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AirMaintenance UPDATE

The Magazine for Aircraft Maintenance Professionals

Transport Canada Approved for R/T

Seeing things: wheel inspection equipment

Lightning: FAA Advisory Circular AC No: 20-53C

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What to wear?

An upstart firm sets its sights on manufacturing job-specific products for women in civil, commercial and industrial careers.

Women in the workforce have different shapes and sizes than their male colleagues. This should be all too apparent, yet the obvious seems to have eluded most manufacturers of protective clothing who continue to produce lines of work apparel tailored almost exclusively to men. The status quo is a safety issue.

In 1999, the National Institute for Occupational Safety and Health (NIOSH) issued a report summarizing interviews with 475 tradeswomen. In it, women voice major issues about their Personal Protective Clothing and Equipment (PPE). Not only was ill-fitting PPE found to be a safety hazard but it kept women from getting proper training and mentoring from male peers. A 2016 repeat of the same study revealed that nothing had changed except that manufacturers had coloured shrunken-down male patterns pink and called them women safety items. Some refer to this method as "Pink-it and Shrink-it" or "Barbie-fied."

An upstart company called SeeHerWork (www.seeherwork.com) also conducted over 50 focus groups in 2018 with similar findings. And now this firm, launched in September, designs, manufactures and sells workwear, safety equipment, and other job-specific products for women in civil, commercial and industrial careers. Its corporate goal is to make the workplace a safer and more practical setting for women.

"Making Personal Protective Clothing and Equipment that fits the female form available to women is the first step in making women more comfortable in these high paying occupations that are experiencing labor shortages," said Jane Henry, Founder of SeeHerWork. "We heard story after story of how rather than providing protection, the PPE given to women on the job often compromises safety. Multiple tradeswomen told us how they sometimes have to tape themselves up with duct tape to keep extra material from flying around or abandon protective gear altogether in order to obtain the dexterity needed—which can expose them to potential hazards." ■

Departments

Features

AirMaintenance Update

Unit 7, 11771 Horseshoe Way
Richmond BC V7A 4V4 Canada
phone: (604) 214-9824 • **fax:** (604) 214-9825

amumagazine@outlook.com or amumag2015@gmail.com **website:** www.amumagazine.com

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art director: Cliff Vickstrom
publisher: Bill Carter
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Upcoming Events

Aerospace Technology Week 2019

Aerospace Technology Week has announced that next year's March 12-13 event will take place at the MOC Event Center in Munich, Germany, and will be the largest gathering for the avionics, electronics, connectivity, aerospace testing and airline communities.

Aerospace Technology Week is comprised of three co-located events:
(1) Avionics Expo
(2) Aero Testing Expo
(3) Connected Aircraft Europe

Each event has a dedicated high-level conference and there is a larger central exhibition with sections for each and further details can be found at www.aerospacetechweek.com.

Avionics Expo

Established for over 10 years, Avionics Expo is the leading exhibition and conference for the commercial and defence sectors, fixed wing and rotorcraft. Both SESAR and Next-Gen recognize the need to integrate the air and ground parts of their air traffic management systems by addressing efficiency needs of flight trajectories planning and execution and the seamless sharing of accurate information.

This framework provides a vehicle for the US and Europe to work together towards interoperable standards. ICAO estimates that $120 billion US will be spent on air transportation systems transformation in the next 10 years. While the Next-Gen and SESAR modernization programs account for a large share of this spending in Europe and the US, there are parallel investment initiatives in other regions.

Aero Testing Expo

Aero Testing Expo, running for its third year, is a key platform for the aviation, rocket-and-space sectors to discuss the regulations, challenges, technological developments and systems. Accordingly, the potential for fatigue and even engine failure like the one that happened on Southwest Flight 1380 in the Spring of 2018. Even with record profits, operators cannot afford such failures like that.

Connected Aircraft Europe

The inaugural Connected Aircraft Europe aims to add new dimensions to the established connectivity themes of IFC and IFEC – by including AI, VR, IoT, Cybersecurity, Blockchain, Flight Tracking, Flight Operations and MRO applications.

Airline operators around the world are increasingly deploying satellite and broadband-based solutions on their aircraft to keep-up with passenger demand for inflight connectivity (IFC).

These systems can also provide enhanced flight operations by enabling real time data sharing with ground-based operations teams. ■

CHC Safety and Quality Summit
October 2 – 4, 2018
Dallas, TX
www.chcsafetyqualitysummit.com

Spirit of St. Louis Air Show & STEM Expo
October 13 – 14, 2018
St. Louis, MO; www.spirit-airshow.com

Helitech International
October 16 – 18, 2018
Amsterdam, Netherlands
www.helitechinternational.com

NBAA-BACE 2018
October 16 – 18, 2018
Orlando, FL
www.nbaa.org/events/bace/2018

Florida International Airshow
October 19 – 21, 2018
Punta Gorda, FL
www.floridaairshow.com

Great Pacific Airshow
October 19 – 21, 2018
Huntington Beach, California
www.pacificairshow.com

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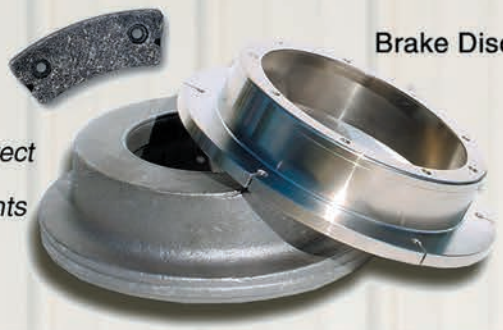

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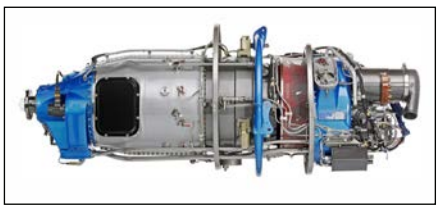


The GE H-Series is a family of turboprop engines offering a customized range of ratings and performance. The H-series incorporates technologies to advance the M601 legacy of reliable power for turboprop aircraft. GE H75-200 delivers higher power reserve (+200 thermo HP versus M601), improved fuel efficiency (five to 10 percent versus M601 reported by operators), and increased hot-day takeoff capability. Engine features up to 4,000 hours TBO (versus M601E: 2,000/3,000 hours) with the possible extension to 8,000 equivalent cycles (versus M601E: 6,600 equivalent cycles). **For information visit** www.stolairus.com

Fuel truck features aluminum frame

Beta Fuel System's 5K Refueler features an engineered frame made with aluminum for lighter weight, while the tanks come in aluminum, stainless steel or a combination of the two. The side modules provide maximum protection from impact using a narrower chassis and flexible joints to protect the pipework and valves. Individual control and filter modules mount directly onto the chassis rather than a sub frame. The 5K Refueler comes standard with BETA's all-aluminum filter vessel. It also features an underwing hose reel with electric rewind, a single foot valve for simplicity, and more durable stainless steel pipework. **For information visit** www.betafueling.com

M1 Microcrane will lift 2,000 pounds

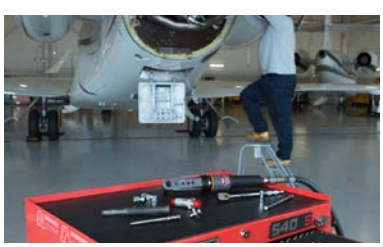
Smart Rig's new M1 Microcrane fits through 36-inch doorways, narrow aisles and inside elevators, yet expands to boom up to a 22-foot tip height for installation and repairs of control surfaces, wings, flaps, tails, helicopter engines, rotor gear heads, rotor blades and miscellaneous components in the aviation industry. It is rated at 2,000 pounds and has a hook height of 20 feet three inches. It is only 30 inches wide and weighs 1,800 pounds with 300 pounds of removable counterweights to reduce weight while transporting. The mobile crane is used for repairing or removing parts such as inlet cowls, slats in aircraft fleets, rotary blades, ground support equipment, and canopy windshields. **For more information visit** www.smartrigcranes.com

AIM Engineering launches wing assembly jig

AIM Engineering has partnered with robot suppliers to design and develop a new generation wing assembly jig for NEO converted aircraft. The jig, which can be used in a simple standard assembly jig or a fully robotic solution, meets the new rate increase for NEO converted aircraft. The jig structures have been designed to take robotic drilling and fastening loads. The staging element of the jig is an automated/inter-locked system with a high level of safety interfaces/equipment applied. They also ensure that expansion and contraction compared to the component is not an issue.

For information visit www. arlingtonindustriesgroup.com

PROTO's new tools are aerospace-compliant



PROTO Industrial Tools has introduced new products to its range of 1,500-plus aerospace-compliant mechanics tools. From newly innovated intermediate sockets, wrenches, extensions, and ratchets, to torque tools and accessories, select PROTO hand tools meet the specifications mandated by the SAE International group of engineers. These hand tools meet both dimensional and plating specs to help promote productivity, safety, and durability suitable for most heavy industrial verticals.

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WIRELESS SENSORS TO AID AIRCRAFT INSPECTIONS

Smart composite materials now under development at Embry-Riddle Aeronautical University in Daytona Beach, Florida show promise for improving aviation safety by continuously monitoring aircraft for structural failures – even in flight. Embry-Riddle researchers are depositing sensors in the form of zinc-oxide nanowires directly onto carbon fibres. The sensors are "piezoelectric," meaning they generate a specific electrical charge in response to different levels of mechanical stress.

In a "real-world" application, airlines would wirelessly receive data from these sensors to continuously monitor their fleet. "Our hope," says professor of Aerospace Engineering Marwan Al-Haik, "is that, after we get that correlation between defect size and electrical signal, if it's a crack length that exceeds, let's say five millimetres, a signal would be sent to an operator on the ground. That person would say, 'Uh oh, that's the 747 and it's in wing. We'd better take a look at that right away.'"

AIRBUS' FIRST SUSTAINABLY FUELED AIRCRAFT

Airbus' A320 family production facility in Mobile, Alabama has delivered its first aircraft partially powered by sustainable jet fuel. The latest A321 for JetBlue departed Mobile September 20th with 15 percent sustainable jet fuel in its tanks. In total, five A321 aircraft are due to be delivered to JetBlue from Mobile using sustainable fuel by the end of 2018.

Since May 2016, Airbus has offered customers the option of taking delivery of new aircraft from Toulouse, France, using a blend of sustainable jet fuel.

Following the deliveries to JetBlue, Airbus will determine the next steps toward offering this option to more customers taking aircraft deliveries from Mobile. Longer term, Airbus envisions supporting industrial production of sustainable fuels for aviation in the southeastern US.

UNIVERSAL HELICOPTERS PURCHASES LAKELSE AIR

In early September, Happy Valley-Goose Bay, Labrador-based Universal Helicopters announced the purchase of Lakelse Air of Terrace, British Columbia, and said it has now become Canada's only coast-to-coast Indigenous-owned helicopter services company.

The purchase includes the Lakelse Air fleet of 12 aircraft as well as its other assets. The purchase price was not disclosed. Lakelse will continue to operate as a separate company under its existing management and staff. A senior leadership team headed by Universal president and CEO Shane Cyr, and comprised of Lakelse and Universal senior managers, will provide strategic direction to Lakelse, which has experience in aerial construction and powerline activity, mining and exploration, oil and gas, and in forestry and forest fire suppression.

GREAT SLAVE HELICOPTERS IS PROVIDED PROTECTION

On September 4th, Yellowknife-based Great Slave Helicopters Ltd. was granted protection under the Companies' Creditors Arrangement Act following an order of the Ontario Superior Court of Justice. KSV Kofman Inc. was appointed as the CCAA monitor of the court-supervised Sale and Investment Solicitation Process.

The CCAA proceedings will allow the company to operate in a stabilized environment while the monitor carries out the SISP. A copy of the court materials filed in the company's CCAA proceedings is available here: www.ksvadvisory.com/insolvency-cases/great-slave-helicopters.

P&WC OPENS BRAZIL DMF

Pratt & Whitney Canada has appointed its third Designated Maintenance Facility (DMF) in Brazil, Helipark Manutenção Aeronáutica Ltda. Based in Carapicuíba, in São Paulo, this new DMF will service the PT6B-37A, PW206C, PW207D, PW207D1, PW207D2 and PW210A helicopter engines. This new appointment is part of P&WC's effort to grow its service network in the region and provide cost-effective, customized solutions to increase aircraft availability.

Pratt & Whitney's support network in the region also includes the P&WC

Do Brasil maintenance facility, the Covington Aircraft Engines Inc.'s PT6A Satellite, a P&WC parts distribution centre located in Sorocaba, seven Field Support Representatives (FSRs), and specialized Mobile Repair Teams.

CATHAY PACIFIC TO DONATE FIRST 777 TO MUSEUM

Boeing and Cathay Pacific announced they have donated the first-ever Boeing 777 airplane to the Pima Air & Space Museum in Arizona. The airplane flew from Cathay Pacific's home airport in Hong Kong to Tucson, Arizona on September 18th. The jet will be displayed permanently at the museum alongside more than 350 other notable aircraft.

In the 1990s, Cathay Pacific was one of a handful of airlines to provide input for the 777 during the design phase. This gave Hong Kong's home airline a unique opportunity to refine the airplane's features to suit its needs. Among the requests were a cabin cross-section similar to the Boeing 747, a modern 'glass' cockpit, fly-by-wire system, and, lower operating costs.

TC CERTIFIES 90-SEAT CABIN FOR BOMBARDIER Q400

Bombardier's 90-passenger Q400 aircraft configuration has now received its certification from Transport Canada, becoming the first in-production commercial turboprop in the world to reach that capacity. The 90-seat configuration is aimed at high-demand turboprop markets and Bombardier hopes the new configuration will help enhance economic connectivity between smaller towns and major hubs.

"With increasing growth in the number of passengers per departure in the turboprop market, we are excited to offer our customers a higher-capacity configuration and 15 percent lower cost per seat compared to the previous standard Q400, leading to more profitability potential for airlines," said Todd Young, Head of the Q Series Aircraft Program, Bombardier Commercial Aircraft. "Upon delivery later this year, our launch customer SpiceJet will become the first airline to take advantage of the profitable and efficient operations of the 90-seat Q400 aircraft following its order of up to 50 in 2017."

ACH HELIONIX FITTED FOR THE KINGS

At press time for this issue, Airbus Corporate Helicopters was scheduled to display the company's new ACH135 Helionix for the first time on the rooftop of the Monaco Yacht Club during the 2018 Monaco Yacht Show in late September.

Fitted with the company's in-house ACH Line interior configuration, the updated ACH135 Helionix's features include an auto hover 'pause' button (ideal to buy the pilot time when faced with low visibility or busy environments), a 'go-around' button (the aircraft will automatically fly around and reposition itself on the best landing approach at the push of a button) and automated engine management (ensuring a smooth and safe flight even if one of the two engines fails). ■

FAA Advisory Circular:

By now most of you are wondering how to protect against vapor ignition caused by lighting. Thankfully, the Federal Aviation Administration recently issued an Advisory Circular on the matter. The following are excerpts.

Opposite Page: A lightning strike can penetrate non-conducting materials easier and ignite fuel vapors. Above: Damage from lightning strikes to non-conducting materials, such as fiberglass and aramid-reinforced composites, can be more severe than damage to metal surfaces.

Lightning in the Bottle

FAA Advisory Circular AC No: 20-53C
Date: 09/24/18
Subject: Protection of Aircraft Fuel Systems Against Vapor Ignition Caused by Lightning

This advisory circular (AC) provides applicants with guidance for obtaining Federal Aviation Administration (FAA) approval of compliance pursuant to title 14, Code of Federal Regulations (14 CFR) 23.954, 27.954, and 29.954, Fuel system lightning protection. This AC recommends how to protect an aircraft's fuel system from lightning strikes that may ignite fuel vapors.

Lightning Effects on Fuel Systems

8.1 Lightning may strike aircraft flying in or near thunderstorms, and nearby lightning flashes may produce corona and streamer formations on the aircraft. Lightning can be a hazard to aircraft fuel systems if those systems are not properly designed, built, and maintained.

8.2 The effects of lightning on aircraft can range from seemingly insignificant sparking at fasteners or joints to severe damage. If sparking occurs in a fuel vapor environment, it may ignite the fuel vapor and damage the aircraft.

Above: Lightning may strike aircraft flying in or near thunderstorms.

8.3 All or some of the lightning current may be conducted through fuel tanks or fuel system components. It is important to determine where the lightning current flows through the aircraft to allow for adequate design measures to protect the fuel system.

Note: FAA Reports DOT/FAA/CT-83/3 and DOT/FAA/CT-89/22 provide guidance on determining lightning current flow through the aircraft and fuel system lightning protection techniques.

8.4 Aircraft skin and fuel tanks are constructed of metals, low electrical conductivity composite materials, and electrically insulating materials. These materials react differently when subjected to a lightning strike. Metals and carbon fiber composite materials (CFC) offer a high degree of electric field shielding and some magnetic field shielding. Electrically insulating materials, however, offer little or no electric or magnetic field shielding. For this reason, lightning does not have to come into direct contact with fuel systems to pose a hazard. Lightning-induced arcing, sparking, or corona may be sufficient to ignite fuel.

8.5 Damage from lightning strikes to non-conducting materials, such as fiberglass and aramid-reinforced composites, can be more severe than damage to metal surfaces. A lightning strike can penetrate non-conducting materials easier and ignite fuel vapors.

9 Fuel System Lightning Protection

9.1 To protect fuel systems from lightning, you should perform one, or a combination of, the following steps:

9.1.1 Rid the fuel tank and fuel system of ignition sources. This is the preferred approach. To achieve this, you must specifically design for ignition source prevention, as thousands of amperes of current are conducted, and yet a spark of only about two-tenths of a millijoule, released inside a fuel tank, can ignite fuel vapor; or

9.1.2 Reduce fuel tank flammability to ensure the fuel tank atmosphere will not support combustion; or

9.1.3 Design the fuel tank so that fuel tank pressures do not exceed structural design limits if fuel ignition occurs.

Note: FAA Reports DOT/FAA/CT-83/3 and DOT/FAA/CT-89/22 provide detailed fuel system lightning protection techniques.

Above: Flammable fuel vapor may exist in any part of the fuel system.

9.2 When designing the fuel system lightning protection, consider the following factors:
9.2.1 Flammable fuel vapor may exist in any part of the fuel system;
9.2.2 Streamers or lightning strikes may ignite flammable vapors in vent outlets;
9.2.3 Streamers or corona can contain enough energy to serve as an ignition source;
9.2.4 Strike attachment to poorly conducting parts may result in energy levels sufficient to induce sparks and arc inside the fuel tank, and could ignite fuel vapors;
9.2.5 Strike attachments may puncture the skin, heat fuel tank skins, or cause arcing in fuel tank structures;
9.2.6 Lightning currents flowing in the internal components of the fuel system (such as fuel and vent lines, conduits, or internal structural parts) may produce electrical sparks and ignite fuel vapors;
9.2.7 Lightning currents flowing in the airframe can produce voltage

Above: The effects of lightning on aircraft can range from seemingly insignificant sparking at fasteners or joints to severe damage.

differences between adjacent parts or structure. The lightning electromagnetic fields can induce transient voltage and current in the electrical wiring and components of the fuel system; and

9.2.8 Strike attachment may weaken adhesives/structural bonds or mechanical fasteners enough to affect the integrity of the fuel tank.

9.3 Composite materials such as CFCs have lower electrical conductivity than aluminum. When used to construct fuel systems, CFCs often require design features different from those required on metallic structures to provide an equivalent level of protection. Using adhesive bonding in the construction of CFC to build fuel systems may decrease lightning current conductivity. Decreased conductivity affects both metallic and non-metallic structures such as rubber or fiberglass. In composite structures, lightning-induced voltage and current in electrical wiring in the fuel system and other electrically conducting parts may be higher and have different waveforms than in conventional aluminum airframes.

9.4 Parts of the fuel system are typically found throughout much of an aircraft and occupy considerable volume. These parts include the fuel tanks themselves and other areas that may contain fuel vapors. Protect all the following parts from lightning strikes when designing the aircraft:

9.4.1 Vent outlets,
9.4.2 Metal fittings inside fuel tanks,
9.4.3 Fuel filler caps and access doors,
9.4.4 Drain plugs,
9.4.5 Tank skins,
9.4.6 Fuel transfer lines inside and outside the tanks,
9.4.7 Electrical bonding jumpers between components in a tank,
9.4.8 Mechanical fasteners inside tanks, and
9.4.9 Electrical and electronic fuel system components and wiring.

10 Steps to Demonstrate Compliance

You may demonstrate compliance with the applicable certification requirements by following the steps below:

10.1 Create a Certification Plan

Describe the fuel system lightning protection approach and analytical procedures or qualification tests planned to show the protection effectiveness of your proposed aircraft fuel lightning protection. For designs consisting of unique characteristics or materials, the FAA may impose special conditions, issue papers, or regulations to show compliance with the certification requirements. The compliance plan should include:

10.1.1 Determine the lightning strike zones. Determine the aircraft surfaces, or zones, where lightning strike attachment will likely occur to your particular design, and the portions of the airframe through which currents may flow between these attachment points.

10.1.2 Determine the lightning environment. Identify the particular aircraft components that will be in each lightning strike zone, and determine whether certain components should be located elsewhere.

Note: AC 20-155A offers methods you can use in determining lightning strike zones and the aircraft lightning environment.

10.1.3 Identify possible ignition sources. Identify systems and components that might ignite fuel vapor.

10.1.4 Set protection criteria. Set lightning protection pass/fail criteria for items you are evaluating.

10.2 Verify Protection Adequacy
To verify the adequacy of the protection designs, perform simulated lightning tests, perform analysis, or compare the protection design with previously proven protection designs. When analyzing protection designs, you should also identify margins to account for assumptions made in the analytical techniques. Compliance is verified by determining that the fuel system can tolerate the applicable lightning environments. If the acceptance criteria are not met, modifications should be made to the design.

When your intended means of compliance includes tests, you should do the following:

10.2.1 In your test plans, describe:

10.2.1.1 10.2.1.2 10.2.1.3 10.2.1.4

The production or test articles,
Production or test article drawings as required, Installation procedures for the product, Applicable lightning zones.

Above: Metals and carbon fiber composite materials offer a high degree of electric field shielding and some magnetic field shielding.

Schedules and locations of proposed tests

10.2.2 Obtain FAA acceptance of your test plan.
10.2.3 Obtain FAA conformity of the test articles and installation conformity of applicable portions of the test setup.

10.2.4 Schedule dates for the FAA to witness tests, as coordinated.

10.2.5 Submit test reports describing all results for FAA review and approval.

11 Maintaining Fuel System Lightning Protection

11.1 Some fuel systems or equipment require dedicated protection devices or specific techniques to protect them. For these fuel systems and equipment, you should define requirements for maintaining and monitoring the lightning protection devices or techniques to ensure their integrity remains intact. You should also define the aircraft dispatch requirements, limitations, or both when a protection device has degraded.

11.2 Some fuel system components may be protected through the use of shield and connector electrical bonding, sealing materials, grounding jumpers, and structural foil shield liners. When using these types of devices, you must specify in the instructions for continued airworthiness the procedures you will use to prevent these protection items from remaining on the aircraft in a degraded condition, or describe how you will prevent their accidental removal during normal aircraft maintenance. Degradation or removal of these items could cause the system to lose its designed protection integrity.

11.3 Where possible, do not use devices susceptible to corrosion, fretting, flexing cycles, or other life-limiting design features. However, when using these types of devices, you must publish their replacement cycles in your instructions for continued airworthiness manual. When using devices such as surge protectors, you must identify the number of lightning strikes each device can encounter before it must be replaced.

Note: FAA Report DOT/FAA/CT-89/22 provides guidance on surge protectors and their maintenance.

11.4 Define the inspection techniques and intervals necessary to ensure the continued integrity of the lightning protection features. Examples of inspection techniques include built-in test equipment, resistance measurements, continuity checks of the entire system, and general visual or detailed visual inspections for damage, wear, or corrosion.

12 Where to Find This AC

You may find this AC at http://www.faa.gov/regulations_policies/advisory_circulars/ ■

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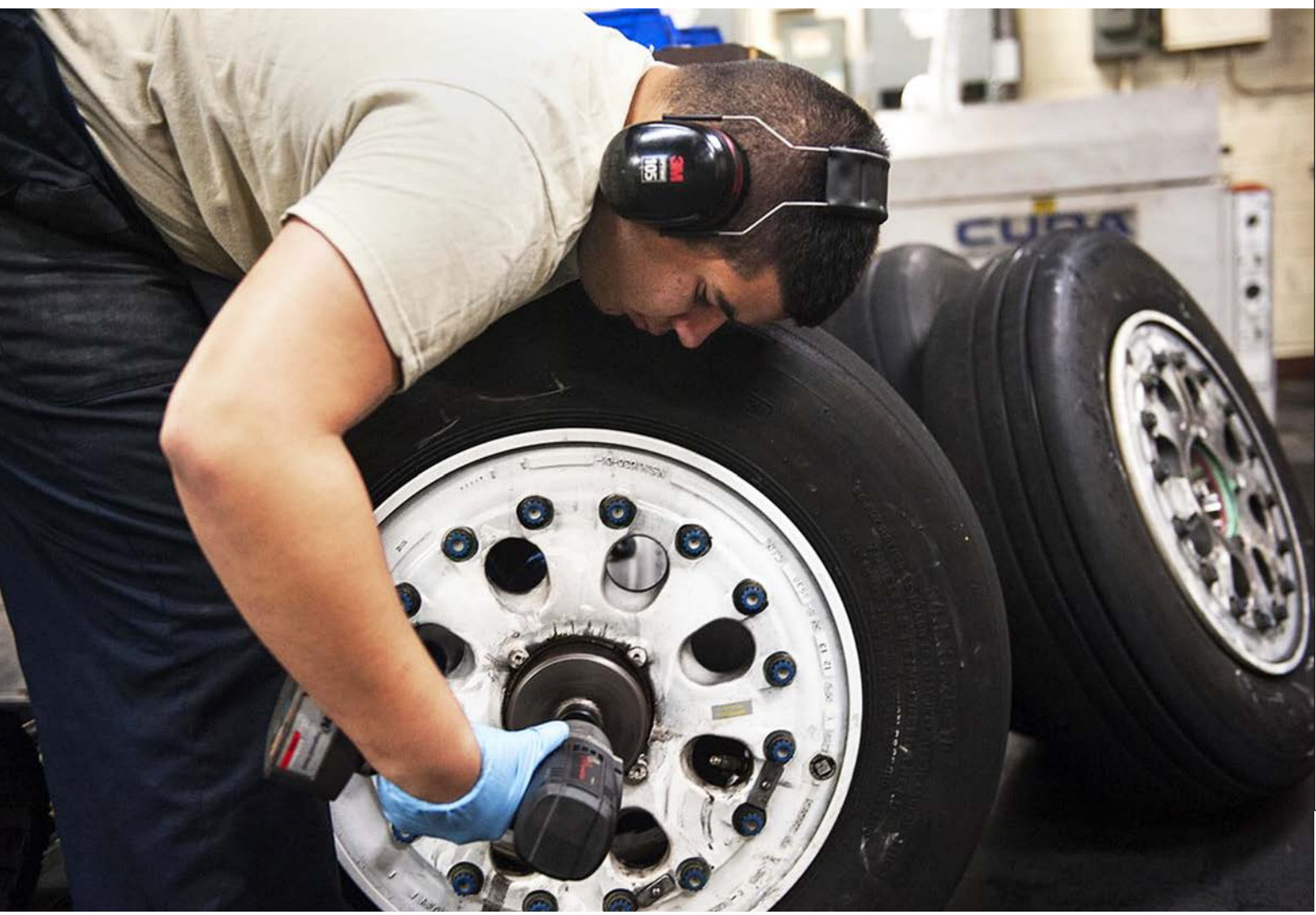
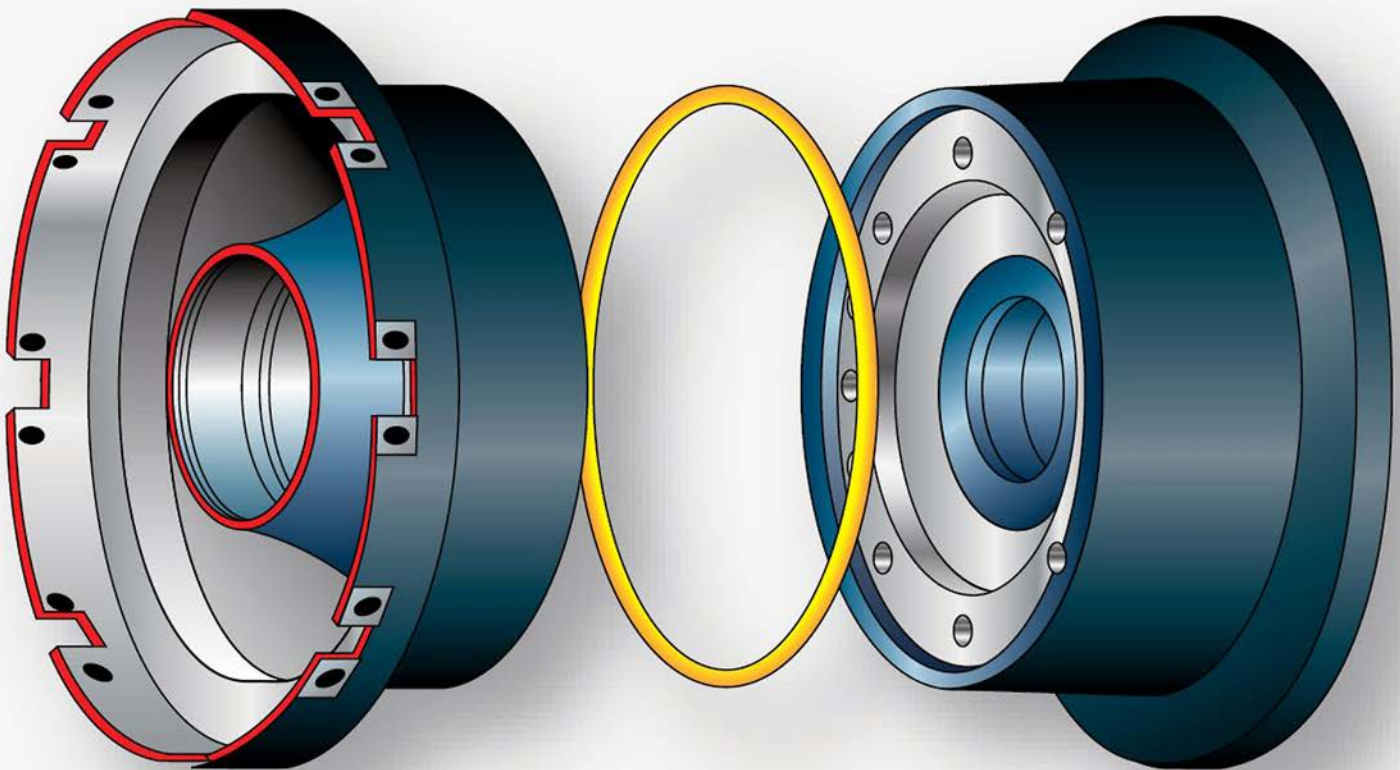


Seeing things:

Ensuring aircraft safety requires having the right wheel inspection equipment.



Opposite: Wheel and tire technician, takes apart an aircraft wheel. Above: Removable flange wheels found on older aircraft are either drop center or flat base types.

using the right gear

To ensure safe aircraft takeoffs and landings, one of the most vital areas to inspect for possible fatigue cracking and heat damage is the wheel bead seat, the critical area where the rubber edge of a tire contacts the wheel. The problem is that this requires having the right wheel inspection equipment on hand for the job — and not all MROs do.

The preferred approach to test wheels made of aluminum or magnesium alloys for cracks or other damage is to utilize eddy current devices along with wheel-specific probes. The critical area is the wheel bead seat, which is the area most likely to fail as a result of fatigue or heat damage.

To prevent such failure, maintenance personnel must be able to perform eddy current testing with probes that fit the precise size and measurements of the wheel bead seat.

Eddy current testing — a nondestructive test (NDT) method that uses electromagnetic induction or electricity and magnetism to create a magnetic field in the item inspected — is very effective in detecting a wide range of flaws such as small cracks, surface defects, and heat damage etc.

These sophisticated NDT devices provide extremely accurate wheel inspection results when paired with the correct probe. However, in the aviation industry almost no two

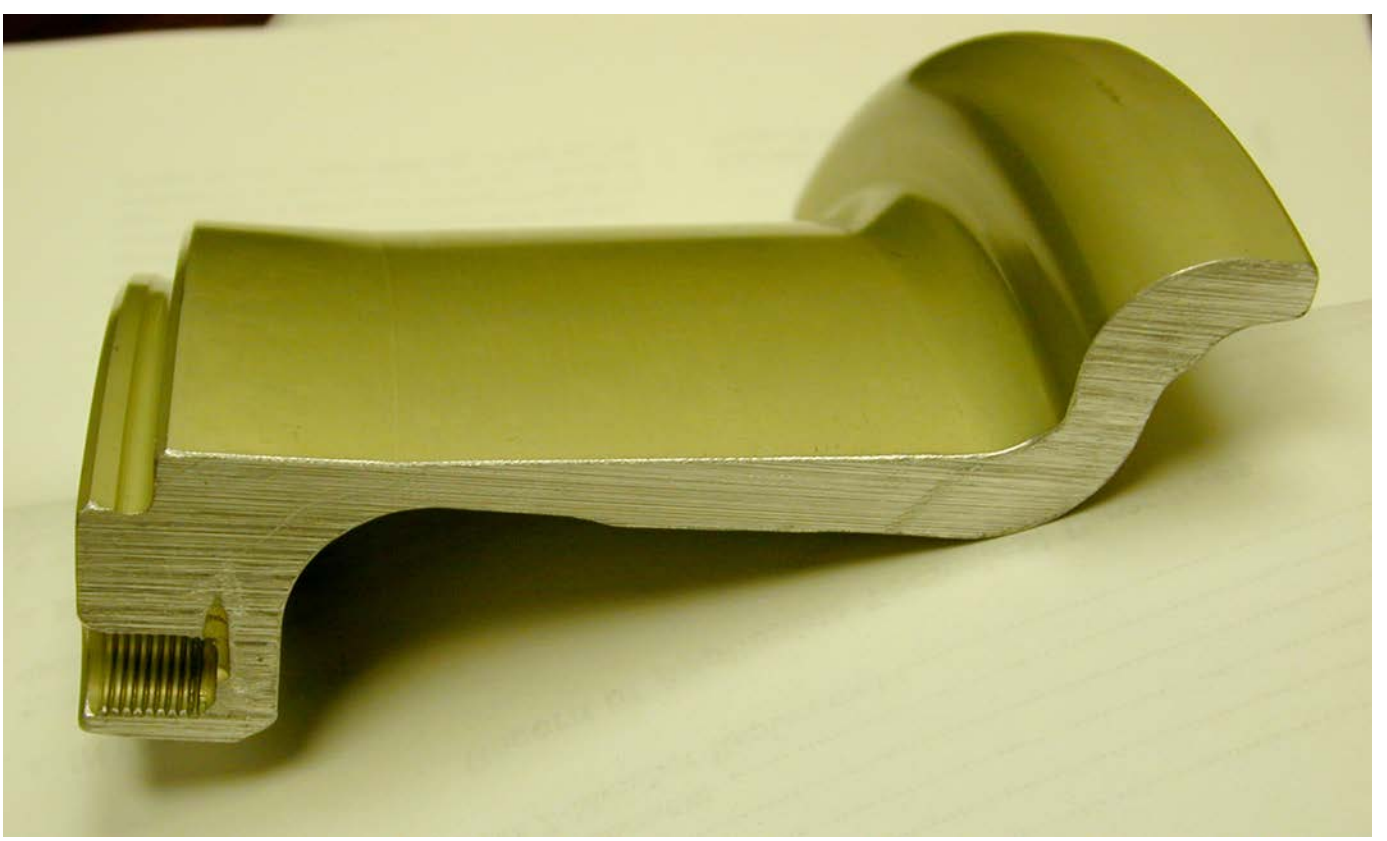
Above: The circumference and radius of the wheel is usually different for every single make or model of airplane from the Airbus A-300 to the Westland EH-101.

wheels are alike, with many varying in size, diameter and circumference. A single large wheel manufacturer might have up to hundreds of different wheels. This presents a challenge for many MRO operations because when testing the contact of the probe with the surface of the wheel bead seat is critical, so often a wide range of wheel-specific probes are required.

"The circumference and radius of the wheel is usually different for every single make or model of airplane from the Airbus A-300 to the Westland EH-101," says Ken Strass, owner of Centurion NDT, a manufacturer of portable eddy current and ultrasonic instrumentation that makes a wide variety of probes and coils. "This is true of both main and nose gear wheels."

On top of this, aircraft manufacturers are continuously updating or reformulating different aircraft.

"The 737 is up to revision eight, the 737 Max," says Strass. "Aircraft manufacturers may also have long range versions, and the wheel itself may be slightly different because the tires are different."



Above: Refrence Standard side view.

Above: Inspecting a wheel on a motorized turntable.

Because of this, suppliers such as Centurion NDT must be able to offer an extensive library of aviation wheel bead seat probes to accommodate the variety of wheels manufactured for the industry.

Eddy Current Instrumentation

In addition to having the appropriate probe on hand for the aircraft wheel, it is also essential, of course, to have a reliable, easy-to-use, eddy current device.

As an example of this, the company's eddy current device, the ED-1100, has been incorporated by Goodrich Corporation as an instrument to use in wheel maintenance inspection. Goodrich Corporation, a Fortune 500 company, is a global supplier of systems and services to the aerospace, defense and homeland security markets.

The portable unit, which is about the size of an iPad with an LCD screen, will locate surface and near-surface defects and conductivity changes in magnetic and non-magnetic materials, and can cover about 85 percent of the applications for eddy current testing that might be performed. It is used for a variety of applications including detecting flaws in aircraft wheels, struts, propellers, hubs and engine components. It uses absolute, differential and reflection probes to detect flaws or determine properties such as conductivity, hardness, alloy type, and heat treat condition.

Unlike traditional all-digital units, the instrument has an automatic balance/null feature that substantially reduces set-up time for manual operation. By moving the probe and turning a phase control knob on the front panel, lift-off can be completed in seconds.

As an example of wheel testing, a Goodrich Nondestructive Testing Manual describes an eddy current test with a contour bead seat probe. The procedure inspects for cracks in aluminum or magnesium alloy wheel halves and wheel bases.

To inspect wheel halves, wheelbases, or side rims with a contour, differential-coil, bead seat probe, the manual states to put the probe in the bead seat of the part and press the balance or null button on the instrument to center the indicator dot on the display.

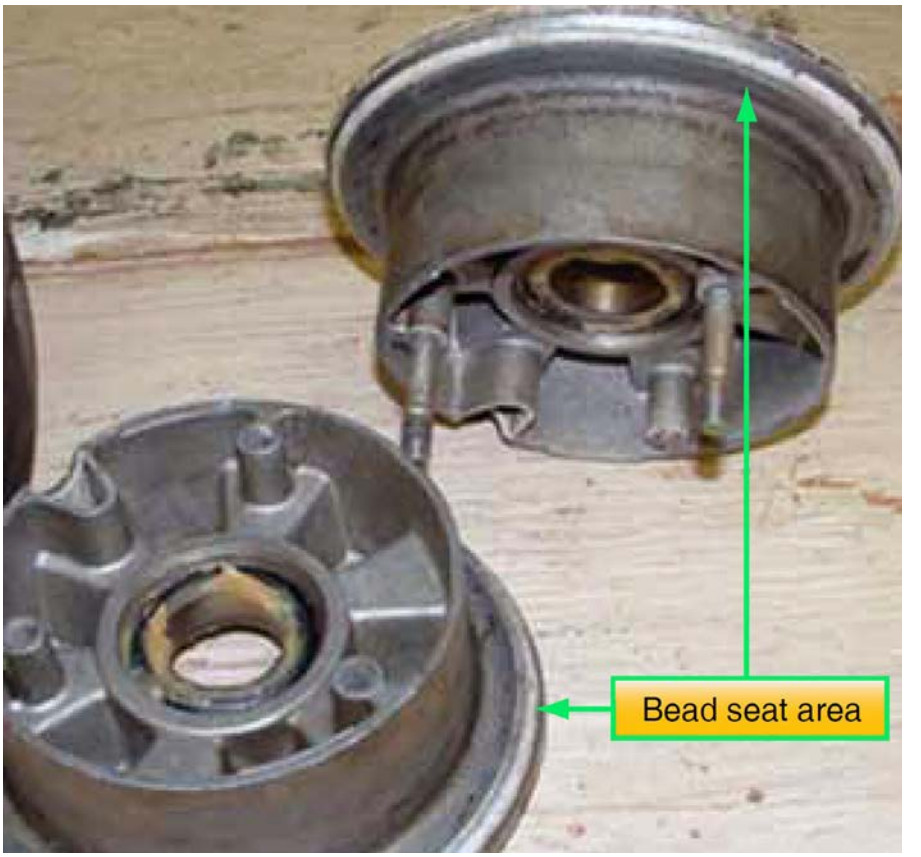
The manual also states to put the wheel half, wheel base, or side rim on a turntable, hold the probe firmly on the bead seat, and slowly turn the part until the full bead seat is inspected. It instructs to turn the part (or move the probe) at the same speed that was found to give the best signal in the calibration procedure In such a procedure, moving the part

or probe at a constant speed can be essential to obtaining a good eddy current reading. Because of this, to improve accuracy and ease testing of the wheel bead seat, some companies like Centurion NDT also offer a motorized wheel turntable accessory.

Instead of manually running the probe around the wheel, which can lead to less reliable test results, the motorized turntable provides a constant rotational speed specific to the diameter size of the wheel half. This enables the inspector to simply hold the eddy current probe in place as the wheel spins.

The constant rotational speed gives accurate and repeatable results. With greater consistency, even the smallest cracks are more clearly visible on the screen, without the more erratic results common to manual methods.

"Passenger safety and airline reputation is on the line during every takeoff and landing," says Strass. "Aircraft repair stations and MROs need to ensure that they have the right equipment for safety inspection, including eddy current devices, wheel probes and accessories." ■



Above: The bead seat areas of a light aircraft wheel set.

PACIFIC

Pacific AME Association

2018 PAMEA Presidents message

I watched with interest the trial of three men accused of negligence that killed 47 people and destroying the town of Lac-Mégantic in Quebec. These three men were regular employees doing their job the way they have always done it. They have lived this trial for the last five years. They have wondered for those last five years if they will spend the rest of their lives in prison. I see a comparison of aviation employees who live their lives complying with regulations and the forces around those regulations.

Every time an AME performs a job, and ultimately signs a logbook, they could find themselves in the same position as the three employees that worked for that railway. Every time a pilot takes an unairworthy airplane on a flight, or does not report a defect that exists or works on the airplane without telling anyone, they put themselves in the same position as those three rail employees. Yet people in aviation break the rules every day, and if they stand up to the company that owns the plane or the boss that runs the company, they are at risk of losing their job. So they compromise, they take a risk, "It will never happen to me," or "I've never seen this happen and I have been working in the industry for 30 years and blah, blah, blah."

The fact is every time you touch an airplane, or sign a logbook you put yourself at risk. How many people out there work on private airplanes without any liability insurance, or do a small job for a friend. Or they moonlight at another company to earn extra money, not knowing if they are covered by any sort of insurance or protected from liability. How many people do you know who have lost their job because they would not perform a job or sign a logbook? A lot of licenced people think they are protected because they sign with an ACA. Don't fool yourself: the company won't protect you, the lawyers will find out who you are.

Who does an AME turn to when they have a legal question? There are the coffee shop people with their great amount of knowledge, rightly or wrongly interpreted. There is self-study, open up the CARs on the internet and interpret it yourself. Or just do it the way you've always done it, and hope for the best. You cannot turn to your local Transport Canada representative any more, the doors are locked, and probably for good reason. The fact is, for the lonely AME there is no one to turn to for legal or practical advice.

That is why a good association, well positioned with the ability to go to the authorities with questions and interpretations of the CARs. That is why the AME Associations need to be stronger and have the ability to hire legal representation for their members. We used to have legal assistance available but that was dropped in favour of having large social gatherings with sandwiches and booze.

The AME Associations across Canada are trying to get the strength in numbers to provide a source of assistance to AMEs working in the field, yet only a very small fraction of AMEs realize the benefits of belonging to a professional association. The companies they work for do not encourage their employees to belong, because an informed employee may not do the bidding of the company.

I urge every AME in this business to explore the benefits of a professional association, be a part of the solution not a part of the problem, take your head out of the sand and do something. Better yet, volunteer to take a role in running the association. There is a shortage of skilled workers in the aviation industry, young people are staying away from the training schools and choosing to do something else. The money's no good and there is no future in the aircraft maintenance industry. There is no pride in the profession. We are at a turning point where we can make a difference.

Let's hope the new executive of PAMEA can make some changes, attract new members and provide new direction for aircraft maintenance workers in the industry.

— Bob Rorison
PAMEA President (Retiring)

www.pamea.ca

CENTRAL

Central AME Association

23rd Annual Manitoba Aviation Symposium

February 27- 28, 2019
Canad Inns Destination Centre Polo Park
1405 St Matthews Avenue, Winnipeg, Manitoba

Schedule
Wednesday:
- 0745 to 0900: Registration & Continental Breakfast; Trade show area
- 0900 to 1630 Speakers & Presentations / Trade Show Open
- 1630 to 1830 Banquet Reception/Cocktails in the TYC Event Centre
- 1830 to 2100 Banquet in TYC

Thursday
- 0745 to 0900 Registration & Continental Breakfast; Trade show area
- 0900 to 1630 Speakers & Presentations; Trade Show Open until 1400
- (Booth tear down @ 1400)

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

New Safety Incentive

There is a new Transport Canada maintenance related safety incentive that our association has recently become involved with. It is more of an instructional and informative nature that is not aimed at changing the regulations. Transport Canada has embarked on a general aviation safety campaign. This campaign has been spearheaded by COPA which is arguably the most encompassing voice of aviation in Canada.

The campaign is aimed at educating pilots, passengers, and the general public on key areas related to safety in general aviation. It will focus on voluntary improvements to safety, rather than the regulatory route. It is modeled after the highly successful General Aviation Joint Steering Committee in the US. Maintenance is one of eight working groups in the project.

The maintenance group has met several times. There are three regional AME associations and a CFAMEA representative listed with the maintenance group as well as AMO and individual maintenance organizations totalling approximately 25 persons from across the country. Although the meetings are held in Ottawa, a video and telephone conferencing system is available for us to participate.

One very positive comment heard from TC was, "We (TC) are trying that all regional offices and inspectors will interpret and apply the rules and regulations the same way all across Canada." We will keep you updated on the progress of this group. Hopefully it will help not only with standardization of the rules for AMEs but also for the education of aircraft owners so that we can bring a safer operation to everyone.

More information can be found on the web site:
http://www.tc.gc.ca/en/campaigns/general-aviation-safety.html

— *Submitted by Stephen Farnworth*
For the Board of Directors

Central Ohio PAMA

HFI Maintenance Scholarships

Helicopter Foundation International (HFI), a 501(c)(3) nonprofit organization, annually offers up to 19 scholarships to help support students studying to become part of tomorrow's helicopter industry. Maintenance scholarship opportunities include:

Bill Sanderson Aviation Maintenance Technician Scholarship

Be about to graduate from an FAA-approved Part 147 aviation maintenance technician (AMT) school, or be a recent recipient (within the last two years) of an airframe and powerplant (A&P) certificate.
If you are a non-US citizen, have your respective country's FAA-equivalent tests completed and provide proof of foreign citizenship.

Maintenance Technician Certificate Scholarship

Be enrolled in a maintenance technician certificate program at an FAA-approved Part 147 school or international equivalent
Expect to receive your maintenance technician certificate after January 1, 2019 (if you will receive your certificate before this date, you are not eligible to apply).

All applications must be submitted by midnight EST, November 30, 2018. Questions? Email scholarships@rotor.org

For more information and to apply, visit helicopterfoundation.org/scholarships.

www.copama.org

If you'd like to contribute your professional association's newsletter to AirMaintenance Update, contact our editor, John Campbell via email at: amu.editor@gmail.com

ATLANTIC

Atlantic AME Association

Our Objective

To provide a forum of AMEs elected by AMEs or AMEs voluntarily offering to serve on such a body, to act as a vehicle to represent the views and objectives of the AME Association (Atlantic) Inc. at any level required to preserve or alter as the case may deem necessary, the rights, privileges and legislation of AMEs as a whole.

ARAMC 2019

ARAMC 2019 will be held in Moncton, at the Delta Hotels by Marriott Beausejour, New Brunswick from April 24-26. More information will be added as it becomes available.

www.atlanticame.ca

DALLAS – FORT WORTH

PAMA Dallas – Fort Worth

Blessing Scholarship

The DFW PAMA Scholarship Fund provides support for deserving Airframe, Powerplant and Avionics students and seeks to improve the training, education and reputation of individuals who are involved in aerospace maintenance and management.

Eligibility Criteria

- Must be currently enrolled at or entering Tarrant County College with the intent to pursue an Associate of Applied Science Degree in Aviation Maintenance Technology.
- Must enroll as a full-time student, up to a maximum of 17 hours, in the Aviation Maintenance Technology Program, taking a full load per the flow of classes outlined by the Aviation Department.
- Scholarship will fund only AERM classes to include tuition, fees and textbooks plus the Federal Aviation Administration written examinations at the rate assessed for a Tarrant County resident, as calculated on an annual basis.
- Must have a minimum TCC GPA of 2.5 or high school equivalent if a first-time TCC student.
- Must be a legal resident of the United States (cannot complete FAA certification otherwise).
- Must not have been convicted, in the past calendar year, or be convicted while receiving scholarship funds, for a violation of any federal or state statutes pertaining to narcotic drugs, marijuana and depressants or stimulant drugs or substances.
- Is a merit-based scholarship.
- Will continue to receive a scholarship, for up to the duration of the program, if a minimum semester GPA of 2.5 is achieved each semester and all courses are completed.
- Must become a member of the Dallas/Fort Worth Chapter of the Professional Aviation Maintenance Association.
- Must attend a PAMA DFW meeting per semester or write an aviation-related maintenance report, coordinated with the chapter.
- Must complete one testimonial report prior to graduation that can be placed in the local and national newsletters.

Application Process

Complete the TCC Foundation scholarship application. Incomplete applications will not be considered.

First-time TCC students: an academic transcript, if applicable. Submit to the Foundation office.

Scholarship Amount

Tuition, fees and textbooks for AERM classes; up to 17 hours per semester

www.pamadfw.com

PAMA SoCal Chapter

June 2018 Meeting Wrap

The SoCal Chapter thanks Mr. Tony Russo, Van Nuys Facility Manager and all at Duncan Aviation for their time and excellent technical presentation on "Avionics overview going from Analog to Digital. Is this a career for you?" and for hosting the elegant dinner on June 12, 2018 at the 94th Aero Squadron Restaurant in Van Nuys, CA. For more information about Duncan and their extensive array of offerings, visit DuncanAviation.com.

www.socalpama.org

Western AME Association

About Us

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 Canadian Federation of Aircraft Maintenance Engineers Associations (CFAMEA) is a national body which is supported and financed by all the regional associations and which represents the associations at the national level.

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 50 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.

Symposium and Trade Show

The Western AME Association is pleased to announce we have confirmed the date and time of the next symposium and trade-show. You can find us at the Coast Plaza in Calgary on March 20-22, 2019 with the theme "The AME, Guardian of the Vested Interest."

www.wamea.com

Interview with the CHAIRMAN

In an interview, the Professional Aviation Maintenance Association's new leader, John Goglia discusses what PAMA's future looks like to him.

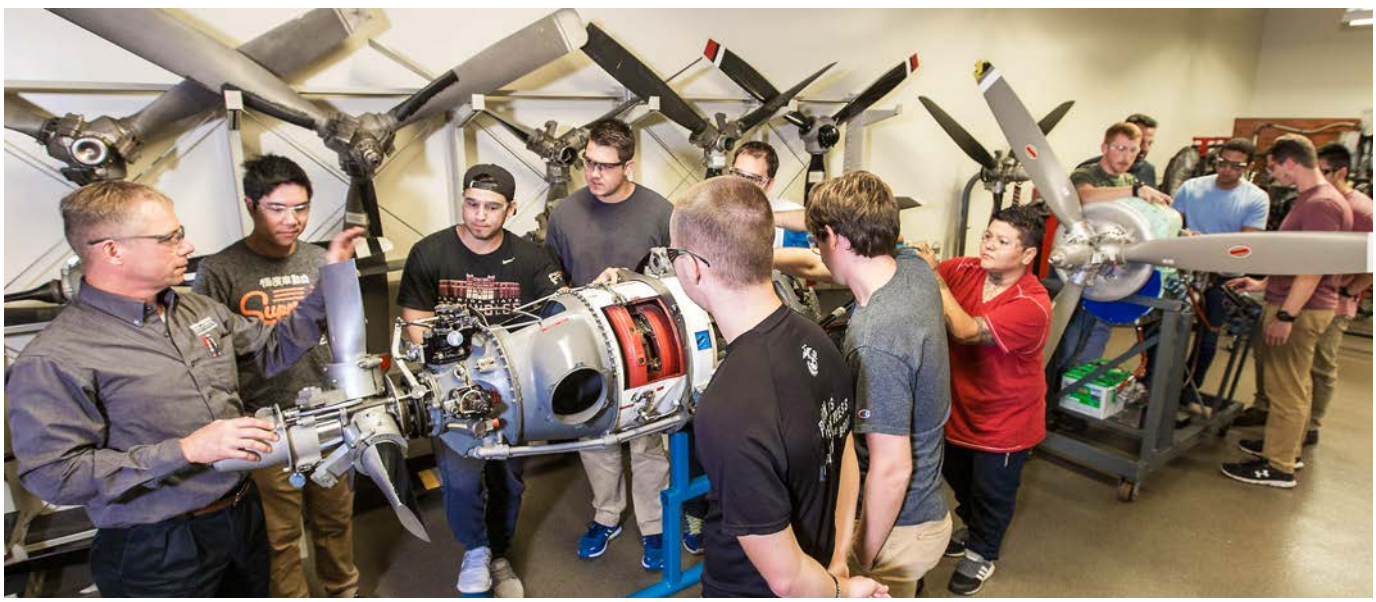
Earlier this year, PAMA elected new leadership. The Honorable John Goglia took the reins in January and is hard at work forging partnerships and developing new iniatives that will ensure PAMA's sustainability and viability.

After decades of experience as a mechanic at United Airlines and US Airways, John was the first and only airframe and powerplant mechanic to receive a presidential appointment to the National Transportation Safety Board (NTSB), serving from August 1995 to June 2004. He played a key role in focusing international attention on the increasing significance of aircraft maintenance in aviation accidents.

John now fills his time as an independent aviation safety consultant, adjunct professor at Vaughn College of Aeronautics and Technology, and president and co-founder of the Aerospace Maintenance Council, a non-profit trade group that raises awareness about aviation maintenance technician careers through its annual Aerospace Maintenance Competition.

Among numerous other accolades, he is recipient of the Professional Aviation Maintenance Association/ Flight Safety Foundation Joe Chase Award and the FAA Charles Taylor Master Mechanic Award. His 40 plus years of experience in the industry has made him a sought-after consultant, expert, speaker and writer.

Above: The Annual PAMA Aviation Maintenance Olympics are signifcant achievements for the association.



Top photo: "One of the things we're looking at is putting a program together to help move mechanics up to the supervisor or management level." Bottom: "We think more students would be interested in being part of our community if they knew what it was like."

Here, John discusses his vision for PAMA, and what's been going on behind the scenes in the first few months since his election.

What made you want to take on the job?

For me, it's about giving back. Aviation was very good to me and it's about giving back to my community of mechanics, and helping young people find their own path in this industry.

As a long-time member, what is PAMA's significance in the industry?

PAMA provides a voice for the general aviation maintenance community. It plays a very important role for aviation safety, and as representative for professionals in our industry.

What has been its crowning achievement?

The PAMA Olympics. PAMA founded the competition more than a decade ago; it lives on through chapter-sponsored local events, and nationally through the Aerospace Maintenance Competition. The event showcases our talents and does a lot to promote careers in aviation. It's something the association should be really proud of.

Given the anticipated workforce shortage, what role can PAMA play to help attract and retain the next generation of aviation maintenance professionals?

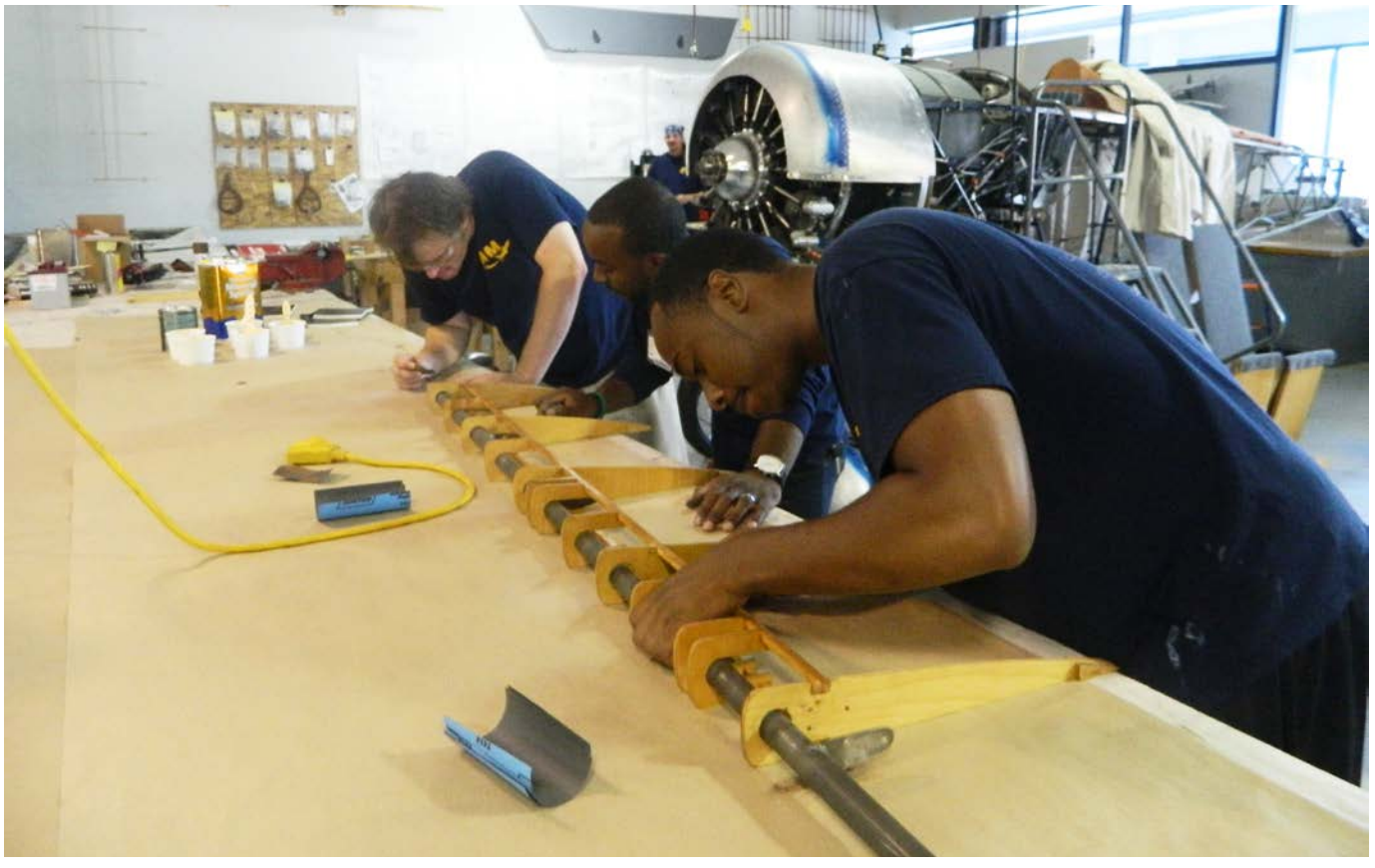
Our members are the best spokespersons for our industry. We are the only ones that can show students what it's like to be a mechanic. We are in the beginning stages of an effort that

Above: PAMA's mission is to promote continuous improvement in aviation safety through communication, education, representation and support of its members.

would bring high school students into facilities to see what we do first-hand, to spark an interest in aviation. We think more students would be interested in being part of our community if they knew what it was like. It's not just about using your hands; you have to be tech savvy, a good troubleshooter, good with electronics, etc.

When you think back to your career in aviation maintenance, what makes you most proud?

I felt most proud the day I got my A&P license. I decided to go to mechanic school because I liked to fix cars; I figured I'd like fixing airplanes too. I'm also proud of the opportunities I created as an A&P. I started riveting and made my way up through the ranks, all the way to confirmation by the U.S. Senate. There is more to maintenance than being a mechanic, there are so many other ways you can succeed and give back. I want current and future maintenance professionals to see and know that. There's a lot of opportunity.



Above: "We are the only ones that can show students what it's like to be a mechanic."

What has been PAMA's focus since you took on the leadership role?

The board made tweaks to the bylaws, secured professional management, quality checked the member database to ensure we're able to better communicate with the membership, and cleared outdated content off the website. We're also exploring partnerships that will bring value to our members and finding ways to get industry involved. There's definitely been a lot going on behind the scenes.

One of the things we're looking at is putting a program together to help move mechanics up to the supervisor or management level, to create a pathway. We'd like to give the workforce the opportunity to get more than just technical training; you need writing and people skills to go to the next step.

What are the three things you want to accomplish during your tenure as chairman?

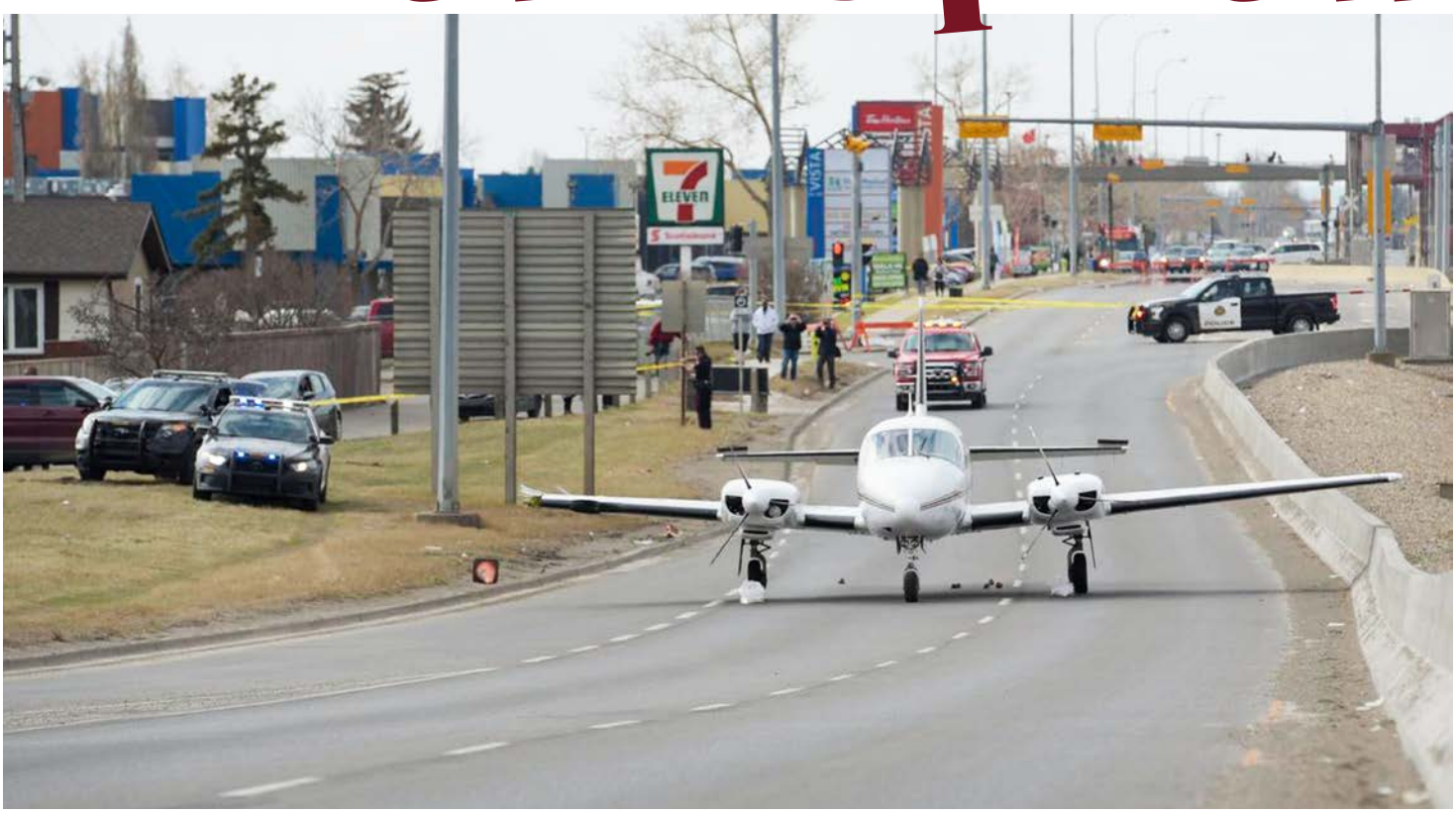
We want to:

1) Put PAMA back on solid, financial footing

2) Create a reputation for promoting careers in aviation maintenance and opening the doors for young people that want to come into aviation and ...

3) Meet our moral obligation to society and our community through membership enhancements. ■

A morning wake-up call

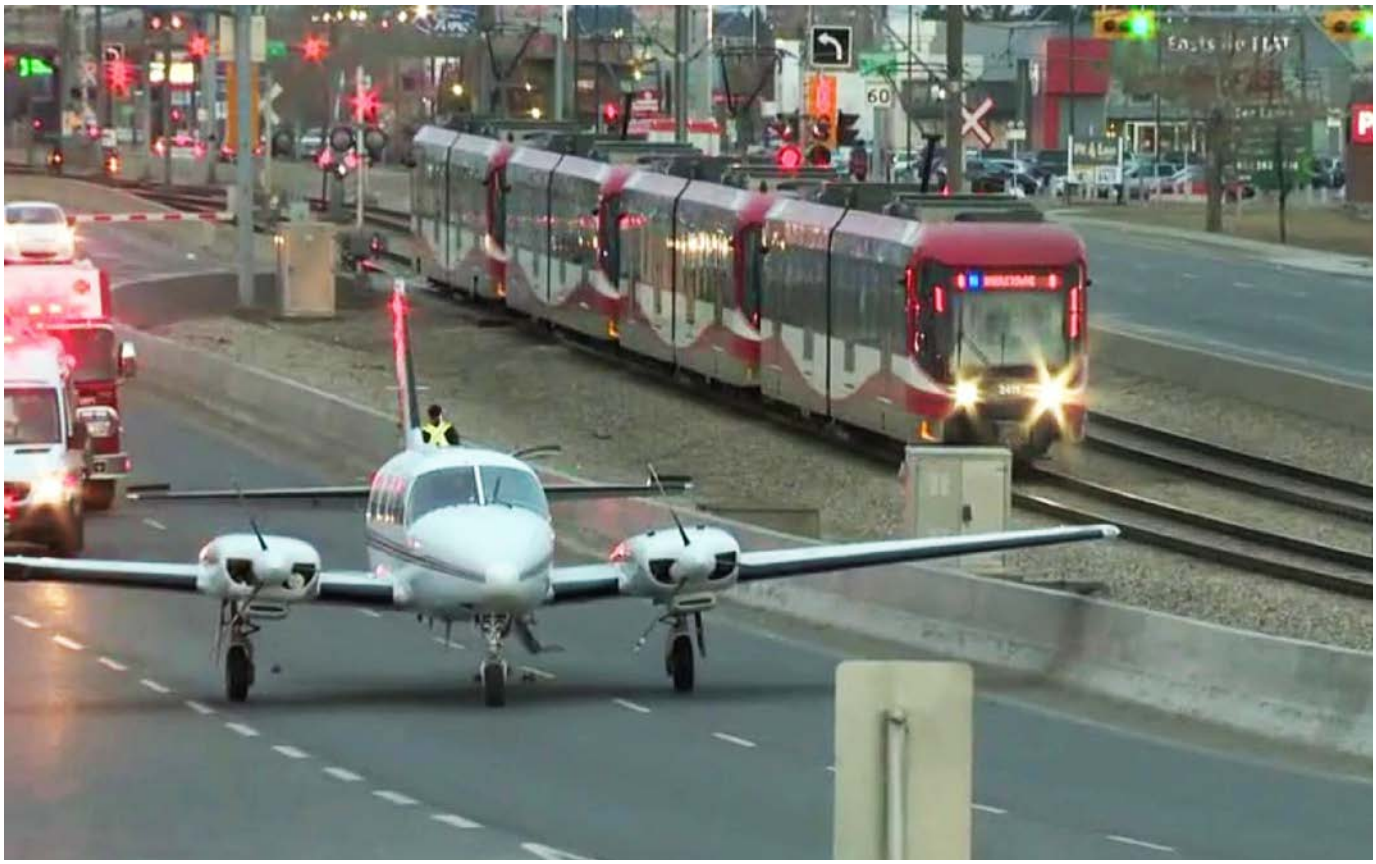


A Navajo Chieftain surprises commuters when loss of engine power forces an untimely landing on the streets of Calgary.

On April 25, 2018, the Super T Aviation Piper PA-31-350 Navajo Chieftain C-FCWW departed Medicine Hat Airport (CYXH), Alberta, on an instrument flight rules (IFR) flight plan, with two flight crew members and fourpassengers on board for a scheduled charter flight to Calgary International Airport (CYYC), Alberta. The aircraft had been fuelled with 50.1 U.S. gallons of 100LL aviation gasoline (AVGAS) and the operational flight plan showed a final fuel load of 144 U.S. gallons (864 pounds). This resulted in full inboard fuel cells (56 U.S. gallons in each) and approximately 1⁄3 full outboard cells (16 U.S. gallons in each). After departure, the aircraft climbed to a cruising altitude of 8,000 feet above sea level. The crew completed the cruise checklist, which included switching the fuel selectors from inboard to outboard fuel cells. A descent was initiated at 0535, when the aircraft was approximately 20 nautical miles southeast of the threshold for Runway 35R at CYYC. Prior to the descent, the crew completed the descent checklist.

At 0536, the arrival controller offered the aircraft a landing option for Runway 35L, which the crew accepted. At 0538, when the aircraft was approximately 12 nautical miles south of Runway 35R, the right engine began to surge. The captain requested that the first officer run the engine failure in-flight checklist.

Above: Super T Aviation Piper PA-31-350 Navajo Chieftain C-FCWW.



Above: Emergency vehicles approach the Piper PA-31-350 Navajo Chieftain C-FCWW.

The items on the checklist were performed, with the exception of the cause check and feathering the propeller. The cause check directs the crew to check fuel flow, fuel quantity, fuel selector position, oil pressure and temperature, and magneto switches.

Shortly thereafter, the flight crew contacted the arrival controller and requested to land on Runway 35R, because it was a more direct flight path. The arrival controller cleared the aircraft for the visual approach to Runway 35R. At 0539, the crew contacted the arrival controller and stated that they had lost the right fuel pump. The arrival controller asked if they wanted to place aircraft rescue and firefighting on standby; the flight crew declined. At approximately 0540, the left engine began to surge.

At 0542, the aircraft was transferred to the tower controller. Moments later, the flight crew transmitted a Mayday call. The tower controller cleared the aircraft for landing on Runway 35R and informed the flight crew that aircraft rescue and firefighting would be on standby. Recognizing that the aircraft was not going to make it to the airfield, the flight crew selected a suitable road (36 Street N.E.) to attempt an emergency landing.

At 0543, the flight crew made a second Mayday call, informing the tower controller that they would be landing on a road because they would not be able to make it to the airfield.

The aircraft touched down in the northbound lanes of 36 Street N.E., just north of the intersection with Marlborough Drive N.E. Shortly after the aircraft touched down, its right

wing contacted a light standard on the right side of the road, shearing off the outer four feet of the wing. The aircraft continued north, through the intersection with Marbank Drive N.E., and came to a stop just south of the on-ramp for eastbound 16 Avenue N.E., which is part of the Trans-Canada Highway.

After the aircraft had come to a stop the passengers opened the main door, and they and the first officer evacuated the aircraft before making their way to the east side of the road, away from the aircraft. Moments later, the captain also evacuated the aircraft. The passengers and flight crew waited on the side of the road for emergency services to arrive. There were no injuries to the passengers, the flight crew, or any persons on the ground. The emergency locator transmitter did not activate.

Aircraft

The Navajo Chieftain fuel system consists of fuel cells, engine-driven and emergency fuel pumps, fuel boost pumps, control valves, fuel filters, fuel pressure and fuel flow gauges, fuel drains, and non-icing NACA10 fuel cell vents. Fuel is stored in flexible fuel cells (two in each wing panel). The outboard cells hold 40 U.S. gallons each, and the inboard cells hold 56 U.S. gallons each, for a total of 192 U.S. gallons. Of this amount, 182 U.S. gallons is useable.

The fuel management controls are located in the fuel control panel at the base of the pedestal and include the fuel cell selectors, fuel shutoffs, and fuel crossfeed controls. During normal operation, each engine is supplied by fuel from its respective fuel system. The fuel controls on the right side of the pedestal control the fuel from the right cells to the right engine, and the fuel controls on the left side of the pedestal control the fuel from the left fuel cells to the left engine.

Two electric fuel-quantity gauges are mounted in the overhead switch panel. The right fuel quantity gauge indicates the quantity of fuel in the selected right fuel system cell (inboard or outboard), and the left fuel quantity gauge indicates the quantity of fuel in the selected left fuel system cell (inboard or outboard). The fuel gauges are connected electrically to microswitches mounted in the fuel selector console. When a fuel cell is selected, its corresponding fuel level is shown.

The aircraft is equipped with two red "FUEL BOOST INOP" lights in an annunciator panel mounted at the top of the centre instrument panel. These warning lights illuminate when the fuel boost pressure is sensed at less than three psi. There are also two electrically powered emergency fuel pumps for use in case of an engine-driven fuel pump failure. These pumps are controlled by switches placed in the overhead switch panel, located in the ceiling above the right seat in the cockpit, and can be activated at any time.

Super T Aviation fuel management standard operating procedure

The air operator's SOPs do not include any guidance information on fuel monitoring or management, and the investigation found that the captain and first officer used different methods to manage and monitor fuel consumption throughout the flight. The captain referenced the global positioning system (GPS), which provides basic fuel-planning data based on a fuel load and fuel consumption rate input by the user.

The GPS did not have any data input with respect to the actual fuel burn, nor did it have any data input with respect to how much fuel was actually on board the aircraft at a specific time, or in which fuel cell. In addition, the captain relied on memory to determine how much fuel was on board and in which fuel cell, and when to switch cells.

The first officer leaned the engines out to 22 gallons per hour (per engine) based on the digital fuel flow meter and incorporated an observation of the fuel quantity gauges in his routine instrument scan. The flight crew members did not discuss fuel management strategies during the pre-flight briefing.

Aircraft examination

The aircraft was towed back to the airport property and placed in a hangar for post-accident examination. Electrical power was applied to the aircraft using the battery, and the fuel

. . . if flight crews do not complete checklist procedures in their entirety, opportunities to rectify emergency situations can be lost. However, in this occurrence, when the flight crew decided that the aircraft could not make it to the airport, their prioritization of selecting a suitable alternate landing area and managing the energy state of the aircraft contributed to the success of the emergency landing. Super T Aviation made several changes to its Piper Navajo SOPs, QRH, and normal procedures checklist for the aircraft . . .

quantity readings from the fuel gauges were noted. Both the left and right inboard fuel cells were indicating that they were approximately 3⁄4 full.

This corresponds to a useable fuel quantity of approximately 40 U.S. gallons in each inboard fuel cell.

With the fuel selector valves in the outboard position, the left outboard cell was indicating empty and the right outboard cell was showing a full gauge deflection — past the full mark. Mechanical damage to the outboard fuel quantity–sending unit of that cell was observed through the fuel filler opening.

The outboard fuel cells were drained of fuel. The left outboard fuel cell contained 0.09 U.S. gallons, and the right cell contained 0.05 U.S. gallons. The POH specifies that the unusable fuel for the outboard fuel cells is two U.S. gallons per cell.

The wing-root fairings were removed to facilitate a visual inspection of the major fuel system components. Control continuity and operation of both firewall shutoff valves, fuel cell selector valves, and crossfeed valves were checked.

All items operated as required. A visual and operational inspection of both fuel boost pumps and both emergency fuel boost pumps was completed. No anomalies were noted. A visual inspection and an operational check of both powerplant controls were completed for freedom of movement and travel. No anomalies were found.

A ground run of the aircraft engines was performed. Both engines were operated up to 25 inches manifold pressure and 2500 rpm. The aircraft's fuel system and engine performance were found to be nominal, i.e., there was nothing mechanically wrong with the engines that would have prevented them from being able to power the aircraft. Due to the absence of fuel in the outboard fuel cells, the ground run was carried out with the inboard fuel cells selected.

Safety messages

As shown in this occurrence, when fuel management SOPs are not in place, fuel starvation can occur even if there is sufficient fuel remaining on board the aircraft to complete the planned flight.

In addition, if flight crews do not complete checklist procedures in their entirety, opportunities to rectify emergency situations can be lost. However, in this occurrence, when the flight crew decided that the aircraft could not make it to the airport, their prioritization of selecting a suitable alternate landing area and managing the energy state of the aircraft contributed to the success of the emergency landing.

Safety action taken

Following this occurrence, Super T Aviation made several changes to its Piper Navajo SOPs, QRH, and normal procedures checklist for the aircraft, and submitted them to Transport Canada. These changes included the following:

- A step has been added to set a timer when the outboard tanks are selected.
- The step to switch from the outboard tanks to the inboard tanks has been moved from the before landing checklist to the descent checklist on the company-generated normal procedures checklist.
- Guidance on procedures for accepting runway changes has been added to the company SOPs.
- More detail on aircraft evacuation procedures has been added to the SOPs.
- Enhanced procedures on preparing passengers for an emergency landing have been added to the SOPs.
- Tabs have been added to the QRH pages to facilitate quick procedure identification.
- More detail on procedures for rough-running engines has been added to the SOPs and a rough-running engine checklist has been added to the QRH.

Additionally, the training syllabus for new crewmembers and the company's emergency response plan have been amended, and an industry-supplied course on fatigue management and human factors has been scheduled.

The preceding were excepts from the TSB's limited-scope investigation into this occurrence. The Board authorized the release of its investigation report on July 25, 2018. It was officially released August, 9, 2018. ■

Aviation Services

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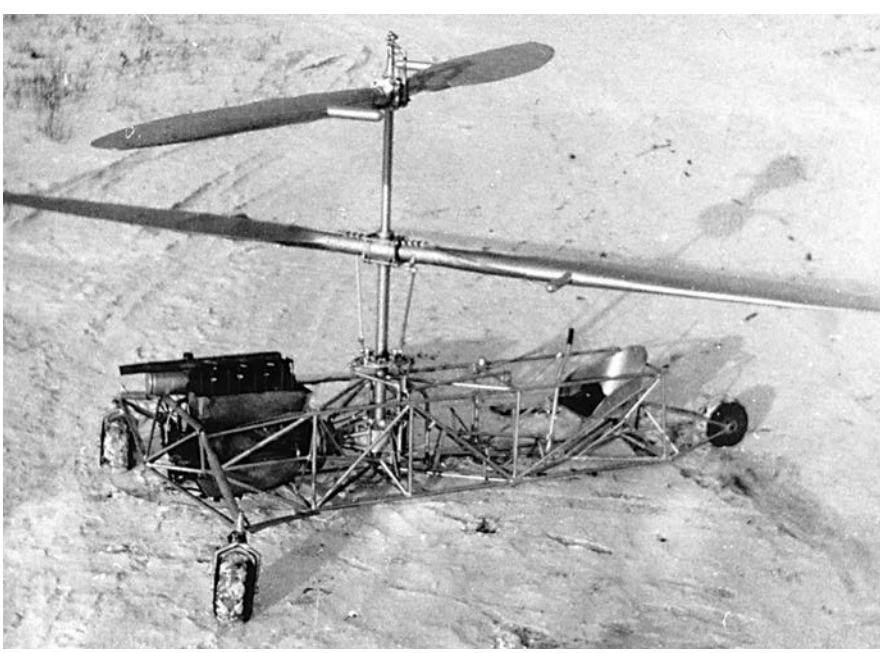
The Flying Froebe Brothers

As a rather small community in Manitoba celebrated its centenary this summer, a large but nearly forgotten incident in the history of Canadian aviation was brought back to life. Here's the story of three mechanically curious farm boys.

Before Sikorsky came the Froebe Brothers, whose remarkable story was retold this summer when Homewood, Manitoba celebrated its 100th anniversary in July. It was here in the 1930s that Canada's first helicopter (the Froebe Helicopter) was designed and built by the three brothers on their farm near Homewood, 65 kilometres southwest of Winnipeg.

As some of Canada's pioneers of home-built aircraft Doug, Theodore, and Nicholas Froebe had a keen interest in flight and engines, and started their experiments by constructing a Heath Parasol home-built aeroplane in 1927. Shortly after, they began working on vertical flight.



Gathering whatever information they could find, the brothers bought a used aircraft engine, constructed a frame from aircraft grade steel tubing, and made or purchased other parts as they were needed. (Mechanics will recognize parts from automobiles and farm machinery.)

The helicopter was well designed and constructed with cyclic, collective, and throttle controls, all being manipulated by both hands. The contra-rotating rotor blades were made of stainless steel covered by fabric, and powered by a 98-horsepower four-cylinder in-line air-cooled de Havilland Gipsy engine.

Total flying time for the machine was four hours and five minutes, made in a number of short test flights. Its flight was marred by severe vibration and a shortage of power. The flight logbook indicated that the best flights were made in the dense, cold air of winter.

Throughout the 1940s, the Froebe brothers continued to modify their experimental design and made efforts to sell their concept to Canadian and American interests but gradually, they realized that more viable production helicopters rolling out of factories such as Bell and Sikorsky companies doomed any hope of commercial or military contracts.

The Froebe brothers did not apply for a patent, with their helicopter being largely forgotten. Their original machine was discovered in a granary on the Froebe farm intact except for the tires and donated by the Froebe family to the Western Canada Aviation Museum.

(With files from the Royal Aviation Museum of Western Canada)

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