then there have been other areas that have seen a decline in activity. I have been informed that the areas that saw a decline in activity, or virtual shut down, are now in the re-hiring and ramp up phase. Congratulations to those areas and to the AMEs affected—welcome back.

In April, our association held a virtual AGM. This was the first AGM since 2019 and had representatives from all the Atlantic provinces. An election was held to elect a new Board of Directors for our association. The new board saw a return of a number of previous members and the election of two new members. There were eight nominees for seven Directors positions, and I want to thank everyone who let their name stand for election. I hope the person who was not elected this time will let their name stand on future ballots. Thank you.

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

CENTRAL OHIO

Central Ohio PAMA

A New Horizon

As mandates are removed and we start the return to normalcy, we hope you have survived the pandemic; physically and economically! To our members, we look to start our planning for the future of COPAMA. To our supporting vendors, we hope you are returning to profitability and normal levels of production.

2021 Inspection Authorization Renewal in IACRA

The 10.4.1 IACRA release will allow applicants to apply for their Inspection Authorization renewal. This application path will be available to current IA holders as an alternative to mailing in a paper copy. (Visit: www.iacra.faa.gov/IACRA/Default.aspx)

www.copama.org

SOCAL

PAMA SoCal 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.

SoCal PAMA News Brief Spring 2021

The SoCal PAMA Board of Directors Virtual Meeting March 12, 2021 included:

1. State of the industry (recovering)
2. Live trade shows scheduled for 2021 (AEA, NBAA)
3. Local A&P schools reopening (TBA)
4. Venue & safety protocols for 2022 Chapter meetings (planning)
5. Chapter finances (review)

Thank You to Aircraft Window Repairs for another generous donation to the Chapter Scholarship Fund during this difficult time. To make a tax-deductible donation to the Chapter Scholarship or Operating Fund, Or to post a job opening or event
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www.socalpama.org

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AME LICENSING:
Validity vs Recency?

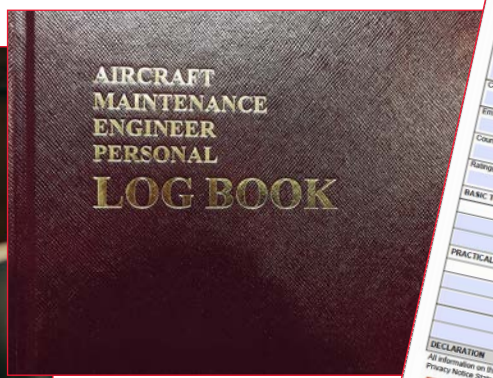
COVID-19 has created no end of uncertainty.
One big question now dogging some AMEs: "Is my licence current?"
Following is some clarification. *By Lacey Scoggins*

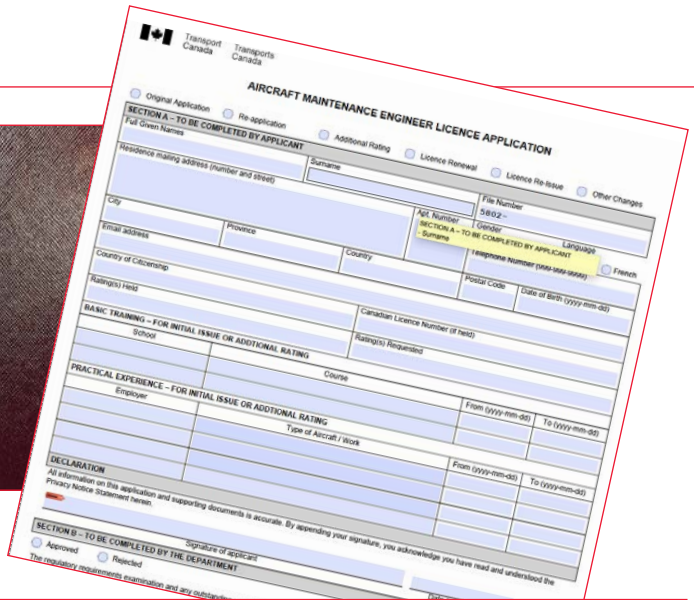
THE COVID-19 PANDEMIC has been a disruptive force and continues to disrupt air travel in ways I won't even attempt to quantify. In recent good news, efforts of putting the pandemic behind us are underway, but we still have a long road ahead. Getting passengers back into our skies safely remains the collective goal of our industry and civil aviation authorities from around the globe.

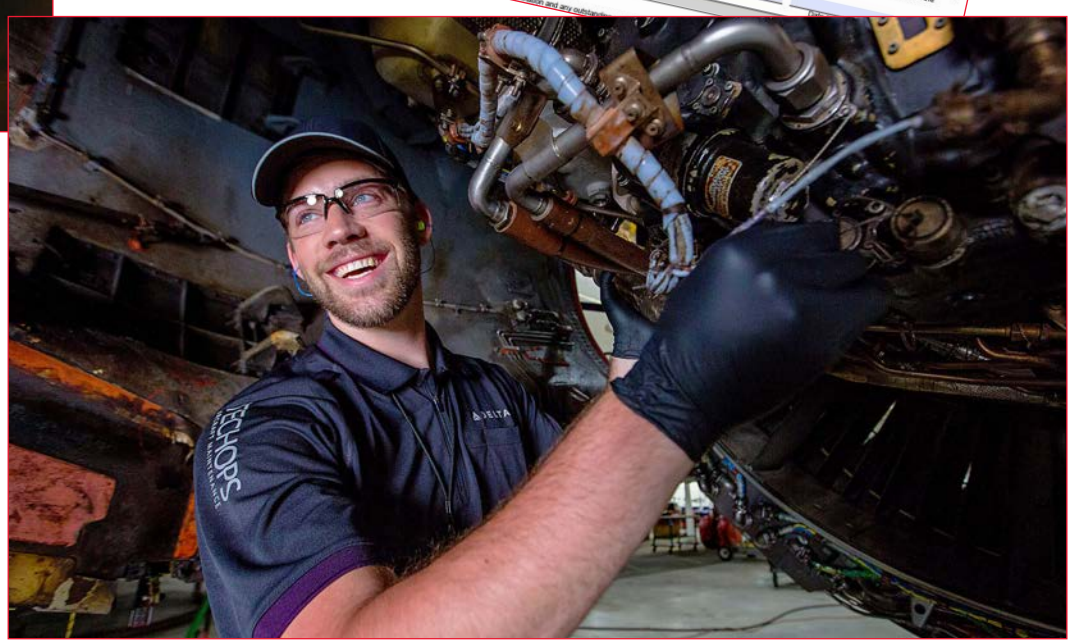
One question that's come up during recent discussions with the AME Association (Atlantic) and Aircraft Maintenance Engineers is the AME licence recency. It's important to understand what it means to be current and dispel any myths on how to retain or regain recency. Let's dive in!

Assuming that you are the proud holder of a Canadian AME licence M1, M2, E, or S, or a combination of the sorts, certain Canadian Aviation Regulation (CAR) now apply to you. For this discussion, we will examine CAR 403.04 & 403.05.

CAR 403.04 states in part that "… an aircraft maintenance engineer (AME) licence is valid for the period specified in the







403.04

licence." This CARs reference speaks to the validity period indicated on your licence card. Think of this date as an expiration date, so in essence, your AME licence is valid within those dates unless of course it is surrendered, suspended or canceled.

Confirm the validity "best before date" on your AME licence card. If your licence is within the validity period, you can proceed to the next step. If you find yourself with an expired licence between March 1, 2020 and December 1, 2021, do not worry. Exemption NCR-002-2021 extends the validity of any AME licence expired within the aforementioned date range, and is valid until December 1, 2021. TCCA has indicated that an extension to the exemption is possible should the need arise.

NCR-002-2021 was written due to circumstances related to COVID-19. TCCA continues to accept and process AME licence renewals and print the credit card style AME licence. TCCA recommends using the exemption only if required.

For those who find themselves with an expired licence prior to March 1, 2020, your AME licence is not valid and you will need

to apply for a re-issuance of your licence. Please contact your nearest TCCA if this applies to you.

After checking the "best before date" on your licence (or within the exemption dates) and making the determination that it is valid, are you good to sign a maintenance release? Not exactly. This is where CAR 403.05 comes into play.

CAR 403.05 states in part that "…No holder of an aircraft maintenance engineer (AME) licence shall exercise the privileges of the licence unless:

(a) the licence was issued within the preceding 24 months; or

(b) the holder of the licence has, for at least six months within the preceding 24 months,

(i) performed aircraft maintenance,

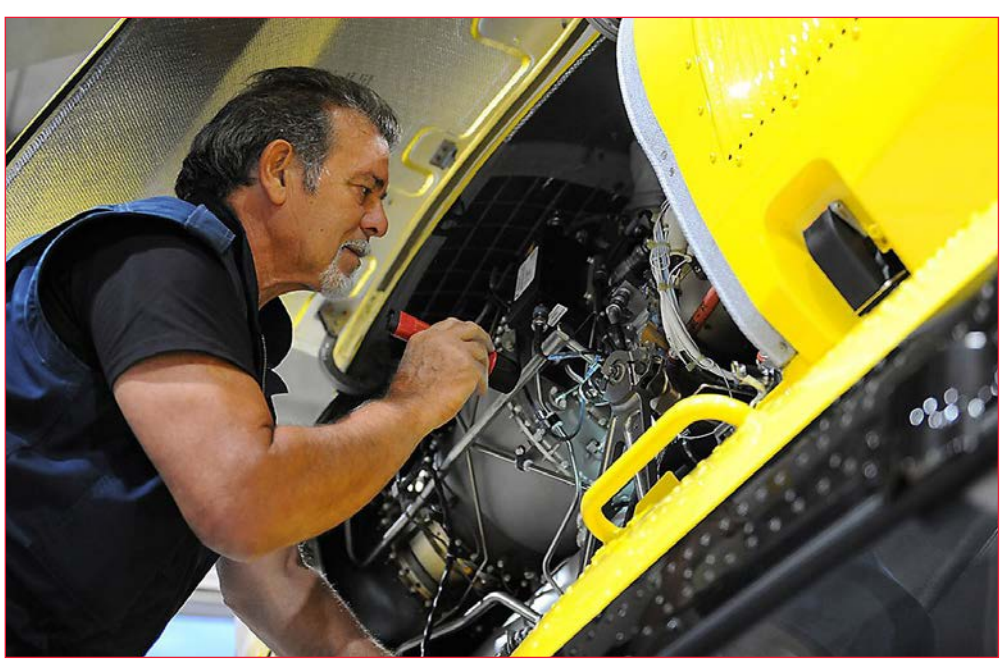
(ii) supervised the performance of aircraft maintenance,

(iii) supervised in an executive capacity the performance of aircraft maintenance, or

(iv) served as an aviation maintenance instructor or supervised another aviation maintenance instructor in an aircraft maintenance training course provided by an approved training organization."

Emphasis on the word privilege as this may mean you could be the holder of a valid licence but may not be able to

It's important to note that if an AME fails the regulatory requirements examination, the licence is subject to suspension in accordance with subsection 7.1(1) of the Aeronautics Act.



exercise the privilege of the licence (i.e. signing a maintenance release).

You are considered current if you received your licence within twenty-four months; worked for six months (consecutive or non-consecutive) within the last twenty-four months performing any of the items listed in CAR 403.05 (i through iv); or have successfully completed the regulatory examination by TCCA within the last twenty-four months.

It's important to note that there are no regulatory requirements other than the ones mentioned above. If an AME licence holder takes additional maintenance training, for example, it cannot be used toward meeting the recency requirements in CAR 403.05.

Should you find yourself out of currency, you have options to regain it. You can work for six months performing any of the items listed above in CAR 403.05(b)(i) through (iv) or attempt and pass the regulatory examination by TCCA.

It's important to note that if an AME fails the regulatory requirements examination, the licence is subject to suspension in accordance with subsection 7.1(1) of the Aeronautics Act. Once the licence is suspended, its privileges can no longer be exercised until the AME demonstrates competence by successfully completing the regulatory examination.

At the time of writing this article, TCCA has not issued any exemption to the currency rule [CAR 403.05]. They are aware of on-going concerns for those AMEs impacted by work stoppage due to COVID-19 and are working on a possible exemption as part of the aviation restart engagement with stakeholders. All COVID-19 related exemptions are published online.

(Visit the Transport Canada website (**www.tc.canada.ca**) and find the article "COVID-19 measures, updates, and guidance for aviation issued by Transport Canada." ■

(Lacey Scoggins is a Civil Aviation Safety Inspector at Transport Canada. Her story also appears in the AME Association Atlantic July 2021 Newsletter.)

Corrosion Never Sleeps

This incident involving an under-utilized Challenger 605 once again shows how inactivity can be its own source of wear and tear.

ON **23 FEBRUARY 2020**, the Canadian Pacific Railway Company Bombardier CL-600-2B16 (Challenger 605) (registration C-GKCP, serial number 5945) departed Palm Beach International Airport, Florida, United States, for Calgary International Airport, Alberta, with 3 crew members and 10 passengers on board. During the descent into the greater Calgary area, the flight crew selected flaps 20 and immediately received a "FLAPS FAIL" caution message on the engine indication and crew alerting system. The flight crew requested and received delaying vectors to the east, and proceeded to complete the flaps fail procedure in the Quick Reference Handbook.

The aircraft was then sequenced back in for a zero-flap landing on Runway 17R. The aircraft touched down at 1434 Mountain Standard Time. During the landing roll, maximum reverse thrust was selected and the aircraft's pitch attitude increased to the point where the aircraft became partially airborne for a brief moment and the rear fuselage struck the runway.

During the process of recovery from the nose-high attitude, the nose landing gear struck the runway hard. The landing roll was completed and the aircraft continued to the intended parking area. There were no injuries to any of the aircraft occupants although there was significant damage to the forward fuselage.


Rear fuselage damage.

DAMAGE TO AIRCRAFT

The initiating event for this occurrence was the failure of the flap flexible drive shaft connecting the 2 left inboard flap actuators. When the flap control unit sensed a potential asymmetric flap condition developing, the "FLAPS FAIL" caution message was displayed on the EICAS, and the flap system stopped operating, limiting the possibility of difficulty in controlling the aircraft due to an asymmetric flap condition.

During the landing roll, the rear fuselage and tail cone made contact with the runway surface. As a result, the aft fuselage fuel drain mast broke off the aircraft and the lower skin of the tail fairing received significant abrasion damage. The drain mast measures approximately 13 inches long, 8 inches high, 3 inches wide, and weighs 1.1 pounds. It is constructed primarily of carbon fiber composite with aluminum tubing installed internally. The tubing is connected to the aircraft's fuel system.

The lower forward fuselage sustained significant structural damage when the nose landing gear made contact with the runway after the aircraft pitched up. The left and right lower fuselage skins adjacent to the nose landing gear were deformed. Several fuselage frames were damaged in the lower forward fuselage, and there was deformation of both the left and right nose landing gear upper torque box structure due to the overload experienced during impact with the runway.

FLAP SYSTEM

The Challenger 605 flap system consists of inboard flap panels (left and right), outboard flap panels (left and right), a flap power drive unit, flap flexible drive shafts (10), flap actuators (8), flap brake detector units (2), a flap control unit, and, in the cockpit, a flap selection lever.

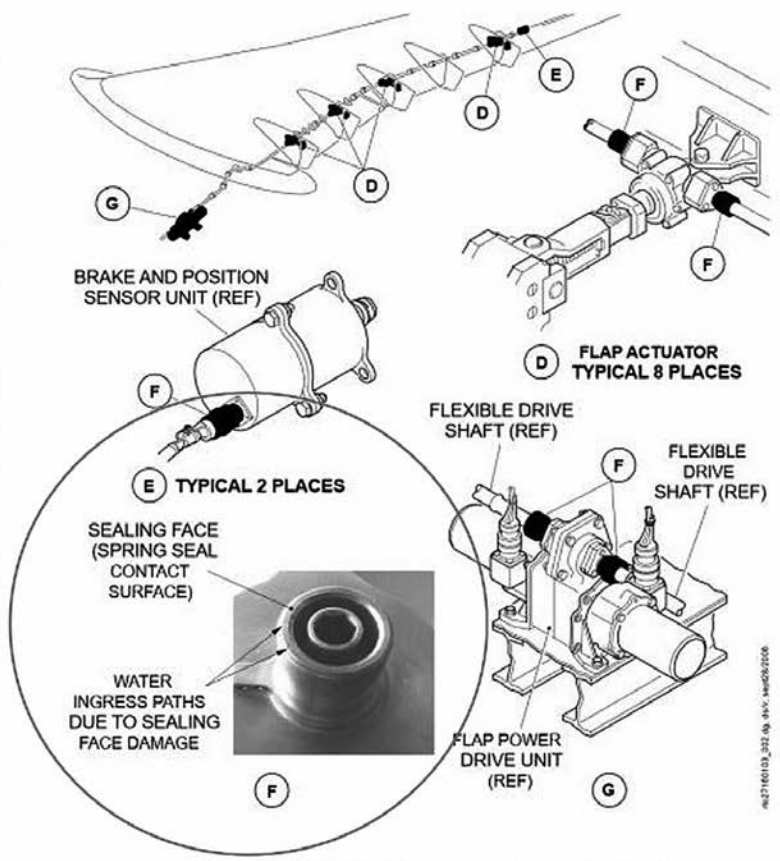
Under normal conditions of operation, the flap power drive unit—located in the main landing gear bay—pow-

CRJ200

DATE ISSUED	REVISION NUMBER	REVISION DATE	canadair REGIONAL jet	AIRLINE DESIGNATOR CODE	COMPONENT EFFECTIVITY S/N OFF	COMPONENT EFFECTIVITY S/N ON
DATE RETURNED	47	APR 10/17				
WORK ORDER	AIRCRAFT MODEL		WORK AREA 500		TASK CARD NUMBER 000-27-580-103	
STATION	AIRCRAFT NUMBER		AIRCRAFT HOURS/CYCLES	TASK TYPE DI	MAN-HOURS 0.25	SKILL MECHANIC

Detailed Inspection of the Left Flap Flexible Drive-Shaft Core (Drive-Shaft No. 2)

AIRCRAFT EFFECTIVITY:



Flexible Drive-Shaft Core – Inspection/Check
Figure 1 (Sheet 2 of 2)

COMPLAINTS MOVED TO MAINTENANCE CARRY-OVER ITEM NUMBER(S):

PAGE 13 OF 13

Opposite, top: The Bombardier Challenger 600 series is a family of business jets. It was first produced by Canadair as an independent company and then produced from 1986 by Canadair as a division of Bombardier Aerospace.

Above: Bombardier CRJ maintenance task card no. 000-27-580-103

ers the flap actuators via the flap flexible drive shafts, and the flaps are held in the selected position by the flap brake detector units.

The flap control unit monitors system operation and if the unit detects a fault with a component in the flap system, the appropriate message is displayed to the flight crew on the EICAS, and the system is disabled. There is no alternate means of flap operation. A review was conducted of the various Challenger series of aircraft to compare the flap flexible drive shaft part numbers. It was determined that none of the flap flexible drive shaft part numbers for the Challenger 605 had changed from the original Challenger 600.

In this occurrence, the left-hand flap flexible drive shaft that connects the inboard and outboard actuators of the left-hand inboard flap, sheared where the flexible inner core is swaged to the outboard flap actuator drive end.

MANUFACTURER'S MAINTENANCE RECOMMENDATIONS

The aircraft manufacturer publishes a schedule for required maintenance, including specific maintenance tasks and the intervals at which the tasks need to be completed. The task intervals are specified in flight hours, flight cycles, calendar time, or a combination of one or more of those, and are based on an average aircraft utilization of 500 flight hours and 300 flight cycles in 12 calendar months.

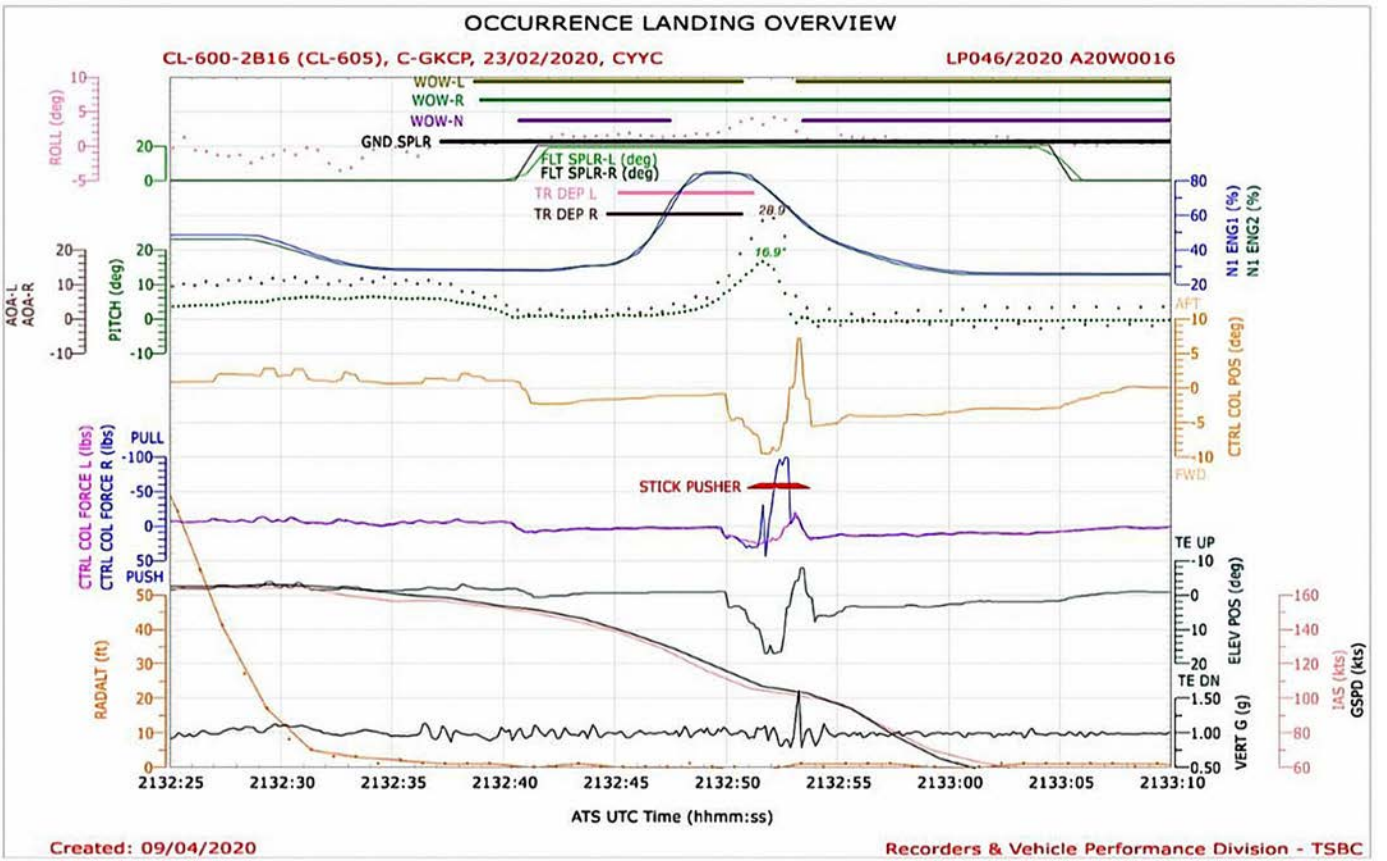
As part of the Bombardier customer service program, the company actively tracks fleet utilization across its product line. For the 12 calendar months ending 31 January 2020, the Challenger 605 fleet had an average annual utilization of 275 flight hours and 144 landings.

FLAP FLEXIBLE DRIVE SHAFT INSPECTION

Task 275000-202 requires a detailed inspection of the flap flexible drive shafts at an interval of 2400 flight hours. The inspection task is to be completed in accordance with task 27-53-07-220-801 of the Aircraft Maintenance Manual and includes the removal and visual inspection of the inner core of the flap flexible drive shaft. If the inner core has dry or hard grease evident, it is to be cleaned, inspected, and serviced before being reinstalled in the aircraft.

At the time of the occurrence, the flap flexible drive shafts had accumulated 1699.3 hours since new. Therefore, because the aircraft had not accumulated 2400 hours of flight time, the inspection had not been carried out, nor was it required to have been. This flap flexible drive shaft would have last been inspected to some degree before the original installation on the aircraft at manufacture in 2013. As such, the component had never been inspected by maintenance personnel.

The failed flap flexible drive shaft was sent to the TSB Engineering Laboratory in Ottawa, Ontario, for analysis to determine why the part had failed. The TSB Engineering



Occurrence landing overview based on flight data recorder information.

Laboratory conducted a detailed examination of the part, which revealed 2 puncture holes in the protective outer casing under the data plate for the part. These holes were likely introduced as an unintended consequence during the manufacturing process of the drive shaft assembly, when the data plate was being installed. These holes would have allowed water moisture to enter the flap flexible drive shaft housing cavity, allowing corrosion to begin. In addition, both the inboard and outboard segments of the inner drive shaft showed significant corrosion and lack of lubrication.

Whenever there is a mechanical connection in a component or system, there is the potential for a sealed environment to be compromised. In this case, the sealed environment is the inner part of the flap drive shaft housing where the flexible drive shaft core resides and rotates. The flap flexible drive shaft assembly is connected via a threaded coupling nut to both the inboard and outboard flap actuator assemblies of the left inboard flap panel. As such, this then becomes an area of potential leakage into the sealed environment. If there is an imperfect seal between the face of the flap actuator and the face of the flap flexible drive shaft casing, water moisture and other contaminants can penetrate the core of the drive shaft housing and corrosion of the drive shaft core can result.

Occurrence aircraft's failed flap flexible drive shaft.

MANUFACTURER'S MAINTENANCE REQUIREMENTS

The manufacturer's maintenance recommendations for the Challenger 605 fleet are based on an average annual utilization of 500 hours whereas the fleet's actual annual average is 275 hours. The occurrence aircraft's average utilization over the course of its life was in line with the fleet average. As a result of the reduced utilization, required maintenance activities that had intervals based on flight hours or flight cycles were typically being completed with a calendar time that was approximately twice as long as the intervals that would have occurred if the aircraft was being used as expected by the manufacturer.

Using the failed flap flexible drive shaft as an example, the detailed inspection interval is set at 2400 flight hours. If an aircraft flies 500 flight hours per year, which is what the recommendation is

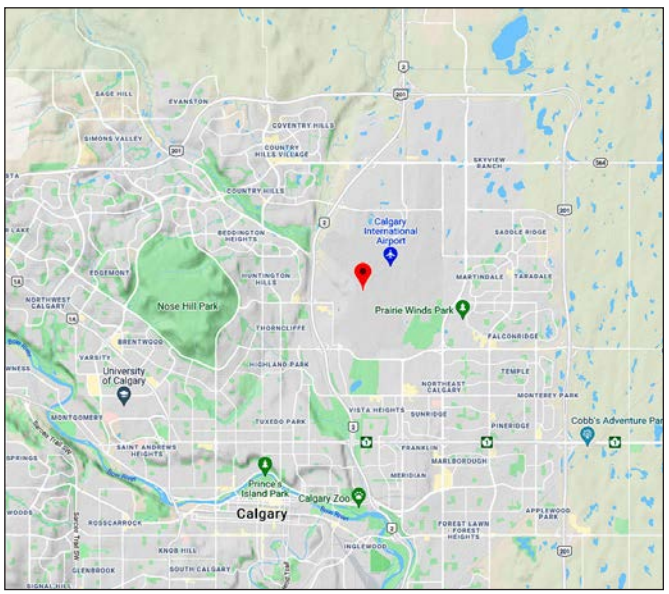
based on, the flap flexible drive shaft would receive a detailed inspection every 4.8 calendar years. However, using actual annual fleet average aircraft utilization number (275 flight hours), that same maintenance activity would be carried out only every 8.7 calendar years.

FINDING AS TO CAUSES AND CONTRIBUTING FACTORS

These are conditions, acts or safety deficiencies that were found to have caused or contributed to this occurrence:

1. Moisture entered the flap flexible drive shaft casing, likely through the undetected puncture holes and the drive shaft casing to flap actuator interface, which led to the subsequent corrosion and failure of the inner drive shaft.

2. As the occurrence aircraft's actual annual utilization was approximately half of that expected by the manufacturer, the calendar time interval between maintenance inspections increased. As a result, the corrosion that developed was not detected because the shaft had not yet reached the 2400 flight-hour maintenance interval.



Map showing the location of the occurrence.

3.The Challenger 605 flight simulator used for recurrent training did not accurately represent the zero-flap handling characteristics of the aircraft when the thrust reversers are deployed, nor was it required for certification. As a result, the flight crew was inadequately prepared to prevent, or recover from, the nose pitch-up that occurred when the thrust reversers were deployed.

4. The pilot monitoring did not read the cautions included on the flaps fail checklist out loud to the pilot flying during the completion of the Quick Reference Handbook procedure. As a result, information critical to the safe operation of the aircraft was not brought to the pilot flying's attention.

5. Insufficient pressure was applied to the control column to maintain the nose on the runway while using maximum reverse thrust; as a result, the nose pitched up, the aft fuselage contacted the runway, and the aircraft transitioned to a partial weight-off-wheels state.

6. When the left main wheel left the runway surface and the angle of attack reached 28.9°, the stick pusher activated and commanded a rapid nose-down pitch input. As a result of this rapid nose-down pitch, the forward section of the aircraft was damaged when the nose wheel contacted the runway.

SAFETY ACTION TAKEN: CANADIAN PACIFIC RAILWAY COMPANY

During the aircraft repair process, the maintenance provider performed a detailed inspection of the remaining flap flexible drive shafts for their condition and serviceability. No other defects were noted. Following the occurrence, Canadian Pacific Railway Company conducted a comparison of various Aircraft Flight Manual (AFM) and Quick Reference Handbook (QRH) procedures that involved reduced flap landings conditions. As a result of this review, some internal procedures were amended to address the differences between the caution or warning notes published in the AFM and QRH.

SAFETY ACTION TAKEN: TRANSPORTATION SAFETY BOARD OF CANADA

On 29 July 2020, the TSB issued Bombardier Air Safety Information Letter A20W0016-D1-L1 to highlight the Challenger 605 series flap system inspection interval and the Challenger CL60 series cross-fleet product improvement observation.

SAFETY ACTION TAKEN: BOMBARDIER INC.

In response to the TSB's safety information letter, Bombardier has, in January 2021, issued a temporary revision to the QRH flap fail procedure, expanding on the published caution note following step 14. ■

(These were excerpts taken from the Transportation Safety Board of Canada's investigation report into this occurrence. The Board authorized the release of this report on 21 April 2021. It was officially released on 12 May 2021.)

Aviation Services

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The Mike Zubko Project

Joint funding will bring a fresh look and new operability to one of Canada's northernmost airports.

ON **JUNE 23**, Michael McLeod, Member of Parliament for the Northwest Territories, announced joint funding of a combined $42 million for the construction of a new air terminal building at the Inuvik Mike Zubko Airport (YEV). The Government of Canada is investing $31.5 million in this project through the Green Infrastructure Stream (GIS) of the Investing in Canada plan, and the Government of the Northwest Territories is providing $10.5 million.

"Canada's experience under COVID-19 has demonstrated how interdependent Canadians are, as well as our need to stay connected," said McLeod. "Connecting Canadians through regional transportation hubs, like the Inuvik Airport, brings jobs to our communities, and will support Canada's economic recovery."

Ottawa explains the aging air terminal building will be replaced with a more modern building with improved structural features that will greatly increase the safety and efficiency of the airport. The main level will include a public space, baggage systems, concessions, and air carrier operations. The airport administration and building services will be located on the second level, and the opportunity for occupancy by NAV CANADA has been identified on levels two through five.

Once completed, Ottawa notes the new air terminal building will improve the overall capacity of the airport and operations facilities. It will also result in enhanced structural capacity to adapt to climate change impacts, natural disasters and extreme weather events.

"[This] announcement is a great example of government partnership that will provide Arctic communities with safe and reliable transportation systems," said Natasha Kulikowski, Mayor of the Town of Inuvik. "I look forward to welcoming residents and visitors on behalf of the Town of Inuvik to the new, modern, and world class Inuvik Mike Zubko Airport Terminal Building."

Under the Investing in Canada Plan, the federal government is investing more than $180 billion over 12 years in public transit projects, green infrastructure, social infrastructure, trade and transportation routes, and Canada's rural and northern communities. Across the Northwest Territories, the Government of Canada has invested more than $453 million in over 110 infrastructure projects. ■

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