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Fresh Online Training Courses from CCAA

The role of the Aircraft Maintenance Technician is changing, says Ottawa-based Canadian Council for Aviation & Aerospace, adding that "The increasing sophistication of modern-day aircraft and changing technology means that successful AMTs must have the broad range of skills needed to accomplish required day-to-day maintenance activities. This now includes significant expertise in the area of avionics."

With that in mind, the CCAA is now offering two new online training modules as part of its Aircraft Technician Training Series. The new courses are Avionics Training: (Fundamental Skills for Aircraft Electronic and Electrical Systems) and Troubleshooting & Analytical Thinking.

The Avionics course takes about 60 hours to complete and is composed of 10 separate learning blocks ranging from Basic Digital to Avionics Specialized Skills, Auto Flight Systems and Cabin Systems. The cost is $799. CCAA partners get an additional 20 percent discount. The six-hour Troubleshooting & Analytical Thinking course is $149.

Among the other online courses available from CCAA is CARS training, which consists of 17 individual learning streams including CARS Stream 3 - Aircraft Maintenance Engineer, which is intended to prepare individuals for the regulatory requirements examination administered by Transport Canada. An overview of management systems, quality assurance and safety management is also included. The cost for this particular learning stream is $470.

CCAA says it is "The only national association in the country dedicated to attracting and developing workers with the skills the Canadian aviation and aerospace industry needs to meet the demands of the current and future workplace." ■

— John Campbell
Editor

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Upcoming Events

NBAA-BACE 2020: BACE organizers pull pin on Orlando

The National Business Aviation Association announced in early July the cancellation of its 2020 Business Aviation Convention & Exhibition (NBAA-BACE), which was scheduled to take place in Orlando, Florida, October 6-8. The cancellation is based on guidance from public health officials such as the Florida Department of Health which recently issued an advisory recommending that individuals avoid participation in gatherings of more than 50 people.

In addition, numerous states, including Florida, have onerous travel restrictions in place, and flights to and from many international countries are banned. These restrictions make it not only difficult, but in many cases impossible, for individuals and companies to participate in the world's largest business aviation event.

"The promotion of safety is a primary reason NBAA was founded in 1947, and safety is at the foundation of all we are today," said NBAA President and CEO Ed Bolen. "As COVID-19 has emerged as a pandemic, NBAA has consistently looked to local, state, federal and global health officials to inform our decisions and guide our actions with regard to live events."

According to Bolen, "NBAA has always advised its members to conduct a thorough risk evaluation before every flight to determine whether or not the mission can be safely conducted. We have brought that same discipline to the upcoming NBAA-BACE, and we regret that this year's event must be grounded. We will immediately begin working with exhibitors and others as we wind down this year's event and begin preparations for next year's NBAA-BACE."

The 2021 NBAA Business Aviation Convention & Exhibition is scheduled to take place October 12-14 in Las Vegas, Nevada.

London Airshow
The Show will Go On: 'Think Drive-In'

Organizers of Airshow London have announced details of "Skydrive," which promises to be "Canada's first socially responsible and physically distant air show." Scheduled for September 12-13, both days will feature three-hour shows where attendees are encouraged to "Think 'drive-in movie', but it's a drive-in air show instead!"

The Ontario government's move into Phase 2 of reopening the province in June included drive-in events. As a consequence, organizers of Airshow London say they reformatted the traditional structure to create a safe, innovative, and still-exciting event that conforms to public health guidelines and offers a family-friendly and memorable experience.

Gates on both days open at 11am. This year, there will be no Static Display (additional aircraft parked for visitors to climb aboard), food vendors, or displays.

Despite COVID-19's negative impact, this year's line-up of aviation acts at Airshow London is unprecedented, say organizers. Along with aircraft from the Royal Canadian Air Force, the show will host four U.S.-based Demonstration Teams (United States Air Force Thunderbirds, United States Army Golden Knights, United States Air Force F-22 Demo Team and United States Air Force C-17 Demo Team), plus a number of fly-bys from US-based fighter jets, tankers and cargo jets.

FMI, visit www.airshowlondon.com

UNITED STATES

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www.usaircraftexpo.com

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www.nbaa.org

Advertisers Index

STCs & new products

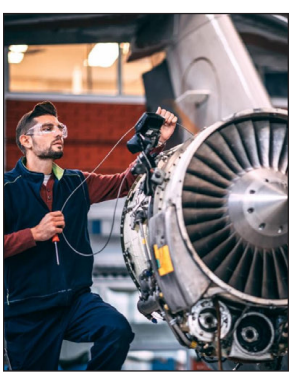
Hydraulic jack folds for transport

Stertil-Koni's new portable air-over-hydraulic jack is intended for servicing vehicles in the maintenance bay or on the road. Weighing 60 pounds, this two-stage Model SKB25-2 has a lifting capacity of first stage, 25 metric tons, with a final stage of 10 metric tons. The portable design incorporates a 21.6-inch handle that folds for transport. This unit incorporates an optional wall mounting bracket to secure it out of the way on the workshop wall. Its maximum height without extensions is 12.5 inches.
www.Stertil-Koni.com

King Air upgrade kit earns STC

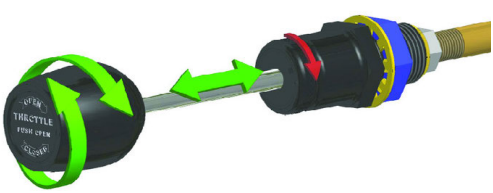
Blackhawk Aerospace announced the Federal Aviation Administration's Supplemental Type Certificate approval of their new XR upgrade kit for the King Air 350 Series. The XR Kit optimizes a stock King Air 350 series aircraft by increasing max gross takeoff weight to 16,500 pounds and maintaining a basic aircraft empty weight that is 220 pounds lighter than comparable extended range aircraft for greater payloads and up to 25 percent more endurance. The original Pratt & Whitney Canada PT6A-60A engines and four-bladed aluminum propellers are replaced with 1200 shaft horsepower PT6A-67A engines and MT five-bladed composite propellers.
www.blackhawk.aero

Digital manual addresses procedures



AviationManuals has launched a customized General Maintenance Manual developed specifically for Part 91 flight operations. The company's General Maintenance Manual is delivered with ARCdocs software and iPad app, and addresses procedures for maintenance leadership and shop floor personnel. The GMM covers: Roles and responsibilities; Personnel policies; Inspection programs; MEL management; Functional flight checks; Airworthiness directives; Tool calibration; Inventory control; and Training and safety programs.
www.aviationmanuals.com

Throttles use friction to drive action



McFarlane's new Vernier-assist throttles eliminate the need for threads, locking balls and pins. Simply turn the knob for fine adjustments, or push in or out for coarser movement. An adjustable friction lock secures the control in position, but is easily overridden in case of an emergency. The McFarlane patented roller action uses only friction to drive the vernier action. The friction control provides smoothness, precision, and safety when operating the throttle. These controls are FAA-PMA approved for installation in most single engine aircraft.
www.mcfarlaneaviation.com

Torque wrench features fine-tooth ratchet

Enerpac's DSX-Series aluminum square drive torque wrenches feature a fine-tooth ratchet that prevents the tool from locking on, a 35-degree rotation angle that assists with repetitive bolt tightening tasks, and a retained push-button quick release. Another feature is a multi-direction 360-by-180 degree high flow aluminum swivel that helps prevent twisted and tangled hydraulic hoses. Additional key features include torque output ranging from 141 to 24,057 foot-pounds and a compact nose radius for use in tight locations.
www.enerpac.com

Safety gloves feature great dexterity

Pyramex's new dipped gloves are constructed from polyurethane, latex or nitrile, each designed to be the safest, most comfortable work gloves available. All gloves meet ANSI/ISEA 105-2016 cut standards (with ratings from A1-A9 depending on model) as well as CE EN388:2016 (with levels A-F depending on model). Two new polyurethane models designed for a wide range of applications from metal fabrication to manufacturing are the new GL403C and GL404C gloves. Both models incorporate a polyurethane palm coating and great dexterity for handling small parts. www.pyramexsafety.com

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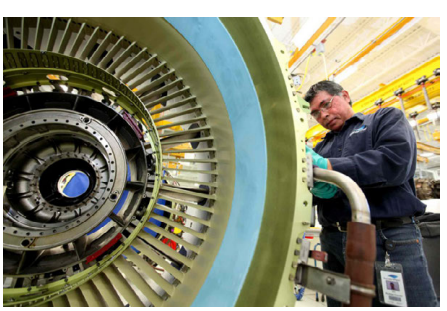
IADA IS NOW INVITING NEW DEALERS

The International Aircraft Dealers Association says it is now accepting applications from aircraft dealers to be accredited through the organization's independent accrediting process. "We have 45 of the unquestioned best pre-owned aircraft expert dealers anywhere in the world who are accredited by the organization to be the 'top guns' of our industry," said IADA Executive Director Wayne Starling. "And we are open for new dealers who have the professionalism and expertise to be a part of IADA. Our entire 110-member organization is a major player in the overall aviation industry, with total sales of $145 billion and over 350,000 employees," he added.

STANDARDAERO FAST-TRACKS COE CONSOLIDATION



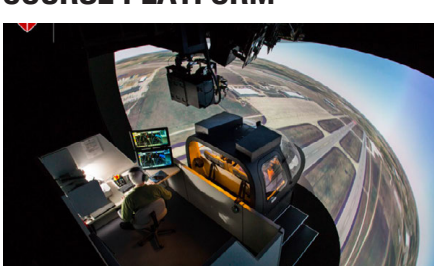
StandardAero has now completed the consolidation of the company's Winnipeg, Manitoba, Helicopter Center of Excellence, after accelerating the final phase of integration of helicopter MRO engine operations into one site. The company's transition program included the integration of two additional COEs located in Langley, British Columbia, and Summerside, Prince Edward Island, to support helicopter airframe/component MRO services and turboprop engine MRO services. The two-year COE restructuring program was originally expected to be completed by the end of 2020.

Effective immediately, all helicopter inductions will be conducted at the Winnipeg COE.

LANDMARK FUELING IN AUSTRALIA

Air bp, the international aviation fuel products and services supplier, has passed a milestone of 250,000 fuelings using its Airfield Automation digital technology. The landmark fueling took place during the month of July in Adelaide, Australia, when the business supplied Jet A-1 to The Royal Flying Doctor Service. Since launching in May 2018, Airfield Automation has been rolled out to 145 Air bp network locations in 18 countries on four continents. Before many aircraft were grounded due to the Covid-19 pandemic, Air bp was completing around 1,000 fuelings per day globally.

BELL LAUNCHES VIRTUAL COURSE PLATFORM



Bell says its Training Academy will now offer virtual pilot and maintenance training for global customers who may be unable to travel to Bell's global training facilities. The courses that are currently available via the Bell Training Academy's Virtual Platform are the Bell 505 Pilot, Bell 505 Avionics & Field Maintenance, Bell 429 Pilot and Bell 407 Pilot. Bell expects to offer virtual courses for all Bell current commercial products by the end of July 2020.

CESSNA SKYHAWK CELEBRATES 65TH

Textron Aviation recently marked the 65th anniversary of the first flight of its Cessna Skyhawk. Since the aircraft first took to the sky on June 12, 1955, more than 45,000 Skyhawks have been delivered to customers around the world—more than any other aircraft in the industry and solidifying the Skyhawk as an aircraft of choice for pilot training. "The aircraft quickly established its place as the ultimate training tool, with more than 1,100 built and delivered to customers during its first year of production," said Chris Crow, vice president of Textron Aviation Piston Sales.

PRODUCTION WINDS DOWN ON G550

Gulfstream Aerospace announced it has sold the last commercially available Gulfstream G550, clearing the way for its production to wind down. The final

commercial aircraft will be delivered to a customer in 2021. "The G550 set the standard for subsequent aircraft and the industry," said Mark Burns, president, Gulfstream. "With more than 600 in service, the G550 has earned its place as a leader in business aviation." Announced in 2000, the G550 entered service in 2003 and set more than 55 speed records. Gulfstream Aerospace invented the first purpose-built business aircraft, the Gulfstream I, which first flew in 1958.

MORE APPROVALS OF GARMIN AUTOPILOT

Garmin International announced new autopilot aircraft approvals for its GFC 500 and GFC 600 autopilots. Aircraft such as the Bonanza B36TC, Cessna T210, Cessna 421C and Piper PA-46 are among the latest additions. Garmin says it has completed 42 Supplemental Type Certifications in the past three years on more than 30 aircraft, spanning nearly 200 aircraft models. "As Garmin increasingly expands its portfolio of aircraft approvals, demand for the GFC 500 and GFC 600 continues to achieve significant growth," said Carl Wolf, vice president of aviation sales and marketing.

FAA ISSUES COVID SAFETY ALERTS

The continued spread of COVID-19 prompted the FAA during the month of July to issue two Safety Alerts for Operators recommending flightcrews and operators familiarize themselves with Oceanic and Terminal Airspace procedures for the closure of ATC facilities with little or no notice. For operations in Oceanic airspace, the FAA encourages flightcrews to review guidance in the Aeronautical Information Publications for the countries where they operate as well as regional operational air traffic management contingency plans. The FAA also provides operational guidance for the unexpected closure of an Oceanic ATC facility, including procedures on rerouting and broadcasting. ✦

Feature

Tool Time

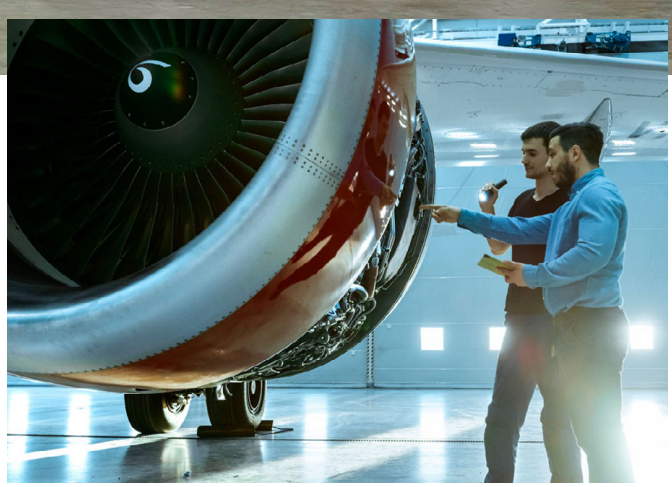
The Federal Aviation Administration is now developing a toolkit to assess the Safety Culture of maintenance repair operators and is reaching out for feedback from shops, both big and not-so-big.

BY KYLIE KEY, PH.D.,
INCHUL CHOI, PH.D.,
AND JUSTIN DURHAM

THERE are benefits to having a positive safety culture — but how do you know whether you have an adequate safety culture, and how to improve? Helping the aviation industry answer these questions is a goal of researchers at the FAA's Civil Aerospace Medical Institute (CAMI).

WHAT IS A SAFETY CULTURE?

Safety culture can be defined as employees' perceptions of how much safety is valued in their organization and the extent to which risk-taking behaviours are viewed as necessary to ensure timely completion of tasks. The level of safety culture in the workplace is typically measured with a survey of employees' commitment to safety. But it's not just an employee's commitment to safety — after all, employees don't work in a vacuum. Safety culture is shaped by the work environment. While there are many surveys available, they can be expensive and may require trained researchers or consultants to analyze and interpret the data, making them out of reach for smaller organizations. Major airlines may be able to afford these costs, but smaller organizations usually cannot.



Above: We need smaller organizations to provide expert feedback to help us improve the survey and the process.

Right: Whether you have a workforce of two or two thousand, job resources and demands are drivers of safety culture.

FAA MAINTENANCE SAFETY CULTURE ASSESSMENT TOOLKIT

Researchers at CAMI are working to provide a stand-alone process for organizations to have full ownership of their culture assessment and associated proprietary data. The FAA Maintenance Safety Culture Assessment Toolkit is designed to include everything needed for a DIY culture assessment and improvement effort that will allow organizations control of the process by providing the survey instrument, data analysis tools, and educational/guidance materials for safety culture promotion.

This toolkit goes beyond simple measurement of employee commitment to safety, which is the focus of most culture surveys. It measures environmental factors from the work environment, such as the job resources available and the demands that are faced to complete a task. Together, job resources and demands form the foundation of culture, in turn influencing an employee's outcomes (e.g., job satisfaction, risk-taking behaviour) and the organization's bottom line (e.g., errors, accidents/injuries, productivity).

Whether you have a workforce of two or two thousand, job resources and demands are drivers of safety culture and

Table 1

Job Resources	Job Demands
• Is there a strong commitment to safety at all levels (from senior executives to new hires)?	• Are there mixed messages communicated to employees (e.g., leaders say they care most about safety, but their actions speak more towards productivity or profit)?
• Does management devote sufficient effort to managing safety?	• Is there unrealistic time pressure or are deadlines unachievable?
• Is there a clear policy for Just Culture?	• Is there an unmanageably high workload?
• Do employees feel comfortable reporting hazards and safety events?	• Are there inadequate personnel to complete work tasks safely?
• Are there sufficient equipment, tools, and parts/consumables to perform tasks?	• Do employees have to cover for underperforming colleagues?
• Are the technical manuals/job cards accurate and usable?	• Is there pressure to work long hours or overtime?
• Is training carried out at appropriate intervals?	• Do job requirements put pressure on employees' personal lives?

Safety culture can be defined as employees' perceptions of how much safety is valued in their organization.

Honestly assess yourself and your organization using sample items in Table 1.

should be included in any culture assessment. Although the toolkit is currently in development, we urge you to honestly assess yourself and your organization using sample items in Table 1, considering ways that you may be able to allocate additional job resources and reduce demands.

As noted, the toolkit is under development and the instrument is being refined. The current version has about 180 items, but takes only 20–30 minutes to complete and is administered via an anonymous online survey link. The data analysis tool plots the distribution of participant responses, along with the goal set by the organization, to pinpoint opportunities for improvement.

LESSONS LEARNED FROM BETA-TESTING

Before publicly releasing this toolkit, we are beta-testing to ensure it meets the needs of the aviation industry. So far, we are in various beta-testing stages with three organizations, each with 50-plus employees: a large part 145 maintenance operator, a rotorcraft maintenance organization, and a group of pilots.

Some key lessons learned and next steps are:

1. Each organization faces different operational challenges, necessitating tailored survey content. A future goal is to empower users to tailor the survey to their operations without needing our help.

2. Some organizations cannot spare 20 minutes for every employee to complete the full survey, but they still want a quick pulse of their culture. A future goal is to create a "short form" of the survey, perhaps by expanding Table 1. This short form would include only the top safety culture items that apply to every organization, large or small.

3. Without ensured anonymity, no amount of incentives or advertising for the survey will result in an adequate participation rate. Protecting anonymity is key, no matter how many (or few) respondents there are.

The aviation industry has an appetite for the toolkit and has encouraged us to expand our efforts to other operations types (e.g., cabin crew, ground handling). We have also been asked to make a scaled-down version of the toolkit for smaller operations such as general aviation (GA).

Major airlines may be able to afford the costs of indepth surveys, but smaller organizations usually cannot.

CULTURE ASSESSMENT IN GA

The most critical challenge to a successful GA toolkit is protecting employee anonymity to ensure an adequate participation rate and sincere responses. Our tentative plan is to:

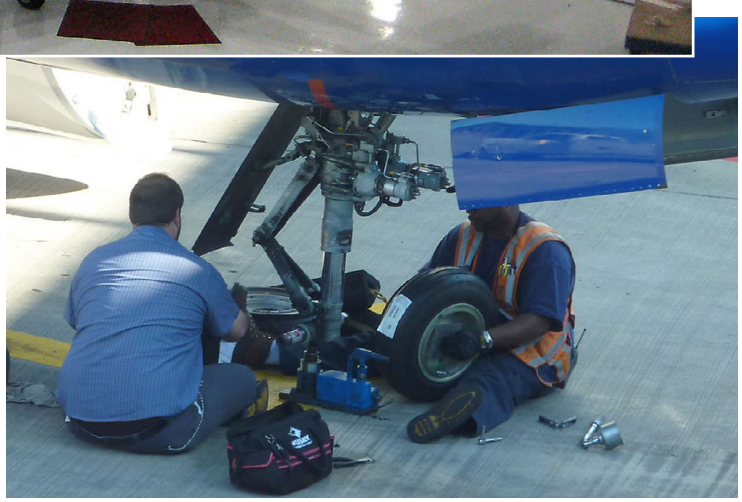
(a) create a customizable anonymous survey administered online, so that responses are de-identifiable,

(b) prevent managers from seeing individual responses by aggregating the data into a centralized database, and ...

(c) create an automatically generated report with an overall picture of the organization's safety culture, but not disclose detailed information that could identify participants (such as job role or scheduled shift).

Additionally, if the number of the respondents is very small, we could average the data across multiple similar organizations with similar size and scope of operations. Each organization could then receive the same report about industry on average, revealing general trends and plausible issues that they may have.

This is one potential method for making the toolkit work for GA, but we need smaller organizations to provide expert feedback to help us improve the survey and the process. We need to better understand the unique operational challenges in the GA environment, what we are missing, and how we can make a better tool for smaller organizations. To make this toolkit work — we need you.



The most critical challenge to a successful GA toolkit is protecting employee anonymity.

If you are interested in testing the survey or have suggestions, please contact Dr. Kylie Key at **kylie.n.key@faa.gov**. We continually look for ways to improve and look forward to hearing your feedback! ■

(The preceding was previously published in FAA Safety Briefing, the FAA's safety policy voice of non-commercial general aviation. The authors are with the FAA Civil Aerospace Medical Institute.)

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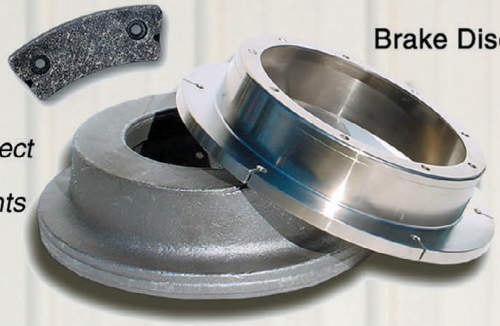

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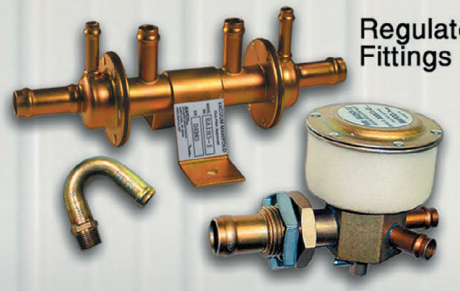

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THE RISE OF THE BUBBLE

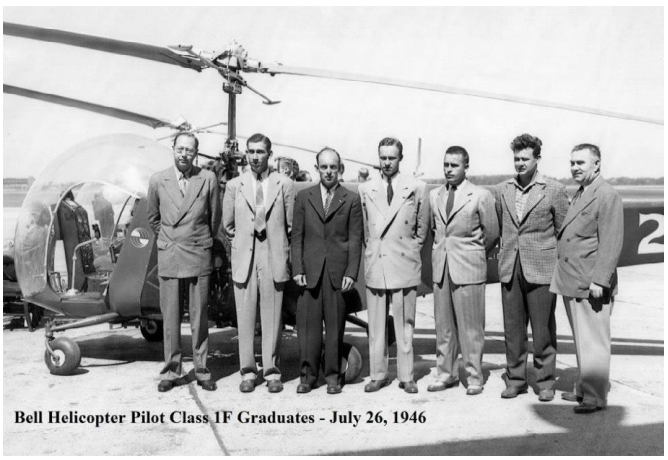
By Mario Bazzani

Bell is now celebrating its 85th anniversary. Looking backward in time, an aviation historian recounts the development of the 47B helicopter, an aircraft that would reshape civilian life and industrial practices, as well as the fortunes of Bell as a manufacturing firm.

THE BELL 47B was the first helicopter specifically developed by the Bell Aircraft Corporation for civil use. It was the result of the experiences gained by the "Gardenville group" headed by Arthur M. Young (1905-1995), who worked on the three Bell Model 30 prototypes between 1942 and 1945. In 1928 Young set up a small laboratory in a barn on the family estate in Radnor, Pennsylvania where he began experimenting with small electric models.

After 13 years of research and many failures Young understood that the stability of a two-blade rotor could be significantly increased thanks to a stabilizer bar with counterweights to both extremities mounted perpendicularly to the two blades and linked directly to the rotor so the rotor plane was controlled independently of the mast. This device significantly enhanced the stability.

In September 1941 Young packed one of his models along with some films and went to Buffalo, New York where he met some Bell engineers. There he presented his films and did some test flights inside a hangar with his remote-controlled model. In that occasion he met Larry Bell (the founder of the Bell Aircraft Corporation in 1935). The two of them made a deal for the development of a full-scale helicopter and therefore in June 1942 Young and his assistant Bart Kelley moved to Gardenville, a hamlet on the north border of West Seneca,



Left: Dwight Eisenhower preps for a presidential ride.

Above: Bell Aircraft Pilots Training Academy.

Above, right: The Bell 47 acquired legendary status transporting wounded soldiers during the Korean War.

Below, right: Bell 47 designer Arthur Young at work in the test field.

New York, where along with a small team he could work in relative secrecy. The first test flight of the prototype known as the Model 30 occurred in July 1943.

On March 8, 1946 the Model 47 was awarded the world's first commercial helicopter license. Exactly two months later on May 8, 1946 Bell received helicopter type certificate no. 1 (NC-1H) from the CAA. It is interesting to remember that in the various versions (over 20 were developed by the American manufacturer) the Bell 47 was built in more than 5,000 units by Bell to which were added over 1,400 units produced under license in Italy, Japan and England. Production ceased in 1973.

Automotive design

From an aesthetic point of view the Bell 47B looked very different from the other Bell 47 models produced later. The Bell 47B featured car-like windscreen discarded on later variants and replaced by the famous fish-bowl cockpit bubble which made the Bell 47 one of the most popular helicopters in the world. At that time many people were convinced the helicopter would eventually replace the car, and it should not be surprising that Larry Bell himself asked a Detroit car manufacturer to assist his engineers in the styling of the helicopter.

Legend has it that Larry Bell wanted the Model 47 to appeal to non-pilots and required a cabin configuration with doors large enough and cabin high enough to enable a gentleman to get in without having to remove his hat, even a top hat. It should also not surprise that the helicopter was equipped with ashtrays, glove box, soundproofing, two upholstered seats arranged side by side and fitted with safety belts, carpets and a generous luggage compartment. Like in a car the windows in the doors could easily be opened or closed to control ventilation.

In 1946 Bell built two prototypes of the Bell 47B (NX41967 s/n 2 and NX92845 s/n 9) and in the course of the year in a huge hangar of the Bell plant on the airport of Niagara Falls in Wheatfield, New York the assembly line was set up for the production in series of this model which took place in parallel with

The 47J variant was a four-seater.

that of the 28 Bell 47A (military designation YR-13 / HTL-1) ordered by the US Army Air Force.

Unfortunately at that time while the pre-series models were tested some dramatic flight incidents occurred. The first took place on August 10, 1946 near Lakewood, New York when Milton R. Carlson, the brother of Floyd Carlson who had been the first professional test pilot hired by Bell for the helicopter program and among the first helicopter pilots in the US, lost his life. The cause of the accident was never ascertained and this dampened the atmosphere of general enthusiasm that was growing around the new invention.

But what's a helicopter for?

In June 1946, Bell announced a production of 500 helicopters was scheduled for that year and estimated there would be a strong demand from government agencies, industry, commerce and agriculture. For this reason Bell bought 500 Franklin engines most of which ended up accumulating dust in a warehouse. The problem at the time was that, except for insiders, few people really knew what a helicopter was capable of. Therefore it was necessary to show the potential of this aircraft whose transport capacity and performance were still rather limited. For this reason some pilots were charged to carry out promotional tours.

But the problems were certainly not yet over. One obstacle that surely restrained sales of the helicopter was its price of $25,000, which was three times more expensive than that of a light aircraft and 10 times the cost of a luxury car. Sales of the new Bell helicopter were much less than what Larry Bell and management had envisioned. Despite the quickly accumulated record of utility, the company's investment was returned slowly.

Another obstacle that somehow restrained the enthusiasm was that early models required plenty of maintenance. Grease nipples and grease boots were still in the future, so the helicopter had to be taken apart after every 25 flying hours to be lubricated. The transmission had to be taken apart too, and have bearings replaced and hand-packed with grease every 25 hours. The maintenance engineer had his hands full. The old brochures never mentioned this fact because it would potentially have deterred potential customers.

Fortunately overhaul intervals on the helicopter went from 25 hours to 50 hours and then to 100 and finally to 200 hours

Bell 47 B: A Technical description

The Bell 47B is a helicopter of standard configuration with a two-blade main rotor and an anti-torque tail rotor. The main rotor is equipped with the famous stabilizing bar. The main rotor blades, of symmetrical aerofoil section, are made of laminated wood with a steel insert in the leading edge for strength and mass-balance. The fuselage is built in three sections: the cabin, the centre frame with the engine and its accessories and the tailboom. All instruments, engine controls and switches are placed on a central column and are readily accessible.

The center section accommodates the six cylinder opposed air-cooled motor type Franklin 6V4-178-B3 (335 cubic inches) which has a maximum takeoff power at sea level of 130/178 kW/hp @ 3,000 rpm. The engine with clutch, drive shaft and rotor assembly is packed in an integral unit with the engine supported on rubber mounts at the top and bottom and attached to the welded framework of the forward fuselage. The main rotor is driven through a centrifugal clutch and a two-stage planetary transmission with a 9:1 motor/rotor reduction ratio. A free-wheeling mechanism is incorporated in the transmission.

The Bell 47B has a quadricycle landing gear.

The Bell 47B has a quadricycle landing gear. The front wheels are castering while the rear wheels are fixed. The anti-torque rotor (the blades were also made of laminated wood) is driven by a tubular shaft and is controlled by cables and pulleys. The helicopter was available in red base colour vermillion, green Salt Lake, Blue Honolulu. On request it could be painted with orange or yellow colours.

(The preceding were excepts from the story originally published by Mario Bazzani at **www.heli-archive.ch***)*

An acrobat (possibly Marilyn Rich) dangles from a hovering Bell 47B helicopter (r/n NC102B) during a demonstration at the the National Air Races, Cleveland, Ohio.

Irvin-Bell Helicopter Sales was one of the first European helicopter operators. On 25 September 1947 G-AKCX crossed The Channel for demonstrations in Belgium, Holland and Switzerland.

before having to tear down the aircraft. This resulted in the helicopters being able to be away from their main base for longer periods before requiring major downtime for overhauls. On request Bell organized a mobile workshop (Bell Aircraft Helicopters Mobile Service Unit), which went directly on site with the spare parts needed in order to do the maintenance work and the repairs.

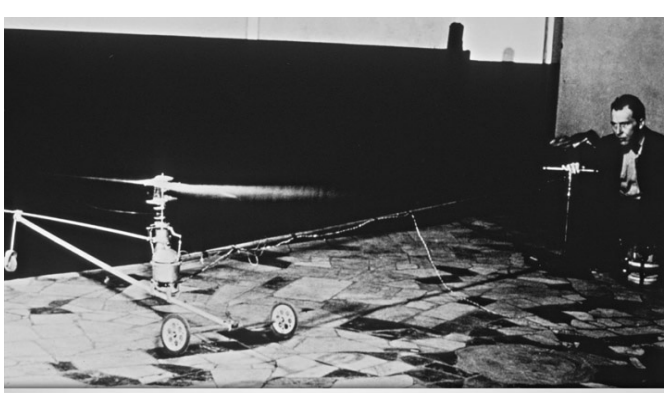
The 47G model combined a 200 hp Franklin engine with the three-seat configuration of the 47D-1 and introduced the twin saddlebag fuel tank configuration.

First deliveries

Despite the difficulties already mentioned (and of course many others) the American manufacturer started to deliver the first commercial helicopters. The first Bell 47B registered NC7H was delivered on December 31, 1946 to Helicopter Air Transport (HAT) based at the Central Airport in Camden, New Jersey, the first commercial operators of helicopters in the world. On January 5, 1947, HAT commenced a high-priority freight service on behalf of the magazine Filene's in Boston, Massachusetts. However this job did not last long: the helicopter was simply too expansive. An hour of flight usually cost around $75, a lot of money at that time!

The Bell 47Bs were used for various aerial services, which then became a classic for the rotary-wing such as for example flying schools, power or pipeline patrols, or aerial photography. New types of work for the helicopter were ongoing, in fields such as agriculture, forestry, or oil and gas exploration. Curiously the first really profitable job for HAT's helicopters was of a different kind: they were often used to attract crowds of onlookers to public events. There was a great curiosity around the eggbeaters, but again this business did not last long and therefore both HAT and the other commercial helicopter operators (among the first were Lundberg Ryan, Southern Arizona Air Service, New England Helicopter Service, Central Aircraft, Helicopter Field Operation, Armstrong Flint) were forced to find new job opportunities.

The last airworthy Bell 47B (N116B) was restored in 1989 by a private owner and is today displayed at the National Air and Space Museum.



Arthur Young operating research model helicopter | CIRCA 1941

In July 1947 one of HAT's Bell 47B on floats was sent to Louisiana to be used on behalf of the Robert H. Ray company Houston, a geophysical company conducting gravimetric oil surveys in a marshy area near Houma. For environmental reasons the use of special vehicles known as marsh buggies was not allowed in that area, and therefore it was decided to experimentally employ the helicopter. Its use proved to be much more convenient, faster and especially more economical. The Bell 47B moved a technician with gravimeter from point to point. From that moment on the petroleum industry commenced to increasingly use helicopters for tasks of all kinds.

The successors

The last s/n 50 assembled (NC130B) was delivered on June 16, 1947 to Gannett Newspaper Rochester, New York. From the experience accumulated on this model (and the agricultural version known by the designation Bell 47B3) Bell developed a new helicopter known as Bell 47D. Altogether 43 Bell 47B were produced. Several of these were successively modified and upgraded to newer versions that radically changed their original look and this in order to be adapted to the needs of their operators.

The last airworthy Bell 47B (N116B) was restored in 1989 by a private owner and is today displayed at the National Air and Space Museum. Another historical helicopter likewise preserved is N5C (s/n 3) originally used as a Bell demonstrator until it was sold to Chicago Seaplane Base in April 1951 where it was used for student training and charter work. ★

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ATLANTIC

Atlantic AME Association

June Update

The pandemic we find ourselves in is like nothing we have ever been through before. As aviation professionals, we continue to keep our aircraft safely flying and doing our part to ensure that our co-workers—and ourselves—stay healthy and we, as AMEs, do all in our control to ensure the safety of our passengers, crew, and equipment.

I am sure your employer has protocols in place to ensure your safety and by following these and the directions of your federal and provincial health professionals you will be safe and healthy and will come out of this stronger than ever.

As part of the Covid-19 pandemic, Transport Canada has issued guidance material for aviation personnel. In this guidance material you will find: Safety Bulletins, Safety Alerts, AME license renewal exemption criteria, Essential Worker designations and restrictions, and just about anything you need to know as it relates to Covid-19 and the Canadian Aviation Transportation Industry.

You are all aware by now that we had to cancel the 2020 Atlantic Region Aircraft Maintenance Conference, which was scheduled for St. John's. With this cancellation, a number of AME Association (Atlantic) scheduled events were also cancelled.

The Annual General Meeting, Election of Officers, Financial Statements, and Membership Number update did not occur. We, as your Board of Directors, made the decision to post-pone these events until the next ARAMC, which is scheduled to take place in Halifax in April of 2021. However, if you would like to review the financial position of the association, please let me know and I will make arrangements to facilitate your request. The Awards Banquet, with the presentation of Awards and Bursaries is also cancelled until 2021.

I want to mention the AME students of both colleges in our region and the stress they are under at this time. They were in the final semester of their studies, looking forward to finishing their instructional classes and getting out and starting their careers as aviation professionals. We ask you to stay strong and complete your school tenure as the personal rewards you receive from careers as aviation professionals are very fulfilling.

Stay Safe, Stay Healthy, Stay Strong.
Bob Pardy, President

News from the rock

By Melvin D. Crewe

Hello fellow AMEs, apprentices, students, and corporate members. It's newsletter time and an opportunity to update our readers on news from this end of the province. One of the top stories out of St. John's was the cancellation of ARAMC 2020. With near record numbers of displayers and delegates anticipated to attend and planning well underway, we were forced to cancel the conference as the world health situation worsened due to COVID-19 and travel bans were put in place.cWe thought about rescheduling to 2021, but commitments have already been made to the Westin in Halifax for that time. It looks as though the conference will be in Moncton in 2022 and return to St. John's in 2023.

The aviation community in this area received some sad news recently with the passing of two well-known people. Bobby Briggs Jr., son of Bob Briggs, Sr., passed away suddenly at the age of 64 in Fredericton, New Brunswick.

George Furey, Sr., ex EPA, ex Labrador Airways and ex Provincial Airlines Ltd. engineer passed away at age 84 years from cancer. George was a real aviation lover and continued doing consulting work for PAL long after he retired. He just could not get enough of airplanes. In 1986, George served on the inaugural ARAMC Committee when the conference was held at the Battery Hotel in St. John's.

On behalf of the AME Association (Atlantic) Inc. and the Atlantic Region Aircraft Maintenance Conference Committee, I extend deepest condolences to the Briggs and Furey families.

The past number of weeks and months has been a period of upheaval in the airline industry and the lives of people around the world. The COVID-19 pandemic has seen people isolating and quarantining in their homes, and it has significantly affected their ability to travel. Airlines have been forced to limit flights and reduce staffing levels. In the midst of all of this, we saw the tragic loss of an RCAF Cyclone helicopter in the Ionian Sea that claimed the lives of all six crew members. Most recently, another tragedy unfolded with the loss of one of the Snowbirds at Kamloops where one crew member safely ejected and one received fatal injuries.

That's it for now from "The Rock." Stay safe, everyone!
www.atlanticame.com

PACIFIC

Pacific AME Association

PAMEA: Who We Are

Rod Hayward, President

Rod Hayward has had an interesting and diverse career within the aviation industry, as a pilot, engineer, entrepreneur, and educator. Rod's considerable operational experience is combined with the management experience garnered as one of the founders of Terrace based regional airline, Hawkair. In addition to a pilot's licence, Rod holds an M1 and M2 Aircraft Engineers licence as well as a MBA from the University of Northern British Columbia. Throughout his career, Rod has held a number of Transport Canada approved positions such as Director of Maintenance, Quality Assurance Manager, Safety Manager, and Accountable Executive.

Within the BC aviation community, Rod has been a member of the BC Aviation Council (BCAC) Operator's Committee and was an active member of the YVR Airport Consultative Committee (ACC) while at Hawkair. Rod recently stepped down as the General Manager/ CEO for Hawkair, a position he held for 9 years, in order to join the School of Business at the University of the Fraser Valley (UFV) in Abbotsford. Rod shares his unique knowledge of aviation and business while teaching both general business courses and aviation focused business courses in UFV's Bachelor of Business in Aviation program.

Peter Chick, Secretary / Treasurer

Peter J Chick has over 35 years experience in aviation: Aircraft Maintenance Engineer, MD-M, Maintenance Manager, DOM, Quality Assurance Manager, Auditor and Pilot for many small operators. Developed Transport Canada approved Maintenance Control Manuals, Maintenance Policy Manuals and Quality Assurance Programs.

Rob Fraser, Director of Training

Rob graduated BCIT in 1986 and spent 5 years in the corporate avionics world, where he obtained his "E" licence. He then moved on to the airline industry, obtaining his M2 licence along the way. Rob has spent over 30 years in the airline and corporate industry, the last 13 of which have been as a full time maintenance instructor. He is type endorsed on the CRJ100/200/705/900, and the Dash 8 100/300 and Q400, and specializes in teaching landing gear, hydraulics, airframe fuel, flight deck instrumentation and ice protection, as well as electrical and avionics. Rob is also the chief instructor for taxi/run training at Jazz.

Al Behmer, Bylaw Director

Al Behmer has worked in the Aviation Industry for 35 years, starting back in 1983 with the Canadian Armed Forces as an Aircraft Refinisher. Leaving the Air Force in 1988 he joined Conair Aviation where he received training on the repairs of sheet metal aircraft structures. From 2000 to 2007 he lead a team of composite technicians at Cascade Aerospace repairing and modifying composite structures on aircraft such as B737, B757, Q400's, C-130 Hercules and others.

In 2007 Al joined the University of the Fraser Valley as an Instructor for the Aircraft Technician Repair program until 2017 and is currently contracting as an Aircraft Structures Technicia

David Sproule, Director Special Events

PAMEA member.

Bob Rorison, Retired President

PAMEA member since 1982, PAMEA Past President, CFAMEA (AMEC) director, 50 years in aviation, from bush planes to business aviation, and everything else in between. Robert Hope Pursuit of excellence award recipient. Queens jubilee award recipient for volunteerism in Canada. BCIT Instructor, retired.

www.pamea.ca

AME Association of Ontario

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email: association@ame-ont.com website: www.ame-ont.com

Maintenance Conference

It is with great disappointment that we are announcing the cancellation of the 2020 Ontario Aircraft Maintenance Conference and Workshop, which was being held October 28-30. The conference typically hosts over 600 people and the venue has informed us that gatherings of over 250 people are not likely going to be allowed in October. As the Aircraft Maintenance Conference takes months of planning from the committee, exhibitors, skills challenge participants and speakers, we feel that it is impossible to move forward considering the current uncertainty around re-openings and gathering sizes.

We would like to thank all of you who have contributed to the success of the event over the years and look forward your continued support. If you have any questions or ideas for next year, please send then to cara@precisioaerocomponents.com

The AME Association of Ontario and the conference committee look forward to seeing you at the 2021 Ontario Aircraft Maintenance Conference, which will be held October 27-29, 2021.

Annual General Meeting

The Annual General Meeting of the AME Association of Ontario is being rescheduled in a virtual on-line format. Notification and details will be issued to all registered members in the coming months.

The AGM is normally held during the annual conference and workshop. As a federally registered not-for-profit corporation, the AME Association of Ontario is required to hold an annual meeting to inform their members of the corporation's financial status as well as to consult with and obtain members approvals. Due to the Covid-19 situation Corporations Canada is allowing some exemptions and flexibility in the conduct of these meetings.

Submitted by Stephen Farnworth
For the Board of Directors

www.ame-ont.com

CENTRAL

Central AME Association

Association Objectives

1. To promote an 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 honorable practices among the membership and between persons in the aviation industry

www.camea.ca

WESTERN

Western AME Association

About Our Association

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.

The Western AME Association is run by a volunteer group of AMEs who are elected by the member AMEs to the Board of Directors. The membership is comprised of AMEs, non-licensed personnel working in the industry, students and apprentices as well as corporate members.

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 Ohio PAMA

PAMA Recognizes Student Scholarship Awardees

On June 24, PAMA recognized its 2020 scholarship award recipients in an online, virtual webinar. While the announcement was scheduled to take place as part of the Aerospace Maintenance Competition awards ceremony in Dallas, the presentation was rescheduled to take place via webinar when the competition was cancelled due to pandemic concerns.

PAMA presented awards to the following recipients:

Darnell Bahe is an honors student in the aviation maintenance technology program at Central New Mexico Community College with glowing recommendations from his instructors. Mr. Bahe has demonstrated the leadership qualities, teamwork, and high safety standards that will serve him well in his future career as an airframe and powerplant mechanic. His military experience performing maintenance on helicopters has served him well in school labs where he consistently demonstrated superior performance. In the future, in addition to working in the field of civilian aircraft maintenance, Mr. Bahe plans to teach aviation maintenance at his Native American high school, supporting the Navajo Nation Airport and promoting aviation maintenance careers to Navajo youth. Darnell received a $1,000 scholarship, courtesy of PistonPower by AEPC.

Christian Wood is majoring in aviation maintenance science at Embry-Riddle University where he maintains a 3.74 grade point average in the school's honors program. He is the recipient of the ERAU Honors Program Outstanding Service Award. Not only has Mr. Wood distinguished himself academically but also in his extracurricular activities. For example, he helped one of his professors operate a composite exhibition for over 800 school children at the Oshkosh AirVenture show in Wisconsin. Mr. Wood so impressed his bosses during an internship at a major aircraft manufacturer, that he was asked back for another prestigious internship. He plans to work in corporate aviation maintenance. Christian received a $1,000 scholarship, courtesy of JSfirm.com.

JuliAnne Miller maintains a 4.0 grade point average in aviation maintenance technology at Lansing Community College in Michigan. She is the recipient of the Mason, Michigan Experimental Aircraft Association Award for her professionalism and dedication to aviation. Ms. Miller's zeal and determination is exemplified not only by her academic excellence but also by her perfect attendance record despite a daily commute of 215 miles. Upon graduation, Ms. Miller plans to pursue Inspection Authorization. JuliAnne received a $500 scholarship, courtesy of JSfirm.com.

Representatives of the Aerospace Maintenance Council who presented their annual student awards as well joined PAMA's scholarship committee. Congratulations to all our award recipients. Visit the scholarship page for more information on the application deadline for 2021, and to contribute to the PAMA scholarship fund.

www.copama.org

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.

www.socalpama.org

This summer, aircraft engine manufacturer Rolls-Royce celebrated the 110th anniversary of Charles Stewart Rolls' non-stop double crossing of the English Channel by airplane. It was a world-first accomplishment.

Faith and

After a frustrating week of waiting for fog and winds to clear, aviation pioneer, Charles Stewart Rolls finally managed to leave Dover, England on June 2nd, 1910, for the round trip to Sangatte, France.

At 6:30 pm on June 2, 1910, aviation pioneer Charles Stewart Rolls took off alone in his flimsy biplane from Swingate aerodrome, near Dover, to achieve the world's first non-stop double crossing of the English Channel by airplane. He had been waiting in frustration for over a week, his departure repeatedly frustrated by high winds, fog or mechanical problems with the machine. But finally, conditions were calm and clear. Among the spectators on the cliffs were Rolls' parents, Lord and Lady Llangattock, and his sister and brother-in-law, Sir John and Lady Shelley.

According to a report in the Daily Telegraph, Rolls reached an altitude of 900 feet and a speed of "quite forty miles an hour" as he approached the coast of France. By 7:15 pm, he was flying over the small French town of Sangatte, where the present-day Channel Tunnel emerges. Leaning out of his airplane, he threw overboard three weighted envelopes, each containing the message:

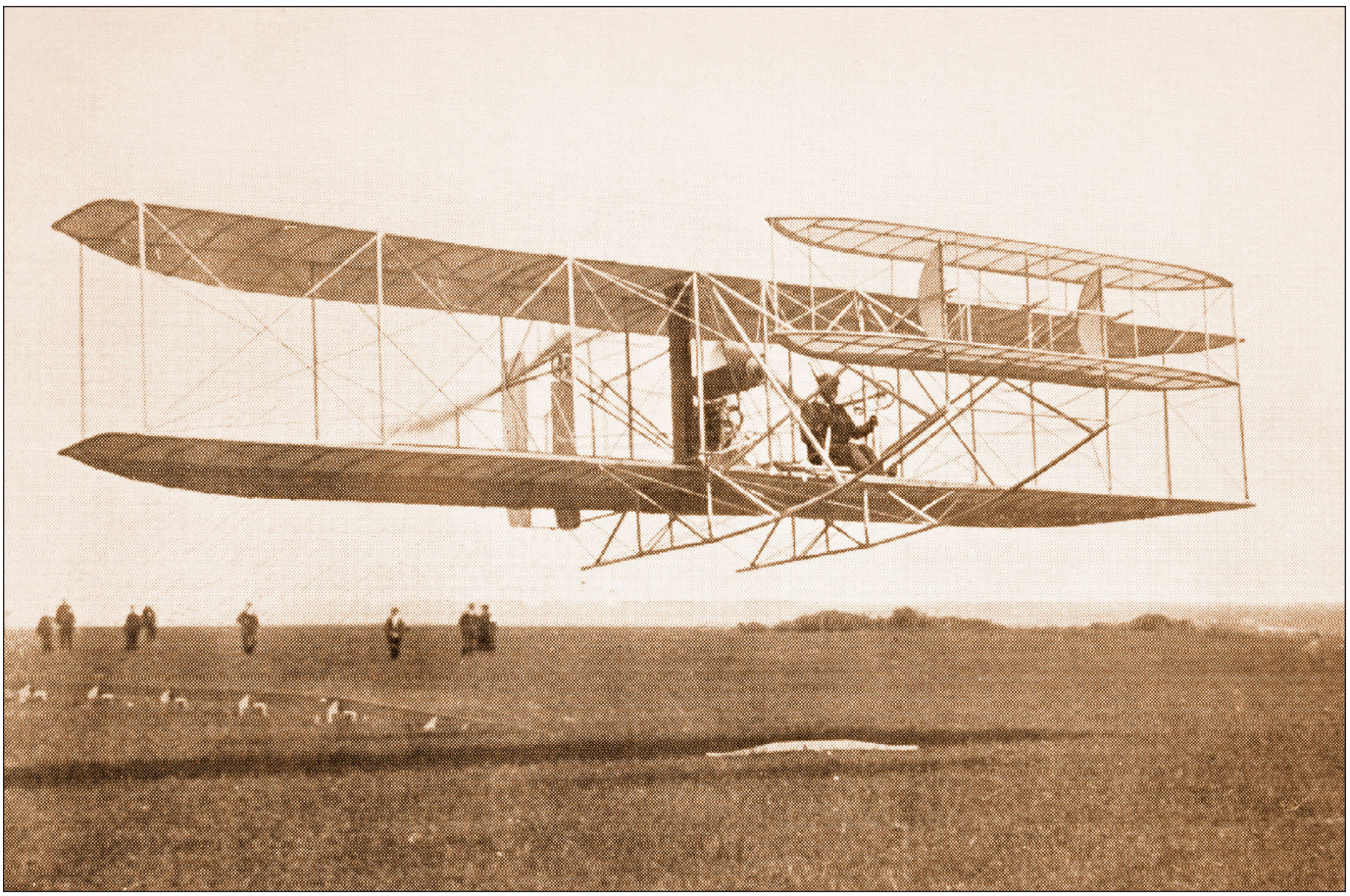
"Greetings to the Auto Club of France…Dropped from a Wright aeroplane crossing from England to France. C. S. Rolls, June 1910. P.S. Vive l'Entente"

Fate in the Machine

He then turned northward and set a course for the English coast. At 8:00 pm, he was back in Dover where, the Daily Telegraph reported, "The sea front, cliffs and piers were thronged with people, all in the most intense state of excitement."

Rolls rewarded them in typically flamboyant style, by flying in circles around the outer towers of the town's medieval castle. "I decided that, as I had plenty of petrol and my engines were working splendidly, I would encircle the Castle, although it would lengthen my flight considerably," he told the Telegraph. The crowd loved it. This was more than mere entertainment: they knew they were present at a moment of history.

In an adventure lasting 95 minutes, Rolls had achieved two immortal landmarks. He had become both the first Englishman to fly an airplane across the English Channel, and the



Flight proved to be Rolls' last great aeronautical achievement, coming only a month before his tragic death at the age of 32.

first aviator ever to fly non-stop from England to France and back again.

The flight caused a sensation and made Rolls an instant national celebrity. The recently-crowned King George V sent a personal telegram: "The Queen and I heartily congratulate you on your splendid Cross-Channel flight. George R.I."

The Aero Clubs of both England and France presented him with special awards. London's famous Madame Tussauds even began making a waxwork of him. Flight Magazine, meanwhile, lauded his Corinthian spirit, loftily assuring its readers that Rolls had made the crossing not in the name of "merely winning souvenirs" and "without the smallest monetary inducement" – a claim that may have rankled somewhat with Rolls, who had spent almost a third of a million pounds (at today's prices) of his own money on flying in the first half

of 1910 alone. It was perhaps with this in mind that he wryly remarked: "It is the only time I have succeeded in taking ten gallons of fuel in and out of France without paying duty."

It is a sign of how quickly aviation and aircraft were developing that Rolls' record-breaking flight came less than a year after Louis Blériot had stunned the world with the first powered flight from France to England in July 1909. Rolls made his double crossing in a Wright Flyer, designed by Wilbur and Orville Wright, who had recorded the world's very first flight in a heavier-than-air machine just seven years earlier in 1903.

This timescale underlines the truly perilous nature of Rolls' adventure. His airplane, built from wood and fabric braced with spars and wires, had a wingspan of just 12 metres (40 feet) and weighed only 457 kilograms (1,008 pounds) including the engine – about the same weight as a grand piano. The physical dangers of crossing the sea in so primitive a machine are obvious; it seems Rolls decided to attempt the return trip only when he was actually over Sangatte and reassured everything was working well.

His sole concessions to safety were a lifejacket for himself, and four large buoyancy bags filled with compressed air lashed to the machine's undercarriage. The Daily Telegraph noted laconically: "Happily, there was no need to test their efficacy."

But Rolls was as experienced as he was daring. His flying career spanned what was then virtually the entire history of aviation. Born in 1877, Rolls had been fascinated by engines since his schooldays – he went on to earn a degree in Mechanical & Applied Science from Trinity College, Cambridge – and was captivated by flying from its inception. He was a founding member of the Royal Aero Club, initially as a balloonist, making over 170 flights and winning the Gordon Bennett Gold Medal in 1903 for the longest sustained time aloft. In the spring of 1909, when the Wright brothers came to England from America as guests of the Royal Aero Club, Rolls acted as their official host. A year later, he became only the second person in Britain to be awarded an airplane pilot's licence.

After their historic first meeting in 1904, Rolls tried to persuade Henry Royce to build an airplane. He failed, but undeterred, Rolls bought a Wright Flyer in which he made more than 200 flights.

Tragically, it was in such a machine that Rolls met his death just a month after his cross-Channel feat. On July 12, 1910, during a competition at Bournemouth, the tail-piece broke off and the aircraft plunged to the ground from a height of 100 feet, crashing close to the crowded grandstand in a tangle of spars and canvas. Rolls sustained a fractured skull and was pronounced dead at the scene; he was only the twelfth person in history to be killed in a flying accident, and the first Briton to lose his life in a powered aircraft. He was just a few weeks short of his 33rd birthday.

Although Rolls is vastly more famous today for his automotive achievements, his contribution to aviation was immense and important. In April 1912, a statue commemorating his double Channel crossing was erected in Guilford Gardens on Dover's seafront; it now stands in Marine Parade Gardens, where it was rededicated on June 2,1995 by the then Chairman of the Rolls-Royce Heritage Trust.

Torsten Müller-Ötvös, CEO, Rolls-Royce Motor Cars, said, "Charles Rolls combined a fine technical mind with a bold, adventurous spirit; it is no wonder that aviation and motoring held such powerful, almost magical attractions for him. He was a true pioneer in both fields, instrumental in the development of aeroplanes and motor cars with his record-breaking feats." ■

Starved for Fuel

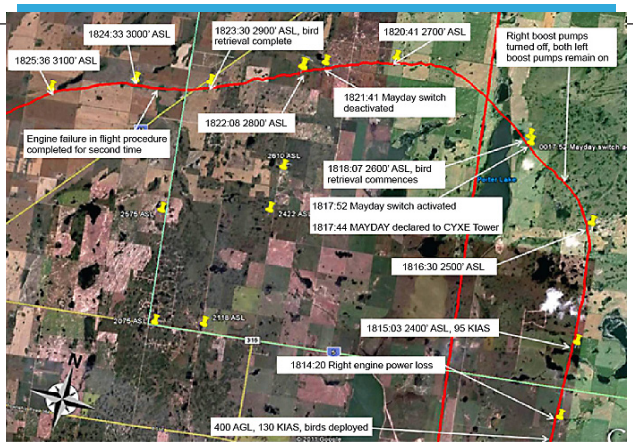
C-FDKM in flight with birds deployed.

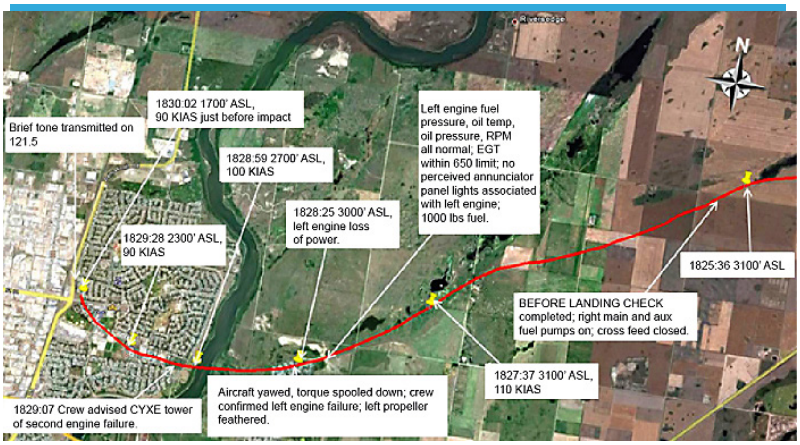
Double engine power loss brings about a forced landing situation in Saskatoon.

Crash site overview.

ON April 01, 2011 at 1503 Central Standard Time, the Construcciones Aeronauticas SA (CASA) C-212-CC40 (registration C-FDKM, serial number 196) operated by Fugro Aviation Canada Ltd., departed from Saskatoon/Diefenbaker International Airport, Saskatchewan, under visual flight rules for a geophysical survey flight to the east of Saskatoon. On board were 2 pilots and a survey equipment operator. At about 1814, the right engine lost power. The crew shut it down, carried out checklist procedures, and commenced an approach for Runway 27.

When the flight was 3.5 nautical miles from the runway on final approach, the left engine lost power. The crew carried out a forced landing adjacent to Wanuskewin Road in Saskatoon. The aircraft impacted a concrete roadway noise abatement wall and was destroyed. The survey equipment operator





Top left: Flight path 1814 to 1825-36

Top right: Flight path 1825-36 to 1830-02

Manufacturer	Construcciones Aeronauticas SA
Type and model	C-212-CC40
Year of manufacture	1981
Serial number	196
Special Certificate of Airworthiness – Restricted, issue date	2004-06-01
Total airframe time	21292.7 hrs
Engine type (number of)	Garrett TPE331-10R-511C (2)
Propeller/rotor type (number of)	Hartzell HCB4MN-5AL (2)
Maximum allowable take-off weight	7700 kg
Recommended fuel type(s)	Jet A, Jet A-1, JP-8, Jet B, JP-5 P4, Jet A, Jet A1sss
Fuel type used	Jet A

Above: C-FDKM Aircraft Specifications

sustained fatal injuries, the first officer sustained serious injuries, and the captain sustained minor injuries. No ELT signal was received.

Pre-flight preparation

The aircraft and crew conducted a survey flight on the morning of the occurrence, and the aircraft operated normally throughout the flight. After that flight, an aircraft maintenance engineer employed by Fugro Aviation Canada Limited (Fugro) fuelled the aircraft with 1703 litres of Jet A fuel.

Before the occurrence flight, the pilots conducted a pre-flight inspection of the aircraft during which all annunciator panel lights were confirmed to be operational. The single red line (SRL) and torque/temperature limiting (TTL) systems were also confirmed to be operational. The pilots calculated the aircraft weight and balance using a spreadsheet on a laptop computer.

The captain occupied the left seat and the first officer (FO) the right seat. Prior to engine start, the crew reset the fuel totalizers to zero. Both engine starts were normal. The flight departed from Saskatoon at 1503.

Survey flight

The area to be surveyed was within 30 nautical miles (nm) to the east of Saskatoon over generally flat terrain at an elevation of 1700 to 1800 feet above sea level (asl). There were a number of towers and electrical lines in the area.

The first 3 hours of the flight were completely normal. The pilots transferred control hourly and, during the occurrence, the FO was the pilot flying. The flight was northbound on the last north-south line of the survey block with about 10 nm to complete.

> *The propeller rotation slowed and the aircraft yawed. The right engine torque fell below 20%. The crew confirmed that the right engine had lost power.*

The aircraft was flying straight and level in the survey configuration with flaps up and the 2 survey sensors, or birds, deployed behind and below the aircraft. Altitude was 2300 feet asl, indicated airspeed was 130 knots (KIAS) with engine power stable at 99.7% rpm and 60–65% torque. The left and right normal fuel booster pumps were on, the fuel crossfeed was closed, and both left and right fuel pressure instruments were indicating normal readings. No annunciators or warning lights were illuminated and there were no abnormal engine instrument indications. None of the engine control levers had been moved recently. Fuel flow was 340 pounds per hour (pph) on the left engine and 360 pph on the right engine.

Right engine power loss

At about 1814:20, the aircraft experienced a shudder from the right engine just before it smoothly spooled down. The propeller rotation slowed and the aircraft yawed. The right engine torque fell below 20%. The crew confirmed that the right engine had lost power.

Response to right engine power loss

The captain set maximum power on the left engine (100% torque, 100% rpm and exhaust gas temperature [EGT] greater than 600 °C and less than the limit of 650 °C) and verbally advised the FO that maximum power was set. All engine indications for the left engine remained normal.

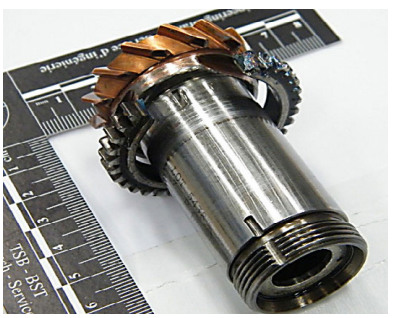
The FO applied pressure to the left rudder pedal to counter the yaw and adjusted the rudder trim to reduce, but not eliminate, the rudder pedal force required. The rudder trim was not set to full travel. The FO requested the captain assist on the left rudder pedal and the captain did so. This method was used for the remainder of the flight, and the rudder trim setting remained unchanged for the remainder of the flight.

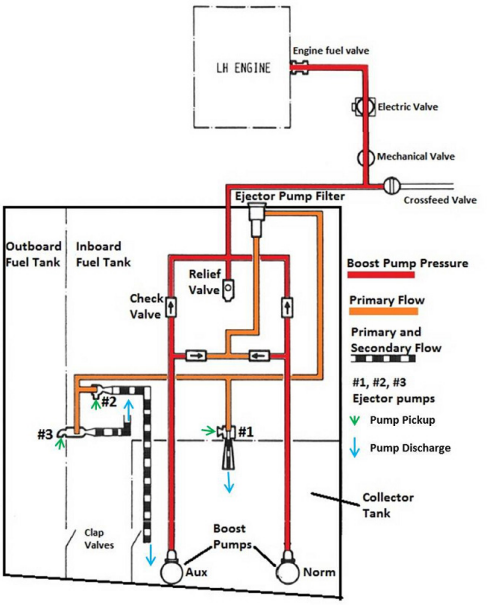
The FO banked the aircraft 5° left to help maintain directional control, and maintained the left bank until the left engine lost power later in the flight. The ball on the turn and slip indicator was steady at well left of centre.

The captain began to action the memory items for the engine failure in flight procedure. When the captain called for the FO to confirm the right emergency shutdown lever, the FO halted him before the lever was moved. The FO then turned on the left and right auxiliary fuel booster pumps; both the left and right normal booster pumps were already on. After a couple of seconds, the FO confirmed the right emergency shutdown lever and the captain moved it to the feather position.

The propeller feathered, and the captain completed the remaining memory items of the procedure, including "hydraulic pump on" and setting the flaps to 25%. The flaps stayed at 25% for the remainder of the flight. After completing the memory items, the captain reset the master caution light.

The FO concentrated on aircraft control because performance was marginal. Airspeed decreased substantially to less than 95 KIAS. As the FO had more experience on the aircraft





Top: C-FDKM in flight with birds deployed. Top right: Simplified schematic of the left wing fuel system. Bottom left: Gear which failed and was no longer keyed to the torque sensor shaft. Bottom right: Tooth wear on the loaded face and flank. Far right: No. 2 ejector nozzle and foreign object debris.

than the captain, the pilots agreed to let the FO continue as pilot flying. The captain would continue with the checklists and radio communications with air traffic control (ATC).

The crew decided that, before recovering the sensor birds, the survey equipment operator would remain seated until they had confirmed the aircraft would climb. If necessary, the birds would be released. Either recovery or release would require the survey equipment operator to get out of his seat and move about the cabin to operate the required equipment.

At 1816:30, the flight had climbed to 2500 asl, and the FO turned toward the northwest. This permitted the flight to proceed closer to Saskatoon while avoiding a group of towers immediately to the west. The captain then referred to the quick reference handbook (QRH) for the engine failure in flight procedure checklist, confirmed all memory items had been carried out, and completed the remaining items on the checklist. Both the right normal and right auxiliary fuel booster pumps were turned off; the left normal and left auxiliary fuel booster pumps remained on.

At 1817:44 the captain notified the Saskatoon control tower of the situation with a MAYDAY call, advising they had lost power on one engine and were returning to Saskatoon.

After completing the checklist, the captain kept his left hand on the control column, right hand on the power levers, and feet on the rudder pedals. He was ready to assist the FO

or take control if necessary, but was not applying any pressure to the controls other than the left rudder pedal.

The crew did not attempt to restart the right engine; their priorities were aircraft controllability, climbing to higher altitude, recovering the birds, and returning to Saskatoon. After the engine failure in flight checklist had been completed, the indicated right fuel pressure increased to and remained at 50 pounds per square inch (PSI). This was a result of high ambient nacelle temperature causing expansion of the trapped fuel in the lines between the closed firewall fuel valve and the fuel control unit. The fuel crossfeed was closed at the time and the fuel pressure on the left engine remained normal.

Bird retrieval

By 1818:07, the aircraft had climbed to 2600 feet asl and accelerated to about 99 KIAS, and the pilots had instructed the survey equipment operator to recover the birds. The survey equipment operator got up to do so. The recovery process took 4 to 5 minutes, during which time the flight initially continued climbing to the northwest to avoid the towers to the west and then turned westward.

Left engine power loss

At about 1828:25, airspeed was 105 KIAS or greater when the left engine smoothly lost power with no surging. The captain was looking at the engine instruments at the time, and all indications had been normal. Torque and rpm were 100% with no fluctuations; EGT was slightly greater than 600 °C and less than the 650 °C limit; fuel pressure, oil temperature, oil pressure, and fuel flow were all normal. The captain observed the torque indicator smoothly and rapidly decreasing from 100% to 20% within a couple of seconds. The captain did not observe any of the other engine instruments as the loss of power occurred.

Both pilots could feel the aircraft decelerate when the engine lost power. As the torque decreased to 20%, the captain could feel the FO changing the position of the rudder pedals. Both pilots could feel the aircraft yawing to the left, and it was clear to both that the left engine had lost power. Airspeed at the time was about 110 KIAS, and the altitude was 3000 feet asl (about 1300 feet agl). The captain verbally advised the FO that the left engine had lost power.

Forced landing

Both pilots immediately concluded the flight would not reach the runway, and the captain pointed out a large street to the FO as a feasible forced landing site and the FO concurred. Neither pilot could see any better alternative.

Analysis

TSB Laboratory analysis indicated that the case hardening of the gear tooth flanks and roots of 2 spur gears in the torque sensor gear train was below the manufacturer's specification requirements and likely led to the wear of the loaded faces and flanks of the gear teeth. The combined wear of the 2 gears likely caused an abnormal vibration that produced excessive cyclic loading and eventual fatigue cracking in the tooth roots

of the intermediate gear. The intermediate spur gear subsequently separated into several fragments and caused the loss of power transmission to the high-pressure engine-driven fuel pump. The immediate result would have been fuel starvation of the engine, flameout and the loss of power.

Fuel system

Analysis showed the presence of foreign object debris (FOD) material that was dissimilar to the type of sealant material utilized in the construction, repair or maintenance of the fuel tank, but it could not be determined how or when the FOD was introduced into the fuel tank. The staining of the No. 2 ejector pump nozzle indicates that it had been present for some time prior to the accident flight. The origin of the materials in the FOD was not determined. The inlets of the ejector pumps are unscreened; consequently, FOD of a compatible size and shape present in the fuel tank could be ingested into the nozzle area of the ejector pump.

Left engine power loss

The left engine power loss was likely caused by fuel starvation resulting from operating at various bank angles and left yaw with a compromised fuel system. This flight attitude exposed the No. 1 ejector pump, and the reduced output of the contaminated No. 2 ejector pump led to the depletion of the collector tank. As the booster pump output pressure and flow decreased, the engine became fuel starved and experienced a loss of power likely followed by a flameout. Testing of the fuel system demonstrated that the illumination of the low fuel pressure warning light was probably coincident with the left engine power loss.

Conclusions

1. The right engine lost power when the intermediate spur gear on the torque sensor shaft failed. This resulted in loss of drive to the high-pressure engine-driven pump, fuel starvation, and immediate engine stoppage.

2. The ability of the left-hand No. 2 ejector pump to deliver fuel to the collector tank was compromised by foreign object debris (FOD) in the ejector pump nozzle.

3. When the fuel level in the left collector tank decreased, the left fuel level warning light likely illuminated but was not noticed by the crew.

4. The pilots did not execute the fuel level warning checklist because they did not perceive the illumination of the fuel level left tank warning light. Consequently, the fuel crossfeed valve remained closed and fuel from only the left wing was being supplied to the left engine.

5. The left engine flamed out as a result of depletion of the collector tank and fuel starvation, and the crew had to make a forced landing resulting in an impact with a concrete noise abatement wall. ■

(These were report excerpts from the Transportation Safety Board's investigation into this occurrence. Consequently, the Board authorized the release of this report on 12 December 2012. It was released on 8 January 2013.)

Aviation Services

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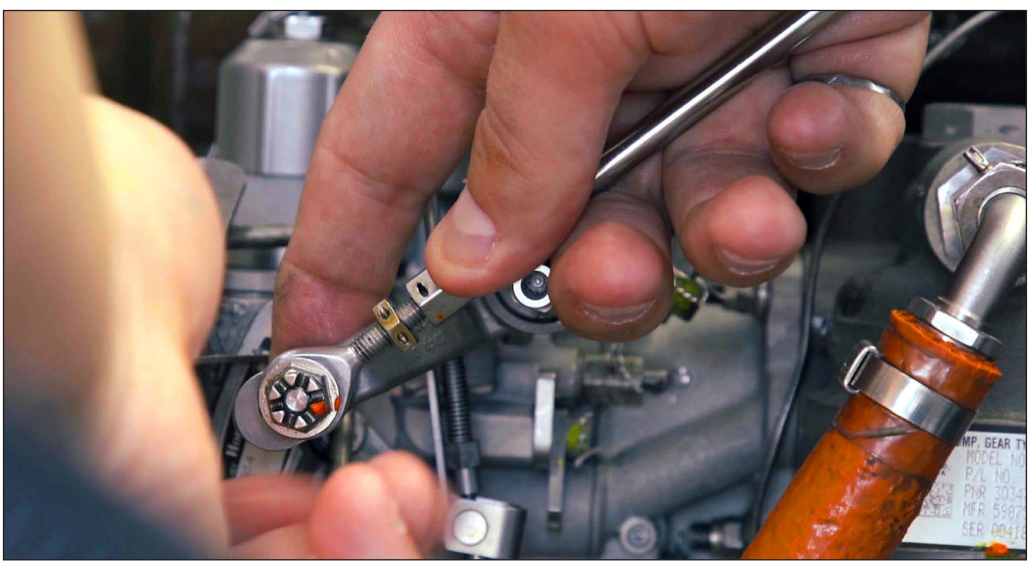
The Secrets of Engine Rigging Revealed

Pratt & Whitney's YouTube PT6 channel makes tricky work a little easier.



PRATT & WHITNEY announced in late June that it has launched a new video as part of its engine rigging video series for pilots, owners and maintainers of Cessna Caravan aircraft. The series now on YouTube includes rigging videos for aircraft powered by either PT6A-114A or PT6A-140 engines.

Jan Hawranke, Externals, Controls & Nacelles (ECN) Program Leader for PT6A engines, remembers exactly when he started to worry that the art of engine rigging was in danger of disappearing.

During the course of one year, an aircraft OEM sent back a dozen fuel control units that appeared to be faulty and couldn't be matched to each other on a twin-engine aircraft. This was a significant concern, since engines must be rigged exactly the same way to perform in harmony.

Jan didn't understand why the units were being returned, though, since they were in perfectly good condition. That's when the "aha" moment hit him: the real issue was that the OEM's mechanics didn't have the information they needed to rig the fuel control units properly. "There's an art to good rigging," says Jan. "A lot of it comes down to the mechanic's feel and experience. The fuel control units being returned were a red flag to us that something was changing."

"Proper rigging is important because it improves aircraft handling, passenger comfort and environmental performance, while reducing pilot workload, unscheduled maintenance and operating costs," said Nicholas Kanellias, vice president, general aviation, at Pratt & Whitney. "The rigging video series is an example of how we are continuing to provide readily accessible and relevant support as well as practical information to help simplify and improve the operations of our customers."

Engine rigging is an art and the Pratt & Whitney engine rigging video series brings that art to life. "The response from PT6A operators to the series as a whole has been very enthusiastic. Owners and maintenance technicians find value in these videos because they provide clear, detailed explanations about rigging, making a fairly complex task easier to understand and implement on their aircraft," added Kanellias.

The videos were filmed in the Tropic Air hangar, a regional airline based in San Pedro, Belize, and show the basic set-up of the engine control system, final rigging and engine adjustments. The content is designed to help customers save both time and money and ensure proper engine rigging for a single aircraft or for an entire fleet. The newly created video for PT6A-140-powered Grand Caravan EX aircraft and the first video for Cessna Caravan aircraft powered by the PT6A-114A engine are available on the PT6 Nation YouTube channel. ■

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